Study 4.1

SPECIAL-STATUS PLANTS AND NON-NATIVE INVASIVE PLANTS STUDY

October 2016

1.0 Project Nexus

South Sutter Water District's (SSWD) continued operation and maintenance (O&M) of the Camp Far West Hydroelectric Project (Project) may have an effect on special-status plants and lead to the spread of non-native invasive plants (NNIP).

For the purpose of this Special-status Plants Study (Study), a special-status plant is a plant species that has a reasonable possibility of being affected by Project O&M or associated recreation and meets one or more of the following criteria: 1) is listed by the Sacramento, California, office of the United States Department of the Interior, Fish and Wildlife Service (USFWS) as a Species of Concern (USFWS-S); 2) listed by the California Department of Fish and Wildlife (Cal Fish and Wildlife) as a California Rare (SR) species under the Native Species Plant Protection Act; 3) Fully Protected (FP) under California law; 4) listed as threatened or endangered under the California Endangered Species Act (CESA); or 5) listed on the California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants.[1]

For the purpose of this Study, NNIP an NNIP is a plant species listed as a noxious weed by the California Department of Food and Agriculture (CDFA).[2,3]

2.0 Study Goals and Objectives

The goal of this Study is to supplement existing information regarding special-status plant species or the spread of NNIPs.

The objective of this Study is to gather the information necessary to meet the Study goal.

The Study does not include the development of potential requirements in the new license.

[1] Botanical species listed as threatened or endangered, or a candidate or proposed for listing, under the Endangered Species Act (ESA) are addressed in a SSWD's relicensing Study 5.1, ESA-Listed Plants.

[2] CDFA-designated noxious weeds are typically assigned one of three ratings: 1) A-list plants are mandated for eradication or control; 2) B-list plants are widespread plants that Agricultural Commissioners may designate for local control efforts; and 3) C-list plants are considered too widespread to control (CDFA 2015).

[3] Aquatic invasive plants, including algae, are not addressed in this Study.

3.0 Existing Information and Need for Additional Information

3.1 Special-status Plants

Existing, relevant and reasonably available information regarding botanical resources and special-status plants in the Project Vicinity[4] is provided in Section 3.2.4.2 of SSWD's Pre-Application Document (PAD). SSWD identified 13 special-status plants species known to occur or with the potential to occur in the Project Vicinity, five of which were in United States Geological Survey (USGS) 1:24,000 scale topographic quadrangles containing the existing Federal Energy Regulatory Commission (FERC) Project Boundary. Table 3.1-1 provides for each of these special-status plants: 1) status; 2) flowering period; 3) elevation range; 4) habitat requirements; 5) USGS quadrangle; and 6) documented occurrence in the Project Vicinity. The list has been developed as a guide of species likely to occur within the existing FERC Project Boundary; however, all special-status plant species located during the Study will be mapped and reported.

Table 3.1-1. Special-status plants known or with the potential to occur in the Project Vicinity.

Common Name/ Scientific Name	Status[1]	Flowering Period	Elevation Range (ft)	Habitat Requirements	USGS Quadrangle(s)	Known From Project
FOUND WITHIN QUARDRANGLES THAT INCLUDE THE FERC PROJECT BOUNDARY						
Mexican mosquito fern *(Azolla mexicana)*	CRPR 4.2	Aug	100-330	Marshes and swamps, ponds, slow water	Wolf	Yes, one occurrence found in seep 3, which was located along the North Shore Recreation Area
Brandegee's clarkia *(Clarkia biloba* ssp. *brandegeeae)*	CRPR 4.2	May-Jul	200-3,000	Chaparral, cismontane woodland, often roadcuts	Wolf, Camp Far West, Auburn, Gold Hill, Rough and Ready, Lake Combie, Grass Valley	Yes, two small occurrences along the south side of 'riverine' reach of the reservoir
Stinkbells *(Fritillaria agrestis)*	CRPR 4.2	Mar-Jun	32-5,100	Chaparral, cismontane woodland, valley and foothill grasslands, clay and sometimes serpentinite	Camp Far West	No
Humboldt lily *(Lilium humboldtii* ssp. *humboldtii)*	CRPR 4.2	May-Jul	295-4,200	Chaparral, cismontane woodland, lower montane woodland	Wolf, Auburn, Grass Valley, Lake Combie	No
Brazilian watermeal *(Wolffia brasilensis)*	CRPR 2B.3	Apr-Dec	65-330	Marshes and swamps (assorted shallow freshwater)	Camp Far West	No
Subtotal	*5*					
FOUND WITHIN QUARDRANGLES THAT DO NOT INCLUDE THE FERC PROJECT BOUNDARY						
Big-scale balsamroot (*Balsamorhiza macrolepis)*	CRPR 1B.2	Mar-Jun	300-4,600	Chaparral, cismontane woodland, and valley and foothill grassland (sometimes serpentine)	Lincoln	No, though potential habitat present

[4] In this Study, "Project Vicinity" refers to the area surrounding the Project on the order of USGS 1:24,000 topographic quadrangle.

Table 3.1-1. (continued)

Common Name/ Scientific Name	Status[1]	Flowering Period	Elevation Range (ft)	Habitat Requirements	USGS Quadrangle(s)	Known From Project
FOUND WITHIN QUARDRANGLES THAT DO NOT INCLUDE THE FERC PROJECT BOUNDARY (cont'd)						
Sierra foothills brodiaea *(Brodiaea sierra)*	CRPR 4.3	May-Aug	164-3,100	Chaparral, cismontane woodland, usually serpentinite or gabbroic	Rough and Ready, Grass Valley, Smartville	Yes, one occurrence along south side of 'riverine' reach of reservoir[2]
Dwarf downingia *(Downingia pusilla)*	CRPR 2B.2	Mar-May	0-1,400	Valley and foothill grassland, vernal pools	Sheridan, Lincoln, Browns Valley	No
Boggs Lake hedge-hyssop (*Gratiola heterosepala)*	CRPR 1B.2, SE	Apr-Aug	30-7,880	Marshes, swamps, and vernal pools	Lincoln	No
Ahart's dwarf rush *(Juncus leiospermus* var. *ahartii)*	CRPR 1B.2	Mar-May	100-750	Valley and foothill grassland	Lincoln	No
Legenere (*Legenere limosa*)	CRPR 1B.1	Apr-Jun	0-2,900	Vernal pools	Browns Valley	No
Brown beaked rush *(Rhynchospora capitellata)*	CRPR 2B.2	Jul-Aug	150-6,600	Lower montane coniferous forest, meadows and seeps, marshes and swamps, upper montane forest	Grass Valley	No
Pincushion navarretia *(Navarretia myersii* ssp. *myersii)*	CRPR 1B.1	Apr-May	65-1,085	Vernal pools, often acidic	Lincoln	No
Subtotal	*8*					
Total	**13**					

Sources: CNPS 2015, Sycamore Associates 2013

[1] Special-status (CDFW 2015, USFWS 2015):
CRPR: California Rare Plant Rank (CNPS 2015)
1B: Species considered rare, threatened or endangered in California and elsewhere
2: Species considered rare, threatened or endangered in California, but more common elsewhere
3: More information needed about this species; review list
4: Limited distribution; watch list
.1: Species seriously threatened in California
.2: Species moderately threatened in California
.3: Species not very threatened in California
SE = State Endangered

[2] This occurrence from Sycamore Associates in 2013 is not yet in any of the online databases.

Additional information, which will be provided by this Study, is needed to address the Study goal regarding the specific location of special-status plants in relation to Project facilities, Project O&M activities, Project recreation, and any other Project-related activities that might affect special-status plants.

3.2 Non-native Invasive Plants

Existing, relevant and reasonably available information regarding NNIPs in the Project Vicinity is provided in Section 3.2.4.2 of SSWD's Pre-Application Document (PAD). SSWD identified 38 NNIP species with a reasonable potential to be affected by the Project. Table 4.0-1 provides a target list of NNIPs for this study, including the following general information for each plant: 1)

scientific name; 2) common name; 3) CDFA status; 4) flowering period; 5) elevation; 6) preferred habitat and 7) known occurrence on the Project. Data to be collected will be based on the CDFA status: any species ranked A, B or Q will receive a quantitative analysis; any species ranked C will receive a qualitative analysis.

Table 3.2-1. NNIPs known to occur or potentially occurring in the Project Vicinity.

Common Name/ Scientific Name	CDFA Status	Flowering Period	Elevation (ft)	Habitat
KNOWN TO OCCUR WITHIN THE EXISTING FERC PROJECT BOUNDARY				
Barb goatgrass *(Aegilops triuncialis)*	B	May-Aug	Below 3,300	Disturbed sites, cultivated fields, roadsides
Italian thistle *(Carduus pycnocephalus)*	B	May-Jul	Below 3,300	Roadsides, pastures, waste areas
Yellow starthistle *(Centaurea solstitialis)*	C	Jun-Dec	Below 4,300	Pastures, roadsides, disturbed grassland or woodland
Rush skeletonweed *(Chondrilla juncea)*	A	May-Dec	Below 2,000	Disturbed areas
Bermudagrass *(Cynodon dactylon)*	C	Jun-Aug	Below 3,000	Disturbed areas
Klamathweed *(Hypericum perforatum)*	C	Jun-Sep	Below 5,000	Rangeland areas, pastures, fields, roadsides, forest clearings, burned areas
Subtotal	*6*			
NOT KNOWN TO OCCUR WITHIN THE EXISTING FERC PROJECT BOUNDARY				
Russian knapweed *(Acroptilon repens)*	A	May-Sept	Below 6,200	Fields, roadsides, cultivated ground, disturbed areas
Camelthorn *(Alhagi maurorum)*	A	Jun-Aug	Below 1,640	Agricultural areas, riverbanks
Alligatorweed *(Alternanthera philoxeroides)*	A	Jun-Oct	Below 700	Shallow water, wet soils, ditches, marshes, pond margins, slow-moving watercourse
Capeweed *(Arctotheca calendula)*	A	Mar-Jun	Below 820	Disturbed sites
Plumeless thistle *(Carduus acanthoides)*	A	May-Aug	Below 4,300	Roadsides, pastures, waste areas
Musk thistle *(Carduus nutans)*	A	Jun-Jul	330-4,000	Roadsides, pastures, waste areas
Slenderflower thistle *(Carduus tenuiflorus)*	C	May-Jul	Below 3,300	Disturbed sites, roadsides, pastures, annual grasslands, waste areas
Woolly distaff thistle *(Carthamus lanatus)*	B	July-Aug	Below 3,600	Disturbed sites
Purple starthistle *(Centaurea calcitrapa)*	B	Jul-Oct	Below 3,300	Disturbed areas
Diffuse knapweed *(Centaurea diffusa)*	A	Jun-Sep	Below 7,600	Fields, roadsides
Spotted knapweed *(Centaurea stoebe* ssp. *micranthos)*	A	July-Aug	Below 8,500	Open disturbed sites, grasslands, forested areas, roadsides
Squarrose knapweed *(Centaurea virgate* var. *squarrosa)*	A	Jun-Aug	Below 4,600	Degraded rangelands
Canada thistle *(Cirisum arvense)*	B	Jun-Sep	Below 5,900	Disturbed areas
Artichoke thistle *(Cynara cardunculus)*	B	Apr-Jul	Below 1,640	Disturbed sites, open sites in grasslands, pasture, chaparral, riparian areas, abandoned agricultural fields
Scotch broom *(Cytisus scoparius)*	C	Mar-Jun	Below 3,300	Disturbed areas
Water hyacinth *(Eichhornia crassipes)*	C	Jun-Oct	Below 650	Ponds, sloughs, waterways
Medusahead *(Elymus caput-medusae)*	C	Apr-Jul	Below 6,900	Disturbed sites, grassland, openings in oak woodlands and chaparral
Oblong spurge *(Euphorbia oblongata)*	B	Apr-Aug	Below 3,300	Waste areas, disturbed sites, roadsides, fields

Table 3.2-1. (continued)

NOT KNOWN TO OCCUR WITHIN THE EXISTING FERC PROJECT BOUNDARY (continued)				
Leafy spurge *(Euphorbia virgate)*	A	Jun-Sep	Below 4,600	Waste areas, disturbed sites, roadsides, fields
Japanese knotweed *(Fallopia japonica)*	B	Jul-Oct	Below 3,300	Disturbed moist sites, roadsides, and riparian and wetland areas, upland sites where water tables are shallow
Giant knotweed *(Fallopia sachalinensis)*	B	Jul-Oct	Below 1,640	Disturbed moist sites, roadsides, and riparian and wetland areas
French broom *(Genista monspessulana)*	C	Mar-May	Below 1,600	Disturbed areas
Hydrilla *(Hydrilla verticillata)*	A	Jun-Aug	Below 650	Ditches, canals, ponds, reservoirs, lakes
Dyer's woad *(Isatis tinctoria)*	B	Apr-Jun	Below 3,300	Roadsides, fields, disturbed sites
Hairy whitetop *(Lepidium appelianum)*	B	Apr-Oct	Below 6,600	Disturbed open sites, fields, pastures
Lense-podded whitetop *(Lepidium chalepense)*	B	Apr-Aug	Below 5,000	Disturbed open sites, fields, pastures
White-top *(Lepidium draba)*	B	Apr-Aug	Below 5,000	Disturbed, generally saline soils, fields
Dalmation toadflax *(Linaria genistifolia* ssp. *dalmatica)*	A	May-Sep	Below 3,300	Disturbed places, pastures, fields
Purple loosestrife *(Lythrum salicaria)*	B	Jun-Sep	Below 5,300	Seasonal wetlands, ditches, cultivated fields
Scotch thistle *(Onopordum acanthium)*	A	Jul-Sep	Below 5,300	Disturbed areas
Tansy ragwort *(Senecio jacobaea)*	B	Jul-Sep	Below 5,000	Disturbed sites, waste places, roadsides, fields
Gorse *(Ulex europaeus)*	B	Nov-Jul	Below 1,300	Disturbed areas
Subtotal	*32*			
Total	**38**			

Sources: NRCS 2015; Cal-IPC 2015; CDFA 2015; DiTamaso and Healy 2007; Sycamore Associates 2013

Additional information, which will be provided by this Study, is needed to address the Study goal reading the potential for the spread of NNIP.

4.0 Study Methods

4.1 Study Area

The Study Area consists of four specific areas, each with a 100-foot-wide buffer around them, within the existing FERC Project Boundary: 1) the North Shore Recreation Area (NSRA); 2) the South Shore Recreation Area (SSRA); 3) the Camp Far West Dam and associated dikes and Spillway; and 4) the Camp Far West Dam Powerhouse, for a total of 505 acres. These are the areas where SSWD's Project O&M activities or Project-related recreation could affect special-status plants or spread NNIP. The facilities are described in Section 2 of SSWD's PAD, and the Study Area is shown in Figure 4.1-1.

If SSWD proposes an addition to the Project, the Study Area will be expanded, if necessary, to include areas potentially affected by the addition.

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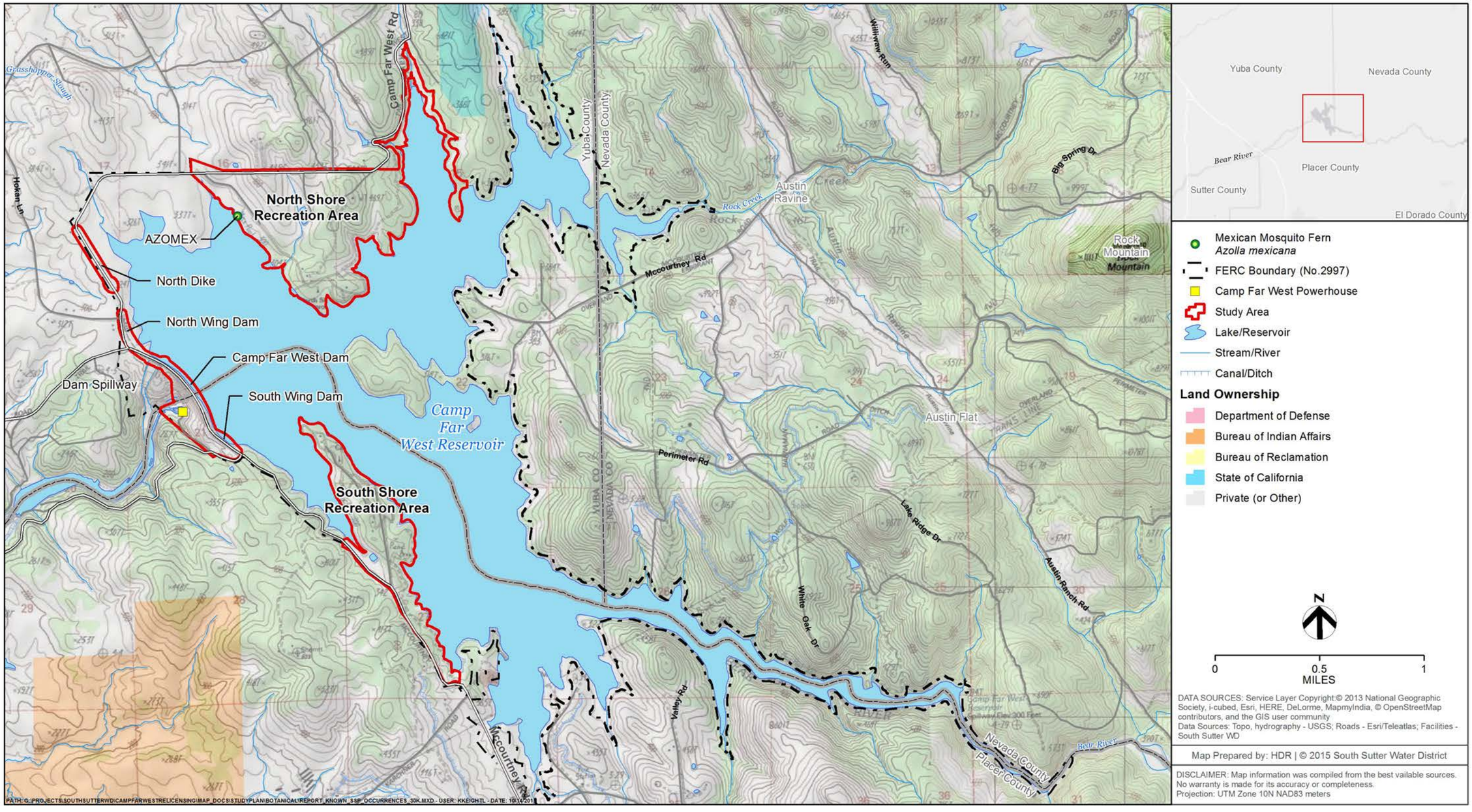

Figure 4.1-1. Study Area for Special-status Plants and NNIP.

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4.2 General Concepts and Procedures

The following general concepts and practices apply to all SSWD relicensing studies:

- Personal safety is the most important consideration of each fieldwork team.
- If required for the performance of the study, SSWD will make a good faith effort to obtain permission to access private property well in advance of initiating the study. SSWD will only enter private property if such permission has been provided by the landowner.
- SSWD will acquire all necessary agency permits and approvals prior to beginning fieldwork for a study that requires them.
- Field crews may make variances to the study plan in the field to accommodate actual field conditions and unforeseen problems. When a variance is made, the field crew will follow to the extent applicable the protocols in and intent of the study plan.
- SSWD's performance of the study does not presume that SSWD is responsible in whole or in part for measures that may arise from the study.
- If Global Positioning System (GPS) data are required by a study plan, they will be collected using either a Map Grade Trimble GPS (i.e., sub-meter data collection accuracy under ideal conditions), a Recreation Grade Garmin GPS unit (i.e., 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 SSWD's consultant's relicensing GIS analyst. Metadata will be developed for deliverable GIS data sets. Upon request, GIS maps will be provided to NMFS, USFWS, Cal Fish and Wildlife or State Water Resources Control Board in a form, such as ESRI Shapefiles, GeoDatabases, or Coverage with appropriate metadata. Metadata will be Federal Geographic Data Committee compliant.
- SSWD's field crews conducting relicensing studies will record incidental records of aquatic, botanical and wildlife species observed during the performance of a study. All incidental observations will be reported in the DLA and FLA. The purpose of this effort is not to conduct a focused study (i.e., no effort in addition to the specific field tasks identified for the specific study plan) or to make all field crews experts in identifying all species, but only to opportunistically gather data during the performance of a relicensing study. Species included for incidental observation will include, but are not limited to: bald eagle (*Haliaeetus leucocephalus*); golden eagle (*Aquila chrysaetos*); osprey (*Pandion haliaetus*); any bats or positive sign of bats; Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*), including redds and carcasses; northern western pond turtle (*Actinemys marmorata*); foothill yellow-legged frog (*Rana boylii*); American bullfrog (*Lithobates catesbeianus*), and aquatic invasive species.
- Field crews will be trained on, provided with, and use materials (e.g., Quat disinfectant) for decontaminating their boots, waders, and other equipment between water-based study

sites. Major concerns are amphibian chytrid fungus, and invasive invertebrates (e.g., zebra mussel, *Dreissena polymorpha*).

- If in the performance of a study, SSWD observes an ESA-listed or special-status species, within 30 days of the observation SSWD will submit to Cal Fish and Wildlife's California Natural Diversity Database a record, on the appropriate form, of the observation.
- If a study plan requires collection and reporting of time series data, the data will be provided at a minimum in HEC-DSS format. A viewer for these files (HEC-DSSVue) can be obtained from the United States Army Corps of Engineers at the following website as of March 2008: http://www.hec.usace.army.mil/software/hec-dss/hecdssvue-dssvue.htm in both Microsoft® Excel and *.DSS formats.
- If a field crew encounters human remains during field work, all work within a 100-foot radius of the discovery will stop immediately. The field crew will not disturb the remains in any way, secure the area to the best of its ability, mark the location with flagging tape in such a way as to not draw attention to the remains, and record the location using a GPS unit or plot the location by hand on a map if no GPS unit is available. As soon as possible thereafter, the field crew will contact SSWD and the relicensing Cultural Resources Lead to report the discovery. SSWD will report the finding and initiate the appropriate steps required under State of California and federal law to address the discovery. Any human remains encountered will be treated with respect, and the field crew members will keep the location confidential and will not disclose the location of the discovery to the public or to any other study crews. The field crew will keep a log of all calls/contacts it makes regarding the discovery and that details the event. Work will not proceed in the secured area of the discovery until provided clearance by SSWD.

4.3 Methods

Study methods will consist of the following four steps: 1) gather data and prepare for field effort; 2) conduct field surveys; 3) prepare data and quality assure/quality control (QA/QC) data; and 4) consult with SSWD's Project operations staff. Each step is described below.

4.3.1 Step 1 – Gather Data and Prepare for Field Efforts

SSWD will identify and map known occurrences of special-status plants within the Study Area, and prepare field maps for use by field survey teams. The maps will include aerial imagery, Project features, and known special-status plant and NNIP occurrences. Survey timing will be planned based on herbarium collection dates. The map will be used for guidance purpose only; all special-status plant species and NNIP located during the Study will be ultimately mapped and reported.

4.3.2 Step 2 – Conduct Field Surveys

In conjunction with SSWD's relicensing Study 5.1, *ESA-Listed Plants*, and Study 5.2, *ESA-Listed Wildlife – Valley Elderberry Longhorn Beetle*, SSWD's surveyors will conduct special-

status plant and NNIP surveys as outlined in the "Botanical Survey" section of the Cal Fish and Wildlife's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFG 2009). Surveys will be comprehensive over the entire Study Area, except for areas deemed to be unsafe (e.g., due to steep, unstable terrain) by the field team, using systematic field techniques to ensure thorough coverage, with additional efforts focused in habitats with a higher probability of supporting special-status plants (e.g., serpentine outcrops) and NNIP. Surveys will be floristic in nature, documenting all species observed; taxonomy and nomenclature will be based on *The Jepson Manual* (Baldwin et al. 2012).

When special-status plants are documented within the Study Area, the following information will be collected:

- Digital photographs to describe the occurrence, its habitat, and any potential threats (i.e., at least one digital photograph will be collected for each occurrence, with other photographs to document potential threats, or as needed).
- Estimated area (i.e., approximate length and width) covered by the special-status plant population and estimated number of individual plants in the population. If plant population is estimated to cover an area greater than 0.1 acre (ac), surveyors will delineate the occurrence boundary using a GPS unit, collecting either polygon data, or sufficient point data that a realistic occurrence polygon can be constructed from the point data using GIS. For occurrences less than 0.1 ac in size, the location of the approximate center of the occurrence will be taken as point data using a GPS unit.
- Dominant and subdominant vegetation in the area.
- Estimated distance to nearest Project facility, feature, or Project-related activity.
- Activities observed in the vicinity of the population that have a potential to adversely affect the population (e.g., recreational trails and uses).
- Estimated phenology and descriptions of reproductive state.

When NNIP are found within the Study Area, the following information will be collected:

- Digital photographs, if needed, to describe the occurrence.
- For those species where "quantitative" data is required, if a plant population is estimated to cover an area greater than 0.1 ac, or if the occurrence is linear (e.g., as along a road) and greater than 100 ft long, surveyors will delineate the approximate occurrence boundary, or end-points in the case of a linear occurrence, using a handheld GPS with an accuracy of 50 ft. If occurrences are smaller than those dimensions, only a single central GPS point is needed to indicate the location of the occurrence. If a single GPS point is used to map an occurrence, the area of the NNIP population will be estimated using one of two acreage classes: up to 0.01 ac, and 0.01 to 0.1 ac. The NNIP cover of the occurrence will be characterized as either concentrated or diffuse.
- NNIP indicated with the descriptor "qualitative" will be described more generally. These

species tend to produce large or diffuse populations that may be unwieldy to map in detail. These "qualitative" species need only be mapped using a single GPS point near the center of the occurrence to indicate an occurrence. The area of the infestation will be estimated into one of four acreage classes: up to 0.1 ac, 0.1-0.25 ac, 0.25-4.0 ac, and greater than 4 ac. The NNIP cover of the occurrence will be characterized as either concentrated or diffuse.

- Estimated distance to nearest Project facility, feature, or Project-related activity.
- Activities observed in the vicinity of the NNIP population that have a potential to spread NNIPs.
- Estimated phenology and descriptions of reproductive state of that invasive occurrence.

4.3.3 Step 3 – Prepare Data and Quality Assure/Quality Control Data

Following field surveys, SSWD will develop GIS maps depicting special-status plant and NNIP occurrences, Project facilities, features, and specific Project-related impacts (e.g., dispersed use camping) 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 mapped occurrences.

4.3.4 Step 4 – Consult with SSWD's Project Operations Staff

Once the locations of occurrences in the Study Area are defined, SSWD's O&M staff will be consulted to identify Project O&M and Project-related activities that typically occur in the area of the special-status plant and NNIP occurrences that have a potential to adversely affect the special-status species or spread NNIPs.

5.0 Consistency of Methodology with Generally Accepted Scientific Practices

This Study is consistent with the goals, objectives, and methods outlined for most recent FERC hydroelectric relicensing efforts in California, including the Don Pedro Project (FERC No. 2299), Yuba River Hydroelectric Project (FERC No. 2246) and Merced River Hydroelectric project (FERC No. 2179), and uses standard botanical survey methods as defined by Cal Fish and Wildlife.

6.0 Schedule

SSWD anticipates the schedule to complete the study as follows:

Planning ..... March 2017
Fieldwork ..... April 2017 – October 2017
QA/QC Review ..... Novemeber 2017

The Study information will be included in SSWD's DLA and FLA. If SSWD completes the Study before preparation of the DLA, SSWD will post the information on SSWD's Relicensing Website and issue an e-mail to Relicensing Participants advising them that the report is available.

7.0 Level of Effort and Cost

SSWD estimates the cost to complete this Study in 2016 dollars is between $81,500 and $99,500.

8.0 References Cited

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