SECTION 4.0

DESCRIPTION OF THE ACTION AREA AND ADJACENT AREAS

4.1 Definition of Action Area and Adjacent Areas

The Action Area is defined as "*all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action*" (50 C.F.R. § 402.02). Direct effects are defined as "*the direct or immediate effects of the project on the species or its habitat*" (USFWS and NMFS 1998). Indirect effects are defined as "*those [effects] that are caused by the Proposed Action and are later in time, but still are reasonably certain to occur*" (50 C.F.R. § 402.02).

The Action Area for this consultation is determined considering the extent of the direct and indirect effects of the Proposed Action, including consideration of YCWA's proposed FERC Project Boundary. This section of the Applicant-Prepared Draft BA also describes the adjacent areas, which all are located upstream of the Action Area. Adjacent areas are those areas that are affected by the Proposed Action, but are not occupied by any of the listed species addressed in this Applicant-Prepared Draft BA and do not contain their critical habitats.

4.2 Adjacent Areas Upstream of the Action Area

4.2.1 North Yuba River

4.2.1.1 New Bullards Bar Reservoir

Approximately 15.4 mi[1] of the North Yuba River canyon from the NMWSE of the reservoir at RM 17.8 to New Bullards Bar Dam at RM 2.4.

4.2.1.2 New Bullards Bar Dam Reach

Approximately 2.4 mi of the North Yuba River from the New Bullards Bar Dam at RM 2.4 to the confluence of the North Yuba River with the Middle Yuba River at RM 0.0.

4.2.2 Middle Yuba River

4.2.2.1 Our House Diversion Dam Impoundment

Approximately 0.4 mi of the Middle Yuba River canyon from the NMWSE of the impoundment at RM 13.0 to the dam at RM 12.6.

[1] All river miles in Section 4.2 are based on YCWA's relicensing Geographic Information System (GIS) database.

4.2.2.2 Our House Diversion Dam Reach

Approximately 7.9 mi of the Middle Yuba River from Our House Diversion Dam at RM 12.6 to the confluence of the Middle Yuba River and Oregon Creek at RM 4.7.

4.2.2.3 Oregon Creek Reach

Approximately 4.7 mi of the Middle Yuba River from the confluence of the Middle Yuba River and Oregon Creek at RM 4.7 to the confluence of the Middle Yuba River with the North Yuba River at RM 0.0.

4.2.3 Oregon Creek

4.2.3.1 Log Cabin Diversion Dam Impoundment

Approximately 0.2 mi of Oregon Creek canyon from the NMWSE of the impoundment at RM 4.5 to the dam at RM 4.3.

4.2.3.2 Log Cabin Diversion Dam Reach

Approximately 4.3 mi of Oregon Creek from Log Cabin Diversion Dam at RM 4.3 to the confluence of Oregon Creek with the Middle Yuba River at RM 0.0.

4.2.4 Yuba River Upstream of Englebright Reservoir

4.2.4.1 Middle/North Yuba River Reach

Approximately 5.8 mi of the Yuba River from the confluence of the North Yuba River and the Middle Yuba River at RM 40.0 to the New Colgate Powerhouse at RM 34.2.

4.2.4.2 New Colgate Powerhouse Reach

Approximately 2.0 mi of the Yuba River from New Colgate Powerhouse at RM 34.2 to the NMWSE of Englebright Reservoir at RM 32.2.

4.2.4.3 USACE's Englebright Reservoir

Approximately 7.9 mi of the Yuba River from the NMWSE of Englebright Reservoir at RM 32.2 to Englebright Dam at RM 24.3.

4.3 Action Area

Currently, the upstream extent of designated spring-run Chinook salmon and steelhead critical habitats is Englebright Dam located at RM 24.3 on the Yuba River. No spring-run Chinook salmon or steelhead are present in the Yuba River Basin upstream of Englebright Dam, nor have

they been present upstream of Englebright Dam since its construction in 1941. Therefore, for purposes of this Applicant-Prepared Draft BA, the Action Area includes the reach of the Yuba River from Englebright Dam downstream to its confluence with the Feather River.

The upstream extent of North American green sturgeon designated critical habitat currently is Daguerre Point Dam, located at about RM 11.6 on the Yuba River. Green sturgeon are not present in the Yuba River upstream of Daguerre Point Dam. Therefore, for purposes of this Applicant-Prepared Draft BA, the portion of the Action Area evaluated for green sturgeon only includes the Yuba River from Daguerre Point Dam downstream to its confluence with the Feather River.

4.3.1 Downstream Extent of the Action Area

According to NMFS (2014b), the Action Area is the area that will "*experience measurable or detectable changes in land, air, and water, or other measurable factors that result from the full scope of the proposed action and all interrelated or interdependent actions*." For the reasons discussed in the following sections, it is not anticipated that direct or indirect effects would occur to listed species downstream of the mouth of the Yuba River (i.e., in the lower Feather River or Sacramento River).

4.3.1.1 Flow Considerations

To investigate whether Yuba River flows under the Proposed Action could result in measurable changes in lower Feather River aquatic habitat conditions, the following analysis was conducted.

- Step 1. Modeled daily flows in the lower Yuba River at Marysville were averaged to obtain monthly average flows under the Proposed Action scenario and the Base Case (Environmental Baseline) scenario.

- Step 2. Monthly average flows in the lower Feather River immediately downstream of the Yuba River were obtained from DWR's 2013 Delivery Reliability Report (DRR) Existing Conditions CalSim II scenario.

- Step 3. For the portion of the modeled period of record that is common between the two modeling platforms[2], which extend from October 1969 through September 2003, the differences between monthly average flows in the lower Yuba River at Marysville under the Proposed Action and the Environmental Baseline were calculated, and then added to the monthly average flows in the Feather River.

- Step 4. The percent changes in monthly average flows in the Feather River immediately downstream of the Yuba River were evaluated to investigate whether changes in lower Yuba River flows at Marysville resulting from the Proposed Action have the potential to

[2] Calsim II was used to derive modeled monthly average flows in the lower Feather River, and YCWA's Water Balance and Operations Model was used to derive modeled flows in the lower Yuba River.

result in detectible changes in lower Feather River flows downstream of the confluence with the lower Yuba River.

Over the 407 months of the period evaluated (Oct 1969-Sep 2003), the average difference in monthly average flow is -0.03 percent (3 one-hundredths of 1 percent). Consequently, the Proposed Action, relative to the Environmental Baseline, would not result in detectable changes in Feather River flows immediately downstream of the Yuba River, and changes in aquatic habitat conditions downstream of the mouth of the Yuba River would not be measurable.

Moreover, operations of the SWP control relatively large flows in the lower Feather River. Thus, even if measurable changes to flows in the Yuba River were to occur, it would not be practicable to attempt to segregate potential changes in lower Feather River flow downstream of the Yuba River associated with potential changes in Yuba River outflow. This conclusion is consistent with previous analyses, as when NMFS (2016b) excluded the Sacramento River downstream from the Feather River from the action area for the BO on DWR and FERC's activities at the Oroville Facilities Hydroelectric Project (FERC Project No. 2100-134), stating "*While operations of Oroville Facilities do influence flows downstream of the confluence of the Feather River and the Sacramento River, through the Delta, San Pablo and San Francisco Bays to the ocean, these flows are mixed with natural flows and those related to the operation of the CVP, so that the effects are not easily segregated. The broader effects of the Oroville Facilities as part of the coordinated operations of the CVP and SWP are analyzed in the CVP/SWP BO. These include the effects of the co-mingled flows of the CVP and SWP in the lower Sacramento River, downstream from the confluence of the Feather River with the Sacramento River, through the Sacramento-San Joaquin River Delta, Suisun Bay, San Pablo Bay, San Francisco Bay, and westward to the Pacific Ocean. Therefore, in section 2.4 Effects of the Action of this Opinion, we do not consider the downstream effects of the proposed action in terms of how the Feather River flows influence the Sacramento River and fish downstream of the Feather River. The effects analyzed in the CVP/SWP BO, however, are considered in sections 2.2 Rangewide Status of Species and Critical Habitat in the Action Area and 2.6 Integration and Synthesis of this Opinion."* Similar to the approach taken by NMFS (2016b), considerations regarding system-wide effects of coordinated CVP and SWP operations in the Feather River, the Sacramento River and the Delta are presented in Chapter 5 (Status of Listed Species and Critical Habitat) of this Applicant-Prepared Draft BA.

4.3.1.2 Water Temperature Considerations

Because YCWA's Relicensing Water Temperature Model does not simulate changes in lower Feather River water temperatures, it is not possible to make a direct comparison of potential effects associated with daily water temperature changes at Marysville in the lower Yuba River with potential daily water temperature changes downstream in the lower Feather River. Therefore, to investigate whether changes in Yuba River water temperatures under the Proposed Action could result in measurable changes in lower Feather River aquatic habitat conditions, the following analysis was conducted.

- Step 1. Modeled daily water temperatures in the lower Yuba River at Marysville were averaged to obtain monthly average water temperatures under the Proposed Action scenario and the Base Case (Environmental Baseline) scenario.

- Step 2. The weighted monthly average water temperature downstream from the Yuba River was computed by comparing the flow and water temperature at the mouth of the Yuba River with that from the Feather River upstream of the Yuba River. Monthly average flows in the lower Feather River were obtained from DWR's 2015 Delivery Capability Report (DCR) Base Conditions CalSim II scenario. Water temperatures in the Feather River were obtained through application of Reclamation's monthly water temperature model.

- Step 3. For the portion of the modeled period of record that is common between the modeling platforms[3], which extends from October 1969 through September 2003, the flow-weighted average water temperature in the Feather River below its confluence with the Yuba River was computed for each month of the common period of record, using each month's average water temperature and flow for the Yuba River at its confluence with the Feather River, and each month's average flow and water temperature on the Feather River upstream from the Yuba River.

- Step 4. The percent change in flow-weighted monthly average water temperatures in the Feather River near the confluence with the Yuba River was evaluated to investigate whether changes in lower Yuba River water temperatures at Marysville have the potential to result in detectible changes in lower Feather River water temperatures.

The period of interest for this water temperature evaluation extends from May through November. Over the 238 months of the period evaluated (Oct 1969-Sep 2003), the average difference in monthly average water temperature is 0.01 percent (1 one-hundredths of 1 percent). Consequently, the Proposed Action, relative to the Environmental Baseline, would not result in detectable changes in Feather River water temperatures immediately downstream of the Yuba River, and changes in aquatic habitat conditions downstream of the mouth of the Yuba River would not be measurable.

Therefore, based on these flow and water temperature considerations associated with the Proposed Action, this Applicant-Prepared Draft BA does not include the lower Feather River as part of the Action Area. The lower Feather River, however, is considered in the context of the ESU and DPS, respectively (see Section 5.0 – Status of the Species, of this Applicant-Prepared Draft BA).

[3] Calsim II was used to derive modeled monthly average flows and Reclamation's water temperature model was used to derive average monthly water temperatures in the lower Feather River. YCWA's Water Balance and Operations Model and Water Temperature Model were used to derive modeled flows and water temperatures in the lower Yuba River.

4.3.2 Yuba River Reaches

Various reach delineations of the Yuba River have been used for specific studies and purposes in the Yuba River downstream of Englebright Dam. For the purposes of evaluation of the potential effects to listed species addressed in this Applicant-Prepared Draft BA, two sets of reach delineations are primarily referred to: 1) geomorphic reaches; and 2) hydrologic reaches/zones.

The geomorphic reaches were delineated by Wyrick and Pasternack (2012) into eight segments based on the longitudinal profile and associated geomorphic variables. Tributary junctions form the upstream boundary of two reaches and dams form the boundary for two more reaches. The other reach boundaries are formed by hydro-geomorphic variables such as the onset of emergent floodplain gravel, transition from confined bedrock valley to wider, meandering system, and decreases in bed channel slope. Table 4.3-1 provides length and gradient of each of the reaches. Figure 4.3-1 provides a map of the geomorphic reaches in relation to local landmarks.

These geomorphic reaches were utilized by the RMT (2013a) in describing geomorphological characteristics of the lower Yuba River, and also were included in YCWA's (2013) Technical Memorandum 7-10, *Instream Flow Downstream of Englebright Dam*, which can be found on FERC's eLibrary as referenced by the FERC accession number provided in Table E6-2 of Appendix E6, of YCWA's Amended FLA.

Table 4.3-1. Geomorphic reaches in the Yuba River downstream from Englebright Dam.

Reach Name	Description	Gradient (%)[1]	Start (RM)[1]	End (RM)[1]	Length (mi)
Englebright Dam	Confluence with Deer Creek to Englebright Dam	0.31	23.4	24.3	0.8
Narrows	Deer Creek to emergent gravel at canyon mouth	Not Measurable[2]	22.3	23.4	1.1
Timbuctoo Bend	Upstream of Hwy 20 Bridge to end of emergent gravel bar by Blue Point Mine	0.20	18.6	22.3	3.8
Parks Bar	Dry Creek to 0.35 mi upstream of Hwy 20 Bridge	0.19	13.9	18.6	4.7
Dry Creek	Daguerre Point Dam to Dry Creek	0.14	11.6	13.9	2.3
Daguerre Point Dam	RM 8.3 to Daguerre Point Dam	0.18	8.3	11.6	3.3
Hallwood	RM 3.3 to slope break near Eddie Drive at RM 8.3	0.13	3.3	8.3	5.0
Marysville	Junction with Feather River to RM 3.3	0.05	0.0	3.3	3.3
	Total	**0.16**	**0.0**	**24.3**	**24.3**

[1] Closest RM from base map drafted by YCWA in 2012. RMs were digitized at a large scale over high-resolution aerial imagery along the active river alignment.

[2] The Narrows Reach is very confined with Class III-V rapids that prevent topographic and bathymetric surveys due to safety and accessibility issues. Slope and thalweg location cannot be accurately determined (Wyrick and Pasternack 2012).

The four hydrologic reaches/zones were delineated for the purposes of modeling flow-dependent habitat availability and habitat duration analyses, which rely on homogeneous hydrology within a modeled river section (YCWA 2013). Hydrologic zone (HZ) boundaries were based on points of primary inflows (accretion) and outflows (diversions) in the study area. Table 4.3-2 describes the boundaries and length of each HZ. Figure 4.3-2 provides a map of the hydraulic modeling reaches in relation to local landmarks.

Table 4.3-2. Hydrologic zone boundaries established for habitat modeling in the Yuba River downstream from Englebright Dam.

Hydrologic Zone Name	Zone Abbreviation	Zone Description	Lower Boundary (RM)	Upper Boundary (RM)	Length (mi)
Daguerre Point Hydrologic Zone	DPHZ	Zone extends from the Feather River Confluence upstream to Daguerre Point Dam.	0.00	11.6	11.6
Dry Creek Hydrologic Zone	DryHZ	Zone extends from Daguerre Point Dam upstream to the confluence of Dry Creek.	11.6	13.9	2.3
Deer Creek Hydrologic Zone [1]	DeerHZ	Zone extends from the confluence of Dry Creek upstream to the confluence of Deer Creek.	13.9	23.4	9.5
Englebright Dam Hydrologic Zone	EDHZ	Zone extends upstream from the confluence with Deer Creek to approximately 500 ft below Englebright Dam.	23.4	24.3	0.9

[1] The Narrows Reach, which is within the Deer Creek reach, is very confined, with Class III-V rapids that prevent topographic and bathymetric surveys due to safety and accessibility issues. Slope and thalweg location cannot be accurately determined. Therefore, habitat was not modeled in this 1.1 mi section of the Deer Creek reach.

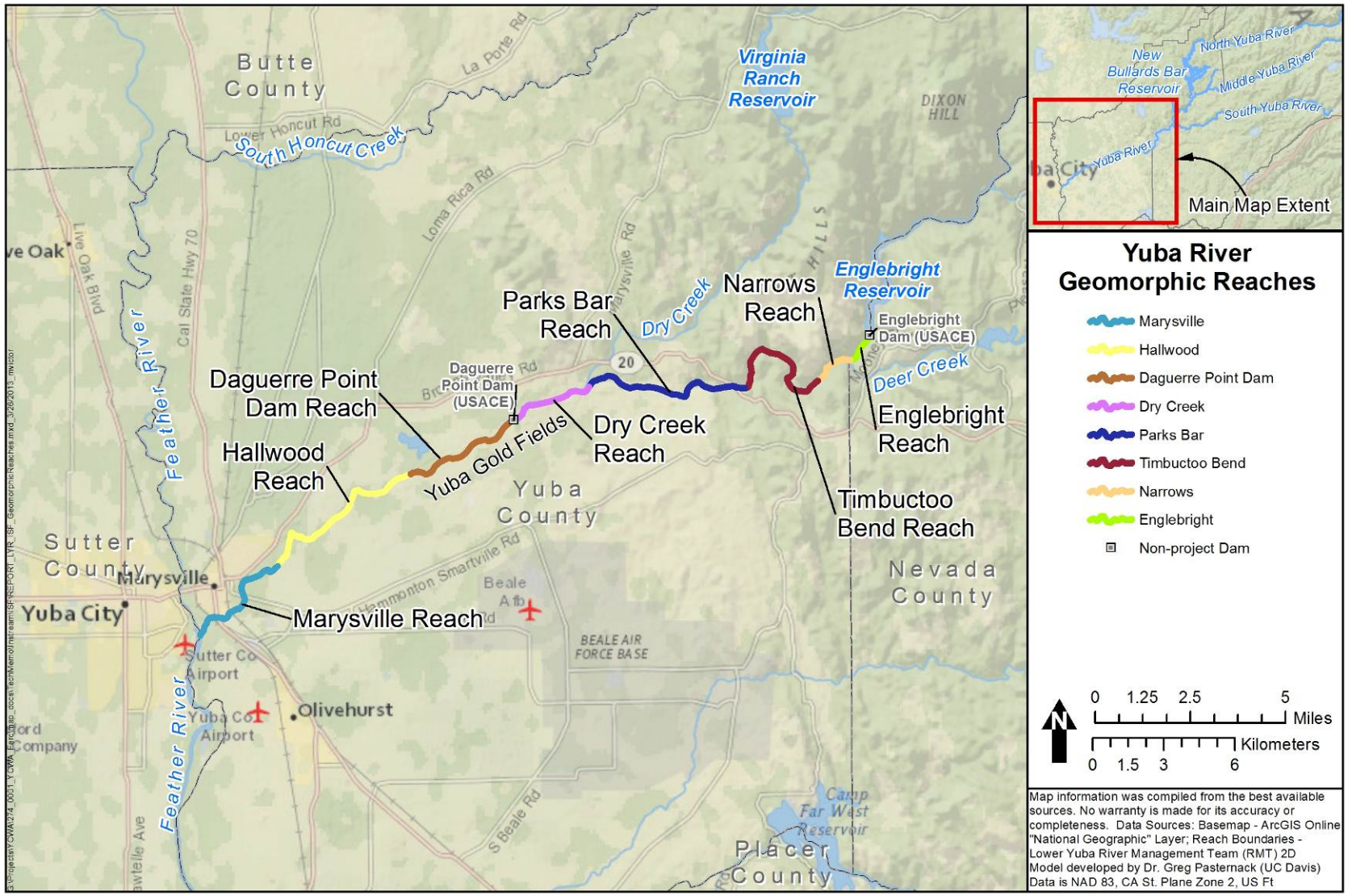

Figure 4.3-1. Map of study area showing geomorphic reach boundaries.

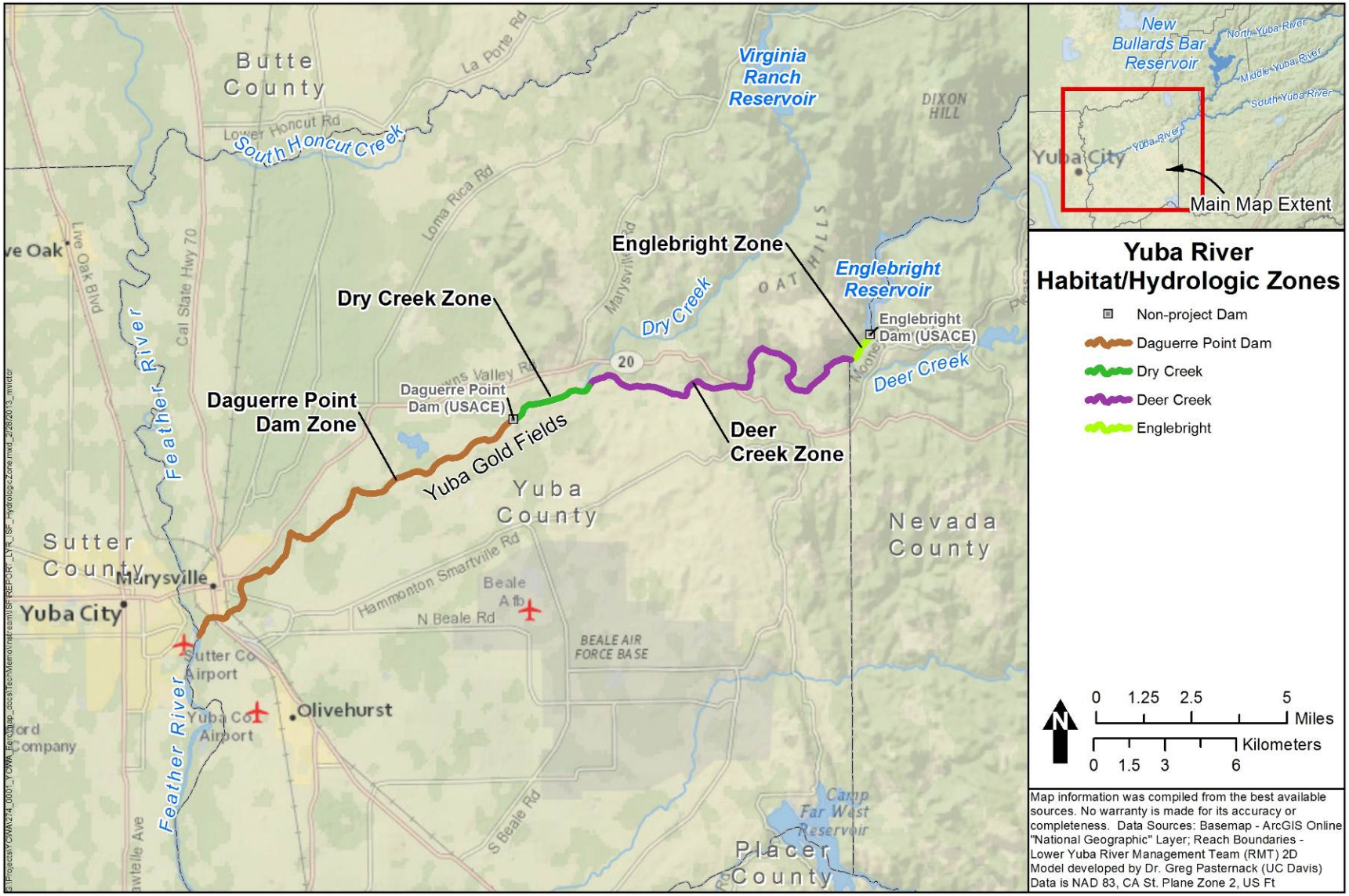

Figure 4.3-2. Map of habitat/hydrologic zone boundaries.

4.4 Areas Downstream of the Action Area

4.4.1 Feather River

The Feather River Basin encompasses an area of about 5,900 sq mi (DWR 2007). The Feather River is a major tributary to the Sacramento River and provides about 25 percent of the flow[4] in the Sacramento River (DWR 2007). The lower Feather River extends from the Fish Barrier Dam (RM 67.3) near Oroville Reservoir downstream to the confluence of the Feather and Sacramento rivers (RM 0) (Figure 4.4-1).

Flows in the lower Feather River are influenced by releases from Oroville Dam and Reservoir, which is operated by DWR as part of the SWP. Downstream of Oroville Dam, water is diverted in several directions to: 1) the Thermalito Complex; 2) the Feather River Fish Hatchery (FRFH); and 3) the Low Flow Channel. The sources combine below the Thermalito Afterbay, creating the High Flow Channel. The Low Flow Channel is highly regulated and contains the majority of the anadromous salmonid spawning habitat. The Yuba and Bear rivers are both tributaries to the Feather River. The Yuba River flows into the Feather River near the City of Marysville, 39 RM downstream of the City of Oroville. The Bear River flows into the Feather River about 55 RM downstream of the City of Oroville. Approximately 67 RM downstream of the City of Oroville, the Feather River flows into the Sacramento River near the town of Verona (DWR 2007).

As described in RMT (2010a), monitoring data indicate that water temperatures observed in the lower Feather River at Gridley (located approximately 20 mi upstream of the Feather-Yuba confluence) are warmer than those observed in the lower Yuba River at Marysville by 7°F to 16°F during June, 9°F to 14°F during July, and 11°F to 16°F during August for the 2008 and 2009 monitoring period; it is anticipated that water temperatures in the lower Feather River at the Yuba-Feather confluence would be even warmer.

The lower Feather River below the Yuba-Feather confluence primarily serves as a migration corridor for adult and juvenile anadromous fish. Adult spring-run Chinook salmon may be entering the Feather River as sexually immature fish, and must hold in freshwater for up to several months before spawning (Moyle 2002). While maturing, adult spring-run Chinook salmon hold over the summer in deep pools in the low-flow section of the Feather River between Thermalito Diversion Dam (5 miles below Oroville Dam) and the downstream Thermalito Afterbay Outlet (California HSRG 2012). DWR (2009a) report that June through mid-October is the primary period during which water temperature could potentially limit natural production in the Feather River, and that water temperatures above 68°F are likely detrimental to spring-run Chinook salmon holding in the Feather River. For the first 7.5 mi below the Fish Barrier Dam, water temperatures in the Feather River can be controlled by releasing water from Oroville Reservoir. Below the Thermalito Outlet, discharge of warmed water from the Thermalito Afterbay can increase ambient river temperatures (DWR 2009a).

[4] As measured at Oroville Dam.

Figure 4.4-1. Other aquatic habitat areas (e.g., lower Feather River) affecting Yuba River spring-run Chinook salmon, steelhead and green sturgeon throughout the ESU/DPS (YCWA et al. 2007).

Downstream of the lower Feather River, flows are mixed with natural flows and those related to the operation of the CVP and the SWP, so that the effects of these co-mingled flows and their effects on spring-run Chinook salmon, steelhead and green sturgeon are not easily segregated. The broader effects of the co-mingled flows of the coordinated operations of the CVP and SWP on these species are analyzed in the NMFS BO for the coordinated operations of the CVP (Operations Criteria and Plan (OCAP)/OCAP BO). These include the effects of the co-mingled flows of the CVP and SWP in the lower Sacramento River, downstream from the confluence of the lower Feather River with the Sacramento River, through the Sacramento-San Joaquin River Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay, and westward to the Pacific Ocean. Although this Applicant-Prepared Draft BA does not include Sacramento River reaches downstream of the Feather River or the Delta as part of the Action Area, these areas are considered in the context of an ESU/DPS, respectively (see Section 5.0 – Status of the Species, of this Applicant-Prepared Draft BA).