

# Yuba River Mainstem Study Site and Transect Field Selection Package

## 1.0 Introduction

This information package was developed by Yuba County Water Agency (YCWA) to aid in field selecting study sites and transects as part of relicensing of the Yuba River Development Project (FERC Project No. 2246).

YCWA will select study sites and transects in collaboration with Relicensing Participants for the following studies and in accordance with procedures described in the respective plans.

- 3.10 Instream Flow
- 1.1 Channel Morphology
- 6.1 Riparian Habitat
- 3.8 Fish Population
- 3.1 Aquatic Macroinvertebrates

In their review of these study plans, Relicensing Participants recommended that YCWA co-locate study sites and/or transects to the extent feasible. YCWA agrees, but with the understanding that “co-location” will not be at the expense of properly sited and collected data for any individual study. If co-locating a site or transect does not work for a particular study, study sites or transects for that study will be selected independent of the other studies.

YCWA recommends that the PHABSIM method (Instream Flow 3.10) be the “driver” in the selection process since it requires the largest number of study sites and/or transects and the study site/transect selection protocol is relatively strict. Because PHABSIM study sites and transects will be selected to represent the range of hydraulic and channel types in the study reach there should be adequate opportunities for co-locating other studies with the PHABSIM study sites and transects. YCWA agrees to adjust the selection of PHABSIM study sites and transects to accommodate co-location if the co-located studies all benefit without compromising the methods or selection protocol of the individual studies.

PHABSIM study sites and transects will be selected in accordance with Instream Flow Study Plan 3.10, Section 5.3.5 – Study Site and Transect Selection. Section 5.3.5.2 – Transect Selection and Placement describes the “Least-Common-Selector” (LCS) process, a stratified random sampling approach based on the least-available sampled mesohabitat type (Payne 1992<sup>1</sup>). While the LCS is the preferred method and is the method described in the study plan, YCWA

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<sup>1</sup> Payne, T.R. 1992. Stratified random selection process for the placement of Physical Habitat Simulation (PHABSIM) transects. Paper presented at AFS Western Division Meeting, July 13-16, in Fort Collins, CO.

may be required to deviate from this method in certain stream reaches where restricted access to the stream limits the population of habitat units from which the LCS can be randomly selected. Any deviations will be described later in this field package.

Study sites and transects for studies 3.10 Instream Flow, 1.1 Channel Morphology, and 6.1 Riparian Habitat will be selected concurrently, while study sites for 3.8 Fish Population and 3.1 Aquatic Macroinvertebrates will be selected at a later time with the intent of co-locating, to the extent feasible, these studies with the other study sites. Because stream fish population and macroinvertebrate study methods are not transect based, possible co-location of these studies with other studies will be by study site only.

## **2.0 General Morphology of the Yuba River Mainstem**

The 7.1 mile channel of the Yuba River mainstem from the confluence of the Middle and North Yuba Rivers to the head of Englebright Reservoir is predominantly bedrock-controlled, with only very short boulder/cobble sections. The channel is laterally and vertically stable due to dominant bedrock control. Sinuosity is very low as there are no plan and profile sections strongly influenced by alluvial deposition. Pools are large and deep, and separated by long sections of pocket water that runs through and under very large boulders. Finer sediment (cobble and finer) accumulations are not common.

This confined bedrock-dominated section of river is very inaccessible. Though the long profile of the river is not very steep, according to the mapped gradient of 1.8 percent, high gradient riffles dominate the gradient “steps.” The river flows through bedrock canyons, and the vertical walls inhibit ground access. The only location that was ground-mapped was the area just above and below New Colgate Powerhouse (25% of the section). Habitat is dominated by mid-channel pools and pocket-water formed between large boulders. Boulders are the only instream cover identified though deep pools likely also provide cover. Large woody debris was not found and accumulations of trout spawning-sized gravel were uncommon.

This section of the Yuba River mainstem is divided at New Colgate Powerhouse into two study reaches - the Middle/North Yuba River Reach and the New Colgate Powerhouse Reach.

## **3.0 Proposed Study Sites**

### **3.1 New Colgate Powerhouse Reach**

The New Colgate Powerhouse Reach extends approximately 1.7 miles downstream from the New Colgate Powerhouse at RM 33.9 to the normal maximum water surface elevation of USACE’s Englebright Reservoir at RM 32.2, in the vicinity of French Bar. Below this point backwater effects of Englebright Reservoir affect river hydraulics (Figure 1).

There is less than 1.4 mi of the mainstem Yuba below the PH before the backwater effects of Englebright Lake affect habitat features. The downstream end of the accessible reach begins just

below French Bar at RM 32.55 (Figure 1). However, shoreline access to this reach by foot is only possible for approximately 0.3 miles below New Colgate Powerhouse. Transect selection and PHABSIM field measurements below this point would only be possible by boat.

This entire section was not ground-mapped so habitat frequency was obtained from video mapping (Table 1, Figure 2). Note that video mapping is not continuous so there are habitat units between the units shown in Table 1 that may be eligible for transect placement. The time stamp column indicates the location on the video where the habitat was identified. Low gradient riffles and glides both are the least common habitats but low gradient riffle (LGR) was selected as the LCS. A random number generator ordered the four LGR LCS as 3, 2, 4, 1. Therefore, the 3<sup>rd</sup> LGR is LCS #1 (HMU#5 with time stamp 33.37). However, since there are so few accessible units, it is recommended that Relicensing Participants review the entire accessible section.

Table 2 provides a summary of the habitat frequencies for the reach, and columns for notes as to transect selection for the PH Reach.

## **2.2 Middle/North Yuba River Reach**

The Middle/North Yuba River Reach extends approximately 5.8 miles downstream from the confluence of the North Yuba River with the Middle Yuba River at RM 39.7 to the New Colgate Powerhouse at RM 33.9. The potential study site was selected from the only accessible portion of the reach; namely from the Colgate PH upstream about one mile (Figure 1). Table 3 shows the habitats that were mapped in this location. Table 3 and Figure 2 show that most of the habitats found in the reach are located within this accessible location. Low gradient riffle was the least common habitat and was selected as the LCS. A random number generator ordered the five LGR LCS as 3, 4, 5, 1, and 2. Therefore, the 3<sup>rd</sup> LGR is LCS #1 (HMU#8). However, since there are so few accessible units, it is recommended that Relicensing Participants review the entire accessible section.

Table 4 provides a summary of the habitat frequencies for the reach, and columns for notes as to transect selection for the Middle/North Reach.

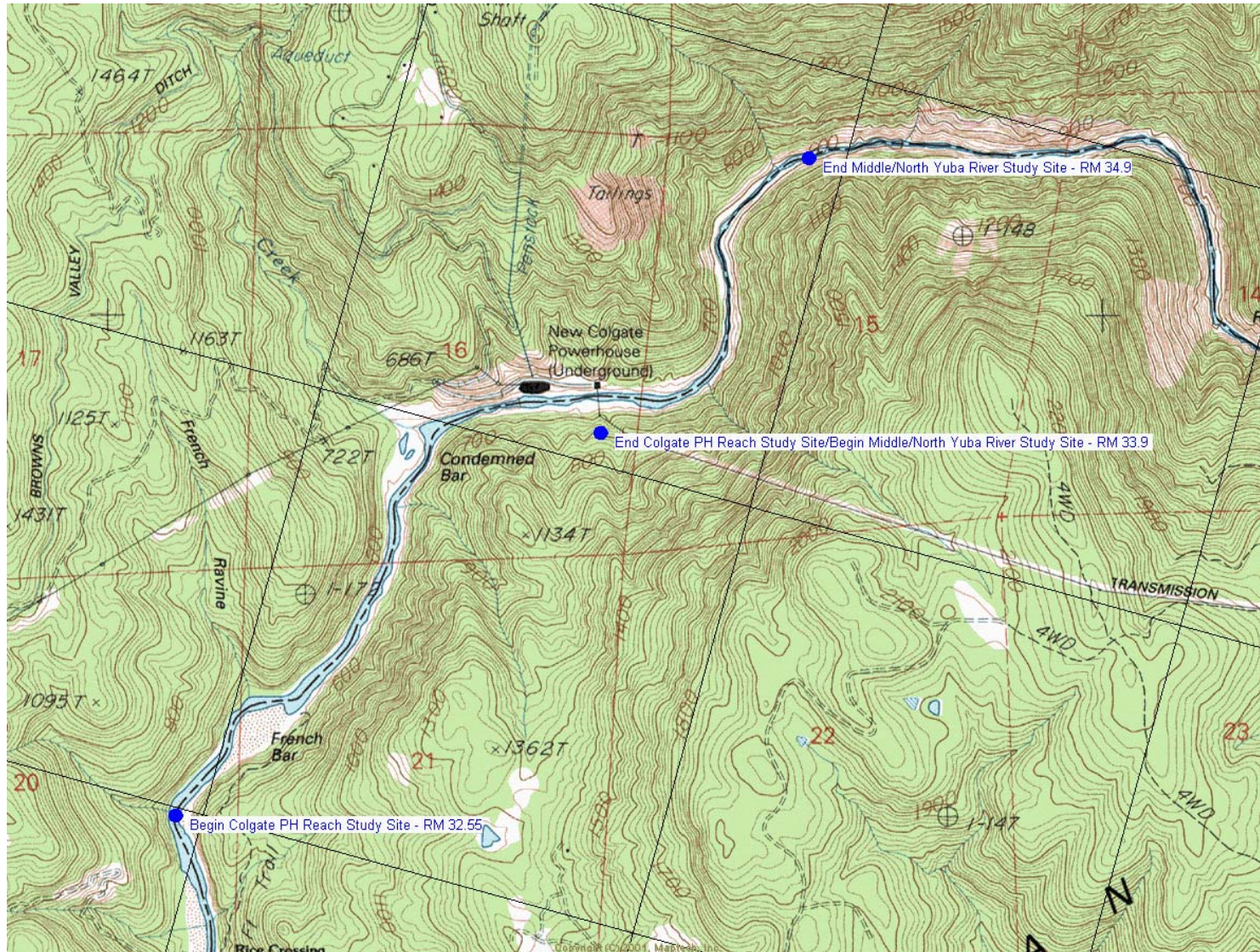


Figure 1. Accessible location for the mainstem Yuba above and below Colgate Powerhouse

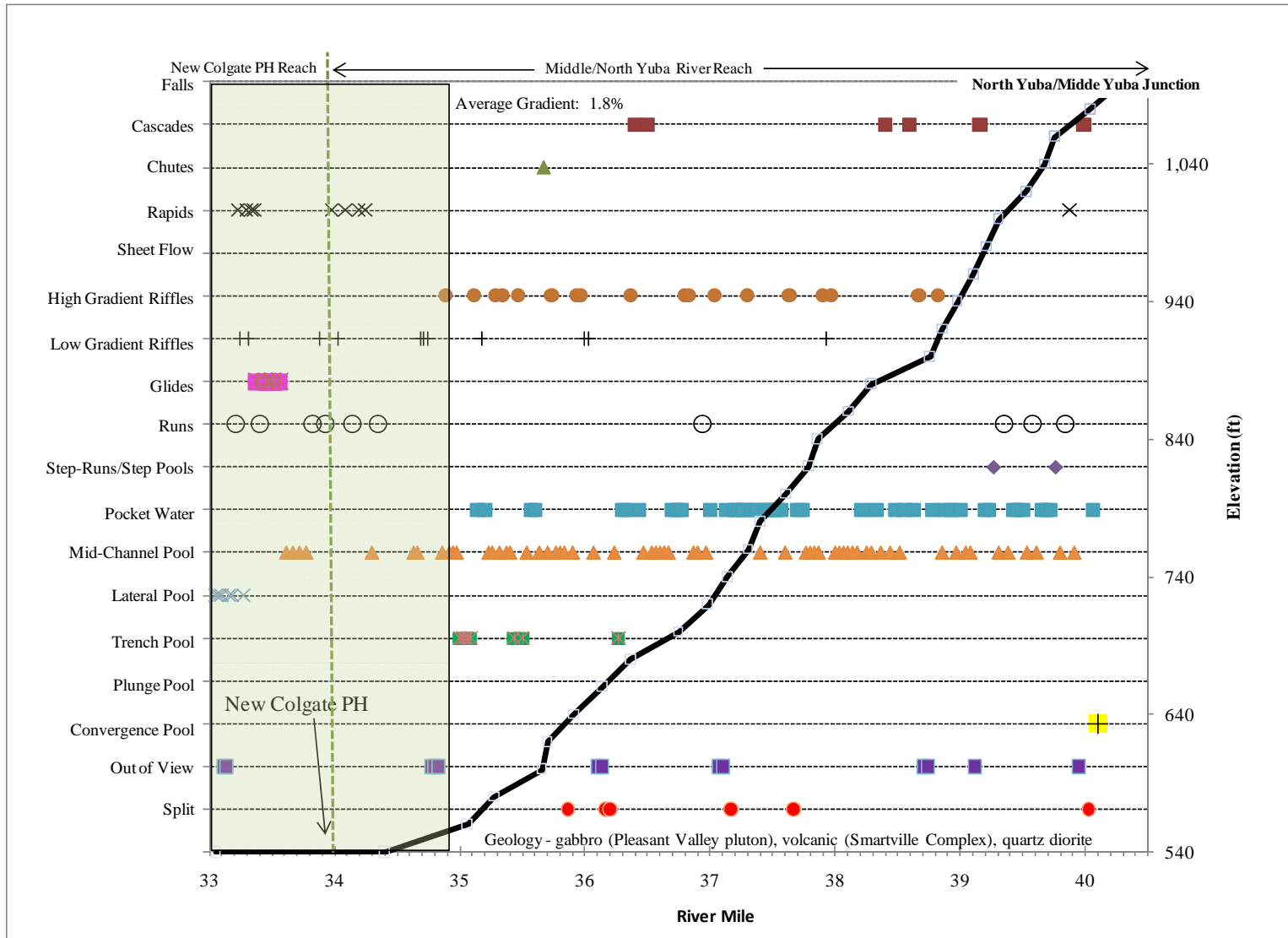


Figure 2. Mainstem Yuba reaches video-based habitat mapping units, longitudinal profile and potential study sites.

**Table 1. Video-based habitat mapping units on the mainstem Yuba River below Colgate Powerhouse.**

Time	RM	Habitat	Habitat	HM Unit	LCS
0:28:34	32.55	13	LAP		
0:28:37	32.57	13	LAP		
0:28:40	32.59	13	LAP		
0:28:43	32.62	17	OOV		
0:28:46	32.64	17	OOV		
0:28:49	32.66	13	LAP		
0:28:52	32.68	13	LAP		
0:28:55	32.70	9	RUN		
0:28:58	32.73	4	RAP		
0:29:01	32.75	7	LGR		4
0:29:04	32.77	13	LAP		
0:29:07	32.79	4	RAP	French Bar	
0:29:10	32.81	7	LGR		2
0:29:13	32.83	4	RAP		
0:29:16	32.86	4	RAP		
0:29:19	32.88	8	GLI	split	
0:29:22	32.90	9	RUN	1	
0:29:25	32.95	8	GLI	2	
0:29:28	33.01	8	GLI	2	
0:29:31	33.06	8	GLI	2	
0:29:34	33.11	12	MCP	3	
0:29:37	33.16	12	MCP	3	
0:29:40	33.22	12	MCP	3	
0:29:43	33.27	12	MCP	3	
0:29:46	33.32	9	RUN	4	
0:29:49	33.37	7	LGR	5	1
0:29:52	33.43	9	RUN	6	
0:29:55	33.48	4	RAP	7	
0:29:58	33.53	7	LGR	split at low flow	3
0:30:01	33.58	4	RAP	8	
0:30:04	33.64	9	RUN	9	
0:30:07	33.69	4	RAP	10	
0:30:10	33.74	4	RAP	10	
0:30:13	33.79	12	MCP	11	
0:30:16	33.85	9	RUN	12	
0:30:19	33.90	#N/A		Colgate PH	

**Table 2. Habitat frequency based on video-mapped data and target transects for the Mainstem Yuba River Colgate Powerhouse Reach (RM 32.55 to 33.9).**

<b>Mainstem Yuba Colgate PH Reach Habitat Frequency</b>					
<b>Habitat</b>	<b>Number</b>	<b>Number Frequency</b>	<b>Estimated Minimum # Target Transects*</b>	<b># Selected (Ch. Morph)</b>	<b># Selected (Instream Flow)</b>
High gradient riffles	0	0%	0		
Low gradient riffles	4	15%	3		
Runs/Step-Runs	8	30%	5		
Glides	4	15%	3		
Pocket Water	0	0%	0		
Pools	11	41%	7		
<b>TOTAL</b>	<b>27</b>	<b>100%</b>	<b>17</b>		

\*For Instream Flow Study

**Table 3. Ground based habitat mapping unit on the Middle/North Yuba Reach (mainstem Yuba River above Colgate Powerhouse)**

Section Number	LCS	Original Unit #	Unit Habitat Type	Length (ft)	Apprx. River Mile	Est avg BFW (ft)	Max. pool depth (ft)	Comments
Yuba > Colgate		1	MCP	532	34.00	98	10	POOL @ base of PH
Yuba > Colgate	4	2	LGR	452	34.09	116.25		2.5% gradient
Yuba > Colgate		3	MCP	391	34.16	140.33	10	MCP with POW characteristics at pool tailout. 2x6 & 1x4 patches of spawning gravel out of water RBA
Yuba > Colgate		4	HGR	318	34.22	135		4% gradient (water temp monitor LBA)
Yuba > Colgate		5	MCP	1036	34.42	102.5	10	pool tailout has POW characteristic but deep water not moving, no scour so MCP
Yuba > Colgate	5	6	LGR	91	34.43	53.67		2.5% gradient
Yuba > Colgate		7	HGR	67	34.45	48		11% gradient
Yuba > Colgate	1	8	LGR	52	34.46	68		1% gradient
Yuba > Colgate		9	POW	177	34.49	62.67		
Yuba > Colgate		10	HGR	85	34.51	51.33		9% gradient
Yuba > Colgate		11	MCP	257	34.55	84.67	10	6+ deep @ edge LBA
Yuba > Colgate	2	12	LGR	33	34.56	56		1.5% gradient
Yuba > Colgate		13	POW	223	34.60	89.33		
Yuba > Colgate	3	14	LGR	54	34.61	133		2% gradient
Yuba > Colgate		15	MCP	592	34.73	87.25	10	depth is over 6 ft! at edge LBA
Yuba > Colgate		16	HGR	105	34.75	47.5		9% gradient
Yuba > Colgate		17	MCP	110	34.77	64	10	characteristics of POW but no divergent flow and deep
Yuba > Colgate		18	HGR	216	34.81	84.67		4% gradient
Yuba > Colgate		19	POW	412	34.89	116.5		moved away from river to climb banks
		20	MCP	380	34.96	80	10	estimated length and width from above - cliffed out both sides

**Table 4. Habitat frequency based on video-mapped data and target transects for the Middle/North Yuba Reach (mainstem Yuba River from the Colgate PH to North/Middle Junction RM 33.9 to 39.6).**

<b>Mainstem Yuba North/Middle Reach Habitat Frequency</b>						
<b>Habitat</b>	<b>Number</b>	<b>Number Frequency</b>	<b>Adjusted Number Frequency</b>	<b>Estimated # Target Transects</b>	<b># Selected (Ch. Morph)</b>	<b># Selected (Instream Flow)</b>
High gradient riffles	18	13%	14%	2		
Low gradient riffles	7	5%	5%	2		
Runs/Step-Runs	6	4%	0%	0		
Glides	0	0%	0%	0		
Pocket Water	42	31%	32%	5		
Pools	63	46%	48%	8		
<b>TOTAL</b>	136	100%	100%	18		

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