Lower Mokelumne River Project

FERC Project No. 2916

Technical Work Group (TWG) Meetings

June 3, 2025

EBMUD

Kleinschmidt

AGENDA

- **Welcome and Introductions**
  - TWG Purpose & Objectives
- **FERC Project No. 2916 Relicensing Overview**
  - Project 2916 Overview
  - FERC Process & Schedule
- **Resource Areas Overview**
  - Review existing info, data gaps, discussion
    - Water Resources
    - Fish & Aquatics
    - Terrestrial Resources
    - Recreation & Land Use
- **Questions**

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Welcome & Introductions

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Lower Mokelumne Relicensing Team

Project Management Team

Priya Jain

Brad Ledesma

Joe Tam

Sabrina Cheng

Karen Donovan

Resource Leads

Ana Ulloa
Alice Towey
Ben Bray
Casey Del Real
Casey Leblanc
Chris Potter
Chuck Beckman
Deborah Preciado
Eric Toth
Ginger Chen
Jason Zhou
Michelle Workman
Sami Harper
Thomas Hardie

Consultant Team

Kleinschmidt
Shannon Luoma

Fatima Oswald

Olivia Smith

Angela Whelpley

Vanessa Martinez

Craig Addley

JNA
Janelle Nolan
Robyn Smith

Facilitator
Marie Rainwater

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TWG Meetings Purpose and Objectives

Today’s meeting:

- Overview of project and operations
- Overview of existing data/information/data gaps

TWG Meetings Purpose and Objectives

Future resource specific TWGs (June & July):

- Ensure EBMUD is aware of relicensing participants interests and objectives as they prepare their study plan proposal for inclusion in the PAD
- Receive additional feedback on any proposed study plans including:
  - Purpose, objectives, and adheres to FERC study plan criteria
  - Project nexus
  - Methods, timing, and scope

Lower Mokelumne River (FERC Project No. 2916) Relicensing Overview

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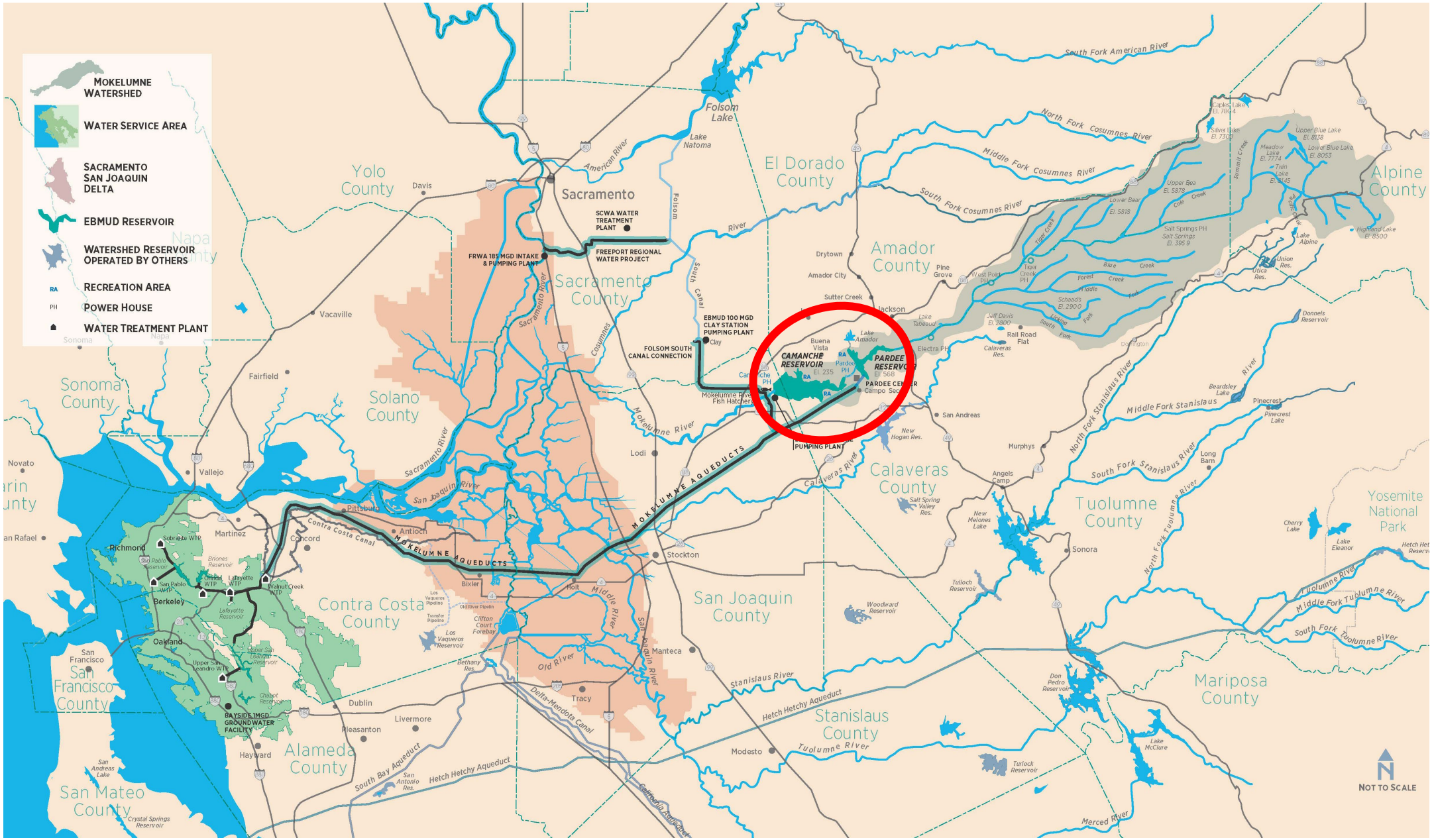
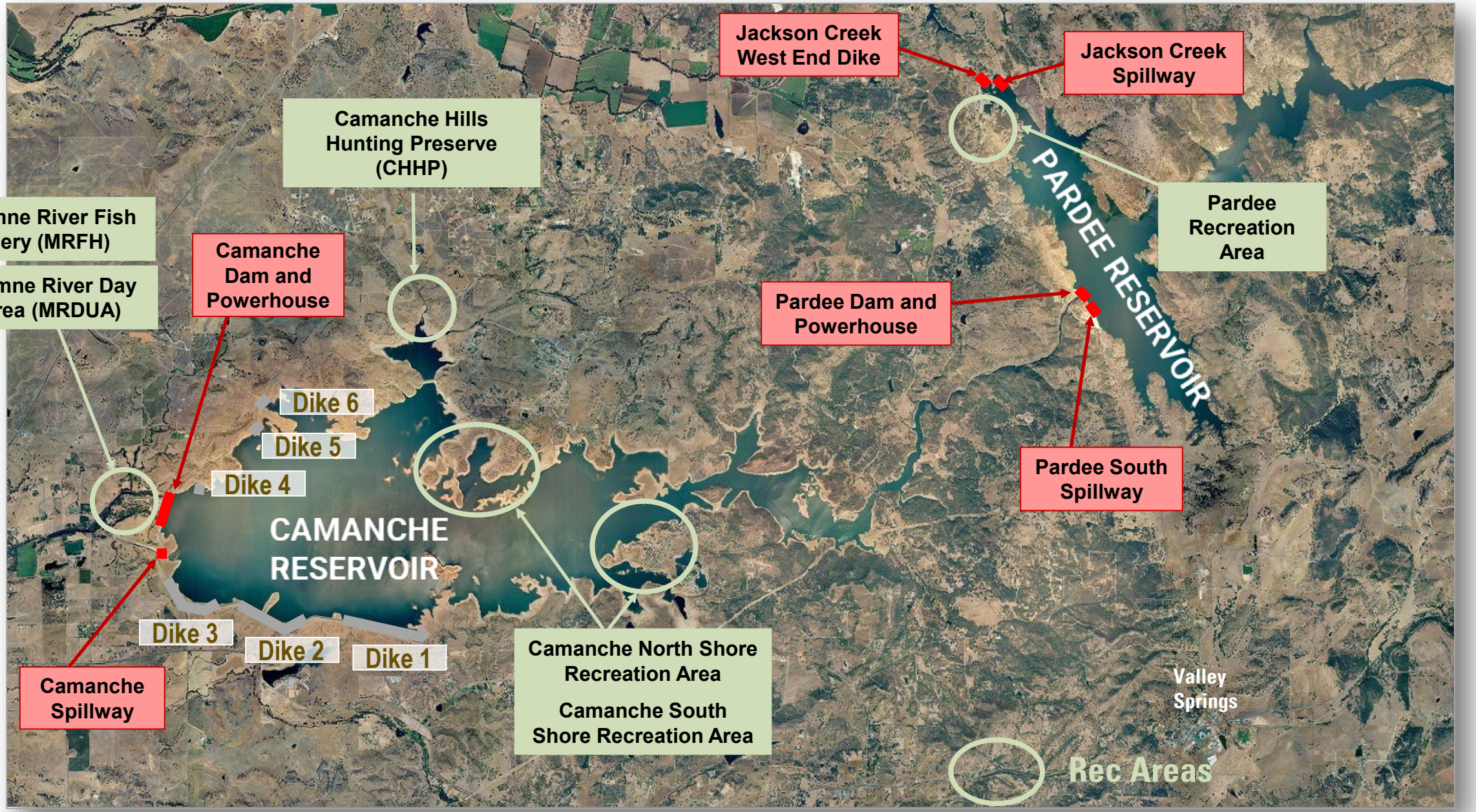
Lower Mokelumne River (P-2916) – Mokelumne Watershed



Lower Mokelumne River (P-2916) – Project Features & Recreation Sites



Pardee Facilities

- **Constructed:** 1927-1929
- **Powerhouse** (authorized installed): 28.6 MW (3 Hydro Units)
- **Reservoir Capacity:** 203,795 acre-feet normal max pool
- **Type of Construction:** curved concrete gravity
- **Dam Elevation:** 581.5 feet / crest 575 feet
- **Max Dam Height:** 345 feet
- **Dam Length:** 1,337 ft
- **South Spillway:** ungated crest and concrete channel

Camanche Facilities

- **Constructed**: 1963-1964
- **Powerhouse** (authorized installed): 9.45 MW
- **Reservoir Capacity**: 417,120 acre-feet normal max pool
- **Type of Construction:** zoned, earth fill, roller compacted embankment
- **Dam Elevation:** 263 feet (Local) 265.2 feet (NAVD88)
- **Max Dam Height:** 171 feet
- **Dam Length :** 2,640 feet
- **Spillway:** ungated crest and concrete channel
- **Dikes:** 6 earthen embankment dikes

FERC Relicensing & Schedule

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FERC Relicensing - Integrated Licensing Process (ILP)

What is a License?

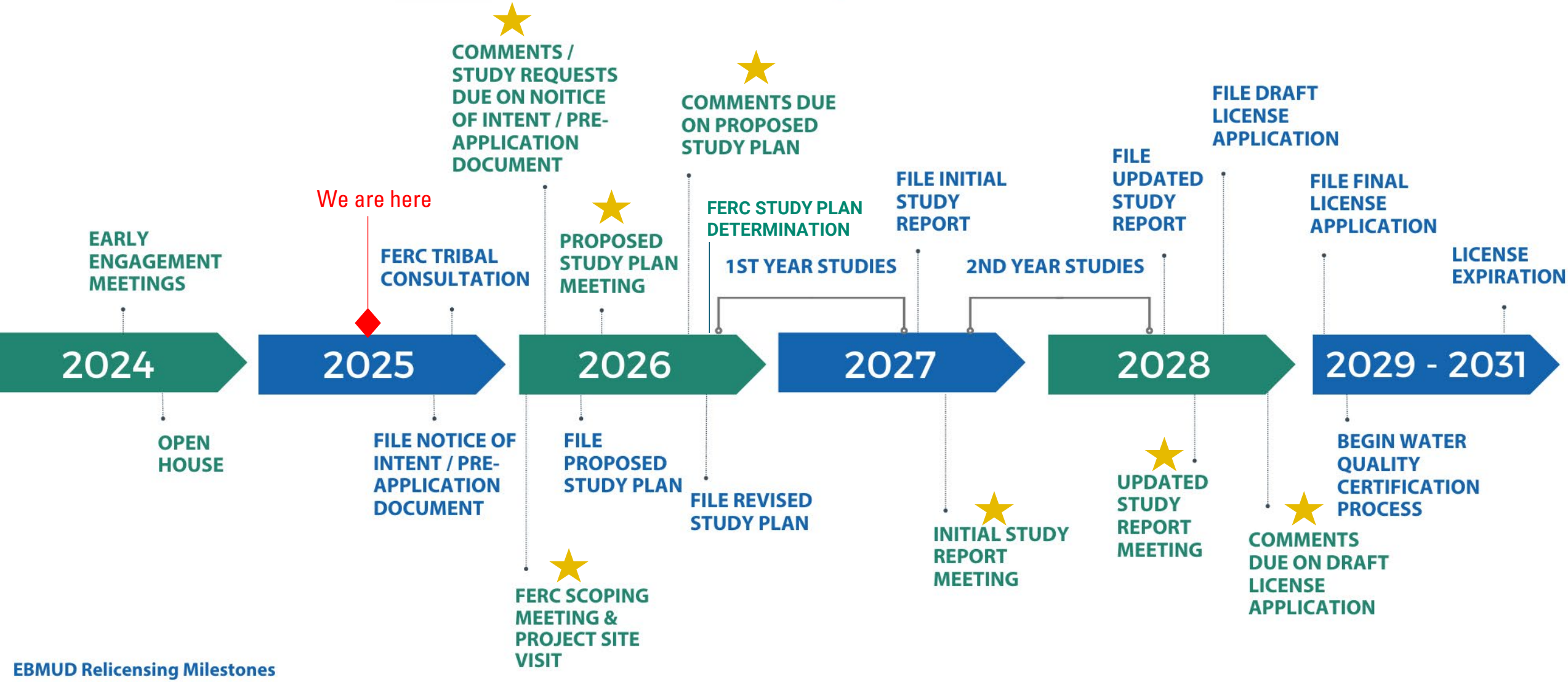
- “Permit to operate”
- Specifies conditions for construction, operation, and maintenance of a project
- Default term is 40 years
- Can be amended during license term

What is FERC Relicensing?

- 5 to 7-year process
- Setting new (updated) operating conditions for the next 40-year license
- Brings project in compliance with regulation changes since the previous license
- Involves multiple interested parties with public involvement opportunities
- Licensee opportunity to add capacity, change operations, new construction, or in some cases, pursue license surrender

RELICENSING SCHEDULE

Lower Mokelumne River Project, FERC No. 2916



EBMUD Relicensing Milestones

Interested Parties Involvement Opportunities

★ Comment Opportunities (not all are shown)

Why Conduct Studies?

- The Proposed Study Plan (PSP) is a FERC requirement under the ILP
- Provide FERC the necessary information to conduct their analysis
- Identify pertinent & preliminary Project issues
- Lay groundwork for future license conditions & PM&Es

18 CFR § 5.11 Potential Applicant's proposed study plan and study plan meetings.

(a) Within 45 days following the deadline for filing of comments on the pre-application document, including information and study requests, the potential applicant must file with the Commission a proposed study plan.

FERC's 7 Study Guide Criteria

1- Goals & Objectives

2&3 - Relevant Resource Management Goals & Public Interest Considerations

4 - Existing Information & Need for Additional Information

5 - Project Nexus

6 - Proposed Methodology

7 - Level of Effort & Costs

Resources Overview

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Resource Areas

Water Resources

Fish & Aquatics

Terrestrial Resources

Recreation & Land Use

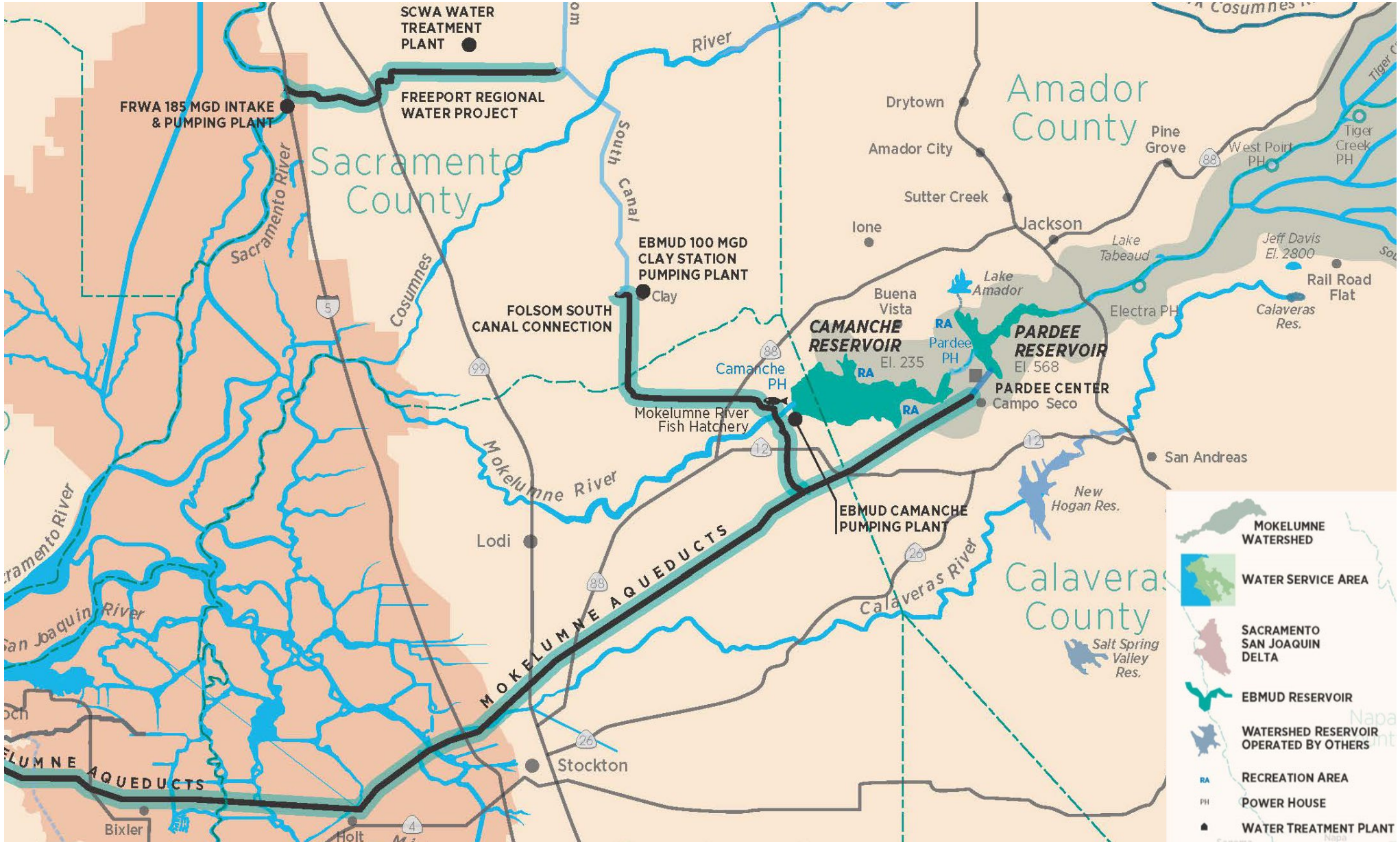
Cultural & Tribal

Tribal engagement will occur throughout relicensing separately from the TWG meetings to protect confidentiality

Water Resources

Operations, Hydrology, & Water Quality

Water Resources – Operations, Hydrology, & Water Quality



Water Resources – Operations, Hydrology, & Water Quality

EBMUD Operating Criteria

- USACE Flood Control Manual
- SWRCB Water Rights Licenses and Permit Terms
- Joint Settlement Agreement
- Agreements with other water rights holders

EBMUD Operational Considerations

Reservoirs are operated in tandem to meet:

- Municipal water supply
- Obligations to downstream diverters
- Fishery requirements
- Water quality (temperature, DO)
- Contribution to Delta inflow/outflow
- Flood control (streamflow regulation)
- Power generation

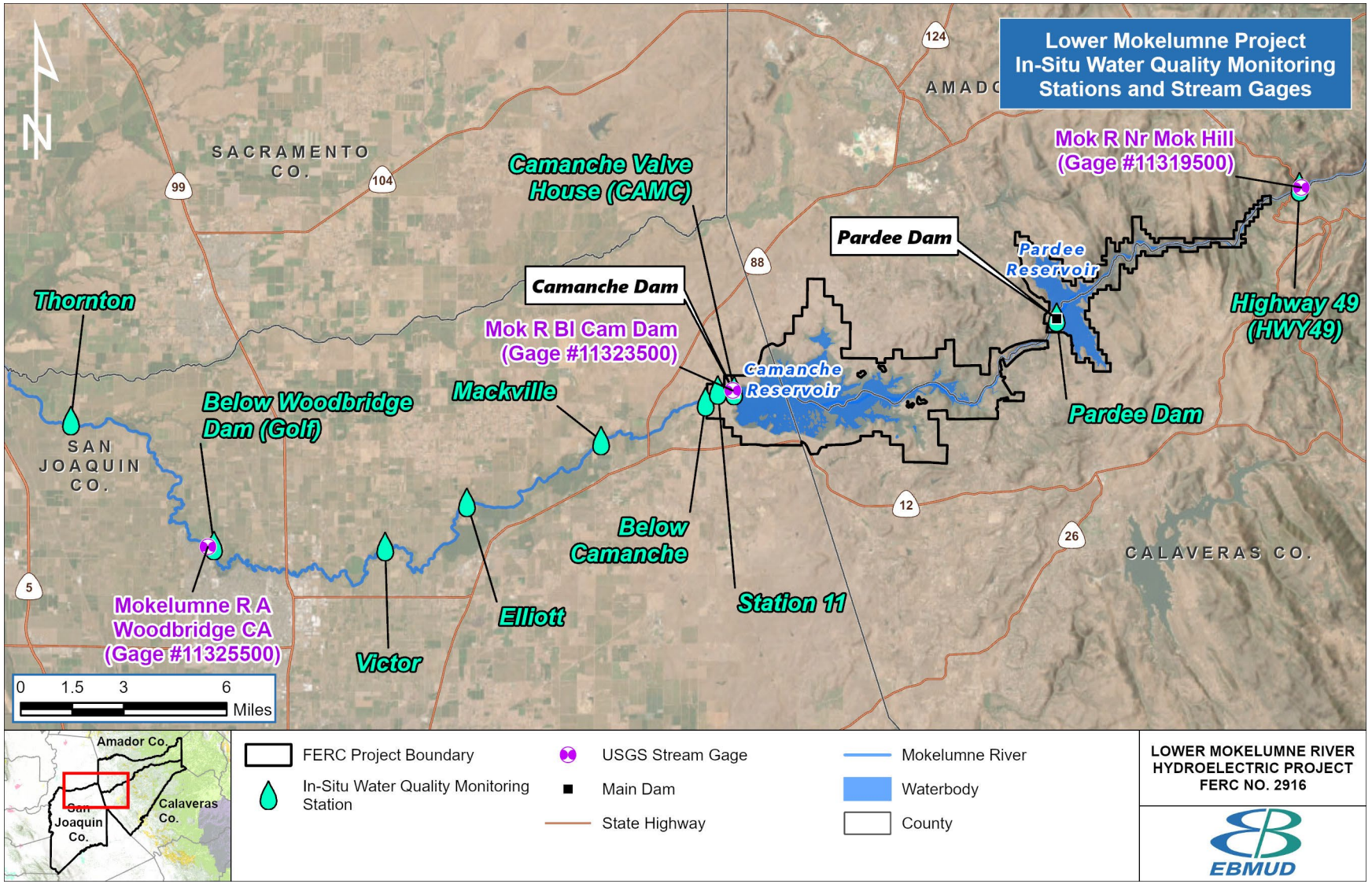
Water Management Reporting

- USACE Daily Reservoir Report
- USGS Annual Data Validation
- FERC Annual Project Operations Report
- California Data Exchange Center (CDEC)
- SWRCB Water Rights Reporting

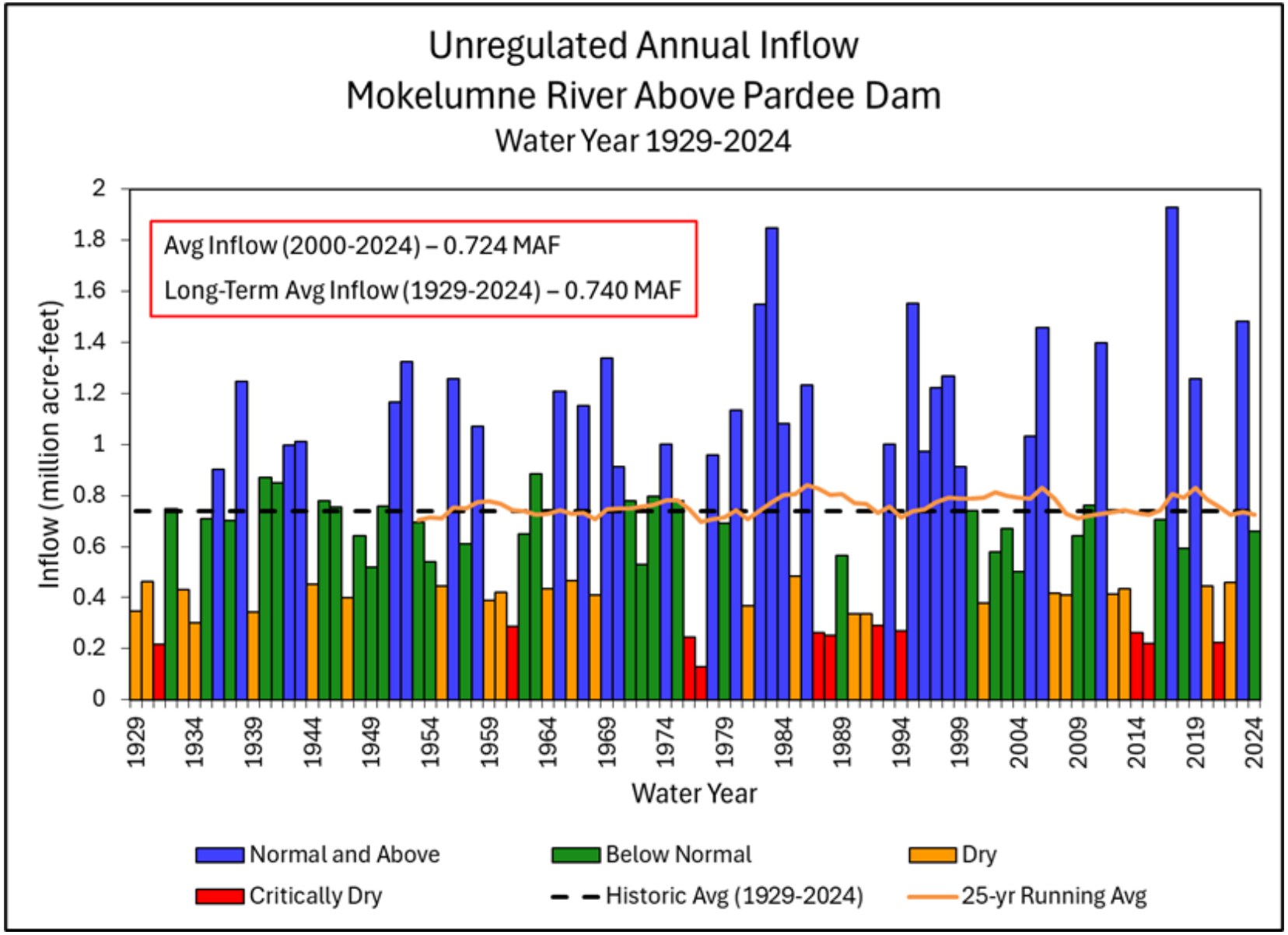
Water Quality Monitoring

- Daily and monthly in-situ water temperature data from 1998-2024
- Semi-continuous; daily spring-fall reservoir water temperature data from 2007-2024
- Manual water quality profile data from Pardee and Camanche

Water Resources – In-Situ Water Quality Monitoring Stations & Stream Gages



Water Resources – Operations and Hydrology



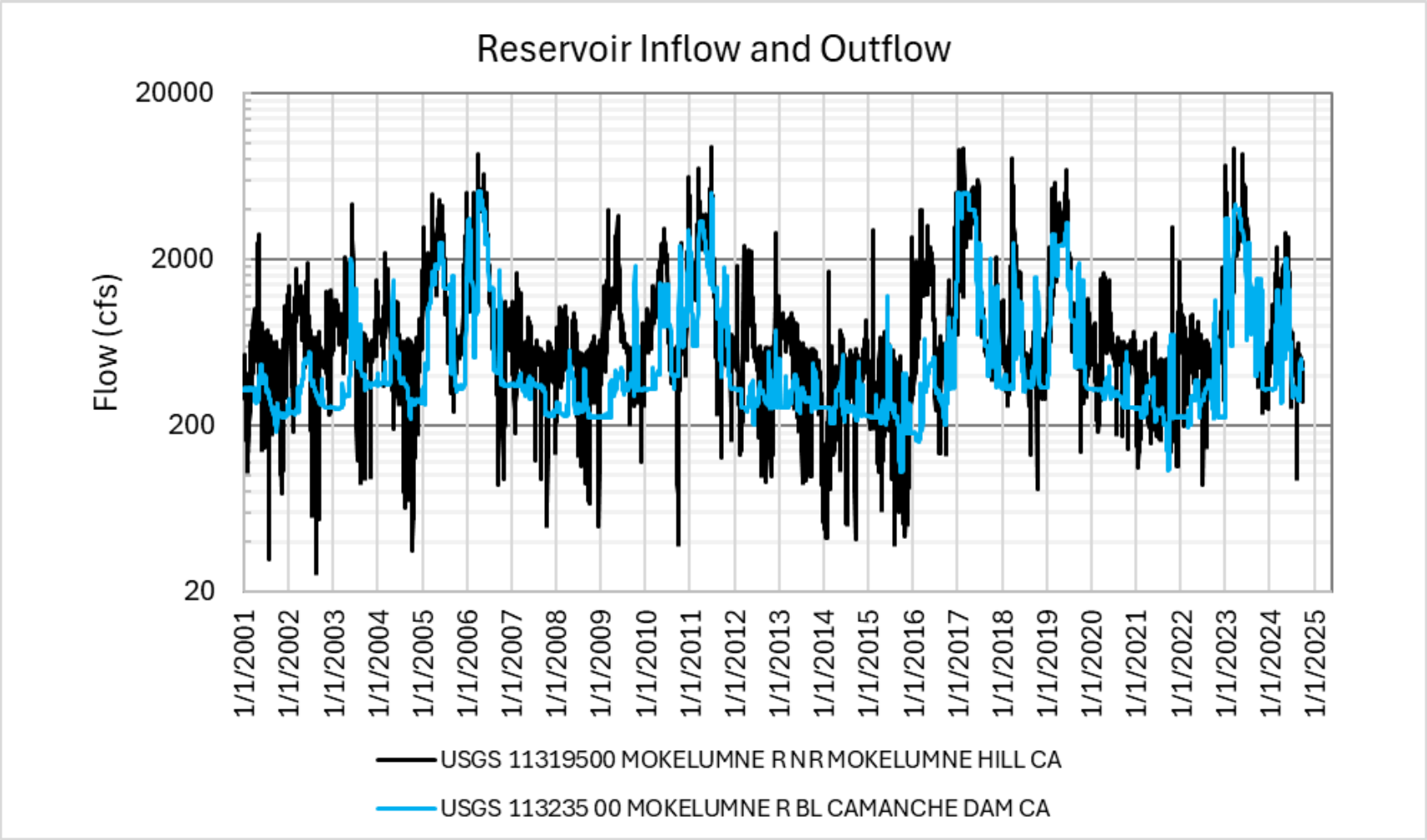
Water Resources – Operations and Hydrology

Inflow (2001-2025) to Pardee Reservoir

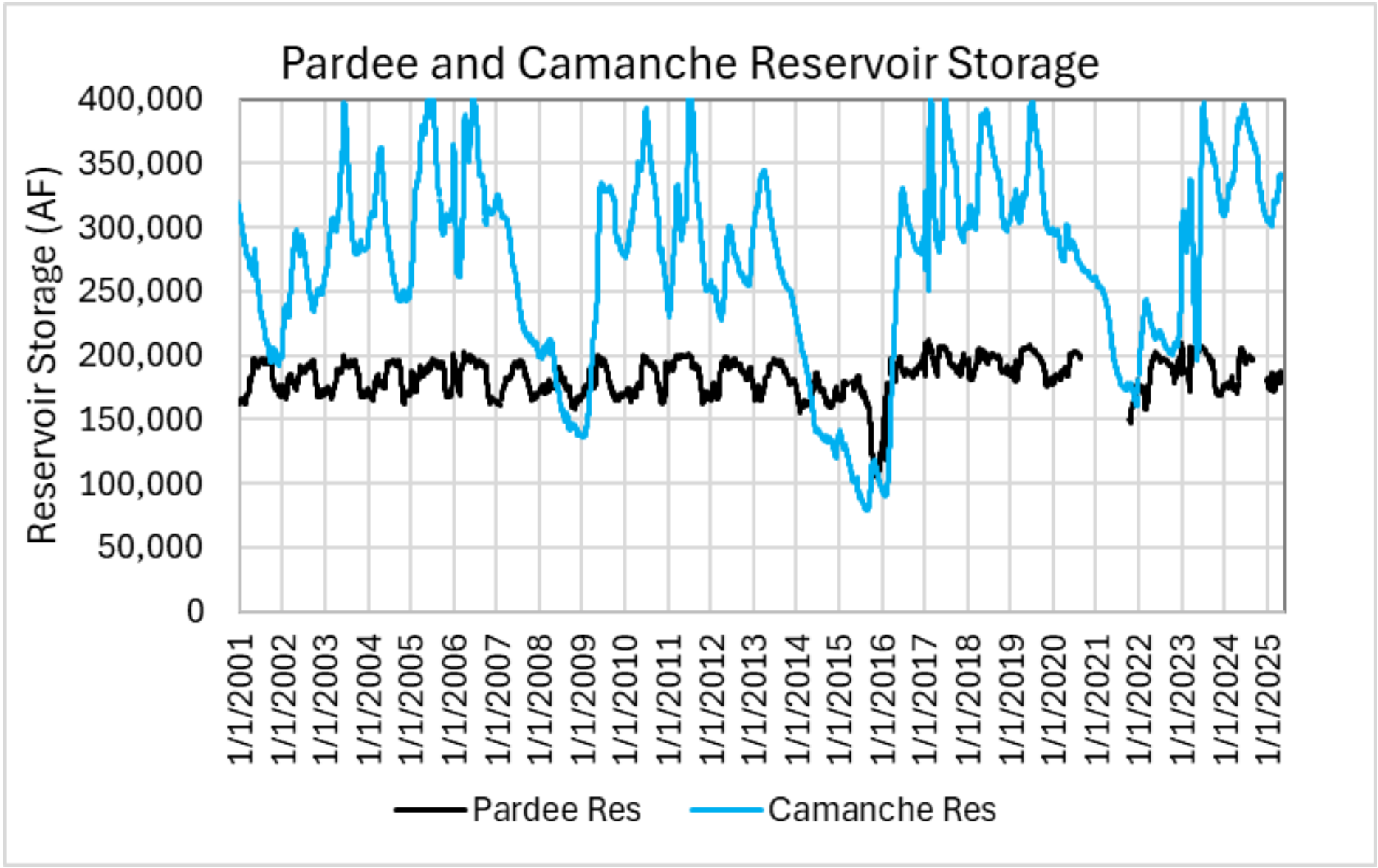
- Variable
- Regulated from upstream Projects

Outflow (2001-2025) from Camanche Reservoir

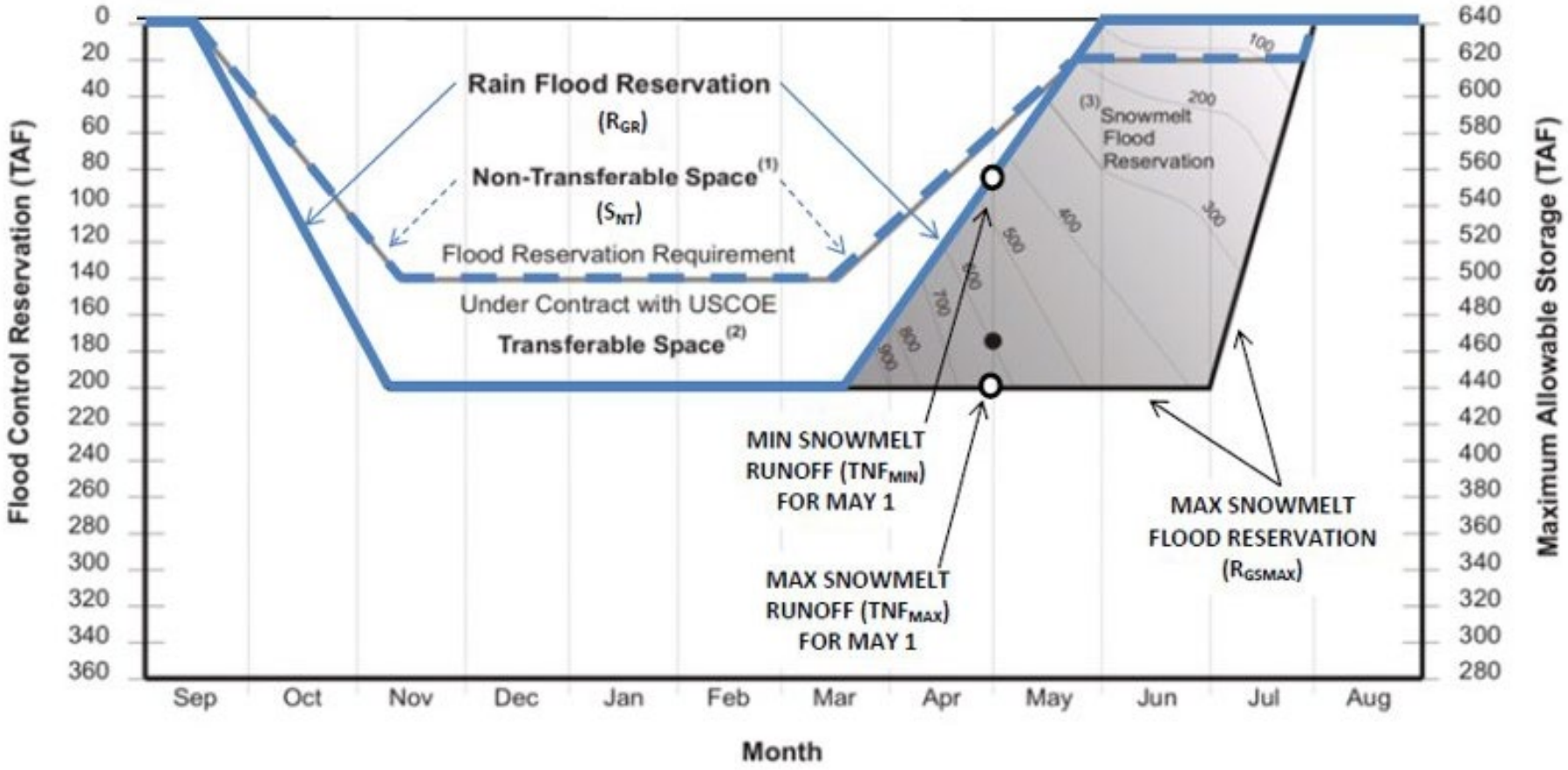
- Compared to inflow: Less fluctuations, Lower maximum flow values, Higher minimum flow values



Water Resources – Operations and Hydrology



Water Resources – Flood Control Chart



Notes:
(1) Non-transferable Space = minimum flood control space that must be maintained in Pardee and Camanche Reservoirs.
(2) Transferable Space = reduction of flood control space requirement provided by upstream (PG&E) reservoirs.
(3) Snowmelt Flood Reservation is dependent on estimated runoff-to-follow in TAF.

Example shown by ●: If on May 1, 600 TAF or more of runoff is expected through July 31, the portion of the curve above this line is used to estimate minimum transferable space.

Water Resources – JSA Year Type Criteria and Release and Flow Requirements

Table 1. JSA Year Type Criteria

PERIOD	CRITERIA	JSA YEAR TYPE			
		NORMAL AND ABOVE	BELOW NORMAL	DRY	CRITICALLY DRY
Oct – Mar	Pardee & Camanche Reservoir Storage[1]	> Max allowable storage[2]	Max allowable to 400 TAF	399 TAF to 270 TAF	269 TAF to 0 TAF
Apr – Sept	Unimpaired Runoff[3,4]	≥ 890 TAF	889 TAF to 500 TAF	499 TAF to 300 TAF	299 TAF to 0 TAF

[1]Projected Pardee & Camanche Reservoir storage on November 5
[2]Maximum allowable storage on November 5 as determined by Army Corps of Engineer's Water Control Manual for Camanche Dam and Reservoir (Sept 1981) – maximum allowable storage is the EBMUD Requirement line
[3]Water year unimpaired runoff into Pardee Reservoir as forecasted by DWR in the April 1 Bulletin 120 report
[4]April-September shall be critically dry when Pardee and Camanche Reservoir storage on November 5 is projected to be less than 200 TAF based on the DWR April 1 Bulletin 120 report

Table 2. Camanche Reservoir Release Requirements

PERIOD	JSA YEAR TYPE			
	NORMAL & ABOVE	BELOW NORMAL	DRY	CRITICALLY DRY
Oct 1-15	325	250	220	100
Oct 16-31	325	250	220	130
Nov-March	325	250	220	130
April	325*	250*	220	130
May	325*	250*	220	100
June	325*	250*	100	100
July-Sept	100	100	100	100

*Footnote 5 – Additional release is required depending on Pardee and Camanche Reservoir levels relative to maximum allowable storage for the end of the prior month as follows:

- If < 10 TAF below maximum allowable storage, add 200 cfs for subsequent month
- If 10-19 TAF below maximum allowable storage, add 150 cfs for subsequent month
- If 20-29 TAF below maximum allowable storage, add 100 cfs for subsequent month
- If 30-39 TAF below maximum allowable storage, add 50 cfs for subsequent month

Table 3. Flow Below Woodbridge Dam Requirements

PERIOD	JSA YEAR TYPE			
	NORMAL & ABOVE	BELOW NORMAL	DRY	CRITICALLY DRY
Oct 1-15	100	100	80	15
Oct 16-31	100	100	80	75
Nov-March	100	100	80	75
April	150	150	150	75
May	300	200	150	15
June	300	200	20	15
July-Sept	25	20	20	15

Water Resources – Operations and Hydrology

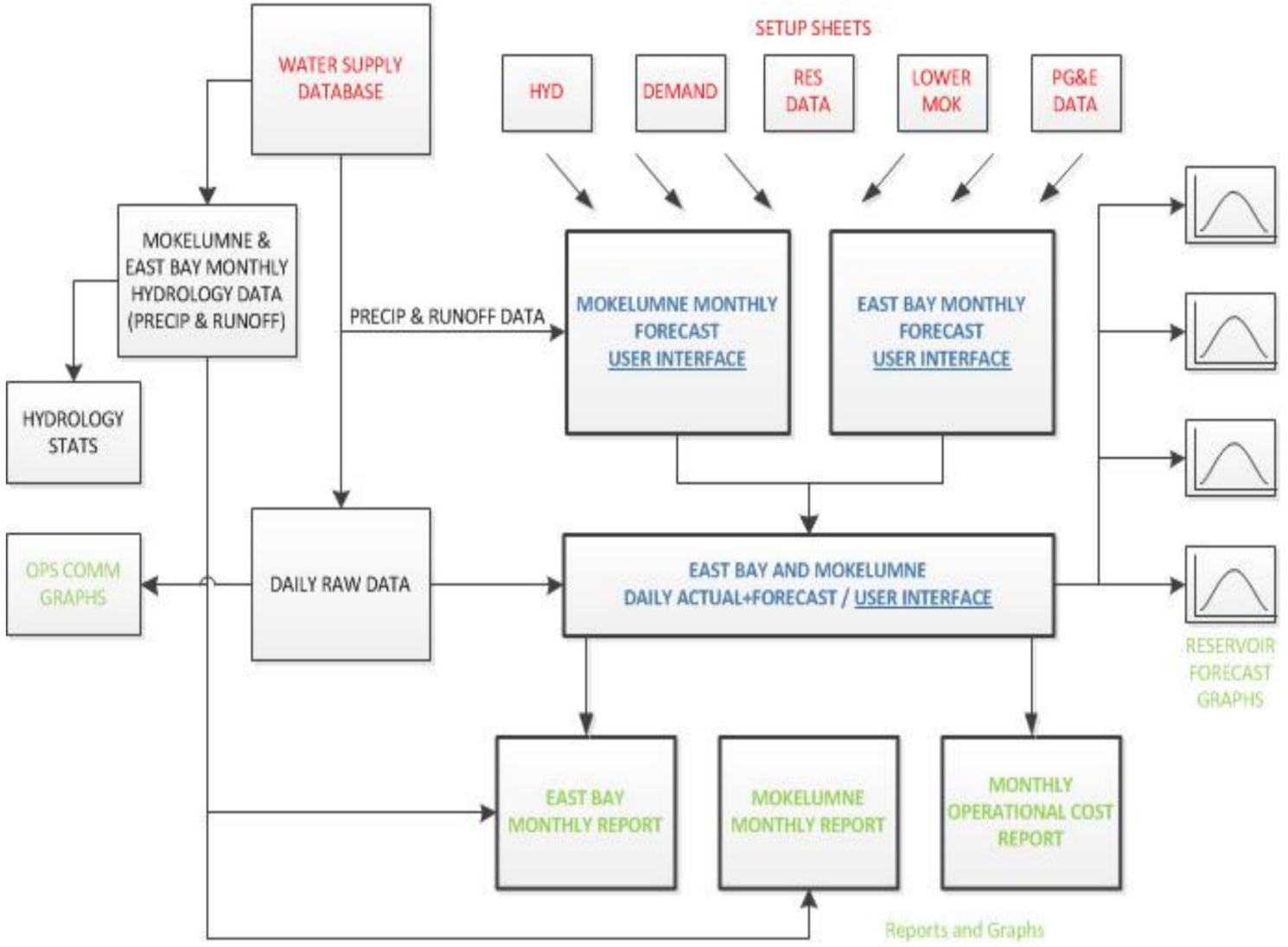
EBMUD Water Supply Operations Model

MS Excel based mass balance accounting tool

Set up with combination of monthly user inputs and daily time steps

Used to manage water supply reservoir levels for:

- meeting forecasted water treatment plant production needs,
- emergency storage goals,
- flood control,
- water quality limitations,
- In-stream flow requirements
- water rights and agreements,
- power generation goals.

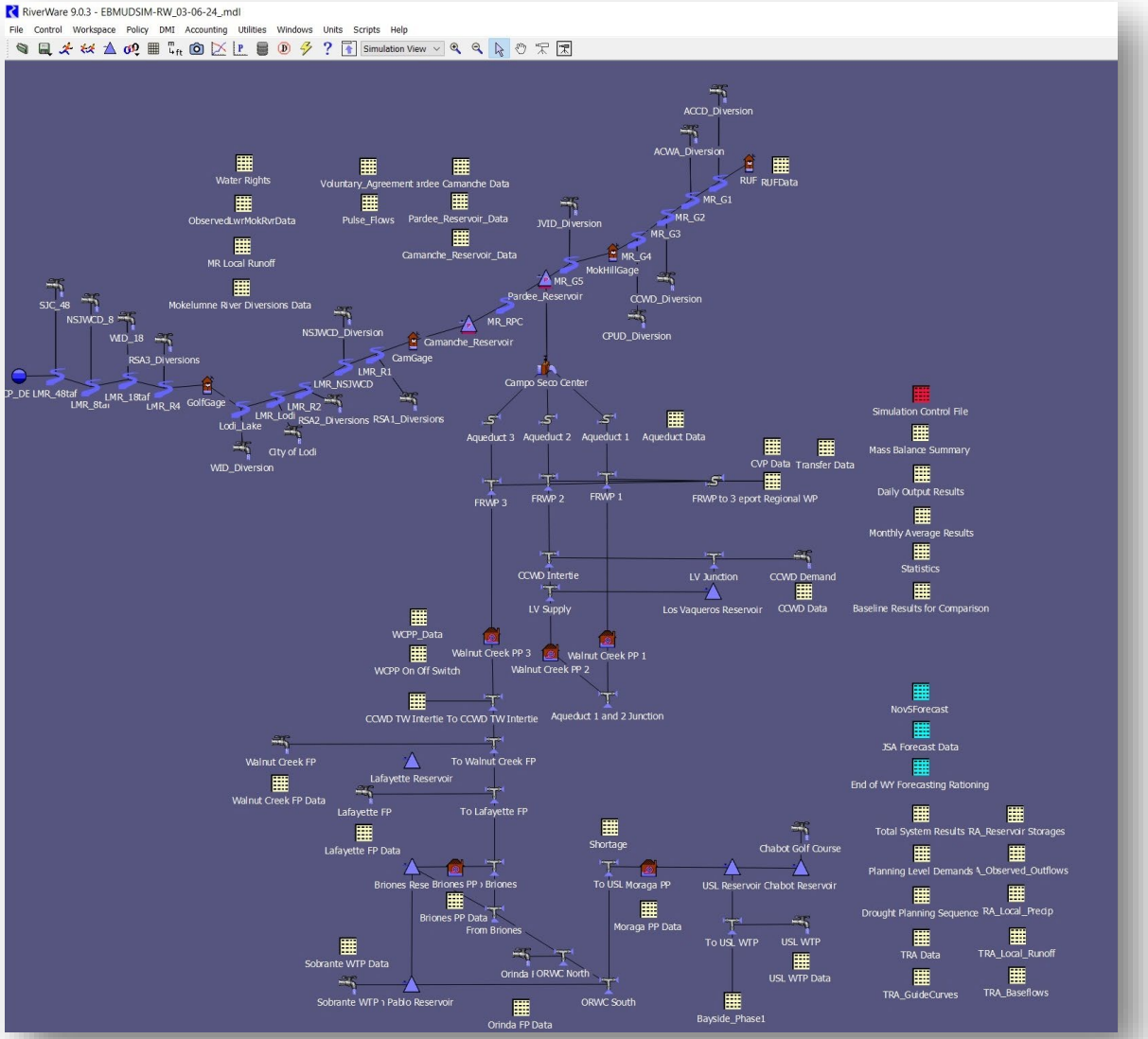


Water Resources – Operations and Hydrology

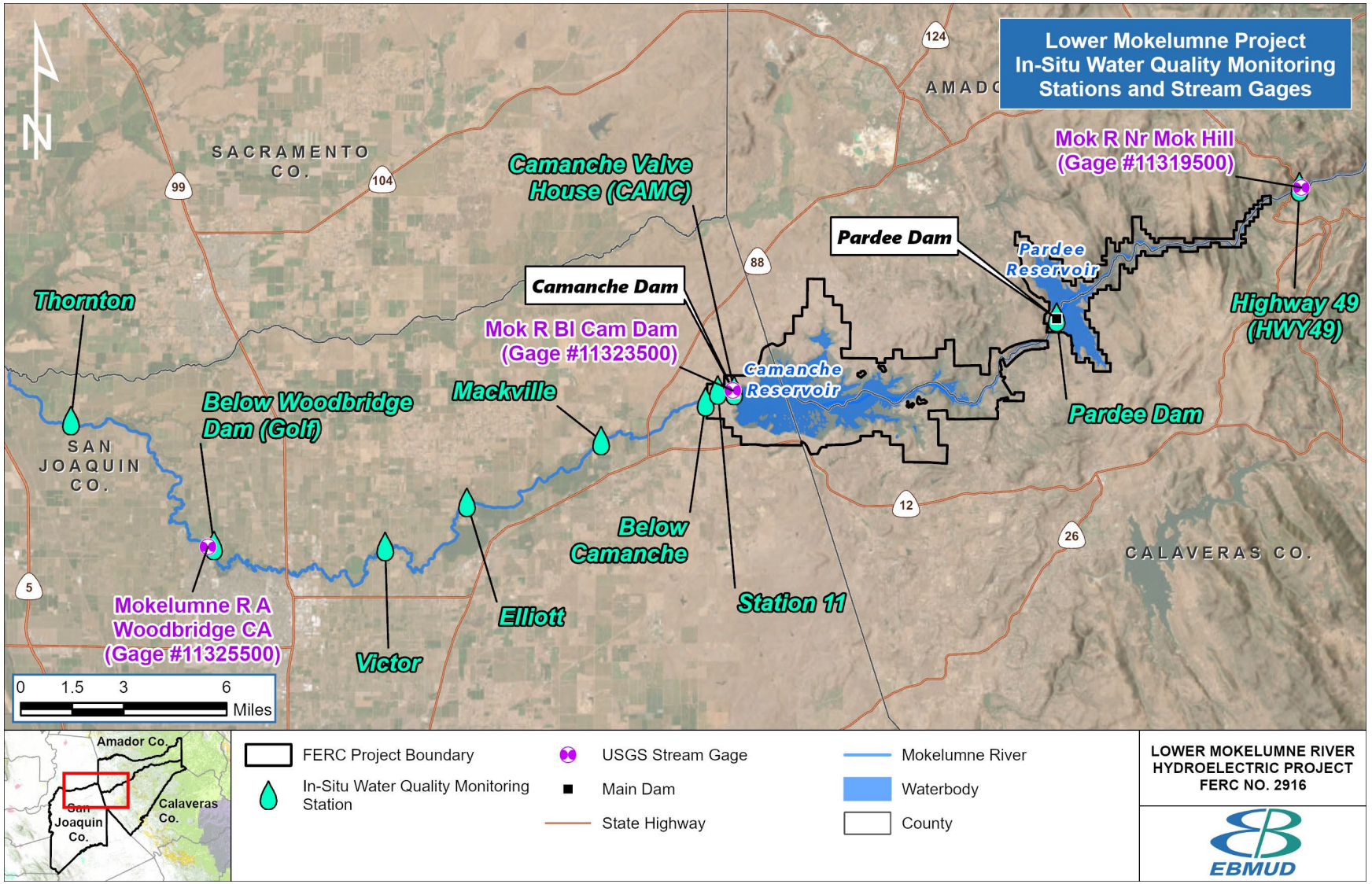
Water Supply System Planning Model

EBMUDSIM-Riverware

- Implemented following the fixed level-of-development approach for water supply planning
- Simulate current conditions and future conditions out to 2050 with the past 100 years of hydrology available for the simulation
- Modeling studies typically utilize monthly timestep output, however, daily timestep data are available for more refined analysis or to use as boundary conditions to drive water temperature model applications



Water Resources – In-Situ Water Quality Monitoring Stations & Stream Gages



Water Resources –Water Quality

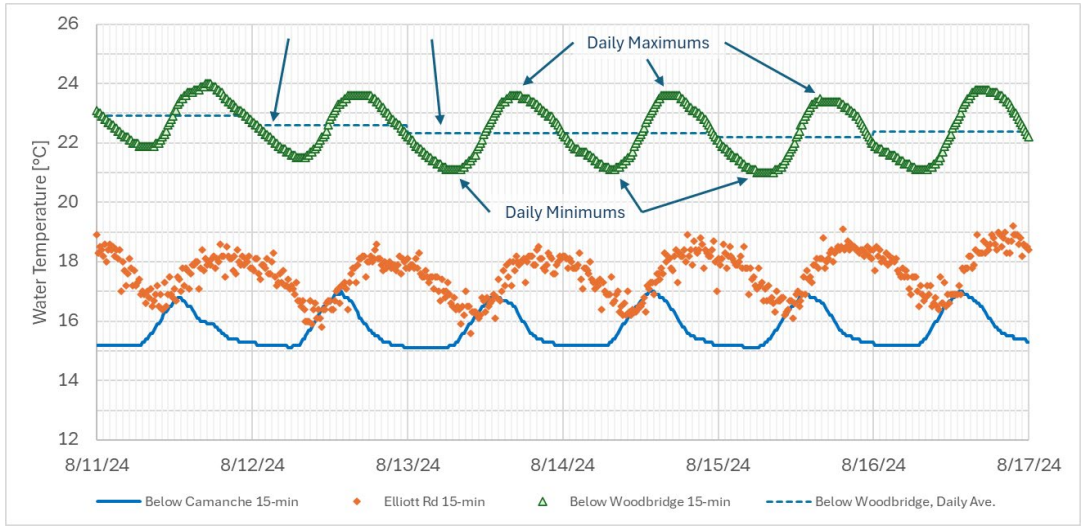
‘In-Situ’ Water Temperature and Dissolved Oxygen

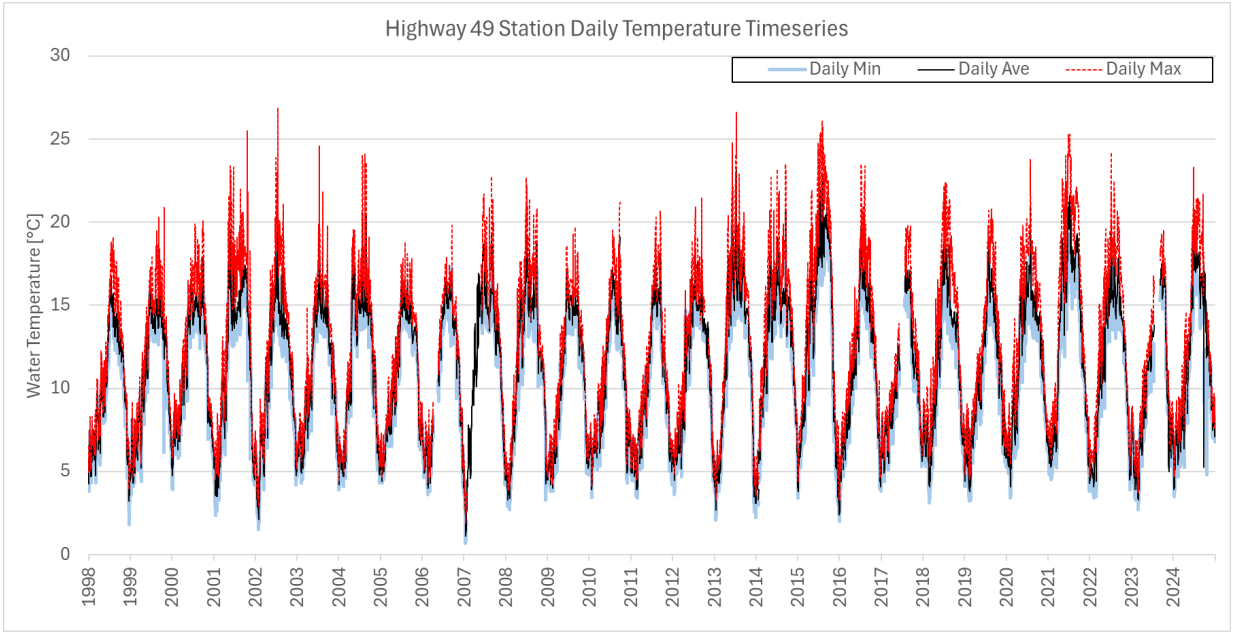
Water Temperature

- 8-Stations
- Automated (SCADA)
- Daily & Monthly Stats (1998-2024)
  - Upstream of Pardee at Highway 49
  - Camanche Dam Valve House (CAMC)
  - Below Camanche Station
  - Mackville Station
  - Elliott Station
  - Victor Station
  - Below Woodbridge (Golf) Station
  - Thornton Station

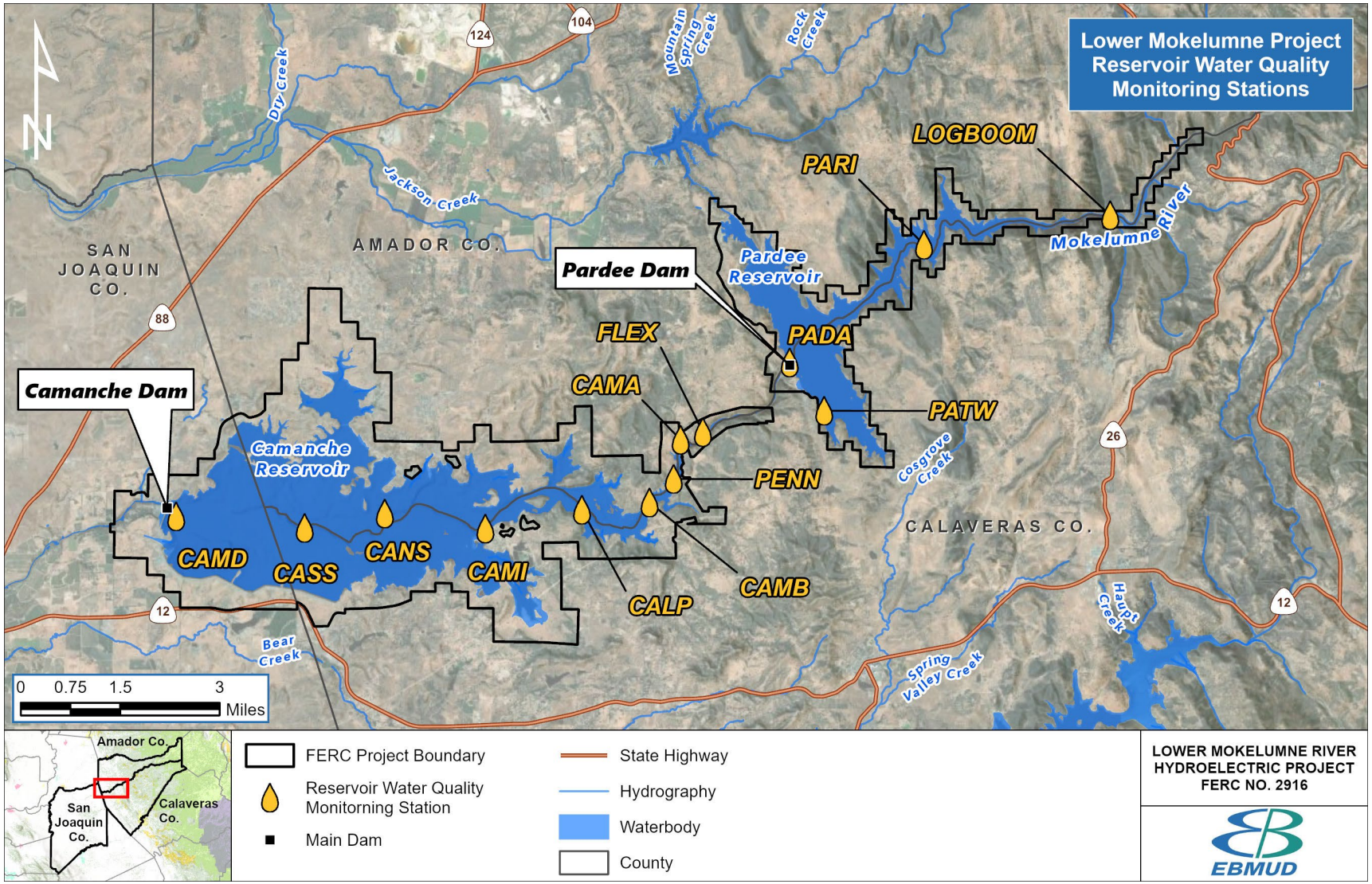
Dissolved Oxygen

- 1-Station
- Automated (SCADA)
- May – Dec (2011-2024)
  - Station 11, Below Camanche Day Use Area





Water Resources –Reservoir Water Quality Monitoring Stations



Water Resources –Water Quality

‘Reservoir’ Water Temperature and Quality Data (Manual)

13-Stations
Water Quality Sonde (manual measurements)
Measurement intervals vary from a few to a few dozen profiles collected each year (1998-2024)

Parameters Available*:

- Depth, Elevation, Water Temperature, pH, DO
- Specific Conductivity, Chlorophyll, Blue-Green Algae Phycocyanin, Turbidity (2015)

Pardee Reservoir

- LOGBOOM-Pardee Reservoir inlet
- PARI-Pardee Reservoir Interior
- PATW-Pardee Tower
- PADA-Pardee Dam

*Secchi disc readings typically acquired with manual profile measurements

Camanche Reservoir

- FLEX/CAMFLEX-Camanche Reservoir Inlet
- CAMA
- PENN/PENN20-Penn Mine
- CAMB- Buena Vista Rd/Camanche Parkway S. Bridge crossing
- CALP-Lancha Plana
- CAMI
- CASS-South Shore
- CANS-North Shore
- CAMD-Camanche Dam

Water Resources –Water Quality

‘Reservoir’ Water Temperature and Quality Data (Automated)

3-Automated Water Quality Stations

Pardee Reservoir

Pardee Dam (Station: PADA)

- Thermocouple Sensor Array
- Real time; hourly and daily (2009-2024)

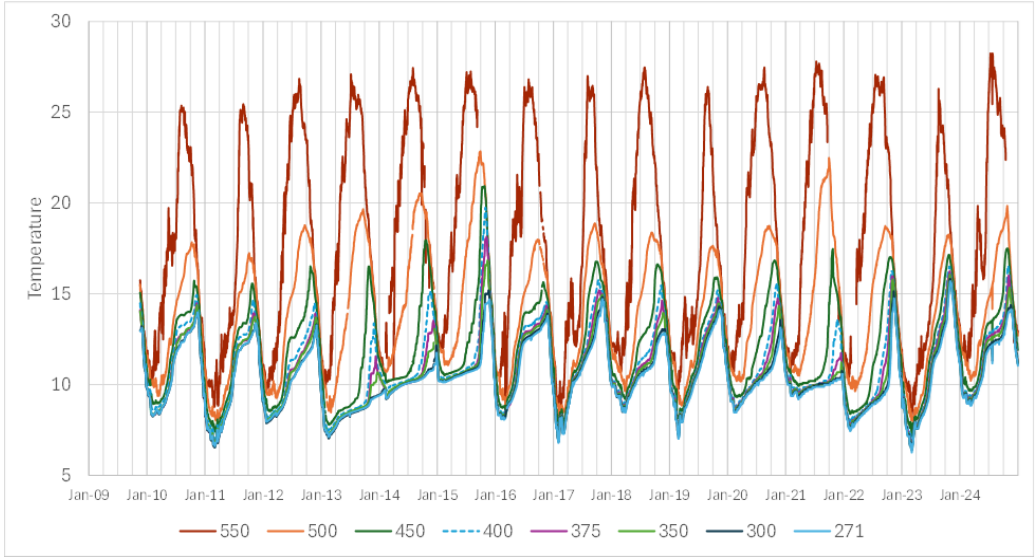
Pardee Tower

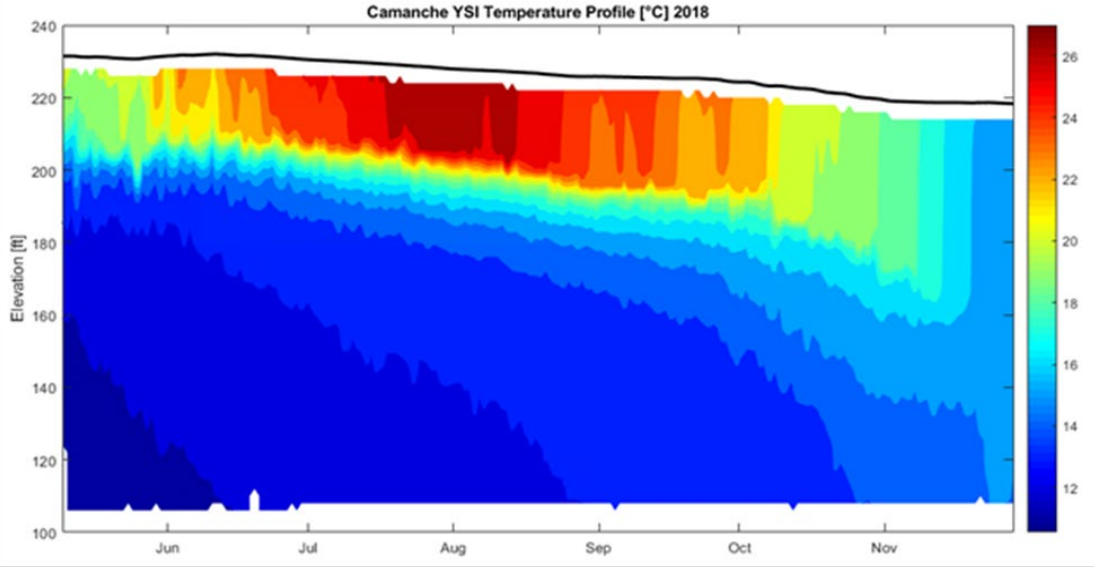
- Water Quality Profiler
- Real time (12-hour); hourly and daily (2023-2024)

Camanche Reservoir

Camanche Dam (Station: CAMD)

- Water Quality Profiler
- Real time (6-hour) (Apr/May – Nov/Dec) (2007-2024)





Water Resources –Water Quality

Water Temperature Models

CE-QUAL-W2 ver. 4.5

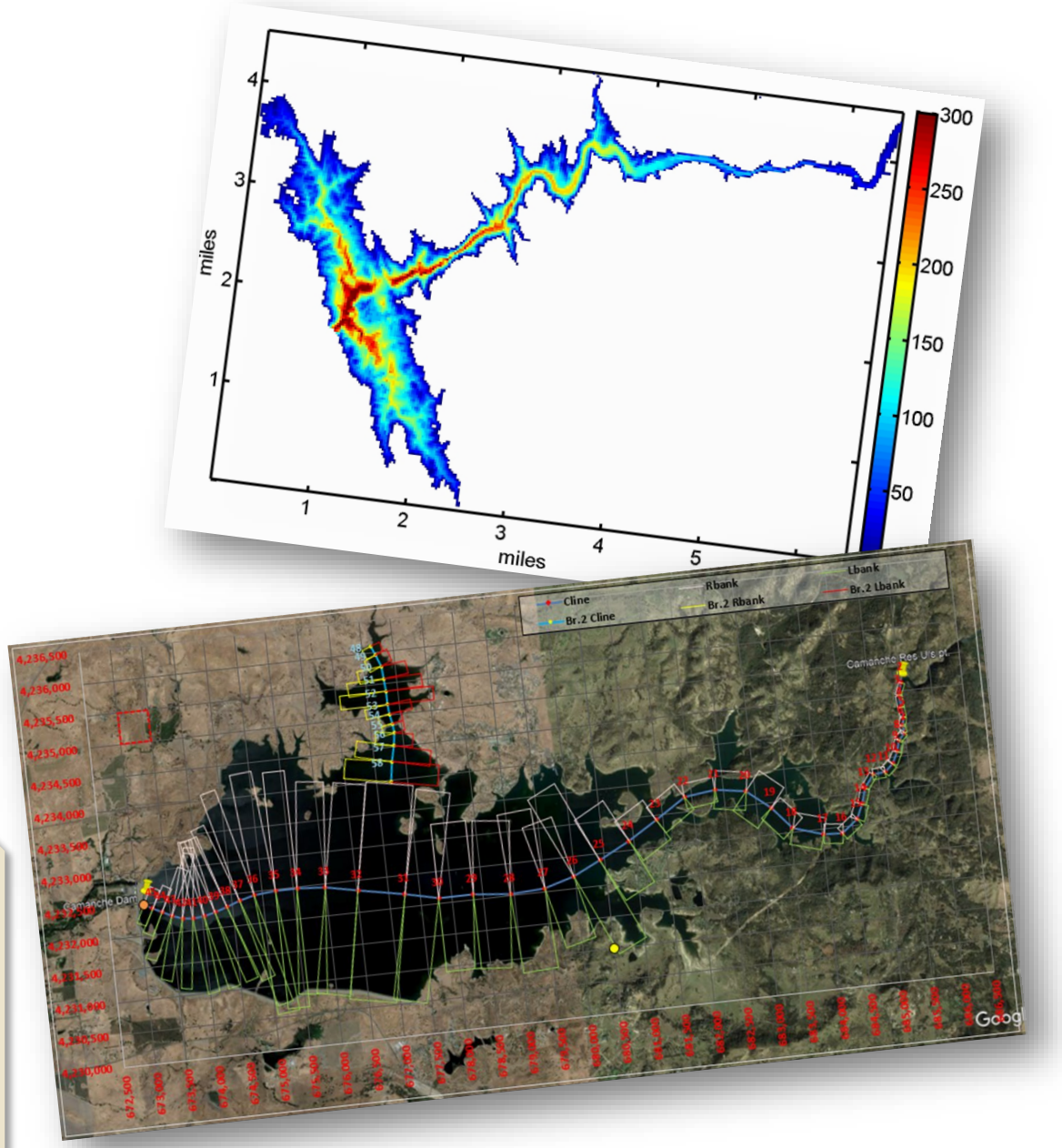
A two-dimensional hydraulic and water temperature model application for both Pardee and Camanche.

SNTEMP/RMS4

A one-dimensional hydraulic and water temperature model application - RMS4 for hourly timestep resolution and a SNTEMP for daily timestep resolution - for the reach connecting Pardee and Camanche Reservoirs.

SSTEMP

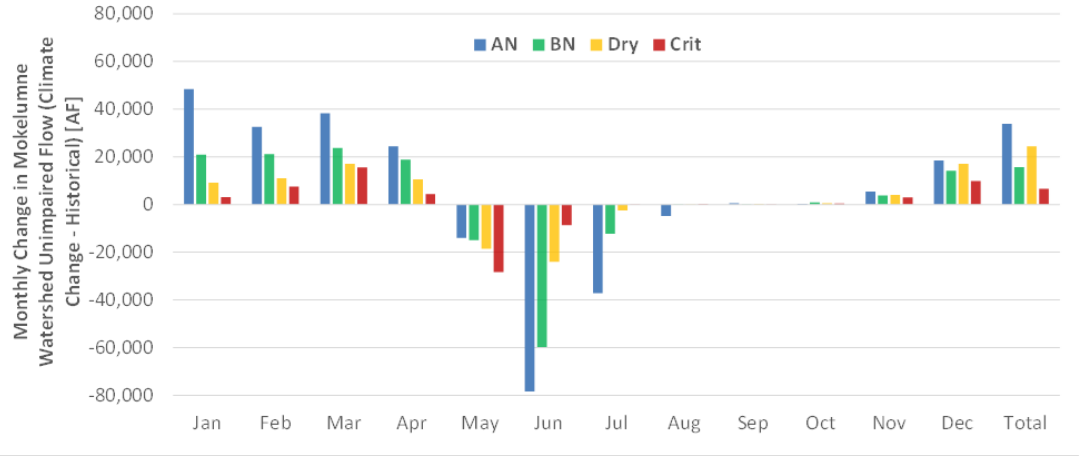
Monthly timestep model with statistical model application that simulates temperatures for the lower Mokelumne river from Camanche Dam to Station Golf below Woodbridge Dam that allow for a prediction of the monthly maximum of the seven-day average daily maximum water temperature given release temperature and flow from Camanche Dam and meteorological inputs.

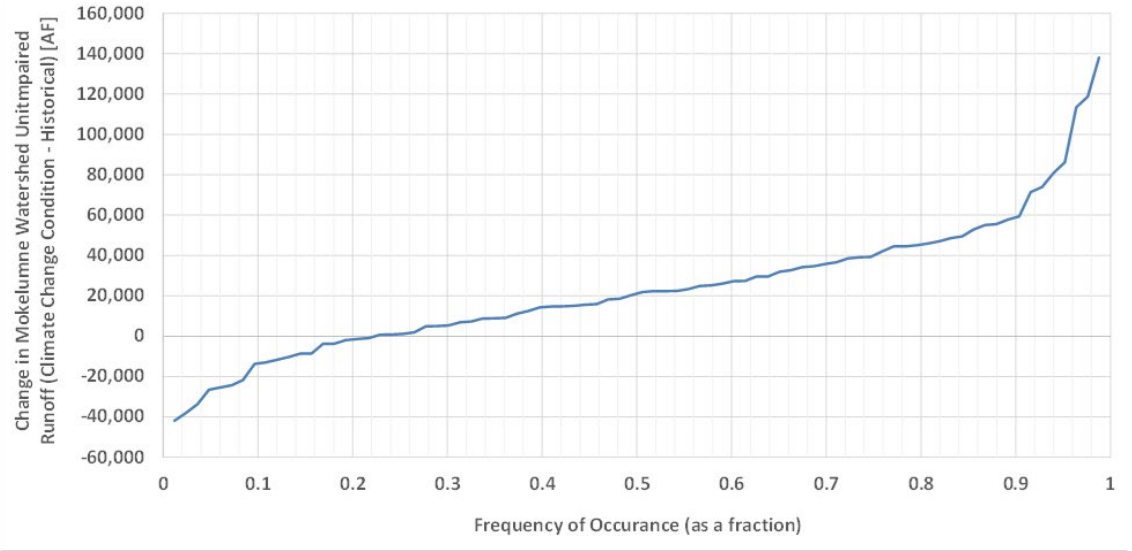


Water Resources – Climate Change

Climate Change

- Understanding effects of climate change hydrology on Project
- Studies typically updated or revisited every 5-years for Urban Water Management Plan
- Most recent study in 2022 in collaboration with USBR
  - Developed regulated undiminished flow into Pardee for future (2035-centered) conditions using top-down methodology





Water Resources – Operations, Hydrology, Water Quality

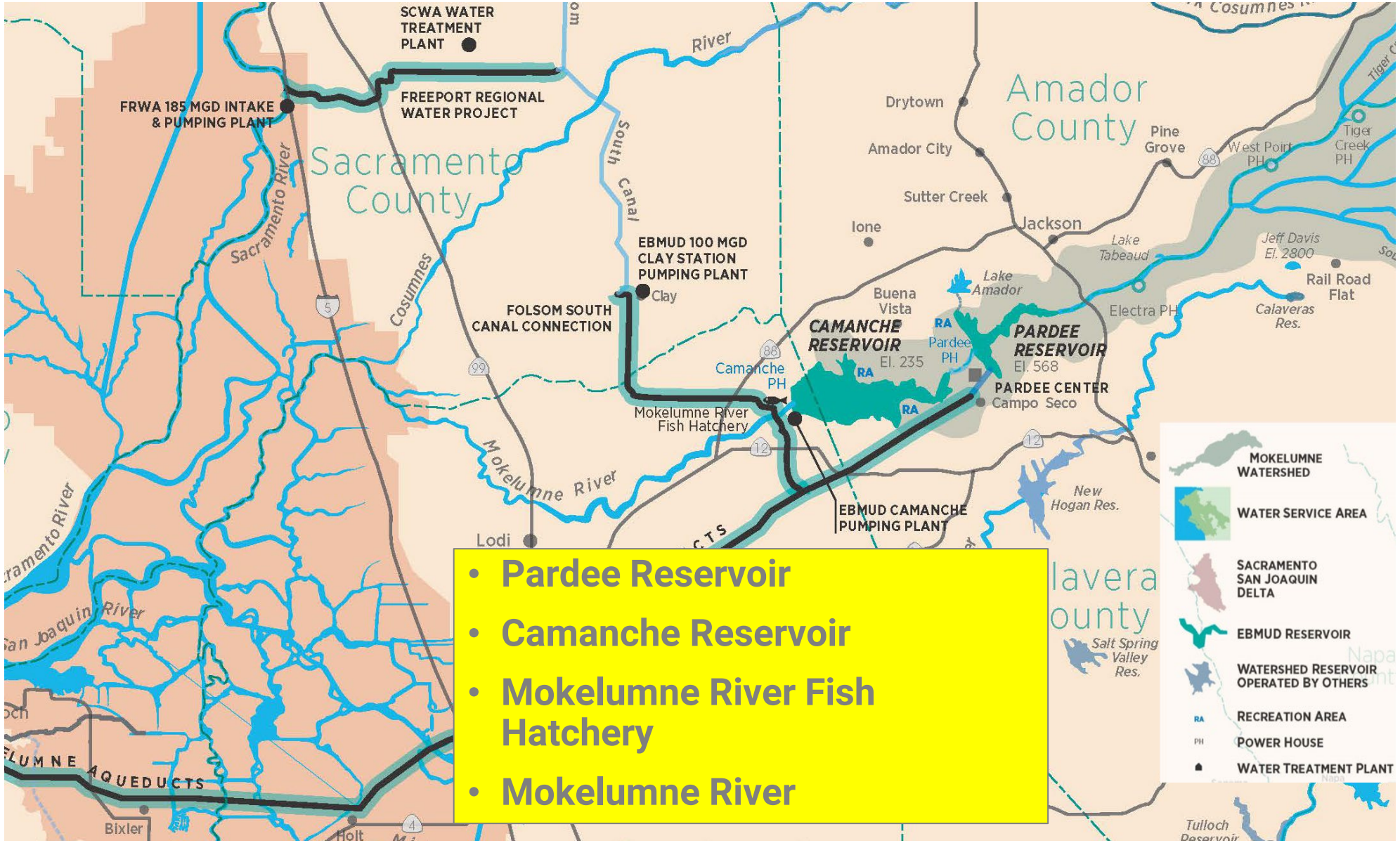
Preliminary Study Objectives

- Model system hydrology
- Characterize existing project water quality and water temperature
- Model aquatic habitat in relation to instream flows for existing and scenarios
- Model water temperature for existing and scenarios

Fish & Aquatics

- Overview
- Fish Habitat
- Fish Population
- Macroinvertebrates

Fish & Aquatics



- **Pardee Reservoir**
- **Camanche Reservoir**
- **Mokelumne River Fish Hatchery**
- **Mokelumne River**

Mokelumne Joint Settlement Agreement and Partnership

- Joint Settlement Agreement signed in 1998 and included in D-1641
- Integrated approach includes flow and non-flow measures
- 10-fold increase in flows from early 1990s
- Flows based on life stage needs and water year type (storage and runoff)
- Formal collaboration with resource agencies and stakeholders to optimize river management
- $2 million Endowment for habitat improvements
- $12.5 million in improvements to upgrade hatchery (2003)

Fish & Aquatics

Existing Data (Sources)

- State and Federal Database Reviews
- Joint Settlement Agreement
- EBMUD Biological Survey Reports
- License Compliance Documents
- EBMUD Data and Publications
- Scientific Literature
- Recovery Plans/Habitat Conservation Plans

Fish & Aquatics – Salmonids/ Amphibians & Reptiles

Family	Species	Status	Pardee Reservoir	Camanche Reservoir	Camanche Dam to WIDD	WIDD to Cosumnes River	Cosumnes to San Joaquin
Salmonidae: Salmon and Trout Family	Brown Trout	I	X		X		
	Chinook Salmon	N, SSC			X	X	X
	Chum Salmon	N			X		
	Kokanee	N	X*	X*	X	X	
	Rainbow trout	N	X	X			
	Steelhead/rainbow trout	N, FT, SCC			X	X	X

Family	Species	Status	Pardee Reservoir	Camanche Reservoir	Camanche Dam to WIDD	WIDD to Cosumnes River	Cosumnes to San Joaquin
Ranidae: Trug Frog Family	American Bullfrog	I	X	X			
Salamandridae: True Salamander and Newt Family	Sierra Newt	N	X				
Emydidae: Hard-shelled Turtle Family	Northwestern Pond Turtle	N,FPT	X	X			
	Red-eared Slider	I		X			

Fish & Aquatics – non-salmonids

Family	Species	Status	Pardee Reservoir	Camanche Reservoir	Camanche Dam to WIDD	WIDD to Cosumnes River	Cosumnes River to San Joaquin River
Atherinopsidae: Silversides Family	Inland Silverside	I				X	X
Catostomidae: Sucker Family	Sacramento Sucker	N	X		X	X	X
Centrarchidae: Sunfish Family	Black Crappie	I	X	X	X	X	X
	Bluegill	I	X	X	X	X	X
	Green Sunfish	I	X	X	X	X	X
	Largemouth Bass	I	X	X	X	X	X
	Redear Sunfish	I	X	X	X	X	X
	Redeye bass	I			X	X	X
	Smallmouth Bass	I	X	X	X	X	X
	Spotted Bass	I	X	X	X	X	X
	Warmouth	I			X	X	X
	White Crappie	I		X	X	X	X
Clupeidae: Herring Family	American Shad	I				X	X
	Threadfin Shad	I	X	X	X	X	X
Cottidae: Sculpin Family	Pacific Staghorn Sculpin	N			X		X
	Prickly Sculpin	N	X	X	X	X	X
Cyprinidae: Minnow Family	California Roach	N	X				
	Common Carp	I	X	X	X	X	X
	Fathead Minnow	I				X	X
	Golden Shiner	I	X	X	X	X	X
	Goldfish	I		X	X	X	X
	Hardhead	N, SSC	X		X		
	Hitch	N, SSC			X	X	X
	Sacramento Blackfish	N, SSC		X	X	X	X
	Sacramento Pikeminnow	N	X	X	X	X	X
	Sacramento Splittail	N, SSC				X	X

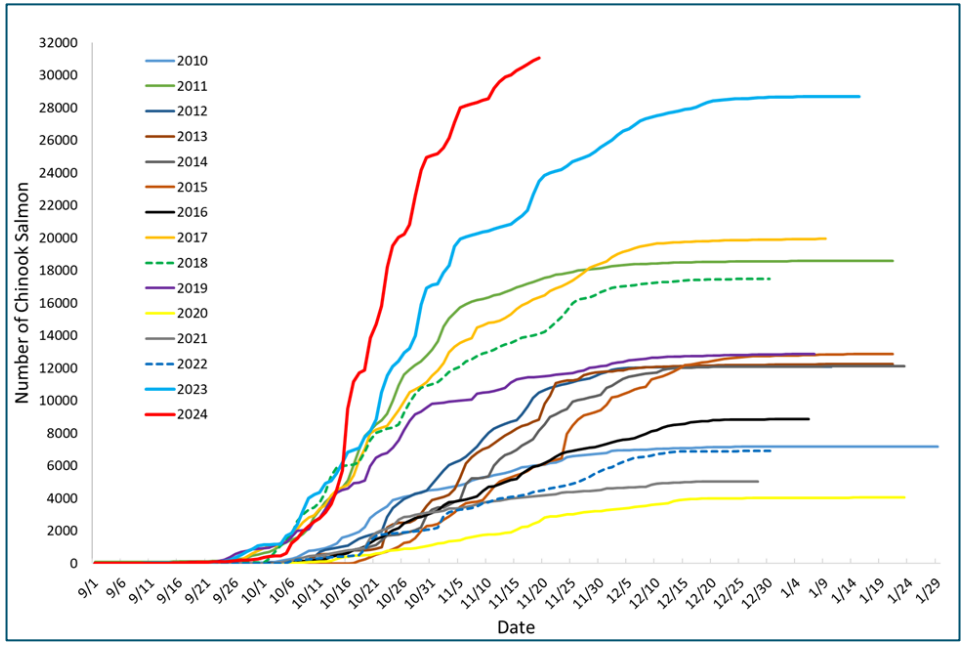
Fish & Aquatics – non-salmonids (cont.)

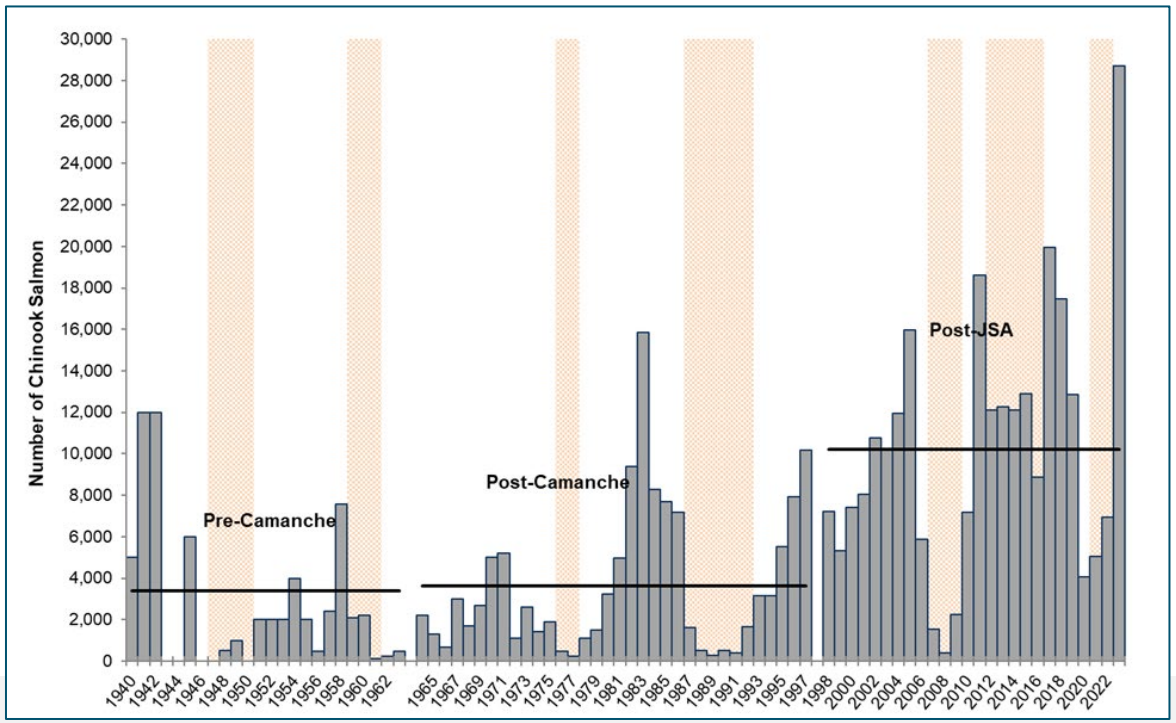
Family	Species	Status	Pardee Reservoir	Camanche Reservoir	Camanche Dam to WIDD	WIDD to Cosumnes River	Cosumnes River to San Joaquin River
Embiotocidae: Surfperch Family	**Tule Perch**	**N, SSC**			**X**	**X**	**X**
Gobiidae: Goby Family	Yellowfin Goby	I				X	X
Ictaluridae: Catfish Family	Black Bullhead	I			X	X	X
	Brown Bullhead	I			X	X	X
	Channel Catfish	I	X	X	X	X	X
	White Catfish	I	X	X	X	X	X
Moronidae: Striped Bass Family	Striped Bass	I			X	X	X
Osmeridae: Smelt Family	Delta Smelt	N, FT, CE				X	X
	Wakasagi	I				X	
Percidae: Perch Family	Bigscale Logperch	I			X	X	X
Petromyzontidae: Lamprey Family	Pacific Lamprey	N, SSC			X	X	
Poeciliidae: Livebearers	Western mosquitofish	I		X	X	X	X

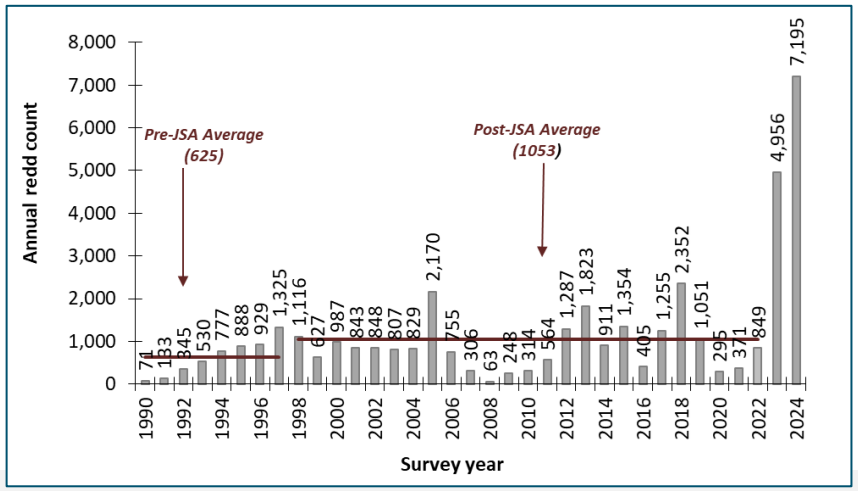
Fish & Aquatics – River Survey Information

Lower Mokelumne River Surveys

- Salmonid Escapement – August – July annually
  - Video monitoring @Woodbridge Dam
- Redd and Carcass surveys – October-March/January – annually – Camanche Dam to Elliott Rd.







Fish & Aquatics – River Survey Information

Lower Mokelumne River Surveys

- Juvenile migration surveys – December –July annually
  - Rotary Screw Trap -Elliott Rd and below Woodbridge Dam
- Fish community surveys – seasonally – annually
  - Backpack and boat electrofishing and seinining - Camanche Dam to Tower Park (Delta Forks)
- Acoustic Telemetry
  - 2021-Present Spring/Summer
  - Camanche Dam – Golden Gate

Brood Year	JSA Water Year Type (Apr. – Sept)	Upstream Abundance Estimate (rkm 87.4)	Downstream Abundance Estimate (rkm 62)	Survival Between Traps
2009	Below Normal	124,279	67,349	54.19%
2010	Normal & Above	842,570	281,500	33.41%
2011	Dry	202,772	51,799	25.55%
2012	Dry	1,203,754	147,590	12.26%
2013	Dry	595,070	169,864	28.55%
2014	Critically Dry	431,677	61,305	14.20%
2015	Below Normal	856,127	134,593	15.72%
2016	Normal & Above	No Estimate	326,455	NA
2017	Below Normal	456,372	40,117	8.79%
2018	Normal & Above	4,693,253	2,799,209	59.64%
2019	Dry	214,226	24,097	11.25%
2020	Dry	197,004	82,145	41.70%
2021	Dry	107,931	61,415	56.90%
2022	Normal & Above	≥ 842,449*	184,242	≤ 21.84%
2023	Below Normal	1,781,298	444,117	24.93%

*Incomplete abundance estimate (trap pulled on 3/16/23)

Year	Survival (%)	SE	95% lower C.I.	95% upper C.I.	Detection efficiency (%)	Number Released
2021	0.1	0.1	0	0.7	100	960
2022	0.1	0.1			100	957
2023	14.8	1.1	12.8	17	98.1	1104
2024	0.8	0.3	0.4	1.7	100	913

Fish & Aquatics – Reservoir Survey Information

Pardee Reservoir 2011-2023

- Biennial Night Electrofishing Surveys – 5 standardized sites
- Purpose: species composition, detecting gross shifts in assemblage, early detection of non-natives.

Species Common Name	Total Count	Ave. Length (mm)	Min. Length (mm)	Max. Length (mm)
Black Crappie	6	98	48	176
Bluegill	1835	65	29	174
California Roach	2	109	108	110
Channel Catfish	25	375	72	560
Common Carp	16	541	92	742
Golden Shiner	2	127	90	164
Green Sunfish	610	56	27	172
Hardhead	6	102	62	161
Largemouth Bass	820	144	17	536
Lepomis hybrid	55	66	35	230
Rainbow Trout	2	377	323	431
Redear Sunfish	264	96	35	274
Sacramento Pikeminnow	6	119	86	195
Sacramento Sucker	5	187	81	326
Smallmouth Bass	144	136	25	415
Spotted Bass	33	52	28	242
Threadfin Shad	1	103	103	103
White Catfish	1	48	48	48

Fish & Aquatics – Reservoir Survey Information

Camanche Reservoir 2011-2023

- Biennial Night Electrofishing Surveys – 8 standardized sites
- Purpose: species composition, detecting gross shifts in assemblage, early detection of non-natives.

Species Common Name	Total Count	Ave. Length (mm)	Min. Length (mm)	Max. Length (mm)
Black Crappie	45	98	22	350
Bluegill	1484	73	19	160
Channel Catfish	22	253	45	582
Common Carp	218	436	210	620
Gambusia	1	29	29	29
Golden Shiner	1	101	101	101
Goldfish	44	284	30	390
Green Sunfish	461	74	26	190
Largemouth Bass	965	109	33	513
Lepomis hybrid	37	92	45	189
Prickly Sculpin	2	56	46	66
Rainbow Trout	15	381	256	435
Redear Sunfish	161	102	45	205
Sacramento Pikeminnow	1	127	127	127
Smallmouth Bass	13	97	32	367
Spotted Bass	1014	125	30	522
Threadfin Shad	1512	62	24	129
White Catfish	7	237	61	491
White Crappie	1	56	56	56

Fish & Aquatics – Lower Mokelumne River Macroinvertebrates

- Surveys 1996-2002
- Gravel enhancement sites
- Purpose: determine relationship between gravel enhancement sites, redd densities, and macroinvertebrate community (Chan et al 2003)
    - Results: BMI populations recolonized enhancement areas quickly with no change in species profiles
    - No sensitive species were identified
    - Targeted surveys for New Zealand Mudsnail in 2006
        - study supports previous work indicating NZMS may reduce benthic macroinvertebrate diversity in streams they invade, but normal annual variation and the expansion of the snail's range continue to cloud direct correlations.

Fish & Aquatics – Golden Mussels

Monitor District Reservoirs

- Visual substrate inspections for adults
- Veliger tows for DNA analysis
- eDNA sampling

Defend – Protect Critical Entry Points with exclusion/inspections

- Camanche/Pardee/San Pablo – boat access closed for summer season
- USL (protect from imports, Freeport)
- Fish plants - hatcheries inspected, some fish plants halted

Mitigate

- Freeport
  - Vulnerability study underway
  - Monthly eDNA sampling and substrate monitoring
- Investigate Engineered solutions
- Identify and advocate for necessary science

Fish & Aquatics – Habitat Restoration

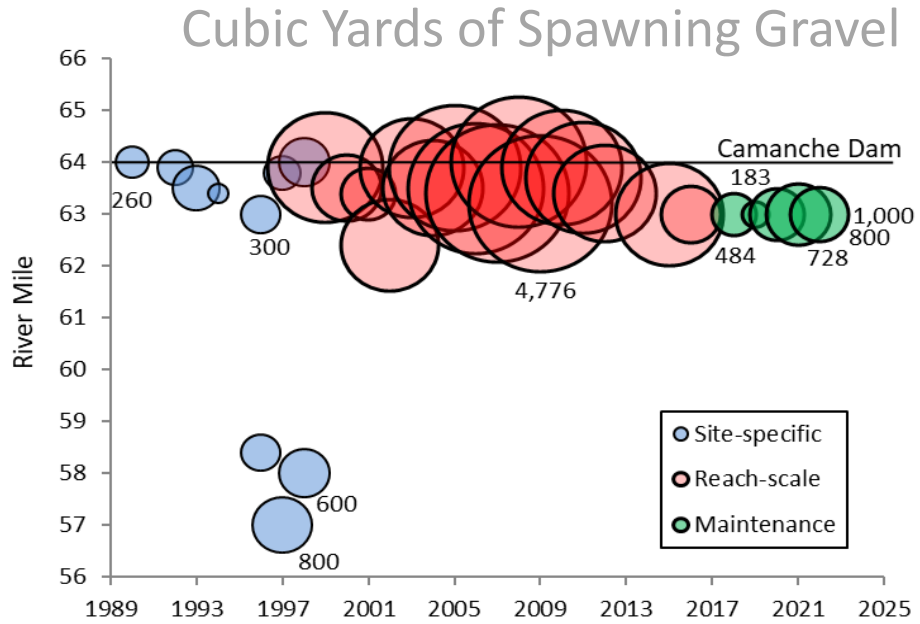
EBMUD Existing Data/Environment

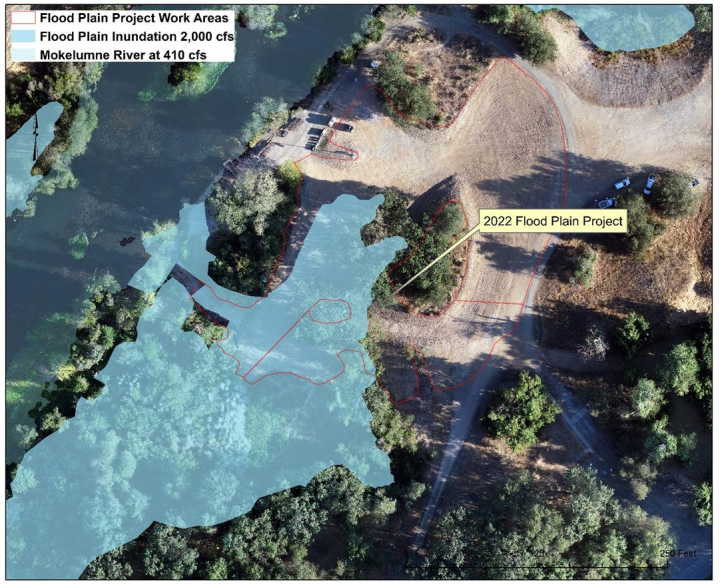
Habitat Restoration

- Gravel Augmentation
- 1990-1998: Site-specific projects
- 1999-2016: SHIRA (reach-scale restoration)
- 2017-present: SHIRA (reach-scale Maintenance)
- Floodplain & Side channels – 2005, 2015-present
- Habitats are surveyed annually
    - Bathymetry, gravel size, WSE, fish use, temperature, DO

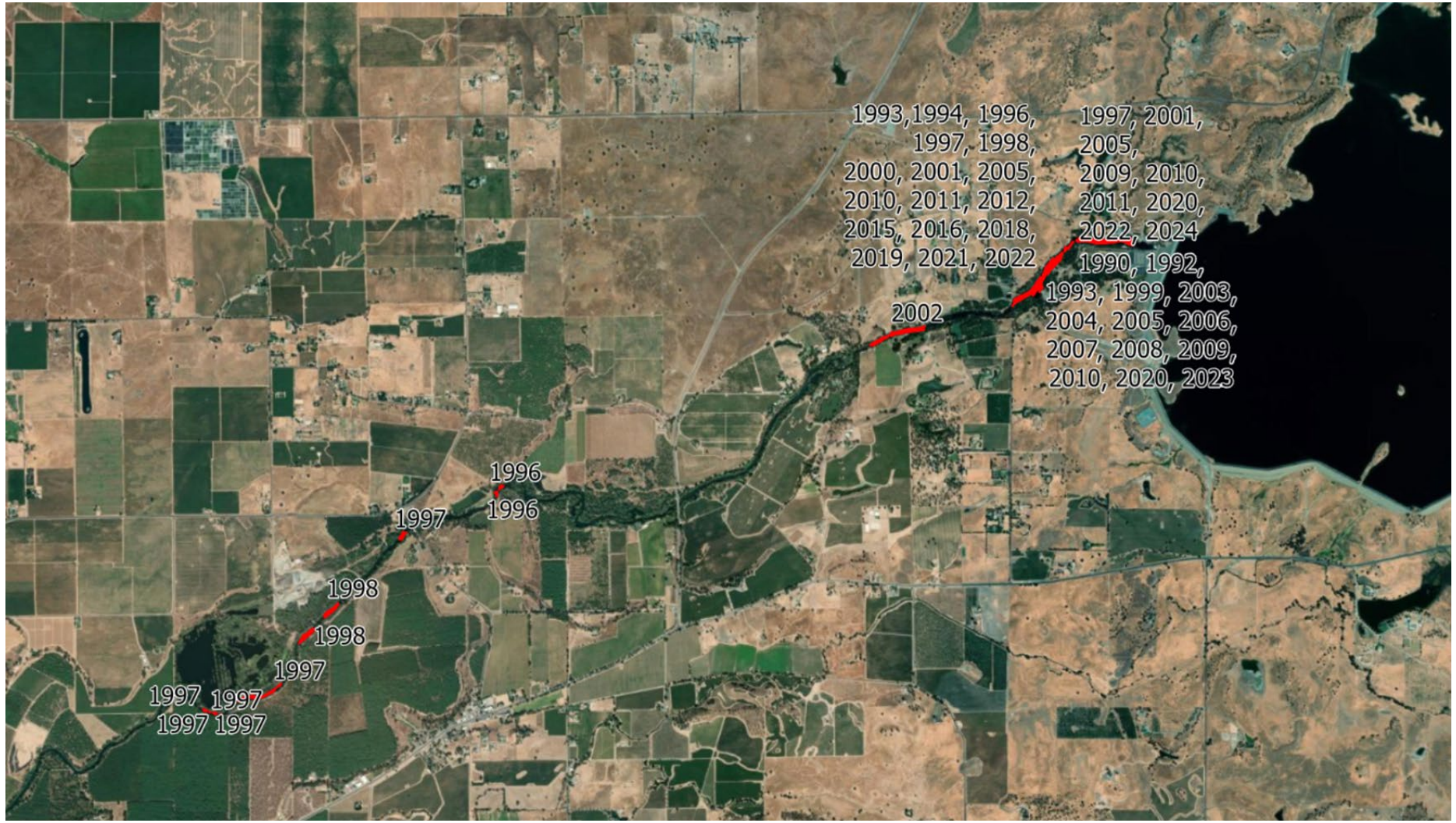
Habitats

- Lower Mokelumne River - HEC-RAS model – simulates flows 100-5,000
- Habitat suitability developed from depth/velocity profiles at each flow for the entire river
- Defines spawning and rearing habitat for salmonids
- Temperatures from Cam Dam to Thornton
- Habitat types include pool, riffles and run





Fish & Aquatics – Habitat Restoration Projects 1990-2024

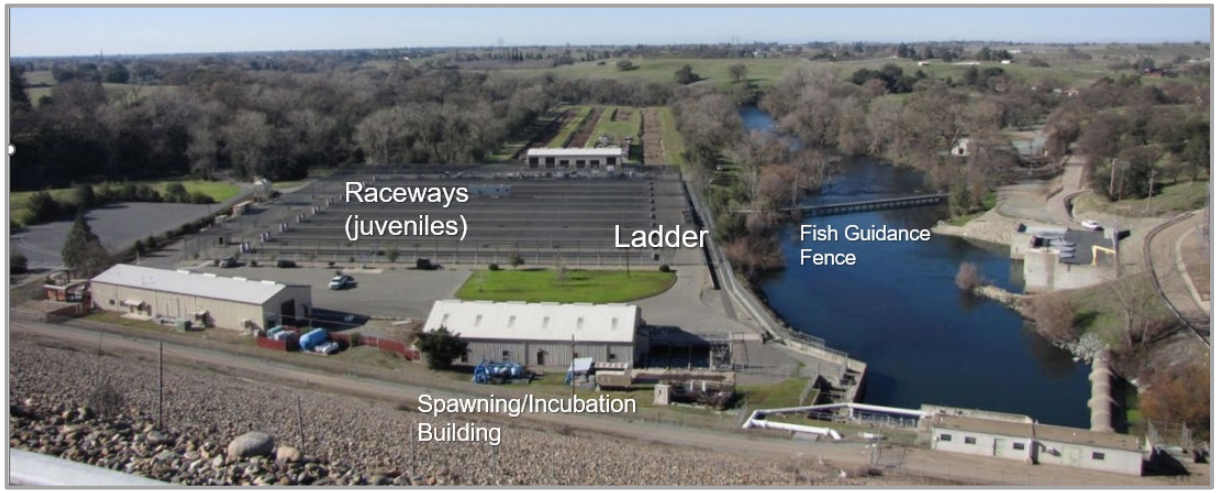


Fish & Aquatics – Hatchery and Operations

Hatchery

- Built in 1963
- Designed to offset the loss of fish spawning habitat
- Facilities: raceways (juveniles), ladder, spawning/incubation building, and fish guidance fence
- Species raised and released:
  - Fall Run Chinook salmon- spawning mid-October to Late December
  - Steelhead trout- spawning December to March
- Collaboration between EBMUD/CDFW to pinpoint release locations, increase survival, and reduce straying rates

- Goals
  - Promote fish health and survival rates
- Success
  - From 1998-2003, fall-run Chinook salmon escapement (returns) increased by 3,028
  - From 2009-2014, salmon returns exceeded 12,000 (with record run over 18,000 in 2011)
  - 2023 and 2024 over 20,000



Fish & Aquatics

Preliminary Study Objectives

- Gather information necessary to adequately analyze the potential effects of ongoing operation and maintenance of the Lower Mokelumne River Project
  - Document fish species composition, distribution, and abundance in the river reaches
  - Reservoir Fish Habitat - characterize the management of reservoir water surface elevations and its relationship to availability of fish habitat under existing and proposed Project operations
  - Identify and map potential habitat for NWPT in the study area
  - Model water temperature and dissolved oxygen for existing conditions and proposed Project operations

Terrestrial Resources

- Wildlife / Rare, Threatened, & Endangered (RTE) Species
- Botanical/RTE Species
- Wetlands, Riparian, & Littoral Habitats

Terrestrial – Wildlife / RTE

Existing Data (Sources)

- State and Federal Database Reviews
- EBMUD Biological Survey Reports
- License Compliance Documents
- EBMUD Data and Publications
- Scientific Literature
- Recovery Plans/Habitat Conservation Plans

EBMUD Existing Data/Environment

Amphibians *(CA Tiger Salamander, CA Red-Legged Frog, Western Spadefoot):*

- Dip net surveys (March-April)
- Pit trap surveys (Oct-March)
- Annual surveys since 2009

Invertebrates *(Valley Elderberry Longhorn Beetle/habitat):*

- 804 known shrubs
- Surveys every 3 years since 2008
- Surveyed District property in the Camanche and Pardee Watershed
- Surveyed using transect/visual encounter
- Last survey was 2024

Birds *(Bald Eagle, Swainson's Hawk, Burrowing Owl, Raptors):*

- Annual USFWS Eagle surveys since 1985
- An additional ~20 annual nesting bird surveys
- Surveyed District property in the Camanche and Pardee Watershed
- Surveyed using transect/visual encounter
- Date of Last Survey was May 2025

Monarchs / Bats:

- Five known bat species to occur
- Surveyed District property in the Camanche and Pardee Watershed.
- Survey method was visual encounter
- Surveyed as needed
- Last survey was January 2025

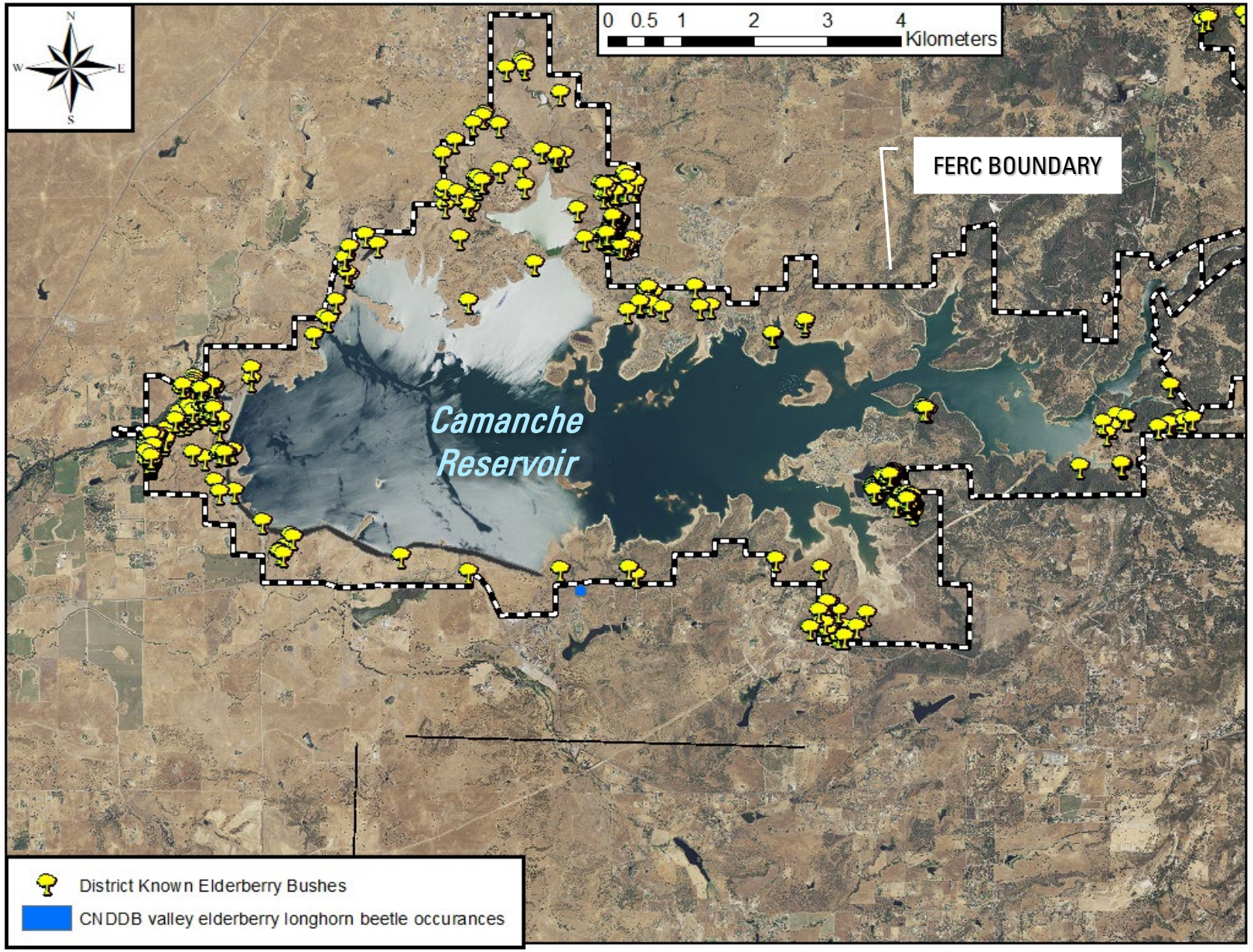
Game species *(Chukar, Pheasants, Valley quail, waterfowl):*

- 41 known species to occur
- Surveyed District property in the Camanche and Pardee Watershed
- Survey method was visual encounter
- Surveyed as needed
- Last survey was January 2025

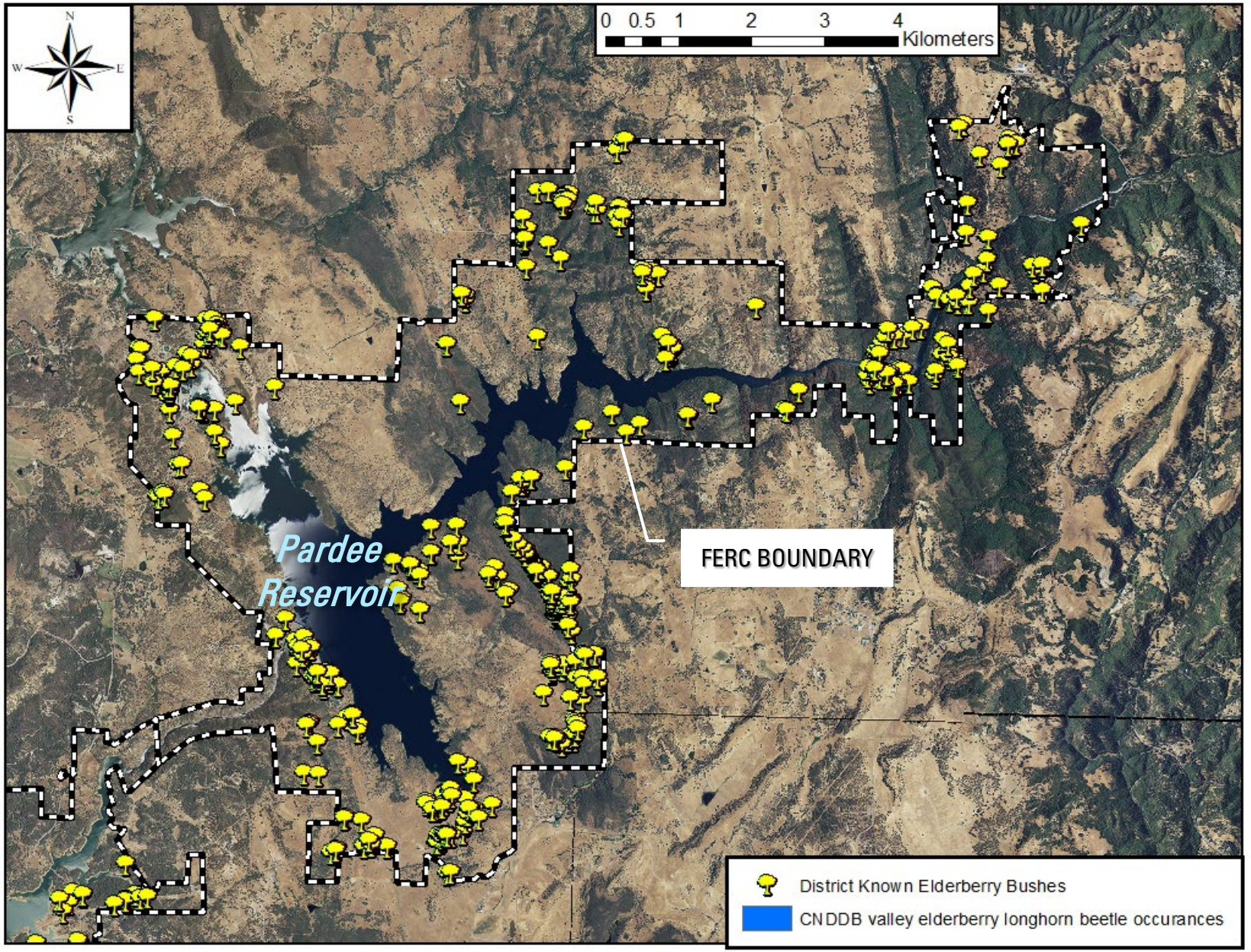
Safe Harbor Agreement

30-year Agreement signed in 2009 between USFWS and EBMUD:

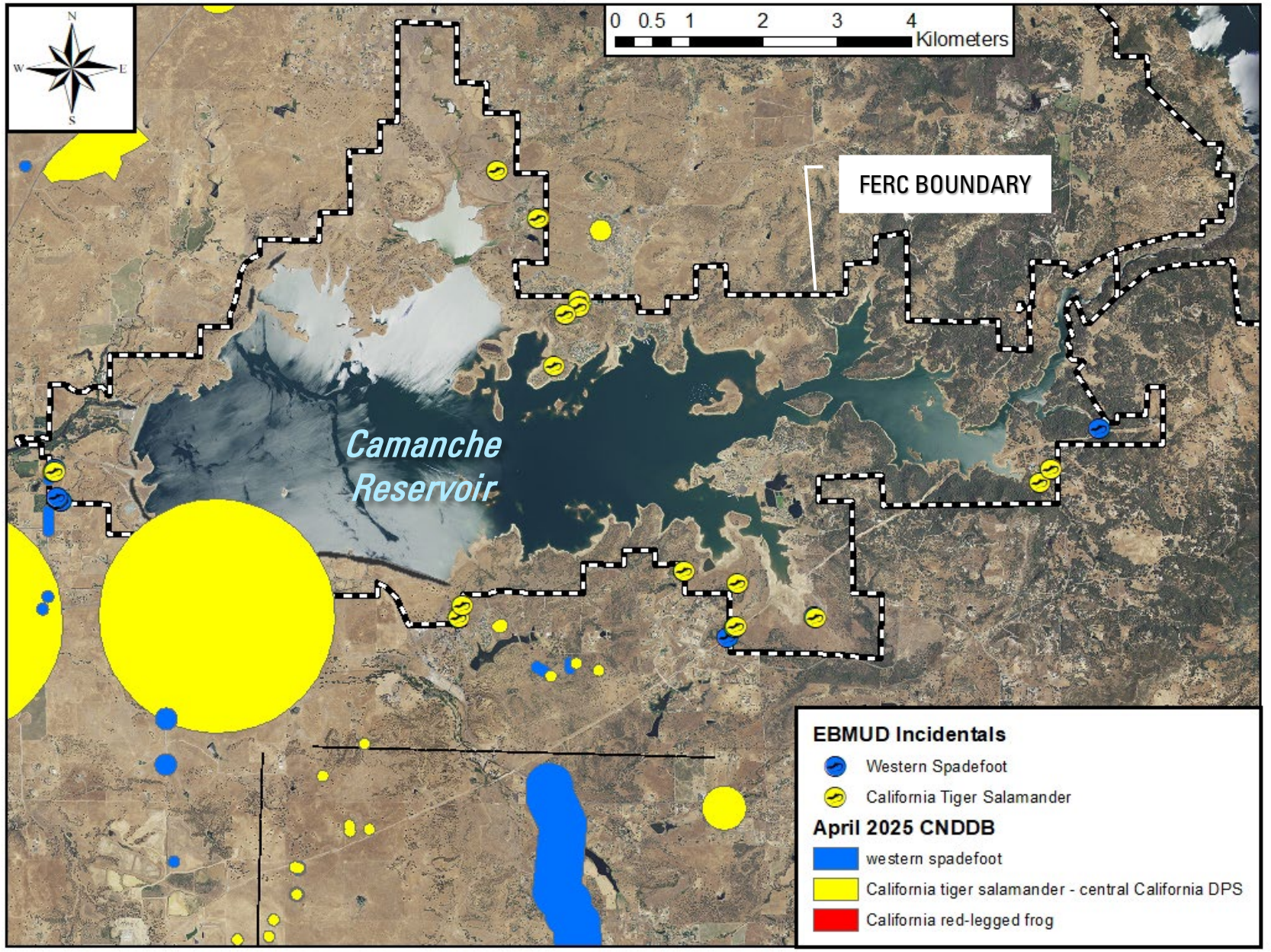
- To promote the enhancement and management of habitat for California tiger salamander, California red legged frog and valley elderberry longhorn beetle on EBMUD watershed lands
- To provide regulatory assurances to EBMUD (ITP) for regular maintenance in exchange for maintaining habitat baseline, and adding conservation measures



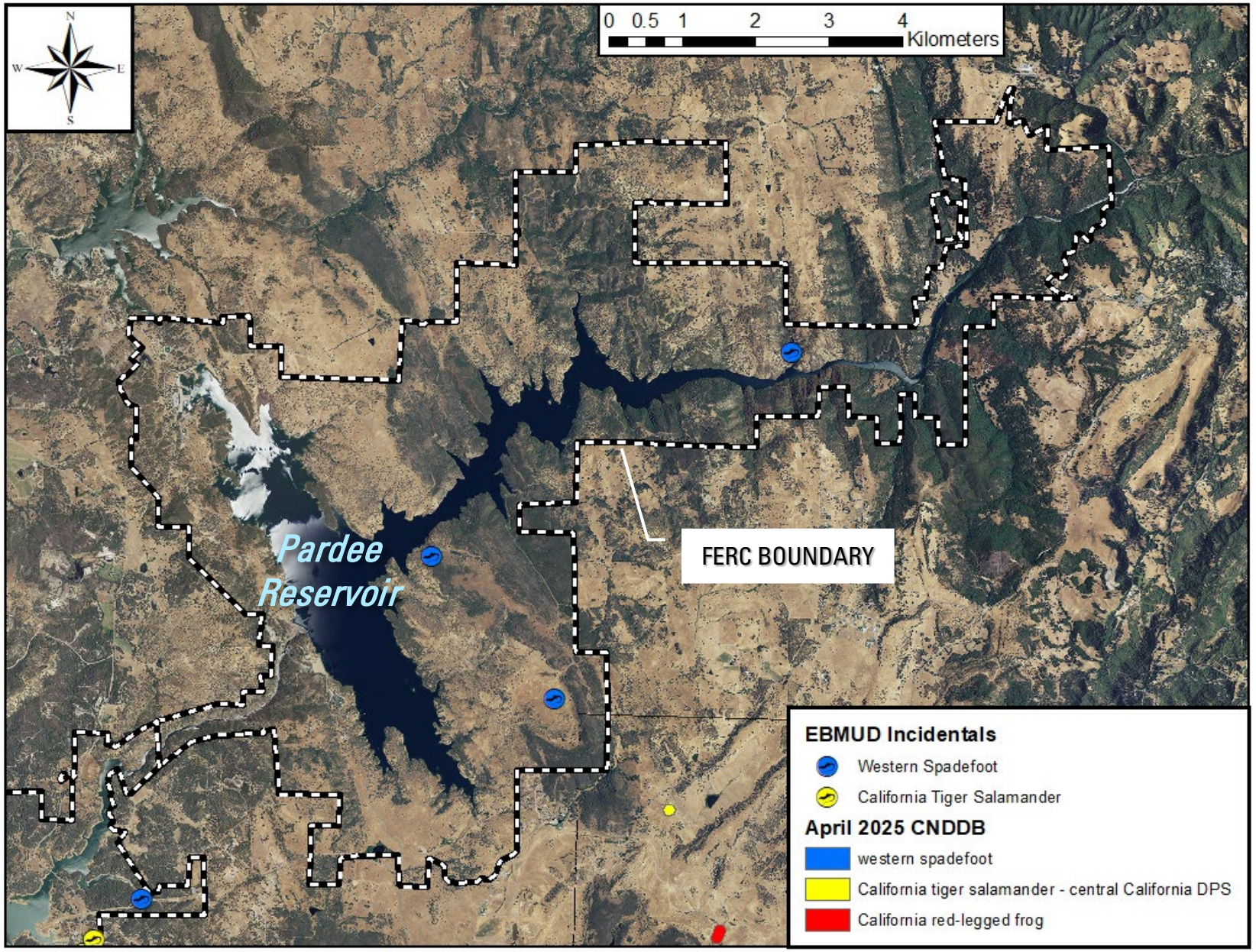
Known elderberries and Valley Elderberry Longhorn Beetle occurrences near Camanche Reservoir



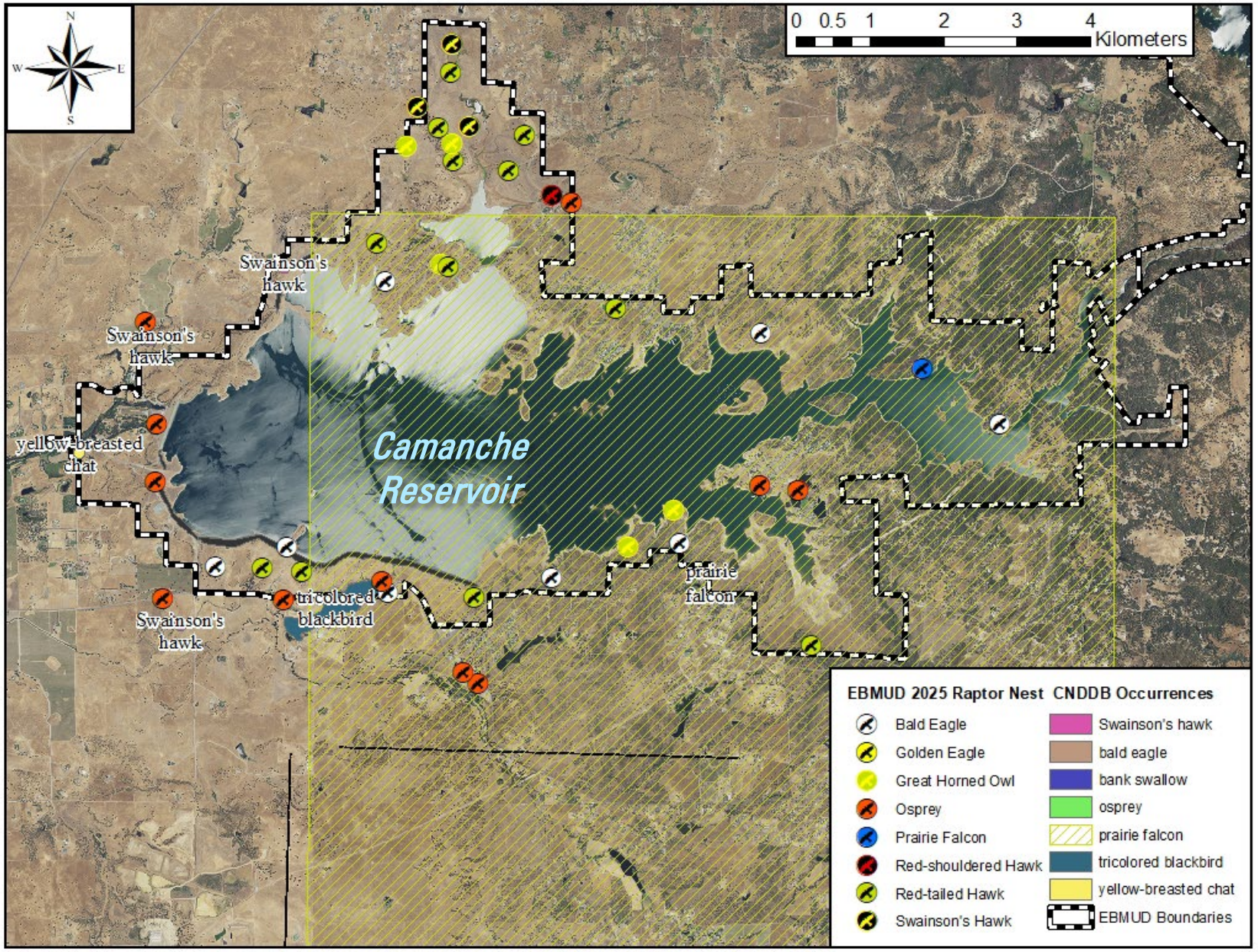
Known elderberries and Valley Elderberry Longhorn Beetle occurrences near Pardee Reservoir



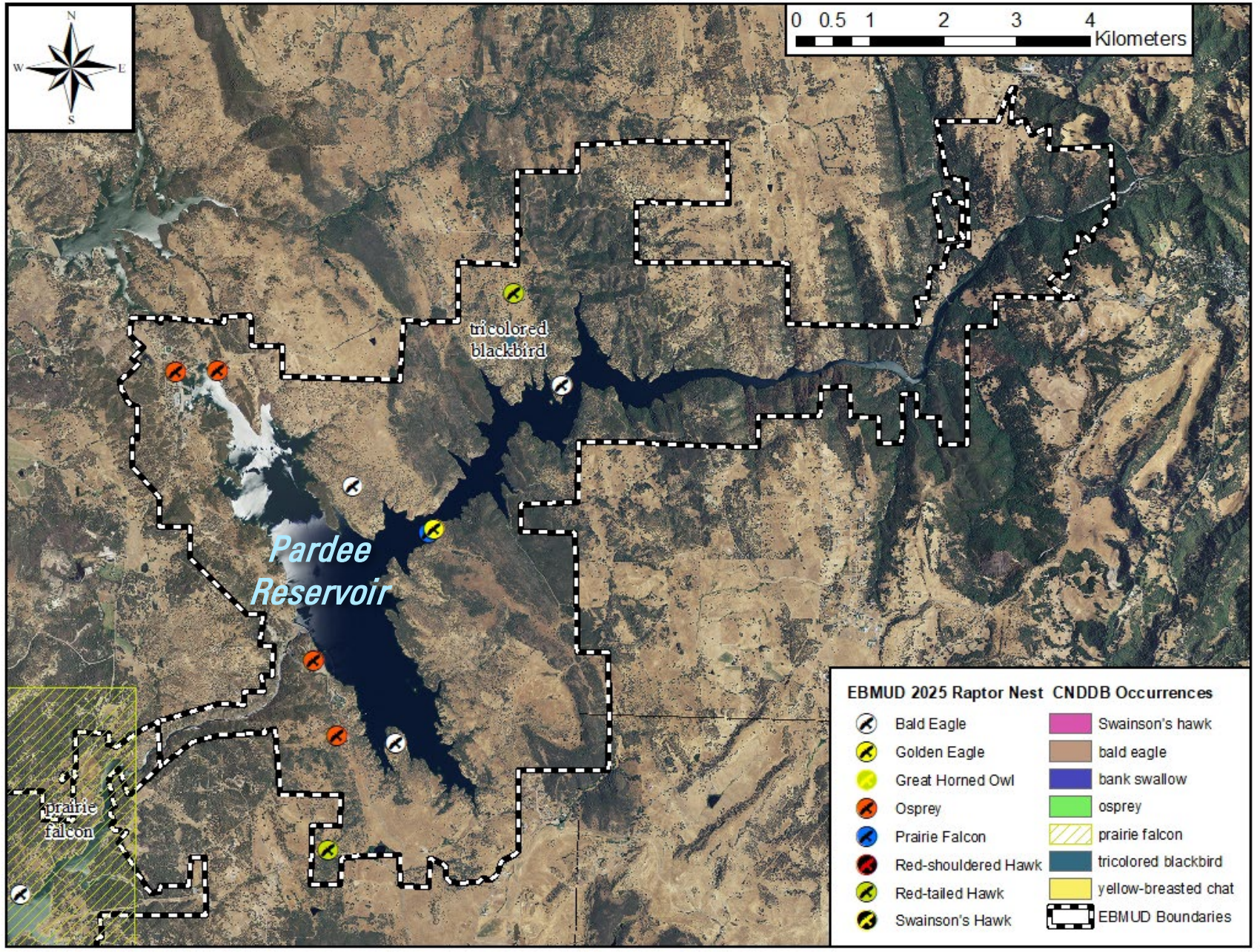
Known California tiger salamanders, California red-legged frog, and western spadefoot known occurrences near Camanche Reservoir.



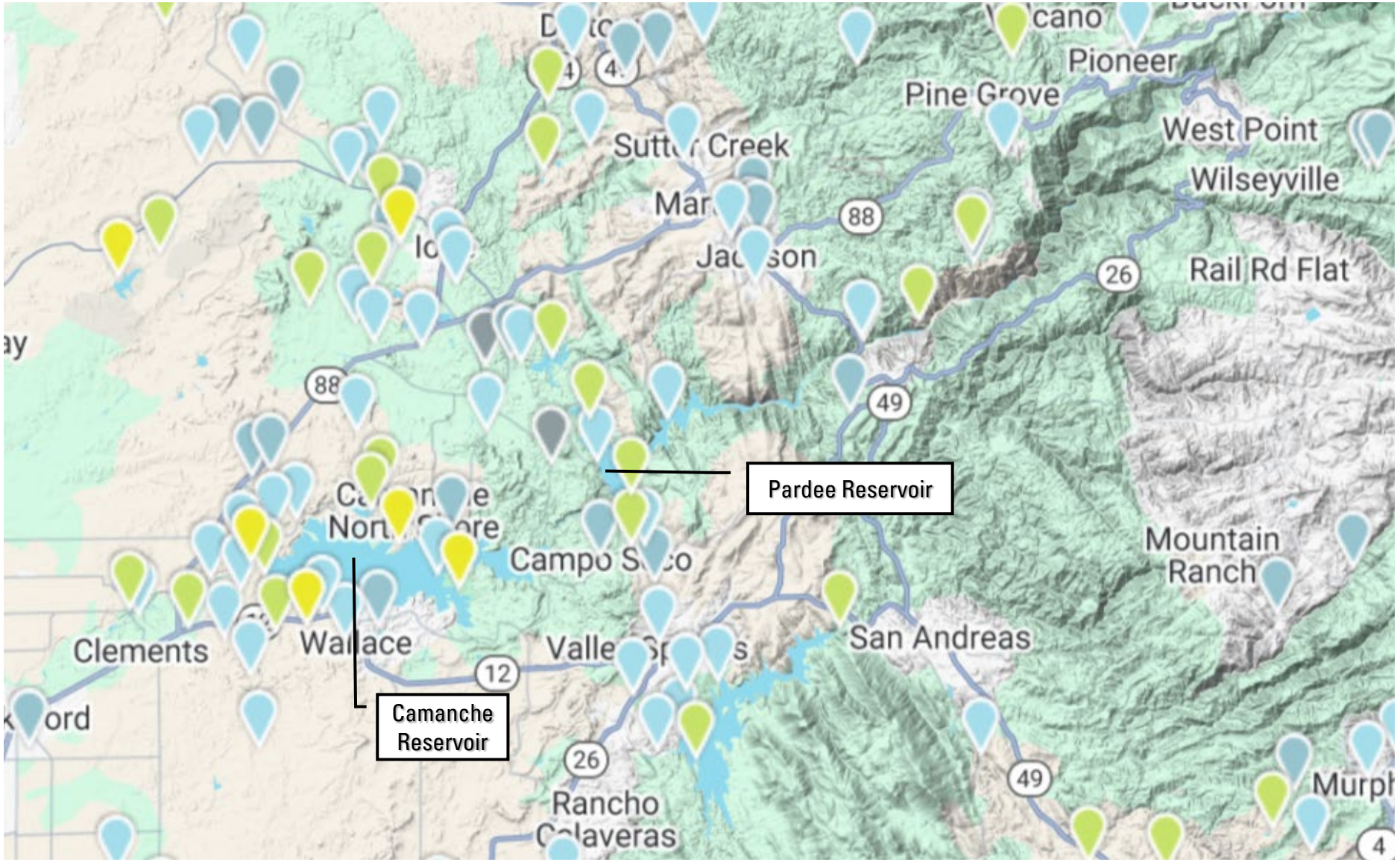
Known California tiger salamanders, California red-legged frog, and western spadefoot known occurrences near Pardee Reservoir



Known Raptor nest and CNDDB SSC occurrences near the Camanche Reservoir.



Known Raptor nest and CNDDB SSC occurrences near the Pardee Reservoir.



There are a potential of 218+ species of birds that may occur near the Project. They are winter, summer, or year-round residents.

Terrestrial – Wildlife / RTE

Data Gaps

- Identify special-status wildlife species known, potentially, and unlikely to exist in Project boundary / habitat suitability
- Define critical wildlife habitat present in the Project boundary
- Updated information on the location of special-status bat roosts in Project facilities
- Identify habitat for wildlife species (milkweed for Monarch butterfly) in conjunction with the special-status plant surveys

Terrestrial – Wildlife / RTE

Preliminary Study Objectives

- Identify protected or managed species present within the Project boundary
- Assess habitat suitability for special status wildlife and plants
- Identify habitat for special status species

Terrestrial – Botanical

Existing Data

- State and Federal Database Reviews
- EBMUD Biological Survey Reports
- License Compliance Documents
- EBMUD Data and Publications
- Scientific Literature

Existing Environment

Vegetation alliances (including riparian communities)

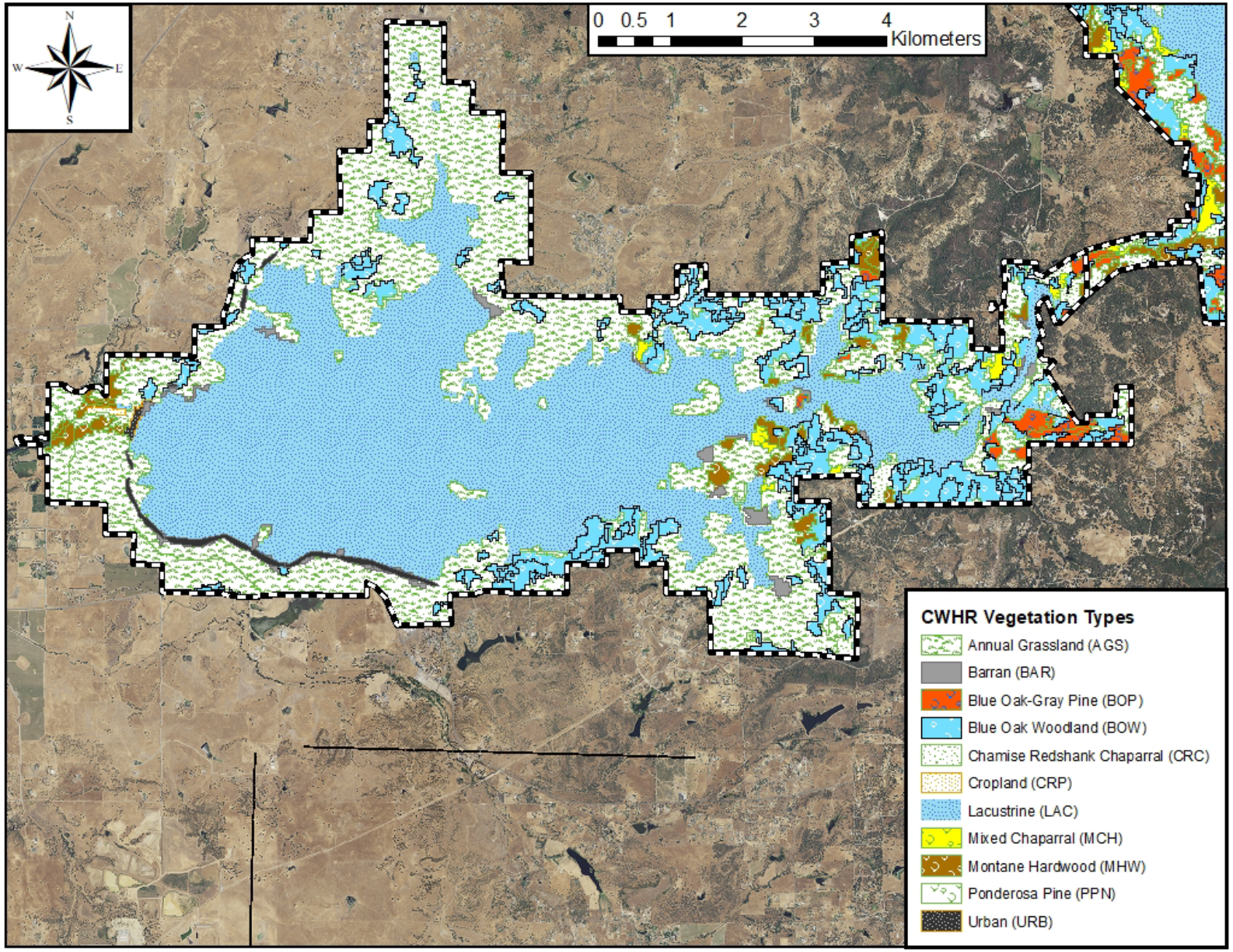
- Residual Dry Matter Surveys
- Surveyed points on District property in the Camanche and Pardee Watershed.
- Weigh and measure
- Annually since 2009
- Last sampled September 2024

Special-status plants

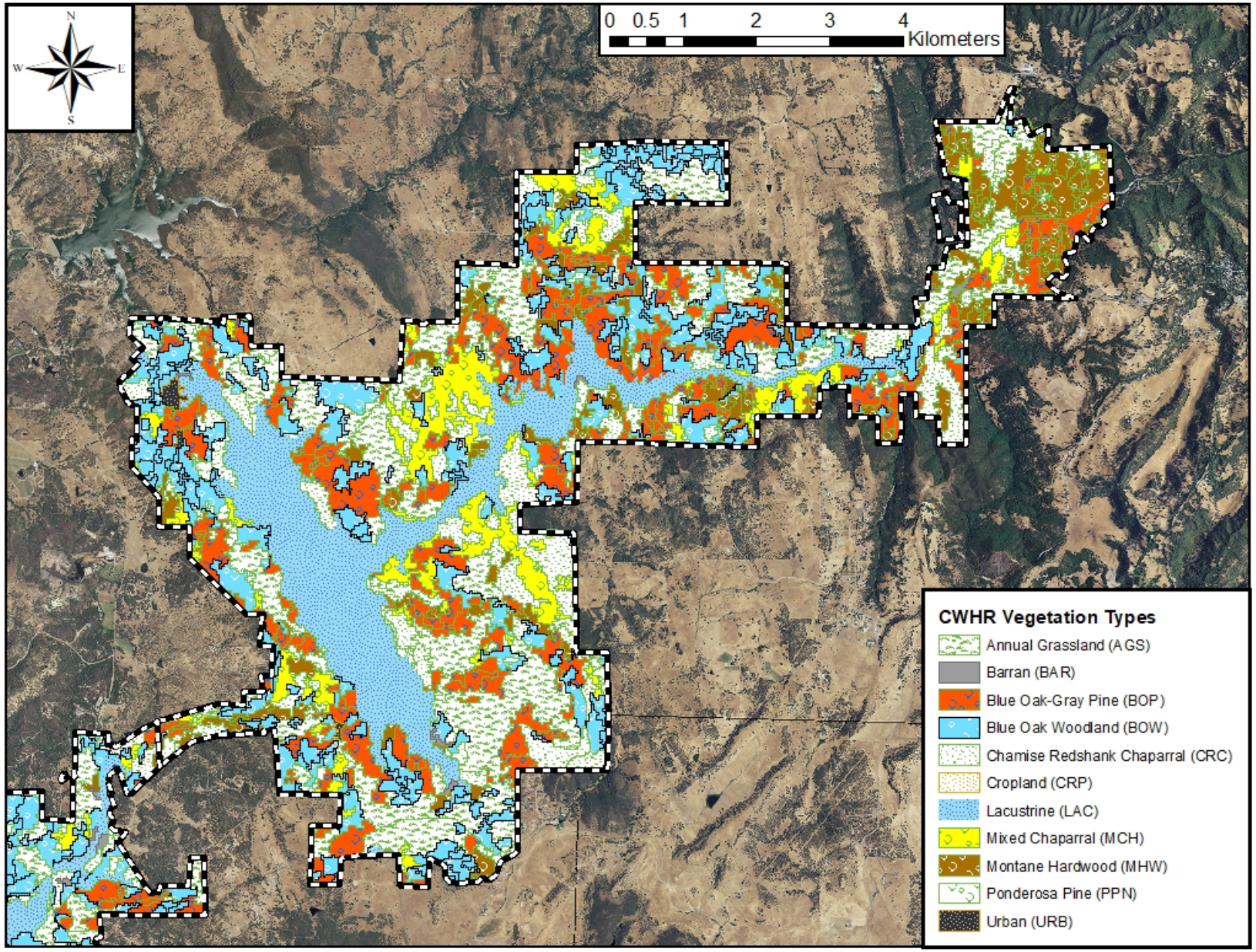
- District Watershed
- CDFW CNDDB

Non-native invasive plants

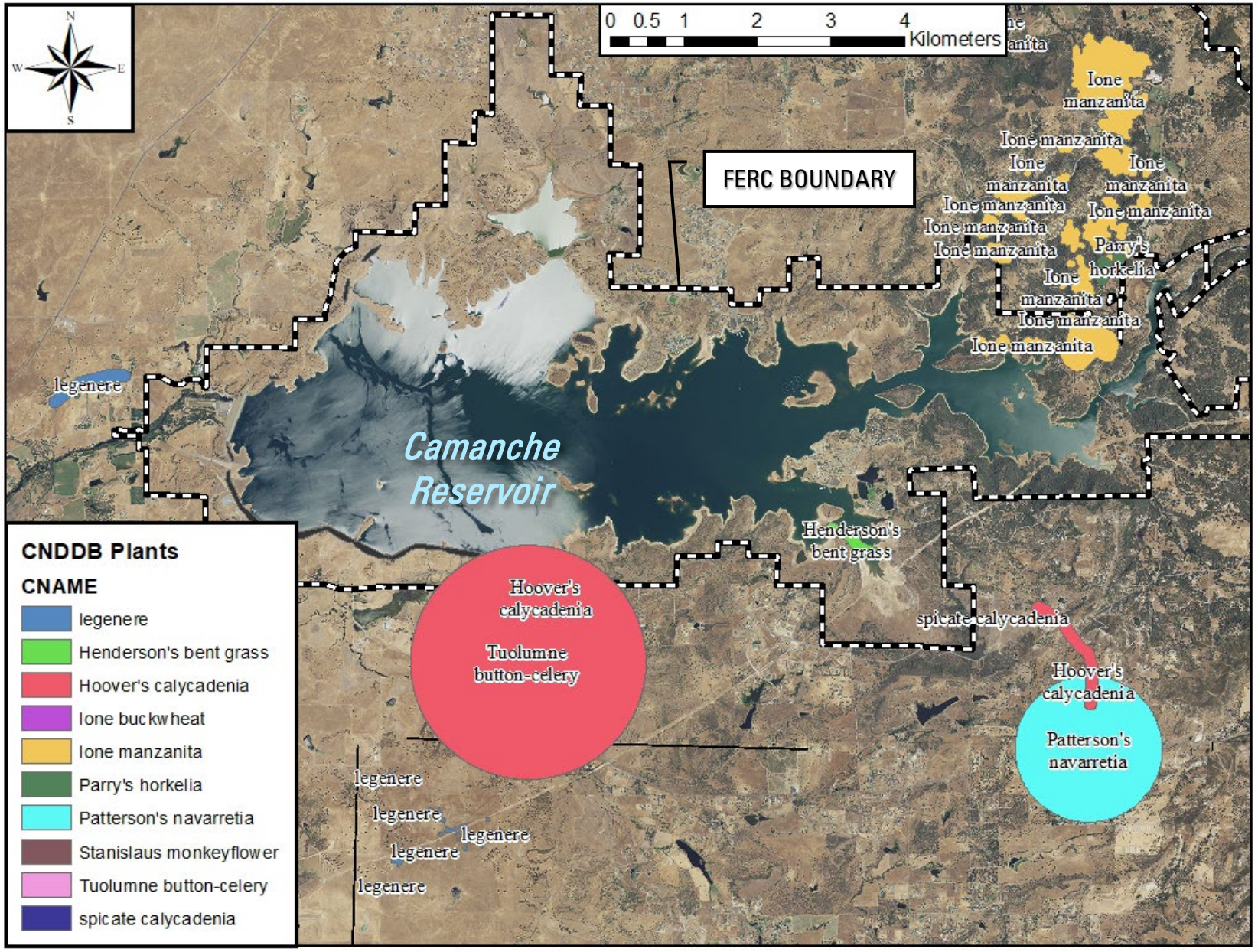
- Surveyed points on District property in the Camanche and Pardee Watershed.
- Visual Encounter Method



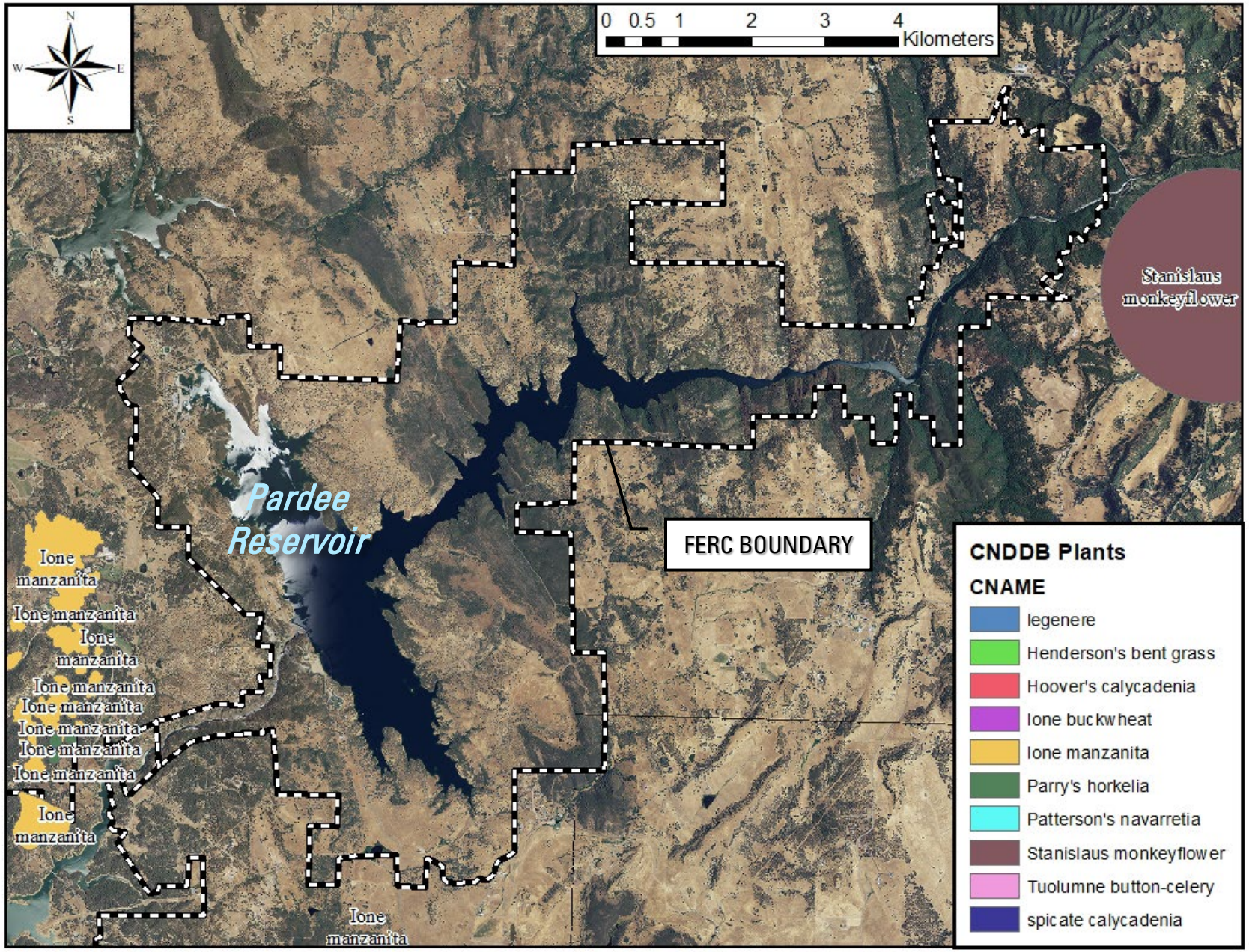
California Wildlife Habitat Relationships Vegetation types near Camanche Reservoir



California Wildlife Habitat Relationships Vegetation types near the Pardee Reservoir



Camanche - April 2025 California Natural Diversity Database plant species of special concern



Pardee - April 2025 California Natural Diversity Database plant species of special concern

Terrestrial – Botanical

Data Gaps

- Updated information on vegetation alliances, including riparian alliances
- Updated information on special-status plant populations
- Updated information on NNIPs

Terrestrial – Botanical

Preliminary Study Objectives

Vegetation Alliances

- Update vegetation alliances mapping

Special-status Plant Species

- Conduct special-status plant surveys

Non-Native Invasive Plants

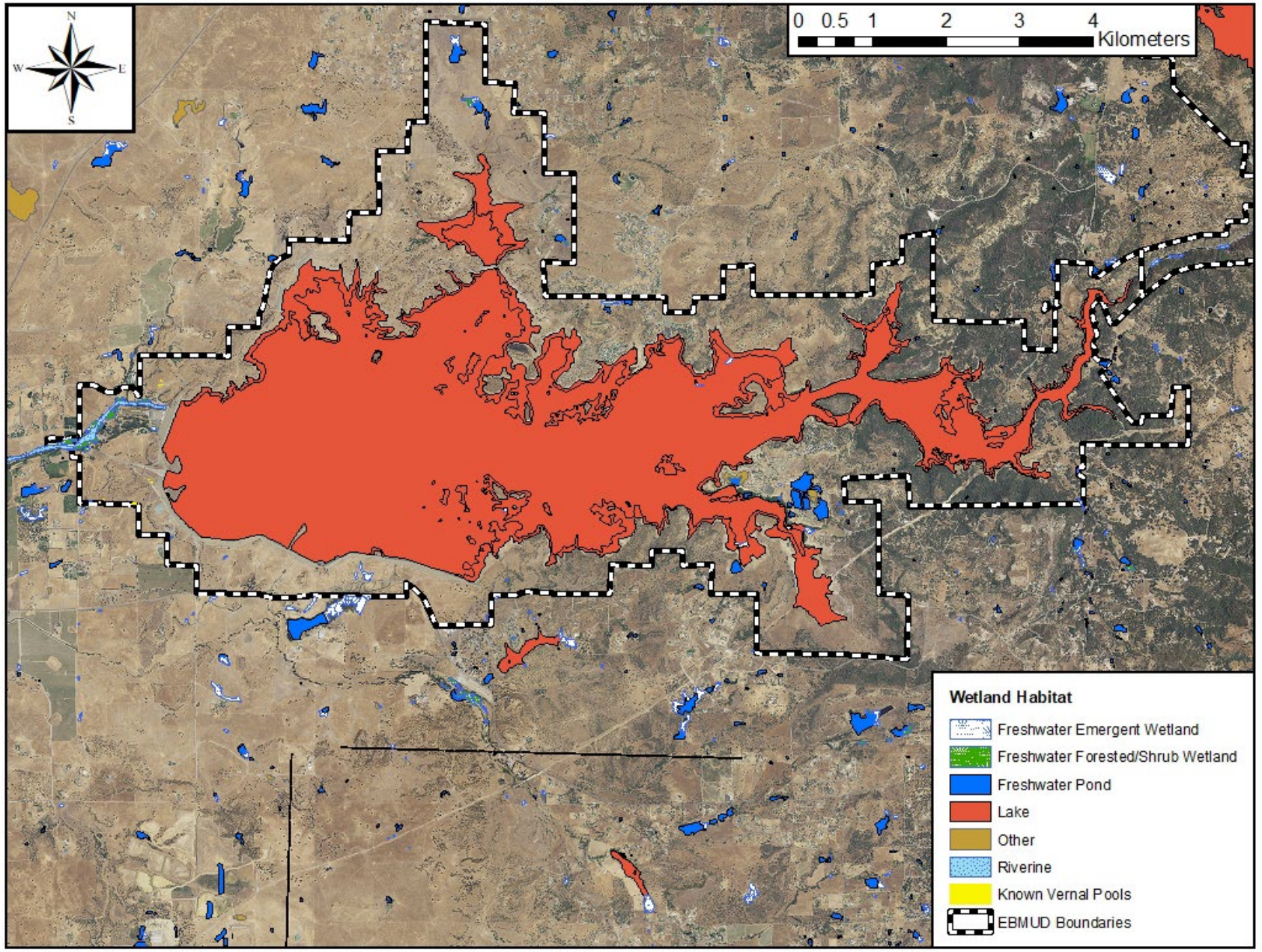
- Conduct survey for NNIPs in conjunction with special-status plant surveys

Terrestrial – Wetlands, Riparian, & Littoral Habitat

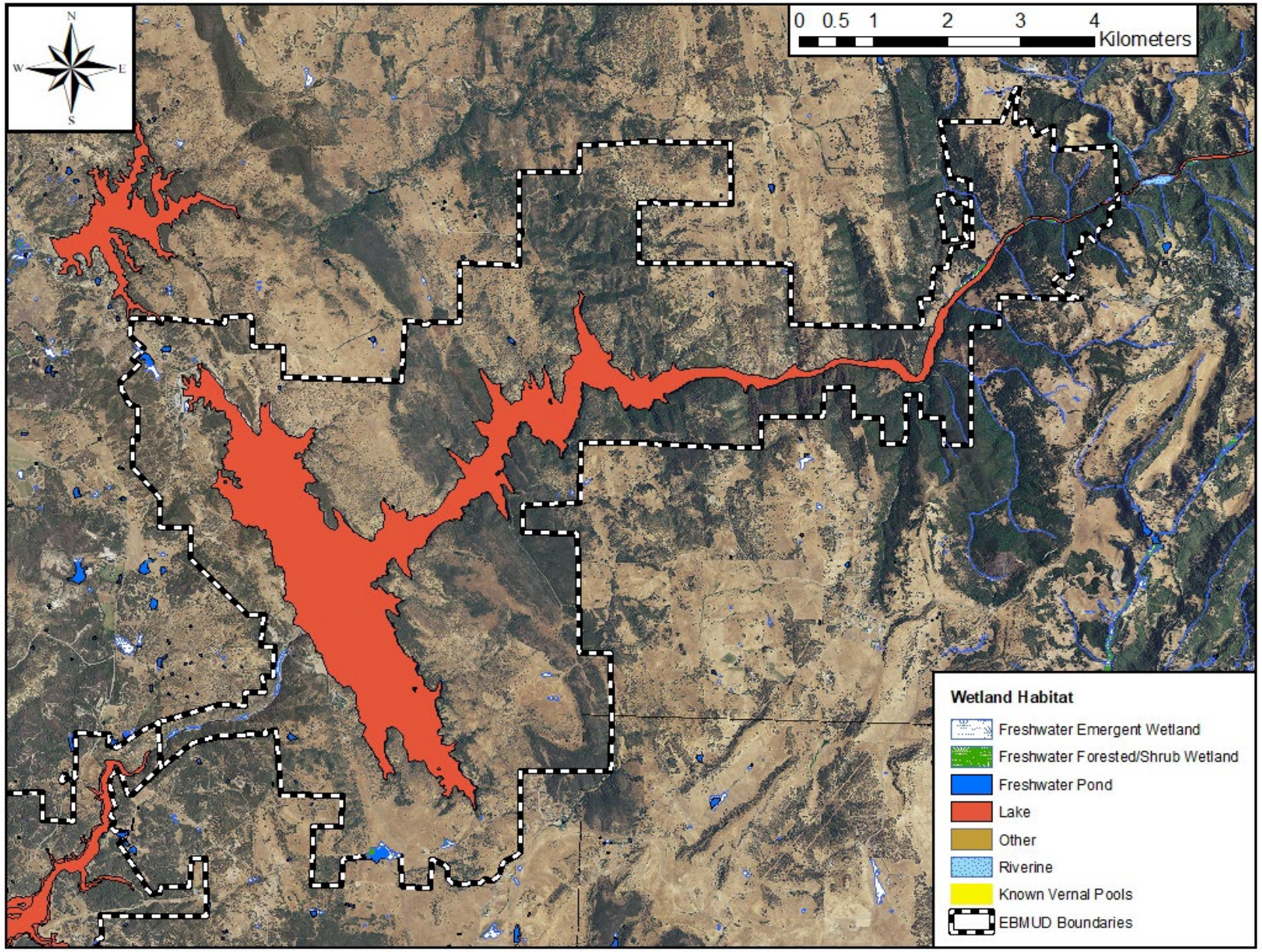
Existing Environment

- 5 types of wetland habitats
- Known wetland plant species identified as part of protocol level botanical inventory surveys

- Fresh Emergent Wetland
- Vernal Pool
- Valley Foothill Riparian
- Lacustrine
- Riverine



Wetlands, ponds, littoral habitat, and vernal pools near Camanche Reservoir.



Wetlands, ponds, littoral habitat, and vernal pools near the Pardee Reservoir.

Terrestrial – Wetlands, Riparian, & Littoral Habitat

Data Gaps

- Wetland type descriptions, floodplain, and wetland function
- Acreage for each type of wetland, riparian, and littoral habitat (including variability)
- Storage functionality

Terrestrial – Wetland, Riparian, & Littoral Habitats

Preliminary Study Objectives

- Identify wetland and floodplain types, including littoral habitat and storage functionality present within the Project boundary
- Assess wetland, riparian, and littoral habitat suitability for wildlife and plants
- Identify wetland, riparian, and littoral habitat for special status species

Recreation and Land Use

- Recreation Resources
- Land Use

Recreation – Facilities & Use

FERC Recreation Project Sites:

- **Camanche Reservoir**
- **Pardee Reservoir**
- **Mokelumne River Day Use Area**
- **Camanche Hills Hunting Preserve**

Existing Data (Sources)

- EBMUD Recreation Management Plan
- State and Federal Database Reviews
- Recreation Inventory Maps
- Visitor Attendance
- Fish Stocking Data
- Recreation Card and QR Code User Experience Surveys
- EBMUD Data and Publications
- FERC Form 80
- Annual maintenance inspections

Recreation – Facilities & Use

Activity	Camanche Reservoir	Pardee Reservoir	Mokelumne River Day Use Area	Camanche Hills Hunting Preserve
Fishing	✓	✓	✓	
Boating and/or Rafting	✓	✓	✓	
Swimming	✓		✓	
Camping	✓	✓		
Day Use (Picnic)	✓	✓	✓	✓
Trails	✓	✓		
Hunting				✓

Recreational Activities Offered

- Fishing (2 docks)
- Boating (3 boat launches)
- Swimming (In Mokelumne River; In Camanche Res.; Pool at Pardee Res.)
- Camping (22 campgrounds)
- Day Use (13 picnicking areas)
- Trails (5 staging areas, 48 miles of trail within Mokelumne Watershed)
- Hunting (Covers 1600 acres)

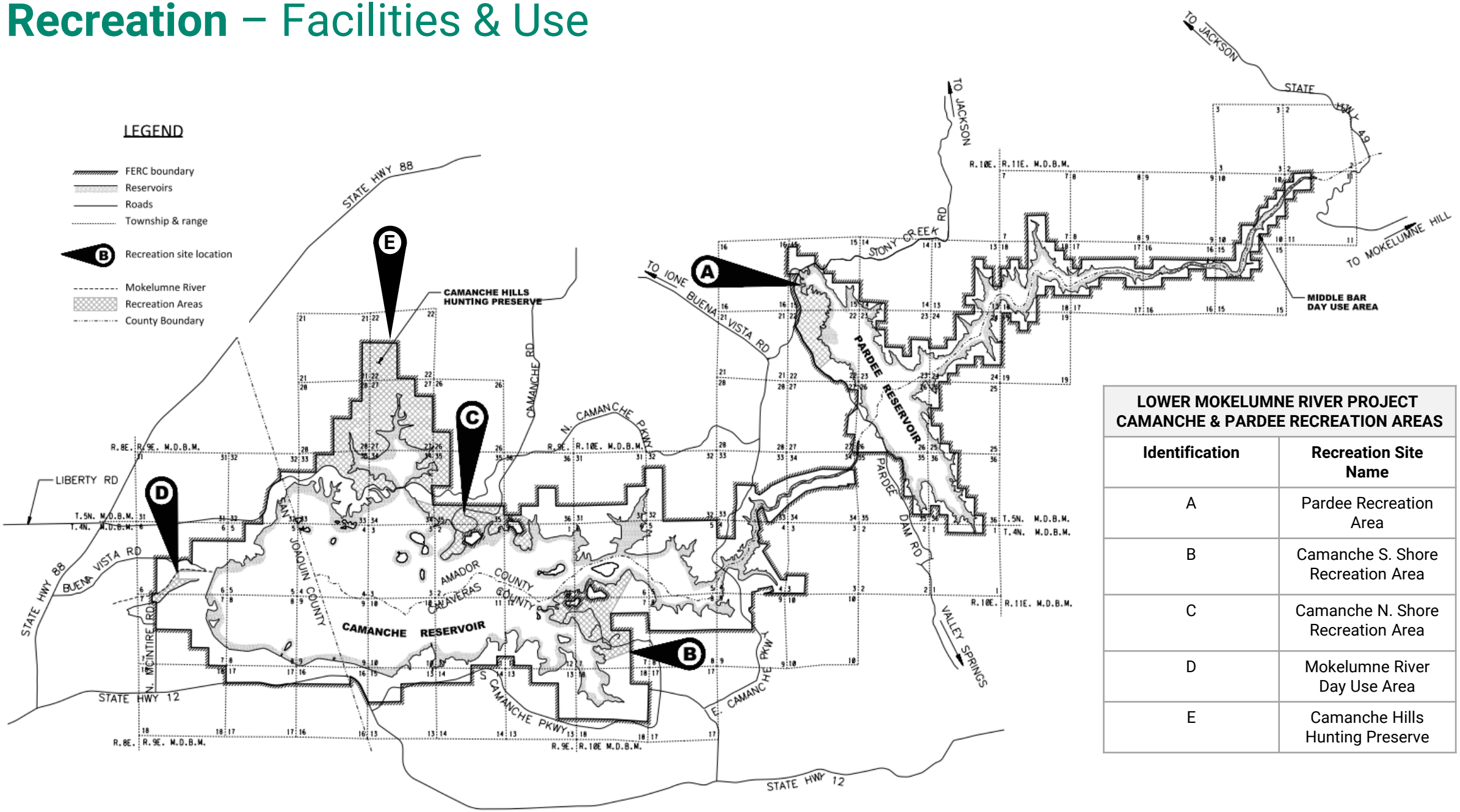
Recreation – Facilities & Use

Fish (Trout) Stocking at Camanche Reservoir

Year	South Pond (lbs)	South Lake (lbs)	North Lake (lbs)	Total (lbs)
2015	14,100	12,400	14,200	40,700
2016	18,350	16,100	15,500	49,950
2017	20,700	20,900	27,400	69,000
2018	23,100	22,800	24,900	70,800
2019	21,600	21,300	21,600	64,500
2020	18,600	17,400	16,200	52,200
2021	25,500	21,000	24,300	70,800
2022	21,100	19,900	20,500	61,500
2023	20,700	22,500	19,900	63,100
2024	18,700	16,900	15,800	51,400

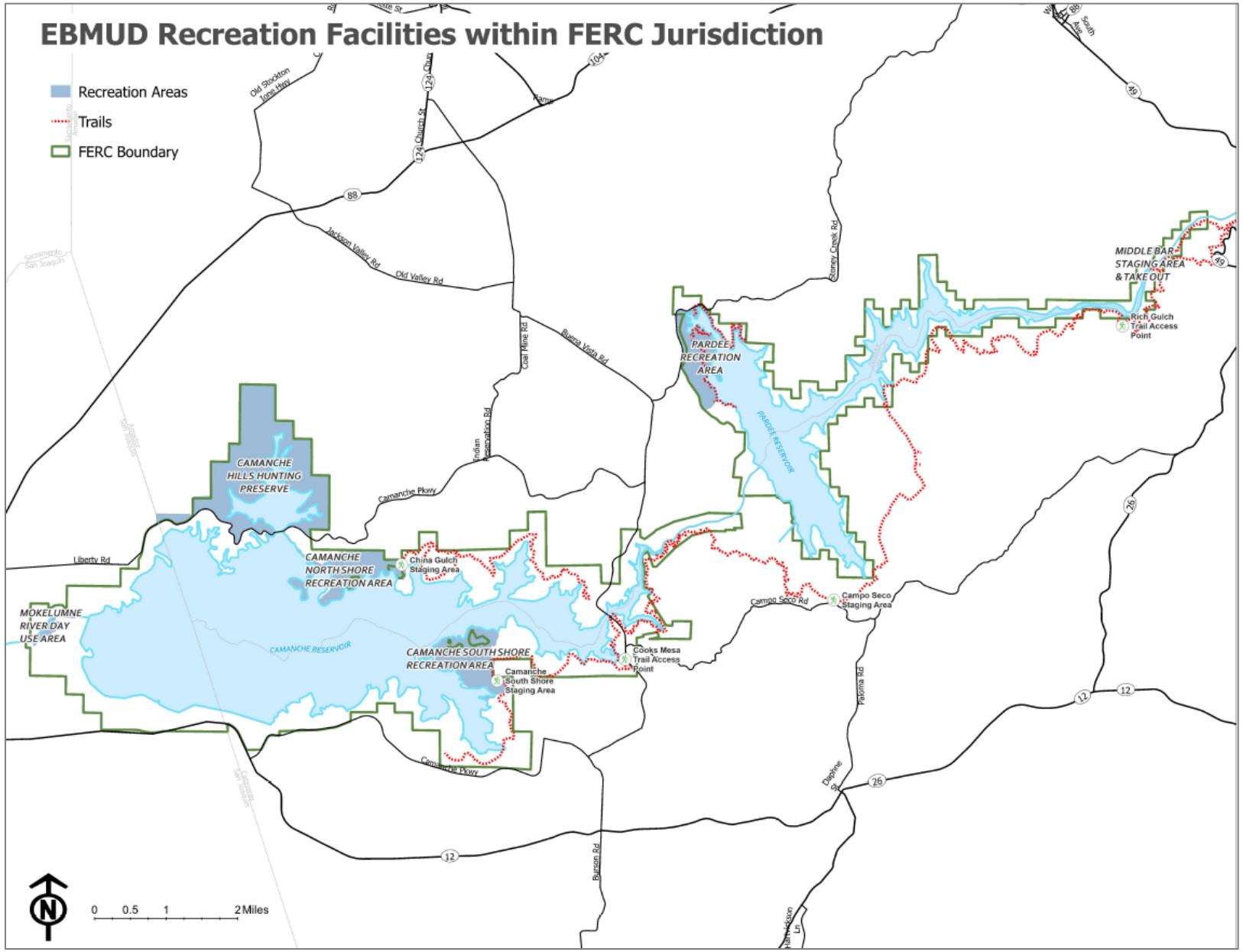
Note: Typically stocked about 7 months of the year; excluding from about June through October.

Recreation – Facilities & Use

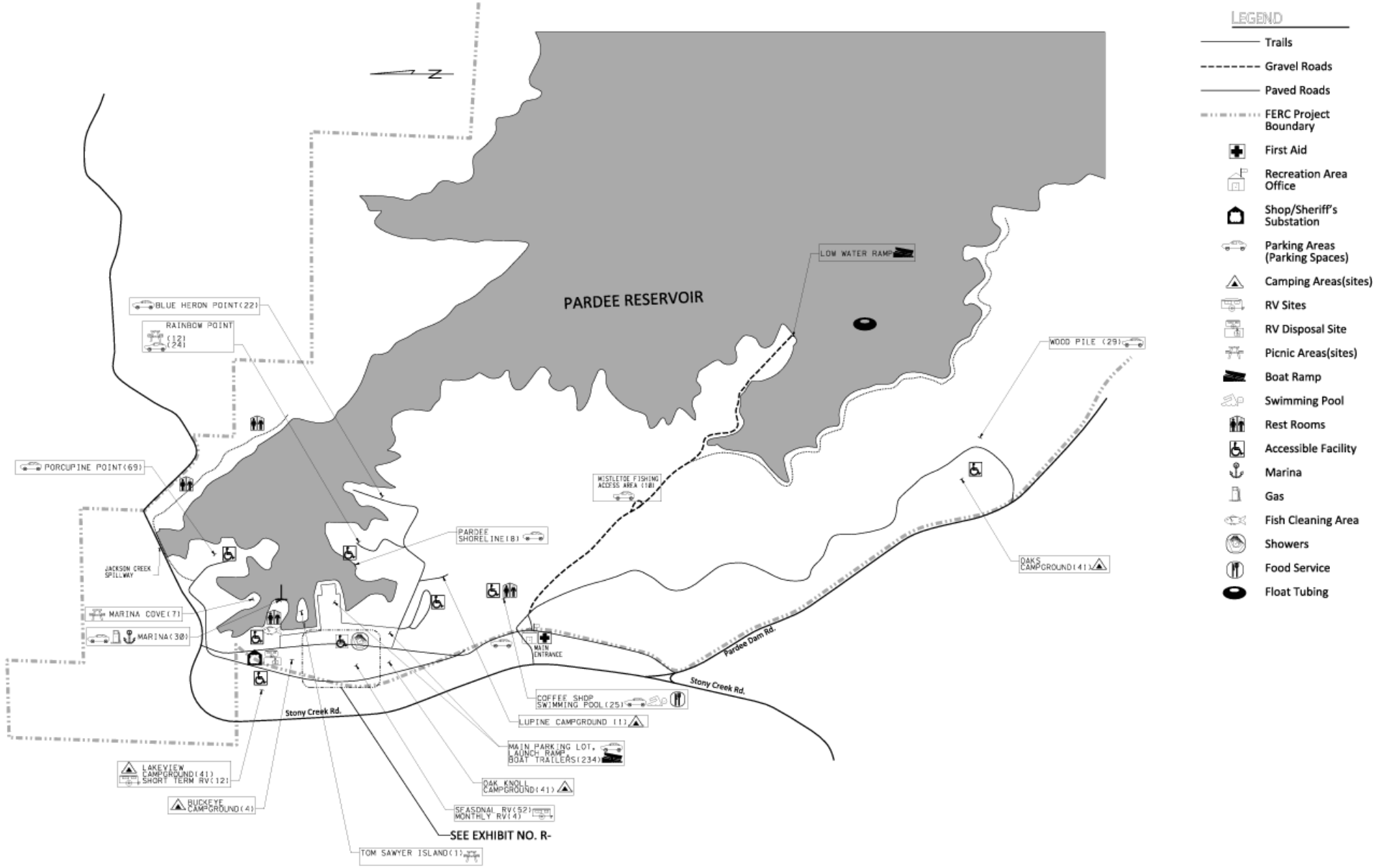


LOWER MOKELUMNE RIVER PROJECT CAMANCHE & PARDEE RECREATION AREAS	
Identification	**Recreation Site Name**
A	Pardee Recreation Area
B	Camanche S. Shore Recreation Area
C	Camanche N. Shore Recreation Area
D	Mokelumne River Day Use Area
E	Camanche Hills Hunting Preserve

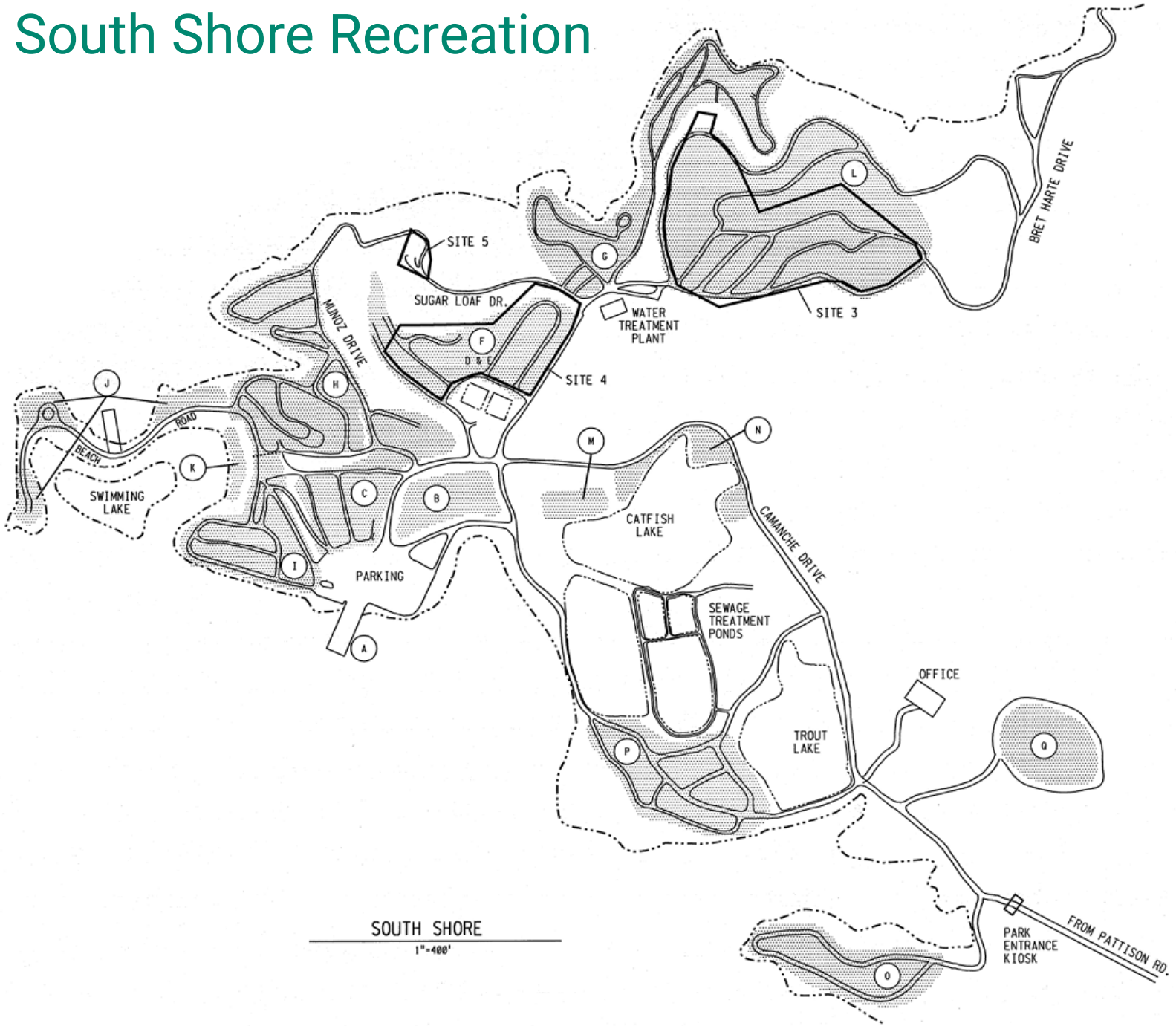
Recreation – Facilities & Use



Recreation – Pardee Recreation Area



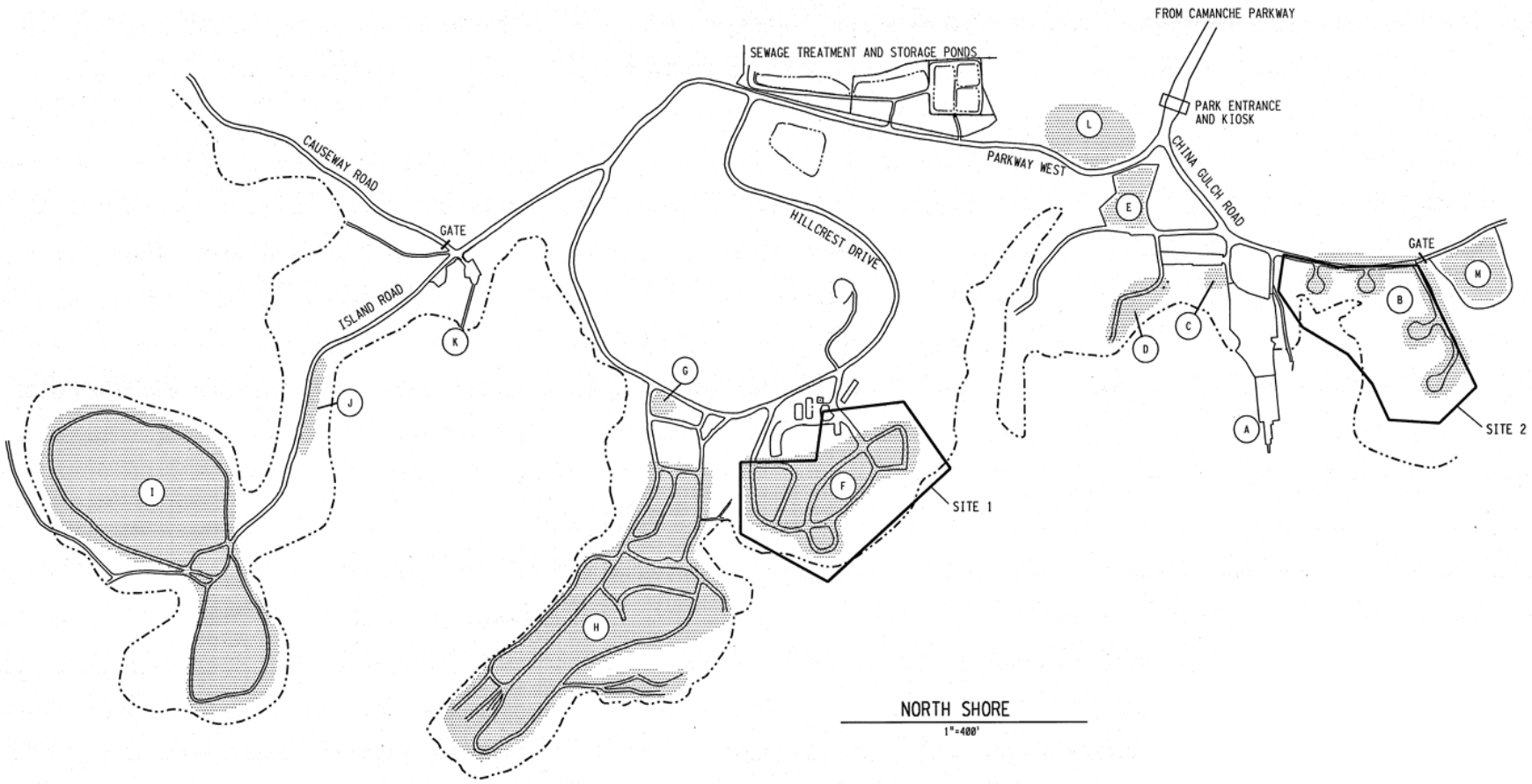
Recreation – Camanche South Shore Recreation



LEGEND – SOUTH SHORE

- (A) BOAT LAUNCH, STORE, SNACK BAR, AND SERVICE STATION MARINA
- (B) DAY USE AREA
- (C) RECREATION VEHICLE AREA
- (F) RECREATION VEHICLE AREAS
- (G) CAMP AREA
- (H) WEST CAMP AREA
- (I) SOUTH CAMP AREA
- (J) DAY USE AREA AND LOW WATER LAUNCH RAMP
- (K) SWIM BEACH AND CHANGE ROOMS
- (L) MOBILEHOME PARK
- (M) MAINTENANCE YARD AND SHOP
- (N) CAMP AREAS
- (O) CAMP AREA
- (P) RECREATION VEHICLE CAMP
- (Q) EQUESTRIAN STAGING AREA

Recreation – Camanche North Shore Recreation

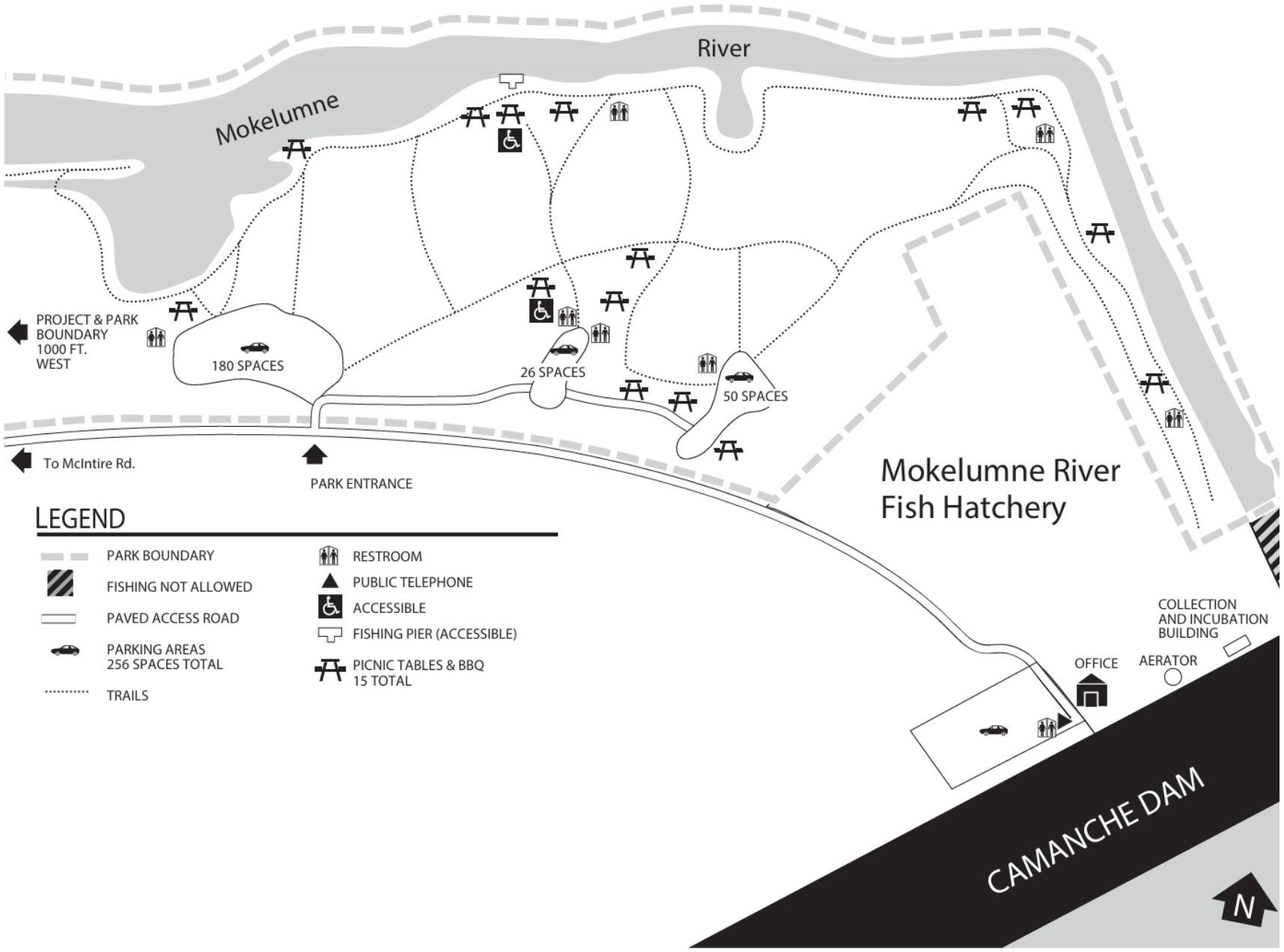


LEGEND - NORTH SHORE

- (A) BOAT LAUNCH RAMP, MARINA, STORE, RESTAURANT, AND SERVICE STATION
- (B) NEW MOBILEHOME PARK
- (C) OFFICE
- (D) HOUSEKEEPING UNITS
- (E) MAINTENANCE YARD AND SHOP
- (F) OLD MOBILEHOME PARK
- (G) OVERFLOW PARKING
- (H) BLUE OAK CAMPGROUND
- (I) OVERFLOW AREA
- (J) PENINSULA CAMPGROUND AREA
- (K) WHOLE ACCESS (HANDICAP) LAUNCH, PARKING, AND RESTROOM
- (L) RIDING STABLE
- (M) EQUESTRIAN STAGING AREA

N

Recreation – Mokelumne Day Use Area



Recreation – Facilities & Use

Data Gaps

- Updated inventory of the condition of recreation area facilities and amenities i.e. picnic tables, trash receptables, firepits, etc.
- Recreation user demographics i.e. age range, hometown, etc.
- Spot counts of vehicles, recreation activities at recreation areas
- Creel surveys

Recreation – Facilities & Use

Preliminary Study Objectives

- Assess current inventory and condition of facilities/amenities in Project boundary
- Assess use at recreation sites in Project boundary
- Hear from the community what recreation attributes of the Project are most valued, what changes, if any, are suggested, etc.

Schedule & Next Steps

EBMUD

Upcoming TWG Meetings

June 24-26 Initial Virtual TWG meetings:

Discuss proposed studies, develop goals, objectives, & methodology of studies

- Tuesday 6/24, 9-11am Recreation and Land Use
- Wednesday 6/25, 9-11am Fish and Aquatic Resources, 1:30-3:30pm, Water Resources
- Thursday 6/26 9-11am, Wildlife/Botanical/RTE

July 29-31 Secondary Virtual TWG meetings:

*Present preliminary draft study plans**

- Tuesday 7/29 1:30-3:30pm Recreation and Land Use
- Wednesday 7/30 9-11am Fish and Aquatic Resources, 1:30-3:30pm Water Resources
- Thursday 7/31 9-11am, Wildlife/Botanical/RTE

TWG Roles and Participation

- Open to agencies/Tribes/NGOs/interested parties with baseline knowledge of the TWG meeting resource area focus
- Encourage participants to commit to the process and arrive prepared for meetings (review documents, provide technical feedback, etc.)
  - Understand that time commitment may increase once formal relicensing begins (after filing of PAD).
- Join a TWG by emailing MokRelicense@ebmud.com

Stay Informed

- Lower Mokelumne Website: EBMUD.com/MokRelicense
- Email: MokRelicense@ebmud.com
- FERC e-Subscription (docket number “P-2916”) at www.ferc.gov
  - Formal Relicensing begins October 2025 with EMBUD submittal of the Pre-Application Document (PAD)