USDA United States Department of Agriculture

Colorado Snow Surveys

CSU Extension – Drought Leadership Training

Water Supply Planning Information Resources and Runoff Projections

Feb 4, 2022

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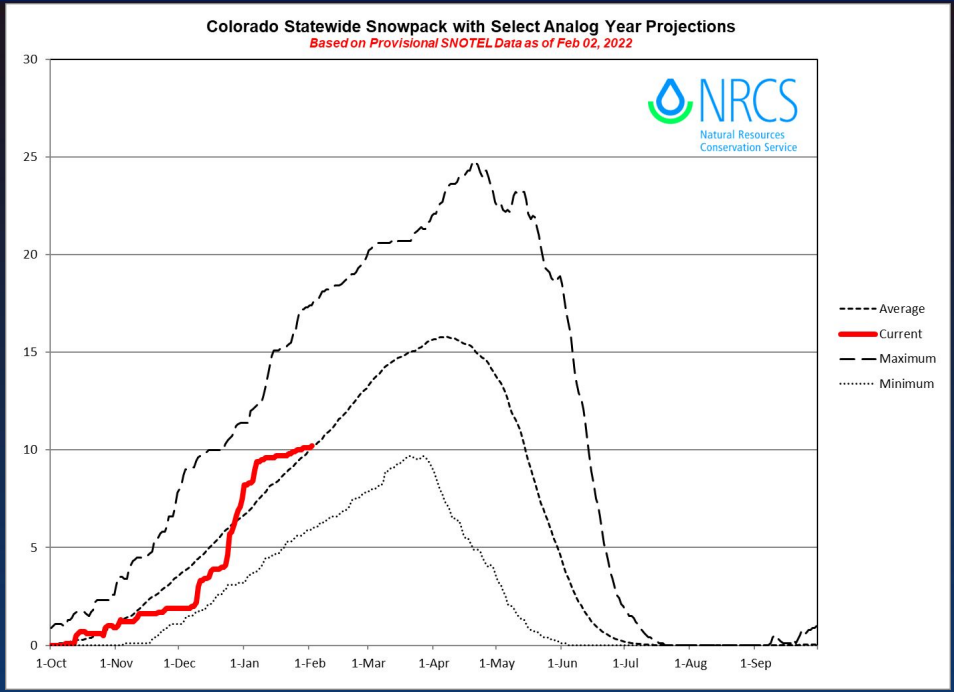
Website - Colorado Snow Survey

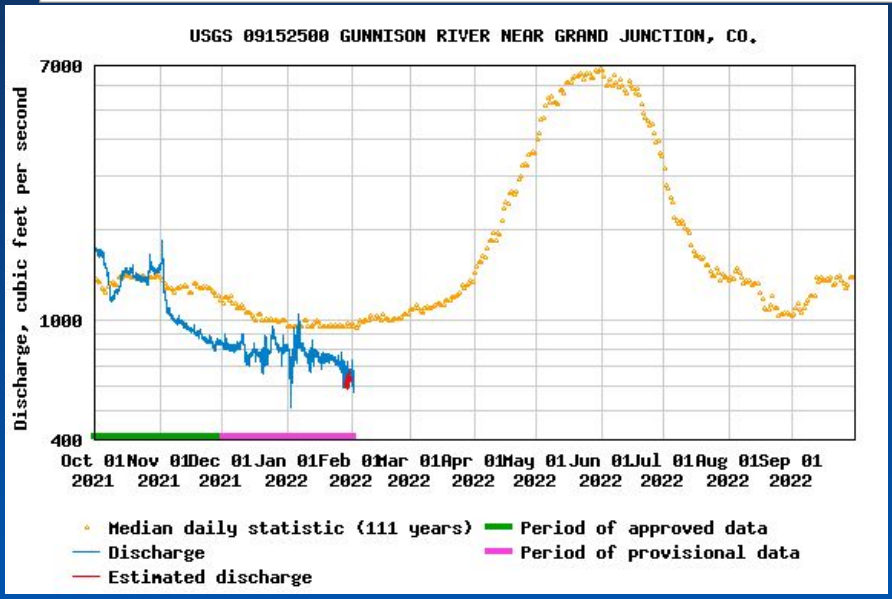
Forecasting Runoff – How much? With what confidence?

Presentation Preview

- Tools to better understand prospects for future runoff
  - Snowpack
  - Forecasts
  - How they work
- How to interpret those tools
- How the tools apply to triggers and scenarios
- Where to access the tools and data

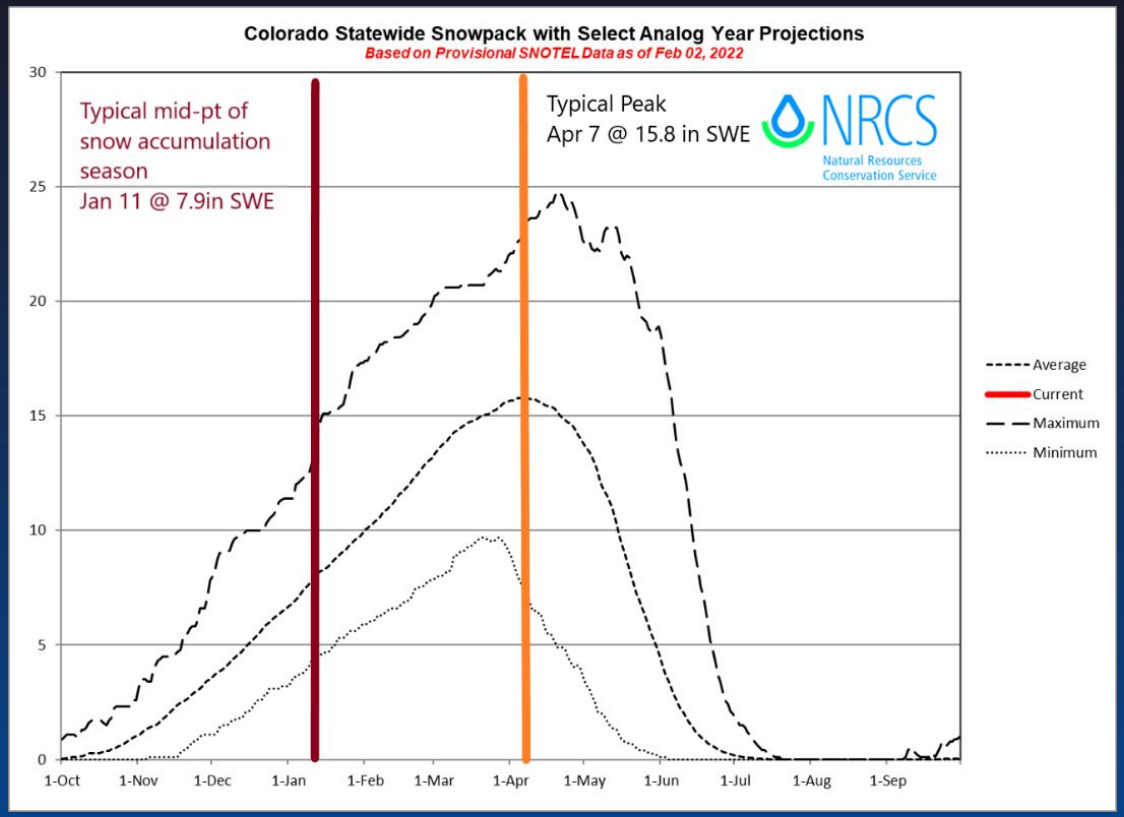
Colorado Snow Surveys



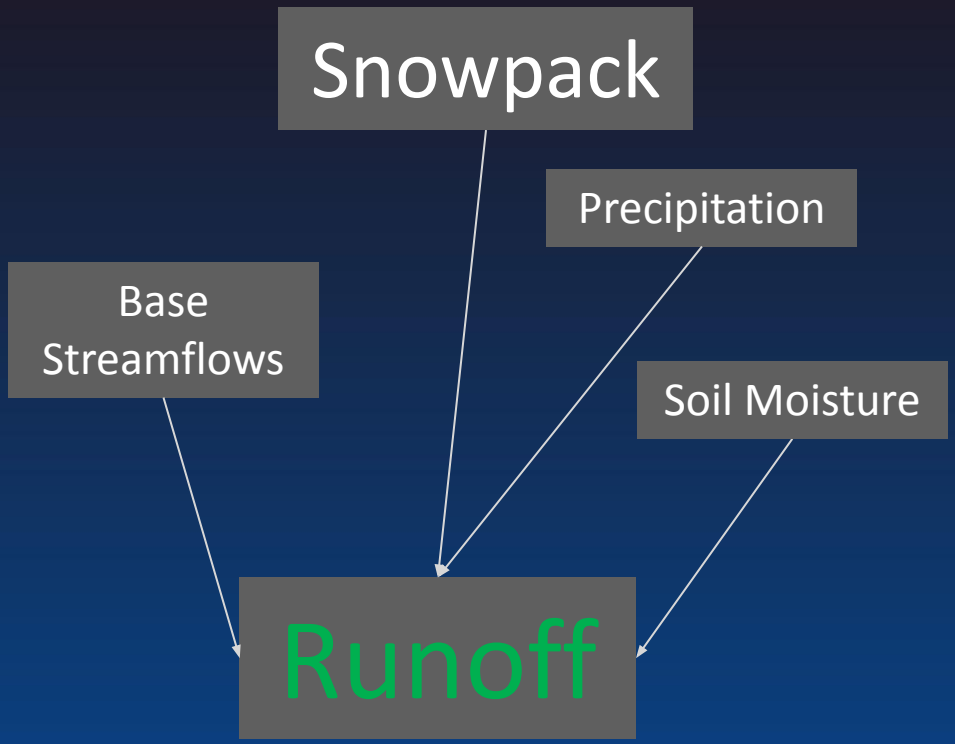


- Snowpack is often the largest driver of runoff in Colorado.

Colorado Snow Surveys

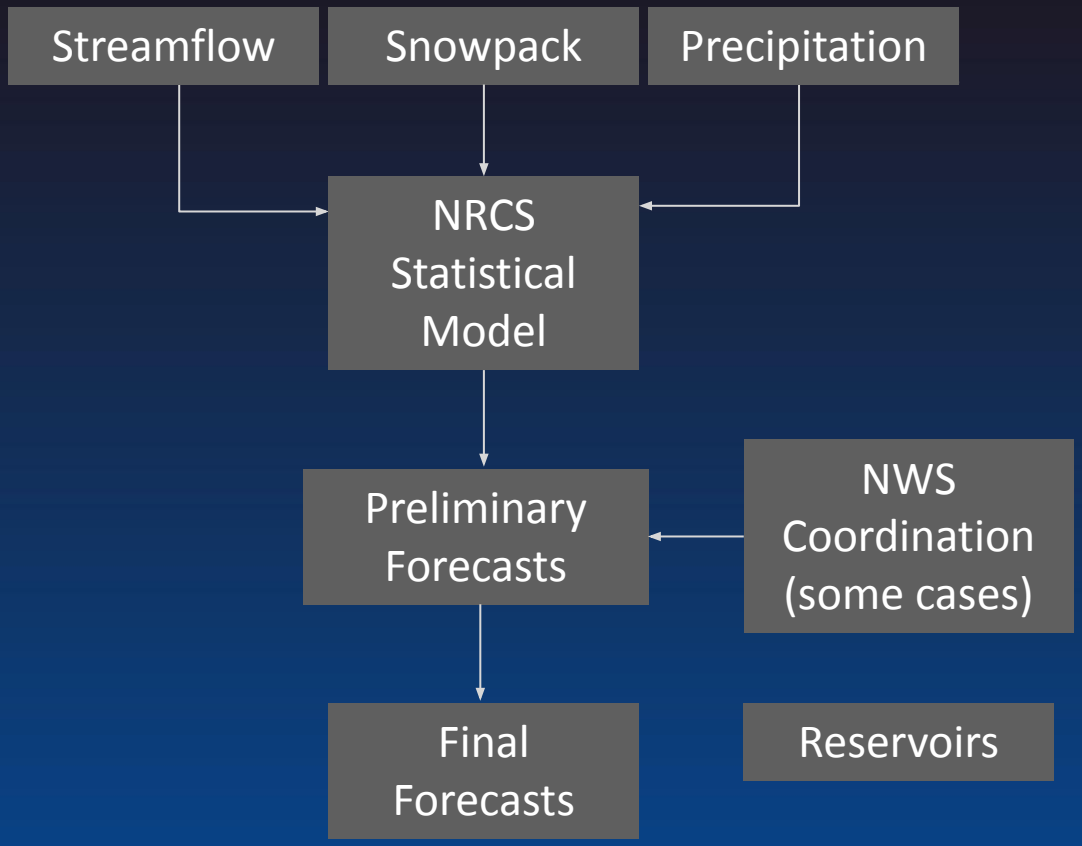


- Snowpack is often the largest driver of runoff in Colorado.
- Runoff indicators can be gleaned from snowpack levels



- Streamflow forecasts are the best indicator of expected runoff
- However, it is not the best indicator of how much runoff to expect

Colorado Snow Surveys



- Streamflow forecasts are the best indicator of expected runoff

Other forecasting entities exist, such as National Weather Service (NWS) River Forecast Centers (RFC) - provide streamflow forecasts in addition to NRCS.

Water Supply Forecasts

- Are provided in monthly volumetric increments
  - Total volumetric flow are regularly provided, i.e. Apr-July or Apr-Sept
- Unimpeded flows – forecasts DO NOT account for reservoir changes and irrigation withdraws
- Outputs present as a range of probabilistic outcomes at different exceedances. Not so much as single values.
- Weather (precipitation) forecasts are not included in streamflow forecasts because weather forecasts beyond seven days are very inaccurate. Streamflow forecasts are longer term forecasts.
- Statistical nature of forecasts account for near normal future precipitation

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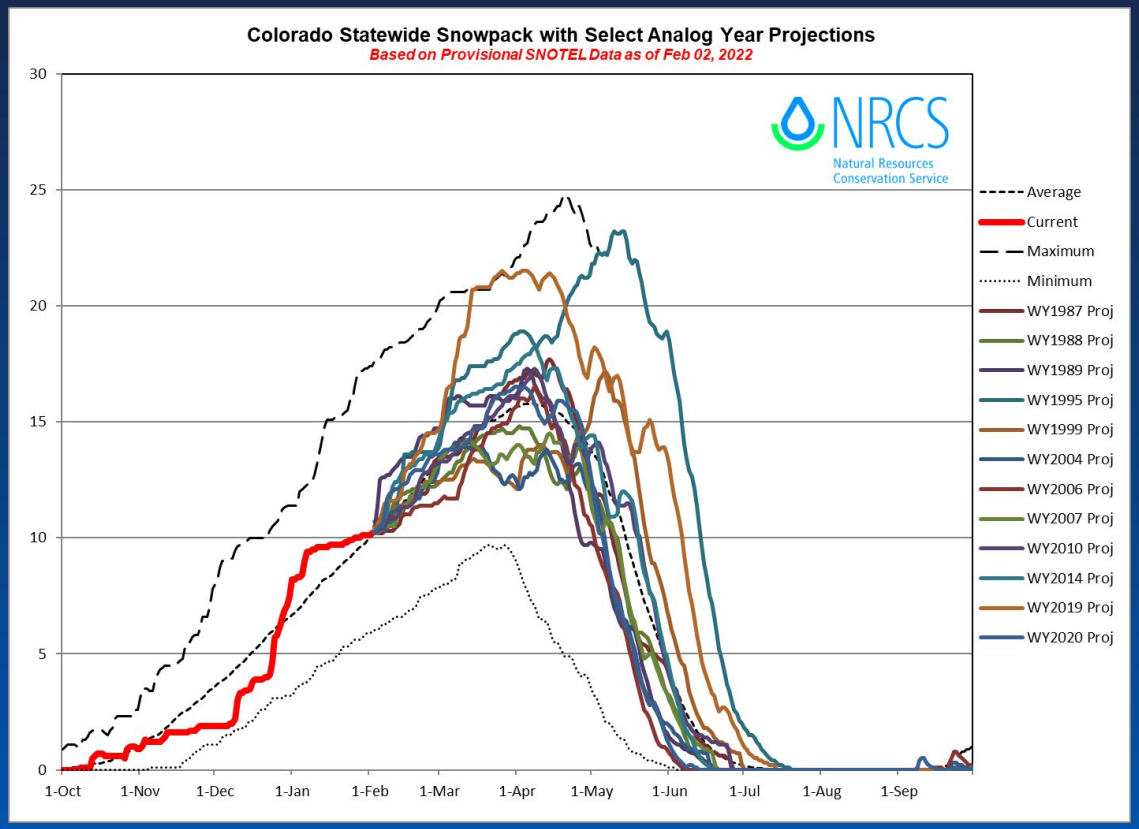
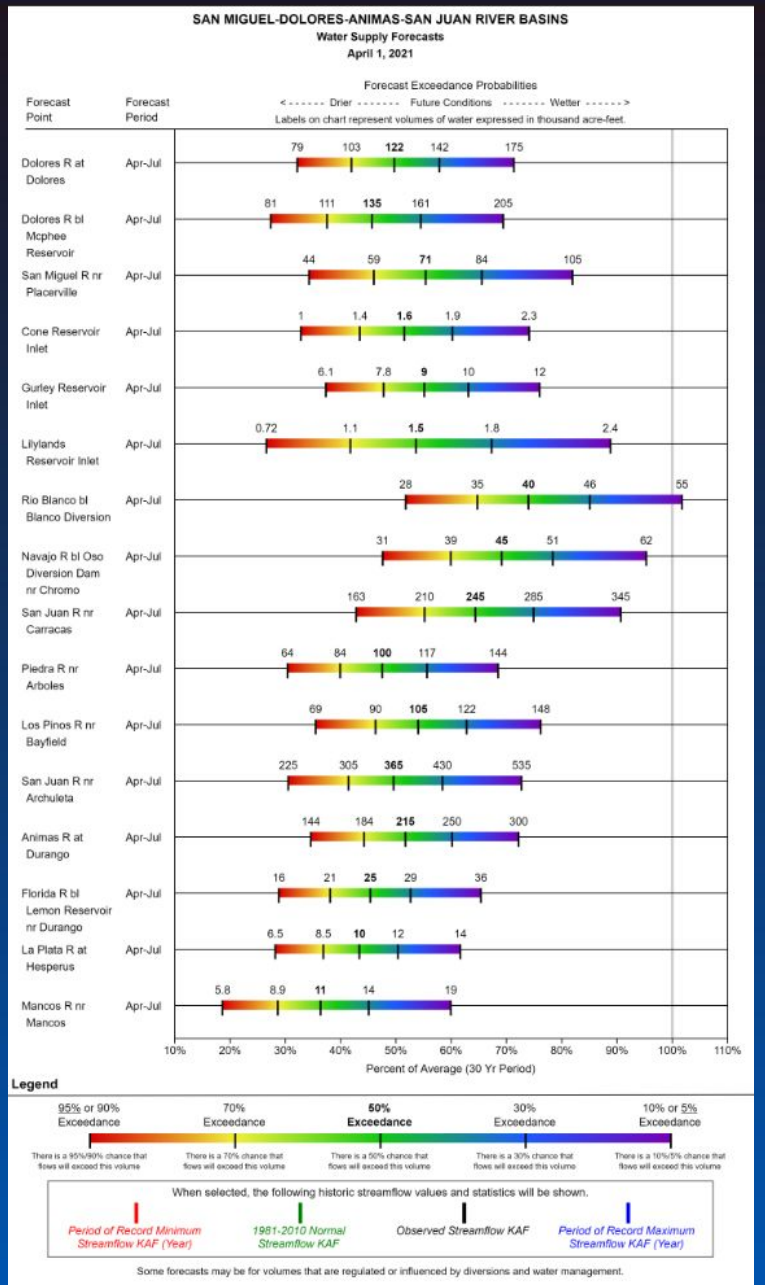
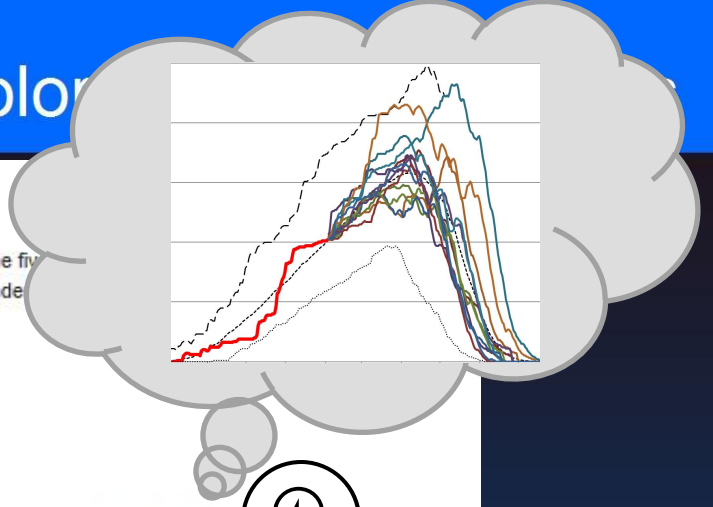




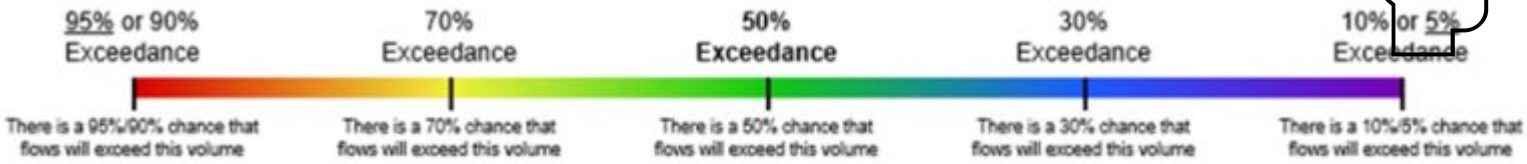


Interpreting Water Supply Forecast Charts

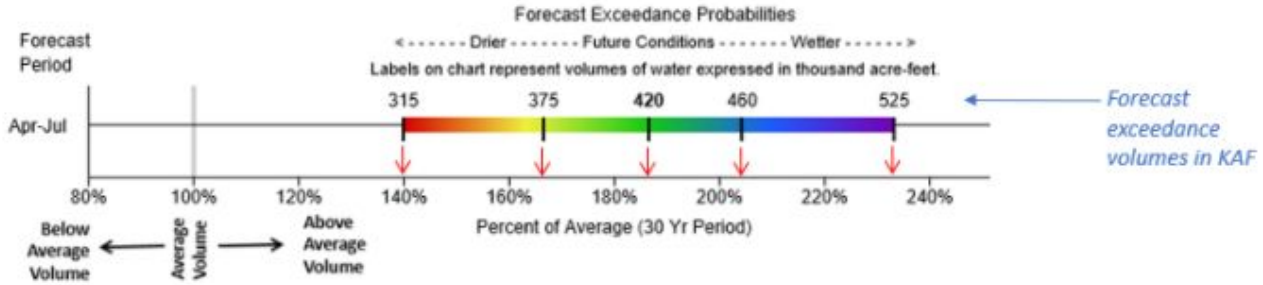
Typically, the Natural Resources Conservation Service (NRCS) has presented streamflow forecasts as a table format showing the fi
year median (or average) as follows. The examples below show a comparison to the 30-year average, but the default central tende

Forecast Exceedance Probabilities for Risk Assessment Chance that actual volume will exceed forecast							
Forecast Period	90% (KAF)	70% (KAF)	50% (KAF)	% Avg	30% (KAF)	10% (KAF)	30yr Avg (KAF)
APR-JUL	315	375	420	187%	460	525	225

The Forecast Chart provides a visual alternative to the table. The forecast range is represented by a colored bar. Vertical lines on the bar signify the five forecast exceedances.

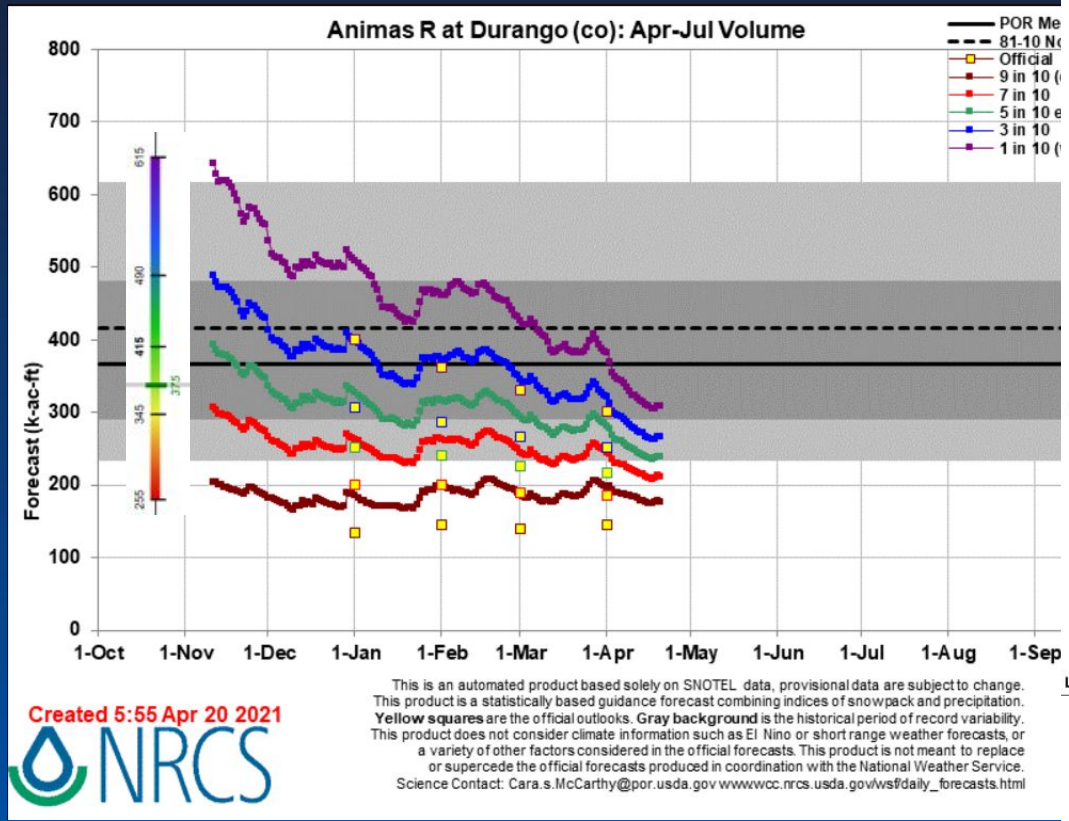


Below is an example. The numbers above the forecast bar are the five exceedance probability volumes in thousand acre-feet (KAF). Each exceedance forecast's percent of average can be estimated by looking at the horizontal axis. The gray line centered above 100% on the horizontal axis represents the 1991-2020 historical average streamflow for the forecast period.



In the example, the entire forecast bar is shifted right of the gray line indicating a forecast for above average streamflow. The 50% exceedance is represented by the black line in the green portion of the colored bar. This represents a forecast volume of 420KAF which is ~185% of average. If drier than normal future conditions occur the 70% exceedance forecast may be more likely (375KAF or ~165% of average). If future conditions turn wetter than normal, the 30% exceedance forecast may be more likely (460KAF or ~205% of average). Water users are encouraged to consider the range of forecast exceedances instead of relying solely only on the 50% forecast.

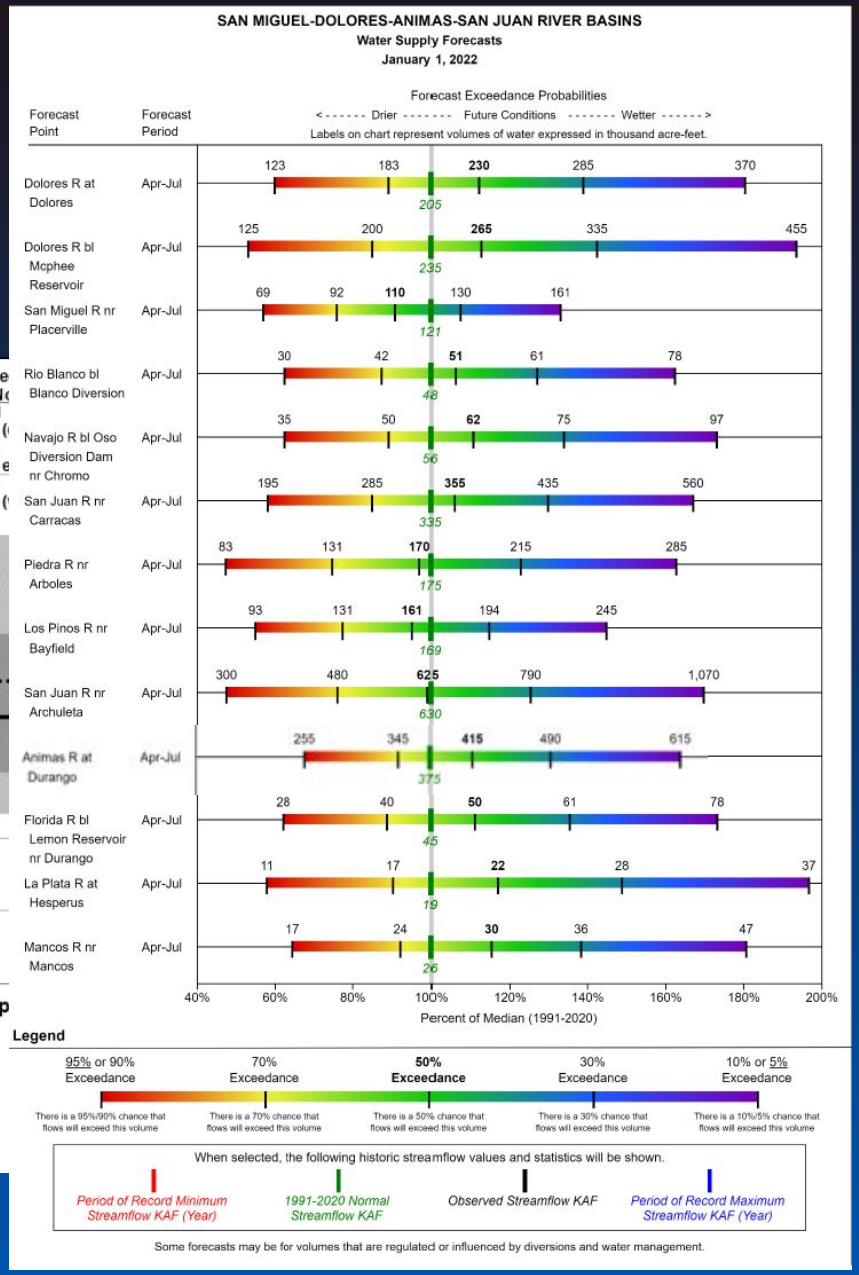
What to Anticipate Moving Forward



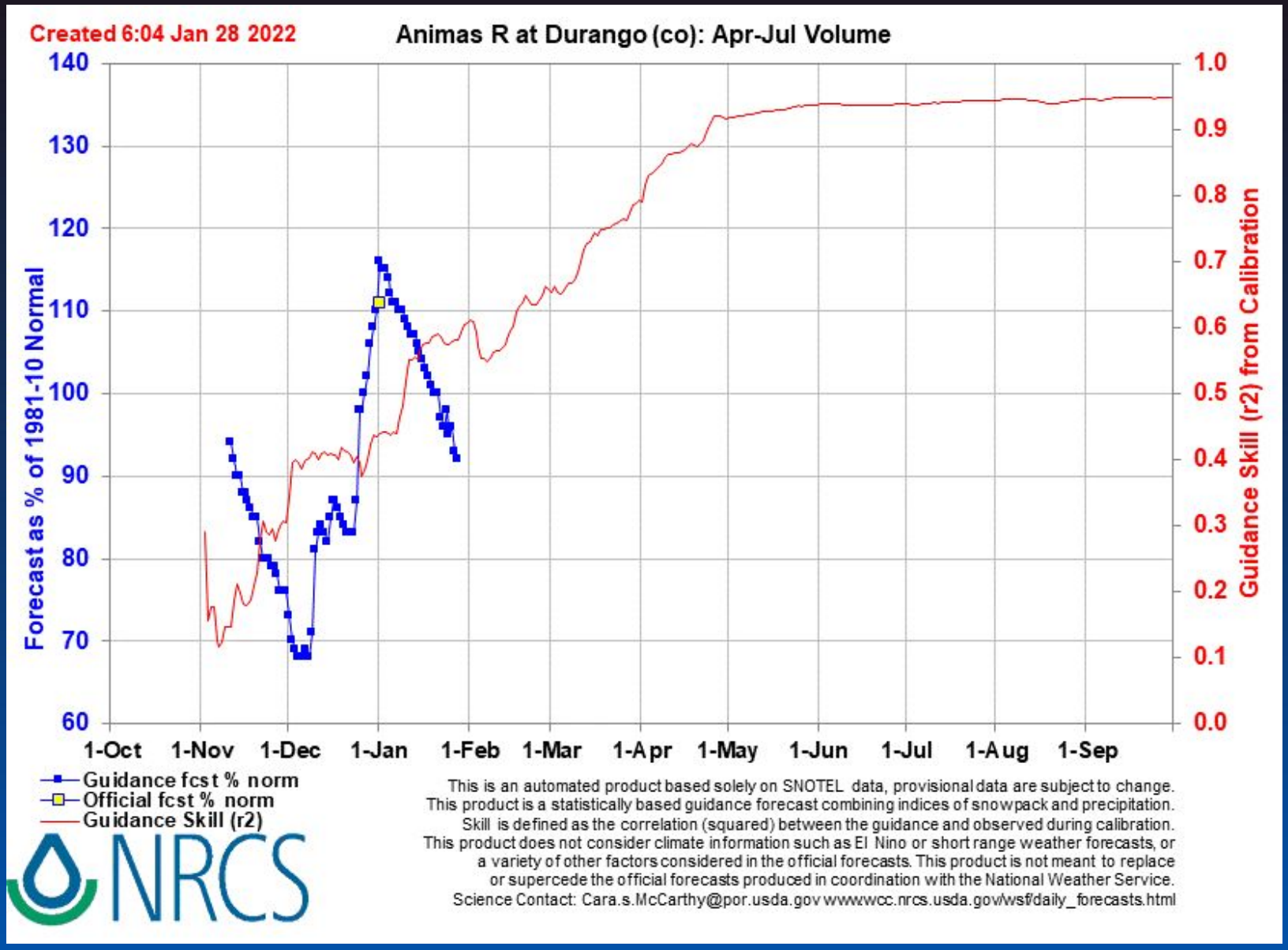
Created 5:55 Apr 20 2021

NRCS

This is an automated product based solely on SNOTEL data, provisional data are subject to change. This product is a statistically based guidance forecast combining indices of snowpack and precipitation. **Yellow squares** are the official outlooks. **Gray background** is the historical period of record variability. This product does not consider climate information such as El Nino or short range weather forecasts, or a variety of other factors considered in the official forecasts. This product is not meant to replace or supercede the official forecasts produced in coordination with the National Weather Service. Science Contact: Cara.s.McCarthy@por.usda.gov wwwwcc.nrcs.usda.gov/wsf/daily_forecasts.html



Colorado Snow Surveys



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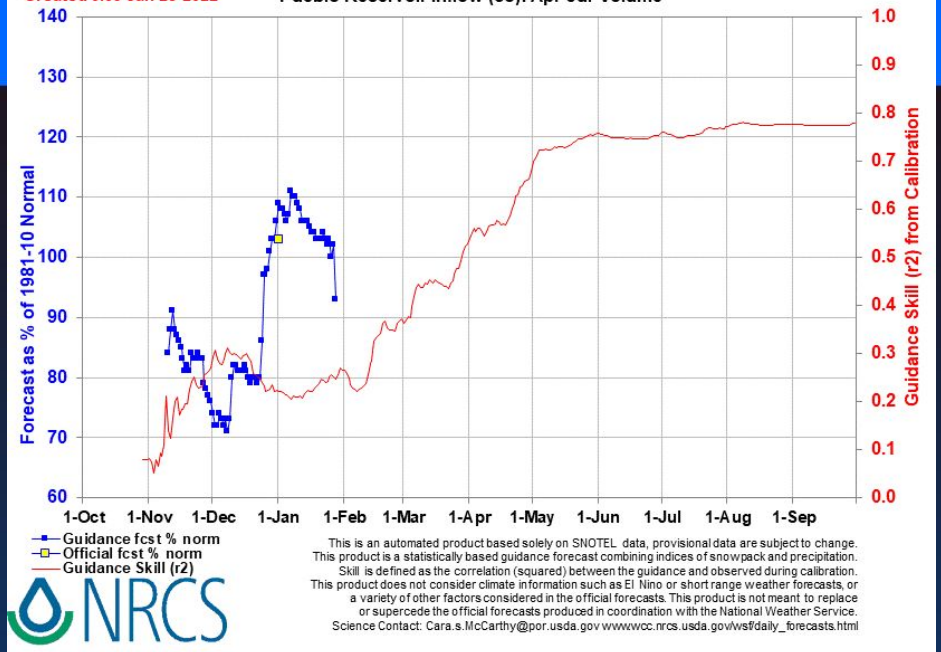
Pueblo Reservoir Inflow (co): Apr-Jul Volume



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Science Contact: Cara.s.McCarthy@por.usda.gov wwwwcc.nrcs.usda.gov/wsf/daily_forecasts.html

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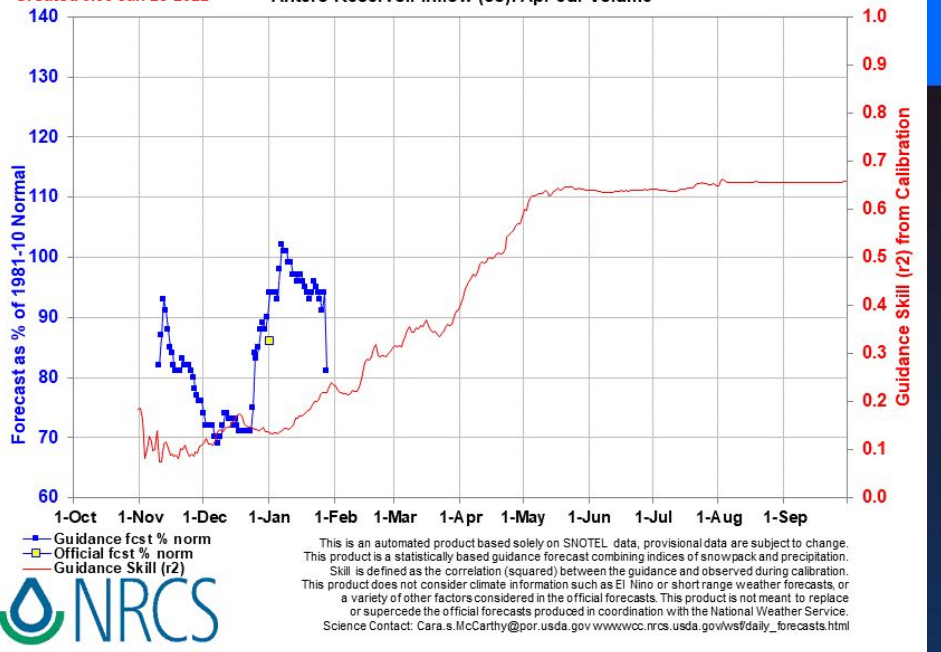
Antero Reservoir Inflow (co): Apr-Jul Volume



NRCS

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Science Contact: Cara.s.McCarthy@por.usda.gov wwwwcc.nrcs.usda.gov/wsf/daily_forecasts.html

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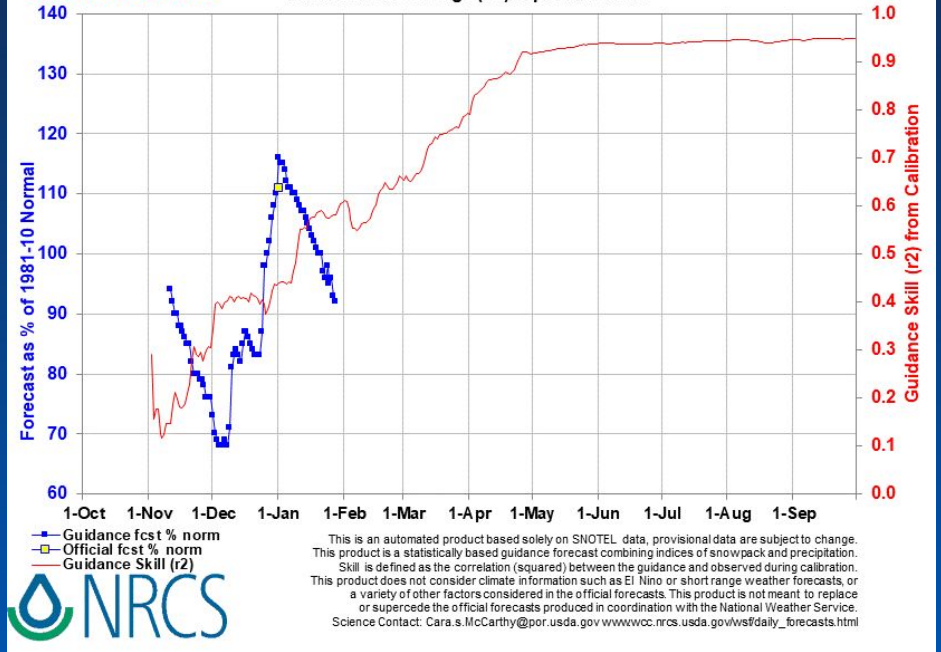
Animas R at Durango (co): Apr-Jul Volume



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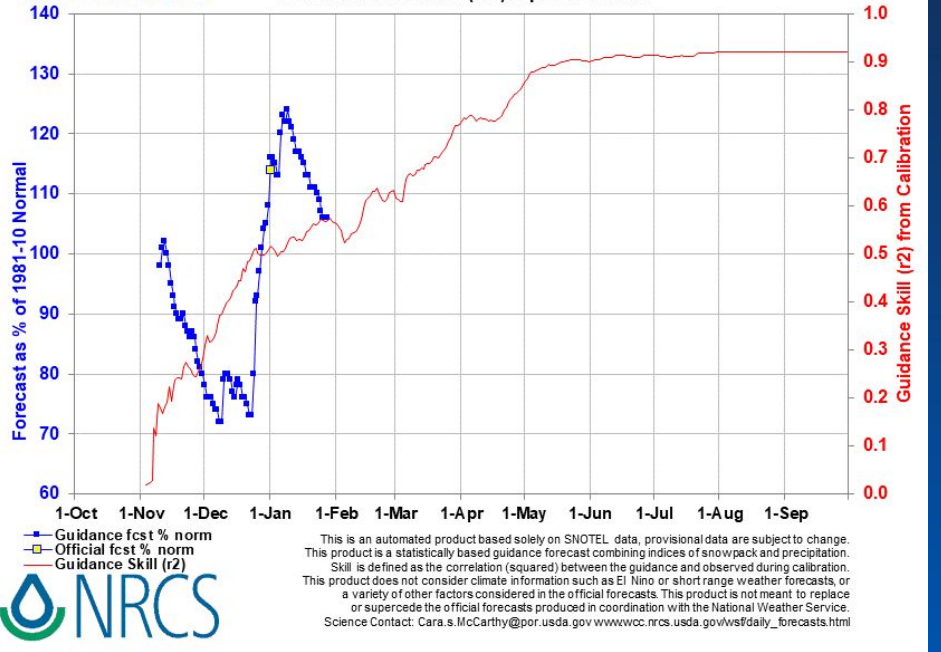
Colorado R nr Cameo (CO): Apr-Jul Volume



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Questions You May Pose:
What indicators Exist?

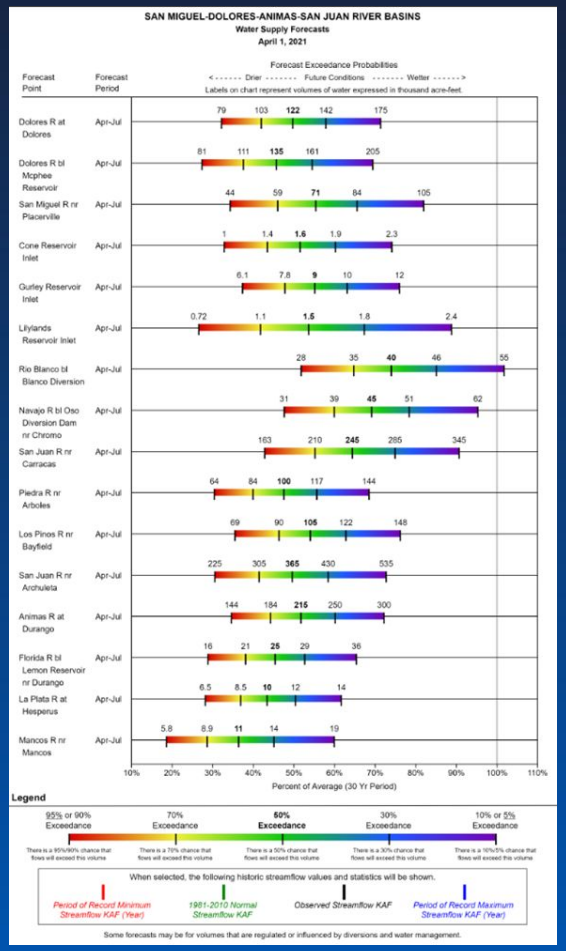
In a drought, are there forecasting tools to indicate following:		
Threshold:	Answer:	
Below normal streamflows are guaranteed	No	It is an ongoing case of
When it becomes clear normal flows are not achievable	No	diminishing possibilities

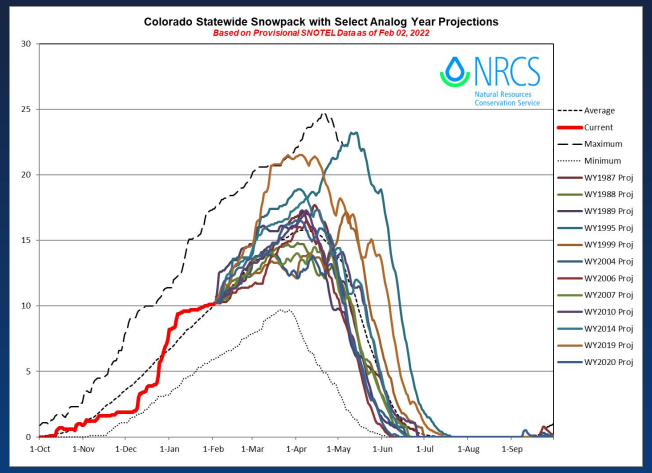
- Streamflow forecasts are one of the most useful predictive tools available.
- As soon as forecasted flows are projected to be below normal it is more likely than not runoff will be below normal.
- The certainty in that forecast is expressed in the forecast range.

Questions You May Pose:

Can future precipitation be counted on?

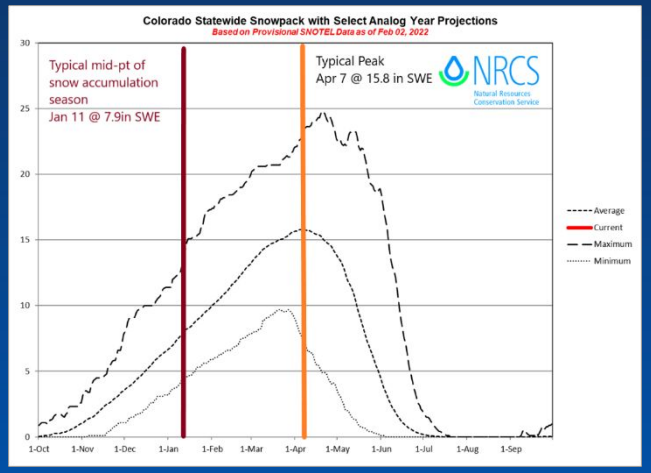
What would it take to turn this year around?





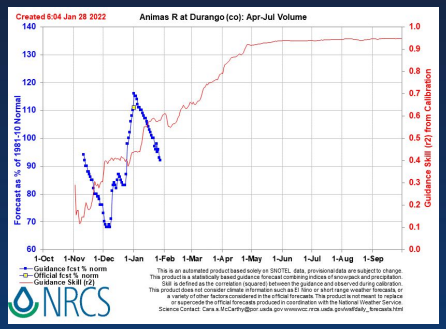
Question of when and how much risk are you willing to assume because there is no hard deadline.

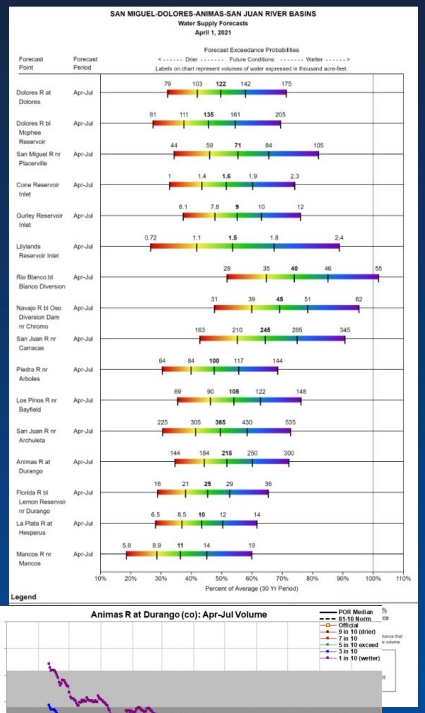
Answer: Use range of forecast probabilities to anticipate potential outcomes

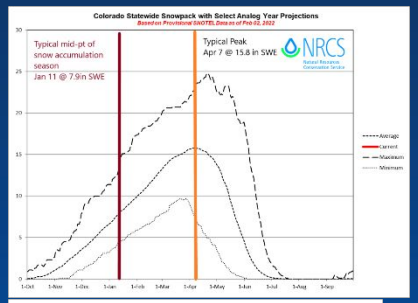


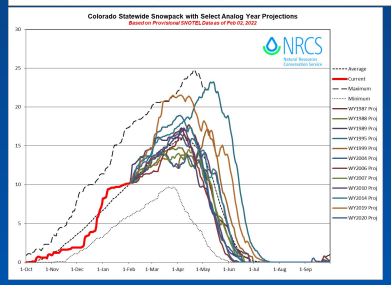
How Gauge Your Water Supply

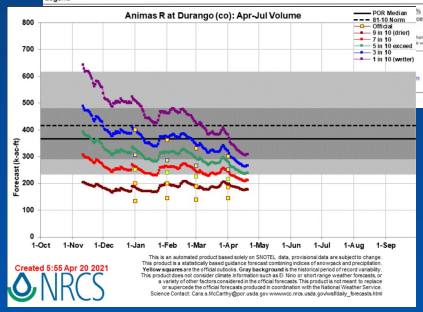
Use the tools to inform your decisions.
And use your institutional knowledge of your watershed.



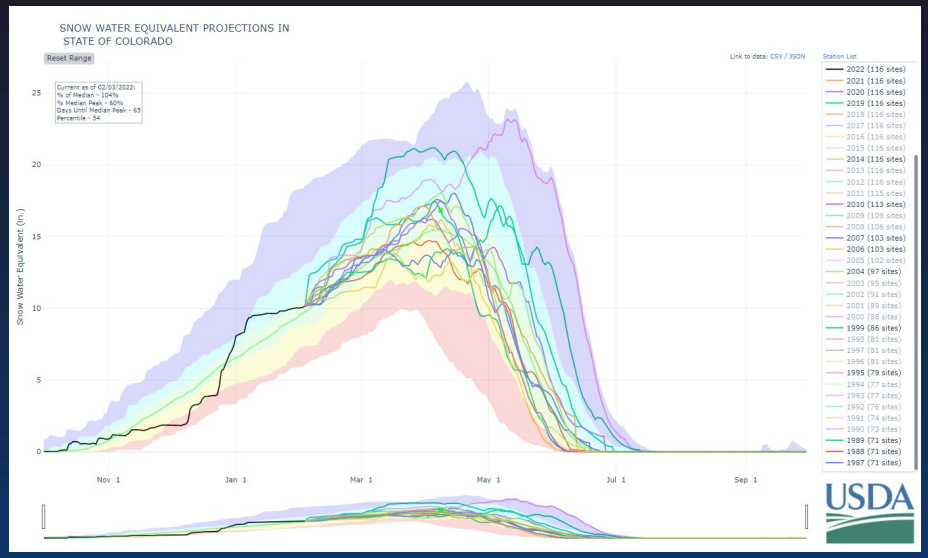


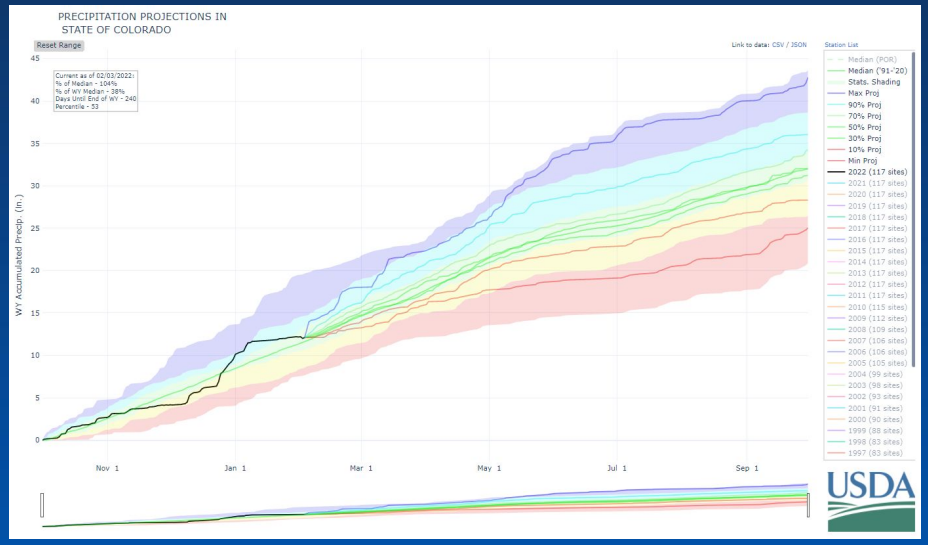






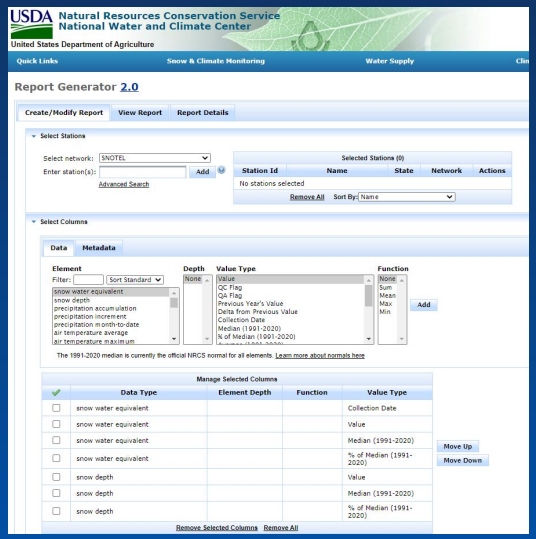
Snowpack and Precipitation Products





Interactive Charts (iCharts)

Chart tool that allows user to include or exclude years and/or limited metrics to analyze outcomes or possibilities



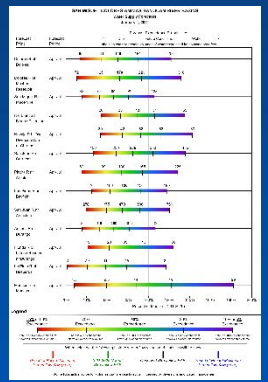
Report Generator

Data access to for granular data. Generate your own data analysis process for evaluating runoff prospects.

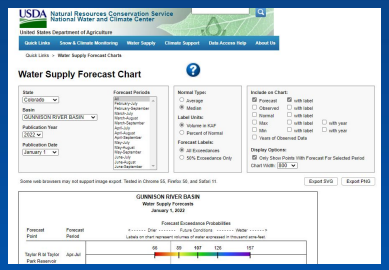
How to find Water Supply Forecasts

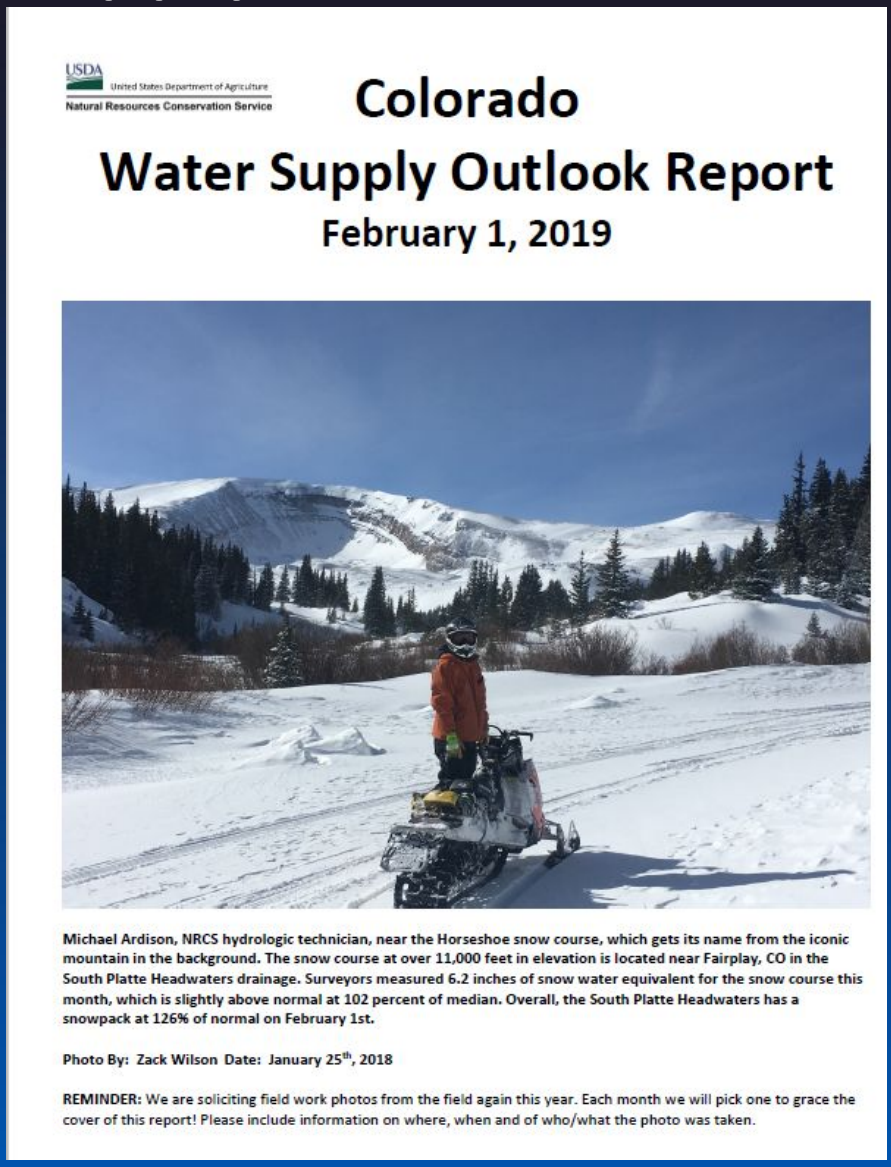
- Produced monthly January through June
- Contains official water supply forecasts
- Can subscribe to email list on our website

Colorado Snow Survey Home Page



NWCC Home Page





USDA United States Department of Agriculture
Natural Resources Conservation Service

Colorado
Water Supply Outlook Report
February 1, 2019

Michael Ardison, NRCS hydrologic technician, near the Horseshoe snow course, which gets its name from the iconic mountain in the background. The snow course at over 11,000 feet in elevation is located near Fairplay, CO in the South Platte Headwaters drainage. Surveyors measured 6.2 inches of snow water equivalent for the snow course this month, which is slightly above normal at 102 percent of median. Overall, the South Platte Headwaters has a snowpack at 126% of normal on February 1st.

Photo By: Zack Wilson Date: January 25th, 2018

REMINDER: We are soliciting field work photos from the field again this year. Each month we will pick one to grace the cover of this report! Please include information on where, when and of who/what the photo was taken.

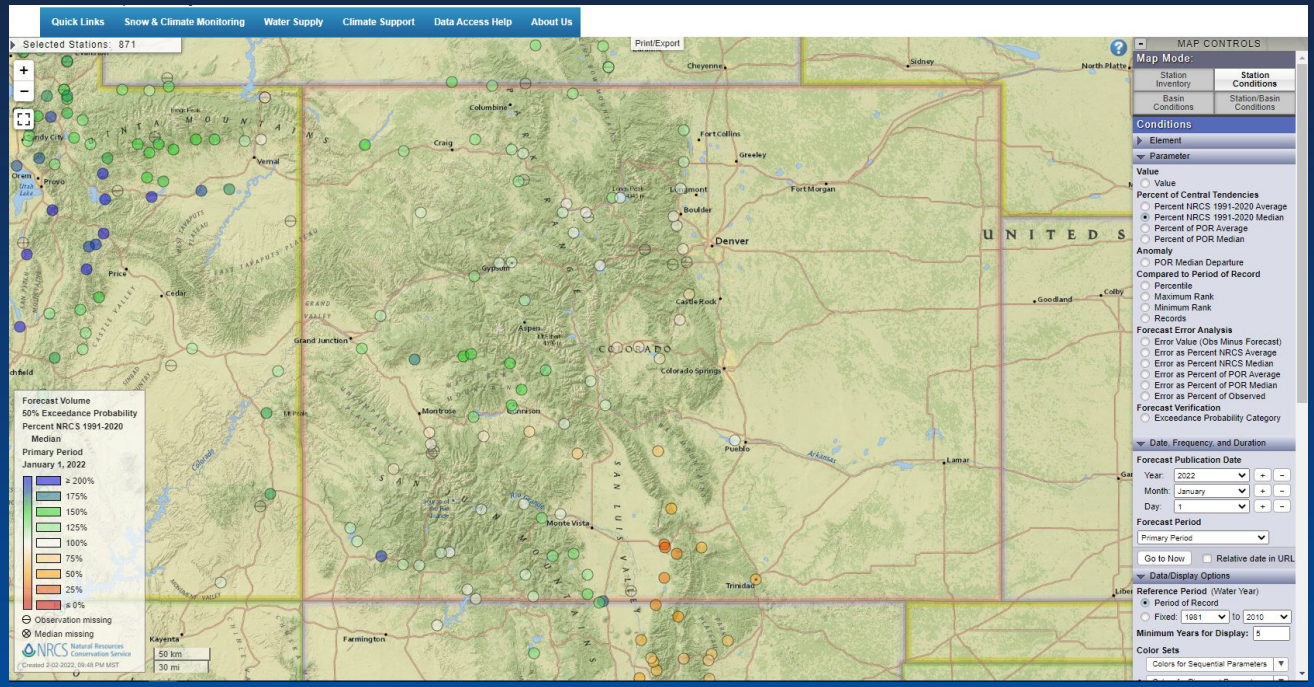
How to Access Forecast Data & Information

Interactive Map

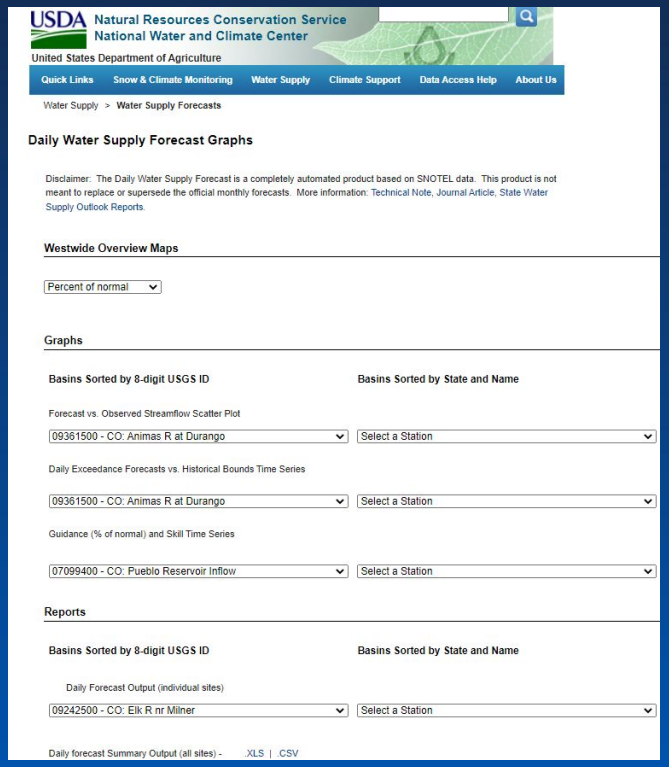
The interactive map can be accessed through both the CO Snow Survey and NWCC websites

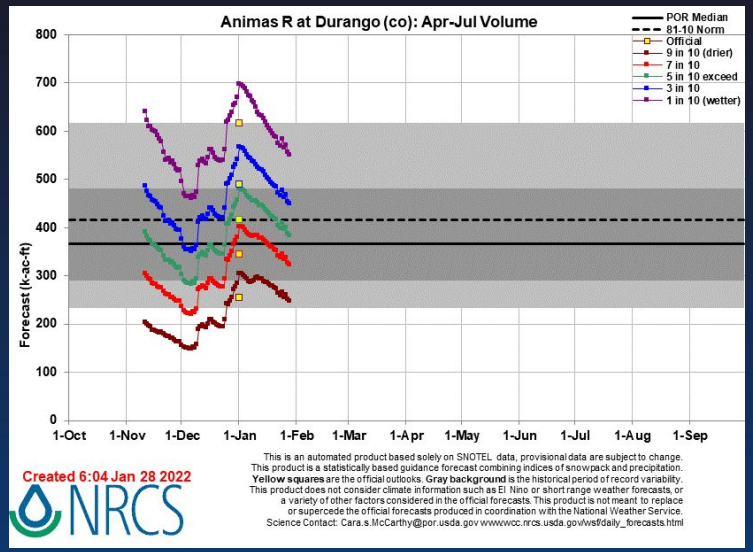
The web based map will provide access:

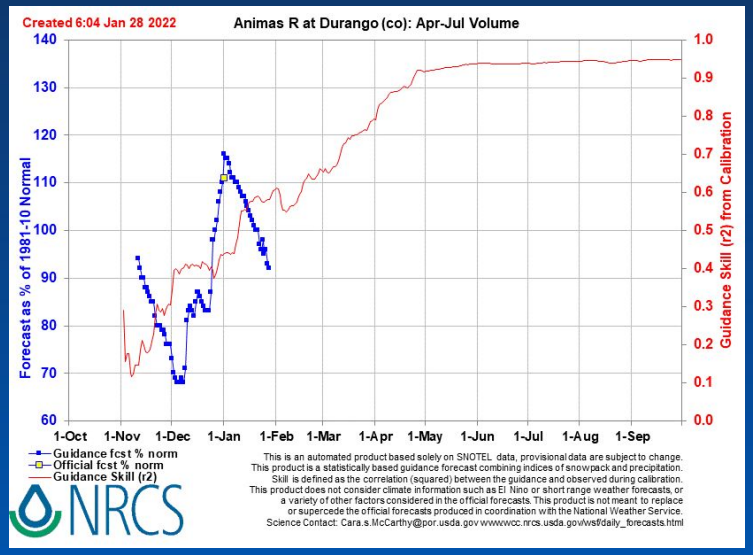
- Most recent Streamflow forecasts
- Reservoir and historical streamflows
- Forecast accuracy and verification metrics
- All current and historical data for a SNOTEL site as well as basin-wide summaries
- Export data as .csv



Daily Water Supply Guidance Forecasts







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