

## 1.0 AQUATIC INVASIVE SPECIES STUDY APPROACH

*This preliminary draft study approach is provided to inform of the general methods DWR followed during the study phase under FERC's Traditional Licensing Process.*

### 1.1 PROJECT NEXUS

Continued Project operation and maintenance (O&M) and Project-related recreation activities have potential to introduce and propagate aquatic invasive species (AIS). For the purpose of this study, AIS are defined as aquatic, non-native organisms that invade ecosystems beyond their natural, historic range and may harm ecosystems, recreation, commercial or agricultural resources.

#### 1.1.1 Existing Information and Need for Additional Information

Existing, relevant, and reasonably available information regarding AIS within the proposed Project boundary is provided in Section 4.5.1.1 of the Federal Energy Regulatory Commission Pre-Application Document. As a summary, the California Department of Water Resources (DWR) concluded one AIS, Asian clam (*Corbicula fluminea*), is known to occur in Silverwood Lake, and 14 AIS have the potential to occur in the Project reservoir and impoundments.

DWR regularly conducts surveys for quagga and zebra mussels and cyanobacteria. California State Parks also conducts pre-entry boat inspections for quagga and zebra mussels. However, no other regular formal surveys for other AIS are conducted on Silverwood Lake. Additional information is needed about whether AIS is present in the study area and, if so, the specific locations of AIS in relation to Project facilities, normal Project O&M activities, Project-related recreation, and any other Project-related activities that might facilitate the propagation of AIS.

#### 1.1.2 Study Goals and Objectives

The goal of this study approach is to determine if continued Project O&M and Project-related recreation activities could increase abundance of AIS or spread them to new areas if they are present within the proposed Project boundary. This may occur if:

- an AIS is located within the study area; and
- a specific Project O&M or recreation activity has a reasonable possibility of spreading AIS.

The objective of this study approach is to gather sufficient data necessary to fill recognized information gaps about the presence and location of AIS within the study area.

### **1.1.3 Study Methods**

#### **1.1.3.1 *Study Area***

The study area consists of Silverwood Lake only. The study area does not include Devil Canyon Afterbay or the Devil Canyon Second Afterbay. The afterbays are closed to public recreation, which is the primary vector that introduces AIS to reservoirs. DWR conducts frequent routine zebra and quagga mussel monitoring at the Devil Canyon facilities. The study area is shown in Figure 1.1-1.

#### **1.1.3.2 *General Concepts and Procedures***

- Personal safety is the most important consideration of each fieldwork team. Fieldwork will only occur in safely accessible areas and under conditions deemed safe by the field crews. Locations within the study area that cannot be accessed in a safe manner (e.g., locations containing dense vegetation or unsafe slopes) and areas inundated when the surveys are performed, will not be surveyed; these areas will be identified in the data summary and an explanation for survey exclusion will be provided.
- The study approach is anticipated to begin in May 2017.
- The study approach does not include the development of requirements for the new license, which will be addressed outside the Study.
- This study approach focuses on AIS within the proposed Project boundary, but the study area is specific to that resource.
- DWR will acquire all necessary agency permits and approvals prior to beginning fieldwork for the Study.
- Field crews may make variances to the study approach in the field to accommodate actual field conditions and unforeseen problems. Any variances from the study approach will be noted in the data resulting from the Study.
- To prevent the introduction and transmittal of amphibian chytrid fungus and invasive aquatic species (e.g., quagga mussels, zebra mussel, and Asian clams), field crews will be trained on, provided with, and use materials (e.g., Quat) for decontaminating their boots, waders, and other equipment when leaving or traveling between water-based study sites. Field crews will follow DWR's Quagga and Zebra Mussel Rapid Response Plan and California Department Fish and Wildlife's (CDFW) Aquatic Invasive Species Decontamination Protocol which can be found at the following link:  
(<https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=43333>). All boats used during the study will follow cleaning protocols, including inspections before and after use. All decontamination requirements in place at Project reservoirs

including those of DWR's *Quagga and Zebra Mussel Rapid Response Plan* for the State Water Project will be strictly followed (DWR 2010).

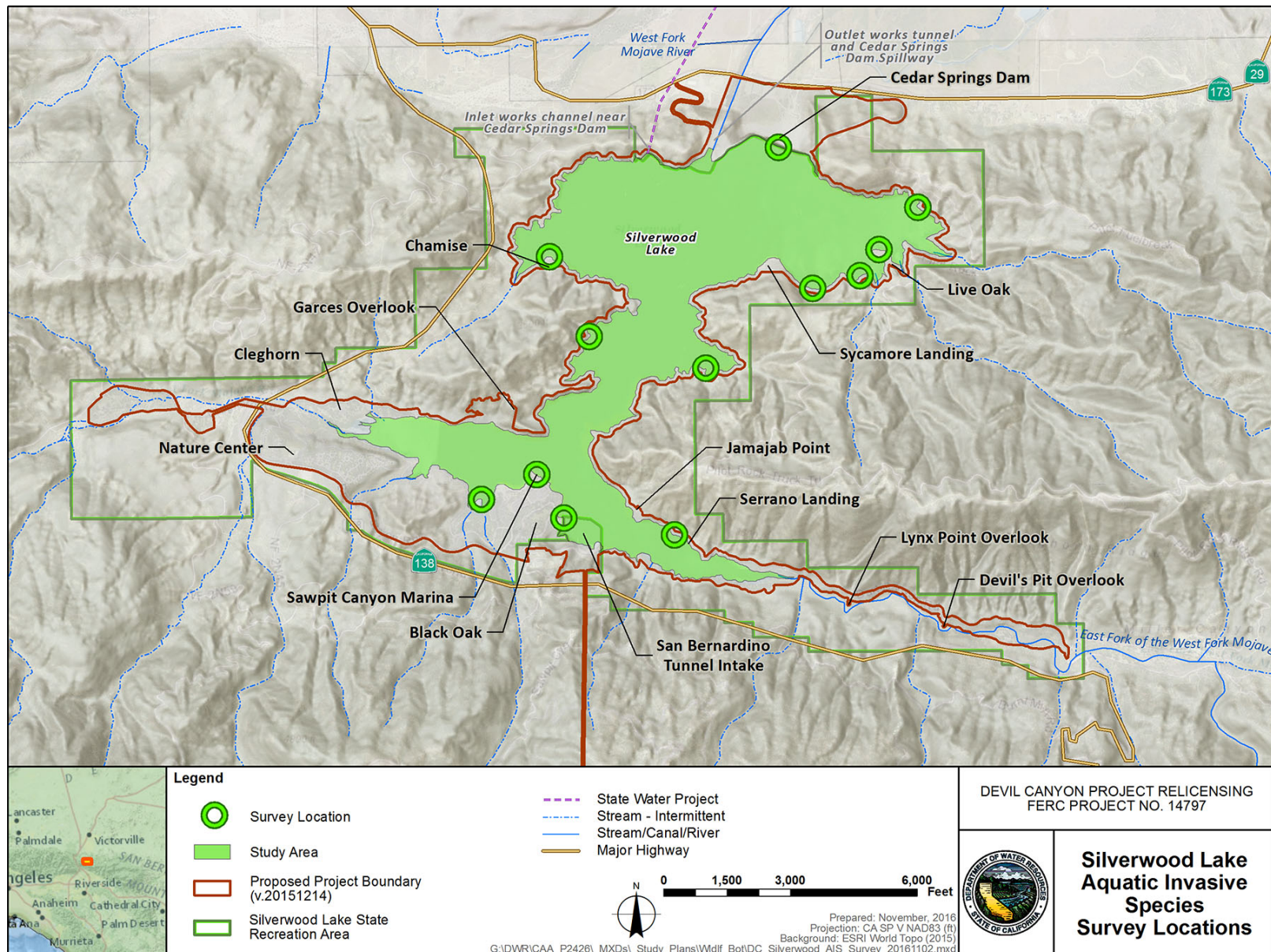


Figure 1.1-1. Map of Focused Survey Locations for Aquatic Invasive Clams and Snails

### 1.1.3.3 *Methods*

The study approach will consist of two steps: (1) gather data and prepare for field effort, and (2) conduct surveys. These steps are described below.

Step 1 – Gather Data and Prepare for Field Effort. DWR will prepare field maps for the study area, depicting aerial imagery and Project features. Field preparation will include development of data sheets and determination of the survey dates. This effort will include coordination with California State Parks staff at Silverwood Lake.

Step 2 – Conduct Surveys. DWR will conduct specific surveys for aquatic invasive snails and clams (i.e., Asian clam, European ear snail, New Zealand mudsnail and channeled apple snail), red-eared sliders, American bullfrog, red swamp crayfish and aquatic invasive plant species (i.e., curly leaf pondweed, Eurasian watermilfoil, hydrilla, water hyacinth and parrot's feather milfoil). DWR currently conducts frequent routine monitoring for zebra and quagga mussels and cyanobacteria, so they are not proposed for inclusion in the field surveys<sup>1</sup>. However, if these species or any other AIS that are not specifically targeted during this Study are observed, they will be recorded as incidental sightings.

Surveys for aquatic invasive snails and clams will be performed at 12 locations: Serrano Landing beach area, three sites at Quarry Cove, the dam face of Cedar Springs Dam, Chamise Cove, Sawpit Canyon Marina boat launch, Outhouse Cove, the San Bernardino Tunnel Intake area and two additional unnamed coves (see Figure 1.1-1).

Survey sites will be located in areas where AIS are more likely to be introduced or with potential habitat for aquatic invasive snails and/or clams. In general, areas with silt, sand or gravel substrate and a relatively low gradient will be targeted for the focused survey.

At each focused survey site, surveyors will establish a 320-foot transect along the shoreline. DWR will collect general site information, including the geographical extent of the site (using a map grade global positioning system [GPS] unit), the date and time of the survey, field crew present, and general characterization of the weather. Representative photographs of each site will be taken.

DWR will record the dominant and sub-dominant substrate, the average water depth and maximum water depth encountered during the survey. Basic water quality parameters will be collected including water temperature, dissolved oxygen, pH, conductivity and turbidity using a hand-held probe (e.g. HydroLab or YSI). For purposes of characterizing the aquatic plant species composition along each 320-foot transect, all aquatic vegetation will be identified to the species level using a presence/absence protocol.

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<sup>1</sup> Relevant information from DWR's zebra and quagga mussel monitoring and cyanobacteria treatment programs will be included in DWR's Draft and Final License Applications.



At each focused survey location, the presence or absence of Asian clams, European ear snail, New Zealand mudsnail, and channeled apple snail will be evaluated using two methods: visual surveys and a sediment sieve.

First, a visual inspection of the shoreline aquatic vegetation and immediate shallow water will occur at each survey site to determine the presence of snails, clams, or other mollusks. Depending on gradient, water level, and clarity, staff will also visually inspect an area of the shoreline up to 33 feet from the wetted edge.

Additionally, up to 10 unique sediment samples will be collected and sieved within each focused site. Five samples will be collected along the shoreline (approximately 66 feet apart), and five more will be collected approximately 33 feet offshore, following the same spacing as the onshore samples (Grohs and Klumb 2010). The samples collected along the shoreline, not underwater, will involve shoveling substrate directly into a 5-gallon bucket with a stainless steel wire cloth affixed to the bottom (Figure 1.1-2). Each sample will consist of enough sediment to fill the bucket to a predetermined volume (approximately 2 to 3 shovelfuls). The substrate sample will be rinsed to remove the fine sediment and staff will note the presence or absence of snails and clams of interest in each subsample. Other mollusks will be identified to the extent possible.

Samples taken in open water will be collected using an Ekman dredge or similar device (Figure 1.1-3) and follow the same process described above.



**Figure 1.1-2. Example Sieve and Bucket System**



**Figure 1.1-3. Example Ekman Dredge**

To document the presence of open water AIS plants, in the open water (as compared to the shoreline surveys described above), DWR will survey the portions of the reservoir open to motorized boats, following pre-established survey transects spaced 96 feet apart. The water surface will be surveyed for aquatic plants. In addition to the boat driver, there will be two surveyors, one on each side of the boat, each scanning a 48-foot-wide area.

All aquatic plant species documented during the open water surveys will be identified to species level, if possible. If necessary for identification, plants will be collected and keyed using the Jepson Manual (Baldwin et. al. 2012).

If an AIS plant species is identified, the following information will be collected:

- Digital photos to describe the occurrence
- GPS delineated point or polygon
- Estimated phenology and descriptions of reproductive state
- Potential Project-related activities in the vicinity of the specimen
- Estimated size of occurrence (i.e. number of individuals and affected area in acres)

AIS plant surveys will be conducted in the late summer or early fall.

American bullfrog and red swamp crayfish will be noted if incidentally observed during the study.

#### **1.1.3.4 *Quality Assurance and Quality Control***

Field data will be collected in a manner that promotes high quality results, and will be subject to appropriate quality assurance/quality control (QA/QC) procedures including rechecking field data sheets, spot-checking data, and reviewing electronic data, including Geographic Information System (GIS) products, for completeness.

#### **1.1.3.5 *Analysis***

Following the surveys, DWR will prepare GIS maps depicting AIS occurrences, Project facilities, recreation activities, and other data collected during surveys. Water quality will be reviewed, where applicable, and as relevant to the potential introduction or establishment of AIS in the study area.

#### **1.1.3.6 *Reporting***

DWR will compile and summarize results of this Study for incorporation into the Draft License Application and Final License Application. A map showing the locations of AIS occurrences found in the reservoir will be included in the summary.

Specific AIS will be reported to relevant agencies within three days of being located as follows:

- California Department of Fish and Wildlife, if quagga or zebra mussels, New Zealand mudsnail, or channel apple snail are observed
- California State Parks, Division of Boating and Waterways, if water hyacinth is observed
- California Department of Food and Agriculture, if hydrilla is observed

#### **1.1.4 Consistency of Methodology with Generally Accepted Scientific Practices**

The Study methodology is consistent with recently performed surveys for AIS, including 2014 and 2016 surveys for Asian clams in New York and New Bullards Bar Reservoir in California respectively, 2010 surveys for New Zealand mudsnails in Washington, and 2012 surveys for aquatic invasive plants, snails, and bivalves at the Umpqua National Forest in Oregon.



### **1.1.5 Schedule**

The Study may begin as early as January 2017, but is anticipated to begin in May 2017. DWR anticipates the schedule below will be followed to complete the Study.

Fieldwork Preparations	May 2017 – August 2017
Field Surveys	
Plants	August 2017 – September 2017
Clams and Snails	September 2017 – October 2017
Data QA/QC	October 2017– November 2017
Data Analysis and Reporting	November 2017– December 2017

### **1.1.6 Level of Effort and Cost**

Based on the work effort described above, DWR estimates the current cost to complete this Study will range between \$109,000 and \$145,000.

### **1.1.7 References**

Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken, editors. 2012. The Jepson manual: vascular plants of California, second edition. University of California Press, Berkeley.

DWR. 2010. The Quagga and Zebra Mussel Rapid Response Plan for the State Water Project. 93 pp. CONFIDENTIAL/PRIVILEGED – Not for Public Distribution.

Grohs, K. and R. Klumb. 2010. Asian clam sampling on five South Dakota Reservations. United States Fish and Wildlife Service. Accessed October 17, 2016. Last updated October 7, 2010. Available online: <<https://www.fws.gov/mountain-prairie/fisheries/gpFWCODocs/GrohsandKlumbSDReservationsAsianClamReport2010.pdf>>. U.S. Fish and Wildlife. Pierre, South Dakota.