Snow Melt Peak Flow Forecast

Colorado Basin River Forecast Center

CBRFC's Focus : Peak Flows from Snow Melt Runoff

Methods of Analysis

physical parameters

Main Variables:

Current Soil Moisture States

Snowpack

Future Precipitation Events

Future Temperature

Current Base Flow Condition

(1) Historical Observations: Regression Analysis

Regressions check

Regression methods are static compared to physically based models. lend themselves to use where real time data is not available and as a against the model based forecast where available.

Comparing: Historical Seasonal Volumes to Historical Peaks
Comparing: ESP MP Forecast Volumes by Mo. to Historical Peaks

Comparing: Historical Snowpack to Historical Peaks

Focus from April - June: Peak Flows – Threat of Snow Melt Flooding

Methods of Analysis

physical parameters

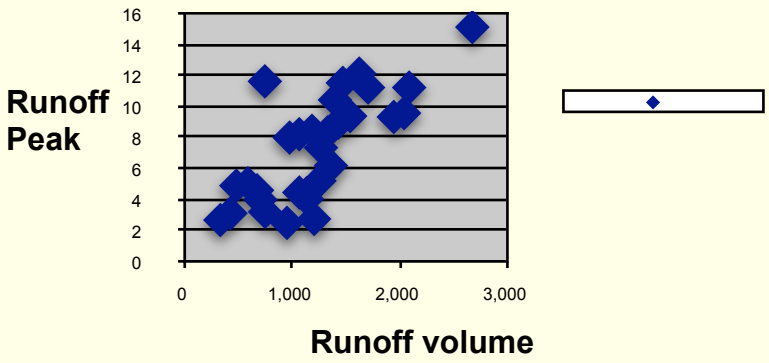
(1) Regression Method: Historical Observations i.e. Climatology

Example:

Comparing Historical Observed Seasonal Volumes or Historical Forecast Volumes to Historical Peaks

The accuracy of this method improves considerably as you approach the average period of peak flow.

	April-July Obs. volume (acre-ft)	Peak Flow Mean-Daily-CFS	
1983	94,000	1670	June 19
1995	99,000	2530	June 16
1998	74,000	1130	May 22
1999	52,000	1250	May 26
2000	41,000	950	May 6



Methods of Analysis

(2) Model Analysis: NWSRFS, River forecast System, ESP

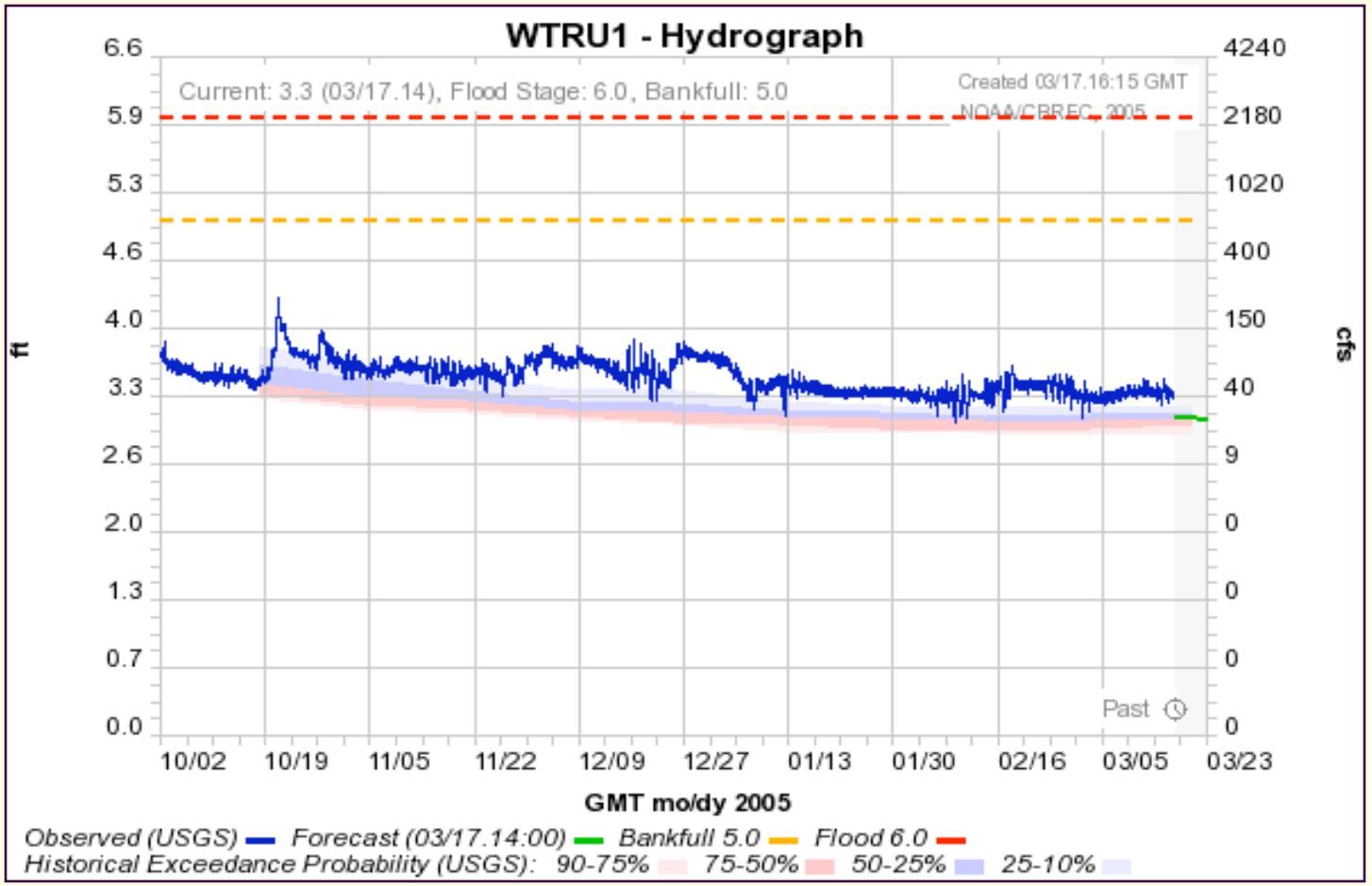
Initial Watershed Conditions

- Antecedent Flow
- Soil Moisture States
- Snow Pack Conditions
- Reservoir Regulation Plans

Model results should produce better results than static regression equations.

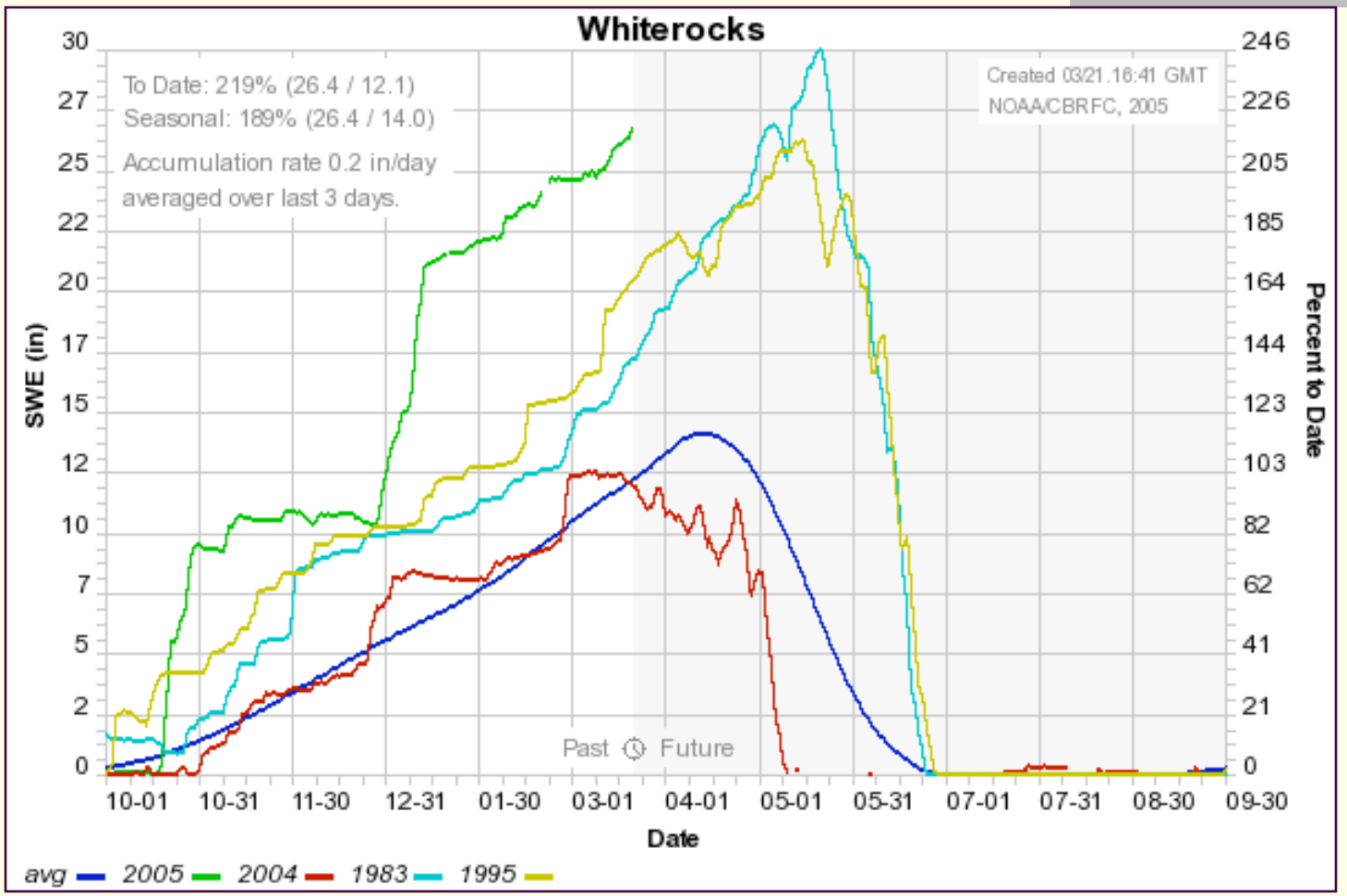
Model analysis using ESP can also be used to weight a forecast based on certain Climate Indices' such as El Nino or CPC 3 month Climate Forecast Model output.

Initial Watershed Condition: Antecedent Flow for Whiterocks



Initial Watershed Condition: Snowpack

Comparing Peaks of Similar Years against Model and Regression Output helps Reduce Uncertainty



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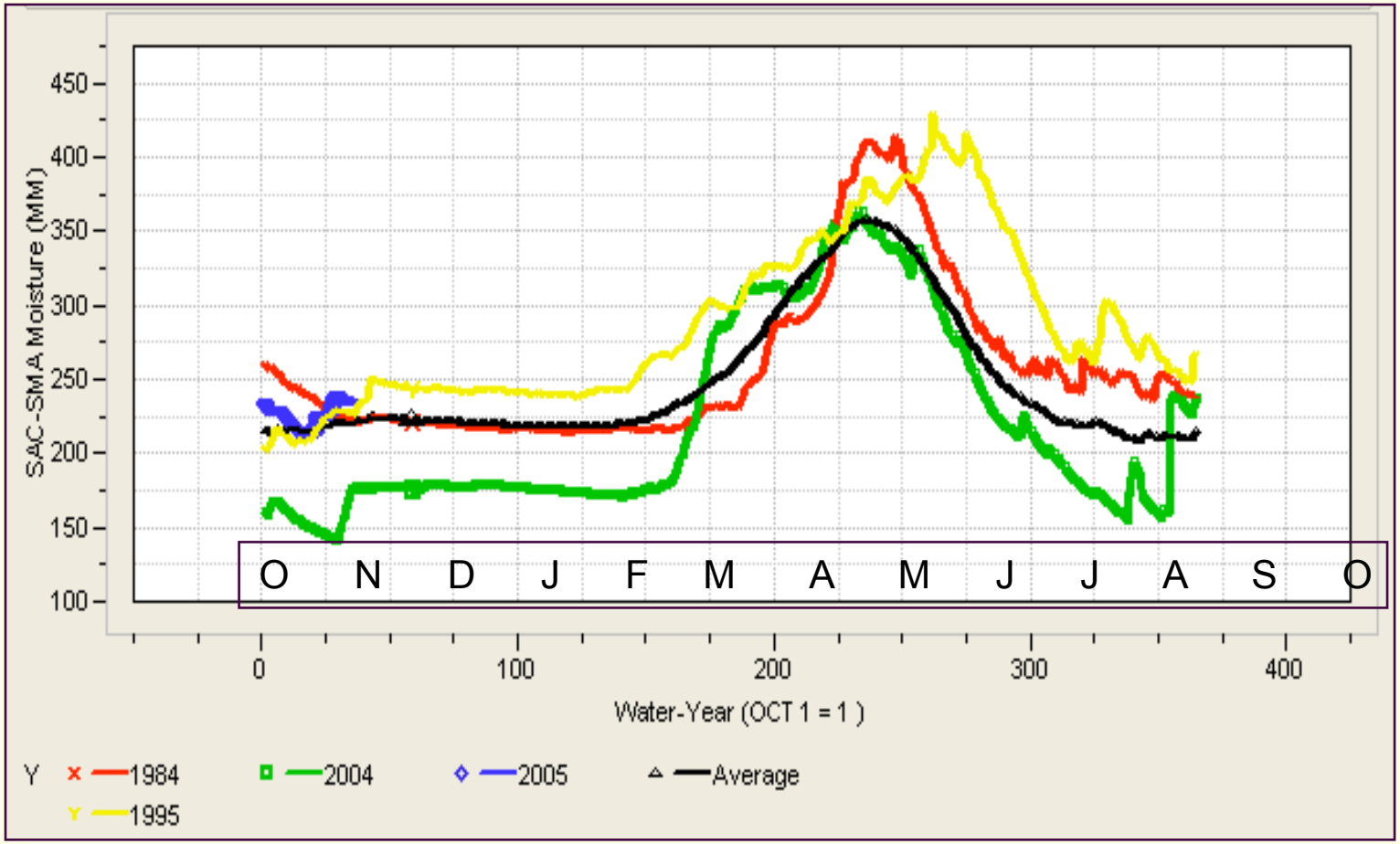
Initial Watershed Condition: Soil Moisture

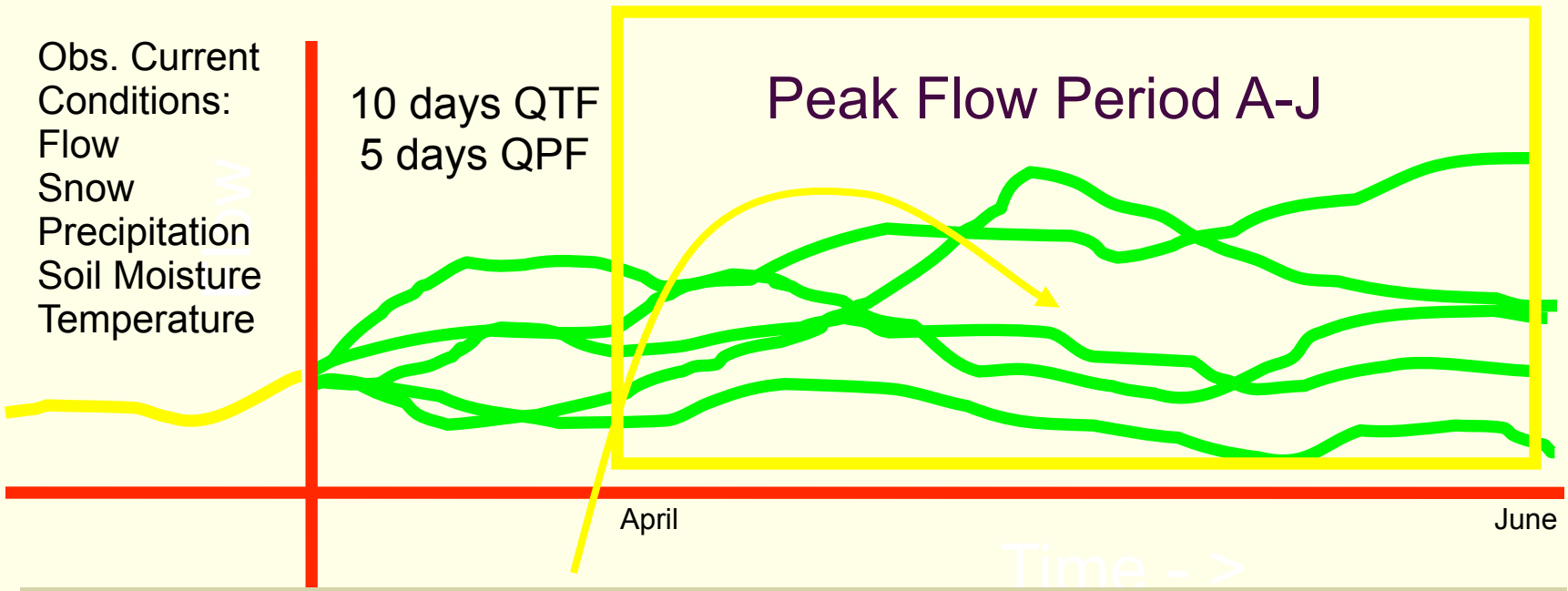
Currently No Basin Wide or Historical Soil Moisture Network
NWRFS Uses: Sacramento Soil Moisture Accounting Model



NOAA

NWS

ESP ~ Peak Flow Forecasts



ESP Creates a frequency distribution using each forecast value in the specified window and determines a “most probable” Max Mean Daily forecast. Using this method we determine the Max, Min and Most Probable values.

NOAA

NWS

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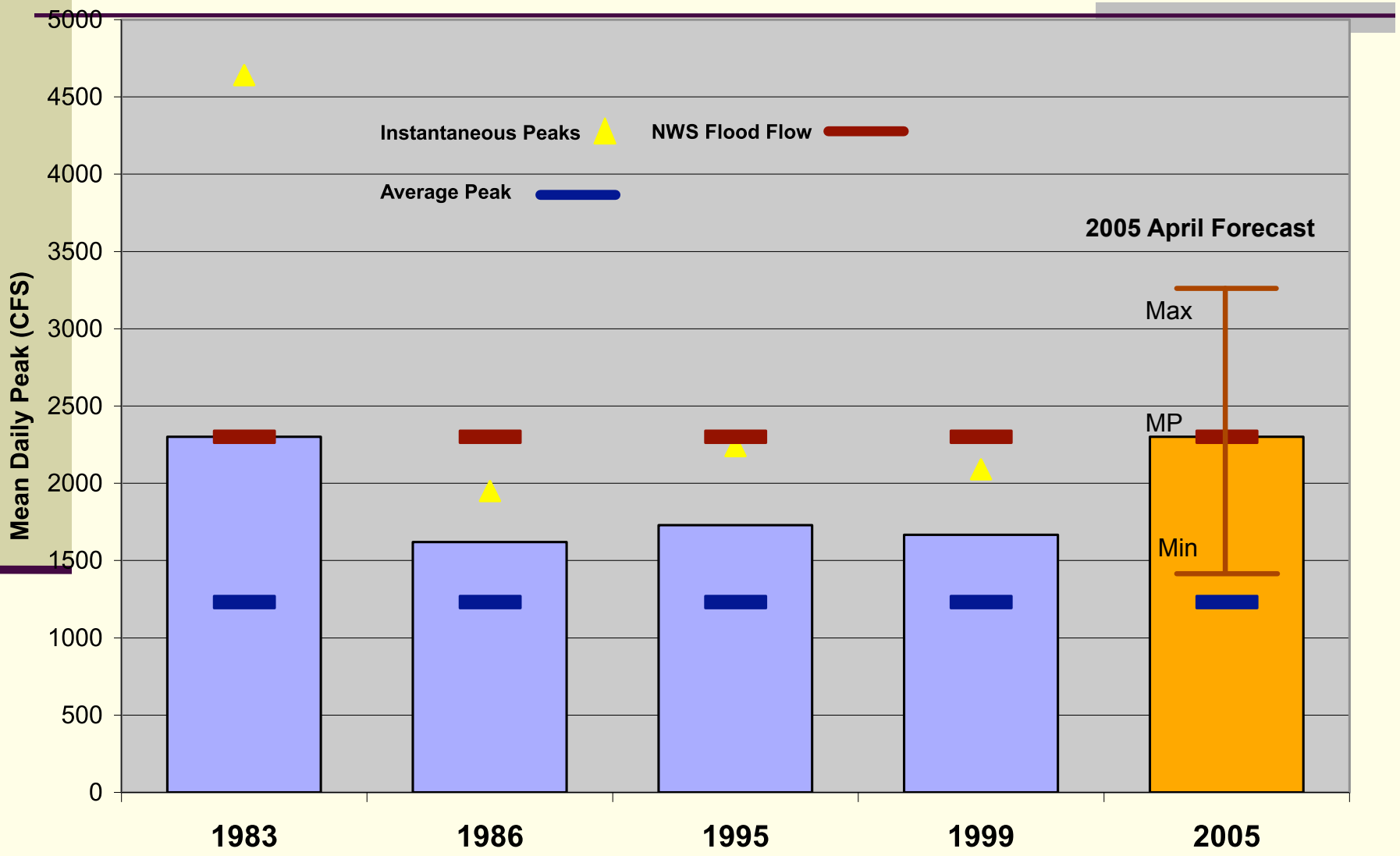
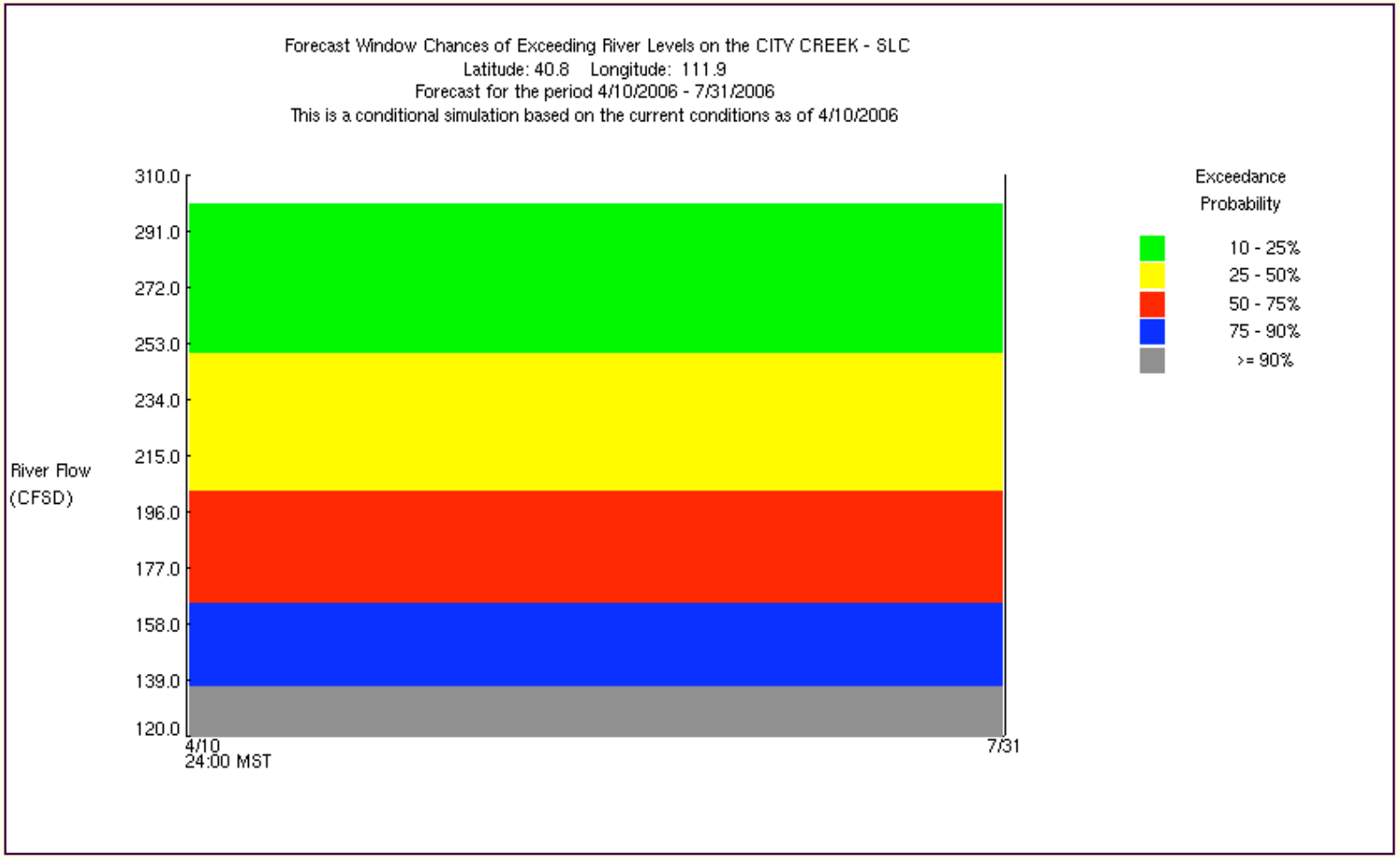
Max Instantaneous vs. Max Mean Daily

Whiterocks River near Whiterocks



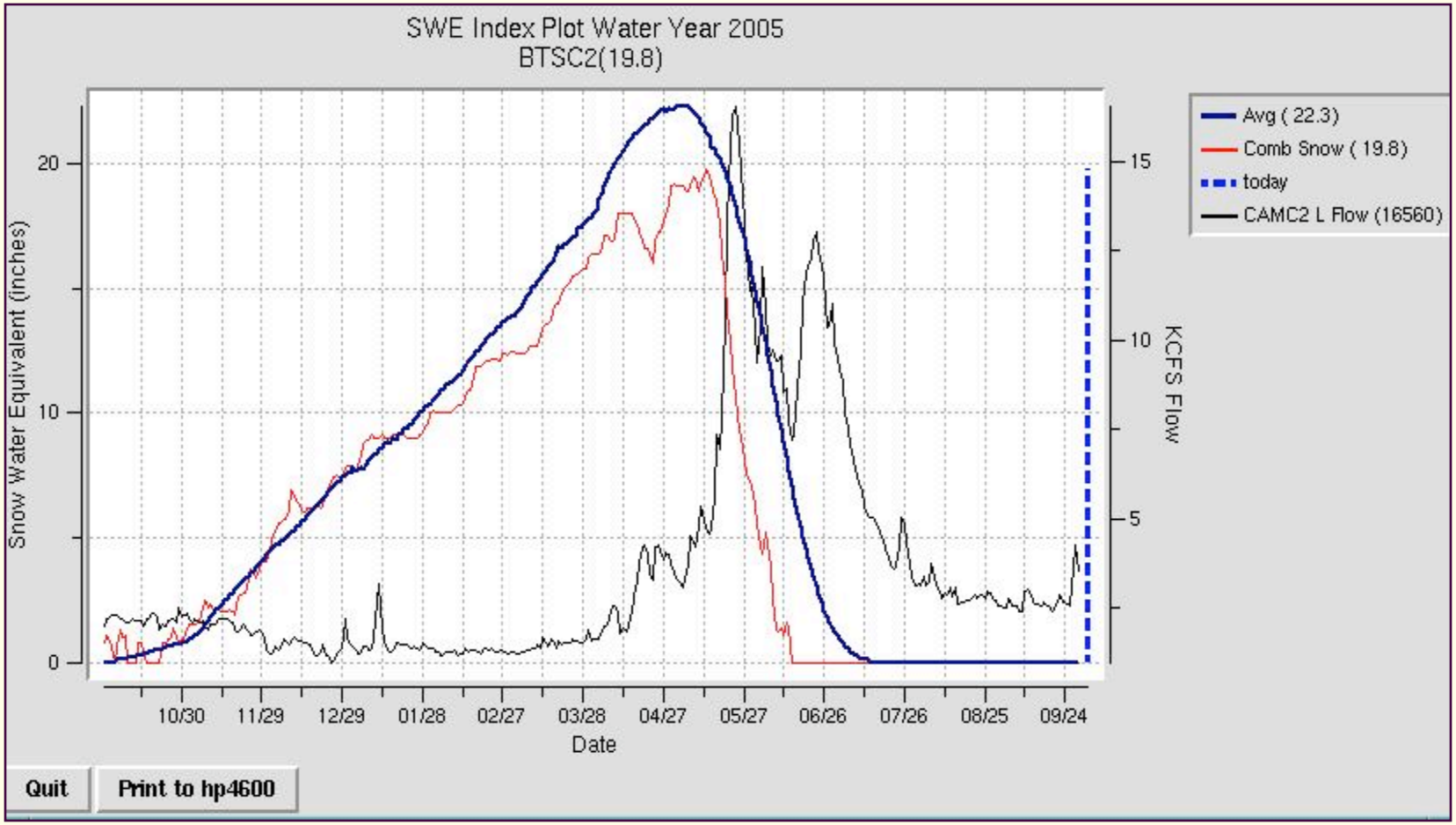
Peak Flow Exceedance Probability

Visualizing Exceedance Probability



Timing Related Issues

Multiple Peaks are not Uncommon.



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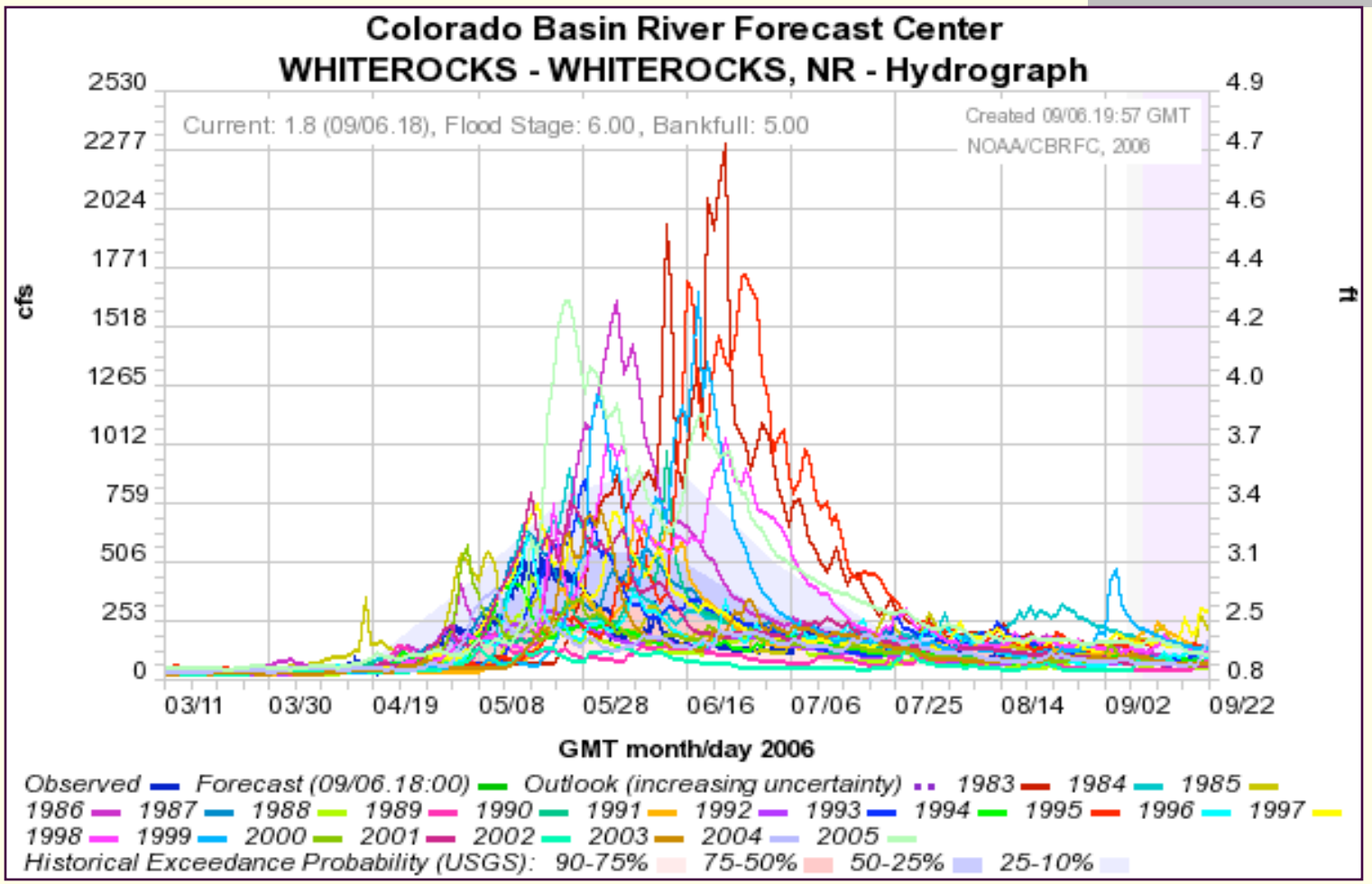
Hydrographs – CBRFC Webpage

Useful Tools for Historical Data Searches



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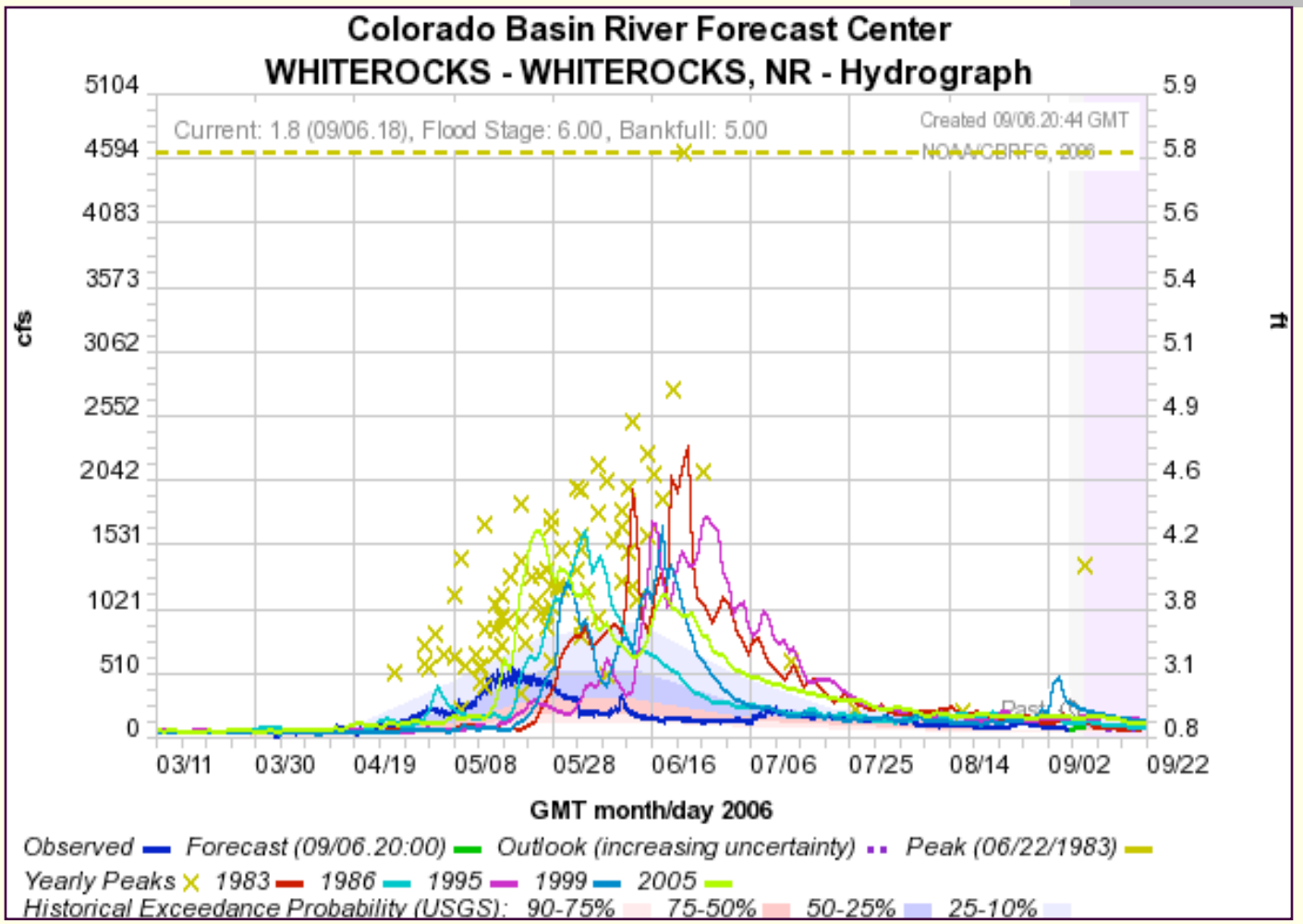
Peak Flow Display Options on the Web

Mean Daily Flow and Instantaneous Peaks



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CBRFC Peak Flow Publication

Selected Historical Data for Cisco, Green River, UT, Cataract Canyon and San Juan at Bluff

Colorado near Cisco, UT

Highest 5 Peak Flows
1914-1917 and 1923-2005

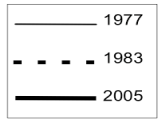
cfs	date
76800	6/19/17
69500	5/27/84
65600	6/3/14
63400	5/15/41
63400	6/10/57

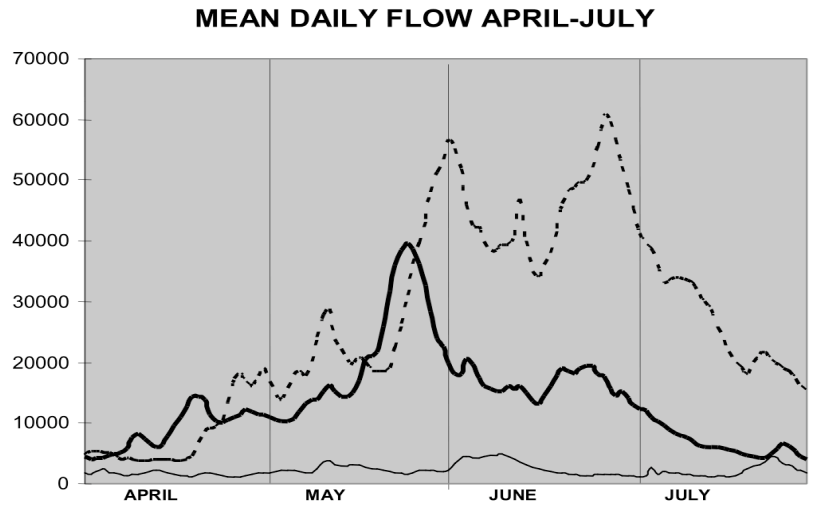
Highest 5 Peak Flows
Post Regulation 1961-2005

cfs	date
69500	5/27/84
60500	6/27/83
51400	6/19/95
47600	5/23/93
44600	5/29/79

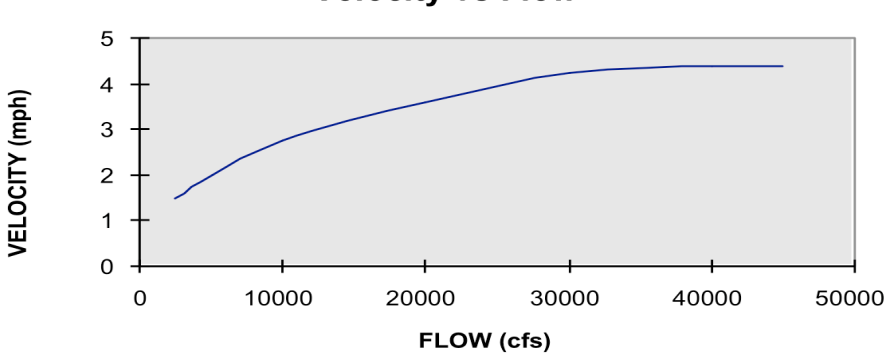
Lowest 5 Peak Flows
1914-1917 and 1923-2005

cfs	date
4580	6/3/02
4970	7/24/77
9600	5/31/89
10400	5/12/04
11800	6/9/81





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.



Monthly Publication ~ March 2006

Data for Selected Sites that are User Driven and can be Expanded

Red indicates MMD Flows above Flood Flow

STATION NAME	Historic Peak	Average Peak	Flood* Flow	2005 Peak	2005 Date	2006 Forecast Exceedance Probability 90%	75%	**50%**	25%	10%	Normal time of peak
COLORADO - KREMMLING, NR	12,700	3,900	10,100	2,510	6/25	N/A	N/A	**N/A**	N/A	N/A	5/15 - 6/27
EAGLE - GYPSUM, BLO	6,580	3,600	6,600	3,400	5/23	3,500	4,000	**5,000**	6,000	6,500	6/1 - 6/21
ROARING FORK - GLENWOOD SPRINGS	11,200	6,150	16,800	5,720	6/24	4,000	5,300	**6,500**	7,700	9,000	6/3 - 6/18
COLORADO - CAMEO, NR	38,000	17,500	23,500	16,800	5/25	13,000	17,000	**21,000**	25,000	30,000	5/29 - 6/18
PLATEAU CK - CAMEO, NR	4,100	1,460	3,260	2,310	5/24	300	700	**1,000**	1,400	2,000	5/9 - 6/11
EAST - ALMONT, NR	5,000	2,080	3,100	2,070	5/25	1,500	1,810	**2,100**	2,500	3,000	5/28 - 6/17
NF GUNNISON - SOMERSET, NR	7,080	3,310	12,400	4,730	5/21	1,500	1,800	**2,500**	3,300	4,200	5/11 - 6/2
SURFACE CK - CEDAREDGE	640	210	1,400	685	5/24	40	80	**120**	200	250	5/3 - 6/8
UNCOMPAHGRE - COLONA	1,900	1,390	3,100	1,130	6/25	N/A	N/A	**N/A**	N/A	N/A	5/20 - 6/27
COLORADO - CO-UT STATELINE, NR	68,300	26,150	47,800	30,300	5/25	20,000	25,000	**29,000**	33,000	38,000	5/22 - 6/16
DOLORES - DOLORES	6,950	2,980	8,700	4,890	5/23	1,000	1,300	**1,750**	2,200	2,800	5/9 - 6/4
SAN MIGUEL - PLACERVILLE, NR	2,740	1,310	2,650	1,380	5/23	500	700	**950**	1,200	1,400	5/26 - 6/23
DOLORES - CISCO, NR (see note1 below)	12,900	6,050	N/A	9,030	5/26	N/A	N/A	**N/A**	N/A	N/A	4/26 - 6/5
COLORADO - CISCO, NR	69,500	28,800	61,300	39,500	5/25	22,000	27,000	**31,000**	35,000	40,000	5/20 - 6/15
GREEN - DANIEL, NR, WARREN BRIDGE, AT	5,620	2,975	N/A	2,850	6/25	2,100	2,500	**2,900**	3,100	3,400	5/30 - 6/30
NEW FORK - BIG PINEY, NR	9,110	5,285	N/A	5,330	6/23	3,000	4,200	**5,000**	5,500	7,000	5/31 - 6/24
GREEN - LABARGE, NR	18,800	9,270	14,600	8,590	6/25	N/A	N/A	**N/A**	N/A	N/A	5/30 - 6/24
BIG SANDY - FARSON, NR	1,690	820	1,300	926	6/22	N/A	N/A	**N/A**	N/A	N/A	5/28 - 6/23
GREEN - GREEN RVR WY, NR	15,400	7,110	15,500	6,510	6/03	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	1,030	6/21	700	810	**900**	1,050	1,400	5/10 - 6/9
BLACKS FORK - LITTLE AMERICA, NR	6,970	2,440	5,500	5,500	5/19	1,500	2,000	**2,400**	3,900	5,000	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*

Colorado Basin River Forecast Center

Final Monthly Publication – Early June

Where peaks have occurred the magnitude and date are listed.

STATION NAME	Historic Peak	Average Peak	Flood* Flow	2005 Peak	2005 Date	Provisional 2006 Peak through 6/06/06 % indicates snowmelt peak has occurred	Normal time of peak
COLORADO - KREMMLING, NR	12,700	3,900	10,100	2,510	6/25	**2690 cfsd on 5/22 (%)**	5/15 - 6/27
EAGLE - GYPSUM, BLO	6,580	3,600	6,600	3,400	5/23	**3920 cfsd on 5/23 (%)**	6/1 - 6/21
ROARING FORK - GLENWOOD SPRINGS	11,200	6,150	16,800	5,720	6/24	**5640 cfsd on 5/23 (%)**	6/3 - 6/18
COLORADO - CAMEO, NR	38,000	17,500	23,500	16,800	5/25	**16400 cfsd on 5/23 (%)**	5/29 - 6/18
PLATEAU CK - CAMEO, NR	4,100	1,460	3,260	2,310	5/24	**1250 cfsc on 5/23 (%)**	5/9 - 6/11
EAST - ALMONT, NR	5,000	2,080	3,100	2,070	5/25	**1830 cfsd on 5/27 (%)**	5/28 - 6/17
NF GUNNISON - SOMERSET, NR	7,080	3,310	12,400	4,730	5/21	**2350 cfsd on 5/23 (%)**	5/11 - 6/2
SURFACE CK - CEDAREDGE	640	210	1,400	685	5/24	**150 cfsd on 5/23 (%)**	5/3 - 6/8
UNCOMPAHGRE - COLONA	1,900	1,390	3,100	1,130	6/25	**540 cfsd on 5/22 (%)**	5/20 - 6/27
COLORADO - CO-UT STATELINE, NR	68,300	26,150	47,800	30,300	5/25	**21300 cfsd on 5/24 (%)**	5/22 - 6/16
DOLORES - DOLORES	6,950	2,980	8,700	4,890	5/23	**1490 cfsd on 5/22 (%)**	5/9 - 6/4
SAN MIGUEL - PLACERVILLE, NR	2,740	1,310	2,650	1,380	5/23	**815 cfsd on 5/25**	5/26 - 6/23
DOLORES - CISCO, NR (see note1 below)	12,900	6,050	N/A	9,030	5/26	**1080 cfsd on 4/16 (%)**	4/26 - 6/5
COLORADO - CISCO, NR	69,500	28,800	61,300	39,500	5/25	**21400 cfsd on 5/24 (%)**	5/20 - 6/15
GREEN - DANIEL, NR, WARREN BRIDGE, AT	5,620	2,975	N/A	2,850	6/25	**2330 cfsd on 5.24**	5/30 - 6/30
NEW FORK - BIG PINEY, NR	9,110	5,285	N/A	5,330	6/23	**4710 cfsd 5/24**	5/31 - 6/24
GREEN - LABARGE, NR	18,800	9,270	14,600	8,590	6/25	**7280 cfsd on 5/24**	5/30 - 6/24
BIG SANDY - FARSON, NR	1,690	820	1,300	926	6/22	**700 cfsd on 5/23**	5/28 - 6/23
GREEN - GREEN RVR WY, NR	15,400	7,110	15,500	6,510	6/03	**4150 cfsd on 6/5**	5/23 - 7/11
HAMS FORK - FRONTIER, NR, POLE CK, BLO	2,000	825	1,600	1,030	6/21	**850 cfsd on 5/21**	5/10 - 6/9
BLACKS FORK - LITTLE AMERICA, NR	6,970	2,440	5,500	5,500	5/19	**640 cfsd on 5/4**	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*

CBRFC Peak Flow Information

- If you have a point you'd like to add to our publication or have more specific needs in terms of Peak Flow Forecasts, please let us know so that we can provide you with forecasts where possible.
- From our webpage select: "Snowmelt Peak Flow" and the current month.
- http://www.cbrfc.noaa.gov/product/peak/peak.cgi
- For more information or suggestions contact: Brent.Bernard@noaa.gov