Defining Recreational Streamflow Needs in the Lower Dolores River:
Integrating Specific and Overall Evaluations of Flow and Recreation Quality

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Abstract:

Changes in stream flows have profound effects on river-based recreation values, such as the quality and quantity of whitewater boating opportunities, and considerable work evaluating flow-recreation relationships has occurred over the last several decades. In this study, American Whitewater used a web-based approach to collect information on whitewater flows in five segments of the Lower Dolores River and organized the data to define flows that provide for certain recreational needs. An online survey was completed by 366 commercial and non-commercial boaters, who evaluated flows for whitewater boating on the Dolores River, from Bradfield Bridge to the Colorado River. Respondents first evaluated overall recreation quality, and identified low, acceptable and optimum flows for three different whitewater craft-types. Overall flow-evaluations are summarized graphically with inverse "U-shaped" curves describing the quality of boating opportunities for the full range of stream-flow. In a second set of questions, survey respondents reported single flows that provide specific recreation experiences, from technical low water to challenging high water trips. Integrating the results from single flow judgments with the overall evaluations of recreation quality, provide qualitative information on the relationship between streamflow and whitewater recreation in the Lower Dolores River, resulting in clearly defined recreational flow needs. Additionally, American Whitewater analyzed historic hydrologic records to quantify the timing, frequency, and duration of days when defined whitewater flows are provided below McPhee Dam. Results from this study provide resource managers with better information on whitewater flow-needs in the Dolores River basin, which can be used in the development of annual operating plans for McPhee Dam and to improve the scheduling and prediction program for releases to the Lower Dolores River.

Contents

I. Introduction

The Dolores River, located in the southwest corner of Colorado, carves one of America's premier wild river canyons. For 170 miles, from McPhee Dam to the confluence with the Colorado River, the Dolores traverse some of the most remarkable landscapes in the desert southwest. The stream corridor provides rare fish and wildlife habitats, globally significant plant communities, and other flow-influenced natural resource values. In addition, the Dolores River provides high quality whitewater recreation, such as rafting, kayaking, and canoeing. In their 1975 Wild and Scenic Rivers (WSR) Report, the Colorado Department of Natural Resources, US Department of Interior, and US Department of Agriculture recommended that Congress designate the Dolores River as Wild and Scenic for it's Outstandingly Remarkable Values, including Whitewater Boating. At the time of the WSR study, increased need for out-of-stream agricultural, municipal, and industrial water use assumed to decrease in-stream flows in the Dolores River below the proposed McPhee Dam. Recently, multiple efforts to pursue legal or administrative avenues for improving in stream flows for fish and recreation have begun in the Dolores River basin. This report provides information defining recreational flow-needs in the Lower Dolores River, including the quantity, timing, and frequency of stream flows that support high-value whitewater boating values below McPhee Dam, that give the Dolores part of its Wild and Scenic character.

Whitewater boating is a flow dependent recreational use of rivers, and considerable work evaluating flow-recreation relationships has occurred over the last several decades (Brown et al., 1992; Shelby, Brown, & Taylor, 1992; Whittaker et al., 1993). Many of the flow-recreation studies focus on whitewater boating, as flow often determines whether people have opportunities to take a trip and what level of challenge or social value is provided (Whittaker & Shelby, 2000). Different flow levels provide for varied boating opportunities. As flows increase from zero, different paddling opportunities and challenges exist within ranges of flows on a spectrum: too low, minimal acceptable, technical, optimal, high challenge, and too high. Standard methodologies[1] are used to define these flow ranges based on individual and group flow-evaluations. The various opportunities provided by different flow ranges are often described as occurring in various "niches" (Shelby et al., 1997). Studies have developed initial flow-evaluation curves for the Dolores River and provide a meaningful way to evaluate how flows affect recreation opportunities (Shelby & Whittaker, 1995). Mean responses to flow-evaluations provide useful descriptions of group agreement over flows, but highlight the need for sub-group evaluations, such as mean evaluations for each craft-type.

Whitewater Boating is enjoyed in different crafts, such as canoes, kayak, and rafts. Different craft types provide different opportunities for river-base recreation, from individual or small group trips, to large group multi-day excursions. Flows that provide greater social value for one type of craft, such as canoes, may not provide equivalent social value for rafting. Changes in flow can have direct effects on the quality of whitewater boating, for every craft type. Direct effects may change quickly and directly as flows change, such as safety in running rapids, number of boat groundings, travel times, quality of rapids, and beach and camp access. Indirectly, flow effect wildlife viewing, scenery, fish habitat, and riparian vegetation over the long term as a result of flow regime (Shelby et al. 1992b; Whittaker et al. 1993).

In order to minimize the effects of changing stream-flows on the Lower Dolores River from McPhee Dam, the US Bureau of Reclamation regulates streamflows "to encourage the most effective boating use by release of snowmelt runoff in anticipation of spills".[2] Clear definitions of recreational flow-needs in the Lower Dolores River will aide in the development of annual operating plans that balance Project Authorizations, and deliver predictable flows for recreational values, such as whitewater boating.

[1] Whittaker, D., B. Shelby, J. Gangemi. 2005. Flows and Recreation, A guide to studies for river professionals. US Department of Interior, National Park Service, Anchorage, AK
[2] US Bureau of Reclamation; Definite Plan Report, 1977

II. Dolores River Whitewater Boating – Historical Perspective.

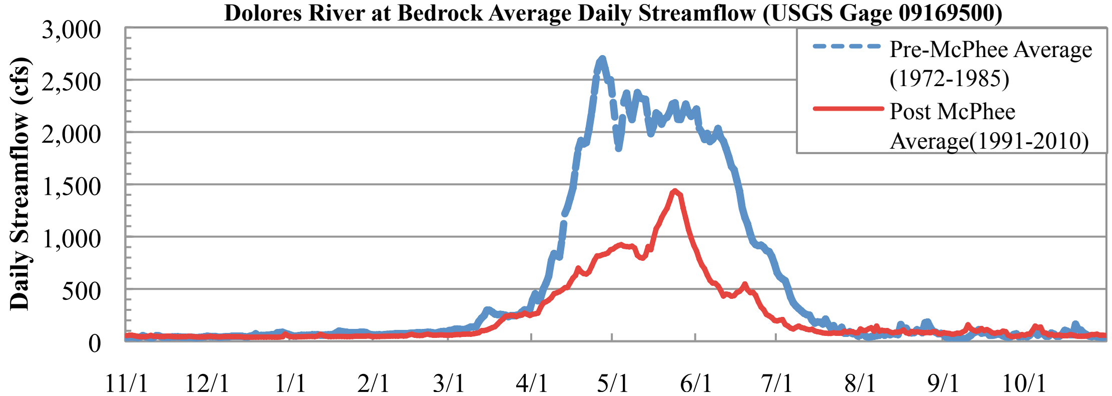
In May of 1948, Otis "Doc" Marston led a group of adventurers down the Dolores River from Cahone to the Colorado River[3]. Prior to this expedition, earlier runs by Preston Walker and Norm Nevills indicate that the Dolores River has thrilled whitewater boaters since before the 1930s. In the years since, people from all over the world have traveled to the southwest corner of Colorado to experience the Dolores river, a resource widely regarded as second only to the Grand Canyon for it's world-class multi-day whitewater boating opportunities.

In the 1975 Dolores River Wild and Scenic River (WSR) Study Report[4], state and federal agencies recommended that 105 miles of the Dolores River be included in the National Wild and Scenic Rivers System for such values as recreational rafting and kayaking. At the time of the WSR Study, recreational use reached a high in 1976 of 3200 "boater-days". During the 46-year Period of Record for the WSR study, "boating opportunities occurred in nearly every year" (only 2 years had none).

In their 1977 Final Environmental Impact Statement (FEIS) for the Dolores Project, which includes McPhee dam and reservoir, the Bureau of Reclamation (BOR) describes the increasing popularity of rafting and kayaking on the Dolores River. Within the BOR study, the Dolores Project was shown to adversely affect whitewater recreation below McPhee Dam, as flows are projected to be significantly reduced. Based on the 46-year period of record for the 1975 WSR Study Report, changes in stream flow under the Dolores Project would result in 24 years with no boating opportunities or about one out of every five years (Dolores Project Final EIS, U.S. Bureau of Reclamation, 1977). Annual boating use was expected to decrease from over 2800 boating days to within a range of 1333 to 1937 boater days[5], *"depending upon the effectiveness of efforts to make the most efficient use of available flows through grouping in periods of 5 or more consecutive days and public awareness of forecasted flows" (Dolores Project FEIS, pg. C-38. 1977).* Usable Days, referred to as "launching Days[6]" under the 1977 FEIS, were projected to decrease by an annual average of 30.7 days during April 25 to July 1 (54.6 without Project / 23.9 with Project).

With the completion of McPhee Dam and Reservoir in 1987, the primary storage facility for the BOR's Dolores Project, 69 percent of the historic flow of the Dolores River is depleted annually (BLM, 1990), as opposed to 39 percent before Project construction, attributable to pre-Dolores Project allocations to the Montezuma Valley Irrigation District.

Figure A
Dolores River at Bedrock Average Daily Streamflow (USGS Gage 09169500)



Note: Daily streamflow at the Dolores River at Bedrock streamgage is based upon data obtained from USGS (National Water Information System).

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[3] Running the Dolores River, Otis Marston, 1948

[4] Colorado Department of Natural Resources, U.S. Department of Agriculture, and U.S. Department of Interior, Dolores River: Wild and Scenic River Study Report December 1975.

[5] Figures based on maximum use rate of 80 percent of flows during may 21 to June 10 (BOR, 1977).

[6] In their 1977 FEIS, the US Bureau of Reclamation defines a "launching Day" as "the occurrence of riverflows of 500 second-feet of greater of snowmelt runoff. Under Project Conditions all launching days would occur in groups of 5 or more consecutive days" USBOR, Dolores Project FEIS, Pg. C-38)

With completion of the Dolores Project, user-days for whitewater boating have declined measurably in the Lower Dolores. Commercial Use reached a peak on the Dolores River in 1995 at 3,257 User-days, injecting over $371,304 in direct expenditures into local economies with an economic impact of $950,538[7]. From 1988-1998, there were 1614 commercial user-days annually on average, contributing $183,996 in direct expenditures each year. In the following decade, 1999 to 2009, these figures had dropped to 383 average annual commercial user-days and $43,662 in direct expenditures. In 2010 there were only 112 commercial user-days contributing only $12,960 in direct expenditures. The 1977 FES for the Dolores Project suggests that boating flows would not be available below McPhee Dam in the long term, depending on the "scheduling and prediction program for releases".

Anecdotal evidence suggests that user-days have declined in the past 20 years due to a number of factors, including lack of advance notice of managed releases for boating, insufficient flow volumes during a managed release, and public distrust in the scheduling of releases for boating, as outlined in annual operating plans for McPhee Reservoir. Current management guidelines for McPhee Dam have shifted away from the original 500cfs recreational flow-threshold originally described in Dolores Project authorizations. Today, managed releases of 800-1000 cfs are provided below McPhee Dam – though input from the whitewater boating community suggests that this range is not sufficient to maintain the "Outstandingly Remarkable Values" that make the Dolores suitable for inclusion into the National Wild and Scenic Rivers System.

III. Recreational Flow Assessment – Defining Whitewater Boating Streamflow Needs

In-stream flow, the amount of water in a river, fundamentally affects recreation quality in most river settings. In the short term, flows determine whether a river provides opportunities for boating, and they affect attributes such as the challenge of whitewater or trip aesthetics (Brown, Taylor, & Shelby, 1991; Whittaker et al., 1993; Whittaker & Shelby, 2002). Longer-term flow regimes may also have effects on ecological resources (Bovee, 1996; Richter et al., 1997; Tharme, 2002), riparian environments (Jackson & Beschta, 1992), or channel features such as beaches, pools, and riffles (Hill et al., 1991).

To develop standards that define flow needs for whitewater boating on the Dolores River, American Whitewater collected and organized personal evaluations of resource conditions, and recreation-relevant hydrology consistent with standard methodologies published by the National Park Service. An online survey was conducted in 2010, involving 366 commercial and non-commercial boaters in evaluating flows and recreation quality for five segments of the Dolores River. Respondent numbers for the Dolores River Flow Survey (n=366) were the largest to date for any American Whitewater flow survey and it has one of largest respondent groups for any experience based survey since the technique was developed in the early 1980's. For the survey, 97% of respondents identify themselves as private paddlers, 76% identify themselves as advanced or expert paddlers, and 82% reported paddling 5-20+ days per season. A wide range of craft types were surveyed with rafters (64%), kayakers (30%), and canoeists (6%) all represented.

American Whitewater incorporated two separate approaches into the web-based survey to assess the relationship between streamflow and recreation quality in the Lower Dolores River. The first approach asked survey respondents to evaluate *overall* recreation quality using a seven-point "acceptability" scale (unacceptable -3 and acceptable 3) for flows measured at two United States Geological Survey (USGS) data stations. Using a survey-based normative approach, individual evaluations of flows are aggregated into social norms, which describe the group's collective evaluation of those same specific stream flows (Shelby et al., 1996; Whittaker, 1997). Structural norm characteristics were used to graphically represent the relationship between flows and recreation quality for each identified streamflow. Mean evaluations for each flow condition are plotted graphically to create flow-acceptability curves. This approach has been applied to stream flows for recreation in several studies, including the Colorado River (Shelby and Whittaker, 1995, Shelby et al. 1992a, Vandas et al. 1990). A second approach to data collection was used to capture *specific* evaluations of streamflow and recreation quality. In this approach, respondents were presented with a short narrative description of a specific recreation experience, and were asked to report a single flow associated with that recreational experience (see section III.B.).

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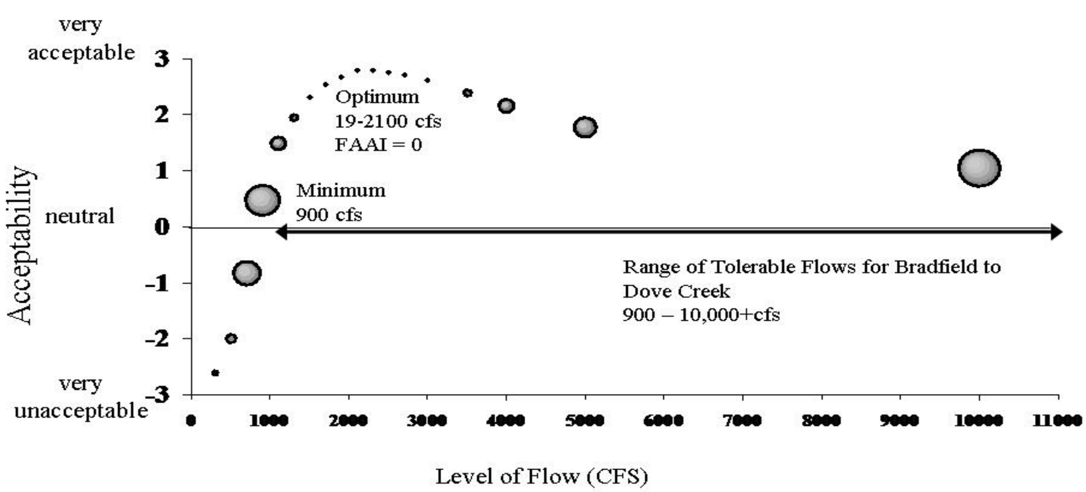
[7] *Commercial River Use in the State of Colorado*. Colorado River Outfitters Association, 2010

A. <u>Flow-Acceptability curves</u>

Flow-acceptability curves graphically relate flow to evaluations of recreational quality. In most cases, the curves show inverted U shapes where low flows and high flows provide tolerable (less valuable) recreation conditions, while medium flows provide more optimal (greater value) conditions. Flow Acceptability Agreement Index (Potential for Conflict Index or FAAI) determines minimum acceptable, or least tolerable flows and respondent agreement regarding the acceptability of each specific flow level. Figure 2 illustrates the Flow-Acceptability Curve for Reach 1 of the Dolores River[8] – Bradfield Launch to Dove Creek Pump Station, and defines optimum flows, a range of tolerable flows, and minimum flows[9]. Figures and Tables A1-A5 (attached: Appendix A), illustrate Flow-Acceptability Curves and FAAI data for each Dolores River Segment studied.

Figure 1

Flow Acceptability Agreement Index Curve for Bradfield Launch to Dove Creek Pump Station
(Flows levels are represented by USGS Dolores below McPhee Reservoir Gage)



In the example provided, lowest acceptable flow was 900 cfs - identified as minimum in Figure 1 above. However, aggregated acceptability values barely hovered above the neutral line, suggesting that some respondents felt lower flows were acceptable. Flow Acceptability Agreement Index statistics for 900 cfs show some disagreement between respondents, ranging between 0.38 – 0.51 (FAAI statistics range between 0 complete agreement, to 1 complete disagreement). An open response question asking respondents to identify the lowest acceptable flow returned median scores between 700-800 cfs, suggesting that the minimum acceptable flow for a percentage of respondents is lower than 900 cfs.

Table 1

Bradfield Launch to Dove Creek Pump Station
Mean Acceptability Scores and Flow Acceptability Agreement Index
(Flows represented are flow levels at USGS Dolores below McPhee Reservoir Gauge)

Specific Flow CFS	Mean Acceptability	FAAI
300	-2.62	0.05
500	-2.01	0.12

[8] American Whitewater maintains the National Whitewater Inventory www.americanwhitewater.org/content/River/view/

[9] - Minimum Flow refers to lowest flows for a recreation experience. Minimum flows do not provide high value resource conditions.
- Optimum Flow refers to the flow level that provides the best resource condition, or greater value across all study participants.
- Tolerable Flows refer to the range of flows that provide acceptable recreational opportunities. Higher resolution studies often describe tolerable flows as a range of experience types or "niches", - low flow, technical, optimal, high flow, and highest safe.

700	-0.84	0.30
900	0.47	0.38
1100	1.48	0.17
1300	1.94	0.09
1500	2.31	0.04
1700	2.54	0.01
1900	2.68	0.00
2100	2.79	0.00
2300	2.79	0.01
2500	2.76	0.03
2700	2.72	0.03
3000	2.61	0.03
3500	2.38	0.09
4000	2.16	0.15
5000	1.78	0.25
1000	1.05	0.45

For all segments, minimum flows were identified as 900 cfs as the flow that crosses the neutral line, while optimum flows ranged between 1900–2100 cfs, with extremely high agreement levels (FAAI values of 0.0). Mean acceptability for high flows never fell below the neutral line, even up to 10,000 cfs, suggesting that flows in the Lower Dolores River never reach levels that are too high. Specific Flow-Evaluations asked respondents to identify the "highest acceptable flow", with results describing a median score of 5000 cfs. Integrating the results from specific and overall flow-evaluations, suggests that recreation quality declines as flows exceed 5000 cfs, but may not drop below acceptable levels. Mean responses to the overall flow-evaluations for Segments 1-5 of the Lower Dolores River are summarized in Table A.

Table A

Acceptable and Optimal Flows for Whitewater Boating
Dolores River below McPhee Dam

Lower Dolores River Segment	Lowest Acceptable Flows (CFS)	Optimal Flows (CFS)	Highest Acceptable Flows (CFS)
1) Bradfield to Dove Creek	900	1900-2100	10,000+
2) Dove Creek to Slickrock	900	2100-2500	10,000+
3) Slickrock to Bedrock	900	2100-2500	10,000+
4) Bedrock to Gateway	900	2100-2700	10,000+
5) Gateway to Colorado River	900	1900-2700	10,000+

B. Specific Flow Evaluation

To further refine and validate results from the overall flow-evaluation curves described in Section III A, a set of single-flow judgments were requested of survey respondents. For each study segment, respondents reported a single flow value that provides a distinct paddling experience or "niche" along a spectrum: low, technical, standard, high challenge, and maximum or "highest acceptable" flow. These "niches" help refine the full range of acceptable flows for whitewater boating, and aid in understanding the relationship between streamflows and recreation quality. Overlaying the specific and overall flow-evaluation results provides greater detail for understanding the effect changes in streamflows have on recreation quality.

With single preference responses reported as specific values, measures of central tendency, such as the mean and median, are useful representations of the recreational experience in question. The distribution of single preference responses to the flow-experience question is highly variable, with several outliers reporting flows that do not normally occur in the Dolores River system. For the purposes of this analysis, median reported values, as opposed to mean values, were used to describe each flow-experience type relationship. Figures 1B – 5B (Appendix B) plot the range of reported flows for each experience type, as well as median values.

Table B

SEGMENT 1- Bradfield Bridge to Dove Creek

Experience Type	Maximum Flow	Minimum Flow	**Median Flow**
Minimum Flow	2,000	250	**700**
Low Flow	2,500	250	**900**
Technical	2,500	200	**800**
Standard	3,500	500	**1,500**
High Flow	20,000	600	**3,500**
Maximum Flow	20,000	1,000	**5,000**

SEGMENT 2 - Dove Creek to Slickrock

Experience Type	Maximum Flow	Minimum Flow	**Median Flow**
Minimum Flow	5,000	200	**800**
Low Flow	3,000	300	**1,000**
Technical	2,200	350	**900**
Standard	3,500	600	**1,500**
High Flow	20,000	1,000	**3,500**
Maximum Flow	30,000	800	**5,000**

SEGMENT 3 - Slickrock to Bedrock

Experience Type	Maximum Flow	Minimum Flow	**Median Flow**
Minimum Flow	2,500	100	**800**
Low Flow	3,000	100	**1,000**
Technical	2,200	100	**800**
Standard	3,000	200	**1,500**
High Flow	15,000	800	**3,500**
Maximum Flow	25,000	1,000	**5,000**

SEGMENT 4 - Bedrock to Gateway

Experience Type	Maximum Flow	Minimum Flow	**Median Flow**
Minimum Flow	2,500	150	**800**
Low Flow	2,500	300	**1,000**
Technical	2,500	200	**800**
Standard	10,000	750	**1,500**
High Flow	25,000	1,000	**4,000**
Maximum Flow	50,000	800	**5,000**

SEGMENT 5- Gateway to Colorado River

Experience Type	Maximum Flow	Minimum Flow	**Median Flow**
Minimum Flow	2,500	80	**800**
Low Flow	4,000	80	**1,000**
Technical	3,000	150	**900**
Standard	6,000	200	**1,700**
High Flow	15,000	700	**3,500**
Maximum Flow	50,000	850	**5,000**

Data from Specific Flow-Evaluations can be organized by craft-type, such as rafts, kayaks, and canoes, to help illustrate the various levels of disagreement described by Flow-Acceptability Agreement Index and plotted as "bubbles" in the Overall Flow-Evaluation Curves from Section III A. Based on aggregated results from all craft-types, Overall Flow Curves indicate that at certain flows, primarily lower and higher flows, some disagreement exists across personal evaluations of flows and recreation quality. Data from single flow reporting for minimum and low flows, illustrates the disagreement over lower flows between canoes, kayaks, and rafts. Table C summarizes the results of Specific Flow-Evaluations by craft-type.

Table C
Median Minimum, Low, Technical, Standard, High and Maximum Flows
Dolores River below McPhee Reservoir

Dolores River Segment **Canoe Evaluations**	Minimum Flow (cfs)	Technical Flow (cfs)	Low Flow (cfs)	Standard Flow (cfs)	High Flow (cfs)	Maximum Flow cfs)
1) Bradfield to Dove Creek	600	700	900	1550	2250	3000
2) Dove Creek to Slickrock	700	700	1100	1500	3000	3200
3) Slickrock to Bedrock	500	700	900	1500	2500	3000
4) Bedrock to Gateway	700	700	900	2000	3000	3500
5) Gateway to Colorado River	500	600	775	1200	2500	1900

Dolores River Segment **Kayak Evaluations**	Minimum Flow (cfs)	Technical Flow (cfs)	Low Flow (cfs)	Standard Flow (cfs)	High Flow (cfs)	Maximum Flow (cfs)
1) Bradfield to Dove Creek	700	900	900	1500	3000	5000
2) Dove Creek to Slickrock	700	800	1000	1500	3000	5000
3) Slickrock to Bedrock	700	800	800	1500	3500	5000
4) Bedrock to Gateway	700	800	1000	1500	4000	6000
5) Gateway to Colorado River	700	900	1000	1500	3500	5000

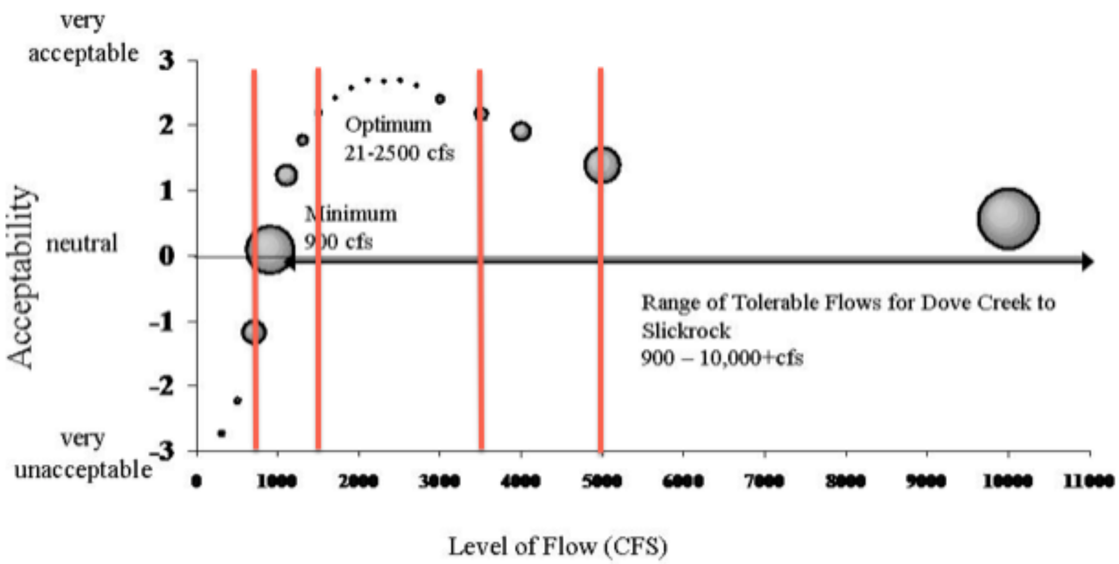
Dolores River Segment **Raft/Cataraft Evaluations**	Minimum Flow (cfs)	Technical Flow (cfs)	Low Flow (cfs)	Standard Flow (cfs)	High Flow (cfs)	Maximum Flow (cfs)
1) Bradfield to Dove Creek	700	850	900	1500	3500	5000
2) Dove Creek to Slickrock	800	900	1000	1500	3300	4000
3) Slickrock to Bedrock	800	800	1000	1500	3500	5000
4) Bedrock to Gateway	800	900	1000	1500	3500	5000
5) Gateway to Colorado River	800	900	1000	1800	3500	5000

Results suggest several interesting findings. First, they highlight the significant differences between open canoes and other common whitewater craft. All four identified experience niches are described by flows that are lower for canoes than other craft types. In addition, minimum flows for rafts are considerably higher than those for all other boats, underscoring the differences in flows preferred by larger craft.

Secondly, for most segments, single-flow evaluations are shown to closely mimic relative values identified by the FAAI curves for minimum acceptable, optimal, and maximum acceptable flows. While there is a noticeable difference between overall flow evaluations for whitewater boating (aggregated evaluations for all craft-types), and for specific flow evaluations for each individual craft-type, integrating overall and specific flow evaluations can be a useful method for describing the value of recreational opportunities affected by flow.

Overlaying results from specific flow-evaluations onto overall Flow Evaluation Curves is a helpful approach to analyzing the data from the study. Following along the FAAI curve for Dolores River Segment 2 in Figure B, the median flow identified for minimum whitewater rafting (highlighted in Table C), is 800 cfs. This is close to the point on the overall flow-evaluation curve where the neutral line between un-acceptable and acceptable valuation is crossed. Similar correlation can be found in comparing standard, high and maximum flow values (1500cfs, 3300cfs, and 5000cfs respectively) to the corresponding points along the FAAI curve. Integrating results from both overall and specific flow-evaluation questions help in verifying overall flow evaluations, and provides more information than either format by itself. Results also support anecdotal input from users, that flows of 800-1000cfs is less preferable for rafting.

Figure B
Integrating Overall and Specific Flow Evaluations
Dolores River Segment 2 – Dove Creek to Slickrock



IV. Usable Days Analysis – Quantifying Whitewater Recreation Opportunities.

Whitewater boating opportunities, described as "usable days" or "boating days", are defined by the number of days that flows meet recreational needs. Usable Days is the dominant metric most relevant to managing flow-dependant recreation. Evaluations of flow and recreation opportunities describe the number of "usable days" within acceptable and optimal flow ranges defined by Overall Flow Evaluation Curves. On rivers across the nation where paddling has been expressly protected, mitigated, or enhanced it has been done through protecting or providing the existing or negotiated number of days within these flow ranges.

The above approach is evident on highly regulated rivers where specific days of releases at specific flows are scheduled as mitigation to support paddling. Often whitewater recreation on these rivers was severely impacted under previous hydropower licenses, and FERC requires recreational releases as an enhancement to existing conditions. Because of their long history of impairment, and the baselines of the regulatory frameworks[10], it is often a given that significant impairment will remain. For a list of rivers where the FERC, in concert with state and federal agencies, has required the release of specific flows on specific days for paddling, see Appendix C. In addition to FERC regulated dams that provide scheduled whitewater releases, other federal water management agencies provide usable days through managed releases, such as the Tennessee Valley Authority and the BOR.

[10] The Federal Power Act, implemented by the Federal Energy Regulatory Commission (FERC), defines existing conditions at time of licensing as the baseline, and at that time requires equal consideration of power and non-power uses of rivers. Because hydropower projects are relicensed every 30 to 50 years, relicensing hydropower dams typically results in *enhancements* of non-power uses from an original baseline that was disproportionately focused on power generation.

At each of these dams, management agencies have supported the concept of usable or boatable days as the variable that defines existing whitewater boating conditions, as well as impacts to whitewater boating and mitigation opportunities. *Boatable Days*, based on the natural flow regime and the regulatory framework, public access, and adequate flow information, are requested by American Whitewater on every river we work on that is impacted by flow regulation.

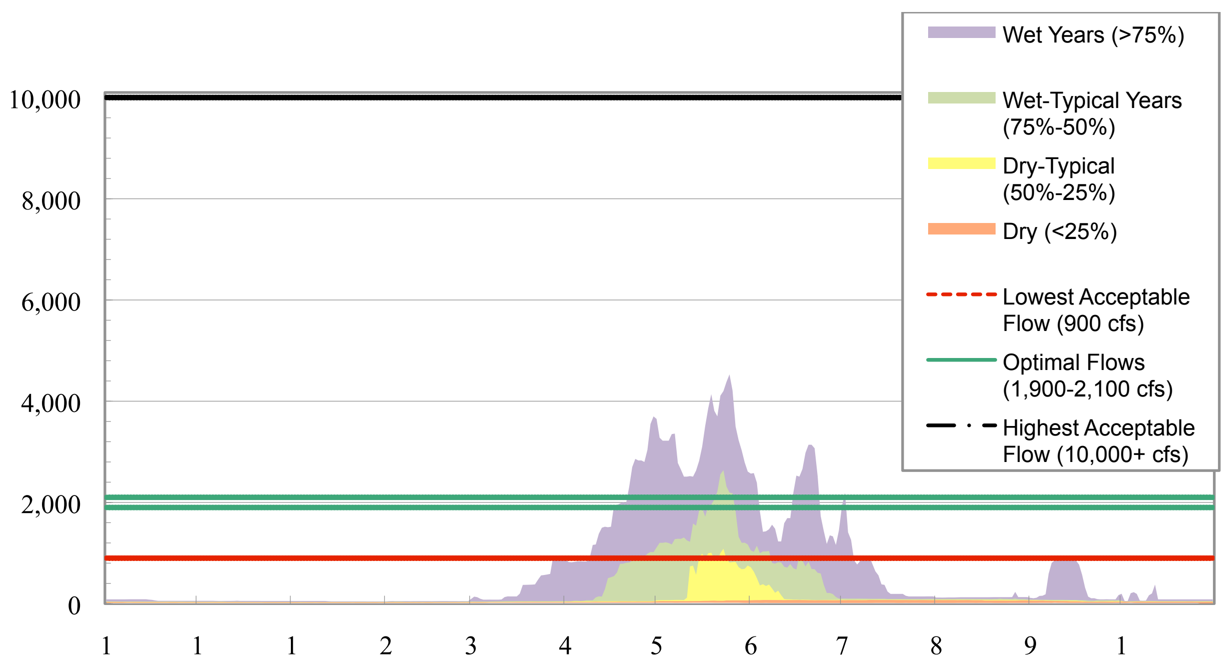
For each of the five study segments of the Lower Dolores River, a *usable days* analysis was conducted to identify the number of days when acceptable and optimal whitewater boating flows are provided below McPhee Dam. Using recreational flows defined by overall Flow-Evaluations described in Section IIIA above, this analysis quantifies corresponding whitewater recreation opportunities, or the number of days when these flows have been available. The number of Usable Days for each flow range varies given the type of hydrologic year.

For the purposes of this assessment, year-types (wet, wet-typical, dry-typical, and dry) are defined by ranking the total annual flow (acre-ft) at each stream gage (see Figure C). Therefore, the wet-typical category may be comprised of different years for one hydrologic anaysis than another (because different gage data are used). Year types ranked based upon April 1 snowpack are provided for each segment for comparison. Note that these values represent the combined April1 snowpack for the San Juan, Animas, Dolores & San Miguel Basins. Data was obtained from NRCS Colorado Snow Survey Program website. Further refinement based upon Dolores River Basin SNOTEL sites and McPhee Inflow forecasts will be completed in the next phase of this study.

Figure C

Dolores River below McPhee Reservoir (CODWR-DOLBMCO, Irrigation Year 1991-2010)

River Segment 1: Bradfield to Dove Creek

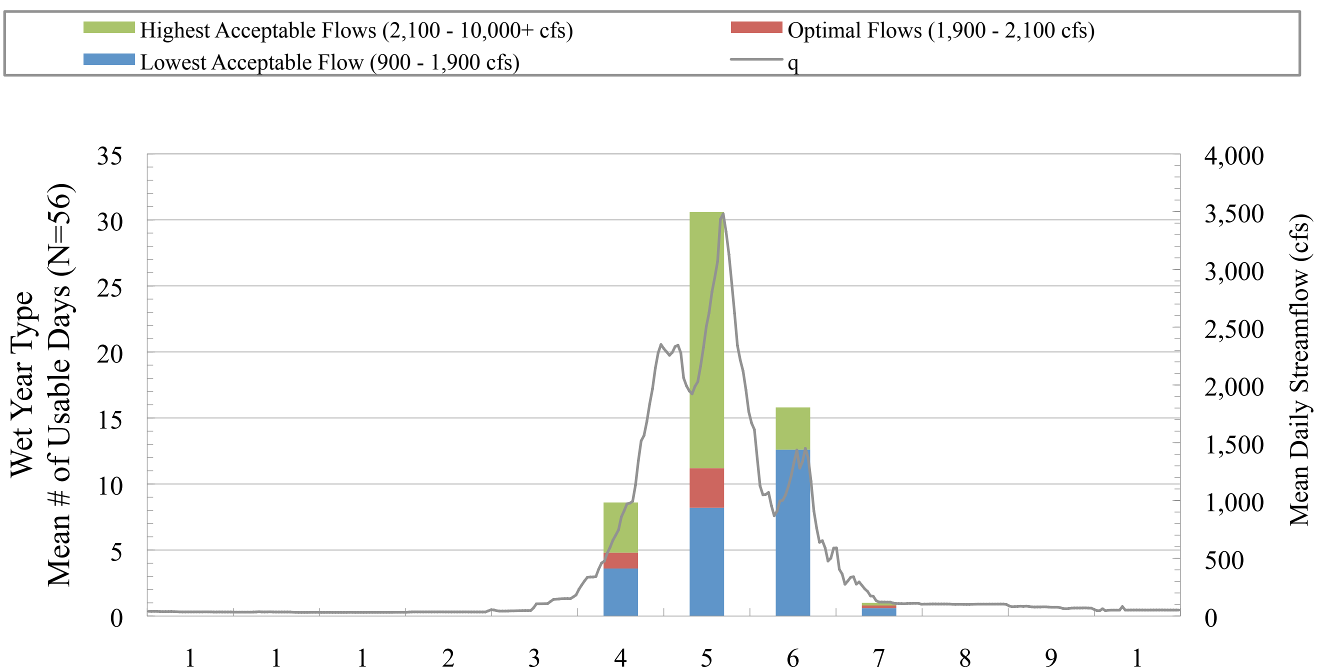


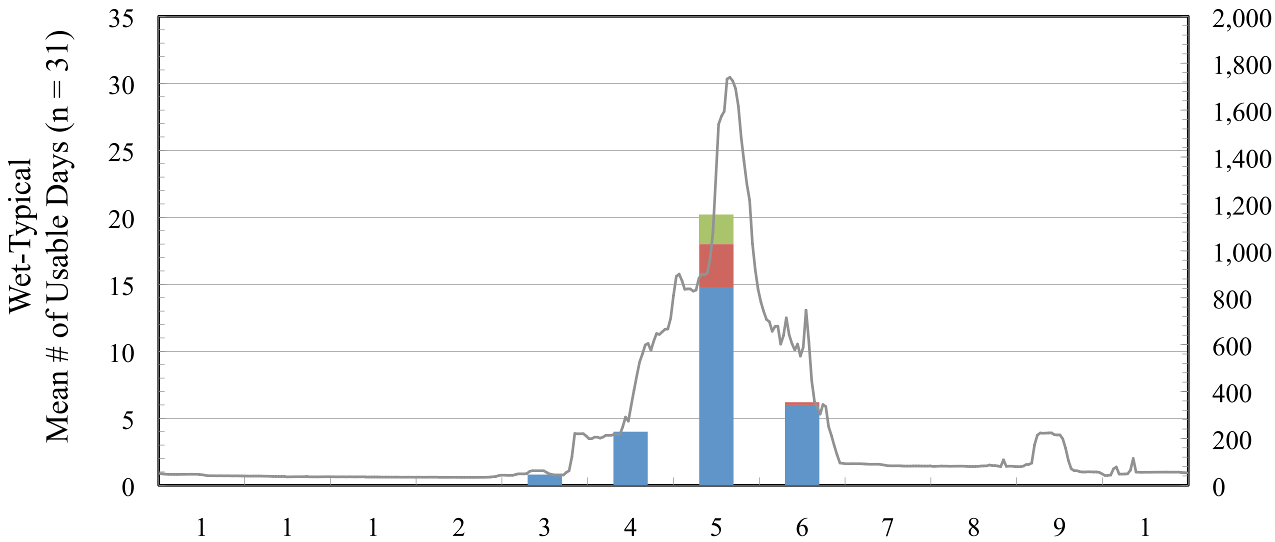
Hydrologic year-type analyses result in a better understanding of the relationship between recreational opportunities and variable hydrologic conditions in the Lower Dolores River. The period of record for this hydrologic analysis, suggests that flows below McPhee Dam never exceed 5,000 cfs which may help describe the level of disagreement over the acceptability of this flow level as reported by Overall Flow-Evaluations.

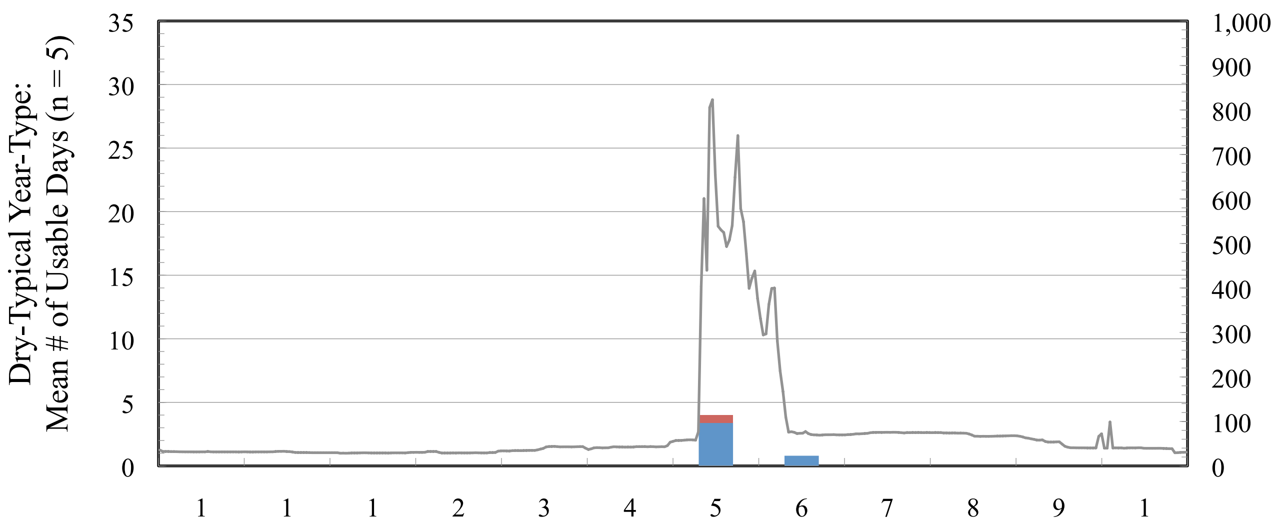
For each study segment, results of hydrological comparisons can be better illustrated by plotting mean gage data together with mean usable days for each year-type. By overlaying the average annual hydrograph for an historical year-type, with a graphic representation of mean usable days for the same respective hydrologic year, a more complete story of usable days can be described. Table D below provides a representative sample of these comparisons, with the number of usable days plotted on the vertical axis, and monthly values plotted on the horizontal axis. Each range of flows for whitewater recreation is plotted by month, with low acceptable, optimal, and high acceptable flows identified. This graphic comparison provides a complete picture of the historical timing of recreational flows below McPhee Dam measured by monthly average.

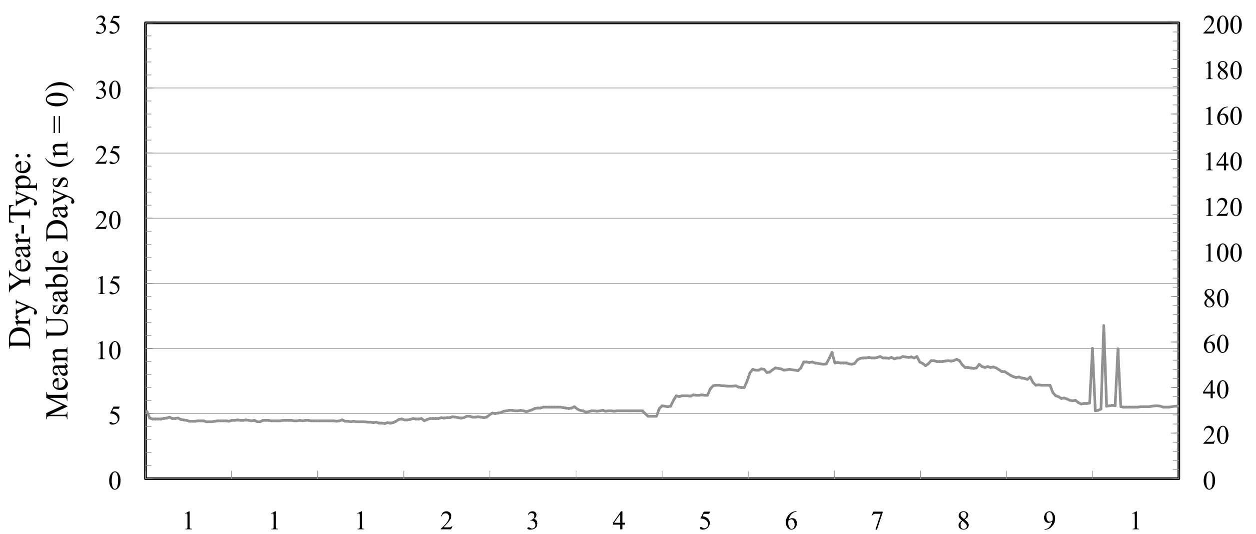
For the 20-year period of record used in the analysis (1991-2010), Usable Days are described as occurring within a range - minimum, mean, and maximum number of Usable Days - within each year type. The mean number of Usable Days for Dolores River Study Segment 1, described by year type, is presented in Table D. Mean results for Segment 1 indicate that no usable days exist in dry years (n=0), and few in dry-typical years (n=5), and only then at low-acceptable levels. In wet and wet-typical year types (n=31 and n=54, respectively), the full range of whitewater flows are found to be available, including days within low acceptable, optimal, and high acceptable levels. Tables D-H (Appendix D) describe the range of Usable Days for each segment of the Dolores River, by year type.

Table D
River Segment 1: Bradfield to Dove Creek
Historical Daily Streamflow & Number of Usable Days




Wet-Typical
Mean # of Usable Days (n = 31)
35
30
25
20
15
10
5
0
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1
1
1
2
3
4
5
6
7
8
9
1


Dry-Typical Year-Type:
Mean # of Usable Days (n = 5)
35
30
25
20
15
10
5
0
1,000
900
800
700
600
500
400
300
200
100
0
1
1
1
2
3
4
5
6
7
8
9
1


Dry Year-Type:
Mean Usable Days (n = 0)
35
30
25
20
15
10
5
0
200
180
160
140
120
100
80
60
40
20
0
1
1
1
2
3
4
5
6
7
8
9
1

Results of the Usable Days analysis for Segment 1 provided above, indicate that over the 20-year period of record, whitewater boating opportunities occurred only in all but the driest year-types, and primarily in the months of April-July.

Table E below, summarizes the results of the Usable Days Analysis, and provides several key pieces of information regarding the timing, quality, and quantity of flows for whitewater boating in the Lower Dolores River. For example, in irrigation year 1993 there were a total of 75 Usable Days between April 1 and July 31, or days when flows were at or above the minimum acceptable flow of 900 cfs. Of those 75 days, 45 were above the 2100cfs threshold that defines High Acceptable flows, with 7 optimal days between 1900-2100 cfs. The results from the analysis help describe when whitewater boating opportunities are typically available in the Lower Dolores, as well as what types of experiences those opportunities provide.

Table E

Usable Days-Dolores River below McPhee Reservoir (Irrigation Year 1991-2010)

Days per month that Existing Hydrology met **WHITEWATER BOATING** Flow Preferences

Segment 1 (Bradfield to Dove Creek)

Year Types (wet, wet typical, dry typical, and dry) Ranked by Yearly Volume

(Lowest Acceptable Flow = 900 cfs, Optimal Flows = 1,900 - 2,100 cfs, Highest Acceptable Flow = 2100-10,000+ cfs)

			Apr			May			Jun			Jul			Total Days	Total Days		
Ranking of Years Based Upon April 1 Snowpack*		Irrig. Year	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows		Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows
1993	Wet Category (>75%)	1993	8	5	9	0	2	29	15	0	7	0	0	0	75	23	7	45
1995		1995	3	0	0	11	4	16	24	0	6	3	1	1	69	41	5	23
2000		1997	2	0	7	0	0	31	18	0	3	0	0	0	61	20	0	41
2005		1998	4	1	3	17	0	12	4	0	0	0	0	0	41	25	1	15
2008		2005	1	0	0	13	9	9	2	0	0	0	0	0	34	16	9	9
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet Category		4	1	4	8	3	19	13	0	3	1	0	0	56	25	4	27
1991	Wet-Typical Category (75% - 50%)	1992	0	0	0	23	3	4	10	0	0	0	0	0	40	33	3	4
1992		1994	0	0	0	19	4	0	6	0	0	0	0	0	29	25	4	0
2001		1999	0	0	0	6	1	7	8	1	0	0	0	0	23	14	2	7
2009		2000	9	0	0	8	0	0	0	0	0	0	0	0	17	17	0	0
2010		2008	11	0	0	18	8	0	6	0	0	0	0	0	43	35	8	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet-Typical Category		4	0	0	15	3	2	6	0	0	0	0	0	30	25	3	2
1994	Dry-Typical Category (75% - 50%)	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996		1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998		2007	0	0	0	3	0	0	0	0	0	0	0	0	3	3	0	0
2000		2009	0	0	0	12	3	0	0	0	0	0	0	0	15	12	3	0
2003		2010	0	0	0	2	0	0	4	0	0	0	0	0	6	6	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Typical Category		0	0	0	3	1	0	1	0	0	0	0	0	5	4	1	0
1999	Dry Category (<25%)	2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002		2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004		2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006		2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007		2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Dry Category		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes: Average usable days are based upon daily streamflow data for the study period 1991-2010 (irrigation year) at the Dolores River below McPhee Reservoir streamgage (data obtained from SEO's Hydrobase) and whitewater flow preferences based upon a 2010 American Whitewater survey.

The mean number of Usable Days for each Year-Type described in Table E can aide in developing more predictable flow-management targets for segments of the Dolores River below McPhee Dam. For example, as of April 1, if NRCS snowpack conditions indicate wet-typical conditions, then a reasonable expectation for a managed release for whitewater boating could be estimated as 30 Usable Days, with five days at or above optimal flow thresholds. We recognize however, that a significant factor in the development of these management guidelines, is the amount of carryover storage in McPhee Reservoir whereas significant snowpack may not lead to high streamflows below the dam in the same year.

Analysis of daily flow data from 1991-2010 indicates high variability in the frequency of flows needed for whitewater boating. The Bureau of Reclamation's 1977 Final Environmental Study indicated that depletions in flow from the Dolores Project would impact whitewater boating opportunities (defined as days of 500cfs or greater) to the extent that usable days would likely be available 4 out of five years. Based on the period of record for this study, usable days have decreased significantly to about 1 out of three years.

IV. Conclusion

Stream-flows affect whitewater recreation in a number of ways from determining whether a stretch has recreational opportunities fro various craft-types, or provides a range of experiences from technical low flows to high water, high challenge experiences. This report provides information critical for understanding the relationship between instream flows and whitewater boating, and establishes qualitative and quantitative targets that can inform future flow allocation negotiations. Defined flow-needs for recreation are crucial elements in any river management planning or decision-making process, particularly on the Dolores River where hydroelectric projects and Wild and Scenic River Suitability is under consideration, as flow management is a central issue.

To define streamflows needed to provide recreational opportunities in the Lower Dolores River basin, American Whitewater collected and organized personal evaluations of recreational resource conditions, and recreation-relevant hydrology, consistent with standard methodologies. Survey respondents were asked to participate in two approaches to evaluating streamflows and recreation quality on five river segments.

In aggregate, survey respondents rated flows of 900 cfs as the minimum acceptable for all crafts, while flows between 1900-2700cfs provide for optimal flows in all five study segments. Highest acceptable flows were greater than 10,000 cfs for all whitewater craft. Disagreement over flow acceptability suggests that a number of individual respondents found flow levels of at least 500 cfs acceptable, and flows above 5,000 cfs, unacceptable. Results suggest that for different whitewater boating craft, different sets of challenges and flow preferences exist. Study participants reported single flows that provide distinct recreational opportunity “niches”, such as minimum, low, standard, and high challenge flows – advancing our understanding of the varied recreational opportunities within the range of acceptable flows for whitewater boating.

Integrating results from overall flow-evaluations with specific flow evaluations, provides more information than either format by itself, and helps validate the Flow-Evaluations Curves presented here. For each study segment, the median response for specific flows reported for minimum whitewater corresponds to the point where the overall flow-evaluations cross the neutral line of the curve. Similarly, the median response for standard flows corresponds with the peak of the curve where ratings are highest. Results from this study, indicate that current BOR guidelines for a managed release of 800-1000cfs, provides less than optimal whitewater boating conditions for all craft-types – particularly large rafts. Efficient use of a managed release would meet the needs of the greatest number of users by providing optimal flows for the highest number of days possible, given hydrologic conditions.

Usable Days analysis indicates that existing whitewater boating opportunities, as well as enhancement opportunities, typically occur between April and July in the Lower Dolores River. Results indicate that optimal flows (greater than 1900cfs) have only been available in the wettest 50% of the years since 1991. The Usable Days metric provides a relative comparison value to evaluate potential effects of flow manipulation below the Dam on whitewater boating opportunities, while allowing for annual variability in hydrologic conditions in the Dolores River basin. To the extent that flow regimes can be managed at McPhee Dam to produce different resource conditions downstream, this study provides critical information for resource managers responsible for making the most efficient use of available flows though scheduling and prediction of releases for whitewater boating.

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Appendix A:

Figure 1A

Flow Acceptability Agreement Index Curve for Bradfield Launch to Dove Creek Pump Station (Flows represented are flow levels at USGS Dolores below McPhee Reservoir Gauge)

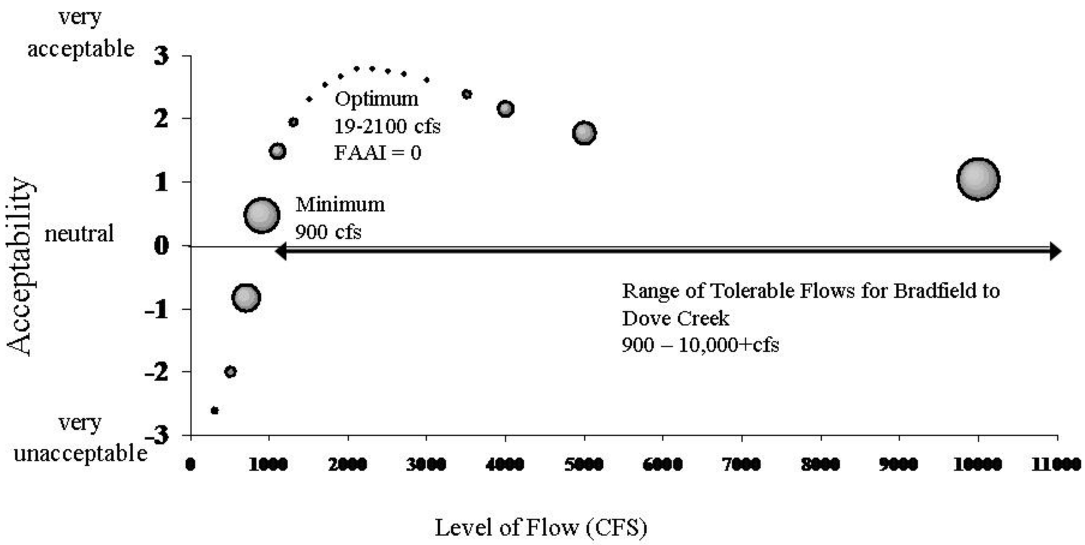


Table 1A

Bradfield Launch to Dove Creek Pump Station
Mean Acceptability Scores and Flow Acceptability Agreement Index
(Flows represented are flow levels at USGS Dolores below McPhee Reservoir Gauge)

Specific Flow CFS	Mean Acceptability	FAAI
300	-2.62	0.05
500	-2.01	0.12
700	-0.84	0.30
900	0.47	0.38
1100	1.48	0.17
1300	1.94	0.09
1500	2.31	0.04
1700	2.54	0.01
1900	2.68	0.00
2100	2.79	0.00
2300	2.79	0.01
2500	2.76	0.03
2700	2.72	0.03
3000	2.61	0.03
3500	2.38	0.09
4000	2.16	0.15
5000	1.78	0.25
1000	1.05	0.45

Figure 2A
Flow Acceptability Agreement Index Curve for Dove Creek Pump Station to Slickrock
(Flows represented are flow levels at USGS Dolores below McPhee Reservoir Gauge)

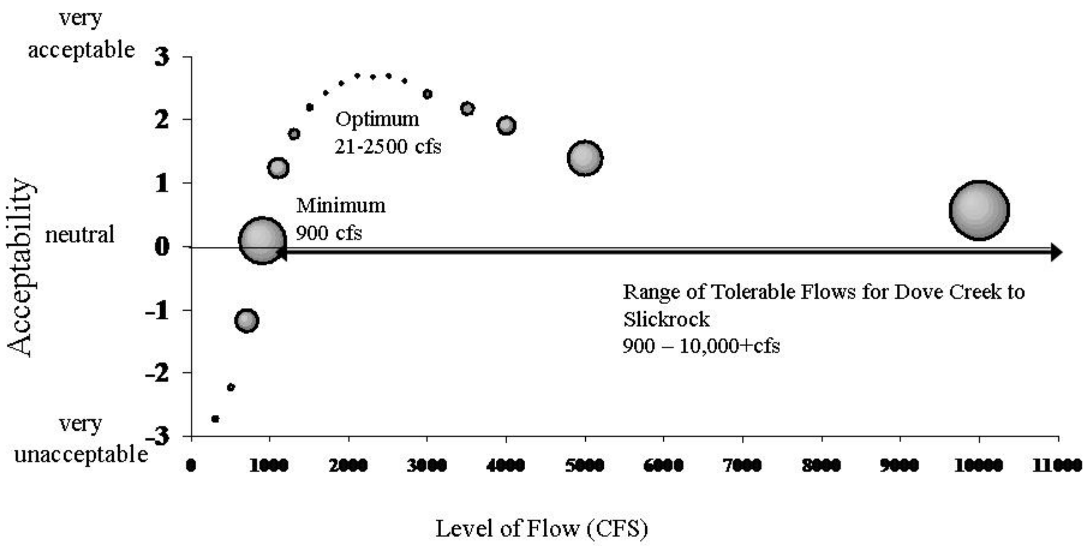


Table 2A
Dove Creek Pump Station to Slickrock
Mean Acceptability Scores and Flow Acceptability Agreement Index
(Flows represented are flow levels at USGS Dolores below McPhee Reservoir Gauge)

Specific Flow CFS	Mean Acceptability	FAAI
300	-2.73	0.03
500	-2.24	0.07
700	-1.17	0.25
900	0.08	0.50
1100	1.24	0.21
1300	1.78	0.12
1500	2.2	0.05
1700	2.43	0.03
1900	2.58	0.03
2100	2.7	0.02
2300	2.67	0.02
2500	2.69	0.03
2700	2.61	0.05
3000	2.41	0.08
3500	2.17	0.14
4000	1.91	0.20
5000	1.39	0.37
1000	0.56	0.61

Figure 3A

Flow Acceptability Agreement Index Curve for Slickrock to Bedrock

(Flows represented are flow levels at USGS Dolores below McPhee Reservoir Gauge)

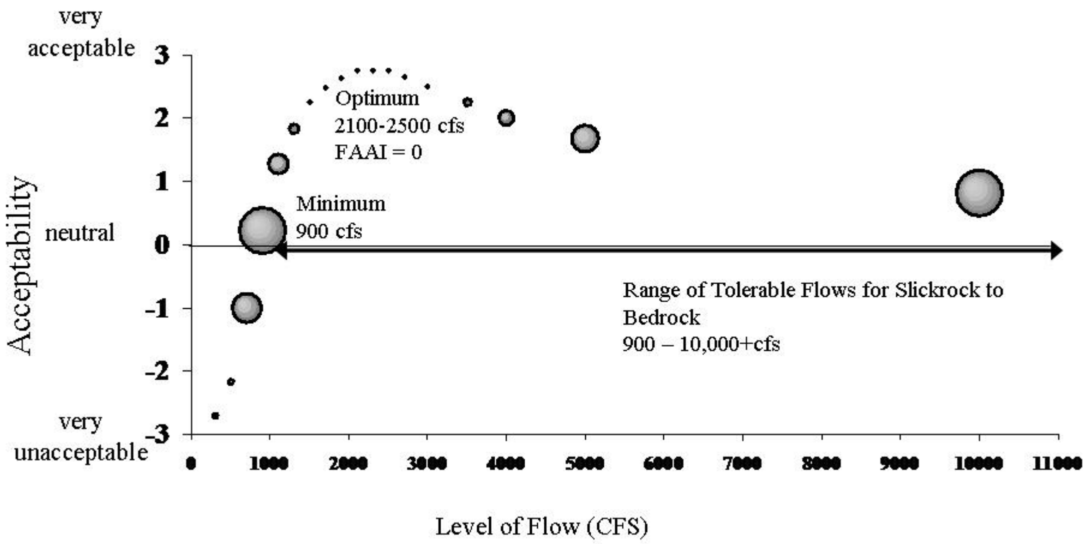


Table 3A

Slickrock to Bedrock

Mean Acceptability Scores and Flow Acceptability Agreement Index

(Flows represented are flow levels at USGS Dolores below McPhee Reservoir Gauge)

Specific Flow CFS	Mean Acceptability	FAAI
300	-2.71	0.02
500	-2.17	0.06
700	-1	0.31
900	0.22	0.49
1100	1.27	0.21
1300	1.84	0.11
1500	2.26	0.02
1700	2.49	0.03
1900	2.64	0.00
2100	2.75	0.00
2300	2.75	0.01
2500	2.75	0.02
2700	2.65	0.03
3000	2.51	0.06
3500	2.25	0.10
4000	2.01	0.17
5000	1.68	0.30
1000	0.82	0.51

Figure 4A
Flow Acceptability Agreement Index Curve for Bedrock to Gateway
(Flows represented are flow levels at the USGS Dolores nr Bedrock Gauge)

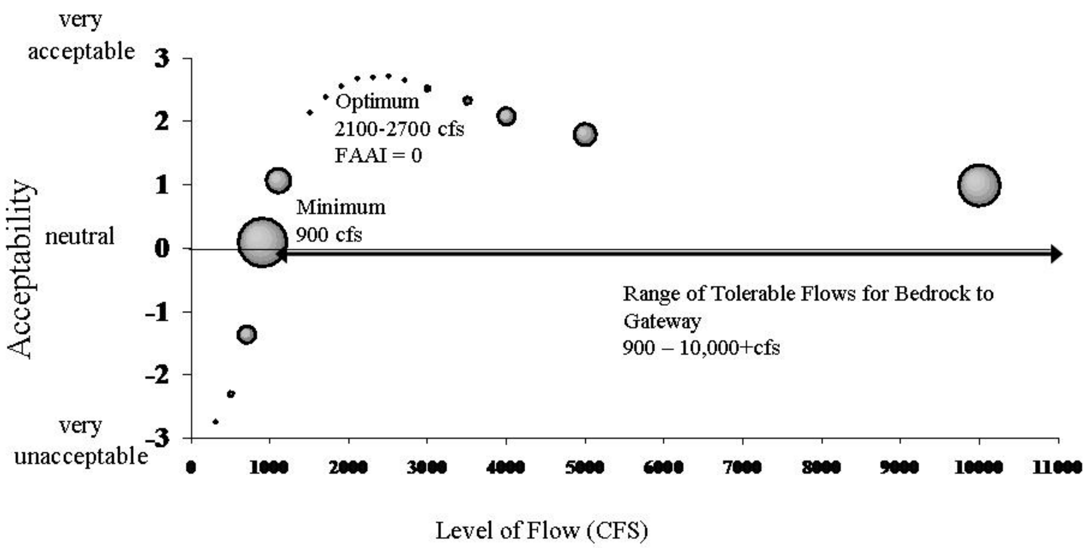


Table 4A
Bedrock to Gateway
Mean Acceptability Scores and Flow Acceptability Agreement Index
(Flows represented are flow levels at the USGS Dolores nr Bedrock Gauge)

Specific Flow CFS	Mean Acceptability	FAAI
300	-2.75	0.02
500	-2.31	0.05
700	-1.37	0.19
900	0.08	0.51
1100	1.07	0.25
1300	1.76	0.10
1500	2.14	0.05
1700	2.39	0.02
1900	2.55	0.00
2100	2.67	0.00
2300	2.7	0.01
2500	2.71	0.02
2700	2.66	0.05
3000	2.53	0.07
3500	2.33	0.10
4000	2.08	0.18
5000	1.79	0.24
1000	0.99	0.43

Figure 5A

Flow Acceptability Agreement Index Curve for Gateway to Colorado River
(Flows represented are flow levels at the USGS Dolores nr Bedrock Gauge)

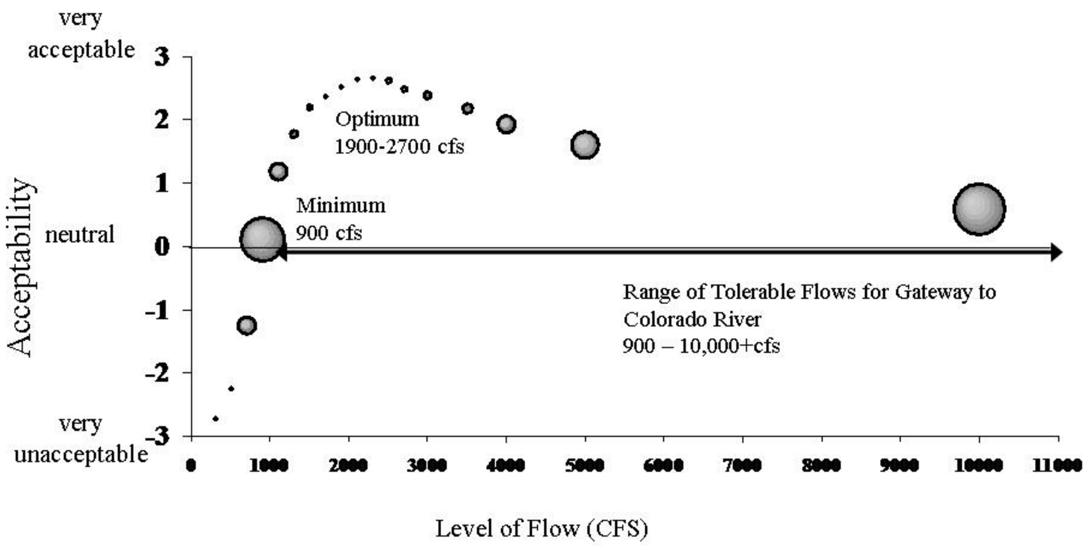


Table 5A

Gateway to Colorado River
Mean Acceptability Scores and Flow Acceptability Agreement Index
(Flows represented are flow levels at the USGS Dolores nr Bedrock Gauge)

Specific Flow CFS	Mean Acceptability	FAAI
300	-2.74	0.02
500	-2.26	0.04
700	-1.26	0.19
900	0.1	0.46
1100	1.18	0.18
1300	1.78	0.10
1500	2.19	0.07
1700	2.37	0.05
1900	2.52	0.05
2100	2.63	0.04
2300	2.65	0.04
2500	2.61	0.05
2700	2.48	0.06
3000	2.38	0.08
3500	2.17	0.12
4000	1.93	0.19
5000	1.6	0.28
1000	0.58	0.56

Appendix B:

Table 1B

SEGMENT 1 – Bradfield Bridge to Dove Creek

Experience Type	Maximum Flow Value	Minimum Flow Value	**Median Flow Value**
Minimum Flow	2,000	250	**700**
Low Flow	2,500	250	**900**
Technical Flow	2,500	200	**800**
Standard Flow	3,500	500	**1,500**
High Flow	20,000	600	**3,500**
Maximum	20,000	1,000	**5,000**

Figure 1B
Range Plots for Whitewater Boating Flows by Experience Type
Dolores River below McPhee Reservoir- SEGMENT 1 (Bradfield to Dove Creek)

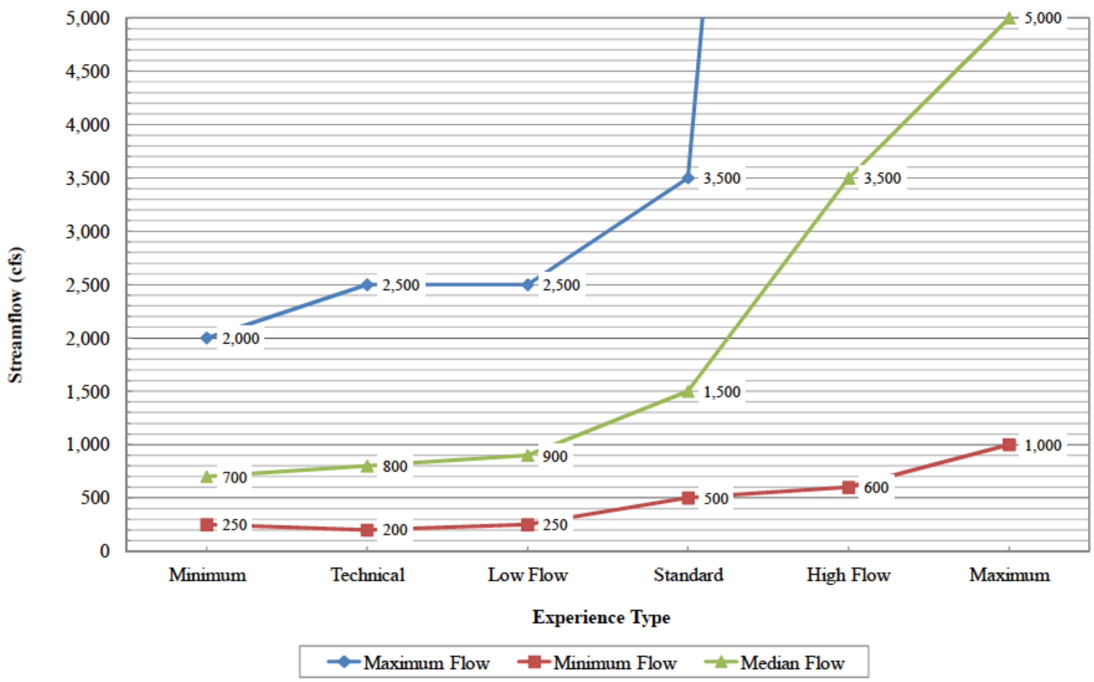


Table 2B

SEGMENT 2 – Dove Creek to Slickrock

Experience Type	Maximum Flow Value	Minimum Flow Value	**Median Flow Value**
Minimum Flow	5,000	200	**800**
Low Flow	3,000	300	**1,000**
Technical Flow	2,200	350	**900**
Standard Flow	3,500	600	**1,500**
High Flow	20,000	1,000	**3,500**
Maximum	30,000	800	**5,000**

Figure 2B
Range Plots for Whitewater Boating Flows by Experience Type
Dolores River below McPhee Reservoir- SEGMENT 2 (Dove Creek to Slickrock)

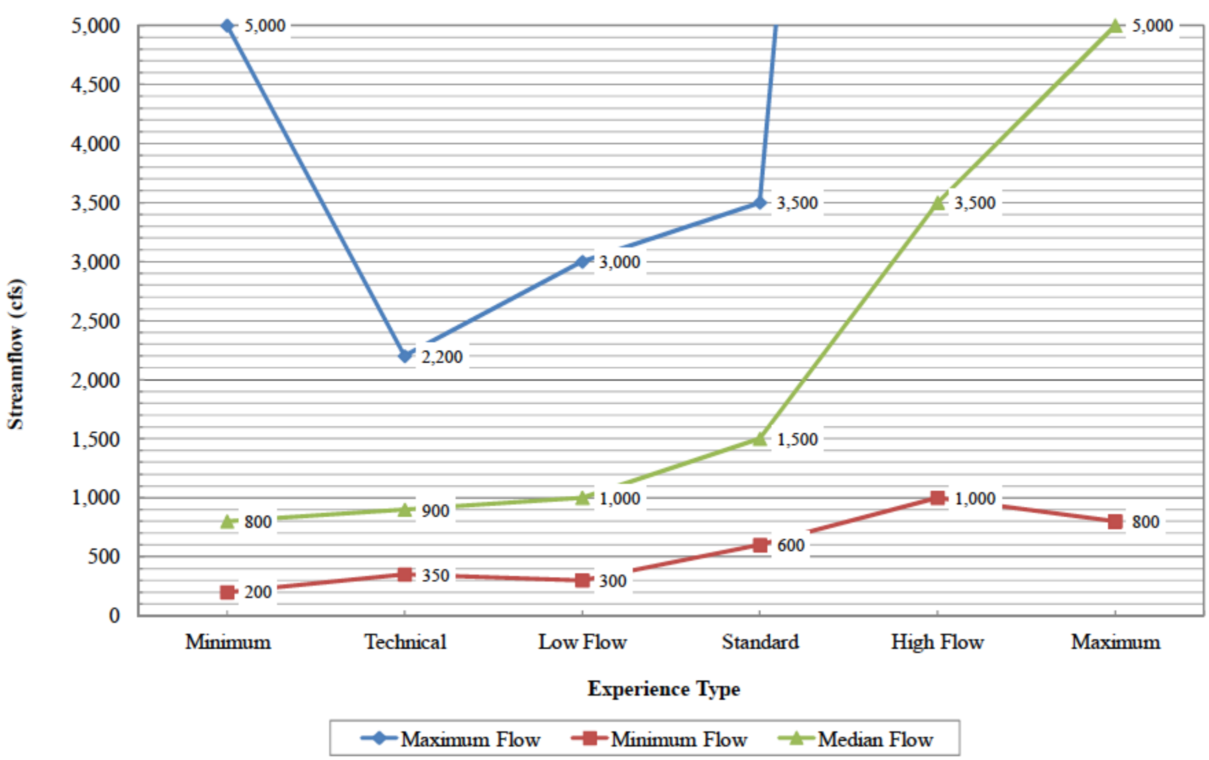


Table 3B

SEGMENT 3 – Slickrock to Bedrock

Experience Type	Maximum Flow Value	Minimum Flow Value	**Median Flow Value**
Minimum Flow	2,500	100	**800**
Low Flow	3,000	100	**1,000**
Technical Flow	2,200	100	**800**
Standard Flow	3,000	200	**1,500**
High Flow	15,000	800	**3,500**
Maximum	25,000	1,000	**5,000**

Figure 3B
Range Plots for Whitewater Boating Flows by Experience Type
Dolores River below McPhee Reservoir- SEGMENT 3 (Slickrock to Bedrock)

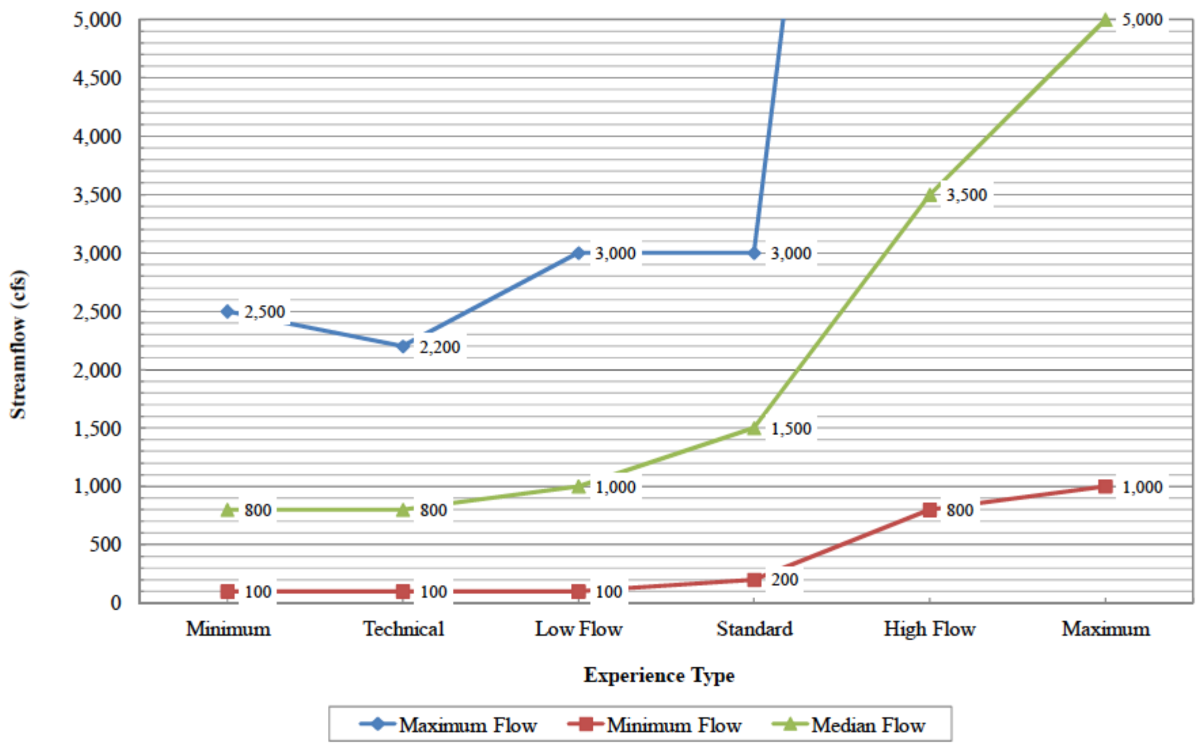


Table 4B

SEGMENT 4 – Bedrock to Gateway

Experience Type	Maximum Flow Value	Minimum Flow Value	**Median Flow Value**
Minimum Flow	2,500	150	**800**
Low Flow	2,500	300	**1,000**
Technical Flow	2,500	200	**800**
Standard Flow	10,000	750	**1,500**
High Flow	25,000	1,000	**4,000**
Maximum	50,000	800	**5,000**

Figure 4B
Range Plots for Whitewater Boating Flows by Experience Type
Dolores River below McPhee Reservoir- SEGMENT 4 (Bedrock to Gateway)

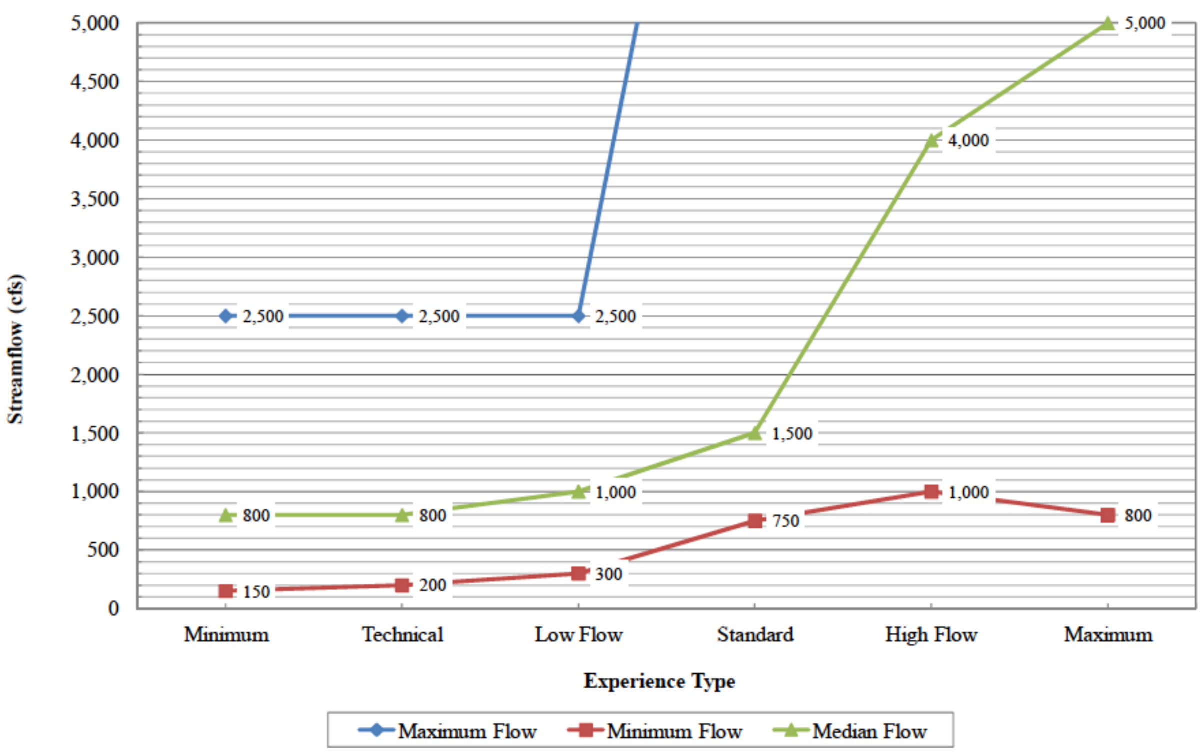
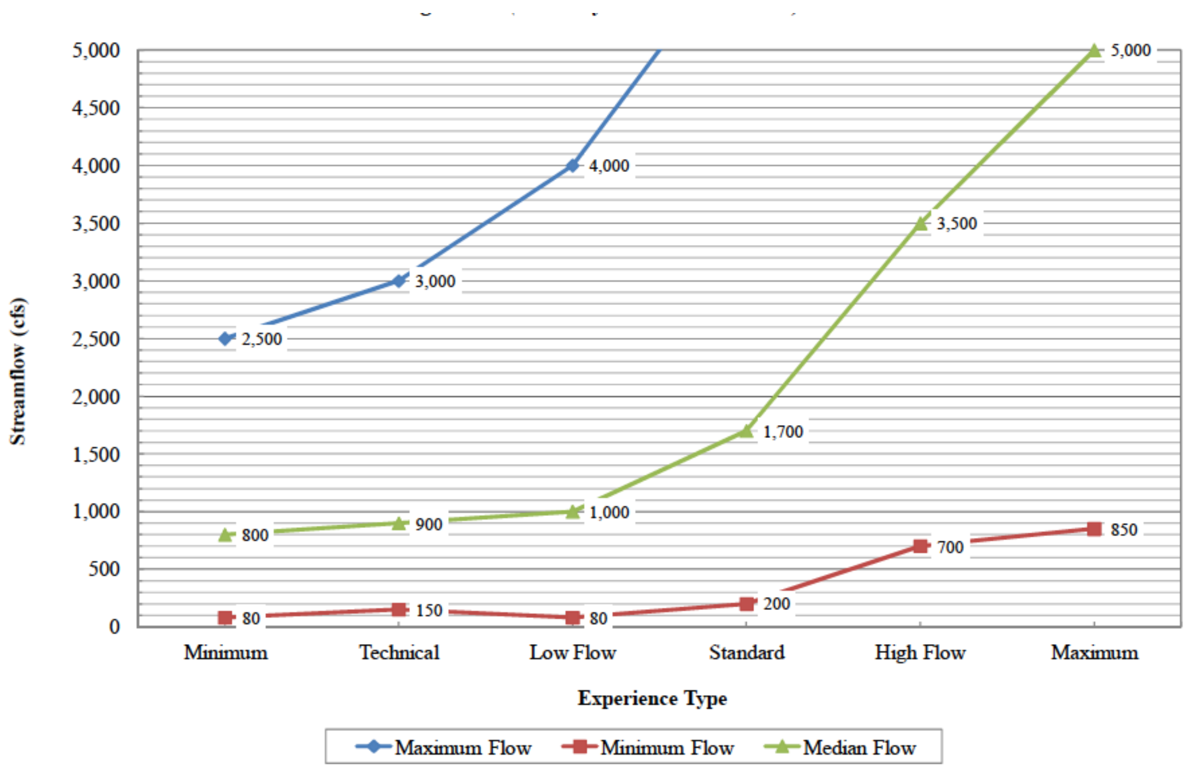


Table 5B

SEGMENT 5 – Gateway to Colorado River

Experience Type	Maximum Flow Value	Minimum Flow Value	**Median Flow Value**
Minimum Flow	2,500	80	**800**
Low Flow	4,000	80	**1,000**
Technical Flow	3,000	150	**900**
Standard Flow	6,000	200	**1,700**
High Flow	15,000	700	**3,500**
Maximum	50,000	850	**5,000**

Figure 5B
Range Plots for Whitewater Boating Flows by Experience Type
Dolores River below McPhee Reservoir- SEGMENT 5 (Gateway to Colorado River)



Appendix C

A subset of FERC regulated hydropower projects at which discrete usable boating days have been scheduled and/or provided as mitigation for impacts to whitewater boating, and/or analyzed as part of a whitewater flow study.

River	Project Name	State	FERC Project #
COOSA RIVER	JORDAN DAM	AL	00618
COOSA RIVER	MITCHELL	AL	00082
BUTTE CREEK	FORKS OF BUTTE	CA	06896
FEATHER RIVER	FEATHER RIVER	CA	02100
KERN RIVER	BOREL	CA	00382
KERN RIVER	ISABELLA	CA	08377
KERN RIVER	KERN CANYON	CA	00178
KERN RIVER	KERN RIVER NO 1	CA	01930
KERN RIVER	KERN RIVER NO 3	CA	02290
KINGS RIVER	PINE FLAT	CA	02741
MIDDLE FORK AMERICAN R	MIDDLE FORK AMERICAN RIVER	CA	02079
MIDDLE FORK STANISLAUS RIVER	BEARDSLEY/DONNELLS	CA	02005
N FK KINGS R	HAAS-KINGS RIVER	CA	01988
NORTH FORK FEATHER RIVER	POE	CA	02107
NORTH FORK FEATHER RIVER	ROCK CREEK-CRESTA	CA	01962
NORTH FORK FEATHER RIVER	UPPER NORTH FORK FEATHER RIVER	CA	02105
NORTH FORK MOKELUMNE RIVER	MOKELUMNE RIVER	CA	00137
PIRU CREEK	SANTA FELICIA	CA	02153
PIT RIVER	MCCLOUD-PIT	CA	02106
PIT RIVER	PIT 3, 4, & 5	CA	00233
PIT RIVER	PIT NO. 1	CA	02687
SAN JOAQUIN R	KERCKHOFF	CA	00096
SAN JOAQUIN RIVER	BIG CREEK NO 3	CA	00120
SAN JOAQUIN RIVER	BIG CREEK NO 4	CA	02017
SAN JOAQUIN RIVER	BIG CREEK NO.1 & NO.2	CA	02175
SOUTH FORK AMERICAN R	UPPER AMERICAN RIVER	CA	02101
SOUTH FORK AMERICAN RIVER	CHILI BAR	CA	02155
SOUTH FORK FEATHER RIVER	SOUTH FEATHER POWER	CA	02088
SOUTH FORK OF THE AMERICAN RIVER	EL DORADO	CA	00184
SOUTH YUBA RIVER	DRUM-SPAULDING	CA	02310
SOUTH YUBA RIVER	YUBA-BEAR	CA	02266
STANISLAUS R MIDDLE FORK	SAND BAR	CA	02975
STANISLAUS RIVER	SPRING GAP-STANISLAUS	CA	02130
WEST BRANCH FEATHER RIVER	DESABLA-CENTERVILLE	CA	00803
TALLULAH RIVER	NORTH GEORGIA	GA	02354
BEAR RIVER	BEAR RIVER	ID	00020
DEAD RIVER	FLAGSTAFF STORAGE	ME	02612
KENNEBEC RIVER	INDIAN POND	ME	02142
MAGALLOWAY RIVER	AZISCOHOS [?]	ME	04026
RAPID RIVER	UPPER & MIDDLE DAMS STORAGE	ME	11834
S BR PENOBSCOTT R	CANADA FALLS	ME	

W BR PENOBSCOT R	PENOBSCOT	ME	02458
W BR PENOBSCOT R	RIPOGENUS	ME	02572
SWAN RIVER	BIGFORK	MT	02652
WEST ROSEBUD CREEK	MYSTIC LAKE	MT	02301
PIGEON RIVER	WALTERS	NC	00432
TUCKASEGEE RIVER	DILLSBORO	NC	02602
WEST FORK TUCKASEGEE RIVER	WEST FORK	NC	02686
NANTAHALA RIVER	NANTAHALA	NC	02692
EF TUCKASEGEE	EAST FORK	NC	02698
ANDROSCOGGIN RIVER	PONTOOK	NH	02861
PEMIGEWASSET RIVER	AYERS ISLAND	NH	02456
HOOSIC RIVER	HOOSIC	NY	02616
MONGAUP RIVER	RIO	NY	09690
MOOSE RIVER	MOOSE RIVER	NY	04349
RAQUETTE RIVER	[STONE VALLEY REACH]	NY	
RAQUETTE RIVER	PIERCEFIELD	NY	07387
SACANDAGA RIVER	STEWARTS BRIDGE	NY	02047
SALMON R	SALMON RIVER	NY	11408
SARANAC RIVER	SARANAC RIVER	NY	02738
BEAVER RIVER	BEAVER FALLS	NY	02593
BEAVER RIVER	BEAVER RIVER	NY	02645
BLACK RIVER	GLEN PARK	NY	04796
BEAVER RIVER	LOWER BEAVER FALLS	NY	02823
BLACK RIVER	WATERTOWN	NY	02442
KLAMATH RIVER	KLAMATH	OR	02082
SOUTH FORK ROGUE RIVER	PROSPECT NO 3	OR	02337
SUSQUEHANNA RIVER	HOLTWOOD	PA	01881
SALUDA RIVER	SALUDA	SC	00516
WATEREE RIVER	CATAWBA-WATEREE	SC	02232
LITTLE TENNESSEE RIVER	TAPOCO	TN	02169
DEERFIELD RIVER	DEERFIELD RIVER	VT	02323
LITTLE RIVER	WATERBURY	VT	02090
LAKE CHELAN	LAKE CHELAN	WA	00637
SPOKANE RIVER	SPOKANE RIVER	WA	02545
SULLIVAN CREEK	SULLIVAN LAKE (STORAGE)	WA	02225
SULTAN RIVER	HENRY M JACKSON (SULTAN)	WA	02157
TIETON RIVER	TIETON DAM	WA	03701
BLACK RIVER	HATFIELD	WI	10805
CHIPPEWA RIVER	JIM FALLS	WI	02491
GAULEY RIVER	SUMMERSVILLE	WV	10813

Appendix D

Figure D
Dolores River below McPhee Reservoir (CODWR-DOLBMCO, Irrigation Year 1991-2010)
River Segments 1: Bradfield to Dove Creek

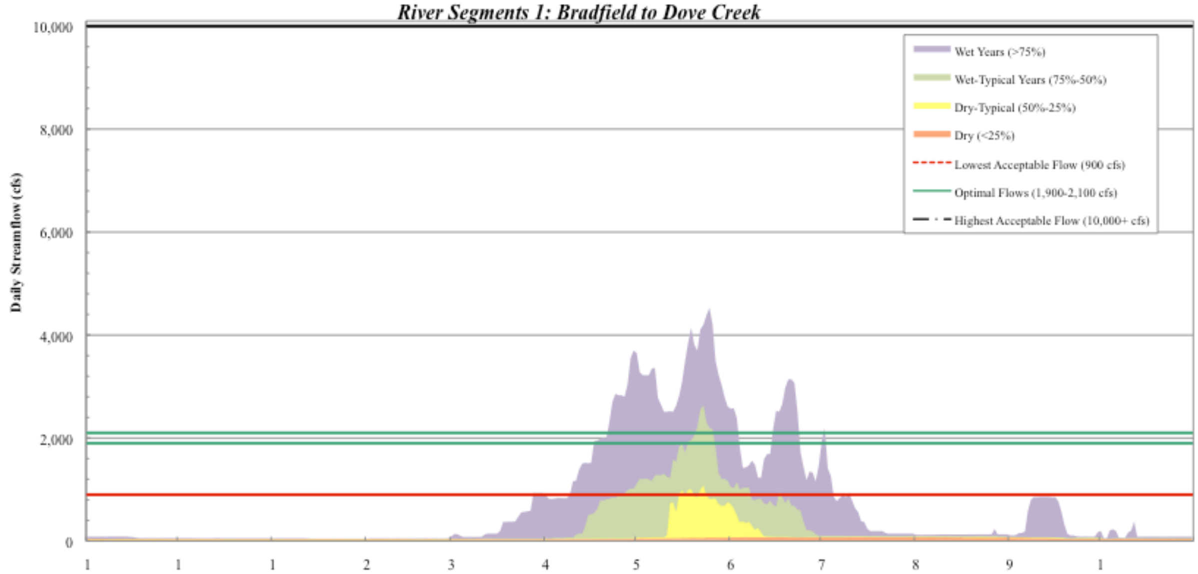
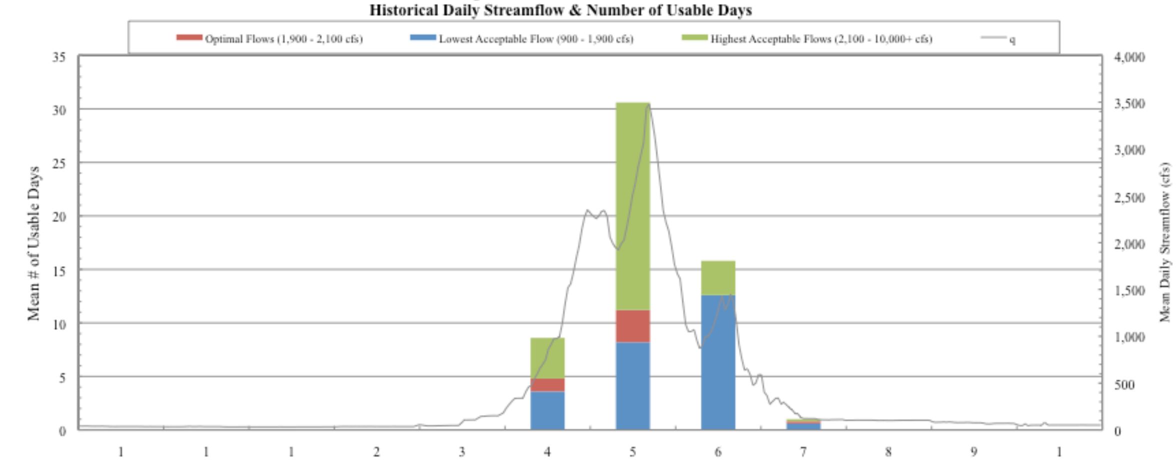


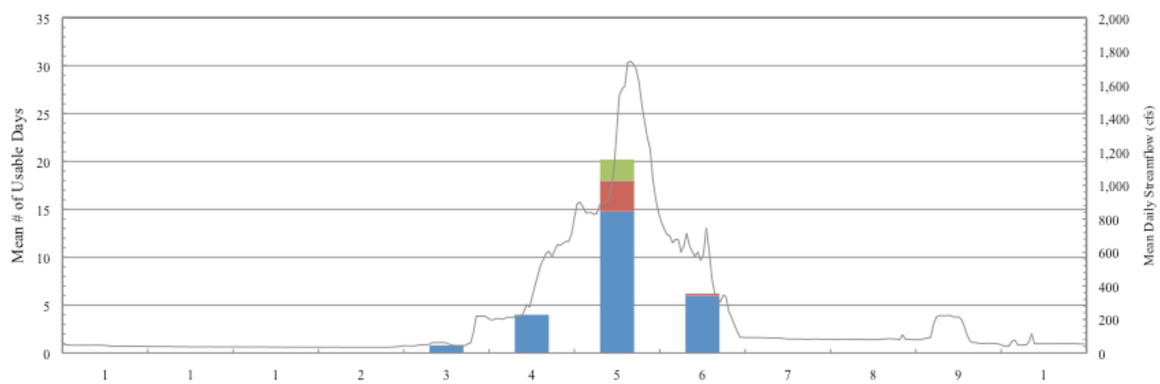
Table D - Boatable Days-Dolores River below McPhee Reservoir (Irrigation Year 1991-2010)
Days per month that Existing Hydrology met **WHITEWATER BOATING** Flow Preferences
Segment 1 (Bradfield to Dove Creek)
Year Types (wet, wet typical, dry typical, and dry) Ranked by Yearly Volume
(Lowest Acceptable Flow = 900 cfs, Optimal Flows = 1,900 - 2,100 cfs, Highest Acceptable Flow = 10,000+ cfs)

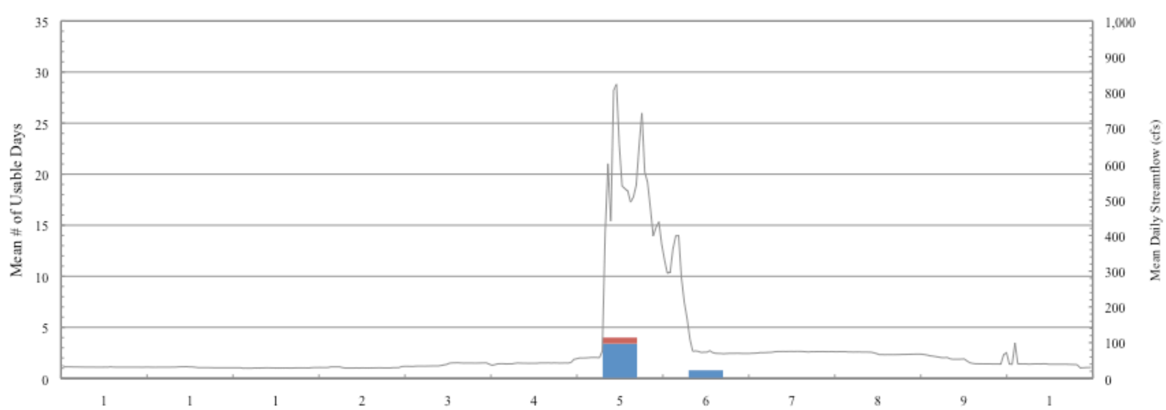
			Apr			May			Jun			Jul			Total Days	Total Days		
Ranking of Years Based Upon April 1 Snowpack*		Irrig. Year	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows		Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows
1993	Wet Category (>75%)	1993	8	5	9	0	2	29	15	0	7	0	0	0	75	23	7	45
1995		1995	3	0	0	11	4	16	24	0	6	3	1	1	69	41	5	23
1997		1997	2	0	7	0	0	31	18	0	3	0	0	0	61	20	0	41
2005		1998	4	1	3	17	0	12	4	0	0	0	0	0	41	25	1	15
2008		2005	1	0	0	13	9	9	2	0	0	0	0	0	34	16	9	9
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet Category		4	1	4	8	3	19	13	0	3	1	0	0	56	25	4	27
1991	Wet-Typical Category (75% - 50%)	1992	0	0	0	23	3	4	10	0	0	0	0	0	40	33	3	4
1992		1994	0	0	0	19	4	0	6	0	0	0	0	0	29	25	4	0
2001		1999	0	0	0	6	1	7	8	1	0	0	0	0	23	14	2	7
2009		2000	9	0	0	8	0	0	0	0	0	0	0	0	17	17	0	0
2010		2008	11	0	0	18	8	0	6	0	0	0	0	0	43	35	8	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet-Typical Category		4	0	0	15	3	2	6	0	0	0	0	0	30	25	3	2
1994	Dry-Typical Category (75% - 50%)	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996		1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998		2007	0	0	0	3	0	0	0	0	0	0	0	0	3	3	0	0
2000		2009	0	0	0	12	3	0	0	0	0	0	0	0	15	12	3	0
2003		2010	0	0	0	2	0	0	4	0	0	0	0	0	6	6	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Typical Category		0	0	0	3	1	0	1	0	0	0	0	0	5	4	1	0
1999	Dry Category (<25%)	2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002		2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004		2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006		2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007		2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Dry Category		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:
Average usable days are based upon daily streamflow data for the study period 1991-2010 (irrigation year) at the Dolores River below McPhee Reservoir streamgage (data obtained from SEO's Hydrobase) and floatboating
*Ranking of Snow Water Equivalent (SWE) is based upon April 1 basin snowpack reports for the San Juan, Animas, Dolores & San Miguel Basins. Data was obtained from NRCS-Colorado Snow Survey Program website.

River Segment 1: Bradfield to Dove Creek
Historical Daily Streamflow & Number of Usable Days







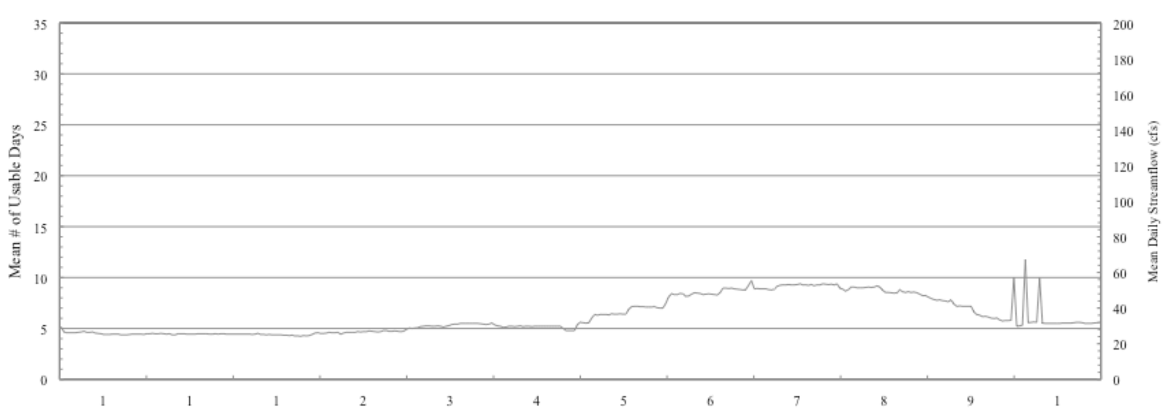


Figure E
Dolores River below McPhee Reservoir (CODWR-DOLBMCO, Irrigation Year 1991-2010)
River Segment 2: Dove Creek to Slickrock

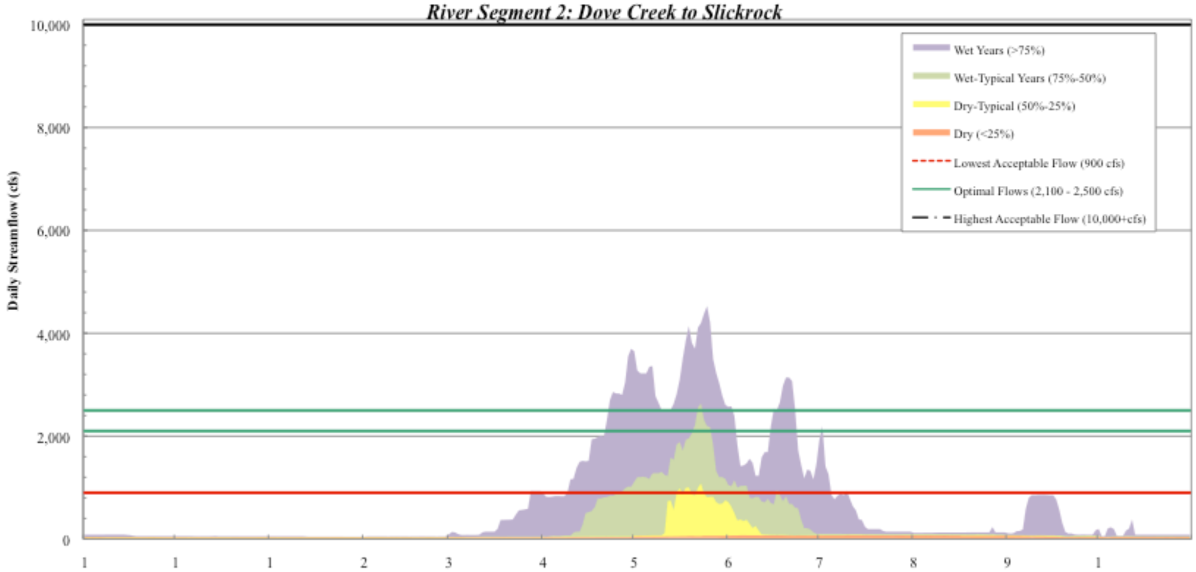
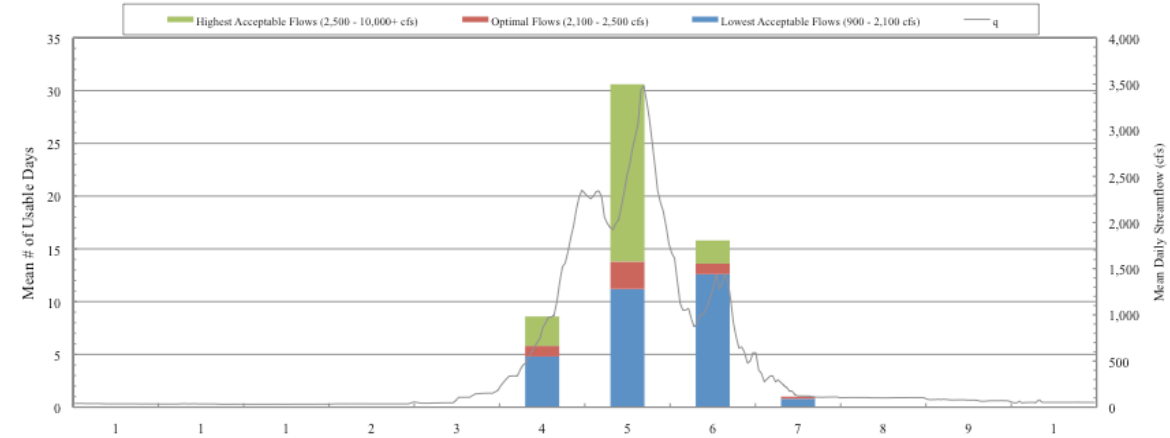


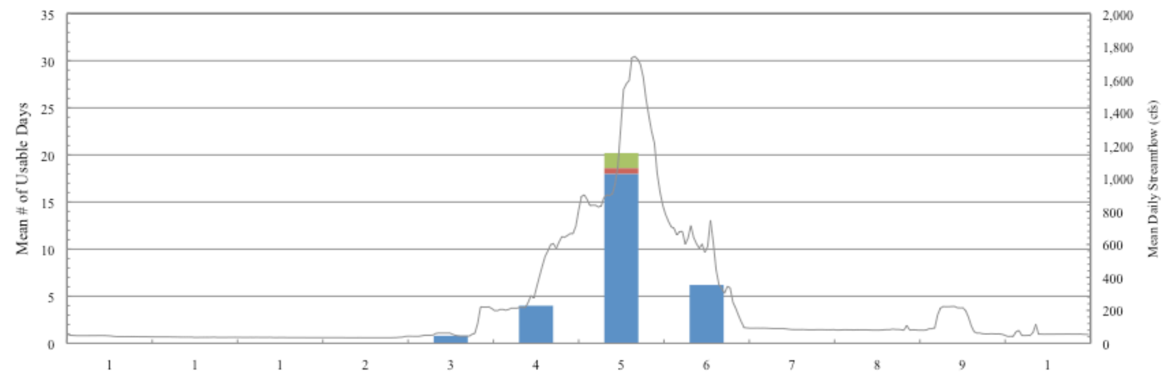
Table E - Boatable Days-Dolores River below McPhee Reservoir (Irrigation Year 1991-2010)
Days per month that Existing Hydrology met **WHITEWATER BOATING** Flow Preferences
Segment 2 (Dove Creek to Slickrock)
Year Types (wet, wet typical, dry typical, and dry) Ranked by Yearly Volume
(Lowest Acceptable Flow = 900 cfs, Optimal Flows = 2,100 - 2,500 cfs, Highest Acceptable Flow = 10,000+ cfs)

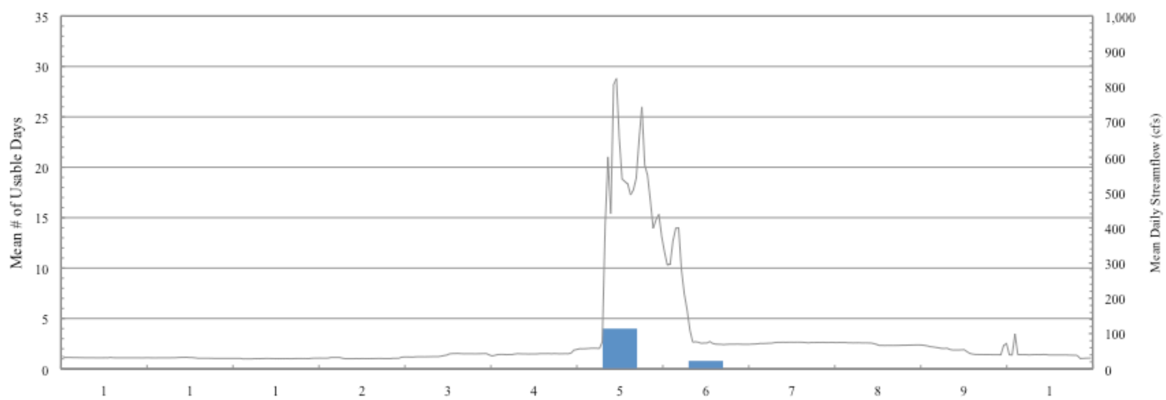
			Apr			May			Jun			Jul			Aug			Total Days	Total Days		
Ranking of Years Based Upon April 1 Snowpack*		Irrig. Year	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows		B1	B2	B3
1993	Wet Category (>75%)	1993	13	1	8	2	5	24	15	4	3	0	0	0	0	0	0	75	30	10	35
1995		1995	3	0	0	15	4	12	24	0	6	4	1	0	0	0	0	69	46	5	18
2000		1997	2	3	4	0	0	31	18	1	2	0	0	0	0	0	0	61	20	4	37
2005		1998	5	1	2	17	3	9	4	0	0	0	0	0	0	0	0	41	26	4	11
2008		2005	1	0	0	22	1	8	2	0	0	0	0	0	0	0	0	34	25	1	8
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet Category		5	1	3	11	3	17	13	1	2	1	0	0	0	0	0	56	29	5	22
1991	Wet-Typical Category (75% - 50%)	1992	0	0	0	26	2	2	10	0	0	0	0	0	0	0	0	40	36	2	2
1992		1994	0	0	0	23	0	0	6	0	0	0	0	0	0	0	0	29	29	0	0
2001		1999	0	0	0	7	1	6	9	0	0	0	0	0	0	0	0	23	16	1	6
2009		2000	9	0	0	8	0	0	0	0	0	0	0	0	0	0	0	17	17	0	0
2010		2008	11	0	0	26	0	0	6	0	0	0	0	0	0	0	0	43	43	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet-Typical Category		4	0	0	18	1	2	6	0	0	0	0	0	0	0	0	30	28	1	2
1994	Dry-Typical Category (75% - 50%)	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996		1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998		2007	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0
2000		2009	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	15	15	0	0
2003		2010	0	0	0	2	0	0	4	0	0	0	0	0	0	0	0	6	6	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Typical Category		0	0	0	4	0	0	1	0	0	0	0	0	0	0	0	5	5	0	0
1999	Dry Category (<25%)	2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002		2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004		2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006		2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007		2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Dry Category		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:
Average usable days are based upon daily streamflow data for the study period 1991-2010 (irrigation year) at the Dolores River below McPhee Reservoir streamgage (data obtained from SEO's Hydrobase) and floatboating preferences based upon a 2010 American Whitewater survey.
*Ranking of Snow Water Equivalent (SWE) is based upon April 1 basin snowpack reports for the San Juan, Animas, Dolores & San Miguel Basins. Data was obtained from NRCS-Colorado Snow Survey Program website.

River Segment 2: Dove Creek to Slickrock
Historical Daily Streamflow & Number of Usable Days







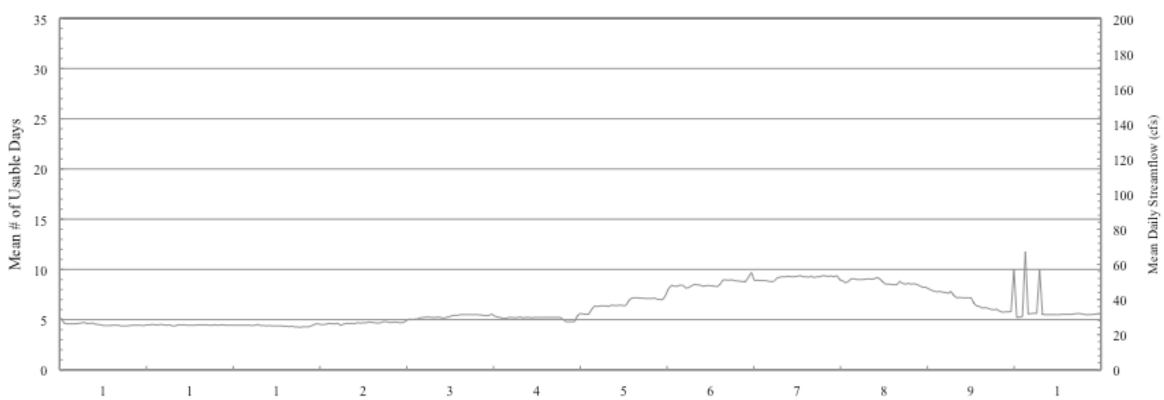


Figure F
Dolores River below McPhee Reservoir (CODWR-DOLBMCO, Irrigation Year 1991-2010)
River Segment 3: Slickrock to Bedrock

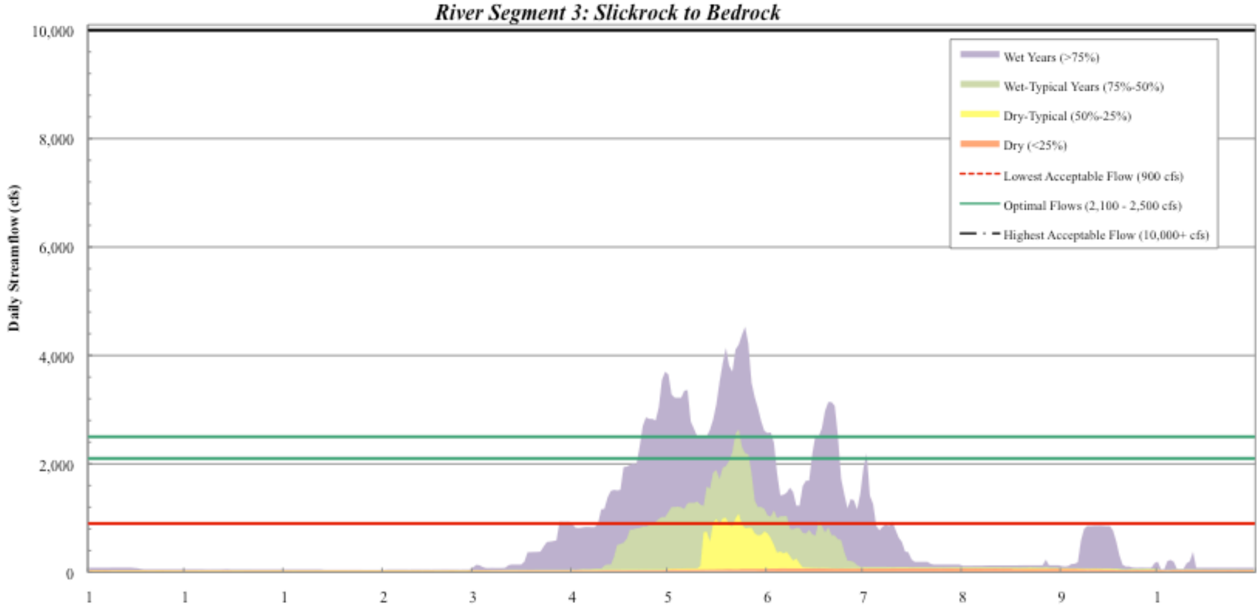
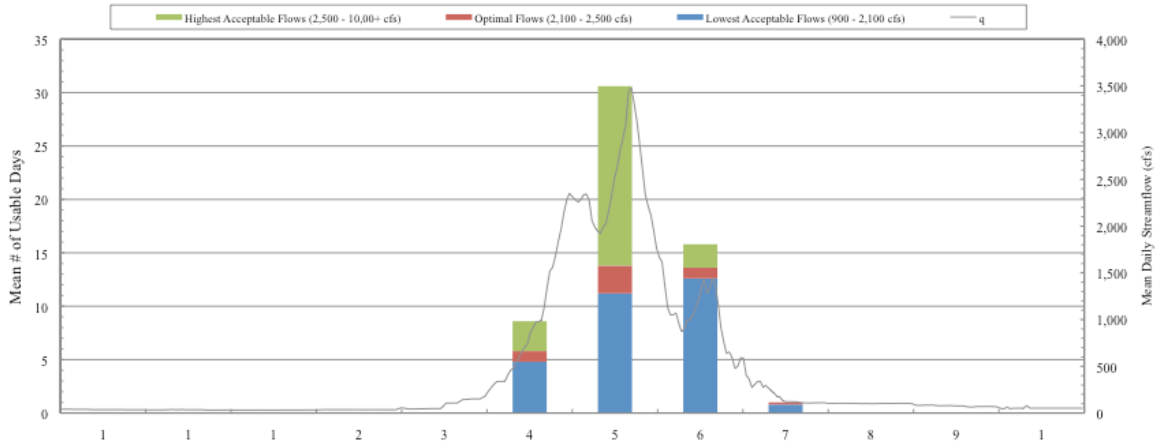


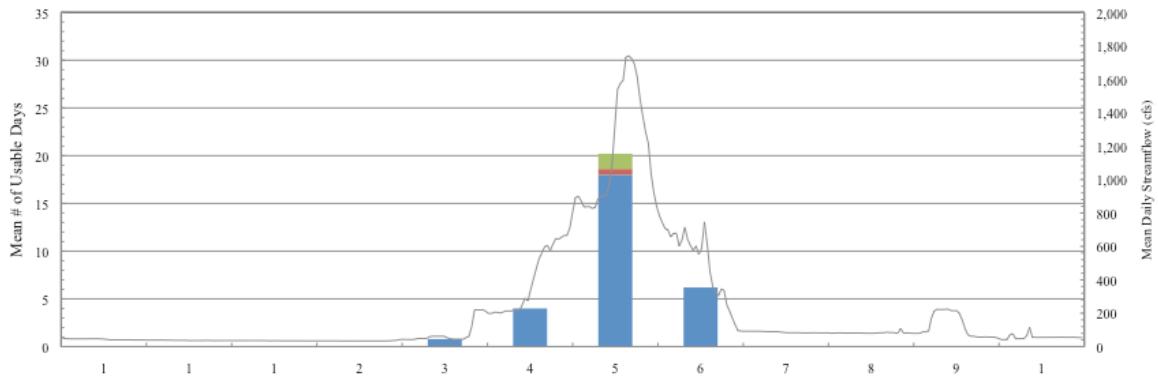
Table F - Boatable Days-Dolores River below McPhee Reservoir (Irrigation Year 1991-2010)
Days per month that Existing Hydrology met **WHITEWATER BOATING** Flow Preferences **Segment 3 (Slickrock to Bedrock)**
Year Types (wet, wet typical, dry typical, and dry) Ranked by Yearly Volume
(Lowest Acceptable Flow = 900 cfs, Optimal Flows = 2,100 - 2,500 cfs, Highest Acceptable Flow = 10,000+ cfs)

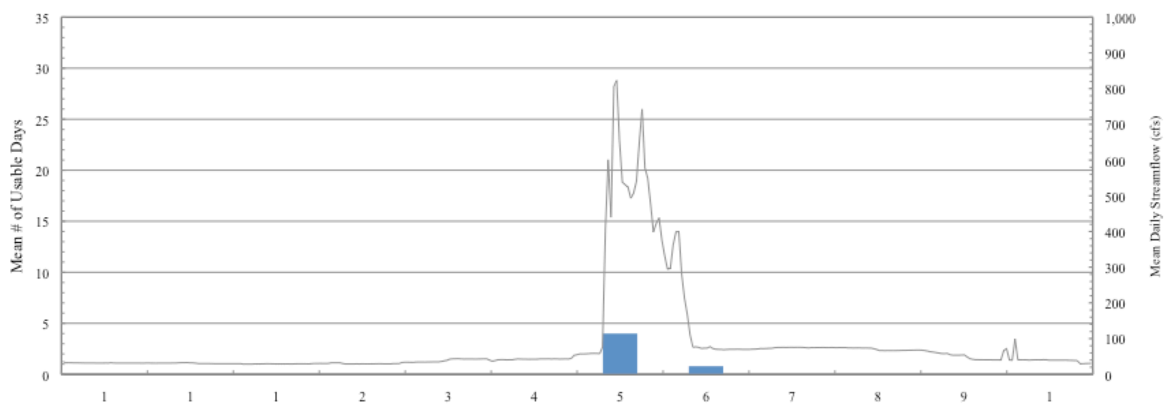
			Apr			May			Jun			Jul			Aug			Total Days	Total Days		
Ranking of Years Based Upon April 1 Snowpack*		Irrig. Year	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows	Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows		Lowest Acceptable Flows	Optimal Flows	Highest Acceptable Flows
1993	Wet Category (>75%)	1993	13	1	8	2	5	24	15	4	3	0	0	0	0	0	0	75	30	10	35
1995		1995	3	0	0	15	4	12	24	0	6	4	1	0	0	0	0	69	46	5	18
2000		1997	2	3	4	0	0	31	18	1	2	0	0	0	0	0	0	61	20	4	37
2005		1998	5	1	2	17	3	9	4	0	0	0	0	0	0	0	0	41	26	4	11
2008		2005	1	0	0	22	1	8	2	0	0	0	0	0	0	0	0	34	25	1	8
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet Category		5	1	3	11	3	17	13	1	2	1	0	0	0	0	0	56	29	5	22
1991	Wet-Typical Category (75% - 50%)	1992	0	0	0	26	2	2	10	0	0	0	0	0	0	0	0	40	36	2	2
1992		1994	0	0	0	23	0	0	6	0	0	0	0	0	0	0	0	29	29	0	0
2001		1999	0	0	0	7	1	6	9	0	0	0	0	0	0	0	0	23	16	1	6
2009		2000	9	0	0	8	0	0	0	0	0	0	0	0	0	0	0	17	17	0	0
2010		2008	11	0	0	26	0	0	6	0	0	0	0	0	0	0	0	43	43	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet-Typical Category		4	0	0	18	1	2	6	0	0	0	0	0	0	0	0	30	28	1	2
1994	Dry-Typical Category (75% - 50%)	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996		1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998		2007	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0
2000		2009	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	15	15	0	0
2003		2010	0	0	0	2	0	0	4	0	0	0	0	0	0	0	0	6	6	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Typical Category		0	0	0	4	0	0	1	0	0	0	0	0	0	0	0	5	5	0	0
1999	Dry Category (<25%)	2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002		2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004		2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006		2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007		2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Dry Category		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:
Average usable days are based upon daily streamflow data for the study period 1991-2010 (irrigation year) at the Dolores River below McPhee Reservoir streamgage (data obtained from SEO's Hydrobase) and floatboating preferences based upon a 2010 American Whitewater survey.
*Ranking of Snow Water Equivalent (SWE) is based upon April 1 basin snowpack reports for the San Juan, Animas, Dolores & San Miguel Basins. Data was obtained from NRCS-Colorado Snow Survey Program website.

River Segment3: Slickrock to Bedrock
Historical Daily Streamflow & Number of Usable Days







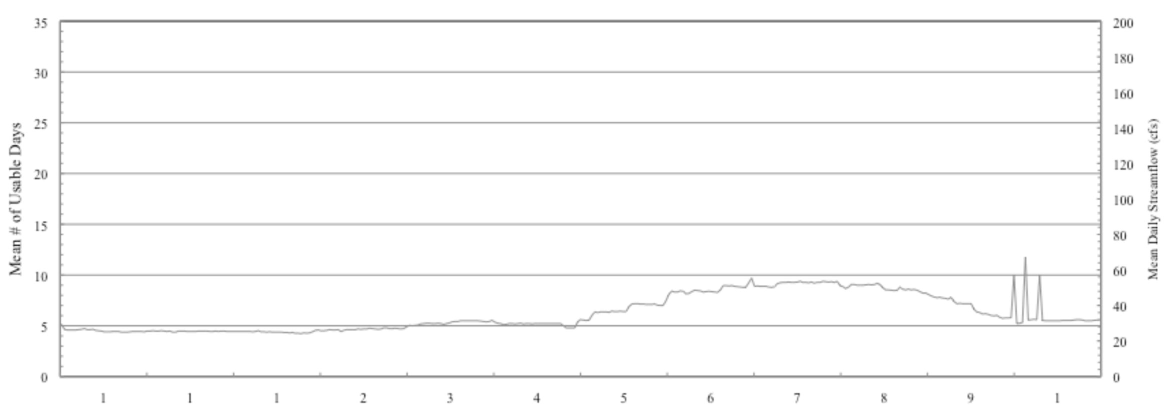


Figure G
Dolores River at Bedrock (USGS 09171100, Irrigation Year 1991-2010)
River Segment 4: Bedrock to Gateway

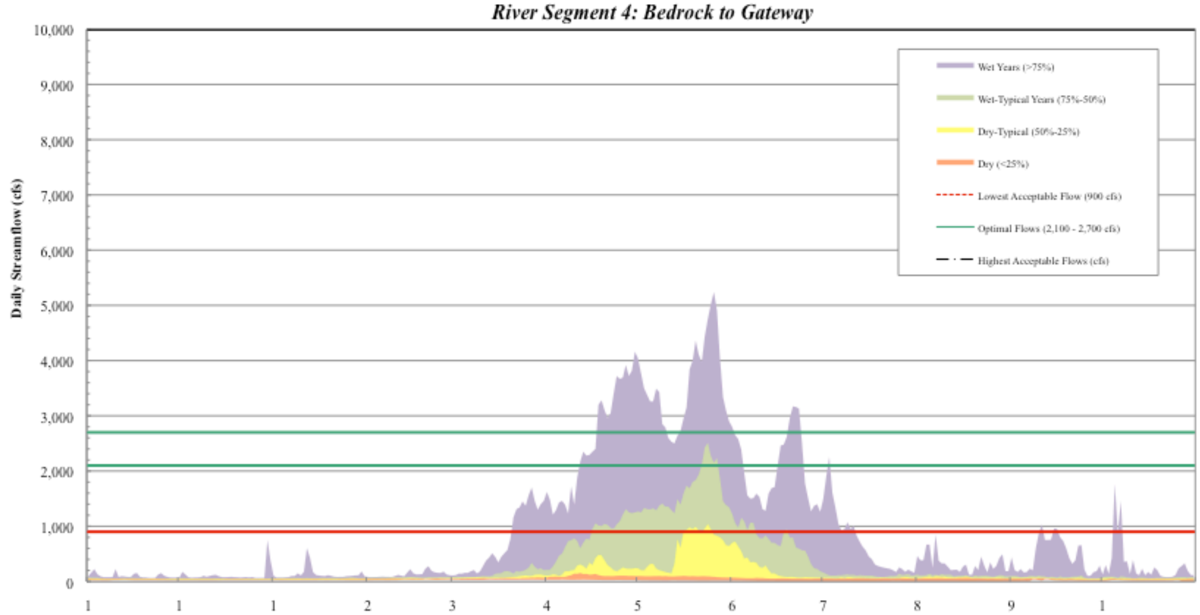


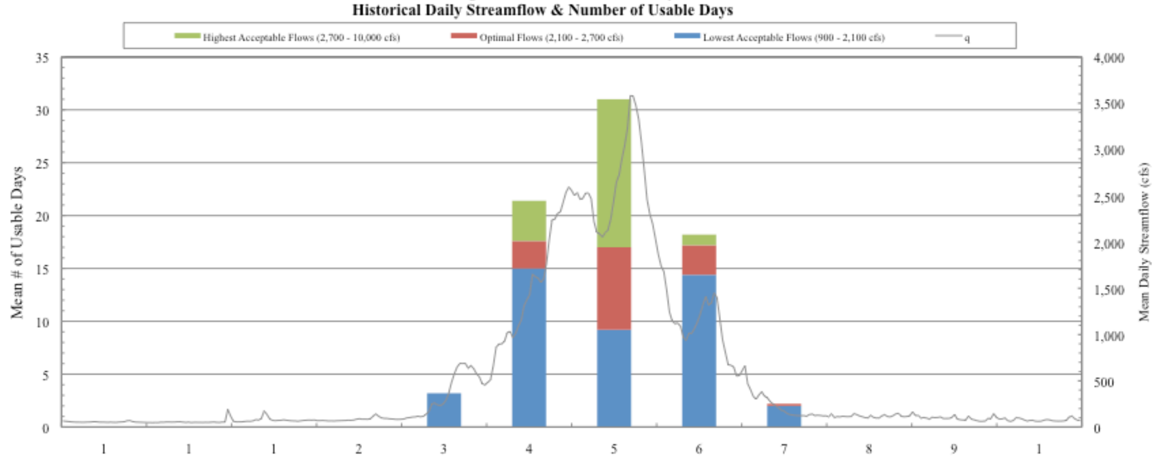
Table G - Boatable Days-Dolores River near Bedrock (USGS 09171100, Irrigation Year 1991-2010)
Days per month that Existing Hydrology met **WHITEWATER BOATING** Flow Preferences **Segment 4 (Bedrock to Gateway)**

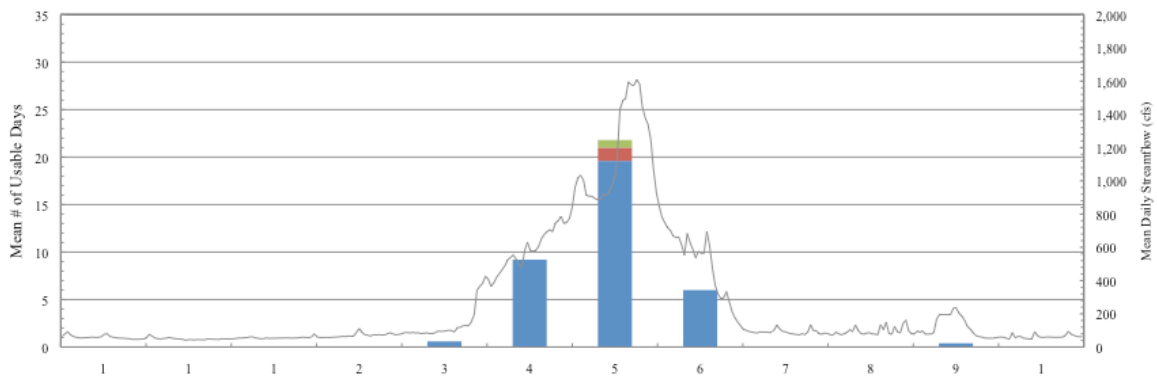
(Low Flows = 900 - 2,100 cfs, Standard Flows = 2,100 - 2,700 cfs, High Flows =2,700 - 10,000 cfs)

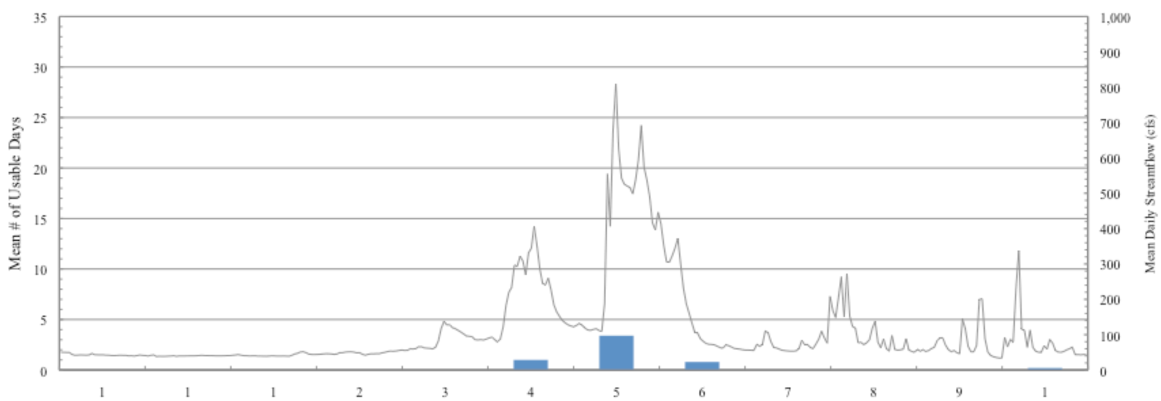
			Apr			May			Jun			Jul			Aug			Total Days	Total Days		
Ranking of Years Based Upon April 1 Snowpack*		Irrig. Year	Low Flows	Standard Flows	High Flows	Low Flows	Standard Flows	High Flows	Low Flows	Standard Flows	High Flows	Low Flows	Standard Flows	High Flows	Low Flows	Standard Flows	High Flows		Low Flows	Standard Flows	High Flows
1993	Wet Category (>75%)	1993	11	6	13	0	7	24	19	7	1	0	0	0	0	0	0	88	30	20	38
1995		1995	16	0	0	16	10	5	23	3	4	10	1	0	0	0	0	88	65	14	9
2000		1997	11	3	4	0	7	24	19	4	0	0	0	0	0	0	0	72	30	14	28
2005		1998	19	4	2	18	4	9	5	0	0	0	0	0	0	0	0	61	42	8	11
2008		2005	18	0	0	12	11	8	6	0	0	0	0	0	0	0	0	55	36	11	8
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet Category		15	3	4	9	8	14	14	3	1	2	0	0	0	0	0	73	41	13	19
1991	Wet-Typical Category (75% - 50%)	1992	10	0	0	26	3	2	11	0	0	0	0	0	0	0	0	52	47	3	2
1992		1994	0	0	0	27	0	0	5	0	0	0	0	0	0	0	0	32	32	0	0
2001		1999	0	0	0	7	4	2	9	0	0	0	0	0	0	0	0	22	16	4	2
2009		2000	7	0	0	10	0	0	0	0	0	0	0	0	0	0	0	17	17	0	0
2010		2008	29	0	0	28	0	0	5	0	0	0	0	0	0	0	0	62	62	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet-Typical Category		9	0	0	20	1	1	6	0	0	0	0	0	0	0	0	37	35	1	1
1994	Dry-Typical Category (75% - 50%)	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996		2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998		2007	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0
2000		2009	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	14	14	0	0
2003		2010	5	0	0	0	0	0	4	0	0	0	0	0	0	0	0	9	9	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Typical Category		1	0	0	3	0	0	1	0	0	0	0	0	0	0	0	5	5	0	0
1999	Dry Category (<25%)	1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002		2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004		2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006		2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007		2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Dry Category		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:
Average usable days are based upon daily streamflow data for the study period 1991-2010 (irrigation year) at the Dolores River near Bedrock streamgage (USGS 09171100. Data obtained from USGS National Water Information System) and floatboating
Year types (wet, wet typical, dry typical, and dry) are ranked by total annual volume.
*Ranking of Snow Water Equivalent (SWE) is based upon April 1 basin snowpack reports for the San Juan, Animas, Dolores & San Miguel Basins. Data was obtained from NRCS-Colorado Snow Survey Program website.

River Segment 4: Bedrock to Gateway
Historical Daily Streamflow & Number of Usable Days







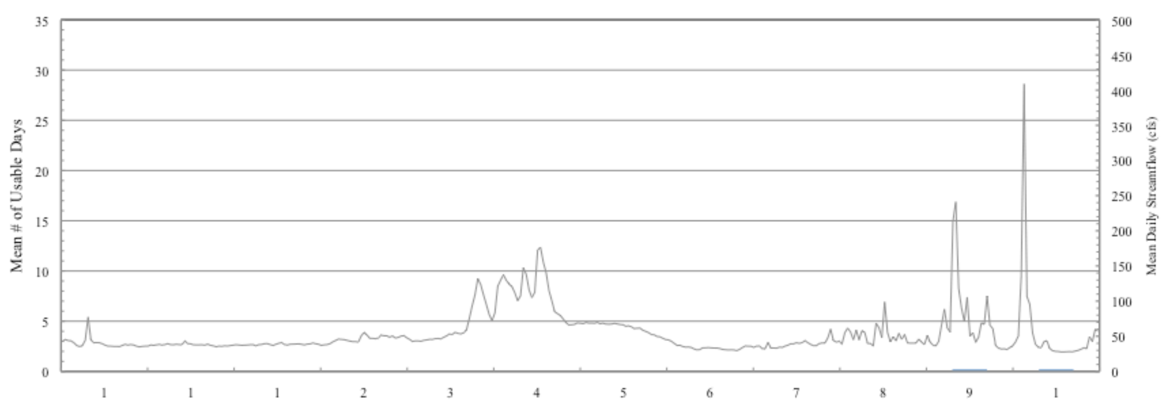


Figure H
Dolores River near Bedrock (USGS 09171100, Irrigation Year 1991-2010)
River Segment 5: Gateway to Colorado River

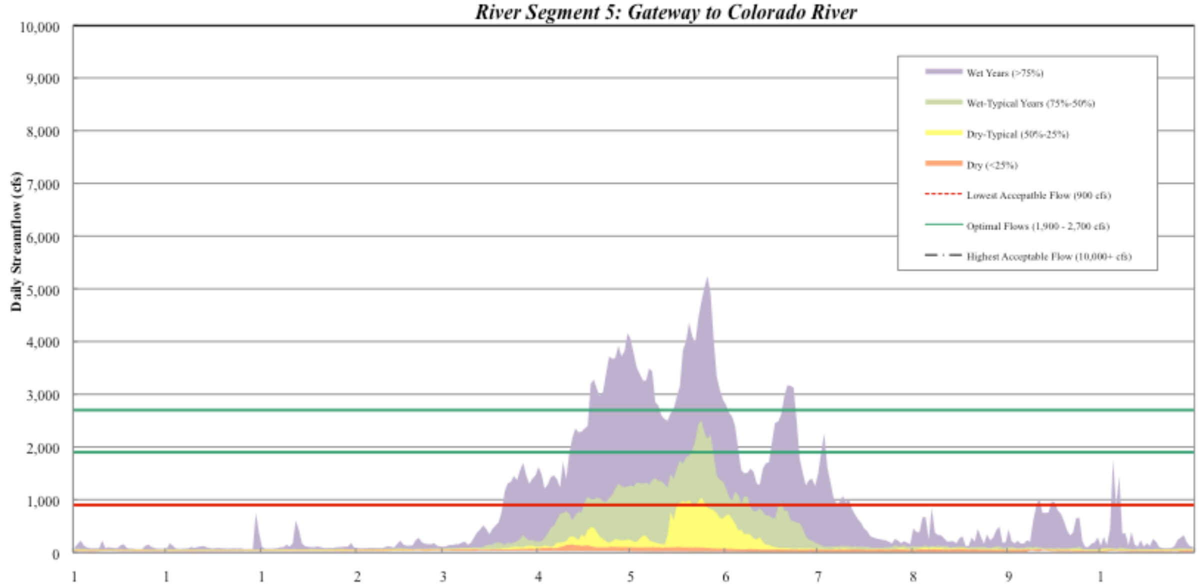


Table H - Boatable Days-Dolores River near Bedrock (USGS 09171100, Irrigation Year 1991-2010)
Days per month that Existing Hydrology met **WHITEWATER BOATING** Flow Preferences **Segment 5 (Gateway to Colorado River)**

(Low Flows = 900 - 1,900 cfs, Standard Flows = 1,900 - 2,700 cfs, High Flows = 2,700 - 10,000 cfs)

			Apr			May			Jun			Jul			Aug			Total Days	Total Days		
Ranking of Years Based Upon April 1 Snowpack*		Irrig. Year	Low Flows	Standard Flows	High Flows	Low Flows	Standard Flows	High Flows	Low Flows	Standard Flows	High Flows	Low Flows	Standard Flows	High Flows	Low Flows	Standard Flows	High Flows		Low Flows	Standard Flows	High Flows
1993	Wet Category (>75%)	1993	11	6	13	0	7	24	18	8	1	0	0	0	0	0	0	88	29	21	38
1995		1995	16	0	0	11	15	5	23	3	4	9	2	0	0	0	0	88	59	20	9
2000		1997	11	3	4	0	7	24	18	5	0	0	0	0	0	0	0	72	29	15	28
2005		1998	18	5	2	15	7	9	5	0	0	0	0	0	0	0	0	61	38	12	11
2008		2005	18	0	0	11	12	8	6	0	0	0	0	0	0	0	0	55	35	12	8
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet Category		15	3	4	7	10	14	14	3	1	2	0	0	0	0	0	73	38	16	19
1991	Wet-Typical Category (75% - 50%)	1992	10	0	0	25	4	2	10	1	0	0	0	0	0	0	0	52	45	5	2
1992		1994	0	0	0	23	4	0	5	0	0	0	0	0	0	0	0	32	28	4	0
2001		1999	0	0	0	6	5	2	9	0	0	0	0	0	0	0	0	22	15	5	2
2009		2000	7	0	0	10	0	0	0	0	0	0	0	0	0	0	0	17	17	0	0
2010		2008	29	0	0	28	0	0	5	0	0	0	0	0	0	0	0	62	62	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Wet-Typical Category		9	0	0	18	3	1	6	0	0	0	0	0	0	0	0	37	33	3	1
1994	Dry-Typical Category (75% - 50%)	1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996		2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998		2007	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	3	2	1	0
2000		2009	0	0	0	13	1	0	0	0	0	0	0	0	0	0	0	14	13	1	0
2003		2010	5	0	0	0	0	0	4	0	0	0	0	0	0	0	0	9	9	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Typical Category		1	0	0	3	0	0	1	0	0	0	0	0	0	0	0	5	5	0	0
1999	Dry Category (<25%)	1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002		2001	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004		2002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006		2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007		2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sample size (n)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Mean of Dry Category		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:
Average usable days are based upon daily streamflow data for the study period 1991-2010 (irrigation year) at the Dolores River near Bedrock streamgage (USGS 09171100. Data obtained from USGS National Water Information System) and floatboating
Year types (wet, wet typical, dry typical, and dry) are ranked by total annual volume.
*Ranking of Snow Water Equivalent (SWE) is based upon April 1 basin snowpack reports for the San Juan, Animas, Dolores & San Miguel Basins. Data was obtained from NRCS-Colorado Snow Survey Program website.

River Segment 5: Gateway to Colorado River
Historical Daily Streamflow & Number of Usable Days