

STUDY DESCRIPTION AR-4
Assessment of Potential for Fish Entrainment
at Project Intakes and Diversions
September 14, 2026

This Study Description was developed to inform information gaps identified by Calaveras County Water District (CCWD) for the relicensing of its North Fork Stanislaus River Hydroelectric Project (Project).¹

STUDY AREA

The Study Area includes intake infrastructure on New Spicer Meadow Dam, McKays Dam, and the North Fork Diversion Dam. Study Locations across the Study Area are identified in Figure 1. Note that CCWD believes that no entrainment assessment is necessary on the Beaver Creek Diversion Dam and impoundment because the intake already has a fish screen to mitigate any potential entrainment.²

¹ In addition to the details provided in this study description, study implementation will also follow the "*Concepts and Practices Applicable to All Relicensing Studies*" developed by CCWD.

² The Beaver Creek Diversion Dam Intake was originally designed and commissioned with a perforated fish screen. In 1999, the fish screen was enlarged and replaced with a CDFG approved 3/32" wedge-wire screen.

North Fork Stanislaus River Hydroelectric Project
FERC Project No. 2409
Study Description AR-4

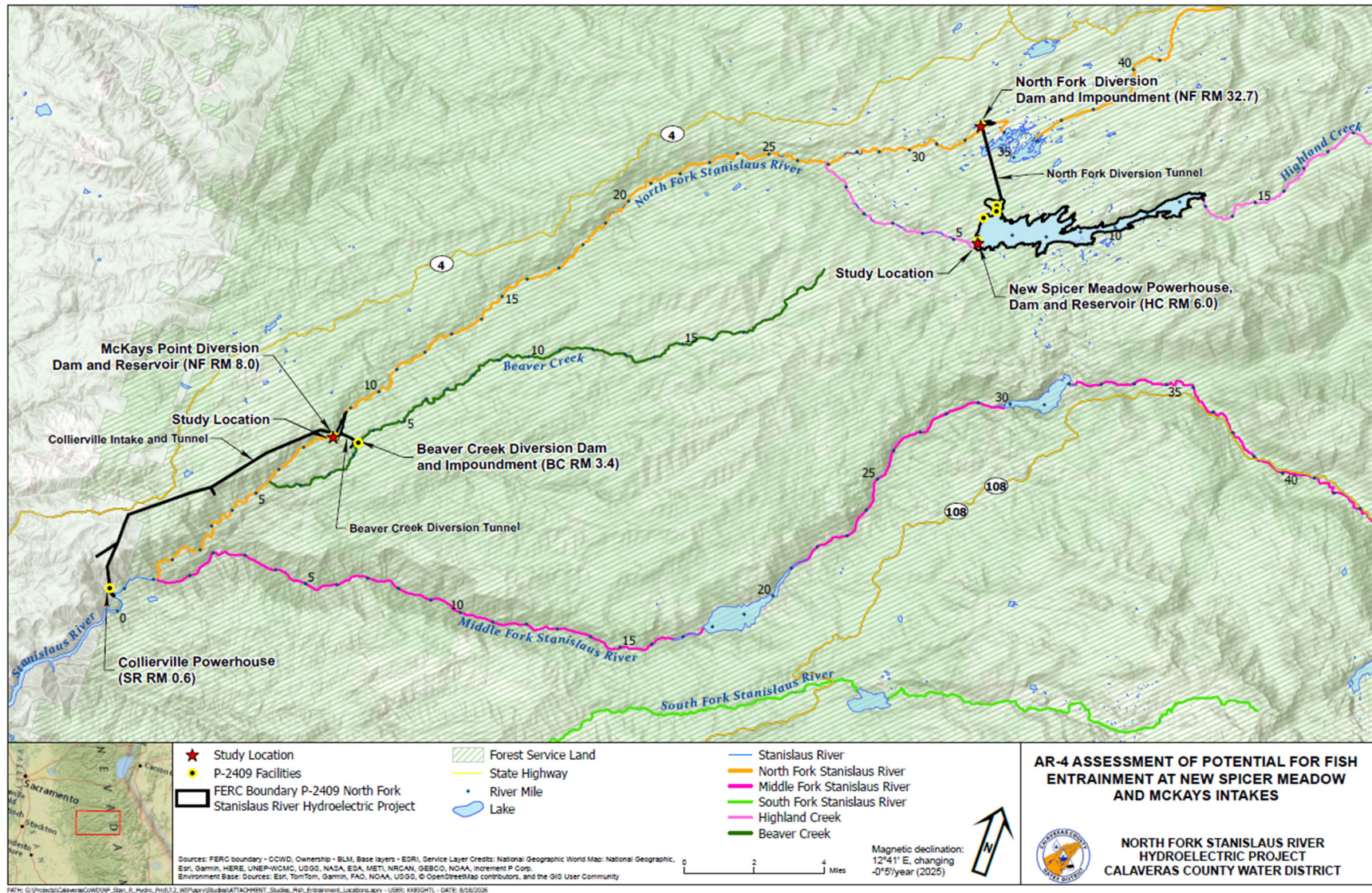


Figure 1. North Fork Stanislaus River Hydroelectric Project AR-4 Study Locations.

STUDY METHODS

Methods

A desktop assessment of the potential for fish entrainment at New Spicer Meadow intake, McKays intake, and the North Fork Diversion will be conducted. In addition, supplemental field monitoring as described in this section will be conducted at New Spicer Meadow intake and North Fork Diversion. All information collected during this assessment will be subject to appropriate QA/QC procedures including checking all data for accuracy and completeness.

This assessment will consist of four steps: (1) characterize each intake and diversion to better describe water velocities, temperature regime, and depth of water diversion/intake during the season of diversion (2) determine what, if any, reservoir or stream fish would be near the intakes; (3) determine swim speeds for fish life stages likely to be near the intakes; (4) summarize entrainment potential including comparison of swim speeds for relevant fish life stages and intake water velocities and incorporating results of field sampling. These steps are described below:

Step 1 – Characterize Each Intake

CCWD will examine existing design drawings and operations of the intakes to characterize the typical intake depth, dimensions, and flows. Using this information, CCWD will calculate typical approach velocities near and at each intake, and at various distances from the intake. Approach velocities will be calculated by examining the cross-sectional area of the tunnel intake structures and the median, 10 percent, and 90 percent exceedance discharges. These values will be compared with the annual inflow/outflow hydrographs to evaluate the temporal risk of entrainment to fish. The temperature regime at each intake will also be described.

Step 2 – Determine Likelihood That Reservoir Fish Would be Near the Intakes

Using the information developed in Step 1, existing information regarding the fish species composition in McKays and New Spicer Meadow reservoirs and information in existing literature regarding the fish species' life history, CCWD will determine which of the species' life stages has a reasonable potential to be near the intakes and when. Species will be assessed for potential risk of entrainment under both stratified and non-stratified lake conditions. The seasonality of stratification and its effect on species presence near the intakes will be described from available information. Results from the AR-1 Study Description will be used to inform species composition in New Spicer Reservoir (i.e., boat electrofishing and eDNA sampling). Results from AR-2 Study Description will be used to inform species composition in the North Fork Diversion Dam impoundment (i.e., electrofishing and snorkeling in the North Fork Stanislaus River upstream of the North Fork Diversion Dam). To improve the quality of information, CCWD will conduct supplemental field sampling at the New Spicer Meadow Dam intake and North Fork Diversion Dam intake as described below. CCWD believes that no supplemental field sampling is needed in the McKays Dam Impoundment because the intake is located at a substantial depth, as described in Exhibit A.

New Spicer Meadow Dam and North Fork Diversion Dam Intakes Gillnetting

Gill netting will be conducted in New Spicer Meadow Reservoir in the vicinity of the three reservoir intakes and in the North Fork Diversion Dam impoundment in the vicinity of the intake to characterize fish species composition. Sampling will occur once in spring (or when accessible) and once in late summer/fall. The specific gill net deployment strategy will be informed by intake characteristics identified during Step 1 and by site access and field safety considerations. To the extent practicable, nets will be deployed adjacent to each intake and positioned horizontally for 6 to 8 hours during daylight hours. Nets will be checked at approximately 2-hour intervals to remove and identify captured fish. Sets longer than 4 hours will be avoided to reduce mortality risk. Variable mesh gill nets will be utilized to target a gradient of fish sizes.

Captured fish will be enumerated, identified to species, and measured to fork length. Trout origin will be identified (hatchery or wild) based on the presence or absence of an adipose fin clip. Captured fish will be allowed to recover after processing and will be released at the site after the sampling is complete or in an area away from the gill net. The time of each deployment and retrieval, the minimum and maximum of water depth of each gill net, and Secchi depth will be recorded at each gillnet location.

Step 3 – Determine Swim Speeds for Fish Life Stages Likely to be Near the Intakes

A targeted literature review will be conducted to evaluate the existing understanding of relevant fish swimming capabilities. Using this information, CCWD will determine the swim speeds of fish and their respective life stages that have the potential to be proximal to the tunnel intakes as determined in Step 2. A fish's ability to avoid entrainment is related to its swimming ability, which is a function of its size. Results of the additional field sampling at the New Spicer Meadows Reservoir intakes and North Fork Diversion intake will be incorporated.

Step 4 – Summarize Entrainment Potential

The Licensees will compare the intake velocities calculated in Step 1 with the swim speeds calculated in Step 3 and assess the potential for fish entrainment at the intake infrastructure on New Spicer Meadow Dam, McKays Dam, and the North Fork Diversion Dam.

Analysis

CCWD will produce a report to present the results of the desktop entrainment analysis and field monitoring. CCWD will compare the intake velocities calculated in Step 4 with the swim speeds calculated to determine the risk for fish entrainment. Upon completion, CCWD will convene with the relicensing participants to review the results of the desktop and field sampling.

REPORTING

This Study will generate the tables and plots described above for each step including characterizing each intake, determining relevant fish species, displaying fish swim speeds or estimates of annual entrainment, and relevant comparison and summary tables.³

SCHEDULE

CCWD anticipates the schedule for Study completion as follows:

Conduct Desktop Analysis	May – December 2027
Conduct Field Surveys	May – October 2027
Reporting	December 2027 – March 2028

³ In addition to the details provided in this section, reporting will also follow “*Concepts and Practices Applicable to All Relicensing Studies*” developed by CCWD.

Page Left Blank