New Bullards Bar Dam Reach (North Yuba) 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[1]).

[1] 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.

While the LCS is the preferred method and is the method described in the study plan, YCWA may be required to deviate from this method in certain stream reaches where restricted access to the stream limits the "pool" 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 New Bullards Bar Dam Reach (North Yuba)

The New Bullards Bar Dam Reach extends approximately 2.3 miles downstream from the New Bullards Bar Minimum Flow Release Powerhouse at RM 2.3 to the confluence of the North Yuba River with the Middle Yuba River at RM 0.0.

While the is channel in this section is dominated by gradients below 3 percent (average gradient of 2%), there is one short section where the gradient is greater than 3 percent and one short section that is above 5 percent (Figure 3). Just above the 5 percent section, the gradient flattens to less than 1 percent. The geology in this reach is composed of Mesozoic volcanic rocks of the Smartville Complex. Most of the reach is composed of bedrock and car and house-sized boulders that separate large mid-channel pools. There are very short and infrequent areas of cobble-size deposits, but most of the substrate is large and immobile. There is no apparent floodplain or terrace development.

This 2.3-mile reach is largely inaccessible. Two areas were ground-mapped: North Yuba upstream of the Middle Yuba River junction and just downstream of New Bullards Bar Dam; the remainder was mapped using the aerial video. Both video mapping and ground-based mapping were combined for the habitat mapping results. The video of the upper section near New Bullards Bar Dam missed most of the habitat that was ground-mapped, so the ground-mapped data (49% of the reach) was used in lieu of the video.

This is a very rugged stream with large boulders that often cover the channel, and large, deep pools bounded by bedrock. The middle steeper section cannot be safely accessed by foot from upstream due to a deep bedrock gorge with vertical cliff walls blocking the way. The lower section is a rugged path through very large boulders that cover pocket-water and separate deep pools. The river must be crossed below the junction to reach the left-bank-ascending as the right-bank-ascending is vertical adjacent to a large, deep pool so does not offer access to this lower part of the reach. The crossing would be hazardous at high flow.

Pocket-water and mid-channel pool habitat types dominate. Identified cover is exclusively boulders but the depth of pools can also provide cover to resident trout. Trout spawning-sized

gravel accumulations were rare (511 sq ft), as was large woody debris and potential natural barriers to resident trout upstream movement likely are very common in the confined, steep channel. Bank erosion was rare, given the bedrock/boulder channel margins.

3.0 Proposed Study Site Selection

A 0.5 mile accessible section within the reach was selected for possible study site and transect placement just downstream from New Bullards Bar, as listed in Study Plan 1.1 Channel Morphology Upstream of Englebright Reservoir, dated August 2011 (Figure 1).

There are only twelve habitat units within the accessible 0.5 mi stretch of the North Yuba below New Bullards Bar Dam (Figure 1). The downstream end of the accessible reach is a bedrock-controlled (with vertical side walls) drop-off (RM 1.5, Figure 2). The upstream end is just below the weir at the base of the spillway pool. The habitats assessed during the ground-based mapping are included as Table 1. Figure 3 shows all the habitats as identified during video-based habitat mapping.

The least common habitat type is runs/step-runs (Table 2) but there are only two representatives (Table 1). The next least common is high gradient riffle, also with two representatives. Low gradient riffle is the next with only two representatives, and pocket-water is the next least common with no representatives in the accessible section. Since there are so few units, the first two least common habitats (RUN/STEP and HGR) were combined so there were four representatives. The random number generator selected them in the order 3, 1, 4, 2. Therefore, LCS #1 is HMU#5 and is a step-run. Since there is such limited access, the LCS can be used as a starting point but it is recommended that the entire accessible section be reviewed by Relicensing Participants.

Although the majority of the reach is composed of pocket-water formed by shallow runs that flow in, under and around large boulders, it appears that pocket-water is not represented within the accessible section of the North Yuba below New Bullards Bar. Relicensing Participants may be able to place a transect in this section that is close enough to representing pocket-water habitat type. It may be possible that the downstream limitation was at the higher flows encountered during habitat mapping and access past this point may be possible at lower flows. However, access would be limited during high flow measurements.

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

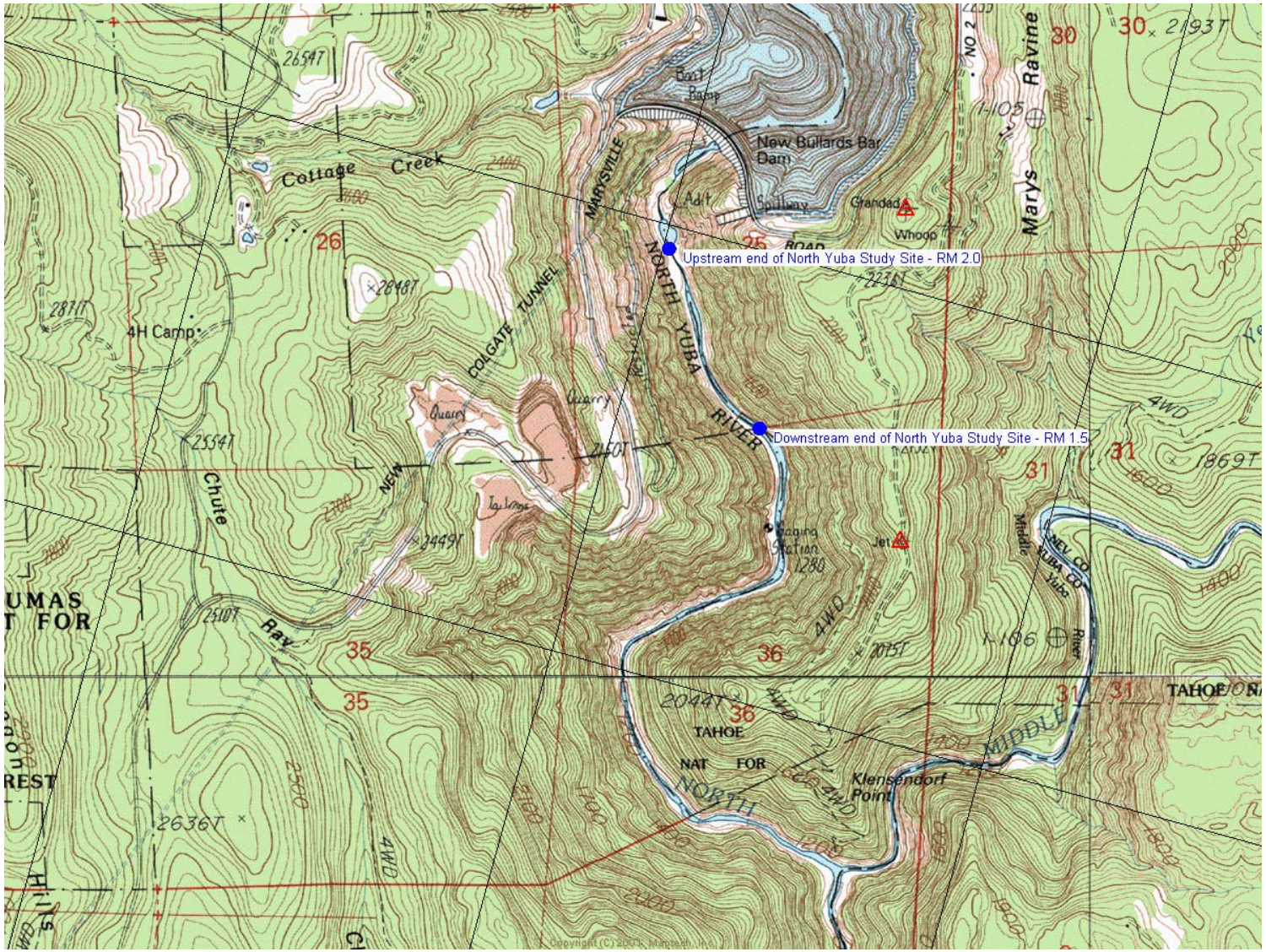

Figure 1. Accessible location for the Middle Yuba Our House Dam Reach below Our House Dam.

Figure 2. Downstream limit (below visible pool) of accessible section of North Yuba below New Bullards Bar Dam.

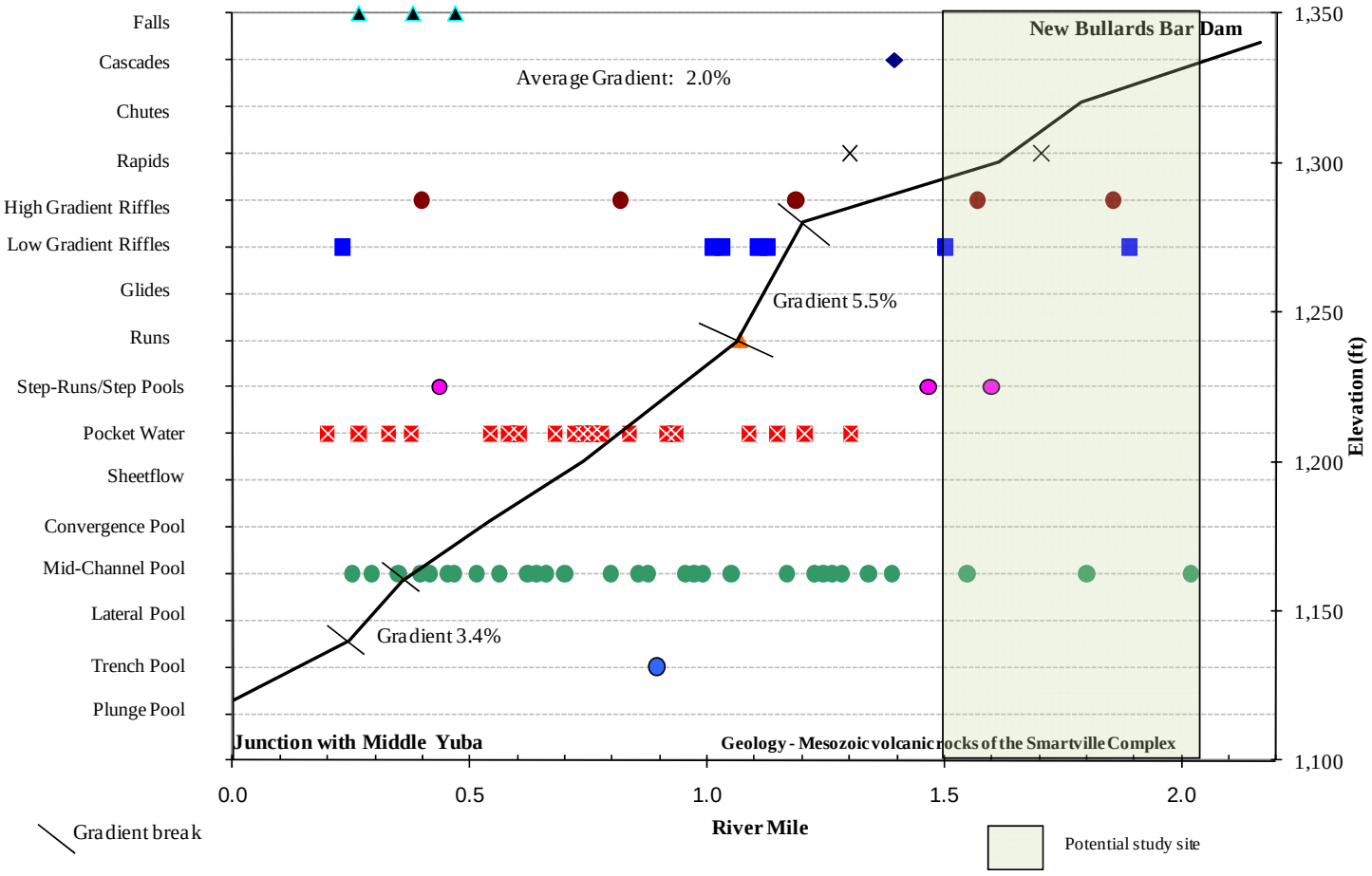

Figure 3. North Yuba below New Bullards Bar Dam video-based habitat mapping units, longitudinal profile and potential study site.

Table 1. Ground-based habitat mapping unit in the North Yuba River within the accessible section below New Bullards Bar Dam.

Section Number	LCS	Original Unit #	Unit Habitat Type	Length (ft)	River Mile	Est avg BFW (ft)	Max. pool depth (ft)	Comments
video mapping			HGR		1.19			
video mapping			POW		1.21			
video mapping			MCP		1.23			
video mapping			MCP		1.24			
video mapping			MCP		1.26			
video mapping			MCP		1.28			
video mapping			POW		1.30			
NY below Bullards Bar		13	RAP	222	1.30	65.33		2.5 gradient, stepped but with standing waves, garter snake.
NY below Bullards Bar		12	MCP	212	1.34	72.5	10	probably greater than 10' deep.
NY below Bullards Bar		11	MCP	264	1.39	73.67	10	probably greater than 10' deep. Mid pool control divides into 2 pools.
NY below Bullards Bar		10	CAS	22	1.39	55		~4' deep overall
NY below Bullards Bar	2	9	STEP	379	1.47	75.5		pools are 6' deep throughout step run (step - pools)
NY below Bullards Bar		8	LGR	188	1.50	107.33		1% gradient
NY below Bullards Bar		7	MCP	241	1.55	102.33	10	
NY below Bullards Bar	4	6	HGR	124	1.57	73.5		5% gradient
NY below Bullards Bar	1	5	STEP	151	1.60	113.5		2 steps with 2 different water levels
NY below Bullards Bar		4	RAP	556	1.70	97.6		3% gradient
NY below Bullards Bar		3	MCP	500	1.80	170.67	15	probably greater than 15' deep
NY below Bullards Bar	3	2	HGR	304	1.86	95		Gradient 5%, top is run-like.
NY below Bullards Bar		1B	LGR	175	1.89	50		1% gradient
NY below Bullards Bar		1A	MCP	683	2.02	139	10	>> deep 20' pool below dam ends in a weir (8') that makes a waterfall in HGR.

Table 2. Habitat frequency based on video-mapped data and target transects for the North Yuba below New Bullards Bar Dam (RM 0 to 2).

North Yuba Habitat Frequency						
PHABSIM Habitat	**Number**	**Number Frequency**	**Adjusted Number Frequency**	**Estimated Minimum # Target Transects***	**# Selected (Ch.Morph)**	**# Selected (PHABSIM)**
High gradient riffles	5	8%	8%	2		
Low gradient riffles	7	11%	11%	2		
Runs/Step-Runs	4	6%	6%	2		
Glides	0	0%	0%	0		
Pocket Water	19	29%	29%	5		
Pools	31	47%	47%	8		
TOTAL	66	100%	100%	19		

*for Instream Flow Study only