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.

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	Peak as of May 6	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	570	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	635	2,000	2,500	**3,500**	4,500	5,000	6/1 - 6/21
ROARING FORK - GLENWOOD SPRINGS	11,200	6,150	11,860	2,170	6/01	820	2,500	3,500	**4,600**	6,000	7,500	6/3 - 6/18
COLORADO - CAMEO, NR	38,000	17,500	28,550	4,020	6/02	2,850	9,000	12,000	**15,500**	18,000	22,000	5/29 - 6/18
PLATEAU CK - CAMEO, NR	4,100	1,460	5,100	120	4/03	256		400	**700**	1,200	1,700	5/9 - 6/11
EAST - ALMONT, NR	5,000	2,080	2,870	680	6/01	465	900	1,100	**1,300**	1,700	2,000	5/28 - 6/17
NF GUNNISON - SOMERSET, NR	7,080	3,310	14,600	655	5/31	1,160		1,500	**2,000**	2,500	3,200	5/11 - 6/2
SURFACE CK - CEDAREDGE	640	210	1,980	50	5/07	100			**120**	160	210	5/3 - 6/8
UNCOMPAHGRE - COLONA, NR	1,900	1,390	3,000	290	5/21	180	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	4,540	10,000	15,000	**19,500**	23,000	28,000	5/22 - 6/16
DOLORES - DOLORES	6,950	2,980	10,280	445	4/15	1,190		1,300	**1,700**	2,200	2,600	5/9 - 6/4
SAN MIGUEL - PLACERVILLE, NR	2,740	1,310	3,120	280	5/31	320	450	600	**800**	1,100	1,300	5/26 - 6/23
DOLORES - CISCO, NR (see note1 below)	12,900	6,050	N/A	400	4/03	1,320	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	5,240	12,000	17,000	**22,000**	26,000	31,000	5/20 - 6/15
GREEN - DANIEL, NR, WARREN BRIDGE, AT	5,620	2,975	N/A	2,000	6/03	420	1,200	1,600	**1,800**	2,400	2,800	5/30 - 6/30
NEW FORK - BIG PINEY, NR	9,110	5,285	N/A	2,200	6/03	300	1,200	1,900	**2,600**	3,400	4,200	5/31 - 6/24
GREEN - LABARGE, NR	18,800	9,270	11,100	4,300	6/04	1,100	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	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	N/A	5/23 - 7/11
HAMS FORK - FRONTIER, NR, POLE CK, BLO	2,000	825	1,600	310	6/02	120	150	280	**400**	550	800	5/10 - 6/9
BLACKS FORK - LITTLE AMERICA, NR	6,970	2,440	5,440	55	5/24	50	100	400	**700**	1,600	2,700	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	Peak as of May 6	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	1,000	1,800	2,200	**2,700**	3,200	3,700	5/19 - 6/12
YAMPA - MAYBELL, NR	24,400	10,475	27,000	3,300	6/02	4,900	5,500	6,500	**8,000**	10,000	12,000	5/13 - 6/10
LITTLE SNAKE - LILY, NR	13,400	4,745	33,300	900	4/30	1,300	1,700	2,300	**3,100**	4,200	5,500	5/5 - 6/12
YAMPA - DEERLODGE PARK	32,300	13,955	17,000	3,400	6/03	6,000	6,500	8,000	**9,500**	12,000	15,000	5/11 - 6/6
GREEN - JENSEN, NR (see note1 below)	38,500	17,600	23,700	7,100	5/25	7,000	9,000	11,000	**14,000**	16,500	19,500	5/14 - 6/11
ROCK CK - UPR STILLWATER RES	2,080	1,350	N/A	680	5/20	80	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	40	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	600	1,200	1,500	**1,800**	2,200	2,800	5/21 - 6/14
GREEN - GREEN RIVER, UT (see note1 below)	47,200	22,560	47,000	7,300	5/27	7,400	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	10	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	30		40	**70**	100	130	5/19 - 6/18
DIRTY DEVIL - HANKSVILLE, NR, POISON SPGS **	1,310	445	N/A	N/A	N/A	140	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	5	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	12,000	20,000	29,000	**38,000**	46,000	56,000	5/20 - 6/16
SAN JUAN - PAGOSA SPRINGS	4,640	2,485	11,300	221	4/16	640	750	850	**920**	1,200	1,300	5/15 - 6/12
ANIMAS - DURANGO	10,700	4,675	8,350	777	5/21	1,040	1,800	2,350	**2,500**	3,200	3,600	5/28 - 6/14
SAN JUAN - BLUFF, NR (see note2 below)	15,200	7,340	40,900	847	5/24	840	2,300	2,850	**2,950**	3,700	4,100	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	Provisional 2002 Peak through May 6th % indicates snowmelt peak has occurred	Normal time of peak
VIRGIN - LITTLEFIELD, NR	17,000	1,915	19,500	289	3/06	**485 cfs on 3/17 (%)**	3/15 - 5/6
VIRGIN - HURRICANE, NR	9,620	1,520	6,600	113	4/16	**404 on 3/17 (%)**	3/14 - 5/9
SANTA CLARA - PINE VALLEY, NR	212	65	N/A	1.7	3/24	**13 on 4/29 (%)**	4/25 - 5/25

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	Peak as of May 6	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	270	600	700	**850**	1,100	1,500	5/22 - 6/14
LOGAN - LOGAN, NR, STATE DAM, ABV	1,870	985	1,200	485	6/02	275		350	**550**	850	950	5/18 - 6/10
BLACKSMITH FORK - HYRUM, NR, UP&L DAM	1,530	490	N/A	130	4/15	150				350	450	4/24 - 5/20
WEBER - OAKLEY, NR	4,170	1,625	3,100	985	5/31	220	500	700	**900**	1,200	1,600	5/24 - 6/16
CHALK CK - COALVILLE	1,420	600	1,900	195	5/21	N/A	30	100	**200**	350	550	5/5 - 5/31
PROVO - WOODLAND, NR	2,530	1,685	3,000	1,270	5/20	290	500	900	**1,200**	1,600	2,100	5/11 - 6/6
PROVO - HAILSTONE, NR	3,560	2,150	N/A	2,260	5/21	485	600	1,000	**1,800**	2,300	3,000	5/14 - 6/7
LITTLE COTTONWOOD CK - SALT LAKE CITY, NR	762	470	700	475	5/31	50	100	150	**250**	400	500	5/23 - 6/20
BIG COTTONWOOD CK - SALT LAKE CITY, NR	980	430	700	365	5/21	35	100	150	**215**	350	500	5/18 - 6/9
MILL CK - SALT LAKE CITY, NR	153	65	150	30	6/02	10			**15**	25	40	5/18 - 6/10
PARLEYS CK - SALT LAKE CITY, NR	605	180	300	75	4/03	35		45	**65**	110	135	4/23 - 5/22
EMIGRATION CK - SALT LAKE CITY, NR	164	55	120	25	4/10	3			peaked 4/18			4/11 - 5/19
CITY CK - SALT LAKE CITY, NR	322	90	150	40	5/24	10		15	**20**	35	50	5/12 - 6/1
SEVIER - HATCH	1,430	495	1,200	55	4/16	57		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*

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	970-243-7007x493	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	208-233-0834	http://www.wrh.noaa.gov/Pocatello/
10) Pueblo, CO	Sherrie Hebert 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