From: Staples, Rose
Sent: Monday, May 02, 2011 8:24 PM
To: Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Zipser, Wayne - SCFB
Subject: Don Pedro Relicensing Newsletter Volume 1 Issue 1 Published on Website

Volume 1 – Issue 1 of the Don Pedro Project Relicensing Newsletter has been uploaded to the website (www.donpedro-relicensing.com)! It is attached to an announcement in the INTRODUCTION section! If you have any difficulty opening or downloading the file, please let me know. Thank you.

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Volume 1 | Issue 1

Don Pedro

MID Water and Power

TID WATER & POWER

A newsletter about the relicensing of the Don Pedro Project

Public Scoping Meetings set for May 11

The Federal Energy Regulatory Commission (FERC) will host a pair of public scoping meetings on May 11 in relation to the Modesto and Turlock irrigation districts' relicensing efforts for the Don Pedro Project.

The morning meeting is planned to begin at 9 a.m. and will take place at the California State University, Stanislaus University Student Union Event Center in Turlock, located at 801 W. Monte Vista Ave.

The evening meeting is set to start at 7 p.m. and will take place at Modesto's DoubleTree Hotel, Ballroom 3, located at 1150 Ninth St.

The purpose of these meetings, which are sponsored and facilitated by FERC, is to identify relevant issues of public interest involving the Don Pedro Project in relation to the National Environmental Policy Act.

May 11 FERC Meetings

TURLOCK SCOPING MEETING

WHERE: CSU Stanislaus University Student Union Event Center, located at 801 W. Monte Vista Ave., Turlock

WHEN: 9 a.m.

MODESTO SCOPING MEETING

WHERE: DoubleTree Hotel, Ballroom 3, located at 1150 Ninth St., Modesto

WHEN: 7 p.m.

The scoping meetings, just as any other formal FERC scoping meetings, are designed for members of the public to make statements about the project to FERC staff in an open forum. One of the primary purposes of a formal scoping meeting is so the members of the public have an opportunity to speak their concerns.

MORE INSIDE: Don Pedro's significance and background, plus more about the relicensing process

Also at the scoping meeting, it is expected that FERC staff will describe the environmental review process, as well as provide relevant information and answer procedural questions.

As co-relicensing applicants, MID and TID will have staff members present. It is expected that District representatives will briefly describe the Don Pedro Project and will be available before and after the formal part of the meeting for questions and answers.

Comments on the proposed project may be submitted in written form or communicated verbally during the course of the scoping meeting. The scoping meetings are recorded by a stenographer and become part of the formal record of the FERC proceeding on the project.

Information gathered at these scoping meetings may also help the Districts develop environmental protection measures to present in its environmental resource reports filed with FERC in its Final License Application. This information will also provide FERC staff with the resources needed to publish a more complete environmental impact document for public review.

Important dates

May 10
FERC site inspection of Don Pedro Project

May 11
Public Scoping Meetings in Modesto and Turlock

May 18
Cultural Relicensing Working Group (RWG) and Recreation RWG Meetings

May 19
Aquatic/Water RWG and Terrestrial RWG Group Meetings

June 10
Deadline for Relicensing Participants to request studies and to comment on the Pre-Application Document (PAD)

June 21
Aquatic/Water RWG and Terrestrial RWG Meetings

July 25
Districts to file Proposed Study Plan (PSP) with FERC

From the original dam and powerhouse built in 1923 to the significant facility that exists today, Don Pedro continues to show ...

a history of benefits

People in the region are passionate about the Don Pedro Project. And why wouldn't they be?

The project's reservoir and dam provide flood protection for many area residents. Some water from Don Pedro eventually makes its way to Modesto Reservoir, where it is eventually treated and purified to become drinking water for many Modesto residents. Much of the water from Don Pedro is used by growers to irrigate crops that help feed and employ many in the region, state and nation. There are recreation opportunities aplenty. And let's not forget the power plant that provides clean, efficient and affordable energy powering thousands of homes and businesses within the MID and TID service areas.

Simply put, the Don Pedro dam, reservoir and powerhouse offer a collection of benefits that will continue to be of great value to the people of the Central Valley and beyond.

That value was always part of the vision of the project's forefathers. But to know the story of the project, it's best to know the story of the districts and the people that were antecedents to the project.

Formed in 1887, the Modesto and Turlock irrigation districts are the oldest irrigation districts in California, and are among the oldest in the nation. They were created by a vote of the people in accordance with the laws of the State of California to provide water for agricultural purposes in their respective irrigation service areas which today total approximately 200,000 acres of trees, vines, row and forage crops.

Soon after formation, the Districts acquired a water diversion site on the Tuolumne River located downstream of the Don Pedro site along with "pre-1914" water rights; the Districts have added other water rights to these over time. An original Don Pedro Reservoir with approximately 290,400 acre-feet of storage and its associated Powerhouse were brought online in 1923 to improve water availability for the long growing season of the Central Valley and to bring electrification to a portion of this rural area. The Districts have been providing retail electric service to the communities' farms, homes, municipalities, business and industry since that time. Today, the Districts serve approximately 200,000 electric customers in a 1,000-square mile area.

The Tuolumne River has a long history of water planning. Concern

1887: *Modesto and Turlock irrigation districts are organized.*

1923: *The Original Don Pedro Dam and Powerhouse is constructed, capable of generating up to 15 megawatts and storing 289,000 acre-feet of water.*

1961: *Voters overwhelmingly approve bonds to fund the New Don Pedro project.*

1966: *MID and TID received a federal license for an enlarged Don Pedro from the Federal Power Commission, the predecessor to FERC.*

1967: *Ground is broken on New Don Pedro; diversion tunnel work begins*

1970:
- *Don Pedro Recreation Agency formed*
- *Old Don Pedro opened and water storage transferred to New Don Pedro*

over the need to withstand the effects of multiple dry years and the growing demand for electricity resulted in the Districts partnering with the City and County of San Francisco to develop the current Don Pedro Project. The new Don Pedro Project inundated the original dam and impoundment, and the resulting new Don Pedro Reservoir has a storage capacity of 2,030,000 acre-feet, more than seven times that of its predecessor; the new Don Pedro Powerhouse constructed with the dam has a maximum generating capacity of 203 megawatts. Planning for the enlarged Don Pedro began in the 1940s and culminated when the Districts received the federal license in 1966 from the Federal Power Commission, the predecessor to FERC.

The City and County of San Francisco contributed to the construction of the project but has no ownership interest in the dam, reservoir, or powerhouse, nor does it have any ownership of water in the reservoir. San Francisco participated in construction of the project in order to obtain a water banking arrangement in the new reservoir which provides it with greater flexibility in storing water for use at its upstream power facilities and for water supply. Construction of the project also relieved San Francisco of flood control responsibilities in the watershed thereby providing another important benefit for the City.

As the sixth largest reservoir in California, Lake Don Pedro provides extensive habitat for fish and wildlife, and has a wide recreation following. It is known for its bass tournaments and houseboating. Approximately 400,000 visitor-days of recreation occur at the reservoir each year. Activities include camping, boating, fishing, and enjoying water sports such as skiing, wake boarding, and the use of personal watercraft.

1971:

- *New Don Pedro Dam and Powerhouse is constructed with a total generating capacity of 203 megawatts and a water storage capacity of 2,030,000 acre-feet*
- *New Don Pedro Project officially changed to Don Pedro Dam*

Transmission lines near the Don Pedro Powerhouse help transport up to 203 megawatts of generation that helps power MID and TID customers homes and businesses.

The relicensing process

Notice of Intent to relicense filed, public scoping meeting next

Relicensing of the Don Pedro Project follows the Integrated Licensing Process as designated by the Federal Energy Regulatory Commission (FERC).

The Modesto and Turlock irrigation districts took the first step in this several-year process by filing of a Notice of Intent (NOI) and a Pre-Application Document (PAD) in February 2011.

The next formal step is FERC's scoping of the issues to be considered in the relicensing of the project. On May 11, FERC will hold two scoping meetings to obtain public input.

Filings throughout the process will be made available to the public on the project relicensing website located at www.donpedro-relicensing.com. Certain information may be restricted from publication on the relicensing website in accordance with FERC's regulations protecting Critical Energy Infrastructure Information (CEII) or in cases where the document contains sensitive information.

The PAD contains a synopsis of the known information relevant to the relicensing of the Don Pedro Project. It includes a detailed description of the project, an explanation of the relicensing process and the schedule to be followed as well as pertinent information related to Project operations, engineering, water resources, environmental resources, recreation, cultural resources, and socioeconomics. The information in the Pre-Application Document allows FERC and interested parties to identify data gaps and needs for additional information which will form the basis for study requests to acquire the information needed in developing the new license.

The Process

1. Districts filed PAD and NOI in Feb. 2011.
2. FERC conducts scoping.
3. Interested parties discuss issues and develop study requests.
4. Applicant files its proposed study plan and conducts approved studies.
5. Studies are conducted and Study Report issued for review and comment.
6. Applicant files draft and final license applications.
7. FERC issues new license with new terms and conditions in 2016.

Modesto Irrigation District
Water and Power

WATER & POWER
Serving Central California since 1887

Name of Agency
Return Address Line 1
Return Address Line 2
City, State ZIP

Upcoming Meeting

May 11, 2011
FERC Scoping Meetings in Turlock and Modesto. More info inside.

[redacted]

From: Staples, Rose
Sent: Thursday, May 05, 2011 7:59 PM
To: Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Subject: Don Pedro - Final List April 1 Meeting Questions/Requests and Responses to Data Gap Study Requests April 19-20 RWG Meetings

Three Messages in One!

The final list of the questions/requests from the April 1st Don Pedro Relicensing Participants meeting has been uploaded to the www.donpedro-relicensing.com website—as an attachment to the April 1 Meeting Announcement on the meeting calendar under the MEETINGS tab. The document is labeled ***DP RP Progress Tracking List*._110505_Upload.** If you are unable to locate the document or are unable to download it, please let me know. Please also note that those items (from the February 28th meeting) which have since been completed are shaded in gray and will be moved to the CLOSED ITEM worksheet (the second tab at the bottom of the workbook) when the Progress Tracking List is uploaded the next time.

Please find below the **Districts' response** to Relicensing Participants' "data gap" study requests left unaddressed at the April 19 Meetings of the Recreation and Cultural Resources Work Groups and the April 20 Meeting of the Aquatic/Water/Terrestrial Resources Work Group.

Response to Recreation Resources Work Group

[1] Lower Tuolumne River boating study -- RP commented that the Districts should consider undertaking a study of recreational boating in the lower Tuolumne River below La Grange Dam. The "project nexus" would be that the current flows provided below La Grange did not consider whether these flows are usable for recreational boating purposes, but only for fishery purposes. The Districts would agree to prepare a study plan to investigate recreational boating in the lower Tuolumne River with the following scope:

- the reach below La Grange is considered a flat water/swift water experience, not a whitewater experience;
- the objective of the evaluation would be to determine the lowest boatable flow for recreational, personal (non-commercial), non-motorized craft, including canoes, kayaks and rafts;
- the primary goal of such recreational boating is to travel from Point "A" to Point "B" in a certain amount of time, but because of the large number of public entrance and exit points, any length of trip can be accommodated; therefore, the objective is to determine the lowest flow that is boatable;
- "boatable" would be defined as being able to be traversed without undue scraping of the bottom of the craft with reasonable skills for the significant majority of the trip;
- the study would be undertaken using local boaters and District personnel field testing flows at various locations on the lower Tuolumne starting with the lowest established fishery flow of 50 cfs, then 75 cfs, then 100 cfs;
- the study would not include an assessment of river access because there are already many opportunities for public access; nor any assessment of "optimum" flows because there are no objective criteria for a flat water boating experience.

[2] Wards Ferry Takeout for Whitewater Boaters --- the Districts are still reviewing the request for a feasibility study of an improved takeout for whitewater rafters entering the reservoir. We expect to be able to respond on or before May 18.

[3] Study of Recreational Use Levels, Visitor Preferences, and Unmet Demand --- the Districts believe that previous studies and the information routinely collected by DPRA is likely sufficient

to evaluate these issues once the raw data is fully researched. The Districts are undertaking this review of the raw data and will respond to this issue on or before May 18.

[4] Study of Existing Facility Condition Assessment and Public Accessibility --- the Districts will undertake this study, prepare a study plan, and include the same in its July 25, 2011 Proposed Study Plan (PSP) package.

[5] Study of Visual Quality Assessment – the Districts will undertake an assessment of visual effects and visual quality related to federal lands occupied by and immediately adjacent to the Project. BLM has designated Visual Resource Management Areas established, which therefore meets the applicable parts of the FERC ILP seven criteria (standard methods; goals and objectives). Non-federal lands have no criteria against which to objectively judge visual effects. The reservoir is an important visual component of the landscape. The Districts will prepare a study plan for inclusion in its July 25, 2011 PSP.

There were **no additional Cultural or TCP** Resource study requests, only suggestions for improving the draft Study Plans in the PAD. The Districts are revising the draft Plans and will reissue these revised drafts to the Work Group for further review and comment.

Response to Aquatic/Water/Terrestrial Resources Work Group

[1] The Districts were asked whether they intended to perform a study of the relationship between flow in the lower Tuolumne River and the other known stressors on anadromous fish in the river. This request was also later described as consisting of a limiting factor analysis for each of the life stages of these species. Developing a matrix of life stage vs stressor was thought to be a way of determining data gaps and/or possible PM&E measures. The Districts have considered this study request and are not planning to propose such a study at this time. Several of the most significant factors (stressors) affecting salmon and *O. Mykiss* in the lower Tuolumne River are completely unrelated to the Don Pedro Project, or even to MID and TID activities on the river. One of the major issues affecting salmon on the lower Tuolumne River is the extensive disruption to the river bed and banks caused by historical in-channel gold mining operations which have markedly, permanently, and adversely modified the available habitats in the lower Tuolumne River. Another major factor is the in-channel and overbank gravel operations which also have permanently altered the river channel and overbank areas. A third major factor affecting success of salmon restoration has been the introduction of non-native game species by CDFG, especially smallmouth and largemouth bass, which have been shown to forage heavily on smolt and fry. The Project, and the Districts' water users, are now being asked to address these non-Project factors by adding flow to the lower river to "solve" or "mitigate" these non-Project impacts. The Districts do not believe that these factors are Project effects, nor should the Project be expected to solve problems completely unrelated to either the Project or the Project beneficiaries. In any event, such a study would be a PM&E study and should only come after a measurable Project effect has been shown. While the Districts do not propose to undertake such a study at this time, the Districts remain open to reconsider this request if Relicensing Participants could provide the Districts with a specific study proposal which would help us better understand the type of study being requested.

[2] Mussel Study – it was suggested at the meeting that a significant change in mussel populations in the lower Tuolumne River has been observed (actually, since about 1995). This was suggested to be a data gap in the PAD, and the decline was suggested to be potentially due to Project operations. The potential Project effect was identified as ramping. The Project has not performed any significant unit ramping since 1995. The Districts point out that the observations referenced are anecdotal and no evidence of a decline in mussel populations have been documented. The Districts are not planning to prepare a study plan to research mussel populations in the lower Tuolumne River at this time.

[3] Wetland Mapping – it was suggested that the Districts should consider performing a separate wetland mapping effort at the Project, instead of identifying wetlands as a part of other studies. The Districts are not aware of any Project-related impacts to wetlands as the Project has operated in its current fashion for almost 50 years and the near-Project environment has adapted to this operation. If Project-specific wetland impacts are observed while conducting related wildlife and/or botanical studies, then these will be documented, reported and investigated.

[4] 3-D Reservoir Temperature Model – the Districts will prepare a study plan to develop a 3-D reservoir temperature model; this will be included in the Districts' July 25, 2011 Proposed Study Plan (PSP).

[5] The Districts were asked if they planned to undertake a socioeconomic study of the potential impact on water users of alternative instream flows in the lower Tuolumne River. The Project nexus, or the effect on socioeconomic resources, would occur if greater flows are provided to the lower Tuolumne River, resulting in less flow available to the current water users on the Tuolumne River, including MID, TID, CCSF and their customers. The Districts will prepare a study plan for conducting a socioeconomic assessment and include this study plan in its July 25, 2011 PSP package.

[6] The Districts were asked if they intended to prepare population projections and projections of potential increased water needs for irrigation and M&I use over the term of the new license for the purpose of (1) comparing water needs to water rights and (2) identifying potential effects of increased water use on water quality. The Districts are not currently projecting a conflict between its water rights and water needs. The Districts do not understand the Project nexus or connection between water needs and water quality in the lower Tuolumne given the current operation of the Project; therefore, the Districts are not proposing to prepare such a study at this time.

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Don Pedro Progress Tracking List

Items completed are shaded in gray and will be moved to the CLOSED ITEM worksheet before the next issue of the Progress Tracking List (PTL) is uploaded to the Relicensing Website.
Red Text indicates either NEW items or NEW responses/status updates added since the last upload.
(RP = Relicensing Partipant)

Item No.	*Souce of Item*	*Item*	*Date Requested*	*Date Due*	*Responsible Party*	*Action Taken/Status*	*Date Closed*
1	RP	Poll of RPs for meeting availability and resource area interests.	2/28/2011	3/8/2011	Districts	Created Doodle Poll questionaire and sent it to RPs via email on 3/2/2011. Responses due 03/07/2011. **Poll completed 03/07/2011; 2011 meeting dates announced to RPs via email on 03/15/2011 and have been posted on website calendar.**	
2	CSPA; CDFG; and TRT	Use of an independent facilitator.	2/28/2011	n/a	n/a	Request documented; **Districts' response emailed to RPs on 03/07/2011.**	
3	Several RPs	Alternating the meeting locations for future meetings.	2/28/2011	3/11/2011	Districts	Request for alternating meeting locations to be considered. **Districts' response emailed to RPs on 03/15/2011.**	
4	Several RPs	Use of web conferencing as part of future meetings.	2/28/2011	3/11/2011	Districts	Request for web conferencing as part of the meeting to be considered. **Districts' response emailed to RPs on 03/15/2011.**	
5	NGOs	RPs not to have to pay for PAD reproduction costs.	2/28/2011	3/11/2011	Districts	Request for RPs not to have to pay for PAD reproduction costs to be considered. **Districts' response emailed to RPs on 03/15/2011.**	
6	Several RPs	Procedure for managing study plan revisions on the Don Pedro website.	2/28/2011	3/18/2011	Districts	Process for sharing study plan revisions on the Don Pedro website to be described to RPs.	

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
7	Several RPs	Exhibit G or other Project Boundary Maps for tailwater and Gasburg Creek areas.	2/28/2011	3/11/2011	Districts	Project Boundary Maps to be uploaded to the Don Pedro website. **Two Project Boundary maps (showing area below the Don Pedro Dam) have been uploaded and RPs advised via email 03/15/2011.**	
8	Districts	RP review of Relicensing Participants List in PAD (Appendix B) to identify additional parties interested in the relicensing.	2/28/2011	3/18/2011	RPs	RPs to advise Districts of additional interested parties and their contact information, if known. **Additional names have been received and added to the Relicensing Participants Contact Email List**.	
9	NHI	"Discussion of Cummulative Impacts" to be an agenda item for the April 19-20 meeting.	2/28/2011	04/19-20/2011	Districts	"Discussion of Cummulative Impacts" to be added to the agenda for the April 19-20 RP meeting. **Project effects were discussed at the April 19-20 RWG meetings.**	
10	RPs	Uploading of Meeting Slides to the Don Pedro ebsite.	2/28/2011	3/11/2011	Districts	Slides used at the Feb 28 RP meeting to be uploaded to the Don Pedro website. **Meeting presentation slides have been uploaded and RPs advised via email 03/15/2011.**	
11	**RPs**	**Provide a copy of this year's snow surveys used for forecasting.**	**4/1/2011**	**n/a**	**Districts**		
12	**RPs**	**Provide an historic account of the times and duration since project commencement that the reservoir has been into the flood conservation pool during the applicable period-frequency, number of occurrences, duration, and water year type.**	**4/1/2011**	**n/a**	**Districts**		

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
13	RPs	Where, and when, is riparian water used--and how is it separated from storage? Is riparian water the water used on lands that meet the definition of "riparian lands"? Include a map of the lands that are served under a riparian claim. Provide season and amounts of water provided on those lands under claim of riparian right.	4/1/2011	n/a	Districts		
14	RPs	How long does the reservoir normally stay at the peak elevation it reaches in any year?	4/1/2011	n/a	Districts		
15	RPs	Provide the unimpaired flows at La Grange and the historical flows at La Grange since the Project began operating.	4/1/2011	n/a	Districts		
16	RPs	Provide copies of the Districts' pre-1914 appropriative rights, as noted or recorded in accordance with the state laws at the time.	4/1/2011	n/a	Districts		
17	RPs	Provide pre-settlement, post-new Don Pedro flows and reservoir elevations similar to which is provided in the PAD for post-settlement.	4/1/2011	n/a	Districts		
18	RPs	What model will be used to develop the Project Operations Model?	4/1/2011	n/a	Districts		
19	RPs to CCSF	Is there a technical document that describes in some detail the operations of the HHWP?	4/1/2011	n/a	CCSF		

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
20	RPs to CCSF	What is the projected future water demand estimated by CCSF? Are new water storage resources being planned to meet the demand?	4/1/2011	n/a	CCSF		
21	RPs to CCSF	Provide the historical water bank "account balance" that the Districts have provided CCSF. Also, provide documentation on water bank accounting method.	4/1/2011	n/a	CCSF		
22	RPs to CCSF	Explain how the Don Pedro FERC relicensing process can affect CCSF.	4/1/2011	n/a	CCSF		
23	RPs to CCSF	What compensation does CCSF provide the Districts when CCSF's water bank account has a negative balance?	4/1/2011	n/a	CCSF		
24	RPs to CCSF	Could CCSF provide copies of the water balance reports it sends to the Districts?	4/1/2011	n/a	CCSF		
25	RPs to CCSF	Does CCSF have a water balance model it could share with relicensing participants? Or could CCSF provide portions of its water model to the Districts' water balance model?	4/1/2011	n/a	CCSF		
26	RPs to CCSF	What quantity of water in acre feet will CCSF take annually from the river in the next 40 years, compared to same in the last 10 years? What will be the effect on pre-flood releases below Don Pedro?	4/1/2011	n/a	CCSF		

From: Staples, Rose
Sent: Thursday, May 05, 2011 7:55 PM
To: Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Subject: Parking Info for the May 11th FERC Don Pedro Project Scoping Meeting at CSUS

Knowing that school will be in session at California State University Stanislaus during the time of the morning FERC Scoping Meeting for the Don Pedro Project,

being held at the University's EVENT CENTER, we thought we would check in with the campus for parking advice. We would like to share with you the information we received.

We are advised that people "should be directed to Parking Lot #8 and/or Lot #11A (temporary gravel lot) off of Geer Rd. The Event Center is centrally located so they'll have to walk a little regardless but Lot #8 and 11A will afford the most available spaces."

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For more information on the FERC Site Visit (May 10th) and the two FERC Scoping meetings (Turlock and Modesto) on May 11th, including an itinerary for the Site Visit, please visit the www.donpedro-relicensing.com website MEETING section and click on the May 10 and May 11 announcements. Thank you.

Rose Staples CPS CAP
Executive Assistant
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From: Staples, Rose
Sent: Friday, May 06, 2011 4:50 PM
To: Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Subject: Additional Alert Regarding Parking at CSUS for the May 11th FERC Scoping Meeting on the Don Pedro Project

I wanted to pass along to everyone some additional information I learned regarding parking at California State University Stanislaus. The reason we are being directed to Parking Lot #8 or Lot 11A is that you

apparently need a CSUS Parking Permit to be able to park in any of the OTHER areas on campus (other than Parking Lot #8 or Lot #11A); and if you park in any of those other areas without a permit, you would be ticketed and fined.

Rose Staples CPS CAP
HDR|DTA
Direct: 207-239-3857

From: Staples, Rose
Sent: Thursday, May 05, 2011 7:47 PM
To: 'Alves, Jim - City of Modesto'; 'Asay, Lynette - N-R'; 'Aud, John - SCERD'; 'Barnes, James - BLM'; 'Beuttler, John - CSPA'; 'Bond, Jack - City of Modesto'; 'Boucher, Allison - TRC'; 'Boucher, Dave - Allison - TRC'; 'Bowes, Stephen - NPS'; 'Bowman, Art - CWRMP'; 'Brewer, Doug - TetraTech'; 'Brochini, Anthony - SSMN'; 'Buckley, John - CSERC'; 'Burt, Charles - CalPoly'; 'Carlin, Michael - SFPUC'; 'Catlett, Kelly - FOR'; 'Charles, Cindy - GWWF'; 'Cory, Philip - TNC'; 'Costa, Jan - Chicken Ranch'; 'Cowan, Jeffrey'; 'Cox, Stanley Rob - TBMWI'; 'Cranston, Peggy - BLM'; 'Cremeen, Rebecca - CSERC'; 'Day, P - MF'; Devine, John; 'Dixie, Yakima K - CVMT'; 'Donaldson, Milford Wayne - OHP'; 'Dowd, Maggie-SNF'; 'Drekmeier, Peter - TRT'; 'Edmondson, Steve - NOAA'; 'Eicher, James - BLM'; 'Fety, Lauren - BLM'; 'Findley, Timothy - Hanson Bridgett'; 'Freeman, Beau - CalPoly'; 'Fuller, Reba - TMTC'; 'Furman, Donn W - SFPUC'; 'Ganteinbein, Julie - Water-Power Law Grp'; 'Giglio, Deborah - USFWS'; 'Goode, Ron - NFMT'; 'Gorman, Elaine - YSC'; 'Gutierrez, Monica - NOAA-NMFS'; 'Hastreiter, James L - FERC'; 'Hatch, Jenny - CT'; 'Hayat, Zahra - MF'; 'Hellam, Anita - HH'; 'Hersh-Burdick, Rachael - USACE'; 'Heyne, Tim - CDFG'; 'Holden, James '; 'Horn, Jeff - BLM'; 'Horn, Tini'; 'Hughes, Noah'; 'Hughes, Robert - CDFG'; 'Jackman, Jerry '; 'Jackson, Zac - USFWS'; 'Jennings, William - CSPA'; 'Jensen, Art - BAWSCA'; 'Jensen, Laura - TNC'; 'Johannis, Mary'; 'Johnson, Brian - CalTrout'; 'Kanz, Russ - SWRCB'; 'Keating, Janice'; 'Kempton, Kathryn - NOAA-MNFS'; 'Kinney, Teresa'; 'Koepele, Patrick - TRT'; 'Lein, Joseph'; 'Levin, Ellen - SFPUC'; 'Lewis, Reggie - PRCI'; 'Linkard, David - TRT /RH'; Loy, Carin; 'Lyons, Bill - MR'; 'Manji, Annie'; 'Marko, Paul '; 'Marshall, Mike - RHH'; 'Martin, Michael - MFFC'; 'Mathiesen, Lloyd - CRRMW'; 'McDaniel, Dan -CDWA'; 'McDevitt, Ray - BAWSCA'; 'McDonnell, Marty - SMRT'; 'McLain, Jeffrey - NOAA-NMFS'; 'Means, Julie - CDFG'; 'Mills, John - TUD'; 'Morningstar Pope, Rhonda - BVR'; 'Motola, Mary - CT'; 'O'Brien, Jennifer - CDFG'; 'Orvis, Tom - SCFB'; 'Ott, Bob'; 'Ott, Chris'; 'Pinhey, Nick - City of Modesto'; 'Porter, Ruth - RHH'; 'Powell, Melissa - CRRMW'; 'Puccini, Stephen - CDFG'; 'Raeder, Jessie - TRT'; 'Ramirez, Tim - SFPUC'; 'Rea, Maria - NOAA-NMFS'; 'Reed, Rhonda - NOAA-NMFS'; 'Richardson, Kevin - USACE'; 'Robbins, Royal'; 'Romano, David O - N-R'; 'Roos-Collins, Richard - Water-Power Law Grp for NHI'; 'Roseman, Jesse'; 'Rothert, Steve - AR'; 'Sandkulla, Nicole - BAWSCA'; 'Schutte, Allison - HB'; 'Sears, William - SFPUC'; 'Shumway, Vern - SNF'; 'Shutes, Chris - CSPA'; 'Slay, Ronn - CNRF/AIC'; 'Smith, Jim - MPM'; Staples, Rose; 'Steindorf, Dave - AW'; 'Stork, Ron - FOR'; 'Stratton, Susan - CA SHPO'; 'Taylor, Mary Jane - CDFG'; 'TeVelde, George A '; 'Thompson, Larry - NOAA-MNFS'; 'Verkuil, Colette - TRT/MF'; 'Walters, Eric - MF'; 'Wantuck, Rick - NOAA-NMFS'; 'Welch, Steve - ARTA'; 'Wesselman, Eric - TRT'; 'Wheeler, Dan'; 'Wheeler, Dave'; 'Wheeler, Douglas - RHH'; 'Williamson, Harry (NPS)'; 'Wilson, Bryan - MF'; 'Winchell, Frank - FERC'; 'Wood, Dave - FR'; 'Wooster, John -NOAA'; 'Workman, Michelle - USFWS'; 'Yoshiyama, Ron'; 'Zipser, Wayne - SCFB'
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HDR|DTA
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Office: 207-775-4495 | Direct: 207-239-3857 | Fax: 207-775-1742
Email rose.staples@hdrinc.com

From: Staples, Rose
Sent: Monday, May 09, 2011 8:44 PM
To: Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Subject: Wednesday Parking and Reminder of May 18 and May 19 Don Pedro RWG Meetings

Parking for Wednesday's Scoping Meeting at CSUS's Event Center

My apologies for all the emails and confusion regarding PARKING for FERC's Wednesday's scoping meeting at CSUS. FERC was assured by the Event Center when they booked the event that there would not be a parking problem. Initial calls to the campus regarding where best to advise participants to park led to the original series of emails last week. Today, after receiving another inquiry by a relicensing participant, I placed a call direct to the Event Center and was advised that *free parking* is along the streets (Monte Vista and Geer being closest to the Center)—and that to use their parking lots (and I was directed to lots 8 and 11 as being good choices) you would need to stop at one of the "vending machine" type kiosks which are at various locations around the campus to buy a $6 parking permit. If you are not familiar with the campus—and their parking system, you might want to check beforehand by calling the campus or checking in with the Event Center staff when you arrive as to exactly where you can park for free on campus.

May 18 and May 19 RWG Meetings

The Cultural & Recreation RWG meetings are scheduled to be held on Wednesday, May 18th.
The Aquatic/Water and Terrestrial RWG Meetings are scheduled to be held on Thursday, May 19th.
AGENDAS for these meetings should be emailed to you (and posted on the website) by Thursday, May 12th.

Thank you.

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From: Staples, Rose
Sent: Wednesday, May 11, 2011 10:04 AM
To: Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Subject: Another Piece of the CSU Parking Puzzle

I received in another email with another piece of the parking puzzle at CSU:

"Just called the parking office at CSU, and apparently if you are in a vehicle with Exempt (State) plates, you do not need to pay for parking in the regular lots."

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From: Staples, Rose
Sent: Friday, May 13, 2011 2:55 PM
To: Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Subject: Updated Progress Tracking List has been Posted; May 18-19 Meeting Agendas Will Be Posted Later This Afternoon

The most recent issue of the Don Pedro Relicensing *Progress Tracking List* has been posted to the website (MEETINGS\MEETINGS CALENDAR\April 20 & April 21 RWG Meeting Announcement). It

contains the OPEN action points – questions – requests up through and including the April 20th and April 21st RWG Meetings, along with responses to date. If you have any difficulties in accessing and/or downloading the document, please let me know.

Agendas for next week's RWG Meetings will be forwarded to you a little later this afternoon, but the general timeline for the meetings are:

May 18:
Cultural RWG 9:00 a.m. to 11:30 a.m.
Recreation RWG 1:00 p.m. to 4:30 p.m.

May 19:
Aquatic/Water RWG 9:00 a.m. to 1:00 p.m.
Terrestrial RWG 2:00 p.m. to 5:00 p.m.

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Don Pedro Progress Tracking List

Items completed are shaded in gray and will be moved to the CLOSED ITEM worksheet before the next issue of the Progress Tracking List (PTL) is uploaded to the Relicensing Website.
Red Text indicates either NEW items or NEW responses/status updates added since the last upload.
(RP = Relicensing Partipant) - Last Updated 5/13/2011 by R Staples

Item No.	*Souce of Item*	*Item*	*Date Requested*	*Date Due*	*Responsible Party*	*Action Taken/Status*	*Date Closed*
		Items 1-5 Closed					
6	Several RPs	Procedure for managing study plan revisions on the Don Pedro website.	2/28/2011	3/18/2011	Districts	Process for sharing study plan revisions on the Don Pedro website to be described to RPs.	
		Items 7-10 Closed					
11	**RPs**	**Provide a copy of this year's snow surveys used for forecasting.**	**4/1/2011**	**n/a**	**Districts**	**Districts' response in progress.**	
12	**RPs**	**Provide an historic account of the times and duration since project commencement that the reservoir has been into the flood conservation pool during the applicable period-frequency, number of occurrences, duration, and water year type**	**4/1/2011**	**n/a**	**Districts**	**Districts' response in progress.**	
13	**RPs**	**Where, and when, is riparian water used--and how is it separated from storage? Is riparian water the water used on lands that meet the definition of "riparian lands"? Include a map of the lands that are served under a riparian claim. Provide season and amounts of water provided on those lands under claim of riparian right.**	**4/1/2011**	**n/a**	**Districts**	**Districts' response in progress.**	
14	**RPs**	**How long does the reservoir normally stay at the peak elevation it reaches in any year?**	**4/1/2011**	**n/a**	**Districts**	**Districts' response in progress.**	
15	**RPs**	**Provide the unimpaired flows at La Grange and the historical flows at La Grange since the Project began operating.**	**4/1/2011**	**n/a**	**Districts**	**Districts' response in progress.**	

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
16	RPs	Provide copies of the Districts' pre-1914 appropriative rights, as noted or recorded in accordance with the state laws at the time.	4/1/2011	n/a	Districts	Districts' response in progress.	
17	RPs	Provide pre-settlement, post-new Don Pedro flows and reservoir elevations similar to which is provided in the PAD for post-settlement.	4/1/2011	n/a	Districts	Districts' response in progress.	
18	RPs	What model will be used to develop the Project Operations Model?	4/1/2011	n/a	Districts	Districts' response in progress.	
19	RPs to CCSF	Is there a technical document that describes in some detail the operations of the HHWP?	4/1/2011	n/a	CCSF		
20	RPs to CCSF	What is the projected future water demand estimated by CCSF? Are new water storage resources being planned to meet the demand?	4/1/2011	n/a	CCSF		
21	RPs to CCSF	Provide the historical water bank "account balance" that the Districts have provided CCSF. Also, provide documentation on water bank accounting method.	4/1/2011	n/a	CCSF		
22	RPs to CCSF	Explain how the Don Pedro FERC relicensing process can affect CCSF.	4/1/2011	n/a	CCSF		
23	RPs to CCSF	What compensation does CCSF provide the Districts when CCSF's water bank account has a negative balance?	4/1/2011	n/a	CCSF		
24	RPs to CCSF	Could CCSF provide copies of the water balance reports it sends to the Districts?	4/1/2011	n/a	CCSF		
25	RPs to CCSF	Does CCSF have a water balance model it could share with relicensing participants? Or could CCSF provide portions of its water model to the Districts' water balance model?	4/1/2011	n/a	CCSF		

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
26	RPs to CCSF	What quantity of water in acre feet will CCSF take annually from the river in the next 40 years, compared to same in the last 10 years? What will be the effect on pre-flood releases below Don Pedro?	4/1/2011	n/a	CCSF		
27	Recreation RWG Mtg	Districts were asked to Investigate relationship of the Project Boundary and the downstream Wild & Scenic River Boundary.	4/19/2011	n/a	Districts	Districts' response in progress.	
28	Recreation RWG Mtg	Districts were asked to consider performing a "feasibility" or "site suitability" study of relocating or improving current take-out.	4/19/2011	4/29/11; extended to 5/05/11, then 5/18/11	Districts	Districts responded via email 5/05/11 that they are reviewing the request and they expect to be able to respond on or before 5/18/11.	
29	Recreation RWG Mtg	NPS to provide new ORV guidelines applicable to the Project area.	4/19/2011	4/29/2011	NPS		
30	Recreation RWG Mtg	Districts' debris maintenance and log-jam removal/management appreciated. Districts were asked if it will continue as part of the new license?	4/19/2011	n/a	Districts	Districts' response in progress.	
31	Recreation RWG Mtg	The question was asked that if dispersed recreational use was found to be impacting rare or sensitive plant areas, would Districts restrict such use?	4/19/2011	n/a	Districts	Districts responded to this during the meeting, noting that the new license application is likely to contain identification of unique or sensitive habitats, and it is not uncommon to restrict recreation access to those areas. In fact, some areas of the reservoir shoreline are already restricted.	
32	Recreation RWG Mtg	Districts were asked if they were planning to prepare a study plan for surveying recreational users to identify unmet demand, satisfaction levels, and need for additional facilities?	4/19/2011	4/29/2011; extended to 5/05/11; then 5/18/11	Districts	Districts responded via email 5/05/2011 that they are reviewing existing raw data and expect to be able to respond to this issue or or before 05/18/11.	

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
33	Recreation RWG Mtg	Districts were asked if the current flows on the lower Tuolumne are boatable and compatible with other uses (fishing)?	4/19/2011	n/a	Districts	Districts responded via email 5/05/11.	
34	Recreation RWG Mtg	Districts were asked to consider the following study needs: (1) boatable flows on lower Tuolumne River (were fishery flows boatable) and possible need for additional put-ins/take-outs, (2) suitability of Wards Ferry take-out, (3) recreational use levels, visitor preferences and satisfaction, unmet demand, (4) existing facility condition assessment, including ADA accessiblility, and (5) visual quality assessment, possibly photo documentation of visual quality at different water levels or landscape features to be brought into future planning of recreation	4/19/2011	n/a	Districts	See responses to Items 28, 32, 33, 43, and 57.	
35	Recreation RWG Mtg	The Districts were asked if Turlock Lake was stocked; and if so, with what?	4/19/2011	n/a	Districts	Districts' response in progress.	
36	Cultural RWG Mtg	Study plan should include the requirement for field investigators to have California archaeology experience.	4/19/2011	n/a	Districts	Study plan will include.	
37	Cultural RWG Mtg	Consistent standards of investigation must be used from area to area, probably adopt the BLM standards.	4/19/2011	n/a	Districts	Districts' response in progress.	
38	Cultural RWG Mtg	James Barnes, BLM archaeologist, should be copied on all correspondence with the SHPO regarding Section 106 consultation.	4/19/2011	n/a	Districts	Will occur.	

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
39	Cultural RWG Mtg	Agreement should be reached prior to field studies on how to handle discovery of human remains--and human remains on BLM lands. BLM does not delegate responsibility to FERC for handling human remains on BLM lands. The NID/PG&E process was satisfactory, including the providing of site records to BLM, why sites were not evaluated if this were to occur, and the content of Technical Memos.	4/19/2011	n/a	Districts	Districts' response in progress.	
40	Cultural RWG Mtg	It was suggested that the Districts visit the newly opened UC Davis collection.	4/19/2011	n/a	Districts	Districts will do.	
41	Cultural RWG Mtg	James Barnes to give suggestions for how to consider/approach isolets.	4/19/2011	n/a	BLM		
42	Cultural RWG Mtg	It was emphasized that "protect and preserve is the goal".	4/19/2011	n/a	Districts	Districts acknowledge this goal.	
43	Water / Aquatic / Terrestrial RWG Mtg	It was asked if it was the Districts' intention to perform a study that would develop a clear understanding of how flow relates to other stressors to the anadromous fisheries? Or perform a "limiting factors analysis" of each salmon life stage compared to individual stressors?	4/20/2011	4/29/2011; extended to 5/05/2011	Districts	Districts responded via email 5/05/11.	
44	Water / Aquatic / Terrestrial RWG Mtg	The question was asked if Turlock Lake and Modesto Reservoir were stocked, by whom, and with what? Also, does Turlock Lake spill into the Tuolumne River?	4/20/2011	n/a	Districts	Districts' response in progress.	
45	Water / Aquatic / Terrestrial RWG Mtg	The qustion was asked where did the population of rainbow trout in La Grange Reservoir come from?	4/20/2011	n/a	Districts	It was noted at the meeting that no one knew the origin of this population..	

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
46	Water / Aquatic / Terrestrial RWG Mtg	The question was asked if pikeminnow populatuion has increased over time? Districts to locate and distribute Tim Ford report developed using known information	4/20/2011	n/a	Districts	Districts' response in progress.	
47	Water / Aquatic / Terrestrial RWG Mtg	Districts were asked to provide a citation for study done for Merced Project relicensing on riffle habitat use.	4/20/2011	n/a	Districts	Districts' response in progress.	
48	Water / Aquatic / Terrestrial RWG Mtg	It was pointed out that CDFG recently issued a draft EIR on section dredging that was still open for comment.	4/20/2011	n/a	n/a	No action required.	
49	Water / Aquatic / Terrestrial RWG Mtg	R Kanz requested a copy of the ongoing IFIM study plan be forwarded to him. It was also asked if any disease studies been conducted on anadromous fish in the Tuolumne River? CDFG to look into this and respond.	4/20/2011	n/a	Districts & CDFG	Districts to forward copy of ongoing IFIM study plan to R Kanz.	
50	Water / Aquatic / Terrestrial RWG Mtg	Question raised about period of time over which O. mykiss tracking occurred?	4/20/2011	n/a	Districts	Districts' response in progress.	
51	Water / Aquatic / Terrestrial RWG Mtg	The question was asked if a study should be undertaken to determine effect on predator location in river with changing water temperature?	4/20/2011	n/a	Districts	N Hume responded during the meeting that he believed this could be addressed with existing data.	
52	Water / Aquatic / Terrestrial RWG Mtg	It was asked what impact does flow have on moving predators out of prime spawning and rearing habitat?	4/20/2011	n/a	Districts	Districts' response in progress.	

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
53	Water / Aquatic / Terrestrial RWG Mtg	The question was raised about the status of other native species in the lower Tuolumne River (including lamprey, sturgeon, and cyprinids)? It was also noted that reports of sturgeon in the Tuolumne have occurred; this was clarified to be an anecdotal observation by a riparian water user near the Grayson Ranch in late summer.	4/20/2011	n/a	Districts	Districts' response in progress.	
54	Water / Aquatic / Terrestrial RWG Mtg	Question raised about the status of mussels in the lower Tuolumne River? Is this a data gap? It was reported that anecdotal observations were that prior to 1995 there were many mussels in the river and that now there are very few. Idea was offered that stranding may be a potential cause. It was pointed out that the Project no longer peaks, but RPs noted that flows change in accordance with seasonal downstream flow requirements.	4/20/2011	n/a	Districts	The Districts responded via email 5/05/11.	
55	Water / Aquatic / Terrestrial RWG Mtg	Districts were encouraged to refer to counties' weed watch list for additional information on invasive weeds.	4/20/2011	n/a	Districts	Districts will contact counties.	
56	Water / Aquatic / Terrestrial RWG Mtg	Districts were advised to refer to a study of cottonwoods in the Central Valley.	4/20/2011	n/a	Districts	The Districts advised in the meeting that this study, performed by Stella et al, was summarized in the PAD.	
57	Water / Aquatic / Terrestrial RWG Mtg	It was pointed out that the Districts were not proposing to perform a study dedicated to wetlands mapping and the potental project effects on wetlands. RPs wondered if this would not be needed/useful	4/20/2011	4/29/2011; extended to 5/05/2011	Districts	The Districts responded via email 5/05/11.	

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
58	Water / Aquatic / Terrestrial RWG Mtg	Districts were advised to consider the relationship between pollinator species, vernal pools, and special-status plants.	4/20/2011	n/a	Districts	Districts to consider modifying the current study plan.	
59	Water / Aquatic / Terrestrial RWG Mtg	Concern was raised about effect of dispersed recreation on sensitive areas (e.g. serpentine soils). Consider modifying current plan?	4/20/2011	n/a	Districts	Districts' response in progress.	
60	Water / Aquatic / Terrestrial RWG Mtg	Concern about proposed size of areas to be studied around project facilities.	4/20/2011	na/a	Districts	Districts responded during the meeting that a possible approach to coming to site-specific agreement would be for BLM staff to join field investigators in the field to perform beta testing of appropriate area to study based on actual site observations. Study would have to be modified to indicate such an approach. It was noted that BLM may have limited staff time.	
61	Water / Aquatic / Terrestrial RWG Mtg	Districts were advised that the protocols for CRLF that were in the YT/DS study plan were acceptable.	4/20/2011	n/a	Districts	No response required.	
62	Water / Aquatic / Terrestrial RWG Mtg	Districts were asked to upload copy of proposed WPT protocols to the website	4/20/2011	n/a	Districts	Districts will do.	
63	Water / Aquatic / Terrestrial RWG Mtg	Zac Jackson to forward report which included observations of WPT downstream of the project.	4/20/2011	n/a	USFWS	The report has been forwarded.	
64	Water / Aquatic / Terrestrial RWG Mtg	Districts were asked to Include Critical Habitat maps in the ESA study plan.	4/20/2011	n/a	Districts	At the meeting, the Districts agreed to include Critical Habitat maps in the study plan.	

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65	Water / Aquatic / Terrestrial RWG Mtg	It was indicated that the Districts would likely be asked for a PM&E measure for periodic eagle monitoring. It was asked if the Districts would accept this; and if so, it would obviate the need for study now.	4/20/2011	n/a	Districts	Districts' response in progress.	
66	Water / Aquatic / Terrestrial RWG Mtg	Regarding water quality study plan, Is oxidation-reduction occuring at reservoir bottom?	4/20/2011	n/a	Districts	Districts' response in progress.	
67	Water / Aquatic / Terrestrial RWG Mtg	Regarding water quality study plan, will reservor bathymetry be able to distinquish original ground from sediment?	4/20/2011	n/a	Districts	Districts' response in progress.	
68	Water / Aquatic / Terrestrial RWG Mtg	Districts should consider getting ADCP readings between old Don Pedro and the new Don Pedro.	4/20/2011	n/a	Districts	Districts' response in progress.	
69	Water / Aquatic / Terrestrial RWG Mtg	Districts were asked if there would be a separate study plan for the 3D temperature model development?	4/20/2011	n/a	Districts	The Districts are developing a study plan for the 3D temperature model development.	
70	Water / Aquatic / Terrestrial RWG Mtg	It was suggested the Districts get data on flows and temps in Moccasin Creek; thought CCSF would have it?	4/20/2011	n/a	Districts	Districts will do.	
71	Water / Aquatic / Terrestrial RWG Mtg	Districts were asked if they would prepare a Study Plan for a Socioeconomic Study? It was suggested it would be needed for CEQA.	4/20/2011	4/29/2011; extended to 5/05/2011	Districts	Districts responded via email 5/05/11.	

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
72	Water / Aquatic / Terrestrial RWG Mtg	Districts were asked if they planned to conduct an analysis of projected population growth and irrigination use compared to their water rights? Study potential effects of such growth on water quality (due to less water being in the river)	4/20/2011	4/29/2011; extended to 5/05/2011	Districts	Districts responded via email 05/05/11.	
73	Water / Aquatic / Terrestrial RWG Mtg	Districts were asked if they were going to evaluate benefits to fisheries with more flow being released to the river. Suggested that high-flow benefits was a data gap	4/20/2011	n/a	Districts	Districts indiciated in meeting that the current IFIM study is investigating that issue. Also, data from prior monitoring could also address that question.	
74	Water / Aquatic / Terrestrial RWG Mtg	Districts were asked to plot escapement vs total acre-feet released to the lower Tuolumne.	4/20/2011	n/a	Districts	Districts' response in progress.	
75	Water / Aquatic / Terrestrial RWG Mtg	It was suggested that a data gap existed as no data on number of salmon emerging from the gravel and the number leaving the Tuolumne.	4/20/2011	n/a	Districts	Districts responded in the meeting that they were uncertain how a one- or two-year study of this would inform any such gap, nor could they think of how to conduct such a study, nor could RPs when asked.	
76	Water / Aquatic / Terrestrial RWG Mtg	It was mentioned that other potential data gaps were (1) potential to improve salmon success if timing of fall impulse flows were adjusted for actual water temperatures, (2) relationship between predation and water temperature, and (3) possible accoustic tagging of bass to track movements under different temperature and flow regimes.	4/20/2011	n/a	Districts	Districts' response in progress.	

Don Pedro Project Tracking List

Item No.	Souce of Item	Item	Date Requested	Date Due	Responsible Party	Action Taken/Status	Date Closed
77	Water / Aquatic / Terrestrial RWG Mtg	The Districts were asked if they were planning any reservoir fish population studies?	4/20/2011	n/a	Districts	Districts responded in the meeting that the reservoir fishery included both good cold and warm water fishery and both were healthy and viable based on the data it had. Reservoir fishery is primarily a stocked fishery. Because there was no evidence of a problem, therefore no apparent Project effect, the study would not be justified	
78	Water / Aquatic / Terrestrial RWG Mtg	It was requested the Districts provide a GIS layer describing the Project Boundary to the BLM.	4/20/2011	n/a	Districts	Districts will do.	

From: Staples, Rose
Sent: Friday, May 13, 2011 5:16 PM
To: Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Subject: Don Pedro RWG Meetings Conference Line Number

Thank you for all the responses I have already received as to your participation in next week's meetings.

For those who want to call in, the conference line number will be:

Conference Line for May 18 and May 19 Don Pedro RWG Meetings
Call-In Number 866-994-6437
Conference Code 5424697994

I will aso be posting it on the website in a few minutes.

Thank you.

Rose Staples CPS CAP
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Don Pedro Relicensing RWG Meetings

May 18-19, 2011

MID Offices – Modesto CA

(If you plan to participate in these RWG meetings, please email rose.staples@hdrinc.com and indicate (1) which meetings, (2) in person or by phone, and (3) if web conferencing)

Wednesday, May 18 – Cultural Work Group

9:00 a.m.- 9:15 a.m.	Introductions
9:15 a.m.- 9:30 a.m.	Review of Relicensing Schedule & Purpose of Current Meeting
9:30 a.m.-10:00 a.m.	Overview of Previous Meeting and Progress Tracking List
10:00 a.m.-11:00 a.m.	Page-by-Page Review of PAD Study Plans
11:00 a.m.-11:30 a.m.	Path Forward and Action Points

Wednesday, May 18 – Recreation Work Group

1:00 p.m.- 1:10 p.m.	Introductions
1:10 p.m.- 1:20 p.m.	Review of Relicensing Schedule & Purpose of Current Meeting (Review and Discuss Available Information and Study Plans Districts will Prepare)
1:20 p.m.- 1:30 p.m.	Overview of Previous Meeting and Progress Tracking List
1:30 p.m.- 3:00 p.m.	Discussion of Proposed Study Plans -Facility Condition Assessment & Public Accessibility -Red Hills ACEC Visual Quality Assessment -Lower Tuolumne River Boating
3:00 p.m.- 4:00 p.m.	Review of Available Information / Need for Additional Information -Recreation Use Levels, Visitor Preferences, and Unmet Demand -Wards Ferry Takeout
4:00 p.m.- 4:30 p.m.	Path Forward and Action Points

Don Pedro Relicensing RWG Meetings

May 18-19, 2011

MID Offices – Modesto CA

(If you plan to participate in these RWG meetings, please email rose.staples@hdrinc.com and indicate (1) which meetings, (2) in person or by phone, and (3) if web conferencing)

Thursday, May 19 – Aquatic/Water Work Group

9:00 a.m. - 9:15 a.m.	Introductions
9:15 a.m.- 9:30 a.m.	Review of Relicensing Schedule and Purpose of Current Meeting (To Review & Discuss List of Study Plans Districts will Prepare)
9:30 a.m.-10:00 a.m.	Overview of Previous Meeting and Progress Tracking List
10:00 a.m.-12:30 p.m.	Review and Discuss List of Aquatic/Water Resources Study Plans (1) Don Pedro Reservoir 3D Temperature Model Development - CDFG On-going Reservoir Temperature Profiles (2) Reservoir Bathymetry (Underway) (3) Operations Modeling (Scope of Study) (4) Lower Tuolumne River Temperature Model Recalibration (5) Continued Discussion of "Limiting Factors Analysis" (6) Update on On-going IFIM Study (7) Socioeconomics Assessment (Scope of Study)
12:30 p.m.-1:00 p.m.	Path Forward and Action Points

Thursday, May 19 – Terrestrial Work Group

2:00 p.m.- 2:15 p.m.	Introductions
2:15 p.m.- 2:45 p.m.	Review of Relicensing Schedule & Purpose of Current Meeting
2:45 p.m.- 3:15 p.m.	Overview of Previous Meeting and Progress Tracking List
3:15 p.m. - 4:45 p.m.	Review of Proposed Study Plans and Study Requests -Wetlands Study Request -Special-Status Reptiles & Amphibian Protocols -Special-Status Plants Study Area
4:45 p.m.- 5:00 p.m.	Path Forward and Action Points

From: Staples, Rose
Sent: Wednesday, May 18, 2011 10:49 AM
To: Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Subject: Don Pedro Water Temp and IFIM Study Plans

There has been a request for copies of the Don Pedro Project Water Temp and IFIM Study Plans, referenced in the AGENDA for tomorrow's meeting. I have uploaded a copy of each to the relicensing website (www.donpedro-relicensing.com) and attached them to the meeting announcement for

tomorrow, May 19th (MEETINGS TAB, under MEETINGS CALENDAR). Please note that these are the October 2009 study plans as submitted to FERC—and that FERC may have subsequently revised the schedules, etc.

If you have any problems locating the documents and/or downloading them, please let me know. Thank you.

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Lower Tuolumne River Water Temperature Modeling
Final Study Plan

Prepared for
Turlock Irrigation District
333 East Canal Drive
Turlock CA 95380

and

Modesto Irrigation District
1231 11th St
Modesto, CA 95354

Prepared by
Stillwater Sciences
2855 Telegraph Ave. Suite 400
Berkeley, CA 94705

October 2009

Stillwater Sciences

Suggested citation: Stillwater Sciences. 2009. Tuolumne River Water Temperature Modeling Final Study Plan. Prepared for Turlock Irrigation District and Modesto Irrigation District. Prepared by Stillwater Sciences, Berkeley, California. October.

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1 BACKGROUND AND PURPOSE

The Federal Energy Regulatory Commission (FERC) issued a July 16, 2009 order ("Order") wherein Ordering paragraph (F) directed the Turlock Irrigation District (TID) and the Modesto Irrigation District (MID) to develop a water temperature model in conjunction with instream flow studies of the lower Tuolumne River (FERC 2009). The purpose of the temperature model is "to determine the downstream extent of thermally suitable habitat to protect summer juvenile *Oncorynchus mykiss* rearing under various flow conditions and to determine flows necessary to maintain water temperatures at or below 68 degrees Fahrenheit from La Grange Dam to Roberts Ferry Bridge". The Order further directs the Districts to include study plan elements of methodologies, schedules, progress reports, and consultation with fishery agencies ("Agencies", including the California Department of Fish and Game, National Marine Fisheries Service, and U.S. Fish and Wildlife Service) in developing the plan.

To examine potential water temperature management scenarios for the benefit of lower Tuolumne River salmonids, two overall study questions will be examined in response to the July 16, 2009 FERC Order:

1. What flows are required to maintain summer water temperatures (MWAT) of 68^{o}F or less downstream to Roberts Ferry Bridge at river mile (RM) 39.5?
2. What is the relationship between flow and water temperature at various time periods during the year in specified reaches of the lower Tuolumne River?

Two existing water temperature models have been previously developed for the lower Tuolumne River. Using water temperature and meteorological data collected from 1978–1988, a stream network temperature (SNTEMP) model (Theurer et al. 1984) was previously developed for the lower Tuolumne River during the late 1980's (TID/MID 1992, Appendix 18). The SNTEMP model used channel and basin geometry along with local meteorological data (i.e., air temperature, relative humidity, solar insolation, and wind speed) collected at the Modesto CIMIS weather station (with corrections for differences in elevation) to predict 5-day average instream temperatures from La Grange Dam (RM 52.2) to near the San Joaquin River confluence (RM 2.6) at various times throughout the year under different flow release scenarios. This SNTEMP model was used in conjunction with results of the CDFG instream flow study of habitat areas for key salmonid life stages (Appendices 4 and 5, TID/MID 1992) and the USFWS instream flow study (USFWS 1995), both conducted under the Don Pedro Project FERC fisheries study plan, in the development of the current flow schedule under Article 37 of the current Don Pedro Project (FERC No. 2299) license (FERC 1996).

More recently, a HEC-5Q model was developed for the Tuolumne River and other tributaries of the San Joaquin River as part of a CALFED-funded temperature model (RMA 2008). The Tuolumne River HEC-5Q sub-model was calibrated using updated water temperature and meteorological data collected from 1996–2006. Based upon statements at a November 2007 training session provided by the model developer, RMA Associates, the model reproduces this historical temperature record to within 1–2°F (0.6–1.1^{o}C) depending upon river location and time of year. This performance is more precise than the previous SNTEMP Model, which had a

predicted error of ± 2.7°F (1.5°C) with a 90% confidence interval of ± 5°F (3.0°C) (TID/MID 1992, Appendix 18). The model also has output on 6-hour intervals, providing more discrete time intervals than the SNTEMP model.

2 RECOMMENDED STUDY APPROACH

In response to the Order, TID and MID (the "Districts") propose to use the existing HEC-5Q model to simulate water temperatures at various flows and times of year. The study approach is to first validate the existing water temperature model against water temperature data not used in the initial model calibration. Second, the validated HEC-5Q model, will be used to test a series of flow scenarios to determine the flows needed to maintain specified water temperatures at particular river locations at various times of the year. Ultimately, the water temperature model predictions developed in this study will be used in conjunction with instream flow incremental methodology (IFIM) predictions of weighted usable area (WUA) developed under a separate study plan (Stillwater Sciences 2009). For example, IFIM estimates of WUA of suitable habitat meeting particular life-stage-specific criteria (i.e., depth, velocity, and substrate) determined at a particular flow and time of year will be superimposed upon areas meeting particular water temperature criteria to create an estimate of effective WUA, or EWUA.

3 STUDY AREA

As shown in Figure 1, the study area extends from La Grange Dam (RM 52.2) downstream to the San Joaquin River confluence (RM 0.0). The upper reach from La Grange to Robert's Ferry Bridge (RM 39.5) specified in the Order represents the downstream extent of most summer *O. mykiss* observations in past snorkel surveys (TID/MID 2009). It also contains the Dominant Spawning Reach (down to RM 46.6) and the Dredger Tailing Reach (down to RM 40.3) which typically have the majority of Chinook salmon spawning activity (McBain and Trush 2000).

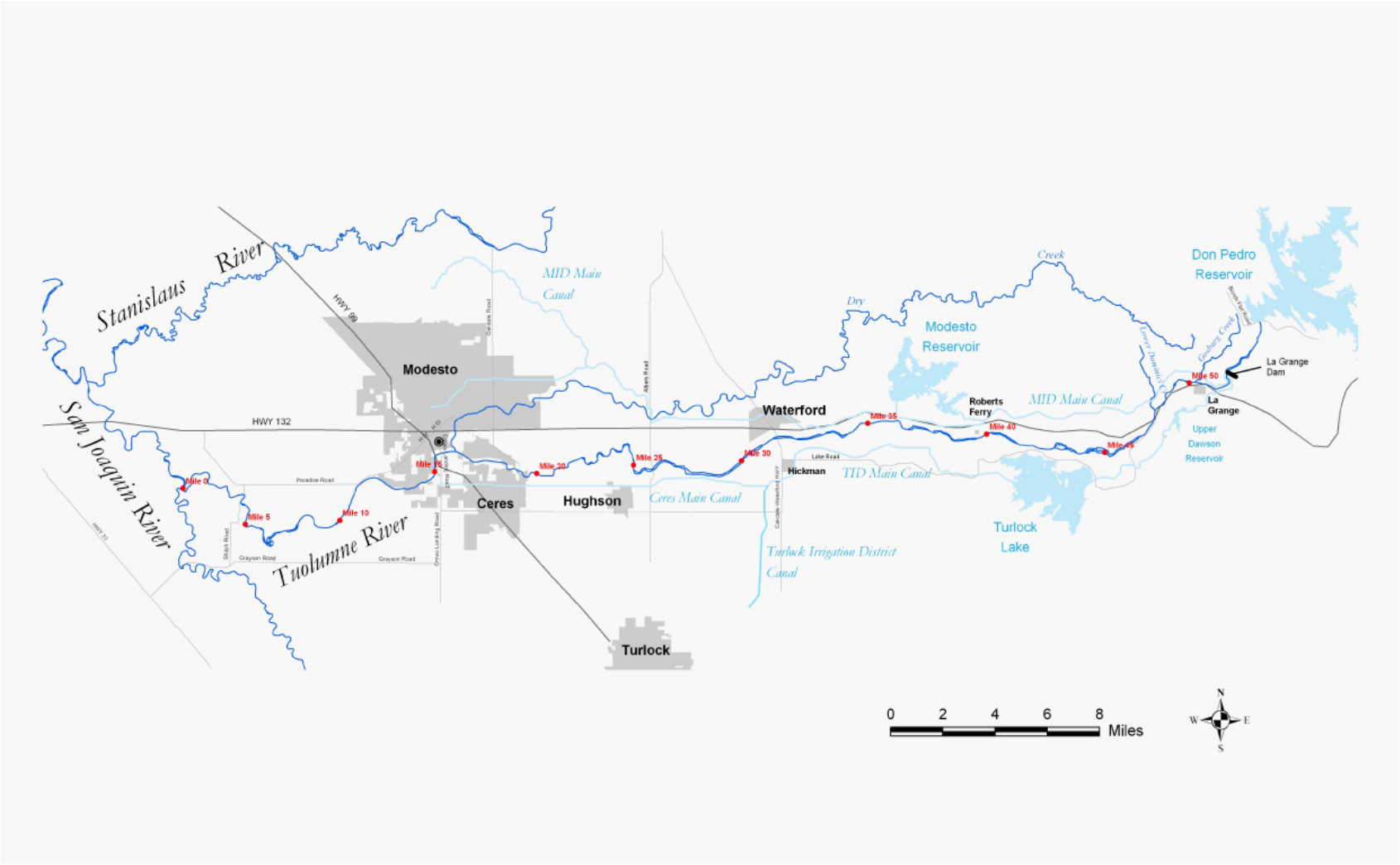

Figure 1. Vicinity map for the Tuolumne River water temperature modeling study.

4 METHODS

The methodology presented in the following sections of this study plan discuss in more detail the steps needed to be performed in order to complete the proposed water temperature modeling study, to inform the complementary IFIM study (Stillwater Sciences 2009), and to report the results to FERC and interested parties.

4.1 Validate Existing HEC-5Q Water Temperature Model

Water temperatures have been recorded continuously by the Districts at various locations in the lower Tuolumne River since 1986 (TID/MID 2005). The HEC-5Q model will be validated against 1996–2009 thermograph data not used in the original model calibration. Data used in the original model calibration may be used if no data independent of the model are available. Because no documentation of the original model calibration was provided in the final CALFED summary report (RMA 2008), an initial step in this process will be to request documentation of thermograph locations, temperature data, and periods of record used in the model calibration so that unbiased goodness of fit statistics can be developed (i.e., observed vs. predicted temperatures) and model uncertainties can be identified. As noted in Section 5, delays in collection of the final HEC-5Q calibration data may result in changes to the proposed schedule. All data records and available metadata (i.e., thermograph model, measurement time-step, specified accuracy, etc) used in the validation exercise will be provided as an electronic data Appendix to the final report.

As recommended by the Agencies, the following temperature modeling goodness of fit metrics are adapted from Theurer et al (1984) using both 6-hr averaged (minimum time-step of the HEC-5Q model) as well as daily averaged thermograph data:

- Maximize the correlation coefficient ($R^2 \leq 1.0$) between modeled and observed water temperatures at individual thermograph locations, as well as across all locations not used in the original calibration data set.
- Determine the fraction of observed temperatures deviating from modeled temperatures by more than 0.5°C, 1°C, and 1.5°C
- Determine any trends in the residual errors (observed minus modeled) either spatially (across several locations) or temporally (at individual locations).

If the goodness of fit results indicate large errors between observed and predicted temperatures, updated model uncertainty estimates will be developed for particular locations or times of year.

4.2 Scenario Development

In addition to an evaluation of the current FERC (1996) flow schedules and the actual flow releases during the 1996–2009 periods as part of the model validation exercise (Section 4.1), the initial scenario will use the validated HEC-5Q model to determine the summer flows necessary to maintain 68°F downstream to Roberts Ferry Bridge (RM 39.5). While these flows are expected to range between 100–400 cfs, the initial model scenario flow range will be expanded if necessary.

In addition to the initial scenario included in the FERC Order (Study Question 1), four additional scenarios corresponding to Study Question 2 were recommended by the Agencies in their review of the Draft Study Plan that correspond to their recommended interim conditions for the protection of various life stages of California Central Valley steelhead (*O. mykiss*) and Fall–run Chinook salmon (*O. tshawytscha*).

1. What flows are required to maintain a summer MWAT of 18ºC (64.4ºF) downstream of La Grange Dam to Roberts Ferry Bridge (RM 39.5)?
2. What flows are required to maintain a MWAT of 18ºC (64.4ºF) downstream of La Grange Dam to the confluence with the San Joaquin River (RM 0) from October 15 to December 1?
3. What flows are required to maintain a MWAT of 13ºC (55.4ºF) downstream of La Grange Dam to Roberts Ferry Bridge (RM 39.5) from October 15 to February 15?
4. What flows are required to maintain a MWAT of 15ºC (59.0ºF) downstream of La Grange Dam to the confluence with the San Joaquin River (RM 0) from March 20 to May 15.

In addition, alternative scenarios (i.e., temperature, location, timing, etc.) may also be evaluated that draw upon findings from the literature or field observations, such as information provided to FERC by the Districts, CCSF, and the Agencies.

4.3 Model Simulations and Analysis

The HEC-5Q model will be used to determine the downstream extent of suitable water temperatures for key *O. mykiss* and *O. tshawytscha* life stages under normal and extreme meteorology. As with any temperature model, using the HEC-5Q model as a predictive tool is limited by the availability of meteorological data corresponding to the conditions of interest (e.g., hottest week of spring or summer), However, various reservoir operation and release scenarios may be simulated against the period-of-record meteorology to generate a range of predicted temperatures for various locations in the river under varying meteorologic conditions. It should be noted that since the reservoir operations modeling component of the existing HEC-5Q is not adequately reflective of actual basin hydrology and District operations of Don Pedro Reservoir, corresponding water storage estimates under various scenarios and water-year types will not be addressed as part of this Study Plan.

4.4 Develop Report

A documentation report will be prepared summarizing the results of the temperature model study, describing the HEC-5Q modeling background, validation, scenario development, model simulations and analysis. The report will include graphics depicting the longitudinal flow versus water temperature relationship under varying meteorologic conditions in order to allow a thermal analysis of various flow regimes. The report will be provided to the Agencies for review and comment prior to submittal to FERC. Periodic progress reports will be prepared as milestone steps under Section 5.

5 SCHEDULE

A proposed schedule is provided in Table 1 and Figure 2. The schedule is predicated on an anticipated study plan acceptance by FERC on or about January 12, 2010, and assumes timely response by the model developer and CDFG in providing requested calibration data and documentation (Section 4.1). In the event that the these responses are not received on a timely basis, or in the event that the validation of the existing model reveals major inconsistencies with observed temperatures in the lower Tuolumne River, the schedule below may be adjusted in consultation with FERC and the stakeholders.

Table 1. Proposed schedule for implementation of FERC-ordered Temperature Modeling Study Plan.

Item	Dates (duration)	Days from FERC Approval of Study Plan
Develop Study Plan and Submit to FERC for Approval	October 14, 2009	--
FERC Response to Study Plan	January 12, 2010 (90d)	
Validate Existing Water Temperature Model	January 13 to April 12, 2010 (90d)	90
Scenario Development	January 13 to May 31, 2010 (139d)	139
Model Simulations and Analysis	June 1 to July 30, 2010 (60d)	199
Progress Report	July 30, 2010 (NA)	199
Prepare Report	October 28, 2010 (90d)	289
Instream Flow and Effective Habitat Evaluations	September 27, 2011 (180d)	623

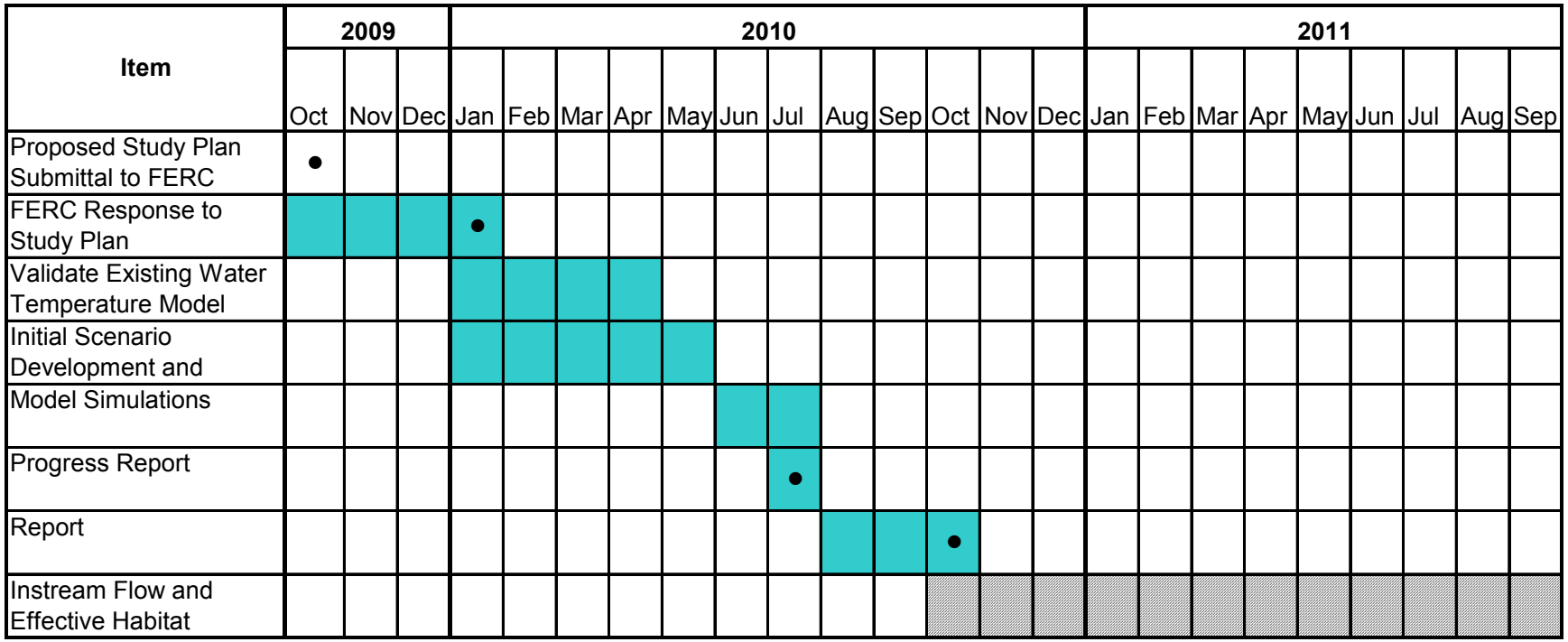

Figure 2. Proposed timeline for implementation of FERC-ordered Temperature Modeling Study Plan.

6 REFERENCES

FERC (Federal Energy Regulatory Commission). 1996. Reservoir release requirements for fish at the New Don Pedro Project, California. FERC Project No. 2299-024, FERC, Office of Hydropower Licensing, Washington, D.C.

FERC. 2009. Order on Rehearing, Amending License, Denying Late Intervention, Denying Petition, and Directing Appointment of a Presiding Judge for a Proceeding on Interim Conditions. Issued July 16, 2009. 128 FERC ¶ 61,035. New Don Pedro Project, California. FERC Project No. 2299.

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Theurer, F.D., K.A. Voos, and W.J. Miller. 1984. Instream water temperature model. Instream flow information paper 16. FWS/OBS-84/15. v.p. U.S. Fish and Wildlife Service.

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TID/MID. 2005. 2005 Ten Year Summary Report. Pursuant to Paragraph (G) of the 1996 FERC Order issued July 31, 1996. Don Pedro Project, No. 2299. April.

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Lower Tuolumne River Instream Flow Studies
Final Study Plan

Prepared for
Turlock Irrigation District
333 East Canal Drive
Turlock, CA 95380

and

Modesto Irrigation District
1231 11th St.
Modesto, CA 95354

Prepared by
Stillwater Sciences
279 Cousteau Place, Suite 400
Davis, CA 95616

October 2009

Stillwater Sciences

Suggested citation: Stillwater Sciences. 2009. Tuolumne River Instream Flow Studies. Final Study Plan. Prepared by Stillwater Sciences, Davis, California for Turlock Irrigation District and Modesto Irrigation Districts, California.

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1 BACKGROUND AND PURPOSE

The Federal Energy Regulatory Commission (FERC) issued a July 16, 2009 order ("Order") directing Turlock Irrigation District and Modesto Irrigation District ("Districts") to develop and implement an Instream Flow Incremental Method/Physical Habitat Simulation (IFIM/PHABSIM) study of the lower Tuolumne River (FERC 2009). The purpose of the instream flow study is "to determine instream flows necessary to maximize fall-run Chinook salmon *(Oncorhynchus tshawytscha)* and *O. mykiss* production and survival throughout their various life stages." This study plan responds to the Order and provides detailed methods for the proposed approach.

Two prior PHABSIM studies of the lower Tuolumne River have been conducted for the Don Pedro Project (FERC Project No. 2299) as part of the approved FERC Fisheries Study Plan. A 1981 study by CDFG (TID/MID 1992, Appendix 4) was focused within a nine-mile reach (river mile [RM] 50.5–42.0) extending from near the town of La Grange to near Turlock Lake State Recreation Area. A reanalysis of the 1981 CDFG data was also completed by EA Engineering, Science, and Technology (EA) in 1991 on behalf of the Districts (TID/MID 1992, Appendix 5). Selected elements of the CDFG study are summarized in Table 1 below.

Table 1. Selected instream flow model details for studies on the lower Tuolumne River in 1981 and 1992.

Study	Upper RM	Lower RM	Total Transects	Calibration Flows (approx. cfs)			Simulation range (cfs)
				Low	Mid	High	
CDFG reanalysis (TID/MID 1992)	50.5	42.0	19	120	260	410	20–600
USFWS (1995)	52.2	0.0	25 (23 used)	250	600	1,050	25–1,200

In 1992, the second PHABSIM study was conducted by the USFWS (1995), which is also briefly summarized in Table 1. The USFWS study reaches included the entire lower Tuolumne River from La Grange Dam (RM 52.2) downstream to the confluence with the San Joaquin River (RM 0.0), although the most extensive field efforts were focused in riffle and run habitats in the 21-mile reach upstream of Waterford (RM 31) that is most heavily utilized for spawning by salmonid species. Using the results of the USFWS study, the Districts previously responded to an August 2003 information request from FERC staff to develop a flow vs. habitat evaluation that incorporated water temperature effects on Weighted Usable Area (WUA) (Stillwater Sciences 2003).

The rationale for the Order's inclusion of an additional IFIM study is not entirely apparent, especially since both prior studies included simulations for various life stages of *O. mykiss*, in addition to Chinook salmon. In addition to the previous IFIM studies and evaluations, the Districts have also reported on flow fluctuation and juvenile salmonid stranding analyses at flows up to 8,400 cfs (TID/MID 1992, Appendices 14 and 15; TID/MID 2000, Report 2000-6; TID/MID 2005, Appendix E), as well as geographic information system (GIS) based mapping of floodplain inundation surfaces at several flows within this range (TID/MID

2005, Appendix F). The GIS inundation maps were used in a recent assessment of variations in inundation areas at high flows by USFWS (2008). Although data collected from a new study could be combined with data from prior investigations (specifically from the USFWS [1995] study), the recommended study plan detailed below assumes independent, standalone investigations that are not dependent on data from the previous IFIM studies.

2 RECOMMENDED STUDY APPROACH

The instream flow studies are proposed to be separated into a 1-D PHABSIM study from 150 cfs up to at least 400 cfs and a 2-D PHABSIM pulse flow study, which will evaluate spring pulse flows of 1,000 to 5,000 cfs and fall pulse flows of up to 1,500 cfs, as specified in the Order. The 1-D PHABSIM model will estimate habitat availability for various lifestages of Chinook salmon and *O. mykiss* over a range of simulated flow releases included in the FERC Order (150 to at least 400 cfs), as well as in-channel flows up to 1,200 cfs, which corresponds to the flow range in the USFWS (1995) study. The proposed model software is the Riverine Habitat Simulation Model (RHABSIM). This model is an adaptation of the PHABSIM software that was originally developed and maintained by the Instream Flow and Aquatic Systems Group of the U.S. Fish and Wildlife Service in Fort Collins, Colorado (Milhous 1973, Bovee 1982, Milhous et al. 1984). The RHABSIM software, which was developed by Thomas R. Payne and Associates, implements the equivalent algorithms of PHABSIM but features expanded input, output, graphic, and calibration capabilities.

Development and implementation of the IFIM study considers a variety of factors, besides just the hydraulic and habitat suitability criteria (HSC) required for the PHABSIM component of the analysis, to evaluate the suitability of a stream and various flows for the species and life stages of interest. Water temperature is of particular interest since it varies with flow (particularly downstream of large impoundments, such as Don Pedro Reservoir). A water temperature study is planned, based on the results of a HEC-5Q water temperature model (RMA 2008) that will be validated as part of a complementary Tuolumne River water temperature modeling study plan (Stillwater Sciences 2009) included in the Order.

The proposed pulse flow assessment will examine potential responses of salmonid and predator species to spatial variations in inundation area, velocities, and depths in relation to the pulse flows specified in the Order within both in-channel areas as well as temporarily inundated portions of the Tuolumne River floodplain. Although the 1-D PHABSIM methodology is the most commonly used method for flow and habitat assessments within confined channels, the proposed pulse flow assessment will examine the effects of pulse flows for the benefit of migratory salmonid life stages using a 2-D hydraulic model of both in-channel and inundated floodplain areas at flows up to 5,000 cfs. The rationale for the two different methods for the instream flow and pulse flow elements of the study is threefold. First, extension of the IFIM analysis to flows exceeding the bankfull channel width, in the range of 1,500–2,500 cfs in some locations (McBain and Trush 2000), will cause a significant shift in the stage-discharge relationship for the channel. This requires a separate modeling analysis in order to develop a reliably predictive (*i.e.*, log linear) estimate of stage. Second, patchy distribution of floodplain areas makes their treatment as separate, discrete

areas more precise, since the conditions at these locations cannot be as reliably extrapolated to other areas of the river. Third, pulse flows are typically of shorter duration and intended for either the attraction/migration of fall spawners or to facilitate outmigration of juvenile fish; detailed evaluation of such flows in a PHABSIM study in order to assess and generalize their microhabitat suitability for spawning, adult holding, or rearing (which is what the associated HSC are developed for) is of limited use in refining potential flow recommendations.

3 METHODS

The methodology presented in the sections below discusses in more detail the steps for performing the proposed instream flow study and reporting results.

3.1 Logistics

Instream flow studies are best performed when targeted calibration flows are consistently maintained during hydraulic field measurements. Stillwater Sciences will coordinate with TID/MID to ensure these flows are available and manageable during field measurements. Stillwater will notify TID/MID, FERC and the agencies if substantive changes in the study design, methods or schedule are anticipated.

To facilitate field staff safety, allow for coordinated water operations, and facilitate agency staff awareness of study activities, the parties listed in Table 2 will be notified by email or telephone in advance of the proposed field sampling. Prior to mobilization, planned river operations by the Districts will be checked to determine if field surveys would be safe under the anticipated flow and all parties will be notified of any delay or modification to the survey schedule.

Table 2. Field work notification.

Contact	Affiliation	Address	Phone and Email
Tim Ford	TID	333 East Canal Dr. Turlock, CA 95380	209.883.8275 tjford@tid.org
Greg Dias	MID	1231 11th Street Modesto, CA 95354	209.526.7566 gregd@mid.org
Tim Heyne	CDFG	P.O. Box 10 La Grange, CA 95329	209.853.2533 x1# theyne@dfg.ca.gov
To be determined during agency comment period	USFWS	--	--
To be determined during agency comment period	NMFS	--	--

3.2 Study Area Segmentation

The proposed study reach extends from the La Grange stream flow gage (USGS No. 11289650) at RM 51.7 downstream to the lower end of the Gravel Mining Reach at RM 34.2 (McBain and Trush 2000). This reach includes the downstream extent of summer *O. mykiss* observations in past snorkel surveys (TID/MID 2009) as well as large majority of the spawning reach for Chinook salmon. As a secondary option, CDFG has recommended that the downstream boundary for the study extend to RM 24 to the downstream end of the In-Channel Gravel Mining Reach (Figure 1). Within the proposed study reach, the river would be divided into segments of similar habitat, geomorphic, and hydrologic character and analyzed independently. The study reach and number/location of segments would be determined as part of the scoping process.

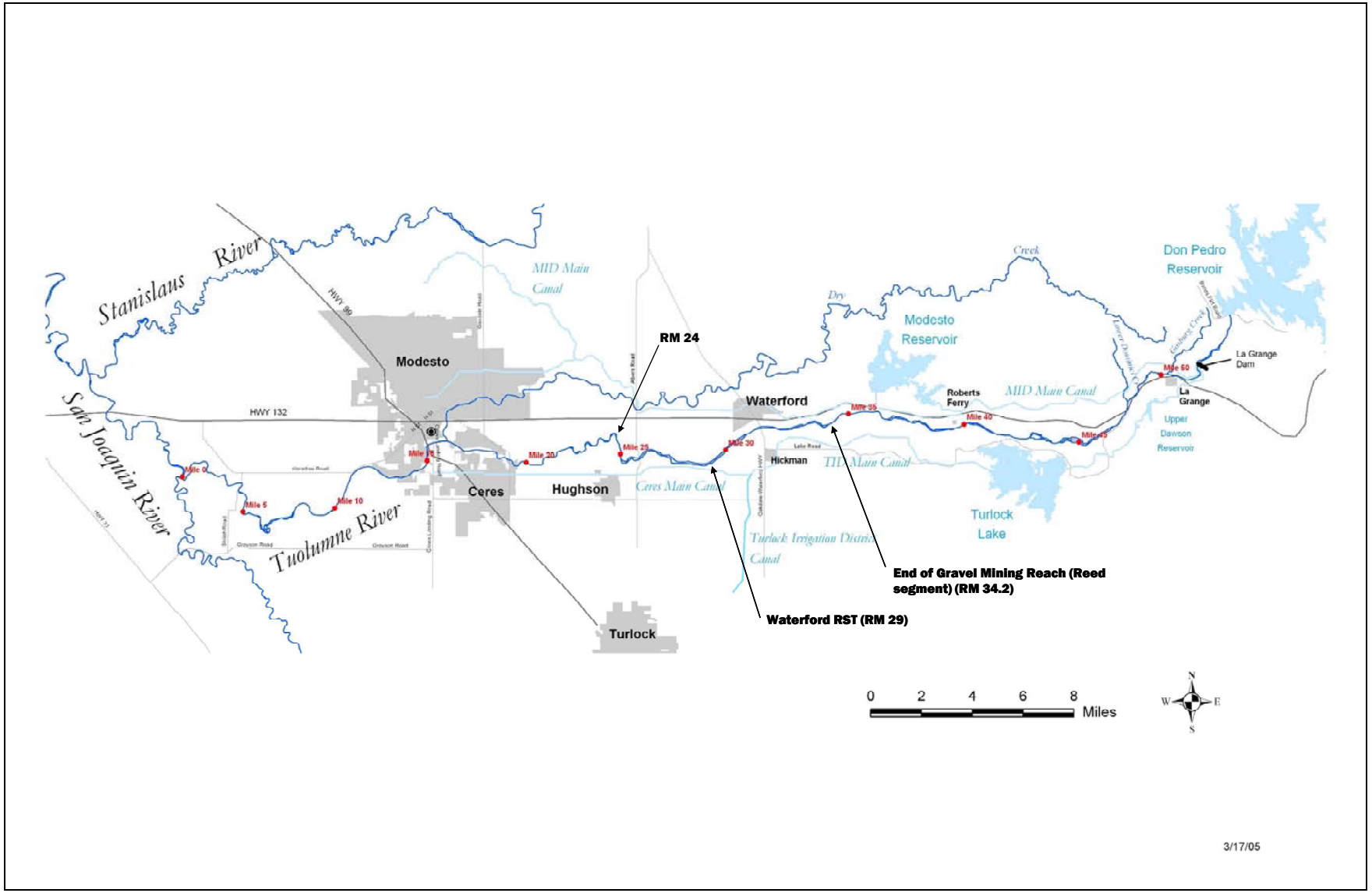


Figure 1. Vicinity map for the lower Tuolumne River IFIM study.

3.3 Habitat Mapping

Within the proposed study reach, existing habitat mapping has been completed down to RM 29.0 below the City of Waterford, as part of *O. mykiss* population estimate surveys being conducted pursuant to the April 2008 FERC Order (Stillwater Sciences, *in prep*.). Data from this current habitat mapping, completed during snorkel surveys during 2008 and 2009, will provide the basis for habitat composition and delineation. Proposed mesohabitat types are listed and described in Table 3.

Table 3. Coarse scale habitat types to be used during instream flow surveys.

Habitat Type	Description
Riffle	Shallow with swift flowing, turbulent water. Partially exposed substrate dominated by cobble or boulder. Gradient moderate (less than 4%).
Run/Glide	Fairly smooth water surface, low gradient, and few flow obstructions. Mean column velocity generally greater than one foot per second (fts^{-1}).
Pool	Slow flowing, tranquil water with mean column water velocity less than 1 fts^{-1} and depths of 10 ft or greater.

The percent composition of these mesohabitat types are shown in Table 4 for the study reach extending from La Grange Gage (RM 51.7) downstream to the end of the Gravel Mining Reach at RM 34.2 (McBain and Trush 2000), along with a secondary reach extending to the location of the existing rotary screw trap (RST) location downstream of the City of Waterford (RM 29.0). Additional habitat mapping would need to be conducted if areas farther downstream are included in the hydraulic simulations (see Study Area Segmentation section above).

Table 4. Mesohabitat types and percentage occurrence.

Habitat Type	# of Units	Total Length (ft)	% of Reach
La Grange Gage (USGS No. 11289650) to end of Gravel Mining Reach (RM 51.7 to RM 34.2)			
Riffle	55	19,195	21%
Run/Glide	55	55,964	61%
Pool	20	16,888	18%
Totals	130	92,046	100.0%
End of Gravel Mining Reach to downstream of Waterford (RM 34.2 to RM 29)			
Riffle	21	6,077	21%
Run/Glide	20	20,885	72%
Pool	2	1,951	7%
Totals	43	28,913	100%

3.4 IFIM/1-D PHABSIM study

3.4.1 Study site selection

Study sites for instream flow data collection will be established in a stepwise process following guidelines from Bovee (1982). First, the study area will be reviewed for possible

segmentation into reaches. Reach segmentation will be based primarily on changes in stream gradient (associated with geomorphic condition), and/or hydrology that may cause habitat types in one reach to display significant hydraulic differences from the same habitat type in another reach (*e.g.*, low gradient riffles in one reach have consistently greater depth or velocity than low gradient riffles in another reach). Stream gradient will be determined using existing topographic data and displayed as a longitudinal profile of elevation versus river mile within the study area.

Second, areas for study sites will be identified. Sites that contain the full complement of common (>10–15% of stream length in the reach) and modelable (*e.g.*, not high gradient riffles or other areas with high air entrainment or significantly non-laminar flow) habitat units in a safe and legally accessible section of stream will be identified. Within these areas, study sites will be established via consensus with the fish resource agencies. In the event consensus is not achieved on study sites, they will be determined by randomly selecting a starting habitat unit (using a random number table or similar device) among the least common habitat unit types. From that starting habitat unit, transect locations will be established in adjacent habitat units (heading upstream or downstream) until the requisite transects are placed in the specified habitat units, as described below. Where possible, sites will be co-located in areas where data have been collected for other studies in order to maximize the potential for integrated data analysis.

An exception to the above protocol will be implemented for habitat units at known spawning sites. Analysis for these units will preferentially target historical high-use spawning sites for Chinook salmon, based on prior surveys and redd counts.

3.4.2 Transect selection

Within each study site, transects will be placed in each habitat unit to be sampled either by professional judgment and concurrence of the transect selection team, or based on a stratified random sampling protocol. The stratified random sampling protocol would involve random placement of transects within strata of similar hydraulic characteristics within each habitat unit, except where such placement would result in transects running through a hydraulic anomaly or other feature (*e.g.*, re-circulating or vertical flow, brush in channel, etc.) that cannot be accurately modeled. In these cases, the transect will be relocated (either placing the transect using professional judgment and concurrence among the transect selection team, or by specifying an arbitrary distance up or downstream of the original location). Transects will be distributed in run, riffle, and pool habitat types. No transects will be placed in habitat units located on private property without the consent of the landowner.

Transect placement will target locations where there is no more than a 0.1 foot difference in stage across the transect and where the velocity profile across the transect is dominantly perpendicular to the transect. Areas with transverse flows, across-channel variation in water surface elevations, or flow contractions/expansions will be avoided.

A sufficient number of transects will be established to model approximately three replicates of each major habitat unit type in the reach (*i.e.*, runs, riffles, and pools), with the number of replicates dependent on the relative proportions of the major habitat unit types (*i.e.*, there

may be more than three replicates of the most common unit type, and fewer of the least common unit type). It is expected that relatively hydraulically homogeneous habitat units will require 1–3 transects per replicate; relatively heterogeneous habitat units will require 2–5 transects per replicate. The final number of transects proposed for the reach will depend on habitat complexity as well as target resource values in the reach, and will be determined during a field site visit with concurrence of agency representatives. If there is not agreement on the appropriate number of transects, the issue will be referred to FERC for final determination.

3.4.3 Field data collection

Target calibration flows will be relatively evenly spaced (on a log scale) and selected to allow the models to simulate in-channel flows over a range covering the current minimum flow (50 cfs) up to approximately 1,000+ cfs, with a target of having the lowest simulated flow at no less than 0.4 of the lowest calibration flow and the highest simulated flow at most 2.5 times the highest calibration flow. The proposed target calibration flow ranges are as follows:

- low flow calibration: approximately 100 cfs;
- middle flow calibration: 250 cfs; and
- high flow calibration: 600 cfs.

Velocity data sets will be collected at all transects at the middle calibration flow, and water surface elevation (WSE) will be collected along each transect at all calibration flows.

3.4.3.1 Hydraulic data

Hydraulic data collection and recording will use standard procedures and guidelines for PHABSIM field studies (Trihey and Wegner 1981; Milhous et al. 1984). In general, hydraulic data collection includes establishing independent elevation reference benchmarks for level control, as well as semi-permanent headpins and tailpins at each transect. Water surface elevations will be measured using an auto-level and stadia rod along each transect at each calibration flow; WSE will be measured near each bank (to the nearest 0.01 foot), and in mid-channel areas where a significant difference between the near-bank WSE exists. A level loop survey tied to the local benchmark will be conducted at each calibration flow to ensure the accuracy of each survey. Benchmark and transect locations will be recorded with a GPS, where feasible.

The local benchmarks established for each transect will serve as the reference elevations to which all elevations (streambed and water surface) are tied. The benchmarks will consist of items that will not change elevation over time, such as lag bolts driven into trees, painted bedrock points, or local infrastructure. Benchmarks will be tied together, where practical, for the upstream and downstream transects at each site, for efficient analysis and QA/QC procedures.

Channel cross section profiles above the highest measured calibration flow will be surveyed (to the nearest 0.1 foot) with a stadia rod and auto-level or total station to establish the

overbank channel profile up to or beyond the water's edge at the highest flow to be modeled, with sufficiently close spacing of verticals to document changes in slope. In-channel profiles will be calculated by subtracting the depth of water measured during the velocity measurements from the average WSE. Additional topographic data collection for each transect will include stage-of-zero-flow (SZF) elevation, which is the controlling elevation within or downstream of the transect line below which flow ceases.

Temporary and permanent staff gage readings and time-of-day will be recorded at the beginning and end of each transect measurement to check that the stage had not changed appreciably during the transect measurement nor the calibration flow measurement for the entire study site.

Depths and mean column water velocities will be measured across each transect at the middle calibration flow. The number of cells sampled for depth and velocity is based on a goal of retaining a minimum of 20–25 stations that would remain in-water at the low calibration flow. Discharge measurements will be collected at each calibration flow following techniques outlined in Rantz (1982). Discharge measurements will be made at each grouping of transects in hydrologically distinct areas using either an existing habitat transect (if deemed suitable) or at some other suitable transect established solely for measuring discharge. These discharge measurements will be used in conjunction with data from the La Grange gaging station (USGS No. 11289650) to determine more precisely the calibration flow and account for accretion, if any, within the study reach.

3.4.3.2 Velocity measurements

Velocity measurements will be made using a Marsh-McBirney Flo-mate pressure transducer-type velocity meters (Hach Corporation, Loveland CO), mounted on standard top-set USGS wading rods. Velocities will be measured at six-tenths of the depth (0.6 depth) when depths were less than 2.5 feet, and at two-tenths (0.2 depth) and eight-tenths (0.8 depth) of the depth when depths equal or exceed 2.5 feet or when the expected velocity profile is altered by an obstruction immediately upstream. In instances of increased turbulence or obstructions, measurements may be taken at all three depths (0.2, 0.6, and 0.8) and a weighted average calculated (Bovee and Milhous 1978). Where transects have a series of water depths greater than approximately 3.5 feet, depth and velocity will be measured using an Acoustic Doppler Current Profiler (ADCP) mounted on a mini-cataraft. The ADCP uses acoustic pulses to measure water velocities and depths across the channel. The ADCP is connected by cable to a power source and a radio modem with data transmitted to a shore-based laptop computer.

3.4.3.3 Substrate data

Data collection at each transect will include substrate and/or cover codes compatible with proposed species HSC. Substrate composition and cover types will be recorded in the field at each cross section location where channel geometry data are collected. Substrate coding, as applicable and feasible (depending on nature of source data), will be adapted to the coding systems specified in Table 5a (from USFWS and CDFG) and/or Table 5b (from prior mapping of the lower Tuolumne River for the Coarse Sediment Management Plan [McBain & Trush 2004]).

Table 5a. Proposed substrate types for the Lower Tuolumne IFIM study. [Use of these codes is subject to final decisions on habitat suitability criteria for substrate]

Substrate Type	Particle Size (inches)
Sand/Silt	< 0.1
Small Gravel	0.1 – 1
Medium Gravel	1 – 2
Medium/Large Gravel	1 – 3
Large Gravel	2 – 3
Gravel/Cobble	2 – 4
Small Cobble	3 – 4
Small Cobble	3 – 5
Medium Cobble	4 – 6
Large Cobble	6 – 8
Large Cobble	8 –10
Large Cobble	10 –12
Boulder/Bedrock	> 12

Table 5b. Coarse sediment size gradation chart showing particle size class descriptions and sizes.

Particle Size Class		Particle Size (mm)	Particle Size (in)
Boulder	**Very Large**	4,096	161.2
		2,896	114.0
	Large	2,048	80.6
		1,448	57.0
	Medium	1,024	40.3
		724	28.5
	Small	512	20.1
		362	14.2
Cobble	**Large**	256	10.1
		181	7.1
	Small	128	5.0
		90.5	3.6
Gravel	**Very Coarse**	64.0	2.5
		45.3	1.8
	Coarse	32.0	1.2
		22.6	0.9
	Medium	16.0	0.6
		11.3	0.4
	Fine	8.00	0.3
		5.66	0.2
	Very Fine	4.00	0.2
		2.83	0.1
		2.00	0.1

Notes:
1. Adapted from McBain & Trush 2004
2. Particle sizes less than 2mm are classified as sand (2-0.063mm), silt (0.063-0.0093mm), and clay (<0.0093mm).

3.4.4 Hydraulic modeling

The hydraulic models used for instream flow studies utilize the data collected in the field for calibration of water surface elevations, discharge, and velocities over a range of flow simulations. The hydraulic modeling will result in output files of hydraulic parameters (depths, velocities, etc.) used in the habitat analysis.

3.4.4.1 Stage-discharge calibration

Stage-discharge relationships are developed from measured discharge and water surface elevation (WSE) using an empirical log/log formula (commonly referred to as IFG-4), or by using a channel conveyance method (referred to as MANSQ). Using the log/log and channel conveyance methods, each transect is treated independently. The IFG-4 method requires a minimum of three sets of stage-discharge measurements and an estimate of SZF for each transect. The quality of the stage-discharge calibration using the IFG-4 method is evaluated by examination of mean error and slope output from the model. MANSQ only requires a single stage-discharge pair, though additional pairs are advisable for validation, and uses Manning's equation to determine a stage-discharge relationship (Bovee and Milhous 1978). In situations where irregular channel features occur on a cross section, for instance bars or terraces, MANSQ is often better at predicting higher stages than IFG-4. MANSQ is most often used on riffle or run transects and is not suitable for transects that have backwater effects from downstream controls, such as pools. It can also be useful as a test and verification of log/log stage discharge relationships.

The Water Surface Profile (WSP) program for use in developing stage-discharge predictions can also be used, but due to its limited application for riffle and run habitat, and its reliance on additional hydraulic control transects, it is not expected to be used extensively in this study, although it may be applicable for certain pool habitat simulations. For the purposes of this study, the IFG-4 program is proposed as the primary method for developing the stage-discharge relationship.

3.4.4.2 Velocity calibration

The preferred method for simulating water velocities is the "one-flow" option. This technique uses a single set of measured velocities to predict individual cell velocities over a range of flows. Simulated velocities are calibrated to measured data and a relationship between a fixed roughness coefficient (Manning's 'n') and depth is developed. In some cases, roughness is modified for individual cells if substantial velocity errors are noted at simulation flows. Velocity adjustment factors (VAFs) are examined to detect any significant water velocity deviations and determine if velocity changes at simulated flows remain consistent with changes in stage and total discharge.

3.4.4.3 Calibration metrics

Various calibration metrics will be used as target values to evaluate performance of the IFG-4 hydraulic model. Although these are not strict thresholds to determine usefulness of the data, an effort will be made to calibrate the model to these standards.

- A beta value (a measure of the change in channel roughness with changes in streamflow) between 2.0 and 4.5;
- Mean error in calculated versus given discharges less than ten percent;
- No more than a 25% difference for any calculated versus given discharge
- No more than a 0.1 foot difference between measured and simulated WSELs
- Mean stage-discharge regression error for all transects less than 10%, and 5% or less for 90% of the transects.
- Velocity Adjustment Factor (VAF) values of 0.2 to 5.0 with a pattern of monotonic increase with an increase in flows and values between 0.90 and 1.10 at the calibration flow.

3.4.5 Target species and habitat suitability criteria (HSC)

Proposed HSC for the current instream flow study will consider the following target species and lifestages:

- *O. mykiss:* adult, spawning, fry, and juvenile.
- Fall-run Chinook salmon: spawning, fry, and juvenile.

Existing HSC data will be compiled for the target species and lifestages, in collaboration with the agencies, to create a database of curves that can be reviewed for applicability to the proposed study. Habitat suitability criteria from prior lower Tuolumne River studies (Tables 6 and 7 will be included in the HSC database for consideration. The database of curves will be reviewed in consultation with the agencies, and screening criteria applied as necessary to minimize the number of curves for further consideration. Proposed screening criteria will include the following, although no single criterion will be used to qualify or disqualify a curve from further consideration.

- Minimum of 150 observations
- Clear identification of fish size classes
- Depth and velocity HSC
- Category II or III data (Bovee 1986)
- Comparable stream size and morphology (*e.g.*, hydrology, stream width and depth, gradient, geomorphology, etc.)
- Source data from the lower Tuolumne River (or other Central Valley streams)
- Habitat availability data collected
- Data collected at high enough flow that depths and velocities are not biased by flow availability
- Availability of presence/absence data

Table 6. Habitat suitability criteria summary from 1981 CDFG IFIM study.

Species	Lifestage	Depth	Velocity	Substrate	Source
Chinook	Spawning	Yes	Yes	Yes	Site-specific
Chinook	Fry	Yes	Yes	All suitable	Unknown
Chinook	Juvenile	Yes	Yes	All suitable	Unknown
Rainbow	Adult	Yes	Yes	Yes	Raleigh et al. (1984)
Rainbow	Juvenile	Yes	Yes	Yes	Raleigh et al. (1984)

Table 7. Habitat suitability criteria summary from USFWS (1995) IFIM study.

Species	Lifestage	Depth	Velocity	Substrate	Source
Chinook	Spawning	Yes	Yes	Combined Substrate / Embeddedness Code	Bovee (1978)
Chinook	Fry	Yes	Yes	All suitable	Bovee (1978)
Chinook	Juvenile	Yes	Yes	All suitable	Bovee (1978)
Rainbow	Adult	Yes	Yes	Combined Substrate / Embeddedness Code	Bovee (1978)
Rainbow	Juvenile	Yes	Yes	Combined Substrate / Embeddedness Code	Bovee (1978)

Following a review and discussion of applicable HSC curves, existing curves may be selected and/or modified for use on the proposed study, or site-specific HSC curves may be developed as deemed appropriate in collaboration with technical experts from the stakeholder group. If there is not agreement on HSC curves to use, the issue will be referred to FERC for final determination.

3.4.6 Habitat modeling

Habitat will be modeled using the HABSIM submodel provided in the RHABSIM software (analogous to HABTAE, HABTAT, etc.). The habitat model combines the hydraulic and HSC components to generate the weighted usable area (WUA), in square feet per 1,000 ft of stream) of the stream for each species and life stage at each simulated flow. The standard option of multiplying individual variable suitabilities (velocity*depth*substrate or cover) for cell centroids will be used to calculate WUA. This output will be proportioned over all habitat types (using the relative abundance of each habitat type and transect as a weighting factor) to obtain the reach-wide estimate of WUA by life-stage. An example of the transect weighting procedure is depicted in Figure 2. WUA versus flow curves will be developed to aid in the interpretation of these habitat flow relationships.

3.4.7 Total habitat time series

A habitat time series (HTS) analysis (Bovee 1982) is proposed for flows up to a maximum of approximately 1,000 cfs (the upper end of the hydraulic modeling range). The HTS analysis uses the WUA versus flow relationship and combines it with current or alternative hydrologic conditions to generate WUA by day under selected flow regimes (including accretion estimates) for different water year types. Figure 3 presents a conceptual example of HTS results. Daily flow values for the study reach under varying water-year types will be

obtained from USGS gage records and used for the analysis. The Total HTS results will be used as the first step in calculation of an Effective Habitat Time Series described below.

3.4.8 Effective habitat time series development

In addition to the standard WUA results as described in the Habitat Modeling and Total Habitat Time Series sections, a secondary analysis showing the "effective" WUA (eWUA) will be conducted. This analysis relates to summertime water temperature suitability for *O. mykiss*, and integrates both micro- and macro-habitat considerations. The results from the HEC-5Q water temperature model (Stillwater Sciences 2009) over a range of flows will be combined with the summer WUA results so that areas ("macrohabitats") with unsuitable water temperatures are excluded from the total WUA sum. In other words, if a given reach has 100,000 square feet of suitable habitat (WUA) based on hydraulic microhabitat conditions at flow 'X', but 30 percent of the reach at flow 'X' is above a critical temperature threshold for the species life stage of interest, the eWUA would be 70,000 square feet. This type of analysis was previously conducted, at a coarser level by Stillwater Sciences (2003), using a combination of the 1992 IFIM evaluation for the lower Tuolumne River (USFWS 1995) and the earlier SNTEMP model results (TID/MID 1992, Appendix 18). The methods are explained more fully in Bovee (1982).

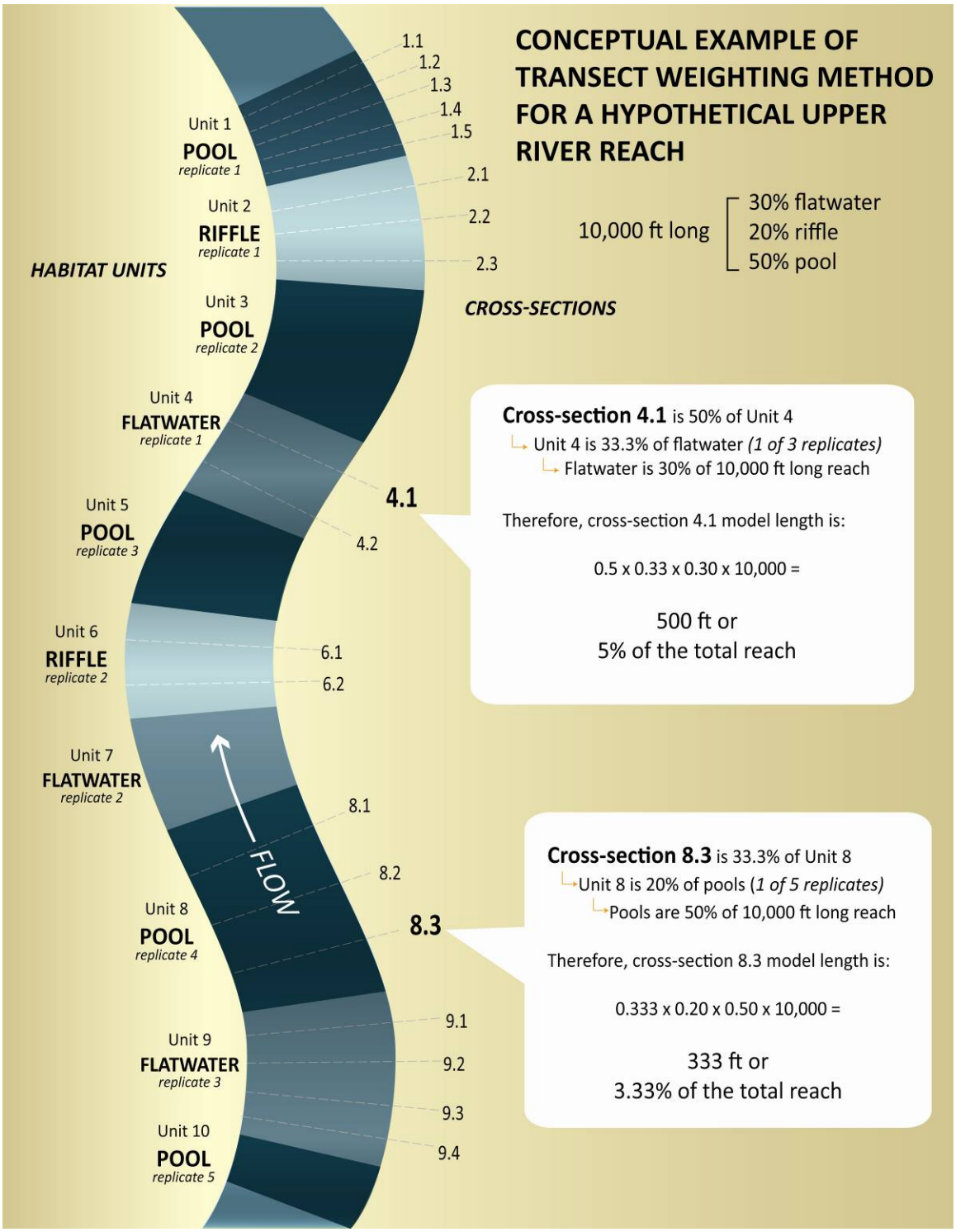


Figure 2. Conceptual example of transect weighting method for reach extrapolations proposed for the lower Tuolumne River IFIM study.

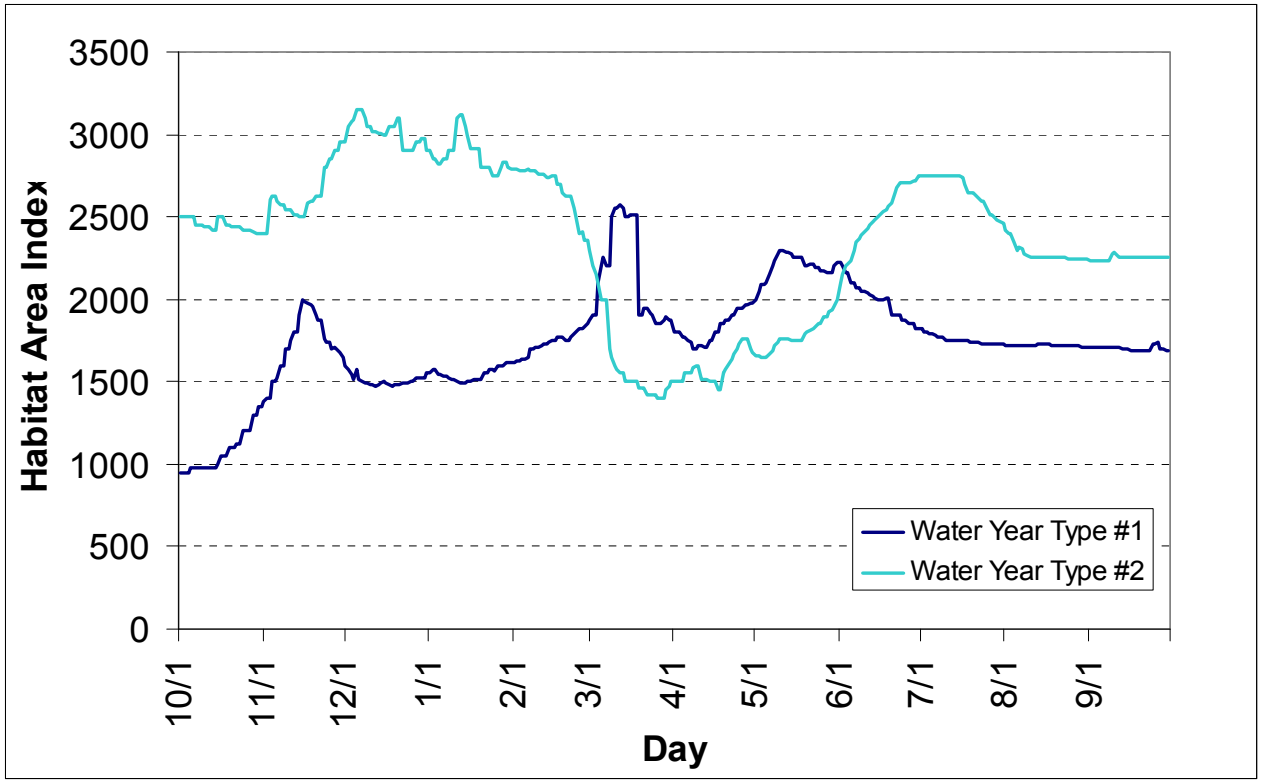


Figure 3. Conceptual example total habitat time series output for the IFIM study.

3.5 Pulse flow assessment

The pulse flow assessment will evaluate spring pulse flows of 1,000 to 5,000 cfs and fall pulse flows of up to 1,500 cfs, as specified in the Order. The detailed approach involves use and expansion of existing topographic maps of the lower Tuolumne River floodplain (RM 52–RM 29), combined with development of a high flow stage-discharge relationship for these same areas as inputs to the River2D hydraulic model (Steffler and Blackburn 2002) or similar two-dimensional modeling software (such as MD-SWMS). The objectives of the assessment are to: 1) gather empirical data on the relationship between water temperature and flow during pulse flow events, and 2) assess habitat usability and habitat segmentation for lower Tuolumne River fish species during pulse flow conditions.

3.5.1 Pulse flow study site selection

Study sites for the pulse flow assessment will include up to four (4) locations upstream of RM 29 (including the gravel-bedded portion of the river used most extensively by salmonids between RM 34.2 to RM 51.7), in addition to other restoration sites (*e.g.*, special run/pool [SRP] 9) where there is existing 2-D modeling data. Study site selection will include areas where significant floodplain inundation is expected at flow ranges up to 5,000 cfs.

3.5.2 Cross section and topography development

Existing LiDAR coverage of the lower Tuolumne River floodplain (RM 52–29), originally developed from aerial surveys of 21 September 2005 at river flows of 321 cfs will be used to for development of the model cross sections and topography. A digital elevation model (DEM) will be used within GIS to develop hydraulic model cross sections, with bathymetric data below the 321 cfs water surface developed (where necessary) using standard survey methods described in Section 3.4.3.1. The existing LiDAR coverage will be point-checked for accuracy, and if significant topographic changes are detected, options for obtaining updated LiDAR coverage will be investigated.

3.5.3 High flow stage discharge relationships

Stage discharge relationships at high flows will be developed at each pulse flow study site within the lower Tuolumne River using either standard survey techniques (where timing and flow conditions allow) or pressure transducers (InSitu® miniTroll) placed in a protective PVC pipe housing and mounted along the active river channel using rebar and foundation stakes. If possible, the pressure transducer elevations will be established using a total station (Sokkia® SET600 or similar) and prism to tie in to an established local benchmark. If this is not possible, the pressure transducer elevation will be tied to an installed temporary benchmark.

The stage recorders will be set at a 15-minute interval and will record corresponding stages to lower Tuolumne River flows of up to 5,000 cfs. Test flows for the pulse flow assessment will include 2,000 cfs, 3,000 cfs, and 5,000 cfs to develop the high flow stage discharge relationship. In the event that the following hydrology conditions are met in the first year of study, tests will occur during the March–May period.

a. The estimated 60-20-20 Index (using 50% exceedance probability) for the then current water year based upon the CDWR within-month March runoff forecast update following March 15 is at least 4.2, provided that (1) daily computed natural flows for both the Tuolumne and San Joaquin Rivers in excess of 50,000 cfs are excluded and (2) the Tuolumne River comprises at least 31% of the index.
b. The 60-20-20 Index for the immediately preceding water year was at least 4.2.
c. The target flow shall be subject to any flow and/or timing limitation required by the VAMP study.
d. The target flow shall be subject to any flow and/or timing limitation required by the Corps of Engineers.

In the event that these high flow conditions are not necessitated by naturally occurring wetter hydrologic conditions (resulting in flood releases in excess of the 301 thousand acre-feet (TAF) annual FERC flow requirements), the Districts will delay data collection for up to 2 years or may alter the intermediate test flows above.

3.5.4 2-D hydraulic model development

River2D model input includes a) topography of the river channel; b) roughness of the channel expressed as a roughness height; c) discharge; and d) downstream water surface elevation. The topography will be developed from the existing LiDAR-derived DEM (subject to the constraints noted in Section 3.5.2 above), whereas elevation data will be developed from the stage discharge relationships described above. Channel roughness will be based on a combination of this topography and professional judgment as a calibration parameter in addition to changes in the finite element network to achieve representative modeled water depths at a given discharge. As an additional calibration, model outputs will be compared to existing flood area inundation maps (TID/MID 2005, Appendix F) previously developed at a wide range of flows (100, 230, 620, 1,100, 3,100, 5,300, and 8,400 cfs).

3.5.5 2-D model simulations and anticipated results

The calibrated 2-D model will be used to simulate flow routing and velocity vectors in both the in-channel areas at pulse flows of 1,000 cfs and 1,500 cfs. In addition, the model will be used to simulate intermediate high flows of 2,500 cfs up to 5,000 cfs. The results of the pulse flow assessment will be used to examine habitat suitability for migratory life stages of lower Tuolumne River salmonids as well as habitat preferences of predators such as largemouth bass *(Micropterus salmoides)* and smallmouth bass *(M. dolomieu)*. During high flows (*e.g.*, spring pulse flows), outmigrating salmon smolts generally use more central portions of the channel, while bass likely seek lower velocities and warmer water near channel margins, as previously examined at individual in-channel restoration sites (McBain & Trush and Stillwater Sciences 2006).

For example, hydraulic modeling conducted at a restored in-channel mining pit ("Special Run Pool" or SRP 9) for pre- and post-project conditions using the River 2D model (Steffler and Blackburn 2002) indicates that the project increases habitat segregation between bass and outmigrating Chinook salmon and may provide a "safe-velocity corridor" for outmigrant salmon during relatively low flow conditions (McBain & Trush and Stillwater Sciences 2006). Modeling for the SRP 9 study suggested that, due to distinct differences in habitat usability between bass and salmon, this effect will occur at predictable flow thresholds in specific habitat types (*e.g.*, riffles and unrestored mining pits habitats). Because high flows may help to spatially separate predators and salmon smolts, the pulse flow study may provide a mechanistic linkage between reductions in the exposure of juvenile salmon to predation at high flows.

Lastly, the pulse flow study will be coordinated with any test flows that examine movement patterns of juvenile Chinook salmon in ongoing rotary screw trap (RST) monitoring, or high flows that are released in relation to fall spawner attraction flows.

3.6 Management alternatives

Management alternatives for the lower Tuolumne River will be considered following completion of the IFIM study and pulse flow assessment detailed in this plan, as well as the Water Temperature study (Stillwater Sciences 2009) included in the Order. Results of these investigations will be evaluated in the context of available information from other studies of

the lower Tuolumne River and consideration of other beneficial uses of Tuolumne River water cited in the San Joaquin River Basin Plan (CVRWQCB 1998) and including: agricultural supply (AGR), cold freshwater habitat (COLD), fish migration (MIGR), municipal and domestic supply (MUN), water contact recreation (REC1), noncontact recreation (REC2), fish spawning (SPWN), warm freshwater habitat (WARM), and wildlife (WILD).

4 REPORTING

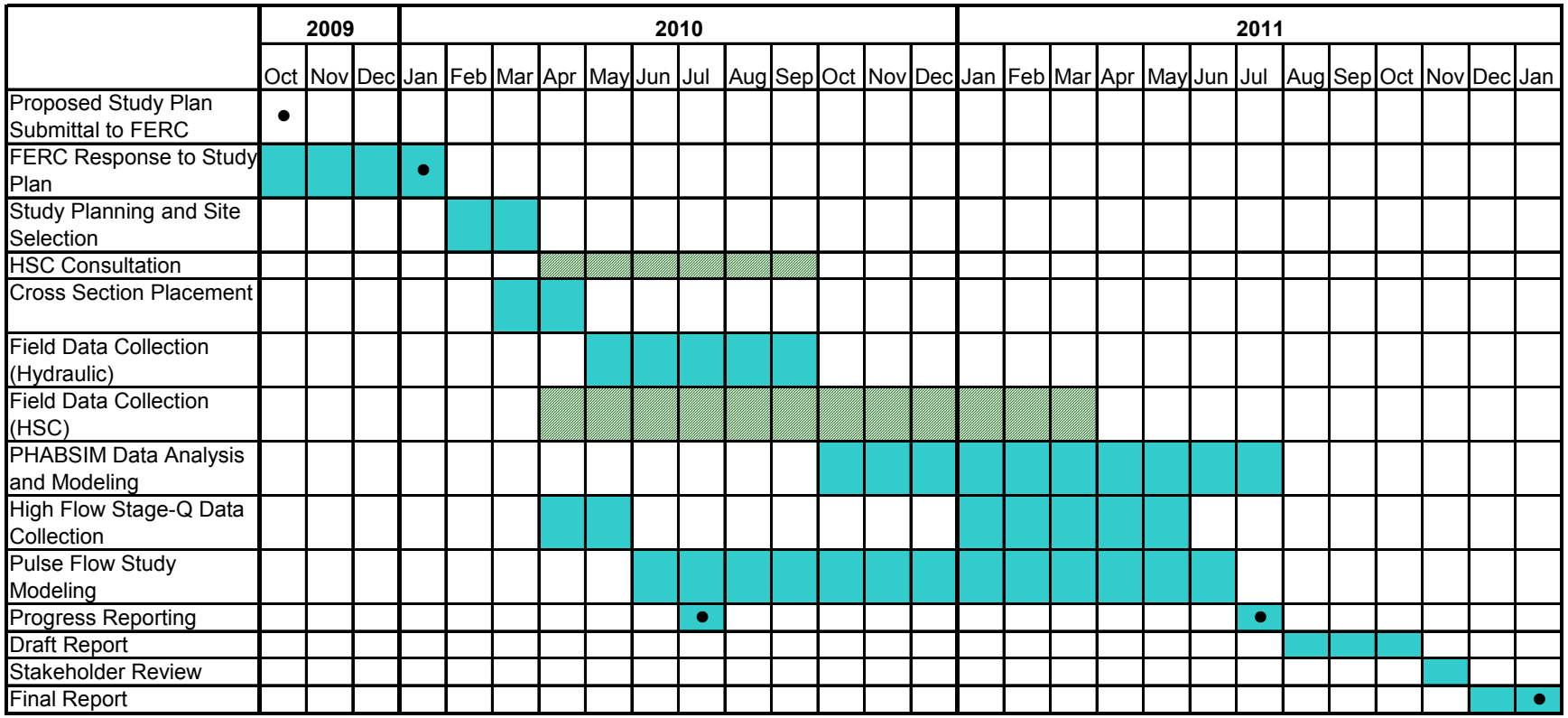
A progress report of the Year 1 and Year 2 data collection efforts, including any changes to the proposed study plan, will be made to the Commission by July 1 in each of two years (2010 and 2011). Following completion of the field studies and analysis, a draft report will be prepared detailing the study methods and results. The draft report will be circulated to the stakeholders for a 30-day review period. Comments will be addressed in a final report that will be filed with FERC within 60 days from the end of the 30-day review period.

5 SCHEDULE

A proposed schedule is provided in Table 8, and graphically represented in Figure 4. The schedule is predicated on an anticipated study plan acceptance date from FERC. A major factor in the proposed schedule is the development of HSC. Although existing HSC are proposed for the lower Tuolumne River, the proposed schedule assumes that site-specific HSC could be necessary for one or more species or life stages, and analytical and reporting tasks are scheduled accordingly. Lastly, for the pulse flow assessment, stage data collection for the highest flow ranges (up to 5,000 cfs) may be delayed from 2010 until appropriate wet year hydrology occurs (flood releases in excess of the 301 TAF annual FERC flow requirements.

Table 8. Proposed schedule for lower Tuolumne River instream flow study implementation.

Item	Dates (duration)	Days from FERC Approval of Study Plan
Proposed Study Plan Submittal to FERC	October 14, 2009	--
FERC Response to Study Plan	January 12, 2010 (90d)	
Study Planning and Site Selection	January 13 to March 13, 2010 (60d)	60
Habitat Suitability Criteria Consultation	March 13 to September 9, 2010 (150d)	240
Cross Section Placement	March 14 to April 27, 2010 (45d)	105
Field Data Collection (Hydraulic)	April 28 to September 24, 2010 (150d)	255
Habitat Suitability Criteria Field Data Collection (if necessary)	April 1, 2010 to March 31, 2011 (365d)	443
Data Analysis (presuming HSC field data collection or 2011 high flow data collection)	April 1, 2011 to July 29, 2011 (120d)	563
High Flow Stage Discharge Data Collection	March 31, 2010 to June 1, 2010 (62d) or January 15, 2011 to June 1, 2011 (137d)	505
Pulse Flow Study Data Analysis and Modeling	June 1, 2010 to June 30, 2011 (394d)	534
Progress Reporting	July 1, 2010 and July 1, 2011	--
Draft Report	October 27, 2011 (90d)	653
Stakeholder Review	November 26, 2011 (30d)	683
Final Report	January 25, 2012 (60d)	743



Note: HSC consultation and field data collection tasks are somewhat independent of other schedule elements of the IFIM Study, but are shown to provide context.

• indicates due date

Figure 4. Proposed schedule for implementation of FERC-ordered instream flow studies.

6 REFERENCES

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From: Devine, John
Sent: Thursday, May 19, 2011 10:11 AM
To: Richard Roos-Collins; Staples, Rose; Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Julie Gantenbein; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Cc: Steve Rothert
Subject: RE: Don Pedro - Final List April 1 Meeting Questions/Requests and Responses to Data Gap Study Requests April 19-20 RWG Meetings

Richard,

We will add these to the Project Tracking List, and try to respond in a timely manner.

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Durango, CO: 970-385-4995

From: Richard Roos-Collins [mailto:rrcollins@waterpowerlaw.com]
Sent: Wednesday, May 18, 2011 2:47 PM
To: Staples, Rose; Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Dixie, Yakima K - CVMT; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Julie Gantenbein; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan - CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Cc: Steve Rothert
Subject: RE: Don Pedro - Final List April 1 Meeting Questions/Requests and Responses to Data Gap Study Requests April 19-20 RWG Meetings

John:

I reply to your May 5th response (below) regarding a possible study of the relative significance of stressors for the anadromous fisheries which are present in the lower T.

You state that we requested a study of mitigation measures for non-project stressors. That is incorrect. We appear to have a misunderstanding, and I apologize if I was unclear in making the oral request. Let me try again.

Our April 20th request was that the Districts undertake a study to evaluate the relative effects of project ops and other stressors on these fisheries in the lower T. How do project ops affect each of these fisheries – its population, geographic distribution, age distribution, or habitat, whether overall or by life stage? Next, can we distinguish the effects of the project relative to other stressors? Ranging geographically from furthest to closest, these non-project stressors plainly include: ocean harvest and other conditions, Delta pumps, bass and other predators in the old mining pools, and water supply diversions in the lower T.

The Districts and CCSF submitted extensive testimony on this general topic during the 2009 hearing. I understood this testimony to mean that the existing record does not allow FERC to distinguish the effects of the project relative to these and other non-project stressors. I understood this testimony to mean, in the alternative, that the existing record does not show that the project effects are significant, given the cumulative effects of other stressors. I attach one declaration as an example of this testimony.

So, to continue the discussion which started on April 20th….You state below that certain non-project stressors are "among the most significant."

- What do you mean by significant?
- What is the basis for your conclusion that the non-project stressors you listed have significant effects?
- Since you use a comparative term ("among the most significant"), what evidence in the existing record is the basis for the comparison – e.g., ranking these non-project stressors as more significant than others?
- Does the existing record show whether project ops are a stressor for these fisheries?
- Does the existing record show whether the project ops are a significant stressor? (I adopt whatever meaning you intended in using the term "significant" in your May 5th email.)

Thanks. I regret that I will be unable to attend the team meeting today or tomorrow. RRC

_____

Richard Roos-Collins
Principal,
Water and Power Law Group PC

Subject: FW: Don Pedro Relicensing: Aquatic and Water Resources Meeting
Location: Modesto, CA

Start: Thu 5/19/2011 12:00 PM
End: Thu 5/19/2011 4:00 PM
Show Time As: Tentative

Recurrence: (none)

Meeting Status: Not yet responded

Organizer: Loy, Carin

For those of you who are participating in the Don Pedro RWG AQUATIC-WATER RWG Meeting, here is the link (below) to web conferencing in to the meeting. If you have LIVE MEETING software installed on your computer, just click on the JOIN MEETING link below. If not, you will need click on the link beneath the FIRST TIME USERS line. Any problems, please let me know. Thank you.

PS: This message is being sent to the entire participants list.

-----Original Appointment-----
From: Loy, Carin
Sent: Thursday, May 19, 2011 12:13 PM
To: Loy, Carin; Staples, Rose
Subject: FW: Don Pedro Relicensing: Aquatic and Water Resources Meeting
When: Thursday, May 19, 2011 12:00 PM-4:00 PM (GMT-05:00) Eastern Time (US & Canada).
Where: Modesto, CA

From: carin.loy@hdrinc.com [carin.loy@hdrinc.com]
Sent: Wednesday, May 18, 2011 1:17 PM
Subject: Don Pedro Relicensing: Aquatic and Water Resources Meeting
When: Thursday, May 19, 2011 9:00 AM-1:00 PM.
Where: Modesto, CA

When: Thursday, May 19, 2011 9:00 AM (PDT)
Where: Modesto, CA

+~+~+~+~+~+~+~+~+~+

The call-in number for the audio portion will be: 866-994-6437, conference code 5424697994. Thank you.

Carin Loy has invited you to present at an online meeting using Live Meeting.

Join the meeting.

Audio Information

Audio has not been set up for this meeting.

First Time Users:

To save time before the meeting, check your system to make sure it is ready to use Microsoft Office Live Meeting.

Notes

Troubleshooting

Unable to join the meeting? Follow these steps:

1. Copy this address and paste it into your web browser:
   https://www.livemeeting.com/cc/hdrinc/join
2. Copy and paste the required information:
   Meeting ID: 7SCJZD
   Entry Code: 5F[/]dh#B
   Location: https://www.livemeeting.com/cc/hdrinc

If you still cannot enter the meeting, contact support

Notice

Microsoft Office Live Meeting can be used to record meetings. By participating in this meeting, you agree that your communications may be monitored or recorded at any time during the meeting.

From: Staples, Rose
Sent: Friday, May 20, 2011 7:38 PM
To: Alves, Jim - City of Modesto; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Beuttler, John - CSPA; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave - Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Buckley, John - CSERC; Burt, Charles - CalPoly; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cory, Philip - TNC; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, P - MF; Devine, John; Donaldson, Milford Wayne - OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau - CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Goode, Ron - NFMT; Gorman, Elaine - YSC; Gutierrez, Monica - NOAA-NMFS; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hellam, Anita - HH; Hersh-Burdick, Rachael - USACE; Heyne, Tim - CDFG; Holden, James ; Horn, Jeff - BLM; Horn, Tini; Hughes, Noah; Hughes, Robert - CDFG; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Kanz, Russ - SWRCB; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick - TRT; Lein, Joseph; Levin, Ellen - SFPUC; Lewis, Reggie - PRCI; Linkard, David - TRT /RH; Loy, Carin; Lyons, Bill - MR; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - CT; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Pinhey, Nick - City of Modesto; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sandkulla, Nicole - BAWSCA; Schutte, Allison - HB; Sears, William - SFPUC; Shumway, Vern - SNF; Shutes, Chris - CSPA; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Verkuil, Colette - TRT/MF; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Williamson, Harry (NPS); Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB
Subject: Don Pedro RWG Meetings Reference Material Posted in a New Location

On the Don Pedro relicensing website, rather than having to drill down through the various MEETINGS levels to reach the material referenced in the RWG meetings, I have created for your viewing four (4) new folders, accessible from the INTRODUCTION TAB (http://www.donpedro-relicensing.com/Lists/Announcements). These folders are called *Cultural RWG Reference Material*,

Recreation RWG Reference Material, *Aquatic-Water Reference Material*, and *Terrestrial RWG Reference Material*. I will keep these folders near the top of the announcement list at all times. I have moved the two 2009 study plans (Water Temp and IFIM) into the Aquatic-Water folder and the two Terrestrial references released earlier in the week into the Terrestrial folder.

Please note that the Recreation RWG folder contains five (5) NEW files, requested at the May 18 Recreation RWG meeting, containing 2005, 2007, 2008, and 2010 Visitor Information.

I will also be creating another new folder, in the same location, for us to keep the most up-to-date release of the *Progress Tracking List (PTL).*

Rose Staples, CPS CAP
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2005 Annual Pass Visitor Days								
MONTH	Monthly Base Total	1 Day	2 Days	3 Days	4 Days	5 Days	6 Days	TOTAL
January	898	669	207	229	63	56	135	**1,359**
February	1,159	863	267	296	81	72	174	**1,753**
March	1,804	1,344	415	460	126	113	271	**2,729**
April	2,612	1,946	601	665	183	163	392	**3,950**
May	4,173	3,109	960	1,064	292	261	626	**6,312**
June	4,689	3,493	1,078	1,197	328	293	703	**7,092**
July	5,198	3,873	1,196	1,325	364	325	780	**7,863**
August	4,609	3,434	1,060	1,175	323	288	691	**6,971**
September	3,569	2,659	821	910	250	223	535	**4,472**
October	1,502	1,119	345	383	105	94	225	**2,307**
November	1,204	897	277	307	84	75	181	**1,450**
December	755	562	174	193	53	47	113	**1,142**
Final total of annual pass visitor days for the year 2005								47,400

YEAR "2005" CUL-DE-SAC USE
VISITOR DAY SAMPLING PROGRAM

Definitions (types) and Numbers of Visitor Days Sampled:

In Season- defined as April 1 through September 30

Off Season- defined as Jan. 1 through March 31, Oct. 1 through Dec. 31

Abbrev.	**Definition** (Visitor Day Type)	**Number of such days in 2005**	**Number of such days sampled in 2005**	**Off Season Holidays (10 total)** (Jan-March, Oct.-Dec.)	**In Season Holidays (15 total)** (April-Sept.)
OSWD	Off Season Weekday	123	9	New Years Day (1/1)	Mother's Day (5/8)
OSWE	Off Season Weekend day	48	4	Martin Luther King (1/17)	Mem. Wknd. (5/27,28,29)
OSH	Off Season Holiday	10	3	President's Day (2/21)	Memorial Day (5/30)
				Easter (3/27)	Father's Day (6/19)
ISWD	In Season Weekday	125	15	Columbus Day (10/10)	4th of July Wknd. (7/1,7/2,7/3)
ISWE	In Season Weekend day	44	13	Veteran's Day (11/11)	4th of July Day (Mon. 7/4)
ISH	In Season Holiday	15	6	Thanksgiving Day (11/24)	Labor Day Wknd. (9/2,9/3,9/4)
	Total days	365	50	Day After Thanksgiving (11/25)	Labor Day (9/5)
				Christmas Eve (12/24)	
				Christmas Day (12/25)	

Cul-de-Sac Use (Average number of visitors per type of visitor day sampled for each specific cul-de-sac):

Cul-de-Sac *(10 sampled)*	**OSWD**	**OSWE**	**OSH**	**ISWD**	**ISWE**	**ISH**
Ward's Ferry	2	3	2	8	24	21
Hwy. 120	2	4	3	5	14	10
Harney Lane	1	2	2	4	7	6
Stent- Jacksonville / River Road	1	1	1	3	3	4
Kanaka Creek	3	5	4	6	16	30
Moccasin Creek	5	11	6	10	18	25
Shawmut Road	3	4	2	5	11	15
Roger's Creek / Hwy. 132	10	29	21	15	43	51
Gillman	1	1	1	1	1	1
Ramos Creek	3	6	3	7	11	13
TOTAL (# visitors for each type of visitor day)	**31**	**66**	**45**	**64**	**148**	**176**

YEAR "2005" CUL-DE-SAC USE
VISITOR DAY SAMPLING PROGRAM

Total Number of Cul-de-sac Visitors in the year "2005" for each type of Visitor Day:

Visitor Day Type	Number of such days in 2005	Times (X)	Average number of visitors for each type of visitor day		Total for 2005
OSWD	123	(X)	31	=	3,813
OSWE	48	(X)	66	=	3,168
OSH	10	(X)	45	=	450
ISWD	125	(X)	64	=	8,000
ISWE	44	(X)	148	=	6,512
ISH	15	(X)	176	=	2,640

*** GRAND TOTAL OF CUL-DE-SAC VISITOR DAYS FOR 2005**	**=**	**24,583**

*(see page 2 for definitions and numbers of Visitor Day types, and the names of the Don Pedro Lake non-fee walk-in access / cul-de-sacs that were sampled)

2007 Annual Pass Visitor Days

74.50% of annual permit holders stay in park 1 day.
11.50% of annual permit holders stay in park 2 days.
8.50% of annual permit holders stay in park 3 days.
1.75% of annual permit holders stay in part 4 days.
1.25% of annual permit holders stay in part 5 days.
2.50% of annual permit holders stay in part 6 or more days.

2007 base number of annual permit holder visitor days	33,882

MONTH	Monthly Base Total	1 Day	2 Days	3 Days	4 Days	5 Days	6 Days	TOTAL
January	894	666	206	228	63	56	134	**1352**
February	1071	798	246	273	75	67	161	**1620**
March	2839	2115	653	724	199	177	426	**4294**
April	3025	2254	696	771	212	189	454	**4575**
May	4161	3100	957	1061	291	260	624	**6294**
June	5464	4071	1257	1393	382	342	820	**8264**
July	5430	4045	1249	1385	380	339	815	**8213**
August	4971	3703	1143	1268	348	311	746	**7519**
September	2387	1778	549	609	167	149	358	**3610**
October	1531	1141	352	390	107	96	230	**2316**
November	1369	1020	315	349	96	86	205	**2071**
December	740	551	170	189	52	46	111	**1119**

Final total of annual pass visitor days for the year 2007	51,247

Exhibit A

DON PEDRO RECREATION AREA "2007" CUL-DE-SAC USE VISITOR DAY SAMPLING PROGRAM

DEFINITIONS:

In Season- defined as April 1 through September 30

Off Season- defined as Jan. 1 through March 31, Oct. 1 through Dec. 31

Visitor Day Types and Number of each Type of Visitor Day Sampled:

Abbrev.	Visitor Day Type	Total # of days in 2007	Total # of days sampled in 2007	Off Season Holidays 9 total	In Season Holidays 16 total
OSWD	Off Season Weekday	122	6	New Years Day (1/1)	Easter (4/8)
OSWE	Off Season Weekend day	51	3	Martin Luther King (1/15)	Mother's Day (5/13)
OSH	Off Season Holiday	9	2	President's Day (2/19)	Mem. Wknd. (5/25,26,27)
ISWD	In Season Weekday	123	15	Columbus Day (10/8)	Memorial Day (5/28)
ISWE	In Season Weekend day	44	11	Veteran's Day(observed 11/12)	Father's Day (6/17)
ISH	In Season Holiday	16	8	Thanksgiving Day (11/22)	4th of July Wknd. (6/30,7/1,7/2,7/3)
	Total days	**365**	**45**	Day After Thanksgiving (11/23)	4th of July Day (Wed. 7/4)
				Christmas Eve (12/24)	Labor Day Wknd. (8/31,9/1,9/2)
				Christmas Day (Sun. 12/25)	Labor Day (9/3)

CUL-DE-SAC USE (AVG. # OF VISITORS PER TYPE OF VISITOR DAY SAMPLED FOR EACH CUL-DE-SAC:

Don Pedro Recreation Area Cul-de-Sacs Sampled	OSWD	OSWE	OSH	ISWD	ISWE	ISH
Ward's Ferry Bridge	2	4	3	7	24	22
Hwy. 120	2	3	4	5	13	15
Harney Lane	0	1	2	2	5	7
Stent- Jacksonville / River Road	0	2	1	2	3	4
Kanaka Creek	4	5	5	9	16	34
Moccasin Creek	7	14	13	12	23	30
Shawmut Road	2	4	2	4	11	15
Roger's Creek / Hwy. 132	12	35	25	17	47	53
Gillman	1	1	1	1	1	1
Grizzly Road	2	2	1	4	3	5
Avg. # visitors for each type of visitor day	**32**	**72**	**57**	**63**	**146**	**180**

DON PEDRO RECREATION AREA "2007" CUL-DE-SAC USE VISITOR DAY SAMPLING PROGRAM

TOTAL NUMBER OF CUL-DE-SAC VISITORS IN THE YEAR "2007" FOR EACH TYPE OF VISITOR DAY:

Visitor Day Type	Number of such days in 2007	Times (X)	Average number of visitors for each type of visitor day		Total for 2007
OSWD	122	(X)	32	=	3,904
OSWE	51	(X)	72	=	3,672
OSH	9	(X)	57	=	513
ISWD	123	(X)	63	=	7,749
ISWE	44	(X)	146	=	6,424
ISH	16	(X)	180	=	2,880

*** GRAND TOTAL OF CUL-DE-SAC VISITOR DAYS FOR 2007**	**=**	**25,142**

2008 Annual Pass Visitor Days

74.50% of annual permit holders stay in park 1 day.
11.50% of annual permit holders stay in park 2 days.
8.50% of annual permit holders stay in park 3 days.
1.75% of annual permit holders stay in part 4 days.
1.25% of annual permit holders stay in part 5 days.
2.50% of annual permit holders stay in part 6 or more days.

2008 base number of annual permit holder visitor days	27333

MONTH	Monthly Base Total	1 Day	2 Days	3 Days	4 Days	5 Days	6 Days	TOTAL
January	677	504	156	173	47	42	102	**1024**
February	1611	1200	371	411	113	101	242	**2437**
March	2277	1696	524	581	159	142	342	**3444**
April	2101	1565	483	536	147	131	315	**3178**
May	3100	2310	713	791	217	194	465	**4689**
June	3506	2612	806	894	245	219	526	**5303**
July	5024	3743	1156	1281	352	314	754	**7599**
August	4536	3379	1043	1157	318	284	680	**6861**
September	2297	1711	528	586	161	144	345	**3474**
October	1260	939	290	321	88	79	189	**1906**
November	634	472	146	162	44	40	95	**959**
December	310	231	71	79	22	19	47	**469**

Final total of annual pass visitor days 2008	41343

Exhibit A

DON PEDRO RECREATION AREA "2008" CUL-DE-SAC USE VISITOR DAY SAMPLING PROGRAM

DEFINITIONS:

In Season- defined as April 1 through September 30

Off Season- defined as Jan. 1 through March 31, Oct. 1 through Dec. 31

Visitor Day Types and Number of each Type of Visitor Day Sampled:

Abbrev.	Visitor Day Type	Total # of days in 2008	Total # of days sampled in 2008	Off Season Holidays 10 total	In Season Holidays 12 total
OSWD	Off Season Weekday	121	5	New Years Day (1/1)	Mother's Day (5/10)
OSWE	Off Season Weekend day	51	3	Martin Luther King (1/21)	Mem. Wknd. (5/23,24,25)
OSH	Off Season Holiday	10	2	President's Day (2/18)	Memorial Day (5/26)
				Easter (3/23)	Father's Day (6/15)
ISWD	In Season Weekday	127	16	Columbus Day (10/13)	4th of July Day (Fri. 7/4)
ISWE	In Season Weekend day	44	12	Veteran's Day(11/11)	4th of July Wknd. (7/5, 7/6)
ISH	In Season Holiday	12	7	Thanksgiving Day (11/27)	Labor Day Wknd. (8/30, 8/31)
	Total days	**365**	**45**	Day After Thanksgiving (11/28)	Labor Day (9/1)
				Christmas Eve (12/24)	
				Christmas Day (Sun. 12/25)	

CUL-DE-SAC USE (AVG. # OF VISITORS PER TYPE OF VISITOR DAY SAMPLED FOR EACH CUL-DE-SAC:

Don Pedro Recreation Area Cul-de-Sacs Sampled	OSWD	OSWE	OSH	ISWD	ISWE	ISH
Ward's Ferry Bridge	2	3	3	8	22	25
Hwy. 120	2	2	4	7	12	16
Harney Lane	0	1	1	2	3	3
Stent- Jacksonville / River Road	0	2	0	1	3	3
Kanaka Creek	4	5	4	8	13	25
Moccasin Creek	8	15	14	16	24	31
Shawmut Road	2	3	2	6	13	13
Roger's Creek / Hwy. 132	13	41	33	21	51	57
Gillman	1	1	1	1	1	1
Grizzly Road	1	1	1	4	5	6
Avg. # visitors for each type of visitor day	**34**	**74**	**63**	**74**	**146**	**180**

TOTAL NUMBER OF CUL-DE-SAC VISITORS IN THE YEAR "2008" FOR EACH TYPE OF VISITOR DAY:

Exhibit B

DON PEDRO RECREATION AREA "2008" CUL-DE-SAC USE VISITOR DAY SAMPLING PROGRAM

Visitor Day Type	Number of such days in 2008	Times (X)	Average number of visitors for each type of visitor day		Total for 2008
OSWD	121	(X)	34	=	4,114
OSWE	51	(X)	74	=	3,774
OSH	10	(X)	63	=	630
ISWD	127	(X)	74	=	9,398
ISWE	44	(X)	146	=	6,424
ISH	12	(X)	180	=	2,160

*** GRAND TOTAL OF CUL-DE-SAC VISITOR DAYS FOR 2008**	**=**	**26,500**

2010 Annual Pass Visitor Days

74.50% of annual permit holders stay in park 1 day.
11.50% of annual permit holders stay in park 2 days.
8.50% of annual permit holders stay in park 3 days.
1.75% of annual permit holders stay in part 4 days.
1.25% of annual permit holders stay in part 5 days.
2.50% of annual permit holders stay in part 6 or more days.

2010 base number of annual permit holder visitor days	27871

MONTH	Monthly Base Total	1 Day	2 Days	3 Days	4 Days	5 Days	6 Days	TOTAL
January	389	290	89	99	27	24	58	**588**
February	789	588	181	201	55	49	118	**1193**
March	1644	1225	378	419	115	103	247	**2487**
April	1978	1474	455	504	138	124	297	**2992**
May	2631	1960	605	671	184	164	395	**3979**
June	4348	3239	1000	1109	304	272	652	**6576**
July	6488	4834	1492	1654	454	406	973	**9813**
August	4397	3276	1011	1121	308	275	660	**6650**
September	3368	2509	775	859	236	211	505	**5094**
October	1035	771	238	264	72	65	155	**1565**
November	515	384	118	131	36	32	77	**779**
December	289	215	66	74	20	18	43	**437**

Final Total of Annual Pass Visitor Days 2010	42154.9

Exhibit A

DON PEDRO RECREATION AREA "2010" CUL-DE-SAC USE VISITOR DAY SAMPLING PROGRAM

DEFINITIONS:

In Season- defined as April 1 through September 30

Off Season- defined as Jan. 1 through March 31, Oct. 1 through Dec. 31

Visitor Day Types and Number of each Type of Visitor Day Sampled:

Abbrev.	Visitor Day Type	Total # of days in 2010	Total # of days sampled in 2010	Off Season Holidays 9 total	In Season Holidays 14 total
OSWD	Off Season Weekday	122	7	New Years Day (1/1)	Easter Sunday (4/4)
OSWE	Off Season Weekend day	51	3	Martin Luther King (1/18)	Mother's Day (5/9)
OSH	Off Season Holiday	9	2	President's Day (2/15)	Mem. Wknd. (5/28, 5/29, 5/30)
					Memorial Day (5/31)
ISWD	In Season Weekday	126	16	Columbus Day (10/11)	Father's Day (6/20)
ISWE	In Season Weekend day	43	12	Veteran's Day(11/11)	4th of July Wknd. (7/2, 7/3)
ISH	In Season Holiday	14	7	Thanksgiving Day (11/25)	4th of July Day (7/4)
	Total days	**365**	**47**	Day After Thanksgiving (11/26)	Labor Day Wknd. (9/3, 9/4, 9/5)
				Christmas Eve (12/24)	Labor Day (9/6)
				Christmas Day (12/25)	

CUL-DE-SAC USE (AVG. # OF VISITORS PER TYPE OF VISITOR DAY SAMPLED FOR EACH CUL-DE-SAC:

Don Pedro Recreation Area Cul-de-Sacs Sampled	OSWD	OSWE	OSH	ISWD	ISWE	ISH
Ward's Ferry Bridge	2	3	3	8	28	23
Hwy. 120	3	6	6	7	15	16
Harney Lane	0	2	1	3	5	4
Stent- Jacksonville / River Road	1	1	1	1	1	2
Kanaka Creek	4	9	11	8	21	30
Moccasin Creek	8	15	20	16	33	40
Shawmut Road	2	4	3	9	13	14
Roger's Creek / Hwy. 132	13	38	28	30	60	63
Gillman	1	1	1	1	1	0
Grizzly Road	2	4	3	4	5	5
Avg. # visitors for each type of visitor day	**36**	**83**	**77**	**87**	**182**	**197**

DON PEDRO RECREATION AREA "2010" CUL-DE-SAC USE VISITOR DAY SAMPLING PROGRAM

TOTAL NUMBER OF CUL-DE-SAC VISITORS IN THE YEAR "2010" FOR EACH TYPE OF VISITOR DAY:

Visitor Day Type	Number of such days in 2010	Times (X)	Average number of visitors for each type of visitor day		Total for 2010
OSWD	122	(X)	36	=	4,392
OSWE	51	(X)	83	=	4,233
OSH	9	(X)	77	=	693
ISWD	126	(X)	87	=	10,962
ISWE	43	(X)	182	=	7,826
ISH	14	(X)	197	=	2,758

GRAND TOTAL OF CUL-DE-SAC VISITOR DAYS FOR 2010	**=**	**30,864**

DON PEDRO RECREATION AGENCY

DAY USE VISITOR DAYS BY COUNTY

COUNTY	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ALAMEDA	40,572	44,560	35,050	33,767	35,170	33,081	30,596	32,266	32,707	33,439
ALPINE	64	20	32	15	48	28	30	6	16	16
AMADOR	229	321	229	192	303	430	221	3,496	211	224
BUTTE	208	259	248	133	159	273	182	258	185	205
CALAVERAS	1,055	1,565	1,326	1,184	1,425	1,509	1,522	1,004	1,294	1,122
COLUSA	37	17	31	16	15	23	194	5	42	40
CONTRA COSTA	17,291	20,192	17,079	16,763	15,263	16,296	16,433	12,813	17,455	17,646
DEL NORTE	42	25	46	48	23	37	15	2	36	43
EL DORADO	891	919	915	1,171	908	1,299	911	1,361	887	939
FRESNO	4,071	5,220	4,710	4,360	4,348	4,060	5,551	4,335	4,118	4,336
GLENN	67	310	44	12	111	0	3	9	36	36
HUMBOLDT	88	123	95	43	68	33	170	45	13	30
IMPERIAL	22	2	19	48	13	10	4	26	37	40
INYO	49	182	21	47	52	51	111	65	34	33
KERN	1,650	2,034	1,567	1,611	2,177	1,563	2,283	1,543	1,369	1,372
KINGS	1,210	922	924	917	889	743	1,076	992	1,044	977
LAKE	96	32	102	67	40	79	99	167	132	131
LASSEN	51	55	34	32	26	49	43	26	63	120
LOS ANGELES	7,154	9,297	8,893	8,508	10,141	8,863	8,223	7,716	8,430	8,954
MADERA	1,640	2,297	2,367	2,152	2,331	2,075	2,741	1,872	2,652	2,996
MARIN	918	1,109	602	956	554	535	462	696	444	478
MARIPOSA	3,711	4,338	4,036	3,331	3,603	3,667	3,847	4,053	4,028	3,974
MENDOCINO	126	35	12	28	93	70	62	27	51	202
MERCED	14,993	16,653	14,729	18,185	16,787	15,396	17,692	15,640	21,062	20,774
MODOC	186	43	12	22	27	24	3	7	15	15
MONO	283	147	84	182	36	62	96	31	52	51
MONTEREY	6,251	7,362	6,127	7,580	6,317	5,063	5,349	4,899	6,884	7,420
NAPA	265	275	519	342	371	292	192	549	434	458
NEVADA	139	227	208	62	144	164	329	199	142	146
ORANGE	4,006	4,224	2,692	3,829	4,269	3,819	4,820	3,179	2,743	2,858
PLACER	998	1,508	923	1,554	1,366	1,442	1,282	852	1,278	1,430
PLUMAS	287	118	69	23	14	79	35	17	43	40
RIVERSIDE	739	1,178	1,312	1,226	1,293	1,403	1,288	750	719	735
SACRAMENTO	4,906	6,088	6,628	6,406	5,428	5,557	5,629	5,287	6,364	6,374
SAN BENITO	4,365	4,960	3,236	3,434	4,411	2,843	3,216	2,231	3,154	3,200
SAN BERNARDINO	1,851	1,931	1,698	1,408	1,530	1,366	1,541	984	1,171	1,244
SAN DIEGO	1,268	2,519	2,191	1,568	1,743	1,359	1,313	979	1,224	1,302
SAN FRANCISCO	4,714	4,469	3,725	2,437	3,849	3,773	3,302	3,581	4,030	4,169
SAN JOAQUIN	22,142	24,387	21,947	22,658	24,694	22,710	24,603	19,400	24,348	24,662
SAN LUIS OBISPO	1,267	2,015	1,265	1,416	1,323	982	685	936	500	532
SAN MATEO	9,402	9,125	6,726	8,373	7,372	7,518	8,090	7,603	9,277	9,491
SANTA BARBARA	1,702	1,186	1,095	959	1,109	862	890	587	616	782
SANTA CLARA	51,220	53,190	42,282	39,300	36,545	31,755	34,295	31,689	33,540	35,439
SANTA CRUZ	8,482	8,634	7,395	7,486	8,074	5,625	5,703	5,720	6,037	6,245
SHASTA	202	186	144	128	149	315	101	270	95	108
SIERRA	44	19	18	7	7	21	23	15	6	9
SISKIYOU	73	47	29	114	49	44	82	5	17	17
SOLANO	2,359	2,047	1,877	1,901	2,079	1,512	2,062	1,988	2,850	2,909
SONOMA	1,998	2,046	2,189	1,518	1,573	1,556	1,706	1,354	1,815	2,031
STANISLAUS	85,852	82,659	85,766	79,817	85,242	91,826	92,082	84,690	82,074	79,262
SUTTER	67	105	87	145	155	117	157	131	94	108
TEHAMA	76	34	19	79	29	33	49	49	62	56
TRINITY	18	8	24	23	0	0	5	11	1	1
TULARE	1,302	1,662	1,069	1,386	1,520	1,295	1,139	1,498	2,069	2,272
TUOLUMNE	21,020	23,751	22,395	20,928	21,588	21,668	22,189	17,519	17,735	17,629
VENTURA	3,928	4,628	4,469	4,024	3,983	4,479	4,819	3,514	3,803	4,036
YOLO	458	619	434	423	353	264	279	216	302	299
YUBA	52	28	148	69	97	47	46	43	62	71
OUT OF STATE	4,000	3,992	4,459	4,194	5,007	4,664	4,300	3,184	4,164	4,527
OUT OF COUNTRY	2,513	1,882	1,734	1,701	2,294	2,075	1,844	1,198	1,588	1,588
TOTAL VISITOR DAYS	344,670	367,786	328,106	320,308	328,587	316,784	326,015	293,588	315,654	319,643

DON PEDRO RECREATION AGENCY

NUMBER OF PERMITS ISSUED - 2010

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
VEHICLE DAY	385	688	1,593	2,166	7,142	10,854	23,011	12,409	7,667	1,007	497	344	67,763
GROUP DAY		1	1			7		8					17
VEHICLE ANN	71	79	129	123	249	228	110	16	1			14	1,020
VEHICLE SEN	54	57	77	50	64	61	42	7	2			14	428
2 ND VEH. ANN	18	13	23	23	38	40	41	6	5	36		1	244
BOAT DAY USE	196	509	1,309	1,530	2,961	4,483	8,334	4,833	3,093	624	320	141	28,333
BOAT ANNUAL	109	96	166	144	270	282	139	20	4			30	1,260
SC BOAT ANN	27	13	7	18	13	8	4	2	1		1	20	114
HOOKUP NIGHT	518	540	1,015	828	917	1,526	1,382	1,130	595	576	354	310	9,691
HOOKUP WEEK	19	48	31	19	1								118
HOOKUP MONTH	18	17	25	17						3			80
TENT NIGHT	650	685	1,363	1,620	1,918	3,332	3,801	2,471	1,063	189	136	138	17,366
TENT WEEK	9	7	6	18									40
LAKESHORE CAMP	1	2	3	9	74	198	613	170	188	12			1,270
PW DAY USE	2	7	13	15	274	743	1,726	1,037	471	29	2		4,319
PW ANNUAL	74	18	10	182	29	44	13	5				26	401
RESERVATION FEES	412	465	789	837	1,023	1,477	1,587	946	415	119	94	82	8,246

DON PEDRO RECREATION AGENCY
DAVIS-GRUNSKY REPORT
2010

MONTHLY VISITOR DAYS

MONTH	# VISITOR DAYS	%
January	1,200	0.40%
February	2,826	0.90%
March	6,097	1.80%
April	10,242	3.20%
May	31,911	10.00%
June	52,578	16.50%
July	96,710	30.20%
August	68,076	21.20%
September	38,784	12.20%
October	6,391	2.00%
November	3,357	1.10%
December	1,471	0.50%
	319,643	100.00%

TOTAL MONTHLY REVENUE

	%
January	6.50%
February	4.70%
March	7.00%
April	6.90%
May	10.70%
June	14.50%
July	20.00%
August	13.40%
September	7.90%
October	3.50%
November	1.50%
December	3.40%
	100.00%

GATE RECEIPTS

	%
VEHICLE DAY USE	29.40%
VEHICLE ANNUAL	6.40%
BOAT DAY USE	12.30%
BOAT ANNUAL	6.60%
TENT UNITS	22.80%
TRAILER UNITS	22.50%
TOTAL	100.00%

ANNUAL PERMIT PEOPLE

MONTH	# PEOPLE		%
January	588		1.40%
February	1,193		2.90%
March	2,487		5.80%
April	2,992		7.10%
May	3,979		9.50%
June	6,576		15.50%
July	9,813		23.30%
August	6,650		15.70%
September	5,094		12.10%
October	1,565		3.80%
November	779		1.80%
December	437		1.10%
	42,153	**Exhibit A**	**100.00%**

RECEIPT BREAKDOWN BY DEPARTMENT

	%
ADMIN. OFFICE	45.50%
WEBSITE	5.00%
FLEMING	28.70%
MOCCASIN	11.40%
BLUE OAKS	9.40%
	100.00%

VISITOR DAYS/COUNTY OF ORIGIN

COUNTY	# VISITORS	%
Stanislaus	79,262	24.70%
Tuolumne	17,629	5.50%
Merced/S. Joaquin	45,436	14.20%
S. California	19,169	6.00%
Bay Area	106,060	33.20%
Rest of State	45,972	14.40%
Out of State	4,527	1.50%
Out of Country	1,588	0.50%
	319,643	100.00%

TOTAL VISITOR DAYS:	**361,796**	**Monthly Visitors + Exhibit A**
CUL-DE-SAC USE:	**30,864**	**Exhibit B**
RAFTING TAKE OUT:	**3,037**	
VISITOR PASSES:	**1,983**	
TOTAL VISITOR DAYS 2010:	**397,680**	

DON PEDRO LAKE
VESSEL MONITORING AND CARRYING CAPACITY STUDY

PURPOSE:

To develop and initiate a vessel lake-use monitoring and carrying capacity study at Don Pedro Lake that will be utilized to help insure the continued availability of a quality recreational boating experience.

GOAL:

The goal of this monitoring and carrying capacity study will be to gather information that will be used to determine if numerical limits or other types of use restrictions or regulations should be placed on specific types of vessels that are operated on Don Pedro Lake. Recommendations to establish specific vessel carrying capacities and or desired vessel lake use regulations should be completed by October 2003.

DEFINITIONS:

Vessel Carrying Capacity- *Specific maximum numerical limits placed on specific types of vessels.*
Private Houseboats- *Privately owned vessels that are 10' or greater in width with sleeping capacity (built in plumbing), limited by a specific number of houseboat permits and subject to specific Agency Houseboat Rules and Regulations.*
Rental Houseboats- *Marina concessionaire owned rental vessels that are 10' or greater in width with sleeping capacity (built in plumbing), limited by a specific number of houseboat permits and subject to specific Agency Houseboat Rules and Regulations.*
Rental Watercraft- *Marina concessionaire owned rental vessels, less than 10' wide and limited by specific number permitted under the marina's concession lease agreement with the Agency.*
Private Watercraft- *Privately owned vessels that are less than 10' wide, with or without sleeping capacity (built in plumbing) that require a current permit from the Agency in order to be stored, moored or operated within the Don Pedro Recreation Area. No specific numerical limits have been set for this type of vessel. Rental vessels that are brought in from outside the Recreation Area are grouped with this category for purposes of this monitoring program.*

JUSTIFICATION FOR LAKE-USE MONITORING PROGRAM:

The growing population of California and the areas surrounding Don Pedro Lake will inevitably lead to an increase in the numbers of recreational boaters who visit the Lake. If a quality recreational boating experience is to be preserved at Don Pedro Lake and vessel overcrowding is to be prevented then carrying capacities for vessels using the lake need to be established.

No comprehensive vessel lake-use monitoring or carrying capacity study has ever been conducted at Don Pedro Lake. Statistical data was never used to establish the existing restricted use areas on the lake or to determine the existing numerical restrictions that have been placed on those vessels that are currently limited. In addition, no numerical limits have ever been established for private watercraft that can be brought in from the outside.

Without a comprehensive Monitoring and carrying capacity study the Agency cannot properly plan for the future. Initially, collected data will be used to understand the impacts that vessels currently operated on the lake are having. Then the data will be utilized to establish specific vessel carrying capacities for specific types of vessels. Once these carrying capacities are established, the Agency can make objective decisions on whether numerical limits or other types of use restrictions should be placed on specific types of vessels or on specific areas of the lake. In addition, the data collected will be useful for the planning of future facilities and infrastructure that will be needed to meet future recreational boating demands.

Multiple benefits can be gained by conducting this study. Establishing specific limits for specific vessel types, properly evaluating existing restricted use areas and implementing new restrictions if needed will ultimately result in less crowding, less noise, less complaints, lower environmental impact, improved safety, greater customer satisfaction and the continued assurance of a quality recreational experience at Don Pedro Lake.

BACKGROUND / HISTORY:

The numbers of private permitted houseboats, and marina concessionaire rental vessels allowed on Don Pedro Lake are currently limited by the Agency. There are no established numerical limits for private watercraft but, existing restricted lake use areas and a variety of other factors can influence the types and numbers of these vessels that are operated at any given time.

PRIVATE HOUSEBOATS:

A review of the history of the New Don Pedro Lake reveals that during the1970s and early1980s, as demand for private houseboat permits increased, the two marina concessionaires periodically petitioned the Agency to increase the number of these permits. The number of private houseboat permits increased incrementally from 47 in 1971 to the current limit of 257 established in 1983. 195 of these houseboats were assigned to the Lake Don Pedro Marina concessionaire and 62 to the Moccasin Pt. Marina. This limit of 257 private houseboat permits and their numerical division between the two marina concessionaires has remained unchanged since 1983.

Public demand and Agency and marina concessionaire financial concerns were always the motivation for increasing private houseboat permit numbers. Additional private houseboats provided additional year round Agency permit and marina mooring fee income

No statistical data was ever compiled or utilized to determine this final houseboat permit number or the potential impacts that this many private permitted houseboats could have on the Recreation Area.

RENTAL HOUSEBOATS:

The number of permitted marina rental houseboats also increased incrementally during the 1970s and the early 1980s. Like the private permitted houseboats, the Agency permitted an increase in rental houseboats to meet the public demand and to generate additional marina revenue.

In 1983 both marina concessionaires were allotted a maximum of 10 rental houseboats for each marina. This allotment remained unchanged until 1999 when upon completion of several required improvements the current Moccasin Pt. Marina concessionaire (Forever Resorts) was allowed to increase their rental houseboat fleet to 20 houseboats. When Forever Resorts purchased the Lake Don Pedro Marina in 2001, they were initially allotted permits for 13 rental houseboats. However, their concession lease agreement stipulated that upon completion of certain facility improvements they could increase their rental houseboat fleet to 20 houseboats. They have recently completed these required improvements and are now eligible to increase their rental houseboat fleet.

The Moccasin Pt. Marina recently reached their 20 rental houseboat limit. The Lake Don Pedro Marina currently has only 13 rental houseboats. The Agency anticipates that the Lake Don Pedro Marina will be increasing their fleet to its 20 houseboat limit over the next couple of years. These rental houseboat permit increases have been granted based on the concessionaire's ability to improve marina facilities. No monitoring program or statistical data was ever utilized to determine these current rental houseboat numbers or the potential impacts that these additional marina rental houseboats might have on the Recreation Area.

RENTAL WATERCRAFT:

Like rental houseboats, the number of marina rental watercraft permitted on the lake have always been restricted by the terms of the marina's concession lease agreement with the Agency. As public demand increased, the Agency permitted the marina concessionaires to increase their rental watercraft fleet.

Currently, the Moccasin Pt. Marina is approved for a maximum of 30 rental watercraft and the Lake Don Pedro Marina a maximum of 50 rental watercraft. These watercraft can consist of any combination of either fishing boats, deck boats, water ski boats or personal watercraft. No monitoring program or statistical data was ever utilized to determine these rental watercraft numbers or the potential impacts that this many rental watercraft might have on the Recreation Area.

PRIVATE WATERCRAFT:

There are no established numerical limits for private watercraft that can be brought in from outside the Recreation Area. However, there are certain limiting factors that do act to control the numbers of these vessels. Private watercraft that are stored or moored within the Recreation Area are limited by either the number of available marina slips and dry storage spaces or by the number of private permitted houseboats upon which many are stored. The only factors that currently limit the number of private watercraft brought in from outside the Recreation Area are the number of available parking spaces within the three developed Recreation Area sites and possibly the Recreation Area permit fees.

The Lake Don Pedro Marina is currently permitted for up to 336 private watercraft slips and 250 private watercraft dry storage spaces. The Moccasin Pt. Marina is permitted for 42 private watercraft slips and 22 covered vessel dry storage units. The Moccasin Pt. Marina also offers open vessel dry storage however the number of open vessel dry storage spaces are not currently specified by their concession lease agreement with the Agency.

The number of permitted private houseboats has a direct effect on the number of private watercraft that can be stored upon them. There is currently no set limit on how many personal watercraft can be stored upon a private houseboat. Some private houseboaters store as many as five personal watercraft aboard their houseboats. Since all vessels that are stored or moored within the Recreation Area are required to have current Agency permits, the expense of this required permit can sometimes act as a limiting factor.

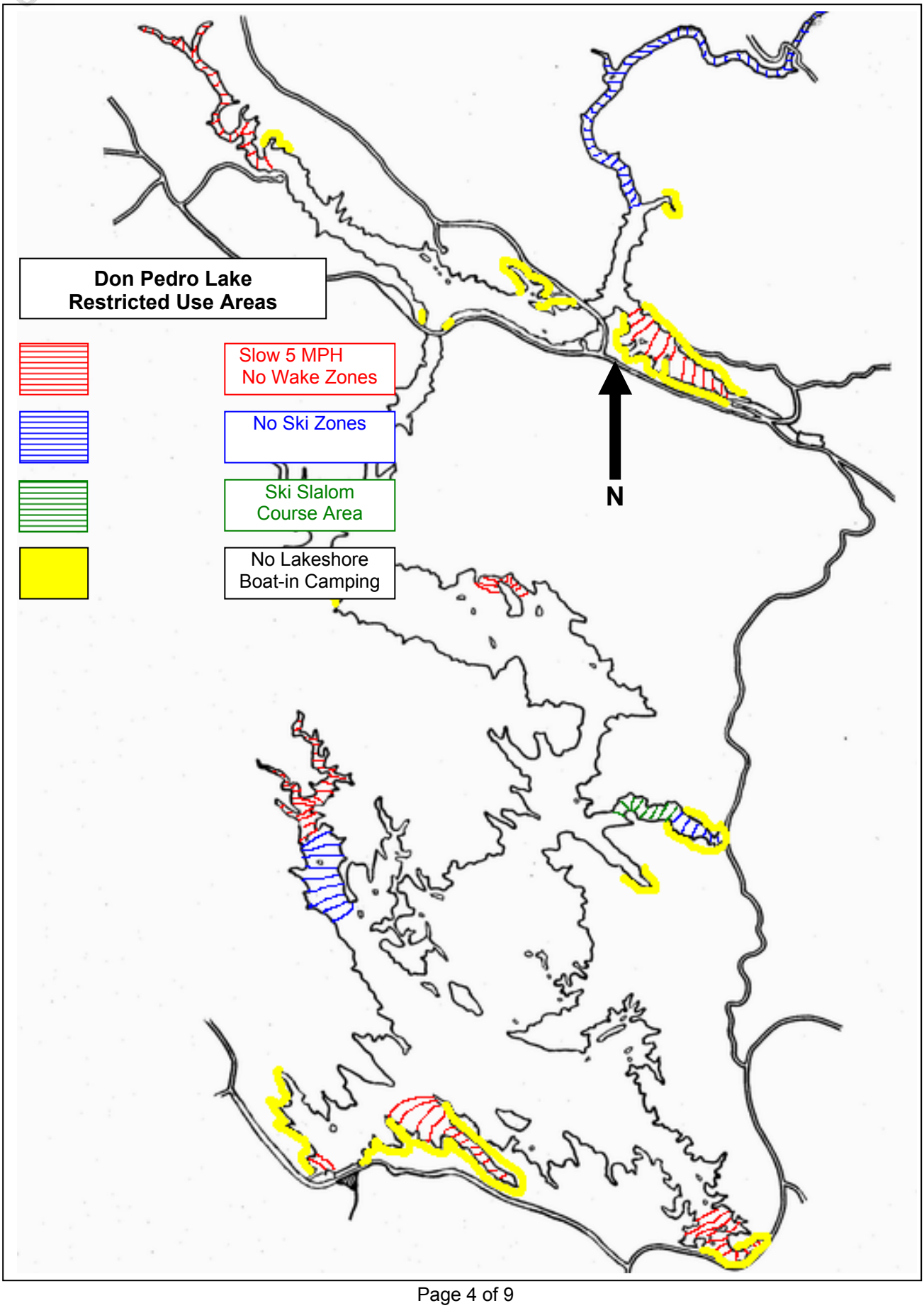
Rental vessels that are rented from concessionaires outside of the Recreation Area that are less than 10 feet in width can be brought into the Recreation Area by the private parties that are renting them. These vessels are subject to the same permit fees as privately owned vessels. They are also limited numerically by the same factors that limit other privately owned watercraft, so for purposes of this monitoring program they will be defined as private watercraft.

No monitoring program or statistical data was ever utilized to establish any of the limiting factors that determine the current numbers of private watercraft that can enter the Recreation Area from outside.

RESTRICTED USE AREAS:

There are currently seven “5 mph No Wake” zones, three “No Ski” zones and one special use “Ski Area” zone established and posted on the lake **(see lake map)*. These restricted zones and the one special use “Ski Slalom Area” zone have an effect on the types, numbers and use patterns of vessels that are operated on the lake. In addition, there are certain areas around the lake where Boat-in Lakeshore Camping is prohibited **(see lake map)*. This restriction also has an effect on vessel numbers and types.

5 mph No Wake zones exist in launch ramp and marina areas and also in shallow or hazardous areas. No Ski zones exist in areas considered suitable for fishing but too hazardous for skiing. Areas where lakeshore boat-in camping is prohibited lie adjacent to either developed private property or public road access. No monitoring program or statistical data was ever utilized to establish any of these restricted areas or to evaluate the impacts of their locations on recreational boating .


Don Pedro Lake
Restricted Use Areas
Slow 5 MPH
No Wake Zones
No Ski Zones
Ski Slalom
Course Area
No Lakeshore
Boat-in Camping
N

CURRENT FACTORS THAT INFLUENCE VESSEL NUMBERS ON DON PEDRO LAKE:

	Private Houseboats	***Rental Houseboats***	***Rental Watercraft***	***Private Watercraft***
Permit Fees Required	Yes	Yes	Yes	Yes
Established Permit Limit	Yes (257 total, 195 at LDPM, 62 at MPM)	Yes (40 total, 20 at each marina)	Yes (80 total, 50 at LDPM, 30 at MPM)	Yes (effected by # of houseboats)
Recreation Area Facilities	Yes	Yes	Yes	Yes
Suitable Houseboat Mooring Areas	Yes	Yes	No	Yes
Available Houseboat Slips	Yes	Yes	No	Yes
Available Watercraft Slips	No	No	Yes	Yes (336 at LDPM, 42 at MPM)
Available Houseboat Repair Space	Yes	Yes	No	No
Available Dry Storage Space	No	No	No	Yes (250 at LDPM, 22+ at MPM)
Available Vehicle and Boat Trailer Parking	Yes	Yes	Yes	Yes
Number of Campsites	No	No	Yes (effects demand)	Yes
Lake Elevation *(launching, parking, surface acreage)*	Yes (effects demand for private houseboats)	Yes (effects demand for rentals)	Yes (effects demand for rentals)	Yes
Restricted Use Areas *(incl. Boat-in Camping)*	No	No	Yes	Yes
Lake Popularity and Marketing	Yes	Yes	Yes	Yes
Lake Location	Yes	Yes	Yes	Yes
Nearby Accommodations	No	No	Yes (effects demand for rentals)	Yes
Economy and Disposable Income	Yes	Yes	Yes	Yes
Weather / Season	No	No	Yes (effects demand)	Yes
Other Regulations	Yes (effects demand)	Yes (effects demand)	Yes (effects demand)	Yes

MONITORING PROGRAM METHODS:

Five methods will be utilized to obtain data for this study:

1) Lake users will be surveyed
2) Personnel who work or volunteer on the lake and or respond to the Lake will be surveyed
3) Criteria and methods utilized by other lake managing agencies for the establishment of vessel numerical limitations will be investigated
4) Existing Don Pedro Lake statistics will be compiled and evaluated
5) And a 2003 vessel use monitoring/sampling program will be implemented.

The data gathered from these five approaches will be compiled together, evaluated and utilized towards the development of vessel carrying capacities and or other recommended lake use regulations and restrictions.

LAKE USER SURVEYS:

If preserving a quality recreational boating experience at Don Pedro Lake is the purpose of this program then the Agency needs to somehow establish criteria for what a quality recreational boating experience actually is. In order to establish these criteria Lake users will be surveyed. Two different lake user surveys will be conducted, a private houseboater survey and a general lake user survey. Questions

regarding frequency of visitation, areas of the lake most visited, numbers and types of vessels owned and operated, and opinions in regards to lake management issues will be asked on both surveys.

The data gathered from Lake User surveys will be utilized to understand the use patterns and impacts of specific boating groups. Their opinions will also help the Agency to establish criteria for what most lake users consider that a "quality recreational boating experience" is. Also, data and opinions collected from these surveys will give the Agency insight into how the boating public will react if specific vessel number restrictions and or other new boating and lake use regulations are implemented as a result of this study.

Private houseboaters are somewhat of a specialized user group on Don Pedro Lake. Their houseboats are moored on the lake year round, most own and operate multiple vessels and as a group they probably spend more time on the lake than any other lake user group. For these reasons, they are being surveyed separately. Specific questions geared towards houseboat use have been included in their survey which has already been sent out to them **(see lake use survey-houseboater*).

Private houseboater survey data will help the Agency to better understand the use patterns and impacts of the houseboats that are currently permitted on the lake. The experiences, perceptions and opinions of houseboaters will be helpful in the establishment of maximum numerical houseboat limits.

Lake User- Survey-Houseboater

DON PEDRO LAKE USE SURVEY *(please return with your Houseboat Permit Renewal Application)*

1. How many days out of each year do you normally spend on your houseboat at Don Pedro Lake?
   a. Less than twenty days
   b. Twenty to forty days
   c. Forty or more days
2. Please list three areas of the lake where you spend the most time on your houseboat. *(example: Upper Bay)*

   (1) _____ (2) _____ (3) _____
3. How much lake area around your houseboat do you normally utilize to recreate within?
   a. Usually stay within a one mile radius of houseboat
   b. Usually stay within a five mile radius of houseboat
   c. Frequently go beyond a five mile radius of houseboat for lake recreation
4. How many other vessels are normally operated on Don Pedro by persons who use your houseboat?
   a. Usually two or less per year
   b. Usually three to five per year
   c. Usually more than five per year
5. Have you ever experienced a time when you felt that too many boats were on the Lake?
   a. No
   b. Yes, (if yes, please explain) _____
6. Should the Agency increase the number of private permitted houseboats currently on the lake?
   a. Yes
   b. No
   7. Should the Agency increase the number of permitted marina rental houseboats currently on the lake?
   a. Yes
   b. No
8. Do you ever encounter difficulty finding a suitable place to moor your houseboat along the shoreline?
   a. Yes, frequently
   b. Y es, sometimes
   c. No, never

******(Please use other side for additional comments)******

Data and opinions from all other lake users will be gathered by means of a general lake user survey *(see lake user survey-general)*. This survey will not be as user specific as is the houseboater survey. General lake user survey participants will be asked to identify the types of activities that they engage in, this will help to identify the type of user that is responding.

These surveys will be distributed to lake users from Recreation Area entrance stations, the Agency Visitor Center, Marina concessionaire facilities and Agency personnel in the field. Marina concessionaires will be requested to mail surveys to slip and dry storage customers. Additional survey forms may also be mailed out with Agency campground reservation confirmation forms. Survey participants will be requested to return completed surveys to the Agency by no later than Sept. 15, 2003. Survey return drop boxes will be provided at all survey distribution locations. Participants will also be able to mail completed surveys back to the Agency or return them to Agency personnel in the field.

LAKE PERSONNEL SURVEY:

Personnel who regularly engage in work at or around the lake and or respond to emergencies at the Lake will be surveyed. The intent of these surveys will be to ascertain worker opinions and impressions in regards to the boating activity that currently takes place on the lake. The ability of Agency, marina, law enforcement, volunteer and emergency response personnel to provide quality service to the current numbers of vessel operators who use Don Pedro Lake is a factor that needs to be considered before vessel carrying capacity numbers can be established. All permanent Agency employees and selected seasonal Agency employees will be surveyed. Selected marina employees, Tuolumne County Sheriff's Boat Patrol unit personnel, Fire Dept. personnel, ambulance personnel and U.S.C.G. Auxiliary volunteers will also be surveyed.

Don Pedro Lake Personnel Survey

**This survey for DPRA, LDPM, MPM, TCSO, TCFD, CDF, Ambulance and U.S.C.G. Auxiliary only!*
***Please return to DPRA staff or Dave Jigour, Division Manager, Lake Operations. Thank You!*

1. Have you ever experienced a time when you felt that there were too many vessels being allowed onto Don Pedro Lake?
   a. No
   b. Yes, (if yes, please explain) _____
2. Are there any changes that you believe should be instituted that would improve the overall quality and safety of the recreational boating experience at Don Pedro Lake?
   a. No
   b. Yes, (if yes, please explain) _____

   _____
3. Within your own area of responsibility, do you feel that <u>most of the time</u> you have adequate staffing and support to provide consistent and quality service to the current numbers of vessel owners and operators that utilize Don Pedro Lake?
   a. Yes
   b. No, (if no, please explain) _____

   _____
4. Are there any specific types of vessels or specific areas on the lake that you believe require additional regulations or restrictions?
   a. No
   b. Yes, (if yes, please explain) _____

   _____
5. Please circle your employer, Agency or volunteer group that you work for or are associated with:
   DPRA LDPM MPM TCSO TCFD CDF Ambulance USCG Auxiliary

Lake User Survey-General

DON PEDRO LAKE USER SURVEY

Your input will help to shape the future of recreational boating on Don Pedro Lake!
Please take a moment to fill out this survey and return it to one of the locations listed below.

1. How many days out of the year do you normally spend at Don Pedro Lake?
   a. Less than 10 days per year or don't visit every year.
   b. 10 to 20 days per year.
   c. More than 20 days per year.
2. Do you own and operate your own vessel(s) on Don Pedro Lake?
   a. Yes b. No c. No, but I operate rental vessels
3. If you own, how many vessels do you own and regularly operate at Don Pedro?
   a. One b. Two c. Three or more
4. What type of water related activities do you engage in on Don Pedro Lake? *(circle all that apply)*
   a. Fishing b. Sailing, wind-surfing c. Boat-in Camping
   d. Houseboating e. Swimming f. Speed boating
   g. Personal Watercraft operation (jet-ski, wave-runner etc.) h. Pleasure boating, sight seeing
   i. Water-skiing, wake-boarding, knee-boarding, other skill required boat towed activities
   j. Tubing or other similar un-skilled boat towed activities
   k. Kayaking, canoeing, other paddled vessels
   l. Other: _____
5. On Don Pedro Lake, how far away from the launch ramp or marina do you normally travel in your vessel?
   a. Usually stay within two miles of launch ramp or marina.
   b. Usually stay within two to five miles of launch ramp or marina.
   c. Frequently go beyond five miles from launch ramp or marina.
6. Name your three favorite areas of the lake *(please use location names listed on map on back).*

   (1) _____ (2) _____ (3) _____
7. Have you ever experienced a time when you felt there were too many boats on the lake?
   a. No
   b. Yes, (if yes, please explain) _____
8. Do you feel that the existing restricted use areas (i.e. 5mph & No Ski areas) on the lake are sufficient and in the proper locations on the lake?
   a. Yes
   b. No, (if no, please explain) _____
9. Are there any changes that should be made that would improve the overall quality and safety of the recreational boating experience at Don Pedro Lake?
   a. No
   b. Yes, (if yes, please explain) _____

   _____

**If you have additional comments you may write them on the back of this form.*
*****Please limit your response to one survey per person,** mail or return this form to Agency staff or to one of the survey return drop box locations listed below **by no later than September 15, 2003.***

Our mailing address:

- Don Pedro Recreation Agency, 31 Bonds Flat Rd., La Grange, CA 95329

Survey return drop box locations:

- Fleming, Blue Oaks and Moccasin Pt. Recreation Area Entrance Stations.
- Recreation Area Headquarters / Visitor Center *(the round building that overlooks the dam)*
- Lake Don Pedro Marina Office, Marina Store and Trading Post.
- Moccasin Pt. Marina Store and Office.

Thank you for your cooperation, DPRA

CRITERIA AND METHODS FROM OTHER LAKE MANAGEMENT AGENCIES:

Other lake management agencies will be contacted in order to determine if they have established maximum vessel carrying capacities for their facilities. The California Department of Boating and Waterways will also be contacted to see if they can recommend any methods for determining vessel carrying capacities. Recommended criteria and methods will be evaluated and a determination made as to whether such criteria and methods could be adapted and utilized at Don Pedro Lake. Methods and criteria for establishing vessel carrying capacities that are obtained as a result of this research, if applicable to Don Pedro Lake, will be incorporated and utilized towards accomplishing the goal of this study.

DON PEDRO LAKE STATISTICS:

The Tuolumne County Sheriff's Department will be contacted and requested to provide boating related incident statistics at Don Pedro Lake for the past 10 years. The California Department of Boating and Waterways will also be requested to provide Don Pedro Lake boating incident statistics. In addition, Agency boating related incident report files will be reviewed. Don Pedro Lake vessel incident statistics will be compiled and compared to visitor day and vessel use statistics in order to determine what correlations exist, if any, between the numbers of vessel related incidents to the numbers of vessels actually being operated. If definite vessel incident trends are observed as a result of researching these statistics then such findings will be taken into consideration in the ultimate determination of specific vessel carrying capacities.

2003 VESSEL USE MONITORING/SAMPLING PROGRAM:

Beginning in the Spring of 2003 a Don Pedro Lake Vessel Use Monitoring/Sampling Program will be initiated. All Agency vessels will be supplied with monitoring/sampling lake maps **(see Vessel Use Monitoring/Sampling Map)*. These maps and instructions will also be provided to the Tuolumne County Sheriff's Boat Patrol Unit and the USCG Auxiliary. Sampling maps will have location names on them, a key with symbols designating specific vessel types (moored or under power) and a place for the day of the week, date, lake elevation and weather conditions. Sampling program participants will be requested to fill out one sampling map per day, date the map, record lake elevation and weather conditions and then record directly on the map the numbers of specific vessel types observed in each area of the lake visited.

Agency Lake Operations personnel will be instructed to fill out sampling maps each day that they go out on the lake. Completed sampling maps will be removed from Agency vessels daily and collected. Tuolumne County Sheriff's Boat Patrol and USCG Auxiliary personnel will also be requested to fill these sampling maps out every day that they are at Don Pedro if possible. Sheriff's and USCG personnel can return their completed sampling maps to Agency personnel or fax or mail them back into the Agency.

The data collected from these monitoring/sampling maps will be useful for several different reasons. It will indicate the areas of the lake that are most and least popular for specific types of vessels. It will illustrate statistically whether certain areas of the lake are over-used while other areas of the lake are under-used. It will statistically show what days during the on-season are the busiest for specific types of vessels in specific areas of the lake. It will show the effects of lake elevation and weather on boating activity. It will help the Agency to determine whether a simple surface acreage formula for determining vessel carrying capacity can be applied to Don Pedro or whether a modified "suitable" surface acreage formula should be applied. It will also be extremely useful towards determining whether sufficient suitable or desirable shoreline mooring space exists on Don Pedro to sustain any further increase in permitted private and or rental houseboats.

Vessel use monitoring/sampling data will provide real vessel use statistics that will be essential for the final determination of specific vessel carrying capacities and or other desirable vessel regulations or restrictions.

DON PEDRO LAKE
VESSEL MONITORING / SAMPLING MAP

**Information and instructions on back cover*

Name: _____

Employer / Organization (if applicable)**:** _____

Date(s) Sampled **list date for each day that observations are recorded*	**Day of Week** *Sun.,Mon., Tues,Wed., Thurs.,Fri., Sat.*	**Weather Conditions**	**Lake Elev.** (if known)	**Notes and Comments**

Please return completed vessel monitoring/sampling maps to Recreation Agency staff or mail them to:

The Don Pedro Recreation Agency at 31 Bonds Flat Rd., La Grange, CA, 95329

If you have any questions, call us at (209) 852-2396.
Thank you for your participation !
DPRA

DON PEDRO LAKE
VESSEL MONITORING AND CARRYING CAPACITY STUDY

The current population growth in the areas surrounding Don Pedro Lake and the overall population growth in California will inevitably lead to an increase in the number of recreational boaters who visit the Lake. In order to be prepared for this inevitable growth, the Don Pedro Recreation Agency is initiating a vessel lake-use monitoring and carrying capacity study for the 2003 boating season. Information gathered from this study will be utilized to establish vessel carrying capacities for Don Pedro Lake. Vessel carrying capacities are specific numerical limits established for specific types of vessels. The purpose for establishing such limits is to prevent vessel overcrowding, overtaxing of available resources and preserve the quality of the recreational boating experience at Don Pedro Lake.

Several different methods will be utilized to obtain data for this study. Lake users and personnel who work at the lake will be surveyed. Criteria and methods utilized by other lake management agencies will be investigated. Don Pedro Lake statistics will be evaluated and vessel use field observations will be recorded and compiled.

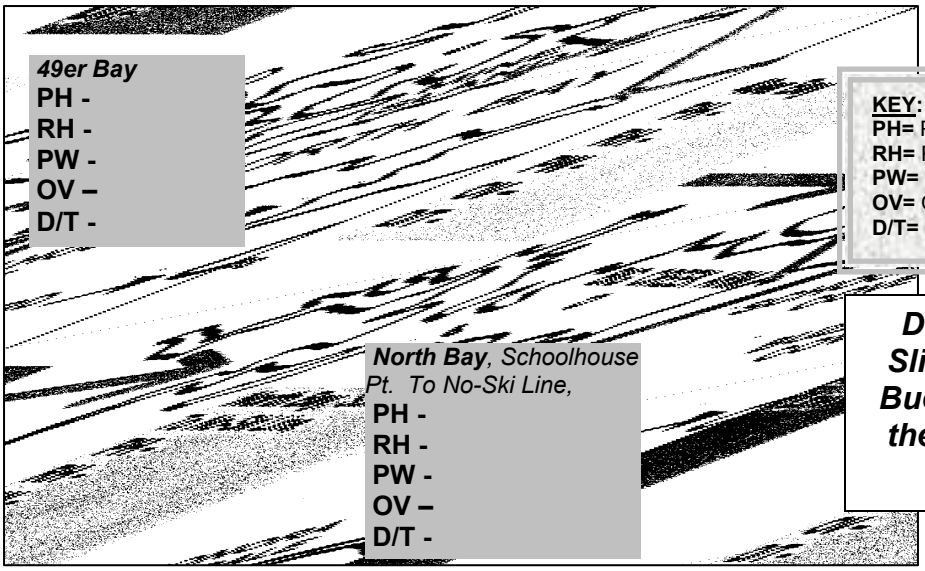
The purpose of the enclosed **Don Pedro Lake Vessel Monitoring / Sampling Map** is to provide a way to record actual vessel use field observations and statistics that can be utilized towards the development of vessel carrying capacities and or other needed vessel lake use regulations.

<u>Don Pedro Lake Vessel Monitoring / Sampling Map Instructions</u>:

Each monitoring/sampling map may be used for one or several days. On the front cover in the spaces provided, please record your name, employer or organization (if applicable), the date or dates that you are making observations, the day of the week, basic weather information (such as sunny and hot), the lake elevation if known (this information can be obtained later) and any special notes or comments such as holiday or special event information.

The enclosed lake map has been divided into twenty-two different vessel monitoring / sampling areas. Adjacent to each area is a corresponding vessel sampling tally box. Please tally the number of vessels that you observe in the corresponding tally box for each area that you are in. Tally private houseboats, rental houseboats and personal watercraft separately. Tally all other types of vessels observed together as "other vessels". Count all moored, beached vessels and vessels that are under power. If you recognize the same vessel in more than one sampling area, do not tally it twice for the same day. **Do not tally vessels in marina slips or houseboats on mooring buoys**. Each map may be used for multiple visits to the lake. However, do not tally sampling data for the same area more than once per each map.

A larger number of participants will increase the accuracy of the statistical data gathered for this sampling program. Your participation and cooperation in recording field observations, whenever possible, will be very much appreciated. ***Thank You, DPRA!***



<u>KEY</u>:
PH= Private Houseboat
RH= Rental Houseboat
PW= Personal Watercraft (jet-skis, wave-runners)
OV= Other Vessels
D/T= Date and Time of day vessel tally recorded

Do Not Tally Vessels in Marina Slips or Houseboats on Mooring Buoys, also please try not to tally the same vessel more than once per day !

KEY:
PH= Private Houseboat
RH= Rental Houseboat
PW= Personal Watercraft (jet-skis, wave-runners, etc.)
OV= Other Vessels
D/T= Date and Time of day vessel tally recorded

N

WARD'S FERRY RD.

HWY. 120 TO GROVELAND

HWY. 132 COULTER

TO MODESTO

Moccasin Bay *inside 5mph line to creek inlet*
PH -
RH -
PW -
OV –
D/T -

Tuol. R. Arm
Above No-Ski Line
PH -
RH -
PW -
OV –
D/T -

GRIZZLY RD.

MOCCASIN ARM

MOCCASIN PT. RECREATION AREA
(MARINA, LAUNCH RAMP AND CAMPGROUNDS)

TUOLUMNE RIVER ARM

MARSHES FLAT RD.

S.E. Upper Bay,
East Bay to Ulloa Island
PH -
RH -
PW -
OV –
D/T -

Hatch Crk. and Willow Crk. Arms
PH -
RH -
PW -
OV –
D/T -

Middle Bay Area -East Side
PH -
RH -
PW -
OV –
D/T -

Ramos and Fleming Crk. Areas
PH -
RH -
PW -
OV –
D/T -

Roger's Creek Arm
PH -
RH -
PW -
OV –
D/T -

Tuol. R. Arm *between Stent Bridge, Mocc. 5mph line and No-Ski line*
PH -
RH -
PW -
OV –
D/T -

Tuol. R. Arm,
Stent Bridge to Hwy.120 Bridge& Harney Ln. Incl. Kanaka Crk.
PH -
RH -
PW -
OV –
D/T -

STENT-JACKSONVILLE ROAD

KANAKA CREEK

HWY. 120/49

EAST BAY

HATCH CREEK ARM

WILLOW CREEK ARM

AQUEDUCT (PIG) ISLAND

ULLOA ISLAND

GARDINER FALLS

GREEN BAY

UPPER BAY

GRAVEYARD CREEK

RAMOS CREEK

FLEMING CREEK

ROGERS CREEK ARM

ROCK ISLAND

JENKINS HILL

SOUTH BAY

LUCAS BAY

South Bay Area
Lucas Bay, Laughlin Is. Fleming Pt. etc.
PH -
RH -
PW -
OV –
D/T -

MIDDLE BAY

LAUGHLIN ISLAND

Fleming Area
Schoolhouse & Buzzard Areas
PH -
RH -
PW -
OV –
D/T -

Wood's Creek Arm,
Hwy. 120 Bridge & Harney Ln. to Wood's Creek 5mph line
PH -
RH -
PW -
OV –
D/T -

N.W. Upper Bay*, S. end of Pig Island to power lines,*
PH -
RH -
PW -
OV –
D/T -

Green Bay Area
PH -
RH -
PW -
OV –
D/T -

Middle Bay Area -West Side
PH -
RH -
PW -
OV –
D/T -

BIG OAK ISLAND

FLEMING PT.

GILLMAN GULCH

FLEMING MEADOWS RECREATION AREA
(MARINA, LAUNCH RAMP AND CAMPGROUNDS)

HARNEY LN.

Railroad Canyon
Hwy.120 bridge to Poor Man's Gulch
PH -
RH -
PW -
OV –
D/T-

RAILROAD CANYON

49er Bay
PH -
RH -
PW -
OV –
D/T -

MINE ISLAND

49er BAY

NORTH BAY

Wood's Creek Arm *from 5mph line to creek inlets*
PH -
RH -
PW -
OV –
D/T -

WOODS CREEK ARM

POOR MAN'S GULCH

Power Lines

WRECK BAY

Wreck Bay*, N. of Power Lines, to R.R. Canyon, Six-Bit& Poor Man's Gulch*
PH -
RH -
PW -
OV –
D/T -

SIX BIT GULCH

Big Creek Arm*, N. of No-Ski Line*
PH -
RH -
PW -
OV –
D/T -

BIG CREEK ARM

SCHOOLHOUSE COVE

BUZZARD COVE

WEST BAY

RECREATION AREA HEADQUARTERS

North Bay Area *To No-Ski Line,*
PH -
RH -
PW -
OV –
D/T -

MEXICAN GULCH

West Bay*, Dam, Blue Oaks, Mexican Gulch*
PH -
RH -
PW -
OV –
D/T -

BLUE
RECREATI
(LAUNCH RAMP AI

SHAWMUT RD.

TO SONORA
TO OAKDALE

I-59

DON PEDRO LAKE USER SURVEY

Your input will help to shape the future of recreational boating on Don Pedro Lake!
Please take a moment to fill out this survey and return it to one of the locations listed below.

1. How many days out of the year do you normally spend at Don Pedro Lake?
   a. Less than 10 days per year or don't visit every year.
   b. 10 to 20 days per year.
   c. More than 20 days per year.
2. Do you own and operate your own vessel(s) on Don Pedro Lake?
   a. Yes b. No c. No, but I operate rental vessels
3. If you own, how many vessels do you own and regularly operate at Don Pedro?
   a. One b. Two c. Three or more
4. What type of water related activities do you engage in on Don Pedro Lake? *(circle all that apply)*
   a. Fishing b. Sailing, wind-surfing c. Boat-in Camping
   d. Houseboating e. Swimming f. Speed boating
   g. Personal Watercraft operation (jet-ski, wave-runner etc.) h. Pleasure boating, sight seeing
   i. Water-skiing, wake-boarding, knee-boarding, other skill required boat towed activities
   j. Tubing or other similar un-skilled boat towed activities
   k. Kayaking, canoeing, other paddled vessels
   l. Other: _____
5. On Don Pedro Lake, how far away from the launch ramp or marina do you normally travel in your vessel?
   a. Usually stay within two miles of launch ramp or marina.
   b. Usually stay within two to five miles of launch ramp or marina.
   c. Frequently go beyond five miles from launch ramp or marina.
6. Name your three favorite areas of the lake *(please use location names listed on map on back).*
   (1) _____ (2) _____ (3) _____
7. Have you ever experienced a time when you felt there were too many boats on the lake?
   a. No
   b. Yes, (if yes, please explain) _____
8. Do you feel that the <u>existing</u> restricted use areas (i.e. 5mph & No Ski areas) on the lake are sufficient and in the proper locations on the lake?
   a. Yes
   b. No, (if no, please explain) _____
9. Are there any changes that should be made that would improve the overall quality and safety of the recreational boating experience at Don Pedro Lake?
   a. No
   b. Yes, (if yes, please explain) _____

**If you have additional comments you may write them on the back of this form.*
*****Please limit your response to one survey per person**, mail or return this form to Agency staff or to one of the survey return drop box locations listed below **by no later than September 15, 2003.***

<u>Our mailing address:</u>

- Don Pedro Recreation Agency, 31 Bonds Flat Rd., La Grange, CA 95329

<u>Survey return drop box locations:</u>

- Fleming, Blue Oaks and Moccasin Pt. Recreation Area Entrance Stations.
- Recreation Area Headquarters / Visitor Center *(the round building that overlooks the dam)*
- Lake Don Pedro Marina Office, Marina Store and Trading Post.
- Moccasin Pt. Marina Store and Office.

<u>Optional:</u>
******Provide your contact information and you will be entered in a drawing for a free 2004 Don Pedro Recreation Agency Annual Pass!** (only one entry per person will be accepted)*

Name (please print) _____ Phone # (optional) _____

Mailing Address _____

Thank you for your cooperation, DPRA

LAKE USE SURVEY *(please return with your Houseboat Permit Renewal Application)*

1. On average how many days out of the year do you spend on your houseboat at Don Pedro Lake?
   a. Less than ten days
   b. Ten to thirty days
   c. Thirty or more days

2. On average, how many other vessels are operated on Don Pedro Lake by all persons who use your houseboat each year?
   a. Two or less
   b. Three to five
   c. More than five

3. Have you ever experienced a time when you felt that there were too many boats being operated on Don Pedro Lake?
   a. Yes, on some weekends and holidays during the Summer
   b. Yes, but only around certain Summer holidays
   c. Yes, but it has only happened a couple of times
   d. No

4. *(complete this sentence)* When boating traffic on Don Pedro Lake is heavy it is …
   a. concentrated primarily in the popular areas of the lake.
   b. evenly distributed throughout the entire surface of the lake.

5. Should the Agency increase the number of private houseboat permits that are currently on the lake?
   a. Yes
   b. No

6. Should the Agency increase the number of permitted marina rental houseboats that are currently on the lake?
   a. Yes
   b. No

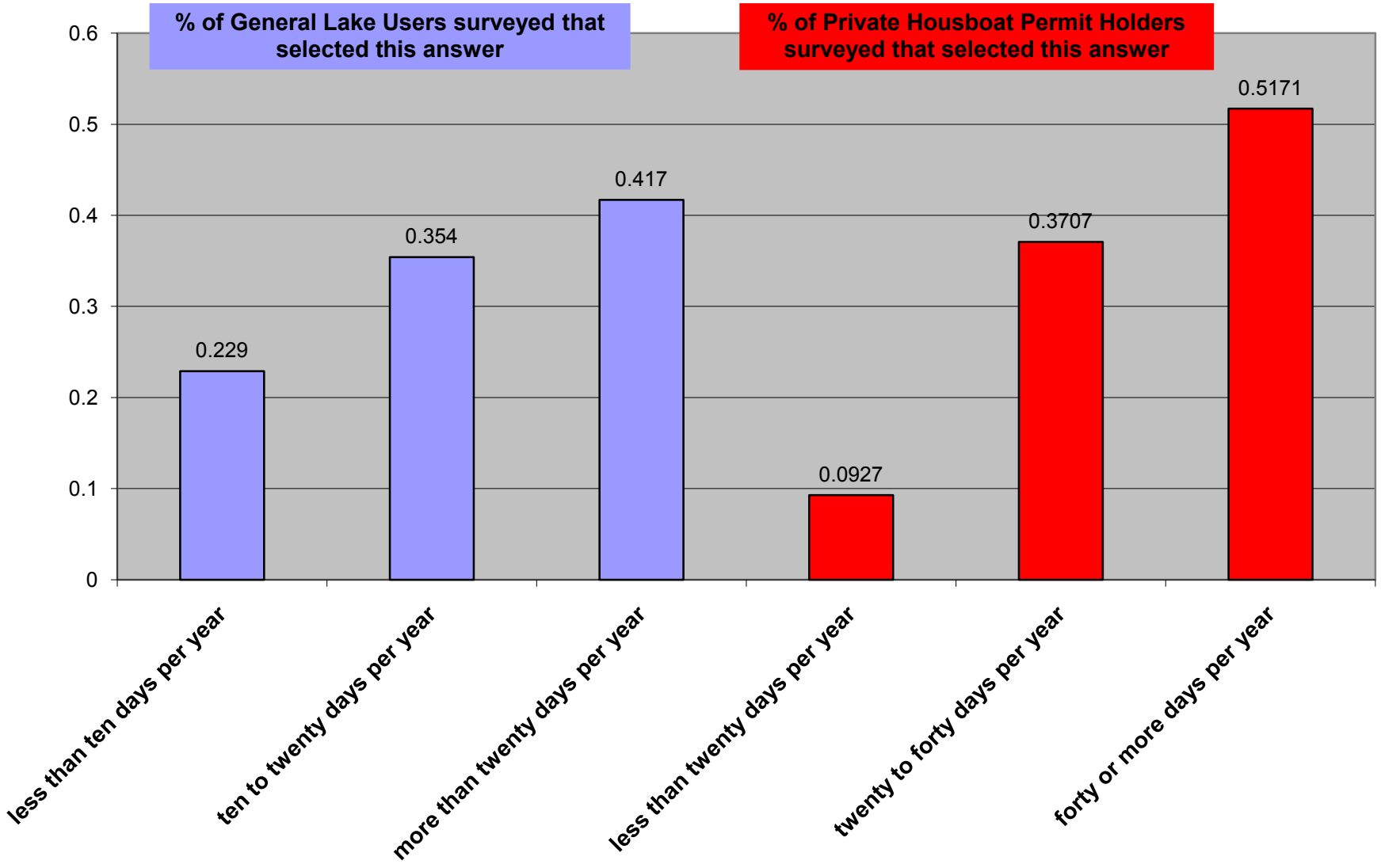
7. From Memorial Day through Labor Day, how often do you encounter difficulty finding a suitable place to moor your houseboat along the shoreline?
   a. Always
   b. Frequently
   c. Occasionally
   d. Never

8. What areas of the lake do you use the most? **(choose up to three favorite areas)*
   a. South Bay Area *(includes Lucas Bay, Ramos Creek and Rogers Creek)*
   b. West Bay Area *(includes Mexican Gulch, Buzzard, Schoolhouse, Fleming, private marina)*
   c. North Bay Area *(includes Big Creek, 49er Bay)*
   d. Middle Bay Area *(includes Mud Flats, east shore of Mine Island, Graveyard Creek)*
   e. Hatch Creek, Willow Creek and Green Bay Areas
   f. Upper Bay Area *(includes East Bay, Pig Island, Siphon and Wreck Bay)*
   g. Railroad Canyon, Six Bit Gulch and Poor Man's Gulch Areas
   h. Wood's Creek Arm *(includes Sullivan Creek)*
   i. Tuolumne River Arm between bridges *(includes Kanaka Creek)*
   j. M occasin Bay
   k. Tuolumne River Arm north of Stent-Jacksonville bridge to above Ward's Ferry Bridge

9. Should the Agency restrict the number of personal watercraft allowed on the Lake?
   a. Yes
   b. No

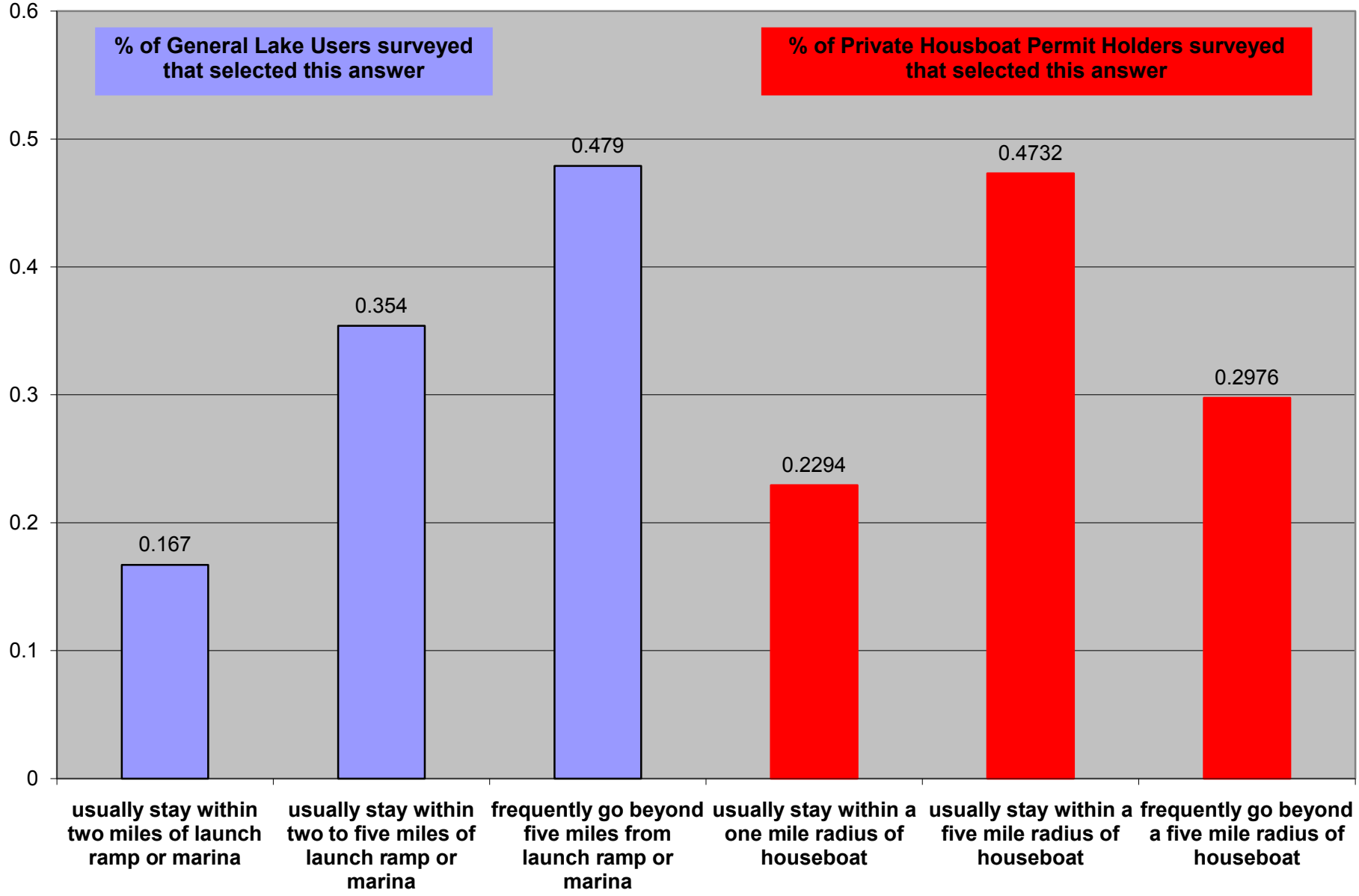
Average number of days per year spent recreating at Don Pedro Lake

(based on 2002 and 2003 user survey results)

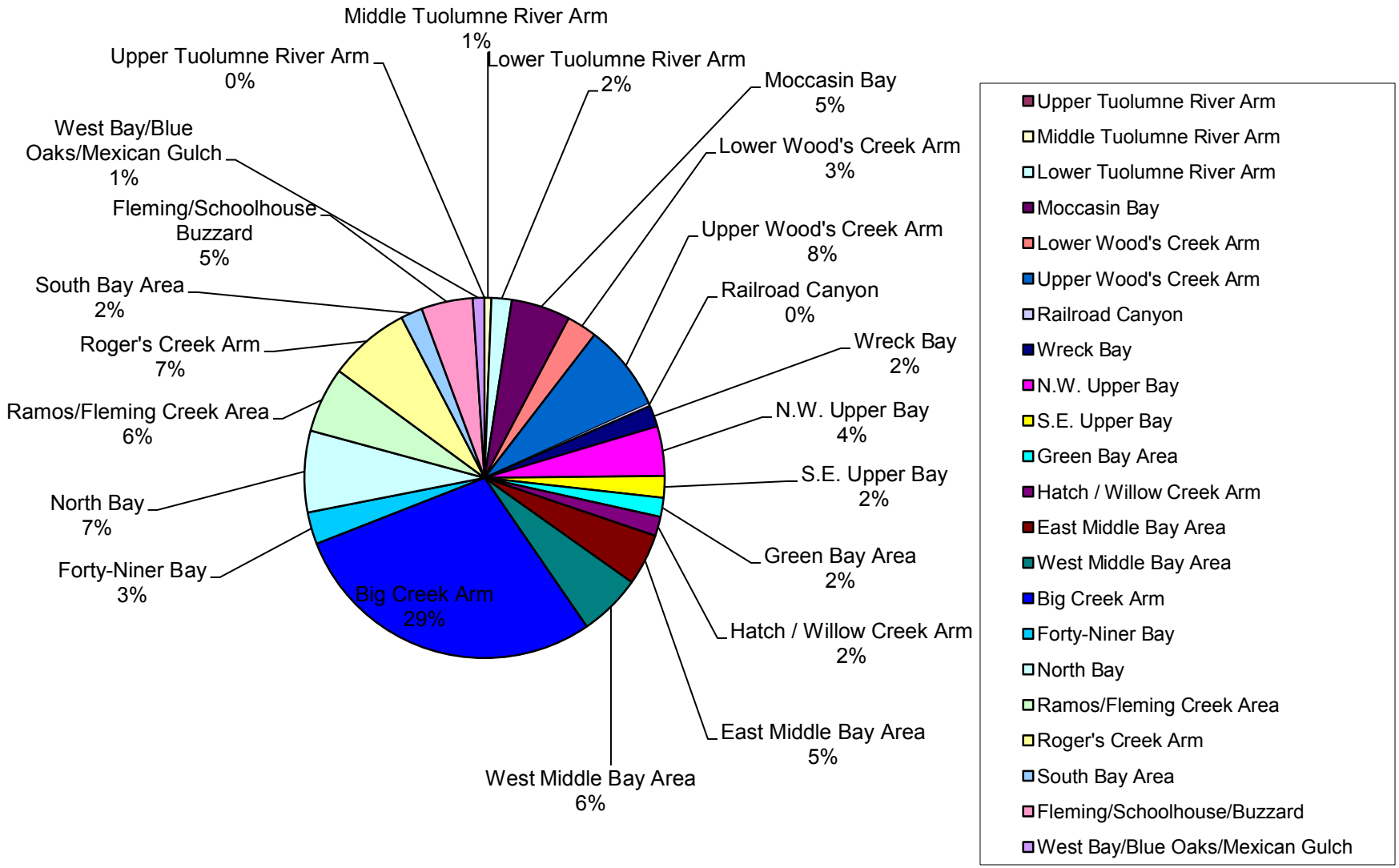


Average distance traveled for recreation on Don Pedro Lake

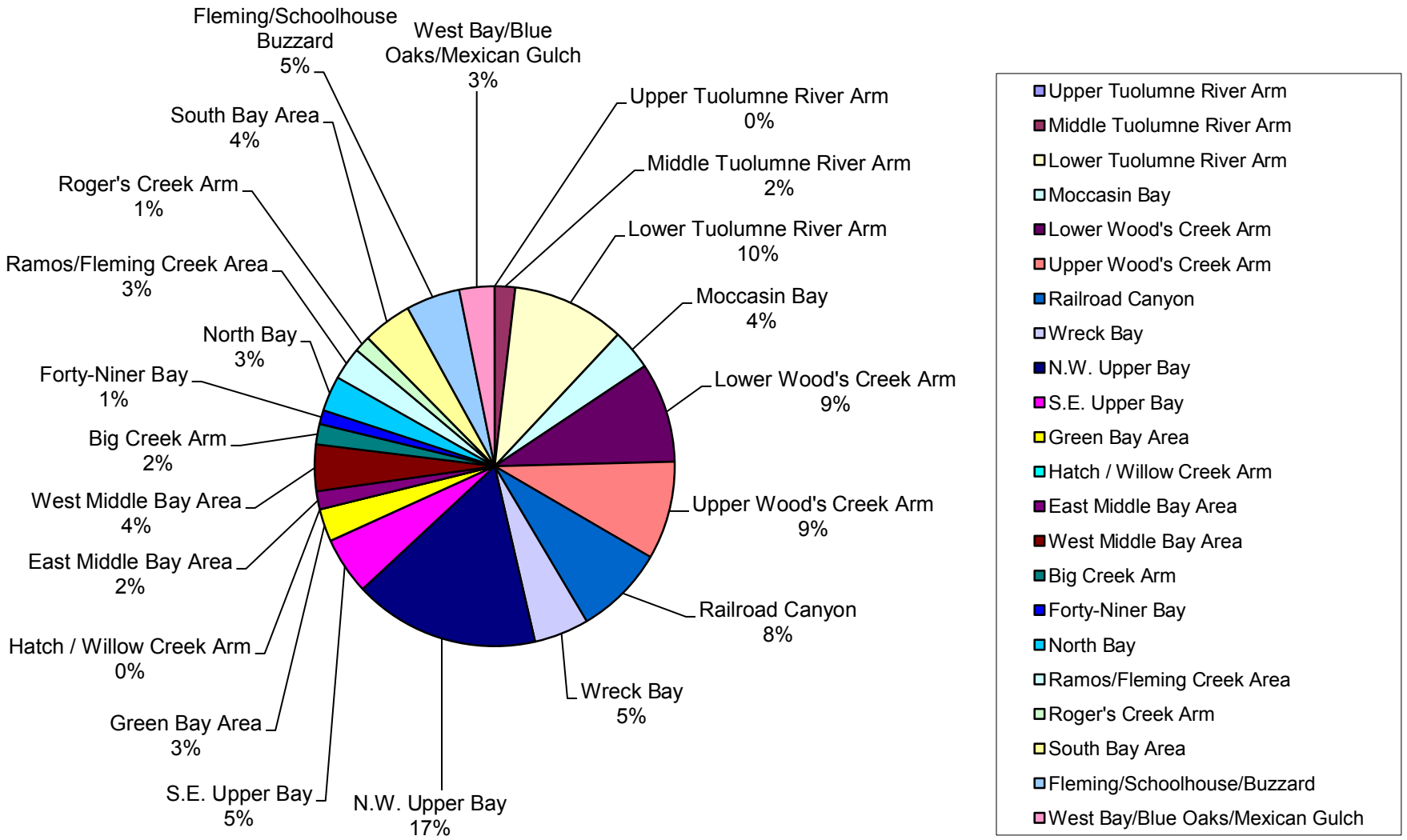
(based on 2002 and 2003 user survey results)



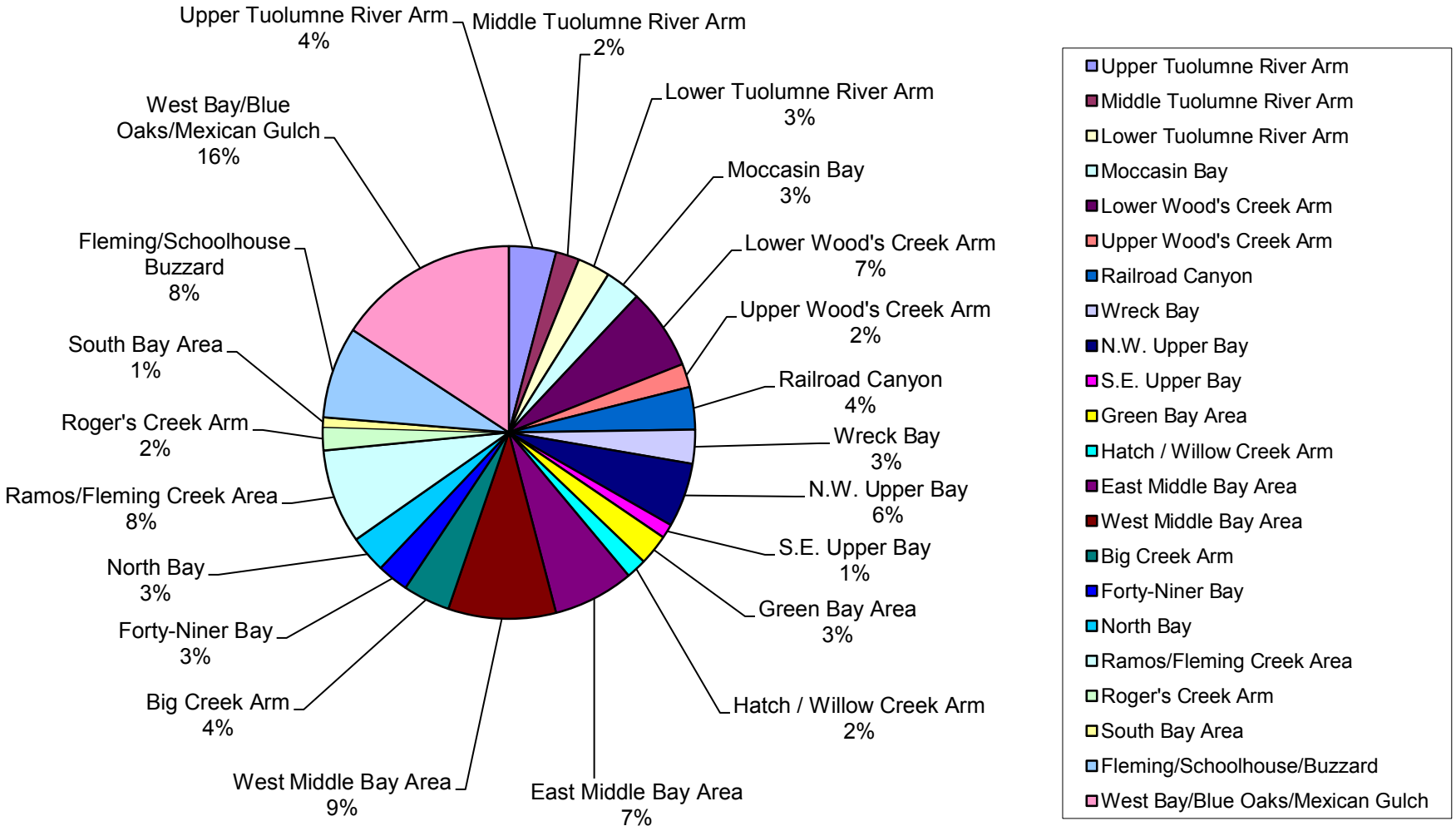
Average "Summer" percentage of <u>Private Houseboats</u> observed in different sampling areas of Don Pedro Lake *(per 2003 and 2004 Vessel Monitoring Sampling Data)*



Average "Summer" percentage of <u>Rental Houseboats</u> observed in different sampling areas of Don Pedro Lake *(per 2003 and 2004 Vessel Monitoring Sampling Data)*

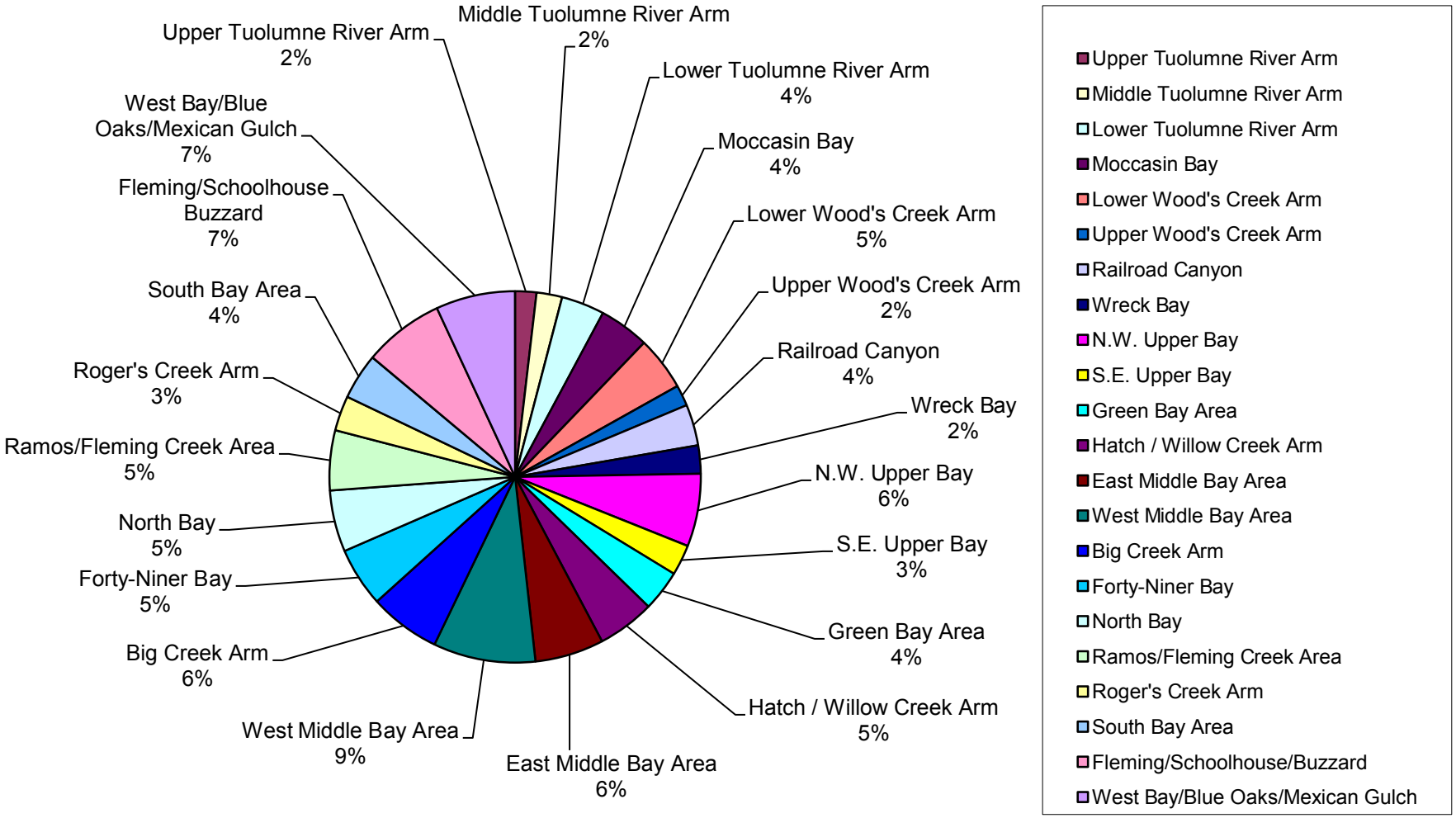


Average "Summer" percentage of Personal Watercraft observed in different sampling areas of Don Pedro Lake *(per 2003 and 2004 Vessel Monitoring Sampling Data)*



Average "Summer" percentage of *<u>Other Type of Vessels</u> observed in different sampling areas of Don Pedro Lake *(per 2003 and 2004 Vessel Monitoring Sampling Data)*

**(<u>Other Types of Vessels</u> include all vessels that are not houseboats or personal watercraft)*



DON PEDRO LAKE "GENERAL USER" SURVEY RESULTS

The Don Pedro Lake "General User" survey was conducted from the 2003 Memorial Day Weekend until mid-October 2003. Survey forms were made available to the public in special labeled survey dispenser boxes placed at all Recreation Area entrance stations, the Recreation Area Visitor Center and both marina concessionaire offices. The survey form was printed on the back of the Agency Dispersed Area / Lakeshore Camping Map. All persons who registered for Lakeshore camping and all persons who requested a map would have consequently received one of these survey forms during this time period. In addition a free annual pass to be chosen by random drawing was offered as an incentive to encourage users to complete and return survey forms. Only 48 survey forms were returned to the Agency. Some were not complete.

Survey Questions, Answers and Comments *Listed in the order that they appeared on the Original Survey*	**Total # of respondents who selected answer or comment**	*** % of respondents who selected answer or comment**
1. How many days out of the year do you normally spend at Don Pedro Lake?		
a. Less than 10 days per year or don't visit every year	11	22.9%
b. 10 to 20 days per year.	17	35.4%
c. More than 20 days per year.	20	41.7%
2. Do you own and operate your own vessel(s) on Don Pedro Lake?		
a. Yes	47	97.9%
b. No	0	0%
c. No, but I operate rental vessels	1	2.1%
3. If you own, how many vessels do you own and regularly operate at Don Pedro? **(only 45 responses to this question)*		***% of 45**
a. One	25	55.6%
b. Two	9	20%
c. Three or more	11	24.4%
4. What type of water related activities do you engage in on Don Pedro Lake? **(multiple selections, % does not total to 100)		***** % of 48 that selected category***
a. Fishing	31	64.6%
b. Sailing, wind-surfing	4	2.1%
c. Boat-in Camping	14	29.2%
d. Houseboating	11	22.9%
e. Swimming	34	70.8%
f. Speed boating	15	31.3%
g. Personal Watercraft operation (jet-ski, wave-runner etc.)	23	47.9%
h. Pleasure boating, sight seeing	27	56.3%
i. Water-skiing, wake-boarding, knee-boarding, other skill required boat towed activities	34	70.8%
j. Tubing or other similar un-skilled boat towed activities	30	62.5%
k. Kayaking, canoeing, other paddled vessels	6	12.5%
Other: Skinny Dipping	1	2.1%
Other: Tube Fishing	1	2.1%

DON PEDRO LAKE "GENERAL USER" SURVEY RESULTS

Survey Questions, Answers and Comments *Listed in the order that they appeared on the Original Survey*	**Total # of respondents who selected answer or comment**	*** % of respondents who selected answer or comment**
5. On Don Pedro Lake, how far away from the launch ramp or marina do you normally travel in your vessel?		
a. Usually stay within two miles of launch ramp or marina.	8	16.7%
b. Usually stay within two to five miles of launch ramp or marina.	17	35.4%
c. Frequently go beyond five miles from launch ramp or marina.	23	47.9%

6. Name your three favorite areas of the lake ***(3 areas selected by each respondent so % does not total to 100)*		
Middle Bay	14	29.2%
Tuolumne River Arm	12	25.0%
Woods Creek Arm	11	22.9%
North Bay / Big Creek Arm	10	20.8%
South Bay / Rogers Creek Arm	10	20.8%
Moccasin Bay	8	16.7%
Upper Bay	7	14.6%
Jenkin's Hill	7	14.6%
West Bay / Fleming / Blue Oaks / Dam Area	6	12.5%
49er Bay	5	10.4%
Hatch Creek Arm	5	10.4%
Railroad Canyon	4	8.3%
Graveyard Creek / Rock Island	4	8.3%
Gardiner Falls / Pig Island	4	8.3%
Six Bit Gulch	3	6.3%
Poor Man's Gulch	2	4.2%
Lucas Bay	2	4.2%
Wreck Bay	1	2.1%
Green Bay	1	2.1%
Ramos Creek	1	2.1%
Willow Creek	1	2.1%
Power Lines	1	2.1%
Ward's Ferry	1	2.1%
Mine Island	1	2.1%
Rough & Ready Creek	1	2.1%
Marina	1	2.1%
SS Relief	1	2.1%

DON PEDRO LAKE "GENERAL USER" SURVEY RESULTS

Survey Questions, Answers and Comments *Listed in the order that they appeared on the Original Survey*	**Total # of respondents who selected answer or comment**	*** % of respondents who selected answer or comment**
7. Have you ever experienced a time when you felt there were too many boats on the lake? **(47 responded to this question)*		***% of 47 that responded***
a. No	30	63.8%
b. Yes, (if yes, please explain)	17	37.2%
****Paraphrased comments in regards to Yes answer on question #7*** *(18 submitted comments)*		
Weekends and Holidays	4	8.5%
Fourth of July Holiday	4	8.5%
Too many unskilled boaters and jet ski operators	2	4.25%
Launch ramps could be better regulated and supervised, sometimes have to wait in long lines to pull and launch boat	2	4.25%
Railroad Canyon is sometimes just like a freeway	1	2.13%
Too many boarders cause too much rough water	1	2.13%
Sometimes so many boats that you have to dodge skiers	1	2.13%
Many seem unaware of what their vessel wake does to moored vessels	1	2.13%
Only fish on weekdays, never on weekends or holidays	1	2.13%
There is always a cove to hang in	1	2.13%

8. Do you feel that the <u>existing</u> restricted use areas (i.e. 5mph & No Ski areas) on the lake are sufficient and in the proper locations on the lake? **(46 responded to this question)*		***% of 46 that responded***
a. Yes	39	84.8%
b. No, (if no, please explain)	7	15.2%
****Paraphrased comments in regards to No answer on question #8*** *(11 submitted comments)*		
Moccasin Bay is not sufficiently marked	3	6.5%
5mph zone extends too far out from the Moccasin Pt. boat ramp	2	4.3%
Wood's Creek 5mph buoy line should be moved back to original location	2	4.3%
Need more 5mph zones to provide areas free of skiers and jet-skiers	1	2.2%
Don't understand "No-Ski" buoys in Big Creek Arm	1	2.2%
Just wish people would abide by them more	1	2.2%
Ramos Creek should be a 5mph zone since there is a restroom there	1	2.2%
You should close off an area to boats and fishing each year for spawning	1	2.2%

DON PEDRO LAKE "GENERAL USER" SURVEY RESULTS

Survey Questions, Answers and Comments Listed in the order that they appeared on the Original Survey	**Total # of respondents who selected answer or comment**	*** % of 48 respondents who selected answer or comment**
9. Are there any changes that should be made that would improve the overall quality and safety of the recreational boating experience at Don Pedro Lake?		
a. No	17	35.4%
b. Yes, (if yes please explain)	31	64.6%
Paraphrased comments in regards to Yes answer on question #9		
Need more boating law enforcement on the lake	6	12.5%
More monitoring, enforcement and supervision needed at Boat launch ramps on busy days	5	10.4%
Need to implement and enforce loud noise and loud music restrictions on lake and along undeveloped shoreline	3	6.3%
More boater education needed in safe operation and boating laws	3	6.3%
Create specific areas where loud music is prohibited	1	2.1%
Vessel mooring should not be allowed on the inside of launch ramp courtesy docks	1	2.1%
Provide separate areas for jet-ski operation	1	2.1%
Post direction of traffic flow signs on lake	1	2.1%
Keep the jet-skis off of the lake	1	2.1%
Back-fill and pave edge of Blue Oaks Boat ramp to make safe	1	2.1%
Add two additional launch ramps in no-camping areas	1	2.1%
Install private launch ramps for people who pay a private launch fee	1	2.1%
Boaters need to pay more attention	1	2.1%
Fee collection and traffic flow into Moccasin Pt. should be better organized	1	2.1%
Add another courtesy dock for unloading	1	2.1%
Keep planting Kokanee and King Salmon	1	2.1%
Need more areas with garbage cans for trash drop off	1	2.1%
Too many rental boats at the marina, take up slip space that could be used for private vessel mooring	1	2.1%
Need a Saturday night barbecue and Sunday morning breakfast at the Trading Post	1	2.1%
Keep area around fish cleaning station and ramp bathroom green and cut	1	2.1%
Its great!	1	2.1%
Extremely pleasurable boating	1	2.1%

DON PEDRO LAKE PRIVATE HOUSEBOAT PERMIT HOLDER SURVEY RESULTS

*This survey was sent out to all 257 Don Pedro Lake private houseboat permit holders in December of 2002. A total of 205 surveys were returned to the Agency. This is a 79.8% survey participation rate. Most surveys were completed, some were partially completed, many were accompanied by comments and suggestions. *(Partially completed surveys for some questions resulted in respondent numbers totaling less than 205 and percentages totaling less than 100) .*

Survey Questions, Answers and Comments *Listed in the order that they appeared on the Original Survey*	**Total # of respondents who selected answer or comment**	*** % of 205 respondents who selected answer or comment**
1. How many days out of each year do you normally spend on your houseboat at Don Pedro Lake?		
a. Less than twenty days	19	9.27%
b. Twenty to forty days	76	37.07%
c. Forty or more days	106	51.71%
2. Please list <u>three areas</u> of the lake where you spend the most time on your houseboat ***(3 areas were selected by each respondent therefore % does not total to 100)*		**
Middle Bay	61	29.76%
North Bay / Big Creek	45	21.95%
Upper Bay	40	19.51%
Woods Creek	39	19.02%
Ramos Creek	34	16.59%
Pig Island / Gardiner Falls	18	8.78%
South Bay	17	8.29%
Schoolhouse	14	6.83%
LDPM Private Houseboat Marina	13	6.34%
Buzzard	11	5.37%
Hatch Creek	11	5.37%
49er Bay	11	5.37%
Kanaka Creek	11	5.37%
Moccasin Pt. Marina	9	4.39%
Wreck Bay / Power Line Area	9	4.39%
Mooring Buoy	9	4.39%
Six Bit Gulch	9	4.39%
Tuolumne River Arm	9	4.39%
Rock Island / Graveyard / Jenkins Hill / Don Pedro Bar Area	9	4.39%
Fleming Creek	5	2.44%
Gillman Gulch	5	2.44%
Mud Flats	5	2.44%
Railroad Canyon	4	1.95%
Harney Lane / Hwy. 120 Bridge Area	4	1.95%
Lucas Bay	3	1.46%
Roger's Creek	2	0.98%
Fleming Meadows	2	0.98%
Domingo Gulch (in Upper Bay West of Ulloa Island)	2	0.98%
4th of July Cove	1	0.49%
Lower Bay / West Bay	1	0.49%
Houseboat Repair Yard	1	0.49%

DON PEDRO LAKE PRIVATE HOUSEBOAT PERMIT HOLDER SURVEY RESULTS

Survey Questions, Answers and Comments *Listed in the order that they appeared on the Original Survey*	**Total # of respondents who selected answer or comment**	*** % of 205 respondents who selected answer or comment**
3. How much lake area around your houseboat do you normally utilize to recreate within?		
a. Usually stay within a one mile radius of houseboat	47	22.94%
b. Usually stay within a five mile radius of houseboat	97	47.32%
c. Frequently go beyond a five mile radius of houseboat for lake recreation	61	29.76%
4. How many other vessels are normally operated on Don Pedro Lake by persons who use your houseboat?		
a. Usually two or less per year.	110	53.66%
b. Usually three to five per year	66	32.20%
c. Usually more than five per year	23	11.61%
5. Have you ever experienced a time when you felt that too many boats were on the Lake?		
a. No	43	20.98%
b. Yes (if yes, please explain)*	155	75.61%
****Paraphrased comments received in regards to Yes answer on question #5*** *(see appendix for photo copies of complete comments and suggestions received)*		
Weekends and Holidays in the Summer	106	51.71%
Fourth of July weekend only	21	10.24%
Too many rental houseboats at Moccasin	7	3.41%
Too many Jet-Skiers and skiers	7	3.41%
Insufficient boating law enforcement and patrol	6	2.93%
Rental Houseboats delay pump-outs at LDPM Marina	5	2.44%
Too many violate no wake zones	5	2.44%
Hard to find good shoreline mooring area at times	5	2.44%
Increasing numbers of inexperienced vessel operators	5	2.44%
No Privacy	4	1.95%
Too many rental boats	2	0.98%
Rental Houseboats delay pump-outs at MPM Marina	1	0.49%
Weekend Fishing Tournaments	1	0.49%
Noise and boat traffic from Moccasin Boat Ramp too close to houseboat mooring lines, causes too many problems	1	0.49%
Too many unattended houseboats left in coves for long periods	1	0.49%
6. Should the Agency increase the number of private permitted houseboats currently on the lake?		
a. Yes	8	3.90%
b. No	191	93.17%
Wrote in “Undecided	1	0.49%

DON PEDRO LAKE PRIVATE HOUSEBOAT PERMIT HOLDER SURVEY RESULTS

Survey Questions, Answers and Comments Listed in the order that they appeared on the Original Survey	**Total # of respondents who selected answer or comment**	*** % of 205 respondents who selected answer or comment**
7. Should the Agency increase the number of permitted marina rental houseboats currently on the lake?		
a. Yes	5	2.44%
b. No	190	92.68%
Wrote in: "Undecided"	1	0.49%
Wrote in: "Yes, if it lowers the cost for private houseboats"	1	0.49%
Wrote in: "West Shore only"	1	0.49%
Wrote in: "Depends on how many"	1	0.49%
8. Do you ever encounter difficulty finding a suitable place to moor your houseboat along the shoreline?		
a. Yes, frequently	44	21.46%
b. Yes, sometimes	120	58.54%
c. No, never	28	13.66%

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USGS
science for a changing world

USGS Western Pond Turtle (*Emys marmorata*) Visual Survey Protocol for the Southcoast Ecoregion

Survey Protocol, version 1

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
WESTERN ECOLOGICAL RESEARCH CENTER

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USGS Western Pond Turtle (*Emys marmorata*) Visual Survey Protocol for the Southcoast Ecoregion

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U.S. GEOLOGICAL SURVEY
WESTERN ECOLOGICAL RESEARCH CENTER

Survey Protocol

Sacramento, California
2006

DRAFT

U.S. DEPARTMENT OF THE INTERIOR
DIRK KEMPTHORNE, SECRETARY

U.S. GEOLOGICAL SURVEY
P. Patrick Leahy, Acting Director

For additional information, contact:

Center Director
Western Ecological Research Center
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3020 State University Drive, East Modoc Hall
Sacramento, CA 95819

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1.0 INTRODUCTION

This protocol documents standard visual survey techniques for southern populations of the western pond turtle (*Emys marmorata*), hereafter referred to as pond turtle, in the southcoast ecoregion of the United States (within the U. S. this extends from Santa Barbara, California to the Mexican boarder). The purpose of this protocol is to provide standard guidelines for determining pond turtle presence and relative abundance. The protocol also contributes information on general habitat components and disturbances found at each location so that hypotheses can be formulated and tested as to why a species occurs or does not occur in a particular area. In addition, the techniques are effective at documenting other aquatic species such as fish, amphibians, snakes, and other aquatic freshwater taxa. This protocol is based on methods found in the USGS Aquatic Species and Habitat Assessment Protocol for Southcoast Ecoregion Rivers, Streams, and Creeks (U. S. Geological Survey, 2006a).

This protocol describes visual surveys that are to be conducted in streams, rivers, ponds, reservoirs and lakes. Surveys conducted on linear sites, for example streams or rivers, will be broken down into 250 m segments. Segmenting the linear survey areas will provide a reasonable means of recording data that are representative of the entire site and will allow for detection probability analyses to be calculated. Surveys should be conducted during the time of greatest pond turtle activity, typically during the breeding season (May - July), and when pond turtles have not left the water to aestivate or overwinter in the uplands. Southern populations of pond turtles may remain active and in the water year-round, if the conditions are suitable (enough water, warm temperatures); however, this is not well studied.

In this protocol we assume that prior to conducting a survey, surveyors have familiarized themselves with background information and the biology of the pond turtle in order to form a good search image and know where to look for this species. For information on the key characteristics, natural history, and biology of the pond turtle we suggest referring to Stebbins (2003) and "A Field Guide to the Reptiles and Amphibians of Coastal Southern California" (http://www.werc.usgs.gov/fieldguide/). A brief summary of pond turtle natural history is included in this protocol.

2.0 POND TURTLE NATURAL HISTORY

The pond turtle, a member of the Emydidae family, is the only turtle native to coastal California. Pond turtles are cryptically colored and vary from brown to olive-brown to dark brown (Figure 1). The scutes on their carapace have a radiating marbled pattern that are sometimes only visible in sunlight and their head and body have a mottled appearance (Figures 1 & 2). Males and females have slight morphological differences. Males tend to have thicker tails and their cloacal opening falls posterior to the posterior edge of their carapace (Figure 3). Females have thinner tails and their cloacal opening falls at or anterior to the posterior edge of their carapace (Figure 3). Males tend to have concave plastrons (to aid in mating), while females tend to have flat or slightly convex plastrons. The carapaces of females are also taller to allow room for eggs.

Figure 1. Western pond turtle.

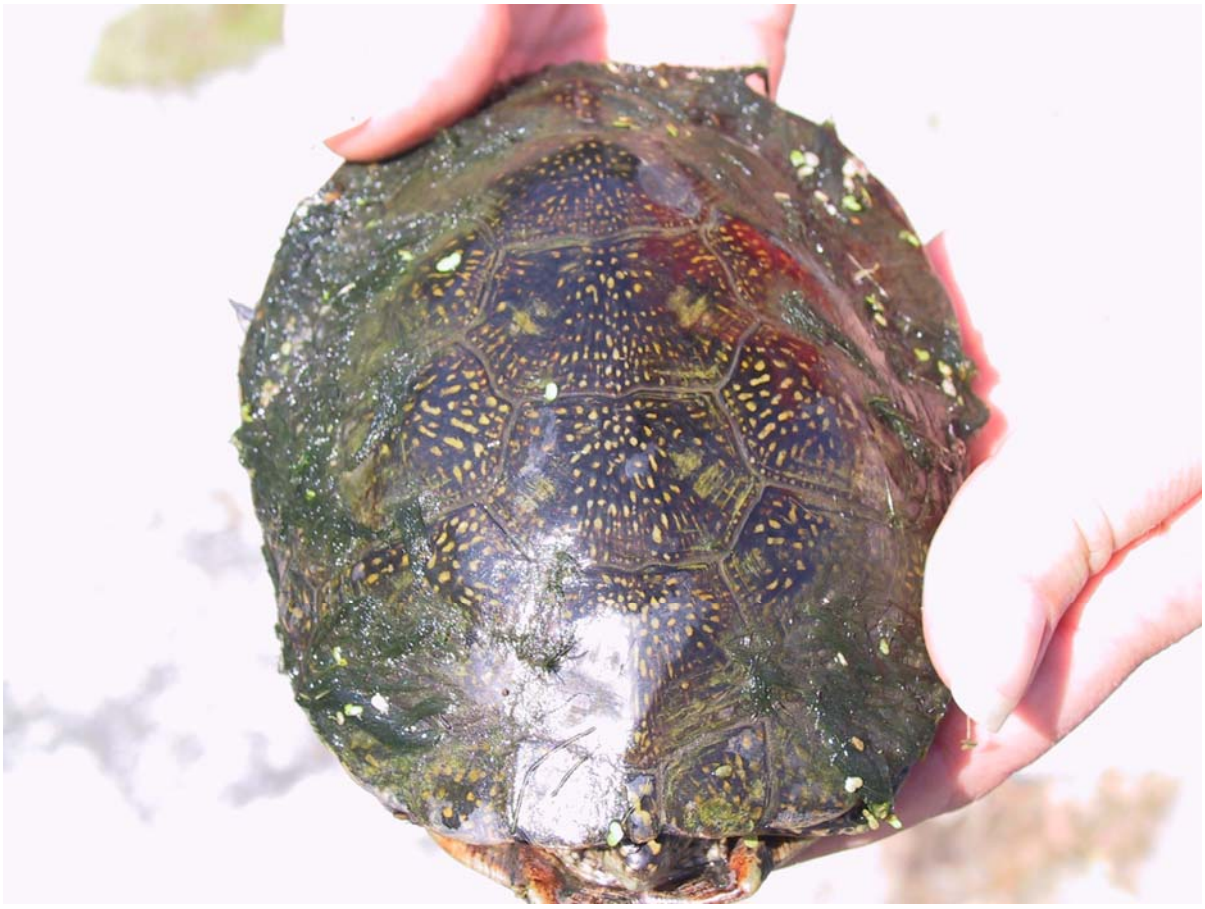


Figure 2. Western pond turtle carapace.

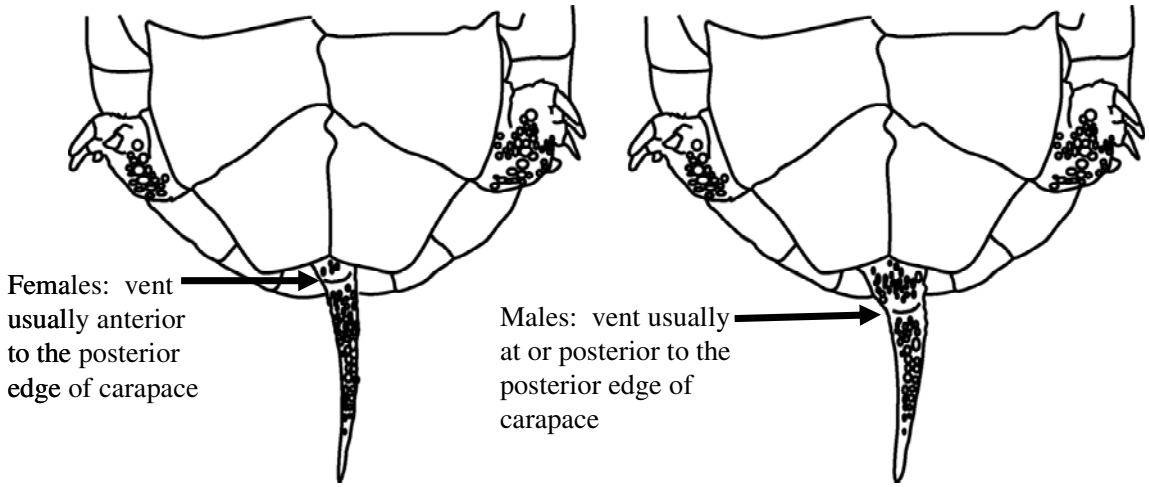


Figure 3. Sexing and measuring guidelines for western pond turtles.

In southern California, pond turtles reach sexual maturity at about 100 - 105 mm in carapace length and 4 - 6 years of age (Holland, 1992; Bury et al., 2001). In southern populations, females typically produce eggs yearly and sometimes double clutch (Goodman, 1997a, 1997b; Lovich & Meyer, 2002; Bury, in press). Clutch size ranges from about 1 to 13 eggs and is positively correlated with body size (Holland, 1991, 1994; Hays et al., 1999; Pires, 2001; Lovich & Meyer, 2002). Eggs are laid in excavated nests in upland habitat. Females will travel 100 m to just over 400 m perpendicular from wetland habitats to nest (Storer, 1930; Rathbun et al., 1992; Holland, 1994; Goodman, 1997a; Reese & Welsh, 1997; Lovich & Meyer, 2002; Rathbun et al., 2002). Hatchling survivorship is low; under undisturbed conditions only 10 - 15% survive the first year (Hays et al., 1999).

Pond turtles can often be found thermoregulating on aquatic basking areas such as rocks, downed logs, or emergent vegetation. They have acute hearing and eyesight and are easily disturbed. You will often hear them as they splash into the water to take cover before you see them. Basking behavior may be witnessed year round in southern populations due to warmer year round temperatures.

Pond turtles are dietary generalists and locate food by either sight or smell. Aquatic invertebrates are the mainstay of the adult diet, but carrion, small fish, frogs and some plants are also consumed. The diet of young pond turtles is poorly understood, but they are thought to eat zooplankton (Jennings & Hayes, 1994; McAllister et al., 1996).

The pond turtle is considered a habitat generalist because it inhabits many types of water bodies ranging from permanent to intermittent and from freshwater to brackish environments (Holland, 1991, 1994; Buskirk, 2002). Pond turtles are known to inhabit creeks, slow moving rivers, marshes, ponds, lakes, reservoirs, vernal pools, canals and even sewage treatment plants (Stebbins, 2003; Holland, 1991; Ernst et al., 1994; Reese, 1996) and prefer habitats with slow flowing water with the presence of woody or rocky debris that provide emergent and underwater refugia sites (Reese, 1996; Reese & Welsh, 1998a; Buskirk, 2002).

Pond turtles are mostly aquatic, but will leave water to travel to surrounding upland habitats to nest, overwinter, bask and aestivate (Holland, 1991; Reese, 1996; Reese & Welsh, 1998b;

Lovich & Meyer, 2002; Rathbun et al., 2002). Although it is clear that pond turtles rely on these terrestrial environments to meet their life history requirements, the amount of time that they spend in these areas and the distance they travel from water is poorly known in the arid southern portion of its range (except see Goodman, 1997a).

Historically, this species was common in most major coast-facing drainages and had a relatively continuous distribution from Washington to northern Baja California, with a few scattered isolated populations elsewhere (Storer, 1930; Stebbins, 2003; Ernst et al., 1994; Jennings & Hayes, 1994). The pond turtle is in a general state of decline throughout much of its range (Brattstrom & Messer, 1988; Holland, 1991; Jennings & Hayes, 1994). In southern California, pond turtles were once widespread and common (Brattstrom, 1988; Brattstrom & Messer, 1988). The pond turtle is a Federal and California Department of Fish and Game Species of Concern. The principal cause of decline in the pond turtle is riparian and terrestrial habitat loss and degradation.

3.0 PURPOSE

Currently, pond turtle inventory and monitoring surveys are conducted regularly across the ecoregion by a large number of biologists from federal and state agencies, educational institutions, and non-governmental organizations throughout Los Angeles, San Bernardino, Riverside, Orange and San Diego Counties. Survey methods and data collection differ greatly among biologists and across sites. Therefore, we are often unable to establish detection probabilities, which require standard survey techniques, to analyze what factors influence probabilities of detection for pond turtles, or to build predictive or explanatory models in an area or region. The purpose of this protocol is to provide a standard means of taking measurements and recording data so that changes reflected in these data are the result of natural phenomena and not because of changes in the way different individuals collect and record these data (Oakley et al., 2003). Standardizing data collection methods will also allow for data comparisons to be made across all parties and agencies using these methods (Oakley et al., 2003). The specific data collection methods described herein are intended for the purpose of quantifying information on the location and biology of pond turtles throughout the southcoast ecoregion and on the habitat components at these survey locations. We attempted to include a full suite of standard measures that may be used to adequately describe and predict suitable habitat for pond turtles and other native and non-native aquatic species. Our goal is to then use these measures as covariates in statistical analyses to determine probability of detection and predict species (MacKenzie et al., 2002, 2003).

4.0 PROTOCOL ORGANIZATIONAL OVERVIEW

This protocol is arranged in chronological order using a step-by-step procedure of what to do before, during and after a survey. We begin with pre-survey preparation, including making a survey map, preparing a field kit, and navigating to a site. We then describe which data are to be collected, the techniques used to collect them, and recording data. We follow with post-survey procedures such as disinfecting and storing equipment, and correcting and storing data. Appendices have been added at the end of this document to provide more detailed information on data definitions (Appendices 1 & 2), southcoast ecoregion vegetative communities (Appendix 3), an example of a paper data form (Appendix 4), and additional references and resources (Appendix 5). When performing certain procedures and measurements within this protocol special equipment may be needed. For care, use and methods for implementing these special

procedures and using required instruments we refer the reader to additional protocols found in the USGS Vertebrate Sampling Protocols for Basic Procedures and Equipment Use (U. S. Geological Survey, 2006b). This manual of basic procedures will be provided as supplementary material to this protocol for those requesting the information.

As procedures, equipment, and survey techniques improve, this protocol may be revised periodically to ensure that the most effective means of surveying and data collection are utilized.

5.0 PRE-SURVEY PROCEDURES

5.1 Preparing a Survey Map

Prior to each initial survey, the survey site must be "pre-defined" in the USGS database before you can collect data in a standardized manner. The term "pre-defined" in this protocol, when surveying a stream, means that the survey start and end points have been determined, that the linear stream area between the start and end points has been divided up into 250 m segments and all associated information (i.e., drainage, location name, datum, GPS, and elevation of each segment) has been linked to each segment and location name (hereafter referred to as segments). When surveying a pond, the term "pre-defined" in this protocol means that a central point is determined and all associated location information has been linked to each location name (hereafter referred to as polygons). Many sites within the southcoast ecoregion have already been pre-defined. Check with the individual project lead for the status of your site and request that it be pre-defined if it has not already been done. If you are a project lead and need to pre-define a 250 m segment or polygon, please refer to the U. S. Geological Survey (2006b) Module 4. Once a site is pre-defined, you should print a map of your survey site that shows the entire survey area. Depending on your survey site segment or polygon make sure your map shows your 250 m segments or central point. For repeated surveys, you will use the same 250 m segments or central point within each polygon for data collection, thus making it possible to standardize how our data are being collected and analyzed.

5.2 Preparing a Field Kit

Prepare or inspect the field kit. Make sure batteries are fresh and there are sufficient extras. Familiarize yourself with the GPS unit. Make sure coordinate system and datum are set appropriately. USGS recommends using the datum WGS84 (NAD83 is also acceptable). The coordinates should be recorded in decimal degrees or hddd.ddddd°. See Figure 4 for the basic contents of a pond turtle field kit.

Survey Kit:

1. Appropriate permits (if required)
2. Copy of protocol
3. Maps
4. GPS unit with accompanying list of coordinates
5. PDA (Personal Digital Assistant) with field forms (or paper data forms). *Note: bring backup paper data forms in case of PDA technical difficulties.*
6. Field guides: USGS field key for aquatic species and/or Stebbins (2003) (western reptile and amphibian species), Conant and Collins (1998) (central and eastern North American turtle species), and McGinnis (1984) (fish).
7. Digital camera

8. Binoculars
9. Thermometer (for air & water temp)
10. Calibrated dissolved oxygen (DO) meter
11. Calibrated conductivity (EC) meter
12. Calibrated pH meter
13. Metric ruler
14. Measuring tape and / or range finder (for stream and channel width measurements)
15. 50 ml vials of 95% ethanol (for collecting any dead specimens and cleaning small instruments). Bring enough to accommodate more than the anticipated number of specimens you intend to collect.
16. Re-sealable bags (1-gallon and 1-quart size). Bring enough to accommodate more than the anticipated number of animals you intend to examine.
17. Alcohol-proof indelible pens (we generally use VWR markers)
18. Extra batteries (AA, AAA, D) depending on equipment
19. Bleach and extra water (for disinfecting equipment that has come in contact with animals or water)
20. Dip net, waterscope, seine, etc., (as needed to detect turtles and non-target species)
21. Hiking boots, rubber boots, waders, or water shoes (depending on the terrain and/or water levels)
22. Safety and first-aid kit
23. Cell phone (optional)

Additional equipment needed to process turtles

24. Pesola® spring scales
25. Passive Integrated Transponder (PIT) tags (optional)
26. PIT-tag reader (optional)
27. 1.5 ml tissue vials (optional)
28. Surgical scissors for taking tissue sample from turtle tails (optional)
29. Small dial calipers (small turtles) and large slide calipers (large turtles) for measuring carapace
30. Triangular file (for notching shell)

Figure 4. Basic equipment needed for pond turtle surveys.

5.3 Navigating to a Site

Use your GPS unit to navigate the vehicle(s) closest to the beginning of the site by selecting the "GO TO" button. On foot, navigate to the start point or edge of the site. Since the coordinates are typically figured using a topographical mapping program (TOPO!®) you can expect there to be some positioning error and you may need to adjust your position accordingly to place yourself in or adjacent the stream channel or pond. When surveying a stream by walking, whenever possible, start downstream and work your way upstream. This prevents stirred up debris from traveling ahead of you, which may alert the animals to your presence before you approach and also decrease your visibility within the creek making it difficult to detect animals. At the beginning of each 250 m segment press the "GO TO" button and select the end point of that 250 m segment (also the start point of the next 250 m segment) and keep track of your distance walked as you survey so you do not overshoot that end point. When a polygon is surveys walk the perimeter of the water. If unable to walk the entire perimeter of the water walk as much as possible to survey the entire site. You may be unable to walk a stream or pond due to thick vegetation or deep water, if this is the case a water craft may be used to survey. Different habitat and site data will be recorded at the beginning and the end of each 250 m segment or perimeter walk of the polygon while animals encountered will be recorded throughout the survey.

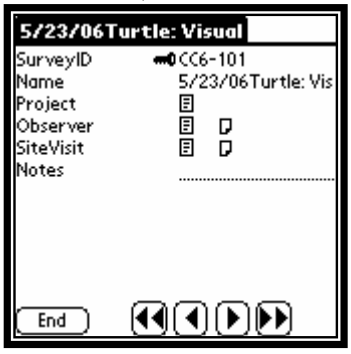
6.0 VISUAL SURVEY PROTOCOL

6.1 Initial Survey Data for Visual Surveys

At the start of each site, 250 m segment or polygon, during a visual survey, data need to be collected before surveying for animals and habitat characteristics. Initial survey data include; block name (study site name), site name, weather, site photo, and water measurements. Data fields are presented in the digital PDA forms format. If using paper data forms, you will be manually recording these data fields.

At the start of each survey (250 m segment or polygon) start a new "StreamSurvey" form. The data fields at the top of the form relate to when, who, why, and how.

1. Survey ID: Self generating with the unique identifier for the survey.
2. Date: Self generating.
3. Survey Type: Select from the drop down menu the option "Turtle: Visual"
4. Name: Self generating with the date and survey type (i.e., 5/8/06Turtle: Visual).
5. Project: Record the project code for which the data are being collected. (Obtain the correct project code from the project lead).
   a) Field Project Notes: Record any pertinent information related to the project code



6. Observer: Hit "add" to open to a new form to begin entering observers. Record the names of each person on the survey.
   a) Observer ID#: Select the observer from the drop down menu; if the name does not appear in the list write the name in.
   b) Observer Order: Self generating field.
   c) Task: Select from the drop down menu the task each observer will do in the field. The options are; Both Observer/Recorder, Observer, Recorder, and Processor.
   d) Note: Enter any additional relevant information about the observer.
7. Site Visit: Hit "add" to open to a new form to begin entering site visit data.

8. Notes: Enter any additional relevant information about the site.

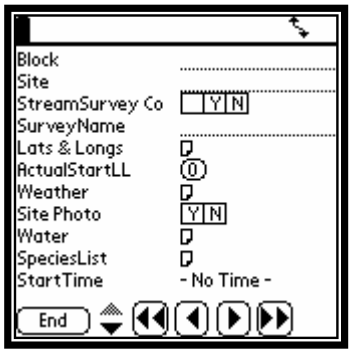
6.1.1 Site Visit Form

The next section of the "StreamSurvey" Form includes site location information, along with several additional site descriptors. Project leads will relay this information to the survey team once the site has been predefined. If using the PDA, some of these variables will be predefined for the survey site and will automatically populate when you choose your site name and segment.

Open the "SiteVisit" form. The data fields at the top are related to the survey location.

1. Block: Chose the block name (= the name of your site) from the drop down menu.
2. Site: If your survey site is a stream select the name of the 250 m segment from the pre-defined list (scroll to the name in your PDA or write down the name that was assigned to the site when it was pre-defined). If your site is a polygon, the "Site" name may be the same as the "Block" name.

Note: At this point the "Block" and "Site" you entered become the "Survey Name" and the predefined latitude/longitude, elevation, datum, drainage, and site length are populated for that record. If using the paper form these fields must be entered by hand.



3. Stream Survey Completed: Y/N. If a stream survey was completed during the current season select Yes (Y), if not select No (N). This will hide fields where data have already been collected.
4. Latitudes/Longitudes/Elevations: If you have correctly pre-defined the site, the start and end coordinates and elevations for each 250 m segment or central point coordinates and elevations for each polygon will be generated by the PDA. If you do not have a PDA, enter data by hand in the fields for latitude, longitude, elevation, and datum on your paper data sheet.
5. ActualStartLL: Select ActualStartLL and add a new record. Hit "GPS Grab" in the form that pops up. This will generate your GPS location, elevation, estimated positioning error (EPE) and datum for where you are recording water quality data. Make sure your GPS is connected to your PDA. If you do not have a GPS cable to connect to your PDA you may enter data by hand in the fields for lat, long, elevation, EPE, and datum.

6.1.1.1 Weather Data

Weather data need to be recorded at the start of the survey. Record the current weather condition, air temp, and wind speed. Data fields are presented in the digital PDA forms format. If using paper data forms, you will be recording these data fields manually.

The following fields appear when you select "Weather" in the form, record all of the weather information (described above).

1. Weather Conditions: Select the general sky conditions. The options are: clear or few clouds, partly cloudy or variable, cloudy or overcast, fog, mist or drizzle, showers or light rain, heavy rain, sleet or hail, snow.
2. Air Temperature: Measure air temperature (in degrees Celsius). Record temperature 1 m off the ground in the shade.

3. Wind: Report the general wind speed based on the Beauford scale. The options are: <1 mph - calm, smoke rises vertically; 2~3 mph - light air movement, smoke drifts; 4~7 mph - light breeze; 8~12 mph - gentle breeze leaves/small twigs in constant motion, raises dust; 13~18 mph - moderate breeze, small branches move; 19~24 mph - fresh breeze, small trees begin to sway; 25~31mph - strong breeze, large branches move; 32~38 mph - near gale, large trees begin to sway, noticeably difficult to walk; >39 mph - gale and above; and no data.
4. Weather Notes: Enter any additional relevant weather information here (i.e., if there were any changes in the weather patterns such as rain during the middle of the survey).
5. Show All: The show all button brings up additional fields that are not required for this protocol. Ask your project lead if you need to record any additional data for your specific project.

Hit "End" to close out the "Weather" form and continue the "SiteVisit" form.

6. Site Photo: Y/N. Indicate whether or not a photo was taken of the study site, Yes (Y) or No (N). Photos should be taken facing upstream at the beginning of each 250 m segment of stream or facing the pond.
    a) Number of Photos: If photos were taken of the site, enter in the number of photos taken. This will later help identify the correct photos for the respective survey sites.

6.1.1.2 Water Quality Measurements

The first time water is encountered, usually (but not always) at the start of the survey site, you will measure and record a number of water quality variables. Before taking measurements, look for any aquatic species within or next to the water. Document the species before recording water quality and stream/pond measurements. If animal species are recorded and the water is affected by the search (i.e., increased turbulence, substrate is disturbed in water, etc.), take water quality in an unaffected area upstream (if surveying a 250 m segment) or away from the disturbance, if possible.

The following fields appear when you select "Water" in the form, record all of the water information (described above).

1. Water Present: Y/N, is water present along the study site? Yes (Y) or No (N). If yes, then report the rest of the water quality measurements. If you select no, the below fields 2-6 will remain hidden fields.
2. Water Temperature: Measure water temperature (in degrees Celsius). Place your thermometer 10 cm below the surface of the water (if possible) in an area that is representative of the creek or pond, (i.e., not in a backwater pool or side channel where temperatures would be expected to be warmer). Leave the thermometer under water for a minute or so and record the temperature once the thermometer reading has stabilized.
3. Latitude/Longitude/Elevation: Select Lat/Long field and hit "GPS Grab" in the form that pops up. This will generate your GPS location, elevation, estimated positioning error (EPE) and datum for where you are recording water quality data. (Make sure your GPS

is connected to your PDA. If you do not have a GPS cable to connect to your PDA you may enter data by hand in the fields for lat, long, elevation, EPE, and datum).

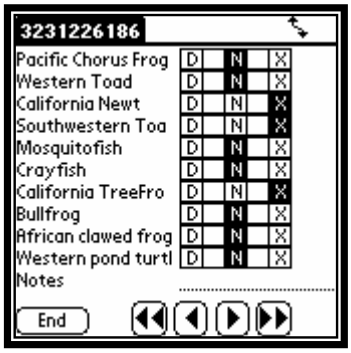
4. pH: Immerse the electrode of the pH meter below the surface of the water in an area that is representative of the creek, (i.e., not in a backwater pool or side channel). Leave the meter under water for a minute or so and record the pH once the reading has stabilized. See USGS, (2006b) Module 12 for more information.
5. Conductivity (µS): Immerse the electrode of the conductivity meter below the surface of the water in an area that is representative of the creek, (i.e., not in a backwater pool or side channel). Leave the meter under water for a minute or so and record the conductivity once the reading has stabilized. Specific conductance should be recorded in microsiemens (µS). See USGS, (2006b) Modules 10 and 11 for more information.

6. Dissolved Oxygen mg/L and % Saturation: Be sure to set the D.O. meter to the appropriate elevation prior to taking each reading. Remove the probe from the body and put it in the water in an area that is representative of the creek, (i.e., not in a backwater pool or side channel). If the water is still or stagnant you will need to slowly and steadily move the probe back and forth through the water while taking the reading. Wait until the reading has stabilized before recording it. D.O. should be recorded in percent saturation and also in milligrams per liter. See USGS, (2006b) Module 13 for more information.
7. Transparency: Do a visual estimate of water transparency of the water at mid-channel (if possible), and chose a category from the lookup table in the PDA. An easy method is to set a penny in the bottom of the pool. Choose one of the following options: "Clear" = can see the year on penny clearly in bottom of pool, "Moderate / Translucent" = cannot see year, but can see outline of penny, or "Opaque" = cannot see year or outline of penny.
8. Remarks: Enter any additional relevant water information here.
9. Show All: The show all button brings up additional fields that are not required for the general pond turtle survey protocol.

When you have completed the water measurements click "End" to return to the main "SiteVisit" form and continue to fill in the following fields.

6.1.1.3 Species List

This list documents negative data and insures common species are accounted for during a survey. A list of the most common species will appear when you select the "Species List" form. Check the appropriate box for each species. If you are going to survey for that specific species, select surveyed and not detected (N). If you are not surveying for that species select not surveyed and not detected (X). Once an animal record is created for a species encounter, the checked boxes will automatically change to detected (D).



Hit "End" to close out the "SpeciesList" form and continue the "SiteVisit" form.

7. Start Time: Record your start time. Click on the "-No Time-" next to start time and the PDA will generate the current time for you, click "OK". You are able to manually adjust this time if this was not the actual start time of the survey.

Once a start time is recorded, begin visually searching the survey reach.

6.2 Visual Survey Techniques

Visual surveys are conducted to determine pond turtle presence, to make an assessment of habitat quality, to determine whether a site is trappable for pond turtles, and to select future trapping locations. Pond turtles are habitat generalists and can occupy a wide range of aquatic habitats, thus the most limiting factor of habitat suitability is the presence of water. Based on literature (Bury, 1972; Holland, 1991; Jennings & Hayes, 1994; Reese, 1996; Reese & Welsh, 1998b; Hays et al., 1999), in addition to the presence of deep pools and slow moving water, the following general characteristics are associated with pond turtle habitat: 1) basking sites, 2) aquatic refugia, 3) streamside refugia, and 4) upland nesting habitat. These characteristics should be kept in mind while conducting a visual survey. Once a site has been determined as potentially suitable pond turtle habitat and conditions are right for trapping, refer to the USGS Western Pond Turtle (*Emys marmorata*) Trapping Survey Protocol for the Southcoast Ecoregion, to conduct trapping (U. S. Geological Survey, 2006c).

As you search for animals, pay attention to the substrate and riparian vegetative and upland communities. Also note any non-native vegetation in the water or along the watercourse. Some common non-native plants include arundo (*Arundo donax*), tamarisk (*Tamarix sp.*), watercress (*Rorripa nasturtium aquaticum*), and mustard (*Brassica nigra*). Please bring and refer to a plant field guide if you are unfamiliar with the common native and non-native plants in southern California. As you conduct the visual survey, point out non-native plants and abrupt habitat changes to other members of the survey, this will help with documenting the vegetation at the end of the survey. Also look around every so often (USGS suggests every 50 m) and make a mental note about the dominant substrate on the banks and in the water, riparian vegetation types, vegetative cover in the channel and on the banks, and amount of potential basking areas and aquatic refugia (see Appendices 1 & 2 for definitions). This information will be recorded at the end of the segment so you want to obtain a representative mental picture of the proportions of these habitat components as you walk through them. It may take some practice to make a good estimate of all of the habitat components and their proportions within each 250 m segment or polygon so you may want to conduct a few mock-surveys to get accustomed to these methods. It is best if each member of the survey team makes their own individual mental notes and estimations, and compares these to the estimates of other team members at the end of each 250 m segment or polygon.

Start slowly walking up the stream channel, either in the water or immediately adjacent to the water. If you are unable to walk the site due to habitat features the visual survey can be conducted by water craft. If you come across an area that looks like it is suitable for trapping or a good location to place a trap, mark the point in your GPS unit. Saving points will help save time searching for trap locations during a trapping survey. In addition to looking for pond turtles and pond turtle habitat you need to document any other native and non-native aquatic species observed. For example, include all life stages of other amphibians, turtles, snakes, fish, crayfish, Asian clams, beavers, and beaver sign (see expected species list in PDA or paper data form for

common species and field guides for proper identification). Use the following techniques to search for aquatic species.

1. Visual encounter: Search aquatic habitat with and without binoculars for the presence of basking or underwater pond turtles. Open pools or possible basking areas should first be observed from a distance and then approached slowly and quietly to help prevent disturbing basking turtles. Listen for the splash of water, possible unseen turtles entering the water. If you should hear a splash, spend additional time observing the area for a turtle to resurface. The length of time open pools or basking areas should be observed and searched depends on your research goals. If trapping surveys will not be conducted, due to difficult terrain, inadequate water depths, insufficient funding, etc., visual surveys may provide estimates of abundance and size classes.

2. Dip netting and seining: Pond turtles can be found at the edge or in the bottom of pooled water, in aquatic vegetation and under ledges along the perimeter of stream refugia and pools. When encountering deep pools and aquatic refugia, first visually search for turtles and any other aquatic animals and egg masses. If no eggs are seen, you may take long sweeps with the dip net or seine through the area. Gently sweep the net along the bottom and sides of the pool or refugia, then check the net for aquatic species by carefully sifting through any mud and debris brought up from the bottom. We recommend using two sizes of nets, a large fish net with a long handle for turtles and deep pools; and a small aquarium size net for small pond turtle hatchlings, fish and tadpoles. Do not disturb any egg masses with dip nets. Capturing turtles, tadpoles and fish with a net is useful method to observe animals more carefully, take voucher photos, and make positive identification. Special state and federal permits may be required for capturing and handling listed species.

6.3 Visual Survey Animal Records

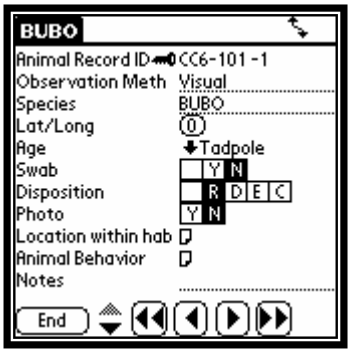
6.3.1 Non-turtle Animal Records

The first time you encounter any species or different species age class within a site, the encounter must be recorded in the animal record. With the exception of turtles, once a species and each age class has been documented one time in the animal record additional encounters do not need to be recorded. Every single turtle encountered must be entered in the animal record. If you have specific questions pertaining to a non-turtle species you may want to record it more than once per site depending on your research goals. The first time you encounter a species within the site take a photo and record the species, age class, coordinates, and disposition in the animal form. If a turtle is actually captured on a visual survey refer to the USGS Western Pond Turtle (*Emys marmorata*) Trapping Survey Protocol for the Southcoast Ecoregion, to process and record the animal data (U. S. Geological Survey, 2006c).

The following fields appear when you select “Animals” and “Add” in the form with all of the site information (described above).

1. Animal Record ID: Self generating with the unique identifier for the animal.
2. Observation Method: Select the method of observation. The options are: Audio, Hand Capture, Trap, or Visual. Although Trap appears in the lookup list, it does not apply while conducting a visual survey.
3. Type: Select from the drop down menu whether the animal is a fish, frog, turtle, bird, invertebrate, etc.

4. Species: During a visual survey, record each species the first time it is encountered within the 250 m segment or polygon by selecting that species from the drop down list. During a trapping survey, record all species captured and record each visually encountered species the first time it is seen during each trapping day.
5. Latitude/Longitude/Elevation: Select Lat/Long field and hit "GPS Grab" in the form that pops up. This will generate your GPS location, elevation, estimated positioning error (EPE) and datum for where you are recording animal data. Make sure your GPS is connected to your PDA. If you do not have a GPS cable to connect to your PDA you may enter data by hand in the fields for lat, long, elevation, EPE, and datum.
6. Age: Select the age. The options are: Adult, Juvenile, Metamorph, Tadpole, 2nd Year Tadpole, and Hatchling.
7. Swab: Y/N. This field will only show up if you are documenting an amphibian record. Refer to Geological Survey (2006b) Module 7 for the swab protocol.
8. Disposition: Select the appropriate checkbox according to if the animal was Released (R), Dead (D), Escaped (E), or Collected (C).
9. Photo: Select Yes (Y) if you took a photo of the animal or No (N) if you did not.
    a) Number of Photos: If photos were taken of the animal, enter in the number of photos taken.

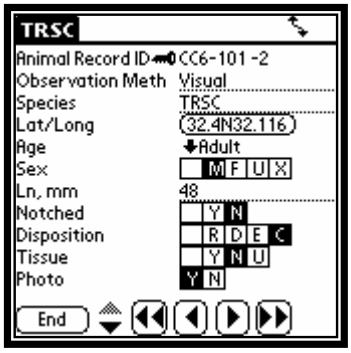


10. Notes: Record any pertinent information that does not fit into one of the other data fields.
11. Show All: The show all button brings up additional fields that are not required for the visual survey protocol. Ask your project lead if you need to record any additional data for your specific project.

6.3.2 Non-native Turtle Animal Records

If you choose non-native turtle from the species drop down menu the fields for Sex, Length, and Notched appear and must be filled in. Refer to the USGS Western Pond Turtle (*Emys marmorata*) Trapping Survey Protocol for the Southcoast Ecoregion for instructions on the additional turtle data collection (U. S. Geological Survey, 2006a).

1. Animal Record ID: Self generating with the unique identifier for the animal.
2. Observation Method: Select the method of observation. The options are: Audio, Hand Capture, Trap, or Visual.
3. Type: Select turtle from the drop down menu.
4. Species: During a visual survey, record each species the first time it is encountered within the 250 m segment or polygon by selecting that species from the drop down list. During a trapping survey, record all species captured and record each visually encountered species the first time it is seen during each trapping day.
5. Latitude/Longitude/Elevation: Select Lat/Long field and hit "GPS Grab" in the form that pops up. This will generate your GPS location, elevation, estimated positioning error (EPE) and datum for where you are recording water quality data. Make sure your GPS is connected to your PDA. If you do not have a GPS cable to connect to your PDA you may enter data by hand in the fields for lat, long, elevation, EPE, and datum.
6. Age: Select the age. The options are: Adult, Juvenile, Metamorph, Tadpole, 2nd Year Tadpole, and Hatchling.

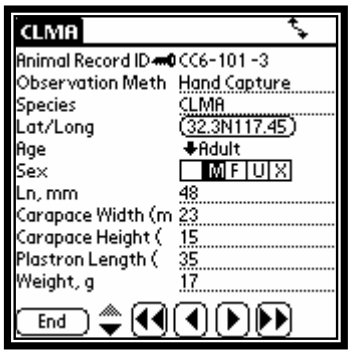


7. Sex: Record the sex of the turtle; Male (M), Female (F), Unknown (U), Not Checked (X).
8. Length: Record the carapace length in mm.
9. Notched: Chose Yes (Y) or No (N) depending on if the turtle has had the plastron notched or you will be notching it.
10. Disposition: Select the appropriate checkbox, Released (R), Dead (D), Escaped (E), or Collected (C).
11. Tissue: Check Yes (Y), No (N), or Unknown (U) depending on if turtle tissue was taken.
12. Photo: Select Yes (Y) if you took a photo of the animal or No (N) if you did not.
    b) Number of Photos: If photos were taken of the animal, enter in the number of photos taken. All turtles captured should have three photos taken; the top of the carapace, the plastron, and the head.
13. Notes: Record any pertinent information that does not fit into one of the other data fields.
14. Show All: The show all button brings up additional fields that are not required for the visual survey protocol. Ask your project lead if you need to record any additional data for your specific project.

6.3.3 Pond Turtle Animal Records

If you chose pond turtle from the species drop down menu the fields for Sex, Length, Carapace Width, Carapace Height, Plastron Length, Weight, Recap, ID Number, Notched, Shell Damage, and Other ID Markings appear and must be filled in. Refer to the USGS Western pond turtle (*Emys marmorata*) Trapping Survey Protocol for the Southcoast Ecoregion for instructions on the additional pond turtle data (U. S. Geological Survey, 2006a).

1. Animal Record ID: Self generating with the unique identifier for the animal.
2. Observation Method: Select the method of observation. The options are: Audio, Hand Capture, Trap, or Visual.
3. Type: Select turtle from the drop down menu.
4. Species: During a visual survey, record each species the first time it is encountered within the 250 m segment or polygon by selecting that species from the drop down list.
5. Latitude/Longitude/Elevation: Select Lat/Long field and hit "GPS Grab" in the form that pops up. This will generate your GPS location, elevation, estimated positioning error (EPE) and datum for where you are recording water quality data. Make sure your GPS is connected to your PDA. If you do not have a GPS cable to connect to your PDA you may enter data by hand in the fields for lat, long, elevation, EPE, and datum.
6. Age: Select the age. The options are: Adult, Juvenile, Metamorph, Tadpole, 2nd Year Tadpole, and Hatchling.



7. Sex: Record the sex of the turtle; Male (M), Female (F), Unknown (U), Not Checked (X).
8. Length: Record the carapace length in mm.
9. Carapace Width: Record the carapace width in mm.
10. Carapace Height: Record the carapace height in mm.
11. Plastron Length: Record the plastron length in mm.
12. Weight: Record the weight in grams.
13. Recap: Record if the animal is a recap Yes (Y) if it has a previous plastron notch or is PIT tagged. If the animal is

not a recap record No (N). If you are unsure, record Unknown (U). Or if you forgot to check record Not Checked (X).

14. ID Number: All pond turtles should be tagged with a passive integrated transponder (PIT) tag, encoded with a unique identification number. The PIT tag is inserted inside the body cavity anterior to the rear right leg following methods of Rathbun et al. (1993) and Buhlmann & Tuberville (1998). If this is a recapture, enter the number in this field as well.
15. Notched: Plastron Notched: Select Yes (Y) or No (N). Indicate whether the turtle's plastron has been marked or will be marked with a single triangular notch on the right femoral scute indicating that the turtle has been PIT tagged. This combined with PIT-tagging will assist in future recognition of individual turtles.
15. Shell Damage: Select Yes (Y) or No (N). If yes is selected enter the following information:
    a. Type of Shell Damage: Describe the severity and location of any shell damage.
16. Other ID Markings: Select Yes (Y) or No (N). This is the unique identification number given to turtles by notching the marginal scutes of the carapace. This method is not used by USGS. Check with landowners/regulatory agencies before initiating a trapping survey to determine if pond turtles have been previously captured and marked in the area.
    a. Record the ID Markings on the scutes of the carapace.
17. Disposition: Select the appropriate checkbox according to if the animal was Released (R), Dead (D), Escaped (E), or Collected (C).
18. Tissue: Check Yes (Y), No (N), or Unknown (U) depending on if turtle tissue was taken.
19. Photo: Select Yes (Y) if you took a photo of the animal or No (N) if you did not.
    a) Number of Photos: If photos were taken of the animal, enter in the number of photos taken. All turtles captured should have three photos taken; the top of the carapace, the plastron, and the head.
20. Notes: Record any pertinent information that does not fit into one of the other data fields.
21. Show All: The show all button brings up additional fields that are not required for the visual survey protocol. Ask your project lead if you need to record any additional data for your specific project.

Hit "End" then "Done" to close out the "Animals" form and continue the "SiteVisit" form.

6.4 Ending a Site

6.4.1 Documenting Non-native Vegetation

Once a visual survey is complete, the non-native vegetation in the water or along the watercourse needs to be recorded.

The following fields appear when you select "Plants" and "add" in the form with all of the site information (described above).

1. Plant Species: Document the species of non-native vegetation detected. Select from the drop down menu.
2. Size Class: For each species report the abundance class of that species across the site by selecting a category from the drop down menu. The options are: few plants, scattered small patches, or large contiguous stands.
3. Notes: Record any other information that is pertinent to non-native vegetation in the field.

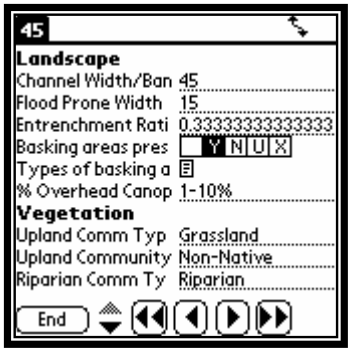
Hit "End" then "Done" to close out the "Plants" form and continue the "SiteVisit" form.

6.4.2 Documenting Landscape and Vegetation

Once a visual survey is complete, riparian vegetative and upland communities in the water and along the watercourse need to be recorded. Mental notes about the dominate substrate on the banks and in the water, riparian vegetation types, vegetative cover in the channel and on the banks, and amount of potential basking areas and aquatic refugia (see Appendix 2 for definitions) will be recorded in this section. If there are drastic differences in the estimations from each team member it is best to take an average of the two estimates or to re-estimate the proportion of the habitat components in that segment if you plan on passing through again on your way back to the vehicle.

The following fields appear when you select "Landscape & Veg" in the form with all of the site information (described above). If surveying a polygon, some fields described in the section below may be hidden.

1. Landscape:
    a. Channel Width / Bankful (m): Measure and record the channel width using a measuring tape or rangefinder. See Appendices 1 & 2 for definitions of landscape variables.
    b. Flood Prone Width (m): Measure and record the flood prone width using a measuring tape or rangefinder. See Appendices 1 & 2 for definitions of landscape variables.
    c. Entrenchment Ratio: If using the PDA this field will be generated for you automatically, otherwise divide the flood plain width by the channel / bankful width to determine the entrenchment ratio. See Appendices 1 & 2 for definition.
    d. Basking Areas Present: Were basking areas present? See Appendix 2 for definition. Record Yes (Y), No (N), Unknown (U), or Not recorded (X).



        i. If Yes, identify the type(s) of basking areas observed within the segment. The choices are sunny rocks, open banks, other. Select all that apply. If you choose "other," indicate what that is.
    e. Percent Overhead Canopy: Estimate the percent of canopy cover over the channel in the 250 m segment or polygon by looking straight up from where you are standing. Look at the proportion of the creek or pond and immediate riparian area that is open to the sky and estimate a percentage for this field. This would be cover growing in the channel and on the bank, shading the channel. The options are 0%, 1 - 10%, 11 - 25%, 26 - 50%, 51 - 75%, 76 - 100%.
2. Vegetation
    a. Upland Community Type: Record the dominant upland vegetative community type from the drop down menu. This may be the habitat in the terrace or upland. The options for upland community types are: Chaparral, Desert, Forest, Grassland, Meadow/Marshes, Riparian, Scrub, Urban/Invasive, and Woodland. See Appendix 3 for definitions and a list of southern California vegetative communities.

b. Upland Community: Record the dominant vegetative community along the 250 m segment outside of the main channel by selecting a community from the dropdown menu. This may be the vegetative community in the terrace or upland. See Appendix 2 for definition and Appendix 3 for a list of southern California vegetative communities. The selection in "Upland Community Type" will determine the options in the drop down list in "Upland Community".
c. Riparian Community Type: Record the dominant riparian vegetative community type from the drop down menu. This is typically the habitat adjacent to the channel on the bank and in the floodplain. The options for riparian community types are: Chaparral, Desert, Forest, Grassland, Meadow/Marshes, Riparian, Scrub, Urban/Invasive, and Woodland. See Appendix 2 for definition and Appendix 3 for a list of southern California vegetative communities.
d. Riparian Community: Record the dominant riparian community along the 250 m segment or polygon by selecting one from the dropdown menu. This is typically the habitat adjacent to the channel on the bank and in the floodplain. See Appendix 2 for definition and Appendix 3 for a list of southern California vegetative communities. The selection in "Riparian Community Type" will determine the options in the drop down list in "Riparian Community".
e. Dominant Riparian Plant: Record the top three dominant riparian plant species seen along the 250 m segment or polygon. Each plant should represent at least 10% of the riparian community or it should not be included. For example, if the segment is largely a monotypic stand of willow, with no other co-dominants ≥ 10%, record willow only.
f. Dominant Riparian Plant 1 (2, 3): Choose from the drop down menu the riparian plant(s) that is most abundant. To be dominant it must comprise at least 10% of the overall vegetation in the area.
g. % Submergent Veg: Choose a category from the drop down menu that best corresponds with the percentage of submergent vegetation along the waterway.
h. % Emergent Veg: Choose a category from the drop down menu that best corresponds with the percentage of emergent vegetation along the waterway.

3. Dominate Bank Substrate
    a. Substrate 1 (2, 3): Estimate and record the top 3 dominant substrate types on the bank and the relative percentage of each along the site by selecting a type and percentage range from the drop down menu. The choices for substrate are clay, silt, sand, pebbles, cobble, boulders/bedrock, leaf-litter, and fallen logs/trees. See Appendix 2 for definitions.
        i. % Substrate 1 (2,3): The options for dominate bank substrate percentage are 0%, 1-10%, 11-25%, 26-50%, 51-75%, 76-100%.

6.4.2.1 Documenting Water and Habitat Characteristics

In the section labeled "PTAquaticRefuge/Disturbance" estimate and record characteristics of the wetted portion of the site. Data fields are presented in the digital PDA forms format. If using paper data forms, you will be recording these data fields manually.

The following fields appear when you select "PTAquaticRefuge/Disturbance" form.

1. End Time: Enter the time that you finished surveying the segment.
2. End Water:

a. Percent Wet Length of Survey: Record the percentage of the length of the 250 m segment or polygon that was wetted by selecting a range from the drop down menu.
b. Percent Reach With Shallow Pooling Water: Estimate the percentage of the 250 m segment or polygon containing shallow pooling water (water less than 10 cm deep with little or no water movement). Include side pools, pooling water along side of the channel, within main channel, and isolated pools when making this estimate. Select the percentage range from the drop down menu.
c. Percent Reach With Medium Pooling Water: Estimate the percentage of the 250 m segment or polygon containing medium pooling water, (water depth greater than 10 cm and less than 1 m). Include side pools, pooling water along side of channel, within main channel, and isolated pools when making this estimate. Select the percentage range from the drop down menu.
d. Percent Reach With Deep Pooling Water: Estimate the percentage of the 250 m segment or polygon containing deep pooling water, (water depth greater than 1 m deep). Include side pools, pooling water along side of channel, within main channel, and isolated pools when making this estimate. Select the percentage range from the drop down menu.

e. Plunge Pools Present: Record whether or not plunge pools were present. See Appendix 2 for definition. Record Yes (Y), No (N), Unknown (U), or Not recorded (X). If "Yes," record the estimated number of plunge pools.
    i. Number of Plunge Pools: If "Yes" to above, estimate the number of plunge pools that occurred along the site. The options are 1 - 5, 6 - 10, 11 - 20, 21 - 30, 31 - 50, and 51 - 100.
f. Aquatic Refugia Present: Record whether or not aquatic refugia were present along the site. See Appendix 2 for definition. Record "Yes" or "No". If "Yes," identify the type(s) of refugia observed within the segment. The options for types of refugia are undercuts, tree roots, woody debris, rock crevices, aquatic submerged vegetation, emergent vegetation, and floating material (dead and live plant matter and / or algae). Select all that apply.

3. Dominate Aquatic Substrate:
    a. Substrate 1 (2, 3): Estimate and record the top 3 dominant aquatic substrate types and the relative percentage of each along the site by selecting a type and percentage range from the drop down menu. The choices for substrate are clay, silt, sand, pebbles, cobble, boulders/bedrock, leaf-litter, and fallen logs/trees. See Appendix 2 for definitions.
        i. % Substrate 1 (2,3): The options for dominate aquatic substrate percentage are 0%, 1-10%, 11-25%, 26-50%, 51-75%, 76-100%.
4. Recent Disturbance:
    a. Disturbance Type: Document any disturbance seen and record the nature of the disturbance that was at the study site. Check all that apply (e.g., heavy foot traffic, trash, road / vehicle crossings, fire, etc.)
    b. Intensity of Disturbance: Estimate the level of the disturbance across the 250 m segment or polygon. The options are light, moderate, and heavy.

c. Notes: Add any relevant information on the stream properties that have not yet been recorded.

6.5 End of Survey

Now that the site has been visually surveyed and animals, habitat, vegetation, substrate and disturbances are recorded in the "StreamSurvey" form, the end site location information needs to be recorded.

Close out the "PT Aquatic Refuge/Disturbance" form by clicking "End" and close out the "Landscape & Vegetation" form by clicking "End." You will now be looking at the "SiteVisit" form. Scroll down to the bottom of this form and be sure to click on "Actual End LL."

8. ActualEndLL: Select "ActualEndLL" and add a new record. Hit "GPS Grab" in the form that pops up. This will generate your GPS location, elevation, estimated positioning error (EPE) and datum for where you have finished your survey. Make sure your GPS is connected to your PDA. If you do not have a GPS cable to connect to your PDA you may enter data by hand in the fields for lat, long, elevation, EPE, and datum.
9. End Time: Record your end time. Click on the "-No Time-" next to end time and the PDA will generate the current time for you, click "OK". You are able to manually adjust this time if this was not the actual end time of the survey.
10. Notes: Record any pertinent information that does not fit into one of the other data fields.
11. Show All: The show all button brings up additional fields that are not required for the visual survey protocol. Ask your project lead if you need to record any additional data for your specific project.

The visual survey is complete. Using the data collected during this survey and communication with the survey team, the project lead can determine if the site is suitable for trapping. Any pictures and possible trap location points taken by the survey team should be downloaded, saved, and transferred to the project lead. If the site is suitable for trapping refer to the USGS Western Pond Turtle (*Emys marmorata*) Trapping Survey Protocol for the Southcoast Ecoregion (U. S. Geological Survey, 2006c).

7.0 POST-SURVEY PROCEDURES

When you are finished with your field survey there are several post survey procedures that must be completed to 1) prevent the spread of biological pathogens and 2) to ensure that your data are correct and can be read by anyone requesting it.

1. Immediately after returning from the field, all equipment coming in contact with water or mud (i.e., boots, dip nets, seine nets, plastic specimen containers) must be thoroughly disinfected in a 16:1 water/bleach solution to prevent moving pathogens between study sites. Turtle traps can be soaked in the solution in a plastic child's pool or large garbage can. Traps can also be sprayed down with a higher concentration of bleach (using a spray bottle) and rinsed with a hose after a few minutes. The traps should then be placed in the sun to dry; see U. S. Geological Survey (2006b) Module 1.
2. Review and check the quality assurance/quality control (QA/QC) of the data from your surveys. Correct any mistakes.
3. Enter data into the USGS database. (This entails hotsyncing your PDA or hand entering data from your paper form).
4. Label photographs and send to project lead.

5. Get positive species identifications from experts if needed.
6. Make sure pH, conductivity and DO meters are calibrated and properly stored; see U. S. Geological Survey (2006b) Modules 10 - 13.

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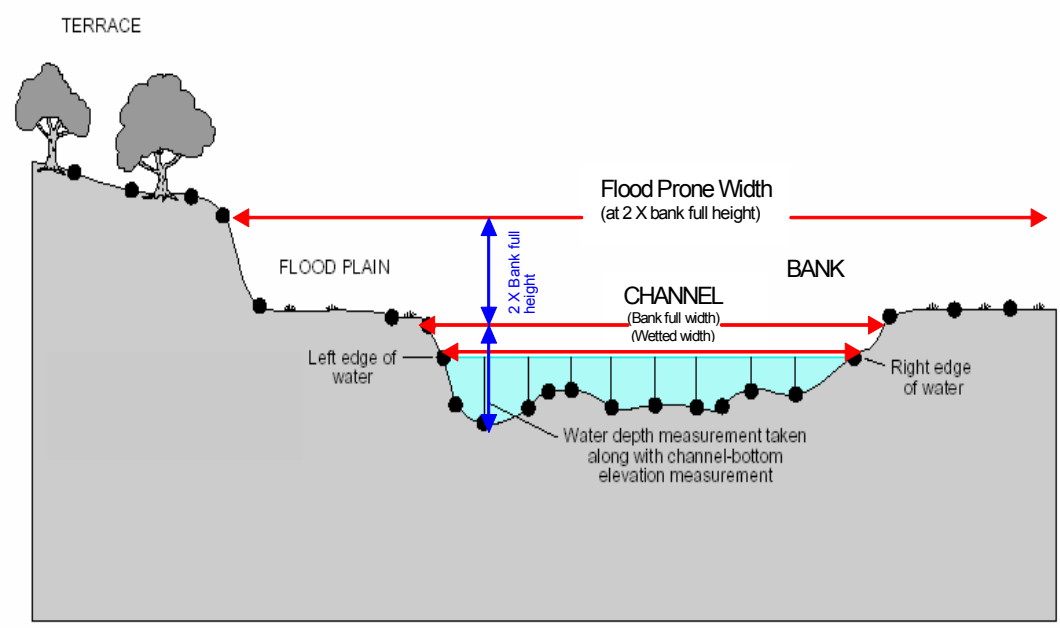
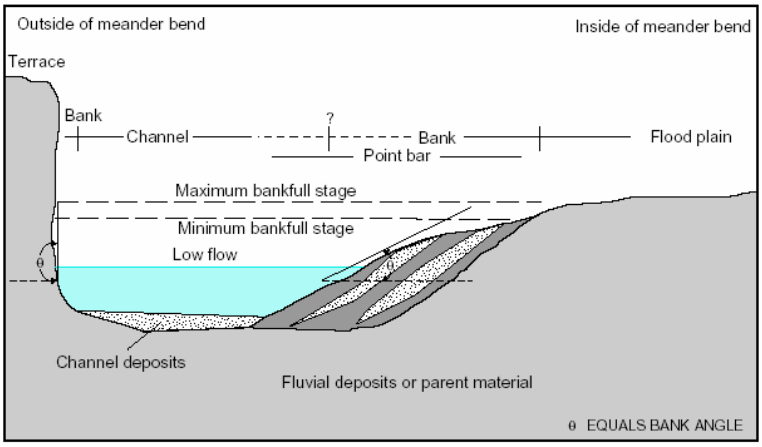
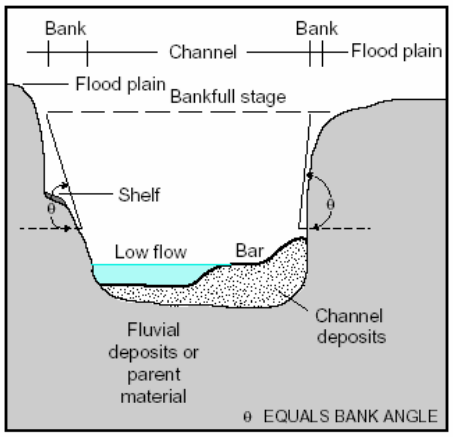
Appendix 1: Landscape figures. (Most material in this section is directly taken or adapted from Fitzpatrick et al., 1998).







Appendix 2: Data definitions (many landscape definitions in this section are taken directly taken or adapted from Fitzpatrick et al., 1998).

Aquatic Refugia: Any material within the water or on the surface that provides shelter, cover, or hiding place, (i.e., rocks, downfall in the form of logs, branches, woody debris, and artificial materials, undercuts of banks, tree roots, rock crevices, aquatic submerged vegetation, emergent vegetation, and other floating material).

Bank: The sloping ground that borders a stream and confines the water in the natural channel when the water level, or flow, is normal. It is bordered by the flood plain and channel.

Basking Area: Area above the surface of the water where sunny space is available for animals to rest and sun themselves (i.e., rocks, sunny banks).

Carapace: The dorsal, convex part of the shell structure of a turtle, consisting of an external layer of horny material, divided into large plates known as scutes, which overlie a layer of interlocking bones.

Channel: The channel includes the thalweg and streambed. Bars formed by the movement of streambed are included as part of the channel.

Conductance: A measure of the dissolved solids content of water supply by means of determining the capacity of a water sample to carry an electrical current. Conductivity is a measure of the ability of a solution to carry electrical current. (www.environmentalencyclopedia.com)

Disconnected Pools: Any pool that is completely disconnected from the main channel.

Dissolved Oxygen: The concentration of oxygen dissolved in water, expressed in mg / l or as percent saturation, where saturation is the maximum amount of oxygen that can theoretically be dissolved in water at a given altitude and temperature. (www.biology-online.org)

Disturbance: Any natural or artificial destruction and / or alteration of the habitat (e.g., flood, fire, beaver dams, vehicle, trail, trash, etc.).

Downfall: Any forest material that has fallen (downfall in the form of logs, branches).

Drainage: The area of land that drains water, sediment, and dissolved materials to a common outlet at some point along a stream channel (www.environmentalencyclopedia.com).

Emergent Vegetation Cover: This is cover from plants that emerge from the water (i.e., cattails, sedges, bulrush).

Flood Plain: The relatively level area of land bordering a stream channel and inundated during moderate to severe floods. The level of the flood plain is generally about the stage of the 1 to 3 year flood.

Overhead Canopy: The area of the stream covered by the topmost vegetative cover. Can be calculated by estimating the average percent of the sky visible between 45 degree upward angles of the bank.

Plastron: The ventral, nearly flat part of the shell structure of a turtle, similar in composition to the carapace; with an external layer of horny material divided into plates called scutes and an underlying layer of interlocking bones.

Permanency: For this protocol, an estimate of how permanent or transitory the water source is (based on prior knowledge or maps). Choices include permanent, semi-permanent, or ephemeral.

pH: An expression of the intensity of the basic or acid condition of a liquid; may range from 0 to 14, where 0 is the most acid and 7 is neutral. Natural waters usually have a pH between 6.5 and 8.5.

Project Code: A unique alpha-numeric code assigned by USGS BRD, San Diego to each of our projects for the purpose of organizing projects, billing project accounts and retrieving data.

Riparian: Areas adjacent to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands (www.environmentalencyclopedia.com).

Scute: A horny, chitinous, or bony external plate or scale, as on the shell of a turtle.

Side Pool: Any still water area that adjoins or is part of the main area channel.

Slope: A measure of the angle of the ground with respect to the plane of the horizon. Also called "inclination". Measured by dividing the "rise" (difference in elevation between point A and point B) by the "run" (the length of the distance between point A and point B).

Streamside Refugia: Any material outside of the water that provides shelter, cover, hiding place, (i.e., tree roots, woody debris, rock crevices, streamside vegetation).

Submergent Vegetation Cover: This is cover from plants growing mostly under water (i.e., algae, waterweed).

Substrate: The surface composition of the ground. (Aquatic substrate = the ground composition under the water, usually cobble, gravel, silt, etc.; Terrestrial substrate = the ground composition on the banks and upland, usually boulder, cobble, leaf litter, etc.)

Terrace: An abandoned flood-plain surface. A terrace is a long, narrow, level or slightly inclined surface that is contained in a valley and bounded by steeper ascending or descending slopes, and it is always higher than the flood plain. A terrace may be inundated by floods larger than the 1 to 3 year flood.

Upland: The area or habitat outside of the riparian corridor.

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Appendix 3. Vegetation communities commonly found in southern California (Holland, 1986; Sawyer and Keeler-Wolfe, 2003; SANDAG, 2006).

Vegetative Community	Abbreviated List	Description	Name that Populates Database	Element Code
Chaparral				
	Mixed Chaparral	general chap	chaparral	37000
	Chamise Chaparral	chamise dominate	chamise chaparral	37200
	Scrub Oak Chaparral	scrub oak dominate	scrub oak chaparral	37900
	Manzanita Chaparral	manzanita dominate	upper sonoran manzanita chaparral	37B00
Desert				
	Creosote Bush Scrub	creosote dominate	mojave creosote bush scrub	34100
	Wash Scrub	sandy canyon bottom with shrubs	mojave wash scrub	34250
	Blackbush Scrub	blackbush dominate	blackbush scrub	34300
	Tamarisk Scrub	tamarisk dominate	tamarisk scrub	63810
	Sonoran Cottonwood-Willow Riparian	desert	sonoran cottonwood-willow riparian forest	61810
	Fan Palm Oasis	fan palm dominate	desert fan palm oasis woodland	62300
	Mojave Riparian Forest	cottonwood and willow	mojave riparian forest	61700
	Joshua Tree Woodland	Joshua tree dominate	Joshua tree woodland	73000
	Desert Mountain White Fir	desert - white fir dominate	desert mountain white fir	85330
Forest				
	Knobcone Pine	1000-5000 ft	knobcone pine forest	83210
	Coulter Pine	4000-5000 ft	coulter pine forest	84140
	Bigcone Spruce-Canon Oak	douglas fir and live oak dominate	bigcone spruce-canon oak forest	84150
	Westside Ponderosa Pine	2000-5000 ft	westside ponderosa pine porest	84210
	Jeffrey Pine	5500-8000 ft	Jeffrey pine forest	85100
	Jeffrey Pine-Fir	6000-8000 ft	Jeffrey pine-fir forest	85210
	White Fir	7500-9500 ft	southern California white fir forest	85320
	Lodgepole Pine	9000-11000 ft	lodgepole pine forest	86100
	Subalpine	9500-11200 ft	southern California subalpine forest	86500
	Cypress	cypress dominated	southern interior cypress forest	83230
Grassland				
	Non-Native	non-native grasses	non-native grassland	42200
	Native	bunchgrass dominate	native grassland	42100
Meadows/Marshes				
	Coastal Salt Marsh	salt tolerant plants	southern coastal salt marsh	52120
	Brackish Marsh	salt marshes with freshwater input	coastal brackish marsh	
	Montane Freshwater Marsh	permanently flooded by fresh water	montane freshwater marsh	52430
	Montane Meadow		montane meadow	45100
	Pavement Plain	herb grass dominated opening in Jeffrey pine forest	pavement plain	47000
Riparian				
	Cottonwood Willow	non-desert	southern cottonwood willow riparian forest	61330
	Coast Live Oak	live oak dominate	southern coast live oak riparian forest	61310
	Alder	alder dominate	white alder riparian forest	61510
	Sycamore-Alder	sycamore, alder dominate	southern sycamore-alder riparian woodland	62400
	Mule Fat Scrub	mule fat dominate	mule fat scrub	63310
	Willow Scrub	willow dominate	southern willow scrub	63320
	Tamarisk Scrub	tamarisk dominate	tamarisk scrub	63810
	Arundo	arundo dominate	arundo	RNF01
Scrub				
	Sage Scrub	low soft-woody subshrubs (to 1 m high)	coastal scrub	32000
Urban/Invasive				
	Arundo Scrub/Forest	arundo dominate	arundo scrub / forest	RNF01
	Tamarisk Scrub	tamarisk dominate	tamarisk scrub	63810
	Eucalyptus Woodland	eucalyptus dominate	eucalyptus woodland	11100
	Other Non-Native Community		other non-native community	11000
	Urban/Developed		urban / developed	12000
	Agriculture		general agriculture	18000
	Field/Pasture		field / pasture	18310
	Unvegetated	no vegetation present	unvegetated habitat	13000
Woodland				
	Oak	oak dominate	oak woodland	71100
	CA Walnut	CA walnut dominate	California walnut woodland	71210
	Pinon/Juniper	pinon / juniper dominate	pinon and juniper woodland	72000

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Appendix 3a. Vegetation communities commonly found in southern California (Holland, 1986; Sawyer and Keeler-Wolfe, 2003; SANDAG, 2006).

SCRUB

SAGE SCRUB

Element Code: 32000

Combined several sage scrub vegetation communities – description from the Diegan Coastal Sage Scrub community, element code – 32500.

Description: Low, soft-woody subshrubs (1 m tall) that is most active in winter and early spring. Many taxa are facultatively drought-deciduous. Dominated by CA sagescrub (*Artemisia californica*) and CA buckwheat (*Eriogonum fasciculatum*) together with laurel sumac (*Malosma laurina*) and white sage (*Salvia apiana*). Stem and leaf succulents, while present, are not nearly as conspicuous as in Maritime Succulent scrub (32400).

Site Factors: Typically on low moisture-availability sites: steep, xeric slopes or clay-rich soils that are slow to release stored water. Intergrades at higher elevation s with several chaparrals (37000) or, in drier more inland areas with Riversidean Sage Scrub (32700).

Characteristic Species: CA sagebrush (*Artemisia californica*), CA buckwheat (*Eriogonum fasciculatum*), bush-snapdragon (*Galvesia speciosa*), isocoma (*Haplopappus venetus*), CA tree mallow (*Lavatera assurgentiflora*), CA broom (*Lotus scoparius*), chaparral mallow (*Malacothamnus fasciculatus*), laurel sumac (*Malosma laurina*), lemonadeberry (*Rhus integrifolia*), white sage (*Salvia apiana*), foothill stipa (*Stipa lepida*).

Distribution: This is a wide-spread coastal sage scrub in coastal southern CA from LA into Baja CA.

DESERT

CREOSOTE BUSH SCRUB

Element Code: (34100)

Description: Shrubs, 0.5 - 3 m tall, widely spaced, usually with bare ground between. Growth occurs during spring (or rarely in summer or fall) if rainfall is sufficient. Growth is prevented by cold in winter and limited by drought at other seasons. Many species of ephemeral herbs may flower in late March and April if the winter rains are sufficient. Other, less numerous species of annuals appear following summer thundershowers. This is the basic creosote scrub of the Mojave Desert, dominated by creosote bush (*Larrea tridentate*) and white bur-sage (*Ambrosia dumosa*).

Site Factors:
Well-drained secondary soils with very low available water holding capacity on slopes, fans, and valleys rather than upland sites with thin residual soils or sites with high soil salinity. Winter

temperatures often below freezing. Intergrades at higher elevations with Shadscale Scrub (36140), or Joshua Tree Woodland (73000), at lower elevations or more osmotic sites with Desert Chenopod Scrub (36100).

Characteristic Species: white bur-sage (*Ambrosia dumosa*), desert senna (*Cassia armata*), Mormon tea (*Ephedra nevadensis*), burrobush (*Hymenoclea salsola*), creosote bush (*Larrea tridentata*), box thorn (*Lycium* spp.).

Distribution: Extensive from the Death Valley region southward across the Mojave Desert to the little San Bernardino Mountains, eastward to northwestern Arizona and southern Nevada. The dominate plant community below 3,000 or 4,000 feet (910 - 1210 m) in this region.

WASH SCRUB

Element Code: (34250)

Description: A low, open community with a scattered to locally dense overstory of microphyllous trees.

Site Factors: Sandy bottoms of wide canyons, incised arroyos of upper bajadas, and sandy, braided, shallow washes of the lower bajadas, usually below about 5,000 feet.

Characteristic Species: catclaw (*Acacia greggii*), alkali saltbush (*Atriplex polycarpa*), desert willow (*Chilopsis linearis*), rabbitbrush (*Chrysothamnus paniculatus*), smoke tree (*Dalea spinosa*), cheesebush (*Hymenoclea salsola*), desert fir (*Peucephyllum schottii*), honey mesquite (*Prosopis glandulosa torreyana*), screwbean mesquite (*P. pubescens*), Desert Almond (*Prunus fasciculata*), Skunk bush (*Rhus trilobata anisophylla*).

Distribution: Washes, arroyos, and canyons of intermittent streams throughout the Mojave Desert region.

BLACKBUSH SCRUB

Element Code: (34300)

Description: Low, often intricately branched shrubs, 0.5 - 1 m tall, with crowns usually not touching and with bare ground between plants. Most growth and flowering occurs in late spring. Dormant in winter (from cold) and probably in summer and fall (from drought).

Site Factors: On dry, well-drained slopes and flats with shallow often calcareous soils of very low water holding capacity, often intergrading with Great Basin Sagebrush Scrub (35210), Joshua Tree Woodland (73000), or Pinyon Juniper Woodlands (72000), but typically at somewhat lower elevations, warmer, and drier.

Characteristic Species: Utah agave (*Agave utahensis*), shadescale (*Artemisia spinescens*), rabbitbrush (*Atriplex confertifolia*), rubberbush (*Chrysothamnus teretifolius*), blackbush (*Coleogyne ramosissima*), Mormon tea (*Ephedra nevadensis*), CA buckwheat (*Eriogonum fasciculatum polifolium*), winterfat (*Eurotia lanata*), big galleta (*Hilaria rigida*), hop-sage

(*Grayia spinosa*), spiny desert olive (*Menodora spinescens),* Mexican bladder sage (*Salazaria mexicana*), Dorr's sage (*Salvia dorrii*), squirreltail (*Sitanion longifolium*), desert globmallow (*Spheralcea ambigua*), turpentine-broom (*Thamnosma Montana*), Joshua tree (*Yucca baccata*).

Distribution: From the Owens Valley region (Inyo and southern Mono Counties to the Mojave Desert (Kern and San Bernardino Counties). Typically between 4000 and 7000 feet.

TAMARISK SCRUB

Element Code: (63810)

Description: A weedy, virtual monoculture of any of several tamarisk (*Tamarix*) species, usually supplanting native vegetation following major disturbance.

Site Factors: Sandy or gravelly braided washes or intermittent streams, often in areas where high evaporation increases the streams saltiness. Tamarisk is a strong phreatophyte and a prolific seeder, attributes which predispose the species to be aggressive competitors in disturbed riparian corridors.

Characteristic Species: big saltbush (*Atriplex lentiformis*), Palmer's coldenia (*Coldenia palmeri*), salt grass (*Distichlis spicata*), arrow-weed (*Pleuchea sericea*), sandbar willow (*Salix exiqua*), tamarix (*Tamarix chinensis*), (*T. ramosissima*).

Distribution: Widely scattered and increasing its range, throughout the drier parts of CA from the rain shadow east of the Inner North Coast Ranges south through the Great Valley to southern CA and across the deserts to Nevada, Arizona and beyond.

SONORAN COTTONWOOD-WILLOW RIPARIAN
Element Code: (61810)

Description: Winter-deciduous, broad-leafed streamside forests to about 60 feet tall, dominated by cottonwood (*Populus fremontii macdougallii*) with dense understories of several *Salix* species. There appear to be virtually no compositional data available for this type.

Site Factors: Deep well-watered, loamy alluvial soils along the near-channel floodplains of perennial desert rivers. This forest intergraded on sites slightly higher above and farther away from the river channels with Mesquite Bosques (61820) before these were cut down for fence posts and fuel.

Characteristic Species: arundo (*Arundo donax*), devil-weed (*Aster spinosus*), big saltbush (*Atriplex lentiformis*), sticky baccharis (*Baccharis glutinosa*), (*B. glutinosa*), (*B. sarothroides)*, common reed (*Phragmites australis*), arrow-weed (*Pleuchea sericea*), cottonwood (*Populus fremontii macdougallii*), willow species *(Salix exiqua*), (*Salix gooddingii gooddingii*), (*Sesbania macrocarpa*), tamarix (*Tamarix* spp).

Distribution: Formerly extensive along the lower Colorado River buy now virtually eliminated by flood control projects, agriculture, or by tamarisk invasion.

FAN PALM OASIS

Element Code: (62300)

Description: Open to dense groves dominated by fan palms (*Washingtonia filifera*) to 75 - 100 feet tall. The understory is sparse in dense groves (where the ground is mulched by fallen fronds) or in more alkaline areas. More open or favorable sites may have a dense understory reminiscent of Mojave or Colorado Riparian Forests (61700, 61800) or Riparian Scrubs (62700, 62800).

Site Factors: Restricted to sites with high water tables in regions with high summer temperatures, mild winters, and little rain. The largest groves are in steep-sided canyons with permanent streams, or adjacent to large springs. Smaller groves occur in canyon bottoms with intermittent surface water, moist canyon sides, or seeps. Oases often have alkaline soils due to high evaporation. Intergrades (often abruptly) wit h Mojave Riparian Forest (61700), Mojave Mixed Scrub (32400), Desert Dry Wash Woodland (62200), or Sonoran Creosote Bush Scrub (33100).

Characteristic Species: southern maidenhair fern (*Adiantum capillus-veneris*), desert columbine (*Aquilegia shockleyi*), squaw waterweed (*Baccharis sergiloides*), netleaf hackberry (*Celtis reticulata*), thistle sp. (*Cirsium nidulum*), stream orchid (*Epipactis gigantean*), smooth horsetail (*Equisetum laevigatum*), velvet ash *(Fraxinus velutina*), alkali goldenbush (*Haplopappus acradenius*), common reed (*Phragmites australis*), CA sycamore (*Platanus racemosa*), arrowweed (*Pleuchea sericea*), western cottonwood (*Populus fremontii*), mesquite (*Prosopis gladulosa*), canyon live oak (*Quercus chrysolepis*), willow Sp. (*Salix exiqua*), (*S. gooddingii*), (*S. lasiolepis*), blue elderberry (*Sambucus mexicana*), alkali dropseed (*Sporobolis airoides*), tamarisk (*Tamarix* spp.), cat-tail (*Typha domingensis*), and nettle (*Urtica dioica*).

Distribution: Scattered in the canyons of the western edge of the Colorado Desert from near Twenty-nine Palms south into Baja CA, usually below 3000 feet.

MOJAVE RIPARIAN FOREST

Element Code: (61700)

Description: A relatively open, broad-leafed, winter-deciduous streamside forest dominated by western cottonwood (*Populus fremontii*), willow (*Salix gooddingii*), and (*S. laevigata*). The open canopy allows a dense shrubby understory of Torrey's saltbush (*Atriplex torreyi*), rabbitbrush (*Chrysothamnus nauseosus*), Woods' rose (*Rosa woodsii*), and sandbar willow (*Salix exiqua*) to prosper. Similar to and intergrading in the lower elevations of Inyo County with Modoc-Great Basin Cottonwood-Willow Riparian Forest (61610).

Site Factors: Flat, fine-grained, subirrigated alluvium along perennial desert rivers.

Characteristic Species: shadescale (*Atriplex confertifolia*), (*A. parryi*), (*A. torreyi*), rabbitbrush (*Chrysothamnus nauseosus*), Russian olive (*Eleagnus angustifoli*a), desert olive (*Forestiera neomexicana*), western cottonwood (*Populus fremontii*) (and var. *macdougallii*), Woods' rose

(*Rosa woodsii*) willow (*Salix exiqua*), (*S. gooddingii*), (*S. Laevigata*), greasewood (*Sarcobatus vermiculatus*), and tamarix (*Tamarix* spp.).

Distribution: Along the larger desert rivers (Owens, Mojave, Colorado) where the vegetation has not been cleared for irrigated agriculture or been dewatered by upstream diversions. Generally below about 4000 feet.

JOSHUA TREE WOODLAND

Element Code: (73000)

Description: An open woodland with Joshua trees (*Yucca brevifolia*) usually as the only arborescent species (to 12 m high) and numerous shrub species between 1 and 4 m tall. Little or no herbaceous understory during most of the year. The dominate species display a diversity of life forms: sclerophyllous evergreen trees and shrubs Yucca (*Yucca* spp.), microphyllous evergreen shrubs juniper (*Juniperus* spp.), semideciduous shrubs buckwheat, horsebrush (*Eriogonum, Tetradymia*), semi-succulents box thorn (*Lycium* spp.), and succulents prickly pear (*Opuntia* spp.). The main growing season is spring, with most growth limited by cold in winter and brought in summer and fall. Many species of ephemeral herbs may germinate following sufficient late fall or winter rains and flower in mid-spring.

Site Factors: Typically on sandy, loamy, or gravelly, well-drained gentle alluvial slopes. Transitional climatologically and biologically between low and high elevation desert regions. Intergrades at lower elevations with Mojave Creosote Bush Scrub (34100) (poorer soil drainage, colder winters from cold air drainage). At higher elevations, intergrades with Mojavean Pinyon-Juniper Woodland (72200) (cooler and moister, but better drained).

Characteristic Species: buckwheat (*Eriogonum fasciculatum*), (spp. *polifolium*), juniper sp. (*Juniperus californica*), (*J. osteosperma*), box thorn (*Lycium* spp.), prickly pear (*Opuntia* spp.), longspine horsebrush (*Tetradymia axillaris*), Joshua tree (*Yucca brevifolia*), Mojave yucca (*Y. schidigera*), banana yucca (*Y. baccata*), Great Basin sagebrush (*Artemisia tridentata*), (*Coreogyme ramossissina*), spiny hopsage (*Grayia spinosa*), juniper (*Juniperus californica*), creosote bush (*Larrea divaricata*), Anderson box thorn (*Lycium andersonii*), stipa (*Stipa speciosa*), Mormon tea (*Ephedra nevadensis*), big galleta (*Hilaria ridida*), spiny menodora (*Menodora spinescens*), branched pencil cholla (*Opuntia ramosissima*), and bladder sage (*Salazaria mexicana*).

Distribution: Desert slopes of the Southern Sierra Nevada, Tehachapi, and Transverse Ranges of Inyo, Kern, LA, San Bernardino, and northern Riverside Counties. Eastward across the Mojave Desert to southwestern Utah, mostly on the slopes of mountains and mesas. Extensive stands in the vicinity of Halloran Summit and Mountain Pass in northeastern San Bernardino County. One extensive stand west of the Sierran Crest on the watershed of the South fork of Kern River. Elevation from 2500 – 5000 feet (760 – 1520 m). Many of the characteristics species (but not Joshua trees (*Yucca brevifolia*) occur southward into San Diego County and northern Baja CA, on the Desert slopes of the Peninsular Ranges.

DESERT MOUNTAIN WHITE FIR

Element Code: (85330)

Description: Fairly low (to 50 feet) open forests dominated by the Rocky Mountain race of white fir (*Abies concolor*) and single leaf pinyon pine (*Pinus monophylla*). Understories are fairly open, shorter than 8 - 10 feet, characterized by several shrubs with affinities to the southern Rocky Mountains.

Site Factors: Steep, mesic, north-facing canons and slopes near mountain ridges and summits, mostly between 6200 and 7500 feet. Occurs on both granite and limestone parent materials.

Characteristic Species: Rocky Mountain maple (*Acer glabrum diffusum*), Coville's service-berry (*Amelanchier utahensis covillei*), sedge (*Carex brevipes*), rabbitbrush (*Chrysothamnus viscodiflorus*), Mormon tea (*Ephedra utridis*), Utah fendlerbush (*Fendlerella utahensis*), Utah fendlerella (*Franxinus anomala*), goldenbush (*Haplopappus cuneatus*), Mojave halimolobos (*Halimolobos diffusa jaegeri*), pink alumroot (*Heuchera rubescens pachypoda*), (*Holodiscus microphyllous*), juniper (*Juniperus osteosperma*), matted prickly-phlox (*Leptodactylon pungens hallii*), canyonlands biscuitroot (*Lomatium parryi*), (*Oryzopsis micrantha*), (*Philadelphus microphyllous stramineus*), singleleaf pinyon (*Pinus monophylla*), current (*Ribes cereum*), (*R. velutinum*), and desert snowberry (*Symphoricarpos longiflorus*).

Distribution: Limited to the higher ranges of the eastern Mojave Desert: Kingston, Clark, and New York Mountains.

CHAPARRAL

MIXED CHAPARRAL

Element Code: (37000)

Combined several chaparral vegetation communities – description from the Southern Mixed Chaparral community (37120)

Description: Similar to Northern Mixed Chaparral (37110) but typically not quite so tall (1.5 – 3 m) or dense. Occasionally with patches of bare soil or forming a mosaic with Venturan Coastal Sage Scrub (32300) or Riversidean Sage Scrub (32700). Divisible into Granitic (37121) and Mafic (37122) subtypes based on substrate, but floristic distinctions between these two subtypes remain unknown.

Site Factors: Similar to Northern Mixed Chaparral (37110) but somewhat lower precipitation and more moderate temperatures. Often adjacent to and on moister sites than Chamise Chaparral (37200). Transitional from the chaparral habitats of California to the coastal semi-desert of Baja CA Norte.

Characteristic Species: chamise (*Adenostoma fasciculatum*), manzanita sp. (*Arctostaphylos gladulosa*), (*A. pennisularis*), Mariposa lily (*Calochortus albus*), ceanothus (*Ceanothus tomentosus olivaceus*), (*C. verrucosus*), mountain mahogany (*Cercocarpus minutiflorus*),

bushrue (*Cneoridium dumosum*), chocolate lily (*Fritillaria biflora*), toyon (*Heteromeles arbutifolia*), honeysuckle (*Lonicera subspicata*), scrub oak (*Quercus dumosa*), laurel sumac (*Malosma laurina*), spiny redberry (*Rhamnus crocea*), lemonadeberry (*Rhus ovata*), gooseberry (*Ribes indecorum*), mission manzanita (*Xylcoccus bicolor*), Mojave yucca (*Yucca schidigera*), and our lord's candle (*Y. whipplei*).

Distribution: Coastal foothills of San Diego County and Northern Baja CA, usually below 3000 feet (910 m).

CHAMISE CHAPARRAL

Element Code: (37200)

Description: A 1 - 3 m tall chaparral overwhelmingly dominated by chamise. Associated species contribute little to cover. Adapted to repeated fires by stump sprouting. Mature stands are densely interwoven with very little herbaceous understory or litter.

Site Factors: Similar to Upper Sonoran Mixed Chaparrals (37100), but on shallower, drier soils or at somewhat lower elevations. Often on xeric slopes and ridges, with adjacent more mesic sites mantled by Upper Sonoran Mixed Chaparrals.

Characteristic Species: chamise (*Adenostoma fasciculatum*), manzanita sp. (*Arctostaphylos glauca*), (*A. tomentosa*), *(A. viscida*), mariposa lily (*Ceanothus cuneatus*), (*C. papillosus*), birch-leaf mountain mahogany (*Cercocarpus betuloides*), hairgrass (*Dendromecon rigida*), CA buckwheat (*Eriogonum fasciculatum*), yerba santa (*Eriodictyon californicum*), deerweed (*Lotus scoparius*), holly-leaf cherry (*Prunus ilicifolia*), scrub oak (*Quercus dumosa*), sugar bush (*Rhus ovata*), lemonadeberry (*R. laurina*), white sage (*Salvia apiana*), black sage (*S. mellifera*), ashy spike-moss (*Selaginella cinerascens*), Mojave yucca (*Yucca schidigera*), and our lord's candle (*Y. Whipplei*).

Distribution: General distribution similar to Northern Mixed Chaparral (37110) but relatively infrequent in the north compared to its abundance in the south. The predominate chaparral type in Ventura, LA, San Bernardino, Riverside, and San Diego Counties.

SCRUB OAK CHAPARRAL

Element Code: (37900)

Description: A dense, evergreen chaparral to 20 feet tall, dominated by scrub oak (*Quercus dumosa*) with considerable birch-leaf mountain mahogany (*Cercocarpus betuloides*).

Site Factors: Somewhat more mesic than many chaparrals, and often occurring at slightly higher elevations (to 5000 feet). These more favorable sites recover from fire more quickly than other chaparrals. Substantial leaf litter accumulates.

Characteristic Species: Del Mar manzanita (*Arctostaphylos glandulosa*), deerbrush (*Ceanothus integerrimus*), CA whitethorn (*C. leucodermis*), blueblossom (*C. thrysiflorus*), birch-leaf mountain mahogany (*Cercocarpus betuloides*), CA ash (*Fraxinus dipetala*), narrow-leaved

bedstraw (*Galium angustifolium*), canyon silktassel (*Garrya veatchii*), toyon (*Heteromeles arbutifolia*),honeysuckle (*Lonicera* spp.), chaparral pea (*Pickeringia montana*), holly-leaved cherry (*Prunus ilicifolia*), scrub oak (*Quercus dumosa*), live oak (*Q. wislizenii frutescens*), spiny redberry (*Rhamnus californica*), holly-leaved redberry (*R. ilicifolia*), poison oak (*Toxicodendron diversilobum*).

Distribution: Western Sierran foothills and North Coast ranges from Tehama County south through the southern California mountains to Baja California.

MANZANITA CHAPARRAL

Element Code: (37B00)

Description: A dense chaparral to 15 feet in which dominance is shared by chamise and various species of Manzanita.

Site Factors: Most stands appear to be disturbance followers, establishing after fire, logging, hydraulic mining, or other disruptions. Young conifers (especially white fir (*Abies concolor*) or ponderosa pine (*Pinus ponderosa*) often can be found beneath the shrub canopy in these seral stands.

Characteristic Species: chamise (*Adenostoma fasciculatum*), Del Mar manzanita (*Arctostaphylos gladulosa*), manzanita (*A. glauca*), big berry manzanita (*A. mariposa*), Indian manzanita (*A. mewukka*), pinemat manzanita (*A. nevadensis*), greenleaf manzanita (*A. patula*), sticky white-leaf manzanita (*A. viscida*), and whitethorn chaparral (*Ceanothus leucodermis*).

Distribution: Widespread in the Sierran foothills and Coast Ranges, usually at elevations higher than Chamise Chaparral (37200), but lower than Montane Chaparral (37500). Somewhat more patchily distributed along the coastal side of the Transverse and Peninsular Ranges, typically between 2500 and 5000 feet.

GRASSLAND

NON-NATIVE

Element Code: (42200)

Description: A dense to sparse cover of annual grasses with flowering culms 0.2 - 0.5 (1.0) m high. Often associated with numerous species of showy-flowered, native annual forbs ("wildflowers"), especially in years of favorable rainfall. Germination occurs with the onset of the late fall rains; growth, flowering, and seed-set occur from winter through spring. With a few exceptions, the plants are dead through the summer-fall dry season, persisting as seeds.

Site Factors: On fine-textured, usually clay soils, moist or even waterlogged during the winter rainy season and very dry during the summer and fall. Oak Woodland (71100) is often adjacent on moister, better drained.

Characteristic Species: slender wild oats (*Avena barbata*), wild oats (*A. fatua*), Brome sp. (*Bromus mollis*), (*B. rigidus*), red brome (*B. rubens*), Fillaree (*Erodium botrys*) red stem fillaree (*E. cicutarium*), CA poppy (*Eschscholtzia californica*), gilia sp. (*Gilia* spp.), tarweed (*Hemizonia* spp.), goldfields (*Lasthenia* spp.), tidytips (*Layia* spp.), Italian ryegrass (*Lolium multiflorum*), lupine sp. (*Lupinus* spp.), pepperweed (*Lepidium dictyotum*), CA burclover (*medicago hispida*), (*Namophila manziesii*), owl's clover (*Orthocarpus* spp.), Phacelia (*Phacelia* spp.), Mediterranean schismus grass (*Schismus arabicua*), fescue sp. (*Vulpia megalura*), and (*V. microstachys*).

Distribution: Valleys and foothills of most of California except for the north coastal and desert regions. Usually below 3000 feet, but reaching 4000 feet in the Tehachapi Mountains and interior San Diego County. Intergrades with Coastal Prairie (41000) along the central coast. Formerly occupied large portions of the Sacramento, San Joaquin, and Salinas Valleys as well as the LA basin, areas that are now agricultural or urban.

NATIVE

Element Code: (42100)

Combined several native vegetation communities – description is a combination of the Valley Needlegrass Grassland (42110) and the Serpentine Bunchgrass (42130) vegetation communities.

Description: Open grassland dominated by perennial bunchgrasses or a mid-height (to 2 feet) grassland dominated by perennial, tussock-forming Needlegrass (*Stipa pulchra*). Cover typically is low, but is markedly dominated by native species (usually much more so than Non-native Grasslands (42200) or Native and introduced annuals occur between the perennials, often actually exceeding the bunchgrasses in cover.

Site Factors: Serpentine Bunchgrass is restricted to serpentine sites. While Valley Needlegrass Grasslands usually on a fine-textured (often clay) soils, moist or even waterlogged during winter, but very dry in summer. Often interdigitates with Oak Woodlands (71100) on moister, better drained sites.

Characteristic Species: blow wives (*Achyrachaena mollis*), bentgrass (*Agoseris heterophylla*), wild oats (*Avena fatua*), goldenstar (*Bloomeria crocea*), brodiaea (*Brodiaea lutea*), ripgut brome (*Bromis diandrus*) brome sp. (*Bromis mollis*), red brome (*Bromis rubens*), serpentine reedgrass (*Calamagrostis ophitidis*), soap plant (*Chlorogalum pommeridianum*), farwell-to-spring (*Clarkia purpurea*), shooting star (*Dodecatheon jefferyi*), CA poppy (*Eschscholtzia californica*), fescue sp. (*Festuca grayii*), tarweed (*Hemizonia luzulaefolia*), trefoil (*Lotus subpinnatus*), oniongrass (*Melica californica*), (*M. imperfecta*), owl's clover (*Orthocarpus attenuatus*), plantain (*Plantago hookeriana californica*), bluegrass (*Poa scabrella*), stipa sp. (*Stipa cernua*), (*S. lepida*), (*S. pulchra*), fescue (*Vulpia microstachys*).

Distribution: Scattered widely through the Coast Ranges, less common in the Sierra Nevada and southern CA mountains.

RIPARIAN

COTTONWOOD WILLOW

Element Code: (61330)

Description: Tall, open, broad-leafed winter-deciduous riparian forests dominated by cottonwood sp. (*Populus fremontii*), (*P. trichocarpa*), and several tree willows. Similar to Central Coast Cottonwood-Sycamore Riparian Forest (61210), although apparently with less coast live oak (*Quercus agrifolia*) or white alder (*Alnus rhombifolia*) (this merits further study). Understories usually are shrubby willows.

Site Factors: Sub-irrigated and frequently overflowed lands along rivers and streams. The dominate species requires moist, bare mineral soil for germination and establishment. This is provided after flood waters recede, leading to uniform-aged stands in this seral type.

Characteristic Species: mugwort (*Artemisia douglasiana*), mule fat (*Baccharis viminea*), wild cucumber (*Marah macrocarpus*), western sycamore (*Platanus racemosa*), western cottonwood (*Populus fremontii*), cottonwood sp. *(P. trichocarpa*), willow sp. (*Salix gooddingii*), (*S. hindsiana*), (*S. lasiandra*), (*S. lasiolepis*), stinging nettle (*Urtica holosericea*).

Distribution: Along perennially wet steam reaches of the Transverse and Peninsular Ranges, from Santa Barbara County south to Baja California north and east to the edge of the deserts.

COAST LIVE OAK

Element Code: (61310)

Description: Open to locally dense evergreen sclerophyllous riparian woodlands dominated by coast live oak (*Quercus agrifolia*). This type appears to be richer in herbs and poorer in understory shrubs than other riparian communities. Similar to and questionably distinct from Central Coast Live Oak Riparian Forest (61220).

Site Factors: Bottomlands and outer floodplains along larger streams, on fin-grained, rich alluvium.

Characteristic Species: bigleaf maple (*Acer macrophyllum*), mugwort (*Artemisia douglasiana*), milkmaids (*Cardamine californica*), spotted hideseed (*Eucrypta chrysanthemifolia*), toyon (*Heteromeles arbutifolia*), keckiella (*Keckiella cordifolia*), honeysuckle (*Lonicera hispidula*), wild cucumber (*Marah macrocarpus*), fiesta flower (*Pholistoma auritum*), coast live oak (*Quercus agrifolia*), skunkbrush (*Rhus trilobata*), CA wild rose (*Rosa californica*), CA blackberry (*Rubus ursinus*), elderberry (*Sambucus Mexicana*), trip vine (*Symphoricarpos mollis*), poison oak (*Toxicodendron diversilobum*), CA laurel (*Umbellularia californica*).

Distribution: Canyons and valleys of coastal southern California, mostly south of Point Conception.

ALDER

Element Code: (61510)

Description: Medium-tall broad-leafed deciduous streamside forests dominated by (*Alnus rhombifolia*), with a shrubby, deciduous understory. Stands in the Coast Ranges have abundant (*Salix* spp.), (*Baccharis viminea*), (*Symphoricarpos* spp.), CA wild rose (*Rosa californica*), and poison oak (*Toxicodendron diversilobum*), while Sierran stands have understories rich in (*Cornus stolonifera*), (*Fraxinus latifolia*), and (*Rhododendron occidentale*). These two types probably should be separated. Riparian alder forests in southern CA need study – these too may be separable.

Site Factors: Best developed along rapidly flowing, well aerated perennial streams with coarse bedloads that reflect high stream power during spring runoff. These streams typically flow in bedrock-constrained, steep sided canyons, so the riparian corridor typically is rather narrow.

Characteristic Species: bigleaf maple (*Acer macrophyllum*), white alder (*Alnus rhombifolia*), mule fat (*Baccharis viminea*), blackfruit dogwood (*Cornus sessilis*), dogwood sp. (*C. stolonifera*), Oregon ash (*Fraxinus latifolia*), western azalea (*Rhododendron occidentale*), willow sp. (*Salix* spp.), and poison oak (*Toxicodendron diversilobum*).

Distribution: Perennial streams in incised canyons of the lower Sierra Nevada, Coast, Transverse, and Peninsular ranges, usually below about 6000 feet.

SYCAMORE-ALDER

Element Code: (62400)

Description: A tall, open, broad-leafed, winter-deciduous streamside woodland dominated by western sycamore (*Platanus racemosa*), (and often also white alder (*Alnus rhombifolia*)). These stands seldom form closed canopy forests, and even may appear as trees scattered in a shrubby thicket of sclerophyllous and deciduous species. Lianas include CA blackberry (*Rubus ursinus*) and poison oak (*Toxicodendron diversilobum*). Distinctions between this type and Sycamore Alluvial Woodland (62100) merit additional study.

Site Factors: Very rocky streambeds subject to seasonally high-intensity flooding. (*Alnus*) increases in abundance on more perennial streams, while (*Platanus*) favors more intermittent hydrographs.

Characteristic Species: bigleaf maple (*Acer macrophyllum*), white alder (*Alnus rhombifolia*), mugwort (*Artemisia douglasiana*), CA spikenard (*Aralia calif*ornica), scouring rush *(Equisetum hyemale*), smilo grass (*Oryzopsis miliacea*), coast live oak (*Quercus agrifolia*), CA blackberry (*Rubus ursinus*), elderberry (*Sambucus Mexicana*), poison oak (*Toxicodendron diversilobum*), CA laurel (*Umbellularia californica*), and stinging nettle (*Urtica holsoericea*).

Distribution: Transverse and Peninsular ranges from Point Conception south into Baja California Norte

MULE FAT SCRUB

Element Code: (63310)

Description: A depauperate, tall herbaceous riparian scrub strongly dominated by mule fat (*Baccharis viminea*). This early seral community is maintained by frequent flooding. Absent this, most stands would succeed to cottonwood- or sycamore-dominated riparian forests or woodlands.

Site Factors: Intermittent stream channels with fairly coarse substrate and moderate depth to the water table. Frequently occurs as a patchy understory in light gaps in Sycamore Alluvial Woodlands (62100), especially under heavy grazing.

Characteristic Species: mule fat (*Baccharis viminea*), sedge sp. (*Carex barbarae*), willow sp. *(Salix exiqua*), (*S. hindsiana*), (*S. lasiolepis*), stinging nettle (*Urtica holosericea*).

Distribution: Widely scattered along intermittent streams and near larger rivers from about Tehama County south through the Coast Ranges and Sierra Nevada to San Diego and northwestern Baja California Norte, usually below about 2000 feet.

WILLOW SCRUB

Element Code: (63320)

Description: Dense, broad-leafed, winter-deciduous riparian thickets dominated by several willow sp. (*Salix*), with scattered emergent western cottonwood (*Populus fremontii*) and (*Plantanus racemosa*). Most stands are too dense to allow much understory development.

Site Factors: Loose, sandy or fine gravelly alluvium deposited near stream channels during flood flows. This early seral type requires repeated flooding to prevent succession to Southern Cottonwood-Sycamore Riparian Forest (61330).

Characteristic Species: arrowweed (*Pluchea sericea*), western cottonwood (*Populus fremontii*), willow sp. (*Salix gooddingii*), (*S. hindsiana*), (*S. laevigata arauipa*), (*S. lasiandra*), (*S. lasiolepis*), (*S. hindsiana*), (*S. leucodendroides*), others?

Distribution: Formerly extensive along the major rivers of coastal southern CA, but now much reduced by urban expansion, flood control, and channel “improvements”.

TAMARISK SCRUB

Element Code: (63810)

Description: A weedy, virtual monoculture of any of several *Tamarix* species, usually supplanting native vegetation following major disturbance.

Site Factors: Sandy or gravelly braided washes or intermittent streams, often in areas where high evaporation increases the streams saltiness. Tamarisk is a strong phreatophyte and a prolific

seeder, attributes which predispose the species to be aggressive competitors in disturbed riparian corridors.

Characteristic Species: big saltbush (*Atriplex lentiformis*), Palmer's coldenia (*Coldenia palmeri*), salt grass (*Distichlis spicata*), arrow-weed (*Pleuchea sericea*), sandbar willow (*Salix exigua*), tamarix (*Tamarix chinensis*), (*T. ramosissima*).

Distribution: Widely scattered and increasing its range, throughout the drier parts of CA from the rain shadow east of the Inner North Coast Ranges south through the Great Valley to southern CA and across the deserts to Nevada, Arizona and beyond.

ARUNDO SCRUB/FOREST

Element Code: (RNF01)

Description: A dense monoculture dominated by arundo also known as the giant reed (*Arundo donax*). This is a very invasive grass that was introduced to CA in the 1880's. This species persist in riparian areas, and reduces or replaces native species

WOODLAND

OAK

Element Code: (71100)

Combined several oak woodland vegetation communities – description from the Coast Live Oak Woodland community, element code – 71160

Description: Very similar to Oregon Oak Woodland (71110) within only one dominate tree, coast live oak (*Quercus agrifolia*), which is evergreen and reaches 10 - 25 m in height. The shrub layer is poorly developed, but may include toyon (*Heteromeles arbutifolia*), gooseberry (*Ribes* spp.), laurel sumac (*Rhus laurina*), or elderberry (*Sambucus mexicana*). The herb component is continuous and dominated by ripgut brome (*Bromis diandrus*) and several other introduced taxa.

Site Factors: Typically on north-facing slopes and shaded ravines in the south and more exposed sites in the north. Intergrades with Coastal Scrub (32000) and Upper Sonoran Mixed Chaparral (37100) on drier sites and with Coast Live Oak Forest (81310) or Mixed Evergreen Forest (81100) on moister sites.

Characteristic Species: CA buckeye (*Aesculus californica*), saniclle (*Sanicula laciniata*), toyon (*Heteromeles arbutifolia*), coast live oak (*Quercus agrifolia*), coffee berry (*Rhamnus californica*), elderberry (*Sambucus mexicana*), poison oak (*Toxicodendron diversilobum*), orange monkey flower (*Diplacus aurantiacus*), pacific pea (*Lathyrus vestitus*), CA sagebrush (*Artemisia californica*), pacific madrone (*Arbutus menziesii*), CA laurel (*Umbellularia californica*), gooseberry (*Ribes* spp.), ripgut brome (*Bromus diandurs*), chickweed (*Stellaria media*), bedstraw (*Galium apartine*), thistle (*Cirsium vulgare*), knotted hedgeparsley (*Torilis nodosa*).

Distribution: Outer south Coast Ranges, and coastal slopes of Transverse and Peninsular Ranges, usually below 4000 feet (1220 m). Intergrades with Blue Oak Woodland (71120) in inner South Coast Ranges and with Engelmann Oak Woodland (71180) in interior southern CA.

CA WALNUT

Element Code: (71210)

Description: Similar to and intergrading with Interior Live Oak Woodland (71150) or Coast Live Oak Woodland (71160), but with a more open tree canopy locally dominated by CA walnut (*Juglans californica*). The open tree canopy allows development of a grassy understory. In most sites, this understory is comprised of introduced winter-active annuals that complete most of their growth cycle before the deciduous walnut (*Juglans*) leafs out in spring.

Site Factors: On relatively moist, fine-textured soils of valley slopes and bottoms, as well as encircling rocky outcrops. These drier, rocky sites often support Venturan (32300) or Riversidean Sage Scrub (32700). Intergrades with Coast Live Oak Woodland (71160) or Coast Live Oak Forest (81310) on more mesic sites, especially in canyons.

Characteristic Species: CA walnut (*Juglans californica*), coast live oak (*Quercus agrifolia),* Engelmann oak (*Quercus engelmannii*), sugar bush (*Rhus ovata*), skunkbrush (*R. trilobata*), red brome (Bromus rubens), horehound (*Marrubium vulgare*).

Distribution: South side of San Gabriel Mountains to the Santa Ana Mountains, mostly between 500 and 3000 feet.

PINON/JUNIPER

Element Code: (72000)

Combined several Pinon and/or Juniper vegetation communities – description from the Great Basin Pinon-Juniper Woodland community, element code – 72121

Description: Very similar to Northern Juniper woodland (72110), but lacking the occasional taller trees and having Utah juniper (*Juniperus occidentalis*) and singleleaf pinyon pine (*Pinus monophylla*) as conspicuous canopy components. Shrub and herb species typically are those seen in adjacent non-forested stands of Great basin Scrub (35000 series).

Site Factors: Very similar to Northern Juniper Woodlands (72110) but receiving slightly more moisture. Intergrades at higher elevations with Jeffrey Pine Forest (85100) or Montane Chaparral (37500) in the Sierra Nevada; and with Bristlecone Pine Forest (86400) or Subalpine Sagebrush Scrub (35200) in the White, Inyo, and Panamint Ranges.

Characteristic Species: wheat grass (*Agropyron spicatum*), big sagebrush (*Artemisia tridentata*), curled-leafed mountain-mahogany (*Cercocarpus ledifolius),* Utah juniper (*Juniperus osteosperma*), singleleaf pinyon pine (*Pinus monophylla*), desert bitterbrush (*Purshia glandulosa*), and antelope bush (*P. tridentate*).

Distribution: Desert mountains from the first range east of the Sierra Nevada from Alpine County to Kern County, east through the Basin Ranges of Nevada. Abundant in the White Mountains, Inyo Mountain, and Panamint Range, from 6000 - 9000 feet (1830 - 2745 m). Intergrades in Kern County (on both sides of the Sierran crest) with Mojavean Pinon-Juniper Woodland (72210).

FOREST

KNOBCONE PINE

Element Code: (83210)

Description: A fire-maintained, variable forest dominated by knobcone pine (*Pinus attenuate*) that may reach 25 - 30 m, though usually closer to 15 m tall. Stands usually are even-aged except on relatively "fire-proof", rocky sites. Understories usually are sparse scatters of chaparral shrubs whose composition varies greatly over the type's range.

Site Factors: Shallow, dry, stoney sites, often on serpentine or other magnesium-rich ultramafics that limit effective conifer competition. Adapted to frequent fires by means of very early and abundant production of seeds, which are retained in the closed cones until released by the heat of a fire. Similar to Bishop Pine Forest (83121), but in more interior, hotter and drier localities, where growth is probably more limited by drought in summer. Often associated with Serpentine Chaparral (37600), Chamise Chaparral (37200) or Californian Mixed Chaparral (37110). On better-developed or non-serpentine soils, may intergrade with Broadleaved Evergreen Montane Coniferous forest (84000).

Characteristic Species: chamise (*Adenostoma fasciculatum*), Saskatoon serviceberry (*Amelanchier alnifolia*), Del Mar manzanita (*Arctostaphylos gladulosa*), whitethorn ceanothus (*Ceanothus cordulatus*), wart-stemmed ceanothus (*C. velutinus*), cypress sp. (*Cupressus abramsiana*), bush poppy (*Dendromecon rigi*da), tarweed (*Holodiscus discolor*), knobcone pine (*Pinus attenuate*), Coulter pine (*P. coulteri*), Monterey pine (*P. radiata*), deer oak (*Quercus sadleriana*), huckleberry oak (*Q. vaccinifolia*), interior live oak (*Q. wislizenii*).

Distribution: Abundant in the Siskiyou, Klamath and North Coast Ranges away from the immediate coast, from southwestern Oregon to southern Sonoma and Napa Counties. On Mt. Diablo, Contra Costa County. Abundant in the Santa Cruz Mts. in Santa Cruz and Santa Clara Counties. In the Santa Lucia Mountains of Monterey County near San Luis Obispo. Eastward from the Klamath Mountains across the southern Cascade Range to Modoc County on the west slope of the Sierra Nevada. From Sierra to El Dorado Counties and Mariposa County. Also in the San Bernardino and Santa Ana Mountains in southern CA, and near Ensenada, Baja CA. Elevation usually between 1000 to 5000 feet (300 and 1500 m), occasionally to 6000 feet (1800 m).

COULTER PINE

Element Code: (84140)

Description: An open forest (or more accurately, woodland) of scattered Coulter pine (*Pinus coulteri*) and CA black oak (*Quercus kelloggii*) over shrubs typically associated with Upper Sonoran Mixed Chaparral (37100). Some stands are dense enough to suppress the shrubby layer. Most growth occurs in spring and early summer

Site Factors: Typical on dry, rocky soils of slopes and ridges. Most frequent on south-facing slopes, frequently intermixing there with Californian Mixed Chaparral (37110) or Lower Montane Chaparral (37510). Subject to fairly frequent fires on these sites. In the Coast Ranges intergrades with Coast Range Mixed Conifer Forest (84110), Coast Range Ponderosa Pine Forest (84130), or Mixed Evergreen Forest (81100) on moist sites; Blue Oak Woodland on low-elevation, dry sites; Knobcone Pine Forest (83210) on dry, sterile soils. In southern CA, frequently merges into Sierran Mixed Conifer Forest (84230) at its upper limits. Fire exclusion may be facilitating conversion of some oak woodlands to Coulter pine stands as in the Gabilan Range.

Characteristic Species: bristlecone fir (*Abies bracteata*), Zaca's manzanita (*Arctostaphylos glandulosa*), pringle manzanita (*A. pringlei drupacea*), pointleaf manzanita (*A. pungens*), deerbrush (*Ceanothus integerrimus*), mountain mahogany (*Cercocarpus betuloides*), Coulter pine (*Pinus coulteri*), ponderosa pine (*P. ponderosa*), CA foothill pine (*P. sabiniana*), bigcone Douglas-fir (*Pseudotsuga macrocarpa*), coast live oak (*Quercus agrifolia*), canyon live oak (*Q. chrysolepis*), and CA black oak (*Q. kelloggii*).

Distribution: Widely scattered, through fragmented, throughout the south Coast Ranges from Contra Costa County south into Baja CA. Elevations vary from 2500 - 5000 feet in the north, to 4000 - 6500 feet in the south. Best developed in San Gabriel, San Bernardino, and San Jacinto Mountains.

BIGCONE SPRUCE-CANON OAK

Element Code: (84150)

Description: An open (on steep slopes) to dense (on flats) forest dominated by (*Pseudotsuga macrocarpa*) 50 - 80 feet tall over a dense sub-canopy of (*Quercus chrysolepis*) and a very sparse herb layer. Most stands are fairly small within a chaparral matrix.

Site Factors: Largely on rocky sites with little soil development. Restricted to mesic exposures and canon sides at low elevations (1000 feet), but on mesic exposures and canyon sides at low elevations (1000 feet), but on warmer aspects at upper altitudinal limit (8000 feet). Fires appear to be frequent, though perhaps less intense than in surrounding chaparrals. Mature (*Pseudotsuga*) is capable of trunk-sprouting after fire. Intergrades in canyon bottoms Southern Riparian Forest (62130), with Upper Sonoran Mixed Chaparral (37000) on more xeric sites, and with Coulter Pine Forest (84140) or Sierran Mixed Conifer Forest (84200) at higher elevations.

Characteristic Species: bigleaf maple (*Acer macrophyllum*), incense cedar (*Calocedrus decurrens*), mountain mahogany (*Cercocarpus betuloides*), big cone Douglas fir (*Pseudotsuga macrocarpa*), coast live oak (*Quercus agrifolia*), canyon live oak (*Q. chrysolepis*), gooseberry (*Ribes californicum*), poison oak (*Toxicodendron diversilobum*), CA laurel (*Umbellularia californica*), wild grape (*Vitis girdiana*).

Distribution: Transverse and Peninsular Ranges from the Mt. Pinos region south to near Banner in San Diego County, mostly on coastal (rather than desert-facing) slopes.

WESTSIDE PONDEROSA PINE

Element Code: (84210)

Description: An open, park-like forest of coniferous evergreens to 70 m tall, dominated by ponderosa pine (*Pinus ponderosa*). The understory typically is sparse, consisting of scattered chaparral shrubs and young trees. There is often considerable accumulation of needle litter and pine cones on the ground. Growth occurs mostly from late spring to midsummer and is probably limited by summer and fall drought. Cones mature in the early autumn. All plants are essentially dormant in the winter.

Site Factors: Well-developed in areas with warm, dry summers and cool, moist winters with considerable snow accumulation at the higher elevations. Often on south-facing slopes, except near lower elevational margins. Usually on coarse, well-drained soils; often granite or basaltic, very rarely serpentine. Probably maintained by occasional ground fires. Crown fires may result in temporary replacement of the forest by dense Montane Chaparral (37500). At its lower limits, intergrades with Coast Range Ponderosa Pine Forest (84130) in the North Coast Ranges, with Blue Oak Woodland (71210) on non-rocky soils in the interior North Coast Ranges and Cascade-Sierra foothills, with Coulter Pine Forest (84140) in southern CA, with Knobcone Pine Forest (83210) on rocky, often serpentine soils; with Lower Montane Chaparral (37510) on dry, rocky soils in the Cascades and northern Sierra Nevada; with Californian Mixed Chaparral (37110) in the southern Sierra and extensively in southern CA. Within its elevational range, intergrades with Montane Chaparral (37500) or Mixed Conifer Forest (84230) on moist sites. At its upper limits, intergrades with Sierran Mixed Conifer Forest (85100) on dry slopes.

Characteristic Species: white fir (*Abies concolor*), manzanita sp. (*Arctostaphylos patula*), incense cedar (*Calocedrus decurrens*), deerbrush (*Ceanothus integerrimus*), whitethorn ceanothus (*C. cordulatus*), mountain misery (*Chamaebatia foliosa*), tanoak (*Lithocarpus densiflorus*), knobcone pine (*Pinus attenuata*), Coulter pine (*P. coulteri*), sugar pine (*P. lambertiana*), ponderosa pine (*P. ponderosa*), canyon live oak (*Quercus chrysolepis*), CA black oak (*Q, kelloggii*), coffee berry (*Rhamnus californica*).

Distribution: Higher elevations of the interior North Coast ranges and Siskiyou Mountains. From Lake County to Siskiyou County and northward into Oregon. Abundant on the west side of the Cascade Range and Sierra Nevada from the Siskiyou Mountains to northern Kern County. Also on the coastal side of the eastern San Gabriel Mountains, LA-San Bernardino Counties; the San Bernardino Mountains, San Bernardino County; and the San Jacinto Mountains, Riverside County. Sparingly presenting the San Rafael-San Emigdio Mountains, Santa Barbara-Ventura Counties; Tehachapi Mountains, Kern County/ Palomar and Cuyamaca Ranges, San Diego

County. Elevation from 2000 - 5000 feet (900 -1500 m) in the north and 4500 - 6500 feet (1300 – 2000 m) in the south. The lowest-occurring montane forest type over most of its range.

JEFFREY PINE

Element Code: (85100)

Description: A tall, open forest dominated by Jeffrey pines (*Pinus jeffreyi*), with sparse understories of species drawn from Montane Chaparral (37500) or Sagescrub Scrub (35200). Very similar in aspect to Ponderosa Pine Forest (84210, 84220). Pure stands are best developed on desert-facing slopes.

Site Factors: Dry, cold sites, especially on well-drained slopes, ridges, or cold air accumulation basins. West of the Sierran crest, it intergrades at its lower elevational limit (5000 - 65000 feet) with Montane Chaparral (37500), Coulter Pine Forest (84140) or Westside Ponderosa Pine Forest (84210). East of the Crest it passes to Pinon-Juniper Woodlands (72000), Great Basin Scrub (35000) or Eastside Ponderosa Pine Forest (84220). Passes in more mesic sites or higher elevations (7000 - 9000 feet), into Upper Montane Mixed Conifer Forest (85200) or Subalpine Forest (86000).

Characteristic Species: Great Basin sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysolepsis sempervirens*), Jeffrey pine (*Pinus jeffreyi*), antelope bitterbrush (*Purshia tridentata*), huckleberry oak (*Quercus vaccinifolia*), snowberry (*Symphoricarpus parishii*), prostrates ceanothus (*Ceanothus prostrates*), snowbush ceanothus (*C. velutinus*), whitethorn ceanothus (*C. cordulatus*), greenleaf manzanita (*Arctostaphylos patula*), curled-leaf mountain mahogany (*Cercocarpus ledifolius*), manzanita sp. (*Arctostaphylos nevadensis*).

Distribution: Similar to Sierran Mixed Conifer Forest (84230) but typically at higher elevations and more extensive toward the south and east. Scattered through the higher North Coast Ranges and Klamath Mountains. Abundant from Shasta and Lassen Counties southward through the Sierra Nevada to Kern County. Best developed on the east side of the central Sierra Nevada, especially south of Mono Lake. Relatively abundantly in the higher portions of the Transverse and Peninsular Ranges of southern CA and Baja California, including the Mt. Pinos region, the eastern San Gabriel Mountains, and the Sierra San Pedro Martir. Elevation usually 5500 - 7500 feet (1650 -2700 m) in the north and 6500 - 9000 feet (2000 - 2700 m) in the south. Stands at lower elevations probably are on ultramafic substrates.

JEFFREY PINE-FIR

Element Code: (85210)

Description: Very similar to Sierran Mixed Conifer Forest (84230), but not quite so tall (to 60 m). The understory is open, primarily of scattered Montane Chaparral (37500) and small trees, lacking the mesophytic components of the Sierran Mixed Conifer Forest. Growth is most active in early and midsummer, about the same as in Jeffrey Pine Forest (85100) and a little later than in Sierran Mixed Conifer Forest (84230).

Site Factors: Similar to and probably the high-elevation equivalent of Sierran Mixed Conifer Forest (84230). Similar to Jeffrey Pine Forest (85100) but moister. On well-drained slopes, usually avoiding the driest and moistest sites. Typically occurs above Sierran Mixed Conifer Forest and intergrades broadly with Jeffrey Pine Forest on dry slopes and ridges, with Upper Montane Fir Forest (85300) on moist, north-facing slopes and with Lodgepole Pine Forest (86100) in cold, wet sites and stream valleys. Replaced at its upper limit by Subalpine Coniferous Forest (86000), usually Lodgepole Pine Forest.

Characteristic Species: White fir (*Abies concolor*) mostly in southern CA, (*A. magnifica*) lacking in southern CA, whitethorn ceanothus (*Ceanothus cordulatus*), rabbitbrush (*Chrysolepis sempervirens*), Jeffery pine (*Pinus Jeffreyi*), (*P. monticola*) lacking in southern CA, (*P. murrayana*), huckleberry oak (*Quercus vaccinifolia*).

Distribution: Abundant from Mt. Lassen southward along the west side of the Sierra Nevada to Tulare County. More scattered on the east side of the Sierra Nevada from Lake Tahoe to the Mt. Whitney region and in the higher portions of the North Coast Ranges and Klamath Mountains. Occurs with fewer trees species in the southern Sierra Nevada in Kern County, and the higher portions of the Tehachapi Mountains, the Mt. Pinos region, the eastern San Gabriel Mountains, San Bernardino Mountains, and San Jacinto Mountains. Elevation usually 6000 - 8000 feet (1800 - 2420 m) in the north and 7000 - 9000 feet (2100 - 2700 m) in the south.

WHITE FIR

Element Code: (85320)

Description: Very similar to Sierran White Fire Forest (84240) and Red Fir Forest (85310) but not so tall or dense. Typically consists of nearly pure stands of white fir (*Abies concolor*) which grows to about 30 m tall. The southern CA stands of this species, especially the Mojave Desert disjuncts, show some affinity to the Rocky Mountain form. The understory is sparse, with moderate accumulation of needles litter and downed branches. Growth is most active from early to midsummer, probably limited by drought in late summer and by low temperature.

Site Factors: Similar to Sierran White Fir Forest (84240), but higher, colder and probably drier. Similar to Red Fir Forest (85310) and probably its southern equivalent, but drier. Usually confined to steep, north-facing slopes where snow lingers until late spring. The soil is usually rocky and well drained. Intergrades at its lower elevation limit or on drier sites with Jeffrey Pine-Fir Forest (85210). Replaced at its upper limit by Lodgepole Pine Forest (86100).

Characteristic Species: white fir (*Abies concolor*), rabbitbrush (*Chrysolepis sempervirens*), sugar pine (*Pinus lambertiana*), gooseberry (*Ribes* spp.), snowplant (*Sarcodes sanguinea*), snowberry (*Symphoricarpos* spp).

Distribution: Scattered in the southern Sierra Nevada and the highest parts of the Tehachapi Mountains, Kern County; on Mt. Pinos, Ventura-Kern County line; common in the higher portions of the eastern San Gabriel Mountains, LA and San Bernardino Counties; the San Bernardino Mountains, San Bernardino County and the San Jacinto -Santa Rosa Mountains, Riverside County. Elevation usually 7500 - 9500 feet (2300 -2880 m).

LODGEPOLE PINE

Element Code: (86100)

Description: Typically form dense forests of slender trees up to 40 m tall, often in nearly pure stands of (*Pinus murrayana*). More open stands up to 20 m tall occur on dry sites or near timberline. May form krummholz at timberline. The trees in the moister, denser stands are relatively short-lived, and if the stand has not burned for a long time, fallen trees, branches and needles cover the ground. The understory is normally spars in these dense stands, but low shrubs and perennial herbs occur abundantly in forest openings.
There is much less litter in the drier, more open stands; other tree species occur occasionally and understory plants are scattered throughout the stand. Flowering of most plants is concentrated in the early summer; growth of at least the smaller plants may be limited by drought in late summer. Most plants are dormant from fall through spring.

Site Factors: Typically occurs at elevations with long, snowy winters and cool, dry summers; colder in winter and usually drier than Red Fir Forest (85310). Often best developed in the transitional elevations between the Upper Montane Coniferous Forest (85000) and the true Subalpine Coniferous Forest (86000). At its lower limit it occupies cold, moist sites within the Upper Montane Coniferous Forest; at its upper limits it occupies dry, exposed sites at timberline, especially in the southern Sierra Nevada and in southern CA. Apparently tolerates large variations in soil and moisture factors, but most commonly occurs on rocky, well drained soils. Where is forms dense forests, it is subject to devastation by fire or epidemic outbreaks of Lodgepole Pine Needle Miner (*Coleothechnites milleri*). Reseeding is relatively rapid following fires, and Lodgepole Pine Forest is often successional in areas that are eventually dominated by other species. However, this fire succession is more universal in the moister forests of the Cascades and northern Rockies.

Characteristic Species: purple mountainheath (*Phyllodoce breweri*), Sierra lodgepole pine (*Pinus contorta murrayana*), quaking aspen (*Populus tremuloides*), cinquefoil (*Potentilla breweri*), wintergreen (*Pyrola* spp.), mountain hemlock (*Tsuga martensiana* from Yosemite North), blueberry (*Vaccinium* spp).

Distribution: Scattered and poorly developed in the Klamath Mountains. More extensive stands occur east of Mt. Shasta on the Modoc Plateau of eastern Siskiyou and Shasta Counties. Scattered in the higher parts of the Warmer Mountains in eastern Modoc County. Abundant in the vicinity of Mt. Lassen. Scattered in the northern most part of the Sierra Nevada, then very abundant from Sierra County to southern Tulare County. Scattered in the highest portions of the San Gabriel Mountains, LA-San Bernardino Counties; abundant on the upper slopes of the San Bernardino Mountains, San Bernardino County; locally abundant near the summit of Mt. San Jacinto, Riverside County; the southern limit is on the summit plateau of the Sierra San Pedro Martir, Baja CA. Extensively developed on the east side of the Cascade Range in Oregon and in the northern Rockies. Elevation 6000 - 8000 feet (1800 - 2420 m) in the north, 9000 - 11000 feet (2700 - 3330 m) in the south. Common as much as 2000 feet (610 m) lower in cold, moist sites such as stream valleys and meadow margins.

SUBALPINE

Element Code: (86500)

Description: Very similar to Whitebark Pine-Lodgepole Forest (86220) and to Foxtail Pine Forest (86300), but dominated by (*Pinus flexilis*) and (*P. murrayana*). The former species is most important on exposed high slopes and ridges, where it may form small pure stands. The trees are rarely over 10 m high even in the lower portions of the forest and form very scattered, low krummholz at timberline. The understory is typically very spars. Growth is concentrated in early summer, probably limited by drought in late summer and by low temperature the rest of the year.

Site Factors: Similar to Whitebark Pine-Lodgepole Pine Forest (86220), but drier and probably not quite so cold. Very similar to Foxtail Pine Forest (86300), but possibly with more variable precipitation and / or faster runoff. Usually occurs on dry, rocky slopes and ridges subject to very strong winds in winter. These winds, rather than other factors associated with high altitude, may determine the upper timberline of this forest. At its lower limit may intergrade with Jeffrey Pine Forest (85100) on south-facing slopes, Southern CA White Fire Forest (84320) on north-facing slopes, or Lodgepole Pine Forest (86100) in various situations. Lodgepole Pine Forest may also occur to timberline. Replaced above timberline by Southern California Alpine Fell-Fields (91130).

Characteristic Species: whitethorn ceanothus (*Ceanothus cordulatus*), rabbitbrush (*Chrysoleris sempervirens*), manzanita (*Arctostaphylos patula platyphylla*), limber pine (*Pinus flexilis*), Sierra lodgepole pine (*P. contorta murrayana*), western juniper (*Juniperus occidentalis australis*), curl-leaf mountain mahogany (*Cercocarpus ledifolius*), white fir (*Abies concolor*), Kern buckwheat (*eriogonum kennedyi alpigenum*).

Distribution: Confined to the highest peaks in southern CA: the upper slopes of Mt. Baden-Powell and San Antonio Mountain in the San Gabriel Mountains; Mt. San Jacinto in the San Jacinto Mountains; most abundant in the vicinity of Mt. San Gorgonio in the San Bernardino Mountains. Outliers of (*Pinus flexilis*) occur on Mt. Pinos, southwestern Kern County and on Toro Peak, Riverside County. Elevation usually 9500 - 11200 feet (2880 - 3390 m) but occasionally as low as 8500 feet (2580 m).

CYPRESS

Element Code: (83230)

Description: A fairly dense, fire-maintained, low forest dominated by either (*Cupressus nevadensis*), (*C. forbesii*), or (*C. stephensonii*). This forest often occurs as isolated groves within a matrix of Chaparral or Pinon Juniper Woodland. Many stands are even-aged due to fire density, and spacing within the stands vary in relation to site factors and fire history.

Site Factors: Similar to but in a drier climate than Northern Interior Cypress Forests (83220), but not usually associated with ultramafic substrates. Most often found on northern exposures.

Characteristic Species: (*Adenostoma fasciculatum*), (*Arctostaphylos gladulosa*), (*Cercocarpus betuloides*), (*Cupressus forbesii*), (*C. nevadensis*), (*C. stephensonii*), (*Eriogonum fasciculatum*), (*Heteromeles arbutifolia*), (*Juniperus californica*), (*Pinus coulteri*), (*P. monophylla*).

Distribution: Southern Sierra Nevada (Kern River watershed, *C. nevadensis*) and Peninsular Ranges south into Baja CA. Elevations vary with species: 1000 - 4500 feet for (*C. forbesii*), 5500 feet for (*C. stephensonii*), and 4000 - 6000 feet for (*C. nevadensis*).

MEADOWS/MARSHES

COASTAL SALT MARSH

Element Code: (52120)

Description: Similar to Northern Coastal Salt Marsh (52110) but with longer growing season and a greater abundance of suffrutescent species in the higher, drier sites. Southern "specialties" include (*Atriplex watsonii*), (*Batis maritima*), (*Lucium californicum*), (*Monanthochloe littoralis*), (*Sueda californica*), and (*Salicornia subterminalis*).

Site Factors: Very similar to Northern Coastal Salt Marsh but with warmer water and air temperatures. (*Frankenia*), (*Suaeda*), and/or (*Salicrnia subterminalis*) often occur along the upper, landward edges of the marshes; (*Salicornia bigelovii*), (*S. virginica*), and (*Batis maritima*) at middle elevations; and (*Spartina*) closest to open water.

Characteristic Species: dwarf coastweed (*Amblyopappus pussilus),* Watson's saltbush (Atri*plex watsonii*), turtleweed (*Batis maritima*), spreading alkaliweed (*Cressa truxillensis*), saltmarsh dodder (*Cuscuta salina*), saltgrass (*Distichlis spicata*), buckthorn (*Frankenia grandifolia*), salt heliotrope (*Heliotropium curassavicum*), marsh jaumea (*Jaumea carnosa*), spiny rush (*Juncus acutus sphaerocarpus*), heliotrope (*Heliotropium limonium californicum*), fig (*Carpobrotus aequilateralis*), icepant (*Mesembryanthemum crystalinum*), slenderleaf iceplant (*M. nodiflorum*), shoregrass (*Monanthochloe littoralis*), dwarf saltwort (*Salicornia bigelovii*), saltwort (*Salicornia* spp.), CA cordgrass (*Spartina foliosa*), wooly seablite (*Suaeda californica*).

Distribution: Bays, lagoons, and estuaries along the coast from about Point Conception to the Mexican border. Intergrades broadly with Northern Coastal Salt Marsh (52110) along the south central coast. Nowhere as extensive as the larger northern marshes, and now considerably reduced by land development activities. Good to fair examples occur at Goleta Slough and near Carpentaria, Santa Barbara Counties; Point Mugu, Ventura County; Upper Newport Bay, Orange County; and several small areas in San Diego County.

BRACKISH MARSH

Element Code: (52200)

Description: Dominated by perennial, emergent, herbaceous monocots to 2 m tall. Cover is often complete and dense. Similar to Salt Marshes (52100) and to Freshwater Marshes (52400) with some plants characteristics of each.

Site Factors: Similar to Coastal Salt Marshes, but brackish from freshwater input. Salinity may vary considerably, and may increase at high tide or during seasons of low freshwater runoff or both. Usually intergrades with Coastal Salt Marshes toward the ocean and occasionally with freshwater Marshes (52400) at the mouths of rivers, especially in the Sacramento-San Joaquin River Delta.

Characteristic Species: Harford's sedge (*Carex harfordii*), slough sedge (*Carex obnupta*), sedge spp. (*Carex* spp), saltgrass (*Distichlis spicata*), rush (*Juncus* spp.), saltwort (*Salicornia* spp.) bogrush (*Scirpus* spp.), cattail (*Typha latifolia*).

Distribution: Usually at the interior edges of coastal bays and estuaries or in coastal lagoons. Adjacent to several Salt Marshes (52110 and 52120). Most extensively developed around Suisun Bay at the mouth of the Sacramento-San Joaquin Delta.

MONTANE FRESHWATER MARSH

Element Code: (52430)

Description: Similar to Coastal and Valley Freshwater Marsh (52430) and to Bogs and Fens (51000), with which many species are shared.

Site Factors: Similar to Coastal and Valley Freshwater Marsh but with a shorter growing season due to cold winters. Less acidic and nutrient-rich than Bogs or Fens.

Characteristic Species: slenderbeak sedge (*Carex athrostachya*), Nebraska sedge (*C. nebracensis*), cottongrass (*Eriophorum*), bogrush (*Scirpus acutus*), (*S. americanus*), others?

Distribution: Widely scattered throughout Montane CA, though less frequent in the Transverse and Peninsular ranges.

MONTANE MEADOW

Element Code: (45100)

Description: Dense growth of sedges and other perennial herbs, usually from 0.5 – 1 m high, but with some taller herbs to 2 m. Main growth period from late spring through summer (summer only at higher elevations); flowering mostly in summer; dormant in winter (from fall through spring at higher elevations). Montane Meadows are subdivided into Wet (45110) and Dry (45120) subtypes. Wet Montane Meadows have soils that remain saturated throughout the year.

Site Factors: On fine-textured, more or less permanently moist or wet soils. May be associated with Bogs (51100), Fens (51200) or Freshwater Swamps (52600) in more extremely waterlogged soils. Adjacent forest or scrub are on coarser, better drained soil, and characterized by young trees encroaching from the margins. On seasonally driers, but still fine-textured Valley and foothill Grasslands (42000) in the North Coast Ranges, Great Basin Grassland (43100) or Great Basin Sagebrush (35200) in northeastern CA. Both Wet and Dry types may occur in a given meadow.

Characteristic Species: small camas (*Camassia guamash*), sedge (*Carex bolanderi*), (*C. rostrata*), (*C. vesicaria*), Sierra shootingstar (*Dodecatheon jeffreyi*), mannagrass (*Glyceria elata*), needle spikerush (*Eleocharis acicularis bella*), cowparsnip (*Heracleum sphondylium* spp. *montanum*), Sierra rush (*Juncus nevadensis*), bigleaf lupine (*Lupinus polyphyllus* ssp. *superbus*), pullup muhly (*Muhlenbergia filiformis*), western brackenfern (*Pteridium aguilinum*), scirpus (*Scrirpus congdonii*), (*S. Criniger*), CA false hellebore (*Veratrum californicum*), (*V. fimbriatum*, in North Coast Ranges).

Distribution: Scattered within the North Coast Coniferous forests (8200), Lower Montane Forests (84000), and Upper Montane Forest (85000) of the North coast ranges, Klamath Ranges, Cascade Ranges, Sierra Nevada, Transverse and Peninsular Ranges. Elevation from 1000 - 7000 feet (300 - 2130 m) in the north to 5000 – 9000 feet (1520 -2740 m) in the south.

PAVEMENT PLAIN

Element Code: (47000)

Description: Herb and grass-dominated openings in Jeffrey Pine Forests (85100) or Pinyon-Juniper Woodland (72300). Total cover usually is low (CA 35%), composed of scattered, short, cushion-forming plants, and dominated by several taxa endemic to the San Bernardino Mountains.

Site Factors: Dense, clay soils armored by a lagg-gravel of quartzite pebbles. Frost action, and wind and water action, prevent large, woody vegetation from establishing.

Characteristic Species: low pussytoes (*Antennaria dimorpha*), Bear Valley sandwort (*Arenaria ursine*), black sagebrush (*Artemisia nova*), Kern buckwheat (*eriogonum kennedyi*), silverhair mousetail (*Ivesia argyrocoma*), (*Poa incurva*).

Distribution: Restricted to about 30 pavements in the area around Big Bear Lake and Holcomb Valley in San Bernardino County. Elevation about 6500 - 7000 feet.

URBAN/INVASIVE

ARUNDO SCRUB/FOREST

Element Code: (RNF01)

Description: A dense monoculter dominated by arundo also known as the giant reed (*Arundo donax*). This is a very invasive grass that was introduced to CA in the 1880's. This species persist in riparian areas, and reduces or replaces native species.

TAMARISK SCRUB

Element Code: (63810)

Description: A weedy, virtual monoculture of any of several Tamarix species, usually supplanting native vegetation following major disturbance.

Site Factors: Sandy or gravelly braided washes or intermittent streams, often in areas where high evaporation increases the streams saltiness. Tamarisk is a strong phreatophyte and a prolific seeder, attributes which predispose the species to be aggressive competitors in disturbed riparian corridors.

Characteristic Species: big saltbush (*Atriplex lentiformis*), Palmer's coldenia (*Coldenia palmeri*), salt grass (*Distichlis spicata*), arrow-weed (*Pleuchea sericea*), sandbar willow (*Salix exigua*), tamarix (*Tamarix chinensis*), (*T. ramosissima*).

Distribution: Widely scattered and increasing its range, throughout the drier parts of CA from the rain shadow east of the Inner North Coast Ranges south through the Great Valley to southern CA and across the deserts to Nevada, Arizona and beyond.

EUCALYPTUS WOODLAND

Element Code: (11100)

Description: eucalyptus is the sole or dominate tree in the canopy; few other species present. Trees are greater than 50 m tall creating a continuous canopy. Shrubs are infrequent and ground layer is sparse.

OTHER NON-NATIVE COMMUNITY

Element Code: (11000)

Description: A dense monoculture dominated by an invasive species other than arundo, tamarix, or eucalyptus.

URBAN/DEVELOPMENT
Element Code: (12000)

AGRICULTURE
Element Code: (18000)

FIELD/PASTURE
Element Code: (18310)

UNVEGETATED
Element Code: (13000)

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Appendix 4. Paper data form.

Turtle: Visual Survey Form

Date							
Project Code		Observer1		Obsv1 Task	observer/recorder/processor	Block	
Survey Type	visual/trapping	Observer2		Obsv2 Task	observer/recorder/processor	Site	
Start Time		Observer3		Obsv3 Task	observer/recorder/processor	Site Photo	Y N
End Time		Observer4		Obsv4 Task	observer/recorder/processor	# photos	

Start Lat		End Lat			
Start Long		End Long		Site	
Start Elev		End Elev		Length	
Datum		Drainage			

Weather:

Temperature	
Condition	clear or few clouds, partly cloudy or variable, cloudy or overcast, fog, mist or drizzle, showers or light rain, heavy rain, sleet or hail, snow, no data
Wind Speed	<1 calm, 2-3 light air movement, 4-7 light breeze, 8-12 gentle breeze, 13-18 moderate breeze, 19-24 fresh breeze, 25-31 strong breeze, 32-38 near gale, >39 gale and above, no data

Start Water Fields:

Water Present	Y/N
Latitude	
Longitude	
Water Temperature	
pH	
Conductivity	
DO % Saturation	
DO mg/L	
Remarks	

Expected Species List:

Pacific Chorus Frog	D		N		X
Western Toad	D		N		X
California Newt	D		N		X
Southweatern Toad	D		N		X
Mosquitofish	D		N		X
Crayfish	D		N		X
California Treefrog	D		N		X
Bullfrog	D		N		X
African Clawed Frog	D		N		X
Western pond turtle	D		N		X
Notes					

All Animals:

	Observ Method	Lat./Long	Type	Species	Age Category	Disposition				Phot	# Photos
1	audio/hand/trap/vis				A,J,Mm,L1,L2,H,Em,U	R	D	E	C	Y/N	
2	audio/hand/trap/vis				A,J,Mm,L1,L2,H,Em,U	R	D	E	C	Y/N	
3	audio/hand/trap/vis				A,J,Mm,L1,L2,H,Em,U	R	D	E	C	Y/N	
4	audio/hand/trap/vis				A,J,Mm,L1,L2,H,Em,U	R	D	E	C	Y/N	
5	audio/hand/trap/vis				A,J,Mm,L1,L2,H,Em,U	R	D	E	C	Y/N	
6	audio/hand/trap/vis				A,J,Mm,L1,L2,H,Em,U	R	D	E	C	Y/N	
7	audio/hand/trap/vis				A,J,Mm,L1,L2,H,Em,U	R	D	E	C	Y/N	
8	audio/hand/trap/vis				A,J,Mm,L1,L2,H,Em,U	R	D	E	C	Y/N	
9	audio/hand/trap/vis				A,J,Mm,L1,L2,H,Em,U	R	D	E	C	Y/N	
10	audio/hand/trap/vis				A,J,Mm,L1,L2,H,Em,U	R	D	E	C	Y/N	

Additional Fields for Non-native Turtles:

	Trap Number (if applicable)	Sex				Length (mm)	Notched		Tissue		
1		M	F	U	X		Y	N	Y	N	U
2		M	F	U	X		Y	N	Y	N	U
3		M	F	U	X		Y	N	Y	N	U
4		M	F	U	X		Y	N	Y	N	U
5		M	F	U	X		Y	N	Y	N	U
6		M	F	U	X		Y	N	Y	N	U
7		M	F	U	X		Y	N	Y	N	U
8		M	F	U	X		Y	N	Y	N	U
9		M	F	U	X		Y	N	Y	N	U
10		M	F	U	X		Y	N	Y	N	U

Additional Fields for Pond Turtles:

	Carapace Width (mm)	Carapace Length (mm)	Plastron Length (mm)	Weight (g)	Shell Damag		Type of Shell Damage	Other ID Markings		
1					Y	N		Y	N	
2					Y	N		Y	N	
3					Y	N		Y	N	
4					Y	N		Y	N	
5					Y	N		Y	N	
6					Y	N		Y	N	
7					Y	N		Y	N	
8					Y	N		Y	N	
9					Y	N		Y	N	
10					Y	N		Y	N	

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Appendix 4. Paper data form (continued).

Exotic Plants:

Plant Species		Size Class	few plants, scattered small patches, large contiguous stands
Plant Species		Size Class	few plants, scattered small patches, large contiguous stands
Plant Species		Size Class	few plants, scattered small patches, large contiguous stands

Landscape:

Channel width/bankfull (m)				
Flood prone width				
Entrenchment Ratio (flood plain wdth / bankfull wdth)				
Basking areas present (sunny rocks, banks, etc.)	Y	N	U	X

Vegetation:

Upland Community Type	
Upland Community	
Riparian Community Type	
Riparian Community	
Dominant Riparian Plant 1	
Dominant Riparian Plant 2	
Dominant Riparian Plant 3	
% Overhead Canopy	0%,1-10%,11-25%,26-50%,51-75%,76-100%
% Submergent Vegetation	0%,1-10%,11-25%,26-50%,51-75%,76-100%
% Emergent Vegetation	0%,1-10%,11-25%,26-50%,51-75%,76-100%

Bank Substrate:

Subst1	clay, dirt, sand, gravel, cobble, boulder, leaf litter, downfall	% Subst1	0%,1-10%,11-25%,26-50%,51-75%,76-100%
Subst2	clay, dirt, sand, gravel, cobble, boulder, leaf litter, downfall	% Subst2	0%,1-10%,11-25%,26-50%,51-75%,76-100%
Subst3	clay, dirt, sand, gravel, cobble, boulder, leaf litter, downfall	% Subst3	0%,1-10%,11-25%,26-50%,51-75%,76-100%

End Water Fields:

Wet Length of Survey	0%, 1-10%, 11-25%, 26-50%, 51-75%, 76-100%				
% shallow pools (<10cm)	0%, 1-10%, 11-25%, 26-50%, 51-75%, 76-100%				
% medium pools (>10cm, < 1m)	0%, 1-10%, 11-25%, 26-50%, 51-75%, 76-100%				
% deep pools (> 1m)	0%, 1-10%, 11-25%, 26-50%, 51-75%, 76-100%				
Plunge pools present	Y	N	U	X	Number of Plunge Pools: 1-5,6-10,11-20,21-30,31-50,51-100
Aquatic refugia present	Y	N	U	X	
Type of Aquatic Refugia: undercuts,tree roots,woody debris,rock crevices,aquatic submerged veg,emergent veg,floating material					

Dominant Aquatic Substrate:

Subst1	clay, dirt, sand, gravel, cobble, boulder, leaf litter, downfall	% Subst1	0%,1-10%,11-25%,26-50%,51-75%,76-100%
Subst2	clay, dirt, sand, gravel, cobble, boulder, leaf litter, downfall	% Subst2	0%,1-10%,11-25%,26-50%,51-75%,76-100%
Subst3	clay, dirt, sand, gravel, cobble, boulder, leaf litter, downfall	% Subst3	0%,1-10%,11-25%,26-50%,51-75%,76-100%

Recent Disturbance:

Disturbance Type	Intensity of Disturbance
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy

Notes:

Wind Speed

ID	mph & indicator
0	<1 calm, smoke rises vertically
1	2-3 light air movement
2	4-7 light breeze
3	8-12 gentle breeze
4	13-18 moderate breeze
5	19-24 fresh breeze
6	25-31 strong breeze
7	32-38 near gale
8	>39 gale and above
9	No data

Sky Code

ID	Description
0	Clear or few clouds
1	Partly cloudy or variable
2	Cloudy or overcast
3	Fog
4	Mist or drizzle
5	Showers or light rain
6	Heavy rain
7	Sleet or hail
8	Snow
9	No data

Plant Size Class

Few Plants
Scattered patches
Large contiguous stands

Animal Age Category

A	Adult
J	Juvenile
Mm	Metamorph
L	Larvae
H	Hatchling
Em	Egg/Egg Mass

Disposition

R	Release
D	Dead
E	Escape
C	Collected

General

Y	Yes
N	No
U	Unknown
X	Not Checked

Expected Species List

D	Detected
N	Surveyed For and Not Detected
X	Not Surveyed For and Not Detected

Appendix 5. Additional references and resources.

Contact Information:
For questions and comments on this protocol (including additional information, modular protocols, and supplementary materials): scompton@usgs.gov, chitchcock@usgs.gov, abacklin@usgs.gov

Additional Reference Material:

Conant, R. and J. T. Collins. 1998. A Field Guide to Reptiles & Amphibians of Eastern & Central North America. Boston, Massachusetts, Houghton Mifflin Company.

Ernst, C. H., J. E. Lovich, and R. W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington and London. 578 pp.

Stebbins, R. C., 2003. A Field Guide to Western Reptiles and Amphibians. Boston, Massachusetts, Houghton Mifflin Company.

Internet Resources:
USGS herp. field guide: http://www.werc.usgs.gov/fieldguide
California's Plants and Animals: http://www.dfg.ca.gov/hcpb/species/species.shtml
eNature Wildlife Field Guide: http://www.enature.com/home/
Western Pond Turtle (*Clemmys marmorata*) Library:
http://www.atlantismagazine.com/bettelheim/marmorata.html

USE OF ARTIFICIAL BASKING SUBSTRATE TO DETECT AND MONITOR PACIFIC POND TURTLES (*Emys marmorata*)

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Many species of turtles, lizards, snakes, and crocodilians are known to bask diurnally. Cagle (1950) suggested that basking in emydid turtles is done in response to the need to thermoregulate, to condition the skin or shell, and to retard epizootic and epiphytic infestations. However, Boyer (1965) determined through field and laboratory study, that the basking response in turtles is driven primarily by the need to thermoregulate. Many semi-aquatic turtles are known to bask on rocks, logs, vegetation mats, and floating debris (Lindeman 1999, Bury and Wolfheim 1973, Boyer 1965, Cagle 1950). Petokas and Alexander (1979) developed a trap that utilized the basking behavior in semi-aquatic turtles in order to facilitate trapping them. Bury and Wolfheim reported on the aggressive interactions of basking Pacific pond turtles (*Emys marmorata*).

Because Pacific pond turtles are declining in number in the state of California, it has become increasingly important to detect them within their habitat (Jennings and Hayes 1994). The purpose of this study was to demonstrate that an artificial basking substrate (basking platform) could be easily constructed and deployed, and with this technique presence of aquatic turtles could be detected and monitored within simple and complex aquatic habitats.

The Los Vaqueros Watershed (watershed), which is part of the upper Kellogg Creek drainage, was located ca. 57 km east of San Francisco, California. Habitat consisted primarily of annual and perennial grassland, oak (*Quercus* spp.) woodlands, riparian woodland, perennial drainages, ephemeral and seasonal wetlands, chaparral, open water, and rock outcrops. Los Vaqueros Reservoir, Kellogg Creek and its tributaries, and 40 perennial stock ponds provided suitable habitat for aquatic turtles. Fifty additional ephemeral stock ponds and wetlands provided refuge for dispersing turtles.

Fourteen rectangular basking platforms were constructed in two different designs (Figure 1). One platform type was made primarily of wood with added floatation (n = 8). The second design was constructed using a foam panel and also included additional floatation, but to a lesser extent (n = 6). Platforms were floated at an oblique angle to the water surface by attaching one or more 60 cm capped polyvinyl chloride tubes (Figure 1).

Baseline surveys (prior to the placement of basking platforms) were conducted throughout the watershed in 1998 for southwestern pond turtles (*E. m. pallida*). Biologists surveyed ponds and creeks on foot by initially scanning the water surface and shoreline using binoculars from a distance. They also walked along the perimeter of ponds and creeks and noted were southwestern pond turtles were observed.

In early spring 1999, basking platforms were placed in nine ponds and two creeks where aquatic emydid turtles were known to occur historically, or where habitat appeared suitable but

where no turtles had previously been found. Platforms were placed in open water and each platform was anchored to the bottom with a length of nylon cord and a concrete weight. Turtles were given 2-7 days to acclimate to the new structures.

Surveys for turtles were made 5-6 times per year for up to five years beginning several days after basking platforms had been deployed. Additional observations of turtles using basking platforms were recorded coincident with mitigation monitoring survey efforts for California red-legged frogs (*Rana draytonii*) in ponds and creeks in the watershed.

Baseline surveys in 1998 indicated southwestern pond turtles occupied two ponds and two creeks in the watershed. A maximum of 11 southwestern pond turtles were observed basking on the bank of one of the two ponds; two southwestern pond turtles were detected in the second pond. Although southwestern pond turtles were observed in the two creeks, no attempt was made to determine their numbers.

Within 2-7 days after deployment of the basking platforms, southwestern pond turtles were detected in eight of the nine ponds and confirmed in both creeks. The maximum number of turtles detected in ponds was 49 (34 turtles in one pond). Moreover, southwestern pond turtles were detected in six ponds where they were not previously known.

Within occupied habitat, observations of basking emydid turtles are relatively common when appropriate basking substrate is present (Reese and Welsh 1998, Bury and Wolfheim 1973, pers. obs). However, complex aquatic habitats (i.e., ponds or creeks with dense emergent and/or riparian vegetation) may reduce or eliminate the ability of an observer to detect turtles. Prior to this study, emergent vegetation in five of the nine ponds where basking platforms were deployed was so dense that those ponds were considered impractical to survey and no southwestern pond turtles were believed to occur. However, after basking platforms were deployed, 3-11 southwestern pond turtles were observed in each of those eight ponds with a highly complex habitat.

In the State of Washington, the northwestern pond turtles (*E. m. marmorata*.) could be detected in lakes and ponds in Washington State by supplying the turtles with basking substrate (Nordby, unpublished report, Stringer, unpublished report). In my study, detection and observations of southwestern pond turtles increased dramatically through the use of basking platforms. Observational studies and surveys of basking southwestern pond turtles at the Los Vaqueros watershed were performed more efficiently after deployment of basking platforms. Timing and temperature relationships of basking (Alvarez, unpublished report), and length of basking time among different age classes (Wilkerson, unpublished report) were both studied using the basking platforms. Further, ongoing monitoring of the presence, distribution, and abundance of this population of southwestern pond turtles is conducted at the Los Vaqueros Watershed using the basking platforms described in this study. These platforms were also deployed in Los Vaqueros Reservoir as a means to attract and monitor non-native species of emydid turtle that may be introduced into the watershed. Species using basking platforms within the reservoir were identified using a spotting scope, and trapping was used to remove non-native species within areas where they were detected.

The basking platform designs described above have proven durable; platforms have lasted up to six years in the field. The designs offered here are inexpensive and easily transportable. Costs for materials used to construct basking platforms ranged from $9.00 to $19.00 depending upon the style selected. This technique can be used as part of a short-term presence-absence survey by deploying the basking platforms at least seven days prior to a survey

and returning to observe animals that may be basking during the day. Behavioral studies of basking turtles can also be facilitated through the use of this technique.

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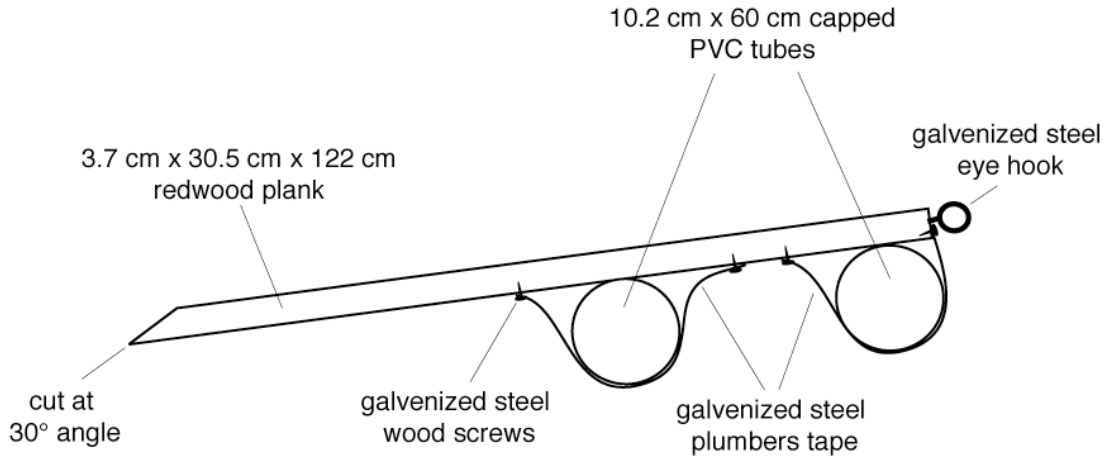
Figure 1. Design and floating position of 2 styles of basking platform used to detect and monitor Pacific pond turtles at the Los Vaqueros Watershed, east Contra Costa County, California. Design B was constructed from a foam panel that was covered by artificial grass (i.e. "astro-turf"). The artificial grass is glued to the top and 4 sides, and is folded over and glued along the bottom edge of the foam panel.

Design A.



Design B.