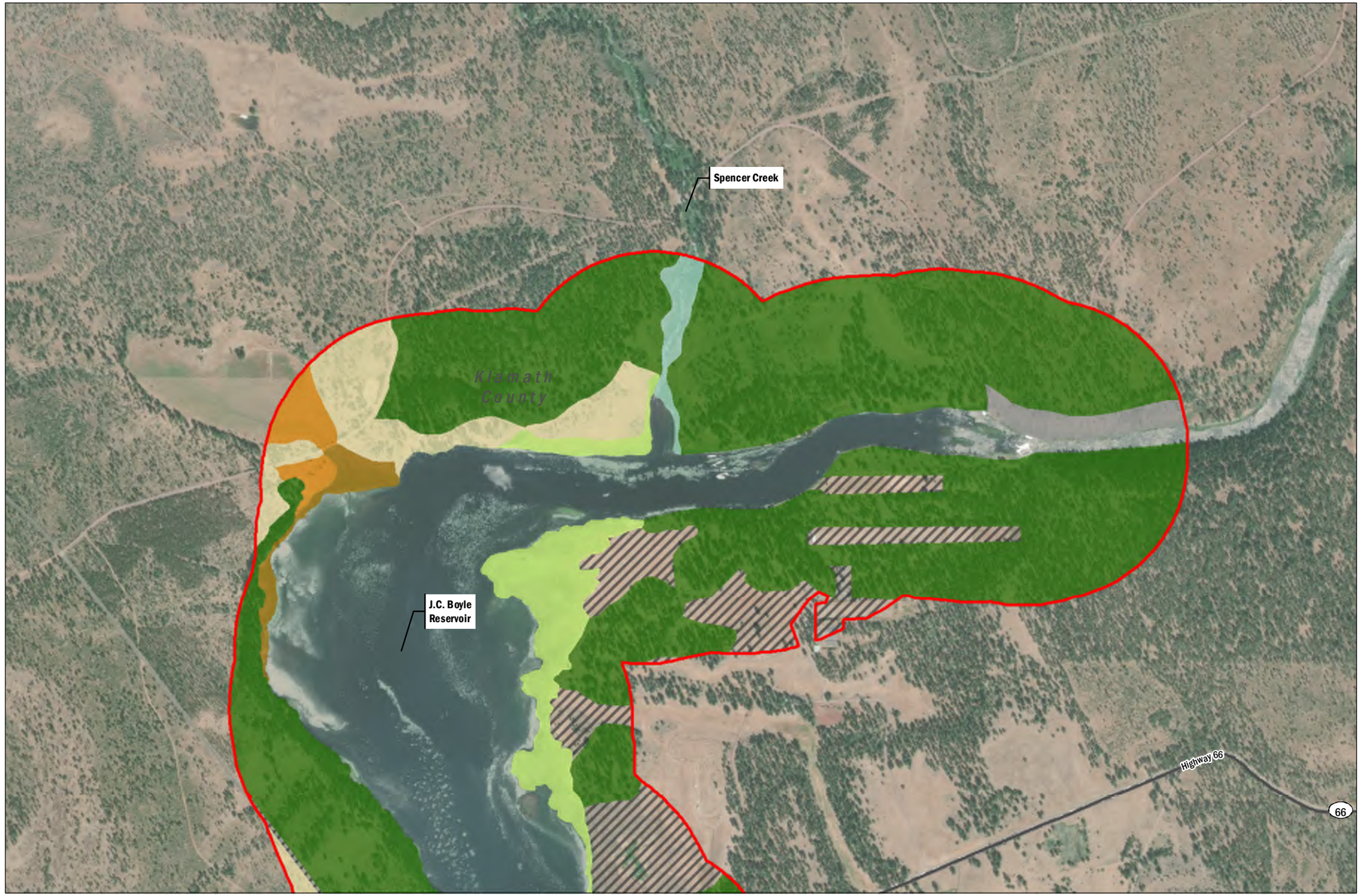
LEGEND

- Access Route
- State
- County
- Stream
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Geyer willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



N

0 0.5 Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation
Klamath River Renewal Project

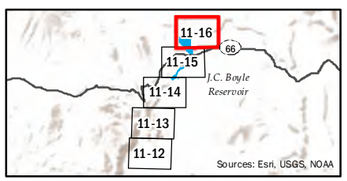


FIGURE 11-16

Vegetation Communities
JC Boyle Reservoir

N

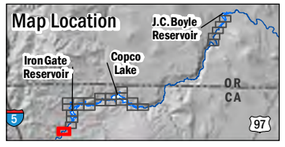
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

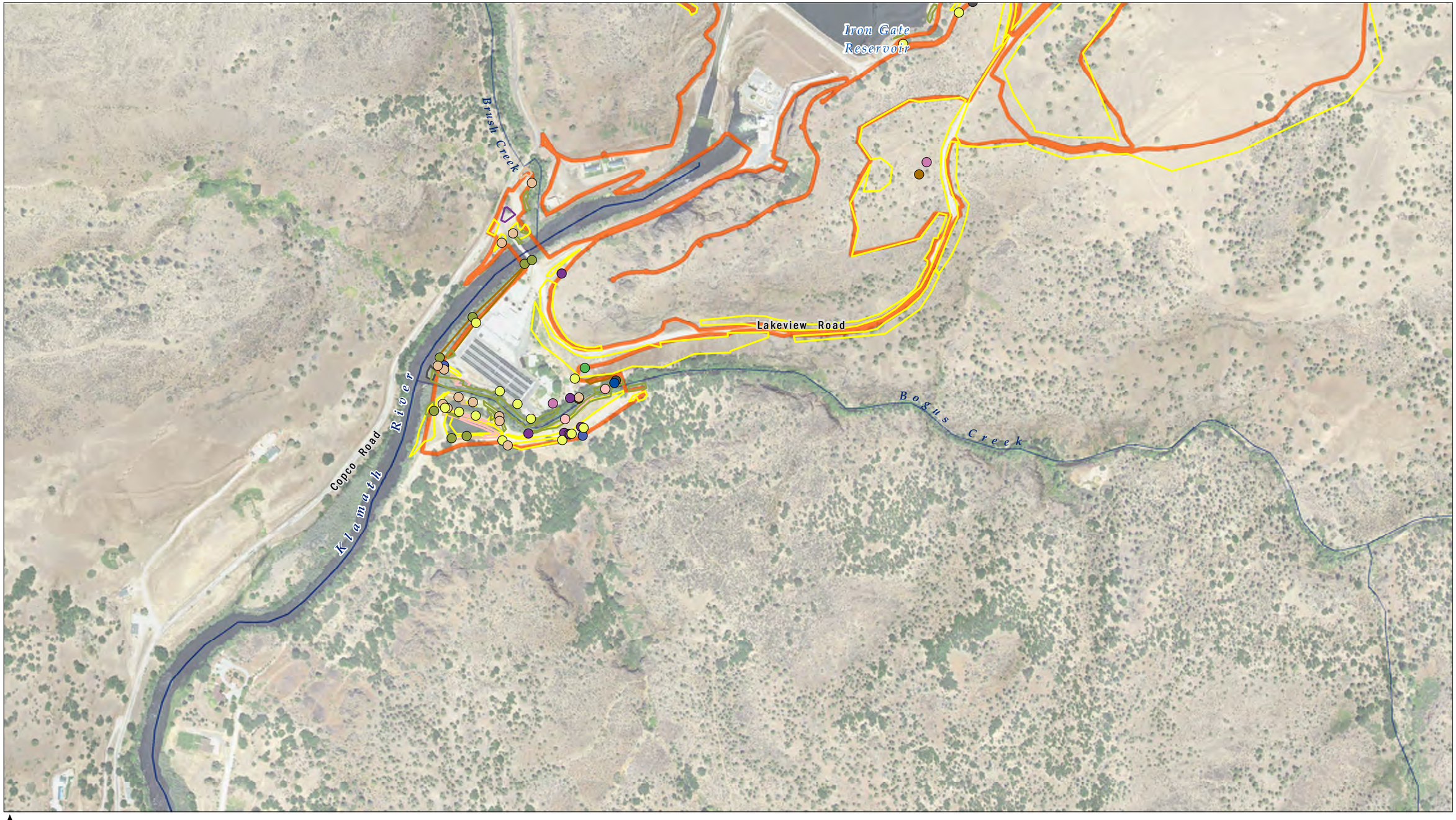


Klamath River
Streams
Limits of Work

Species - Surveyed Point
Convolvulus arvensis

Species - Surveyed Polygon
Centaurea solstitialis
Convolvulus arvensis
Dipsacus fullonum
Rubus armeniacus
Tribulus terrestris

FIGURE 12-1
Invasive Exotic Vegetation Observations



N

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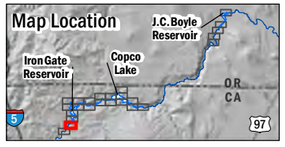
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

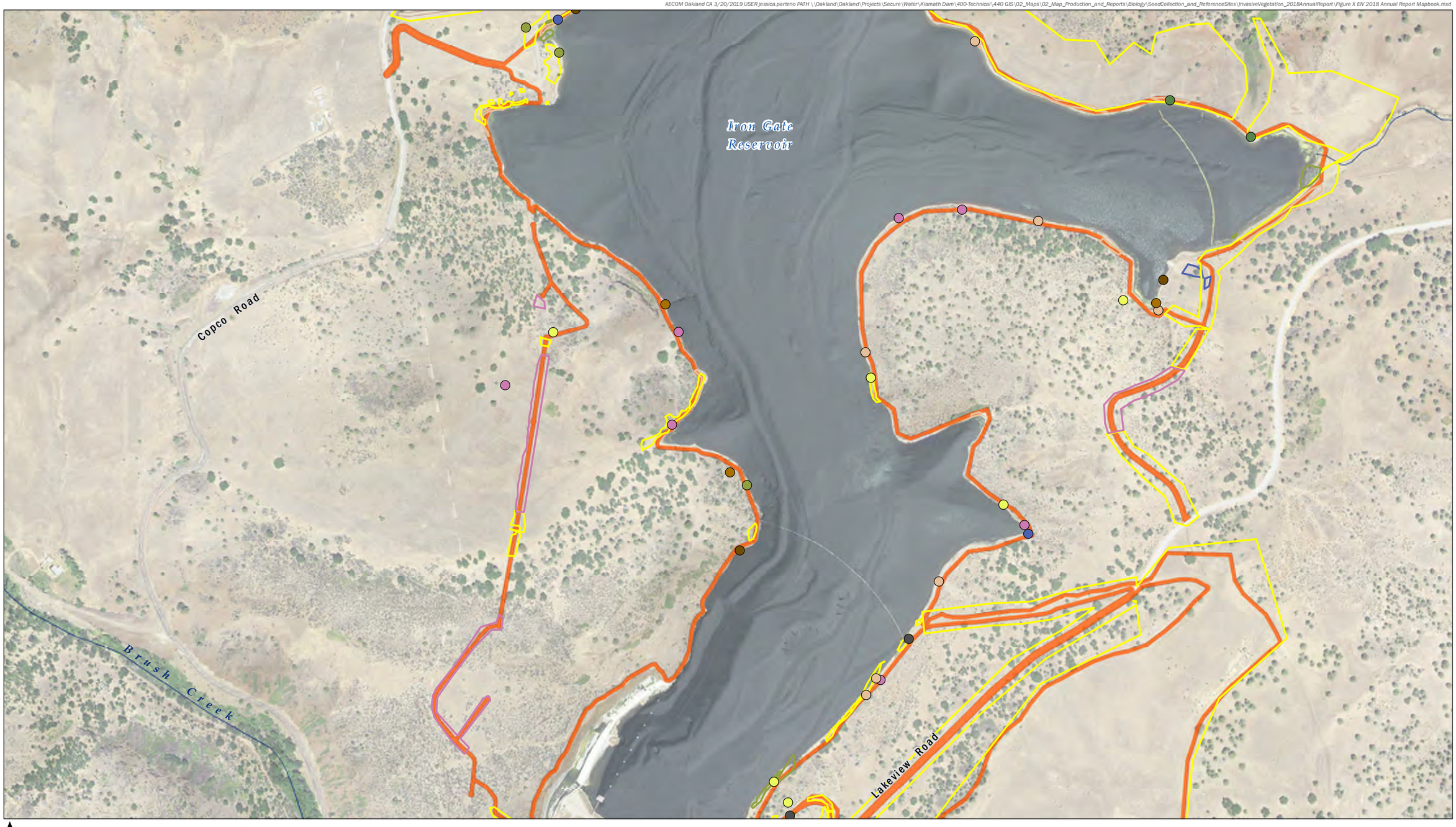


- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Bromus tectorum
- Centaurea solstitialis
- Convolvulus arvensis
- Dipsacus fullonum
- Elymus caput-medusae
- Isatis tinctoria
- Phalaris arundinacea
- Rubus armeniacus
- Tribulus terrestris
- Cirsium vulgare
- Conium maculatum
- Lepidium draba

Species - Surveyed Polygon
- Bromus tectorum
- Centaurea solstitialis
- Dipsacus fullonum
- Rubus armeniacus
- Tribulus terrestris
- Conium maculatum
- Lepidium draba

FIGURE 12-2
Invasive Exotic Vegetation Observations



N

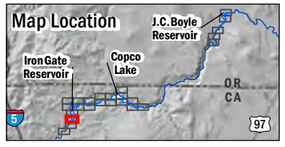
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

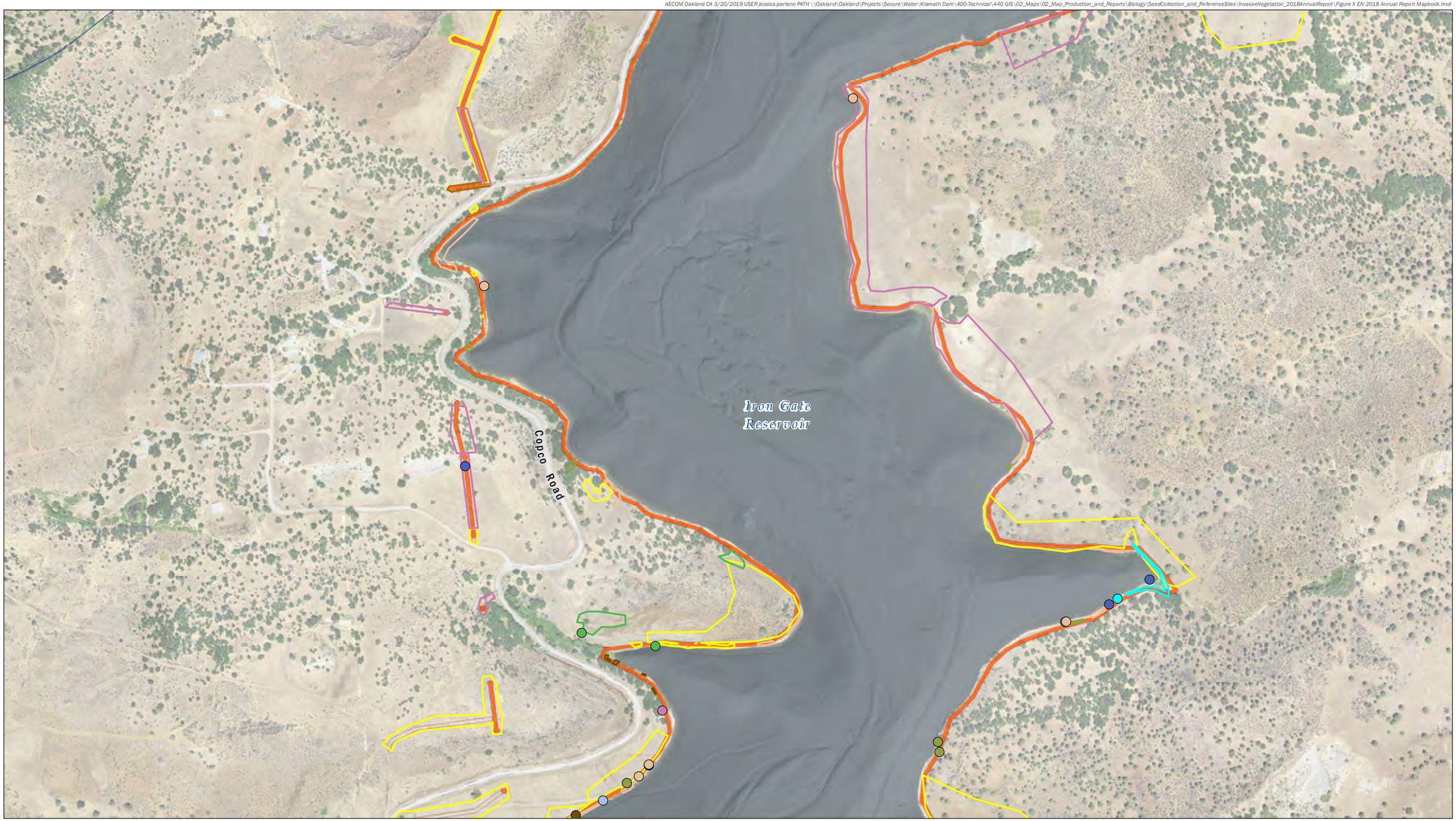


- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Bromus tectorum
- Centaurea solstitialis
- Convolvulus arvensis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus
- Lepidium draba
- Mentha pulegium

Species - Surveyed Polygon
- Bromus tectorum
- Centaurea solstitialis
- Convolvulus arvensis
- Dipsacus fullonum
- Elymus caput-medusae
- Rubus armeniacus

FIGURE 12-3
Invasive Exotic Vegetation Observations



N

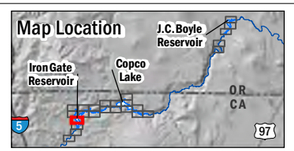
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



Klamath River
Streams
Limits of Work

Species - Surveyed Point
- Convolvulus arvensis
- Dipsacus fullonum
- Elymus caput-medusae
- Isatis tinctoria
- Linaria vulgaris
- Phalaris arundinacea
- Rubus armeniacus
- Xanthium spinosum

Species - Surveyed Polygon
- Bromus tectorum
- Centaurea solstitialis
- Dipsacus fullonum
- Elymus caput-medusae
- Isatis tinctoria
- Phalaris arundinacea
- Rubus armeniacus
- Xanthium spinosum

FIGURE 12-4
Invasive Exotic Vegetation Observations

N

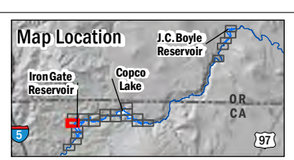
0 1,000
Feet

DATA SOURCE:
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION:
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Bromus tectorum
- Dipsacus fullonum
- Elymus caput-medusae
- Mentha pulegium

Species - Surveyed Polygon
- Centaurea solstitialis
- Dipsacus fullonum
- Rubus armeniacus

FIGURE 12-5

Invasive Exotic Vegetation Observations

N

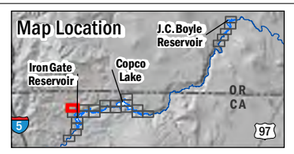
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



Klamath River
Streams
Limits of Work

Species - Surveyed Point
- Bromus tectorum
- Dipsacus fullonum
- Phalaris arundinacea
- Tribulus terrestris

Species - Surveyed Polygon
- Centaurea solstitialis
- Dipsacus fullonum
- Rubus armeniacus
- Tribulus terrestris
- Conium maculatum

FIGURE 12-6
Invasive Exotic Vegetation Observations

N

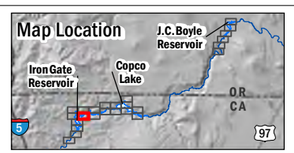
0 1,000
Feet

DATA SOURCE:
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION:
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Centaurea solstitialis
- Phalaris arundinacea
- Rubus armeniacus

Species - Surveyed Polygon
- Centaurea solstitialis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus
- Xanthium spinosum

FIGURE 12-7

Invasive Exotic Vegetation Observations

N

0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

Map Location
J.C. Boyle Reservoir
Iron Gate Reservoir
Copco Lake
OR
CA
5
97

- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Centaurea solstitialis
- Dipsacus fullonum
- Isatis tinctoria
- Phalaris arundinacea

Species - Surveyed Polygon
- Centaurea solstitialis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea

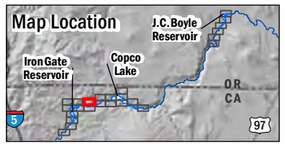
FIGURE 12-8
Invasive Exotic Vegetation Observations

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Dipsacus fullonum
- Phalaris arundinacea

Species - Surveyed Polygon
- Bromus tectorum
- Centaurea solstitialis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus

FIGURE 12-9

Invasive Exotic Vegetation Observations

N

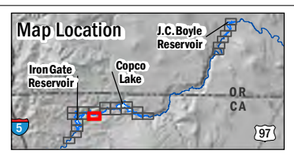
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



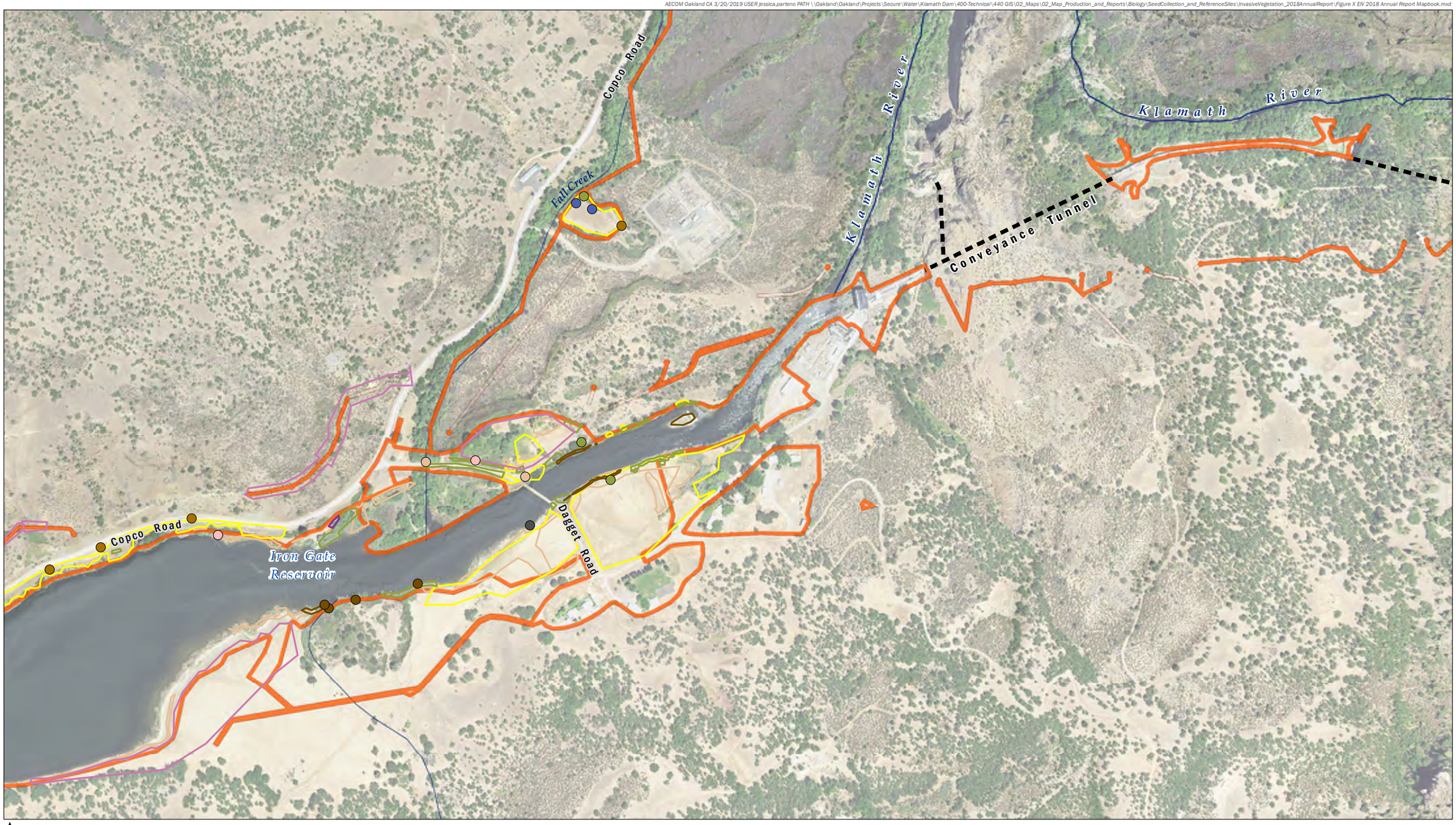
- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Lepidium draba

Species - Surveyed Polygon
- Centaurea solstitialis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus

FIGURE 12-10

Invasive Exotic Vegetation Observations



N

0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

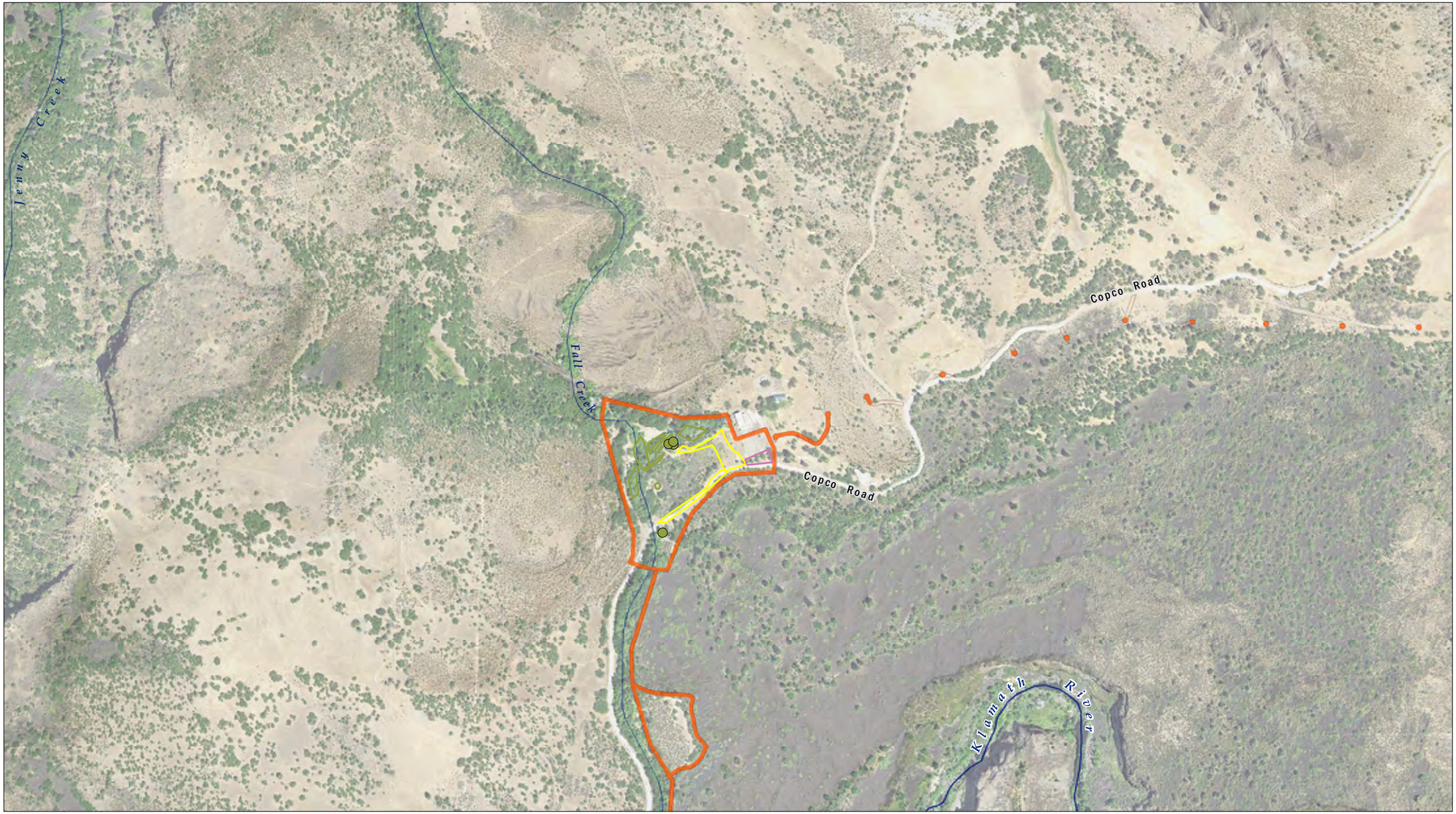
Map Location
J.C. Boyle Reservoir
Iron Gate Reservoir
Copco Lake
OR
CA
5
97

Klamath River
Streams
Limits of Work

Species - Surveyed Point
Bromus tectorum
Convolvulus arvensis
Dipsacus fullonum
Phalaris arundinacea
Rubus armeniacus
Conium maculatum
Lepidium draba

Species - Surveyed Polygon
Centaurea solstitialis
Dipsacus fullonum
Elymus caput-medusae
Phalaris arundinacea
Rubus armeniacus
Tribulus terrestris
Conium maculatum

FIGURE 12-11
Invasive Exotic Vegetation Observations



0 1,000
Feet

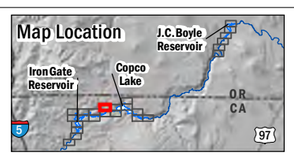
N

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



Klamath River
Streams
Limits of Work

Species - Surveyed Point
Rubus armeniacus

Species - Surveyed Polygon
Centaurea solstitialis
Elymus caput-medusae
Rubus armeniacus

FIGURE 12-12
Invasive Exotic Vegetation Observations

N

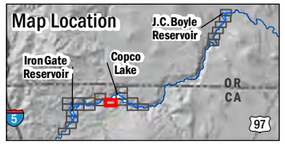
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Bromus tectorum
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus
- Cirsium vulgare

Species - Surveyed Polygon
- Dipsacus fullonum
- Elymus caput-medusae
- Rubus armeniacus

FIGURE 12-13
Invasive Exotic Vegetation Observations

N

0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

Map Location
J.C. Boyle Reservoir
Iron Gate Reservoir
Copco Lake
OR
CA
5
97

Klamath River
Streams
Limits of Work

Species - Surveyed Point
Dipsacus fullonum
Phalaris arundinacea
Rubus armeniacus
Cirsium vulgare

Species - Surveyed Polygon
Bromus tectorum
Centaurea solstitialis
Dipsacus fullonum
Rubus armeniacus

FIGURE 12-14
Invasive Exotic Vegetation Observations

N

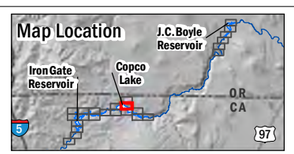
0 1,000
Feet

DATA SOURCE:
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION:
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

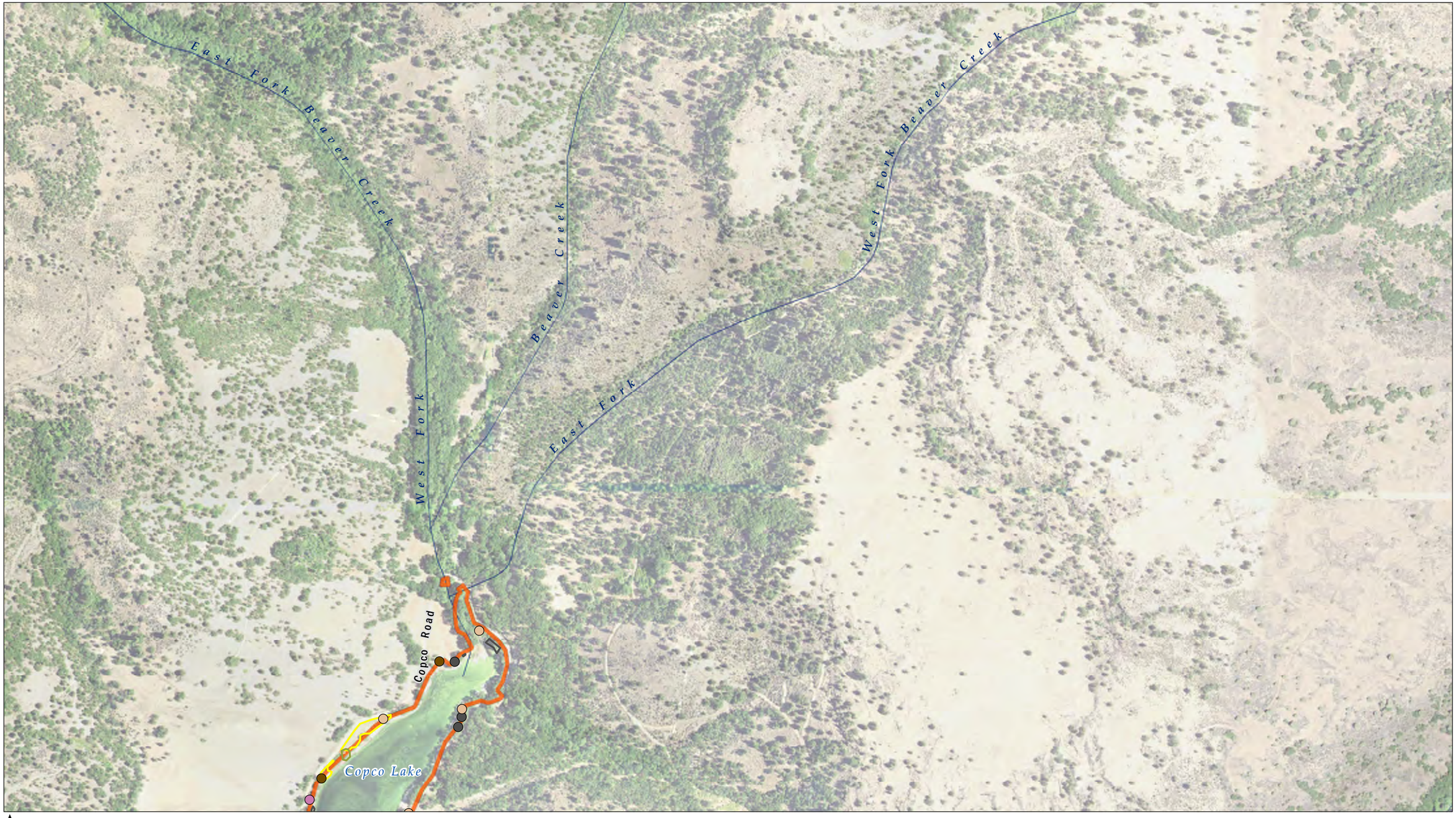


- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Bromus tectorum
- Centaurea solstitialis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus
- Lepidium draba

Species - Surveyed Polygon
- Bromus tectorum
- Centaurea solstitialis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus
- Lepidium draba

FIGURE 12-15
Invasive Exotic Vegetation Observations



N

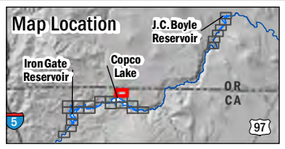
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Lepidium draba

Species - Surveyed Polygon
- Centaurea solstitialis
- Dipsacus fullonum
- Rubus armeniacus
- Lepidium draba

FIGURE 12-16
Invasive Exotic Vegetation Observations

N

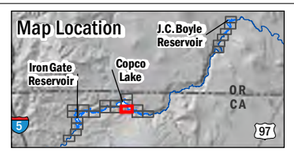
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Carduus nutans
- Bromus tectorum
- Centaurea solstitialis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus
- Cirsium vulgare
- Lepidium draba

Species - Surveyed Polygon
- Bromus madritensis ssp. rubens
- Centaurea solstitialis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus
- Lepidium draba

FIGURE 12-17
Invasive Exotic Vegetation Observations

N

0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

Map Location
J.C. Boyle Reservoir
Iron Gate Reservoir
Copco Lake
OR
CA
5
97

Klamath River
Streams
Limits of Work

Species - Surveyed Point
Bromus madritensis ssp. rubens
Bromus tectorum
Centaurea solstitialis
Dipsacus fullonum
Elymus caput-medusae
Phalaris arundinacea
Rubus armeniacus
Conium maculatum

Species - Surveyed Polygon
Bromus madritensis ssp. rubens
Centaurea solstitialis
Dipsacus fullonum
Elymus caput-medusae
Phalaris arundinacea
Rubus armeniacus
Lepidium draba

FIGURE 12-18
Invasive Exotic Vegetation Observations

N

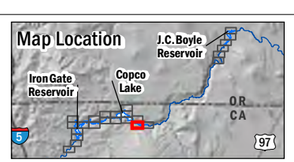
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

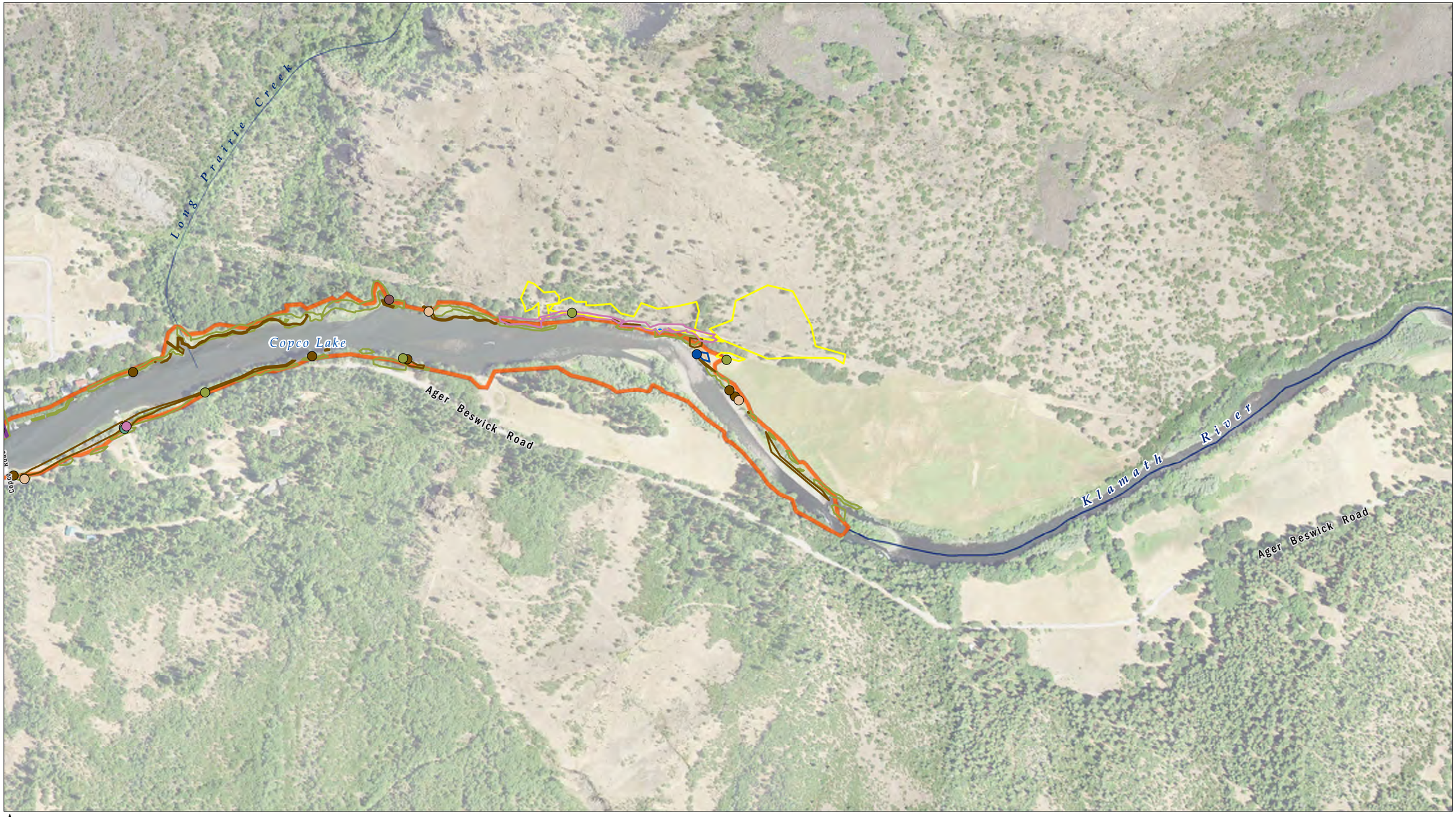


Klamath River
Streams
Limits of Work

Species - Surveyed Point
Centaurea solstitialis
Dipsacus fullonum
Elymus caput-medusae
Phalaris arundinacea
Rubus armeniacus
Bromus diandrus
Conium maculatum
Marrubium vulgare

Species - Surveyed Polygon
Centaurea solstitialis
Dipsacus fullonum
Elymus caput-medusae
Phalaris arundinacea
Rubus armeniacus
Tribulus terrestris
Conium maculatum

FIGURE 12-19
Invasive Exotic Vegetation Observations



N

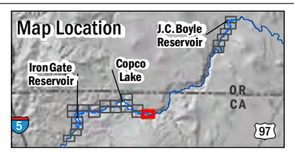
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



Klamath River
Streams
Limits of Work

Species - Surveyed Point
- Carduus nutans
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus
- Bromus diandrus
- Cirsium vulgare
- Conium maculatum
- Marrubium vulgare

Species - Surveyed Polygon
- Centaurea solstitialis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Rubus armeniacus
- Tribulus terrestris
- Aegilops cylindrica
- Cirsium vulgare

FIGURE 12-20
Invasive Exotic Vegetation Observations

N

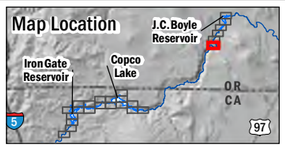
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

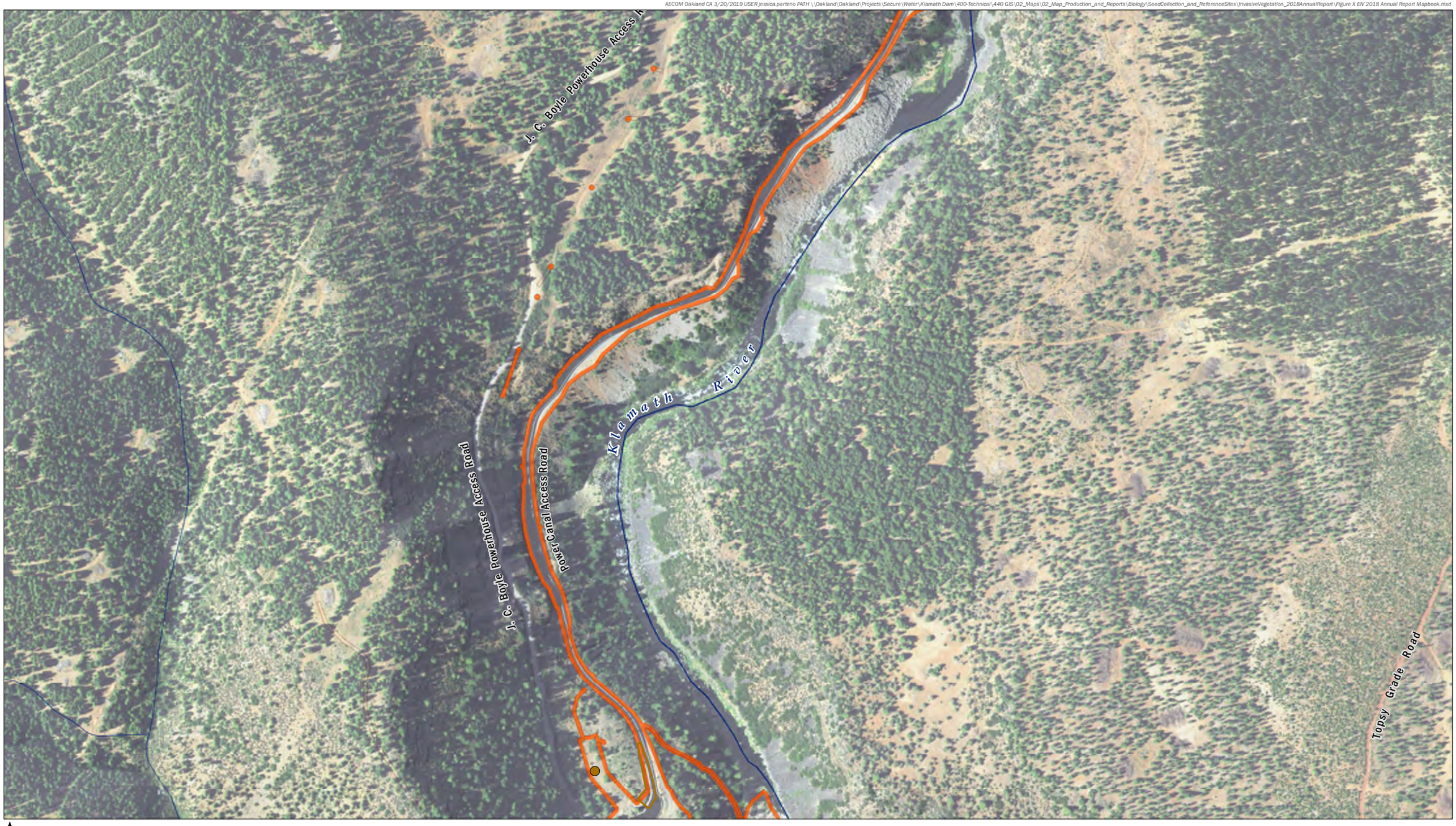


- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Centaurea solstitialis

Species - Surveyed Polygon
- Bromus tectorum
- Centaurea solstitialis
- Elymus caput-medusae
- Phalaris arundinacea

FIGURE 12-21
Invasive Exotic Vegetation Observations



N

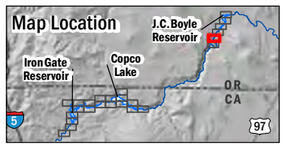
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



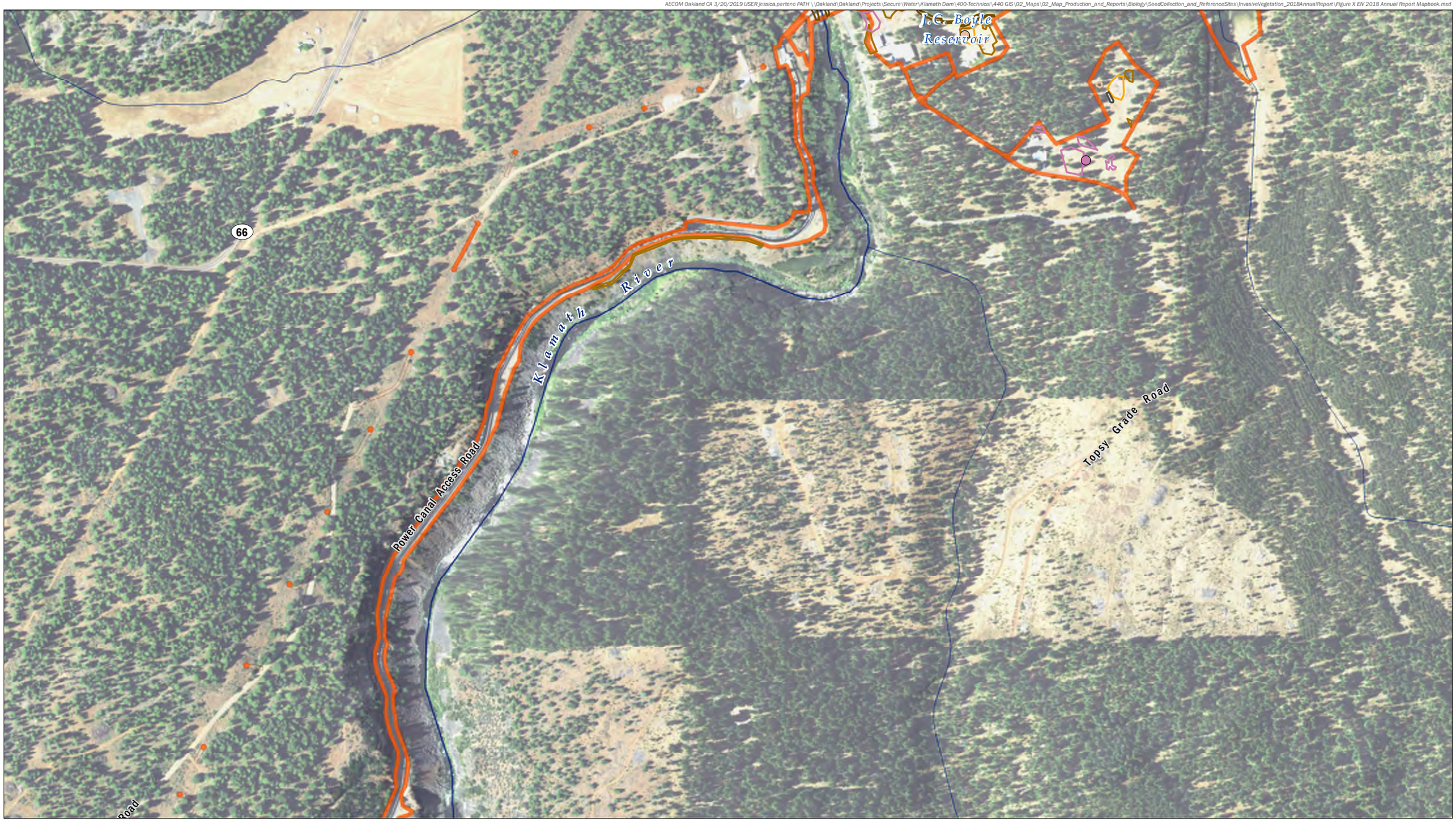
Klamath River
Streams
Limits of Work

Species - Surveyed Point
Bromus tectorum

Species - Surveyed Polygon
Bromus tectorum

FIGURE 12-22

Invasive Exotic Vegetation Observations



N

0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

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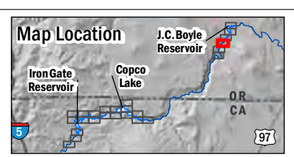
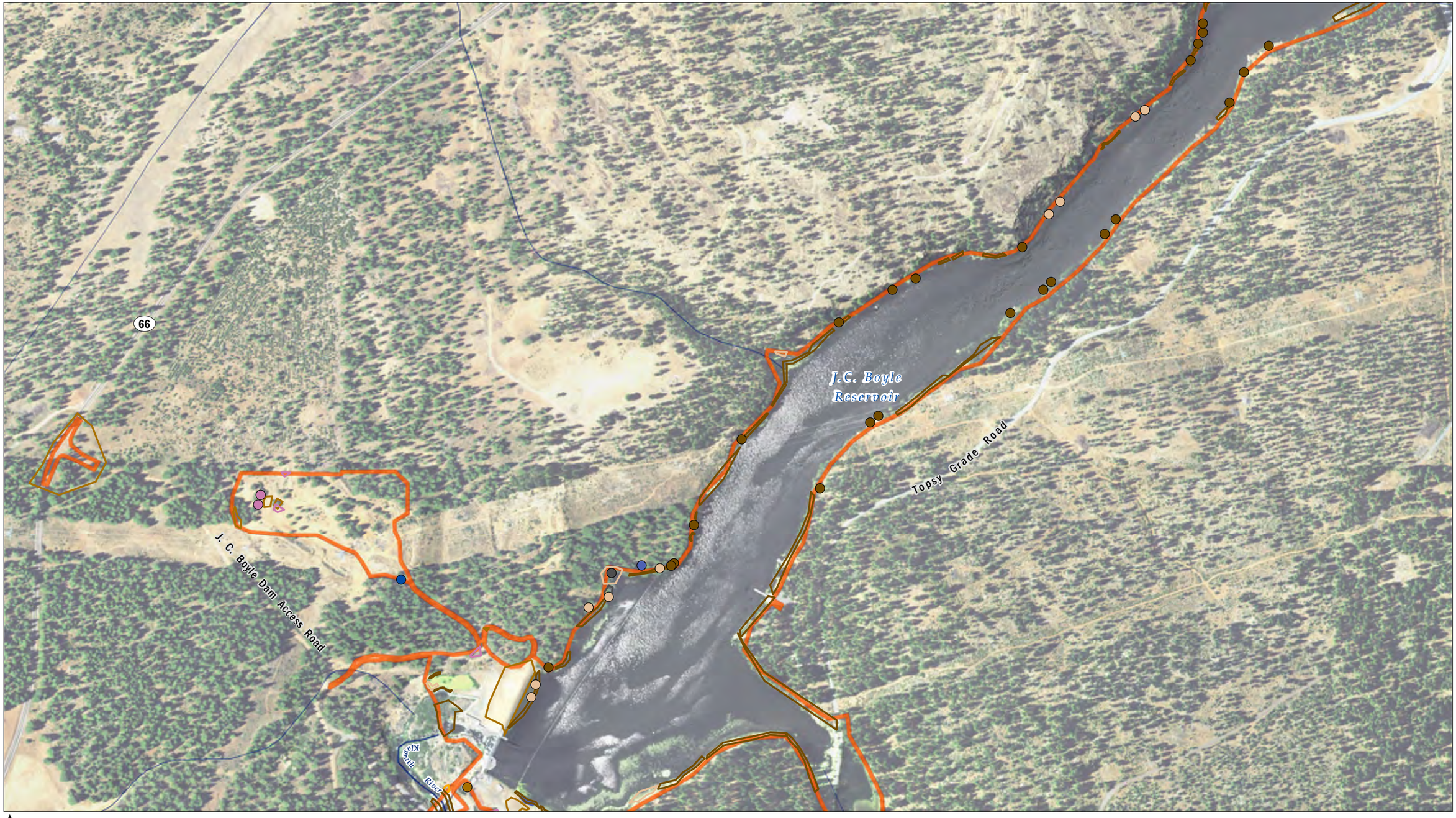


- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Dipsacus fullonum
- Elymus caput-medusae

Species - Surveyed Polygon
- Onopordum acanthium
- Bromus tectorum
- Convolvulus arvensis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Lepidium draba

FIGURE 12-23
Invasive Exotic Vegetation Observations



N

0 1,000
Feet

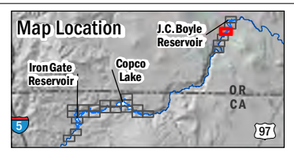
DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

Map Location



- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Bromus tectorum
- Convolvulus arvensis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Cirsium vulgare
- Lepidium draba

Species - Surveyed Polygon
- Onopordum acanthium
- Bromus tectorum
- Convolvulus arvensis
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Lepidium draba

FIGURE 12-24
Invasive Exotic Vegetation Observations

N

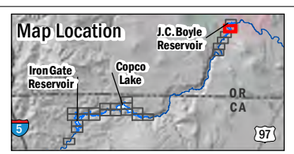
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Bromus tectorum
- Dipsacus fullonum
- Phalaris arundinacea
- Cirsium vulgare
- Lepidium draba

Species - Surveyed Polygon
- Bromus tectorum
- Dipsacus fullonum
- Phalaris arundinacea
- Rubus armeniacus

FIGURE 12-25
Invasive Exotic Vegetation Observations

N

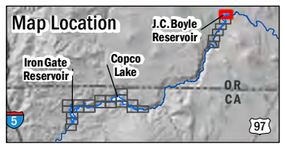
0 1,000
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 3/20/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project



- Klamath River
- Streams
- Limits of Work

Species - Surveyed Point
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Cirsium vulgare
- Hypericum perforatum
- Lepidium draba

Species - Surveyed Polygon
- Dipsacus fullonum
- Elymus caput-medusae
- Phalaris arundinacea
- Cirsium vulgare
- Lepidium draba

FIGURE 12-26
Invasive Exotic Vegetation Observations

Appendix B Northern Spotted Owl Survey Data Sheets

Visit 1: April 24-25, 2018

Surveyor(s): Lidia D'Amico, AECOM; Jennifer Jones, CDM Smith

4/24/2018 Klamath Dam NSO Detection Surveys Weather: 68 F, partly cloudy, 0-5mph wind NE				
Station	Begin Time	End Time	NSO Detection	Notes
5	20:43	20:53	No	Canada Geese heard calling from reservoir
4	21:15	21:25	No	
7	21:40	21:50	No	
14	22:00	22:10	No	Bats heard
16	22:19	22:30	No	Heard frogs and bats
15	22:36	22:46	No	Bat species flyover
18	22:52	23:02	No	
17	23:10	23:20	No	Site adjacent to the Klamath River, ambient noise from river

4/25/2018 Klamath Dam NSO Detection Surveys Weather: 64 F, clear, 0-4 mph wind WNW				
Station	Begin Time	End Time	NSO Detection	Notes
8	20:35	20:45	No	Bat species flyover
12	21:00	21:10	No	Surveyed from edge of stand, walked into area approximately 260 feet from access road.
6	21:25	21:35	No	Site adjacent to off-site recreation area; bonfire pit.
10	21:40	21:50	No	Performed outside of Pacificorp Property; stood at edge of boundary. Saw raccoons
11	22:02	22:12	No	Great-horn owl detected
9	22:35	22:45	No	
13	22:55	23:05	No	

Note: Did not survey stations located on PacifiCorp property (Stations 1 and 3) due to lack of access agreement. Unable to access proposed Station 2 (west of dam); station is behind fence on private property.

NSO Survey Data Sheet

NSO Detection?	**Y**	**N**
BAOW Detection:	**Y**	**N**

Date: 5/29/2018 **Site Name:** J.C. Boyle Dam
Surveyor(s): Jennifer Jones, Kent Barnes **Visit #:** 2 **Outing #** 1
Weather *(circle one)*: Precipitation: *None* *Trace* *Drizzle* *Light* *Heavy* *Snow*
Cloud cover: *Clear* *Partly/Cloudy* *Overcast* *Fog*
Moon phase: *Full* *Half* *Quarter* *None*
Wind: 0 1 2 3 4 5 Temp: 54 Rain In prior 24hrs: YES NO
Type of Survey: ACS SC CC FO RV AV OPP
ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit*. *AV=Additional Visit*. *OPP=Opportunistic Sitting*

Call Point	**Start Time**	**End Time**	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	Response
17	2107	2119	Chorus Frogs	NR
18	2128	2140	Quiet	NR
15	2150	2200		NR
16	2210	2221	Chorus Frogs	NR
14	2229	2241	Crickets	NR
7	2250	2303	Unidentified Raptor call	NR
11	2318	2334	Great Horned Owl very distant Coyote vocalizations toward reservoir	NR
10	2341	2358	Second group of coyote vocalizations off toward the East	NR
5	2410	2421		NR

NSO Survey Data Sheet

NSO Detection?	**Y**	**N**
BAOW Detection:	**Y**	**N**

Date: 5/30/2018 **Site Name:** J.C. Boyle Dam Site
Surveyor(s): Jennifer Jones, Kent Barnes **Visit #:** 2 **Outing #** 2
Weather *(circle one)*: Precipitation: *None* *Trace* *Drizzle* *Light* *Heavy* *Snow*
Cloud cover: *Clear* *Partly/Cloudy* *Overcast* *Fog*
Moon phase: *Full* *Half* *Quarter* *None*
Wind: 0 1 2 3 4 5 Temp: 55 Rain In prior 24hrs: YES NO
Type of Survey: ACS SC CC FO RV AV OPP
ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit*. *AV=Additional Visit*. *OPP=Opportunistic Sitting*

Call Point	**Start Time**	**End Time**	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	**Response**
12	2106	2127	Great horned owl call before survey started—Quiet during	NR
8	2133	2146		NR
6			Did not call teenagers having campfire at survey station	NR
1	2222	2236	Human noise from campground across reservoir	NR
4	2250	2302	Fighter jet noise from base in Kfalls,	NR
9	2312	2325		NR
13	2331	2341		NR
3	2352	2403		NR

NSO Survey Data Sheet

NSO Detection?	**Y**	**N**
BAOW Detection:	**Y**	**N**

Date: 6/11/2018 **Site Name: J. C. Boyle Dam**
Surveyor(s): Kent Barnes, Jennifer Jones **Visit #: 3** **Outing # 1**
Weather *(circle one)*: Precipitation: *None* *Trace* *Drizzle* *Light* *Heavy* *Snow*
Cloud cover: *Clear* *Partly/Cloudy* *Overcast* *Fog*
Moon phase: *Waning Crescent*
Wind: 0 1 2 3 4 5 Temp: 62 f Rain In prior 24hrs: YES NO
Type of Survey: ACS SC CC FO RV AV OPP
ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit. AV=Additional Visit. OPP=Opportunistic Sitting*

Call Point	**Start Time**	**End Time**	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	**Response**
17	2116	2128	River noise	NR
18	2138	2149	Crickets and River noise	NR
15	2201	2212		NR
19	2220	2232	This is new point added on this date. Chorus frogs below us by weir.	NR
13	2240	2250	Quiet	NR
9	2258	2309	Quiet	NR
4	2319	2329	Great horned owl very distant, from the north- no bearing taken	NR
3	2341	2351	Quiet	NR
1	2400	2412	Great horned owls calling still distant but closer than before, possible pair. No bearing taken	NR

NSO Survey Data Sheet

NSO Detection?	**Y**	**N**
BAOW Detection:	**Y**	**N**

Date: 6/12/2018 **Site Name: J. C. Boyle Dam**
Surveyor(s): Kent Barnes, Jennifer Jones **Visit #: 3** **Outing # 2**
Weather *(circle one)*: Precipitation: *None* *Trace* *Drizzle* *Light* *Heavy* *Snow*
Cloud cover: *Clear* *Partly/Cloudy* *Overcast* *Fog*
Moon phase: *Waning Crescent*
Wind: 0 1 2 3 4 5 Temp: 60 f Rain In prior 24hrs: YES NO
Type of Survey: ACS SC CC FO RV AV OPP
ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit. AV=Additional Visit. OPP=Opportunistic Sitting*

Call Point	**Start Time**	**End Time**	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	**Response**
8	2115	2127	Nighthawks calling and diving prior to and throughout survey. Osprey call from cliffs over the Klamath River just after survey ended	NR
12	2142	2152	Quiet	NR
6	2205	2219	Quiet	NR
10	2227	2239	Unknown owl contact call (not *strix*) Possible great horned owl. Bearing 300°. Follow up survey should occur.	NR
11	2255	2306	Quiet	NR
7	2322	2333	River noise	NR
14	2342	2352	Crickets	NR
16	2402	2415	Chorus frogs	NR
5	2434	2446	Quiet	NR

NSO Survey Data Sheet

NSO Detection?	**Y**	**N**
BAOW Detection:	**Y**	**N**

Date: 6/13/2018 **Site Name: J. C. Boyle Dam**

Surveyor(s): Kent Barnes, Jennifer Jones **Visit #: 3** **Outing # 2**

Weather *(circle one)*: Precipitation: *None* *Trace* *Drizzle* *Light* *Heavy* *Snow*

Cloud cover: *Clear* *Partly/Cloudy* *Overcast* *Fog*

Moon phase: *New*

Wind: 0 1 2 3 4 5 Temp:_____ Rain In prior 24hrs: YES NO

Type of Survey: ACS SC CC FO RV AV OPP

ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit. AV=Additional Visit. OPP=Opportunistic Sitting*

Call Point	**Start Time**	**End Time**	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	**Response**
10	1015	1115	Research indicated that our detection the evening before most likely had been a female great horned owl protecting a nest. This follow up survey was conducted to search for this nest. We proceeded from call station 10 and headed Northwest in the general direction of the owl call from the previous night. We used NSO electronic calls in an attempt to solicit a response. We called with 2-3 minute duration approximately every 10 minutes. While conducting our stand search we found no structure, whitewash, feathers, or pellets indicative of nesting owls. While returning to our vehicles Jennifer visually located a fledgling great horned owl. Downy feathers were still visible but the fledgling appeared to have flight capabilities.	

NSO Survey Data Sheet

NSO Detection?	**Y**	**N**
BAOW Detection:	**Y**	**N**

Date: 7/13/18 Site Name: J. C. Boyle Dam
Surveyor(s): Mathew Petty, Kent Barnes Visit #: 4 Outing # 1
Weather *(circle one)*: Precipitation: *None* *T race* *Drizzle* *Light* *Heavy* *Snow*
Cloud cover: *Clear* *Partly/Cloudy* *Overcast* *Fog* Thunder Storms in Area
Moon phase: *Full* *Half* *Quarter* *None* New Moon
Wind: 0 1 2 3 4 5 Temp: 82 f Rain In prior 24hrs: YES NO
Type of Survey: ACS SC CC FO RV AV OPP
ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit. AV=Additional Visit. OPP=Opportunistic Sitting*

Call Point	**Start Time**	**End Time**	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	**Response**
10	2050	2102	Mourning doves in trees above station, great horned owl call	NR
6	2115	2128	Multiple bats	NR
12	2146	2156	Car noise on access road- no visual	NR
8	2215	2225	Osprey call very agitated by NSO calls, possible nest	NR
11	2243	2253		NR
5	2317	2329	Audible bat wing beats, truck noise	NR
3	2343	2354	Quiet	NR
1	2412	2423	Deer near call station, at least gave alarm call (snort)	NR
4	2444	2454	Quiet	NR

NSO Survey Data Sheet

NSO Detection? Y [N]
BAOW Detection: Y [N]

Date: 7/14/18 Site Name: J. C. Boyle Dam
Surveyor(s): Mathew Petty, Kent Barnes Visit #: 4 Outing # 2
Weather *(circle one)*: Precipitation: [*None*] *T race Drizzle Light Heavy Snow*
Cloud cover: *Clear* [*Partly/Cloudy*] *Overcast Fog*
Moon phase: *Full Half Quarter None* Waxing Crescent
Wind: [0 1 2] 3 4 5 Temp: 82 f Rain In prior 24hrs: YES [NO]
Type of Survey: ACS [SC] CC FO RV AV OPP
ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit. AV=Additional Visit. OPP=Opportunistic Sitting*

Call Point	**Start Time**	**End Time**	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	**Response**
17	2058	2110	Bats observed, river noise	NR
18	2122	2134	Quiet	NR
15	2146	2158	Quiet	NR
19	2212	2224	Matt heard movement in canopy, source unidentified	NR
13	2235	2247	Wood rat in bushes (visual)	NR
9	2254	2307	Motorcycles on Route 66, unidentified chirp after end of NSO calling (once)	NR
16	2316	2328	River noise	NR
14	2336	2347	Crickets	NR
17	2404	2415	Bull Frogs	NR

NSO Survey Data Sheet

NSO Detection? Y [N]
BAOW Detection: Y [N]

Date: 7/21/18 Site Name: J. C. Boyle Dam
Surveyor(s): Mathew Petty, Kent Barnes Visit #: 4 Outing # 2
Weather *(circle one)*: Precipitation: [*None*] *T race Drizzle Light Heavy Snow*
Cloud cover: *Clear Partly/Cloudy Overcast Fog* [Hazy Smoke]
Moon phase: *Full Half Quarter None* Saxing gibbous
Wind: [0 1] 2 3 4 5 Temp: 75 f Rain In prior 24hrs: YES [NO]
Type of Survey: ACS [SC] CC FO RV AV OPP
ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit. AV=Additional Visit. OPP=Opportunistic Sitting*

Call Point	Start Time	End Time	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	Response
17	2108	2119	One bat observation	NR
18	2127	2138	Quiet, night hawk call as finishing NSO calls	NR
15	2154	2206	Quiet	NR
19	2212	2223	Cricket Noise	NR
13	2229	2240	Electrical noise in overhead power lines	NR
9	2248	2259	Quiet	NR
4	2308	2319	Car stopped on Route 66, no visual	NR
3	2330	2340	Quiet	NR
1	2348	2358	Quiet	NR

NSO Survey Data Sheet

NSO Detection? Y [N]
BAOW Detection: Y [N]

Date: 7-22-18 Site Name: J. C. Boyle Dam
Surveyor(s): Jennifer Jones, Kent Barnes Visit #: 5 Outing # 2
Weather *(circle one)*: Precipitation: *[None]* *T race* *Drizzle* *Light* *Heavy* *Snow*
Cloud cover: *Clear* *Partly/Cloudy* *[Overcast]* *Fog* Thunder Storms in Area
Moon phase: *Full* *Half* *Quarter* *None* Waxing Gubbous
Wind: 0 [1 2] 3 4 5 Temp:_____ Rain In prior 24hrs: YES [NO]
Type of Survey: ACS [SC] CC FO RV AV OPP
ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit. AV=Additional Visit. OPP=Opportunistic Sitting*

Call Point	**Start Time**	**End Time**	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	**Response**
16	2101	2112	Bats observed, crickets	NR
14	2122	2133	Bats observed (one larger than others- big brown bat?)	NR
7	2145	2157	Quiet	NR
10	2208	2218	Quiet (No GHOW response)	NR
8	2235	2247	Osprey called back- less agitated than previous encounter at this location	NR
12	2304	2314	Quiet	NR
6	2330	2341	Quiet	NR
11	2354	2405	Quiet	NR
5	2421	2435	Coyotes, Bull Frogs, Unknown avian call- not strix	NR

NSO Survey Data Sheet

NSO Detection? Y [N]
BAOW Detection: Y [N]

Date: 8/8/2018 Site Name: J. C. Boyle Dam
Surveyor(s): Jennifer Jones, Kent Barnes Visit #: 6 Outing # 1
Weather *(circle one)*: Precipitation: [*None*] *T race Drizzle Light Heavy Snow*
Cloud cover: *Clear Partly/Cloudy* [*Overcast*] *Fog* Smokey conditions- low visibility
Moon phase: *Full Half Quarter* [*None*] Wanning Crescent
Wind: 0 [1 2] 3 4 5 Temp: 77 Rain In prior 24hrs: YES [NO]
Type of Survey: ACS [SC] CC FO RV AV OPP
ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit. AV=Additional Visit. OPP=Opportunistic Sitting*

Call Point	Start Time	End Time	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	Response
5	2026	2038	Cattle lowing, nighthawks overhead, motorcycles on road, mule deer at call station, unknown raptor call.	NR
			While in-route from station 5 to station 7, we made visual encounter of owl flying across the road. We stopped and used NSO call to try and solicit a response, I heard one call from GHOW very distant, this was not confirmed by Jennifer. Call duration was about 5 minutes.	NR
7	2109	2120	Crickets, Quiet	NR
14	1933	1951	Batteries in the digital caller died mid-way through survey. Extended survey to compensate. Quiet.	NR
16	2200	2211	Very dark, smoke blocking stars, low visibility.	NR
15	2217	2228	River noise	NR
18	2237	2248	Quiet, river noise	NR
17	2258	2309	Quiet	NR
19	2319	2330	Crickets	NR
13	2337	2347	Powerline buzz	NR
9	2355	245	Quiet	NR

NSO Survey Data Sheet

NSO Detection? Y [N]
BAOW Detection: Y [N]

Date: 8/9/2018 Site Name: J. C. Boyle Dam
Surveyor(s): Jennifer Jones, Kent Barnes Visit #: 6 Outing # 2
Weather *(circle one)*: Precipitation: [*None*] *T race Drizzle Light Heavy Snow*
Cloud cover: *Clear Partly/Cloudy Overcast Fog* Smoky, low visibility
Moon phase: *Full Half Quarter* [*None*] Wanning gibbour
Wind: [0 1 2] 3 4 5 Temp: 85 Rain In prior 24hrs: YES [NO]
Type of Survey: ACS [SC] CC FO RV AV OPP
ACS=*Activity Center Search*. SC=*Station calling*. CC=*Continuous Calling*. FO=*Follow Up Outing*. RV=*Reproductive Visit. AV=Additional Visit. OPP=Opportunistic Sitting*

Call Point	**Start Time**	**End Time**	**Results:** *spp., Sex, Direction from Surveyor, UTM's, waypoint name.*	**Response**
4	2030	2041	Cattle lowing to north, vehicles on HWY 66, Robin Call	NR
3	2050	2101	Quiet, one visual-small boat	NR
1	2113	2126	Cattle lowing, motorcycles on HWY 66, single hoot non-strix possible GHOW	NR
	2143	2150	Turtle crews notified us of an incidental owl detection they made north of the Topsy campground, possible strix. We stopped and used the digital caller, with both NSO and BDOW calls, we heard no response.	NR
11	2201	2213	Cattle lowing, visual detection of GHOW, flew in and sat on branch approximately 20 meters from the call station. It made no calls.	NR
8	2235	2247	Quiet, Crickets	NR
12	2305	2316	Crickets	NR
6	2333	2345	Quiet	NR
10	2355	2404	Quiet	NR

Appendix C Western Pond Turtle Trapping Study Summary Data and Photographs

Summary of 2018 J.C. Boyle Western Pond Turtle Trapping Events

Date	Night	Site	# of traps	# of traps that caught turtles	# turtles captured	# transmitters applied
8/6	1	S	12	1	1	1
8/7	2	W	20	2	3	2
8/8	3	S	20	1	1	1
8/9	4	W	20	0	0	0
8/10	5	S	20	0	0	0
8/11	6	W	20	0	0	0
9/4	7	W, S, O	10	0	0	0
9/5	8	W, S, O	37*	2	5	4
9/6	9	W, S, O	42*	0	1**	0
	TOTALS		**201**	**4**	**11**	**8**

S – South
W – West
O – Other
*includes day and night trapping
**turtle caught by hand capture

Photo 1. Commercial opera-style crab trap used for turtle trapping

Photo 2. Side view of trap

Photo 3. Deployment of trap near fallen tree, South site

Photo 4. Deployment of trap near rock face, South site

Photo 5. Deployment of trap near fallen tree, West site

Photo 6. Western pond turtle (WPT), male, captured 8/7 at South site.

Photo 7. Weight measurement using spring scale

Photo 8. Radio transmitter and temperature logger attached to WPT.

Photo 9. WPT, female, caught 8/8 at West site.

Photo 10. Checking female WPT for eggs

Photo 11. Vertebral scutes of female WPT detaching from carapace, indicating unknown shell disease

Photo 12. WPT, male, caught 8/8 at West site.

Photo 13. Morphometric measurements using calipers

Photo 12. WPT, male, caught 8/8 at West site.

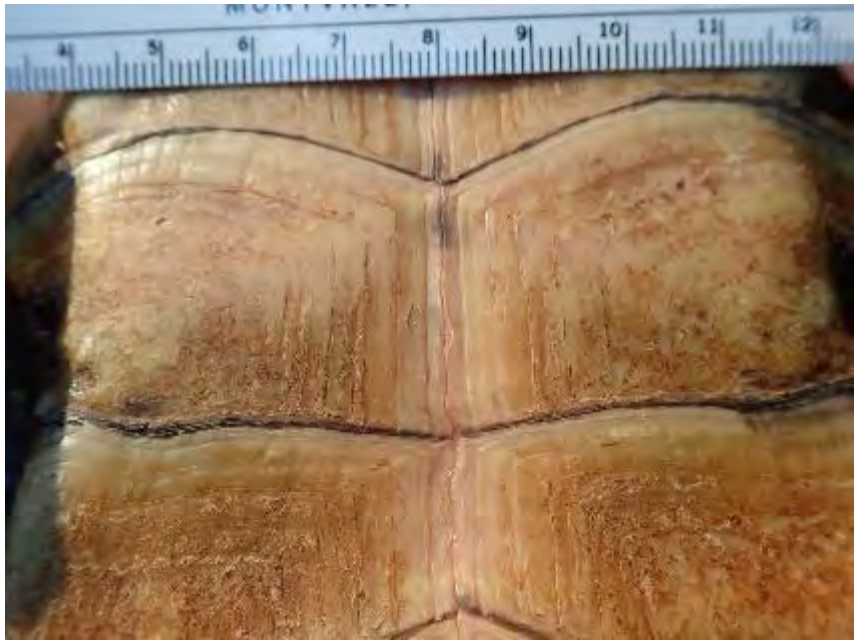
Photo 13. Shell height measurement

Photo 14. Plastron of male WPT showing growth rings (used to estimate age) and unique plastron pattern

Photo 15. WPT, female, caught 8/9 at South site. With radio tracker and temperature logger attached.

Photo 16. Filing identification mark into marginal shields

Photo 17. WPT with identification notches on marginal shields. Note notches at front and rear shields.



MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
100	8/7/2018	1	M	>10	20+	163.0	159.5	117.7	149.4	143.5	82.9	53.4	552

100

Transmitter

Freq **151.790**

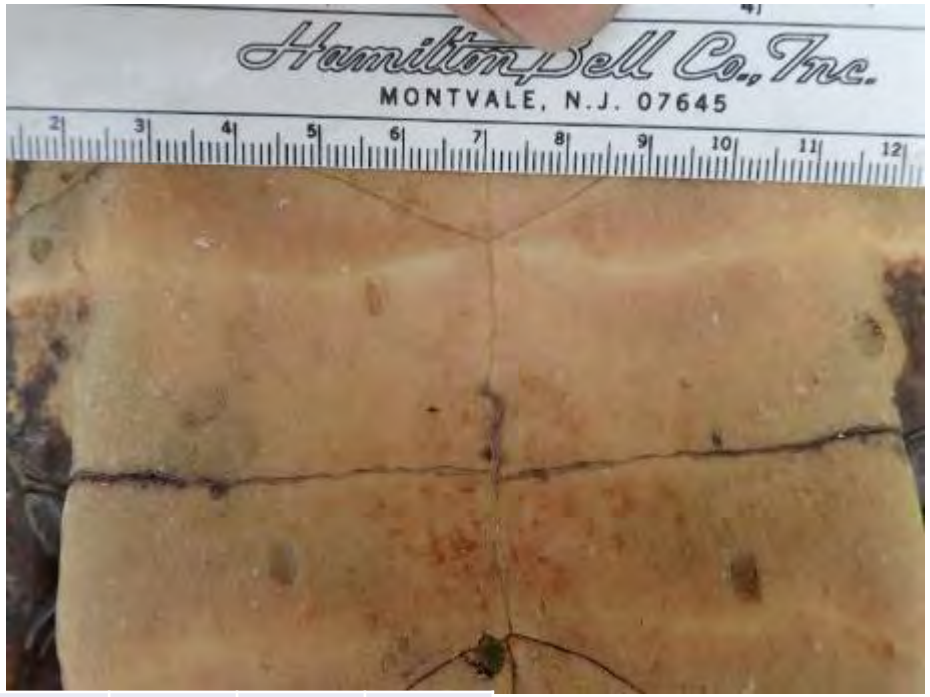
Photo 18. WPT morphology data

MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
101	8/8/2018	1	F	13	20+	182.2	176.3	138.5	176.9	168.0	96.2	68.1	662

Photo 19. WPT morphology data

101

Peeling verbal shields,
No transmitter applied



MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
102	8/8/2018	1	M	99	99	187.7	186.1	140.1	166.1	159.5	97.3	64.8	905

102

- Transmitter
  Freq **151.701**

Photo 20. WPT morphology data

MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
103	9/5/2018	1	F	3	4	121.3	117.0	97.3	112.2	110.2	63.4	44.0	258

103

- Juvenile
- No Transmitter

Photo 21. WPT morphology data

MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
104	9/5/2018	1	M	99	99	180.9	175.1	131.8	165.0	153.5	89.6	60.0	782

104

- Transmitter

  Freq **151.750**

Photo 22. WPT morphology data

MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
105	9/5/2018	1	F	20	20+	166.3	164.0	119.4	156.0	150.0	186.9	61.5	718

105

- Transmitter
  Freq **151.760**

Photo 23. WPT morphology data

MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
106	9/5/2018	1	F	20	20+	170.7	167.4	126.4	157.5	151.1	90.6	65.0	765

106

- Transmitter
  Freq **151.729**

Photo 24. WPT morphology data

MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
107	9/5/2018	1	M	99	99	188.8	186.9	141.0	170.9	163.0	195.5	62.5	865

107

- Transmitter
  Freq **151.770**

Photo 25. WPT morphology data

MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
108	9/6/2018	1	J	2	2	97.3	94.5	81.2	92.7	89.7	52.4	36.0	144

108

- No Transmitter

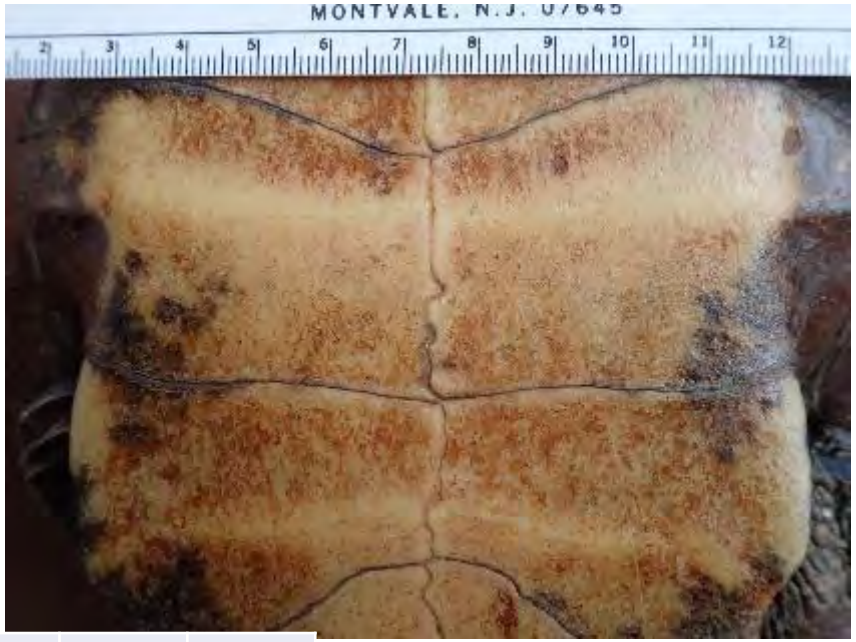
Photo 26. WPT morphology data

MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
119	8/8/2018	1	M	9	10	163.0	160.1	123.6	151.8	148.2	87.7	54.3	600

119

- Transmitter
  Freq **151.919**

Photo 27. WPT morphology data



MARK	DATE	CapHist	SEX	AGE	AGE+	CL	cl	cw	PL	pl	pw	Ht	Wt
120	8/9/2018	1	F	99	99	178.8	176.4	143.0	171.7	164.2	100.5	71.5	975

120

- Transmitter
  Freq **151.820**

Photo 28. WPT morphology data

Klamath River Renewal Project

2019 Annual Terrestrial Resources Survey Report

March 2020

KLAMATH
RIVER RENEWAL
CORPORATION

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Acronyms and Abbreviations

BLM	Bureau of Land Management
CDFW	California Department of Fish and Wildlife
CE	California Endangered
CEQA	California Environmental Quality Act
CMR	capture-mark-recapture
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
COTO	*Corynorhinus townsendii* (Townsend's big-eared bat)
FE	Federal Endangered
FSC	Federal Species of Concern
GIS	Geographic Information System
GPS	Global Positioning System
IPaC	USFWS Information for Planning and Consultation Database
KRRC	Klamath River Renewal Corporation
MYYU	*Myotis yumanensis* (Yuma myotis)
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
OC	Candidate listing by Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife
ODSL	Oregon Department of State Lands
OHWM	ordinary high-water mark
ONHP	Oregon Natural Heritage Program
ORBIC	Oregon Biodiversity Information Center
ORWAP	Oregon Rapid Wetland Assessment Protocol
OSHA	Occupational Safety and Health Administration
Project	Klamath River Renewal Project
RCB	riparian corridor boundary
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WPT	western pond turtle

Chapter 1 Introduction

1. INTRODUCTION

This report summarizes the terrestrial resources surveys conducted in 2019 for the Klamath River Renewal Project (Project). The Klamath River Renewal Corporation (KRRC) and its consultants carried out field investigations to collect existing condition information on the following terrestrial resources:

- Bald and golden eagles
- Bats
- Western pond turtles (WPTs)
- Special-status plants
- Wetlands

KRRC initiated several of these surveys in 2018. This report provides a summary of both 2018 and 2019 findings for the resources listed above. KRRC completed surveys for other terrestrial resources in 2018, as described in the 2018 Annual Terrestrial Resource Survey Report (KRRC 2019a). Section 7 provides a correction to the willow community data previously reported in the 2018 Annual Terrestrial Resources Survey Report (KRRC 2019a).

1.1 Purpose of the Terrestrial Resources Surveys

Information on the existing condition of terrestrial resources in the Project area is needed to inform the ongoing Project design and regulatory permit processes. Early Project planning identified information gaps, as described in previous studies and regulatory compliance documents, including the 2012 Environmental Impact Statement/Environmental Impact Report (USBR and CDFW 2012) and the Joint Preliminary Biological Opinion (NMFS and USFWS 2012).

1.2 Study Area

For each resource listed above, this report describes the methods followed during field investigations. Methods were based on survey work plans developed in close coordination with federal and state resource agencies, including the United States Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), and Oregon Department of Fish and Wildlife (ODFW). The survey work plans are available in Appendix J of the Definite Plan (KRRC 2018).

Unless otherwise noted, surveys were conducted within 0.25 mile of dams and structures to be removed, disposal sites, and haul and access roads (collectively referred to as the study area). The 0.25-mile study area is shown in Figure 1-1 and was developed in cooperation with the resource agencies listed above during development of the survey work plans. Surveys for eagles and bats used different study areas, which are described in the respective sections of this report. This report summarizes the findings of the surveys. Figures cited in the text of this report are provided in Appendix A, and figures updated from the 2018 Annual

Terrestrial Resources Survey Report (KRRC 2019a) are provided in Appendix B. Appendix C provides a list of all plant and wildlife species observed during field investigations.

Chapter 2 Eagles

2. EAGLES

Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are protected under the Bald and Golden Eagle Protection Act (16 Code of Federal Regulations 668) and the Migratory Bird Treaty Act (16 United States Code §§ 701-12), and are fully protected under California law. Bald eagles are listed as endangered under the California Endangered Species Act, but do not have listing status in the State of Oregon. The upper Klamath Basin provides suitable habitat for and is known to support bald eagle and golden eagle populations. Existing information on bald and golden eagles in the Klamath Basin and results from the 2017-2018 eagle surveys can be found in the Klamath River Renewal Project 2018 Annual Terrestrial Resources Survey Report (KRRC 2019a).

2.1 Methods

KRRC developed the approach to the 2019 field surveys based on previous work, including a desktop review of historical and current nest data; a Geographic Information System (GIS) viewshed analysis conducted in 2017 and 2018 that helped define the study area; development of a survey plan in coordination with state and federal agencies; and results of previous eagle surveys (PacifiCorp 2004, KRRC 2018, KRRC 2019a).

2.1.1 Study Area

KRRC defined the study area by the viewshed analysis (KRRC 2019a) and the nature, timing, and location of proposed construction activities. The terms used to describe the study area are defined below.

- The limits of work are those defined in the Definite Plan for the Lower Klamath Project (KRRC 2018).
- High-impact areas include a 1-mile buffer surrounding the limits of work anticipated to have high-impact activities (excluding the extent of the reservoir where no work will occur). High-impact activities include proposed construction and demolition activities associated with the decommissioning of the dams and facilities, and creation of disposal sites.
- Low-impact areas include a 0.5-mile buffer surrounding the limits of work, as well as those access roads that are anticipated to have an increase in traffic and movement of heavy equipment.

The study area encompassed the extent of the viewshed in the high impact areas and low impact areas. The study area defined here is intended to represent the portion of habitat that may be affected by Project activities. In 2019, KRRC biologists surveyed beyond this defined area to account for potential future changes to the Project area and activities and to gain a general understanding of eagle use and occupancy surrounding the Project area.

2.1.2 Field Surveys

Qualified KRRC avian biologists conducted bald eagle and golden eagle surveys concurrently. The surveys focused on areas with suitable nesting, roosting, or foraging habitat for bald and golden eagles, as well as known nest locations. The goal of the surveys was to determine nest site locations in the study area and to determine baseline eagle use and other key habitat features. Additionally, by monitoring eagle behavior at nests prior to construction, it will be easier to identify changes in behavior that may occur during construction. Field surveys employed a variety of techniques and multiple temporal windows to capture seasonal activity. Biologists recorded all survey data digitally through Collector for ArcGIS, using iPads (Apple, Inc.) which preserve the location and time of the observation. Table 2-1 summarizes the 2019 survey date and type.

Table 2-1 Eagle Survey Types and Dates

Survey Type	Survey Date
Ground-based early breeding season survey	February 18 , 2019
Ground-based and helicopter mid-breeding season survey	May 21 through 23, 2019
Ground-based and helicopter late-breeding season survey	June 13 through 19, 2019

2019 Surveys

KRRC biologists used binoculars and spotting scopes when surveying for nest occupancy. Teams were able to view the entire study area using a combination of ground-based surveys on foot and in vehicles, and aerial surveys from a helicopter. In the field, biologists emphasized surveys on microhabitats that could support nesting eagles (e.g., rocky cliffs for golden eagles, large conifers for bald eagles). Biologists surveyed all nests that were historically active. Biologists recorded detailed data based on the guidelines and datasheets provided in the protocols (see field survey protocol in KRRC 2019a). The surveys included three breeding season surveys (February through June 2019), as follows:

1. To determine occupancy, biologists conducted an initial nest search early in the breeding season, from February 18 through 20, 2019, when eagles were most likely to be found near nest sites. The timing of this survey was informed by findings from the 2018 surveys. By estimating the age of chicks in May 2018, biologists were able to determine what winter survey timing would capture the most eagle activity at nests. In this survey, six biologists conducted ground-based observations from vehicles and on foot for 3 days, spending 1 day at each reservoir and corresponding dams. Biologists conducted this first inventory and monitoring survey during courtship, when the adults were mobile and conspicuous. Surveys included observing historical nests and recording all eagle detections in the study area. Biologists also documented courtship behavior and areas of high eagle activity to follow up on during the May and June 2019 surveys. For this early-breeding season survey, biologists extended the study area to include observations at all golden eagle nests within 10 miles of the limits of work, and bald eagle nests within 2 miles. Biologists established survey distances in coordination with wildlife agencies.

2. Biologists conducted a second survey from May 21 through 23, 2019, to observe eagle behavior and mid-season nesting activity, and to determine the number of active nests and nestlings in the study area. Biologists based the survey timing on the results of the 2018 surveys to observe nests when they contained nestlings and to avoid disturbing nests when they were most vulnerable. Three teams of two biologists conducted this survey. Two teams conducted ground-based surveys for 3 days, spending 1 day at each reservoir. The second team conducted aerial helicopter surveys for 2 days, covering all reservoirs; and a ground-based survey for 1 day. Biologists thoroughly surveyed locations where eagle pairs or territorial behavior were observed during previous surveys from the ground and during helicopter surveys. Additionally, biologists surveyed all historical and newly discovered nests from the helicopter and from the ground when accessible.

3. Biologists conducted a late breeding season survey from June 13 through 19, 2019, when the nestlings were near fledging age. One team of three biologists conducted ground-based surveys for 7 days at all reservoirs, and one team of two biologists conducted helicopter surveys for 1 day, covering all reservoirs.

2.2 Findings

2.2.1 Field Surveys

February 2019

Eagle Activity

Biologists observed approximately 117 eagles in the study area, of which 78 were bald eagles and 39 were golden eagles; however, many of these could have been resightings of the same individuals. Common bald eagle behavior observed included subadults and adults perching on trees and utility poles near and in sight of the reservoirs. Biologists observed several adult bald eagle pairs perched together, and exhibiting courtship behavior, acting territorial, vocalizing, performing undulating flight (breeding behavior), visiting nests, and nest-building. Biologists observed bald eagles soaring on thermals with other bald eagles and golden eagles, usually near the reservoirs but also over the Klamath River. Biologists also observed bald eagles foraging in the reservoirs. Biologists observed golden eagles perching on trees and cliffs that were not typically near the reservoirs. Biologists also observed golden eagles foraging on the ground, soaring on thermals with other eagles, flying in pairs, and performing undulating (breeding behavior) flight. Both species of eagles appeared to prefer certain perches and were observed using these same perches during different survey times and days.

At Iron Gate Reservoir and Copco Lake, biologists were able to discern areas of high eagle activity, which had the potential to include nest sites. Biologists observed thirteen potential bald and golden eagle territories surrounding Iron Gate Reservoir. In these areas, biologists observed high eagle activity, undulating flight, or pairs of adult eagles perching for long periods. Additionally, biologists identified five potential golden and

bald eagle territories around Copco Lake with high golden and bald eagle activity. Biologists thoroughly surveyed these areas during subsequent field surveys in May and June of 2019.

At J.C. Boyle Reservoir, there was significantly less eagle activity observed than at the other two sites, with only seven eagles observed. However, this may have been due to the lower visibility at J.C. Boyle, resulting from the high density of trees and limited road access surrounding the reservoir. Biologists noted three potential bald eagle territories where high eagle activity or courtship behavior was observed. Biologists thoroughly surveyed these areas during subsequent field surveys in May and June of 2019. Due to the presence of potential wintering and migratory birds in the area, it is difficult to determine how many of the observed birds represented resident birds. Table 2-2 presents the number, age, and species of eagles observed at each reservoir.

Table 2-2 Total Number of Eagle Observations by Site, Survey, Species, and Age

Iron Gate Reservoir[1]						
Survey Date	Golden Eagle Adults	Golden Eagle Subadults	Golden Eagle Young of the Year	Bald Eagle Adults	Bald Eagle Subadults	Bald Eagle Young of the Year
February 2019[2]	18	1	0	19	1	0
May 2019	2	0	0	12	6	2
June 2019	2	0	0	6	0	2
Total	**22**	**1**	**0**	**37**	**7**	**4**
Copco Lake[1]						
Survey Date	Golden Eagle Adults	Golden Eagle Subadults	Golden Eagle Young of the Year	Bald Eagle Adults	Bald Eagle Subadults	Bald Eagle Young of the Year
February 2019[2]	19	0	0	15	28	0
May 2019	17	0	3	13	10	3
June 2019	6	1	2	2	4	3
Total	**42**	**1**	**5**	**30**	**42**	**6**
J.C. Boyle Reservoir[1]						
Survey Date	Golden Eagle Adults	Golden Eagle Subadults	Golden Eagle Young of the Year	Bald Eagle Adults	Bald Eagle Subadults	Bald Eagle Young of the Year
February 2019[2]	0	1	0	13	2	0
May 2019	2	0	0	8	0	5
June 2019	0	0	0	3	0	7
Total	**2**	**1**	**0**	**24**	**2**	**12**

Notes:

[1] The number of eagles observed is influenced by the visibility at each site and should not be interpreted as relative abundance across sites. Visibility at J.C. Boyle Reservoir is poorer than at Copco and Iron Gate Reservoirs.
[2] The number of eagles detected during the winter survey period is likely to include wintering and migratory individuals.

Eagle Nests

Biologists were unable to access 26 historically active nests because of poor visibility, resulting from dense tree cover, limited access through private property, or poor road conditions. In the case of the 19 remaining nests where access was not limited, observers were able to survey the area and look for eagle activity. Biologists observed bald eagles visiting three historically active nests, and one new nest. Biologists also observed golden eagles visiting three historically active nests, and one new nest. Out of the 26 inaccessible historically active nests, biologists observed bald eagles in the vicinity of four bald eagle nests and golden eagles in the vicinity of five golden eagle nests. This suggested that the inaccessible nests could be active. The conditions of the accessible nests varied. Some nests appeared to be old and unused, while other nests appeared to have been recently active. Biologists also located several observation points that provided exceptional visibility, allowing survey of historically active areas for eagle activity and occupancy. Details of the nest observations are provided in the following paragraphs, and nest locations are shown on Figures 2-1 through 2-6. Historically active nests that were not observed in the 2017-2019 KRRC surveys are excluded from the figures. All nests that were active in 2019, active in 2018, or found to be inactive are depicted on the figures.

At Iron Gate Reservoir, biologists observed a bald eagle pair nest-building at one new bald eagle nest location that had not been historically documented (F19_BE1). No other nests at Iron Gate were accessible by car; however, biologists were able to observe adult bald and golden eagle pairs in the vicinity of each historically active nest (four golden eagle nests and one bald eagle nest: GE3-7, GE3-5, F_GE2, GE3-6, and F_BE1).

At Copco Lake, biologists observed a golden eagle pair perching near and landing in one new golden eagle nest location (F19_GE1) that had not been historically documented. Additionally, biologists observed nest building at one historically active golden eagle nest (GE3-3) within 0.5 mile of the limits of work. Biologists observed a golden eagle pair visiting an existing golden eagle nest (F_GE4) and a bald eagle pair visiting an existing bald eagle nest (BE1-43) outside of the 0.5-mile buffer, but within 0.5 mile of access roads between Copco and J.C. Boyle reservoirs. Several nests were not accessible from the ground (five golden eagle nests and four bald eagle nests); however, biologists observed an adult golden eagle in the vicinity of one historically active nest (GE3-8).

Biologists observed bald eagle adults visiting two existing bald eagle nests (BE1-31, BE1-32) at J.C. Boyle Reservoir. Additionally, biologists observed adult bald eagle activity in the vicinity of two other historically active bald eagle nests (BE1-34, BE1-35), but these nests were not accessible from the ground. Most existing nests at J.C. Boyle were inaccessible due to snowy and icy road conditions.

May 2019

Eagle Activity

Biologists observed several adult bald and golden eagles at all reservoirs, some subadults, and nestlings in active nests. Biologists observed an estimated 21 adult golden eagles, in addition to 3 nestlings described

below. Except for the nestlings, some of these observations may have been resightings of the same eagle. Golden eagle activity included perching near, flying around, and visiting active nests, often in pairs. Biologists also observed golden eagles foraging over land and flying over ridgelines and the reservoirs. Golden eagles exhibited territorial behavior toward bald eagles and other birds.

Photograph 2-1 Two Bald Eagle Nestlings at Nest F19_BE1

Biologists observed an estimated 33 bald eagle adults and 16 subadults, in addition to the 10 nestlings described below. Except for the nestlings, some of these may have been resightings of the same individual. Bald eagle activity included perching near, flying around, defending, and visiting active nests; and feeding chicks. Bald eagles exhibited territorial behavior toward other eagles and raptors and were observed perching and flying around the reservoirs. Bald eagles were also observed soaring on thermals, vocalizing, engaging in courtship behavior, foraging, and flying in pairs. Most bald eagle observations were close to the reservoirs; however, there were some observations near the Klamath River or over ridgelines. Table 2-2 presents the number, age, and species of eagles observed at each reservoir; nest locations are shown on Figures 2-1 through 2-6.

Eagle Nests

Biologists observed a total of seven active bald eagle nests, each with one or two nestlings present; and two golden eagle nests, each with one or two nestlings present. Biologists found one new active bald eagle nest within 0.5 mile of the limits of work (F19_BE5).

At Iron Gate Reservoir, biologists observed one active bald eagle nest (F19_BE1) immediately adjacent to Copco Road and the reservoir. There were two chicks about 6 to 8 weeks old in the nest, often with one or

both bald eagle adults perched nearby. Biologists observed one inactive bald eagle nest (F_BE1), which was also inactive in 2018, within 2 miles of the limits of work. Biologists observed two inactive golden eagle nests (GE3-6, F_GE2) within 2 miles of the limits of work, both of which were also inactive in 2018. Biologists observed one inactive golden eagle nest, which was also inactive in 2018, within 2 miles of the limits of work (GE3-7). Biologists were unable to locate the nest structure of one golden eagle nest that was active in 2018 (GE3-6), within 2 miles of the limits of work.

At Copco Lake, biologists observed two active bald eagle nests at Copco Lake. One of these nests (BE2-3) was within 0.5 mile of the limits of work and contained two nestlings about 8 weeks old, with an adult perched nearby. The other nest (BE1-43) was within 0.5 mile of an access road but more than 2 miles from the limits of work and contained one large chick about 9 weeks old, with an adult perching and flying nearby. The only active golden eagle nests for the 2019 surveys were at Copco Lake. Biologists observed one nest (F19_GE1) that was newly discovered in February 2019 and was within 0.5 mile of the limits of work; this nest contained two 1.5- to 2-week-old nestlings, with an adult perched and flying nearby. The other nest (F_GE3) was within 5 miles of the limits of work and contained one unattended nestling, about 4 to 5 weeks old. Biologists observed two inactive golden eagle nests at Copco Lake. Both nests (GE3-3, and F_GE4) were active in 2018, and biologists observed nest-building activity at these nests during the February 2019 surveys. Biologists observed three subadult bald eagles flying in the territory of nest GE3-3, with no golden eagles defending the nest territory, and therefore confirmed that this nest was inactive in 2019.

Biologists observed four active bald eagle nests around J.C. Boyle Reservoir, including one nest that had not been observed in previous surveys (F19_BE5). Three of these nests (F19_BE5, BE1-36, and BE1-32) were within 0.5 mile of the limits of work, and one of these nests (F_BE2) was within 5 miles of the limits of work. Nest F19_BE5 had a large nest structure in good condition, with 2 adults perched nearby, exhibiting territorial behavior. Based on the behavior of the adults, biologists assumed that this nest was active and that a chick was nearby; however, the nest was empty. Nests BE1-36 and BE1-32 both contained two nestlings approximately 8 weeks old. Nest F_BE2 contained one nestling approximately 9 weeks old. Biologists observed two inactive bald eagle nests. One of these nests (BE1-31) was within 0.5 mile of the limits of work; the other (BE1-15), which was active in 2018, was within 2 miles of the limits of work and within 0.5 mile of an access road. Biologists could not find the nest structure of one bald eagle nest that was inactive in 2018 (BE1-35). Biologists observed one inactive golden eagle nest (GE4-206), which had been active in 2018, within 2 miles of the limits of work.

June 2019

Eagle Activity

Biologists observed an estimated 11 adult bald eagles, four subadult bald eagles, and 12 nestlings. Except for the nestlings, some of these observations may have been resightings of the same eagle. Bald eagle adults were perching by reservoirs and in or near nests; foraging; feeding chicks; and flying over nests, reservoirs, and ridgelines. Subadult bald eagles were flying, perching by reservoirs, and foraging.

Biologists observed approximately eight adult golden eagles, one subadult golden eagle, and two nestlings during the June 2019 survey. Except for the nestlings, some of these observations may have been resightings of the same eagle. Biologists observed golden eagles flying over ridgelines and flying around, perching near, and visiting nests. Biologists also observed golden eagle adults flying in pairs and vocalizing near nests. Table 2-2 presents the number, age, and species of eagles observed at each reservoir.

Eagle Nests

Biologists observed ten active nests during the June 2019 survey: eight bald eagle nests, each with one or two nestlings present; and two golden eagle nests, each with one or two nestlings present. Biologists found one new active bald eagle nest (F19_BE7) containing two nestlings near the 0.5-mile buffer of the limits of work at J.C. Boyle Reservoir in proximity to a historical nest. Biologists found one new inactive bald eagle nest north of Iron Gate Reservoir, within 0.5 mile of the limits of work; one new inactive golden eagle nest that was in good condition, on a cliff face north of the Copco No. 2 Dam, within 0.5 mile of the limits of work (F19_GE2); and a cavity in a cliff face that could be suitable golden eagle nest habitat, at the northeastern edge of Copco Lake where it meets the Klamath River (F19_GE4).

At Iron Gate Reservoir, biologists observed one active bald eagle nest (F19_BE1) immediately adjacent to Copco Road at Iron Gate Reservoir, within 0.5 mile of the limits of work. This nest contained two large nestlings approximately 11 weeks old, and an adult was observed feeding these chicks. Biologists found one new inactive bald eagle nest, north of Iron Gate Reservoir within 0.5 mile of the limits of work (F19_BE6). Biologists observed one inactive golden eagle nest (GE3-7) within 2 miles of the limits of work, which was inactive in 2018. Additionally, three golden eagle nests (GE3-5, GE3-6, and F_GE2) observed to be active or inactive during 2018 surveys were not found during aerial surveys.

At Copco Lake, biologists observed two active bald eagle nests. Nest BE2-3 was within 0.5 mile of the limits of work and contained two large nestlings about 11 weeks old, with one adult perched nearby. Nest BE1-43 was within 0.5 mile of an access road, but more than 2 miles from the limits of work and contained one large nestling about 12 weeks old. Biologists observed two active golden eagle nests at Copco Lake. One of these nests (F19_GE1) was within 0.5 mile of the limits of work; the other (F_GE3) was within 5 miles of the limits of work. Due to the survey angle from the ground and the adult obscuring the view from the helicopter, biologists could only confirm one nestling in nest F19_GE1, which had two nestlings in May 2019. At nest F_GE3, biologists observed one chick approximately 7 weeks old in the cliff nest, and an adult visiting the nest. Biologists observed two inactive golden eagle nests at Copco Lake. One of these nests (F_GE4) was active in 2018, with breeding activity observed near nest F_GE4 during the February 2019 surveys, but was confirmed empty through both aerial surveys (May and June 2019). The second inactive golden eagle nest (GE3-3) was confirmed inactive during the May 2019 survey and was therefore not surveyed during the June 2019. Biologists found an empty cliff cavity that could be suitable golden eagle nest habitat (F19_GE4) and should be surveyed during future eagle surveys. This potential nest site is categorized as inactive on Figures 2-1 through 2-6, but is not included in Table 2-3.

Table 2-3 Active and Inactive Bald and Golden Eagle Nests Observed in 2019 Field Surveys

Nest Name	Golden Eagle		Bald Eagle	
Nest Status in 2019	Active	Inactive	Active	Inactive
Within 0.5 mile of Project footprint	1	2	5	2
Between 0.5 and 2 miles from Project footprint	0	4	1	2
Total Nests within 2 Miles	**1**	**6**	**6**	**4**
Outside of 2-mile buffer surrounding Project footprint, but within 0.5 mile of haul roads	0	0	2	1

At J.C. Boyle Reservoir, biologists observed five active bald eagle nests, one of which was a new nest (F19_BE7) observed during the June 2019 survey. Four of these nests (F19_BE5, BE1-36, BE1-32, and F19_BE7) were within 0.5 mile of the limits of work, and one of these nests (F_BE2) was within 5 miles of the limits of work. At nest F19_BE5, biologists were able to confirm one nestling in the nest, about 8 to 9 weeks old. This nest appeared empty in the May 2019 survey. Nest BE1-36 had one chick about 10 weeks old and one adult perched nearby. This nest contained two nestlings in May 2019. Nest F_BE2 contained one chick about 11 weeks old. Nests BE1-32 and F19_BE7 each contained two chicks approximately 10 to 11 weeks old. Biologists observed two inactive bald eagle nests. One of these nests (BE1-31) was within 0.5 mile of the limits of work; the other (BE1-15), which was active in 2018, was within 0.5 mile of an access road. One bald eagle nest found inactive in 2018 was not found in 2019 (BE1-35). One golden eagle nest (GE4-206) which had been active in 2018 was inactive in 2019, within 1 mile of the limits of work. Biologists searched the surrounding trees for alternate nests for GE4-206, because this nest is in a dead tree and is therefore less suitable for nesting; the search was unsuccessful.

2.3 Conclusions

Biologists observed a total of ten active nests at Copco, Iron Gate, and J.C. Boyle Reservoirs in 2019. Two are golden eagle nests and eight are bald eagle nests. Nine of these nests are within 2 miles of the limits of work or within 0.5 mile of haul roads (Table 2-3).

Additionally, biologists observed eleven inactive nests within 2 miles of the limits of work or within 0.5 mile of haul roads. Five of these are presumed bald eagle nests and six are presumed golden eagle nests, based on historical use data and 2018 surveys. Biologists also observed one potential golden eagle nest site within 0.5 mile of the limits of work. It is not uncommon for eagles to suspend breeding in some years or use alternative nest sites (USFWS 2004); therefore, these inactive nests will continue to be surveyed in the future.

The 2019 survey results showed a higher number of successful bald eagle nests than golden eagle nests in the study area (Table 2-4). However, in 2018, there were more successful golden eagle nests than bald eagle nests in the study area. Several nests that were active in 2018 were not active in 2019, demonstrating that eagles could be suspending breeding in some years in the study area. There are more bald eagle nests surrounding J.C. Boyle Reservoir than there are surrounding Copco and Iron Gate Reservoirs, and there are more golden eagle nests surrounding Copco and Iron Gate Reservoirs than surrounding J.C. Boyle Reservoir. Trends in eagle activity cannot be compared across reservoirs due to different levels of visibility and access.

Table 2-4 Summary of Active and Inactive Eagle Nests from 2017 through 2019 Surveys

Species	Nest Name	Nest Status	Number of Nestlings in 2018 or 2019
Bald Eagle	BE1-15	Active in 2018	1
Bald Eagle	BE1-31	Inactive	0
Bald Eagle	BE1-32	Active in 2019	2
Bald Eagle	BE1-35	Inactive	0
Bald Eagle	BE1-36[1]	Active in 2019	2
Bald Eagle	BE1-43	Active in 2019	1
Bald Eagle	BE2-3	Active in 2019	2
Bald Eagle	F_BE1	Inactive	0
Bald Eagle	F_BE2	Active in 2019	1
Bald Eagle	F19_BE1	Active in 2019	2
Bald Eagle	F19_BE5	Active in 2019	1
Bald Eagle	F19_BE6	Inactive	0
Bald Eagle	F19_BE7	Active in 2019	2
Golden Eagle	F_GE2	Inactive	0
Golden Eagle	F_GE3	Active in 2019	1
Golden Eagle	F_GE4	Active in 2018	2
Golden Eagle	F19_GE1[1]	Active in 2019	2
Golden Eagle	F19_GE2	Inactive	0
Golden Eagle	GE3-3	Active in 2018	1
Golden Eagle	GE3-5	Active in 2018	2
Golden Eagle	GE3-6	Inactive	0
Golden Eagle	GE3-7	Inactive	0
Golden Eagle	GE4-206	Active in 2018	1
Golden Eagle	F19_GE4	Potential Future Nest Site	0

Notes:
BE = Bald eagle nest
GE = Golden eagle nest
F19_GE = New golden eagle nest found during the 2019 surveys, not included in historically active data or the 2017-2018 surveys
F19_BE = New bald eagle nest found during the 2019 surveys, not included in historically active data or the 2017-2018 surveys
[1] For some nests, the number of nestlings decreased by one from May to June 2019. This table reflects the highest number of nestlings observed at each nest.

Chapter 3 Bats

3. BATS

In 2019, KRRC biologists conducted targeted surveys at structures where either 1) additional data were sought to supplement previous summer surveys (2017-2018) for bats; or 2) evidence of bat use had been found during previous inspections, but summer roosting had not been confirmed. The 2017-2018 survey methods and results are described in the 2018 Annual Terrestrial Resources Survey Report (KRRC 2019a).

3.1 Methods

A team of four KRRC biologists conducted evening emergence and acoustic surveys for bats from June 12 through 15, 2019, at structures at J.C. Boyle, Iron Gate, and Copco. KRRC biologists targeted the following structures where additional data were sought to supplement previous summer surveys (2017-2018); or where evidence of bat use had been found during previous inspections, but summer roosting had not been confirmed:

- J.C. Boyle red barn
- Iron Gate diversion tunnel outlet
- Iron Gate powerhouse
- Lakeview Road bridge (at Iron Gate entrance)
- Maintenance Building on Copco Access Road
- Copco No. 1 gatehouse C-12
- Copco No. 1 diversion tunnel outlet

KRRC biologists used night vision during all emergence surveys and documented points of egress. During all emergence surveys, KRRC biologist used iPads (Apple, Inc.) running Echo Meter Touch 2 Pro (Wildlife Acoustics) and a laptop running Sonobat software (Version 4) with a Binary Acoustics ultrasonic microphone (Binary Acoustic Technology, LLC). Field teams conducted emergence surveys when weather conditions were suitable for the evening emergence of bats (e.g., warm temperatures and minimal rain and wind).

3.2 Findings

All bat survey findings from 2017 through 2019 are summarized in Table 3-1; the structures surveyed in 2019 are indicated by green rows. A summary of the 2019 survey results follows the table.

Table 3-1 2017-2019 Bat Survey Findings

Building Name	Suitability[1]	Evidence of Bat Use?	Bat Roosting Confirmed?	Species Confirmed	Survey Dates (all years)	Additional Notes
Iron Gate						
Lakeview Road Bridge	High	Yes	Yes – 200 bats estimated during summer emergence.	MYYU	October 2018, June 2019	First emergence survey in June 2019.
Diversion Tunnel Outlet	High	Yes	Yes – 200 bats estimated during summer emergence. Absent in winter.	MYYU	February 2018 (interior), May-June 2018 (emergence only), June 2019 (emergence only)	None
Powerhouse	High	Yes	Yes – 400 bats estimated during summer emergence.	MYYU	July 2017, May and June 2018, October 2018, June 2019	None
Penstock Intake Structure	High	Yes	Yes – several hundred bats roosting inside at top of structure in summer.	MYYU	July 2017, June 2018, October 2018	None
Barn/Garage at Iron Gate Village	High	Yes	Yes – bats present in rafters/ceiling in summer.	MYYU	July 2017, May and June 2018, October 2018	None
Residence 1 (occupied) blue/gray	Mod-high (attic)	Unknown	Unknown	NA	June 2017 (exterior only)	No interior survey access to occupied residences.
Residence 2 (occupied) tan with green roof	Mod-high (attic)	Yes	Yes – 15 (estimated) bats found huddled behind clock on back porch in summer. Potential attic access through loose screen over vent.	MYYU	July 2017 (exterior only)	No interior survey access to occupied residences.
Fish Holding Facilities	Mod	No	No	NA	July 2017, June 2018, October 2018	None
Restrooms (near powerhouse)	Low - mod	No	No	NA	July 2017, June 2018	None
Emergency Spill Equipment shed	Low	No	No	NA	July 2018	None

Building Name	Suitability[1]	Evidence of Bat Use?	Bat Roosting Confirmed?	Species Confirmed	Survey Dates (all years)	Additional Notes
Copco No. 1 Diversion Tunnel Outlet	High	Yes	Yes – 100 bats estimated during summer emergence.	None	February 2018 inspection, June 2018 emergence	Access limitations prohibit safe, targeted placement of acoustic recording equipment at or near the mouth of the tunnel.
C-12 Gatehouse at Copco No. 1	High	Yes	Yes – 2,000 to 3,000 bats estimated during summer emergence. Several dozen present in late October.	MYYU	July 2017, June 2018, October-November 2018, June 2019	Maternity roost; largest roost found on Project site. Gatehouses C-11 and C-12 are the only Project structures found to have bats present in late October/early November.
C-11 Gatehouse at Copco No. 1	High	Yes	Yes – 100 bats estimated during summer emergence. Approximately 20 bats clustered in interior roof apex in late October.	MYYU	July 2017, June 2018, October-November 2018	Gatehouses C-11 and C-12 are the only Project structures found to have bats present in late October/early November.
Copco No. 1 powerhouse	High	Yes	Yes – several dozen bats clustered on walls in transformer bays and small numbers in lower level in summer.	MYYU	July 2017, February 2018, June 2018, October through November 2018	Abundant staining/guano on lower level but no large roosts found. Small number of COTO detected acoustically during summer emergence, but not confirmed to be present in the powerhouse.
Vacant House (light blue) on Copco Access Road	Mod	No	No	NA	July 2017	None
Maintenance Building (next to switchyard on Copco Access Road)	High	Yes	Yes – 30 bats estimated on summer emergence.	*Myotis* spp.	July 2017, June 2018, October-November 2018, June 2019	First emergence survey in June 2019. One COTO call detected on emergence.
Tin Pumphouse (across from light blue house on Copco Access Road)	Low	No	No	NA	July 2017	None
Groundwater Well House (at entrance to Copco Village)	Low - mod	No	No	NA	July 2017, October-November 2018	None
Vacant House 1 (tan)	High	Yes	Yes – small numbers of bats present under exterior side panels in summer.	MYYU	July 2017, February 2018, May and June 2018, October-November 2018	None

Building Name	Suitability[1]	Evidence of Bat Use?	Bat Roosting Confirmed?	Species Confirmed	Survey Dates (all years)	Additional Notes
Vacant House 2 (blue)	High	Yes	Yes – small numbers of bats present under exterior side panels in summer.	MYYU	July 2017, February 2018, May and June 2018, October-November 2018	None
Vacant House 3 (yellow-green)	High	Yes	Yes – large colony present in summer, in garage behind wood window framing and under rotting wood panels.	MYYU	July 2017, February 2018, May and June 2018, October-November 2018	None
Vacant House 4 (peach)	High	Yes	Yes – present between flashing and fascia board all around roof edge in summer.	MYYU	July 2017, February 2018, May and June 2018, October-November 2018	None
Vacant House #21601 (light yellow)	High	Yes	Yes – 300 bats estimated during summer emergence.	MYYU	July 2017, February 2018, May and June 2018, October-November 2018	Presumed maternity roost.
Occupied House next to Vacant House 4	Mod	Unknown	Unknown	NA	July 2017 exterior only.	No interior survey access to occupied residences. Resident stated he is not aware of any bats in the attic.
House 19038 (next to schoolhouse)	High	Yes	No	NA	July 2017, February 2018, June 2018, October November 2018	None
Bunkhouse	Mod	No	No	NA	July 2017, February 2018, June 2018, October-November 2018	None
Cookhouse	Mod	Yes	Yes – small number of bats present in awning over side door outside in summer.	MYYU	July 2017, February 2018, May and June 2018, October-November 2018	None
Equipment Shed (in front of bunkhouse/cookhouse)	Low	No	No	NA	July 2017, February 2018, June 2018	None
Schoolhouse	Low - mod	No	No	NA	July 2017	None
Hazardous Waste Storage/Wood Shop	Low - mod	No	No	NA	July 2017, February 2018, June 2018	None

Building Name	Suitability[1]	Evidence of Bat Use?	Bat Roosting Confirmed?	Species Confirmed	Survey Dates (all years)	Additional Notes
Copco No. 2 powerhouse	High	Yes	Yes – 50 bats estimated during summer emergence.	MYYU	July 2017, February 2018, June 2018, October-November 2018	Six dead Myotis adults and pups found on ground level and lower level in summer. Small number of COTO detected acoustically during summer emergence, but not confirmed to be present in the powerhouse.
Maintenance Building (next to Copco No. 2 powerhouse)	Low	No	No	NA	July 2017, June 2018	None
Copco No. 2 Dam (concrete dam and associated structures)	Low	No	No	NA	July 2017	None
Control Center at Copco No. 2 powerhouse	Low	No	No	NA	July 2017, February 2018, June 2018	None
J. C. Boyle						
Office/Red Barn	High	Yes	No	None	July 2017, May and June 2018, October 2018, June 2019	June 2019 survey conducted from outside of perimeter fence due to gate access constraint. Two desiccated dead MYYU found in attic in 2017. No live bats found to-date.
Spillway Control Center	High	Yes	Yes – several hundred bats present in summer.	MYYU	July 2017, May and June 2018, October 2018	Presumed maternity roost.
Fish Screen House	Mod-high	No	No	NA	July 2017, June 2018, October 2018	None
Fire Protection Building	Mod	Yes	Yes – outside only, a few bats day roosting in exterior crevices near roof edges (western side and eastern side) in summer.	MYYU	July 2017, June 2018, October 2018	None
Dam Communications	Mod	No	No	NA	July 2017, June 2018, October 2018	None

Building Name	Suitability[1]	Evidence of Bat Use?	Bat Roosting Confirmed?	Species Confirmed	Survey Dates (all years)	Additional Notes
J.C. Boyle powerhouse	Mod	No	No	NA	July 2017, June 2018, October 2018	None
Maintenance Building (next to powerhouse)	Low - mod	No	No	NA	July 2017, June 2018, October 2018	None
Truck Shop	Low - mod	No	No	NA	July 2017, May 2018 and June 2018, October 2018	None
Headgate Control	Low - mod	No	No	NA	July 2017, June 2018	None
Gate Control and Communications	Low - mod	No	No	NA	July 2017, October 2018	None
Power Canal/Spillway	Low	No	No	NA	July 2017, June 2018	None
HazMat Storage Shed	Low	No	No	NA	July 2017	None
Pump House	Low	No	No	NA	July 2017	None
Two occupied residences	Unknown	Unknown	Unknown	NA	NA	No interior survey access to occupied residences.

Notes:

[1] "High" suitability was assigned to structures with bats present and/or where signs of heavy bat use were found, or to structures that showed little or no sign of use or could not be accessed but contain external or internal features generally preferred by roosting bats, such as attics/roof spaces, soffits, fascias, weather boarding, spaces between roof felt/membrane and tiles/slates, window frames, cave/cavity walls, flashing, and the like. "Moderate" suitability was assigned to structures where no bats or very few bats were found, with little or no sign of bat use, that contain points of entry/exit and limited internal and external features preferred by roosting bats. "Low" suitability for roosting was assigned to well-sealed structures with no points of entry/exit, and generally lacking cavities, crevices, and other features generally preferred by roosting bats.

[2] Photograph included in report

NA = Not Applicable

MYYU = *Myotis yumanensis* (Yuma myotis)

COTO = *Corynorhinus townsendii* (Townsend's big-eared bat)

Photograph 3-1 Maintenance Building on Copco Access Road, June 15, 2019

Photograph 3-2 Lakeview Road Bridge, June 12, 2019

During the June 2019 surveys, bat emergences occurred when the average evening outdoor temperature was 75 degrees Fahrenheit. KRRC biologist confirmed bat roosts in six of the seven structures surveyed. Figures 3-1 through 3-5 show all structures across the Project area where active bat roosts have been confirmed during surveys from 2017-2019. Photographs 3-1 and 3-2 depict the exterior view of the Maintenance Building and Lakeview Road Bridge prior to emergence surveys.

Biologists observed evening emergences of approximately 100 bats from the Copco diversion tunnel and approximately 200 bats from the Iron Gate diversion tunnel. More than 2,000 *Myotis* spp. emerged from the Copco No. 1 C-12 gatehouse. As before, more than 400 bats emerged from the below-grade draft pipe channels at the Iron Gate powerhouse. At the J.C. Boyle red barn, no bats were seen emerging from the structure. Big brown bat (*Eptesicus fuscus*) and hoary bat (*Lasiurus cinereus*) were identified acoustically in small numbers in flight nearby. The results of the June 2019 surveys at these five structures are consistent with the emergence and acoustic surveys conducted at these same locations in 2018.

Biologists surveyed the Lakeview Road Bridge and Maintenance Building for emergence and acoustic detections for the first time in June 2019. At the Lakeview Road bridge, biologists observed bats emerging from three discrete locations underneath the bridge. Most of the acoustic detections at this location were not definitively classified; however, a small number of Yuma myotis were confirmed. At the Maintenance Building, most of the calls showed characteristics of *Myotis* spp. These were primarily auto-classified as Yuma myotis and California myotis (*Myotis californicus*), with a small number of long-legged myotis (*Myotis volans*) and/or western small-footed myotis (*Myotis ciliolabrum*). Because these species are difficult to distinguish acoustically, the species detected at this structure are collectively reported as *Myotis* spp. One call at the Maintenance Building was auto-classified as Townsend's big-eared bat (*Corynorhinus townsendii*) and later confirmed by manual vetting. KRRC biologist observed many bats circling around the open area at the back of the building and foraging among the trees behind the building; therefore, the Townsend's big-

eared bat call confirmed the species presence in the vicinity but did not confirm the species to be roosting inside of the structure.

Additionally, during meetings with the design-build contractor in September 2019, KRRC biologists were informed that an engineering team observed one bat in a cavity in a historic concrete gate control structure on the upstream side of the Copco No. 1 dam (Figure 3-3) in March 2018. This structure has not been inspected by KRRC biologists to-date for potential bat roosting.

3.3 Conclusions

Surveys conducted from 2017-2019 confirmed that significant bat roosts are present in many structures across the Project area.

Chapter 4 Western Pond Turtle

4. WESTERN POND TURTLE

4.1 Introduction

KRRC biologists completed general wildlife surveys and noted observations of WPTs in the 0.25-mile study area in 2018, as described in the 2018 Annual Report (KRRC 2019a). In accordance with condition 4.c of the Clean Water Act Section 401 Certification issued by the Oregon Department of Environmental Quality, KRRC conducted a study of WPTs at J.C. Boyle Reservoir. This study was conducted by KRRC biologists in partnership with ODFW from August 2018 through April 2019. This study was implemented to inform key knowledge gaps about native turtles. This study had two primary objectives: 1) to estimate the WPT population size and 2) to determine the timing and locations of WPT overwintering behavior. The results of the study are summarized here. For more detail, figures, and data, please see the full report, Western Pond Turtle Study Report, J.C. Boyle Reservoir (KRRC 2019b).

To assess the population size, KRRC biologists conducted capture-mark-recapture (CMR) in areas known to be used by turtles. In addition, biologists conducted a springtime basking survey to provide a rough estimate of relative abundance. It should be noted that visual surveys do not provide rigorous estimates of population size or density.

Biologists used radio telemetry to track adult turtles through the winter and determine the overwinter timing and location of refugia for WPTs in J.C. Boyle Reservoir. Biologists used temperature data loggers, some attached to radio-tagged turtles and some installed along a transect from upland to deeper waters, to compare temperatures associated with turtle locations with the baseline environmental temperatures. This comparison required the recapture of radio-tagged animals in spring 2019 to retrieve transmitters and recover temperature data.

As described in the 2018 Annual Terrestrial Resources Survey Report (KRRC 2019a), KRRC biologists carried out trapping events and installed environmental temperature loggers in August and September of 2018. Radios and temperature loggers were affixed to eight turtles.

Additional field efforts completed by KRRC biologists in 2019 included:

- Monthly radio-telemetry surveys to identify overwintering habitat and characterize seasonal movement patterns
- Trapping for CMR and for recovery of telemetry equipment and temperature data loggers
- A springtime basking survey to provide a rough estimate of relative abundance
- Retrieval of environmental data loggers to collect baseline temperature data

The WPT Study Report, J.C. Boyle Reservoir (KRRC 2019b) provides additional details of the methods and findings of the study.

4.2 Methods

4.2.1 Fall 2018 – Winter 2019

Telemetry Surveys

Field teams completed telemetry surveys during monthly site visits from November 2018 through April 2019 to ascertain the overwintering habits (timing and location) of the eight radio-tagged WPT. KRRC tested all equipment and found that telemetry receiver accuracy was consistently under 6.5 feet (2 meters). The equipment typically provided locations that were within the margins of error for handheld Global Positioning System (GPS). Locations were recorded using a handheld GPS (Garmin Map78s), with error typically between 10 to 16 feet (3 and 5 meters).

4.2.2 Spring 2019

Trapping and Recovery of Data Loggers

KRRC biologists conducted trapping for CMR and for recovery of telemetry equipment and temperature data loggers in spring of 2019, with site visits on April 3 through 5 and April 23 through 29. Considering the low trap capture success in 2018, the team chose to focus the spring trapping on recapture of radio-tagged WPT to recover the transmitters and temperature data loggers. Trapping was therefore targeted in areas where radio-tagged WPT were found to be present based on telemetry. All eight turtles were successfully radio-located prior to trap deployment in April.

Photograph 4-1 Deployment of Turtle Trap near Large Woody Debris

Biologists placed twenty traps around the reservoir near large woody debris, rock crevices, and other refugia near where radio-tagged turtles were detected. Traps were left in place near radio-tagged turtles and were checked one or more times each day. Bait was replaced as necessary. If telemetry indicated that radio-tagged

turtles were no longer in the area, traps were repositioned near the radio-tagged turtle's new location and rebaited.

On April 27, 2019, KRRC retrieved the environmental data loggers that had been placed along land-to-water transects in the summer of 2018 to collect baseline environmental temperature data.

Basking Surveys

Biologists completed formal basking surveys from April 23 through 29, 2019. These surveys consisted of visually inspecting various basking habitats, such as rock faces, exposed stumps, and downed trees throughout the study area. Biologists recorded the locations of all basking turtles using a handheld GPS unit.

4.3 Findings

4.3.1 Telemetry Study

All eight radio-tagged animals were located via telemetry during each site visit, with the two exceptions noted below. KRRC biologists tracked the approximate travel paths based on monthly telemetry checks for each individual turtle. The telemetry results from the end of summer, through fall and winter and into early spring, are summarized below:

- On September 7, 2018, biologists successfully radio-located seven of the eight turtles. One turtle (#701) only had a faint signal that could not be accurately triangulated.
- On November 14, 2018, biologists located all eight turtles at the reservoir shoreline, apparently inside bank cavities or under large woody debris at the water's edge. Although no radio-tagged turtles were visible, cavities in the bank, crevices, and root wads were visible. Based on telemetry signals, some radio-tagged turtles appeared to be fewer than 3 feet into the bank. Some radio-tagged turtles were located under root wads of standing trees or stumps. Openings to these refugia were often just below the water surface but were completely exposed when the water level was low. Turtles were in the zone exposed to regular fluctuations of reservoir water levels.
- On December 10, 2018, seven of the eight turtles appeared to be in the same locations recorded on the previous visit in November. One turtle had moved, apparently to avoid ice pack.
- On January 29, 2019, there were no recorded movements for any of the turtles; all eight animals appeared to be in the same locations as in December.
- On February 22, 2019, four of the eight turtles had moved short distances (<5 meters) from their overwinter sites, while the other four appeared to be in the same locations reported in December and January.
- On March 5, 2019, most radio-tagged turtles exhibited short distance movements, and by March 13, 2019, telemetry information indicated that turtles were becoming more active.

- From April 3 through 5, 2019, radio-tagged turtles were actively moving throughout the reservoir. Biologists observed some turtles basking. By April 23 through 29, 2019, basking turtles were abundant, and radio-tagged turtles were frequently moving over long distances.

4.3.2 Spring Recapture Efforts

In early April (April 3 through 5), telemetry data indicated that turtles had left overwinter refugia and were actively moving throughout the J.C. Boyle Reservoir. No turtles were caught in baited traps, but two turtles were hand-captured with a dip net. Biologists observed turtles basking on the first day, but observations declined dramatically over the 3-day visit as a large winter storm advanced.

During a second visit in April (April 23 through 29, 2019), weather conditions were more favorable, and biologists regularly observed basking turtles. It appeared that most radio-tagged turtles were moving away from overwinter sites (i.e., shoreline refugia) to more typical spring/summer-use microhabitats during the day (i.e., areas with aerial basking perches, such as woody debris, emergent rocks, and the floating log boom near the dam).

Photograph 4-2 Releasing a Captured Western Pond Turtle

Biologists captured several turtles during the first few days of trapping, but the capture rate declined after the first day. Turtles, including radio-tagged individuals, were consistently observed near trap locations, but the capture rate remained low. Eleven new turtles were caught in traps in 2019, but no recaptures occurred. One radio transmitter (radio #919) was recovered from a trap, but it was no longer attached to the turtle, indicating that the radio-tagged turtle had entered the trap and later escaped. A few turtles were caught by dip net; however, seine netting, snorkeling, and a drift fence trap did not capture any turtles. Due to extremely low underwater visibility and high water levels, active methods of turtle capture were not effective.

Due to the lower-than-required number of captures and recaptures, the CMR data were insufficient to calculate a valid population estimate A larger sample size and higher proportion of recaptures would be required to produce a valid population estimate.

4.3.3 Basking Observations

During basking surveys, KRRC biologists observed a maximum of 35 turtles in 1 day. As observed in previous surveys, WPT used a variety of basking habitats, including exposed rock features and large woody debris. Biologists consistently observed the greatest numbers of basking turtles at the northern end of the floating log boom near the J.C. Boyle Dam; more than a dozen turtles were observed here at one time on several occasions.

4.3.4 Temperature Monitoring

Biologists successfully recovered environmental temperature data from 9 of the 16 environmental temperature loggers. Thermographs from a land-to-water transect reveal distinct signatures between land and water sensors. Based on the environmental thermographs, the greatest temperature fluctuations occurred at the shoreline sensor, which was nearest to where radio-tagged turtles in this study overwintered. However, temperatures in turtle refugia are unknown because no functional temperature loggers were recovered from the study animals. Only one data logger was recovered from a turtle, but the data were not recoverable due to water damage.

4.4 Conclusions

The study of WPTs occupying the J.C. Boyle Reservoir area had two primary objectives: to generate a population estimate for WPTs at the J.C. Boyle Reservoir and to gain information about their overwintering habits. The number of turtles captured and recaptured was insufficient to produce a statistically valid population estimate, but visual surveys confirmed that WPTs are common in the reservoir. Frequent observations of juveniles indicated that the reservoir supports a reproducing population of turtles.

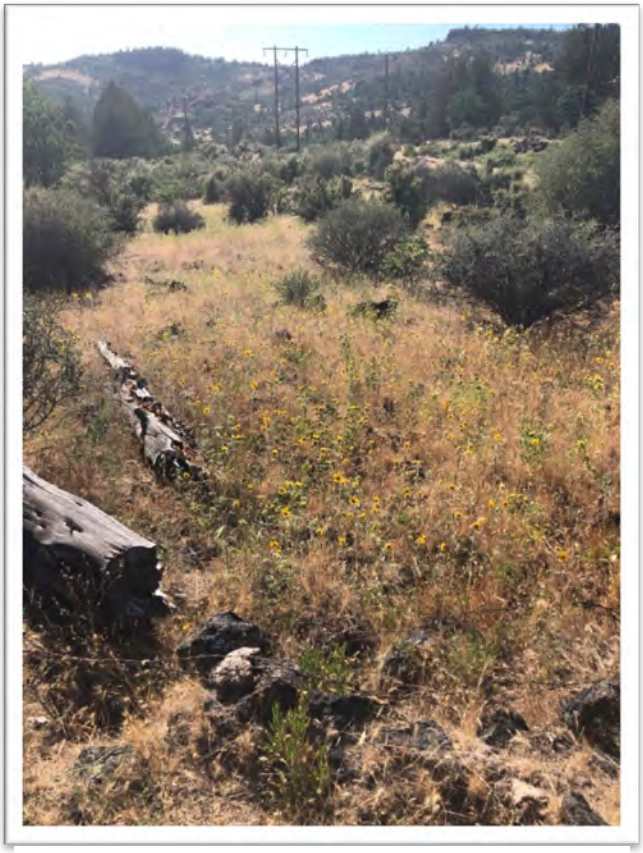
The telemetry study determined that all eight radio-tagged animals overwintered in refugia at the reservoir shoreline. It must be noted that this study was limited in scope and describes the behavior of a subset of turtles at J.C. Boyle Reservoir. Literature on WPT overwinter habits demonstrate that turtles in different systems often behave differently. The findings of this study should be cautiously applied to turtles in the other Project reservoirs. Additional information of WPT life cycle and habitat requirements can be found in previous Project documents (AECOM and CDM Smith 2017).

Chapter 5 Special-Status Plants

5. SPECIAL-STATUS PLANTS

5.1 Introduction

KRRC defined special-status plants to include those species with federal status (federally listed as threatened, endangered, or proposed for listing); state threatened or endangered species, and species on the Oregon Natural Heritage Program Lists 1 to 4 and California Rare Plant Rank 1 to 4. BLM and USFS Sensitive Species are also considered where BLM and USFS lands occur in the study area. The list of special status species in Oregon and California was refined to those with the potential to occur in the project area based on available habitat types and historical records. The species with potential to occur are listed in Table 5-1.



Photograph 5-1 Survey Transect near Copco No. 1 Dam

KRRC biologists identified special-status plant species with the potential to occur in the Project area, based on historical records and review of plant databases. PacifiCorp (2004) documented several special-status plant species during extensive surveys in 2002 and 2003. In addition, KRRC biologists identified documented occurrences of special-status plant species through reviews of state and federal databases, including the Oregon Biodiversity Information Center (ORBIC), the California Natural Diversity Database (CNDDB), and the USFWS Information for Planning and Consultation database (ORBIC 2017, IPaC 2018, CNDDB 2018). Other sources of information on special-status plant species in the Project area include the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants of California, USFWS – Yreka, the Bureau of Land Management (BLM) – Klamath Falls, and the United States Forest Service (USFS) – Klamath National Forest. Table 5-1 shows the documented occurrences for each species with the potential to occur in the project area. If a special status species was previously documented (e.g., on ORBIC, CNDDB) within the project area, it was included in the list of species with the potential to occur even if available habitat did not appear to be present.

Table 5-1 Preliminary List of Special-Status Plants with Potential to Occur

Species	Status	Habitat	Location of Documented Occurrence(s)	Bloom Time	Proposed Survey Effort
Western yellow cedar *(Callitropsis nootkatensis)*	Petitioned for federal listing, CNPS List 4.3	Wet to moist sites, from the coastal rainforests to rocky ridgetops near the timberline in the mountains	Not documented during PacifiCorp surveys or listed on CNDDB or ORBIC for the Project area; may occur based on information from USFWS Yreka office (May 23, 2017)	NA	In construction areas in suitable habitat
Greene's mariposa-lily *(Calochortus greenei)*	FSC, BLM, OC, ONHP List 1, CNPS List 1B	Occurs primarily in annual grassland, wedgeleaf ceanothus chaparral, and oak and oak-juniper woodlands	Several locations around Iron Gate Reservoir (PacifiCorp 2004; CNDDB 2018)	May through July	In construction areas in suitable habitat
Bristly Sedge *(Carex comosa)*	ONHP List 2	Marshes, lake shore, and wet meadows	East Shore of J.C. Boyle Reservoir in two locations (east of Dam and south of Highway 66); also, west of dam (ORBIC 2017)	May through September	Along reservoir margins and in construction areas in suitable habitat
Mountain Lady's Slipper *(Cypripedium montanum)*	ONHP List 4, CNPS List 4	Dry, open conifer forests, more often in moist riparian habitats	J.C. Boyle peaking reach (location details unknown) (PacifiCorp 2004)	March through August	In construction areas in suitable habitat
Gentner's fritillary *(Fritillaria gentneri)*	FE, CNPS List 1B	Cismontane woodland, chaparral and mixed hardwood-conifer vegetation dominated by Oregon oak	Habitat present in the reach along Copco and Iron Gate Reservoirs; no known locations	Late March to early April; April and May at higher elevations	In construction areas in suitable habitat
Bolander's sunflower *(Helianthus bolanderi)*	BLM, ONHP List 3	Occurs in yellow pine forest, foothill oak woodland, and chaparral, and occasionally in serpentine substrates or wet habitats	South of Iron Gate Reservoir near alternative disposal site, J.C. Boyle peaking reach (location details unknown) (PacifiCorp 2004)	June through October	In construction areas in suitable habitat
Washington lily *(Lilium washingtonianum* ssp. *purpurascens)*	CNPS List 4	Forest openings, chaparral, burned clearcuts, and roadsides	Several locations around Copco Lake, including near Copco Road along the seep area (KRRC 2019a)	June through August	Within the limits of work in suitable habitat
Bellinger's meadow-foam *(Limnanthes floccosa* ssp. *Bellingerana)*	FSC, BLM, OC, ONHP List 1, CNPS List 1B	High elevation vernal pools in shallow soiled rocky meadows in spots that are at least partially shaded in the spring	J.C. Boyle peaking reach (location details unknown) (PacifiCorp 2004)	April through June	In construction areas in suitable habitat

Species	Status	Habitat	Location of Documented Occurrence(s)	Bloom Time	Proposed Survey Effort
Detling's silverpuffs (*Microseris laciniata* ssp. *detlingii)*	CNPS List 2	Chaparral and grassy openings among Oregon white oak trees	One location on the western side of Iron Gate Reservoir (CNDDB 2018)	May and June	In construction areas in suitable habitat
Egg Lake monkeyflower *(Mimulus pygmaeus)*	FSC, CNPS List 4	Occurs in damp areas or vernally moist conditions in meadows and open woods	East of J.C. Boyle Reservoir in two locations (north of Highway 66 and southeast of Dam); west of Dam in two locations in damp mudflats; also west of canal near access road in one location (PacifiCorp 2004)	May through August	Along reservoir margins and in construction areas in suitable habitat
Greene's four o-clock *Mirabilis greenei*	CNPS List 4	Dry slopes and flats among juniper and foothill woodlands, and grasslands	Along the western side of the Iron Gate Reservoir (KRRC 2019a)	May and June	Within the limits of work in suitable habitat
Holzinger's orthotrichum moss *(Orthotrichum holzingeri)*	CNPS List 1B.3	Found on vertical calcareous rock surfaces and at the bases of Salix bushes just above rock that is frequently inundated by seasonally high water in dry coniferous forests	Just upstream of Iron Gate Reservoir on Jenny Creek (CNDDB 2018)	N/A	Where in-stream work could occur at Jenny Creek at bridge
Western yampah *(Perideridia erythrorhiza)*	FSC, BLM, OC, ONHP List 1	Occurs in moist prairies, pastureland, seasonally wet meadows, and oak or pine woodlands, often in dark wetland soils and clay depressions	Along three drainages into the western side of J.C. Boyle Reservoir, and in two locations west of the canal near the access road (PacifiCorp 2004)	Mid July and August	Along reservoir margins and in construction areas in suitable habitat
Howell's yampah (Howell's false caraway) *(Perideridia howelii)*	ONHP List 4	Moist meadows and stream banks	One location along the drainage southeast of J.C. Boyle Reservoir; one location along the northern side of Copco Lake north of the road (PacifiCorp 2004)	July and August	Along reservoir margins and in construction areas in suitable habitat
Yreka phlox *(Phlox hirsuta)*	FE, CE, CNPS List 1B	Open areas on dry serpentine soils and at elevations ranging from 2,500 to 4,400 feet	Not known to occur near construction areas; no suitable ultramafic soils occur within 0.5 mile of construction areas (NRCS 2017)	March and April	None – suitable soils not present in construction areas
Strapleaf willow *(Salix ligulifolia)*	ONHP List 3	Riverbanks, wetlands, and floodplains	One location west of J.C. Boyle Dam in a boulder flood channel in the dam release zone (ORBIC 2017)	March through June	Along reservoir margins and in construction areas in suitable habitat

Species	Status	Habitat	Location of Documented Occurrence(s)	Bloom Time	Proposed Survey Effort
Fleshy sage *(Salvia dorrii* var. *incana)*	CNPS List 3	Occurs in silty to rocky soils in great basin scrub, pinyon, and juniper woodland	Three locations around Iron Gate Reservoir (PacifiCorp 2004)	May through July	In construction areas in suitable habitat
Lemmon's silene *(Silene lemmonii)*	ONHP List 3	Open pine woodlands	J.C. Boyle peaking reach to J.C. Boyle Reservoir (location details unknown) (PacifiCorp 2004)	Spring and Summer	In construction areas in suitable habitat

Key:

BLM: Bureau of Land Management sensitive species -species that could easily become endangered or extinct.
CE: California Endangered
CNDDB: California Natural Diversity Database
CNPS List 1A: California Native Plant Society (CNPS)-Presumed extinct in California
CNPS List 1B: rare, threatened, or endangered in California and elsewhere
CNPS List 2: rare, threatened, or endangered in California, but more common elsewhere
CNPS List 3: on the review list – more information needed
CNPS List 4: on the watch list – limited distribution
FE: Federal Endangered
FSC: Federal Species of Concern
OC: Candidate listing by Oregon Department of Agriculture
ONHP List 1: Oregon Natural Heritage Program threatened with extinction or presumed to be extinct throughout their entire range
ONHP List 2: threatened with extirpation or presumed to be extirpated from the State of Oregon
ONHP List 3: more information is needed before status can be determined, but may be threatened or endangered in Oregon or throughout their range
ONHP List 4: of conservation concern but not currently threatened or endangered
ORBIC: Oregon Biodiversity Information Center
USFWS: United States Fish and Wildlife Service

As described in the 2018 Annual Terrestrial Resources Survey Report (KRRC 2019a), KRRC began conducting special-status plant surveys in 2018 to identify any special-status plants that are currently present 1) within a 0.25-mile buffer around the Project area, defined as the dams and structures to be removed, the disposal sites, the haul and access roads that may undergo improvements, and the reservoirs; and/or 2) in areas such as reservoir shorelines that may be affected by the Project. Findings of KRRC surveys in 2018 and 2019 are presented below.

5.2 Methods

KRRC biologists conducted surveys for special status plants with the potential to occur in the project area. Prior to the surveys, KRRC biologists compiled a list of special-status plant species with potential to occur within the limits of work based on documented occurrences and the presence of suitable habitat, as shown in Table 5-1. Surveys were timed to coincide with the bloom time for each species, and the surveys for each species were based on an understanding of the potential habitat suitability in the Project area. The entire limits of work were surveyed for special status plants; however, a focused floristic survey was conducted in areas where there would be construction disturbance. Focused floristic surveys were also conducted where habitat conditions are expected to change due to reservoir drawdown and there were also suitable habitat and locations of known and potential occurrences of special-status plants.

The focused surveys followed the CDFW "Protocols for Surveying and Evaluating Impacts to Special-Status Native Plant Populations and Sensitive Natural Communities" (CDFW 2018). In areas along reservoir shorelines, where changes in hydrology and geomorphology could occur due to the Project, surveys were focused on the locations of known and potential occurrences of special-status plants documented during surveys conducted by PacifiCorp (2004) and data obtained from a desktop review of existing databases (CNDDB, ORBIC, and CNPS).

Following the CDFW protocol, KRRC biologists conducted detailed floristic surveys that entailed identification of every plant taxon observed, to the taxonomic level necessary to determine rarity and listing status. The construction areas include proposed disposal sites (including those considered alternative disposal sites), staging areas, utility line corridors, facility removal areas, and locations where clearing could occur for road modifications such as road widening, turnouts, equipment/material storage, and bridge replacement. In these areas, biologists walked parallel transects generally spaced 5 to 10 meters apart and recorded plant species observed. Biologists also used a boat to survey reservoir shorelines, focusing on areas of suitable habitat and locations of known and potential occurrences of special-status plants. GPS coordinates were recorded for all observed special-status plants, along with descriptions of habitat conditions and proximity to proposed work activities or other notable features.

In consideration of the various peak bloom times of the focal species listed in Table 5-1, the KRRC biologists planned three surveys: early season (April), mid-season (May), and late season (July). The mid-season and part of the late season surveys were conducted in 2018, as described in the 2018 Annual Terrestrial Resources Survey Report (KRRC 2019a). The April early season survey was not conducted in 2018, due to lack of access to PacifiCorp lands. A July 2018 wildfire in the California portion of the study area restricted the late-season survey to the J.C. Boyle Reservoir study area. Therefore, KRRC planned follow-up surveys in 2019 to include the April early-season survey and the July late-season survey (California only). Additionally, any areas that were insufficiently surveyed during 2018 were surveyed in 2019. This included the proposed Fall Creek Hatchery area and river reach between Copco and Iron Gate Reservoirs. Lastly, biologists visited the locations of unconfirmed, historical sightings during the appropriate bloom times to confirm the occurrences of specific species.

Photograph 5-2 Bristly Sedge (*Carex comosa*)

The April 2019 special-status plant survey was specifically scheduled to coincide with the bloom time of Gentner's fritillary. During survey planning, KRRC biologists obtained information from CDFW and USFS botanists on the 2019 phenology at known reference populations to confirm the appropriate timing of the survey in the Project area. Biologists visited a reference population of Gentner's fritillary in Jacksonville, Oregon on April 21, 2019 to confirm that the species was blooming. Biologists took this opportunity to familiarize themselves with the morphological and habitat characteristics of the species to aid in differentiating it from the more common fritillary species, scarlet fritillary (*Fritillaria recurva*), which is very similar in appearance and occupies the same habitat.

The July 2019 special-status plant survey was scheduled to coincide with the late-blooming species shown in Table 5-1, including Greene's mariposa-lily, Bolander's sunflower, Howell's yampah, fleshy sage, and pendulous bulrush. KRRC biologists conducted the survey in the vicinity of Iron Gate Reservoir and Copco Lake from July 15 through July 19, 2019. In addition, during the week of July 22 through July 26, 2019, an AECOM biologist visited the locations of special-status plant observations from the July 2018 survey in the vicinity of J.C. Boyle Reservoir.

5.3 Findings

As shown on Figures 5-1 through 5-3 and presented in Table 5-2 below, biologists identified eight special-status plant species in the Project area during the 2018 and 2019 surveys, as follows:

Photograph 5-3 Greene's Mariposa-lily (*Calochortus greeni*)

- Greene's mariposa-lily (*Calochortus greenei*): KRRC biologists observed numerous *Calochortus* plants in construction areas in the Project area, including at the Iron Gate alternative upland disposal site and along utility corridors in the vicinity of Iron Gate Reservoir and Copco Lake during surveys completed in April 2019. Although plants were not in bloom when first observed in April 2019; the species designation was confirmed as *Calochortus greenei* when sites were revisited in July 2019.

- Detling's silverpuffs (*Microseris laciniata* ssp. *detlingi*). KRRC biologists confirmed a previously documented CNDDB occurrence at the Iron Gate alternative upland disposal site. New occurrences were also observed and mapped along utility corridors along the southeastern side of the Iron Gate Reservoir and south of the Copco No. 2 bypass reach.

- Bristly sedge (*Carex comosa*): In July 2019, KRRC biologists observed and mapped plants throughout the wetland complex along the eastern shore of the J.C. Boyle Reservoir. The location of a historical occurrence south of the Highway 66 bridge was visited during the field surveys and *Carex* was present, but because the plants were not in flower, the species is unconfirmed south of the bridge.

- Bolander's sunflower (*Helianthus bolanderi*): In July 2019, KRRC biologists observed and mapped plants in utility corridors along the northern side of Iron Gate Reservoir and between Iron Gate Reservoir and Copco Lake. Biologists also observed and mapped one occurrence along the eastern side of the J.C. Boyle Reservoir in July 2019.

Table 5-2 Special-Status Plant Observations by Reservoir

Species	Observation Location		
	Iron Gate Reservoir	Copco Lake	J.C. Boyle Reservoir
Greene's mariposa-lily (*Calochortus greenei*)	Several locations in the vicinity of the Iron Gate Reservoir, including within the footprint of the Iron Gate alternative upland disposal site	Along utility corridors between the Copco No. 1 and Copco No. 2 Dams, and between Copco No. 2 Dam and Daggett Road bridge	
Detling's silverpuffs (*Microseris laciniata* ssp. *detlingii)*	Present in the Iron Gate alternative upland disposal site; also along utility corridor on the southeastern side of the reservoir	Along the utility corridor between Copco No. 2 Dam and Daggett Road Bridge	
Bolander's sunflower (*Helianthus bolanderi*)	Present in the Iron Gate disposal area east of the dam; present in the transmission line corridor to west of Jenny Creek confluence	Observed in the transmission line corridor northwest of the reservoir	A large group was observed on the eastern shore in Klamath Sportsman's Park
Fleshy Sage (*Salvia dorrii* var. *incana*)	Two locations near Iron Gate Reservoir; both in proximity to but outside of the construction footprint for removal of utility poles		
Western Yampah (*Perideridia erythrorhiza*)			North of the J.C. Boyle Dam in a dry meadow; will likely be outside the area of impact from the drawdown of the reservoir
Bristly Sedge (*Carex comosa*)			Observed in three locations in Klamath Sportsman Park wetlands on the eastern shore north of the Highway 66 bridge
Greene's Four O'clock (*Mirabilis greenei*)	Observed in the utility corridor on the northeastern side of the reservoir	Observed in four locations along the northern side of the Klamath River, downstream of the Copco No. 2 Dam	
Purple-flowered Washington Lily (*Lilium washingtonianum* ssp. *Purpurascens*)	Near the Fall Creek diversion	Along the northern side of Copco Lake; several observations in mountain seep-associated wetlands along the northwestern shore of the reservoir	
Strapleaf willow (Salix ligulifolia)			Observed along the river just downstream of the J.C. Boyle Dam

- Purple-flowered Washington lily (*Lilium washingtonianum* ssp. *purpurascens*): Biologists recorded a potential observation at one location near the Fall Creek diversion in July 2019. The plant was not in bloom; however, the location is consistent with a confirmed observation of the species in 2018. In July 2019, KRRC biologists observed several plants in bloom, enabling a positive identification, along Copco Road on the northern side of Copco Lake and coinciding with a series of hillside seeps.
- Greene's four o'clock (*Mirabilis greenei*): In April and July 2019, KRRC biologists observed this species in two locations where disturbances resulting from utility pole removal may occur: 1) near the location of the fleshy sage described below, and 2) north of the Klamath River approximately 0.3 mile west of the intersection of Copco Road and Daggett Road.
- Western yampah (*Perideridia erythrorhiza*): In July 2019, KRRC biologists verified a previously documented population north of the J.C. Boyle Dam. The plants were in a dry meadow and would likely be outside of the area impacted by drawdown of the reservoir.
- Fleshy sage (*Salvia dorrii* var. *incana*): In July 2019, KRRC biologists confirmed a previously documented CNDDB occurrence and mapped a population near a culvert along the southeastern side of the Iron Gate Reservoir. Several plant locations along utility corridors on the northern side of Iron Gate Reservoir were also recorded.
- Strapleaf willow (*Salix ligulifolia*): In July 2019, KRRC biologists confirmed a previously documented ORBIC occurrence along the river just below the J.C. Boyle Dam.

Photograph 5-4 Fleshy Sage (*Salvia dorrii* var. *incana*)

5.4 Conclusions

In summary, the KRRC biologists documented special-status plants in the Project area, including at locations that will potentially be disturbed during construction. These findings are consistent with findings of previous surveys conducted in 2018.

Special-status plant surveys have been completed in accordance with the survey work plan (see Appendix J of the Definite Plan [KRRC 2018]). KRRC is not planning additional surveys.

Chapter 6 Wetlands

6. WETLANDS

6.1 Introduction

Wetland and riparian habitats occur throughout the Project area wherever persistent surface water features occur (e.g., streams, seeps, springs, Project reservoirs, or other sources of hydrology). Wetlands are regulated at both the state and federal levels by resource agencies including the United States Army Corps of Engineers (USACE), CDFW, and the Oregon Department of State Lands (ODSL); riparian habitats are only subject to jurisdiction by California agencies (i.e., CDFW and the State Water Resources Control Board). Restoration of the historical Klamath River channel following dam removal is expected to result in a net increase of wetland and riparian acreage; however, some areas may experience a reduction or a loss of associated water sources resulting from reservoir drawdown. This could result in the temporary or permanent loss of some wetlands or riparian areas that primarily depend on reservoir waters for hydrology. Consequently, KRRC developed wetland investigation methodologies in close coordination with USACE, ODSL, and CDFW to characterize existing conditions for wetlands and other waters (including riparian habitats in California). The methodology included determining the primary hydrology source maintaining each assessment area. The results of the wetland delineation work are provided in detail in the separate *2019 Wetland Investigation Summary Report* (KRRC 2020).

Photograph 6-1 Wetland along Shoreline of Copco Lake

To evaluate potential direct impacts on existing habitats, KRRC wetland scientists delineated wetlands in the portions of the Project area where ground-disturbing activities are anticipated to occur (e.g., disposal sites). KRRC wetland scientists also mapped wetlands along the reservoir margins, stream-associated wetlands, and non-wetland riparian vegetation outside of direct construction areas that may experience changes in hydrological conditions resulting from reservoir drawdown or the removal of other dam infrastructure.

6.2 Methods

Prior to the field investigations, KRRC scientists identified wetland investigation sites through a review of previous vegetation and wetland surveys and pertinent agency databases. This included PacifiCorp surveys conducted in 2002 (as reported in PacifiCorp 2004), 2018 KRRC vegetation community mapping (KRRC 2019a), high-resolution aerial imagery, the USFWS National Wetlands Inventory (USFWS 2019), and the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey (NRCS 2019).

KRRC wetland scientists conducted wetland delineation and mapping field surveys from May 6 through May 17, 2019, and from July 15 through July 25, 2019. KRRC wetland scientists delineated wetlands in accordance with the 1987 United States Army Corps of Engineers Wetland Delineation Manual and the Western Mountains, Valleys, and Coast Region Regional Supplement. In the Oregon portion of the Project, scientists applied the Oregon Rapid Wetland Assessment Protocol (ORWAP) to assess functional values of wetlands in construction areas, as described in Section 6.2.2.

The May 2019 investigations focused primarily on areas where ground-disturbing activities are planned to occur (e.g., disposal areas, staging areas, or bridge replacements) and where hydrology sources were identified to be independent of the Klamath River or Project reservoirs. The July 2019 investigations focused on mapping wetlands along and adjacent to reservoir shorelines and sections of the Klamath River within the limits of work, and on confirming preliminary findings by revisiting areas where problematic conditions were encountered in May 2019. Survey teams mapped non-wetland riparian areas on the California side of the Project in both May and July. Non-wetland riparian areas were not mapped in Oregon; however, the vegetation community mapping does identify willow-dominated communities that are often indicators of riparian conditions (see Section 7 for an update to willow vegetation community mapping provided in the 2018 annual report [KRRC 2019a]).

6.2.1 Wetland Delineation

In accordance with the USACE methodology, KRRC scientists first identified areas that exhibited potential wetland characteristics (e.g., hydrophytic vegetation) and then conducted evaluations of representative wetland determination plots to determine whether the area met the requirements for hydrophytic vegetation, hydric soils, and wetland hydrology. Field crews selected determination plots in areas with conditions that were representative of the entire wetland area. Figures 6-1, 6-2, and 6-3 depict the areas investigated for wetlands in the vicinity of Iron Gate Reservoir, Copco Lake, and J.C. Boyle Reservoir, respectively. In addition to the areas shown on the figures, the entire reservoir margin was also surveyed.

When the presence of a wetland was confirmed, field teams mapped the wetland boundary to submeter accuracy using a handheld GPS device (Trimble Geo 7X). For sites containing a defined stream channel, wetland scientists mapped the ordinary high-water mark (OHWM) and the riparian corridor boundary (RCB) to delineate the extent of federal (e.g., OHWM constitutes waters of the United States) and state jurisdictional boundaries (e.g., RCB constitutes waters of the State under CDFW jurisdiction). In areas where private property or safety concerns prevented access to wetlands or riparian vegetation, surveyors used an alternative mapping approach. This consisted of using ArcGIS Collector, a mobile data collection application that provides a map-driven interface that allows the user to capture spatial data from a distance. Collector

was only used to map study areas where line of sight was unimpeded and mapped points could be corroborated with visual observations and aerial imagery.

In several cases, multiple wetlands exhibited sufficiently similar soil, vegetation, and hydrological conditions that they could be appropriately characterized by a single set of paired wetland and upland USACE determination plots recorded for a single representative wetland. For example, wetlands dominated by hardstem bulrush (*Schoenoplectus acutus*) occurring intermittently along the shoreline of each reservoir consistently exhibited very similar characteristics in terms of vegetation, hydrology, and soils. Given their similarity, these wetlands were characterized by at least one representative determination plot at each reservoir. Using this approach, at least one representative set of paired wetland and upland determination plots was evaluated for each wetland type observed at each reservoir.

6.2.2 Oregon Rapid Wetland Assessment Protocol

Based on direction from ODSL, KRRC wetland scientists conducted an additional wetland functions and values assessment in the Oregon portion of the Project area using the ORWAP. ORWAP consists of a series of field and desktop evaluations that provide a standardized, regionally tailored, rapid procedure for estimating the functions and values of wetlands occurring in the state of Oregon (Adamus et al. 2016). ORWAP was conducted in areas where the hydrology is independent from the Klamath River or J.C. Boyle Reservoir (e.g., J.C. Boyle alternative upland disposal site).

Photograph 6-2 Wetland with Hydrology Independent of the Reservoirs

6.2.3 Riparian Vegetation Mapping

Photograph 6-3 Riparian Vegetation at Jenny Creek

CDFW jurisdiction includes ephemeral, intermittent, and perennial watercourses, and can extend to habitats adjacent to watercourses. Wetlands and riparian vegetation near watercourses would be considered "habitats adjacent to watercourses" and are thus subject to jurisdiction by the CDFW under Sections 1600 through 1616 of the California Fish and Game Code. To delineate CDFW jurisdictional boundaries, KRRC wetland scientists mapped riparian areas associated with relatively permanent (e.g., reservoir, river, perennial stream, spring, or pond) and semi-permanent (e.g., ephemeral channels) water bodies within the limits of work. Riparian areas generally had hydrophytic vegetation but failed to meet one or more of the remaining wetland parameters (i.e., hydrology and hydric soils), and thus were classified as non-wetland, riparian habitat. KRRC wetland scientists determined the upslope edge of riparian areas by mapping the line where vegetation transitioned from hydrophytic vegetation to vegetation more representative of dry, upland areas in terms of species composition and density. Upland habitat typically consisted of sparsely vegetated, rocky hillslopes. The riparian boundary was mapped to submeter accuracy using a handheld GPS device or ArcGIS Collector, as previously described for wetland delineations.

Riparian delineation methods were informed by definitions and procedures described in the California Riparian Habitat Joint Venture's 2006 Comparison of Methods to Map California Riparian Areas (Collins et al. 2006).

6.2.4 Determination of Hydrology Source

KRRC wetland scientists evaluated the primary source of hydrology for each wetland and riparian area to determine whether the hydrology was mainly dependent on reservoir waters or on other sources. Hydrology was characterized according to the following classifications:

Photograph 6-4 Wetlands along Spencer Creek

- Reservoir-dependent: the primary hydrology is associated with one of the Project reservoirs.
- Infrastructure-dependent: the primary hydrology is associated with infrastructure related to operation of the dams that will be removed as part of the Project (e.g., the Copco wood-stave penstock).
- Non-reservoir-dependent: the primary hydrology is associated with the Klamath River, a stream or seep, precipitation, or another source.

6.3 Findings

A summary of survey findings organized by reservoir area is provided in the following sections. Total wetland and riparian acreages by reservoir are presented in Table 6-1 and described below.

Table 6-1 Summary of 2018-2019 Wetland Investigation Findings

	Location		
	Iron Gate Reservoir	Copco Lake	J.C. Boyle Reservoir
Total Wetlands	**21.2 acres**	**12.9 acres**	**40.0 acres**
Reservoir-Dependent[1] Wetlands	9.6 acres	9.4 acres	38.1 acres
Non-Reservoir-Dependent Wetlands	11.6 acres	3.5 acres	1.9 acres
Total Riparian Vegetation[2]	**40.8 acres**	**32.2 acres**	**n/a**
Reservoir-Dependent Vegetation	10.2 acres	5.3 acres	n/a
Non-Reservoir-Dependent Riparian Vegetation	30.6 acres	26.9 acres	n/a

Notes:

1 This total also includes acreage for areas that are dependent on dam-related infrastructure to support wetland hydrology.
2 Riparian areas not mapped in Oregon.

6.3.1 Iron Gate Reservoir Area

KRRC wetland scientists characterized 134 individual wetlands and 122 riparian zones in the Iron Gate Reservoir area. This area comprised the following 17 general assessment areas between the proposed Fall Creek fish hatchery and the western extent of the proposed limits of work (Figure 6-1):

- Dry Creek Bridge
- Lakeview Road Bridge
- Iron Gate Disposal Area
- Long Gulch Cove
- Iron Gate Culvert 1
- Iron Gate Culverts 2 and 3
- Mirror Cove South Culvert
- Mirror Cove North Culvert
- Juniper Point Culvert
- Scotch Creek
- Camp Creek
- Wanaka Springs Recreation Site
- Jenny Creek Bridge and Cove
- Reservoir Margin
- Yreka Water Supply Pipeline Crossing Area
- Fall Creek Confluence, Daggett Road Bridge, and Staging Areas
- Fall Creek Bridge and Fish Hatchery

These assessment areas correspond to areas where direct impacts resulting from ground-disturbing activities may occur, such as culvert/bridge replacement and upgrades (e.g., Scotch Creek, Dutch Creek, Camp Creek, and Lakeview Road Bridge), recreation site restoration (e.g., Wanaka Springs Recreation Site), and infrastructure improvements (e.g., Fall Creek Hatchery and Yreka Water Supply Pipeline Crossing Area). In addition, these locations represent areas where hydrological changes are expected to affect existing wetlands (e.g., Jenny Creek and Reservoir Margin). Additional sites were evaluated along access routes to characterize existing conditions in the event that future plans require road modifications (e.g., Mirror Cove North and South and Iron Gate Culverts 1 through 3). As noted in Table 6-1, KRRC wetland scientists mapped 21.2 acres of wetlands and 40.8 acres of non-wetland riparian vegetation for areas associated with Iron Gate Reservoir. In all, 9.6 acres of wetland and 10.2 acres of riparian area were classified as dependent on reservoir hydrology.

6.3.2 Copco Lake Area

KRRC wetland scientists characterized 110 individual wetlands and 52 riparian zones in the Copco Lake area. This area comprised the following 14 general assessment areas between the Copco powerhouse and the eastern extent of the limits of work in California, east of the Copco Road Bridge (Figure 6-2):

- Copco No. 2 Wooden Penstock
- Transmission Corridor Pasture
- Copco Borrow Site, Staging Area, and Disposal Area
- Northern Shore Seeps
- Northern Shore Cove #1
- Beaver Creek Confluence and Culvert
- Patricia Road Culverts
- Raymond Gulch
- Northern Shore Cove #2
- Mallard Cove
- Northern Shore Cove #3
- Northern Shore Cove #4
- Shoreline East of Copco Road Bridge
- Reservoir Margin

These assessment areas can be broadly categorized as either areas where ground-disturbing work is anticipated to occur (e.g., Copco Borrow Site, Staging Area and Disposal Area, Copco No. 2 Wooden Penstock, Raymond Gulch, and Beaver Creek Confluence and Culvert) or areas where changes in hydrological conditions resulting from reservoir drawdown are anticipated (e.g., Mallard Cove and Reservoir Margin). As previously noted, some additional sites were evaluated in the event that future road modifications are required (e.g., North Shore Seeps, Northern Shore Cove 1 to 4, and Patricia Road Culverts). As noted in Table 6-1, wetland scientists mapped 12.9 acres of wetlands and 32.2 acres of riparian vegetation in the Copco Lake area. In all, 9.4 acres of wetland and 5.3 acres of riparian area were classified as reservoir-dependent or infrastructure-dependent.

6.3.3 J.C. Boyle Reservoir Area

KRRC wetland scientists characterized 46 individual wetlands in the J.C. Boyle Reservoir area. This area comprised the following 16 general assessment areas, encompassing the extent of the proposed limits of work in the state of Oregon (Figure 6-3):

- Powerhouse and Tailrace
- Access Road South of Scour Hole
- J.C. Boyle Power Canal and Access Road
- Power Canal Exit Ramp
- Rafter Access Point
- Base of J.C. Boyle Dam
- J.C. Boyle Alternative Upland Disposal Site
- Southwest Cove
- Topsy Campground Cove
- Ephemeral Stream – Western Shore
- Ephemeral Drainage – Eastern Shore
- Pioneer Park Day Use Area
- Klamath Sportsman's Park
- Northwestern Shore
- Spencer Creek Cove and Northern Shore
- Reservoir Margin

Several assessment areas correspond with areas where deconstruction activities will take place (e.g., Powerhouse and tailrace, J.C. Boyle Power Canal and access road, Power Canal exit ramp, and Access road south of scour hole) and areas where road improvements may occur (e.g., northwestern shore and ephemeral stream east), while others represent sites where wetland impacts associated with reservoir drawdown are anticipated (e.g., Klamath Sportsman's Park, Spencer Creek Cove and northern shore, and reservoir margins). As noted in Table 6-1, wetland scientists mapped 40.0 acres of wetlands in the J.C. Boyle Reservoir area. In all, 38.1 acres of wetland were classified as dependent on reservoir hydrology. Non-wetland riparian areas were not mapped at J.C. Boyle.

6.4 Conclusions

KRRC wetland scientists conducted field investigations in May and July of 2019 to characterize and delineate wetlands and riparian zones in the Project area. These efforts were carried out to describe existing environmental conditions and inform the ongoing Project design and regulatory permit processes. The wetland and riparian area delineations are described in detail in a Wetland Delineation Report.

Chapter 7 Errata: 2018 Vegetation Community Mapping

7. ERRATA: 2018 VEGETATION COMMUNITY MAPPING

This section outlines revisions made to the 2018 Annual Terrestrial Resources Survey Report (KRRC 2019a) subsequent to its distribution as a final report.

During vegetation community mapping in 2018, sandbar willow (*Salix exigua*) was misidentified as Geyer willow (*Salix geyeriana*) in wetlands around the margins of Iron Gate Reservoir and Copco Lake. In addition to correcting the species identification, these errata clarify that Geyer willow thickets, considered a sensitive natural community by CDFW, are not present in the California portion of the Project area. Similarly, bitterbrush scrub, a sensitive natural community in California, is not present in the California portion of the Project area.

The following tables list all revisions to the 2018 report. Table 7-1 lists the changes that apply to the text and Table 7-2 lists changes to the figures in Appendix A of the 2018 report (KRRC 2019a). The corrected figures (Figures 3 and 11) are included in Appendix B of this 2019 survey report.

Table 7-1 Text Errata from 2018 Annual Terrestrial Resources Survey Report (KRRC 2019a)

Previous Text	Revised Text	Page Number	Chapter or Section Number
Geyer	Sandbar	19	2.2.2 Willow Flycatcher
Bitterbrush scrub	Bitterbrush scrub (found only in Oregon portion of the study area)	64	Table 8-1: Vegetation Alliances Recorded in the Study Area
Not applicable (revised text indicates a new row in Table 8-1)	*Salix exigua*; Sandbar willow thicket; Shrub; S4.2; G5	64	Table 8-1: Vegetation Alliances Recorded in the Study Area
Geyer willow thicket	Geyer willow thicket (found only in Oregon portion of the study area)	64	Table 8-1: Vegetation Alliances Recorded in the Study Area
Biologists identified the following sensitive natural communities in the study area: • Oregon ash groves • Bigleaf maple forest • Oregon white oak woodland • Bitterbrush scrub • Chokecherry thicket • Shining willow grove • Geyer willow thicket	Biologists identified the following sensitive natural communities in the California portion of the study area: • Oregon ash groves • Bigleaf maple forest • Oregon white oak woodland • Chokecherry thicket • Shining willow grove	64 and 65	8.3 Conclusions

Table 7-2 Figure Errata from 2018 Annual Terrestrial Resources Survey Report (KRRC 2019a, Appendix A)

Previous Text	Revised Text	Figure Numbers
Geyer willow thicket	Sandbar willow thicket	Figures 3-1 through 3-3; 2018 Willow Flycatcher Habitat and Observations
Geyer willow thicket	Sandbar willow thicket	Figures 11-1 through 11-16 Vegetation Communities

Chapter 8 References

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Chapter 9 List of Preparers

9. LIST OF PREPARERS

Table 8-1 List of Preparers

Name	Education	Qualifications
Emma Argiroff	Master of Urban Planning; B.A. Environmental Science; B.A. Art and Design	2.5 years of experience in regulatory compliance, NEPA/CEQA, land use, and transportation planning.
Don Ashton	M.A. Biodiversity; B.S. Biology	25 years of experience as a professional herpetologist (amphibians and reptiles) researching freshwater ecosystems and seeking multi-disciplinary ecosystem-based approaches to complex stakeholder issues regarding flow management and rehabilitation of regulated rivers in California and Oregon.
Sam Bankston	B.S. Aquatic Biology	7 years of experience in fisheries and wildlife science, stream assessment, threatened and endangered species surveys, biological/water quality sampling, wetland delineation, data analysis using R statistical software, and GIS support.
Kacey Bates	Master of Geospatial Information Science and Technology; B.S. Environmental Science	3 years of experience in GIS, geospatial analysis, task automation (Python), data management, cartographic design, water resources, watershed delineation, floodplain delineation, and development of field data collection forms (Collector for ArcGIS, Survey123).
Laura Burbage	M.S. Ecology; Master of Landscape Architecture; B.A. Biology	18 years of experience in wetland science, plant species identification, wetland soils, restoration design – wetland, stream, and upland habitats, nature park design, permitting, NEPA, aesthetic analysis – USACE methodology, and pre-remedial site assessment.
Joe Broberg	B.A. Environmental Studies	9 years of experience and training in botany with a focus on floristic surveys, special-status plants, ecological data collection, tree surveys, wetland delineations, wildlife surveys, and construction monitoring.
Wilson Fogler	B.A. Forestry (Wildlife Habitat Management and Conservation); B.A. Business Management	3.5 years of experience in wetland delineation, wetland monitoring, biological assessments, threatened and endangered species surveys, water resource planning, and GIS support.

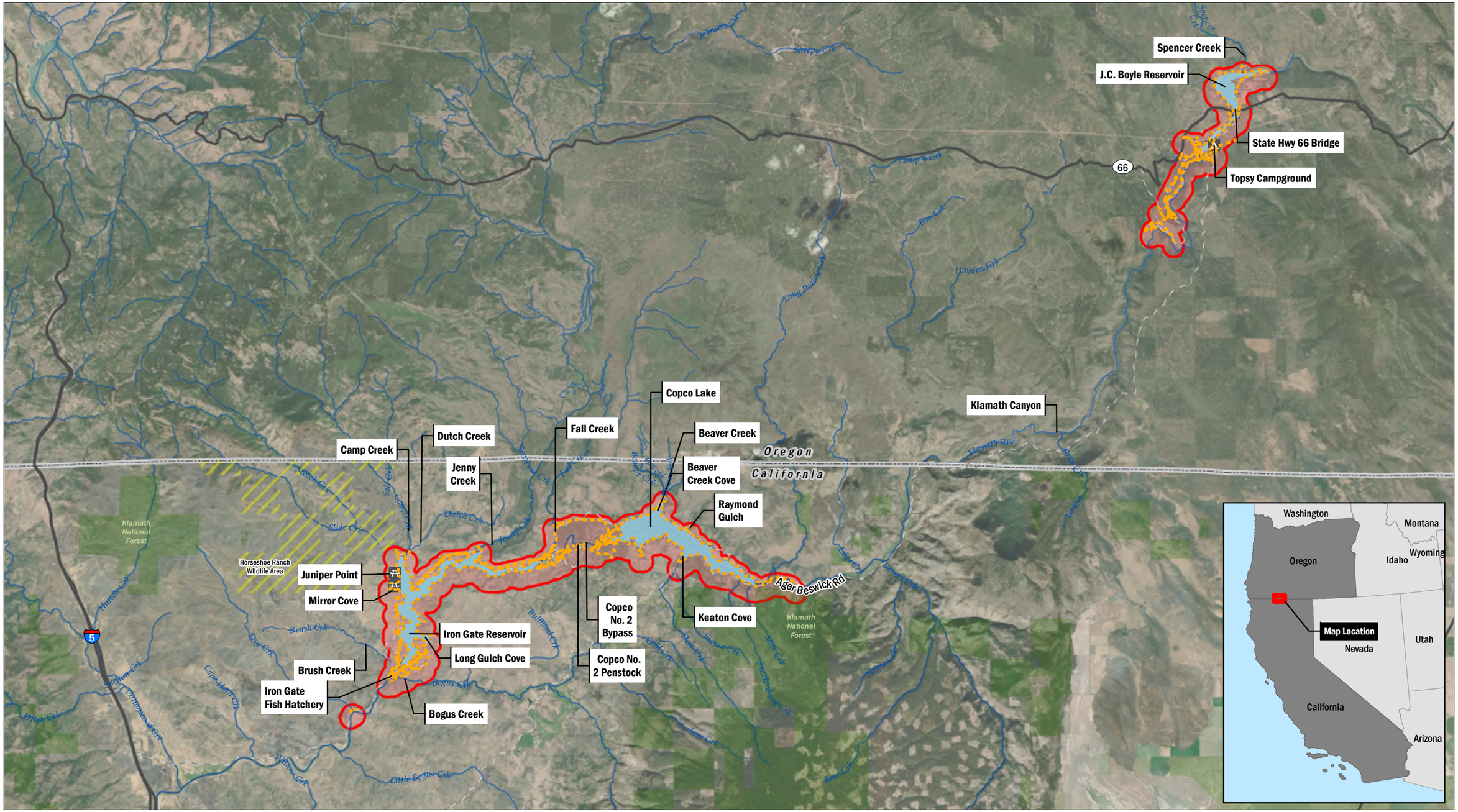
Name	Education	Qualifications
Jennifer Jones	M.S. Environmental Science; B.A. Biology Certified Ecologist – Ecological Society of America	20 years of experience in wildlife and fisheries science, regulatory compliance and permitting, NEPA/CEQA, ecological restoration, wetland delineation, threatened and endangered species surveys, site assessment and remediation, and biological/water quality/soil and sediment sampling.
Christina Kelleher	M.S. Ecology; B.S. Biology; B.A. Sociology 40 Hour Hazwoper Training	5 years of experience in wildlife science, special-status species surveys and monitoring; holds USFWS Recovery Permit and CDFW Scientific Collecting Permit.
Adam Khalaf	M.S. Biological Engineering; B.S. Ecological Engineering	2 years of experience in stream and wetland restoration design, NEPA, and plant and wildlife surveys.
Kate Moran	M.En.- Master of Environmental Science; B.S. Biology; B.A. Sustainability	3 years of experience in wetland science, water resources management, fisheries management and sturgeon research, restoration monitoring, regulatory compliance, and GIS support.
Mandi McElroy	M.S. Wildlife Ecology and Conservation; B.S. Wildlife Biology 40 Hour Hazwoper Training	17 years of experience in wildlife biology with an emphasis on Northern California special status species, habitat assessments, construction monitoring, protocol-level surveys, and impact analyses for regulatory compliance.
Sean O'Hare	B.S. – Biological Science 40 Hour OSHA Hazwoper Training; Methodology of Wetland Delineation Certificate; 30-Hour OSHA Construction	12 years of experience in leading technical field investigations, ecological characterizations, wetland delineations, plant inspection and oversight of planting, stream assessments, water quality assessment, plant surveys, wildlife surveys, and biological assessments; extensive sampling experience.
Matt Petty, PWS, PMP	M.S. Environmental Studies; B.A. Zoology; Environmental Science Professional Wetland Scientist – Society of Wetland Scientists; Certified Ecologist – Ecological Society of America; Project Management Professional – Project Management Institute	14 years of experience in project management, wildlife and fisheries science, regulatory compliance and permitting, NEPA, ecological and stream restoration, wetland delineation, stream and lake assessment, threatened and endangered species surveys, biological/water quality/sediment sampling, and GIS support.
Jonathan Stead	M.S. Ecology, B.S. Biology (Ecology, Behavior, and Evolution)	More than 20 years of experience in ecology and biology, with expertise in environmental permitting and compliance, dam removal, fish passage, stream restoration, and water infrastructure projects.

Name	Education	Qualifications
Kate Stenberg	Ph.D. Wildlife and Fisheries Science and Regional Planning; Master of Administration in Land Use Planning; B.A. Biology-Environmental Studies	35 years of experience in wildlife and fisheries science, regulatory compliance, and NEPA/CEQA.
Conor Veeneman	Professional Science Master, Environmental Science; B.A. Environmental Science; Wetland Professional in Training – Society of Wetland Scientists	4.5 years of experience in wetland delineation, regulatory compliance and permitting, NEPA, stream and wetland restoration design and monitoring, habitat evaluations, threatened and endangered species surveys, biological/water quality/sediment sampling, and GIS support.
Suzanne Wilkins, AICP, ENV SP	B.S. Business Administration	30 years of experience in environmental planning, CEQA/NEPA; regulatory permitting and compliance, and sustainable infrastructure planning.

Notes:
CEQA = California Environmental Quality Act
GIS = Geographic Information System
NEPA = National Environmental Policy Act
OSHA – Occupational Safety and Health Administration
USACE = United States Army Corps of Engineers

Appendix A Figures

CDM Smith 10/11/2019 USER Bateska PATH F:\Klamath_River\2019\MXDs\Overall_Figures\Figure_1_1_Overall_Project_Map_and_Study_Area_2019.mxd



N

0 2.5 5
Miles

Data Source: 2018 TIGER/Line Shapefiles
Basemap Source: Esri, USGS, NOAA

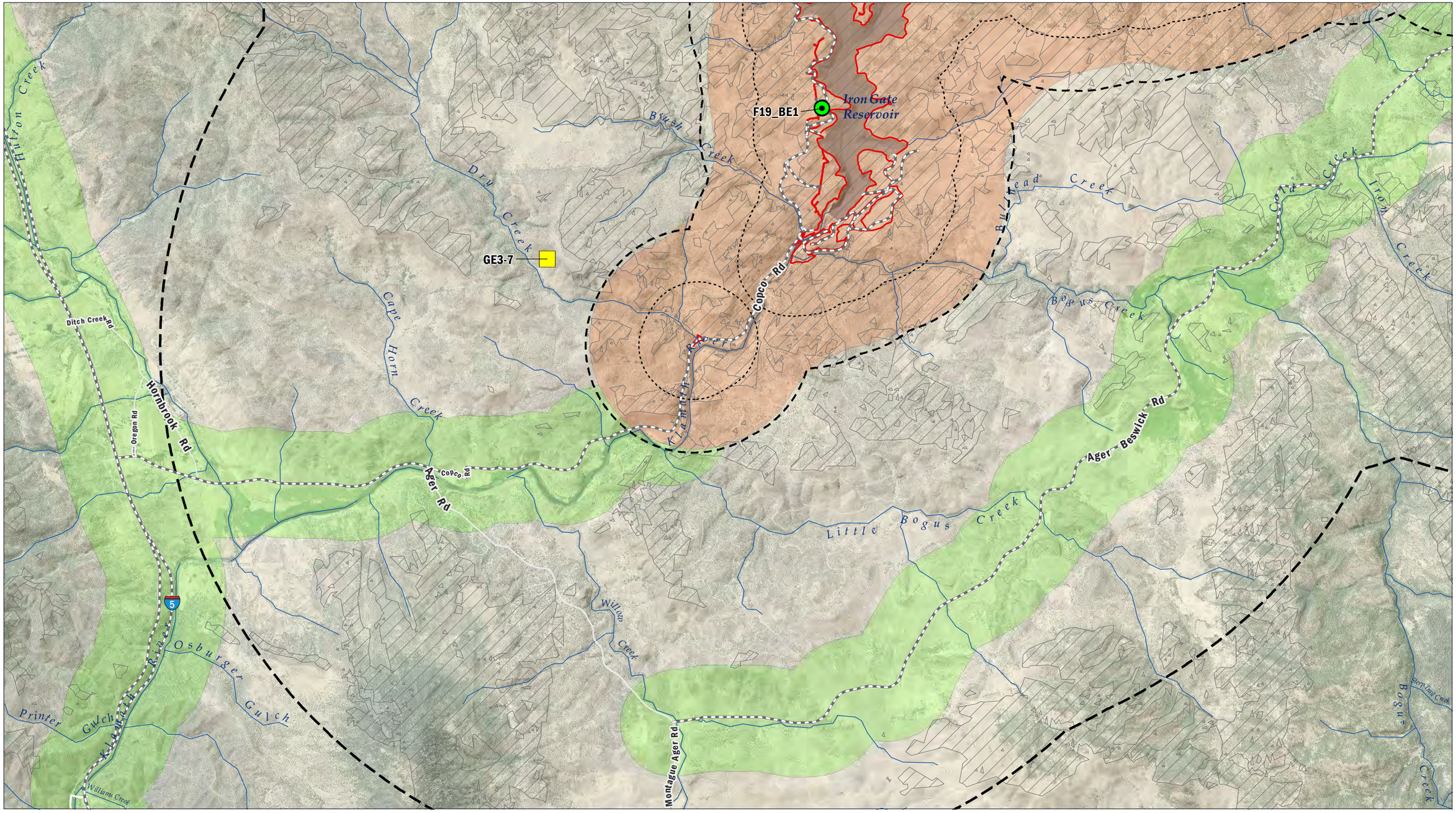
Klamath River Renewal Corporation
Klamath River Renewal Project

Legend

- Limits of Work
- Primary Road
- Access Route
- Stream
- Water Body
- State
- County
- 0.25 Mile Study Area Buffer
- National Forest
- Wildlife Area

FIGURE 1-1

Overall Project Map and Terrestrial Resources Study Area

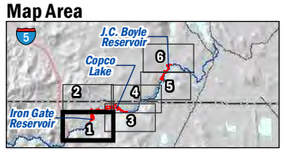


AECOM

Klamath River Renewal Corporation

Klamath River Renewal Project

Map Area



- Access Routes
- Limits of Work
- Viewshed from Limits of Work
- Low Impact Area
- High Impact Area

Project LOW Buffers

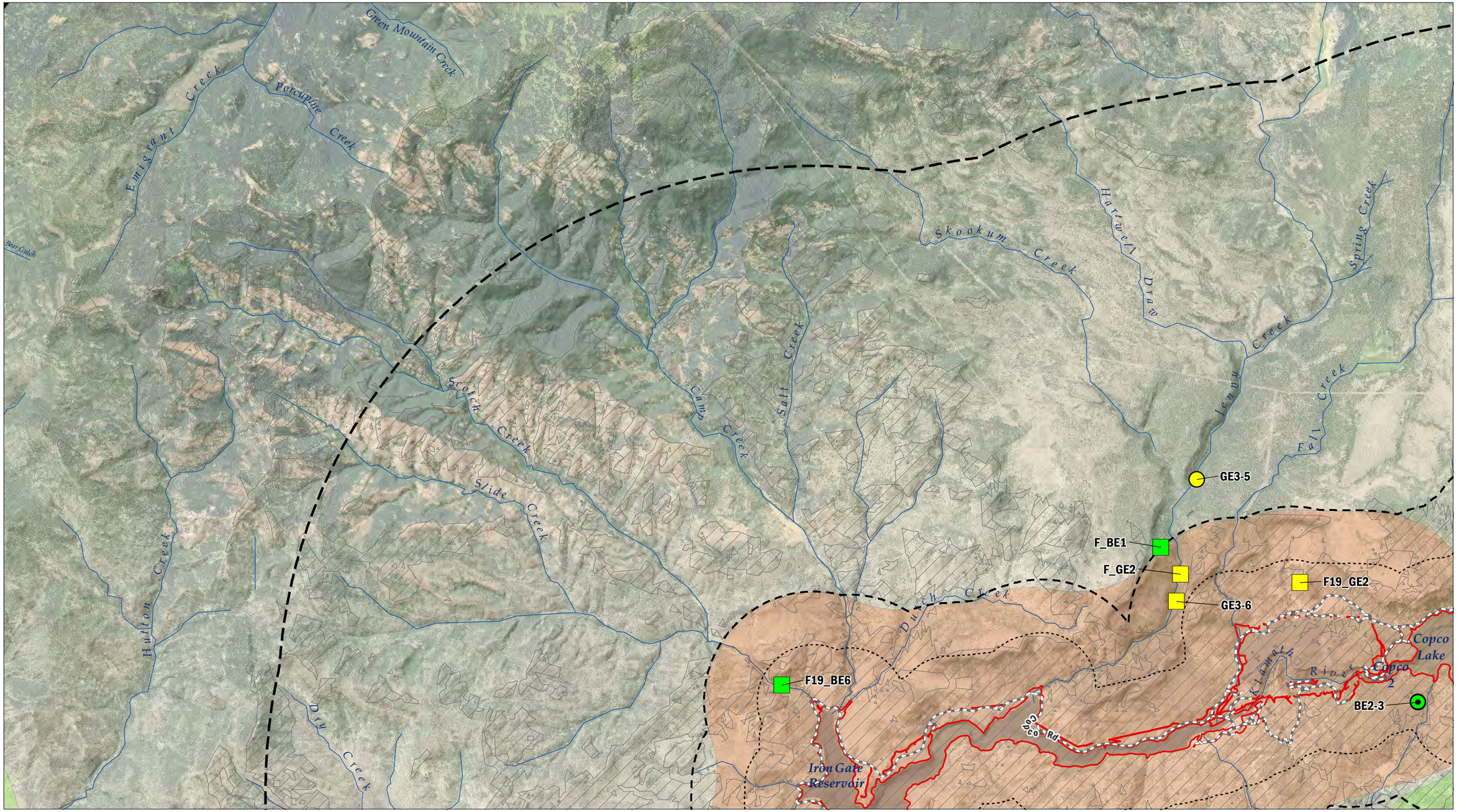
- 0.5 Miles
- 1 mile
- 5 miles
- 10 miles

Eagle Survey Points

- Active in 2019, Bald Eagle
- Inactive, Golden Eagle

FIGURE 2 - 1

Eagle Nest Surveys 2019



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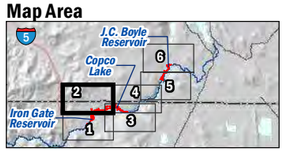
NAIP Imagery, 2014; AECOM, 2019

AECOM

Klamath River Renewal Corporation

Klamath River Renewal Project

Map Area



- Access Routes
- Limits of Work
- Viewshed from Limits of Work
- Low Impact Area
- High Impact Area

Project LOW Buffers

- 0.5 Miles
- 1 mile
- 5 miles
- 10 miles

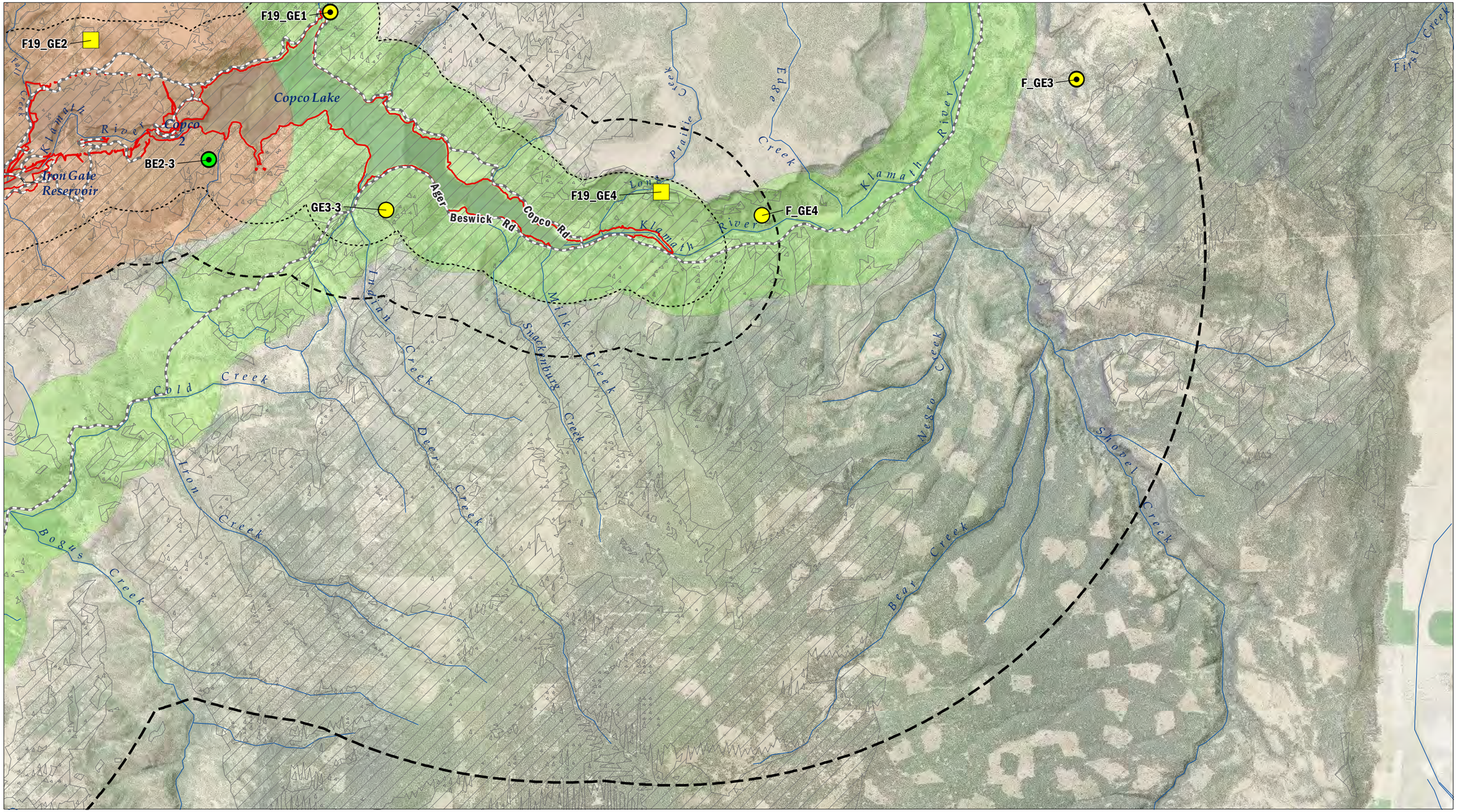
Eagle Survey Points

- Active in 2018, Golden Eagle
- Active in 2019, Bald Eagle
- Inactive, Bald Eagle
- Inactive, Golden Eagle

FIGURE 2 - 2

Eagle Nest Surveys 2019

AECOM Oakland CA 2/26/2020 USER sally.shatford PATH \\Oakland.na.aecomnet.com\Oakland\Projects\Secure\Water\Klamath Dam\400-Technical\440 GIS\02_Maps\02_Map_Production_and_Reports\Biology\Eagles\EagleSurveys_AECOM2017-2019_CDM.mxd



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0 2

Miles

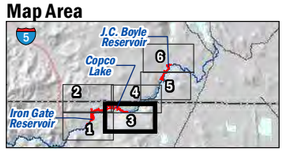
NAIP Imagery, 2014; AECOM, 2019

AECOM

Klamath River Renewal Corporation

Klamath River Renewal Project

Map Area



- Access Routes
- Limits of Work
- Viewshed from Limits of Work
- Low Impact Area
- High Impact Area

Project LOW Buffers

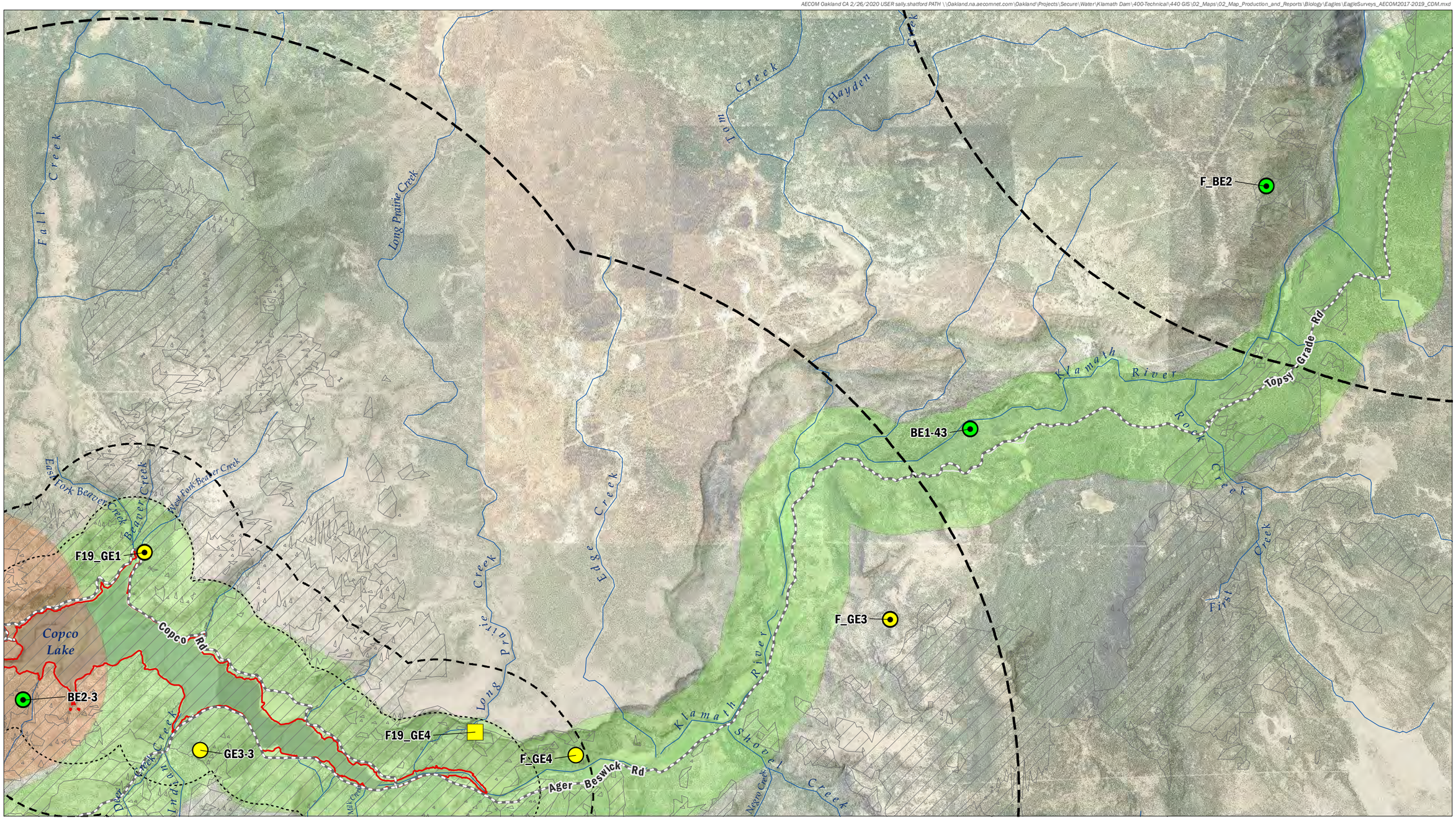
- 0.5 Miles
- 1 mile
- 5 miles
- 10 miles

Eagle Survey Points

- Active in 2018, Golden Eagle
- Active in 2019, Bald Eagle
- Active in 2019, Golden Eagle
- Inactive, Golden Eagle

FIGURE 2 - 3

Eagle Nest Surveys 2019



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Miles

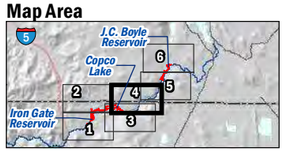
NAIP Imagery, 2014; AECOM, 2019

AECOM

Klamath River Renewal Corporation

Klamath River Renewal Project

Map Area



- Access Routes
- Limits of Work
- Viewshed from Limits of Work
- Low Impact Area
- High Impact Area

Project LOW Buffers

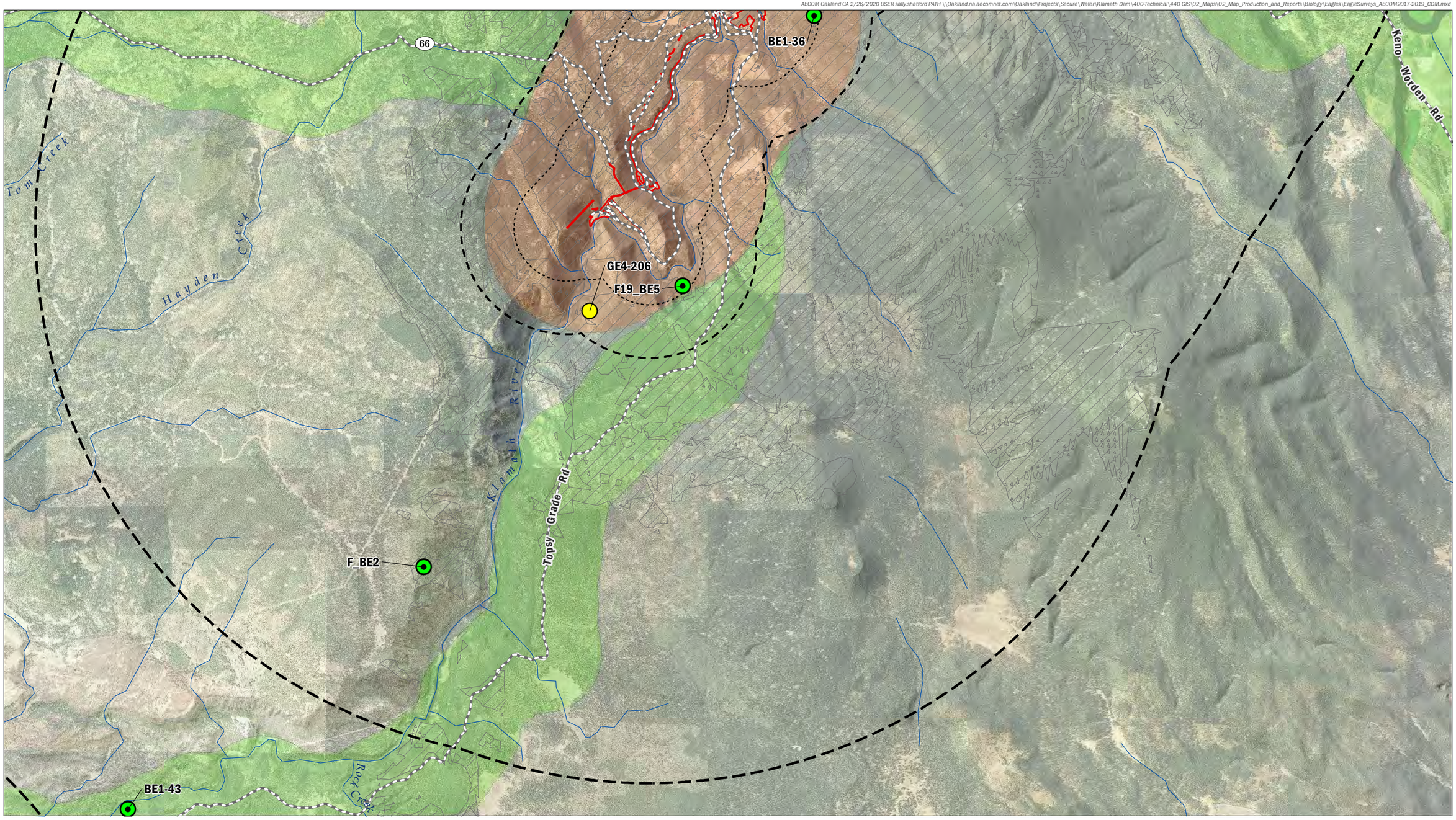
- 0.5 Miles
- 1 mile
- 5 miles
- 10 miles

Eagle Survey Points

- Active in 2018, Golden Eagle
- Active in 2019, Bald Eagle
- Active in 2019, Golden Eagle
- Inactive, Golden Eagle

FIGURE 2 - 4

Eagle Nest Surveys 2019



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Miles

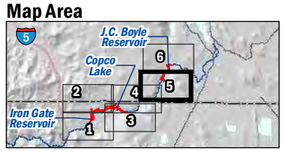
NAIP Imagery, 2014; AECOM, 2019

AECOM

Klamath River Renewal Corporation

Klamath River Renewal Project

Map Area



- Access Routes
- Limits of Work
- Viewshed from Limits of Work
- Low Impact Area
- High Impact Area

Project LOW Buffers

- 0.5 Miles
- 1 mile
- 5 miles
- 10 miles

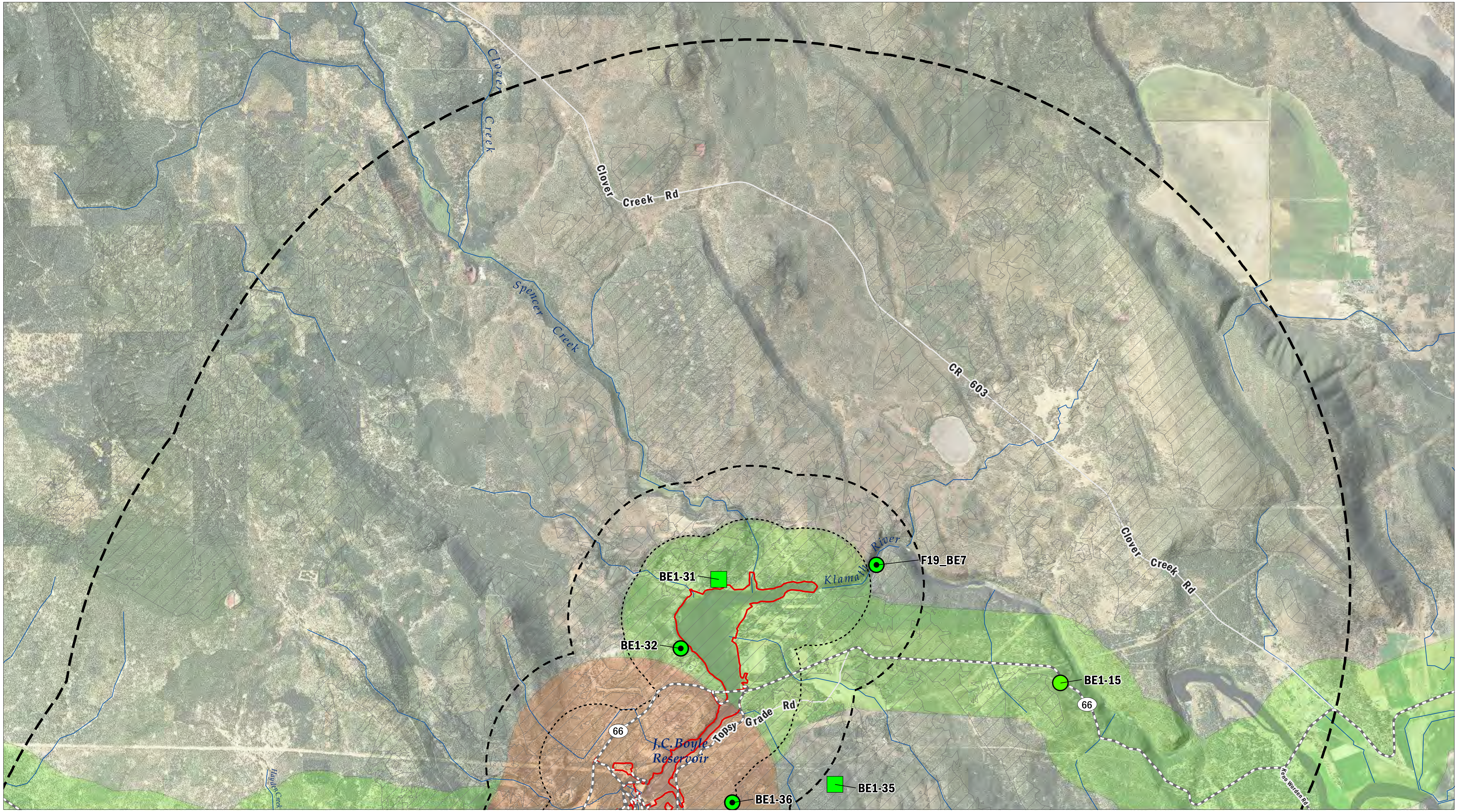
Eagle Survey Points

- Active in 2018, Golden Eagle
- Active in 2019, Bald Eagle

FIGURE 2 - 5

Eagle Nest Surveys 2019

AECOM Oakland CA 2/26/2020 USER sally.shatford PATH \\Oakland.na.aecomnet.com\Oakland\Projects\Secure\Water\Klamath Dam\400-Technical\440 GIS\02_Maps\02_Map_Production_and_Reports\Biology\Eagles\EagleSurveys_AECOM2017-2019_CDM.mxd



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Miles

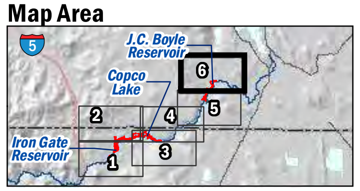
NAIP Imagery, 2014; AECOM, 2019

AECOM

Klamath River Renewal Corporation

Klamath River Renewal Project

Map Area



Access Routes

Limits of Work

Viewshed from Limits of Work

Low Impact Area

High Impact Area

Project LOW Buffers

0.5 Miles

1 mile

5 miles

10 miles

Eagle Survey Points

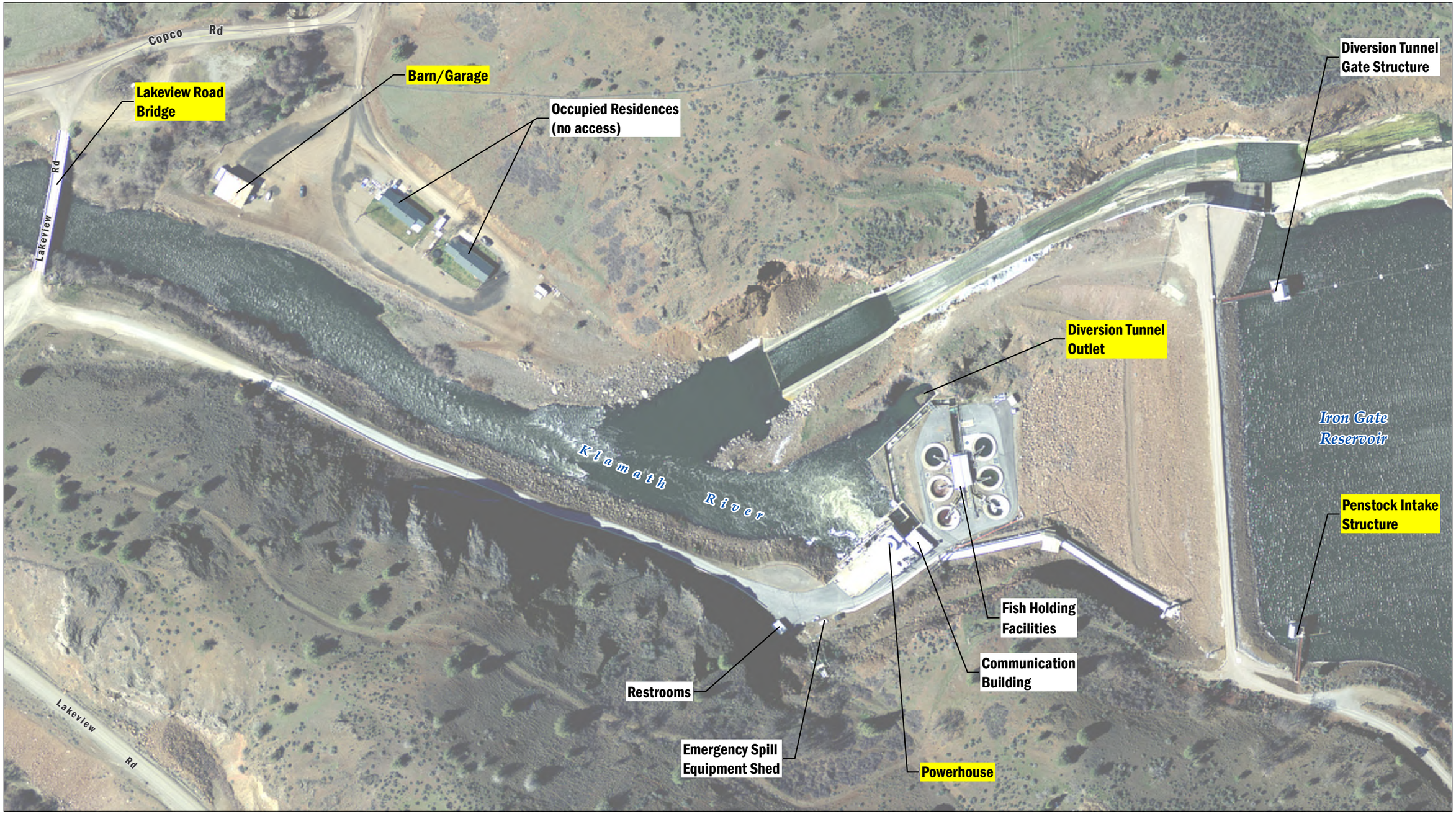
Active in 2018, Bald Eagle

Active in 2019, Bald Eagle

Inactive, Bald Eagle

FIGURE 2 - 6

Eagle Nest Surveys 2019



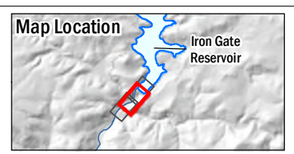
0 300
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 9/24/2019

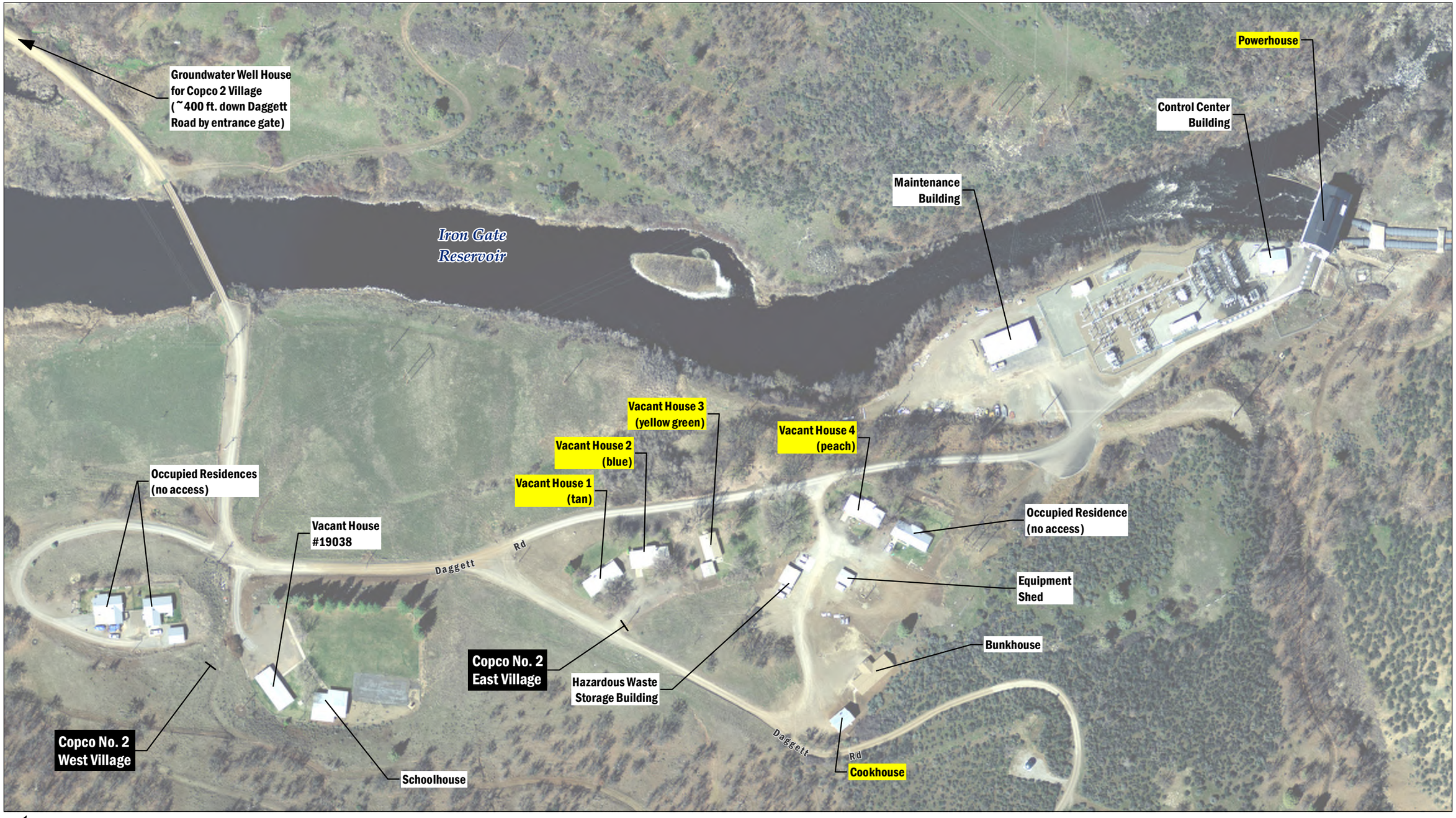
PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

Map Location


Labels
- Active Bat Roost Confirmed
- Roosting Bats Not Found

FIGURE 3-1
2017-2019 Bat Surveys
Iron Gate Dam Area



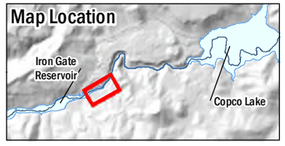
0 300
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 9/24/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

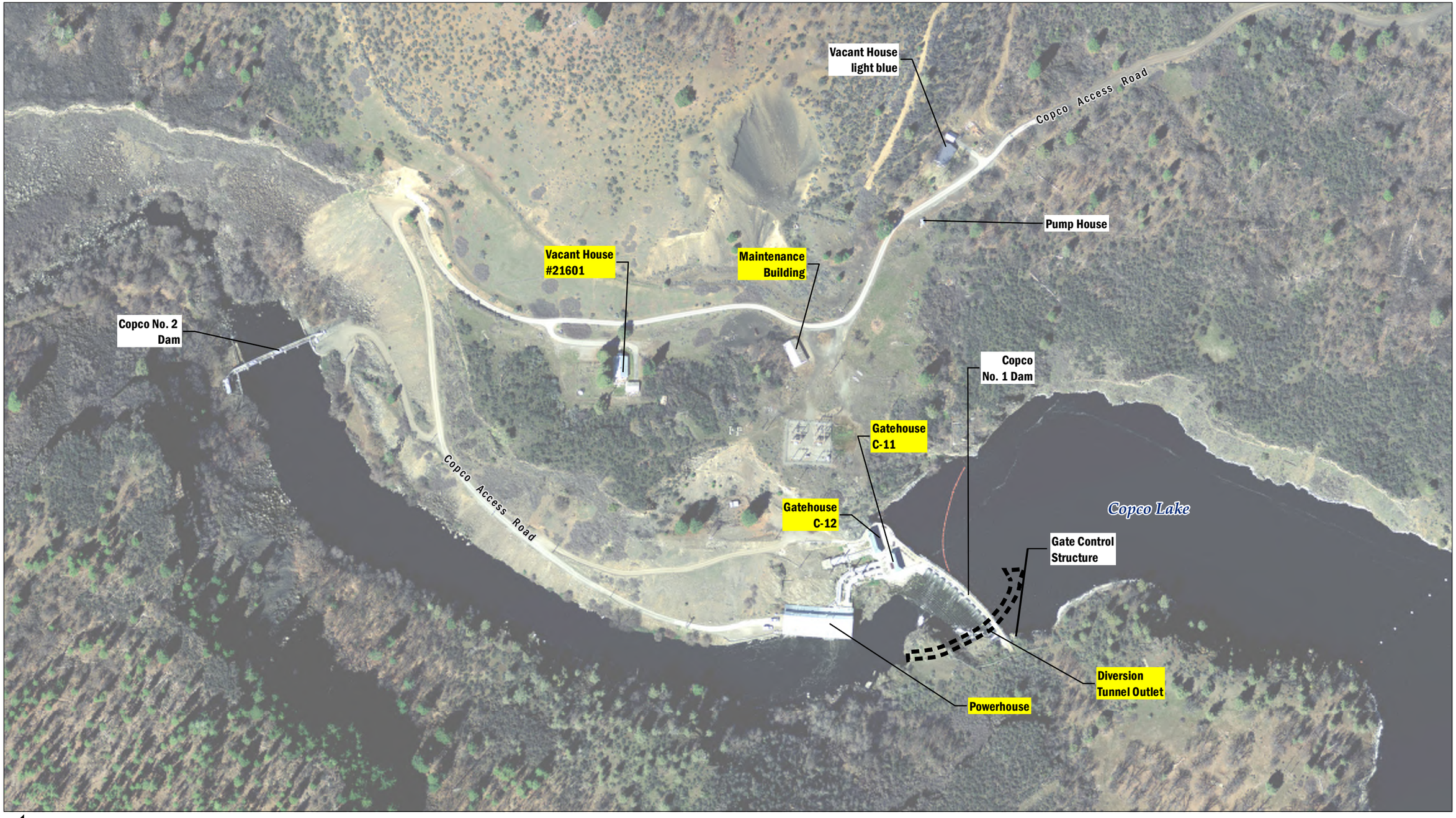


Labels

- Active Bat Roost Confirmed
- Roosting Bats Not Found

FIGURE 3-2

2017-2019 Bat Surveys
Copco No. 2 Powerhouse Area



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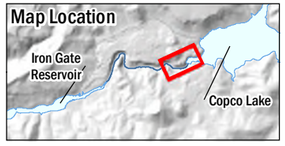
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 9/24/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

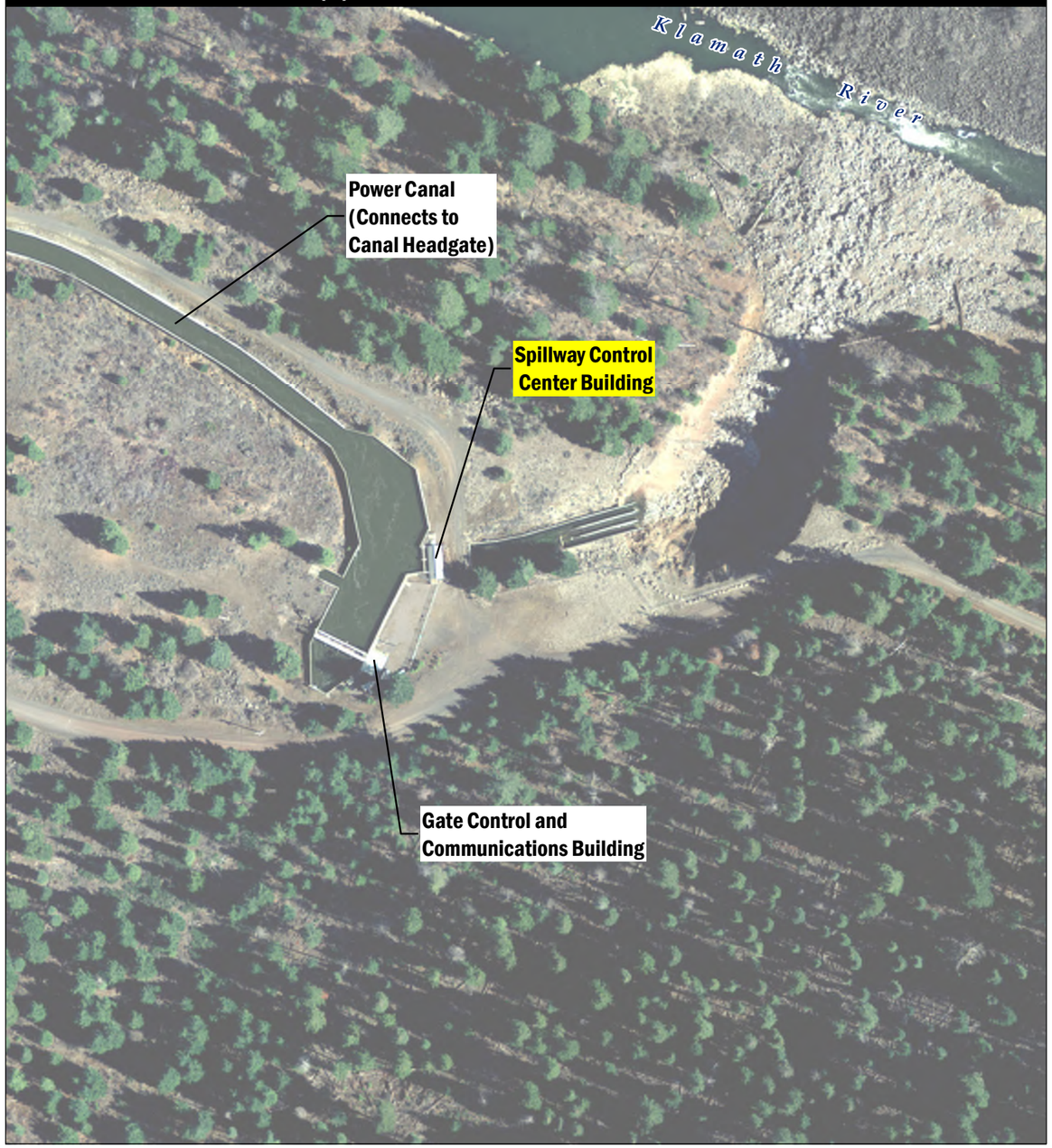
Map Location


Labels
- Active Bat Roost Confirmed
- Roosting Bats Not Found

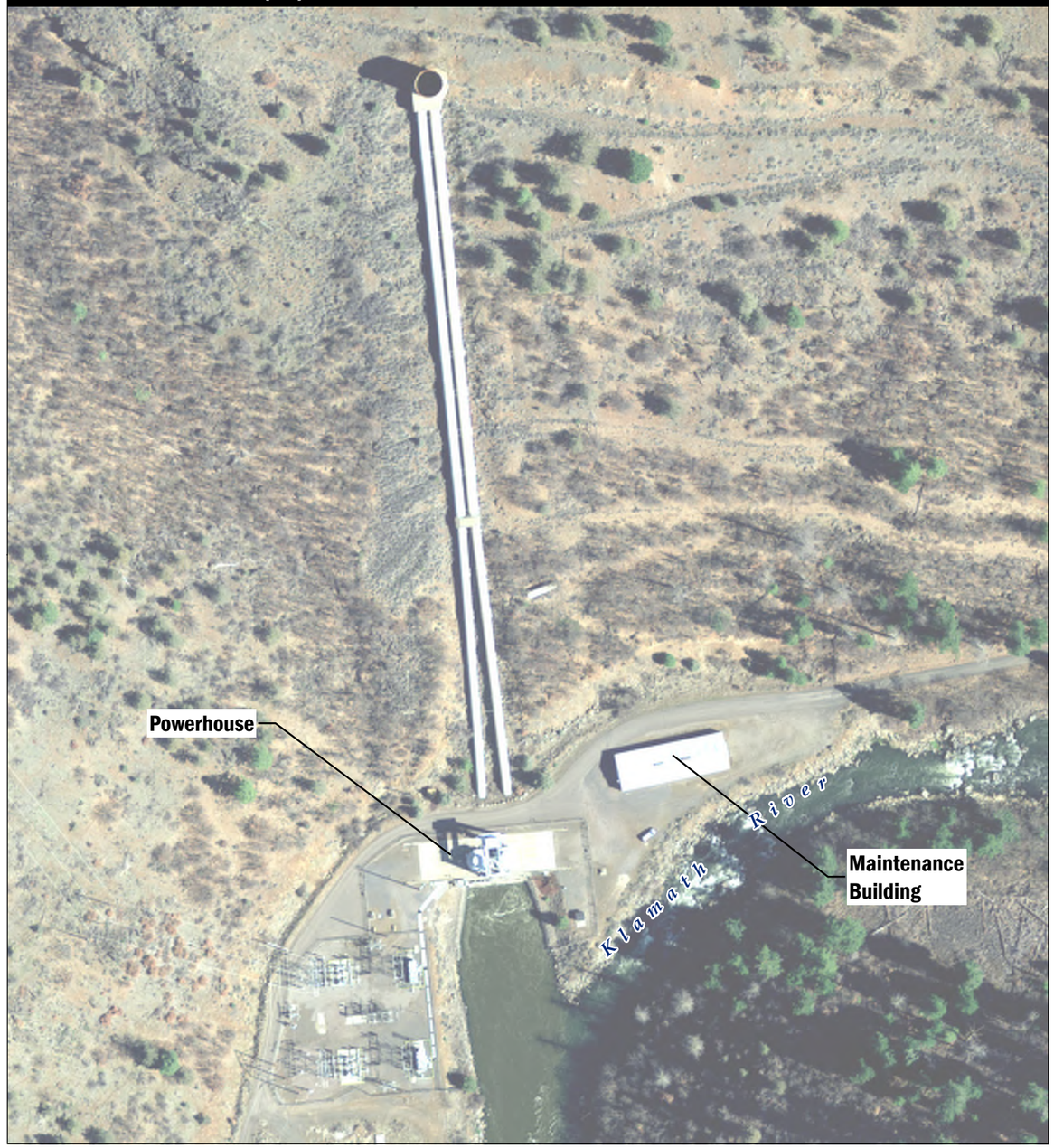
FIGURE 3-3

2017-2019 Bat Surveys
Copco No. 1 Dam Area and
Copco No. 2 Dam Area

(I) FOREBAY AND SPILLWAY



(II) PENSTOCKS AND POWERHOUSE



0 300
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 9/24/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
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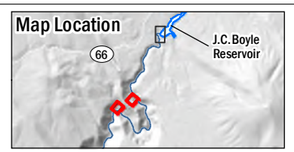
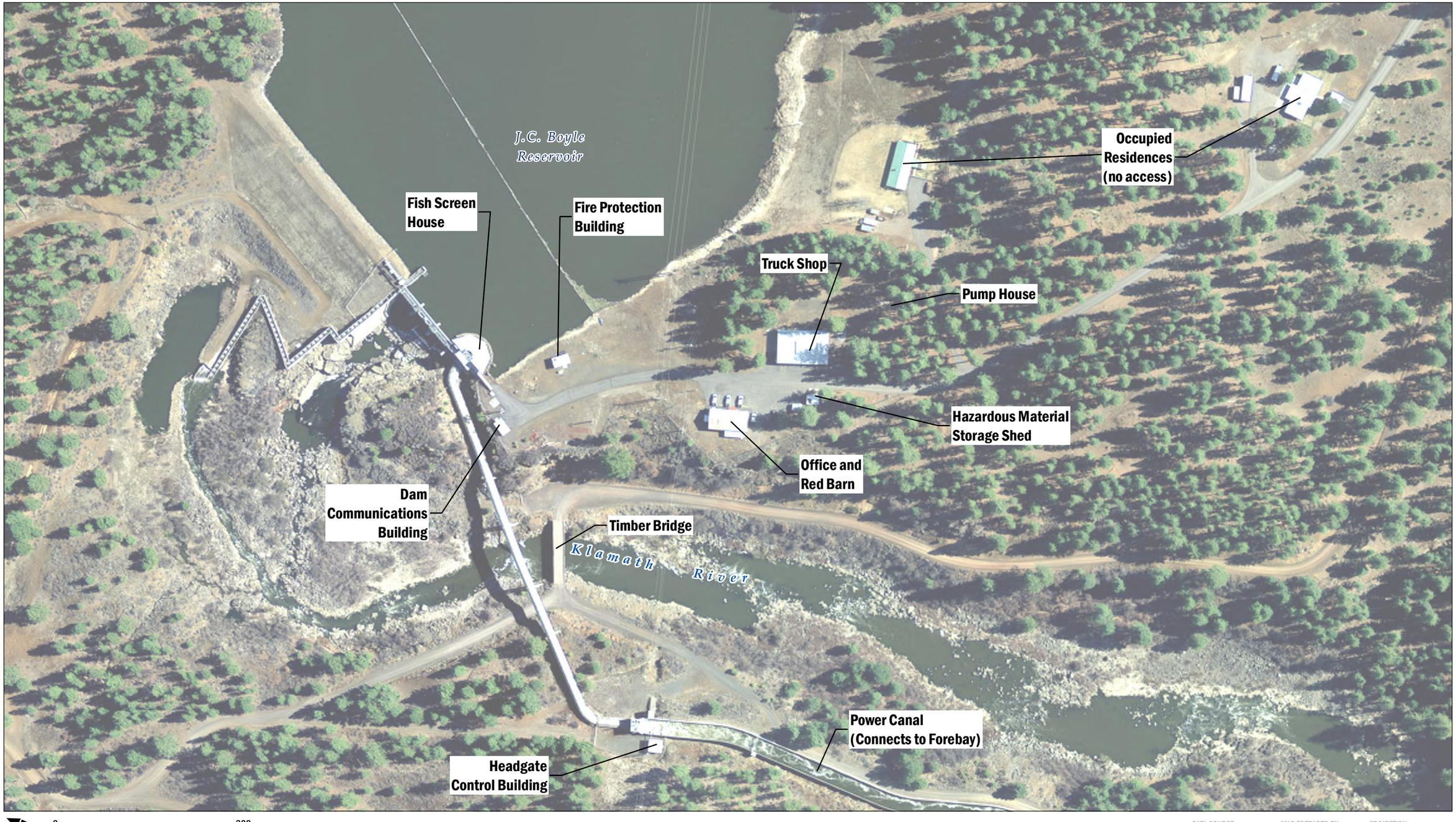


Labels

- Active Bat Roost Confirmed
- Roosting Bats Not Found

FIGURE 3-4

2017-2019 Bat Surveys
J.C. Boyle Forebay and Spillway Area, Penstocks and Powerhouse Area



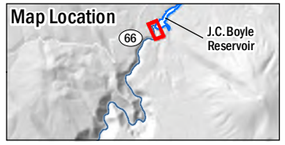
0 300
Feet

DATA SOURCE
NAIP, 2014; USGS (NED), 2015

MAP PREPARED BY:
AECOM Alex Remar, 9/24/2019

PROJECTION
NAD 1983 HARN StatePlane California I FIPS 0401 Feet

AECOM
Klamath River Renewal Corporation
Klamath River Renewal Project

Map Location


Labels
Roosting Bats Not Found

FIGURE 3-5
2017-2019 Bat Surveys
J.C. Boyle Dam Area

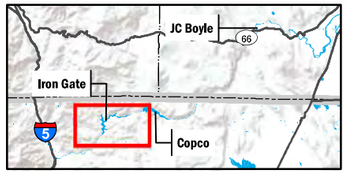
Slide Crk
Scotch Crk
Camp Crk
Dutch Crk
Fall Crk
Jenny Crk
Brush Crk
Dry Crk
Bogus Crk
Cold Crk
Iron Crk
Siskiyou County
Iron Gate Reservoir
Copco Lake
Copco Rd
Copco No. 1 Powerhouse Rd
Copco Access Rd
Dwinnell Rd
Iron Gate Powerhouse Rd
Lakeview Road
Upstream Fish Abatement Access Road
Fowler Rd

Scotch Creek Culvert
Camp Creek Culvert
Juniper Point Culvert
Juniper Point
Mirror Cove
Mirror Cove North Culvert
Mirror Cove South Culvert
Culvert 3
Culvert 2
Culvert 1
Long Gulch Cove
Lakeview Road Bridge
Iron Gate Fish Hatchery
Dry Creek Bridge
Wannaka Springs Rec Site
Jenny Creek Bridge
Iron Gate Alternative Upland Disposal Site
Dagget Road North Staging Areas
Yreka Pipeline North
Dagget Road South Staging Areas
Yreka Pipeline South
Copco No. 2 Penstock
Copco No. 2 Bypass
Borrow Site, Staging Area, Disposal Area

N
0 1 2
Miles

Data Source: CDM Smith
Basemap Source: Esri, USGS, NOAA

Klamath River Renewal Corporation
Klamath River Renewal Project



Legend

- Limits of Work
- 0.25 Mile Study Area Buffer
- Access Route

Special Status Plants (Points)

- Bolander's sunflower
- Bristly sedge
- Calochortus sp.
- Detling's silverpuffs
- Fleshy sage
- Greene's four o'clock
- Greene's mariposa-lily
- Purple-flowered Washington lily

Special Status Plants (Polygons)

- Bolander's Sunflower
- Bristly Sedge
- Calochortus sp.
- Detling's Silverpuffs
- Fleshy Sage
- Greene's mariposa-lily
- Western Yampah

FIGURE 5-1

2019 Special Status Plants
Iron Gate Reservoir

CDM Smith 10/14/2019 USER Bateska PATH F:\Klamath_River\2019\MXDs\Klamath_2019_Annual_Report_Figures\Figure_5_2_Copco_SSP_2019.mxd

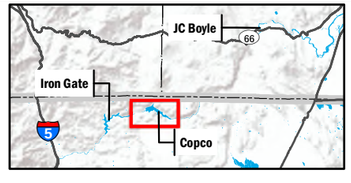
Beaver Creek Culverts
Northern Shore Cove #1
Beaver Creek Cove
Transmission Corridor Pasture
Copco Seeps
Copco Rd
Raymond Gulch Culvert
Copco Lake
Northern Shore Cove #2
Copco No. 2 Penstock
Copco No. 2 Bypass
Copco Access Rd
Northern Shore Cove #3
Dagget Rd
Borrow Site, Staging Area, Disposal Area
Patricia Road Culverts
Northern Shore #4
Iron Gate Reservoir
Copco Rd
Copco Rd Powerhouse Rd
Siskiyou County
Mallard Cove
Long Prairie Crk
Shoreline East of Copco Road Bridge
Ager Beswick Rd
Indian Crk
Deer Crk
Snackenburg Crk
Milk Crk
Copco Road Bridge
Ager Beswick Rd

N

0 0.5 1
Miles

Data Source: CDM Smith
Basemap Source: Esri, USGS, NOAA

Klamath River Renewal Corporation
Klamath River Renewal Project



Legend

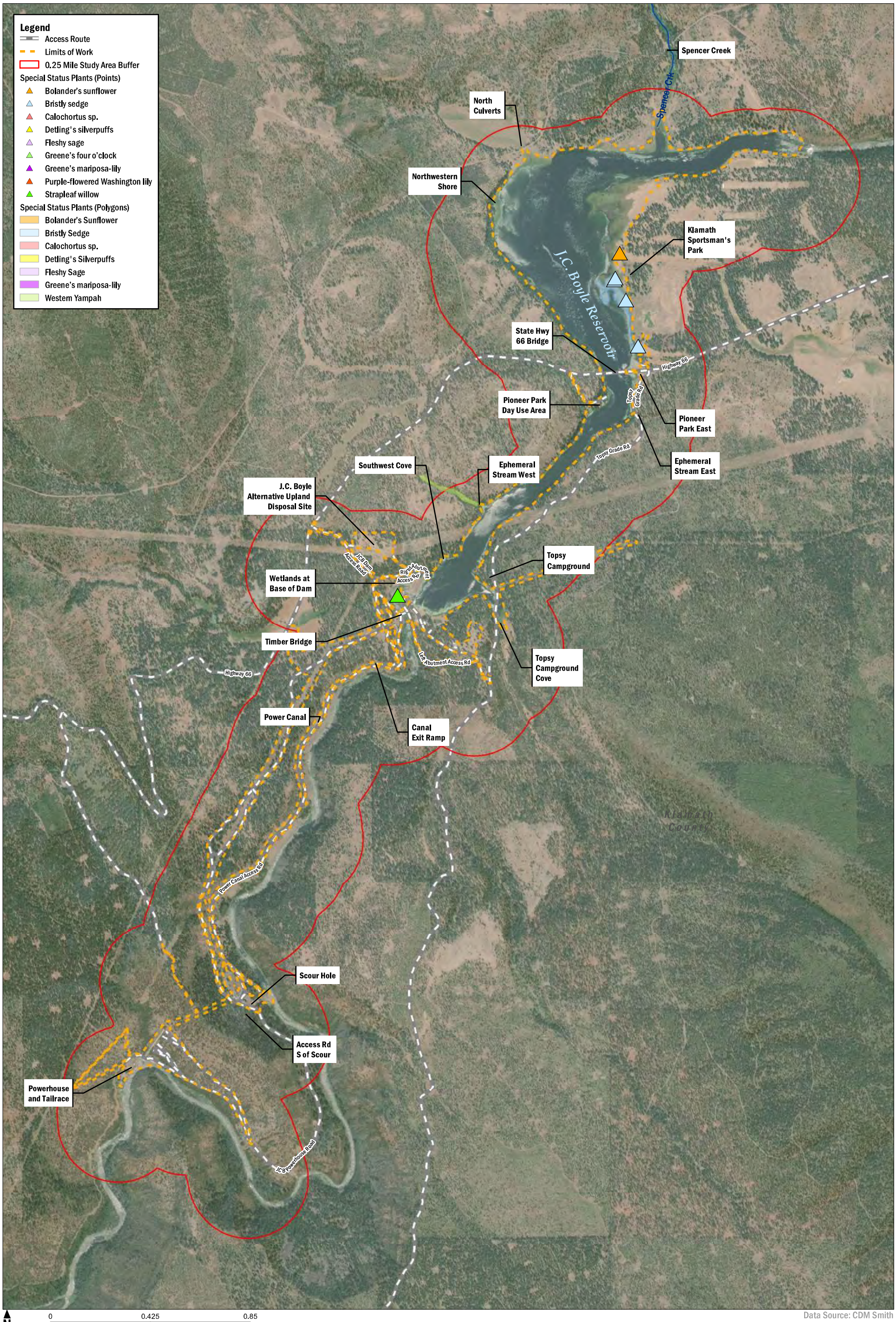
- Limits of Work
- Access Route
- 0.25 Mile Study Area Buffer

Special Status Plants (Points)
- Bolander's sunflower
- Bristly sedge
- Calochortus sp.
- Detling's silverpuffs
- Fleshy sage
- Greene's four o'clock
- Greene's mariposa-lily
- Purple-flowered Washington lily

Special Status Plants (Polygons)
- Bolander's Sunflower
- Bristly Sedge
- Calochortus sp.
- Detling's Silverpuffs
- Fleshy Sage
- Greene's mariposa-lily
- Western Yampah

FIGURE 5-2

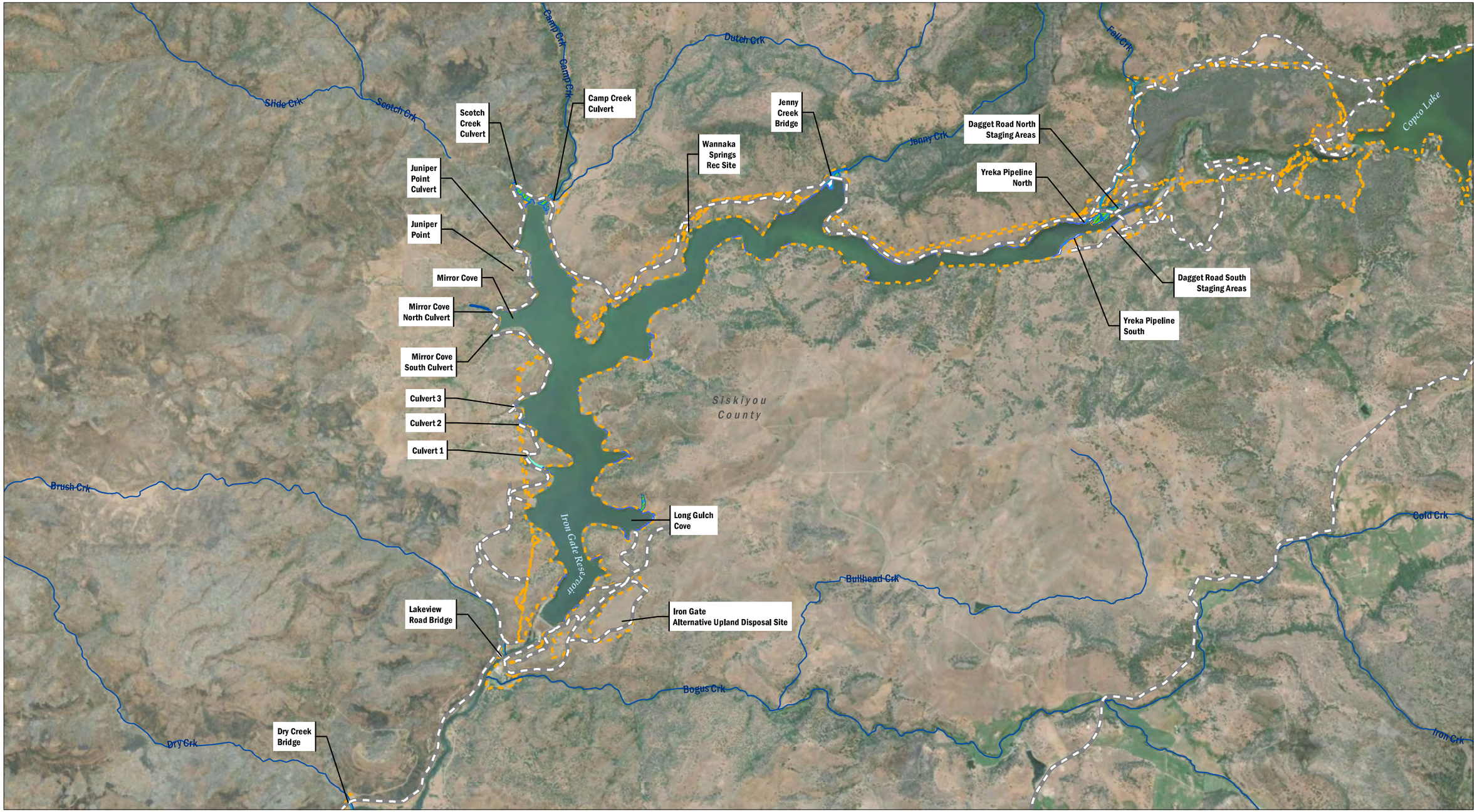
2019 Special Status Plants
Copco Lake



Klamath River Renewal Corporation
Klamath River Renewal Project

FIGURE 5-3

2019 Special Status Plants
J.C. Boyle Reservoir

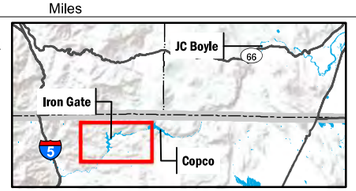


N

0 1 2
Miles

Data Source: CDM Smith
Basemap Source: Esri, USGS, NOAA

Klamath River Renewal Corporation
Klamath River Renewal Project



Legend

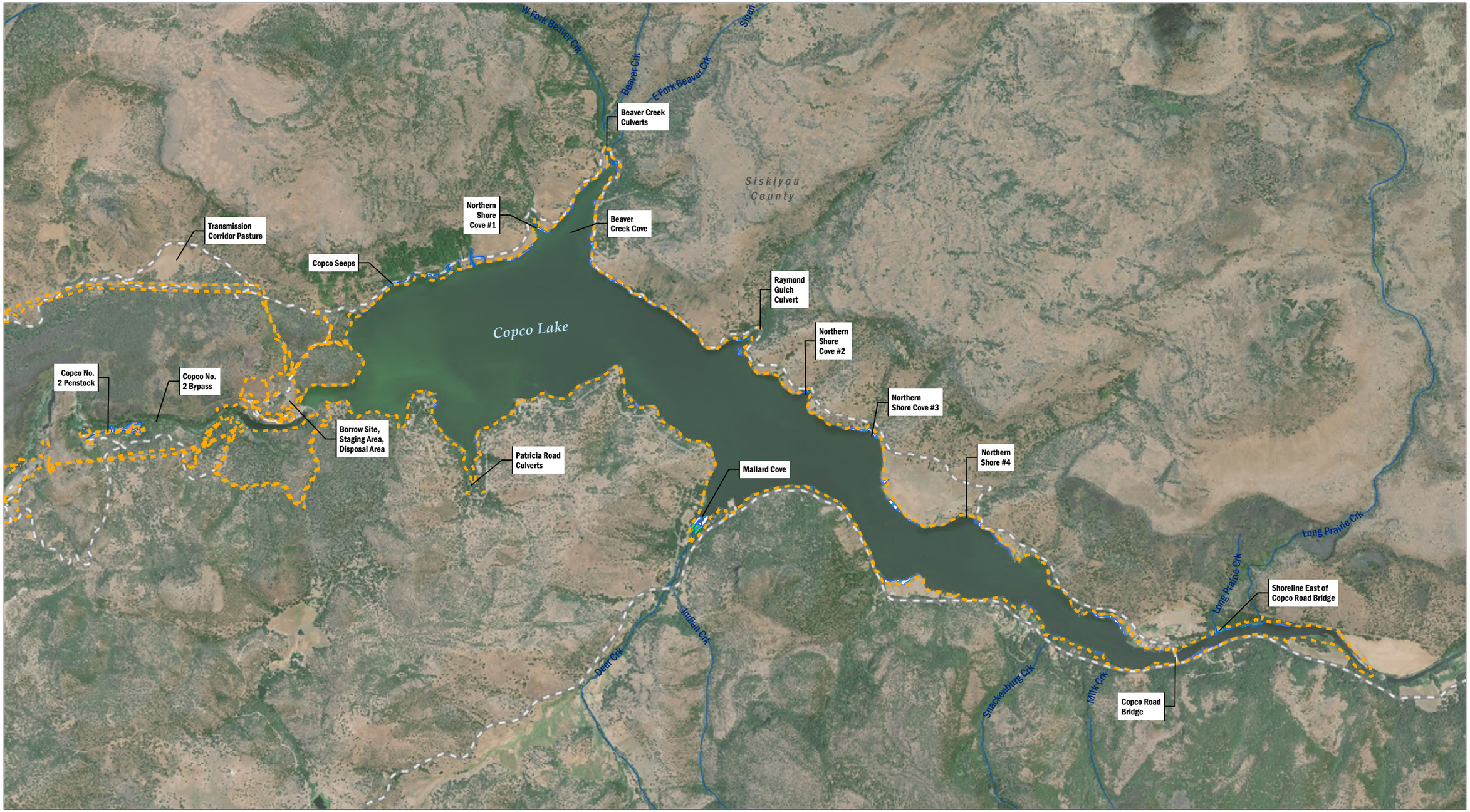
- Limits of Work
- Access Route
- Ephemeral Stream
- Intermittent Stream
- Stream Channel

Wetland Designation

- Reservoir Dependent
- Non-Reservoir Dependent

FIGURE 6-1

2019 Wetland Surveys
Iron Gate Reservoir

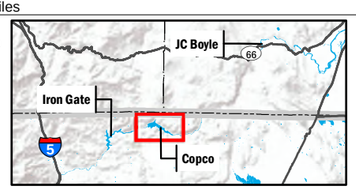


N

0 0.5 1

Miles

Data Source: CDM Smith
Basemap Source: Esri, USGS, NOAA



Legend

Access Route

Wetland Designation

Reservoir Dependent

Non-Reservoir Dependent

Infrastructure Dependent

Klamath River Renewal Corporation

Klamath River Renewal Project

FIGURE 6-2

2019 Wetland Surveys
Copco Lake

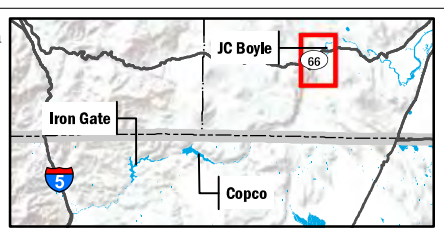
Spencer Creek
North Culverts
Northwestern Shore
J.C. Boyle Reservoir
Klamath Sportsman's Park
State Hwy 66 Bridge
Highway 66
Pioneer Park Day Use Area
Topsy Grade Rd
Pioneer Park East
Ephemeral Stream East
Ephemeral Stream West
Southwest Cove
J.C. Boyle Alternative Upland Disposal Site
JCB Dam Access Road
Disposal Access Rd
Topsy Campground
Wetlands at Base of Dam
Timber Bridge
Topsy Campground Cove
Power Canal Access Rd
Power Canal
Canal Exit Ramp
Klamath County
Scour Hole
Access Rd S of Scour
Powerhouse and Tailrace
JCB Powerhouse Road

N

0 0.425 0.85
Miles

Data Source: CDM Smith
Basemap Source: Esri, USGS, NOAA

Klamath River Renewal Corporation
Klamath River Renewal Project



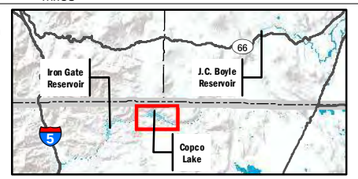
Legend
- Access Route
- Stream Channel
- Limits of Work

Wetland Designation
- Reservoir Dependent
- Non-Reservoir Dependent

FIGURE 6-3

2019 Wetland Surveys
J.C. Boyle Reservoir

Appendix B Revised Figures from 2018 Report



Willow Flycatcher Observation

Willow Flycatcher Habitat
- Bigleaf maple forest
- Sandbar willow thicket
- Oregon ash grove
- Shining willow grove
- Willow thickets

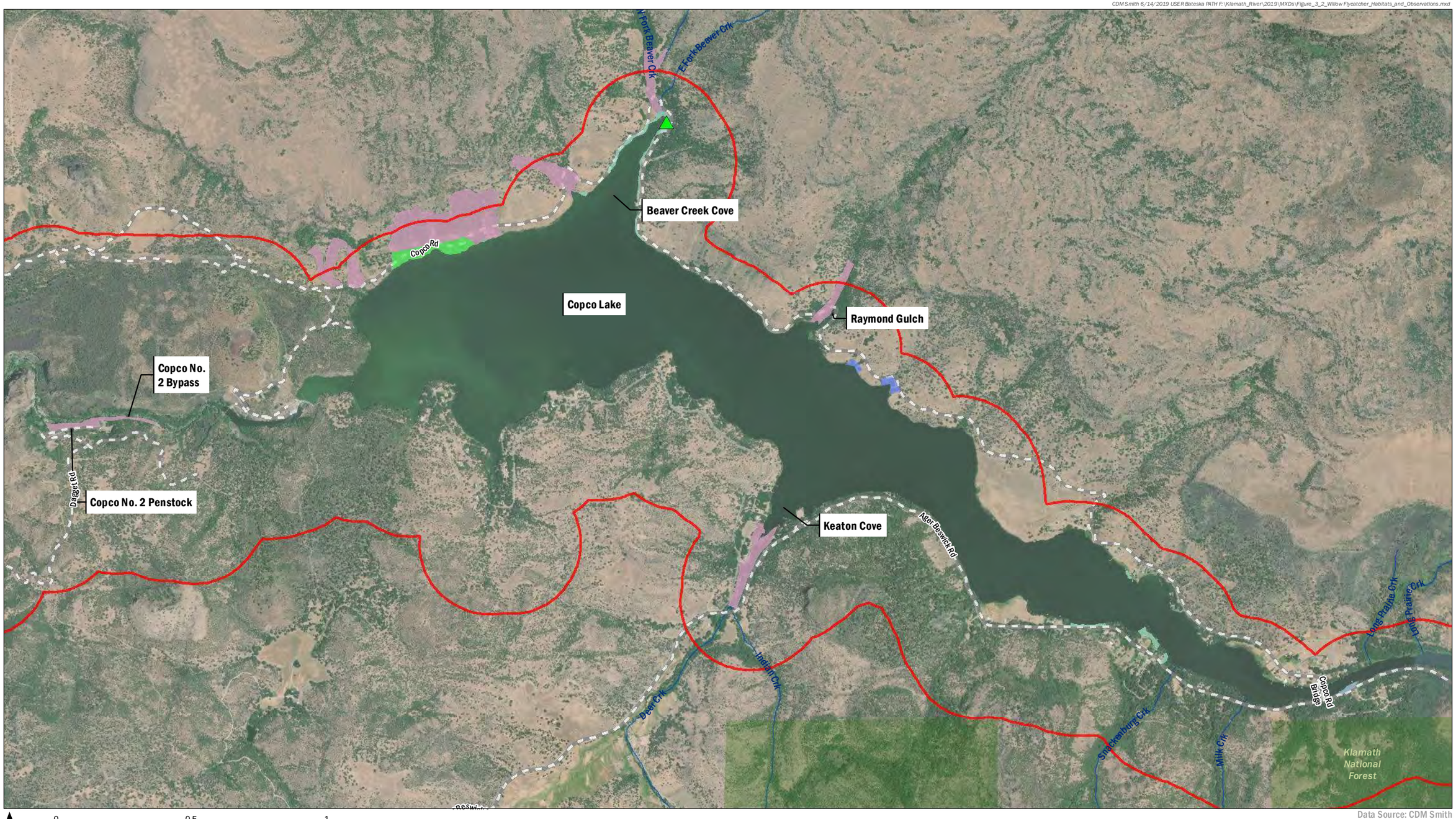
- State
- County
- Stream
- Access Route
- 0.25 Mile Study Area Buffer

Klamath River Renewal Corporation
Klamath River Renewal Project

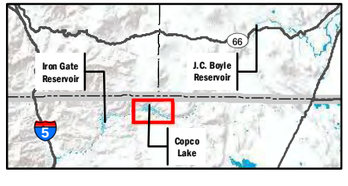
FIGURE 3-1

2018 Willow Flycatcher Habitat and Observations
Iron Gate Reservoir

CDM Smith 6/14/2019 USER Bateska PATH F:\Klamath_River\2019\MXDs\Figure_3_2_Willow Flycatcher_Habitats_and_Observations.mxd



Klamath River Renewal Corporation
Klamath River Renewal Project



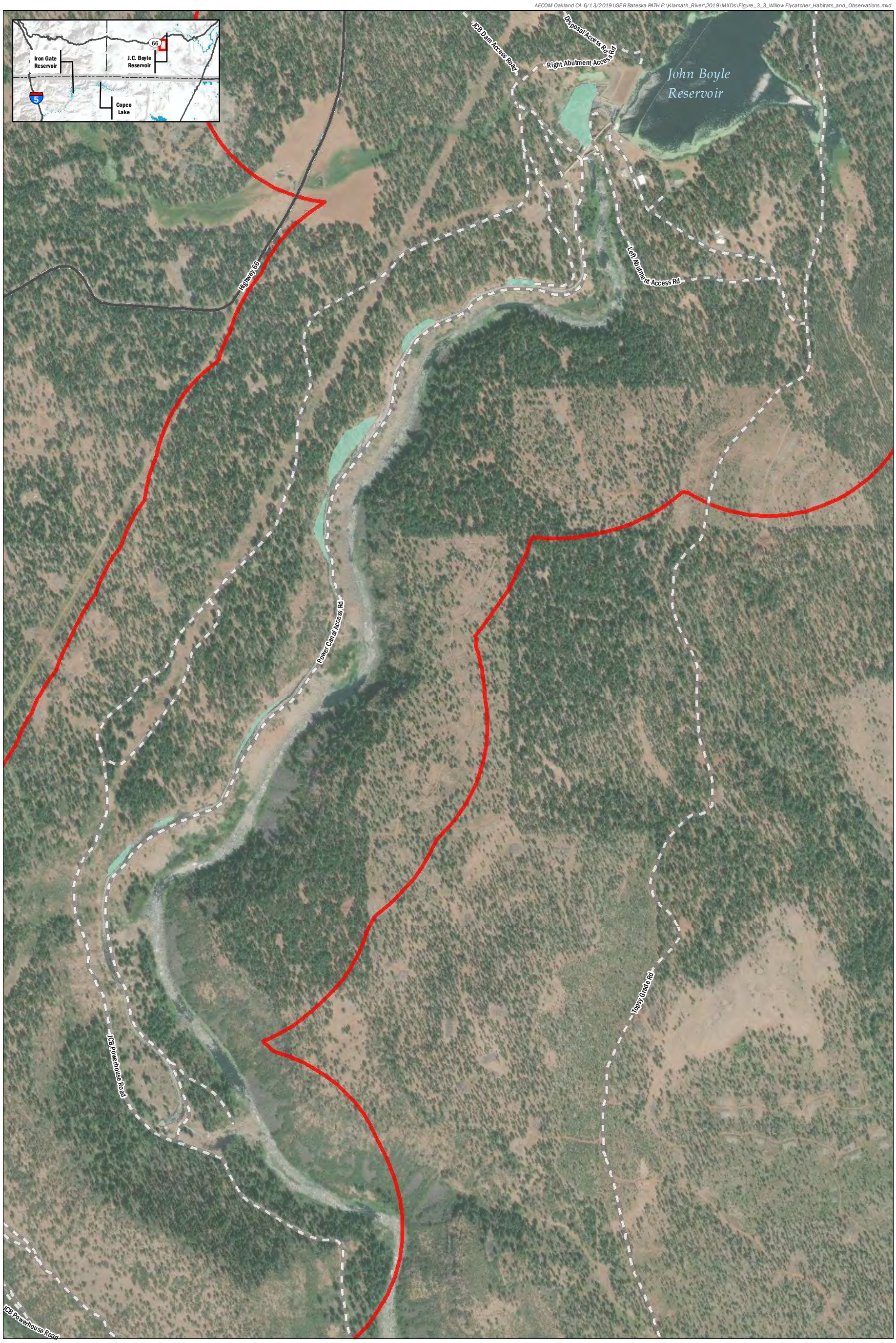
- Willow Flycatcher Observation

Willow Flycatcher Habitat
- Bigleaf maple forest
- Sandbar willow thicket
- Oregon ash grove
- Shining willow grove
- Willow thickets

- State
- County
- Stream
- Access Route
- 0.25 Mile Study Area Buffer

FIGURE 3-2

2018 Willow Flycatcher Habitat and Observations
Copco Lake



N

0 0.5

Miles

Data Source: CDM Smith
Basemap Source: Esri, USGS, NOAA

Willow Flycatcher Observation

Willow Flycatcher Habitat

- Bigleaf maple forest
- Sandbar willow thicket
- Oregon ash grove
- Shining willow grove
- Willow thickets

- State
- County
- Stream
- 0.25 Mile Study Area Buffer
- Access Route

Klamath River Renewal Corporation
Klamath River Renewal Project

FIGURE 3-3

2018 Willow Flycatcher Habitat and Observations
J.C. Boyle Reservoir and Canal

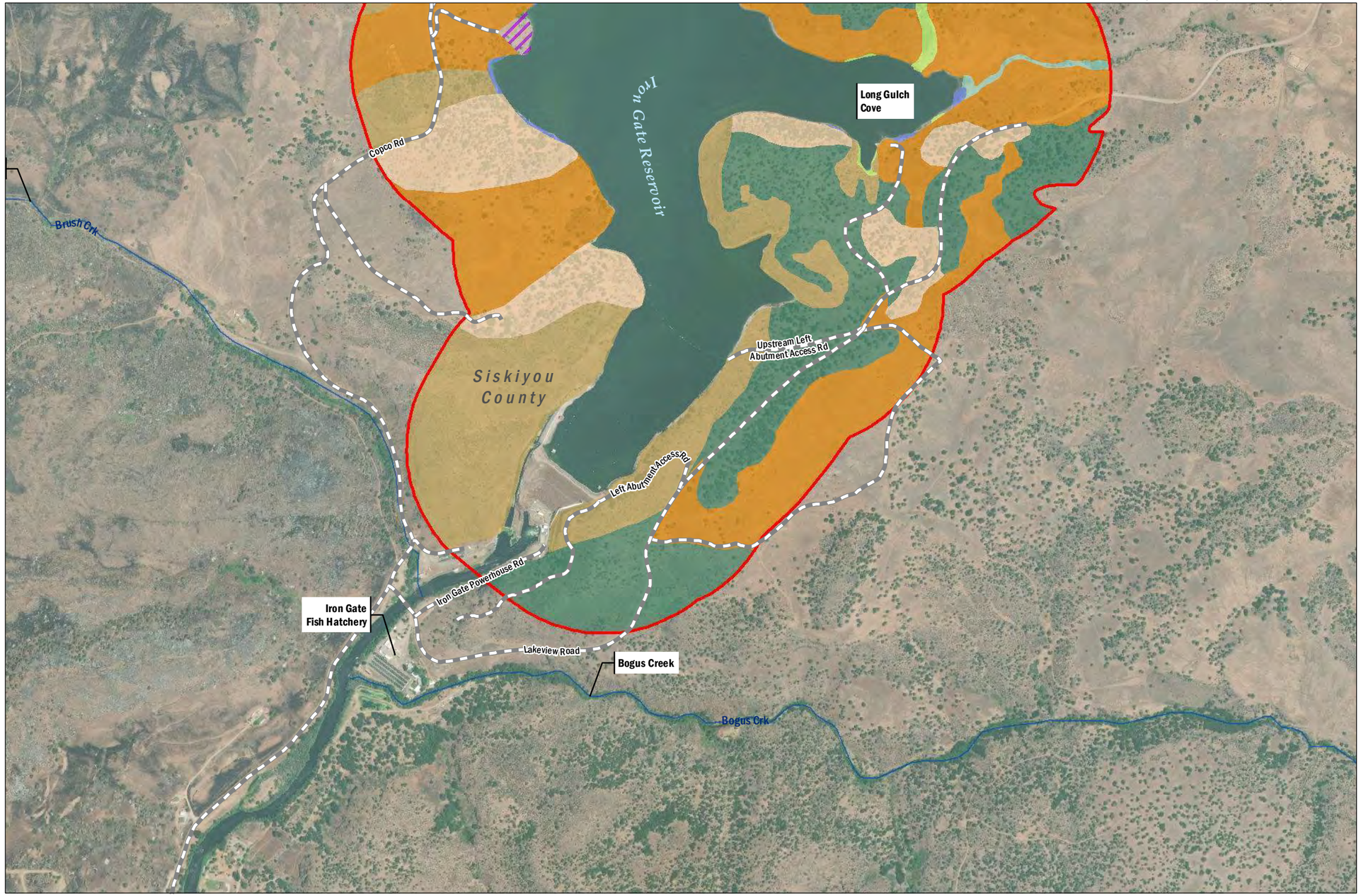
AECOM Oakland CA 8/27/2019 USER:Bateska PATH:F:\Klamath_River\2019\MXDs\Vegetation_Communities\Figure_11_Iron_Gate_Vegetation_Communities.mxd

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



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Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation

Klamath River Renewal Project

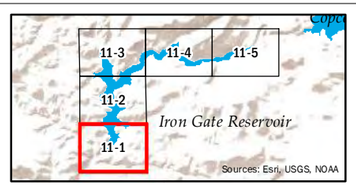


FIGURE 11-1

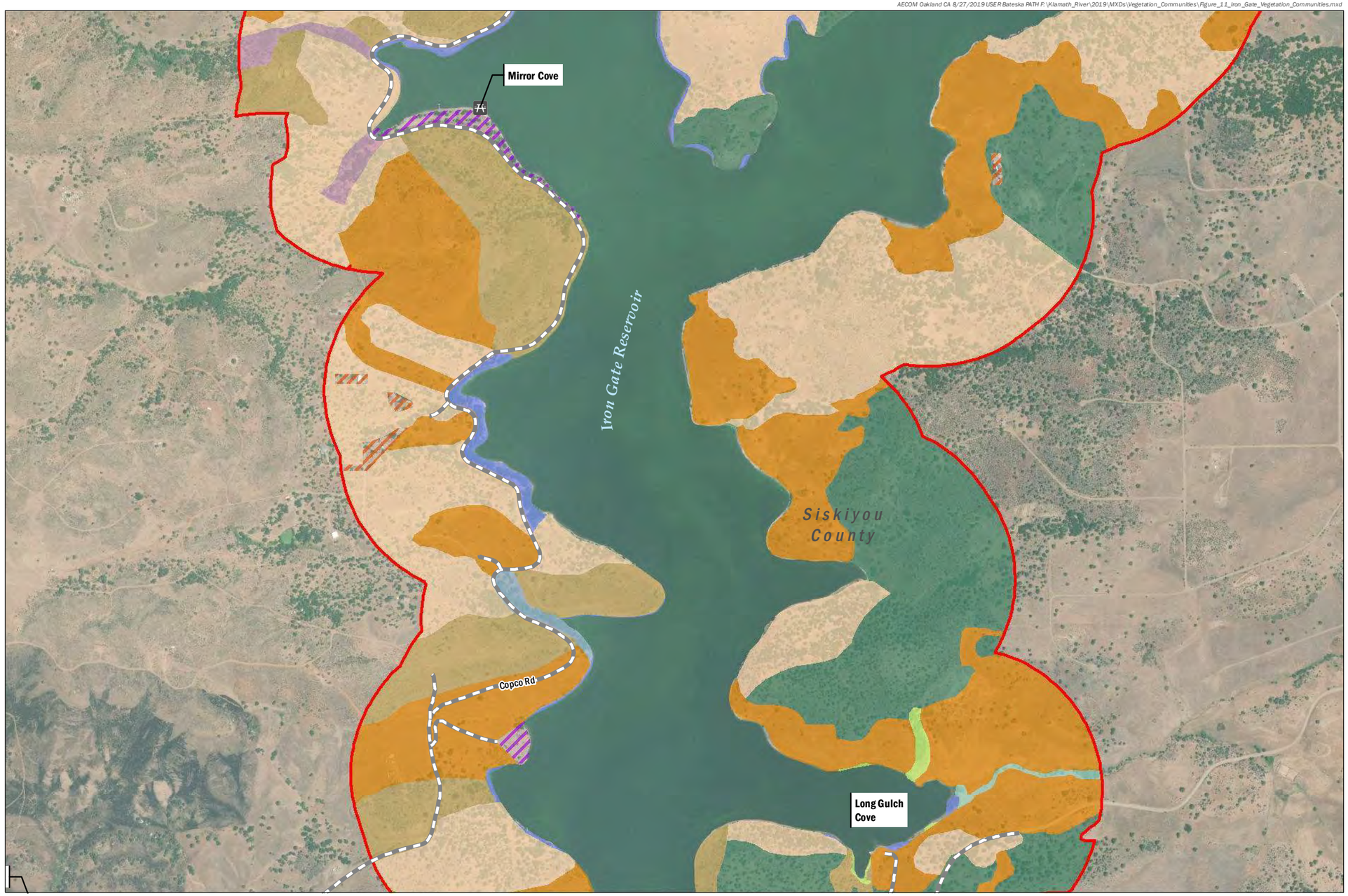
Vegetation Communities
Iron Gate Reservoir

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

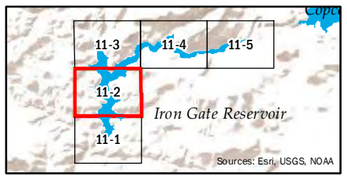
- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



N

0 0.5 Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)



Klamath River Renewal Corporation
Klamath River Renewal Project

FIGURE 11-2

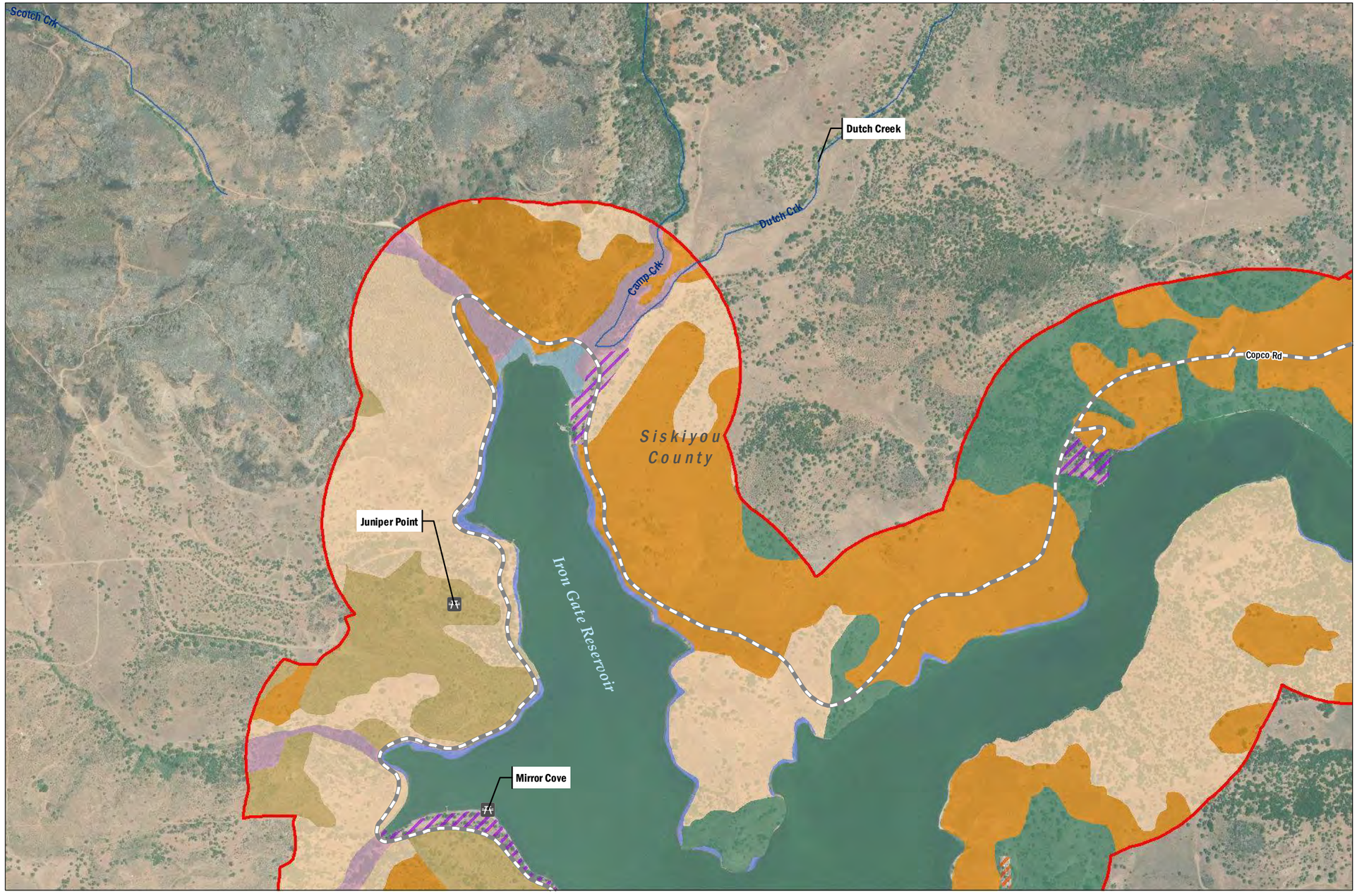
Vegetation Communities
Iron Gate Reservoir

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



N

0 0.5 Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation
Klamath River Renewal Project

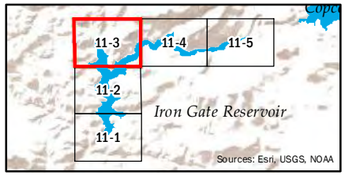


FIGURE 11-3

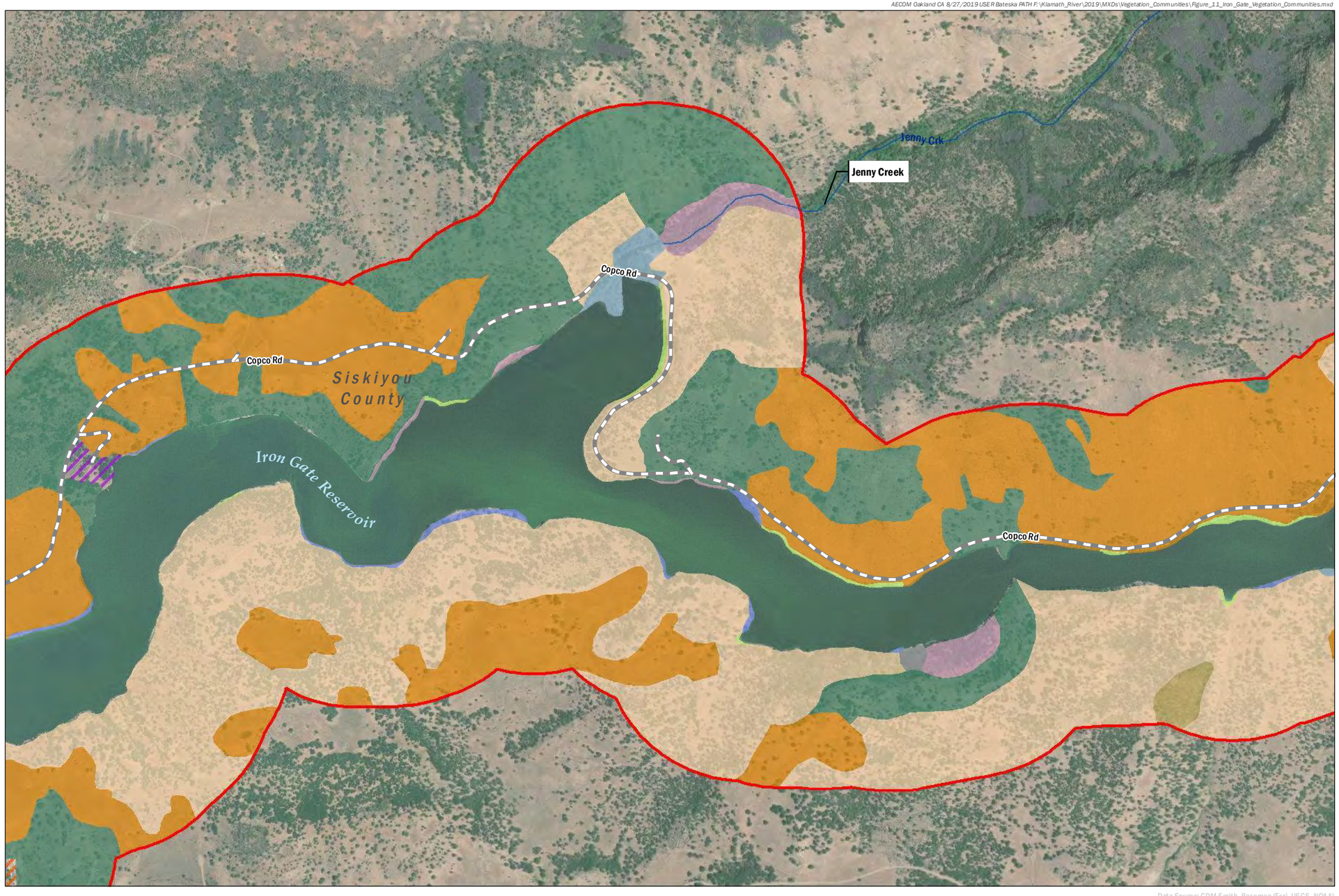
Vegetation Communities
Iron Gate Reservoir

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



N

0 0.5

Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation

Klamath River Renewal Project

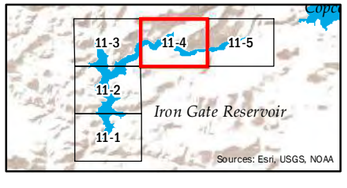


FIGURE 11-4

Vegetation Communities

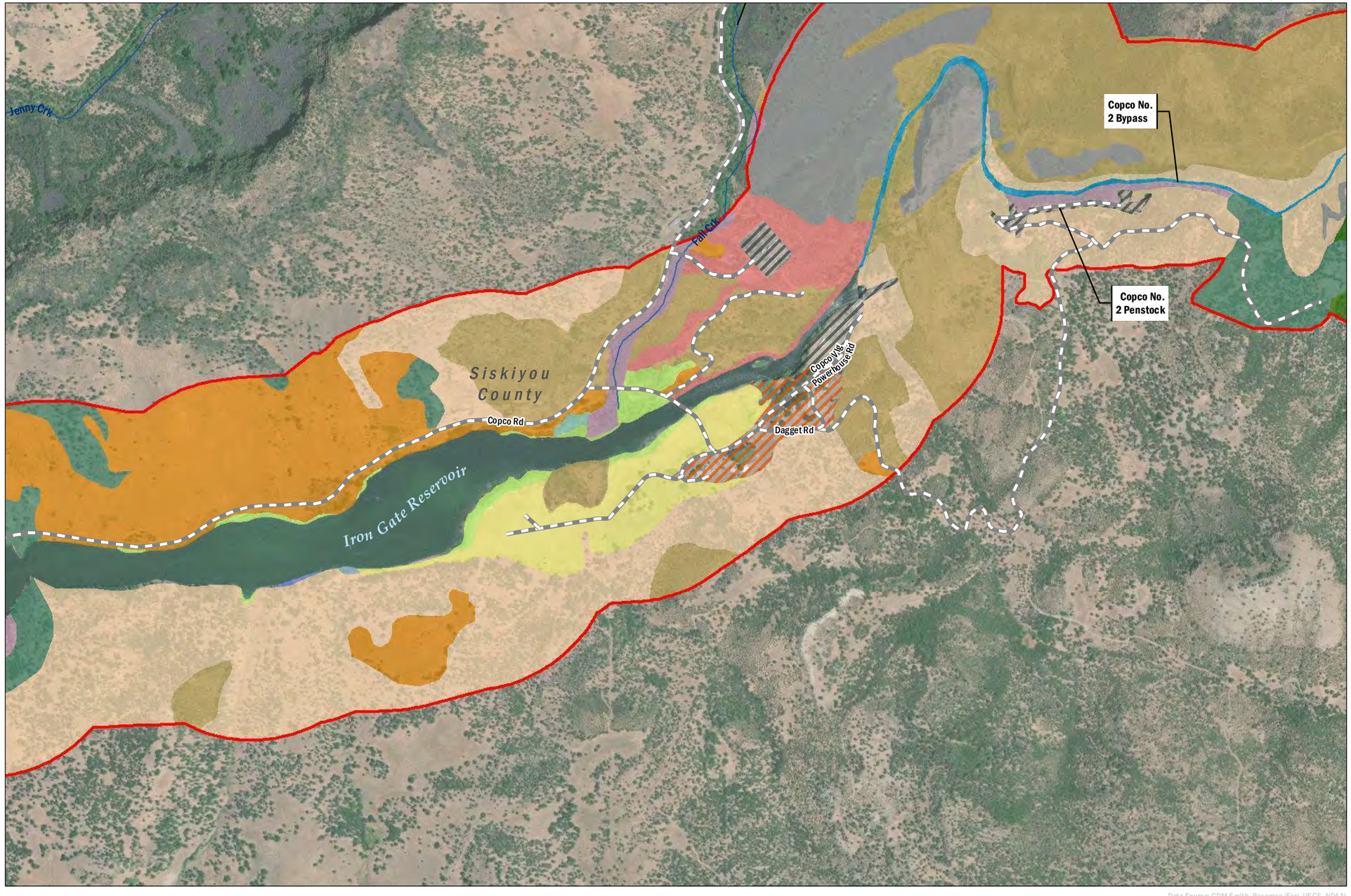
Iron Gate Reservoir

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



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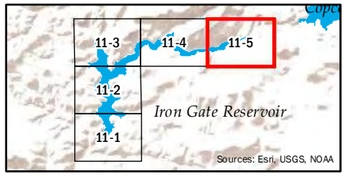
Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)



Klamath River Renewal Corporation
Klamath River Renewal Project

FIGURE 11-5

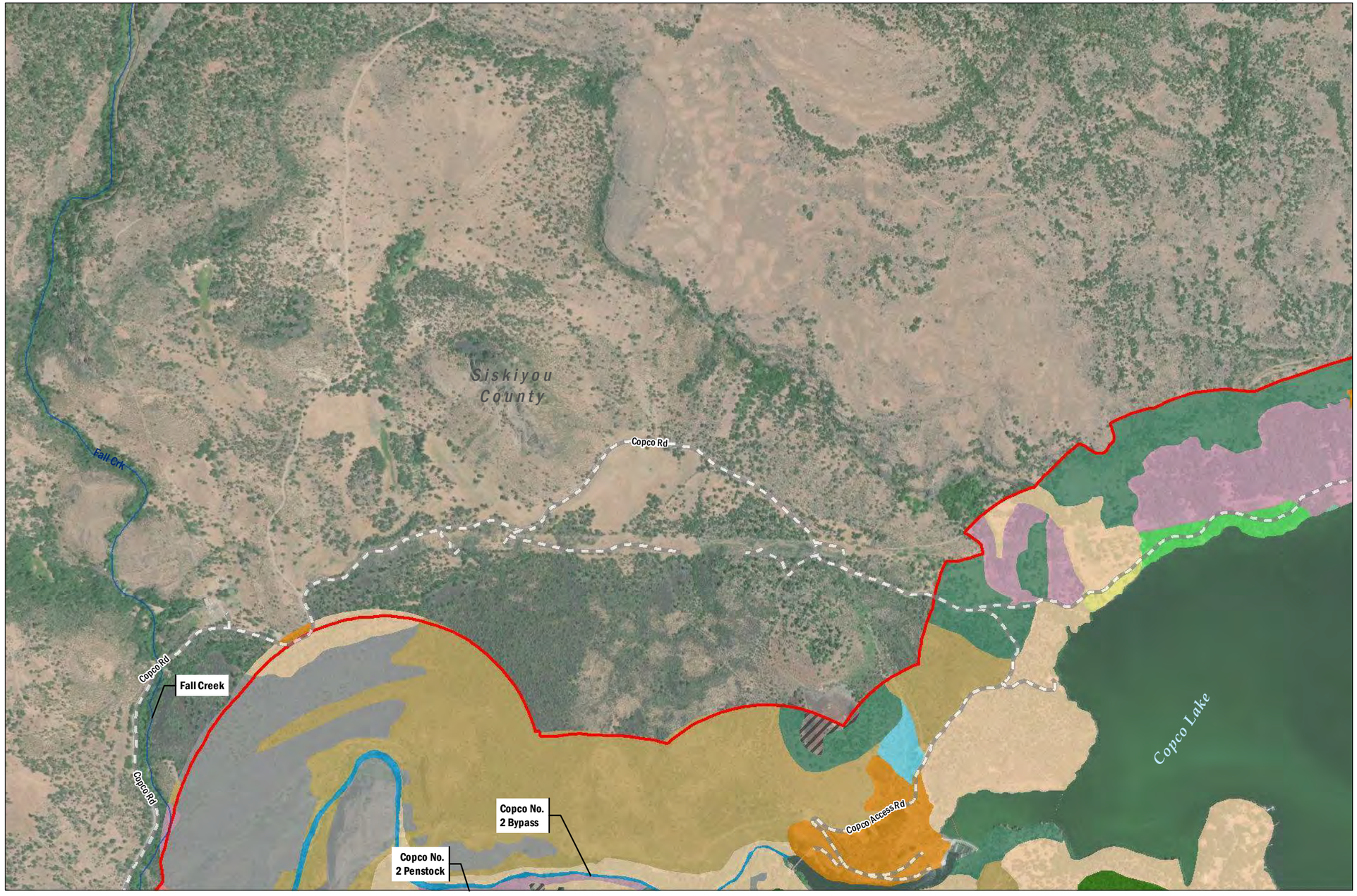
Vegetation Communities
Iron Gate Reservoir

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



N

0 0.5

Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation

Klamath River Renewal Project

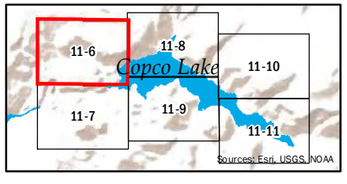


FIGURE 11-6

Vegetation Communities

Copco Lake

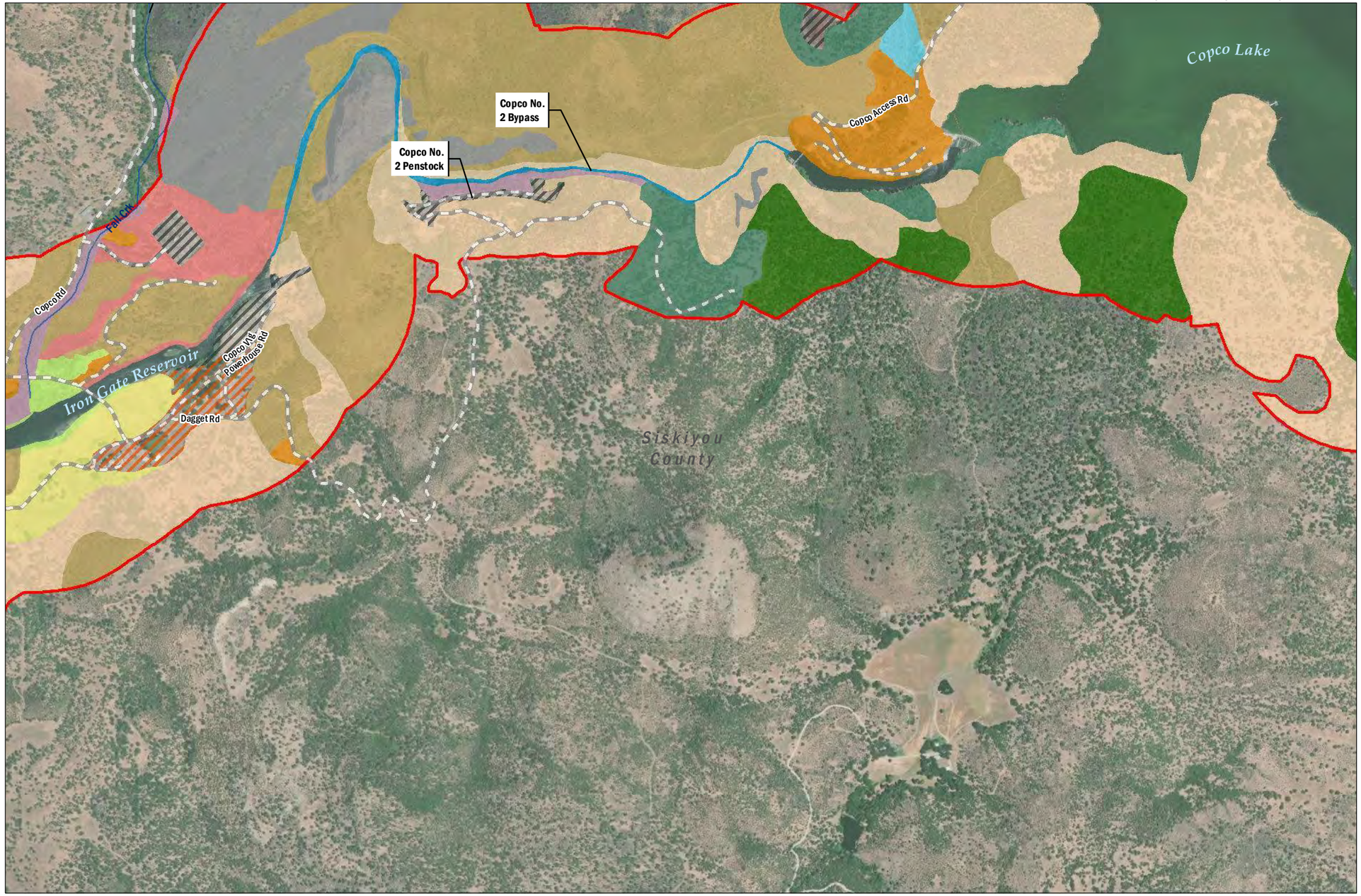
AECOM Oakland CA 8/27/2019 USER Bateska PATH F:\Klamath_River\2019\MXDs\Vegetation_Communities\Figure_11_Copco_Vegetation_Communities.mxd

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



N

0 0.5

Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation

Klamath River Renewal Project

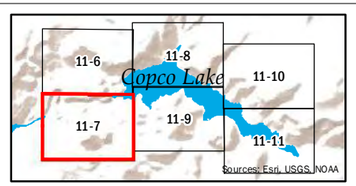


FIGURE 11-7

Vegetation Communities

Copco Lake

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus

N

0 0.5 Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation
Klamath River Renewal Project

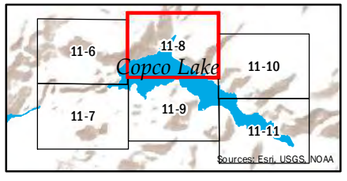


FIGURE 11-8

Vegetation Communities
Copco Lake

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus

N

0 0.5

Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation

Klamath River Renewal Project

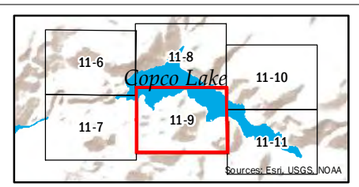


FIGURE 11-9

Vegetation Communities

Copco Lake

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus

N

0 0.5

Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation

Klamath River Renewal Project

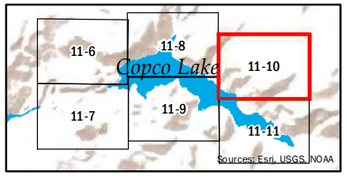


FIGURE 11-10

Vegetation Communities

Copco Lake

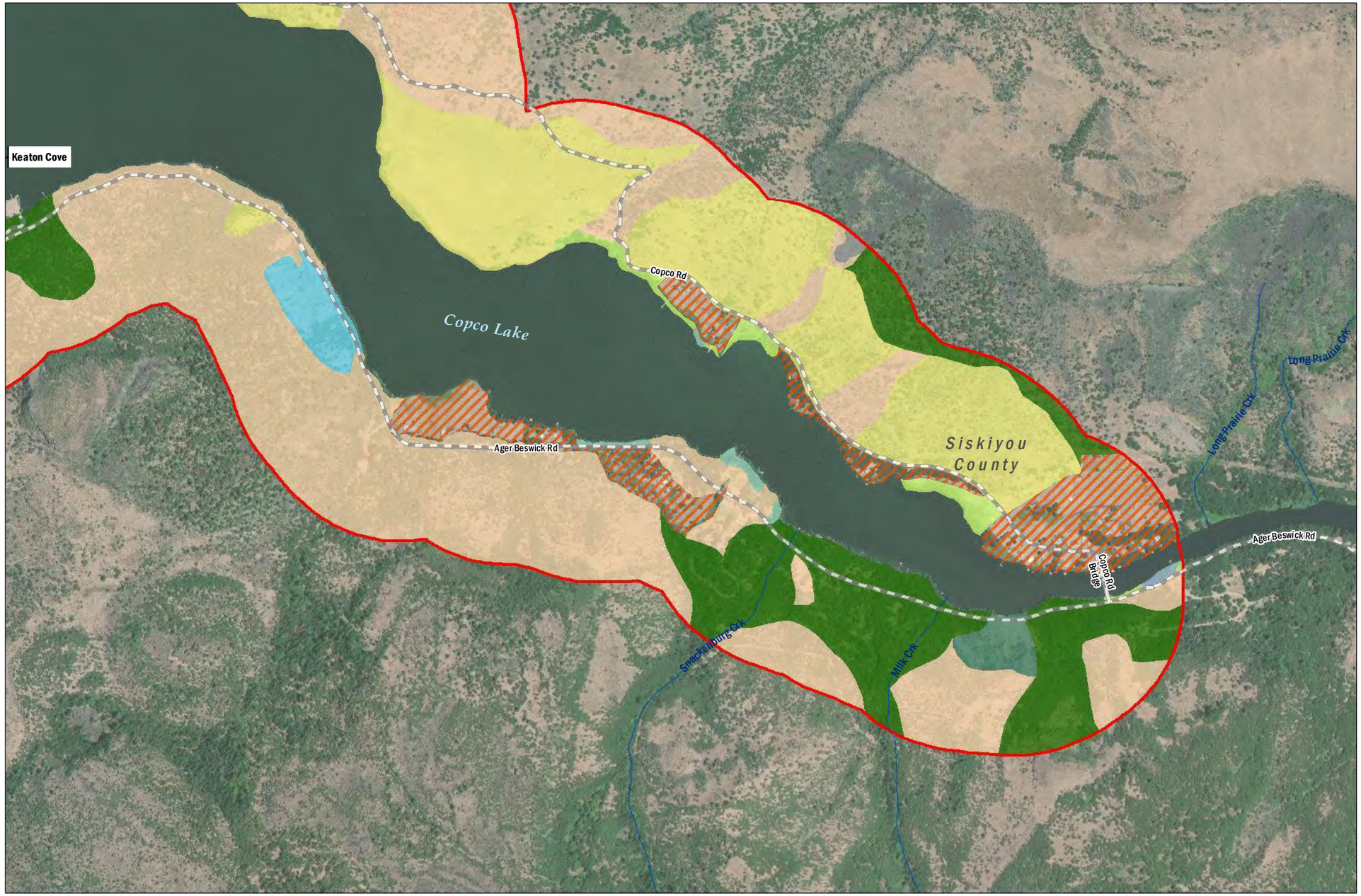
AECOM Oakland CA 8/27/2019 USER Bateska PATH F:\Klamath_River\2019\MXDs\Vegetation_Communities\Figure_11_Copco_Vegetation_Communities.mxd

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Sandbar willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



N

0 0.5

Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation

Klamath River Renewal Project

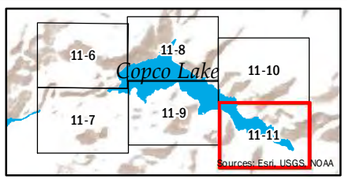


FIGURE 11-11

Vegetation Communities

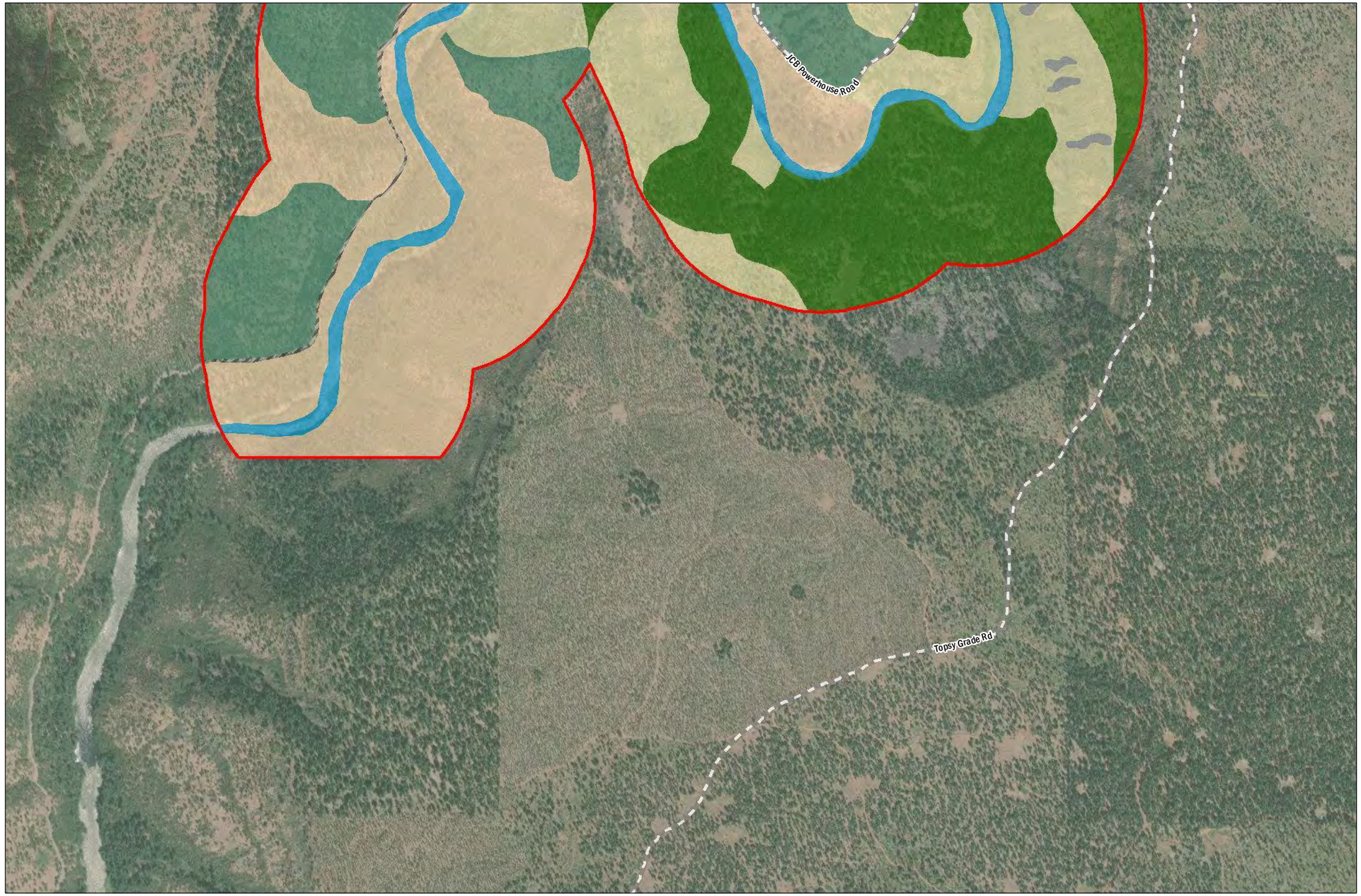
Copco Lake

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Geyer willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Lemmon's willow
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sandbar willow thicket
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



N

0 0.5

Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation

Klamath River Renewal Project

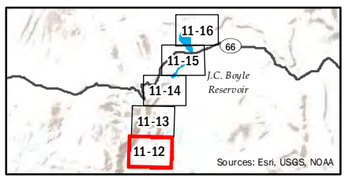


FIGURE 11-12

Vegetation Communities

JC Boyle Reservoir

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Geyer willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Lemmon's willow
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sandbar willow thicket
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus

N

0 0.5

Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation

Klamath River Renewal Project

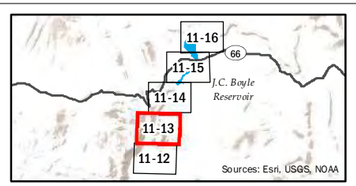


FIGURE 11-13

Vegetation Communities

JC Boyle Reservoir

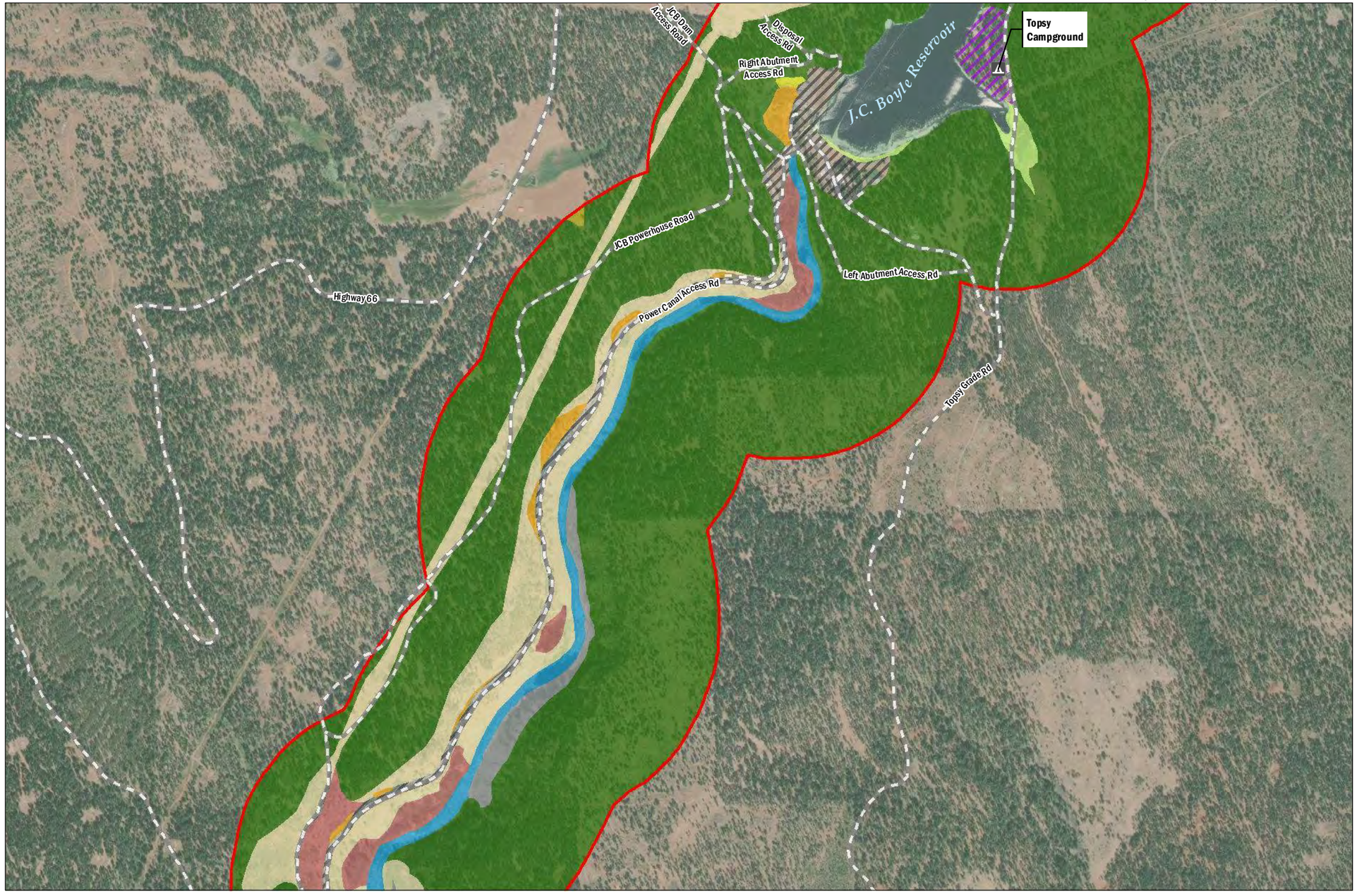
AECOM Oakland CA 8/27/2019 USER Bateska PATH F:\Klamath_River\2019\MXDs\Vegetation_Communities\Figure_11_JC_Boyle_Vegetation_Communities.mxd

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Geyer willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Lemmon's willow
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sandbar willow thicket
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



N

0 0.5

Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation

Klamath River Renewal Project

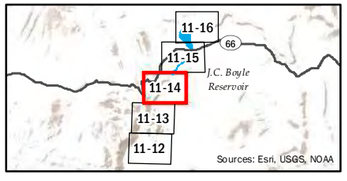


FIGURE 11-14

Vegetation Communities

JC Boyle Reservoir

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Geyer willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Lemmon's willow
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sandbar willow thicket
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus

N

0 0.5 Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation
Klamath River Renewal Project

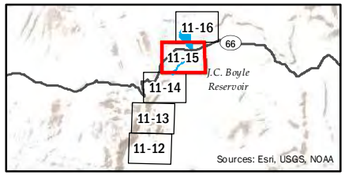


FIGURE 11-15

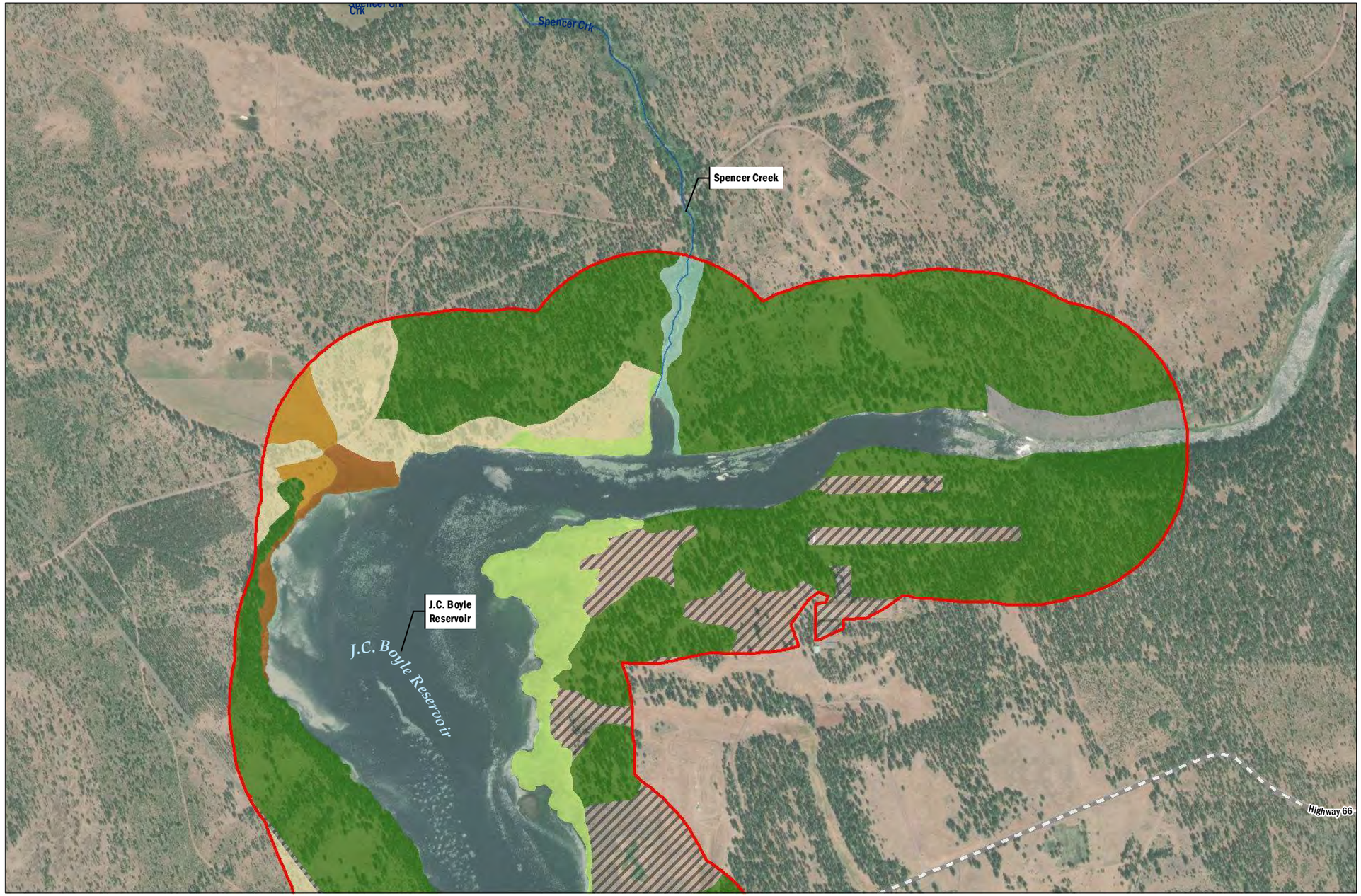
Vegetation Communities
JC Boyle Reservoir

LEGEND

- Access Route
- State
- County
- 0.25 Mile Study Area Buffer

Alliance Name

- Annual brome grasslands
- Bigleaf maple forest
- Birch leaf mountain mahogany
- Bitterbrush scrub
- Cheatgrass - medusahead grassland
- Chokecherry thicket
- Geyer willow thicket
- Hardstem bulrush marsh
- Klamath plum shrubland
- Lemmon's willow
- Oregon ash grove
- Oregon white oak woodland
- Ponderosa pine forest
- Sandbar willow thicket
- Sedge meadow
- Shining willow grove
- Wedgeleaf ceanothus chaparral
- Western juniper woodland
- Willow thickets
- Agricultural pasture
- Disturbed
- Recreational
- Residential
- Riverine
- Talus



N

0 0.5 Miles

Data Source: CDM Smith, Basemap (Esri, USGS, NOAA)

Klamath River Renewal Corporation
Klamath River Renewal Project

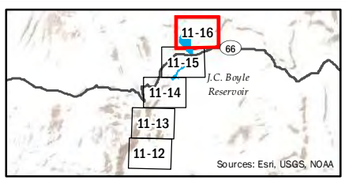


FIGURE 11-16

Vegetation Communities
JC Boyle Reservoir

Appendix C Species Observed during Field Studies