

Study 6.2
**RIPARIAN HABITAT
DOWNSTREAM OF ENGLEBRIGHT DAM¹**
August 2011

1.0 Project Nexus

Yuba County Water Agency's (YCWA or Licensee) continued operation and maintenance (O&M) of the existing Yuba River Development Project (Project) has a potential to affect riparian habitat downstream of Englebright Dam.²

2.0 Resource Management Goals of Agencies with Jurisdiction Over the Resource to be Studied

YCWA believes that four agencies have jurisdiction over riparian habitat potentially affected in the geographic area included in this study proposal: 1) United States Department of Interior, Fish and Wildlife Service (USFWS); 2) United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS); 3) California Department of Fish and Game (CDFG); and 4) State Water Resources Control Board, Division of Water Rights (SWRCB). Each of these agencies and their jurisdiction and management direction, as understood by YCWA at this time, is discussed below.

USFWS

USFWS's jurisdiction and goals and objectives are described by USFWS on pages 1 through 3 of USFWS's March 7, 2011 letter to FERC that provided USFWS's comments on YCWA's Pre-Application Document, or PAD (YCWA 2010). USFWS's jurisdiction, goals and objectives are not repeated here.

NMFS

NMFS's statutory authorities and responsibilities are described by NMFS in Section 2.0 of Enclosure A in NMFS's March 7, 2011 letter to FERC providing NMFS's comments on YCWA's PAD. NMFS's jurisdiction and responsibilities are not repeated here.

CDFG

CDFG's jurisdiction is described by CDFG on page 1 of CDFG's March 2, 2011 letter to FERC providing CDFG's comments on YCWA's PAD. CDFG's goal, as described on page 2 of

¹ Where this study proposal states that information for the study is being developed by the Lower Yuba River Accord River Management Team (RMT), if the RMT does not develop the information as described in this study proposal, YCWA will develop the information. Also, all information developed as part of the relicensing, whether it is developed in the relicensing process or developed in the RMT process and brought into the relicensing, will be made public when YCWA files its final study report. Further, if this study relies on information from RMT data, report or analytics, YCWA will attach the relevant RMT work product to the relicensing report for this study.

² Englebright Dam was constructed by the California Debris Commission in 1941, is owned, operated and maintained by the United States Army Corps of Engineers; and is not included as a Project facility in FERC licenses for the Yuba-River Development Project.

CDFG's letter is to preserve, protect, and as needed, to restore habitat necessary to support native fish, wildlife and plant species.

SWRCB

SWRCB has authority under the federal Clean Water Act (33 U.S.C. §11251-1357) to restore and maintain the chemical, physical and biological integrity of the Nation's waters. Throughout the relicensing process the SWRCB maintains independent regulatory authority to condition the operation of the Project to protect water quality and the beneficial uses of stream reaches consistent with Section 401 of the federal Clean Water Act, the Regional Water Quality Control Board Basin Plans, State Water Board regulations, CEQA, and any other applicable state law.

3.0 Study Goals and Objectives

The goal of the study is to characterize, to the extent necessary for Relicensing, riparian habitat in the Yuba River downstream of the United States Army Corps of Engineer's (USACE) Englebright Reservoir and potentially affected by continued Project O&M.

The objective of the study is to collect information to meet the study goals, including:

- Determine riparian vegetation composition and age class structure, including regeneration and germination
- Evaluate trends in riparian health and factors contributing to riparian conditions in the Study Area

4.0 Existing Information and Need for Additional Information

The Yuba River between the Englebright Dam and the Marysville Gage has a long history of anthropogenic disturbance, primarily related to industrial gold mining efforts. Multiple diversions were created beginning during the late 1800s to supply mining and agricultural interests outside of the Yuba River watershed. Hydraulic mining operations continuing through the 1930s deposited vast amounts of sediment throughout the lower Yuba River. The USACE put Englebright Dam into service in 1941 as a sediment barrier, which subsequently depleted downstream areas of sediment input. The landscape in this area is recognized as highly disturbed from these historical uses, with the riparian habitat capability greatly reduced from pristine conditions. Several efforts have been made or are currently underway to document the status of riparian vegetation in the Yuba River downstream of Englebright Dam, as identified immediately below. All accessible information useful to understanding Project effects will be utilized in this study.

- CDFG mapped all riparian habitats of the Central Valley starting in the 1977 (Nelson and Nelson 1984). This mapping effort used large categories of vegetation type (e.g., forest, shrub, herbaceous and bare gravel bar), and will be useful to assess large changes of riparian habitat over the last 20-30 years. Known as the Katibah maps after the principal investigator,

these resources are reported to exist in CDFG archives as scanned images of variable quality spatial rectification. YCWA has not been able to obtain these at this time.

- CDFG is currently mapping riparian habitats throughout the Central Valley at a similar scale as the Katibah maps, but following the National Vegetation Classification Standard and the California Vegetation Manual (Keeler-Wolf et al. 2009). A GIS layer of these maps for the lower Yuba River up to Highway 20 is expected to be available in 2011 (Diana Hixon, pers. comm.). A riparian mapping project has been initiated by the Yuba Accord's River Management Team (RMT). The RMT has used Light Detection and Ranging (LiDAR) data for the entire riparian corridor up to Highway 20 to yield a map of riparian structure (i.e., height and density). The RMT plans to use ground data from CDFG with the LiDAR data to develop stand classifications following the California Vegetation Manual, yet one scale finer than that being produced by CDFG. This effort is targeted for completion in late 2010. YCWA has not been able to obtain these at this time.
- The RMT in conjunction with University of California at Davis and YCWA have developed a topographic map and two-dimensional hydrodynamic model (SRH-2D) of the Yuba River downstream of Englebright Dam (M&E Program 2010) as a basis for integrating and understanding riparian trends.
- An analysis of historic aerial photographs and maps of the lower Yuba dating from 1906 through 1998 will be undertaken as a joint project between the Yuba County Water Agency and the RMT. That effort is anticipated to be completed by summer 2011 (James et al. 2009).
- Low-altitude aerial video of the Yuba River (YCWA 2009)
- Topographic and geologic maps, including a digital elevation model (DEM) of the Yuba River downstream of USACE's Englebright Dam (M&E Program 2010)
- A conceptual model for effects upon riparian habitat from dams, gold-mining activity and hydrologic alteration was developed as part of a study funded by the US Fish and Wildlife Services' Anadromous Fish Restoration Program (CBEC 2010).
- YCWA's PAD contained information about the riparian vegetation mapped in the area of the Project, including CalVeg maps and National Wetland Inventory (NWI) maps on a 1:24,000 scale, shown with United States Geological Survey (USGS) topographic features and Project facilities. Section 7.6 of the Pre-Application Document includes a table of NWI palustrine and riverine wetland types and acres within the Project Area³ and the Federal Energy Regulatory Commission (FERC) Project Boundary.⁴

Based on NWI maps⁵ (1987), there are approximately 40,417 feet and 125 acres of riverine wetlands within the Project Area, with approximately 8,044 feet and 54 acres within the FERC Project Boundary. Remaining NWI classified wetland habitats in the Project Area

³ For the purposes of this document, the Project Area is defined as the area within the Federal Energy Regulatory Commission (FERC) existing Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within about 0.25 mile of the FERC Project Boundary) and includes Project-affected reaches between Project facilities and downstream to the next major water controlling feature or structure.

⁴ The FERC Project Boundary is the area that YCWA uses for normal Project operations and maintenance, and is shown on Exhibits J, K, and G of the current license.

⁵ National Wetland Inventory (NWI) mapped distances and areas are presented in terms consistent with the information in YCWA's PAD.

include approximately 63,926 feet and 13 acres of palustrine wetlands and approximately 4,635 acres of reservoir open water.

NWI riparian wetlands have been classified using aerial imagery but no ground-mapping data is known to exist to support this inventory. In addition, the site-specific assessments of riparian habitats or habitat condition within the FERC Project Boundary are not adequate for relicensing purposes. To achieve the study goals, additional information is needed.

5.0 Study Methods and Analysis

5.1 Study Area

For the purpose of this study, the study area includes the Yuba River from USACE's Englebright Dam (RM 24) to the Marysville Gage (RM 6.2)⁶. The Study Area does not extend farther downstream because backwater effects of the Feather River may confound Project effects. The lateral boundaries of the Study Area extend to the toe slope of the river valley, training walls, or to a change from riparian species to upland species, whichever is the greater distance. For the purposes of this study, riparian plant species are defined by Reed (1998) or a similar reference.

If YCWA proposes an addition to the Project, the study area will be expanded if necessary to include areas potentially affected by the addition.

5.2 General Concepts and Procedures

The following general concepts and practices apply to the study:

- Personal safety is the most important consideration of each fieldwork team.
- Licensee will make a good faith effort to obtain permission to access private property where needed well in advance of entering the property.
- Field crews may make minor variances to the FERC-approved study in the field to accommodate actual field conditions and unforeseen problems. When minor variances are made, Licensee's field crew will follow the protocols in the FERC-approved study.
- When Licensee becomes aware of major variances to the FERC-approved study, Licensee will issue an e-mail to the Relicensing Contact List describing the variance and reason for the variance. Licensee will contact by phone the Forest Service (if the variance is on National Forest System land), USFWS, SWRCB and CDFG to provide an opportunity for input regarding how to address the variance. Licensee will issue an e-mail to the Relicensing Contact List advising them of the resolution of the variance. Licensee will summarize in the final study report all variances and resolutions.

⁶ River miles (RM) were calculated using the National Hydrography Dataset (NHD) GIS data. River miles start at the confluence of a stream or river into another stream or river (river mile 0) and increase upstream to the terminus of the stream. River miles denoted here indicate the location as measured from the confluence of the Yuba River with the Feather River.

- Licensee's performance of the study does not presume that Licensee is responsible in whole or in part for measures that may arise from the study.
- Global Positioning System (GPS) data will be collected using either a Map Grade Trimble GPS (sub-meter data collection accuracy under ideal conditions), a Recreation Grade Garmin GPS unit (3 meter data collection accuracy under ideal conditions), or similar units. GPS data will be post-processed and exported from the GPS unit into Geographic Information System (GIS) compatible file format in an appropriate coordinate system using desktop software. The resulting GIS file will then be reviewed by both field staff and Licensee's relicensing GIS analyst. Metadata will be developed for deliverable GIS data sets. Upon request, GIS maps will be provided to agencies in a form, such as ESRI Shapefiles, GeoDatabases, or Coverage with appropriate metadata, that is useful for interactive data analysis and interpretation. Metadata will be Federal Geographic Data Committee (FGDC) compliant.⁷
- Licensee's field crews will record incidental observations of aquatic and wildlife species observed during the performance of this study. All incidental observations will be reported in the appropriate Licensee report (e.g., incidental observations of special-status fish recorded during fieldwork for the Special-Status Turtles – Western Pond Turtle Study will be reported in Licensee's Stream Fish Populations Study report). The purpose of this effort is not to conduct a focus study (i.e., no effort in addition the specific field tasks identified for the specific study) or to make all field crews experts in identifying all species, but only to opportunistically gather data during the performance of the study.
- Field crews will be trained on and provided with materials (e.g. Quat) for decontaminating their boots, waders, and other equipment between study sites. Major concerns are amphibian chytrid fungus, and invasive invertebrates (e.g. zebra mussel, *Dreissena polymorpha*). This is of primary importance when moving: 1) between tributaries and mainstem reaches; 2) moving between basins (e.g. Middle Yuba River, Yuba River, and North Yuba River); and 3) moving between isolated wetlands or ponds and river or stream environments.

5.3 Methods

The study will be implemented in one or two phases, as necessary. Phase one will be implemented in 2012 and includes five steps: 1) site selection 2) gather data and prepare for field effort; 3) conduct field surveys; 4) prepare data and quality assure/quality control (QA/QC) data; and 5) prepare report. Each step of this phase is described below in the remainder of the Methods Section, Steps 1-5.

Phase two of the study will be performed if YCWA and Relicensing Participants collaboratively agree that additional riparian information is needed and collaborative agreement on study methods is reached.

⁷ The Forest Service and CDFG each have requested that a copy of the GIS maps be provided to them when the maps are available.

5.3.1 Phase One

5.3.1.1 Step 1 - Site Selection

Riparian habitat study sites are generally selected within a reach to represent the range of channel and habitat types in the reach (Bovee 1982). The characteristic feature of a study reach is homogeneity of the channel structure and flow regime. The sites chosen will represent those sites most likely to exhibit effects of project features and operations on channel morphology and habitat features. Study sites will extend from the wetted edge of the river to the toe slope of the valley, training walls, or to a change from riparian species to upland species, whichever is the greater distance. For the purposes of this study, riparian plant species are defined by Reed (1998) or a similar reference.

The Lower Yuba River has been qualitatively divided into reaches on the basis of key geomorphic or topologic features, including changes in slope in the longitudinal profile and associated geomorphic variables. The reaches occurring within the study area are described as: 1) Englebright Dam, 2) the Narrows, 3) Timbuctoo Bend, 4) Parks Bar, 5) Dry Creek, 6) Daguerre Point Dam, 7) Hallwood, and 8) Marysville (Wyrick and Pasternack 2011) (Table 5.3.1-1).

Table 5.3.1-1. Lower Yuba River reaches delineated by geomorphic characteristics.¹

Reach Name	Valley Width (ft)			Bed Slope (%)	Thalweg Length (ft)	Starting Point Description
	Minimum	Mean	Maximum			
Englebright Dam	316	415	693	0.31	129,440-133,570	Englebright Dam
Narrows	162	298	596	<i>n/a</i>	122,735-129,440	Confluence with Deer Creek
Timbuctoo Bend	318	544	1349	0.201	101,945-122,735	Onset of emergent gravel floodplain upstream of Blue Point Mine
Parks Bar	311	976	1424	0.188	75,965-101,945	Highway 20 Bridge
Dry Creek	783	1009	1607	0.135	63,500-75,965	Confluence with Dry Creek
Daguerre Point Dam	651	1472	1818	0.176	45,000-63,500	Daguerre Point Dam
Hallwood	232	889	1867	0.131	17,500-45,000	Slope break near Eddie Drive
Marysville	224	562	1251	0.052	0 – 17,500	No evident feature

¹Source: Wyrick and Pasternack 2011

The Englebright and Narrows reaches are not expected to sustain substantive riparian habitat due to the confined, steep nature of the river canyon and the predominant bedrock substrate (Harris et al. 1988). Bedrock channels are generally insensitive to short-term changes in sediment supply or discharge. Only a persistent decrease in discharge and/or an increase in sediment supply sufficient to convert the channel to an alluvial morphology would significantly alter bedrock channels (Montgomery and Buffington 1993). Because of the limited potential for riparian vegetation in this reach coupled with very limited access, study sites are not proposed in the Englebright or Narrows reaches. The Marysville reach is not proposed to be included because the backwater effects of the Feather River may confound Project effects.

A minimum of one study site is proposed for each of the remaining reaches occurring in the Study Area. A total of five study sites will be chosen to include changes in channel morphology and riparian vegetation, and additional sites will be added if more are necessary to develop a complete characterization of the riparian habitats occurring within the Study Area. Areas devoid of vegetation will be incorporated to the extent necessary to determine potential causes for the lack of riparian habitat.

5.3.1.2 Step 2 – Collect and Review Existing Data and Information

Existing data, including GIS data, historical information, reports, maps, aerial photography and all other information listed in Section 4.0, Existing Information and Need for Additional Information, relevant to riparian vegetation will be reviewed and examined in preparation for field efforts. These sources are expected to provide documentation on relevant geomorphology, topography, soils, riparian vegetation coverage and type, invasive species, and land-use (i.e., mining, timber management, recreation, road development, fires, grazing, and water diversions). This information will be employed during ground-truthing surveys, site analysis and in the creation of vegetation mapping products and is expected to increase the general understanding of the riparian systems being examined. The current condition of the riparian habitat occurring on the Yuba River will be assessed by combining existing information with field surveys.

5.3.1.3 Step 3 - Condition Assessment

Riparian areas are generally very dynamic, as seasons of drought or floods may desiccate or scour away otherwise healthy vegetation. Therefore, resilience to such events is important and can be assessed by riparian species abundance, richness, distribution and age structure. The health of a riparian community considers these factors in the context of providing resiliency to natural events, as well as structure or complexity for wildlife habitat.

Although each methodology is described in detail in the sub-sections that follow, an overview of the methods is provided in the bullets below. The information will be gathered at each study site determined in Step 1.

At each of the five lower reaches, Timbucktoo Bend, Parks Bar, Dry Creek, Daguerre Point Dam, and Hallwood (Wyrick and Pasternack 2011), the following methods will be performed.

- Vegetation Mapping
 - Field verifying LiDar and NAIP imagery (e.g., species abundance, richness, and distribution)
 - Size-class structure of riparian vegetation
 - Ground-truth vegetation mapping
- Inventory of Existing Cottonwood Stands
 - Size/age class inventory to determine when established
 - Extrapolate conditions under which cottonwoods established
- Elevation Model Topographic Map and Hydrodynamic Model

- Inundation duration and frequency of riparian vegetation
- Erosion, deposition, or other substrate movement as related to riparian vegetation
- Historical aerial photograph analysis⁸
 - Examine what changes have taken place over time
 - When changes took place
 - Examine possible causes for changes

Within selected study sites, the following methods will be applied:

- Large Woody Material
 - Locations and physical characteristics of large wood
 - Function in the channel
- General Riparian Condition
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 - Changes in channel and bank substrate (including any excessive erosion or deposition)
 - Land use activities
 - Unusual stress or mortality on riparian plant community
 - Riparian vegetative and hydrologic connectivity (or lack of)

5.3.1.3.1 Vegetation Mapping

Vegetation mapping will be performed by field verifying LiDar and NAIP imagery of the Study Area. Two sets of data will be collected during vegetation field-verification efforts: 1) Individual trees/shrubs; and 2) Vegetation patch types. This data will be used to calibrate an automatic algorithmic vegetation classification which will be applied to the aerial imagery of the survey area to result in a map of the vegetation present in the Study Area.

Individual tree/shrub data will verify the descriptive metrics of specific tree or shrub species identified on LiDAR and/or NAIP imagery. Data collection will include the canopy dimensions and location, mainstem location and diameter at breast-height (DBH), and dominant understory species. The canopy dimensions will include an estimate of the maximum height and a field-mapped polygon of the canopy perimeter. If physical access is limited in the field, or if satellite reception is blocked by the tree canopy, the mainstem location will be estimated and the canopy edge will be recorded by a minimum of four points at the canopy edge.

Vegetation patch type data will be used to verify areas of vegetation appearing to be similar on LiDAR and/or NAIP imagery. Patches occur when canopy structure is too unresolved to isolate individual trees with an appropriate level of accuracy. These vegetation patches will be identified and delineated into polygons prior to field efforts. Field verification efforts will include visual estimates of vegetation homogeneity within the delineated patch and among other vegetation patches of matching imagery. If the vegetation patch is too large to estimate

⁸ Historical aerial photograph analysis will be performed to the extent that historical aerial photographs are available for each reach.

accurately, the relevé method will be used to determine species composition and cover of woody plants. Vegetation patches may be re-delineated to match field conditions. Data collected within these patches will include woody vegetative species, percent cover, canopy height, canopy variability (emergents), dominant midstory species, and patch perimeter.

A representative number of samples will be taken from individual trees and vegetation patch types to accurately align the riparian vegetation with LiDAR and/or NAIP imagery and to precisely run an algorithmic vegetation mapping program. The data collection will be biased toward collecting individual tree/shrub data to validate the algorithmic vegetation classification because the cognition software delineates individual tree canopies, not patches like traditional methods. Thirty to 50 samples per species and vegetation patch type are expected, but may be modified if specific field needs are identified during field efforts. Ten percent of the data collection locations occurring within the upper six miles of the reach will be located to correspond with features identifiable on NAIP imagery for ensured vegetation mapping accuracy and co-rectification with LiDAR data. The Study Area will be stratified by environmental parameters (i.e., slope, aspect, distance from river, and geomorphically distinct reaches) and an effort will be made to collect samples from each representative stratum, as access allows.

A survey grade real time kinematic (RTK) GPS unit will be used for vegetation mapping efforts.

5.3.1.3.2 Inventory and Aging of Existing Cottonwood Stands

Cottonwoods are tall, fast growing riparian trees that colonize floodplain areas to create a host of riparian habitat benefits. They provide lateral stratification for wildlife habitat, shading for understory development and stream cooling, as well as generating large woody material (LWM) which provides additional habitat and contributes organic matter. These trees are disturbance dependant, with seed dispersal following springtime peak flow events for establishment in recently scoured, wet areas of receding river flows. Because cottonwoods are often considered keystone species to Central California riparian habitats, a large knowledge base can be incorporated to better understand contributing factors to the current condition of riparian habitat.

As an extension of vegetation mapping, all cottonwood stands will be located and mapped. Aging of cottonwood trees will be performed by coring a limited sample of the cottonwood population (no more than 10%). Following the vegetation mapping and historic aerial analysis, YCWA will consult with Relicensing Participants on where (strata) and how many cottonwood cores to be taken with the goal of understanding the conditions under which the existing cottonwood stands became established. Coring will be limited for the purpose of budgeting.

Once the cored cottonwood trees are aged, an estimation of the age using size class structures will be performed to determine approximately when each stand was established and if recruitment continues within each stand. The age classes will be used to retrospectively extrapolate conditions that supported the successful establishment and maintenance of the stands.

5.3.1.3.3 Digital Elevation Model Topographic Map and Hydrodynamic Model

The digital elevation model two-dimensional topographic map developed by the RMT shows the micro-topography of the entire Lower Yuba River riparian corridor up to Highway 20 and is inclusive of the five lower reaches. LiDAR produces images precise enough to determine vegetation types by heights and the SRH-2D models hydrodynamic water surface levels of the channel and banks at various flow releases. This information will be used to verify other vegetation mapping efforts in conjunction with performing vegetation plots and may be used to quantify specific vegetation communities. Inundation levels will be modeled using the SRH-2D and will be used to determine the potential to support riparian vegetation in unvegetated areas.

5.3.1.3.4 Historical Aerial Photograph Analysis

Historical aerial photograph analysis performed by James et al. (2009) for the RMT will examine what changes to riparian vegetation have taken place over time and when the changes happened. Timing in changes of the riparian vegetation can be referenced against such things as changes in river operations and major flood events and can be used to tease out potential Project effects.

5.3.1.3.5 Large Woody Material

Large woody material plays an important role in streams by shaping channel morphology, storing sediment and organic matter, and providing habitat for wildlife. Field mapping efforts of large wood material in select locations within the Lower Yuba River was performed by the RMT, but the extensive amount of LWM present made the ground surveys unrealistically time consuming. RMT field methods were revised to largely substitute aerial photograph analysis, the results of which will be included in reporting efforts, as available. In response to requests by Relicensing Participants, YCWA will conduct LWM surveys within two randomly selected study sites.

LWM occurring within study sites will be counted as follows: all LWM greater than 3 ft in length within the active channel within four diameter classes (4-12 inches, 12-24 inches, 24-36 inches, and greater than 36 inches) and four length classes (3-25 ft, 25-50 ft, 50-75 ft, and greater than 75 ft). More detailed measurements will be taken for key pieces located within riparian habitat study sites. Key pieces of LWM are defined as pieces either longer than 1/2 times the bankfull width, or of sufficient size and/or are deposited in a manner that alters channel morphology and aquatic habitat (e.g., trapping sediment or altering flow patterns). Key piece characteristics to be recorded will include:

- piece location, either mapped onto aerial photos or documented with GPS
- piece length
- piece diameter
- piece orientation
- position relative to the channel
- whether the piece has a rootwad
- tree species or type (e.g., conifer or hardwood)

- whether the piece is associated with a jam or not
- the number of large pieces in the jam
- recruitment mechanism
- function in the channel

Additional information obtained from RMT woody material mapping in the Lower Yuba River will be included as available. LWM information will be included in overall riparian assessment.

5.3.1.4 Step 4 – Prepare Phase 1 Report and Collaborate Regarding Phase 2

At the conclusion of Phase 1, YCWA will prepare a report summarizing Phase 1, provide the report to Relicensing Participants, and meet with Relicensing Participants to discuss the need for additional data collection. If YCWA and Relicensing Participants collaboratively agree additional data are needed, YCWA and Relicensing Participants will collaboratively develop the methods for Phase 2 (the methods may include greenline survey-type data collection), and YCWA will provide the methods to FERC for consideration. YCWA will implement Phase 2 as approved by FERC.

5.3.2 Step 4 – Prepare Data and Quality Assure/Quality Control Data

Following field surveys, YCWA will develop GIS maps depicting existing riparian habitat and other related information collected during the study. Field data will then be subject to QA/QC procedures, including spot-checks of transcription and comparison of GIS maps with field notes to verify locations of wetland and riparian sites found. YCWA will also produce a map for the study area that shows the extent of riparian vegetation as depicted on historic aerial photos compared to riparian vegetation extent depicted on recent aerial photos.

5.3.3 Step 5 – Prepare Report

YCWA will prepare a report that includes the following sections: 1) Study Goals and Objectives; 2) Methods; 3) Results; 4) Discussion; and 5) Description of Variances from the FERC-approved study proposal, if any. The report will include field data to support riparian condition assessment and riparian habitat maps.

The study report will focus on addressing the study goals using riparian vegetation composition, age class structure, and distribution to evaluate trends in riparian health and determine factors contributing to riparian conditions in the Study Area. These factors will be evaluated in a context of the functioning condition of the riparian habitat and what benefits (versus potential benefits) it provides to the biotic communities and abiotic systems of the Yuba River. Project effects and other current or historical land uses will also be incorporated to illustrate the best possible understanding of the conditions supporting or limiting the riparian habitat.

6.0 Study-Specific Consultation

The study includes the following study-specific consultation:

- YCWA will prepare a report summarizing Phase 1, provide the report to Relicensing Participants, and meet with Relicensing Participants to discuss the need for additional data collection. If YCWA and Relicensing Participants collaboratively agree additional data are needed, YCWA and Relicensing Participants will collaboratively develop the methods for Phase 2 (the methods may include greenline survey-type data collection), and YCWA will provide the methods to FERC for consideration. YCWA will implement Phase 2 as approved by FERC. (Step 4.)

7.0 Schedule

YCWA anticipates the schedule to complete the study as follows assuming FERC issues its Study Determination by September 16, 2011 and the study is not disputed by a mandatory conditioning agency:

Site Selection (Step 1).....	September 2011 - May 2012
Collect and Review Existing Data and Information (Step 2)	April - August 2012
Condition Assessment (Step 3).....	May - August 2012
Prepare and QA/QC Data (Step 4)	October – November 2012
Study Report Preparation (Step 5)	November 2012- February 2013
Phase Two.....	May - August 2013

8.0 Consistency of Methodology with Generally Accepted Scientific Practices

This study provides an assessment of potential Project effects on existing riparian vegetation and is consistent with the goals, objectives, and methods outlined for most recent FERC hydroelectric relicensing efforts in California. The proposed methodologies use standard assessment methods developed and used by federal land management agency personnel.

9.0 Level of Effort and Cost

YCWA estimates the cost to complete this study in 2011 dollars is between \$60,000 and \$80,000.

10.0 References Cited

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