

POTENTIAL RESOURCE ISSUE:

Macroinvertebrate community distribution and abundance and special-status aquatic mollusk presence or absence.

PROJECT NEXUS:

Project operations and Project betterments modify or could potentially modify flow regimes and water quality (including water temperature) in the bypass reaches and the peaking reach, potentially affecting the macroinvertebrate community and food availability for fish.

If special-status aquatic mollusk species are present, Project operations and Project betterments could potentially modify their habitat or affect their populations.

POTENTIAL LICENSE CONDITION:

- Instream flow releases.
- Site-specific water quality measures.

STUDY OBJECTIVE(S):

- Document the seasonal density and size distribution of drifting macroinvertebrates in selected bypass reaches and the peaking reach for input to bioenergetics growth and habitat modeling.
- Document the benthic macroinvertebrate community in the peaking reach and compare to adjacent bypass and comparison reaches to characterize general habitat conditions.
- Sample the benthic macroinvertebrate community at long-term USDA Forest Service sampling sites to supplement existing data sets.
- Document the benthic macroinvertebrate community in the bypass reaches downstream of each large reservoir (Middle Fork American River below French Meadows Reservoir and Rubicon River below Hell Hole Reservoir).
- Document the benthic macroinvertebrate community in areas with known water quality issues as determined in the AQ-11 Water Quality Technical Study Plan.
- Determine the presence or absence of three special-status¹ mollusk species (California Floater, *Anodonta californiensis*, scalloped juga, *Juga occata*, and Great Basin ramshorn's snail, *Helisoma newberry newberry*) and identify potentially suitable habitat for these species.

EXTENT OF STUDY AREA:

The study area includes accessible bypass reaches, the peaking reach, and potential comparison reaches identified in Table AQ3-1 and Figure AQ3-1.

¹ Special-status species is defined as any species that is listed as rare, threatened, or endangered or as a species of special concern by a federal, state, or local agency.

STUDY APPROACH:

Macroinvertebrate Drift Sampling for input to Bioenergetics Modeling

- Collect drift samples at select Instream Flow Technical Study sites (Table AQ3-1). Identify two representative riffles and sample drift at the downstream end of each riffle. Collect three drift samples at each riffle using a sampling methodology similar to that used in Hayes et al. 2000.
- Collect drift samples at three different times (June, August, and October). Process samples based on average drift density (number/m³) at each site by 2 mm prey size classes (e.g., lengths 1-3 mm, 3-5 mm, 5-7 mm, etc.). Use general aquatic invertebrate length versus weight relationships to convert macroinvertebrate drift to energy equivalents (joules/m³/size class) for bioenergetics modeling.
- Compare/contrast drift density and size between the study reaches and with the literature.
- Use the drift density information as an input to bioenergetics models to assist in the identification of limiting factors related to fish growth (food, water temperature, habitat) (see AQ-5 Bioenergetics Technical Study Plan).

Benthic Macroinvertebrate Sampling for General Habitat Conditions

Select bypass, peaking, and comparison reaches to collect benthic samples and inventory data following the California Stream Bioassessment Procedure (CSBP) (CDFG 2003). Collect composite riffle samples in October, process samples, and perform taxonomic identification according to CSBP protocols (CDFG 2003). Statistically compare/contrast CSBP sampling results between reaches and with values reported in the literature. Proposed sampling sites for benthic macroinvertebrates are identified in Table AQ3-1 and Figure AQ3-1.

Peaking Reach

- Conduct CSBP sampling in the peaking reach and adjacent bypass and comparison reaches (the Middle Fork American and Rubicon rivers above Ralston Afterbay, the North Fork of the Middle Fork American River, and the North Fork American River) to compare and contrast the macroinvertebrate communities.
 - To ensure comparability, select sample locations in the peaking reach and in the comparison reaches that are similar in substrate and hydraulic characteristics.
 - Include and augment the ongoing Ralston Sediment Management Project fall CSBP sampling and sampling locations (Jones & Stokes 2002; Jones & Stokes 2006) within this sampling protocol (Table AQ3-1).
- In the peaking reach and in the associated comparison reaches, also collect benthic macroinvertebrate samples in June or July (if river flow conditions allow) and compare results to the October sampling to assess the change in seasonal macroinvertebrate abundance.

Long-Term Agency and below Large Reservoir Sampling Sites

- Conduct CSBP sampling at the long-term agency sampling sites above and below the diversions on Duncan and South Fork Long Canyon creeks.

- Conduct CSBP sampling downstream of French Meadows Reservoir on the Middle Fork American River and downstream of Hell Hole Reservoir on the Rubicon River.

Coordinate with the AQ-11 Water Quality Technical Study to identify any additional CSBP sampling locations based on water quality results.

Special-status Aquatic Mollusks Sampling

- Identify potential habitat using aerial photographs, helicopter video, Project maps, USGS 7.5 minute topographic maps, existing literature, and archeological information (e.g., mussel shells).
- Determine the number and location of representative survey sites based on the extent of identified suitable habitat. Presently, it is assumed that there will be approximately 20 survey sites. Where appropriate, the mollusk sampling sites will be co-located at other sampling sites such as the benthic macroinvertebrate sampling sites (Table AQ3-1), fish sampling sites (see AQ-2 Fish Population Technical Study Plan), and/or the tributary locations identified for the foothill yellow-legged frog surveys (see AQ-12 Special-status Amphibian and Aquatic Reptile Technical Study Plan).
- Survey sites will be 100 m in length and surveyed in an upstream direction on each side of the river. River edges will be surveyed to a depth of approximately 60 cm. All substrates will be sampled. Sub-sampling will be used if necessary.
- All site surveys will be timed and surveyed for a minimum of two hours.
- Physical habitat characteristics will be collected (water temperature, substrate composition, water velocity, and estimated channel gradient, width, and mean depth) at each study site.
- Aquatic gastropods will be field identified to family, genus, or species using keys in Burch (1989), McMahon (1991), and Frest and Johannes (1999) and representative specimens will be collected and preserved for laboratory verification.
- Mussels will be field identified using keys in Burch (1975 a, b) and McMahon (1991), and shells will be collected if present for further identification.

SCHEDULE:

To be developed in early 2007.

REFERENCES:

- California Department of Fish and Game (CDFG). 2003. California stream bioassessment procedure (Protocol brief for biological and physical/habitat assessment in wadeable streams).
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- Hayes, J.W., J.D. Stark, K.A. Shearer. 2000. Development and test of a whole-lifetime foraging and bioenergetics growth model for drift-feeding brown trout. *Trans. Am. Fish. Soc.* 129:315-332.
- Jones & Stokes. 2002. Ralston Afterbay sediment management project Indian Bar Pilot Project. Jones & Stokes, Sacramento, CA.
- Jones & Stokes. 2006. Draft water quality and aquatic resources monitoring program for the Ralston Afterbay sediment management project—2005 Annual Report. August. (J&S 05596.05.) Sacramento, CA.
- McMahon, R. F. 1991. Mollusca: Bivalvia. Pages 315-399 *in* J. H. Thorp and A. P. Covich, editors. *Ecology and classification of North American freshwater invertebrates*. Academic Press, San Diego, California. 911 pp.

Table AQ3-1. Macroinvertebrate Sampling Reaches.

Study Reach	Bypass Reaches	Peaking Reach	Comparison Reach	Long-Term Agency Sampling Sites	Number of Benthic Macroinvertebrate Sample Locations	Number of Drift Macroinvertebrate Sample Locations	Jones & Stokes (2002, 2006) Ongoing Benthic Macroinvertebrate Sample Locations
Duncan Creek							
Duncan Creek upstream of Diversion				●	1	--	--
Duncan Creek from Diversion to confluence with Middle Fork American River	●			●	1	--	--
Middle Fork American River							
Middle Fork American River from French Meadows Reservoir to Interbay	●				1	--	--
Middle Fork American River from Middle Fork Interbay to Ralston Afterbay	●				1 ^{a, c}	1	1
Middle Fork American River from Ralston Afterbay to confluence with Canyon Creek		●			1 ^{a, c}	1	3 ^{a, b}
Middle Fork American River from confluence of Canyon Creek to confluence with North Fork American River		●			2 ^a	1	--
Rubicon River							
Rubicon River from Hell Hole Reservoir to confluence with South Fork Rubicon River	●				1	1	--
Rubicon River from confluence with South Fork Rubicon River to Ralston Afterbay	●				2 ^{a, c}	2	1
Long Canyon Creek							
South Fork Long Canyon Creek upstream of Diversion				●	1	--	--
South Fork Long Canyon Creek from Diversion to confluence with Long Canyon Creek	●			●	1	--	--
Other Tributaries							
North Fork Middle Fork American River			●		1 ^{a, c}	--	1
North Fork American River			●		1 ^a	--	--

^aBenthic samples will also be collected in June or July if river flow conditions allow.

^bOne sampling location is split into two locations above and below the confluence of North Fork Middle Fork American River confluence.

^cThese samples would be in approximately the same area as the Jones & Stokes ongoing monitoring, but would enhance that sampling effort.

Placeholder for Figure AQ3-1

Macroinvertebrate Study Reaches

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