

Riparian Vegetation Monitoring Plan

Sacramento Municipal Utility District

Hydro License Implementation • October 2016

Upper American River Project

FERC Project No. 2101



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Acronyms and Abbreviations

Acronym	Definition
BLM	U.S. Bureau of Land Management
CDFW	California Department of Fish and Wildlife
DBH	Diameter at Breast Height
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Geographic Positioning System
MW	Megawatts
NAIP	National Agriculture Imagery Program
RWQCB	Regional Water Quality Control Board
SMUD	Sacramento Municipal Utility District
SWRCB	State Water Resources Control Board
UARP	Upper American River Project
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

This Riparian Vegetation Monitoring Plan (Plan) addresses monitoring set forth in Condition 8.E of Appendix A of the new license issuance order (FERC 2014) and Condition No. 31 of Appendix B of the new license order (FERC 2014) for the Upper American River Project (UARP; FERC Project 2101), owned and operated by the Sacramento Municipal Utility District (SMUD), as well as the U.S. Department of Agriculture, Forest Service (USFS) section 4(e) Condition No. 15 for the Slab Creek Flow Facility Project License Amendment (USFS 2015). Attachments 1, 2, and 3 contain the language from the three documents as applicable to this Plan.

The UARP lies within El Dorado and Sacramento counties, primarily within lands of the Eldorado National Forest. The UARP consists of three major storage reservoirs—Loon Lake, Union Valley and Ice House (with a combined capacity of approximately 379,000 acre-feet), eight smaller regulating or diversion reservoirs, and eight powerhouses. The UARP has an authorized installed capacity of 637 megawatts (MW). The UARP also includes recreation facilities containing over 700 campsites, five boat ramps, hiking paths, and bicycle trails at the reservoirs.

As described in the new license conditions, this Plan builds off of previous work performed during the UARP relicensing process. A 2003 riparian vegetation study conducted during relicensing found that development of riparian vegetation within the 12 stream reaches downstream of project dams is often limited by geomorphic conditions such as confined riverbeds and substrates too coarse to sustain well-developed stands of riparian vegetation (Devine Tarbell & Associates 2004). As a result, the prior study focused on six key project reaches that support developed riparian vegetation, where streamflow has the potential to influence riparian vegetation conditions: below Slab Creek Dam, Camino Dam, Ice House Dam, Robbs Peak Dam, Gerle Creek Dam, and Loon Lake Dam. This monitoring Plan is, thus, focused on the same reaches to: (1) maximize the value of the data collected by selecting reaches with responsive channel morphology and riparian plant communities, and (2) allow for comparisons of riparian conditions before and after the implementation of the new UARP license. In addition to this monitoring plan, a Geomorphic Monitoring Plan will be implemented which may provide results relevant to riparian vegetation. Results from geomorphology monitoring will be considered where relevant data overlap temporally and spatially between the two plans.

2.0 MONITORING PLAN OBJECTIVES

The primary goals of the Plan are to document changes in riparian conditions as a result of modified stream flows and determine if riparian areas are being properly maintained or in need of restoration. Specific objectives of the Plan are to document and assess changes in riparian vegetation extent, measure and assess changes in riparian

vegetation composition, and, in coordination with the Resource Agencies, determine maintenance and/or restoration measures.

3.1 MONITORING SITES AND FREQUENCY

Monitoring conditions set forth in the license specify the monitoring sites, frequency, and methods to be included in this plan. The sites and frequency are addressed in the following subsections, and methods are presented in Section 4.0.

3.2 STUDY AREA AND MONITORING LOCATIONS

The 2003 relicensing study identified 24 sub-reaches within the six identified reaches and established one or more sampling sites categorized as either reconnaissance, ground-truth, or intensive survey sites. These categories were based on susceptibility to UARP effects, such as changes in flow regime, as influenced by the following characteristics (Devine Tarbell & Associates 2004):

- Presence of an alluvial channel;
- Channel not confined by bedrock banks or valley walls;
- Slopes less than 4 percent;
- Presence of a well-developed floodplains (relative to other sites in the reach);
- Accessible by field crews; and
- Coincident with a channel morphology study site, whenever possible.

The 10 intensive survey sites identified in the 2003 study¹ (Devine Tarbell & Associates 2004) are the subject of this monitoring plan as these sites received the most detailed investigations of the three categories, including quantitative assessments and mapping.

Monitoring under this Plan is focused on the previous intensive survey sites, since these locations have the potential to be most indicative of project effects and there is mapping and vegetation data to compare with. All sites are located on public land except for one of the previous intensive sites, Robbs Peak Dam reach site RPD-RV15, which is located on private property and cannot be reoccupied for future monitoring; however, an additional site has been added in support of the License Amendment request for the new Slab Creek Powerhouse (SCD-RV5). As a result, this Plan includes a total of 10 monitoring sites (Figure 1):

1. SCD-RV1 – approximately 1,350-foot long site, upstream of White Rock Powerhouse.
2. SCD-RV3 – approximately 600-foot long site in the Slab Creek Dam reach of the South Fork American River, upstream of the Rock Creek confluence.

¹ Conditions 8.E of Appendix A and Condition No. 31 of Appendix B of the new UARP license issued by FERC erroneously identify the number of intensive survey sites from the riparian report as 15.

3. SCD-RV5 – approximately 300-foot long site downstream of Slab Creek Dam, upstream of Iowa Canyon Creek. This site is a new survey site, and although there is not baseline data for this site, data collected during 2010 in support of the amendment application will be used to the extent appropriate.²
4. CD-RV4 – approximately 350-foot long site in the Camino Dam reach of Silver Creek, upstream of the confluence with South Fork American River.
5. IHD-RV1 – approximately 450-foot long site in the Ice House Dam reach of South Fork Silver Creek, upstream of the confluence with Silver Creek.
6. IHD-RV5 – approximately 1,000-foot long site in the Ice House Dam reach of South Fork Silver Creek, downstream of Ice House Reservoir.
7. GCD-RV1 – approximately 500-foot long site in the Gerle Creek Dam reach of Gerle Creek, upstream of South Fork Rubicon River confluence. A portion of this site is on private property and thus a portion of the site cannot be included in the monitoring. If possible, the site will be expanded to make up for the inaccessible portion.
8. LLD-RV3 – approximately 475-foot long site in the Loon Lake Dam reach of Gerle Creek, upstream of Gerle Creek Reservoir.
9. LLD-RV10 – approximately 800-foot long site in the Loon Lake Dam reach of Gerle Creek, downstream of Jerrett Creek confluence.
10. LLD-RV17 – approximately 650-foot long site in the Loon Lake Dam reach of Gerle Creek, downstream of Loon Lake. A portion of this site is on private property and cannot be included in the monitoring.

² This site is associated with USFS section 4(e) Condition No. 15 for the Slab Creek Flow Facility Project License Amendment, and is not specified as part of current License Conditions.

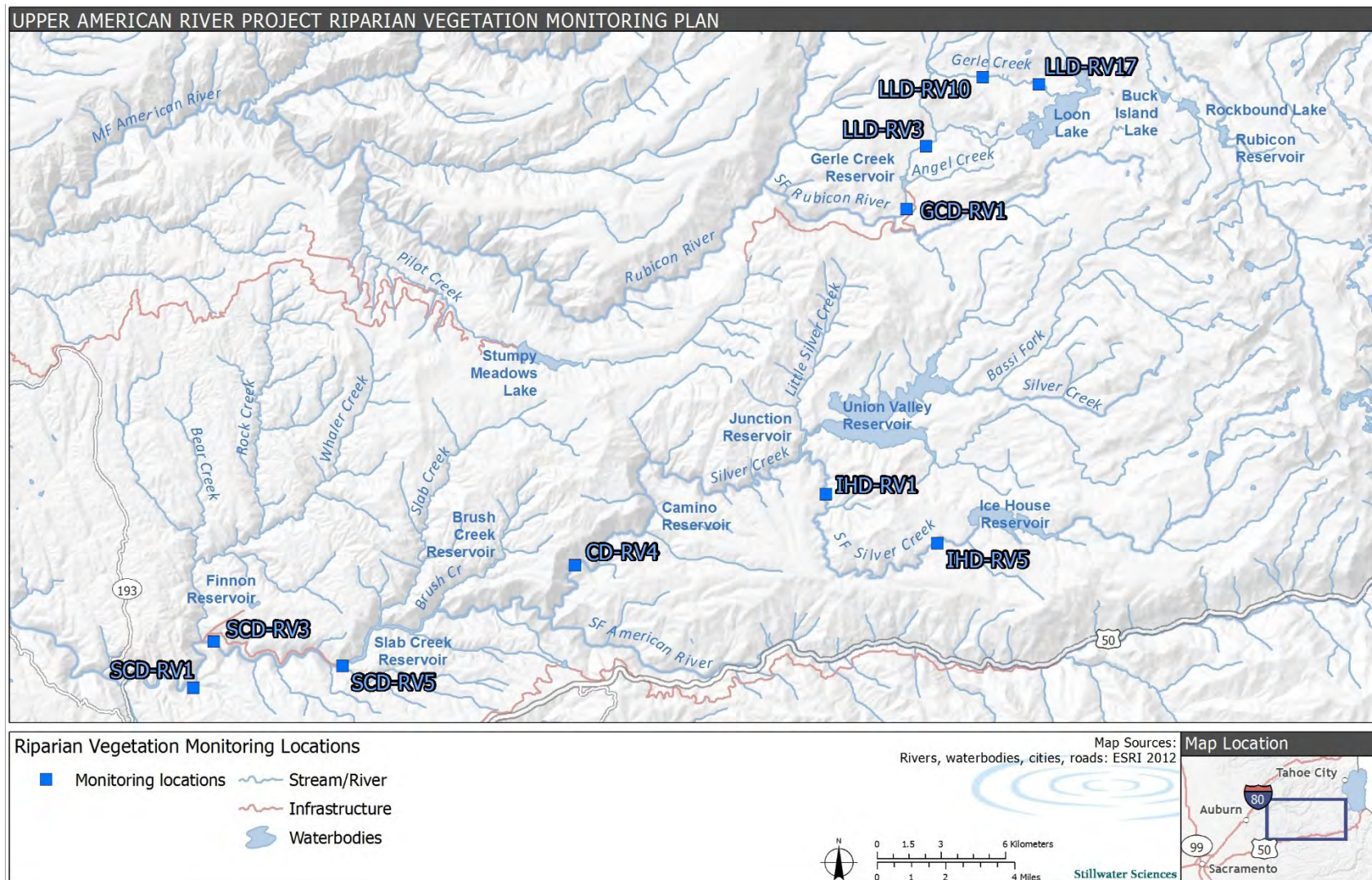


Figure 1. Riparian vegetation study area and monitoring locations in the UARP.

3.3 MONITORING FREQUENCY

Riparian vegetation monitoring will occur in Years 5, 10, and 15 after license issuance, and every 10 years thereafter (e.g., Years 25, 35, 45, etc.) for the term of the license and any extensions or until the new License is issued, unless modified by SMUD and the agencies after review of monitoring results in Year 5 or beyond.

4.1 METHODS

Riparian vegetation monitoring will consist of: (1) mapping riparian vegetation at each monitoring site to quantify riparian vegetation length and width; and (2) conducting transect and greenline surveys at each monitoring site to document species composition and percent cover. The monitoring methodologies proposed are consistent with the methods used during the 2002–2004 riparian studies (Devine Tarbell & Associates 2004) and generally accepted practices in the scientific community. The proposed methodologies use standard riparian monitoring methods developed and used by federal land management agency personnel, such as Winward (2000), Cooper and Merritt (2012), and U.S. Department of Agriculture (USDA), Forest Service (2014).³ Data to be collected is described in the following sections and a list of data to be collected (to be transformed into standardized data sheets or electronic tablet templates) is provided in Attachment 4.

4.2 RIPARIAN VEGETATION EXTENT/AERIAL IMAGERY INTERPRETATION

For each monitoring year (i.e., Years 5, 10, and 15 after license issuance, and every 10 years thereafter for the term of the license and any extensions, or until the new License is issued), the most recently available USDA National Agriculture Imagery Program (NAIP) aerial imagery (which is typically updated every three years) covering the monitoring sites will be acquired, or any more recent imagery that may have been collected for the study area (e.g., WorldView imagery). Acquired imagery will be of sufficient quality (e.g., 1-meter [m] resolution) to detect riparian vegetation boundaries.

For each monitoring year, the boundaries of riparian vegetation within the monitoring sites, as captured by the most recently available aerial imagery, will be digitized in a Geographic Information System (GIS), using a 0.25-acre minimum mapping unit, as supported by the imagery resolution. If different riparian vegetation types are evident in the imagery, these will be digitized separately and, if possible, categorized in accordance with the Manual of California Vegetation (Sawyer et al. 2009) vegetation classification system. If categorization at the detail indicated by Sawyer et al. (2009) is not possible, the USDA Forest Service's Calveg categories will be used. Note that

³ Numerous additional vegetation monitoring protocols were reviewed (e.g., Prichard 1993, Gebhardt et al. 2005, Archer et al. 2008, Burton et al. 2011, YCWA 2012, Dickard et al. 2015), but were ultimately determined to be inappropriate for the study area (e.g., Burton et al. [2011] focuses on assessing grazing impacts) or consistent with the methods already cited.

during the 2003 study (Devine Tarbell & Associates 2004), vegetation classification followed the CalVeg system described by Matyas and Parker (1980) and the United States Forest Service (USDA Forest Service 2000). A comparison between the 2003 vegetation classification and Manual of California Vegetation (Sawyer et al. 2009) vegetation classification used by this study will be provided. Mapped vegetation types will be verified at the monitoring sites: (1) in any areas that can be safely accessed that are deemed ambiguous in the imagery; (2) along and adjacent to the perpendicular transects (see Section 4.2); and (3) along and adjacent to the parallel greenline sampling surveys (see Section 4.2). The imagery interpretation and subsequent ground-truthing/field verification will result in a map and quantification of riparian vegetation types at each monitoring site.

4.3 RIPARIAN VEGETATION COMPOSITION/TRANSECT AND GREENLINE SURVEYS

At each monitoring site, three (3) permanent transects perpendicular to the river will be established (see Figure 2).⁴ Transects will cover the entire riparian corridor, from the boundary with upland vegetation on one side of the river valley to that on the other, including the river channel. If access across the river is unsafe and the opposite bank cannot be accessed reasonably by land, transects will cover half of the riparian corridor, from the boundary with upland vegetation to the river water's edge. Transect locations will be selected to re-occupy the 2003 riparian vegetation study transects (Devine Tarbell & Associates 2004), to the extent possible. If reoccupation is not feasible or transects were not previously established (i.e., at SCD-RV5), transects will be established (in coordination with any Resource Agency participants) to capture representative riparian conditions and variability of riparian conditions at the monitoring site. The upland ends of each transect will be marked with a firmly-installed and labeled rebar stake, recorded with a Geographic Positioning System (GPS) unit with sub-meter accuracy, photo-documented with at least one stable reference point (e.g., a large boulder or tree), and described to facilitate relocating the stake in the future. A compass bearing will be taken from the upland transect endpoint toward the river water's edge to facilitate relocating the same transect alignment in the future.

Along each transect, a line-point intercept survey will be conducted (see Figure 2). Beginning at the river-left (facing downstream) end of each transect, all plant species that intercept each 1-m increment of the transect will be recorded per USDA Forest Service (2014). A densitometer or laser will be aimed downward for lower layers of vegetation and upward for upper layers to assist in determining which species intersects with the transect station (i.e., line point). For lower canopies, the first species viewed or intercepted by the laser will be recorded as a "hit" or presence of that species. Vegetation will be moved out of the way after each hit, exposing higher or lower vegetation and new species. A stadia rod may be used to move overstory vegetation layers once they have been recorded to expose additional upper layers. The layer class

⁴ The 2002–2004 riparian vegetation studies included one to three transects at the monitoring sites.

occupied by each species that is intercepted will be recorded: (1) low/understory vegetation (<1 m), (2) mid-story vegetation (1-5 m), and (3) canopy (>5 m). This will be repeated for all species that intercept the points on the transect until the ground cover is reached, and a ground cover category (e.g., bare soil, gravel, cobble, boulder, bedrock, or water) will be recorded.

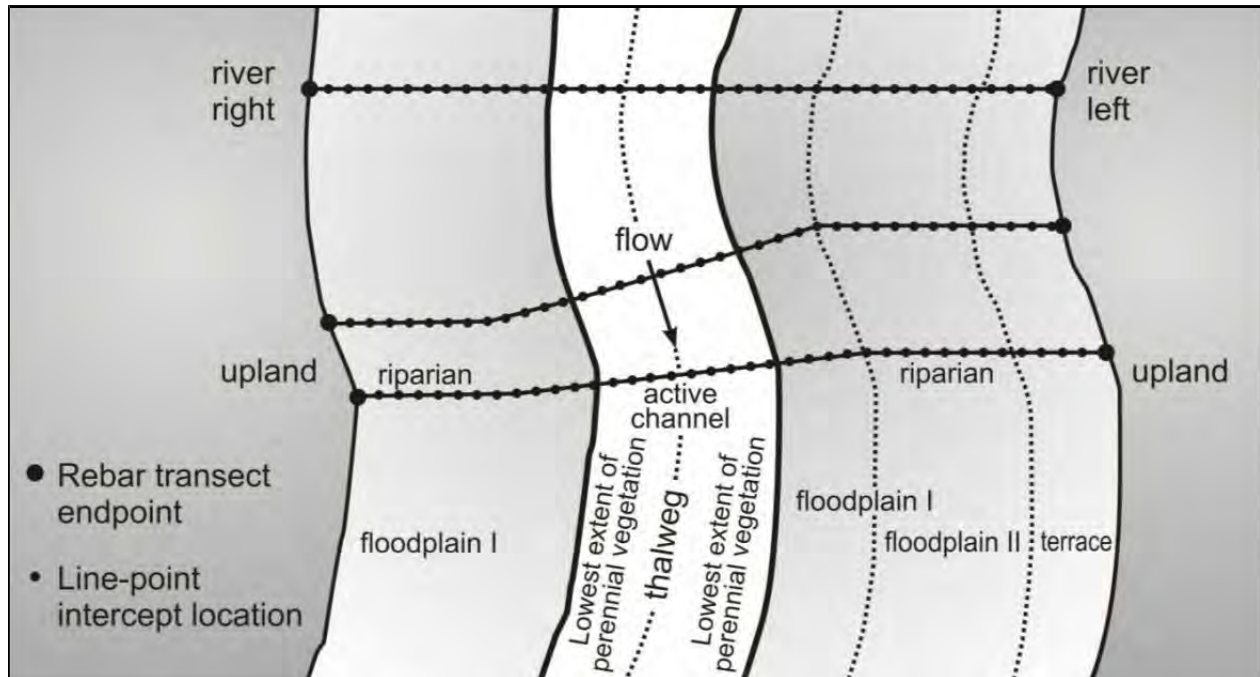


Figure 2. Diagram of hypothetical transect and line-point intercept locations at riparian vegetation monitoring sites (from USDA Forest Service 2014).

Along each transect (including 1-m on either side of the center line), the following additional information will also be recorded:

- The location of the “greenline” as defined by Winward (2000) (i.e., the first perennial vegetation that forms a lineal grouping of community types on or near the water’s edge) (see additional greenline sampling methods below).
- The location and species of woody seedlings and saplings to track whether recruitment is occurring.
- The location/boundaries of key geomorphic features such as terraces, floodplain, streambanks, active channel, and in-channel bars (the relative elevations of these geomorphic features will be measured in reference to bankfull elevations).
- Any indications of alteration, bank instability, recreation or other land use impacts, or unusual plant stress or mortality.
- The overall vegetation type or types along each transect, and their lengths, using the Manual of California Vegetation (Sawyer et al. 2009) vegetation classification

system (this information will be used to ground-truth, verify, and, as necessary, correct the riparian vegetation mapping described in Section 4.1 along and adjacent to transects). Field crews will use electronic (tablet) and/or field maps depicting the preliminary vegetation map for data collection, updates, and annotations.

- Any nonnative invasive or unusual/rare species not detected from the line-point intercept survey.
- Photographs from each transect end taken from each of four directions (e.g., upstream, downstream, streamside, upslope).

Tree and shrub frequency, size, age, and vigor will be assessed at points along transects using the point-centered quarter method (USDA Forest Service 2014). Point-centered quarters will be established along each transect using a line cast perpendicular to the transect (to create four quadrants per point; see Figure 3), and the station along the transect will be recorded so that it can be reoccupied in later study years. A minimum of seven points will be established within tree- and shrub-dominated portions of each transect and will be located at consistent intervals within those portions. This will result in a minimum of 21 points per site (i.e., 7 points per transect, 3 transects per site) (a minimum of 20 points are required per USDA Forest Service 2014). After completing the line-point intercept survey, the field crew will determine the distance of tree- and shrub-dominated vegetation along the transect and locate point-centered quarters accordingly. In each of the four quarters, the closest tree or shrub to the center point will be identified to species and the distance to that tree from the center will be measured. For each tree, diameter at breast height (DBH) will be measured and an age and vigor class will be recorded using the codes in Tables 1 and 2. For each shrub, an age and vigor class will be recorded (Tables 1 and 2). Point-centered quarters must be far enough apart that the same tree or shrub is not sampled in two adjacent quarters.

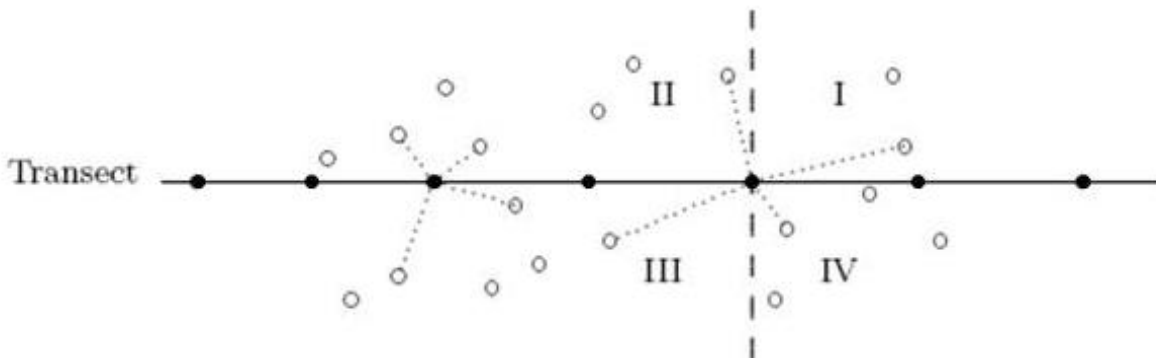


Figure 3. Diagram of hypothetical point-centered quarters along a riparian vegetation monitoring transect (from USDA Forest Service 2014). Filled circles are line-point intercept locations; unfilled circles are trees or shrubs; dotted lines and Roman numerals indicate the boundaries of each point-centered quarter.

Table 1. Tree and shrub age classes¹

Tree Age Classes	Shrub Age Classes
T1 = Seedling (≤ 1 year old)	S1 = Seedling (≤ 1 year old)
T2 = Recruit/Sapling (2-4 years old)	S2 = Recruit (2-4 years old)
T3 = Young Tree (4-10 years old)	S3 = Mature (>4 years old and $<20\%$ dead)
T4 = Mature (>10 years old and $<20\%$ dead)	S4 = Decadent (>4 years old and $\geq 20\%$ dead)
T5 = Decadent (>10 years old and $\geq 20\%$ dead)	

¹ Age classes will be estimated using best professional judgment including indicators such as the number of branch whorls (in conifers) and reproductive status.

Table 2. Tree and shrub vigor classes (from USDA Forest Service 2014)

Vigor Class	Description
1. Dead	Complete leaf death (that is not attributable to normal winter or summer deciduous species)
2. Critically stressed	Major leaf death and/or branch die back ($>50\%$ of canopy affected)
3. Significantly stressed	Prominent leaf death and/or branch die back (21–50% of canopy affected)
4. Stressed	Minimal leaf death and/or branch die back (11–20% of canopy affected)
5. Normal	Little or no sign of leaf stress (5–10% of canopy affected)
6. Vigorous	No sign of leaf stress/very healthy looking canopy ($< 5\%$ of canopy affected)

Sampling of the greenline (i.e., the first perennial vegetation that forms a lineal grouping of community types on or near the water's edge) will be conducted between the upstream-most and downstream-most transect at each monitoring site. Based on the length of the monitoring sites, the distance between these transects is expected to be close to or exceed the minimum greenline sampling distance of 363 feet that is recommended by Winward (2000); in the event that the distance between the upstream-most and downstream-most transects is less than 363 feet, the greenline sampling will extend beyond the transects to ensure a minimum of 363 feet is sampled. To determine the distance walked along the greenline transect, the average length of the sampler's steps will be measured (e.g., if the measured length of the sampler's step is 2.5 ft/step, then a minimum of 145 steps will be take on each side [$363/2.5=145$]). Beginning at the upstream-most transect, the greenline will be walked and the number of paces (of known step length) within each discrete type of greenline vegetation or unvegetated substrate type will be recorded, until the downstream-most transect is reached. The channel will then be crossed, and the same process continued for the other side of the channel. During greenline sampling, field crews will also verify vegetation type(s) along and adjacent to the greenline vegetation community using the Manual of California Vegetation (Sawyer et al. 2009) vegetation classification system to ground-truth, verify, and, as necessary, correct the riparian vegetation mapping described in Section 4.1. As done during the perpendicular transect surveys, field crews will use electronic (tablet) and/or field maps depicting the preliminary vegetation map for data collection, updates, and annotations.

Transect and greenline surveys will occur (1) during lower flow periods to facilitate safe crossing of the river, (2) prior to deciduous species losing their leaves to facilitate

accurate line-point intercept surveys, and (3) when plant phenology ensures the accurate identification of the majority of plant species. This will generally be during late summer.

4.4 ANALYSIS

4.3.1 Riparian vegetation extent/aerial imagery interpretation

Each monitoring year's riparian vegetation extent (length, width, and area) will be mapped and calculated in GIS, based on digitizing each study year's most recently available aerial imagery. Riparian vegetation extent at each of the monitoring sites and for each riparian vegetation type will be calculated in GIS and reported separately.

4.3.2 Riparian vegetation composition/transect and greenline surveys

The line-point intercept survey results will be used to calculate the percent cover of key species (e.g., dominant, representative, and/or nonnative species), species diversity (e.g., total number of species), and each vegetation layer across each transect. The wetland indicator status (from the most recent U.S. Army Corps of Engineers wetland plant list for the western mountains, valleys, and coast region [Lichvar et al. 2016]) for all plant species encountered will be summarized. This analysis will be used to assess vegetation composition and canopy complexity, and can be reported separately for each transect or averaged across transects to assess each monitoring site in order to make comparisons over time.

The point-centered quarter data (i.e., tree and shrub species, DBH, age, and vigor) will be tabulated and averaged/summarized for each transect. This analysis will be used to assess tree and shrub composition, successional stage, and overall health. Depending on the monitoring site characteristics, this data may be reported separately for each transect, average across transects, or averaged across vegetation types, to assess each monitoring site.

The total steps taken in each greenline vegetation type and unvegetated substrate type at each monitoring site will be multiplied by the average length of the walking field crew's stride to calculate the approximate length of each type. The cumulative length of each greenline cover type will then be divided by the total length between the upstream-most and downstream-most transect to calculate the percent composition for each greenline cover type. The cover types will be looked up in Winward (2000) to identify each type's (or the closest related type) successional status and stability class; a comparison between the UARP riparian vegetation types and the most similar Winward (2000) riparian community types will be developed to facilitate the application of the associated stability classes and successional stages.

5.0 REPORTING

Each calendar year, by April 1, SMUD shall schedule and facilitate an Annual Review of Ecological Conditions meeting with the Resource Agencies (i.e., USFS, CDFW, U.S. Fish and Wildlife Service [USFWS], and SWRCB) to review and discuss the results of implementing this plan (FERC 2014). The report will be provided at least two weeks prior to the Annual Review of Ecological Conditions.

SMUD shall file with FERC by June 30 of each year an annual report fully describing the monitoring efforts of the previous calendar year. The Resource Agencies shall have at least 30 days to review and comment on the draft report prior to filing with FERC. SMUD shall provide copies of the annual report to the Resource Agencies.

The annual monitoring report will include a summary of the methods used and the results of the analyses described in Section 4. In addition, any Eldorado National Forest special-status plant species encountered during sampling will be included in the annual monitoring report. Each study year's results will be compared with previous years, as feasible, and any discernable/notable changes between years at individual monitoring sites will be discussed. To the extent possible, given the amount of time that modified streamflows have been in effect, how modified streamflows or uncontrolled high flow events may be influencing riparian conditions and changes therein will be discussed, as well as whether riparian areas are in proper functioning condition (per Dickard et al. 2015 and based on the data collected during the monitoring), or in need of maintenance or restoration will be made in each monitoring report. Any data collected (e.g., species lists, photographs, raw data) that is not already included in the report, and standard GIS shapefiles, will be provided upon request.

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Attachment 1
State Water Resources Control Board 401 Certification for the
UARP Condition 8.E

8.E Riparian Vegetation Monitoring

Within two years of license issuance, the Licensee shall develop a riparian vegetation monitoring plan in consultation with USFS, CDFW, USFWS, and the State Water Board. The Licensee shall provide the Deputy Director with any comments provided by the agencies during the consultation process. The Licensee shall submit the plan to the Deputy Director for review and approval after agency consultation. The Licensee shall provide the Deputy Director with at least 90 days to review and approve the plan prior to submittal to the Commission, if applicable. The Deputy Director may require modifications as part of the approval. The Licensee shall file the Deputy Director's approval, together with any required plan modifications, with the Commission.

Method: The Licensee shall conduct analysis using aerial photo flights and the greenline method. Data collected at each site shall include transects to document species composition, percent cover, and quantification of length and width of riparian community.

Location: Monitoring shall be conducted at the 15 Intensive Field Study Sites (riparian) that were surveyed in the Riparian Study filed with the Commission as part of the License Application on July 15, 2005. The Riparian Vegetation and Wetlands Technical Report (October 2004) defines the greenline as "...the first perennial vegetation that forms a lineal grouping of community types on or near the water's edge..." As described in the Riparian Vegetation and Wetlands Technical Report, each greenline is described by the cumulative distance in feet occupied by each community type.

Timing: Years 5, 10, 15,

Attachment 2.
U.S. Department of Agriculture, Forest Service section 4 (e)
Condition for the UARP

Condition No. 31 Riparian Vegetation Monitoring

Within 2 years of license issuance, the licensee shall develop a riparian vegetation monitoring plan in consultation with FS, CDFG, FWS, and SWRCB. The licensee shall provide FS, CDFG, FWS, and SWRCB a 90-day review and approval period for the monitoring plan prior to implementation. The licensee shall implement the plan upon approval.

Method: Aerial photo flights and Greenline method at the 15 Intensive Field Study Sites (riparian) that were surveyed in the Riparian Study filed at FERC as part of the licensee's application for new license on July 15, 2005. Data collected at each site will include transects to document species composition, percent cover, and quantification of length and width of riparian community.

Frequency: Years, 5, 10, 15, and thereafter for every 10 years for the term of the license.

Rationale: Monitoring at the end of each 5-year period provides an index of changes in riparian conditions over that period of modified streamflow (it should be noted that, depending on the water year cycle that occurs, 5 years may be a relatively short response time for riparian vegetation) to determine if riparian areas are in proper functioning condition and if riparian areas are being maintained or in need of restoration.

Attachment 3.
U.S. Department of Agriculture, Forest Service section 4 (e)
Condition for Slab Creek Powerhouse and Flow Facility

Condition No. 15 Special-Status Plant Protection Plan

Prior to undertaking any activities on National Forest System lands, licensee shall complete a Special-Status Plant Protection Plan for FS approval. Licensee shall submit the plan to FS at least 180 days prior to undertaking activities on National Forest System lands. The plan shall be developed in consultation with FS, CDFW, and FWS. The plan shall include measures to minimize the probability of Project construction and/or operational impacts on *Clarkia biloba* ssp. *Brandegeae*. The plan will include a number of measures, including species protection during construction, employee training, development of an appropriate GIS database, and inclusion of special-status plants at the Project site into the UARP Vegetation Management Plan. Licensee will also include a riparian vegetation monitoring site within the ¼-mile reach in addition to the riparian monitoring sites throughout the UARP. Once the plan is approved by FS, it shall be filed with FERC.

**Attachment 4.
List of Data to Be Collected**

1. Riparian Vegetation Mapping (ground-truthing)

Study Site Name

Date

Crew

Location (GPS point, transect number/station number, and/or GIS polygon number for verification)

Preliminary (aerial-interpretation) veg type

Field verified veg type

Dominant species

Notes

QC check completed (initial and date)

2. Riparian Vegetation Transects

Study Site Name

Transect Number

Date

Crew

Transect start river-left (GPS point, photo number/reference point and photos in each of four directions [upstream, downstream, streamside, upslope], description, notes, compass bearing toward water's edge, riparian edge indicator)

Transect end river-right (GPS point, photo number/reference point and photos in each of four directions [upstream, downstream, streamside, upslope], description, notes, compass bearing toward water's edge, riparian edge indicator)

Transect length (in m)

a. Line Intercept Data:

Station Number (m along transect)

Plant species

Layer class (low/understory [<1 m], mid-story [1-5 m], or canopy [>5 m])

Ground cover category (bare soil, gravel, cobble, boulder, bedrock, or water)

QC check completed (initial and date)

b. Belt Transect Data:

Location of the greenline along transect (i.e., 5-6 m)

Location and species of woody seedlings or saplings

Location and types of geomorphic surfaces (channel thalweg, low-flow channel, low-flow channel bank, active floodplain, high flow channel bank, floodplain terrace, gravel bar, bedrock outcropping, streambank, active channel, in-channel bars, etc.)

Encroachment or bank instability (yes/no and if yes, location and type)
Recreational or other land use activities (yes/no and if yes, location and type)
Unusual plant stress or mortality (yes/no)

Vegetation Types:

- Start station (m along transect)
- End station (m along transect)
- Veg type
- Dominant species, age class by species, percent cover by species
- Substrate type
- Total percent cover (herbs, shrubs, trees, water, other)

Nonnative invasive plant species

Unusual/rare plant species

Photographs (numbers and descriptions)

Large woody debris (yes/no)

Notes

QC check completed (initial and date)

c. Point-centered Quarters Data (minimum 7 per transect assuming 3 transects/site):

Transect Number

Woody Veg Type

Quarter Number

Station along transect (m)

Woody species individuals 1-4 (1 in each quarter of the point-centered quarter
(species name, distance from center, DBH, age class, vigor class)

QC check completed (initial and date)

d. Greenline Sampling Data

Study Site Name

Date

Crew

River-right/river-left

Crew step length (ft)

Minimum number of steps for minimum 363-ft sampling length

GPS start (including notes)

GPS end (including notes)

Vegetation type (or unvegetated substrate type) and associated number of steps

QC check completed (initial and date)