Peak Flow Forecast Briefing

March 21, 2022

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Colorado Basin River Forecast Center
National Weather Service
NOAA

Webinar recording & slides will be available on CBRFC webpage

Today's Presentation:

- Peak flow forecast products overview
    - Mean daily peaks
    - Instantaneous peaks
    - Peak Flow Percentiles
    - Peak Flow Dashboard
- Snow conditions driving peak flow forecasts
- Specific peak flow forecast graphics
- Spring weather impacts
- Upcoming weather
- Summary of flood concerns

Participants will be muted during the webinar.

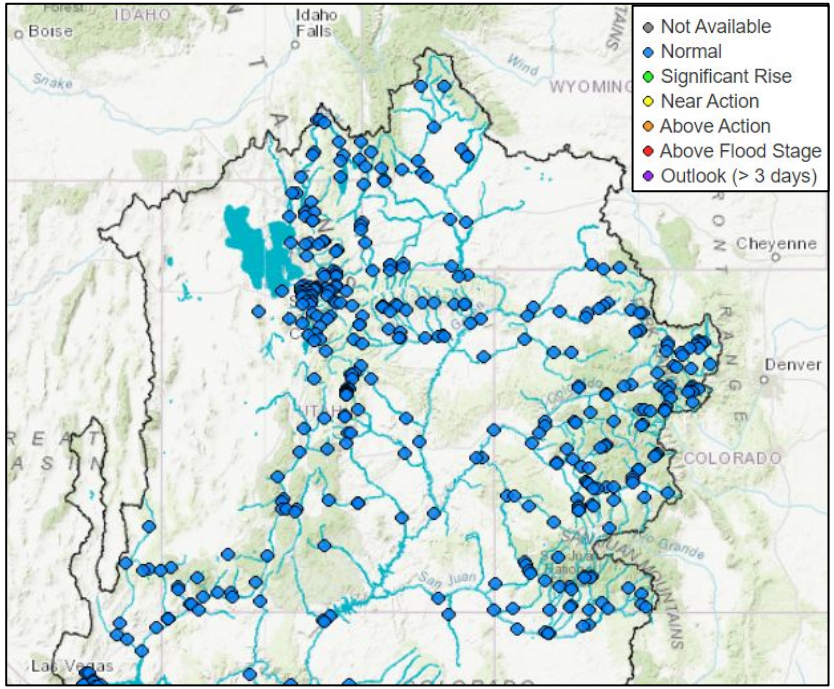
If you have a question please type it in or raise your hand and questions will be answered at the end of the webinar.

Webinar recording & slides will be available on the CBRFC webpage.

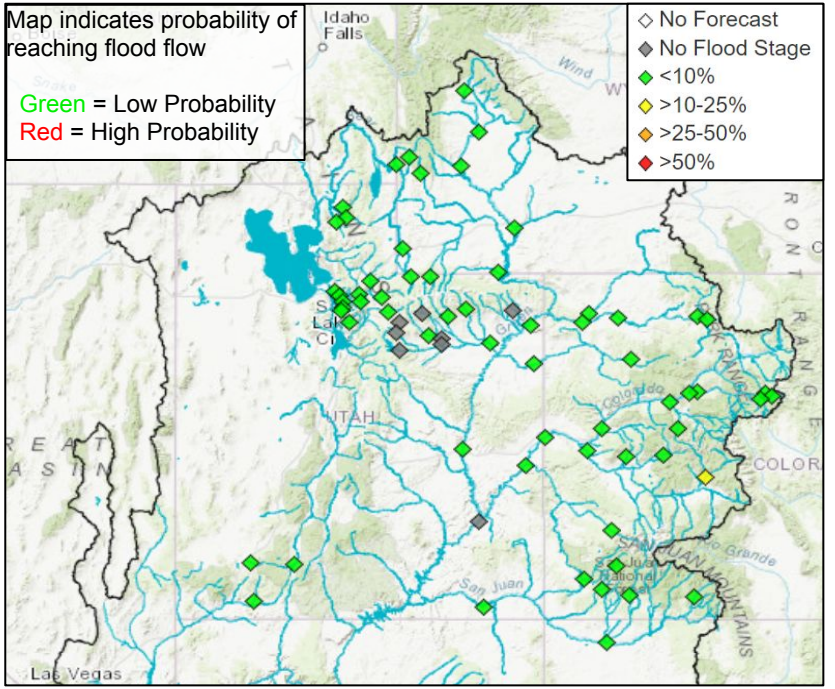
Official Mean Daily Peak Flow Forecast Overview

- Official mean daily peak flow forecast points are a subset of our daily river forecast points.
- Many of these legacy peak flow forecast points were originally developed with recreation interests in mind.
- Most of these sites have established flood stages and therefore provide some flood threat information.

Daily River Forecast Points



Official Mean Daily Peak Flow Forecast Points

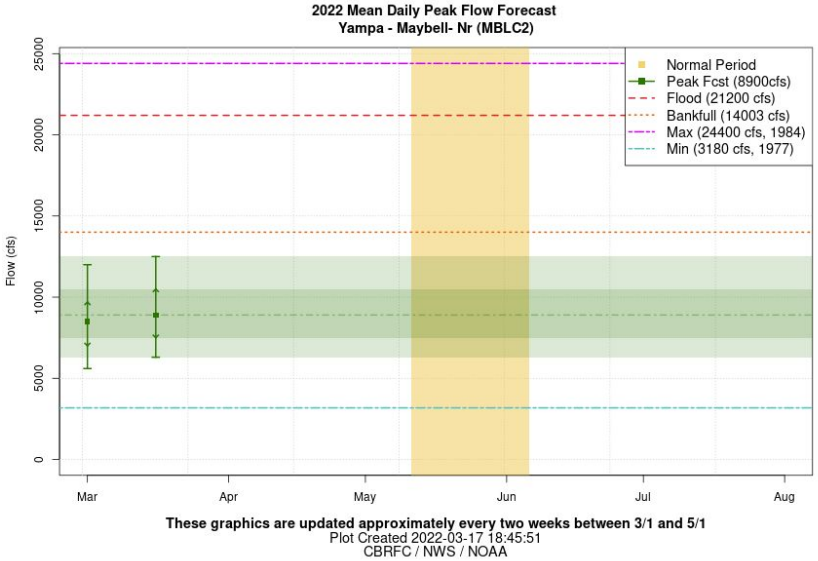


Official Mean Daily Peak Flow Forecast

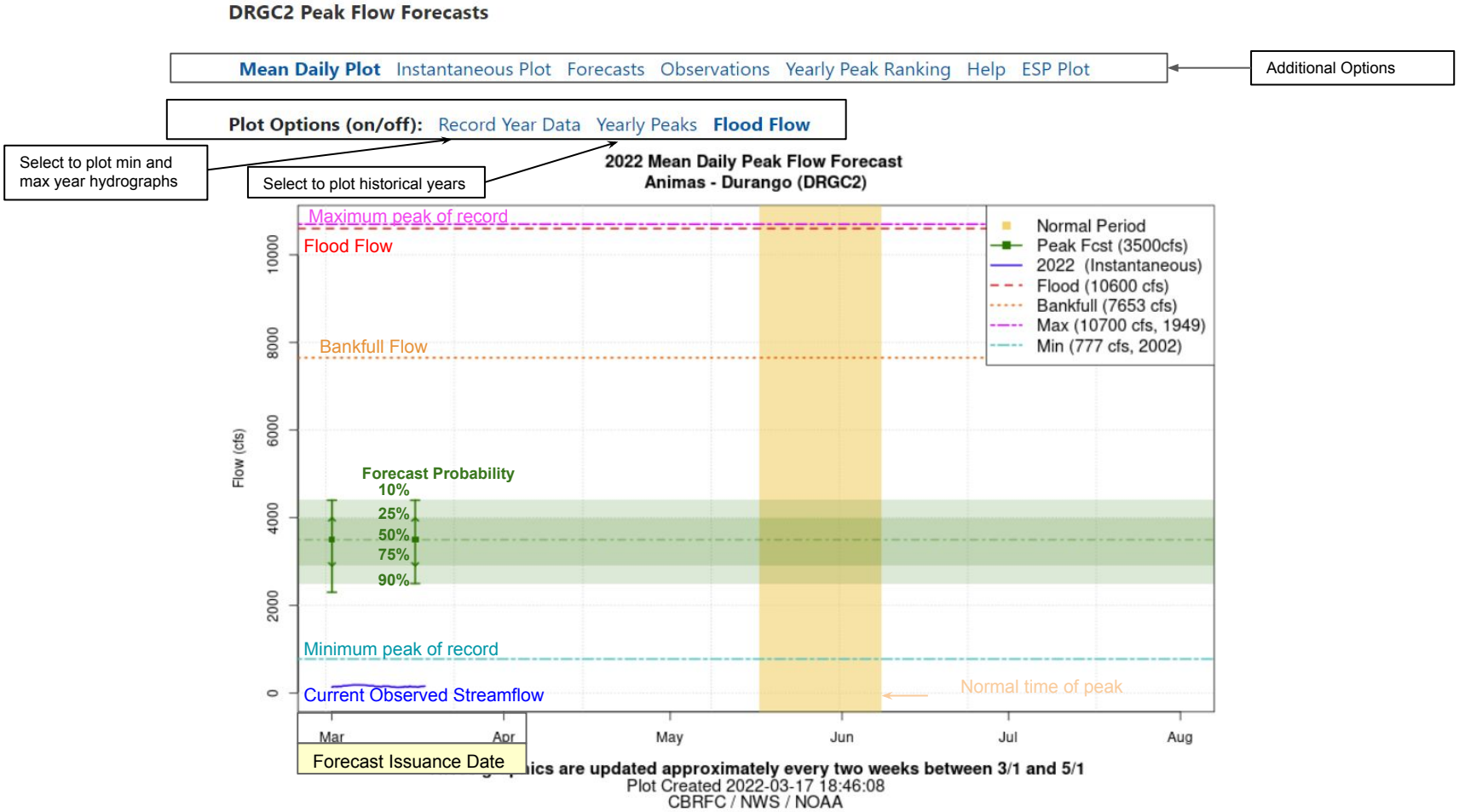
- Probabilistic (regulated ESP) forecaster reviewed
  - Long range outlook of snowmelt peak magnitude
  - Likelihood of exceeding flood thresholds
  - Accounts for reservoirs/diversions
    - based on historical operations
  - Updated bi-weekly March - May 1
    - updates end earlier if peak is near or has occurred

- Do not provide specific date of peak
  - *Typically only have a 5-10 day forecast lead time for timing the peak*

- Limitations:
  - Peak timing
  - Infrequent updates
  - Lack of late season guidance
  - Only for locations with defined thresholds
  - Lack of historical context

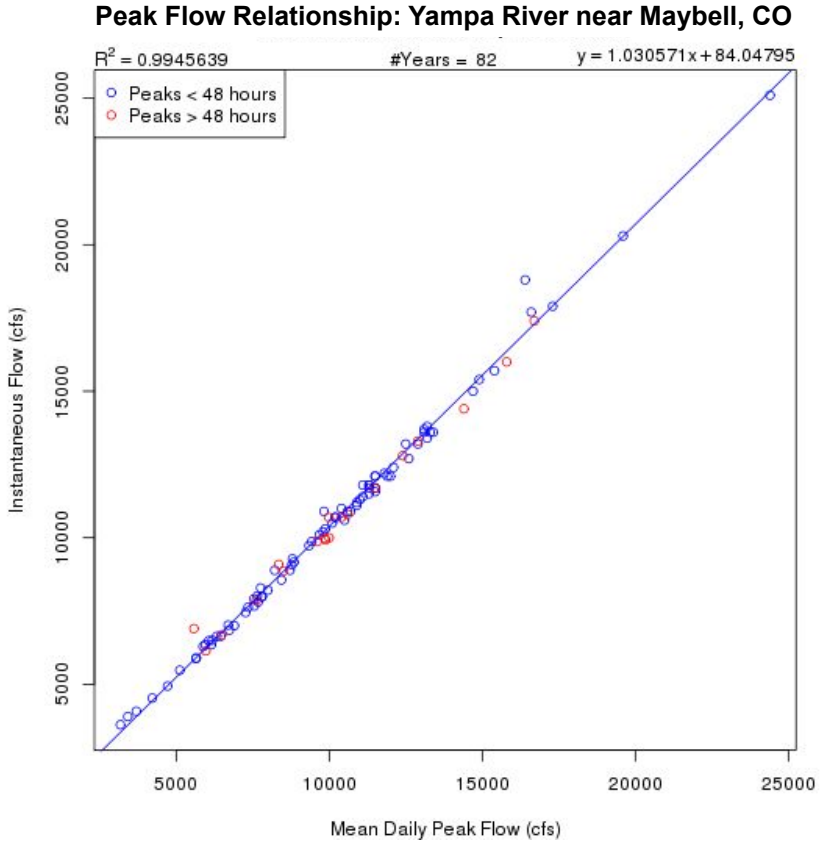


Mean Daily Peak Flow Forecast Graphic Overview



Instantaneous Peak Flow Forecasts

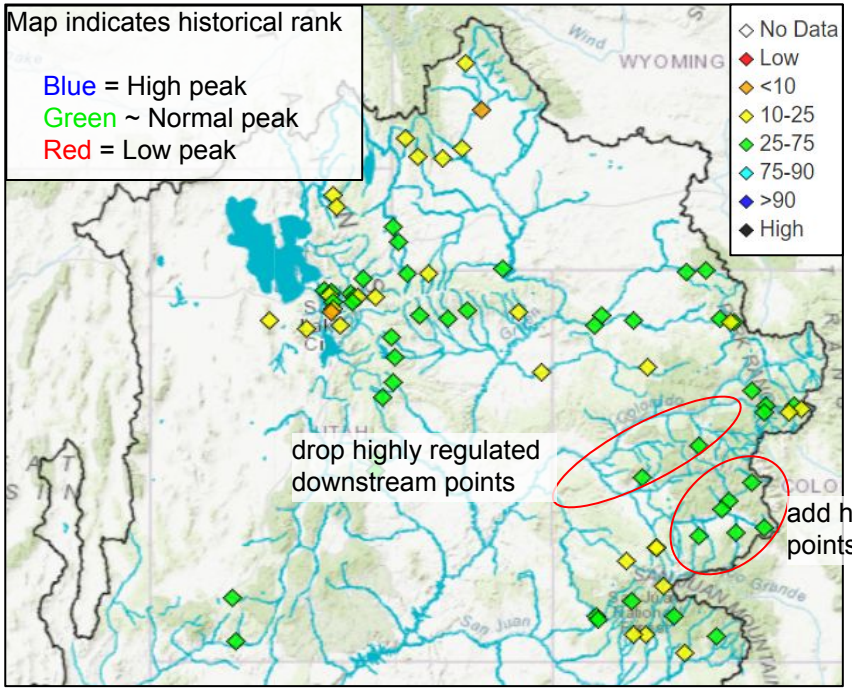
- Relationship between observed mean daily peak and instantaneous peak in each year
- Only available for locations with strong correlations and long historical record
- Sites with frequent heavy rain have poor relationships



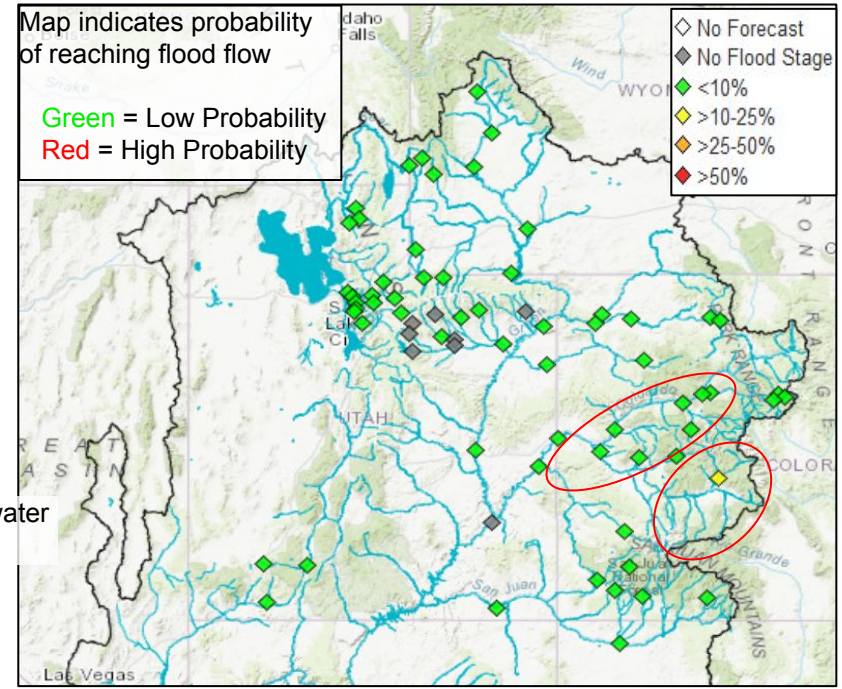
Peak Flow Percentiles Overview

- Peak flow percentile points are a different set of sites than legacy peak flow forecast points (some overlap)
- These points generally have **limited regulation** and a long period of record, but not necessarily an established flood stage.
- This map provides context to the historical record, rather than flood probability.
- Updated daily from raw hydrologic model guidance; no forecaster input.

Model Guidance Peak Flow Percentile Points

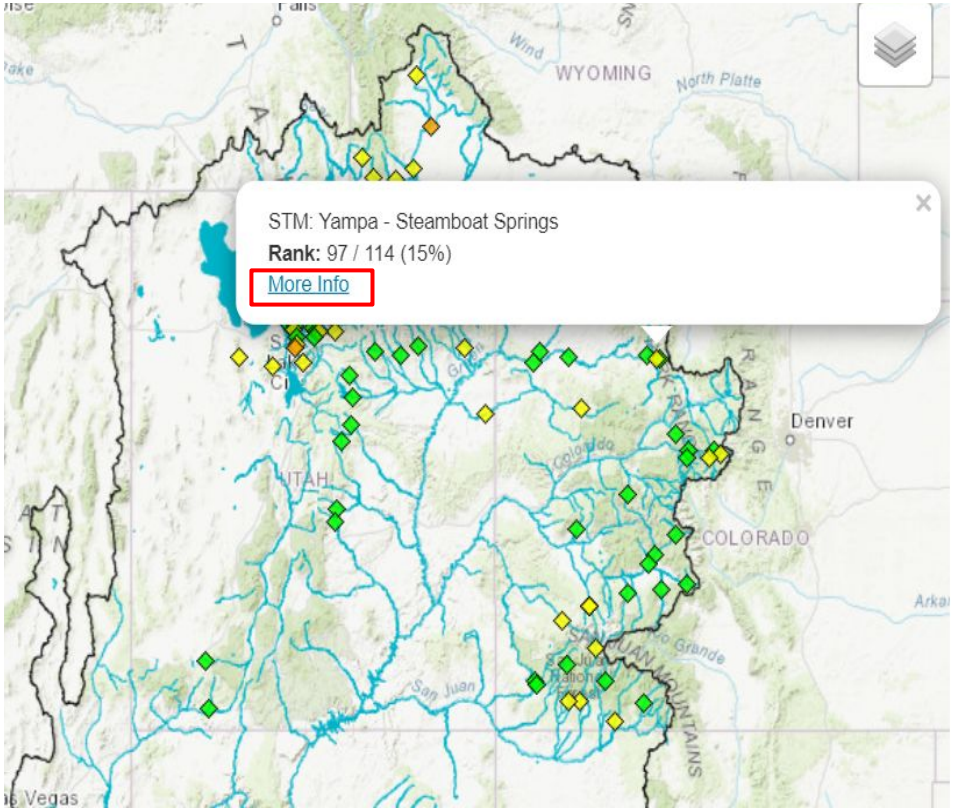


Official Mean Daily Peak Flow Forecast Points



Peak Flow Percentiles Forecast

- Probabilistic (regulated ESP) raw model guidance
  - Ranks the forecast 50% exceedance mean daily peak within the historical record of yearly snowmelt runoff peaks for that site
  - Updated daily
  - Limited regulation - generally headwater sites
- Probabilistic information for time of peak is also available
  - *This will usually point to the 'normal time of peak' until 5-10 days to peak - then it is best to watch the daily deterministic forecasts*
- Available throughout spring snowmelt period
  - Legacy peak flow forecasts stop May 1
  - Helpful for tracking flood/high water potential in late melts and for flows after the seasonal peak



Peak Flow Dashboard

Long Range Probabilistic Peak Flow Guidance: Planning Tool
- Forecast Evolution Plot
- Tabular ESP Forecast
- Probabilistic Forcings
  - 30 years of precipitation and temperature (1991-2020)

Daily Deterministic Streamflow Forecast: Use as time of peak nears
- 10-day streamflow hydrograph
- Tabular 10-day streamflow forecast table
- Deterministic Forcings
  - 10 days of future temperature
  - 7 days of future precipitation

Supplemental Information:
- Model snow: driving peak flow forecasts
- Historical April-July observed peak flows

Peak Flood Potential - STMC2 - Rank: 97 / 114 (15%)

ESP Peak Flow Evolution Plot

ESP Peak Flow Forecast Table

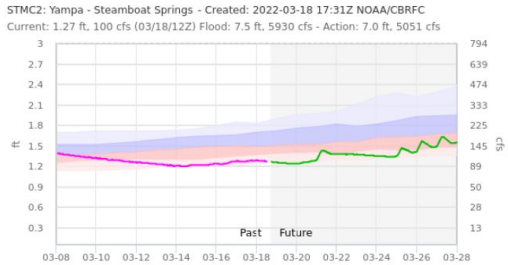
STMC2
ESP Mean Daily Peak
Includes 7 Day Precipitation Forecast
Forecast Date: 2022-03-17 0:0
Flood Flow:
5930 CFS

Exceedance Probability	Mean Flow CFS
min	1580
90%	1870
75%	2020
50%	2360
25%	2730
10%	3380
max	3590

STMC2
ESP Date of Peak
Includes 7 Day Precipitation Forecast
Forecast Date: 2022-03-17
Normal Time of Peak:
05/16 - 06/07

Exceedance Probability	Date of Peak
min	2022-04-28
90%	2022-05-12
75%	2022-05-18
50%	2022-05-29
25%	2022-06-04
10%	2022-06-08
max	2022-06-24

10 Day Streamflow Forecast

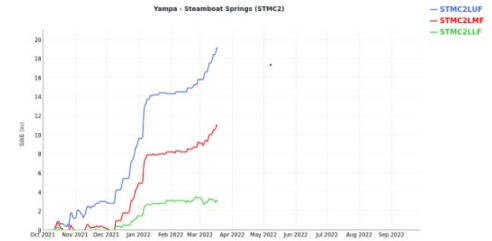


10 day Streamflow Forecast Table

YAMPA - STEAMBOAT SPRINGS
Daily Average Forecast Flow (ending at given date/time)
Units: CFSD
csv file

DATE	TIME	FLOW
3/19/2022	12Z	97
3/20/2022	12Z	95
3/21/2022	12Z	112
3/22/2022	12Z	120
3/23/2022	12Z	118
3/24/2022	12Z	114
3/25/2022	12Z	121

Model Snow



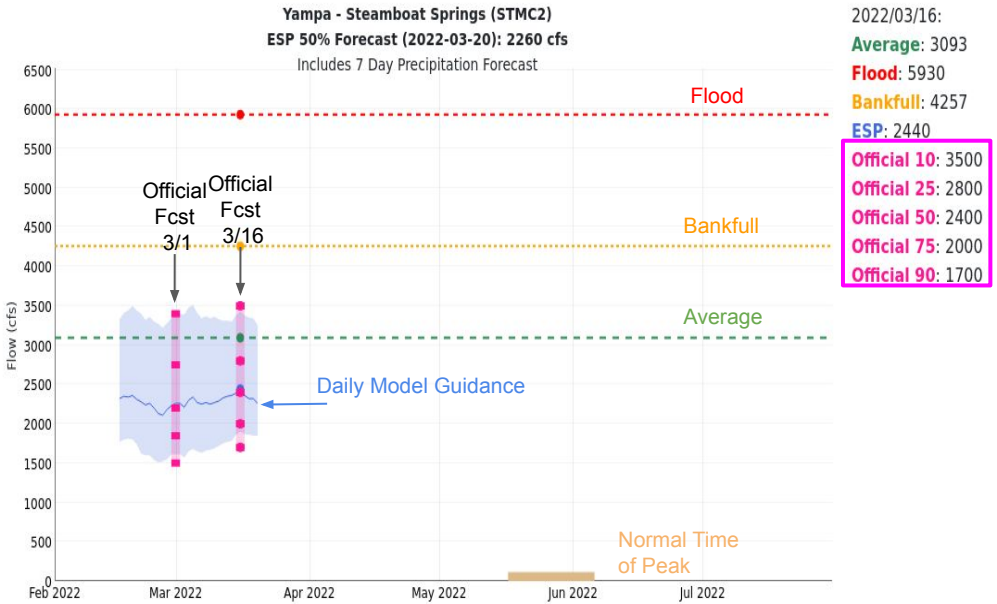
Apr-Jul Historical Peaks

STMC2 QRD5ZZZ Apr-Jul Historical Peaks
High -> Low (reverse table order)
csv file

RANK	YEAR	PEAK	DATE
1	1921	5870.0	6/15
2	1984	5550.0	5/26
3	1917	5280.0	6/20
4	1952	5190.0	6/5
5	1914	5120.0	6/4
6	1957	5100.0	6/8

Peak Flow Dashboard

Peak Flow Evolution Plot



Forecast Evolution Plot:

- Updated daily throughout the runoff period
- Features:
  - Can be used to see trends in forecasts
  - Easily compare model guidance to the average peak
  - Interactive hover gives values in legend

Peak Flow ESP Table

STMC2
ESP Mean Daily Peak
Includes 7 Day Precipitation Forecast
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Exceedance Probability	Mean Flow CFS
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Normal Time of Peak:
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10%	2022-06-08
max	2022-06-24

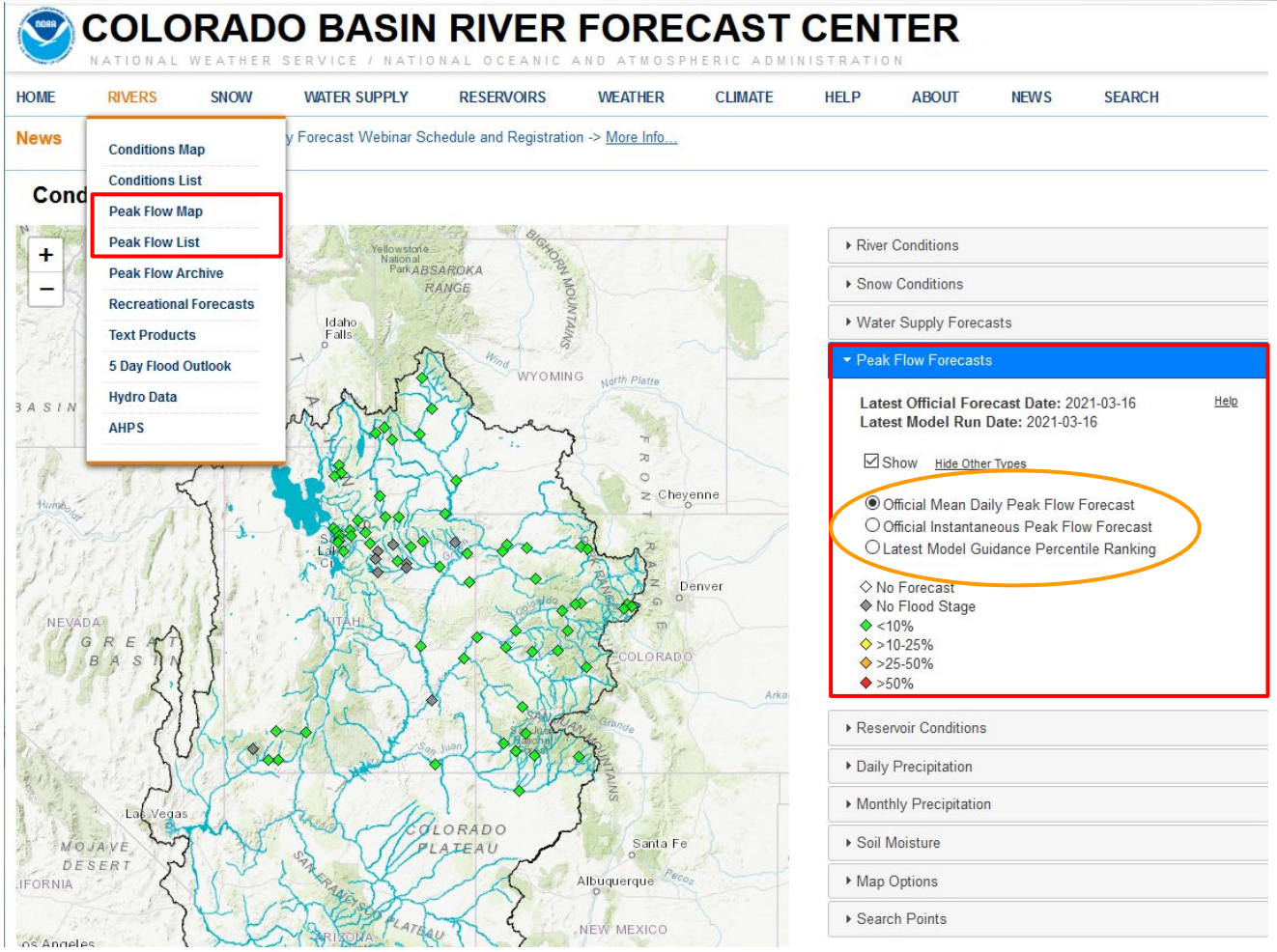
ESP Table:

- Probability of peak magnitude
- Probability of peak date
  - Likelihood for date of peak whatever the magnitude
  - → 90% magnitude not forecast to occur at 90% date of peak

Where to Find Peak Flow Information

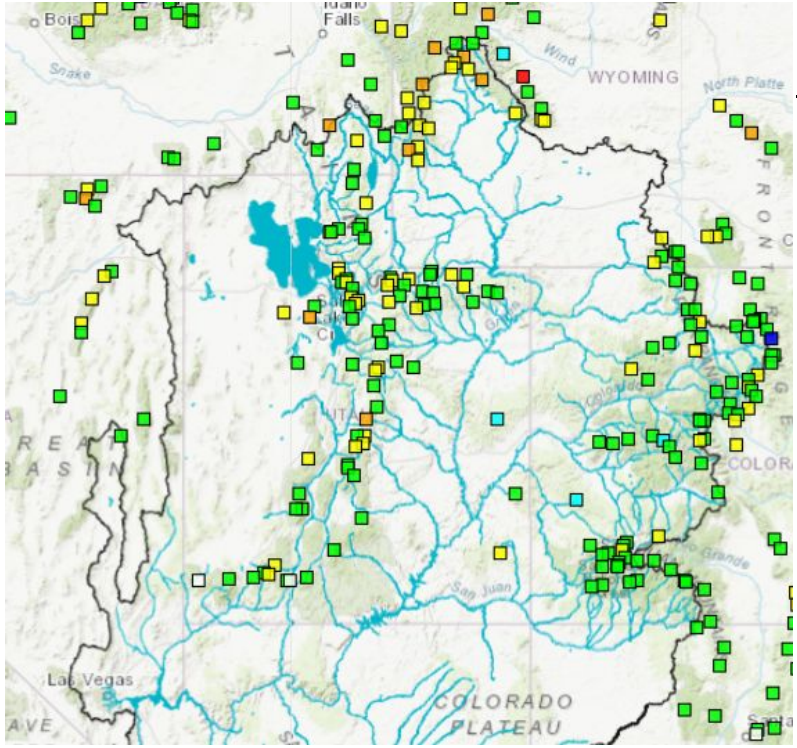
https://www.cbrfc.noaa.gov/

1. Hovering over a point on the map will give the location name
2. Clicking on a point will show a pop-up graph
3. Clicking on the pop-up will open a new page with the graph and more options



Snow Conditions Impacting Spring 2022 Peak Flows

SNOTEL (Observed)
Ranking as of March 21 2022

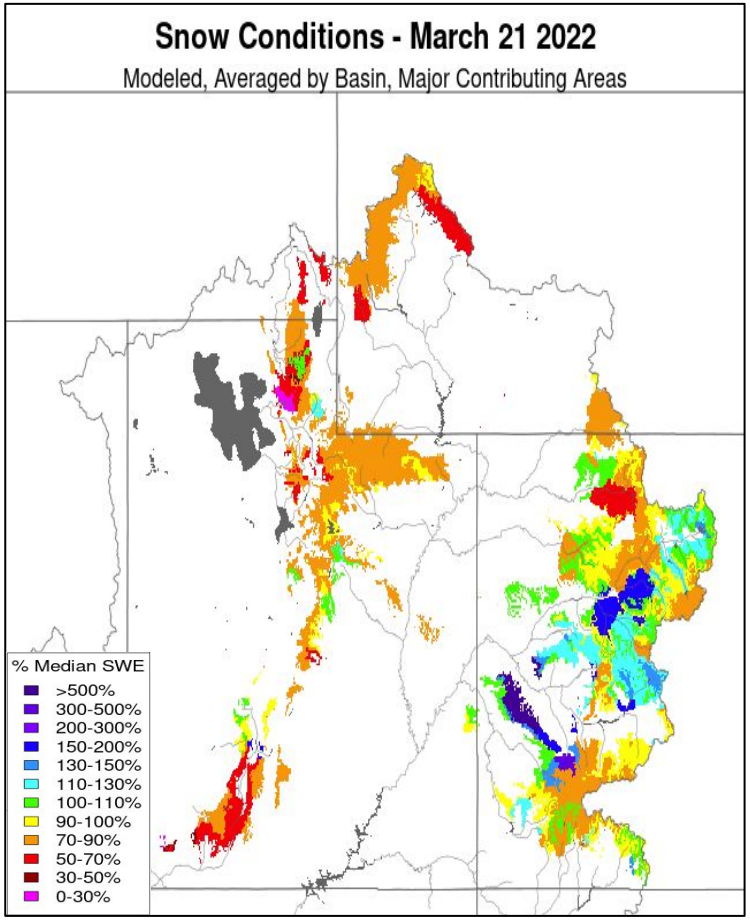


Period of Record
35-40 years

- Percentiles
- Percent Average
- Percent Median

- No Data
- Low
- <10
- 10-25
- 25-75
- 75-90
- >90
- High

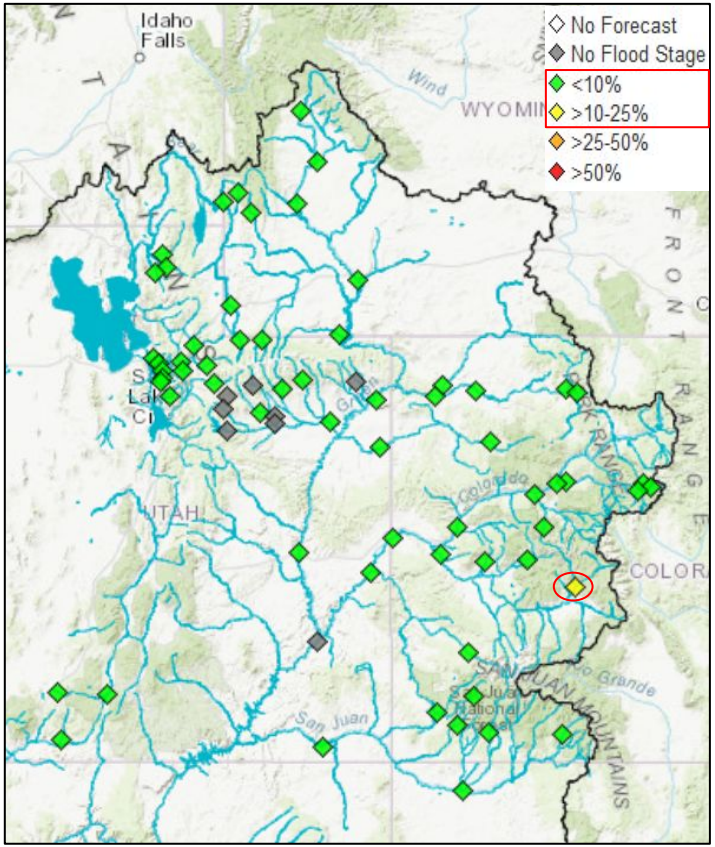
CBRFC Model Snow



Mid-March 2022: Mean Daily Peak Forecasts

Peak flow forecast points alone are not a comprehensive summary of any flood threat.

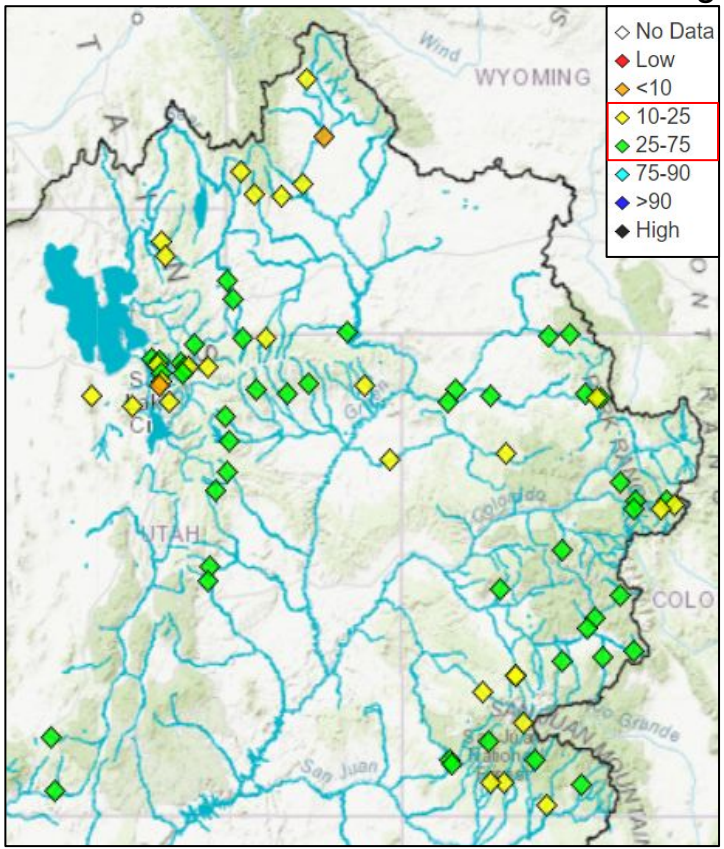
Official Mean Daily Peak Flow Forecast



- <10% chance of reaching flood stage at the majority of mean daily peak flow forecast points
- East River in the Gunnison has that >10% and <25% chance of hitting flood stage.

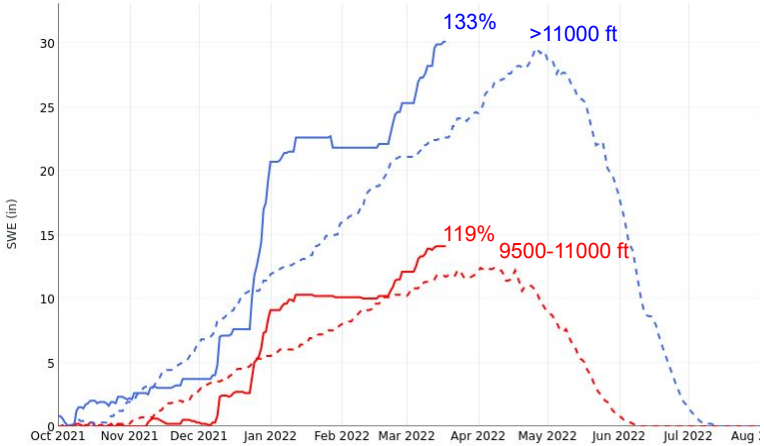
- Majority of sites on percentile ranking map indicate expected peaks will be in the bottom 50th percentile of the historical record

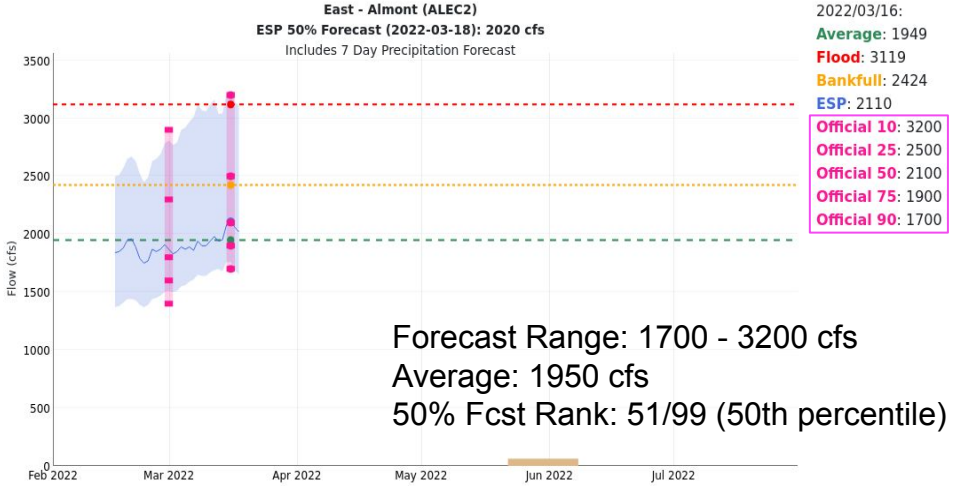
Latest Model Guidance Percentile Ranking



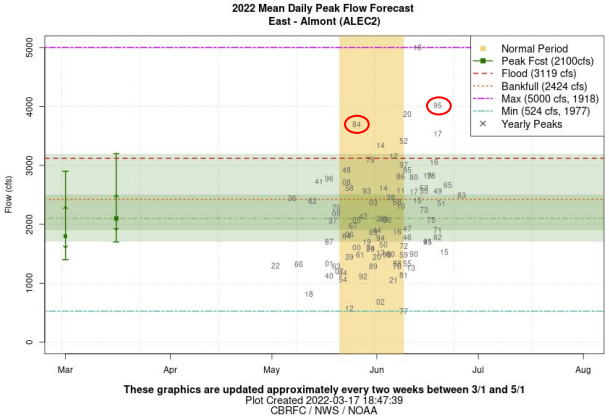
Mid-March 2022 Mean Daily Peak Forecasts: East River- Almont

Model Snow: East River-Almont





Forecast Range: 1700 - 3200 cfs
Average: 1950 cfs
50% Fcst Rank: 51/99 (50th percentile)

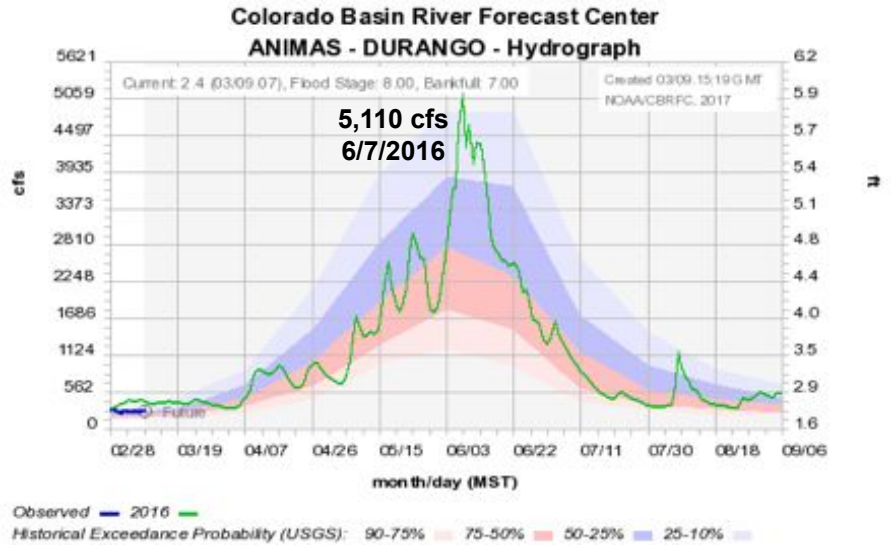


Peaks > 3100 cfs since 1980
1984: 3700 cfs 5/26
1995: 4020 cfs 6/13

Impacts of Spring Weather (Temperature)

Animas River at Durango, CO - March 1, 2016 Peak Flow Forecast				
90%	75%	50%	25%	10%
2800	3100	3600	4300	4700

Normal Peak Period: 5/20 - 6/8

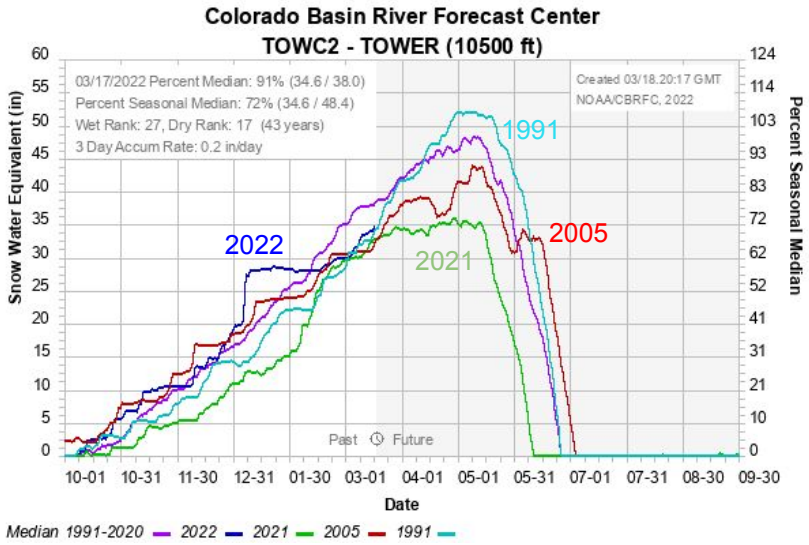


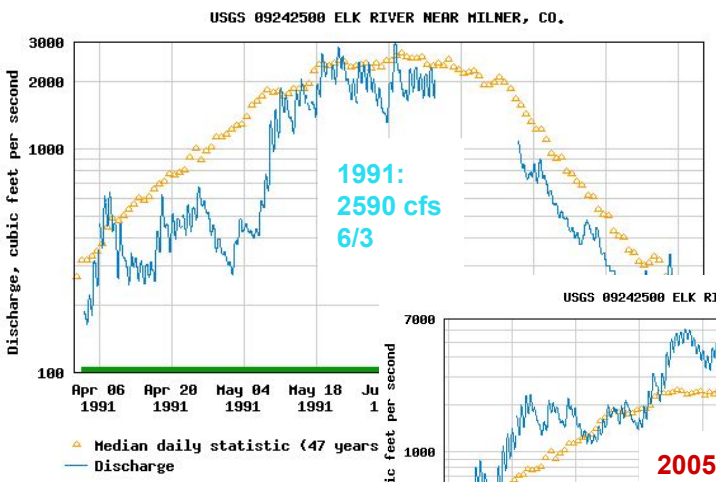
Durango, CO Temperatures

2-6 degrees below normal last 10 days of May

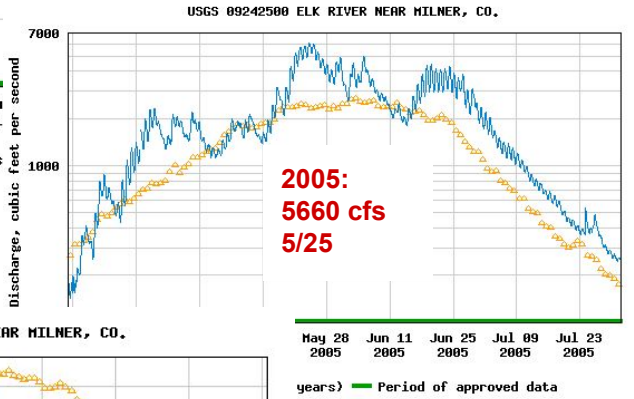
10 degrees above normal by June 5th

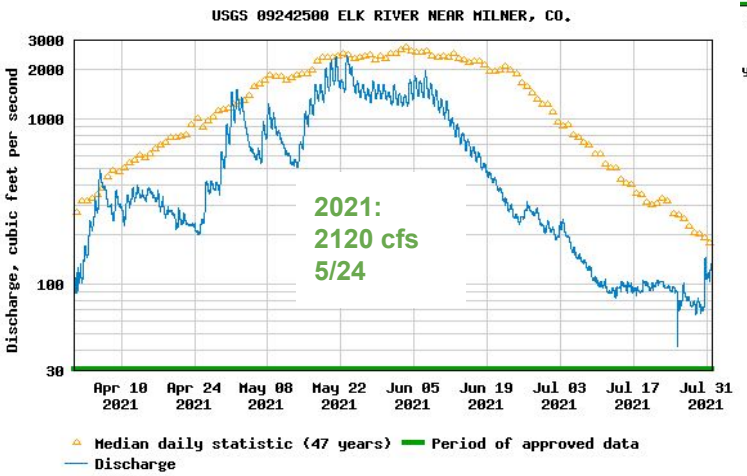
Impacts of Spring Weather





Normal Time of Peak:
5/16-6/6

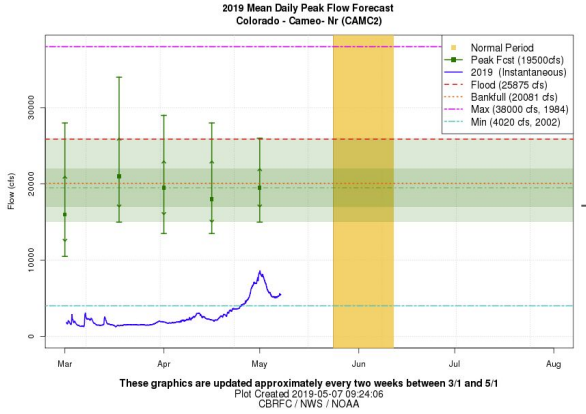




Transition to using daily model for guidance

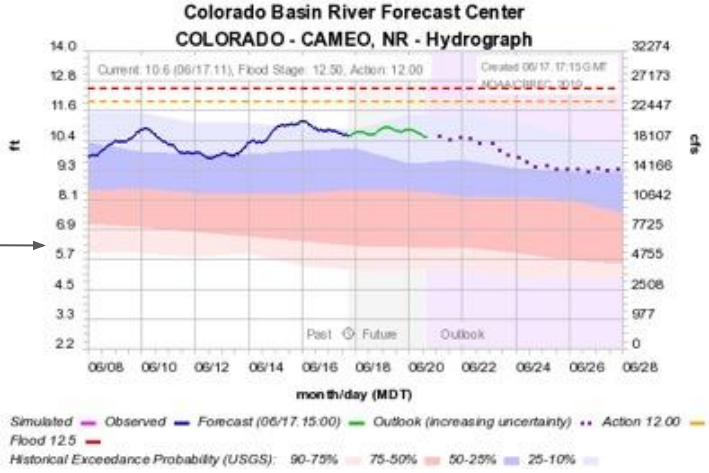
- As the time of peak nears, transition from using probabilistic guidance to using the daily deterministic forecasts.
- The deterministic model extends 10 days into the future and uses 7 days of precipitation forecasts (with zero for days 8-10) and 10 days of temperature forecasts from meteorological models.
  - The probabilistic model uses 7 days of both precipitation and temperature forecasts and then 30 years of historical data.
- The deterministic model includes observed (and planned, if known) reservoir releases and diversion flows that are extended through the forecast period and routed downstream.
  - The probabilistic model uses rules or historical operations.
- Deterministic forecast hydrographs can be accessed either from our front webpage or through the Peak Flow Dashboard.
  - The official mean daily peak flow graphics are discontinued and the forecast list indicates ‘peaking soon’ or ‘peak has already occurred’.

Probabilistic Peak Flow Forecast

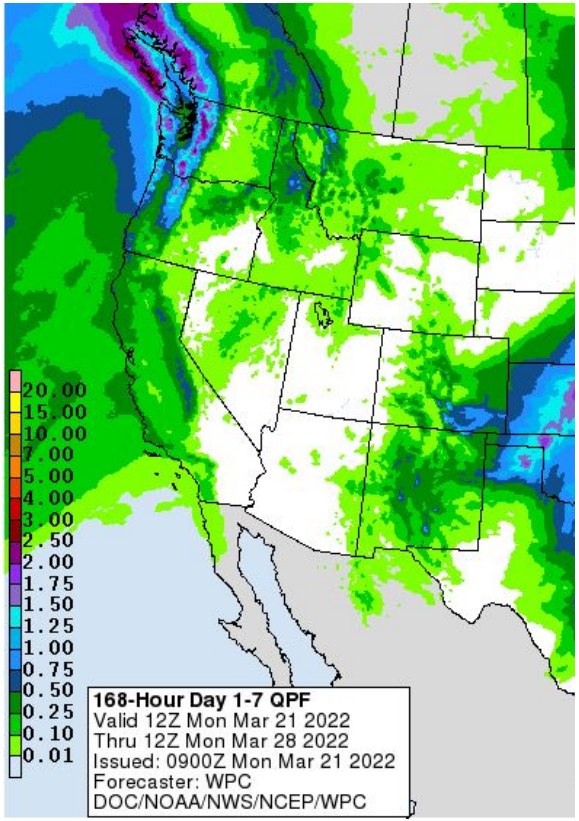


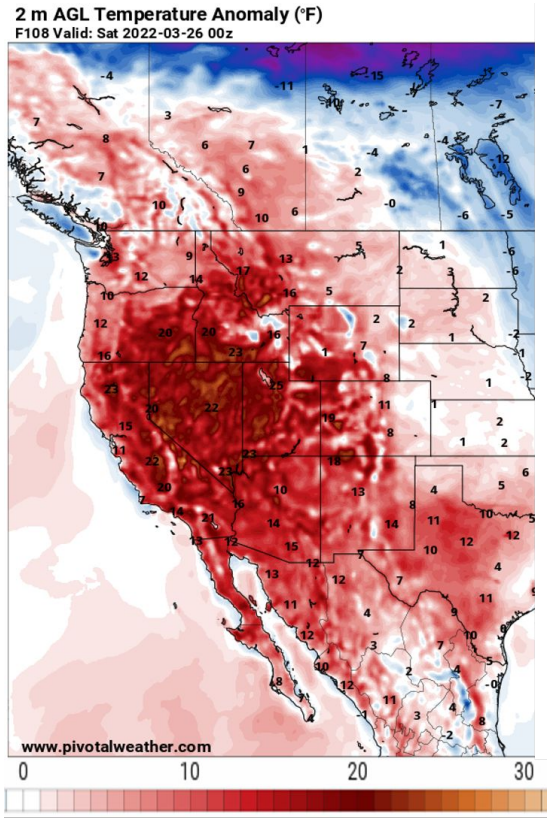
Peak Flow Dashboard

Deterministic Flow Forecast



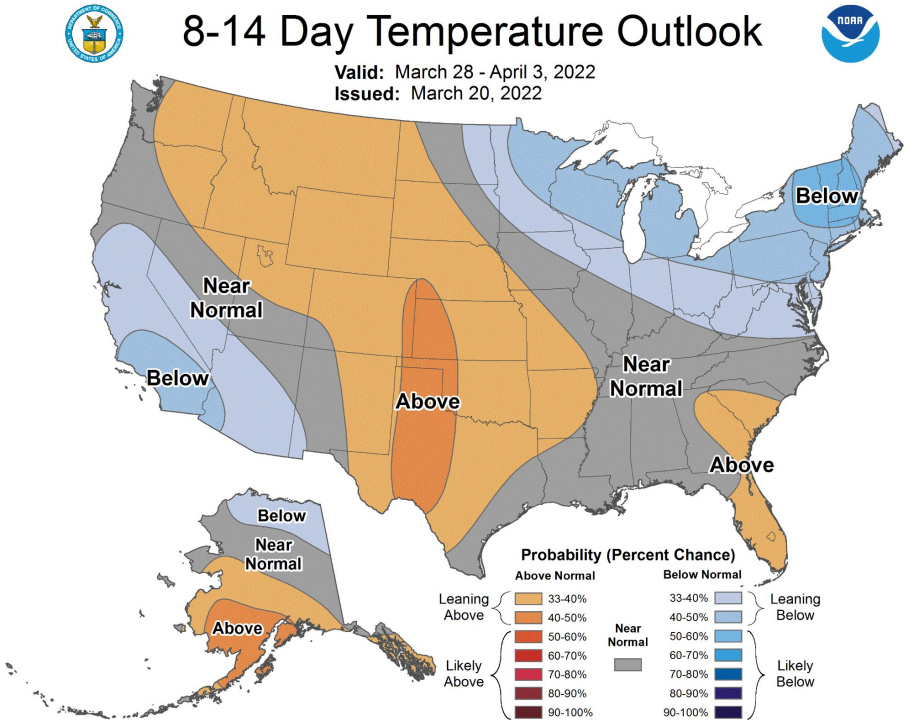
Upcoming Weather: WPC March 21 - 28 Precipitation Outlook

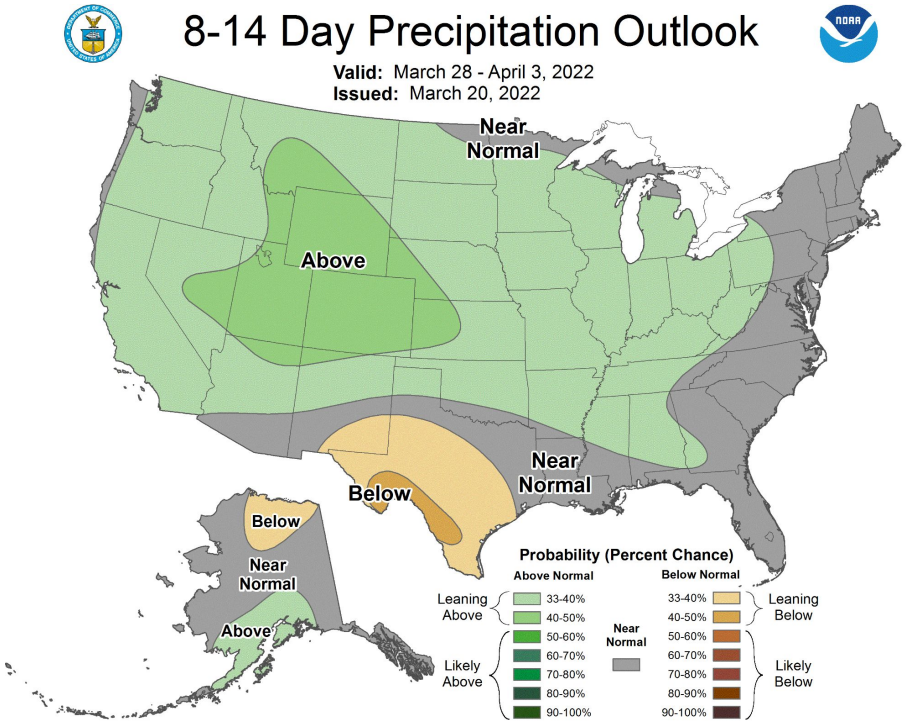




- The trough that brought precipitation throughout the area this weekend will move east today
  - Showers will linger through Wednesday along the divide, though precip amounts will be low.
- An Eastern Pacific ridge will move west, and remain over the Western US through the weekend.
- A warming trend associated with the ridge will bring well above average temperatures across the region.

Upcoming Weather: 8 to 14 day outlook (March 28 - April 3)





A potential trough moves in at the start of next week, signaling elevated odds of above average precipitation, with below normal temperatures Southwest to above average temperatures North and East. Uncertainty in the models is high at this time.

Peak Flow and Flood Threat Summary

- Snowmelt runoff peak flows are likely to below average for most locations in the Great Basin and Colorado River Basin.
  - Exceptions:
    - Near to above average peaks
      - Gunnison River- Northern half of the basin
      - Upper Colorado-Roaring Fork Basin

- While flooding is not expected at this time given current conditions, keep in mind:
  - Forecast procedures do not exist for all locations.
  - Rain events during snowmelt can be cause for concern in any year.
  - In most cases the significance of any snowmelt flood threat doesn't identify itself until April through mid-May.

- Peak flow forecasts have a high level of uncertainty and are highly dependent on Spring weather.

2022 Water Supply Webinar Schedule

**All Times Mountain Time (MT)*

Colorado River Basin

~~Friday~~	~~Jan 7th~~	~~10 am~~
~~Monday~~	~~Feb 7th~~	~~10 am~~
~~Monday~~	~~Mar 7th~~	~~10 am~~
Thursday	Apr 7th	10 am
Friday	May 6th	10 am

Great Basin

~~Friday~~	~~Jan 7th~~	~~11:30 am~~
~~Monday~~	~~Feb 7th~~	~~11:30 am~~
~~Monday~~	~~Mar 7th~~	~~11:30 am~~
Thursday	Apr 7th	11:30 am
Friday	May 6th	11:30 am

Additional briefings scheduled as needed

Webinar schedule & registration information has been posted to the CBRFC web page

https://www.cbrfc.noaa.gov/

CBRFC Webinar Registration & Email List

Colorado Basin River Forecast Center
National Weather Service

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Webinars
Email Updates

Friday, January 7, 2022: CBRFC Water Supply Webinars. Registration: More Info
The first Official Forecast for water year 2022 is now available: Forecast Map

email **cbrfc.webmasters@noaa.gov**
subject line: **email notification list**

This list is used to provide notification when webinars are scheduled, water supply forecasts are updated, and for other news of interest to our stakeholders regarding CBRFC operations.

CBRFC Water Supply Forecast Webinar Schedule & Registration - Water Year 2022

The Colorado Basin River Forecast Center (CBRFC) produces water supply forecasts for the Colorado River Basin and the eastern Great Basin.
CBRFC conducts December through May webinars explaining the forecasts and current conditions.

Follow the links below to register for a webinar.

Early Season Water Supply Outlook Webinar
Wednesday December 15 @ 10 am MT

Colorado River Basin Water Supply Webinars
Friday January 7 @ 10 am MT
Monday February 7 @ 10 am MT
Monday March 7 @ 10 am MT
Thursday April 7 @ 10 am MT
Friday May 6 @ 10 am MT

Utah Water Supply Webinars
Friday January 7 @ 11:30 am MT
Monday February 7 @ 11:30 am MT
Monday March 7 @ 11:30 am MT
Thursday April 7 @ 11:30 am MT
Friday May 6 @ 11:30 am MT

Peak Flow Webinar
Thursday March 17 @ 10 am MT

A notification email will be sent if a date or time change occurs. Additional webinars are scheduled as needed.
The webinar slides will be available on the CBRFC presentations page soon after each briefing.

2022 Presentations

Overview of the 1991-2020 Normal Period and Model Impacts Presentation during Reclamation's October 24-Month Study Rollout
Slides (.pdf)

2022 Early Season Water Supply Outlook
Slides (.pdf)
Recording (.mp4)

CBRFC Contacts & WY22 Basin Focal Points

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