PEAK FLOW FORECASTS

FLOW EXTREMES, NOT SUPPLY

Peak flow forecasts are fundamentally different than water supply volume forecasts. Although the watershed snowpack is a principal component in both analyses, peak flows are not a supply question at all. Rather, peak flows characterize runoff extremes by predicting maximum mean daily flow at a single point during the spring snowmelt season. This extreme is related to the water supply volume, but the relationship is not direct or constant from year to year. As such, peak flow forecasts contain much more uncertainty than water supply volume forecasts.

REGULATED VS. NATURAL FLOWS

An even more fundamental limitation is that peak forecasts describe **regulated** (actual or observed) in-stream flow well into the future, something difficult to do considering the quantity and changing nature of diversions in the Colorado River and Great Basin watersheds. (Note: supply forecasts deal with hypothetical "natural" flow - that which would have resulted in the absence of regulation). The Colorado Basin River Forecast Center routinely forecasts regulated streamflow, but only for several days into the future. Further into the future the ability to forecast reservoir regulation becomes more limited.

DIFFERENT USES AND USERS

Peak flow forecasts are used for different purposes than water supply volume forecasts. Users of these forecasts would include river recreationists, flood control agencies, emergency service directors, wildlife managers and anyone interested in the combined effect of watershed yield **and** human regulation on the actual (observed) in-stream maximum mean daily flows at a site.

FLOOD FLOWS

The National Weather Service defines flood flow as the flow at which damage to structures begins to occur. Over-bank flow may occur but still be below the defined flood flow. Flood flows contained in this document change from year to year due to such channel processes as deposition and scouring. Therefore, the flood flows that follow should only be applied to the current runoff season. It should also be noted that they are instantaneous flows and not maximum mean daily flows.

IMPORTANT NOTE:

Please note that the following peak flow forecasts will be updated during the first week in April and again the first week in May. The updated forecasts can be accessed through the CBRFC homepage (http://www.cbrfc.gov) or by calling the appropriate Service Hydrologist (see page 16 and 17).

INTERPRETIVE NOTES

PEAK FLOW DEFINED

The peak flow forecast represents the maximum mean daily flow (the highest average flow for an entire day during the runoff season) at a point during the April through July period, unless otherwise noted. It does not represent the instantaneous peak (the maximum flow at a single moment). In the case of smooth snowmelt regimes (hydrographs), it may be acceptable to approximate one with the other. In Arizona, the normal snowmelt period is from February to May. Occasionally, heavy rainfall events can produce higher peak flows than the snowmelt peak flows. For verification and calibration purposes, the maximum mean daily flow during the February through May period was used regardless of the runoff source. The Average Peak and Normal Time of Peak (defined as the average date of peak plus/minus one standard deviation which should include approximately 70% of the peaks) for a given gage are all derived from 1971 through 2000 data whereas the Historic Peak is derived from the period of record, including the most recent years, after reservoir regulation began.

FORECAST PROBABILITIES

Peak flow forecasts are presented in terms of probabilities or, more specifically, exceedance probabilities. The forecast labeled "most probable" is actually the 50% exceedance level meaning there are equal chances of being below the value or above the value (i.e., 50 chances out of 100 of being exceeded). The other exceedance probabilities associate the likelihood of exceeding other levels. In general, a close bunching of the exceedance forecasts indicates low variability and that the user can have a high degree of confidence in the forecast information. Conversely, a large spread in the exceedance forecasts indicates high variability.

MODELLING TECHNIQUES

The peak flow forecasts that follow have been derived using a combination of (1) physically-based conceptual models and (2) statistical regression models. The conceptual model is the National Weather Service River Forecasting System in the Extended Streamflow Prediction (ESP) mode. Since the conceptual model requires reservoir operation plans for up to five months into the future, ESP application is limited to basins where regulation is minimal (mostly in the headwater areas).
The farther downstream a forecast point is, the more likely it is that a statistical regression was used between natural snowmelt runoff volume and the observed maximum mean daily flow to generate the forecast. Such an approach performs better when the correlation between regulated and unregulated flow is strong and is constant from year to year.

UPPER COLORADO PEAK FLOW FORECASTS

Mean daily flows in cubic feet per second (cfs)

STATION NAME	Historic Peak	Average Peak	Flood* Flow	2002 Peak	2002 Date	2003 Forecast Exceedance Probability 90%	75%	**50%**	25%	10%	Normal time of peak
COLORADO - KREMMLING, NR	12,700	3,900	8,300	885	6/30	N/A	N/A	**N/A**	N/A	N/A	5/15 - 6/27
EAGLE - GYPSUM, BLO	6,580	3,600	6,400	1,270	6/01	1,500	2,200	**3,000**	3,800	5,000	6/1 - 6/21
ROARING FORK - GLENWOOD SPRINGS	11,200	6,150	11,860	2,170	6/01	2,300	3,500	**4,800**	6,000	7,200	6/3 - 6/18
COLORADO - CAMEO, NR	38,000	17,500	28,550	4,020	6/02	7,000	10,000	**13,000**	16,000	20,000	5/29 - 6/18
PLATEAU CK - CAMEO, NR	4,100	1,460	5,100	120	4/03	200	500	**900**	1,400	2,000	5/9 - 6/11
EAST - ALMONT, NR	5,000	2,080	2,870	680	6/01	900	1,100	**1,400**	1,800	2,100	5/28 - 6/17
NF GUNNISON - SOMERSET, NR	7,080	3,310	14,600	655	5/31	1,200	1,800	**2,300**	3,000	3,800	5/11 - 6/2
SURFACE CK - CEDAREDGE	640	210	1,980	50	5/07	60	80	**120**	160	210	5/3 - 6/8
UNCOMPAHGRE - COLONA, NR	1,900	1,390	3,000	290	5/21	N/A	N/A	**N/A**	N/A	N/A	5/20 - 6/27
COLORADO - CO-UT STATELINE, NR	68,300	26,150	47,500	4,470	6/02	8,500	13,000	**17,500**	21,000	26,000	5/22 - 6/16
DOLORES - DOLORES	6,950	2,980	10,280	445	4/15	1,300	1,800	**2,500**	3,000	3,500	5/9 - 6/4
SAN MIGUEL - PLACERVILLE, NR	2,740	1,310	3,120	280	5/31	450	700	**900**	1,200	1,500	5/26 - 6/23
DOLORES - CISCO, NR (see note1 below)	12,900	6,050	N/A	400	4/03	N/A	N/A	**N/A**	N/A	N/A	4/26 - 6/5
COLORADO - CISCO, NR	69,500	28,800	60,500	4,580	6/03	10,000	15,000	**20,000**	26,000	32,000	5/20 - 6/15
GREEN - DANIEL, NR, WARREN BRIDGE, AT	5,620	2,975	N/A	2,000	6/03	1,500	1,900	**2,400**	2,800	3,300	5/30 - 6/30
NEW FORK - BIG PINEY, NR	9,110	5,285	N/A	2,200	6/03	2,500	3,100	**3,500**	4,200	5,500	5/31 - 6/24
GREEN - LABARGE, NR	18,800	9,270	11,100	4,300	6/04	N/A	N/A	**N/A**	N/A	N/A	5/30 - 6/24
BIG SANDY - FARSON, NR	1,690	820	1,400	470	6/09	N/A	N/A	**N/A**	N/A	N/A	5/28 - 6/23
GREEN - GREEN RVR WY, NR	15,400	7,110	15,900	1,400	5/11	N/A	N/A	**N/A**	N/A	N/A	5/23 - 7/11
HAMS FORK - FRONTIER, NR, POLE CK, BLO	2,000	825	1,600	310	6/02	300	420	**550**	700	900	5/10 - 6/9
BLACKS FORK - LITTLE AMERICA, NR	6,970	2,440	5,440	55	5/24	500	850	**1,300**	2,200	3,300	5/2 - 6/27

N/A - NOT AVAILABLE (NOT A FLOOD FORECAST POINT OR NO FORECAST PROCEDURE EXISTS)

note1 - for releases below McPhee Reservoir call 970-565-7562

** Flood flow is for current year only and is an instantaneous value*

UPPER COLORADO PEAK FLOW FORECASTS (continued)

Mean daily flows in cubic feet per second (cfs)

STATION NAME	Historic Peak	Average Peak	Flood* Flow	2002 Peak	2002 Date	2003 Forecast Exceedance Probability 90%	75%	**50%**	25%	10%	Normal time of peak
YAMPA - STEAMBOAT SPRINGS	5,870	3,240	4,490	1,200	5/22	1,400	1,800	**2,300**	2,800	3,400	5/19 - 6/12
YAMPA - MAYBELL, NR	24,400	10,475	27,000	3,300	6/02	4,300	5,700	**7,000**	9,000	11,000	5/13 - 6/10
LITTLE SNAKE - LILY, NR	13,400	4,745	33,300	900	4/30	1,500	1,900	**2,300**	3,100	3,800	5/5 - 6/12
YAMPA - DEERLODGE PARK	32,300	13,955	17,000	3,400	6/03	4,500	6,500	**8,500**	10,000	12,500	5/11 - 6/6
GREEN - JENSEN, NR (see note1 below)	38,500	17,600	23,700	7,100	5/25	9,000	11,100	**13,100**	14,600	17,100	5/14 - 6/11
ROCK CK - UPR STILLWATER RES	2,080	1,350	N/A	680	5/20	450	580	**700**	850	1,000	5/25 - 6/20
DUCHESNE - TABIONA, NR	1,630	765	4,100	170	5/21	100	150	**200**	370	550	5/15 - 6/15
DUCHESNE - RANDLETT, NR	7,000	2,755	7,400	110	6/03	N/A	N/A	**N/A**	N/A	N/A	4/27 - 7/5
WHITE - MEEKER, NR	6,320	3,200	5,500	800	5/08	1,000	1,300	**1,600**	2,000	2,600	5/21 - 6/14
GREEN - GREEN RIVER, UT (see note1 below)	47,200	22,560	47,000	7,300	5/27	8,000	12,000	**16,000**	20,000	25,000	5/18 - 6/16
SAN RAFAEL - GREEN RIVER, NR	3,600	910	N/A	12	5/17	N/A	N/A	**N/A**	N/A	N/A	5/17 - 7/16
MUDDY CK - EMERY, NR	515	205	N/A	60	5/20	35	60	**100**	120	160	5/19 - 6/18
DIRTY DEVIL - HANKSVILLE, NR, POISON SPGS **	1,310	445	N/A	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	3/12 - 5/31
ESCALANTE - ESCALANTE, NR **	227	72	N/A	N/A	N/A	N/A	N/A	**N/A**	N/A	N/A	3/24 - 6/2
CATARACT CANYON (estimated)	116,700	51,350	N/A	10,000	5/27	18,000	27,000	**36,000**	46,000	57,000	5/20 - 6/16
SAN JUAN - PAGOSA SPRINGS	4,640	2,485	11,300	221	4/16	820	1,020	**1,300**	1,680	2,110	5/15 - 6/12
ANIMAS - DURANGO	10,700	4,675	8,350	777	5/21	2,190	2,580	**3,100**	3,720	4,350	5/28 - 6/14
SAN JUAN - BLUFF, NR (see note2 below)	15,200	7,340	40,900	847	5/24	3,400	3,930	**4,650**	5,520	6,450	5/21 - 7/4

N/A - NOT AVAILABLE (NOT A FLOOD FORECAST POINT OR NO FORECAST PROCEDURE EXISTS)

NOTE1 - Peak flow forecasts on the Green River below Flaming Gorge Reservoir are based on USBR planned regulation.

NOTE2 - Peak flow forecasts on the San Juan below Navajo Reservoir are based on USBR planned regulation.

** Flood flow is for current year only and is an instantaneous value* *** Runoff period March - June*

LOWER COLORADO PEAK FLOW FORECASTS

Mean daily flows in cubic feet per second (cfs)

STATION NAME	Historic Peak	Average Peak	Flood* Flow	2002 Peak	2002 Date	2003 Forecast Exceedance Probability 90%	75%	**50%**	25%	10%	Normal time of peak
VIRGIN - LITTLEFIELD, NR	17,000	1,915	19,500	289	3/06		525	**700**	1,100	1,500	3/15 - 5/6
VIRGIN - HURRICANE, NR	9,620	1,520	6,600	113	4/16	375	450	**600**	850	1,200	3/14 - 5/9
SANTA CLARA - PINE VALLEY, NR	212	65	N/A	1.7	3/24	N/A	N/A	**N/A**	N/A	N/A	4/25 - 5/25

STATION NAME	Historic Peak	Average Peak	Flood* Flow	2002 Peak	2002 Date	2003 Forecast Exceedance Probability **Peak to Date**	**50%**	25%	10%	Normal time of peak
SALT - ROOSEVELT, NR	77,200	9,610	N/A	195	3/11	**1,630**	**4,000**	5,000	7,000	3/6 - 4/9
TONTO CK - ROOSEVELT, NR, GUN CK, ABV	32,200	4,090	N/A	9.8	2/28	**1,930**		3,000	6,000	3/3 - 4/4
OAK CREEK - SEDONA, NR	8,600	1,550	15,700	34	#	**1,640**				3/6 - 4/9
VERDE - HORSESHOE DAM, ABV, TANGLE CK	65,100	8,530	N/A	215	3/20	**4,740**		7,000	14,000	3/6 - 4/9
AGUA FRIA - ROCK SPRINGS, NR	23,600	2,565	N/A	0.3	4/01	**1,190**				2/28 - 4/3

N/A - NOT AVAILABLE (NOT A FLOOD FORECAST POINT OR NO FORECAST PROCEDURE EXISTS)

** Flood flow is for current year only and is an instantaneous value*

 # no discernable peak, flow at this level for most of March 2002

GREAT BASIN PEAK FLOW FORECASTS

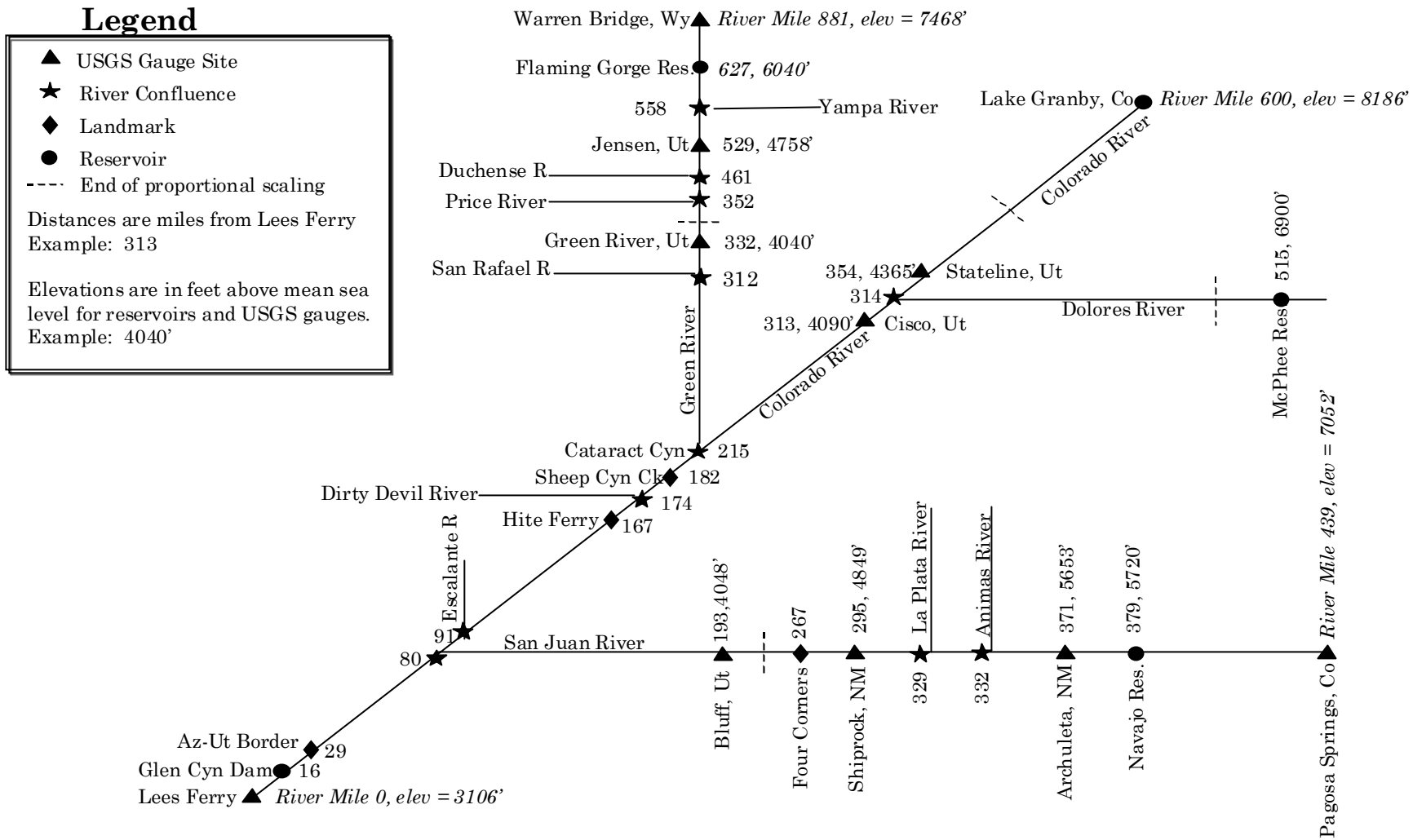
Mean daily flows in cubic feet per second (cfs)

STATION NAME	Historic Peak	Average Peak	Flood* Flow	2002 Peak	2002 Date	2003 Forecast Exceedance Probability 90%	75%	**50%**	25%	10%	Normal time of peak
BEAR - UTAH-WYOMING STATELINE, NR	2,680	1,610	4,400	830	6/01	600	700	**900**	1,200	1,600	5/22 - 6/14
LOGAN - LOGAN, NR, STATE DAM, ABV	1,870	985	1,200	485	6/02	200	350	**550**	850	950	5/18 - 6/10
BLACKSMITH FORK - HYRUM, NR, UP&L DAM	1,530	490	N/A	130	4/15	20	100	**200**	400	500	4/24 - 5/20
WEBER - OAKLEY, NR	4,170	1,625	3,100	985	5/31	500	700	**900**	1,200	1,600	5/24 - 6/16
CHALK CK - COALVILLE	1,420	600	1,900	195	5/21	30	100	**250**	400	600	5/5 - 5/31
PROVO - WOODLAND, NR	2,530	1,685	3,000	1,270	5/20	700	1,000	**1,400**	1,800	2,300	5/11 - 6/6
PROVO - HAILSTONE, NR	3,560	2,150	N/A	2,260	5/21	600	1,200	**2,000**	2,800	3,300	5/14 - 6/7
LITTLE COTTONWOOD CK - SALT LAKE CITY, NR	762	470	700	475	5/31	150	200	**300**	400	500	5/23 - 6/20
BIG COTTONWOOD CK - SALT LAKE CITY, NR	980	430	700	365	5/21	100	150	**215**	350	500	5/18 - 6/9
MILL CK - SALT LAKE CITY, NR	153	65	150	30	6/02	5	10	**20**	35	55	5/18 - 6/10
PARLEYS CK - SALT LAKE CITY, NR	605	180	300	75	4/03	20	50	**70**	115	140	4/23 - 5/22
EMIGRATION CK - SALT LAKE CITY, NR	164	55	120	25	4/10	5	15	**25**	45	65	4/11 - 5/19
CITY CK - SALT LAKE CITY, NR	322	90	150	40	5/24	10	20	**30**	50	65	5/12 - 6/1
SEVIER - HATCH	1,430	495	1,200	55	4/16	50	100	**250**	350	550	5/6 - 6/2

N/A - NOT AVAILABLE (NOT A FLOOD FORECAST POINT OR NO FORECAST PROCEDURE EXISTS)
** Flood flow is for current year only and is an instantaneous value*

RECREATIONAL INFORMATION

RECREATIONAL RIVER REACHES



HIGHLIGHTED RIVER RECREATIONAL SITES

HISTORICAL PERSPECTIVE...

River recreationists often ask questions such as - “What were the big years at this river site and how big were they?...or conversely, what were the low years?”. Ranked for each highlighted river site below are the five highest and lowest annual peak mean daily flows and the years in which they occurred for the April - July flow period window. Since reservoir regulation plays a major role in determining observed peak flows, the highest flows have been analyzed over two different historical periods: the post regulation period alone (after upstream regulatory reservoirs were in-place) and the entire period of record (including both pre- and post-regulatory data). As would be expected, higher (but more short-lived) peaks were generally observed in the pre-regulatory era.

A PEAK AMONG PEAKS...

Streamflow varies dramatically over the course of the snowmelt season. To characterize the magnitude of a year with a single seasonal peak sometimes can be an oversimplification. Illustrating that point are the hydrographs (or graphs of mean daily flow versus time) for several years shown below. Included are plots for a sample low year (1977), sample high year (1983), and last year (2002).

RIVER VELOCITIES...

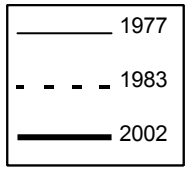
To help river runners approximate their travel times, information on average river velocities at various flow levels is presented for the highlighted river sites. When utilized with the river reach (distance) information displayed earlier, recreationists can make a ballpark calculation (time = distance/velocity). River velocity actually varies with depth and proximity to the channel boundary, but if considered collectively at all points in a cross-section, it can be expressed as an average. These data, as much of the information in this report, were obtained from the U. S. Geological Survey.

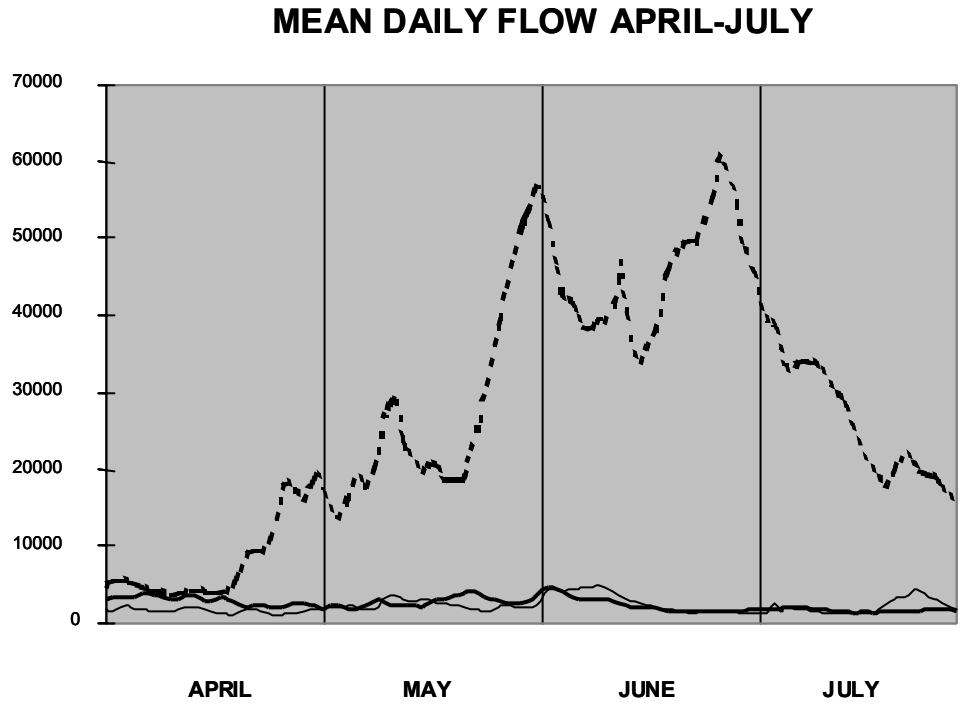
Colorado near Cisco, UT

Highest 5 Peak Flows 1914-1917 and 1923-2002	
cfs	date
76800	6/19/17
69500	5/27/84
65600	6/3/14
63400	5/15/41
63400	6/10/57

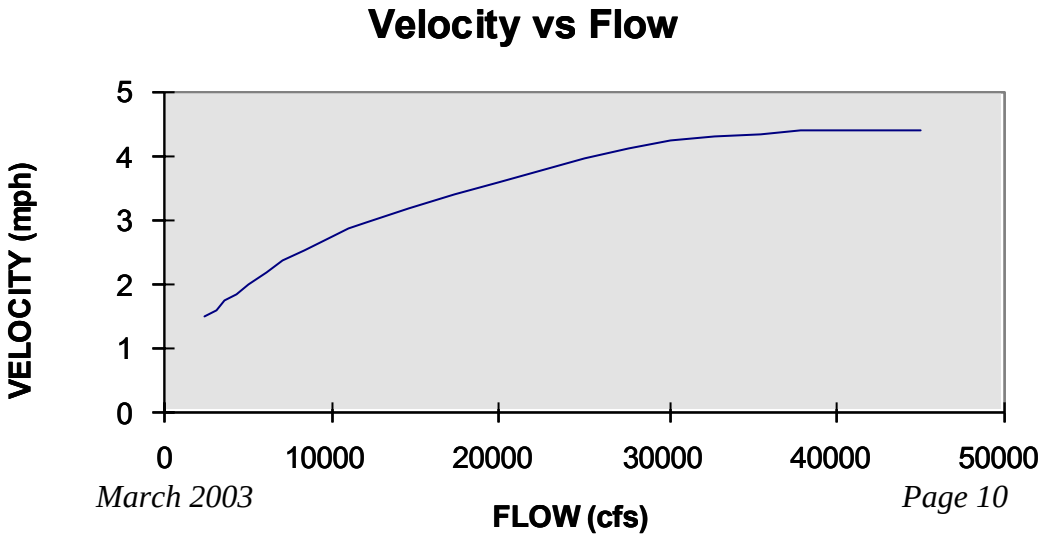
Highest 5 Peak Flows Post Regulation 1961-2002	
cfs	date
69500	5/27/84
60500	6/27/83
51400	6/19/95
47600	5/23/93
44600	5/29/79

Lowest 5 Peak Flows 1914-1917 and 1923-2002	
cfs	date
4580	6/3/02
4970	7/24/77
9600	5/31/89
11800	6/9/81
12100	5/20/63





In general, the higher the flow, the higher the velocity. The velocity reaches a maximum, for the most extreme events, between 5 and 7 mph.



Green near Green River, UT

Highest 5 Peak Flows
1896-1899 and 1905-2002

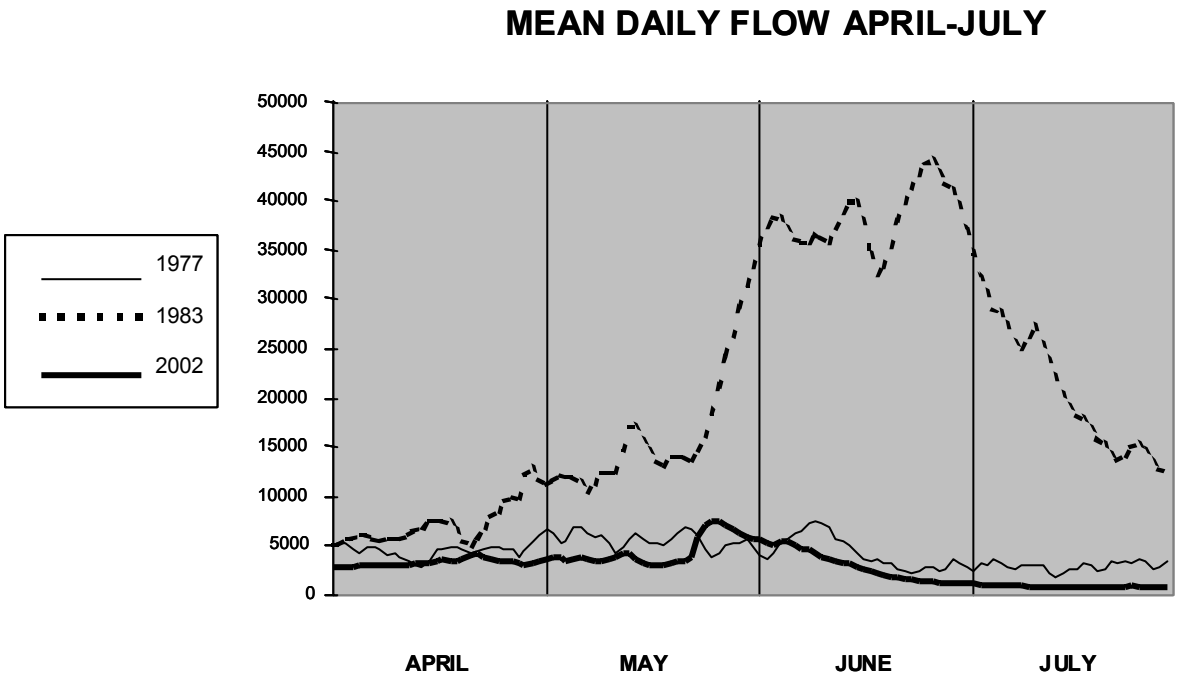
cfs	date
68100	6/27/17
64100	6/16/21
63000	5/29/1897
62200	6/13/09
54600	6/12/12

Highest 5 Peak Flows
Post Regulation 1961-2002

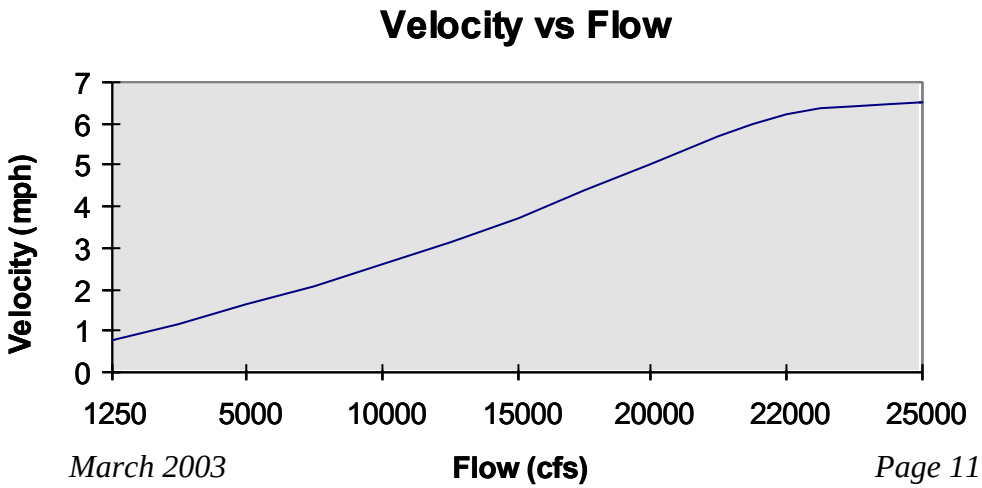
cfs	date
47200	5/20/84
44200	6/27/83
35400	6/8/86
31900	6/9/97
30300	5/24/73

Lowest 5 Peak Flows
1896-1899 and 1905-2002

cfs	date
7570	5/26/02
7600	6/10/77
7840	5/16/89
9370	5/15/63
10700	5/14/92



In general, the higher the flow, the higher the velocity. The velocity reaches a maximum, for the most extreme events, between 5 and 7 mph.

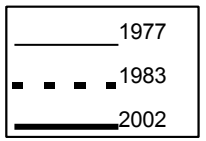


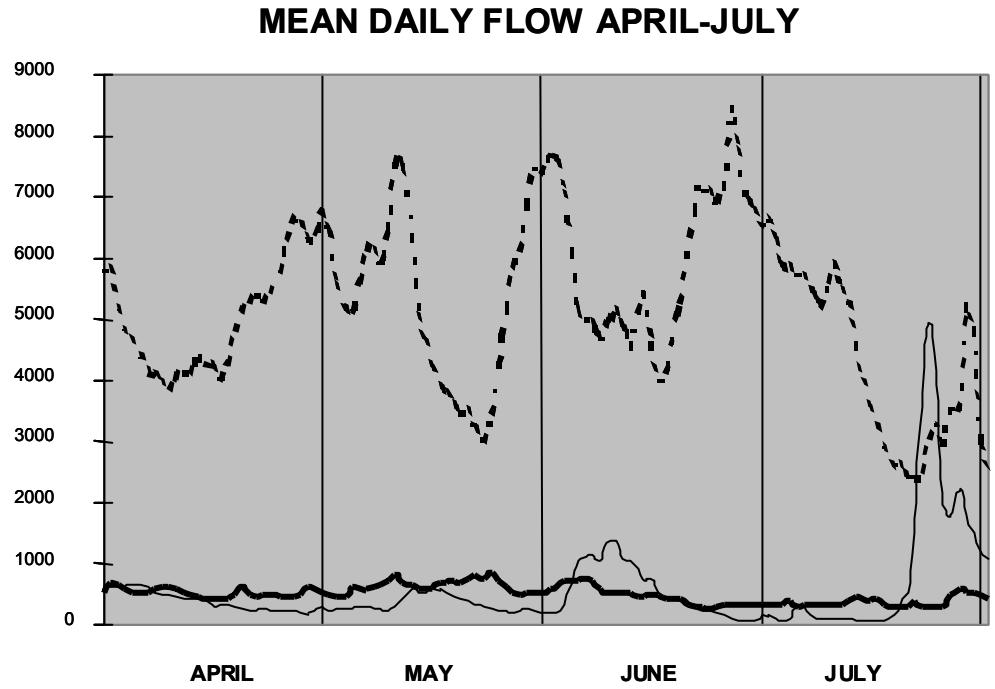
San Juan near Bluff, UT

5 Highest Flows 1915-1917 and 1927-2002	
in cfs	date
52000	6/30/27
33800	5/14/41
25400	6/20/49
18700	6/17/17
18500	6/17/35

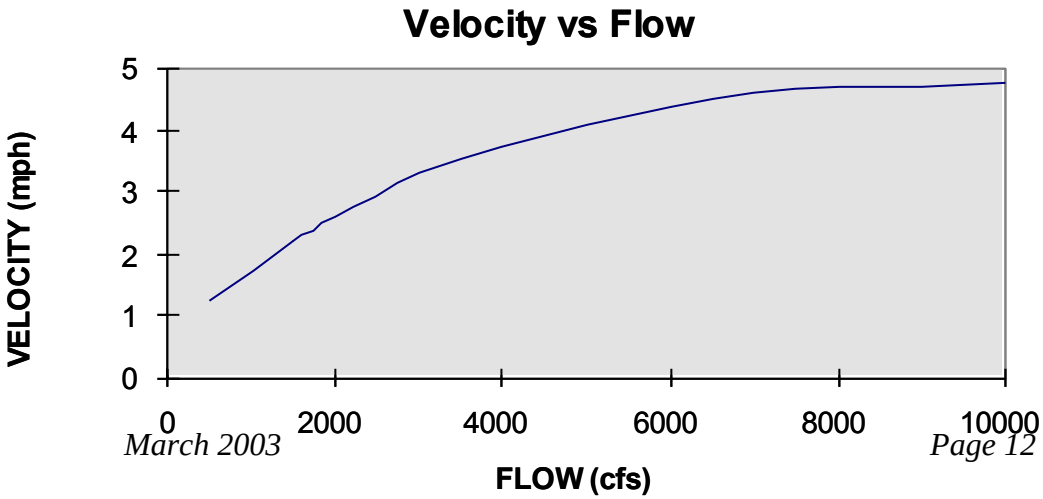
5 Highest Flows Post Regulation 1961-2002	
in cfs	date
15200	5/29/79
12200	4/30/85
11700	5/22/73
11600	6/19/95
11300	6/12/87

5 Lowest Flows 1915-1917 and 1927-2002	
in cfs	date
847	5/24/02
2570	5/19/74
2660	5/10/63
2750	6/23/71
2820	7/29/89

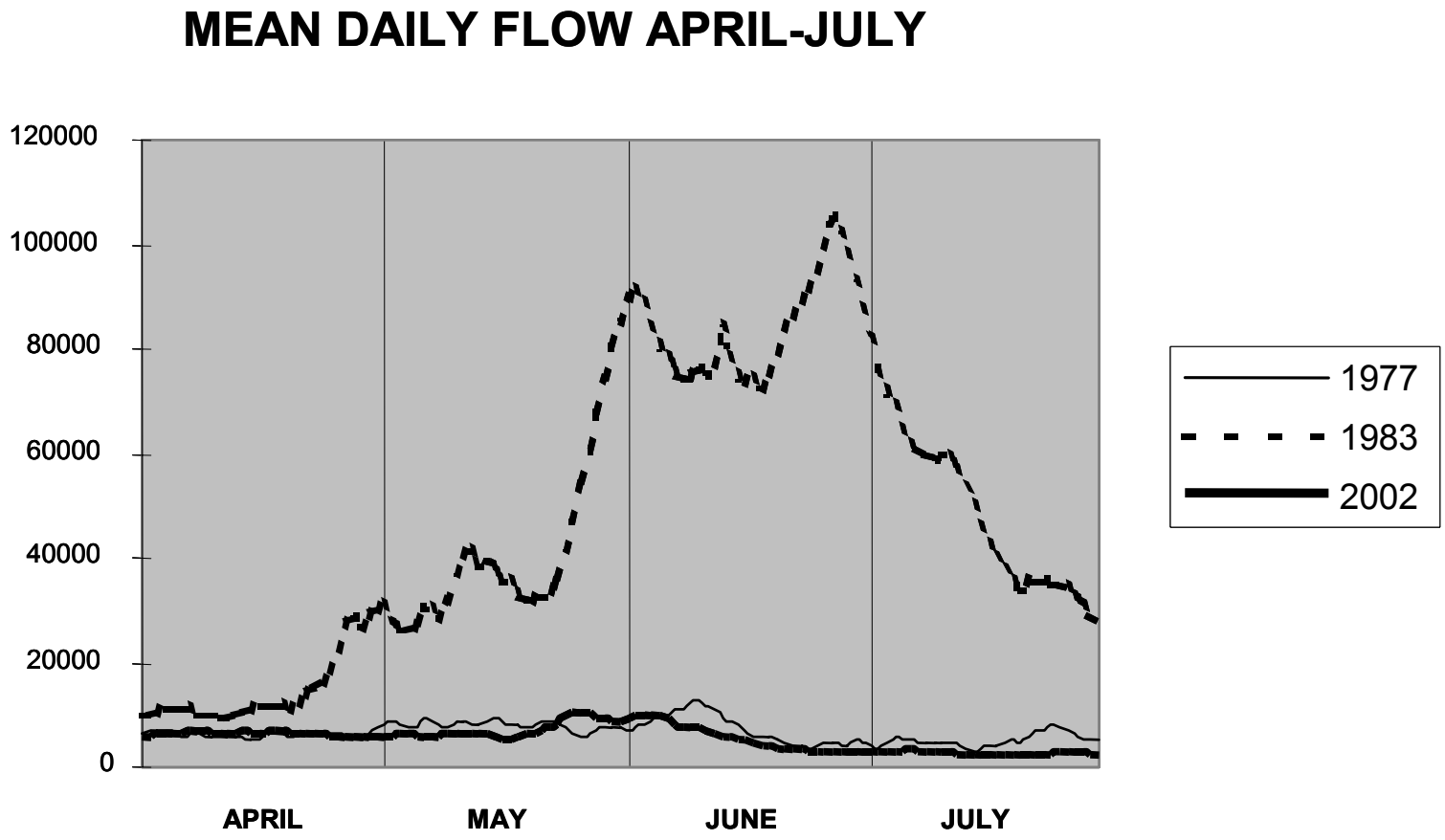




In general, the higher the flow, the higher the velocity. The velocity reaches a maximum, for the most extreme events, between 5 and 7 mph.



Cataract Canyon



The data above for Cataract Canyon have been synthesized from the Green River near Green River, Utah and the Colorado River near Cisco, Utah gages. The flows from these observed upstream points were routed (lagged in time) to Cataract Canyon and added. Information on the distances between river points and assumed average velocities used to make such calculations are shown earlier in this report.

PHONE NUMBERS OF INTEREST

FOR WEATHER INFORMATION:	
NEW MEXICO	505-243-0702
ARIZONA	602-275-0073
NORTHERN ARIZONA	928-774-3301
UTAH	801-524-5133
WYOMING	307-635-9901
SOUTHWESTERN WYOMING	307-857-3898
WESTERN COLORADO	970-243-0914
SOUTHERN NEVADA	702-736-3854
SOUTHEASTERN IDAHO	208-233-0137

FOR RIVER RUNNING CONDITIONS, PERMITS, ETC.			
River	Reach	Organization	Number
COLORADO	Above Westwater Canyon	BLM Grnd Jnctn	970-244-3000
	Westwater Canyon	BLM Moab	435-259-6111
	Cisco thru Cataract Canyon	Canyonlands NP	435-259-7164
	Grand Canyon	Grand Canyon NP	928-638-7888
DIRTY DEVIL		BLM Hanksville	435-542-3461
ESCALANTE		BLM Escalante	435-826-5499
GREEN	Ledore to US40	Dinosaur NM	970-374-2468
	Desolation Cyn to Green Rvr	BLM Price	435-636-3622
MUDDY CREEK		BLM Price	435-636-3622
SAN JUAN	Below Bluff	BLM Monticello	435-587-2141
VIRGIN	Zion NP	Zion NP	435-772-3256
	St. George to Littlefield	BLM Arizona Strip	435-688-3200
YAMPA	Deerlodge to confluence	Dinosaur NM	970-374-2468

FLOOD POTENTIAL INFORMATION

SERVICE HYDROLOGISTS

The graphic on the following page depicts the areas of responsibility of the various Service Hydrologists or Hydro Focal Points. The following list links these individuals and their corresponding areas of responsibility. **A Service Hydrologist/Hydro Focal Point is the National Weather Service hydrologic coordinator and spokesperson for a given hydrologic service area and is the person to contact for current flood potential, streamflows, snowpack information and updates to peak flow forecasts**. Following their phone number is a URL to their homepage.

1) Albuquerque, NM	Ed Polasko	505-243-0702	http://www.srh.noaa.gov/abq/
2) Cheyenne, WY	Ray Gomez	307-772-2468x493	http://www.crh.noaa.gov/cys/
3) Boulder, CO	Treste Huse	303-494-3210x493	http://www.crh.noaa.gov/den/
4) El Paso, TX	Tim Brice	505-589-4088x308	http://www.srh.noaa.gov/elp/
5) Flagstaff, AZ	Tom Clemmons	928-556-9161x249	http://www.wrh.noaa.gov/Flagstaff/
6) Grand Junction, CO	Brian Avery	970-243-7007x633	http://www.crh.noaa.gov/gjt/
7) Las Vegas, NV	Barry Pierce	702-263-9744x228	http://www.wrh.noaa.gov/Lasvegas/
8) Phoenix, AZ	Tom Zickus	602-275-8881x228	http://www.phx.noaa.gov/
9) Pocatello, ID	Bill Wojcik Sherrie Hebert	208-233-0834	http://www.wrh.noaa.gov/Pocatello/
10) Pueblo, CO	Larry Walrod	719-948-9429x895	http://www.crh.noaa.gov/pub/
11) Riverton, WY	Melissa Claghorn	307-857-3898	http://www.crh.noaa.gov/riw
12) Salt Lake City, UT	Brian McInerney	801-524-5142x333	http://www.wrh.noaa.gov/Saltlake/
13) Tucson, AZ	Mike Schaffner	520-670-5156x228	http://www.wrh.noaa.gov/Tucson/

NATIONAL WEATHER SERVICE HYDROLOGIC SERVICE AREAS
IN THE CBRFC AREA OF RESPONSIBILITY