Tuolumne River Whitewater Recreation Use Analysis and Monitoring Evaluation

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Executive Summary

The following presents an analysis of whitewater recreation use data collected on the Wild and Scenic Tuolumne River. Use data was collected on two reaches of the Tuolumne River. The Lower Tuolumne, or Main Tuolumne run, is a 16-mile Class III-IV reach, and the Upper Tuolumne, or Cherry Creek run, is a 9-mile Class V reach. Both of these reaches are classified as "Wild" under the Wild and Scenic Rivers Act and are contained within the jurisdiction of the Groveland Ranger District of the Stanislaus National Forest.

Key Findings

Main Tuolumne

- Annual average total use on the Main Tuolumne is 5,741 boaters a year
- **Total** boater use (combining commercial and private use) on the Main Tuolumne appears to be stable in so far as that there are no statistically significant increasing or decreasing trends, although there is substantial variability from year to year.
- Statistical analysis does indicate a significant decreasing trend in private boater use, and commercial use has been consistently higher then private use since 1992.
- Data collected over the past four years indicates there is ample opportunities for private boaters within the current user day permit limitations.

Upper Tuolumne, Cherry Creek

- Private use on the Cherry Creek Run has been steadily increasing, with use in the year 2000 at 1282 boaters, compared to the period of record average at 680 boaters/year.
- This increase in private use on the Cherry Creek run may reflect a national trend in whitewater boating, with recent advances in boat design and paddling technique enabling more and more boaters to navigate Class V runs.
- Cherry Creek is considered to be the most popular Class V run in the state of California (Holbek, 1998).
- Commercial use has remained very stable over the period of record with average use at 169 boaters/year.

Wild and Scenic River Management Plan and Monitoring

- It does not appear that this monitoring has ever been fully implemented or reported in a manner consistent with the plan (USFS, 1988).
- A regional site visit this year, plus feedback received from commercial outfitters at the annual outfitters meeting, indicates that there are concerns related to campsite condition, and lack of compliance with permit conditions due to the lack of an agency presence at the launch site.
- A Forest Leadership Team (FLT) Review conducted in September of 2000 found that " Forest Service presence at the launch *(at Merals Pool)* has decreased to a point where it is almost non-existent."

Management Recommendations

1) The Forest should attempt to have all their past and future daily use data stored in an electronic data storage system.

2) Funding should be pursued, along with a partnership with the BLM River Ranger program, to ensure consistent monitoring and reporting of standards established in the Tuolumne Wild & Scenic River Management Plan.

3) During times when limited funding is available, launch site monitoring should be targeted during the period of highest estimated demand as indicated in this report. In general, funding should be pursued to support a more active level of river management on the Tuolumne River.

INTRODUCTION

The following presents an analysis of whitewater recreation use data collected on the Wild and Scenic Tuolumne River. The purpose of this analysis is to inform managers at the District, Forest, and Regional level of long-term trends in whitewater recreation use on these popular river segments. This report also includes an evaluation of the monitoring program outlined in the Tuolumne River Wild and Scenic River Management Plan (USFS, 1988).

Use data was collected on two reaches of the Tuolumne River. The Lower Tuolumne, or Main Tuolumne run, is a 16-mile Class III-IV reach, extending from Merals Pool to Ward Ferry Road. The Upper Tuolumne, or Cherry Creek run, is a 9-mile Class V reach, extending from Cherry Oil Road to Merals Pool. Both of these reaches are classified as "Wild" under the Wild and Scenic Rivers Act. They are contained within the jurisdiction of the Groveland Ranger District of the Stanislaus National Forest.

Description of Reaches

The Main Tuolumne offers a classic wilderness river trip characterized by few people, spectacular tributary side hikes, fun and challenging whitewater, and beautiful river beaches, campsites, and scenery. It is often run as a 1-day trip, but is also a popular 2 to 3 day camping trip. Although it is rated as a Class IV run it also contains a well-known Class V rapid named Clavey Falls that adds an additional element of challenge for river runners.

The Cherry Creek section is probably the most popular Class V whitewater run in the California, and is considered to be the initiation run for boaters ready to make the transition from a Class IV to Class V boater (Holbek, 1998). Although the rapids are very challenging, most of them are separated by large pools. This gives ample opportunity for recovery if a boater gets ejected from their boat while negotiating the rapids. The rapids are also characterized by large round granite boulders, which are very forgiving to boaters who get "off line", and are less likely to result in entrapment situations than a steep run characterized by a different geology or downed logs. This section is almost always run as a 1-day trip, although users will often keep floating down the river the next day, and add the Lower Tuolumne to their trip.

Both these runs are classified as "Wild" under the Wild and Scenic Rivers Act, which offers the highest level of protection under this legislation. The Tuolumne Wild and Scenic River Management Plan serves as the guidance document for all the wild and scenic river segments. This documents identifies the management prescriptions and objectives for each reach, indicators, standards, and monitoring procedures, and selected management techniques and management actions.

METHODOLOGY

Private use on both the Main Tuolumne and Cherry Creek run is administered through a private boater permit system. Private use on the Main Tuolumne is restricted through this system to 90 people launching per day. There are currently no limits on private use for the Cherry Creek run. Boaters are required to obtain a permit either through advanced reservation, or the day of their launch. The data from this system is utilized to document use for both of these reaches. The one flaw with this data is that compliance with the permit system has never been formally evaluated. Therefore the accuracy of these use counts, particularly on the Cherry Creek run, is not known with certainty. In the past there has frequently been Forest Service staff at Merals Pool, to ensure compliance with the permit system, although this has not been consistent. In the past two years funding decreases and loss of staff have resulted in a substantially reduced Forest Service presence. On a similar run, the Chattooga River in Georgia, a formal analysis determined that compliance with their self-registration permit system was about 80%.

Commercial use on both of these runs is issued through Special Use permits. There are currently 8 commercial outfitters on the Tuolumne, and they are collectively allowed to launch 26 people a day. Commercial use data is collected through the reporting requirements stipulated in the Special Use permits.

Use data is not stored electronically on the Forest, but rather is stored on hardcopies created annually by the front desk clerk. This data documents the daily number of permits, people, rafts and kayaks, as well as the number of cancellations and no-shows. In addition the Forest maintains hard copies of annual summaries derived from this daily use data.

For the purpose of this analysis, annual use data from both commercial and private use, along with monthly private use totals was input into a spreadsheet. The data was analyzed through graphing in spreadsheet software, and statistical analysis and graphing using SPSS, a statistical software package. Statistical analysis was performed at the 95% confidence interval.

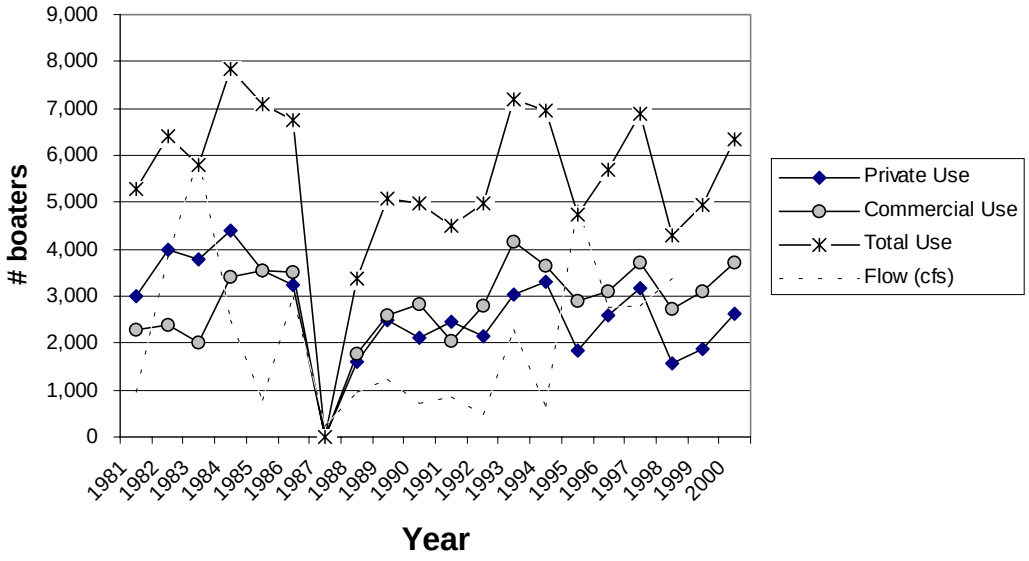
Flow data was derived from US Geological Survey data available on their website. For the purposes of this analysis, flows are presented as the average daily flow at Merals Pool, between May 1 and September 30 for each year.

RESULTS

Trends in Annual Use

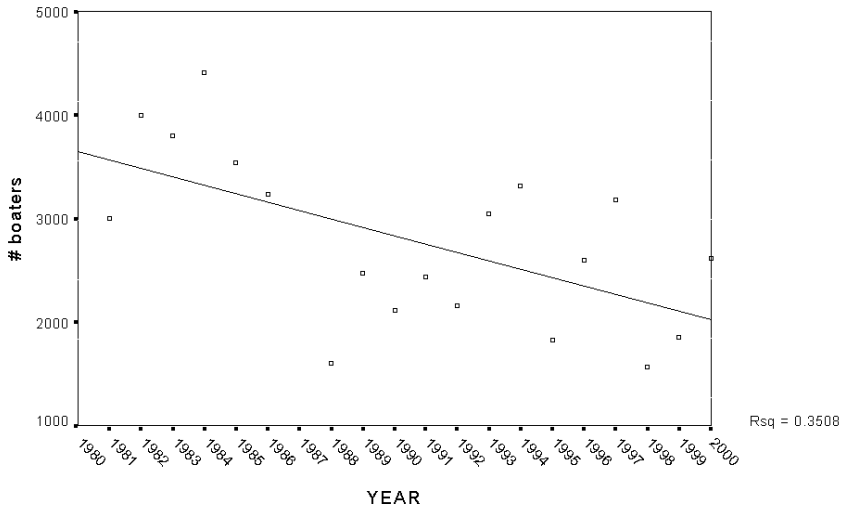
Annual commercial and private use data for both reaches is presented in Table A1 and Table A2 in the back of this report. Average annual use totals for the Main Tuolumne is illustrated in Figure 1A. It should be noted that there was no use in 1987, because extreme drought conditions resulted in virtually no boatable flows in the river.

Figure 1A :Whitewater Boating Use on the Main Tuolumne River



This graph illustrates that <u>total</u> annual boater use on the Main Tuolumne, although variable, appears to be fairly stable with no distinct upward or downward trend. Linear regression analysis also indicates no significant trend in total boater use. ***However regression analysis does indicate a significant decreasing trend in <u>private</u> boater use.***

Figure 1B: Linear Regression Analysis for Private Boater Use On Main Tuolumne

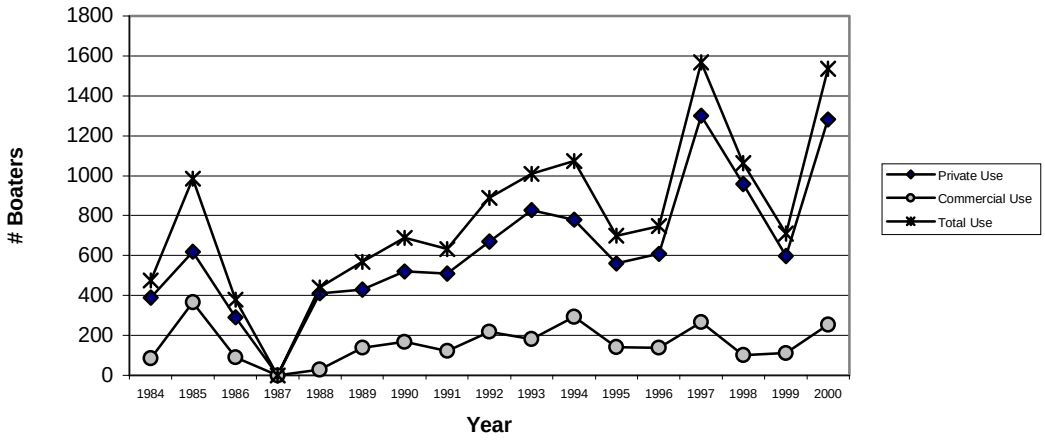


Average total use over the period of record is 5,741 boaters per year and is fairly evenly split between commercial and private use. However, commercial use has been consistently higher then private use since 1992, and has actually been about 30% higher than private use in the past 3 years.

When looking at private use alone, it appears that peak demand occurred from 1982 through 1984, with use numbers never reaching these peaks in subsequent years.

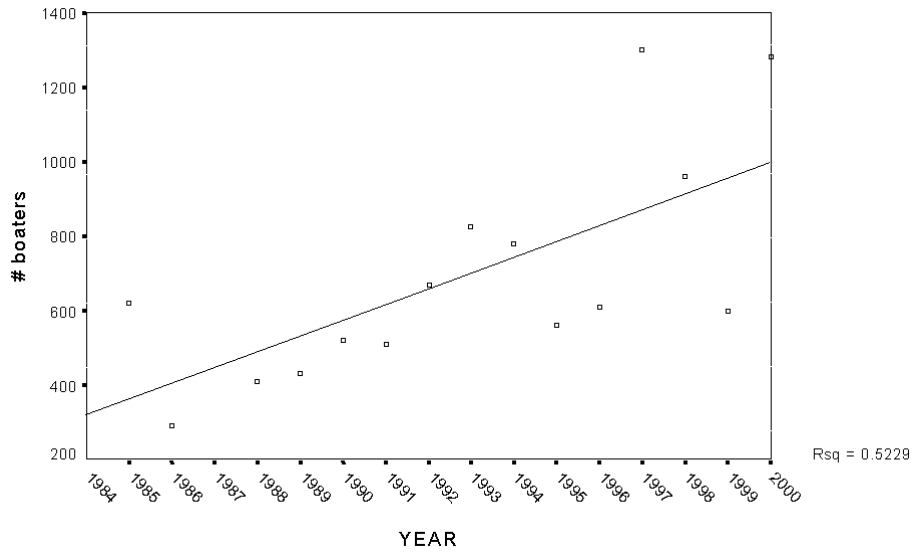
Figure 2A illustrates average annual use totals on the Cherry Creek Run.

Figure 1B: Whitewater Boating Use on Cherry Creek



This graph illustrates that private use on the Cherry Creek Run has been steadily increasing. Again use is variable, so use trends have not always been consistently increasing from year to year. But this is probably due to prohibitively high flow levels, rather then a lack of interest. Cherry Creek has a much narrower range of optimum flows then the Main Tuolumne, and becomes forbidding to all but the most competent class V boater above 2,000 cfs. Commercial use has remained very stable, and is much lower than private use. Average private use over the period of record is 680 boaters a day compared to commercial use at 169 a day. Linear Regression analysis indicates a statistically significant increasing trend in private use at the 95% confidence interval, which is illustrated in Figure 2B.

Figure 2B: Linear Regression Analysis for Private Boater Use On Cherry Creek



Relationship between Flow and Boater Use

Figures 2A and 2B illustrate the relationship between flow and annual whitewater recreation use.

Figure 2A: Comparison between Average Flow and Whitewater Use
Main Tuolumne

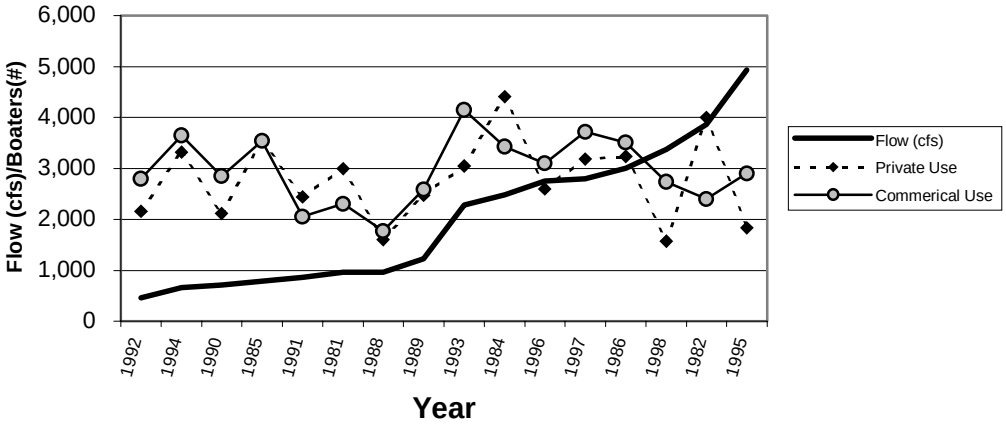
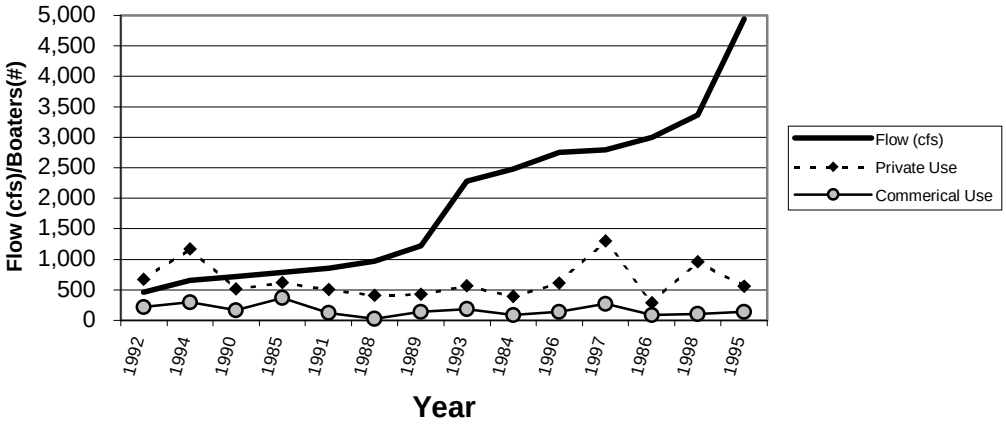


Figure 2B: Comparison between Average Flow and Whitewater Use
Cherry Creek



Statistical analysis does not indicate a significant correlation between seasonal flow averages and private or commercial use, for either run. However Figure 2B does suggest that commercial use begins to drop off during the highest flow years on the Main Tuolumne. Remember that the flow indicated on this chart is the daily average for the season, May 1 through September 30, and therefore does not represent the exact flow at which use may drop. The actual daily flow volume on high demand weekend days undoubtedly does affect use levels but is beyond the scope of this analysis.

Table 2 presents monthly use private boater data along with seasonal flow averages from May through September.

Table 2: Comparison Between Average Annual Flow and Monthly Use Data

Main Tuolumne

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
May	598	783	868	515	841	76	231	321	268	273	283
June	734	786	678	476	812	255	603	757	110	204	500
July	395	582	459	839	678	246	850	901	217	821	813
August	165	286	0	614	471	887	443	850	752	407	635
September	21	0	0	302	111	365	226	303	225	153	384
Flow (cfs)	714	85	462	2,282	657	4,935	2,752	2,799	3,369	NA	NA

Cherry Creek Monthly

May	139	48	14	5	0	0	0	0	10	0	0
June	149	112	176	263	0	0	0	8	0	6	0
July	159	213	186	44	298	0	132	450	0	206	422
August	68	116	288	224	413	297	292	433	395	194	421
September	4	17	0	291	69	263	190	406	559	193	433

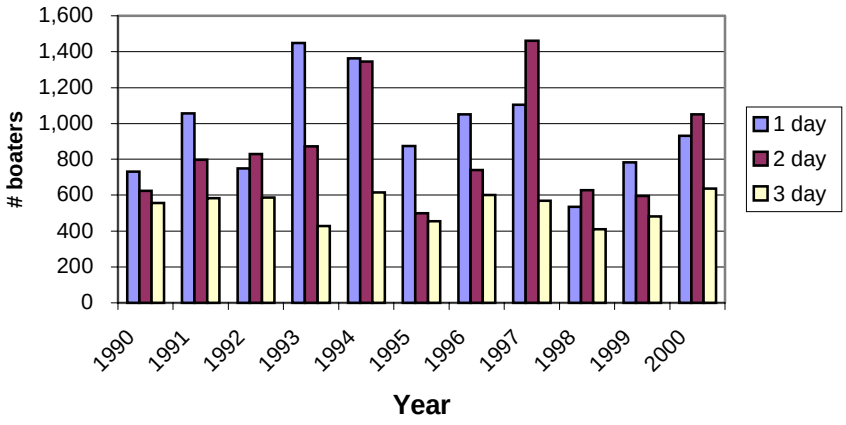
This data illustrates that water year determines the timing of highest monthly private boater demand. For the Main Tuolumne high demand occurs in May thru July for low water years, with demand dropping off in August and September as flows decrease. In high water years, demand is low in May and often June, until flows have dropped to optimum levels, with highest demand occurring in either July and/or August.

For the Cherry Creek run, demand is highest in June, July, and August in low water years. In high water years, demand is highest in July, August, and September.

Trends in Private Boater Trip Length

Figure 3 illustrates private boater trip length data for the Main Tuolumne.

Figure 3: Private Boater Trip Length for Main Tuolumne



This data does not indicate any obvious increasing or decreasing trend in private boater trip length. The most notable trend is that although the number of boaters participating in 1-day, and 2-day trips has varied substantially from year to year, the number of boaters taking 3-day trips has been fairly consistent.

Comparable data for commercial use was not readily available for the preparation of this report. A similar analysis of commercial use data would be useful in future reports.

Daily Private Boater Use

Because daily use data is currently not available in electronic form, the ability to analyze daily use data is limited. However Table 3 presents the results of a simple calculation of the number of days in which high daily private use was observed over the past 4 years.

Table 3: High Use Days (HUDs) for Main Tuolumne and Cherry Creek

Year	#HUDs Main T	#HUDS Cherry Creek	3 highest HUDs Cherry Creek
1997	4	5	41, 43, 45
1998	1	12	54, 71, 79
1999	2	4	32, 36, 48
2000	5	10	47, 51, 64

For the Main Tuolumne high use is defined as a day in which 80 to 90 people were permitted, with 90 people being the daily maximum limit allowed for this run. Table 3 indicates that high use occurs relatively infrequently on the Main Tuolumne, and that for

the majority of the time, adequate user days exist within the permit limitations to accommodate demand.

Since there are currently no use limits for Cherry Creek, I arbitrarily picked high use to be defined as 30 boaters or more. The current encounter standard for Cherry creek is a maximum of 5 other parties encountered per trip. The maximum party size allowed is 26, although the actual party size varies tremendously. Regardless of party size, boaters will tend to break up into groups of about 3 to 6 boats on Class V runs, to avoid overcrowding in rapids.

For the Cherry Creek run, Table 3 indicates that high use is occurring fairly frequently, using this admittedly arbitrary standard of high use at 30 boaters per day. The last column in Table 3 provides the number of boaters on the 3 highest use days for that year. Highest use recorded occurred was on September 14, 1998 at 79 boaters (72 kayaks and 2 rafts).

Monitoring of Indicators and Standards specified in Tuolumne Wild and Scenic River Management Plan

The Tuolumne Wild and Scenic River Management Plan (Plan) identifies indicators, standards, and monitoring procedures for both the Main Tuolumne and Cherry Creek. Indicators include parameters such as number of encounters, congestion at launch sites, campsite condition, and occurrence of litter. This plan also identifies frequency of monitoring ranging from annually for some parameters, and up to two times a year for Cherry Creek, and 4 times a year on the Main Tuolumne, for other parameters. The plan also states that an annual summary will be prepared and made available to inform all interested persons of the status of each indicator.

In 1999 the Forest posted a short condition report on the Forest website, indicating that the Forest Service found good conditions at the campsites, removed small amounts of trash, and that field monitoring indicated that river conditions identified in the Plan are either acceptable or that no changes occurred. A similar report has been prepared in seven out of 11 years since the Plan was completed in 1988.

However there is no reference to monitoring data that could be reviewed by interested parties, no documentation of the frequency of monitoring, and no indication that the social carrying capacity standards were ever monitored. There has also apparently never been any evaluation of the utility of the current social carrying capacity standards related to encounters and congestion. It also does not appear that any monitoring on any kind took place on the Cherry Creek section, or the two other reaches identified in the Plan. In the year 2000, due to additional shortage of staff and funding, no formal monitoring took place on any of the reaches, including the Main Tuolumne.

During August of 2000, the Regional River Recreation Specialist participated in an informal site visit, which included a field trip on the Main Tuolumne with BLM river rangers. This visit along with feedback obtained through commercial outfitters at the annual Tuolumne River Outfitters Meeting (TROA) indicates that there is a growing concern related to the presence of micro-trash, food scraps, and urine odor in campsites.

CONCLUSIONS AND MANAGEMENT RECOMMENDATIONS

The data contained in this report indicates that total boater use (combining both commercial and private use) on the Main Tuolumne appears to be stable in so far as that there are no statistically significant increasing or decreasing trends, although there is substantial variability from year to year. Statistical analysis does indicate a significant decreasing trend in private boater use. Although average annual use over the period of record is almost equal between commercial and private boaters (approximately 2,500 boaters per year for each) commercial use has been consistently higher then private use since 1992, and has actually been about 30 % higher than private use in the past 3 years. Private boater demand peaked between 1982 and 1984 (at approximately 4,000 boaters per year), with use never reaching these levels in subsequent years. Private use in the past 4 years has ranged from 1,500 to 3,100 boaters per year. Analysis of data collected over the past four years indicates that there are ample opportunities for private boaters within the current user day limitations.

The data indicates a different trend for the Cherry Creek run. Private use on the Cherry Creek Run has been steadily increasing, with use in the year 2000 at 1,282 boaters per year compared to the period of record average at 680 per year. Statistical analysis indicates that this trend is significant at the 95% confidence interval. Commercial use has remained very stable over the period of record with average use at 169 boaters per year. This increase in private use on the Cherry Creek run reflects a national trend in whitewater boating, with recent advances in boat design and paddling technique enabling more and more boaters to navigate Class V runs. Cherry Creek is considered to be the most popular Class V run in the state of California.

In an analysis of monitoring efforts related to guidelines established in the Tuolumne River Wild and Scenic River Management Plan, it does not appear that this monitoring has ever been implemented or reported in a manner consistent with the plan. A regional site visit this year, plus feedback received from commercial outfitters at the annual outfitters meeting, indicates that there are concerns related to campsite condition, and lack of compliance with permit conditions due to the lack of an agency presence at the launch site. A Forest Leadership Team (FLT) Review conducted in September of 2000 found that " Forest Service presence at the launch *(at Merals Pool)* has decreased to a point where it is almost non-existent."

Management Recommendations

The following are management recommendations based on the findings contained in this report.

1) **The Forest should attempt to have all their past and future daily use data input and stored in an electronic data storage system**. This should be done for both commercial and private use. This would significantly improve the utility of this data for future analysis. In addition, all future data should be input and stored electronically on spreadsheets, with a backup file system. Hard copies may be maintained for easy reference, but should not be relied upon for primary data storage. A comprehensive analysis of use data should occur every 3 to 5 years.

2) Funding should be pursued, along with a partnership with the BLM River Ranger program, to ensure consistent monitoring and reporting of standards established in the Tuolumne Wild & Scenic River Management Plan. This should include the implementation of visitor surveys to determine whether users are satisfied with their experience, and whether existing carrying capacity standards are relevant and adequate, particularly those related to social carrying capacity.

This survey should also be utilized to evaluate user satisfaction as it relates to current standards on Cherry Creek as it relates to number of encounters and congestion on the river. There are currently no limits on use for the Cherry Creek run, and in general private boaters are very reluctant to support use limits on day use runs, and prefer to manage themselves in this regard. This has been vehemently expressed during the planning process for the South Fork of the American River, which inarguably is the most crowded river in California. However I do feel it would be useful to obtain data from the growing number of boaters utilizing the Cherry Creek run to determine what they feel are preferred use levels, and social carrying capacity standards. The current standard in the Wild and Scenic River Plan for the Cherry Creek run is a maximum of 5 other parties encountered per day, and no more then a 30 minute wait at the launch site. However the allowable party size is 26 persons, which is probably an unrealistically high number for this reach, particularly if each person is in an individual watercraft. A visitor survey would help to validate this standard and determine whether current use levels are acceptable to users. Because Cherry Creek is a Class V run, and the consequences of overcrowding and congestion can result in significant safety concerns, it would be interesting to query the paddling community to determine if, and at what point, they would desire some sort of management controls on use.

And finally it is recommended that some level of use monitoring through actual use counts should be conducted on the Cherry Creek run, to evaluate compliance with the permit system, and therefore relative accuracy of permit use data for this reach.

3) During times when limited funding is available, launch site monitoring should be targeted during the period of highest estimated demand as indicated in this report. This analysis has shown that demand is largely dependent on availability of optimum flows. Therefore by April 15, a determination should be made of water year type, and priority scheduling of launch site patrols at Merals Pool based on the estimated high demand period. Because of the variability in the timing of snowmelt, and other variables, flows should also be monitored throughout the season, to determine when optimum flows are present, and adjust the priority for patrols accordingly. The following is a rough initial schedule for priority patrols, based on water year type.

Dry Years – May, June
Average Year – May, June, July
Wet years – July, August

In general, funding should be pursued to support a more active level of river management on the Tuolumne River.

References

USFS, 1988, Tuolumne Wild and Scenic River Management Plan Revisions, Stanislaus National Forest, Pacific Southwest Region

Holbek, 1998, Lars Holbek and Chuck Stanley, The Best Whitewater in California, 3rd Edition, Watershed Books

Table 1A: Main Tuolumne Whitewater Visitor Use Data

	Private Boater Use						Commercial Use		
Year	1 Day	2 Day	3 Day	Kayak #boats	Raft #boats	Total People	Total People	Total Use	Flow
1981						3,000	2,300	5,300	961
1982						4,000	2,400	6,400	3,863
1983						3,800	2,000	5,800	5,955
1984						4,410	3,426	7,836	2,486
1985						3,540	3,536	7,076	785
1986						3,240	3,510	6,750	3,002
1987						0	0	0	254
1988						1,605	1,770	3,375	966
1989						2,476	2,587	5,063	1,220
1990	732	625	556	481	465	2,120	2,843	4,963	714
1991	1,057	796	584	587	537	2,440	2,050	4,490	854
1992	748	831	585	461	483	2,160	2,801	4,961	462
1993	1,449	870	427	886	608	3,050	4,149	7,199	2,282
1994	1,362	1,345	616	1,028	655	3,320	3,641	6,961	657
1995	875	500	454	603	356	1,829	2,904	4,733	4,935
1996	1,051	741	601	931	495	2,600	3,095	5,695	2,752
1997	1,102	1,460	569	1,079	648	3,180	3,720	6,900	2,799
1998	536	627	409	529	328	1,570	2,730	4,300	3,369
1999	781	596	481	693	342	1,860	3,090	4,950	N/A
2000	930	1,050	635	923	515	2,615	3,714	6,329	N/A
Average	966	858	538	746	494	2,780	2,961	5,741	
Std Dev	275	310	80	229	116	824	669	1,194	
Std Err	83	93	24	69	35	184	154	274	

Table 1B: Upper Tuolumne Whitewater Visitor Use Data (Cherry Creek)

Year	Private Use			Commercial Use	Total
	# Rafts	# Kayaks	# People	# People	People
1984			390	86	476
1985			620	366	986
1986			290	90	380
1987			0	0	0
1988			410	30	440
1989			430	138	568
1990	56	318	520	169	689
1991	50	298	510	123	633
1992	81	343	670	218	888
1993	57	373	565	182	747
1994	76	514	1170	294	1464
1995	25	477	560	141	701
1996	26	511	610	139	749
1997	49	727	1300	267	1567
1998	27	867	960	102	1062
1999	27	529	599	111	710
2000	47	1108	1282	254	1536
Average	44	536	680	169	842
Std Dev	19	276	320	89	352
Std Err	6	83	78	22	88