

SUMMARY: San Joaquin River Recreational Impact Study

California Department of Fish and Wildlife, San Joaquin River Restoration Program

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Between September 2010 and August 2012, researchers from California State University, Fresno surveyed anglers and other recreationists to assess recreation use of Millerton Reservoir and the San Joaquin River between Friant Dam and the confluence with the Merced River. Researchers conducted 1,540 site visits and 3,218 creel surveys during the two-year study. Results show that approximately 190,000 individual visits occurred each year along the San Joaquin River between Friant Dam and the confluence with the Merced River. More than 50 percent of visits were to the Fresno County Recreation Areas at Lost Lake and Skaggs Bridge parks. Organized recreation and education groups also accounted for a high percentage of visits to the river, approximately 40,000 per year or 21 percent of all visits. Upstream of Friant Dam, Millerton Reservoir received approximately 320,000 visitors during 2010, including 19,187 boats launched. Highest angling use was found in Millerton Reservoir and in the San Joaquin River between Friant Dam and Fresno, with angling use peaking in the spring and fall and most anglers coming from the more densely populated areas of Fresno and Madera Counties. Non-angling recreation was also common at parks adjacent to the river, with use peaking in the summer. Results suggest that many visitors value the river for both angling and non-angling recreation uses, and opportunities exist during restoration of the San Joaquin River to limit potential negative impacts to recreation and provide new recreational opportunities.

The California Department of Fish and Wildlife (CDFW), formerly the California Department of Fish and Game, contracted with California State University, Fresno (CSUF) to complete a two-year investigation of recreation use in the San Joaquin River, including Millerton Reservoir and the San Joaquin River between Friant Dam and the confluence with the Merced River.¹ This report summarizes that study. The

¹ Research was completed under CDFW Interagency Agreement #P0940005 between CSUF and CDFW. This report summarizes the results of that research (found in Blumenshine et al., 2012) and presents the results of additional data analysis.

Recreational Impact Study is associated with the San Joaquin River Restoration Program (SJRRP),² a large-scale river restoration effort to restore spring- and fall-run Chinook salmon to the San Joaquin River between Friant Dam and the Merced River confluence. CDFW is one of the implementing agencies of the SJRRP and is committed to support and assist implementation of the SJRRP consistent with CDFW's authorities, resources, and broader regional resources strategies. This support includes funding and overseeing the Recreational Impact Study to assess current and potential future recreation use in the Upper San Joaquin River.

Due to its listing under the California Endangered Species Act (CESA), reintroduction of spring-run Chinook salmon to the San Joaquin River is expected to necessitate modifying fisheries management objectives, including revising fishing regulations in potential spawning and migration habitats and limiting other activities that could impact salmonid life histories and survival. The Recreational Impact Study was proposed because the extent and status of recreational activity, including angling pressure, in the study area was unknown. The objectives of the study were to: (1) Identify existing conditions on the San Joaquin River as they relate to recreational use, (2) Evaluate future recreational impacts to the San Joaquin River Restoration Area, and (3) Recommend potential areas and actions that would mitigate for recreation losses as they relate to Chinook salmon reintroduction and restoration actions.

SITE DESCRIPTION

The study area includes the main stem San Joaquin River between Friant Dam and the confluence with the Merced River (i.e., the SJRRP Restoration Area) and Millerton Lake reservoir behind Friant Dam. For the purposes of this study, this area was separated into three distinct groups of survey sites: Reach 1, Reaches 2-5, and Millerton Lake Reservoir. Sites within Reach 1 of the Restoration Area, which begins at Friant Dam and ends at Gravelly Ford, include Friant Cove (River Mile [RM] 267), Lost Lake Recreation Area (RM 265), Hwy 41 at Wildwood Park (RM 256), Palm and Nees (RM 253), Riverside Golf Course Trail and Riverbottom Park (RM 245), Hwy 99 at Camp Pashayan (RM 243), and Skaggs Bridge Park (RM 234) (**Figure 1**). Lost Lake Recreation Area was closed between December 2011 and February 2012 due to downed trees, and the Riverbottom Park site replaced the Camp Pashayan site after Camp Pashayan was closed to the public early in the study period. Sites within Reaches 2 through 5 of the Restoration area include San Mateo Crossing (RM 212), Mendota Pool (RM 205), Firebaugh River Park at 13th Street (RM 195), Sack Dam (RM 182), West Bear Creek Wildlife Refuge north of Los Banos (RM 143), Hwy 165 bridge (RM 133), and Hwy 140 at Great Valley Grasslands State Park (RM 125) (**Figure 2**). The Hwy 165 site was inaccessible due to roadwork for part of the study period, and the San Mateo site was discontinued due to no observed recreation use. Millerton Reservoir was surveyed at the campgrounds on the Madera County (north) side of the reservoir, at six boat ramps, and on both the Madera and Fresno County (south) shorelines (**Figure 3**).

² The SJRRP is the result of a legal settlement in *NRDC et al. v. Kirk Rodgers et al.* and approval by congress of the San Joaquin River Restoration Act. Although not a party to the law suit, CDFW committed to assist implementation of the Settlement via a Memorandum of Understanding between Settling Parties and the State of California. More information about the SJRRP is available on the program web site, www.restoresjr.net.



Figure 1: Survey sites in Reach 1 of the San Joaquin River, between Friant Dam and Gravelly Ford



Figure 2: Survey sites in Reaches 2-5 of the San Joaquin River, between Gravelly Ford and the Merced River confluence

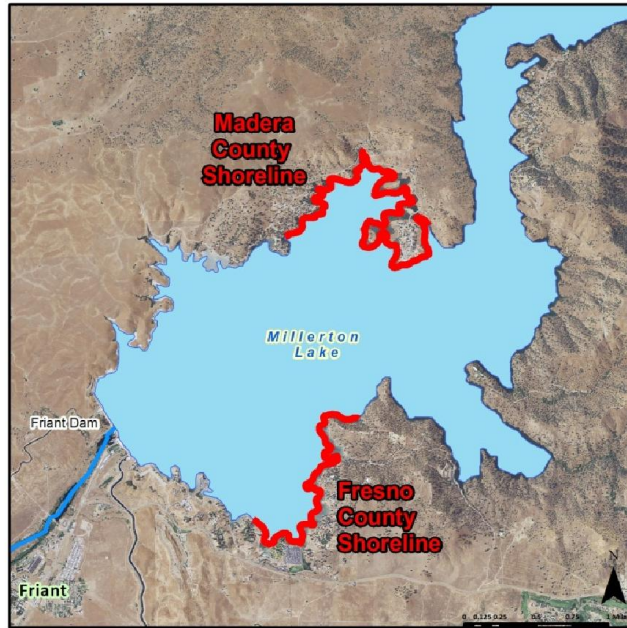


Figure 3: Survey locations on Millerton Lake reservoir

METHODS

Recreational use data were collected using specialized creel surveys designed to record information on both angling and non-angling use in the study area. Supplemental data were provided through attendance records from public access sites and educational or environmental groups. Reach 1 and Millerton Reservoir sites were sampled during the first year of the study (October 2010 through August 2011). Reaches 2-5 sites, as well as the two most heavily used Reach 1 study sites (Friant Cove and Lost Lake Park, as determined during the first year), were sampled during the second year of the study (September 2011 through August 2012). Sampling at a few of the sites in Reaches 2-5 was less frequent due to inaccessibility (e.g., road construction) and/or no observed evidence of recreation use.

Sampling dates and times were chosen using a stratified random sampling method based on work performed by CDFW on the Trinity River (Garrison, 2000). Sampling days were chosen randomly, and weekends and weekdays were considered separately due to most recreation use being focused on Saturdays and Sundays. For each selected sampling day, each of the sites was visited during a randomly chosen survey shift. Weekend survey shifts began at 06:00, 10:00, or 14:00, and weekday shifts began at 07:00 or 16:00. Adjustments were made to account for seasonal daylight fluctuations.

During each site visit, researchers recorded the number of observed anglers, non-anglers, vehicles, and boats. Creel surveys were conducted with all anglers who were accessible and willing to be interviewed. Anglers were asked what time they started fishing, how many fishing trips they typically make each year, if they are subsistence fishing, what species they are targeting, and the number of each species kept and released. Anglers were also asked where else they would fish if they could not fish in the San Joaquin River. Researchers recorded additional information about each angler, including whether they had been surveyed previously, their home ZIP Code, and if they were fishing from a boat or shore.

During the study period, researchers spent 588 days in the field and completed 1,540 separate visits to sites on the San Joaquin River and Millerton Reservoir. A total of 1,843 anglers were surveyed in 3,218 independent creel surveys. Survey data were input into Microsoft Excel spreadsheets, quality checked, and analyzed to characterize recreation use in the study area, including the spatial and temporal distribution of anglers and non-angling recreationists. Angling pressure at each site was defined as the total number of hours fished by all anglers encountered during a site visit (angler-hours), as calculated by subtracting each angler's self-reported start time to the time of the interview.

Supplemental river use data were gathered from private, public, and non-profit organizations. These data include attendance records from Fresno County (Lost Lake Recreation Area and Skaggs Bridge Park), California State Parks (Millerton Lake State Recreation Area), the San Joaquin River Conservancy (Sycamore Island Park), Fort Washington Beach, Sportsmen's Club, and Fresno Unified School District (Scout Island). River use data were also collected from non-profit and educational groups that use the river, including the San Joaquin River Parkway Trust, River Tree Volunteers, the San Joaquin River Stewardship Council, the Fresno Canoe and Kayak Club, and CDFW's Salmonids in the Classroom program.

RESULTS

Based on creel surveys and supplemental data, researchers estimated 190,000 individual visits along the San Joaquin River between Friant Dam and the confluence with the San Joaquin River, and 320,000 visits to Millerton Reservoir, occurred each year during the study period. Of these visits, approximately 100,000 were to Lost Lake and Skaggs Bridge Park, based on a combination of park entrance records and creel survey data to project attendance during times when the gate was not staffed. Reported site visits from government, private, and non-profit groups are summarized in **Table 1**.

The spatial distribution of recreation use was assessed by calculating the average number of angling and non-angling recreationists per site visit for each site (**Figure 4**). Results found most recreation use focused in Millerton Reservoir and Reach 1, but use varied notably between sites. Sites in Reaches 2-5 were used less on average for both angling and non-angling recreation; angling use was observed only at Mendota Pool, Great Valley Grasslands State Park, and Highway 165.

The highest rates of use for angling and non-angling recreation were found at Lost Lake Recreation Area and Skaggs Bridge Park, with 6.7 anglers per site visit and 61.7 recreationists per site visit, respectively. Friant Cove was also used by a large number of anglers, with an average of 3.2 anglers per site visit. Non-angling recreation use was very popular at Millerton Reservoir sites (22.9 to 30.6 recreationists per site visit) and at Lost Lake Recreation Area (35.9 recreationists per site visit). The ratio of anglers to other recreation users also varied among sites. For example, Skaggs Bridge supported high levels of non-angling recreation use and low angling activity, whereas Mendota Pool was predominantly used for fishing.

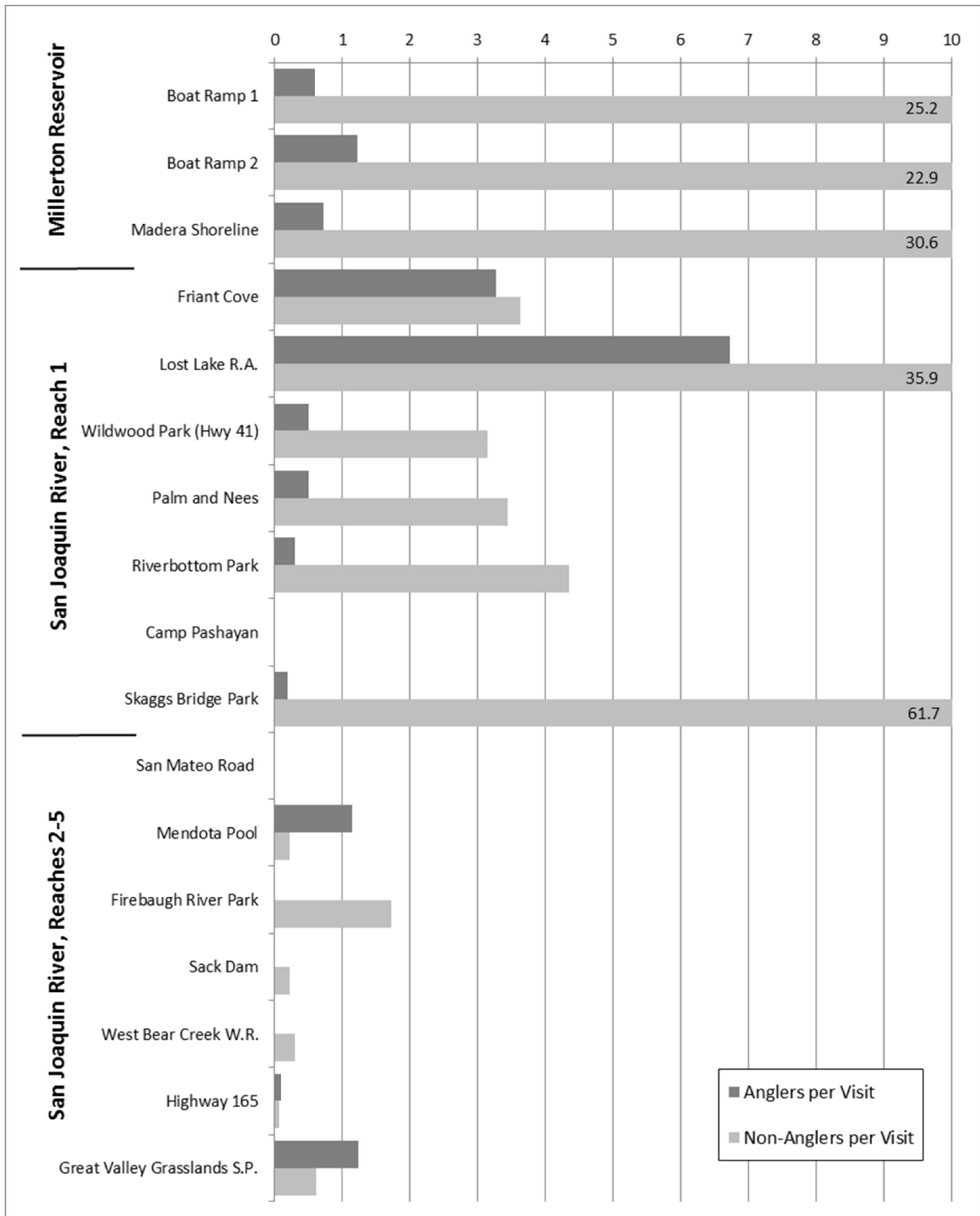


Figure 4: Number of anglers and non-anglers per visit by site

Table 1: Reported attendance at river access sites and by recreation, education, and environmental groups

	Reporting Period	Attendance
Private and Non-profit Groups		
Fort Washington Beach	January - December 2011	12,350
SJR Parkway Trust	January - December 2010	10,142
River Tree Volunteers	January - December 2011	1,951
SJR Stewardship Council	January - December 2010	2,230
Sportsmen's Club	January - December 2010	8,976
Fresno Canoe and Kayak Club	January - December 2010	450
Sycamore Island Park	January - December 2010	3,500
Education Groups		
Scout Island (Fresno Unified)	July 2010 - June 2011	12,734
Salmonids in the Classroom ^a	September 2010 - June 2011	720
State and County Parks		
Lost Lake and Skaggs Bridge Parks ^b	January - December 2010	84,242
Millerton Lake Reservoir ^c	January - December 2010	320,000
Boats Launched at Millerton	January - December 2010	19,187
Persons Camping at Millerton	January - December 2010	49,833

^a Data received directly from CDFW Salmonids in the Classroom program; numbers shown in CSUF report differ.

^b Attendance when gate was staffed. An estimated 72 percent of attendance can be attributed to Lost Lake Park, based on a recorded 21,000 vehicles entering Lost Lake Park and 8,000 entering Skaggs Bridge Park.

^c Total attendance at Millerton Lake Reservoir estimated based on park records and field surveys.

The temporal distribution of recreation use was assessed by calculating the average number of recreationists per site visit by month and the total distribution of anglers and non-anglers by day of week (**Figure 5**). Angling activity was found to be relatively consistent throughout the year, with use peaking in spring and fall. Non-angling recreation was highest during April through October, with peak use in July. Both angling and non-angling recreation were more common on weekends, with 36 (angling) and 30 (non-angling) percent of use occurring on Saturdays and Sundays.

Results of creel surveys found the highest angling pressure in Reach 1 of the river (5.46 angler-hours per site visit reach-wide), with angling pressure ranging from 0.20 angler-hours at Skaggs Bridge Park to 10.6 angler-hours at Lost Lake Recreation Area (**Table 2**). Angling pressure in Millerton Reservoir and Reaches 2-5 was 1.18 and 0.60 angler-hours per site visit, respectively. Anglers in Reach 1 caught an average of 0.34 fish per hour and kept 85 percent of fish caught. In comparison, anglers at Millerton Reservoir sites caught an average of 0.56 fish per hour and kept 11 percent of fish, and anglers in Reaches 2-5 caught an average of 0.13 fish per hour and kept 60 percent of fish.

The species or group of species targeted by anglers varied by survey location, with a large percentage of anglers in Reach 1 targeting trout, and most anglers in Reaches 2-5 targeting warm-water species, such as bass, catfish, or sunfish (**Figure 6**). More than 95 percent of anglers at Friant Cove and Lost Lake Recreation Area sites, the two most popular sites for angling in the survey area, reported they were targeting rainbow trout. At all sites, only 19 anglers reported they were subsistence fishing.

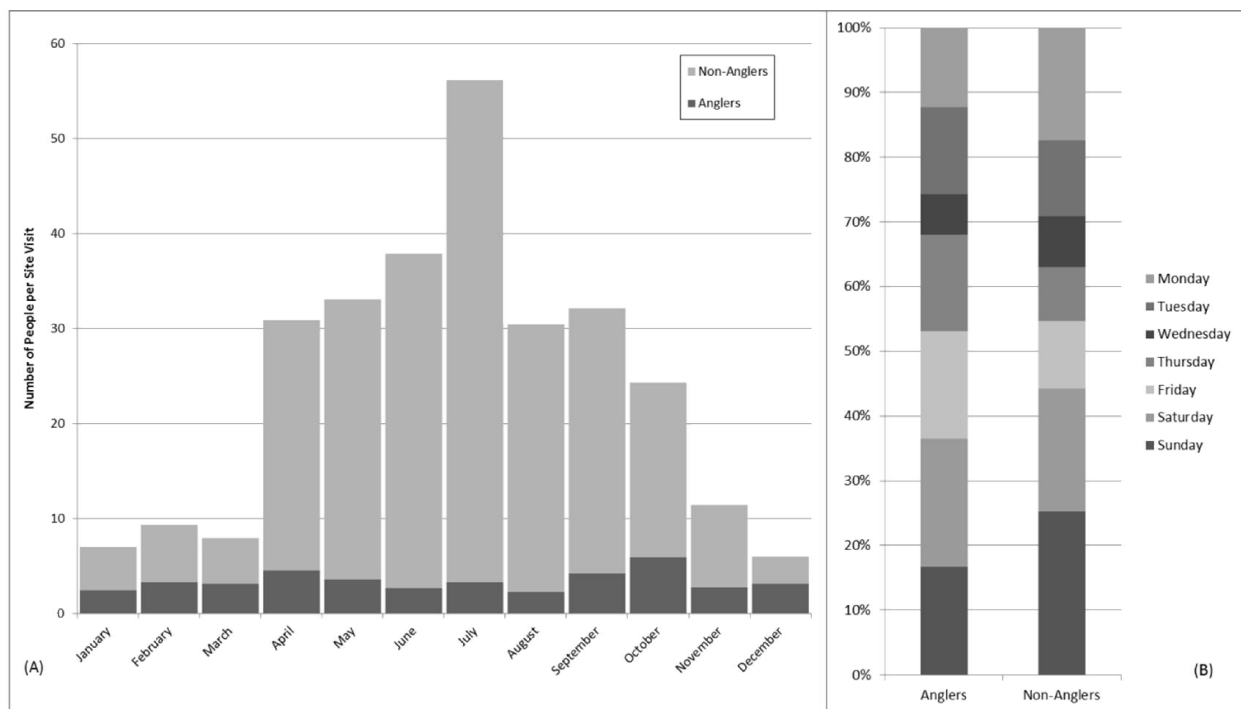


Figure 5: (A) Average number of anglers and non-anglers counted during each month of surveys at all sites; (B) Percentage of anglers and non-anglers counted during surveys by day of week

Table 2: Summary of creel survey results

	Site Visits	Angling Pressure <i>(angler hours per site visit)</i>	Catch Rate <i>(fish per hour)</i>	Fish Kept <i>(percent %)</i>
Millerton Reservoir	373	1.18	0.56	11
Boat Ramp 1 ^a	112	0.46	0.33	12
Boat Ramp 2 ^a	116	3.22	0.60	9.3
Madera Shoreline ^a	145	0.11	0.44	57
San Joaquin River, Reach 1	751	5.46	0.34	85
Friant Cove ^{a,b}	298	4.04	0.30	83
Lost Lake Park ^{a,b}	266	10.6	0.36	86
Palm and Nees ^a	93	0.68	0.08	40
Riverbottom Park ^a	35	0.26	0.33	33
Skaggs Bridge Park ^a	59	0.20	0.67	88
San Joaquin River, Reaches 2-5	198	0.60	0.13	60
Mendota Pool ^b	75	1.01	0.11	50
Highway 165 Bridge ^b	49	0.14	0.14	100
Great Valley Grasslands S.P. ^b	74	0.49	0.17	67

^a Location Surveyed during Year 1 of the study, September 2010 – August 2011

^b Location surveyed during Year 2 of the study, September 2011 – August 2012

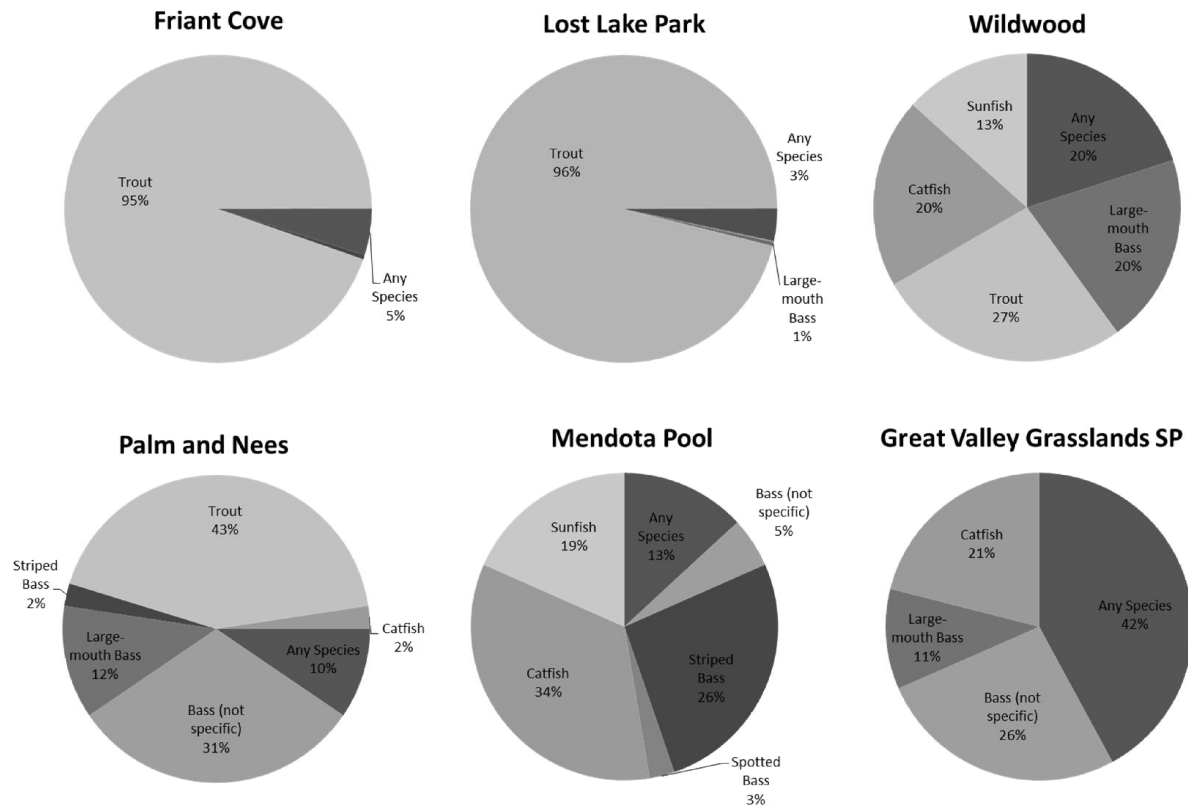


Figure 6: Targeted fish species by San Joaquin River survey site (Note: Results for Skaggs Bridge Park not shown because 100 percent of respondents indicated they were targeting trout)

Based on analysis of the reported ZIP code of interviewed anglers, most anglers live in the more populated areas of Fresno and Madera Counties, such as the cities of Fresno, Madera, and Clovis (**Figure 7**). However, the number of fishing trips made per year was found to depend more on proximity to the river, with anglers living closer to the river and in more rural areas reporting angling more frequently (**Figure 8**).

When asked where they would fish if they could not fish in the San Joaquin River, anglers reported a broad range of alternative locations (**Figure 9**). Overall, 34 sites received more than one response. The most frequent responses from anglers in Reach 1 were Pine Flat Lake (17 percent) and Millerton Lake (12 percent). Anglers in Reaches 2-5 responded that they would fish “the canals” (17 percent) or the Kings River (12 percent). Only 4-5 percent of interviewed anglers said they would only fish in the San Joaquin River.

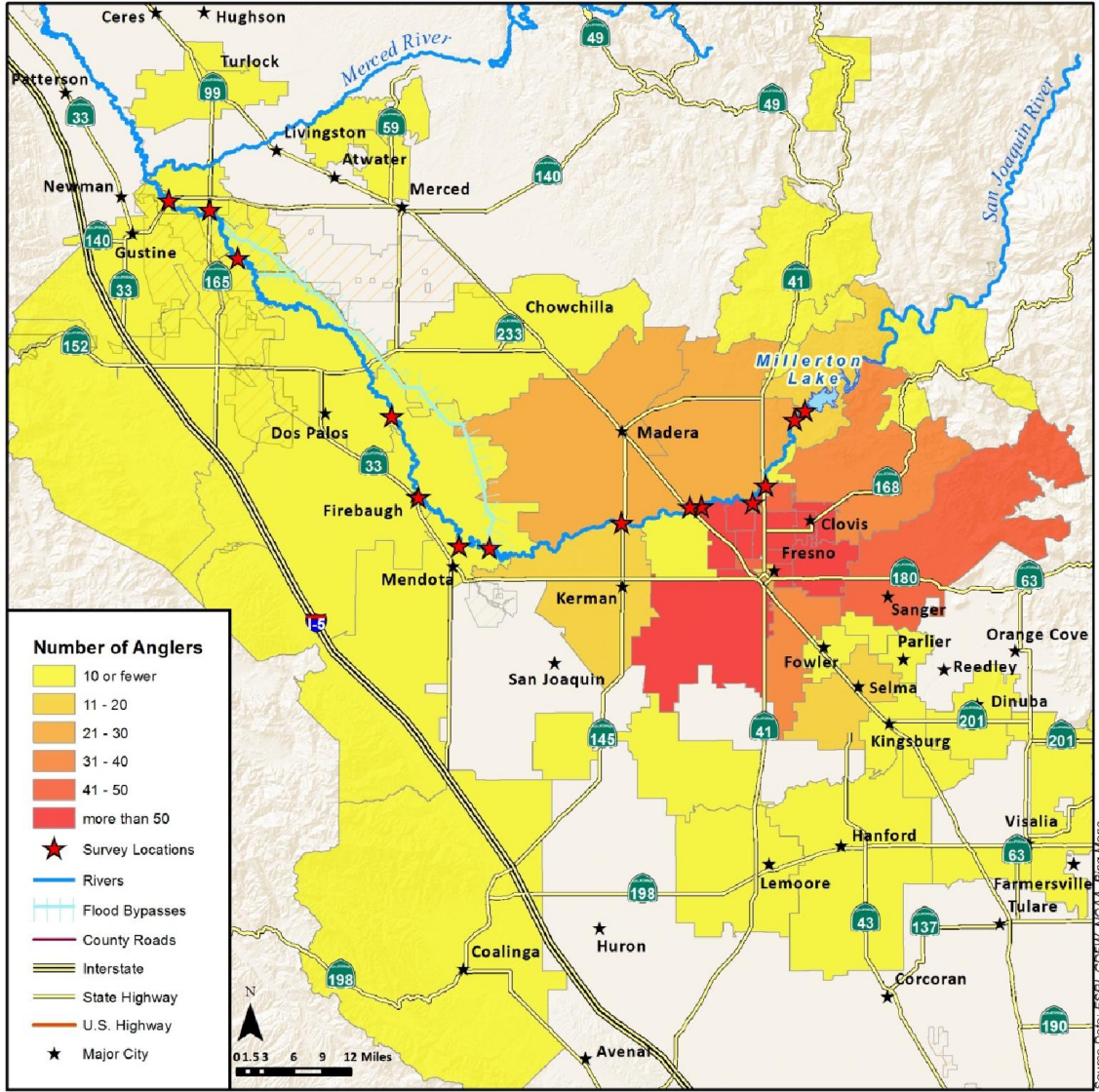


Figure 7: Residence ZIP code of interviewed anglers

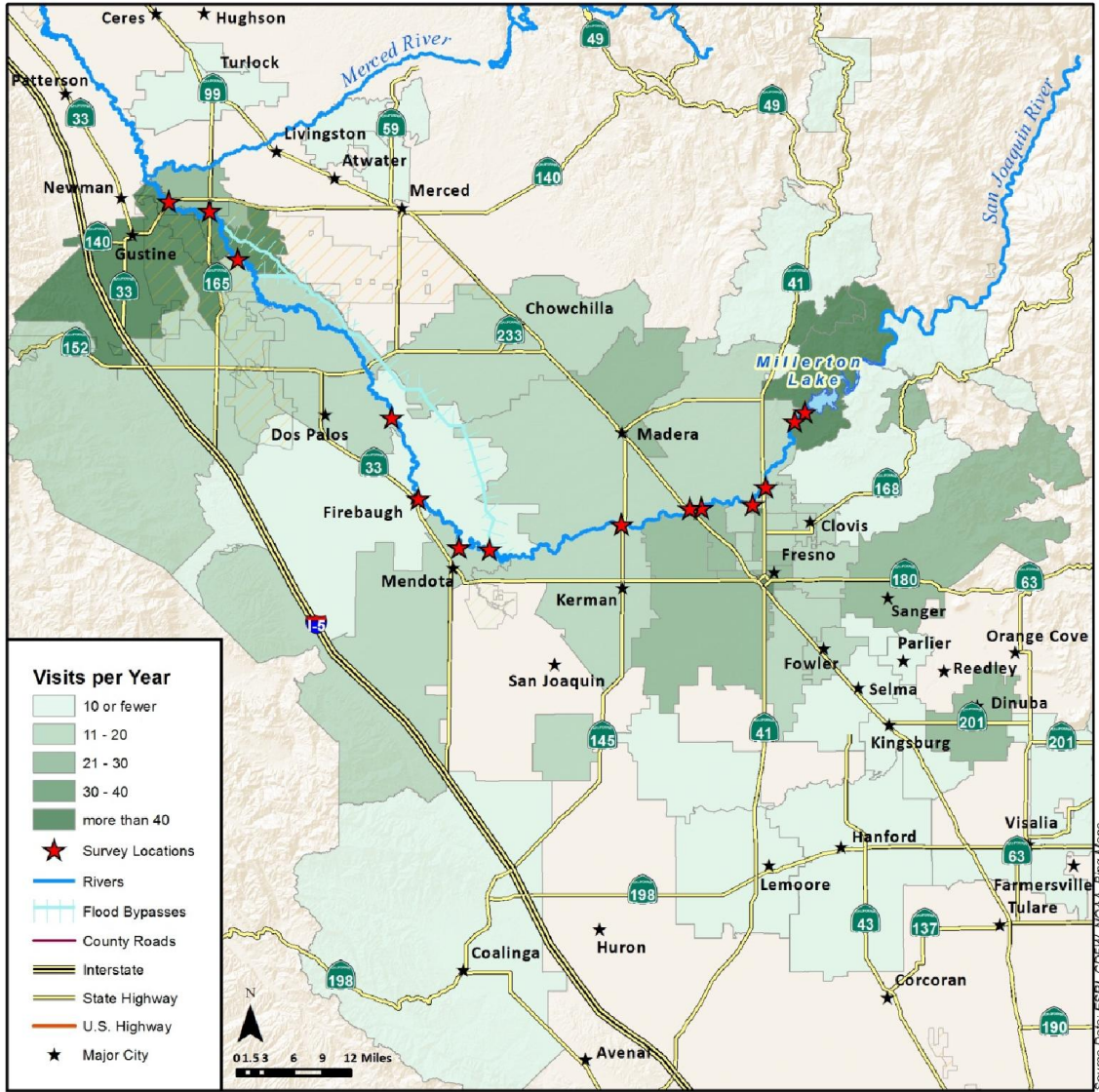


Figure 8: Average reported fishing trips per year by ZIP code

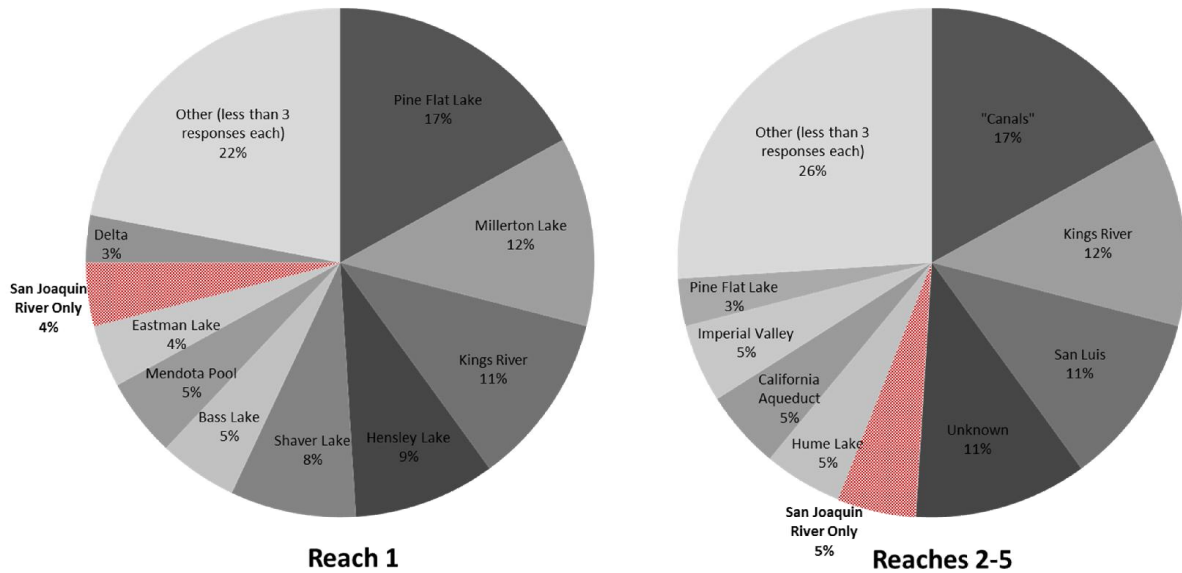


Figure 9: Angler responses when asked where they would fish if they could not fish in the San Joaquin River

DISCUSSION

Based on the results of the Recreational Impact Study, it is clear that the San Joaquin River currently provides tangible and diverse recreational opportunities to a large number of anglers and other recreationists. Future impacts to recreation as a direct or indirect result of the SJRRP, including reintroduction of spring- and fall-run Chinook salmon, may include changes in trout stocking practices, angling regulations, and non-angling recreation opportunities in the Restoration Area. A number of opportunities exist during restoration of the San Joaquin River to limit potential negative impacts to and to provide additional recreational opportunities.

CDFW currently stocks rainbow trout in the San Joaquin River below Friant Dam. This resource is well-utilized by the public, as evidenced by the large number of anglers fishing for trout at Friant Cove and Lost Lake Recreation Area. These trout anglers would be displaced as CDFW ceases stocking in the river to comply with existing policies regarding stocking in anadromous waters. To offset this potential impact, CDFW is pursuing projects to enhance ponds or abandoned gravel mining pits without river connectivity in Reach 1 to support a stocked trout fishery. As stocking ceases in the San Joaquin River, it is proposed that those fish that would have been allocated to the river would instead be planted in these off-channel ponds, with a goal of relocating 100 percent of the current allotment. It is anticipated that three or four off-channel ponds could support the number of trout expected to be stocked, and that fish could be stocked in approximately November through April each year, depending on pond conditions (e.g., water temperature) (CDFW, 2013). Based on study results showing that angling pressure is greatest in Reach 1 and 47 percent of angling activity occurs between November 1 and April 30, it is expected that roughly half of anglers could relocate fishing activities to these ponds.

In order to protect reintroduced populations of Chinook salmon, the California Fish and Game Commission will likely modify fishing regulations in the Restoration Area. Regulation changes may include angling restrictions in Reach 1 during times of adult holding and spawning and gear restrictions in other reaches of the river during periods of adult migration. Salmon fishing would not be allowed in the near term, similar to current restrictions. However, should salmon reintroduction be successful, harvest of non-listed salmon may be supported. CDFW may also increase enforcement of regulations to protect the reintroduced populations. These changes may displace anglers to other locations, such as Pine Flat and Millerton lakes and the Kings River. Study results show that displaced anglers would disperse to a large number of new locations, suggesting that those locations could absorb the relatively small number of additional anglers and would not be significantly impacted by increased pressure on resources.

Based on the size and potential recreational value of the roughly 150 miles between Friant Dam and the Merced River confluence, the San Joaquin River may currently be underutilized, particularly in Reaches 2-5. CSUF researchers suggest that this is a result of limited public access to the river (Blumenshine et al., 2012). The SJRRP creates opportunities to improve and expand recreation on and adjacent to the river, including hiking, biking, horseback riding, boating (including canoeing and kayaking), fishing, hunting camping, picnicking, and wildlife viewing. Instream flows released from Friant provide a perennial stream in reaches that were previously dry most of the time, and restored riparian communities provide habitat for wildlife. Due in part to this, a number of organizations, including CDFW, the San Joaquin River Parkway Trust, and the San Joaquin River Conservancy, are planning recreation enhancements in the river corridor. Planned and potential projects include building hiking and bicycle trails along the river, installing canoe and boat launches, and improving public access to the river. Once salmon are reintroduced to the river, there would be additional opportunities for environmental education, such as salmon viewing areas and interpretive displays.

CDFW plans to investigate these and other options as means of enhancing recreational opportunities in and around the San Joaquin River during and post-restoration. The potential actions described in this discussion may or may not be pursued, depending on the findings of those investigations.

LITERATURE CITED

- Blumenshine, S., J.L. Castro, M.A. Grill, and M. Somma. 2012. San Joaquin River Recreation Study. Completed by California State University, Fresno under Agreement #P0940005 with CDFW. 42 pp. November 30.
- California Department of Fish and Wildlife [CDFW]. 2013. San Joaquin River Restoration Program Salmon Conservation and Research Facility and Related Fisheries Management Actions Project Draft Environmental Impact Report. Expected Public Release October 7.
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