

Statement of Work

**Title: Strategic inventory of freshwater mussels from rivers and lakes of
National Forest lands in the Pacific Southwest Region.**

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Introduction

This project will involve strategic surveys for *Anodonta californiensis* (Figure 1), a regionally sensitive aquatic bivalve mollusk occurring mainly in mainstem river and lake habitats. This and related *Anodonta* species appear to have suffered extreme declines in populations and range of distribution in California and throughout the western United States (Taylor 1981, Mock and other 2004). Although emphasis will be directed towards better defining the current distribution of *Anodonta californiensis* and other regionally sensitive mollusks, the occurrence of other currently non-sensitive aquatic mollusk species will also be recorded as they are encountered.

Although two other species belonging to different genera, namely the western pearlshell *Magaritifera falcata* (Family Margaritiferidae), and western ridge mussel *Gonidea angulata*, currently have no federal status, there is a concern that their populations and distributions may be declining (Frest and Johannes 1995). Therefore, strategic surveys will also be conducted for these two species to better define their status as a basis for evaluating whether they warrant any protections. All of these species may co-occur, so a survey targeting the regionally sensitive *Anodonta californiensis*, should also be effective as a survey for the other species.

Some limited data from museum records and previous surveys are available for *Anodonta californiensis* and other congeneric species (see Table 1). During 2001, a strategic survey (forest-wide scale, targeted at suitable habitats) was conducted by Dr. Jayne Brim Box on the Lassen National Forest (Brim Box and others 2005). The survey focused on the six sensitive aquatic mollusk species known or believed to occur there based on historic ranges and presence of suitable habitat. No specimens of *Anodonta californiensis* were observed from the 113 sites surveyed on the Lassen National Forest. The western pearlshell *Magaritifera falcata* was collected from seven sites. Frest and Johannes (1995), during their survey of 231 sites on the upper Sacramento and Pit rivers, found *A. californiensis* and *A. wahlamatisensis* at three, *A. oregonensis* at one, *M. falcata* at two, and *G. angulata* at six sites. Ellis (1996) reported the occurrence of *A. californiensis* and *Pisidium ultramontanum* from several sites in the Pit and Fall rivers.

Under terms of a contract with the Regional Office last year, Howard (2006) surveyed a total of 103 sites for freshwater mussels in the northern Sierra Nevada region. GIS analysis and map reconnaissance was conducted to identify sites where suitable habitat for freshwater mussels occurred. Once suitable river reaches for freshwater mussels had been identified, a search was made every 10 kilometers. Lakes and reservoirs were also surveyed using SCUBA gear. A total of 41 sites were surveyed in the Plumas National Forest; 28 sites in the Eldorado NF, 27 in the Tahoe National Forest; and 7 in the Lake Tahoe Management Unit. Live mussels were found at 13 of the 103 sites: *M. falcata* at 13 sites and *G. angulata* at one site (Table 2). Using SCUBA equipment *Anodonta spp.* shells of two morphs were found in Donner Lake at a depth of about 10 meters, but no live specimens of *Anodonta* were found at any of the 103 sites surveyed.



Figure 1. Top left – right valve of *Anodonta californiensis*, Lectotype* USNM 86393. Shell length = 58 mm.; Top right – mussel bed composed of *A. californiensis* and *Gonidea angulata*, Middle Fork John Day River, Oregon. Photo by Jayne Brim Box; Bottom left - Type specimens of *Anodonta wahlametensis* (USNM 86363, length = 63.2mm) (above) and *Anodonta nuttalliana* (USNM 86391, length = 60 mm) (below). *Anodonta wahlametensis* was placed in the synonymy of *A. nuttalliana* by Turgeon et al. (1998). Shell photos by Shelia Nadimi, 2003. * A lectotype is a specimen selected from the original material to serve as the type specimen when it was not designated in the original description (or to replace a missing holotype).

Government Furnished Property

Government specialists on the forests where surveys will take place will provide some logistical support by providing information on how to identify which river reaches on their forests may have suitable habitat and thus be appropriate for surveys. Forest personnel may also provide maps or copies of maps to aid the contractors in accessing survey sites. All collecting equipment, preservatives, and containers used for preservation of the voucher specimens will be provided by the contractors.

The Government will provide an unpopulated Excel spreadsheet file containing the data elements described below in the format desired for delivery of the field and biological data requested.

Specific Tasks and Deliverables

The contractors will deliver a report and data in Excel spreadsheet or compatible application. Elements recorded during field surveys and provided in the final report and database include:

- 1) a list of sites surveyed with name of the water body; latitude-longitude; ownership (USFS, BLM, State, private); 7 ½ minute Quad Map name; county; elevation in meters; township; range; quarter section; and UTM coordinates locatable within a distance of 1 second (i.e. approximately within a distance of 100 ft). If a river reach is surveyed, the beginning and ending points of the survey should be recorded. These data will be entered into an Excel or compatible spreadsheet format and provided as a product;
- 2) a description of the habitat at the survey site, including observations of water depth, current velocity, substrate composition, presence of macrophytes, and presence of water diversions;
- 3) the species (or at least genus, when taxonomic uncertainties exist in published literature) of freshwater mussels and other aquatic mollusks collected from each site; and
- 4) the number of each mollusk taxon collected at all sites surveyed.

Under the terms of a Joint Venture Agreement (USDA FS # 07- JV-11052007-225) with Dr. Karen Mock, some specimens or tissue samples extracted non-lethally will be retained and shipped to Utah State University for genetic analysis. Dr. Mock is revising the taxonomy of *Anodonta* spp. in the western United States. These results will better allow the Forest Service to manage the California floater *Anodonta californiensis* in our region because the taxonomy is currently in a state of confusion (Mock 2004, Chong 2006). Once the taxonomic relationships are better understood it will be possible to define the true extent of present populations of the species and the appropriate management activities to provide protection for it.

Geographic Scope for the Freshwater Mussel Surveys

The historic and recent sites referred to in Table 1 will provide a basis for deciding how to prioritize sites for the survey. Sites occurring on or near National Forest lands will receive highest priority, other public lands are of secondary priority and private lands are lowest priority. Table 1 includes sites on or near the following National Forests: Inyo, Klamath, Mendocino, Plumas, Six Rivers, Stanislaus and Tahoe. Southern Province forests (Angeles, Cleveland, Los Padres and San Bernardino) are closest to the type locality (where the species was first collected and described in the science literature) of the Rio Colorado. Therefore, some survey work will be directed towards this geographic area based on the occurrence of suitable habitat.

Proposed Project Schedule

Start Contract Work
Deliver the Final Report

June 15, 2007
December 31, 2008

Budget

Item	Duration/Quantity	Total
Salary for fieldwork	280 hours @ \$50 / hour	\$14,000
Travel (airfare) for two people	1 @ \$500	\$ 500
Lodging in field	20 nights @ \$85 per night	\$ 1,700
Travel to sites	3,000 miles @ \$0.45 per mile	\$ 1,350
Miscellaneous supplies		\$ 1,500
Report writing		\$ 950
TOTAL		\$20,000

Charge Code

NFWF20, 05 21

Table 1. *Anodonta* spp. potential collection localities in California for 2007 field season.

County	Drainage	Locality	Taxon	Reference
Imperial	New River, "Rio Colorado"	Type Locality	<i>A. californiensis</i>	Taylor 1981
Modoc	Pit River	Blue Lake at FS north boat launch, Cedar Creek, Zone 10; 727,830E; 4,558,840N	<i>A. californiensis</i>	Frest & Johannes 1995, Site # 208
Modoc	Pit River	Blue Lake at FS camp ground, Cedar Creek, Zone 10; 728,130E; 4,558,020N	<i>A. californiensis</i>	Frest & Johannes 1995, Site # 209
Shasta	Pit River	Zone 10; 626,300E; 4,358,140N	<i>A. californiensis</i> (?)	Frest & Johannes 1995, site # 118
Shasta	McCloud River	Zone 10; 563,730E; 4,532,560N (0.3 mi ab McCloud Bridge)	<i>Anodonta</i> sp., shell fragments only	Frest & Johannes 1997
Shasta	Pit River	SW of Pit 4 Dam, Zone 10; 603,010E; 4,537,620N	<i>A. wahlametensis</i>	Frest & Johannes 1995, Site # 39
Shasta	Fall River	Below Pit 1 Dam, Zone 10; 630,880E; 4,540,500N	<i>A. wahlametensis</i>	Frest & Johannes 1995, Site # 114
Shasta	Fall River	Below Pit 1 Dam, Zone 10; 630,880E; 4,540,500N	<i>A. oregonensis</i>	Frest & Johannes 1995, Site # 114
Shasta	Pit River	Upstream of Pit 1 Powerhouse, Zone 10; 627,240E; 4,538,620N	<i>A. wahlametensis</i>	Frest & Johannes 1995, Site # 165
Shasta	Pit River	South of footbridge near Pit 1 Powerhouse, Zone 10; 626,690E; 4,538,360N	<i>A. wahlametensis</i> (?)	Frest & Johannes 1995, Site # 197
Shasta	Pit River	Pit 4 Reach, Malinda Gulch, T36N, R2E. Sec 9	<i>A. californiensis</i>	Ellis 2003
Shasta	Pit River	Pit 4 Reach, Malinda Gulch, T36N, R2E. Sec 9	<i>A. wahlametensis</i>	Ellis 2003
Shasta	Big Lake	T38N, R5E, Sec 21	<i>A. californiensis</i>	Ellis 1996
Shasta	Tule River	T38N, R5E, Sec 30 & 31	<i>A. californiensis</i>	Ellis 1996
Shasta	Little Tule River	T38N, R5E, Sec 26	<i>A. californiensis</i>	Ellis 1996, Site LT01
Shasta	Pit River	Upstream of Pit 1 Powerhouse, T36N, R4E, Sec 7	<i>A. californiensis</i>	Ellis 1996, Site PR01
Shasta	Pit River	Fall Creek	<i>Anodonta spp.</i>	Ellis and Haley 2005
Shasta	Pit River	Hat Creek	<i>Anodonta spp.</i>	Ellis and Haley 2005
Tehama	Sacramento River	Dye Creek TNC Preserve, Los Molinos	<i>A. californiensis</i>	DeMartini 2005
Mendocino	South Fork Eel River	Angelo Coast Range Reserve	<i>A. californiensis</i>	Howard & Cuffey 2003
Mendocino ??	South Fork Eel River	Williams Grove	<i>A. californiensis</i>	DeMartini 2005 (Observed 1959-1980s)
Mendocino ??	North Fork Eel River	Long Valley Creek at confluence with NFER	<i>A. californiensis</i>	DeMartini 2005 (Observed circa 1968)
Lassen	Eagle Lake	Willow Creek	<i>A. californiensis</i>	DeMartini 2005 (Observed circa 1995)
Nevada	Truckee River	Donner Lake, T17N, R15E, S13	<i>Anodonta</i> - two morphotypes	Howard 2006, shells only

County	Drainage	Locality	Taxon	Reference
Nevada	Truckee River	Donner Lake	<i>Anodonta wahlamatensis</i>	Carlton, H.P. 1870
Nevada	Truckee River	Donner Lake	<i>Anodonta nutalliana</i>	Hanna, G.D. No date
Nevada	Truckee River	Donner Lake	<i>Anodonta californica</i> [sic]	Murphy, 1942
Plumas	Middle Fork Feather River	Near Beckwith [sic], should be Beckwourth?	<i>Anodonta oregonensis</i>	Smith, A.G. 1948
Plumas	Middle Fork Feather River	Central Valley (Sierra Valley)	<i>Anodonta oregonensis</i>	Taylor, D.W. 1981
Solano	San Francisco Bay Delta	@ 5 mi south of Suisan City	<i>Anodonta</i> sp.	Shepard 2007, shells only
Solano	??	??	<i>A. cf. wahlametensis</i>	Mock et al. 2003
Colusa	Cache Creek, Sacramento	Bear Creek, SE of Wilber Springs	<i>Anodonta</i> sp.	Shepard 2007, shells only
Glenn	??	??	<i>A. cf. wahlametensis</i>	Mock et al. 2003
Monterey	??	??	<i>Anodonta</i> sp.	Mock et al. 2003
Mono	West Fork Walker River	Topaz Lake	<i>Anodonta californiensis</i>	Brian Quelvog 2006
Mono	East Fk. Walker R.	Elevation 6,455 ft	<i>Anodonta californiensis</i>	Brian Quelvog 2006
Tuolumne	Tuolumne River	Tulloch Reservoir, "Prob. NE Shore"	<i>Anodonta californiensis</i>	Brian Quelvog 2006
Stanislaus	Tuolumne River	??	<i>Anodonta oregonensis</i>	Brian Quelvog 2006
Stanislaus	Tuolumne River	Legion Park, 10-679108mE-4165629mN NAD 27. Ceres CA quad	<i>Anodonta wahlamatensis</i>	Brian Quelvog 2007

Table 2. Summary of rivers and creeks where live mussels were observed during summer of 2006.

Stream Name	National Forest	Species	Sites Found
Silver Fork American River	Eldorado	<i>M. falcata</i>	1
American River	Eldorado	<i>M. falcata</i>	1
Yuba River	Tahoe	<i>M. falcata</i>	3
Truckee River	Tahoe	<i>M. falcata</i>	2
North Fork Feather River	Plumas	<i>M. falcata</i>	2
Lost Chance Creek	Plumas	<i>M. falcata</i>	1
Lost Chance Creek	Plumas	<i>G. angulata</i>	1
Indian Creek	Tahoe	<i>M. falcata</i>	1
Spanish Creek	Plumas	<i>M. falcata</i>	2
Total Sites			14

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