SACRAMENTO MUNICIPAL UTILITY DISTRICT
UPPER AMERICAN RIVER PROJECT
(FERC NO. 2101)

WHITEWATER BOATING FEASIBILITY TECHNICAL REPORT

Prepared by:

Devine Tarbell & Associates, Inc.
Sacramento, California

The Louis Berger Group
Oakhurst, California

Prepared for:

Sacramento Municipal Utility District
Sacramento, California

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8.8 Whitewater Boating Feasibility Study
(Note: Above Chili Bar)

8.8.1 Pertinent Issue Questions

The Whitewater Boating Study addresses the following recreational resource questions:

- 1a. Is it possible to have consistent and regular releases that support boating in the reach between Slab Creek Dam and Chili Bar Reservoir?
- 2. What are the optimal and minimum boating flows between Slab Creek Dam and Chili Bar, for all crafts, and all classes of boating?
- 3a. What are the effects of potential boating flows on water levels of Project reservoirs?
- 6. What maximum and minimum flow regimes are required for whitewater boating in stream reaches affected by the Project, including upper Rubicon River?
- 16. Can we provide whitewater boating flow phone, website, flow modeling for 1-week intervals, and past releases?
- 19. Can there be a flow management hydrology model (unimpaired hydrograph) built with a whitewater filter that estimates flows assuming UARP/Chili Bar presence and absence?
- 68. What is the need for, and feasibility of, whitewater boating in the reaches below Project dams?

8.8.2 Background

The Whitewater Boating Feasibility Study will be designed to identify and evaluate opportunities for whitewater boating in Project reaches (above Chili Bar) assess how the Project affects these opportunities and recommend any additional studies needed (e.g., Single Flow Feasibility Study or Controlled Flow Study). A separate study plan, *Recreational Flow Study (Below Chili Bar Dam*), addresses the issue questions regarding whitewater boating below Chili Bar Dam.

8.8.3 Study Objectives

The objectives of this study include:

- Identify and describe reaches where there are existing or potential whitewater opportunities
- Quantify how the Project affects these opportunities (i.e., flows, boatable days, season of use, access)
- Characterize whitewater opportunities affected by Project operations based on physical characteristics, existing information and interviews (e.g., gradient, length, access, channel characteristics, flows, reservoir storage and diversion capacity)
- Determine current and future demand for whitewater boating on Project reaches
- Develop a range of possible flows to provide other TWG's before conducting additional studies
- Describe and assess the adequacy and availability of existing flow information
- Recommend additional studies needed for whitewater resources (e.g., Single Flow Feasibility Study or Controlled Flow Study)

8.8.4 Study Area and Sampling Locations

The study area is defined as the Project reaches directly downstream of all Project dams (except Union Valley Dam which abuts Junction Reservoir) and up to the next reservoir (except the South Fork Rubicon River reach which will end at its confluence with the Rubicon River). The analysis of demand flow for whitewater boating on Project reaches and flow information will rely on a larger study area, which will include all rivers in Central California.

8.8.5 Information Needed From Other Studies

The unregulated/regulated hydrograph (including raw data) for all Project reaches is needed from the Hydrology Study. Channel morphology information on Project reaches is needed from the Channel Morphology Study.

8.8.6 Study Methods And Schedule

The methodology to complete the Whitewater Feasibility Study will include in series of steps to develop the necessary information to address the issue questions. This methodology is proposed for the purpose of identifying river reaches affected by Project operations where there are existing or potential whitewater opportunities while at the same time identifying reaches not affected by the Project or not of interest to the whitewater boating community. These steps, discussed in detail below, include: 1) review existing information, 2) interview key contacts for local information about Project reaches, 3) compare the data for the unregulated vs. regulated hydrograph for Project reaches, 4) identify Project reaches with existing or potential whitewater boating opportunities and 5) recommend any additional studies necessary to determine the range of boatable flows and the types of crafts suitable for each run identified in step no. 4.

1. REVIEW EXISTING INFORMATION - Review existing literature, guidebooks, boater diaries, videos or any other available information to identify runs, access, assessment of difficulty, demand and the range of crafts that may be able to run a reach. Maps will be prepared that identify the Project reaches relative to the routes of access and other important features (i.e., Project dam/diversion, developed recreation facilities, wilderness boundaries, etc). This information will be compiled beginning in the summer of 2002.

2. INTERVIEWS - Additional information about the reaches in the study area will be obtained by interviewing agency representatives, local boating experts, and others persons identified that have local boating knowledge. A questionnaire will be developed to conduct the interviews in the summer and fall of 2002. The questionnaire will be developed with interested stakeholders and will be designed to gather basic information about the runs in the study area. Specific information to be obtained from individuals that have boated the Project reaches, if available, will include: 1) location of runs, 2) quality of runs 3) details of access, 4) estimated class of difficulty 5) estimated flow at the time the reach was boated, 6) estimated range of boatable flows, 7) type of craft used, 8) range of crafts that could be used on the run, 9) number and dates of trips, 10) party size, 11) any safety concerns, 12) how flow information is obtained for Project reaches as well as other reaches, 13) suggestions for improvement (i.e., access, flow and flow information), 14) opportunity for general comments, and 15) listing of other reaches boated by the individual. An initial list of persons to interview will be developed with interested stakeholders and will be supplemented by asking interviewees to provide contact information of additional persons that may have boating experience on the Project reaches. Attempts will be made to contact these additional persons to conduct interviews. The list of contacts and interview responses will be summarized during the summer/fall of 2002.

3. COMPARISON OF REGULATED AND UNREGULATED WHITEWATER BOATING OPPORTUNITIES - The available historical flow information will be summarized to display the flows in the Project reaches under regulated and unregulated conditions. The data will be presented for the entire year (i.e., 12 months) for each reach. The data will be sorted by the type of water year (critically dry, dry, below normal, above normal and wet); graphs of the data as well as the raw data will be provided. This information will be developed as part of the Hydrology Study, which is scheduled to have study results available late in 2002. This information will be used to develop a broad range of possible flow scenarios that could be considered appropriate for PM&E measures. This information will be provided to other technical working groups that are conducting flow related studies to insure that other technical working groups gather the data within the range of flows that may be included as PM&E for whitewater boating. The range of flow scenarios will also be provided to the Aquatics technical working group so that the water balance model can be used to display the effects of the range of possible whitewater boating flows on Project reservoirs.

4. IDENTIFY REACHES WITH POTENTIAL BOATING OPPORTUNITIES/FIELD REVIEW - Based on information gathered in the first three steps, the reaches with existing or potential boating opportunities will be identified. This process will take place in the winter 2002/2003 with interested stakeholders and will include a review of the information gathered in 2002 to determine which reaches can be eliminated from further studies because of physical constraints (e.g., gradient, channel features) or because boating opportunities are not constrained by the Project. If necessary, a field visit to assess the potential of individual reaches will be conducted with interested stakeholders. Additional methods may include conducting an aerial reconnaissance and reviewing aerial photographs and video tape. The end product of this phase will consist of a list of Project reaches with existing or potential boating opportunities completed by the spring of 2003.

5. RECOMMEND ADDITIONAL STUDIES - For the list of Project reaches with existing or potential boating opportunities it is necessary to define a range of boatable flows (minimum and optimum), carrying capacity and the types of craft suitable for boating each identified Project reach. If the information gathered in steps 1-3 above is not adequate to make this determination, this study will identify the additional studies (e.g., Single Flow Feasibility Study or Controlled Flow Study) including a schedule, necessary to obtain this information. A Whitewater Boating Study may be necessary after the completion of the Whitewater Boating Feasibility Study, any Single Flow Feasibility Study, Controlled Flow Study or other flow-related studies. The Whitewater Boating Study would include, but not be limited to, assessing demand, constraints, and conflicts or complementary opportunities with other recreational opportunities.

8.8.7 Analysis

The information developed in this study will ultimately be used to classify the Project reaches into one of two categories. The first category would consist of Project reaches that are not influenced by the Project or not of interest to the whitewater boating community. No further evaluation of these reaches relative to flow will be necessary. The second category would consist of the Project reaches where existing or potential whitewater boating opportunities exist. This second category of reaches will likely require further study and data collection in 2003 to obtain flow related information necessary to develop resource measures for whitewater boating. The analysis to categorize the Project reaches will include an evaluation of 1) adequacy of access, 2) frequency and magnitude of flows (unregulated and regulated), 3) ability to make release (e.g., reservoir storage, maximum release capacity), 3) class of difficulty, 4) barriers to access from Project facilities, 5) location of the reach relative to a Project dam/diversion (i.e. is the reach affected by the Project) 6) demand and 7) the summarized interview responses.

8.8.8 Study Output

The study output will be a narrative report which will include a map of the river reaches which also shows routes of access and other important features (i.e., Project dam/diversion, developed recreation facilities, wilderness boundaries, etc.). Charts and tabular formats may be used to display the physical attributes of the Project reaches and to summarize the responses to interviews (e.g., see tables prepared for the Stanislaus River relicensings). The report will include the issue questions addressed, objectives, study area, methods, results, analysis, discussion and conclusions. The report will identify and propose methodologies and formats for any suggested additional studies. The report will be prepared in a format that allows the information to be inserted directly into the Licensee-prepared Draft Environmental Assessment that will be submitted to the FERC with the Licensee's application for a new license.

8.8.9 Preliminary Estimated Study Cost

A preliminary cost estimate for this study will be developed after approval by the Plenary Group.

8.8.10 Plenary Group Endorsement

This study plan was approved on March 21, 2002 by the following entities of the TWG: ENF, SWRCB, American River Recreation Association/Camp Lotus, NPS, Gold Country Paddlers, El Dorado County Parks Dept., California Outdoors and SMUD. None of the participants at the meeting identified any objection to the content of the study plan. Based on comments from the Plenary Group, the plan was revised and sent out to other members of the Recreation and Aesthetics TWG for their consideration. After no comments were received, the Plenary Group approved the plan on June 5, 2002. The participants at the meeting who said they could "live with" this study plan were PCWA, El Dorado County, BLM, BOR, USFS, CSPA, SMUD, FOR, PG&E. None of the participants at the meeting said they could not "live with" this study plan.

8.8.11 Literature Cited.

None.

WHITEWATER BOATING FEASIBILITY TECHNICAL REPORT

SUMMARY

The Whitewater Boating Feasibility Study investigated whether boating opportunities currently or potentially exist on the UARP Reaches based on existing information, boater interviews and field reconnaissance. The study also explored how these opportunities may be affected by the operation of the UARP. If the results of this study indicated there was insufficient information to make this assessment, additional studies were developed to collect this information.

Six UARP Reaches were evaluated in this study. Three non-UARP reaches in the vicinity of the UARP that have a reported history of whitewater boating use are also discussed in this report for context. In general, the difficulty of the reaches investigated that may provide boating opportunities appears to range from Class III to Class V. Some reaches also appear unnavigable due to steep gradient and the lack of portage routes.

Three of the reaches, Slab Creek, Ice House and Camino appear to provide potential boating opportunities. Existing information is insufficient to determine the class of difficulty of each of these reaches, the types of crafts that would be suitable for these reaches or the minimum and optimum flows that would provide boating opportunities. Consequently, with the approval of the UARP Relicensing Plenary Group, additional flow studies have been or will be conducted on these reaches. At the time this *Whitewater Boating Feasibility Technical Report* is issued, the Slab Creek and Ice House Whitewater Boating Flow Studies are complete and reported on in the *Slab Creek* and *Ice House Whitewater Boating Flow Technical Reports*. The Camino Whitewater Boating Flow Study is scheduled for September 2004.

The Junction Reach has a major obstacle to navigation at Silver Creek Falls. The falls do not appear to be runnable and there are no portage routes around this feature. Because of this obstruction, this reach does not appear to provide a suitable boating opportunity and no additional study is planned for this reach.

The Gerle Creek Reach includes a short segment with a steep gradient, however there are long meadows and abundant riparian vegetation that are not suitable for whitewater boating. Since this condition does not provide for suitable boating opportunity, no additional study is planned for this reach.

The information developed for the Robbs Peak Reach indicates that the gradient may be too steep for whitewater boating. Additionally, there are no records of any attempted descents on this reach. However, air reconnaissance and a review of the USGS quadrangle map do not reveal any obvious channel attributes that would preclude boating on this reach. Additional field reconnaissance is planned in 2004 to supplement the existing information to determine whether this reach provides opportunities for whitewater boating.

The boating opportunities on the Camino Reach are complicated by the unpredictable and potentially high accretion flows that enter the reach at the confluence of the SFAR as well as a very long shuttle time necessary to complete the run. The suitability of this run is still in question and additional studies are being planned in September 2004.

The UARP reaches range from 6.5 to 11.2 miles in length and one-way shuttle times range from 25 minutes to 1.25 hours. Access to the UARP Reaches is generally good however there are some gates on access roads that would require boaters to walk to the streams and rivers. Parking at these locations is generally limited to parking along the shoulders of roads.

Flow information for all but one theUARP Reaches is not available to the public. Boaters who were interviewed for the study indicated their ability to boat in the UARP Reaches would be improved if they had access to information such as seasonal and monthly flow predictions and real-time flow data at the UARP Reaches that could be provided on the Internet.

1.0 INTRODUCTION

This technical report is one in a series of reports prepared by Devine Tarbell & Associates, Inc., and The Louis Berger Group, Inc. for the Sacramento Municipal Utility District (SMUD) as an appendix to the SMUD's application to the Federal Energy Regulatory Commission (FERC) for a new license for the Upper American River Project (UARP or Project). This technical report focuses on the feasibility of whitewater boating on the UARP reaches and identifies the reaches where additional studies are needed to assess feasibility. This report includes the following sections:

- **BACKGROUND** – Includes when the applicable study plan was approved by the UARP Relicensing Plenary Group; a brief description of the issue questions addressed, in part, by the study plan; the objectives of the study plan; and the study area. In addition, requests by resource agencies for additions to this technical report are described in this section.
- **METHODS** – A description of the methods used in the study, including a listing of study sites.
- **RESULTS** – A description of the salient data results. Raw data where copious and detailed model results are provided by request in a separate compact disc (CD) for additional data analysis and review by interested parties.
- **ANALYSIS** - An analysis of the results, where appropriate.
- **FINDINGS** – A broad statement of study findings
- **LITERATURE CITED** – A listing of all literature cited in the report.

This technical report does not include a detailed description of the UARP Alternative Licensing Process (ALP) or the UARP, which can be found in the following sections of SMUD's application for a new license: The UARP Relicensing Process, Exhibit A (Project Description), Exhibit B (Project Operations), and Exhibit C (Construction).

Also, this technical report does not include a discussion regarding the effects of the UARP on whitewater boating or other recreational resources or associated environmental resources, nor does the report include a discussion of appropriate protection, mitigation and enhancement measures. A discussion regarding resource impacts associated with the UARP is included in the applicant-prepared preliminary draft environmental assessment (PDEA) document, which is part of SMUD's application for a new license. Development of resource measures will occur in settlement discussions, which will commence in early 2004, and will be reported on in the PDEA.

2.0 BACKGROUND

The UARP Recreation and Aesthetics Technical Working Group (TWG) developed a total of eight recreation studies to collect information to answer the issue questions relating to recreation resources associated with the UARP. This report contains the results of the Whitewater Boating Feasibility Study, which is discussed below.

2.1 Whitewater Boating Feasibility Study Plan

On June 5, 2002 the UARP Relicensing Plenary Group approved the Whitewater Boating Feasibility Study Plan that was developed and approved by the Recreation and Aesthetics TWG on March 5, 2002. The study plan was designed to address, in part, the following issues questions developed by the UARP Relicensing Plenary Group:

Issue Question 1a	Is it possible to have consistent and regular releases that support boating in the reach between Slab Creek Dam and Chili Bar Reservoir?
Issue Question 2	What are the optimal and minimum boating flows between Slab Creek Dam and Chili Bar, for all crafts?
Issue Question 3a	What are the effects of potential boating flows on water levels of Project reservoirs?
Issue Question 6	What maximum and minimum flow regimes are required for whitewater boating in stream reaches affected by the Project, including upper Rubicon River?
Issue Question 16	Can we provide whitewater boating flow phone, website, flow modeling for 1-week intervals, and past releases?
Issue Question 19	Can there be a flow management hydrology model (unimpaired hydrograph) built with a whitewater filter that estimates flows assuming UARP/Chili Bar presence and absence?
Issue Question 68	What is the need for, and feasibility of, whitewater boating in the reaches below Project dams?

Specifically, the objectives of the study plan were to:

- Identify and describe reaches where there are existing or potential whitewater opportunities
- Quantify how the Project affects these opportunities (e.g., flows, boatable days, season of use, access)
- Characterize whitewater opportunities affected by Project operation based on physical characteristics, existing information and interviews (e.g., flows, reservoir storage and diversion capacity)
- Determine current and future demand for whitewater boating on Project reaches
- Develop a range of possible flows to provide other TWG's before conducting additional studies
- Describe and assess the adequacy and availability of existing flow information
- Recommend additional studies needed for whitewater resources (e.g., Single Flow Feasibility Study or Controlled Flow Study)

As discussed above, this *Whitewater Boating Feasibility Technical Report* does not address UARP impacts or protection, mitigation or enhancement measures. Therefore, this report does not address Issue Questions 1a and 3a. Note that Issue Questions 3a and 19 may be addressed using the UARP CHEOPS Water Balance Model, and questions related to demand are addressed in the *Recreation Demand Technical Report.*

The study area included the UARP reaches directly downstream of all UARP dams (except for Union Valley Dam which abuts Junction Reservoir) and up to the next reservoir (except for the South Fork Rubicon River reach which terminates at its confluence with the Rubicon River). The study area did not include the Reach Downstream of Chili Bar Dam.

2.2 Water Year Types

The information in this subsection is provided for informational purposes, as requested by agencies. The UARP Relicensing Water Balance Model Subcommittee established five water year types to be applied to all preliminary analysis with the understanding that the UARP Relicensing Plenary Group, with cause, may modify the current water year types in the future. The five current water year types are triggered by the February 1, March 1, April 1 and May 1 California Department of Water Resources (CDWR) forecast for total water year unimpaired inflow into Folsom Reservoir. An additional trigger is CDWR's October 1 estimate of the actual total water year unimpaired inflow into Folsom Reservoir. The February 1 forecast determines the water year type applied for the period from February 10 through March 9: the March 1 forecast the period from March 10 through April 9; the April 1 forecast the period from April 10 through May 9; the May 1 forecast the period from May 10 through October 9; and the October 1 estimate the period from October 10 through February 9. The inflow levels area:

- Critically Dry (CD) Water Year — Less than 900,000 acre-feet
- Dry (D) Water Year — From 900,001 to 1,700,000 acre-feet
- Below Normal (BN) Water Year — From 1,700,001 to 2,600,000 acre-feet
- Above Normal (AN) Water Year — From 2,600,001 to 3,500,000 acre-feet
- Wet (W) Water Year — More Than 3,500,000 acre-feet

The study described in this technical report covers the period of record from 1975 to 2001. For this period, the CDWR forecasts and estimates were:

Table 2.2-1. Application of UARP Relicensing Plenary Group water year types for the period from Calendar Year 1975 through 2001.

Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1975	W	D	BN	BN	AN	AN	AN	AN	AN	AN	AN	AN
1976	AN	D	D	CD	CD	CD	CD	CD	CD	CD	CD	CD
1977	CD	CD	CD	CD	CD	CD	CD	CD	CD	CD	CD	CD
1978	CD	AN	AN	AN	W	W	W	W	W	AN	AN	AN
1979	AN	D	BN	BN	BN	BN	BN	BN	BN	BN	BN	BN
1980	BN	AN	W	W	W	W	W	W	W	W	W	W
1981	W	D	D	D	D	D	D	D	D	D	D	D
1982	D	W	W	W	W	W	W	W	W	W	W	W
1983	W	W	W	W	W	W	W	W	W	W	W	W

Table 2.2-1. Application of UARP Relicensing Plenary Group water year types for the period from Calendar Year 1975 through 2001.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1984	W	W	W	W	W	W	W	W	W	W	W	W
1985	W	BN	BN	BN	D	D	D	D	D	D	D	D
1986	D	BN	W	W	W	W	W	W	W	W	W	W
1987	W	D	D	D	CD	CD	CD	CD	CD	CD	CD	CD
1988	CD	BN	D	CD	CD	CD	CD	CD	CD	CD	CD	CD
1989	CD	D	D	BN	BN	BN	BN	BN	BN	BN	BN	BN
1990	BN	D	D	D	D	D	D	D	D	D	D	D
1991	D	CD	CD	D	D	D	D	D	D	D	D	D
1992	D	D	D	D	D	D	D	D	D	CD	CD	CD
1993	CD	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN
1994	AN	D	D	D	CD	CD	CD	CD	CD	CD	CD	CD
1995	CD	W	AN	W	W	W	W	W	W	W	W	W
1996	W	BN	AN	AN	AN	AN	AN	AN	AN	W	W	W
1997	W	W	W	W	W	W	W	W	W	W	W	W
1998	W	AN	W	W	W	W	W	W	W	W	W	W
1999	W	AN	W	AN	AN	AN	AN	AN	AN	AN	AN	AN
2000	AN	BN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN
2001	AN	D	D	D	D	D	D	D	D	D	D	D

2.3 Recreation TWG Determination of Adequacy

At the July 28, 2004, Recreation TWG meeting, the Recreation TWG determined that the Technical Report on Whitewater Boating Feasibility, dated February 2004, is adequate subject to all comments submitted by the TWG participants being incorporated into a new version of the report and reviewed by the Recreation TWG. Table 2.3-1 summarizes all comments and action items and references how each comment was addressed.

Table 2.3-1. Response to Recreation TWG comments on *Whitewater Boating Feasibility Technical Report*, dated February 2004.

Comment	Reference
1. Physical attributes noted do not distinguish between suitability for private and commercial boaters. According to the agencies this comment was intended to apply to the Slab Creek Study report and needs to be addressed in this report.	A detailed discussion of commercial suitability has been included in Section 5.4 of the *Slab Creek Whitewater Flow Technical Report.*
2. Address physical capacity for parking associated with the three reaches with potential boating opportunities. Include some assessment of what could be a social carrying capacity for the three reaches with potential boating opportunities.	A detailed discussion of carrying capacity has been included in Section 5.5 of the *Slab Creek* and *Ice House Whitewater Flow Technical Reports.*
3. More qualitative descriptions are needed of the reach characteristics. This comment refers to the Slab Cr. Study.	The wording used is verbatim from the survey instruments and does not need to be changed.

Table 2.3-1. Response to Recreation TWG comments on *Whitewater Boating Feasibility Technical Report*, dated February 2004.

Comment	Reference
4. The report needs to track where and how issue questions 1a and 3a are addressed. Include in the report the daily quantity of water necessary to provide the opportunity on the three reaches with potential boating opportunities. Include the effect of the quantity of water for each of the flows studied: for Ice House=Ice House Reservoir, Slab Creek and Camino=Union Valley Reservoir. Use quantities in the flow studies, using reservoir levels existing at the time the flow studies were conducted.	A detailed discussion of UARP Operations has been included in Section 3.3 of the *Slab Creek* and *Ice House Whitewater Flow Technical Reports*. A similar discussion will be included in the *Camino Whitewater Flow Technical Report* when this report is prepared.
5. Report needs to include a discussion of future demand for whitewater boating. Include a discussion of future demand in the *Recreation Demand Technical Report*.	Additional text has been added to the discussion of demand for whitewater boating in the *Recreation Demand Technical Report.*
6. Reorder the listing of reaches in multiple tables.	Tables in the report were reordered to include runs on South Fork Rubicon above Robbs Forebay. Reach names were made to be consistent between all tables.
7. Redding mileage should be 205.	This comment pertains to the *Slab Creek Whitewater Flow Technical Report*. The table in Section 4.4.7 where this information appears has been changed to show the distance to Redding as 205 miles.
8. Explain combined flows below SFAR/SC confluence.	Text has been added to Section 5.2 which further explains the flow conditions below the confluence of SFSC and SFAR.
9. Explain that boaters on SFSC above Ice House access the bottom of the run and park at the end of the access road on the north shore.	Text has been added to the description of the run in Section 5.10.
10. Explain that the access point to the gauging station below Ice House on SFSC is located on private land.	A detailed discussion of access has been included in Section 4.4.2 of the *Ice House Whitewater Flow Technical Report*.
11. Explain how the optimal range of flows was determined. This comment refers to the Slab Creek Whitewater Flow Study. Include the definition of optimum flows.	Explanation and definition of the optimum flow has been added in Section 5.2 of the *Slab Creek Whitewater Flow Technical Report*.
12. Include brief summary of ecological studies that were conducted in the flow studies and reference where (what report) findings are provided.	The ecological monitoring effort undertaken for each of the flow studies has been referenced and summarized in each of the respective reports. All details of the ecological monitoring conducted during the flow studies have been placed in an appendix to the report.

3.0 METHODS

SMUD's methods conformed to those approved by the UARP Relicensing Plenary Group. These methods included: 1) reviewing existing information; 2) interviewing local boaters; 3) reviewing regulated and unregulated hydrology information; and 4) field review of the UARP Reaches. Each of these methods is explained below.

3.1 Review of Existing Information

SMUD reviewed and summarized existing information from the following sources:

- The Best Whitewater in California: The Guide to 180 Runs. (Holbek and Stanley 1998)
- Video photography of the UARP Reaches taken from low-flight helicopter
- USGS quadrangle maps
- Capacity information of the dams and diversion structures for the UARP

3.2 Interviews

Interviews with local boaters who have boating experience in the UARP vicinity were conducted in 2002. The interviews were conducted using a list of questions developed to obtain information about current, past and future use of the UARP Reaches. Information from individuals that have boated the UARP Reaches included: 1) location of the run(s); 2) quality of the run(s); 3) details about access; 4) estimated class of difficulty; 5) estimated flow at the time the reach was boated; 6) estimated range of boatable flows; 7) type of craft used; 8) types of crafts that could be used on the run; 9) number and dates of trips; 10) party size; 11) safety concerns; 12) how flow information is obtained for UARP Reaches as well as other reaches; 13) suggestions for improvement (i.e., access, flow and flow information); 14) opportunity for general comments; and 15) listing of other reaches boated by the individual. An initial list of persons to interview was developed from personal acquaintances of the study staff with local boaters in the community near the UARP and it was supplemented by asking interviewees to provide contact information of additional individuals that may have boating experience on the UARP Reaches. The individuals interviewed for this study are listed below:

Name	Name
Andrew Belcher	Richard Montgomery
Mike Fentress	Jared Noceti
Lars Holbek	Mike Snead
Johnny Kern	Todd Stanley
Dustin Knapp	Ron Thompson
Scott Lundgren	Charlie Center
Nate Rangel	Mike Bean

Interviews were conducted by phone and in person. The responses to the questions were recorded during the interview and then summarized in one tabular report.

3.3 Hydrology Data

Hydrology for regulated and synthesized unimpaired conditions in the UARP Reaches was reported in the *Hydrology Technical Report*. As throughout the UARP Relicensing, the hydrologic period of record used was from Water Year 1975 through 2001. These data were used to describe the whitewater opportunities in the UARP Reaches that have existed during this 26-year-long period with the UARP in place, and the opportunities that might have existed if no other water projects existed in the river.

3.4 Field Review

A professional boating expert as well as some of the Recreation and Aesthetics TWG participants with boating experience also evaluated the UARP Reaches in the field. The field reviews served three purposes: 1) to confirm or refute the assessments of the reaches that were developed from interview data, maps and video photography; 2) to assess the UARP Reaches where there was insufficient information from these sources to determine the quality of certain reaches; 3) evaluate specific safety issues on particular reaches; and 4) to assess access, including shuttle times and distances. Field reviews were conducted on the following reaches:

UARP Reach	Date of Field Review	Participants
Gerle Creek between Loon Lake Dam and Gerle Creek Reservoir	August 4-5, 2002	Dave Steindorf
So. Fork Silver Creek between Ice House Dam and Junction Reservoir	Oct. 21-22, 2002 Dec. 18, 2003	Dave Steindorf Carol Efird
So. Fork American River between Slab Creek Dam and White Rock Powerhouse	July 31, 2002	Dave Steindorf
So. Fork. Rubicon River below Robbs Powerhouse	June 11, 2003 Aug. 23, 2003	Dave Steindorf Chris Shackleton
Silver Cr. Between Junction and Camino reservoirs	June 11, 2003 and October 15, 2003	Dave Steindorf Chris Shackleton Bill Center Robin Center Charlie Center

4.0 RESULTS

SMUD evaluated six UARP Reaches and three non-UARP Reaches in this study. These included:

- South Fork American River from Slab Creek Dam to White Rock Powerhouse
- Silver Creek from Camino Dam to Slab Creek Reservoir
- Silver Creek from Junction Dam to Camino Reservoir
- South Fork Silver Creek from Ice House Dam to Junction Reservoir
- South Fork Silver Creek above Ice House Reservoir (non-Project reach)
- South Fork Rubicon from south of Loon Lake to Robbs Peak Reservoir (non-Project reach)
- South Fork Rubicon River from Robbs Peak Reservoir to Main Rubicon River
- Gerle Creek from Loon Lake Dam to Gerle Reservoir
- Upper Rubicon River from Rubicon headwaters to Hell Hole Reservoir (mostly non-Project reach)

These nine reaches are shown in Figure 4.1-1.

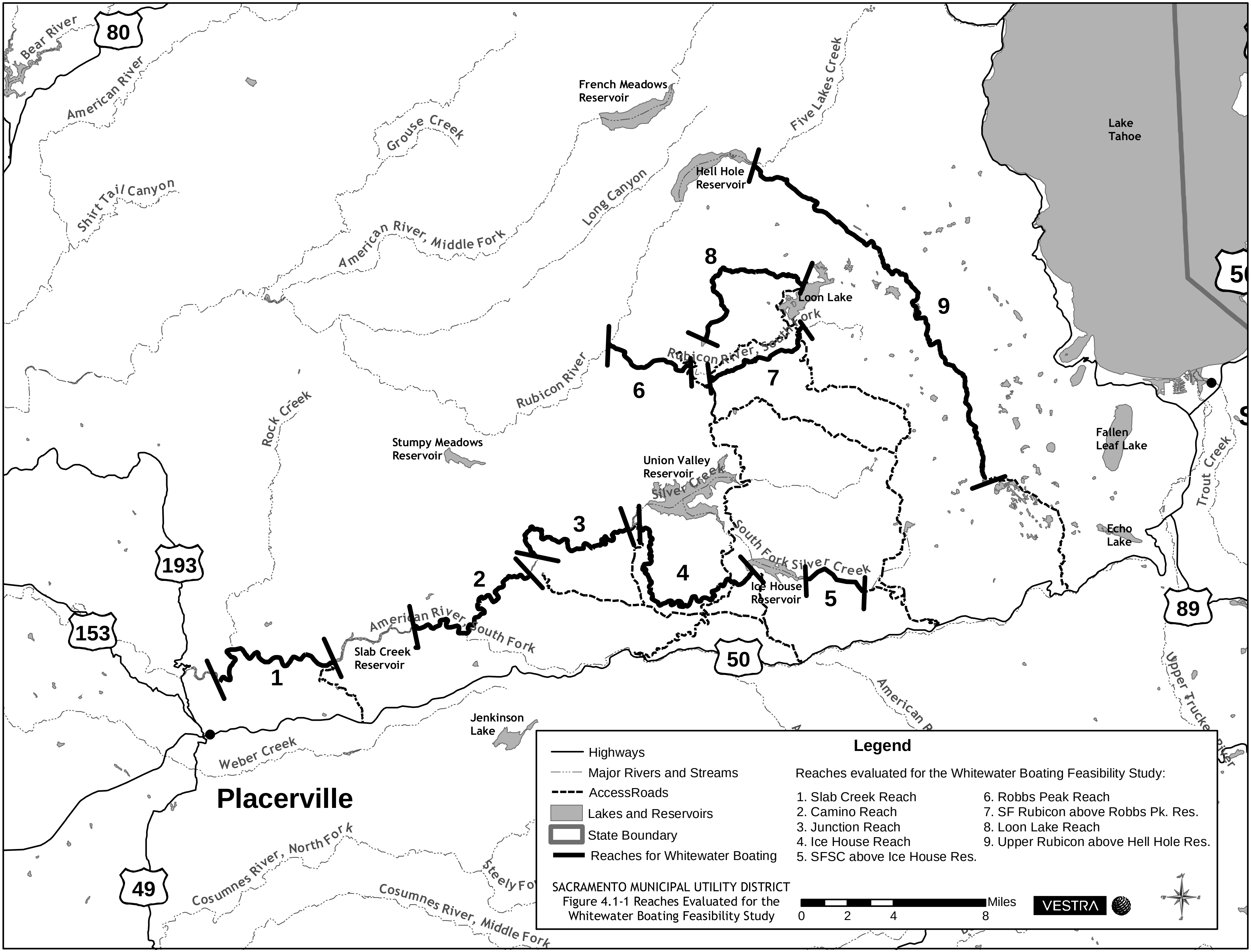
4.1 Review of Existing Information

Tables 4.1-1 to 4.1-3 summarize the information that was collected by reviewing the information sources listed in Section 3.1. The first table (Table 4.1-1) describes the whitewater boating runs on the UARP, the hydroelectric facilities that may affect those runs, and the capacities of the various dams and diversions structures associated with the runs. The definitions for the class of difficulty used in the table are based on the International Scale of River Difficulty as revised by American Whitewater (American Whitewater 1998). These definitions are included for reference in Appendix A of this report.

Table 4.1-2 lists the range of boatable flows and optimum flows as identified by two sources: 1) Stanley and Holbek (1998); and 2) interview data collected from local boaters. Table 4.1-3 summarizes the details regarding access to the reaches evaluated in the study.

4.2 Interviews

The responses of the fourteen boaters who were interviewed about whitewater boating opportunities in the vicinity of the UARP are summarized in Appendix B of this report. Table 4.2-1 below is a summary of the information relative to whitewater resources that was compiled from the information provided by boaters who were interviewed for this study.



Bear River
American River
Shirt Tail Canyon
Grouse Creek
American River, Middle Fork
French Meadows Reservoir
Long Canyon
Five Lakes Creek
Hell Hole Reservoir
Lake Tahoe
Loon Lake
Rubicon River, South Fork
Rubicon River
Rock Creek
Stumpy Meadows Reservoir
Union Valley Reservoir
Silver Creek
South Fork Silver Creek
Ice House Reservoir
Fallen Leaf Lake
Echo Lake
Trout Creek
American River, South Fork
Slab Creek Reservoir
Jenkinson Lake
Weber Creek
Placerville
Cosumnes River, North Fork
Cosumnes River, Middle Fork
Upper Truckee River
80
193
153
49
50
89
1
2
3
4
5
6
7
8
9
Legend
Highways
Major Rivers and Streams
AccessRoads
Lakes and Reservoirs
State Boundary
Reaches for Whitewater Boating
Reaches evaluated for the Whitewater Boating Feasibility Study:
1. Slab Creek Reach
2. Camino Reach
3. Junction Reach
4. Ice House Reach
5. SFSC above Ice House Res.
6. Robbs Peak Reach
7. SF Rubicon above Robbs Pk. Res.
8. Loon Lake Reach
9. Upper Rubicon above Hell Hole Res.
SACRAMENTO MUNICIPAL UTILITY DISTRICT
Figure 4.1-1 Reaches Evaluated for the Whitewater Boating Feasibility Study
0 2 4 8 Miles
VESTRA

Table 4.1-1. Description of the reaches evaluated in this study from Holbek and Stanley and the hydroelectric facilities that may affect those runs.

RIVER REACHES AFFECTED BY THE HYDROELECTRIC PROJECTS				WHITEWATER BOATING INFORMATION FROM HOLBEK AND STANLEY (1998)					
River Reach	**UARP Facilities that may Affect Flow**	**Amount of Water that may be Stored Above (usable storage) in acre-feet (af)/ Diverted Around the Reach**	**Maximum Release Capacity into the Reach (excludes spill past a dam)**	**Name of Whitewater Run**	**Put-In and Take-Out**	**Length (miles)**	**Gradient (Feet per mile)**	**Class**	**Season of Boating Use**
SFAR Below Slab Creek Reservoir	Slab Creek Dam	Slab Creek Reservoir can store 13,309 af/White Rock Powerhouse Penstock flow 3,950 cfs	263 cfs can be released through a low level Howell Bunger Valve in Slab Dam when the reservoir is at full pool	Slab Creek	Put-in Slab Creek Dam to take-out White Rock Power House	7.5	89	IV-V With 1 portage	Winter/ Spring
Silver Creek Below Camino Reservoir	Camino Dam	Camino Reservoir can store 541 af/Camino Powerhouse Penstock flow 2,100 cfs	112 cfs can be released through two low level outlets in Camino Dam when the reservoir is at full pool	Silver Creek (Holbek/Stanley)	Put-in Camino Dam To take-out Forebay Road	9.2	119	V With 2-8 portages	Winter/ Spring
Silver Creek Below Junction Reservoir	Junction Dam	2,608 af may be stored in Junction Reservoir and 266,303 af in Union Valley Reservoir/1,345 cfs may be diverted around the reach into Jay Bird Powerhouse	138 cfs can be released through a low level outlet in Junction Dam when the afterbay is at full pool	Silver Creek above Camino Reservoir	Junction Dam to take-out Jay Bird Powerhouse	8.3	180	Estimate V-VI	Spring
South Fork Silver Below Ice House Reservoir	Ice House Reservoir Jones Fork Penstock and Tunnel	43,445 af may be stored in Ice House Reservoir/287cfs may be diverted around the reach into Jones Fork Powerhouse	746.8 cfs may be released into the reach through a Howell Bunger Valve and 2 other valves in Ice House Dam when the reservoir is at full pool	South Fork Silver Below Ice House Reservoir[1]	Put-in below Ice House Dam or at Ice House Road to take-out Junction Reservoir	11.2	75	III	Spring

Table 4.1-1. Description of the reaches evaluated in this study from Holbek and Stanley and the hydroelectric facilities that may affect those runs.

RIVER REACHES AFFECTED BY THE HYDROELECTRIC PROJECTS				WHITEWATER BOATING INFORMATION FROM HOLBEK AND STANLEY (1998)					
River Reach	**UARP Facilities that may Affect Flow**	**Amount of Water that may be Stored Above (usable storage) in acre-feet (af)/ Diverted Around the Reach**	**Maximum Release Capacity into the Reach (excludes spill past a dam)**	**Name of Whitewater Run**	**Put-In and Take-Out**	**Length (miles)**	**Gradient (Feet per mile)**	**Class**	**Season of Boating Use**
South Fork Silver Above Ice House Reservoir[2]	None	N/A	N/A	South Fork Silver above Ice House Reservoir[1]	Put-in FS Road 12N25 to take out Ice House Reservoir	1.75	481	V	Spring
South Rubicon Below Robbs Peak Reservoir	Loon Lake Dam Robbs Peak Reservoir	68,896 af may be stored in Loon Lake Reservoir and 834 af in the Gerle Res. And 30 af at the Robbs Peak Res/ 1,250 cfs may be diverted around the reach to the Robbs Peak Powerhouse.	13.6 cfs can be released through a low level outlet in Gerle Dam and 4.3 cfs at the Robbs Peak Reservoir when the afterbay is at full pool	South Rubicon Below Robbs Peak Reservoir[1]	Put–in South Fork Campground To take-out Ellicott Bridge	6 .5	268	Estimate V-VI	Spring
South Rubicon Above Robbs Peak Reservoir	None	N/A	N/A	South Rubicon Above Robbs Peak Reservoir	Loon Lake Dam Robbs Peak Reservoir	5.6	189	V-VI	Spring
Gerle Creek	Loon Lake Dam	68,896 af may be stored in Loon Lake Reservoir/997 cfs may be diverted around the reach by the Loon Lake Tunnel	640.6 cfs can be released through two low level outlets and a Howell Bunger valve in Loon Lake Dam when the reservoir is at full pool	Gerle Creek Loon Lake Dam to Gerle Reservoir[1]	Put-in Loon Lake Dam Take-out Gerle Reservoir	8.1	133	Estimate V-VI	Spring

Table 4.1.1. Description of the reaches evaluated in this study from Holbek and Stanley and the hydroelectric facilities that may affect those runs.

RIVER REACHES AFFECTED BY THE HYDROELECTRIC PROJECTS				WHITEWATER BOATING INFORMATION FROM HOLBEK AND STANLEY (1998)					
River Reach	**UARP Facilities that may Affect Flow**	**Amount of Water that may be Stored Above (usable storage) in acre-feet (af)/ Diverted Around the Reach**	**Maximum Release Capacity into the Reach (excludes spill past a dam)**	**Name of Whitewater Run**	**Put-In and Take-Out**	**Length (miles)**	**Gradient (Feet per mile)**	**Class**	**Season of Boating Use**
Upper Rubicon Above Rubicon Reservoir	None	N/A	N/A	Upper Rubicon Above Rubicon Reservoir[1]	Put–in Rubicon Headwaters below Clyde Lake To take-out Rubicon Reservoir	7.5	144	V	Spring
Upper Rubicon Below Rubicon Reservoir	Rubicon Dam	1,030 af may be stored in Rubicon Reservoir/ 1,300 cfs may be diverted around the reach by the Rubicon/ Rock Bound Tunnel	18.4 cfs can be released through two low level outlets in Rubicon Dam when the reservoir is at full pool	Upper Rubicon Below Rubicon Reservoir[1]	Put–in Rubicon Reservoir to Take-out Hell Hole Reservoir	11.7	165	V	Spring

[1] Not identified by Holbek and Stanley as a whitewater boating run. Information for this reach reflects theSMUD's best estimate.
[2]Non-UARP reach

Table 4.1-2. Boatable and optimum flows from guidebooks and SMUD's interviews.

River Reach	Name of Run	Range of Boatable Flows		Optimum Flows	
		Guidebook[1] (cfs)	Interviews[2] (cfs)	Guidebook[1] (cfs)	Interviews[2] (cfs)
SFAR below Slab Creek Reservoir	Slab Creek	500-2000	500-3000	1500	1000-1,500
Silver Creek Below Camino Reservoir	Silver Creek[1]	600-800	500-2500	600	800-1200
Silver Creek below Junction Reservoir	Silver Creek above Camino Reservoir	N/A	N/A	N/A	N/A
South Fork Silver Below Ice House Reservoir	South Fork Silver Below Ice House Reservoir	N/A	300-3,000	N/A	1000
South Fork Silver Above Ice House Reservoir	South Fork Silver Above Ice House Reservoir	N/A	75- 500	N/A	150-200
South Rubicon Below Robbs Peak Reservoir	South Rubicon Below Robbs Peak Reservoir	N/A	N/A	N/A	N/A
South Rubicon Above Robbs Peak Reservoir	South Rubicon Above Robbs Peak Reservoir	N/A	None	N/A	None
Gerle Creek Loon Lake Dam to Gerle Reservoir	Gerle Creek	N/A	N/A	N/A	N/A
Upper Rubicon Above Rubicon Reservoir	Rubicon Headwaters	N/A	400-800	N/A	600
Upper Rubicon Below Rubicon Reservoir	Rubicon Headwaters	N/A	400-800	N/A	600

[1]Holbek and Stanley, 1998
[2]Interviews were conducted with 14 persons that had boated these runs to gather site-specific information about these runs in summer/fall 2002.

Table 4.1-3. Whitewater Access Information.

River Reach	Name of Run	Access			
		Distance (between put-in and takeout)	Travel Time (between put-in and take-out)[1]	Put-in	Take-out
SFAR below Slab Creek Reservoir	Slab Creek	10 miles	30 min.	Locked gate requires a 10-minute hike to river.	.2-mile hike up to locked gate.
Silver Creek Below Camino Reservoir	Silver Creek (Holbek and Stanley)	32 miles	1 hrs. 15min	Peavine Ridge Road to Jay Bird Road to Jay Bird Powerhouse. Road is gated at the powerhouse (at the upstream end of the reservoir and about ¼ mi. from dam)	Forebay Road to Camino Powerhouse
Silver Creek Below Junction Reservoir	Silver Creek Below Junction Reservoir	13 miles	40 min.	Bryant Springs Road off of Peavine Ridge Road to Junction Reservoir	Peavine Ridge Road to Jay Bird Road to Jay Bird Powerhouse. Road is gated at the powerhouse (at the upstream end of the reservoir).
South Fork Silver Below Ice House Reservoir	South Fork Silver Below Ice House Reservoir	9 miles	25 min.	Easy access at Ice House Road or possible put-in at Ice House Dam.	Easy take out on Bryant Springs Road off of Peavine Ridge Road.
South Fork Silver Above Ice House Reservoir	South Fork Silver Above Ice House Reservoir	1.75 miles	30 min.	Forest Service Road 12N25 to river. 100 yard hike to river.	Forest Service Road 11N52 to Upper End of Ice House Reservoir. Parking for six to ten vehicles. Many boaters choose to hike up from the take out.
South Rubicon Below Robbs Peak Reservoir	South Rubicon Below Robbs Peak Reservoir	13 miles	30 min.	Good river access from South Fork Campground.	Wentworth Springs road to Ellicott Bridge. Short steep hike to river.
South Rubicon Above Robbs Peak Reservoir	South Rubicon Above Robbs Peak Reservoir	6 miles	15 min	Loon Lake Dam	Ice House Road
Gerle Creek Loon Lake Dam to Gerle Reservoir	Gerle Creek	12 miles	30 min.	Good access below Loon Lake Dam.	Easy access at Gerle Creek Campground.
Upper Rubicon Below Rubicon Reservoir	Upper Rubicon Below Rubicon Reservoir	49 miles to Loon Lake (Upper Run)/75 miles to Hell Hole Reservoir (Full Run)	1hr. 15 min (Upper Run) 2 hrs. (Full Run)	Hike 3 miles from Loon Lake to Rubicon Springs	Take out at Hell Hole Reservoir. Paddle Lower section and paddle three miles across Hell Hole Reservoir.

Table 4.1-3. Whitewater Access Information.

River Reach	Name of Run	Access			
		Distance (between put-in and takeout)	Travel Time (between put-in and take-out)[1]	Put-in	Take-out
Upper Rubicon Above Rubicon Reservoir	Upper Rubicon Above Rubicon Reservoir	49 miles to Loon Lake (Upper Run)/75 miles to Hell Hole Reservoir (Full Run)	1hr. 15 min (Upper Run) 2 Hrs (Full Run)	Two-mile boat ride across Echo Lake. 6.3-mile hike over Mosquito Pass to put-in. Requires a full day.	Take-out at Loon Lake. Hike 4.3 miles from Rubicon Reservoir to Loon Lake. Take out at Hell Hole Reservoir. Paddle Lower section and paddle three miles across Hell Hole Reservoir.

[1]Does not include time necessary to hike to put-in/take-out.

Table 4.2-1. Summary of information about whitewater resources in the vicinity of the UARP from interviews with whitewater boaters.

Run	**Usual Put-In & Take Out**	**Number of Runs**	***Craft***	***Class ?***	***Flow Range* (Actual Runs)**	***Flow Range* (Estimate)**	**Optimum Boatable Flow (Estimate)**	***Safety Issues***	**Gauge information**	**Access**	**Run Quality 1-10 (10=best)**
SFAR below Slab Creek Dam	Slab Creek Dam to White Rock Powerhouse	+100	Kayak Raft	IV/ V	500 – 2500cfs	500 – 3000cfs	1000-2500 cfs	Mother Lode Falls Portage Continu ous @ high flows	Slab Creek Res. Elevation. Spill @ Chili Bar	Good (Gate at Take-out)	8- 10
Silver Creek Below Camino Dam.	Camino Reservoir to Camino Power House	2	Kayak, Raft	V	1500-2500 cfs	400-2500cfs	800-1200 cfs	Portage of Camino Dam	None	Good	5-8
Silver Creek Below Junction Dam	Junction Res to Camino Res	0	N/A	V	N/A	N/A	N/A	Silver Creek Falls	None	Put- in appears to be a Challenge.	N/A
South Silver Below Ice House Res.	Ice House Res. Junction Res.	1	Kayak, Raft, Canoe	III	500 cfs	300-3000 cfs	1000 cfs	Trees, Culverts	None	Good	4-6
South Silver above Ice House Res	12N25 off Ice House Rd to the end of 11N52 at Ice House Res.	+100	Kayak, Raft	V	50 – 300 cfs	50 – 300 cfs	150-200 cfs	Trees	None	Good (plowing road)	9-10

Table 4.2-1. Summary of information about whitewater resources in the vicinity of the UARP from interviews with whitewater boaters.

Run	**Usual Put-In & Take Out**	**Number of Runs**	***Craft***	***Class ?***	***Flow Range* (Actual Runs)**	***Flow Range* (Estimate)**	**Optimum Boatable Flow (Estimate)**	***Safety Issues***	**Gauge information**	**Access**	**Run Quality 1-10 (10=best)**
South Rubicon Below Robbs Peak Reservoir	Put-in South Fork Camp Ground Take-out Forest Service Road 2	0	N/A	V/ VI	N/A	N/A	N/A	Very Steep Gradien t	None	Good	N/A
South Rubicon Above Robbs Peak Reservoir	Near Loon Lake to Ice House Road at Robbs Forebay	1	Kayak	V/VI	200 cfs	None	None	Trees Gradien t	None	Good	1
Gerle Creek	Put-in Loon Lake Dam Take-out Gerle Res.	0	Kayak	V	N/A	N/A	N/A	Meado ws	None	Good	1
Upper Rubicon Below Rubicon Reservoir	Rubicon Res to Hell Hole Res.	1	Kayak	V	50-200 cfs	400-800 cfs	600cfs	Trees, Portage	None	1 Day hike to Put-in	9
Upper Rubicon Below Rubicon Reservoir	Rubicon below Mosquito Pass to Rubicon Res.	2	Kayak	V	200-800 cfs	400-800 cfs	600 cfs	Trees, Portage, Remote	None	1 Day hike to Put-in	7

N/A=Not Available, no information was provided by those interviewed.

4.3 Hydrology

The effects of the UARP on whitewater boating can be discussed in terms of the number and timing of days available for boating on the UARP Reaches that are within a range of boatable flows in different water year types. To develop this information, SMUD summarized the measured regulated flow information for each reach from Water Year 1975 through 2001, and the synthesized unimpaired information to represent opportunities that might have existed over that same period if there were no water developments in the watershed. The hydrology information was sorted into five water year types based on the CDWR April 1 Forecast for Total Unimpaired Flow into Folsom Reservoir for that water year. The five water year types used the flow criteria established by the UARP Relicensing Water Year Type Subgroup as described in Section 2.2 of this report, and can be characterized as Critically Dry, Dry, Below Normal, Above Normal and Wet. This analysis resulted in 3 Critically Dry Water Years, 7 Dry Water Years, 4 Below Normal Water Years, 5 Above Normal Water Years and 8 Wet Water Years. Then, for regulated and synthesized unimpaired hydrology and for each month, SMUD combined all the months in that water year type. A range of boatable flows for each reach was determined by guidebooks, the interviews with boaters and the judgment of a professional boating instructor. The number of boatable days in that reach in each month that existed under the regulated flow regime and that might have existed if no water developments occurred in the watershed was calculated. As an example, under UARP conditions, in the three Februarys that were characterized as Critically Dry, 12 days may have occurred that had mean daily flows in the boatable range for the Ice House Reach. The results were averaged by dividing the number of boatable days by the number of months in that year type. In the example above, by dividing 12 by 3 to yield an average of 4 boatable days in Critically Dry Februarys under UARP conditions that occurred in Ice House Dam Reach. Histograms for each of the UARP Reaches are included in Appendix C.

Since the results of this study did not provide enough existing information about the Slab Creek, Ice House and Camino reaches, a similar comparison of the number of boatable days is presented in the *Slab Creek* and *Ice House Whitewater Boating Flow Technical Reports* and will be provided in the *Camino Whitewater Boating Flow Technical Report* when that report is issued.

4.4 Field Review

The field reviews revealed shuttle times and distances for the different UARP Reaches and these are listed in Table 4.1-3.

The physical attributes that may affect the boating suitability of the reaches were also documented during the field reviews. The most notable findings are listed below in Table 4.4-1.

Table 4.4-1. Physical attributes noted during field review that affect whitewater boating on UARP reaches.

Reach	Physical Attributes Noted During Field Review
Silver Creek: Camino Dam to Slab Creek Reservoir	Long shuttle (1.25 hrs. one-way and 3.5 hr. round-trip) relative to run length.
Silver Creek: Junction Dam to Camino Reservoir	Silver Creek Falls appears to be an obstacle to boating with no portage route.
South Fork Silver Creek: Ice House Dam to Junction Dam	As many as 20 logs were observed across the channel.
South Fork Rubicon: Robbs Peak Reservoir to Main Stem Rubicon River	Despite gradient, no obvious navigational barriers.
Gerle Creek: Loon Lake Dam to Gerle Reservoir	Low gradient with impassable long meadows and riparian vegetation.

Photographs of the different reaches are included in Appendix D of this report.

5.0 ANALYSIS

This study focuses on four aspects of whitewater boating. First, the UARP Reaches were assessed for existing and potential whitewater boating opportunities. Second, the study compares what whitewater boating opportunities have occurred over the period of record to the whitewater boating opportunities that might have occurred if no water developments were on the river. Third, the study assessed the access to the UARP Reaches. And fourth, the availability and adequacy of flow information in the UARP Reaches was assessed. This section includes a narrative assessment of each reach based on the information collected during the study from interviews, field reviews, and published information followed by a discussion of: 1) the hydrology comparison; 2) access; and 3) existing flow information for the UARP Reaches.

5.1 South Fork American: Slab Creek Dam to White Rock Powerhouse (Slab Creek Reach)

This reach has more history of boating activity than any other reach in the UARP. First run in 1982, it has been run regularly during peak run-off periods in better years and during winter storm events. At eight miles in length, this run is in the moderate range for a single day trip. The shuttle is fairly short at 10 miles long over paved roads. Slab Creek is characterized as a class IV/V run. At lower flows, most of the boaters interviewed felt that the run was primarily class IV in nature; however, they also stated that the difficulty increased dramatically as the flow increased. Many of those interviewed considered the run to be similar to Cherry Creek on the Tuolumne River. While they generally agreed that the run was easier than Cherry Creek at low flows, most felt that it was harder than Cherry Creek at flows above 1,500 cfs. The most difficult rapid on the reach is named “Mother Lode Falls” and it is located shortly below the Mosquito Bridge. The portage for this rapid is on the right and is of moderate difficulty. The granite canyon of the Slab Creek Reach was considered to be high in scenic beauty by the boaters surveyed. Overall, most paddlers rated the quality of this run between an 8 and a 10 on a ten-point scale and said that suitable crafts for boating this reach would include kayaks and rafts. While the interview information indicated that this was a high quality reach, the Recreation and

Aesthetics TWG determined there was insufficient information from this feasibility study to determine minimum and optimum flows for this reach.
In order to acquire this information, the Recreation and Aesthetics TWG approved a controlled flow study for this reach, which SMUD conducted in November of 2003. The reader is referred to the *Slab Creek Whitewater Boating Flow Technical Report* for additional information, including a comparison of the number of boatable days that were available during the period of record to the number of boatable days that might have been available if no water developments were located upstream of this reach.

5.2 Silver Creek: Camino Dam to Slab Creek Reservoir

The reach is 9.2 miles long with an average gradient of 119 feet per mile. This reach has only two recorded runs: 1983 and 1998. Both of these runs were during high run-off events. Both groups thought the run to be class V, giving it quality ratings of 5 to 8 on a 10-point scale and said that suitable crafts for boating this reach would include kayaks and rafts. The estimated range of boatable flows for this reach is between 500 and 2,500 cfs. A helicopter flight over the reach on December 18, 2003 confirmed that there were no obvious impediments to navigation on the run. Silver Creek enters the South Fork American River in the bottom third of the Golden Gate Run, a class V run. The main issue with the run occurs when Silver Creek reaches the confluence with the South Fork American River. Both groups that made this run found that this section of the run to be flowing in the 5,000 to 7,000 cfs range as compared to 1,500 to 2,500 cfs in the upstream portion of the run, and felt that this was too high for safe boating. Figures 5.2-1 and 5.2-2 show the relationship between flows on Silver Creek below the Camino Diversion Dam and flows on the South Fork American below the confluence with Silver Creek. Under synthesized unimpaired conditions, the flows on Silver Creek would be approximately 40 percent of the total flow on the South Fork American River below the confluence. This indicates that a 600 cfs flow on Silver Creek would become a 1,500 cfs flow below the confluence with the South Fork American River. While 1,500 cfs is the upper limit recommended for the Golden Gate run (Holbek and Stanley 1998), it should be noted that Silver Creek enters below most of the major rapids on the Golden Gate run. The second figure diagram shows that under the regulated conditions, the relationship between flows on the two reaches is unpredictable. This is due to the fact that spill flows would only occur during large storm events. This would confirm the experience of the two groups that have completed the run and make boating the run under the existing condition somewhat hazardous. Flows after the spring run off period would be lower and much more consistent.

The shuttle is rather lengthy at 32 miles, which takes approximately 1 hour and 15 minutes to drive, one-way. The round trip for this shuttle from the Sly Park exit on Highway 50 would be roughly 3.5 hours.

On January 3, 2003 and August 27, 2003, this information was discussed at the Recreation and Aesthetics TWG. Although SMUD believes that the shuttle length creates problematic conditions for boating, the Recreation and Aesthetics TWG participants did not determine that further studies are not warranted. On September 1st 2004, the Plenary group approved a single flow whitewater boating study plan for the Camino Reach. The study is scheduled to be conducted on September 15th, 2004. Further information on this reach will be available after the study is completed.

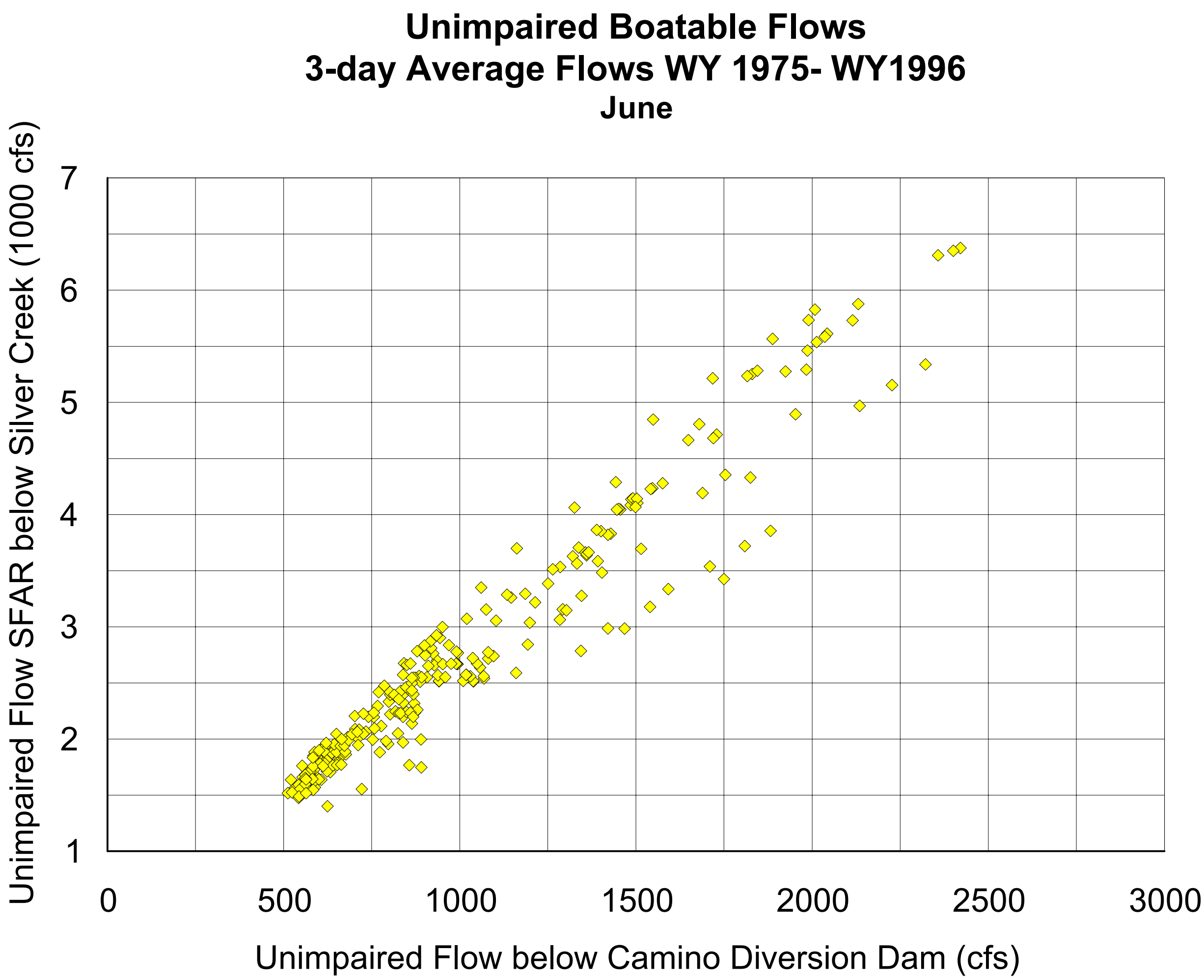


Figure 5.2-1. **Unimpaired flows within the boatable range on SF Silver Creek below Camino as compared to the unimpaired flow of the SFAR below its confluence with Silver Creek.**

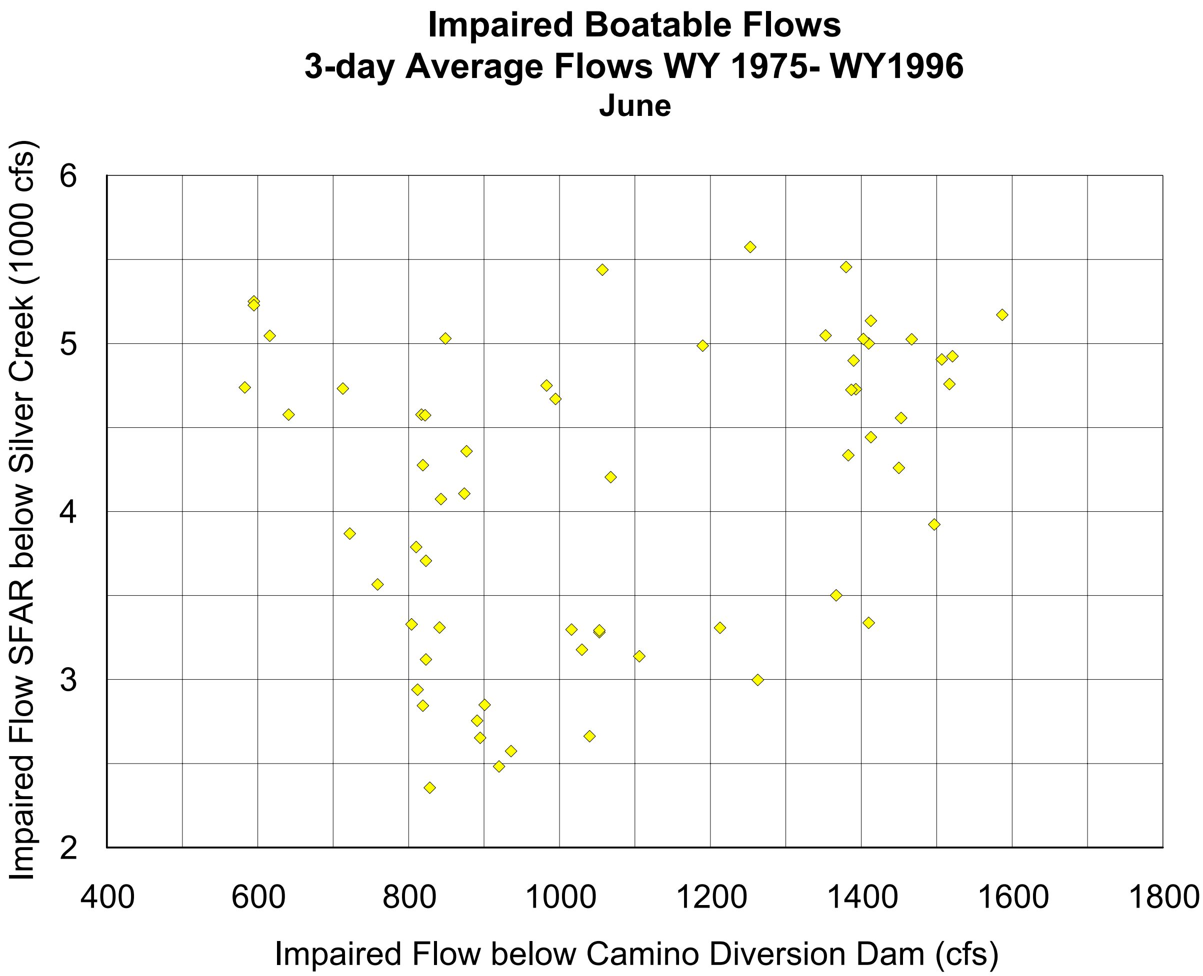


Figure 5.2-2. Regulated flows on SF Silver Creek below Camino as compared to the regulated flow of the SFAR below its confluence with Silver Creek.

5.3 Silver Creek: Junction Dam to Camino Reservoir

Based on the results of this study, this 11-mile reach has never been run. The average gradient of 180 feet per mile is considerably steeper than either the Slab Creek Reach or Camino Reach. The two key obstacles are the section of the river that drops over 400 feet in one mile and the ability to boat or portage Silver Creek Falls which has three drops totaling about 100 feet. On June 11, 2003, a helicopter reconnaissance was conducted to more closely evaluate this reach. On this trip, it was determined that most of the reach appeared to be boatable but Silver Creek Falls was a serious obstacle. On October 15, 2003, a field reconnaissance was conducted to further evaluate the reach. SMUD's consultant, who is a professional boater, and several stakeholders hiked from Camino Reservoir up Silver Creek to Silver Creek Falls. The four mile hike took seven hours due to the steep rugged canyon and the need to swim several pools. The falls consists of three drops totaling about 100 feet. The last drop of the falls is the tallest and the flow line lands on the right canyon wall. Because of this, it does not appear that it could be run safely. Portaging the falls appears to be problematic because there are vertical walls on both sides of the falls that extend downstream of the falls. While this section of river may be runnable by a select few kayakers, it is certainly beyond the skill level of the vast majority of the boaters in Northern California because of the challenges of running or portaging the falls combined with poor egress from the canyon. All members of the field visit agreed that any type of flow study on this reach would not be prudent.

The results of the field reviews were presented to the Recreation and Aesthetics TWG on October 22, 2003 and the participants agreed that based on these findings, no additional studies are necessary on this reach.

5.4 South Fork Silver Creek: Ice House Dam to Junction Reservoir

This section of the South Fork of Silver Creek is significantly different in character than the other UARP Reaches. Its 75 feet per mile gradient is the lowest of the reaches surveyed. The river channel is much more accessible than the steep canyons down stream of Junction Reservoir. The reach is also unique in that the nine-mile shuttle is actually shorter than the 11.2-mile river reach. The interviews revealed a single run was made in 1993 on this reach and the boaters reported the run to be Class III. Those interviewed said that suitable crafts for boating this reach would include kayaks, inflatable kayaks, rafts and canoes. A few sections on the upper end of the reach appear to be more difficult and may be closer to Class IV in nature. Most of the reach is in the area burned by the 1992 Cleveland Fire, which diminishes the natural beauty of the reach and may have created wood hazards in the river. A helicopter reconnaissance in October 2003 confirmed that many trees that had burned in the fire had fallen into the river. More than twenty logs completely span across the river.

SMUD's hydrologic analysis showed that this reach would have had a number of boating days from April through June, in water year types other than Dry and Critically Dry if no water developments were located upstream of this reach.

This section of the South Fork Silver Creek has the possibility of offering boating opportunities to intermediate boaters. In February 2004, the UARP Relicensing Plenary Group approved a Whitewater Boating Flow Study for Ice House Reach, which was completed in May 2004. The results of this study are presented in the *Ice House Whitewater Flow Technical Report*.

5.5 South Fork Silver Creek above Ice House Reservoir

This short 1.75-mile section of unregulated stream immediately above Ice House Reservoir contains no UARP diversions. It was included in the study because of its popularity since first being run in 1998, and because there were estimated to be over 100 user days of the run in 2002. This Class V run consists of a series of bedrock waterfalls that drops nearly 600 feet in the crux of the run. The unique bedrock waterfalls on this run allow this run to be navigable in spite of it's very steep gradient. Those interviewed said that suitable crafts for boating this reach would include kayaks and small rafts.

Boaters access this run by parking at the end of the road on the North Shore of Ice House Reservoir and hiking up the reach or by putting in off of FS road 12N25 at the top of the run. Parts of this access are on private land owned by Sierra Pacific Industries.

This is a non-UARP reach and on January 3, 2003, the Recreation and Aesthetics TWG agreed that no additional studies are necessary on this reach.

5.6 South Fork Rubicon: South of Loon Lake to Robbs Peak Reservoir

The Upper South Fork Rubicon is 5.6 miles long, with an average gradient of 189 feet per mile, is not affected by the UARP. This reach has one recorded run in the spring of 2000; the boaters were in kayaks. The members of this first decent put on the river at a location south of Loon Lake and took out at Robbs Reservoir. They reported that most of this reach was un-runnable due to the steep gradient and trees in the river. They stated that boating this section of river was not worth repeating and that it is suitable only for kayaks.

This is a non-UARP reach and on January 3, 2003 the Recreation and Aesthetics TWG agreed that no additional studies are necessary on this reach.

5.7 South Fork Rubicon River: Robbs Peak Reservoir to Main Stem Rubicon River

Based on the results of this study, the South Fork Rubicon River from Robbs Peak Reservoir to the main stem of the Rubicon River has never been run. The reach consists of 5.1 miles on the South Fork of the Rubicon River and 1.4 miles on the main stem of the Rubicon River. The average gradient on this reach is 268 feet per mile with a section of one mile that drops over 500 feet. The gradient on this reach is quite steep; only the elite Class V boaters would consider attempting any reach with gradient in this range. In June 2003, helicopter reconnaissance was conducted to gather more information on the reach. The determination from the flyover was that despite the steep gradient, the reach does not appear to have any obviously unnavigable river features. It appears that there are opportunities to portage portions of the reach in the canyon. There is one falls with a 25-foot drop that appears potentially runnable. A very rough approximation of the range of boatable flows was estimated to be between 100 to 300 cfs. SMUD’s hydrologic analysis showed that, during the period of record, flows in the boatable range would have occurred in all water year types during the winter and spring if no water developments had been located were located upstream of this reach. With the UARP, spills occurred in 16 out of the 23 years during the period of record. However, flows from spill events that fell within the estimated boatable range were rare.

This information was discussed at the Recreation and Aesthetics TWG meetings and at the October 22, 2003 TWG meeting, the participants agreed that a field reconnaissance should be conducted to assess boatability of the reach. This field evaluation is planned for 2004.

5.8 Gerle Creek: Loon Lake Dam to Gerle Reservoir

Based on the results of this study, Gerle Creek reach below Loon Lake Dam is another reach on the UARP that does not have any documented whitewater boating use. This section of river is 8.1 miles long with an average gradient of 133 feet per mile. The steepest mile is in the last third of the run where the river drops 365 feet. This section is freestone boulder in nature with very little bedrock. The upper section of this reach (below Loon Lake) contains areas that may provide some interesting rapids. There is one sliding falls that is about forty yards in length with a drop of approximately 25 feet. The major obstacle to whitewater boating in this reach is that nearly half of the reach is comprised of two meadows, each of which would be impassible due to vegetation in the channel. Utilizing this reach for boating would require running the whitewater sections and transporting around the meadows. It is doubtful that boaters would be willing to undertake boating on this reach given the relatively short whitewater sections that exist. The only craft suitable for this reach would be a kayak. The estimated range of boatable flows for the reach below Loon Lake on Gerle Creek is between 200 and 1,000 cfs. SMUD's hydrologic analysis showed that very few days would have boatable flows if no water developments occurred in the watershed.

The results of the field review were presented to the Recreation and Aesthetics TWG on January 3, 2003 and the participants agreed that no additional studies are necessary on this reach.

5.9 Upper Rubicon River from the Rubicon River headwaters to Hell Hole Reservoir

This reach of the Rubicon River is divided into two sections. The upper 7.5-mile section from the headwaters near Clyde Lake to Rubicon Reservoir is not affected by the UARP. The lower 11.7-mile section from Rubicon Reservoir to Hell Hole Reservoir is affected by diversions made by the UARP. There have only been two recorded runs on this reach. One of the paddlers, who was on both of the recorded trips, provided video that was very helpful in evaluating this run. One of the main challenges related to this run is in getting to the put-in. Running the upper section requires taking a ferryboat across Echo Lake then carrying kayaks 6.3 miles, through the Desolation Wilderness, over Mosquito Pass at an elevation of 8,400 feet, to the headwaters of the Rubicon River. The paddle down to Rubicon Reservoir is Class V with an average gradient of 144 feet per mile. The video shows a very spectacular run with many long granite slides as the river descends out of the Desolation Wilderness. On the first descent of this reach, the paddlers hiked out via Buck Island Lake to Loon Lake, making a total of nine miles of hiking and seven miles of river boating on this trip.

On the lower section, this group of kayakers found very little water immediately below Rubicon Reservoir. Eventually, tributary accretion provided enough flow to make portions of this section runnable. While the average gradient of 165 feet per mile is only slightly steeper than the upper section, the lower section contains several miles with a gradient of over 400 feet per mile. These steepest sections appear to be unrunnable, requiring several long portages. This reach is suitable for kayaks.

The best sections of this reach appear to be near the headwaters, which is not affected by the UARP. One of the paddlers interviewed stated that even this section was of lower quality than other runs of similar difficulty in the area. The estimated range of boatable flows for the Upper Rubicon River is between 400 and 800 cfs. SMUD's hydrologic analysis showed that, if no water developments occurred in the watershed, flows in the boatable range would have occurred in the peak runoff months of May and June over the period of record. With the UARP, spill events on this reach during the period of record that produced flows in the boatable range were extremely rare.

The six-mile hike to the put-in would be a major deterrent for most boaters. Flow information would greatly improve the opportunity for the few who wish to attempt this run.

These results were presented to the Recreation and Aesthetics TWG on January 3, 2003 and the participants agreed that no additional studies are necessary on this reach.

5.10 Access

Access to the UARP Reaches where there are existing or potential whitewater boating opportunities is generally good. There are many paved roads that lead to points adjacent to the UARP Reaches. There are four locked gates (Ice House Dam, White Rock Powerhouse, Slab Creek Dam and Camino Dam) that require hikes between a third of a mile to one mile to access the reaches. The existing area available for parking where boaters would put-in or take-out for boating on the UARP Reaches is limited to parking along the shoulder of the access road to the site. The most difficult access on the UARP is on the Rubicon River. Accessing this reach by boating from the headwaters of the Rubicon down to Rubicon Reservoir or starting at Rubicon Reservoir would require a several mile hike to the put-in.

More specific details about access to the Slab Creek Reach and the Ice House Reach are included in the *Slab Creek Whitewater Boating Flow Technical Report* and the *Ice House Whitewater Flow Technical Report*. Similarly, details about the access for the Camino Reach will be included in the technical report prepared for that study.

5.11 Flow Information

Adequate flow information for boaters to use to make decisions about boating on the UARP Reaches does not appear to be available to the public. The only exception would be flow information, available on the Dream Flows Web Site, for the Slab Creek Reach. Currently, boaters make intuitive assessments about flows or contact other boaters when deciding to attempt boating in the UARP Reaches. The boaters that were interviewed unanimously stated that having flow information available to them would improve their ability to boat in the UARP Reaches. Useful aspects of flow information would include flow predictions on a seasonal and monthly basis and real-time flow data available on the Internet.

6.0 FINDINGS

The UARP reaches were identified as fitting into one of three categories: (1) suitable for expeditionary type of whitewater boating on an opportunistic basis; (2) unsuitable for whitewater boating because of low gradient or physical barriers; and (3) potentially suitable for whitewater boating. The reaches are listed by category in Table 6.1-1.

Table 6.1-1. Suitability of UARP reaches for whitewater boating.

Suitable for Expeditionary Type of Whitewater Boating	Unsuitable for Whitewater Boating-Low Gradient/Physical Barriers	Potentially Suitable for Whitewater Boating
Robbs Peak Reach Upper Rubicon River[1] (headwaters to Hell Hole Reservoir)	Junction Reach Loon Lake Reach	Ice House Reach Slab Creek Reach Camino Reach

[1]Mostly a non-UARP reach

Additional studies were planned and executed to develop additional information about the suitability and the range of flows that could support whitewater boating in the Ice House, Slab Creek and Camino reaches.

Flow information for the UARP reaches is not generally available to boaters. If flow information were more available, boaters would be better able to plan and schedule their boating trips. The type of information that would be most useful to boaters would be seasonal and monthly flow predictions and real-time flow data. Providing flow information on the Internet would likely be the most effective means to inform boaters about flows in the UARP reaches.

7.0 LITERATURE CITED

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Appendix A

International Scale of River Difficulty
(as revised by American Whitewater, 1998)

Appendix A
International scale of river difficulty
(as revised by American Whitewater, 1998)

this is the American version of a rating system used to compare river difficulty throughout the world. this system is not exact; rivers do not always fit easily into one category, and regional or individual interpretations may cause misunderstandings. it is no substitute for a guidebook or accurate first-hand descriptions of a run.

The six difficulty classes:

class i: easy. fast moving water with riffles and small waves. few obstructions, all obvious and easily missed with little training. risk to swimmers is slight; self-rescue is easy.

class ii: novice. straightforward rapids with wide, clear channels which are evident without scouting. occasional maneuvering may be required, but rocks and medium sized waves are easily missed by trained paddlers. swimmers are seldom injured and group assistance, while helpful, is seldom needed. rapids that are at the upper end of this difficulty range are designated "class ii+".

class iii: intermediate. rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe. complex maneuvers in fast current and good boat control in tight passages or around ledges are often required; large waves or strainers may be present but are easily avoided. strong eddies and powerful current effects can be found, particularly on large-volume rivers. scouting is advisable for inexperienced parties. injuries while swimming are rare; self-rescue is usually easy but group assistance may be required to avoid long swims. rapids that are at the lower or upper end of this difficulty range are designated "class iii-" or "class iii+" respectively.

class iv: advanced. intense, powerful but predictable rapids requiring precise boat handling in turbulent water. depending on the character of the river, it may feature large, unavoidable waves and holes or constricted passages demanding fast maneuvers under pressure. a fast, reliable eddy turn may be needed to initiate maneuvers, scout rapids, or rest. rapids may require ômust" moves above dangerous hazards. scouting may be necessary the first time down. risk of injury to swimmers is moderate to high, and water conditions may make self-rescue difficult. group assistance for rescue is often essential but requires practiced skills. a strong eskimo roll is highly recommended. rapids that are at the upper end of this difficulty range are designated "class iv-" or "class iv+" respectively.

class v: expert. extremely long, obstructed, or very violent rapids which expose a paddler to added risk. drops may contain large, unavoidable waves and holes or steep, congested chutes with complex, demanding routes. rapids may continue for long distances between pools, demanding a high level of fitness. what eddies exist may be small, turbulent, or difficult to reach. at the high end of the scale, several of these factors may be combined. scouting is recommended but may be difficult. swims are dangerous, and rescue is often difficult even for experts. a very reliable eskimo roll, proper equipment, extensive experience, and practiced rescue skills are essential. because of the large range of difficulty that exists beyond class iv, class 5 is an open ended, multiple level scale designated by class 5.0, 5.1, 5.2, etc... each of these levels is an order of magnitude more difficult than the last. example: increasing difficulty from class 5.0 to class 5.1 is a similar order of magnitude as increasing from class iv to class 5.0.

class vi: extreme and exploratory. these runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability and danger. the consequences of errors are very severe and rescue may be impossible. for teams of experts only, at favorable water levels, after close personal inspection and taking all precautions. after a class vi rapids has been run many times, it's rating may be changed to an appropriate class 5.x rating

Appendix B

Summarized Responses to Whitewater Use Questionnaire Calendar Year 2002

Appendix B--SUMMARIZED RESPONSES TO WHITEWATER USE QUESTIONNAIRE -Calendar Year 2002

Table 1. Please tell us about your last trip by filling out the table below for each of the runs you have boated.

Run	Usual Put-In & Take Out	How many times have you paddled this each of these reaches	Exact date, if possible, (month and year, at least) for each run	What kind of boats did you use?	What class do you think this run is?	What do you think the flows were?	Did you have gauge information? What type?
Slab Creek	**Slab Creek Dam to White Rock Powerhouse**						
Richard Montgomery	Slab Creek Dam to White Rock Powerhouse	1	Spring 1997	Kayak	V	2000-2500 cfs	No
Scott Lindgren	Slab Creek Dam to White Rock Powerhouse	6	Spring 1993-1995	Kayak	IV/ V	800-1200 cfs	Flow at Chili Bar
Todd Stanley	Slab Creek Dam to White Rock Powerhouse	15	Spring 1992-2002	Kayak	V	200-3500 cfs	Flow at Chili Bar
Mike Snead	Slab Creek Dam to White Rock Powerhouse	5	1982,1993/94 2002	Kayak	IV/ V	800-2200 cfs	No
Andrew Belcher	Slab Creek Dam to White Rock Powerhouse	8	Spring 1997-2002	Kayak	-V/ V	500-2500 cfs	No
Mike Fentress	Slab Creek Dam to White Rock Powerhouse	5	Spring 1982-1996	Kayak	-V	900-1500 cfs	No
Jared Noceti	Slab Creek Dam to White Rock Powerhouse	12	Spring 1994-2002	Kayak	V	600-2000 cfs	Dream Flows
Ron Thompson	Slab Creek Dam to White Rock Powerhouse	1	Spring 1998	Kayak	V	2000-3000 cfs	No

Table 1. Please tell us about your last trip by filling out the table below for each of the runs you have boated

Run	Usual Put-In & Take Out	How many times have you paddled this each of these reaches	Exact date, if possible, (month and year, at least) for each run	What kind of boats did you use?	What class do you think this run is?	What do you think the flows were?	Did you have gauge information? What type?
Slab Creek	**Slab Creek Dam to White Rock Powerhouse**						
Lars Holbek	Slab Creek Dam to White Rock Powerhouse	10	Spring 1988-1998	Kayak	V	700-2000 cfs	Flow at Chili Bar
Johnny Kern	Slab Creek Dam to White Rock Powerhouse	1	1995	Kayak	V	1000 cfs	No
Silver Creek Below Camino	**Camino Reservoir to Camino Powerhouse**						
Richard Mongomery	Camino Reservoir to Camino Powerhouse	1	***May*** 1982	Kayak	V	1500 cfs	No
Scott Lindgen	Camino Reservoir to Camino Powerhouse	1	Spring 1998	Kayak	***V***	2500 cfs	No
Dustin Knapp	Camino Reservoir to Camino Powerhouse	1	Spring 1998	Kayak	V	1400 cfs	No
Lars Holbek	Camino Reservoir to Camino Power House	1	Spring 1998	Kayak	V	2500 cfs	No
South Fk. Silver Cr. Below Ice House Res.	**Ice House Dam to Junction Res.**						
Jared Noceti	Ice House Dam to Junction Res	1	May 1993	Kayak	III	500 cfs	No
South Fk. Silver Cr. above Ice House Res.	**12N25 off Ice House Rd to the end of 11N52 at Ice House Res.**						
Scott Lindgren		5	Spring1998-2001	Kayak	V	100-300 cfs	No
Todd Stanley		15	Spring1998-2002	Kayak	V	200-300cfs	No

Table 1. Please tell us about your last trip by filling out the table below for each of the runs you have boated

Run	Usual Put-In & Take Out	How many times have you paddled this each of these reaches	Exact date, if possible, (month and year, at least) for each run	What kind of boats did you use?	What class do you think this run is?	What do you think the flows were?	Did you have gauge information? What type?
Andrew Belcher		20	Spring1998-2002	Kayak	V	50-250 cfs	No
Jared Noceti		12	Spring1998-2002	Kayak	V	100-500 cfs	No
Lars Holbek		1	June 2002	Kayak	V	200 cfs	No
Johnny Kern		15	1998-2002	Kayak	V	150-450 cfs	No
S. Fork Rubicon							
Jared Noceti	Loon Lake Dam to Ice House Road	1	Spring 2000	Kayak	V	200	No
Rubicon	**Echo Lake to Hell Hole Res**						
Todd Stanley	Echo Lake to Hell Hole Res	2	6/19/98 6/16/00	Kayak	V	800cfs 1000 cfs	No
Ron Thompson	Echo Lake to Hell Hole Res	2	6/19/98 6/16/00	Kayak	V	200-400 cfs	No

Table 2. We are also interested in your general impressions of the runs. Could you give us those impressions by completing the table below for each of the runs you have boated?

Run	Were there safety issues on this run that stand out in your mind?	What do you feel is the range of boatable flows?	What level of confidence do you have in your estimate of this range of boatable flows? (High, Medium or Low)	What do you feel is the Optimum boatable flow?	What level of confidence do you have in your estimate of this optimum boatable flow? (High, Medium or Low)	What crafts do you think this run is Best suited for?
Slab Creek						
Richard Montgomery	Very continuous at this level	400-3000 cfs	Low	1200-1500 cfs	Low	Kayak, Raft
Scott Lindgren	None	800-2000 cfs	High	1100 cfs	High	Kayak, Raft
Todd Stanley	No	800-2500 cfs	High	1500cfs	High	Kayak, Raft
Mike Snead	Mother Lode Falls Portage Challenge	800-1800 cfs	High	800-1200 cfs	High	Kayak., Raft, Inflatable Kayak
Andrew Belcher	Mother Lode Falls Portage Challenge	500-2000 cfs	High	1200-1500 cfs	High	Kayak., Raft, Inflatable Kayak
Mike Fentress	Trees	500-2000 cfs	High	800-1500 cfs	High	Kayak, Raft
Jared Noceti	Mother Lode Falls Portage Challenge	600-3500 cfs	High	1500 cfs	High	Kayak, Raft
Ron Thompson	Metal by Bridge	800-3000 cfs	Medium	1000cfs	Low	Kayak, Raft
Lars Holbek	No	600-2500 cfs	High	1200 cfs	Med	Kayak, Raft
Silver Creek Below Camino						
Richard Montgomery	Brush Trees	400-3000 cfs	Low	800 cfs	Low	Kayak, Raft
Scott Lindgen	None	600-1500 cfs	High	1000 cfs	Medium	Kayak, Raft
Dustin Knapp	No	500-2000 cfs	High	1500cfs	High	Kayak, Raft
Lars Holbek	Put in, Dam portage	500-3000 cfs	High	1200cfs	High	Kayak., Raft
South Fk. Silver Cr. Below Ice House Res.						
Jared Noceti	Trees, Culverts	300-3000 cfs	Medium	1000 cfs	High	Kayak, Raft, Canoe

Table 2. We are also interested in your general impressions of the runs. Could you give us those impressions by completing the table below for each of the runs you have boated?

Run	Were there safety issues on this run that stand out in your mind?	What do you feel is the range of boatable flows?	What level of confidence do you have in your estimate of this range of boatable flows? (High, Medium or Low)	What do you feel is the Optimum boatable flow?	What level of confidence do you have in your estimate of this optimum boatable flow? (High, Medium or Low)	What crafts do you think this run is Best suited for?
South Fk. Silver Cr. Above Ice House Res.						
Scott Lindgren	None	100-300 cfs	High	175cfs	High	Kayak
Todd Stanley	No	100-250cfs	High	150fs	High	Kayak
Andrew Belcher	Pin, Broaches	50-500cfs	Med	200-250 cfs	High	Kayak
Jared Noceti	Trees	100-500cfs	High	200 cfs	High	Kayak, Raft
Ron Thompson	No	100-300cfs	Medium	150 cfs	High	Kayak
Lars Holbek	No	100-200 cfs	High	150 cfs	Med	Kayak
Johnny Kern	Trees	75-450 cfs	High	200	High	Kayak
South Fork Rubicon						
Jared Noceti	Trees Gradient	None	High	None	High	Kayak
Rubicon						
Todd Stanley	Wood	800-1000 cfs	Medium	600-800cfs	High	Kayak
Ron Thompson	Tunnel to Loon	300-600 cfs take out	Medium	400 take out	Medium	Kayak

Table 3. What would have to change for you to use the runs more than you currently do now? Please be specific by run and improvement. Also, please rate these runs relative to each other and to other similar runs in the state.

Run	Flow Improvements	Flow Information	Better Access	Rate this run (1-10, 10 is best) at optimum flow as compared to other runs on this list.	Rate this run (1-10, 10 is best) at optimum flow as compared to similar runs in the state.
Slab Creek	Yes[1]				
Richard Montgomery	Yes	Yes	No	9	9
Scott Lindgren	Yes	Yes	No (except, gate at put in)	6	6
Todd Stanley	Yes	Yes	Locked Gate (take out)	10	9
Mike Snead	Yes	Yes	No	9	9
Andrew Belcher	Yes	Yes	Locked Gate (take out)	10	9
Mike Fentress	Yes	Yes	No		9
Jared Noceti	***Yes***	Yes	Locked Gate (take out)	9	7
Ron Thompson	***Yes***	Yes	No	7	6
Lars Holbek	***Yes***	Yes	No	9	9
Silver Creek Below Camino					
Richard Montgomery	Yes	Yes	Yes Long Shuttle	5	5
Scott Lindgen	Yes	Yes	No	7	6
Dustin Knapp	Yes	Yes	Locked Gate (take out)	8	7
Lars Holbek	Yes	Yes	Locked Gate (take out)	8	8
South Fk. Silver Cr. Below Ice House Res.					
Jared Noceti	Yes	Yes	No	4 (fire)	6

Table 3. What would have to change for you to use the runs more than you currently do now? Please be specific by run and improvement. Also, please rate these runs relative to each other and to other similar runs in the state.

Run	Flow Improvements	Flow Information	Better Access	Rate this run (1-10, 10 is best) at optimum flow as compared to other runs on this list.	Rate this run (1-10, 10 is best) at optimum flow as compared to similar runs in the state.
South Fk. Silver Cr. Above Ice House Res.	Natural Flow[2]	Yes[3]			
Scott Lindgren	No	Yes	No	9	9
Todd Stanley	No	Yes	No	6	6
Andrew Belcher	No (Wrights lake?)4	Yes	No	9-10	9-10
Jared Noceti	No	Yes	No	10	10
Ron Thompson	No	Yes	Plowing Road	10	10
Lars Holbek	No	Yes	No	9	9
Johnny Kern	No	Yes	Plowing Road	9	7-8
South Fork Rubicon					
Jared Noceti	No	No	No	1	1
Rubicon					
Todd Stanley	***Yes*** (Below Rubicon Res)	Yes	No	8	8
Ron Thompson	***Yes*** (Below Rubicon Res)	Yes	No	9	9

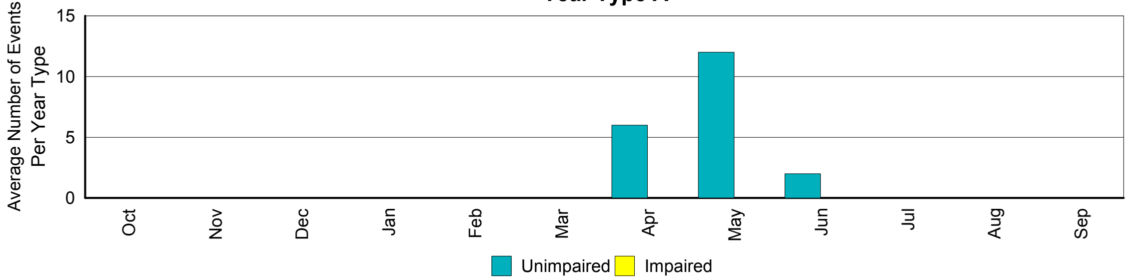
[1]While summer flows would be most popular, most respondents agreed that flows on the Slab Cr. Reach would be used at all times of the year.
[2]This reach is not affected by the UARP.
[3]Most boaters felt that because this reach has reliable natural flows from May through July that flow information is not as critical.
[4]This respondent thought that flow might be impacted by Wrights Lake. A visit to Wrights Lake confirmed that there are no structures at this lake to impact flow into the South Fork of Silver Creek.

Appendix C

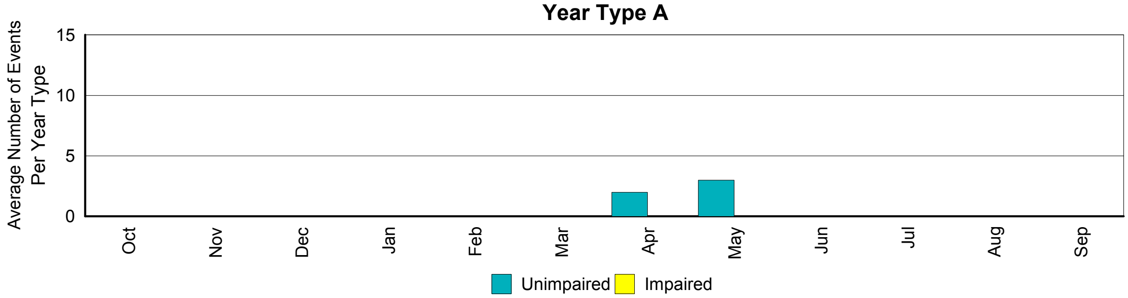
Histograms of Project Reaches
(Days Within Range of Boatable Flows)

WY 1975-2001

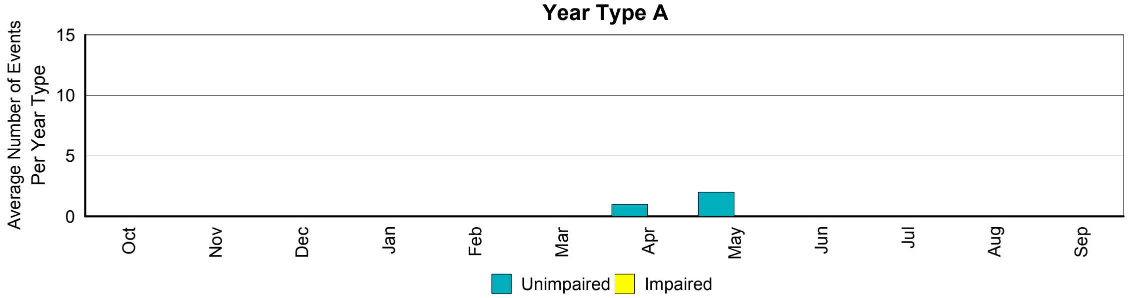
Rubicon River Below Rubicon Reservoir
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A



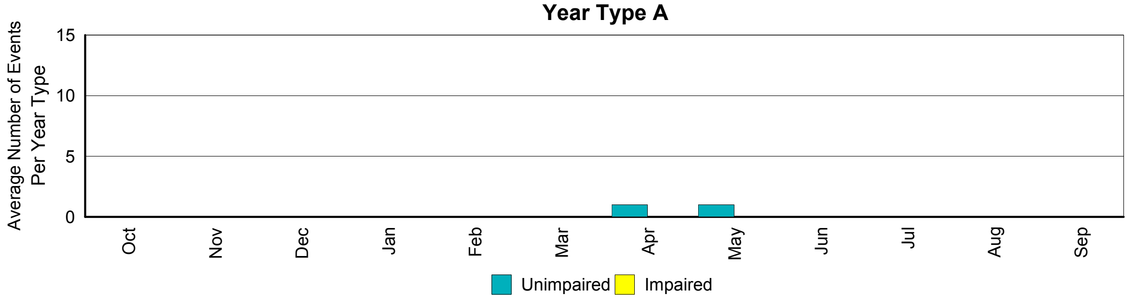
Rubicon River Below Rubicon Reservoir
3-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A



Rubicon River Below Rubicon Reservoir
5-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A

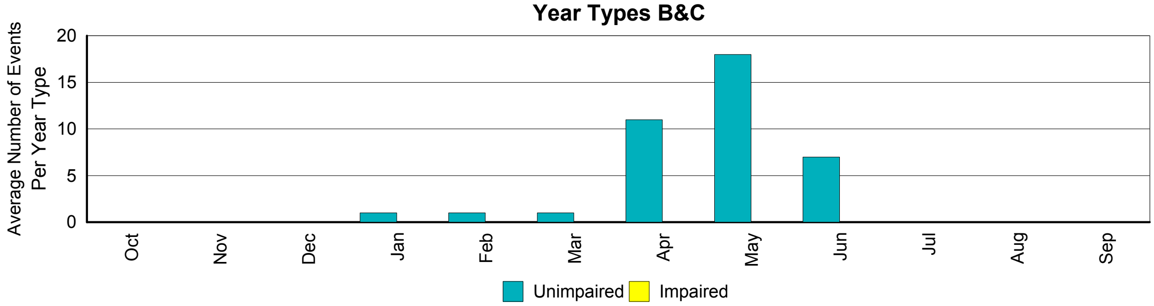


Rubicon River Below Rubicon Reservoir
7-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A

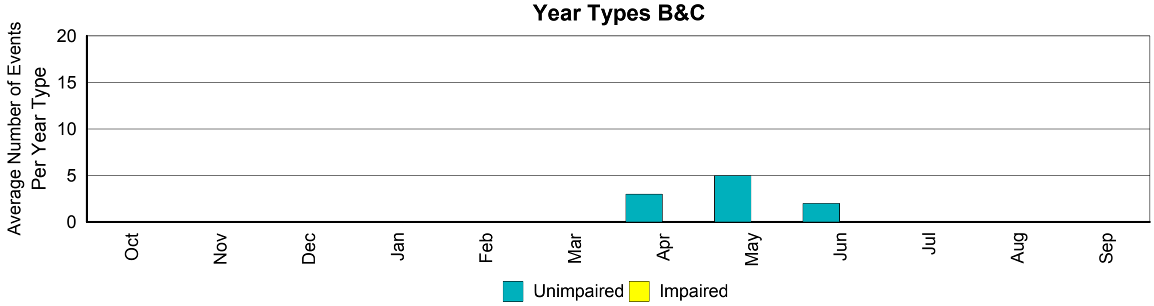


WY 1975-2001

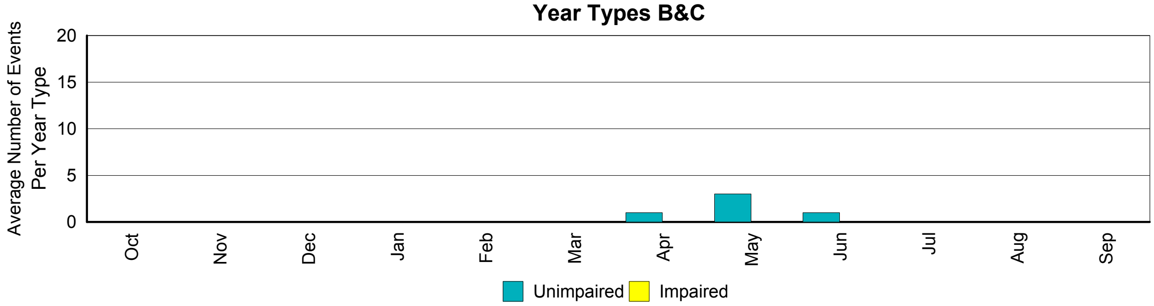
Rubicon River Below Rubicon Reservoir
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Types B&C



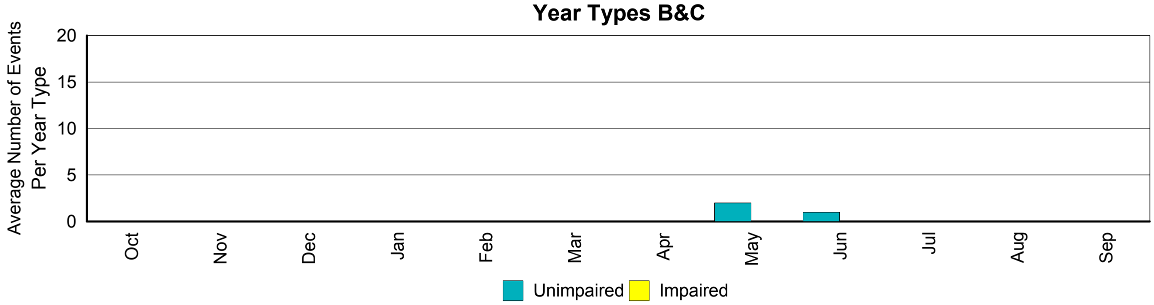
Rubicon River Below Rubicon Reservoir
3-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Types B&C



Rubicon River Below Rubicon Reservoir
5-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Types B&C

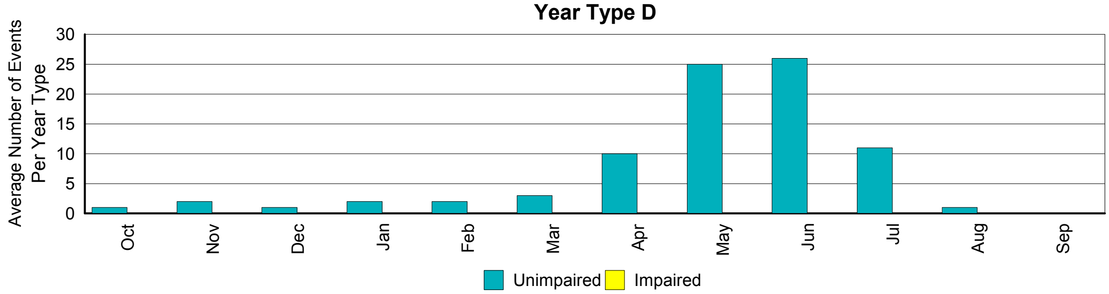


Rubicon River Below Rubicon Reservoir
7-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Types B&C

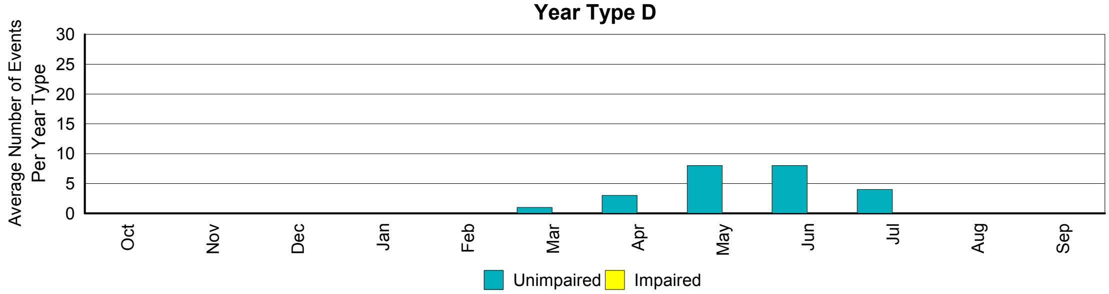


WY 1975-2001

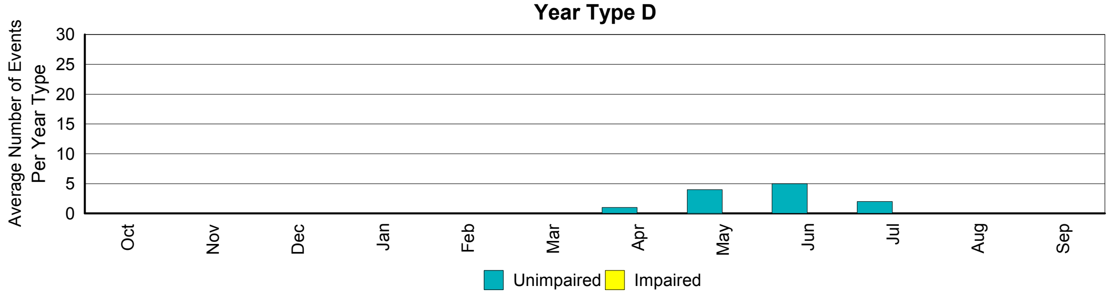
Rubicon River Below Rubicon Reservoir
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D



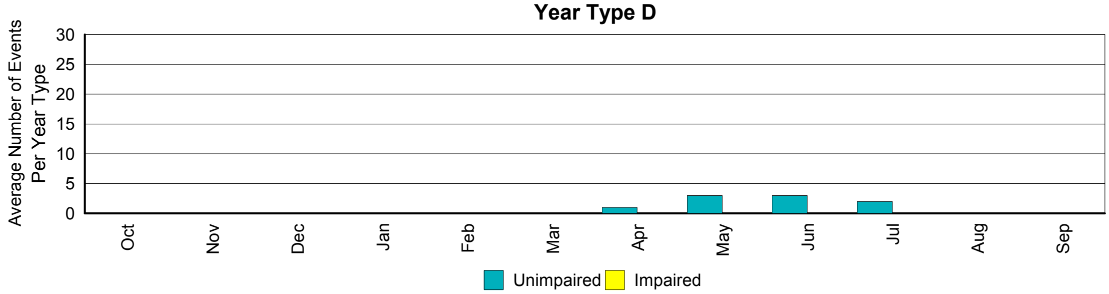
Rubicon River Below Rubicon Reservoir
3-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D



Rubicon River Below Rubicon Reservoir
5-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D

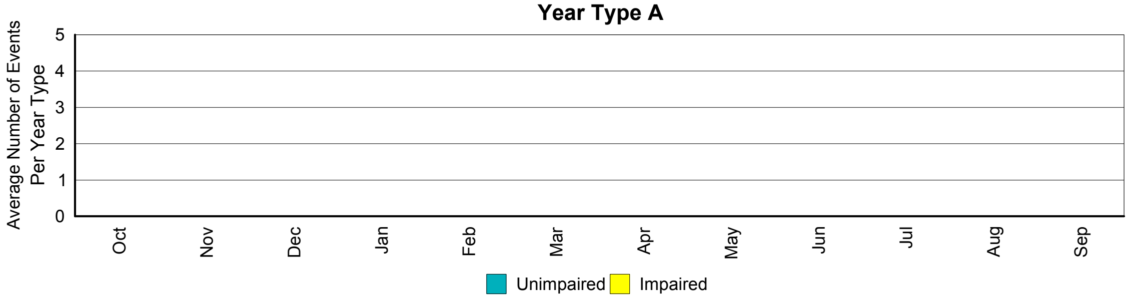


Rubicon River Below Rubicon Reservoir
7-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D

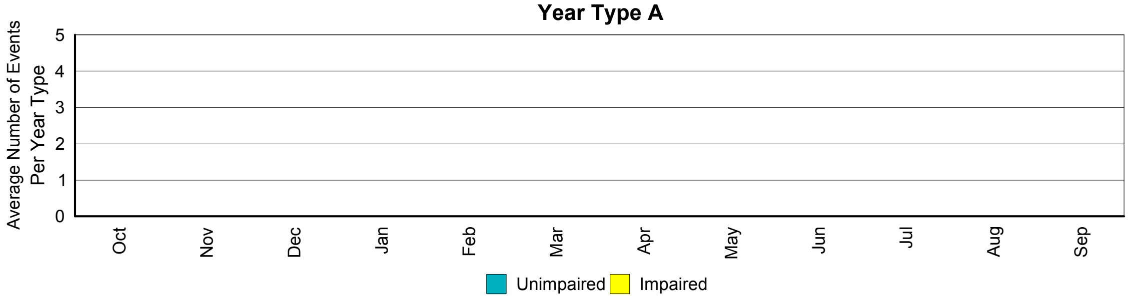


WY 1975-2001

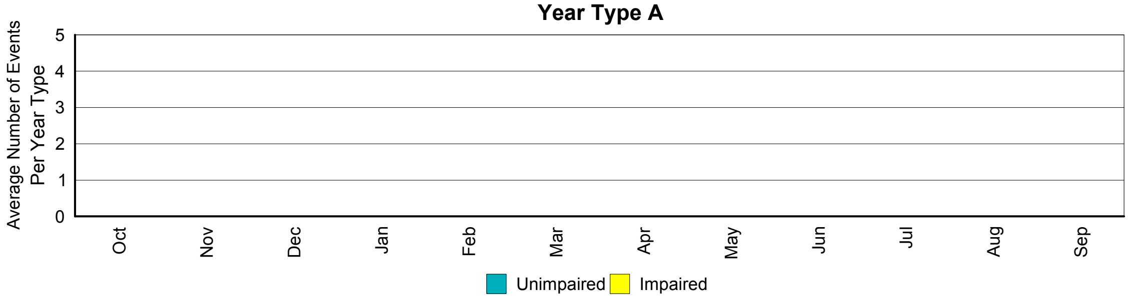
Gerle Creek Below Loon Lake
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A



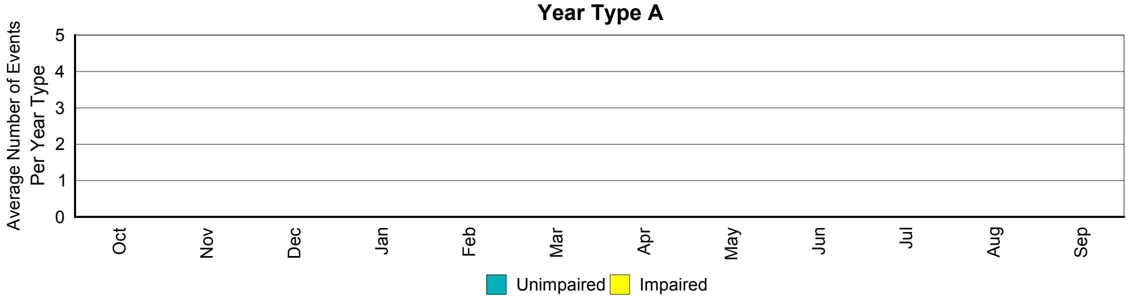
Gerle Creek Below Loon Lake
3-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A



Gerle Creek Below Loon Lake
5-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A

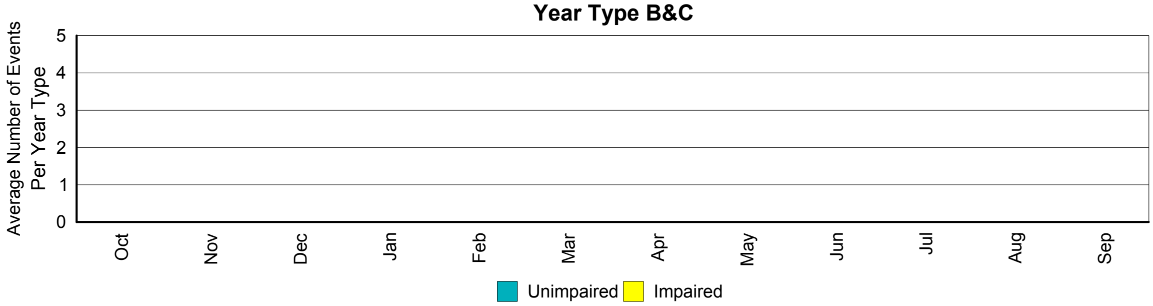


Gerle Creek Below Loon Lake
7-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A

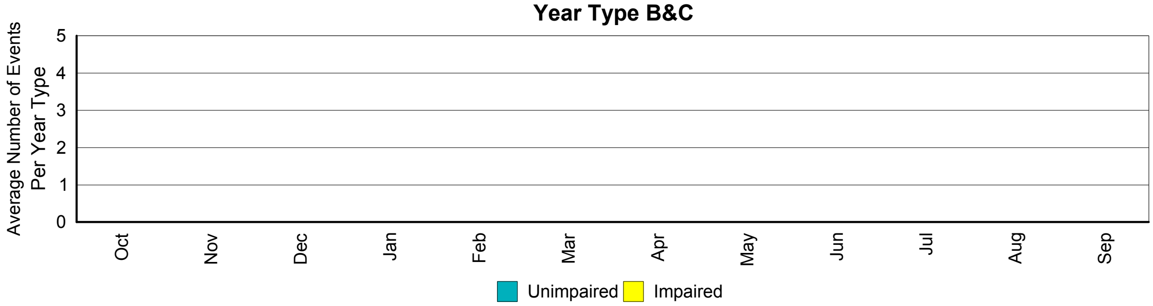


WY 1975-2001

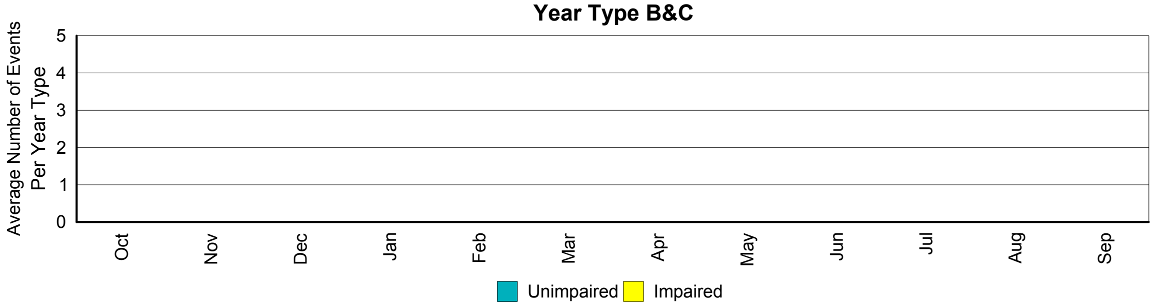
Gerle Creek Below Loon Lake
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type B&C



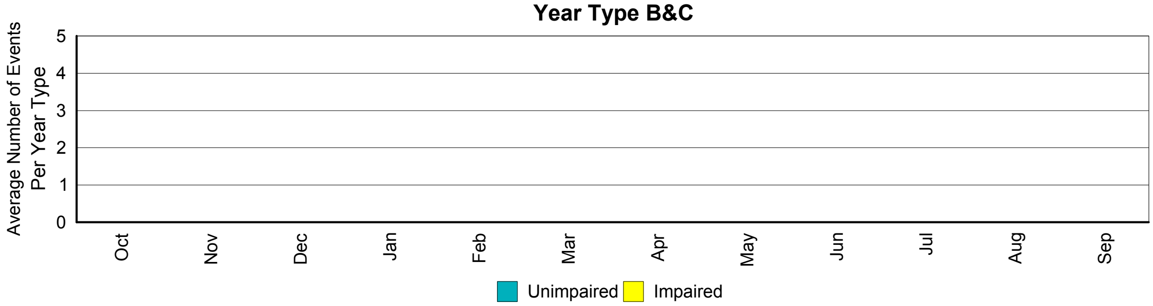
Gerle Creek Below Loon Lake
3-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type B&C



Gerle Creek Below Loon Lake
5-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type B&C

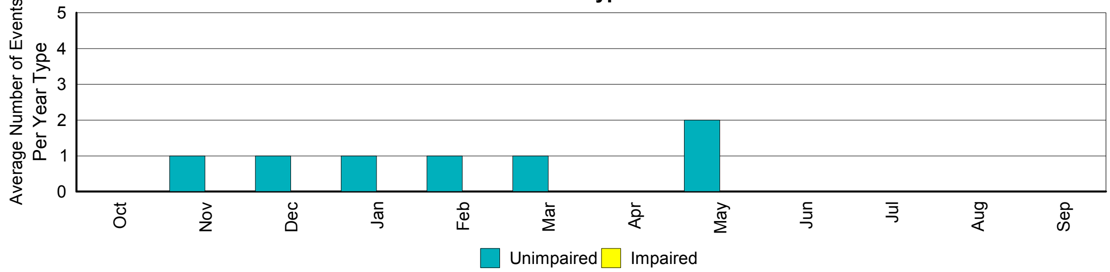


Gerle Creek Below Loon Lake
7-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type B&C

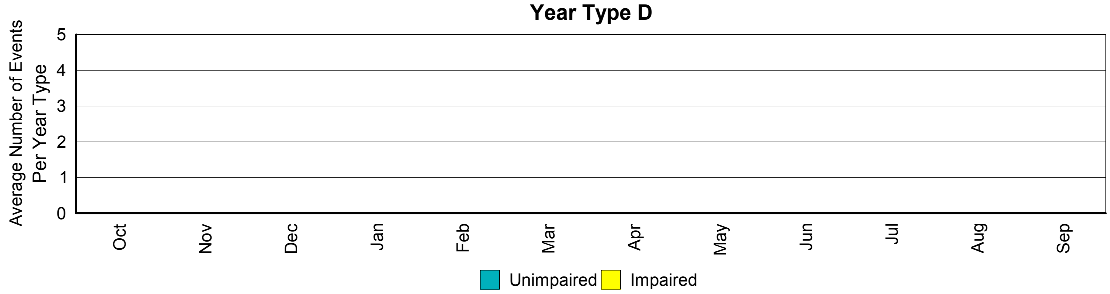


WY 1975-2001

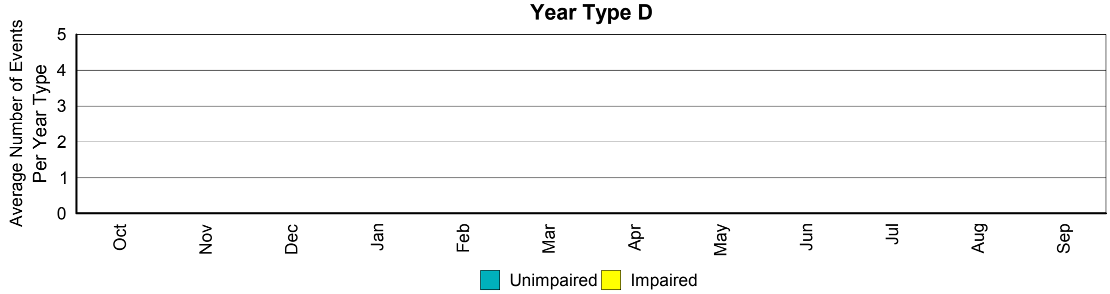
Gerle Creek Below Loon Lake
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D



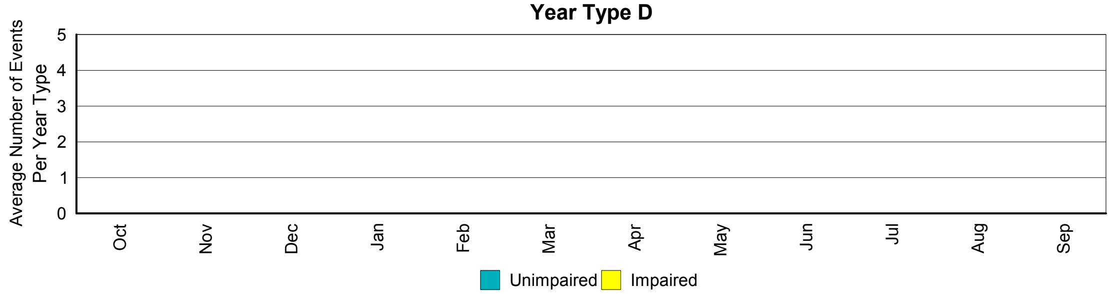
Gerle Creek Below Loon Lake
3-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D

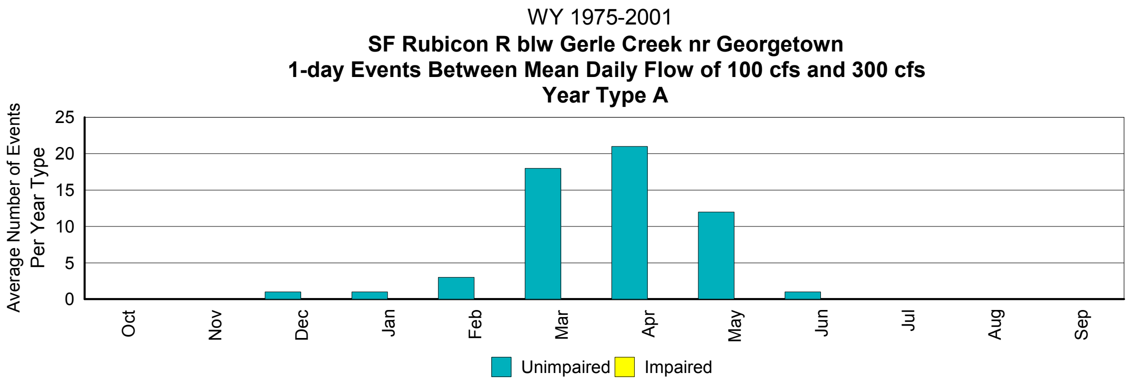


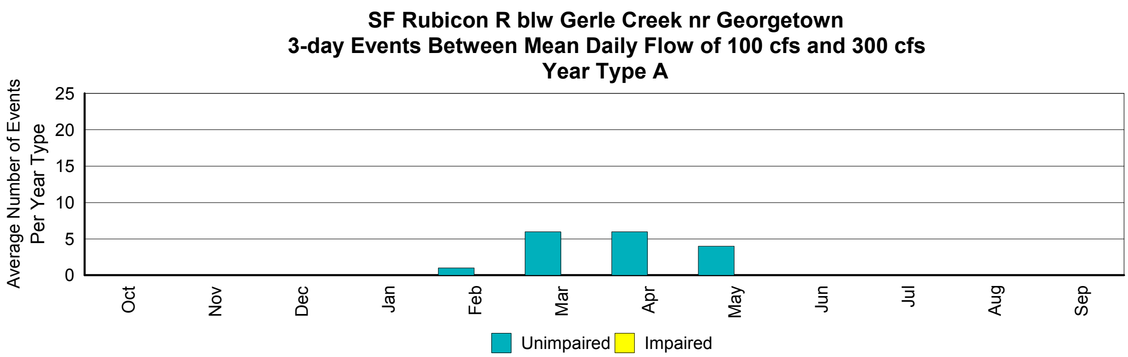
Gerle Creek Below Loon Lake
5-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D

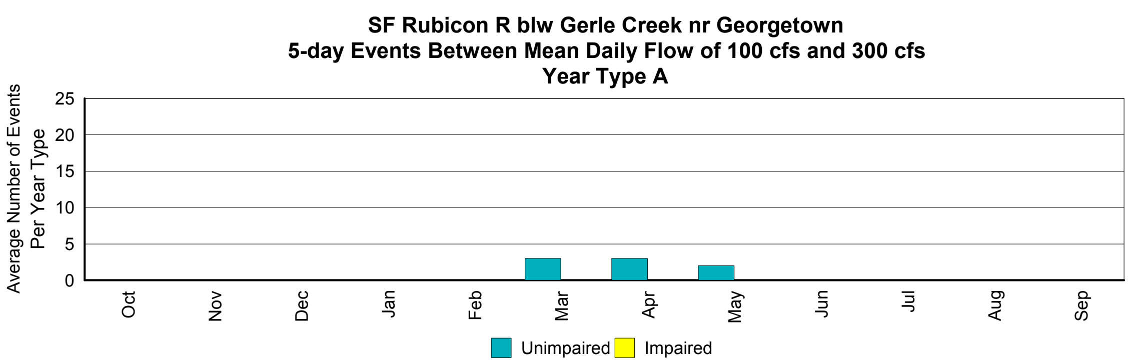


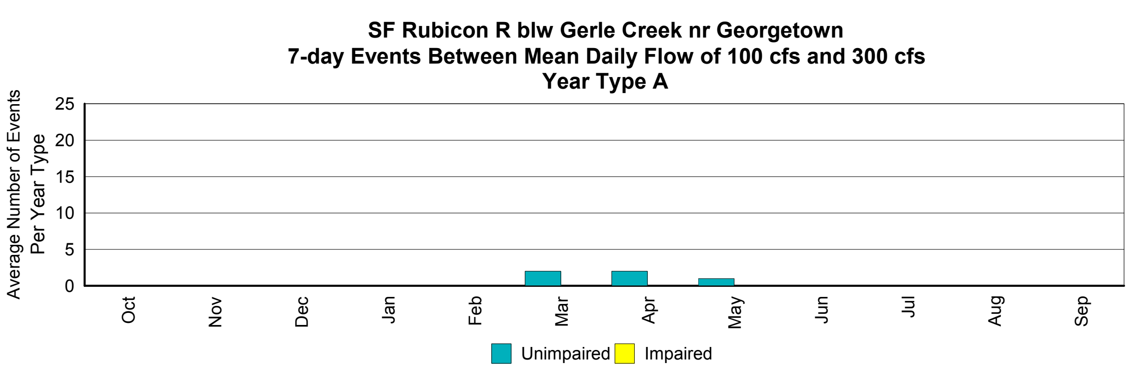
Gerle Creek Below Loon Lake
7-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D




WY 1975-2001
SF Rubicon R blw Gerle Creek nr Georgetown
1-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type A
Average Number of Events Per Year Type
25
20
15
10
5
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Unimpaired
Impaired

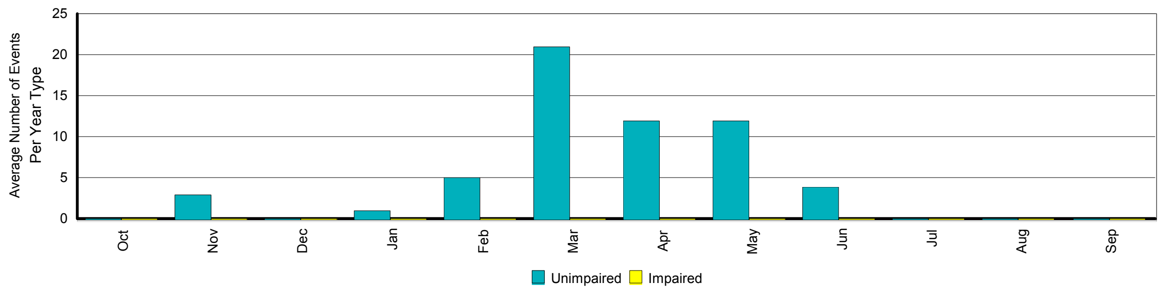

SF Rubicon R blw Gerle Creek nr Georgetown
3-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type A
Average Number of Events Per Year Type
25
20
15
10
5
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Unimpaired
Impaired


SF Rubicon R blw Gerle Creek nr Georgetown
5-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type A
Average Number of Events Per Year Type
25
20
15
10
5
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Unimpaired
Impaired

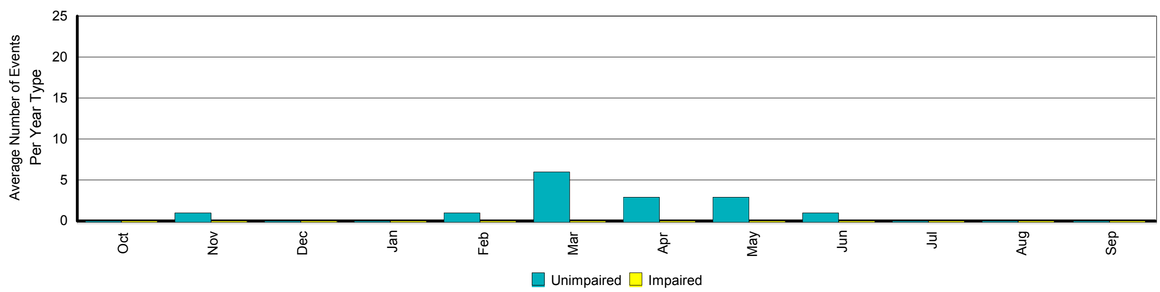

SF Rubicon R blw Gerle Creek nr Georgetown
7-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type A
Average Number of Events Per Year Type
25
20
15
10
5
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Unimpaired
Impaired

WY 1975-2001

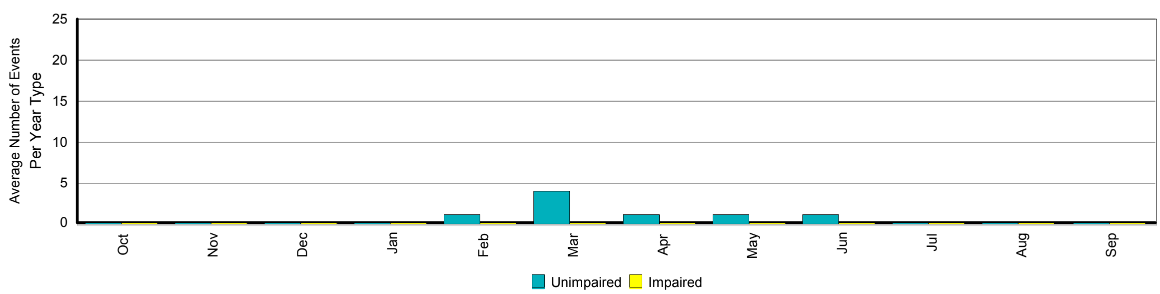
SF Rubicon R blw Gerle Creek nr Georgetown
1-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type B&C



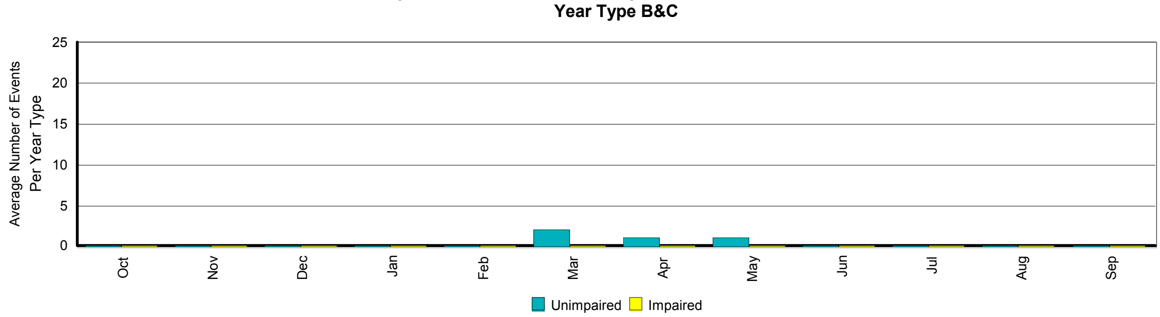
SF Rubicon R blw Gerle Creek nr Georgetown
3-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type B&C



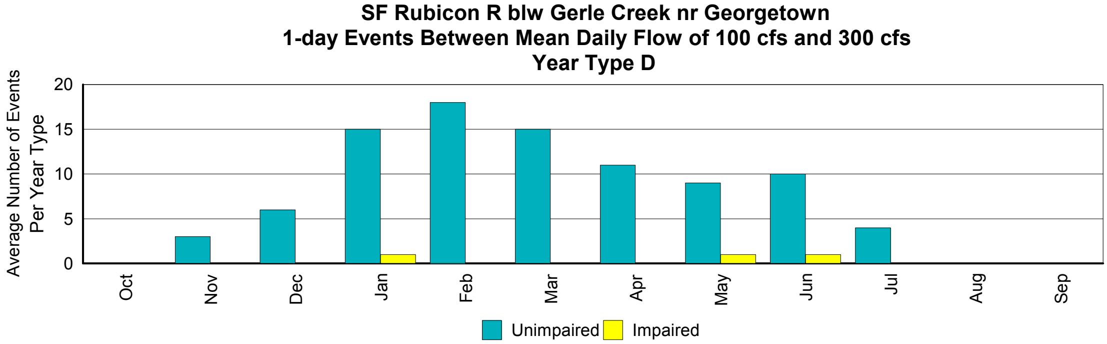
SF Rubicon R blw Gerle Creek nr Georgetown
5-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type B&C



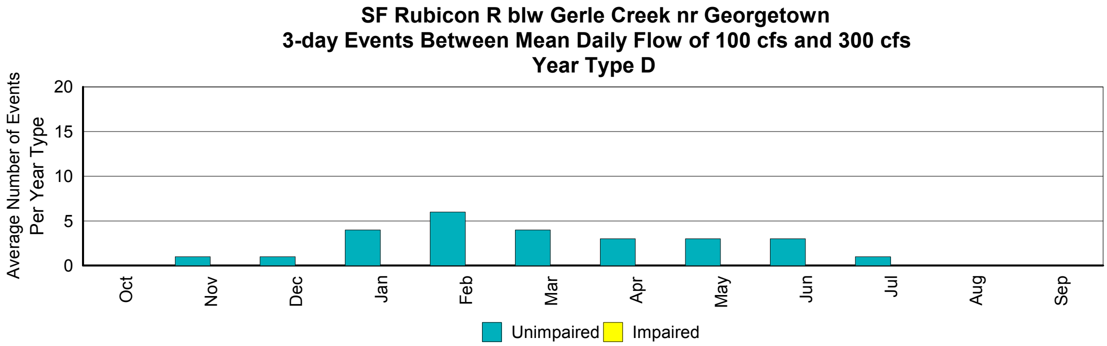
SF Rubicon R blw Gerle Creek nr Georgetown
7-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type B&C



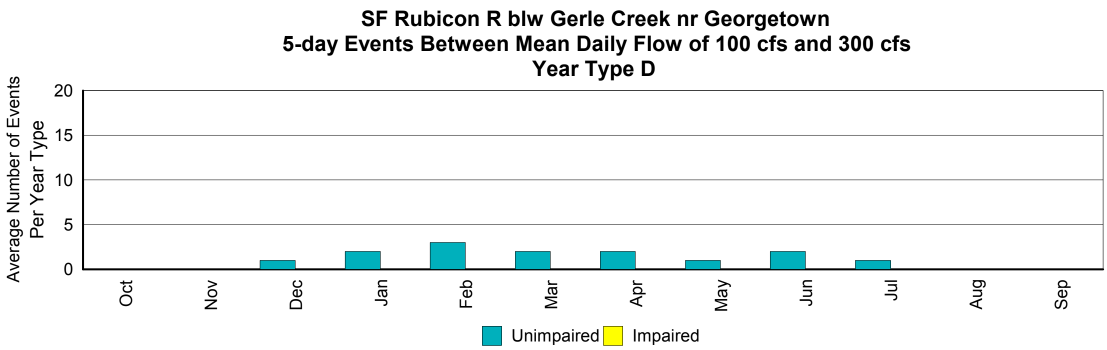
WY 1975-2001



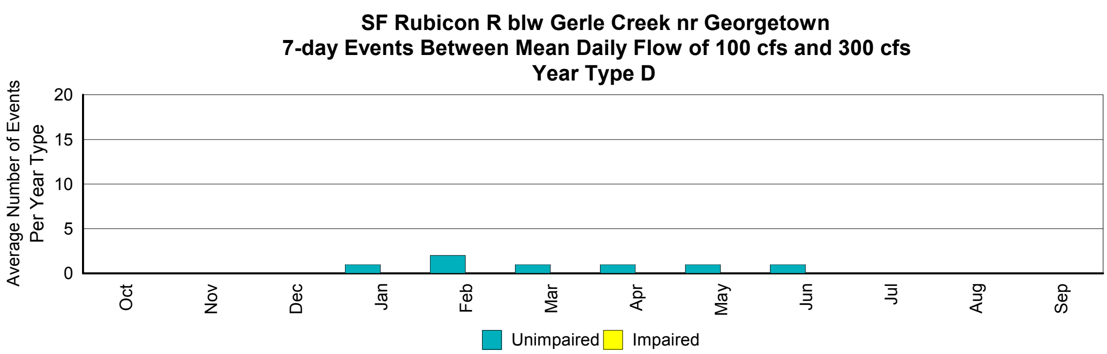
SF Rubicon R blw Gerle Creek nr Georgetown
1-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type D
Average Number of Events Per Year Type
0
5
10
15
20
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Unimpaired
Impaired



SF Rubicon R blw Gerle Creek nr Georgetown
3-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type D
Average Number of Events Per Year Type
0
5
10
15
20
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Unimpaired
Impaired



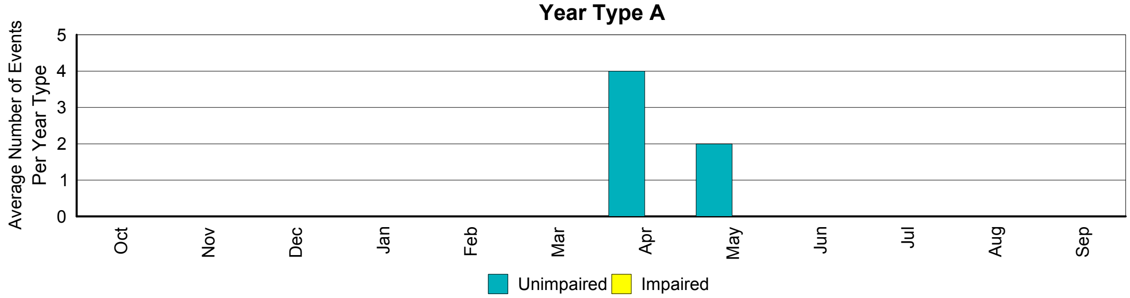
SF Rubicon R blw Gerle Creek nr Georgetown
5-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type D
Average Number of Events Per Year Type
0
5
10
15
20
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Unimpaired
Impaired



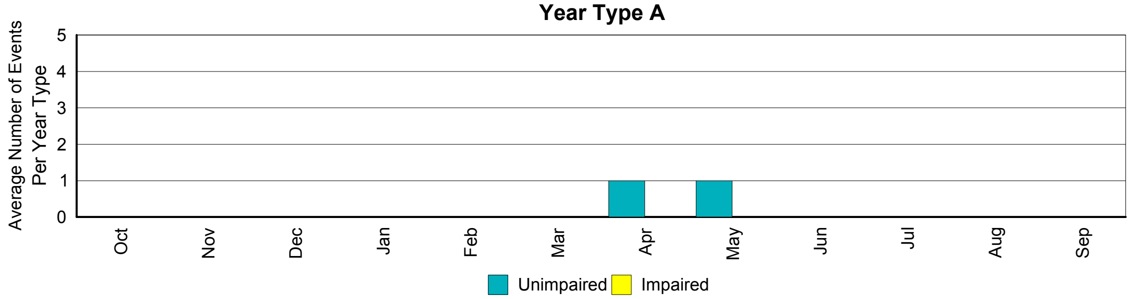
SF Rubicon R blw Gerle Creek nr Georgetown
7-day Events Between Mean Daily Flow of 100 cfs and 300 cfs
Year Type D
Average Number of Events Per Year Type
0
5
10
15
20
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Unimpaired
Impaired

WY 1986-2001

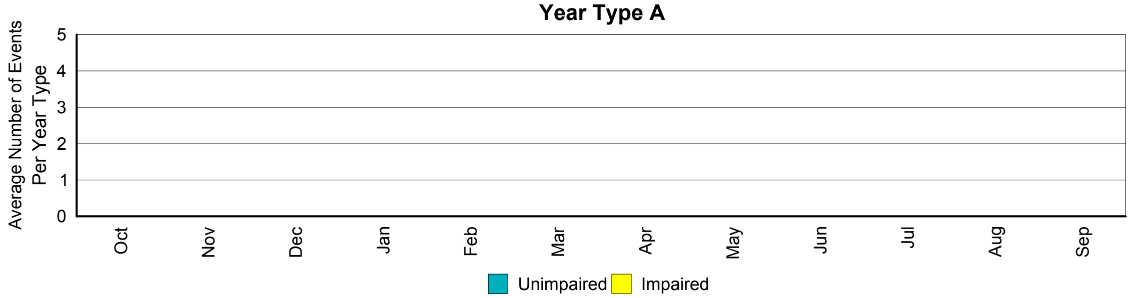
SF Silver Fork Below Ice House Reservoir
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A



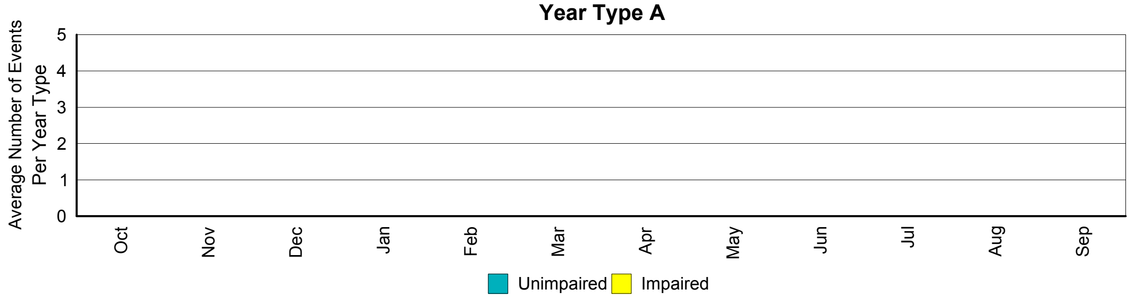
SF Silver Fork Below Ice House Reservoir
3-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A



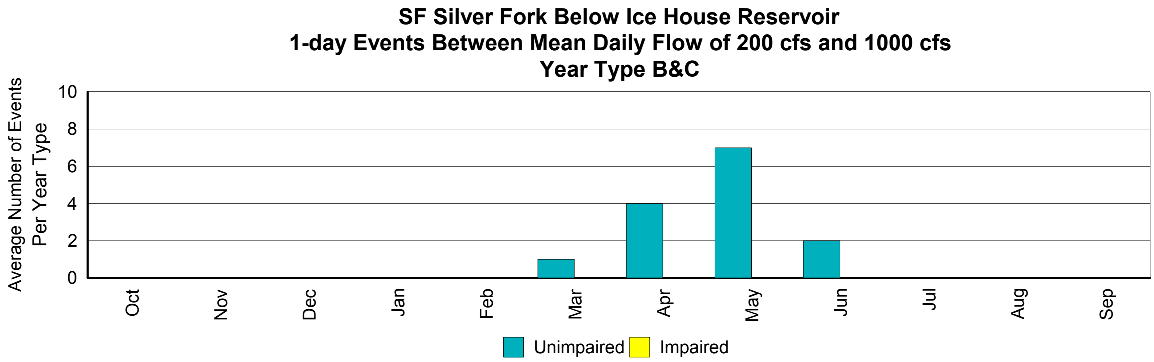
SF Silver Fork Below Ice House Reservoir
5-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A

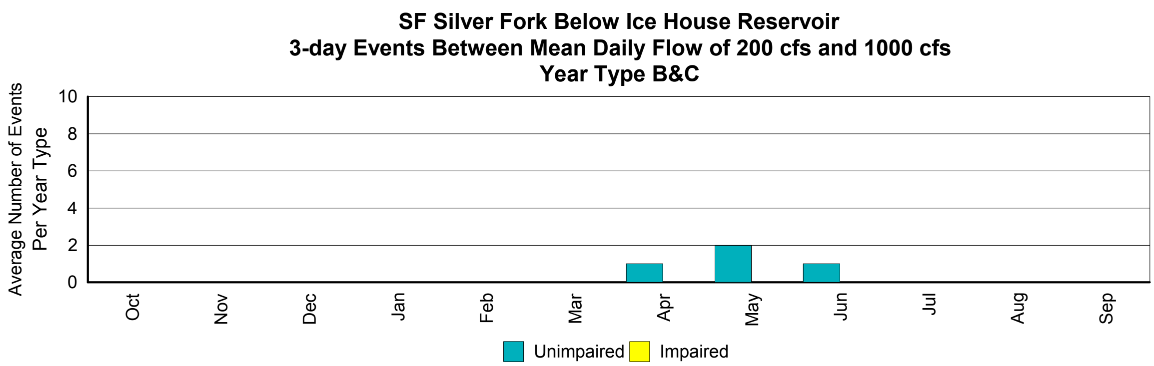


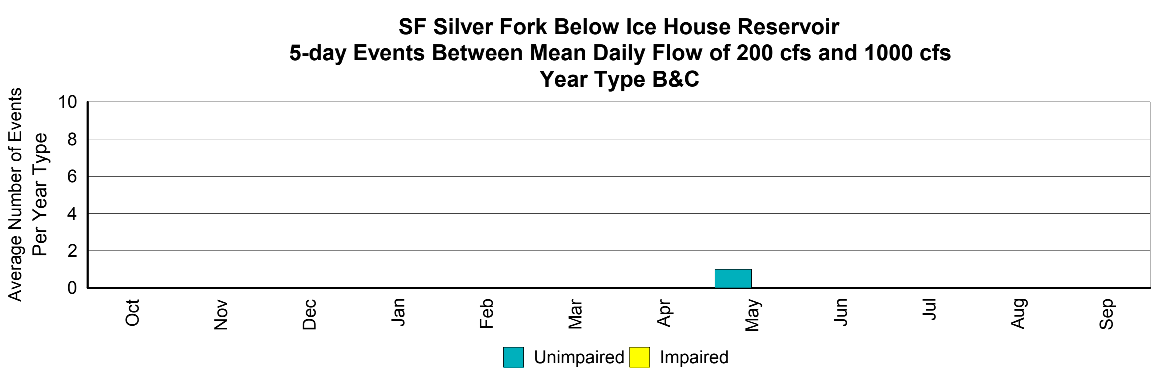
SF Silver Fork Below Ice House Reservoir
7-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type A

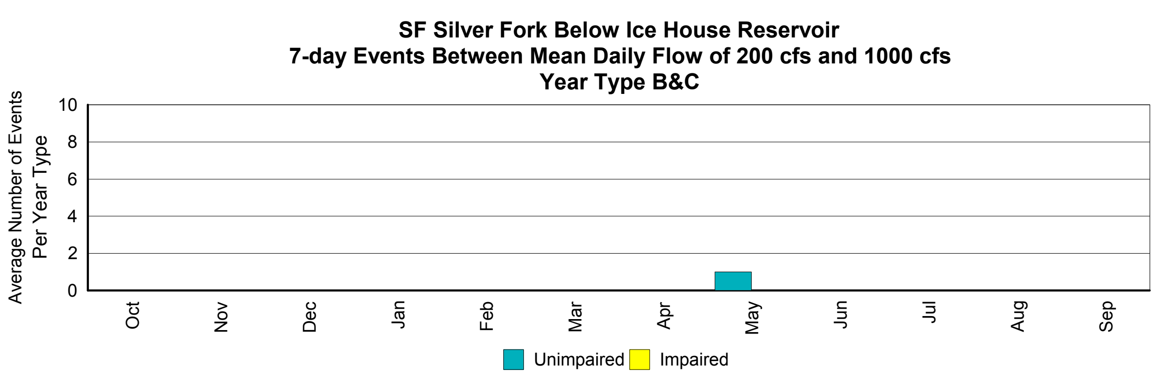


WY 1986-2001


SF Silver Fork Below Ice House Reservoir
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type B&C
Average Number of Events Per Year Type
0 2 4 6 8 10
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
Unimpaired
Impaired

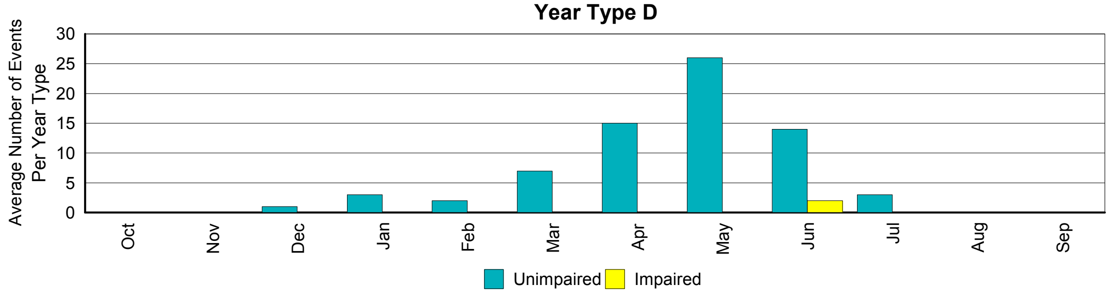

SF Silver Fork Below Ice House Reservoir
3-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type B&C
Average Number of Events Per Year Type
0 2 4 6 8 10
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
Unimpaired
Impaired


SF Silver Fork Below Ice House Reservoir
5-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type B&C
Average Number of Events Per Year Type
0 2 4 6 8 10
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
Unimpaired
Impaired

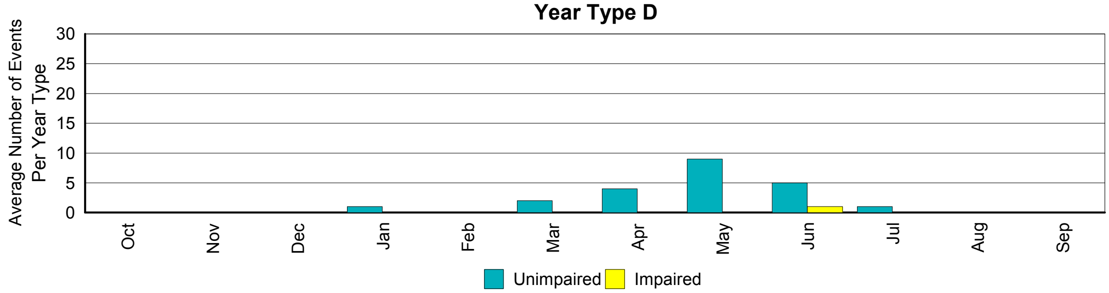

SF Silver Fork Below Ice House Reservoir
7-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type B&C
Average Number of Events Per Year Type
0 2 4 6 8 10
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
Unimpaired
Impaired

WY 1986-2001

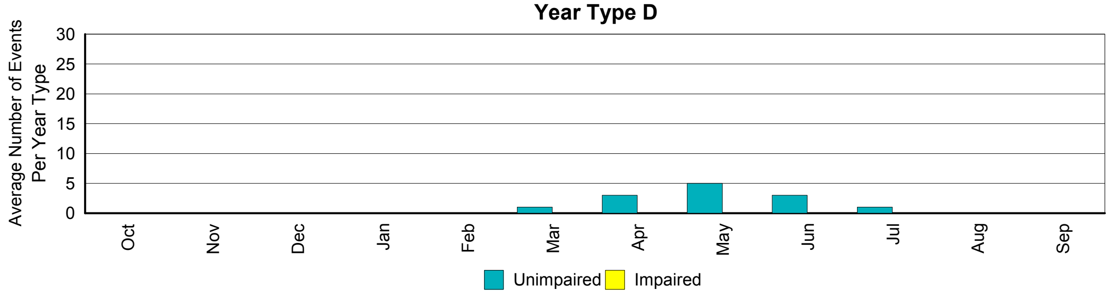
SF Silver Fork Below Ice House Reservoir
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D



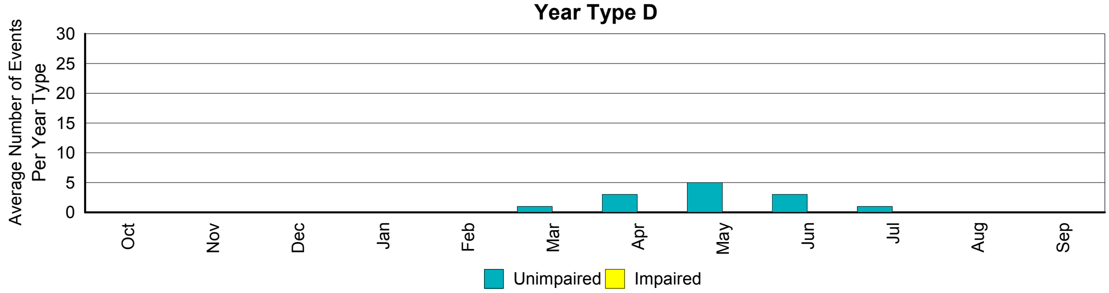
SF Silver Fork Below Ice House Reservoir
3-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D



SF Silver Fork Below Ice House Reservoir
5-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D

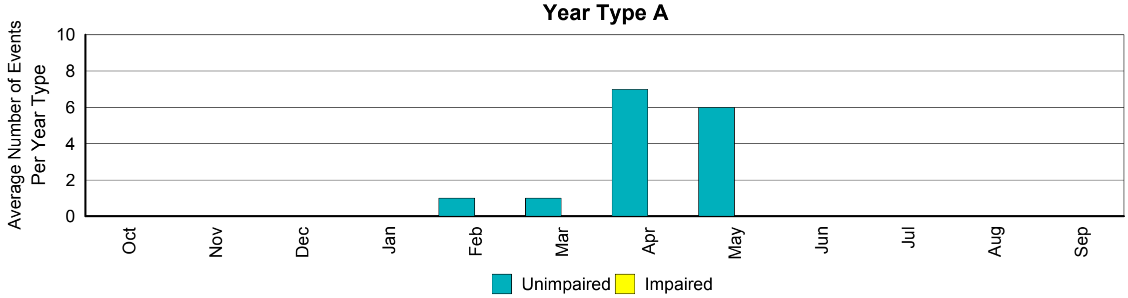


SF Silver Fork Below Ice House Reservoir
7-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type D

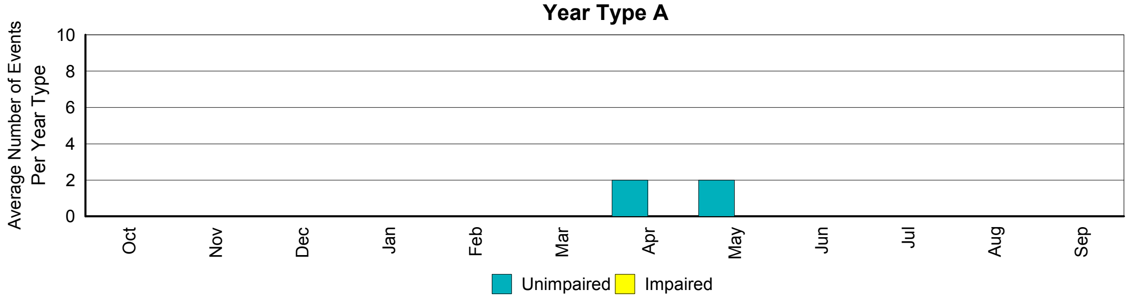


WY 1975-2001

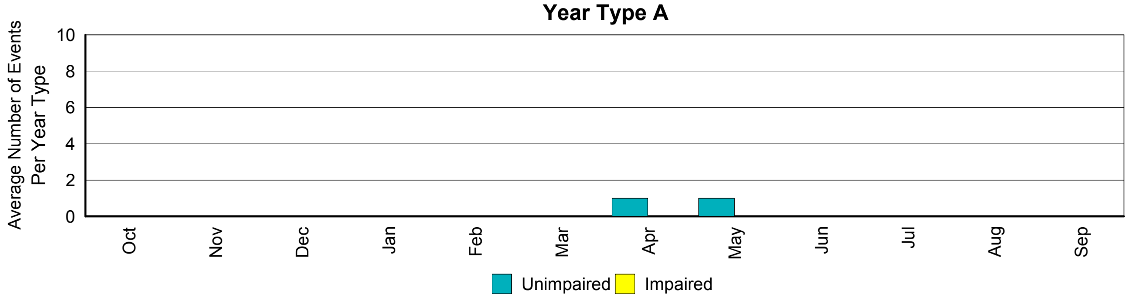
Silver Creek Below Camino Diversion Dam
1-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type A



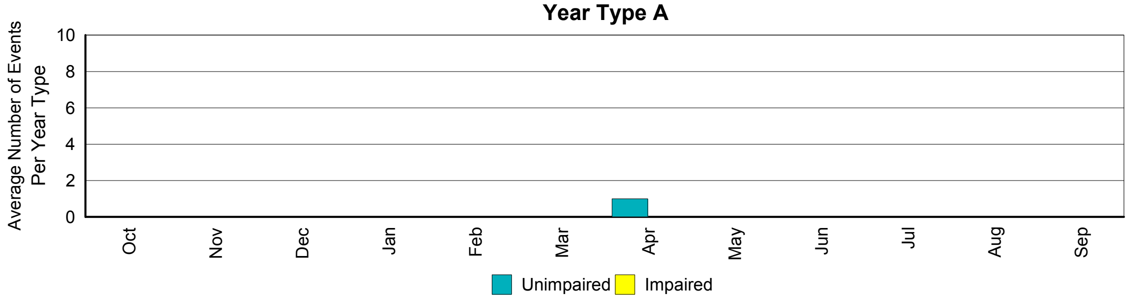
Silver Creek Below Camino Diversion Dam
3-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type A



Silver Creek Below Camino Diversion Dam
5-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type A

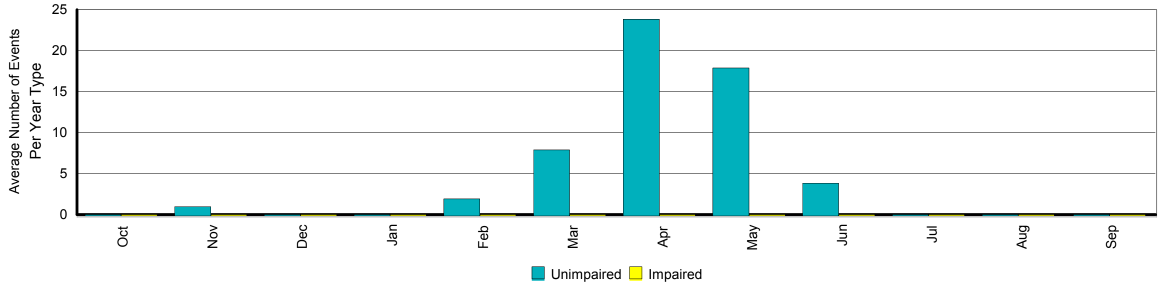


Silver Creek Below Camino Diversion Dam
7-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type A

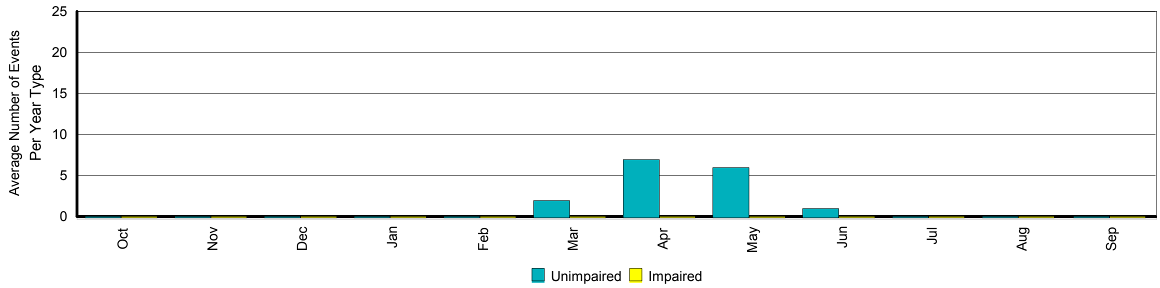


WY 1975-2001

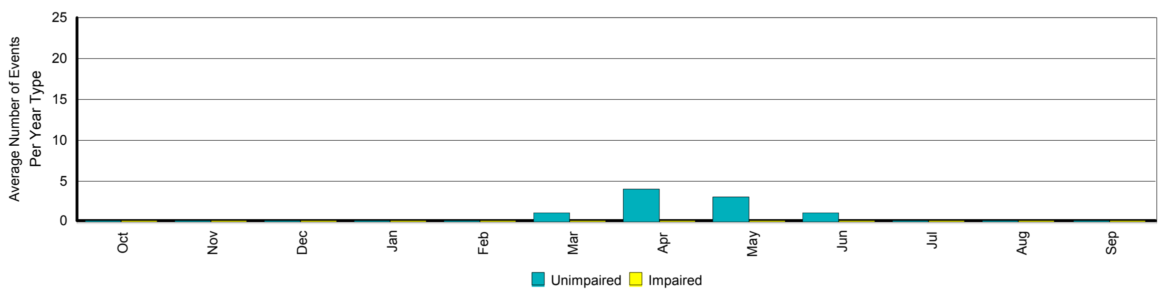
Silver Creek Below Camino Diversion Dam
1-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type B&C



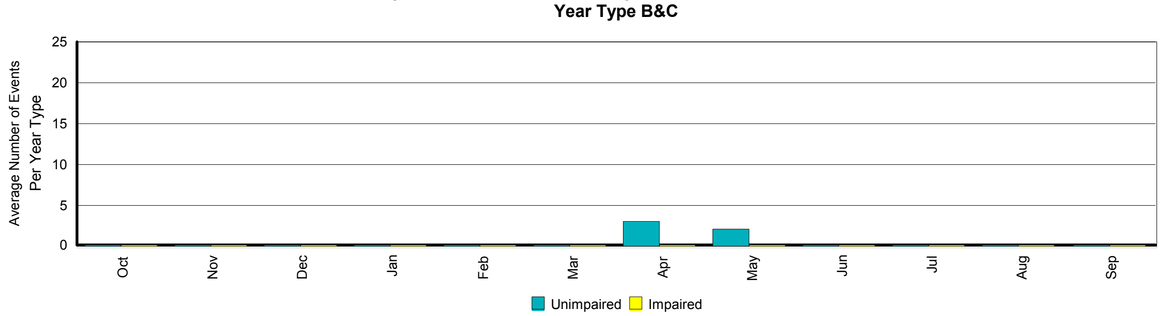
Silver Creek Below Camino Diversion Dam
3-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type B&C



Silver Creek Below Camino Diversion Dam
5-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type B&C

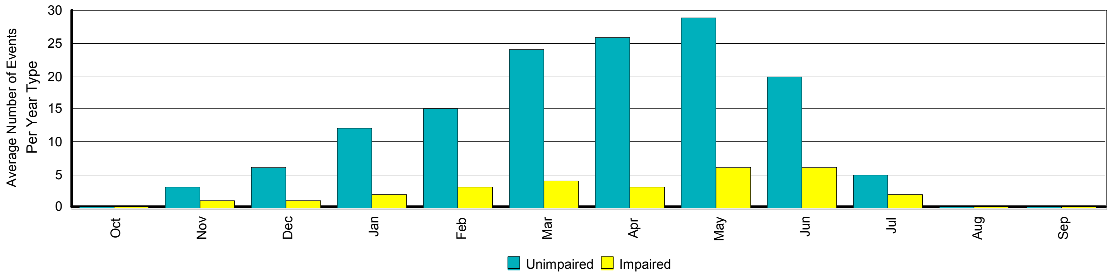


Silver Creek Below Camino Diversion Dam
7-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type B&C

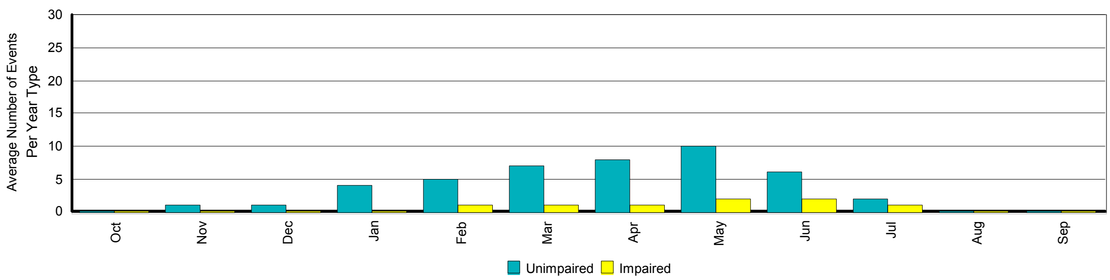


WY 1975-2001

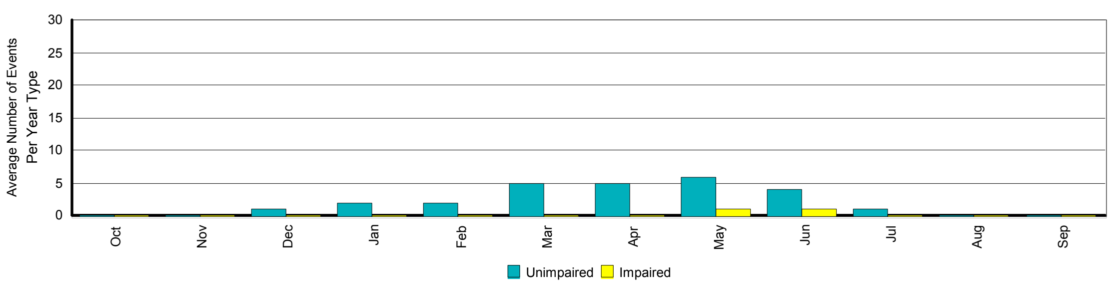
Silver Creek Below Camino Diversion Dam
1-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type D



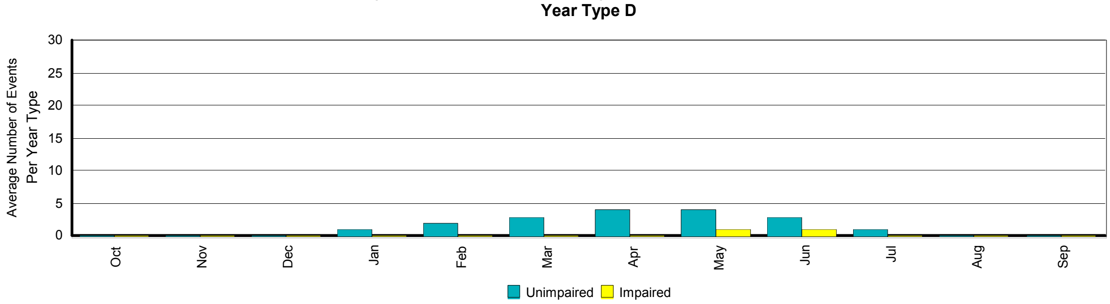
Silver Creek Below Camino Diversion Dam
3-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type D



Silver Creek Below Camino Diversion Dam
5-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type D

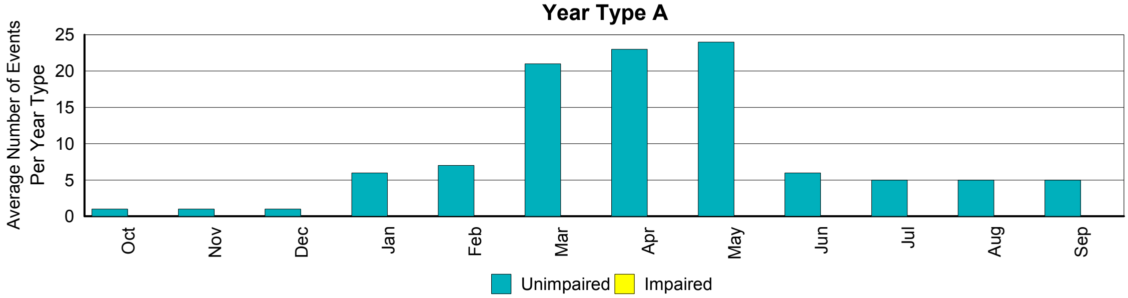


Silver Creek Below Camino Diversion Dam
7-day Events Between Mean Daily Flow of 500 cfs and 2500 cfs
Year Type D

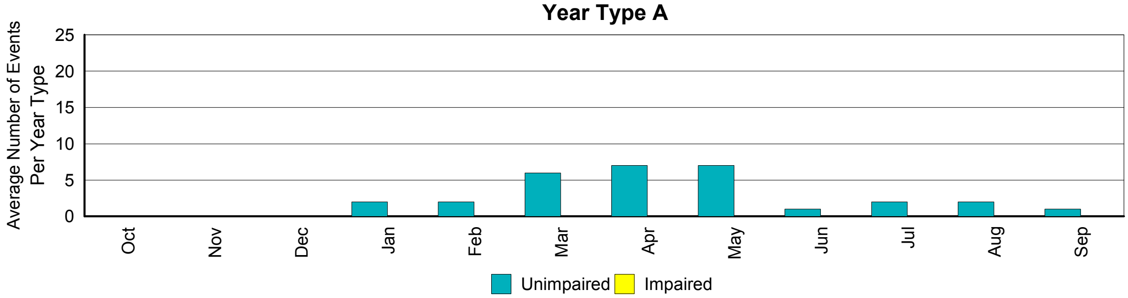


WY 1975-2001

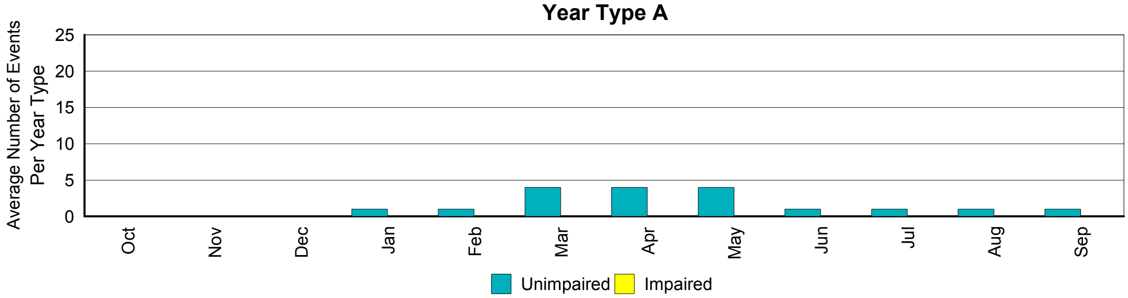
SF American River below Slab R (unreg. by SMUD only)
1-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type A



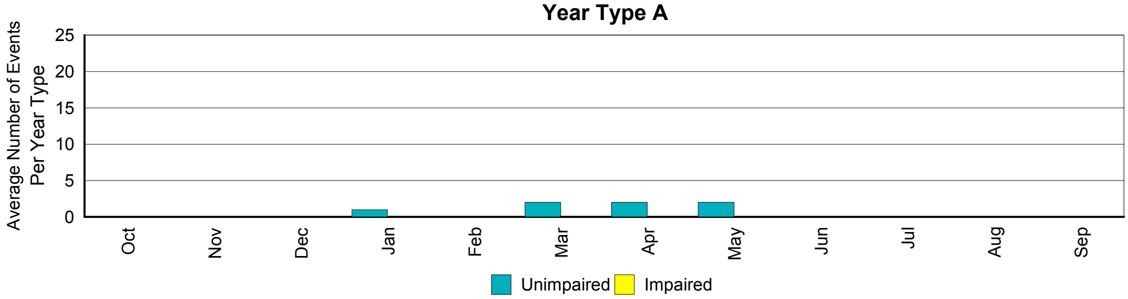
SF American River below Slab R (unreg. by SMUD only)
3-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type A



SF American River below Slab R (unreg. by SMUD only)
5-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type A

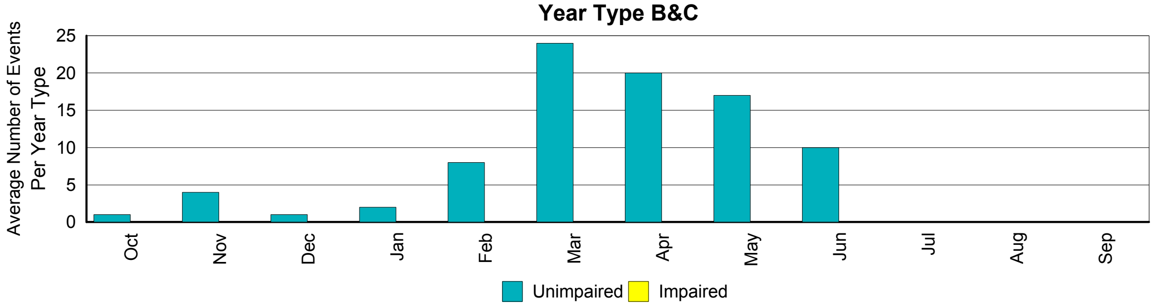


SF American River below Slab R (unreg. by SMUD only)
7-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type A

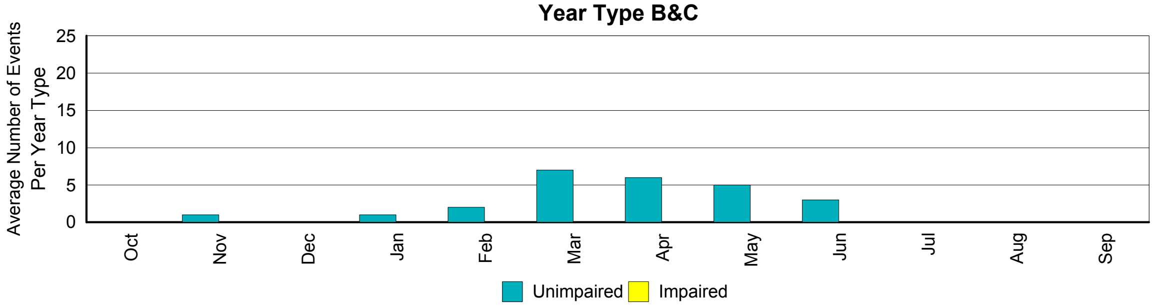


WY 1975-2001

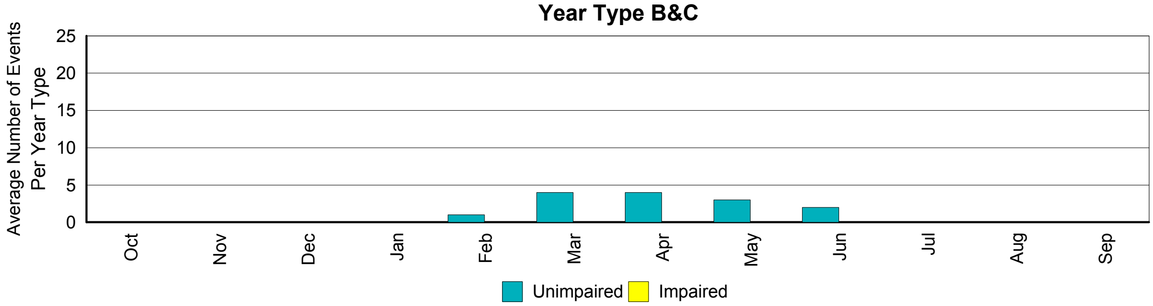
SF American River below Slab R (unreg. by SMUD only)
1-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type B&C



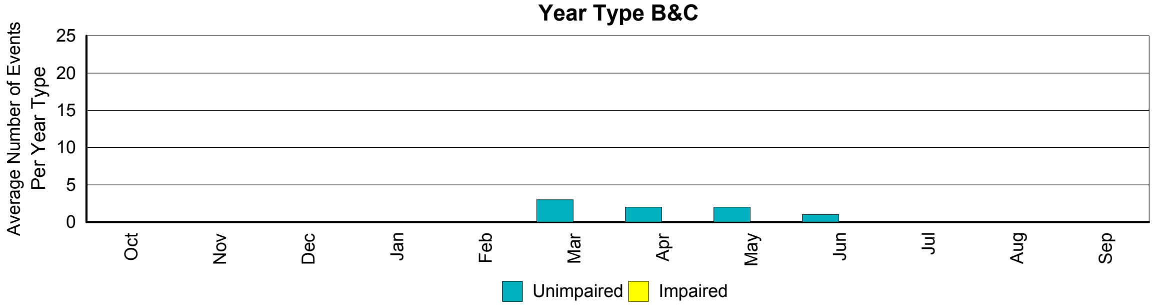
SF American River below Slab R (unreg. by SMUD only)
3-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type B&C



SF American River below Slab R (unreg. by SMUD only)
5-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type B&C

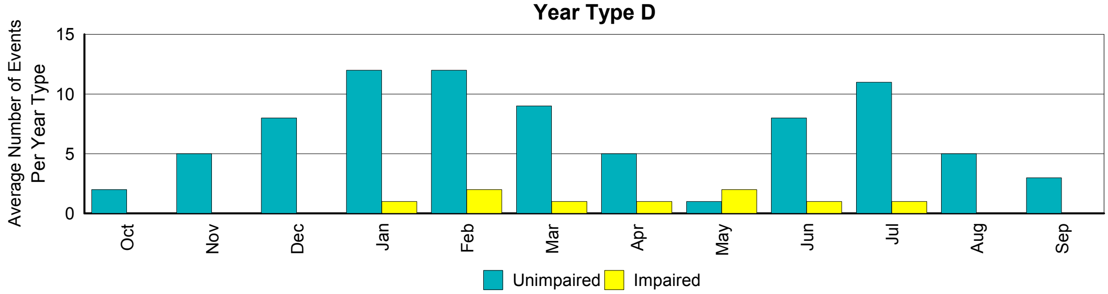


SF American River below Slab R (unreg. by SMUD only)
7-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type B&C

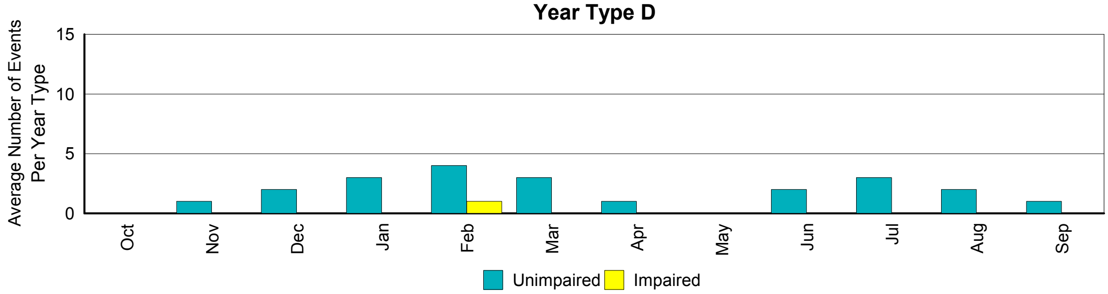


WY 1975-2001

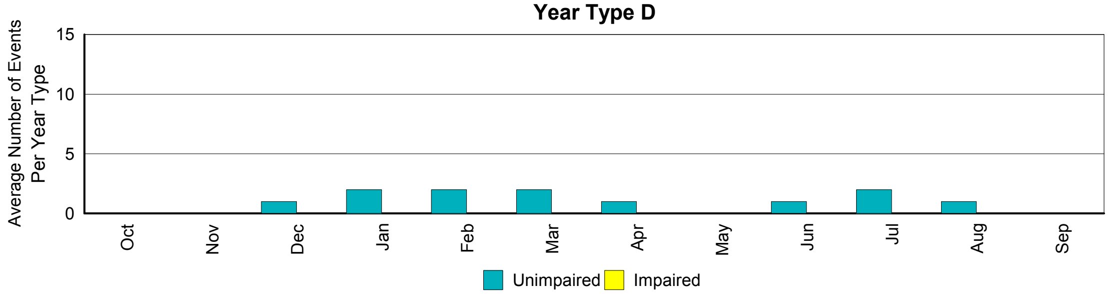
SF American River below Slab R (unreg. by SMUD only)
1-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type D



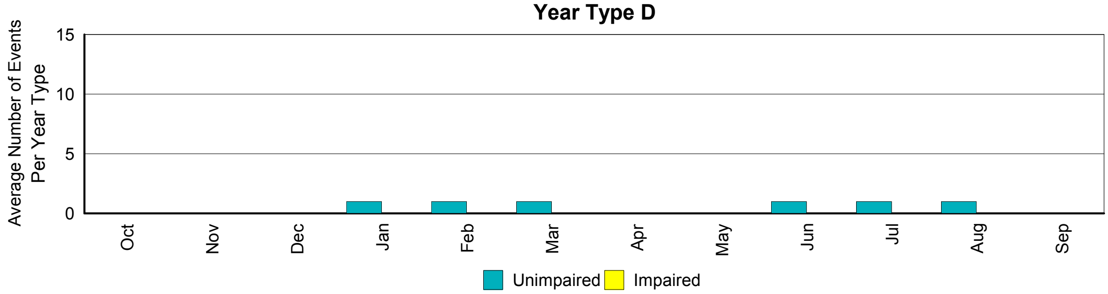
SF American River below Slab R (unreg. by SMUD only)
3-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type D



SF American River below Slab R (unreg. by SMUD only)
5-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type D

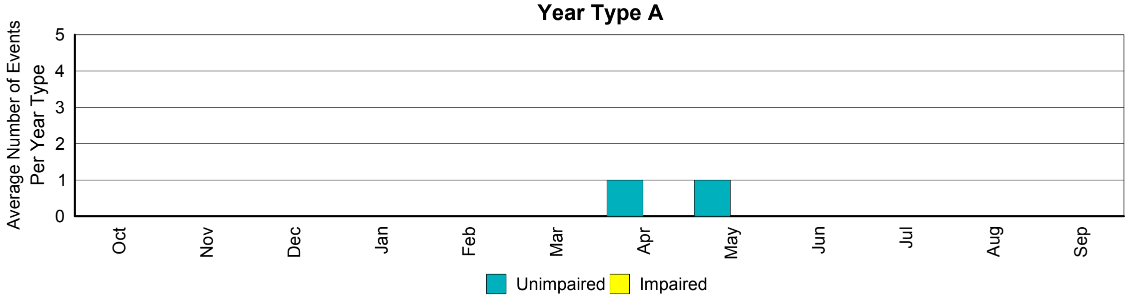


SF American River below Slab R (unreg. by SMUD only)
7-day Events Between Mean Daily Flow of 500 cfs and 1500 cfs
Year Type D

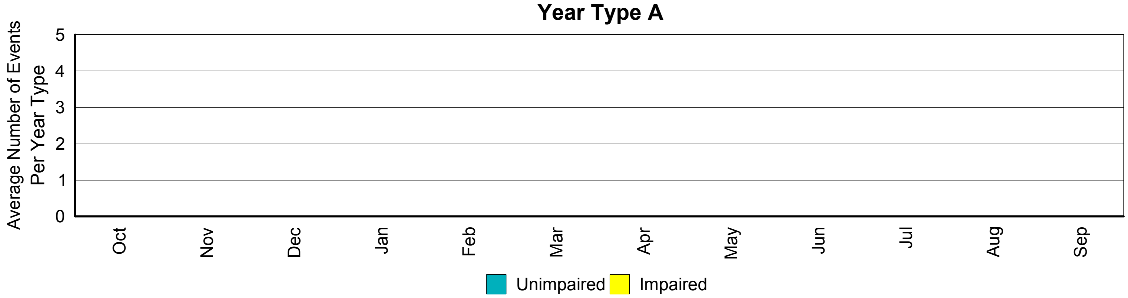


WY 1975-2001

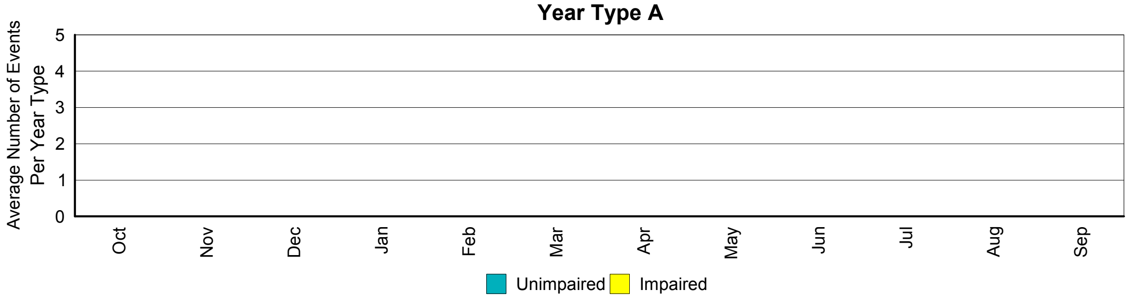
SF American River below Slab R (unreg. by SMUD only)
1-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type A



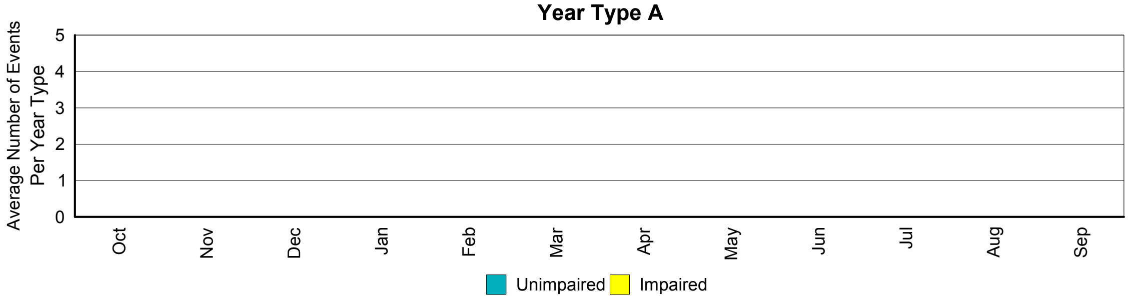
SF American River below Slab R (unreg. by SMUD only)
3-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type A



SF American River below Slab R (unreg. by SMUD only)
5-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type A

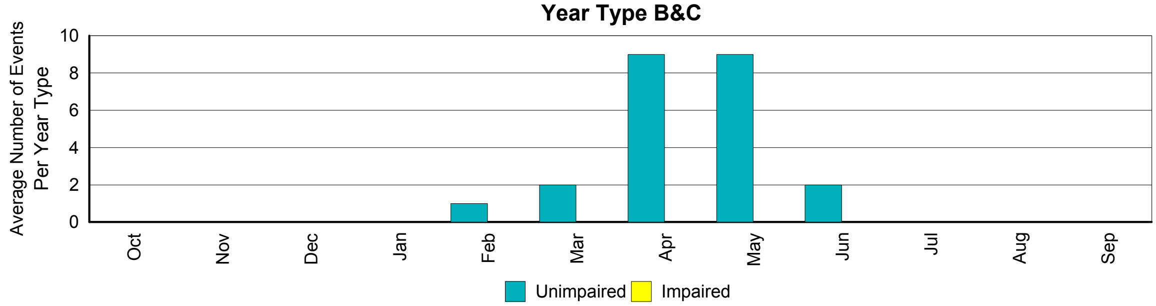


SF American River below Slab R (unreg. by SMUD only)
7-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type A

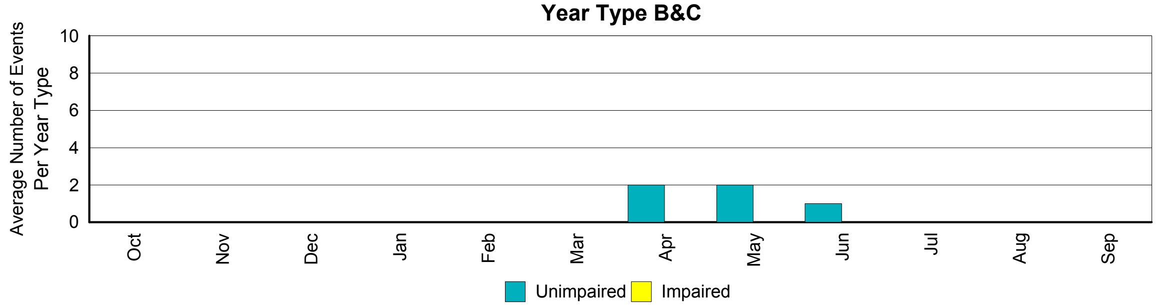


WY 1975-2001

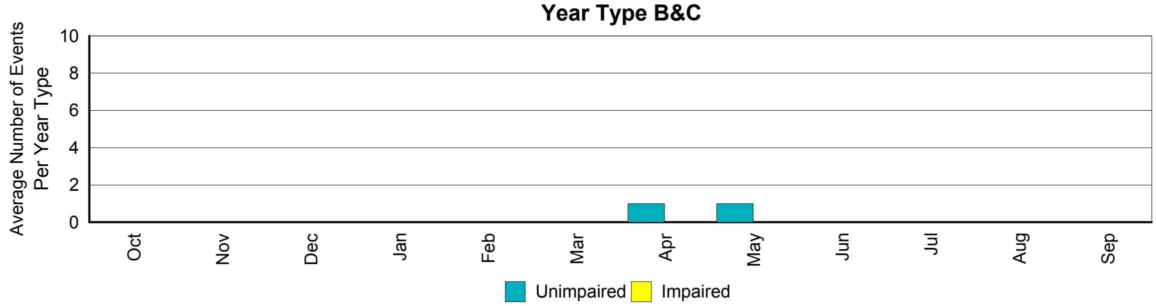
SF American River below Slab R (unreg. by SMUD only)
1-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type B&C



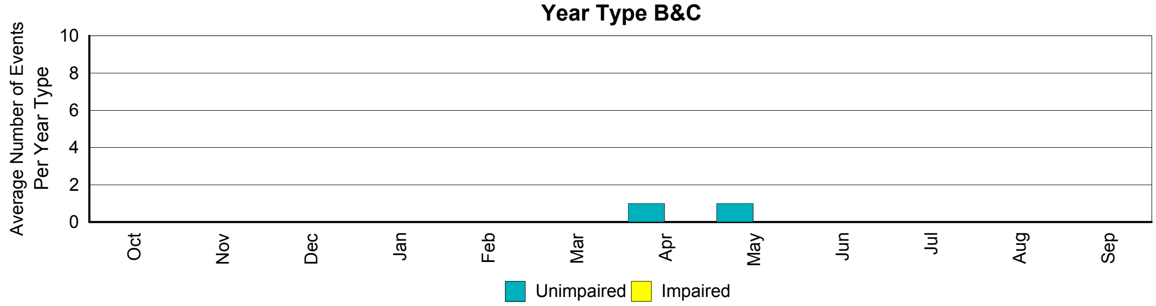
SF American River below Slab R (unreg. by SMUD only)
3-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type B&C



SF American River below Slab R (unreg. by SMUD only)
5-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type B&C

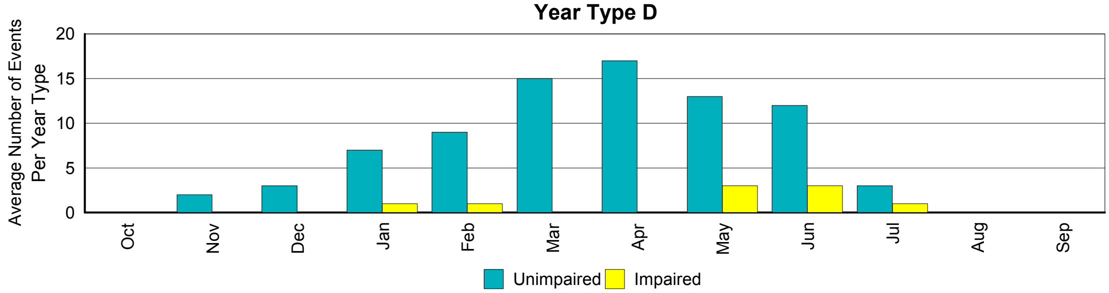


SF American River below Slab R (unreg. by SMUD only)
7-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type B&C

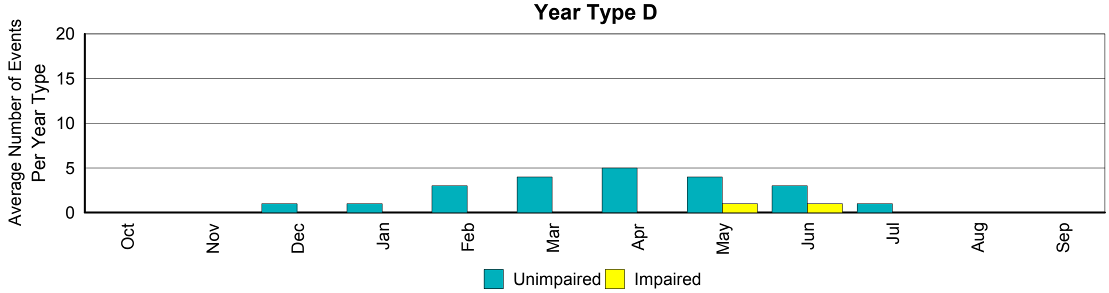


WY 1975-2001

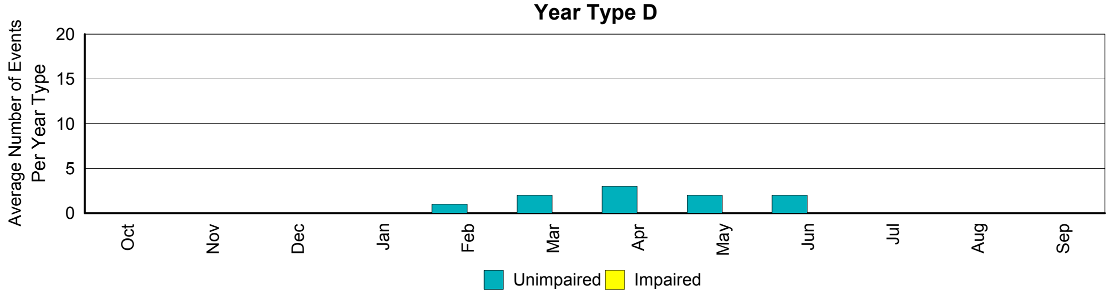
SF American River below Slab R (unreg. by SMUD only)
1-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type D



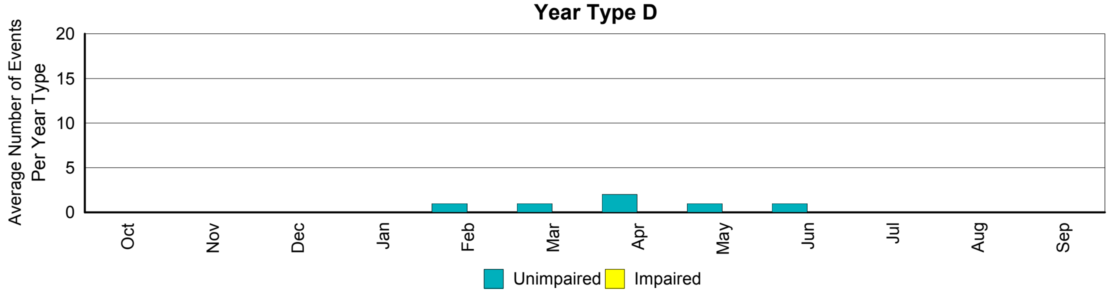
SF American River below Slab R (unreg. by SMUD only)
3-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type D



SF American River below Slab R (unreg. by SMUD only)
5-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type D



SF American River below Slab R (unreg. by SMUD only)
7-day Events Between Mean Daily Flow of 1500 cfs and 3000 cfs
Year Type D

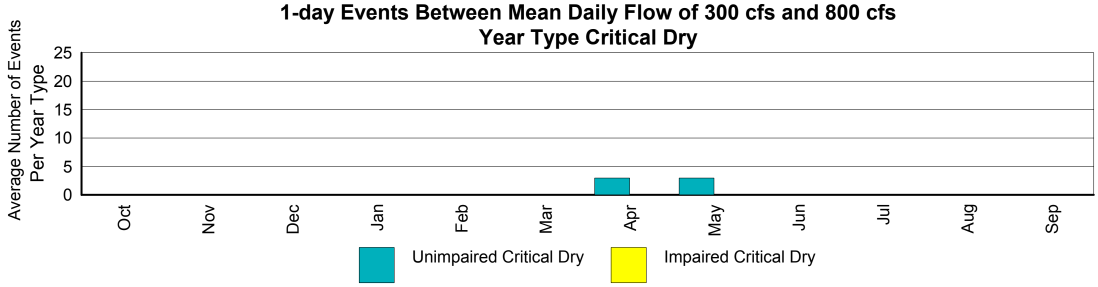


WY 1975-2001

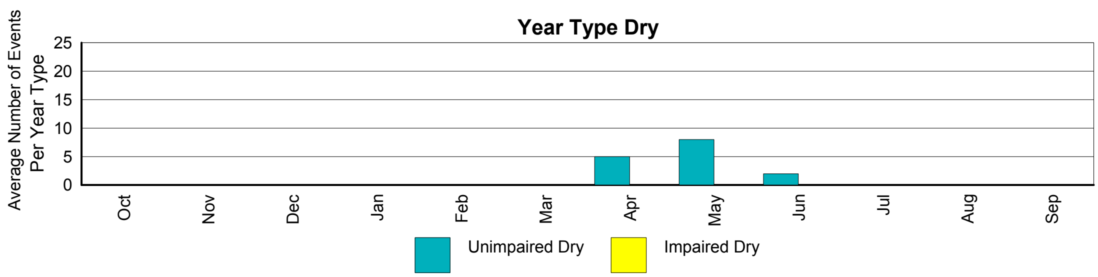
Rubicon River Below Rubicon Reservoir

1-day Events Between Mean Daily Flow of 300 cfs and 800 cfs

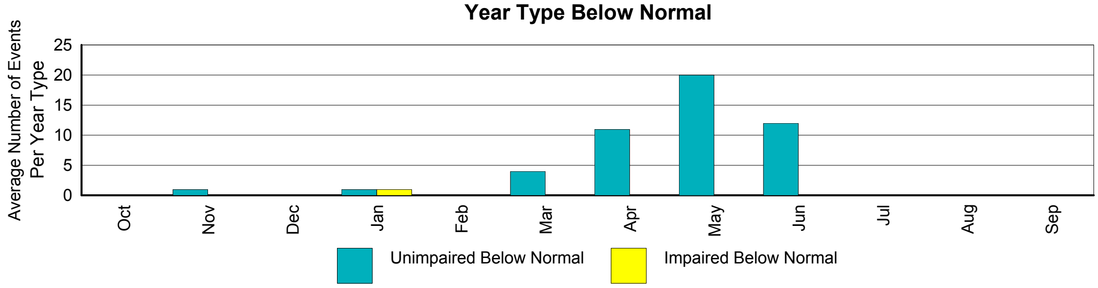
Year Type Critical Dry



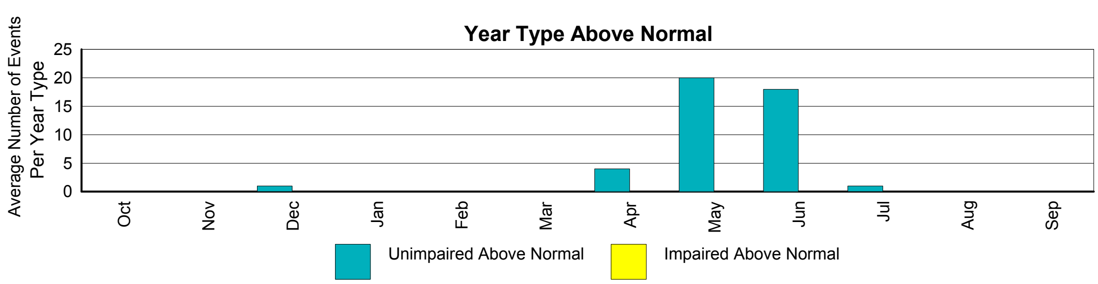
Year Type Dry



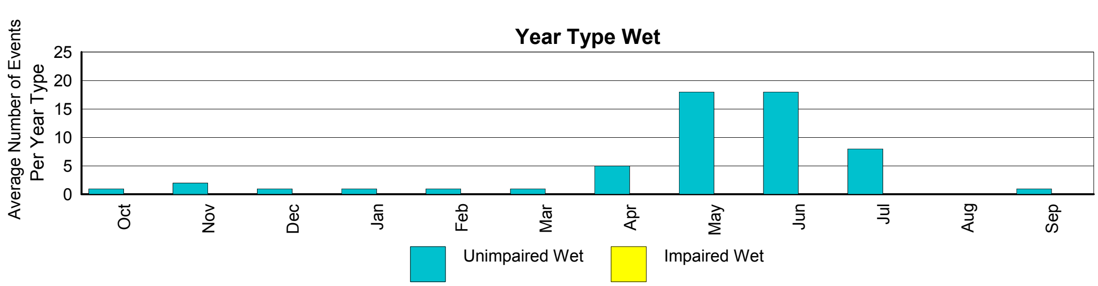
Year Type Below Normal



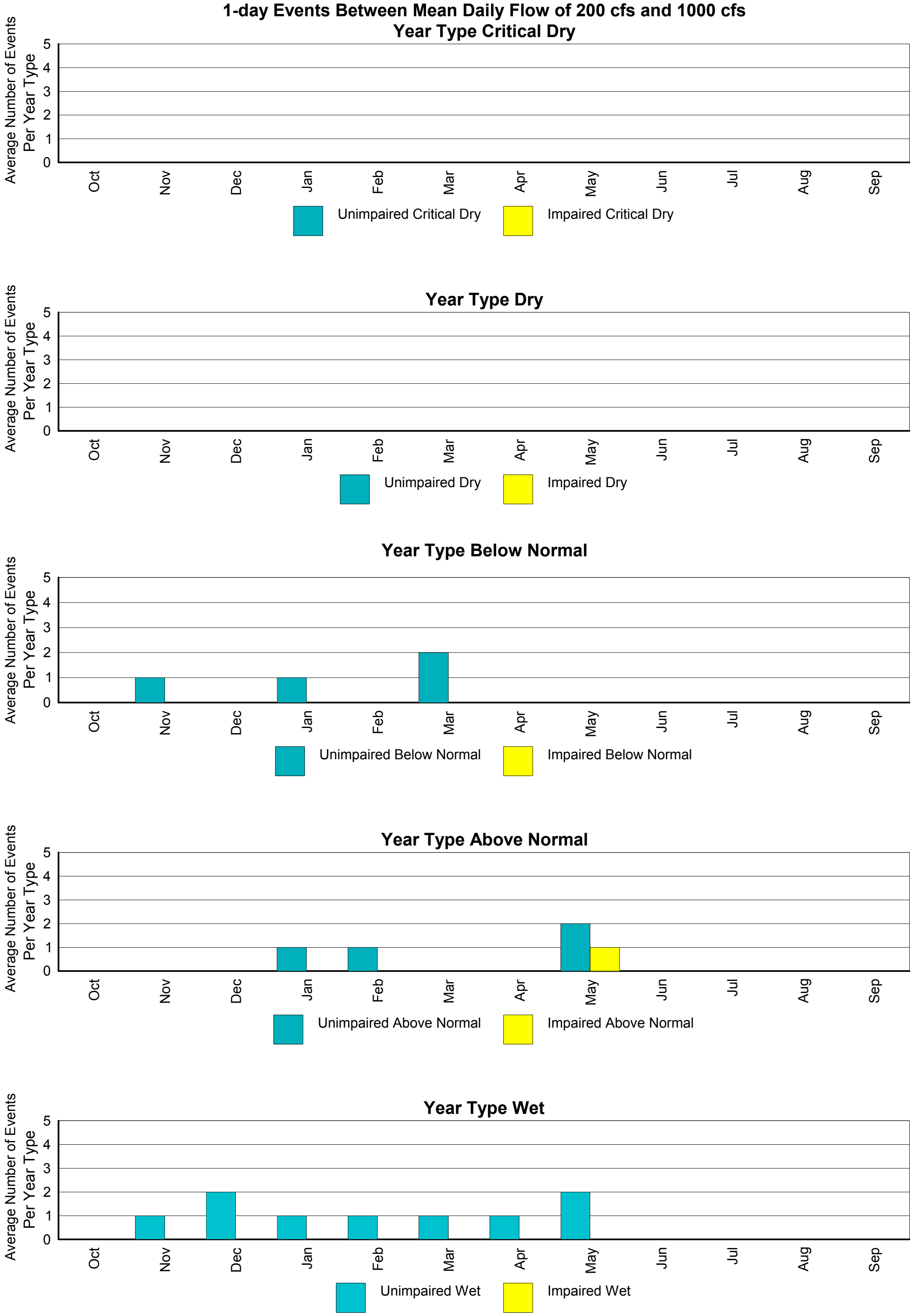
Year Type Above Normal



Year Type Wet



WY 1975-2001
Gerle Creek Below Loon Lake
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs

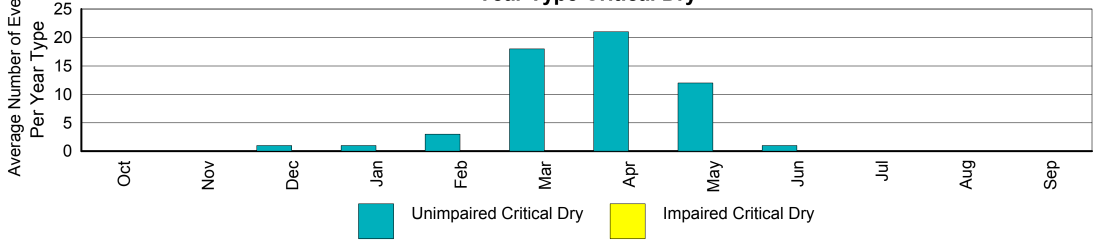


WY 1975-2001

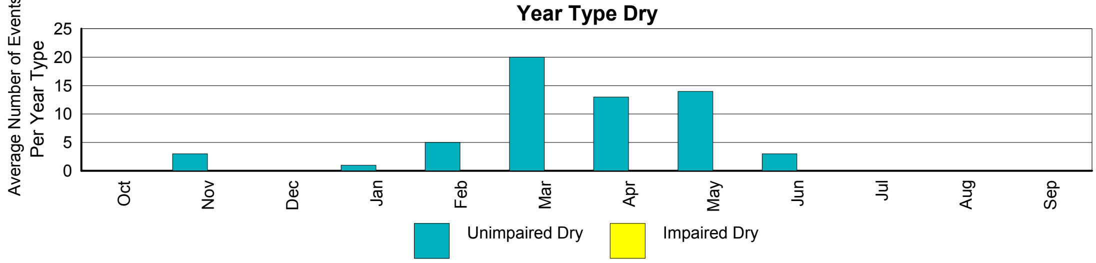
SF Rubicon R Below Gerle Creek Near Georgetown

1-day Events Between Mean Daily Flow of 100 cfs and 300 cfs

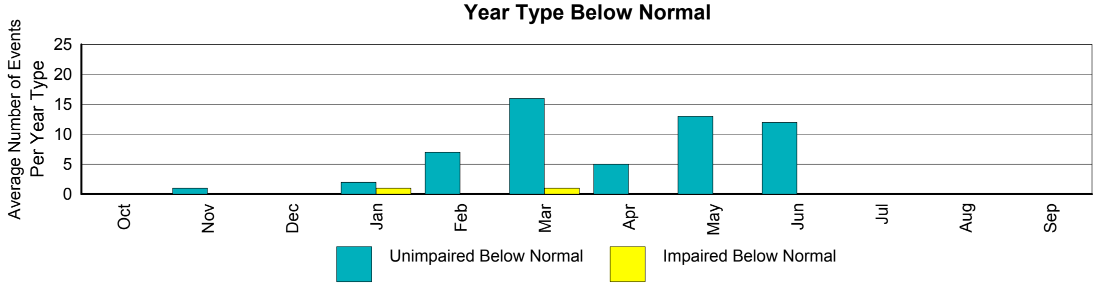
Year Type Critical Dry



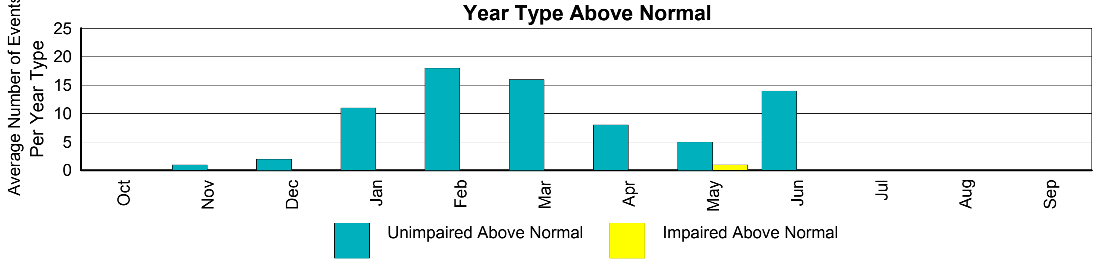
Year Type Dry



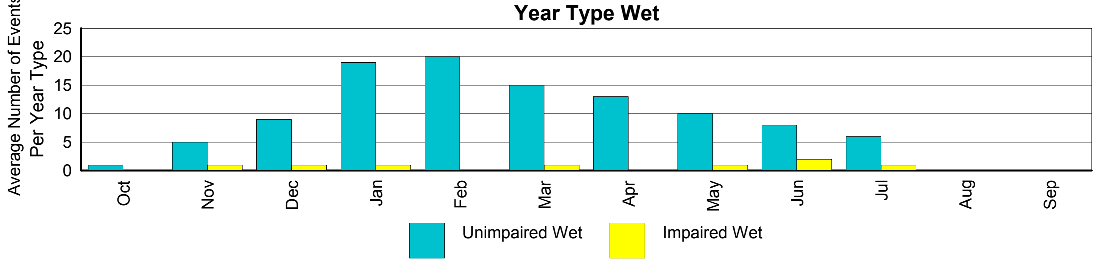
Year Type Below Normal



Year Type Above Normal

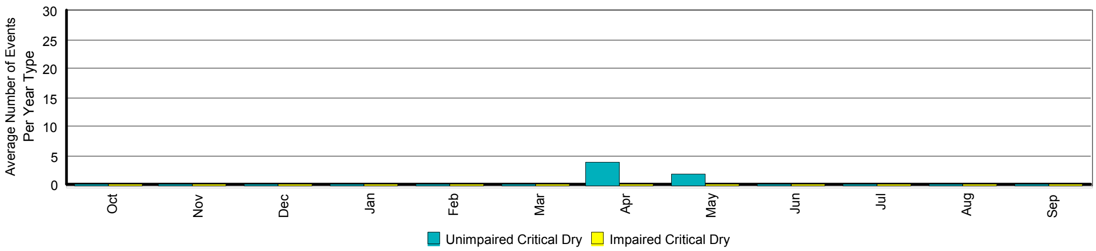


Year Type Wet

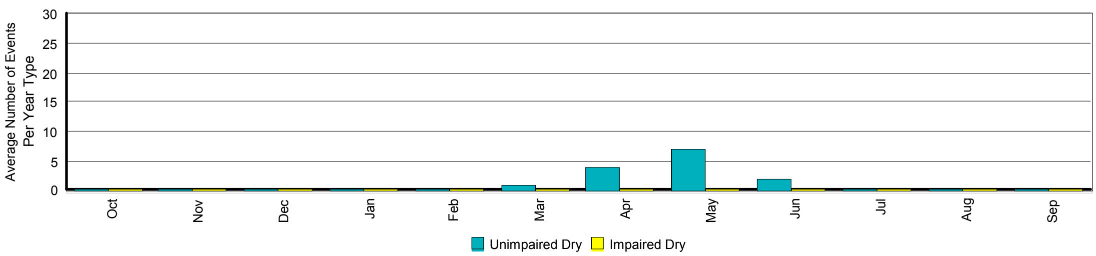


WY 1986-2001

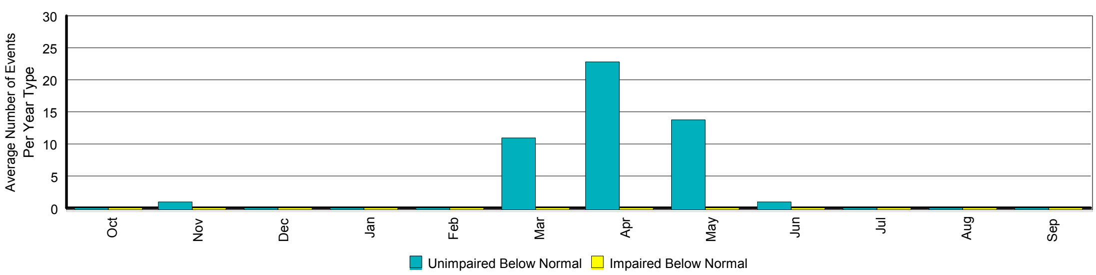
SF Silver Creek Below Ice House Reservoir
1-day Events Between Mean Daily Flow of 200 cfs and 1000 cfs
Year Type Critical Dry



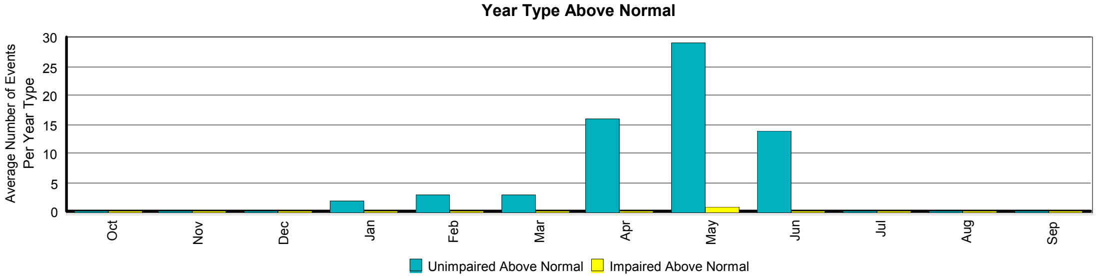
Year Type Dry



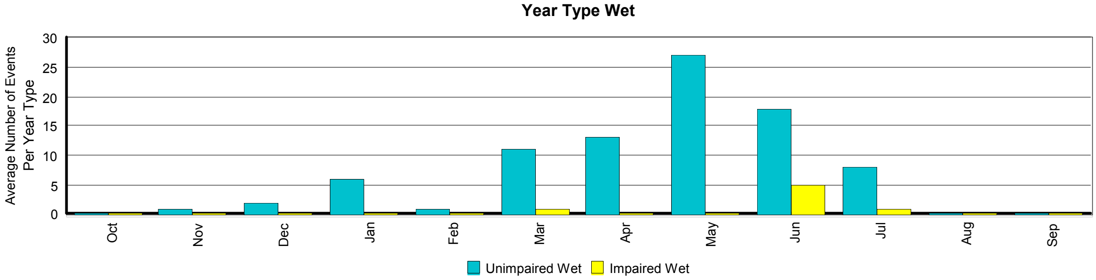
Year Type Below Normal



Year Type Above Normal



Year Type Wet

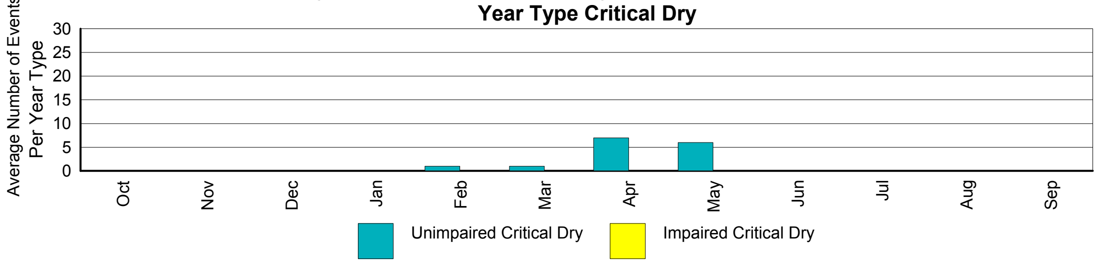


WY 1975-2001

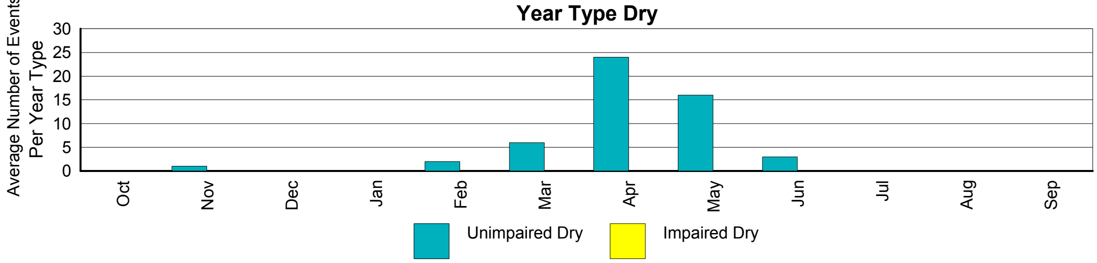
Silver Creek Below Camino Diversion Dam

1-day Events Between Mean Daily Flow of 500 cfs and 1200 cfs

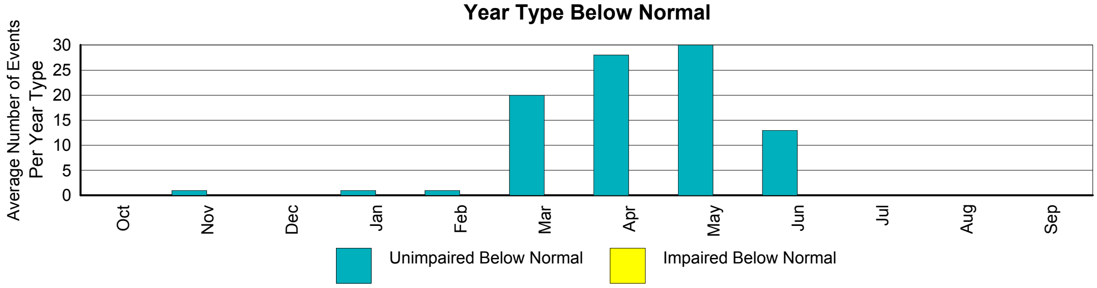
Year Type Critical Dry



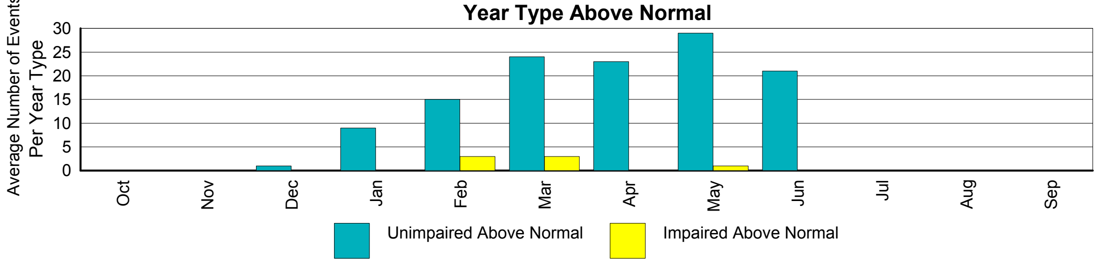
Year Type Dry



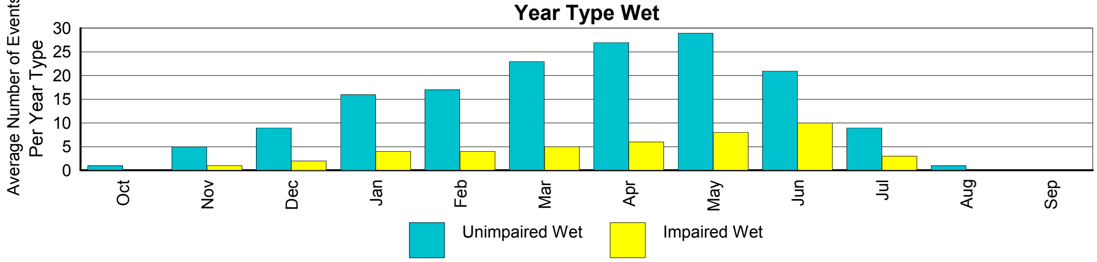
Year Type Below Normal



Year Type Above Normal



Year Type Wet



Appendix D

Photographs of Reaches

D1. Gerle Meadow

D2. Silver Creek

D3. Silver Creek

D4. Silver Creek

D5. Silver Creek

D6. Silver Creek

D7. Silver Creek