

2013 Runoff Forecast Trends

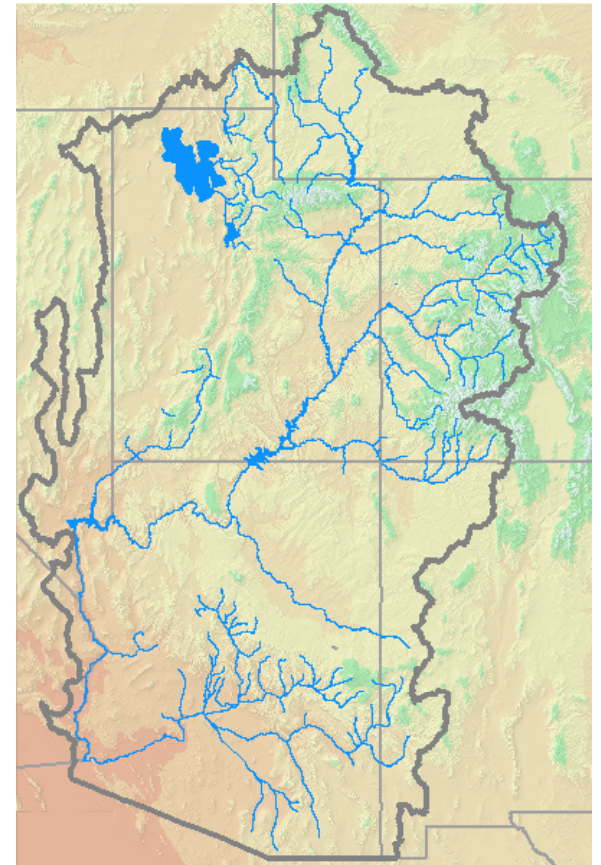
Greg Smith
Senior Hydrologist
Colorado Basin River Forecast Center
National Weather Service

April 25, 2013



River Forecast Centers

CBRFC Forecast Area



2013 Runoff Forecast Trends Gunnison River Basin

A Few Common Topics:



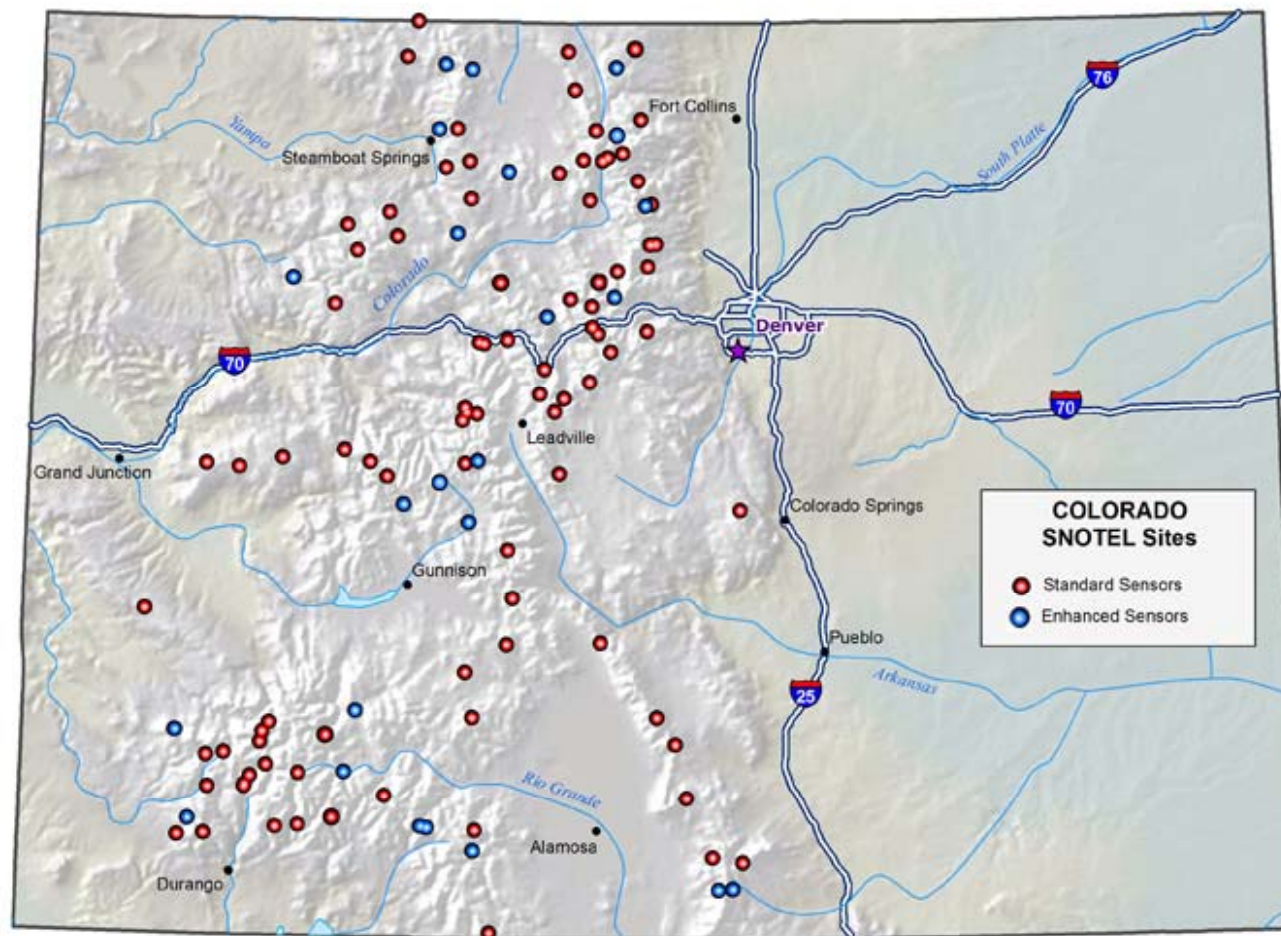
- Accounting for soil moisture and how it impacts the forecasts.
- Primary predictors to the runoff forecasts throughout the season.
- Comparison to 2012 – How the forecasts evolved.
- At times snow conditions this year were very similar to last year.
 - Why were the forecasts this year different than last year ?
 - Why were the forecasts this year greater than last year observed volumes?

YES – we use soil moisture - but not direct measurements of soil moisture

Primary predictor in early season forecasts

Soil Moisture Sites

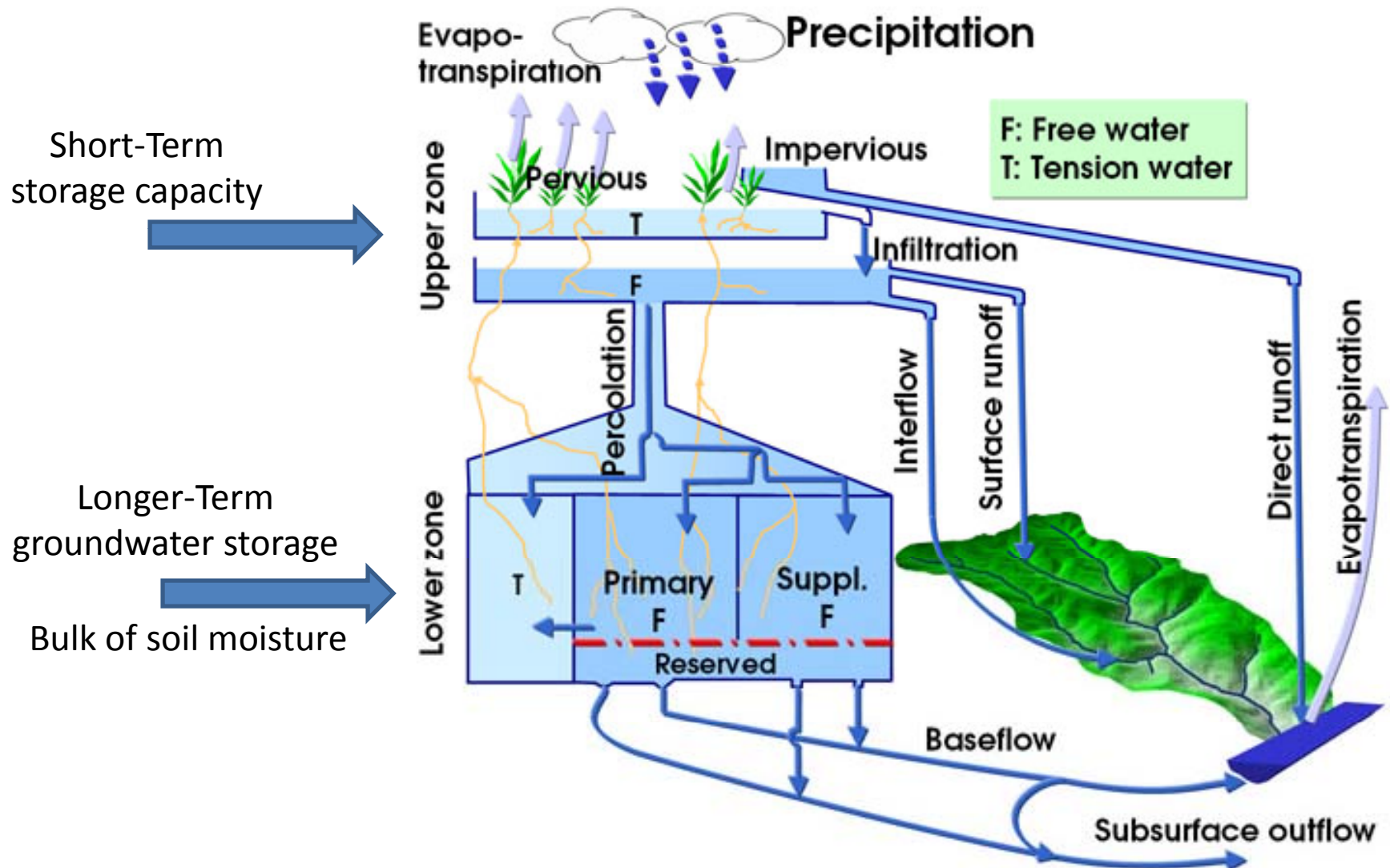
Natural Resources Conservation Service



Soil Moisture is a calibrated model parameter

Spatially lumped value over a pre-defined area (basin sub-area)

Inputs are precipitation, temperature, evapotranspiration



Lumped Parameter Hydrologic Model – Division of a River Basin into sub-areas

Dolores – Dolores (DOLC2) Segment (below Rico)

SAC-SMA Model Sub-Areas

Stations used to compute precipitation & their weighting
(locations approximate)

Middle (8500-11500)

El Diente Peak (EDSC2) SNOTEL (.34)
Lone Cone (LNCC2) SNOTEL (.17)
Scotch Creek (SHSC2) SNOTEL (.34)

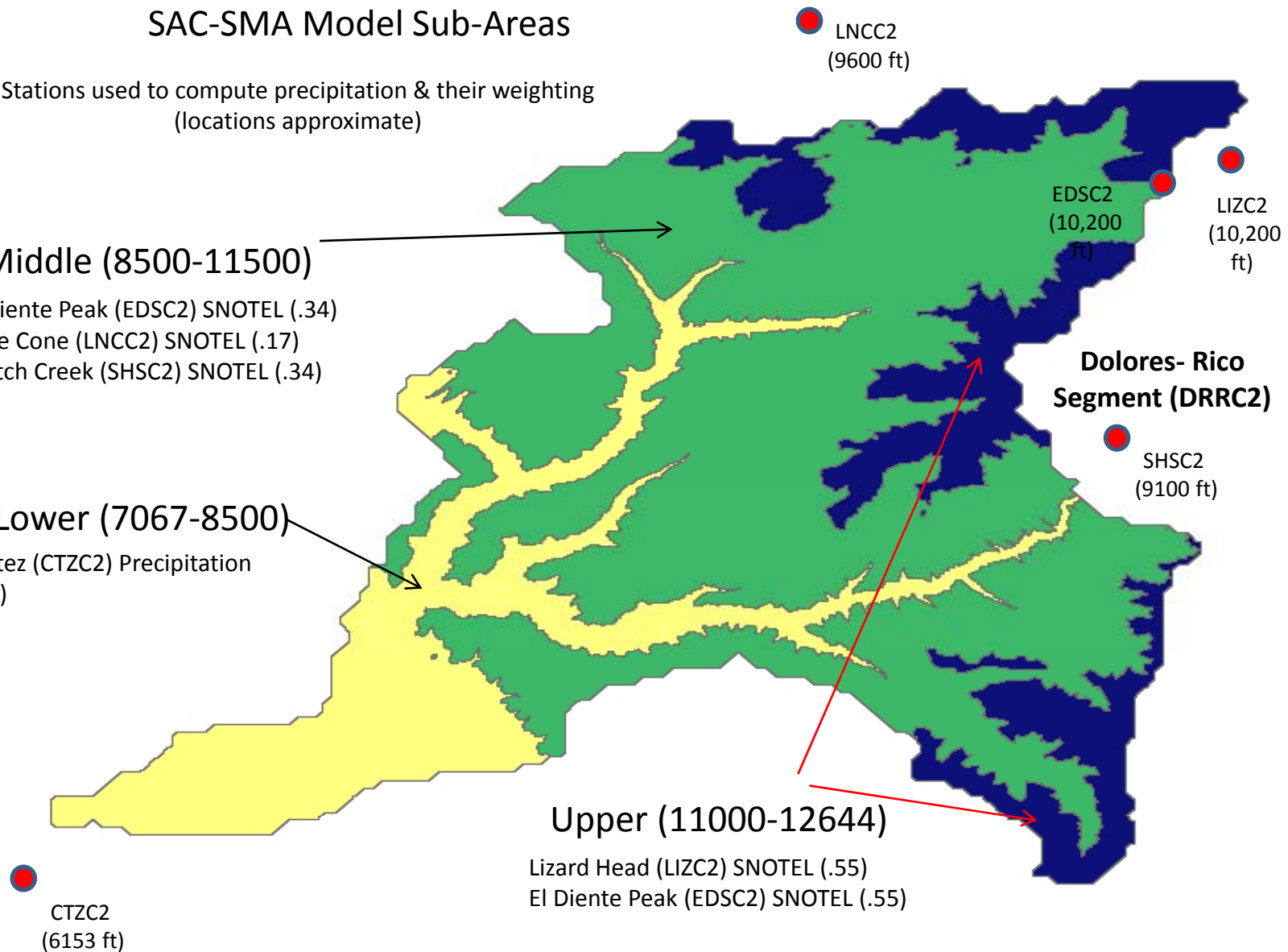
Lower (7067-8500)

Cortez (CTZC2) Precipitation
(1.2)

Upper (11000-12644)

Lizard Head (LIZC2) SNOTEL (.55)
El Diente Peak (EDSC2) SNOTEL (.55)

Dolores- Rico Segment (DRRC2)



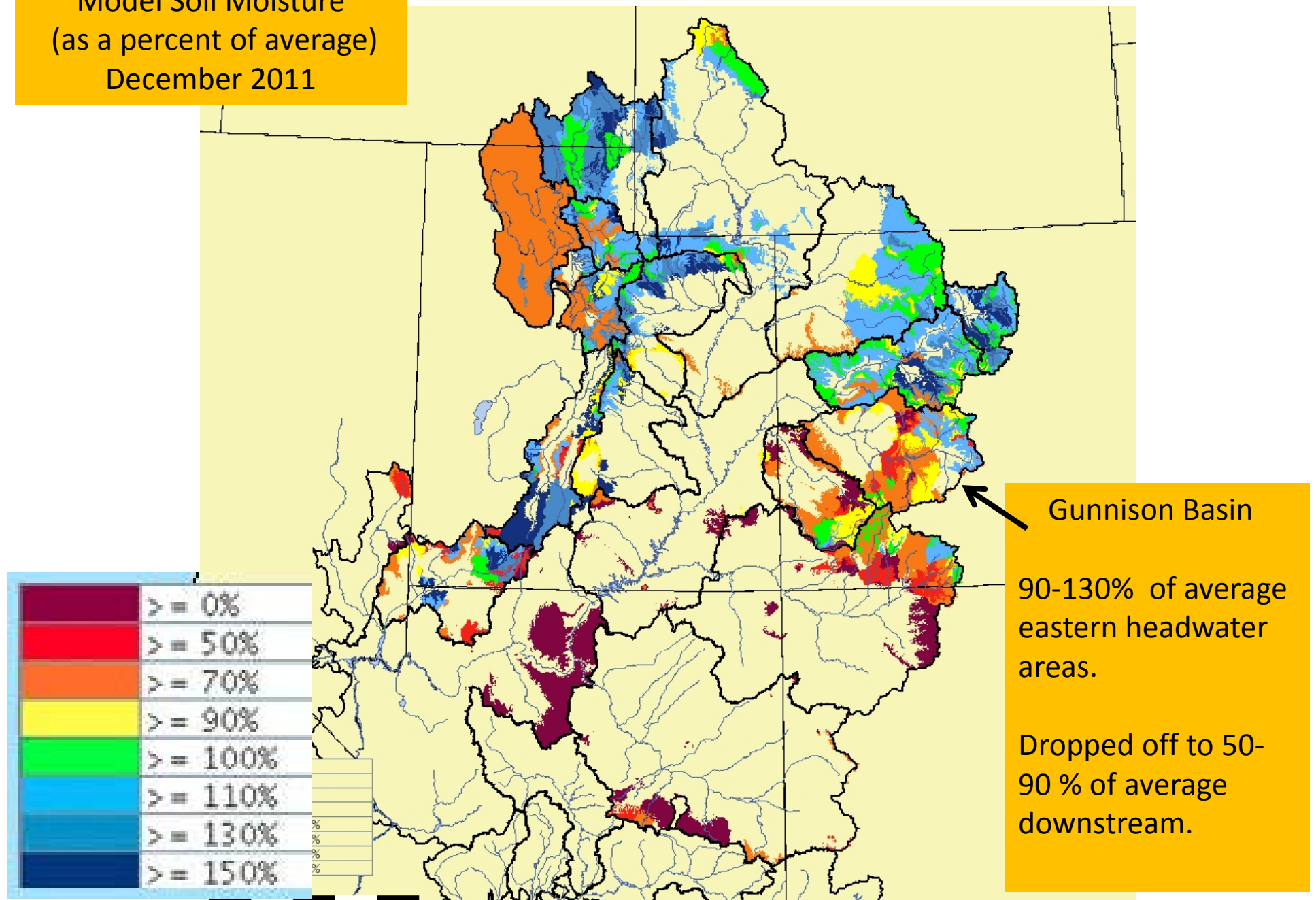
Soil moisture is determined by precipitation measurements – mostly from higher elevation SNOTEL sites.

Gunnison River Basin – SNOTEL Sites used at the CBRFC

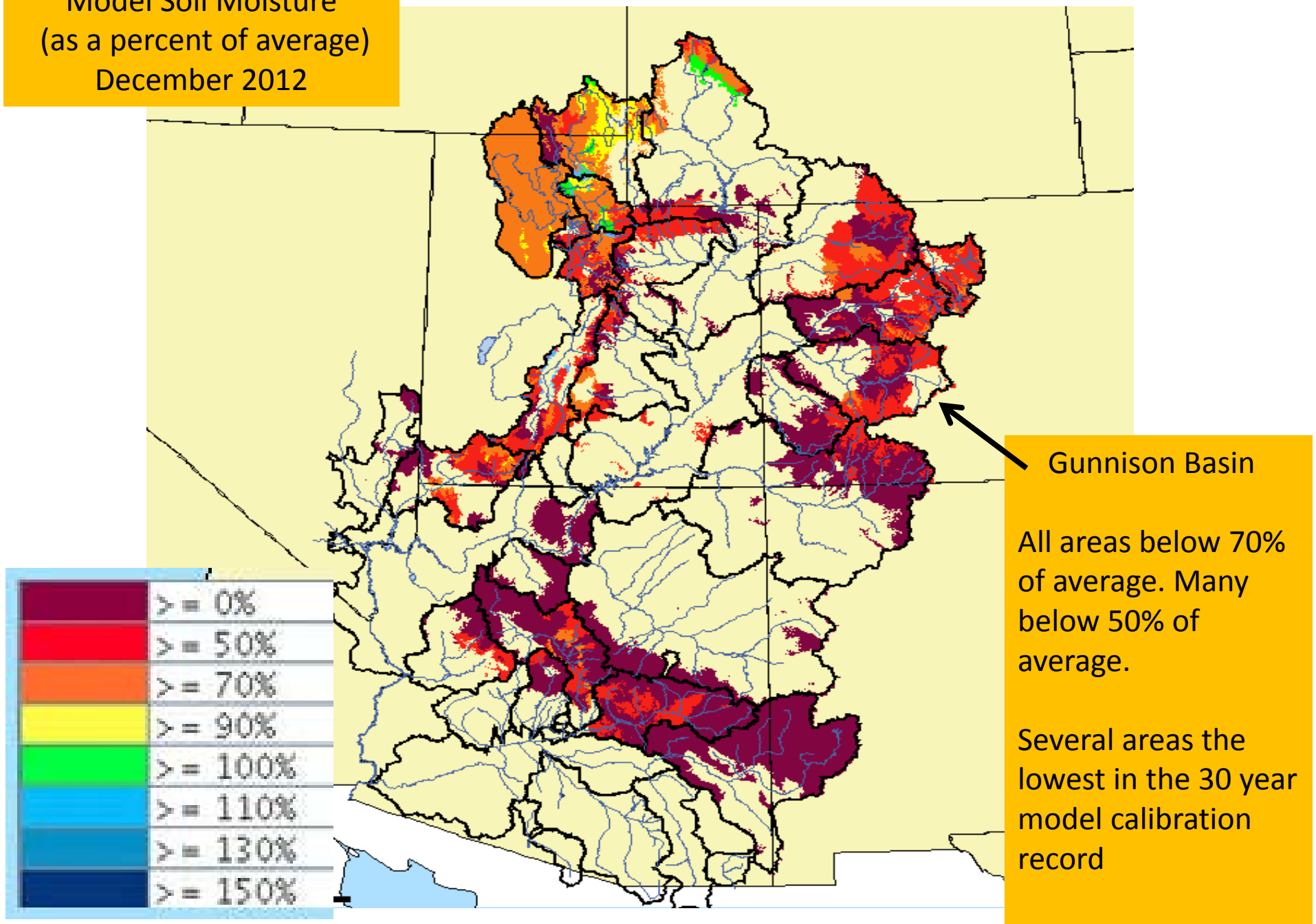


SNOTEL as of April 20 2013

Model Soil Moisture
(as a percent of average)
December 2011

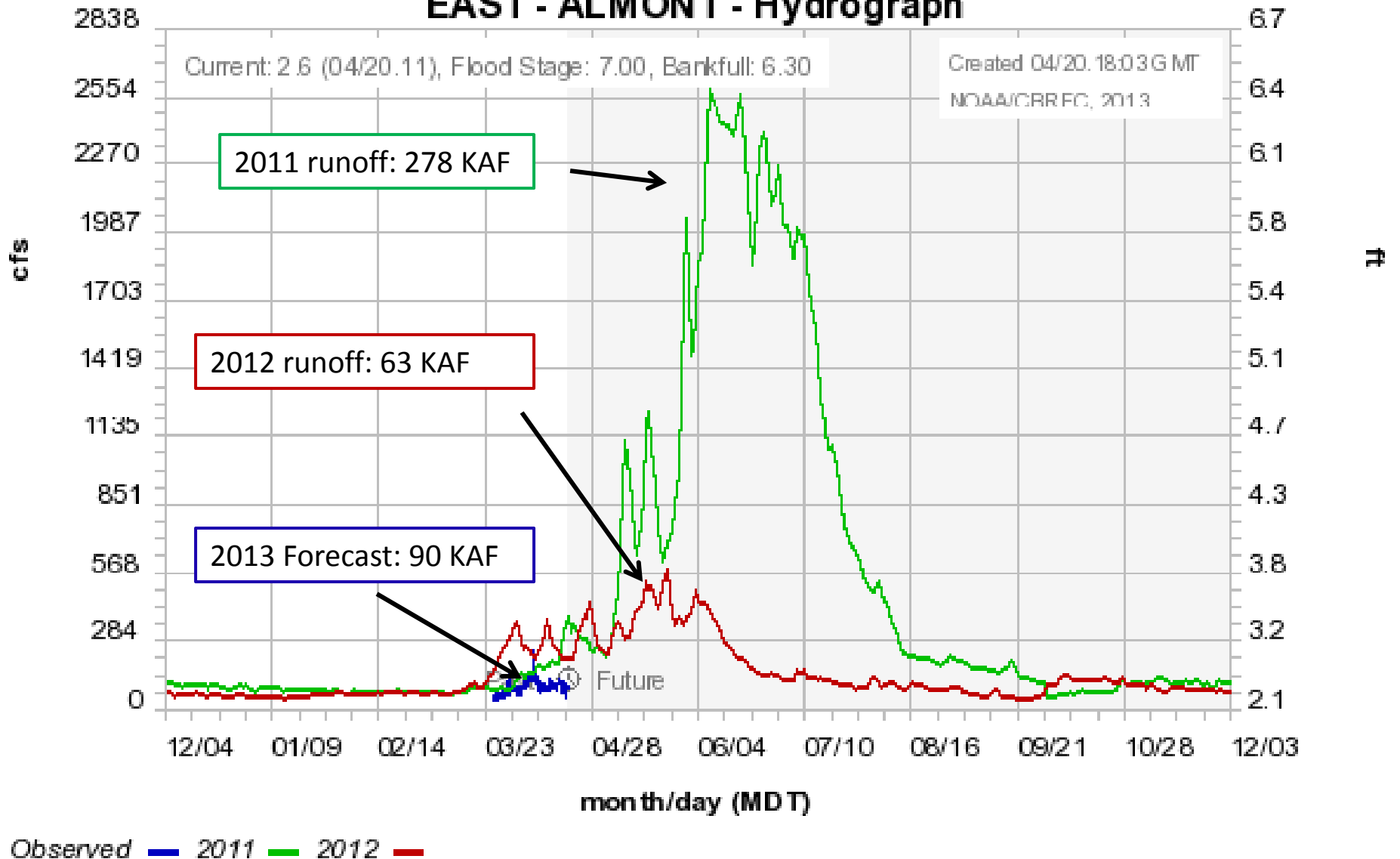


Model Soil Moisture
(as a percent of average)
December 2012



Runoff Predictor: Current / Antecedent Streamflow

Colorado Basin River Forecast Center EAST - ALMONT - Hydrograph



RUNOFF PREDICTORS:



indicates better conditions

Early Fall Outlook
2012 / 2013 comparison

2012
Runoff Season

2013
Runoff Season

Soil Moisture at the start of season



Streamflow



Apr-Jul Blue Mesa Inflow

Oct 1st Outlook:

644 KAF

500 KAF

Observed

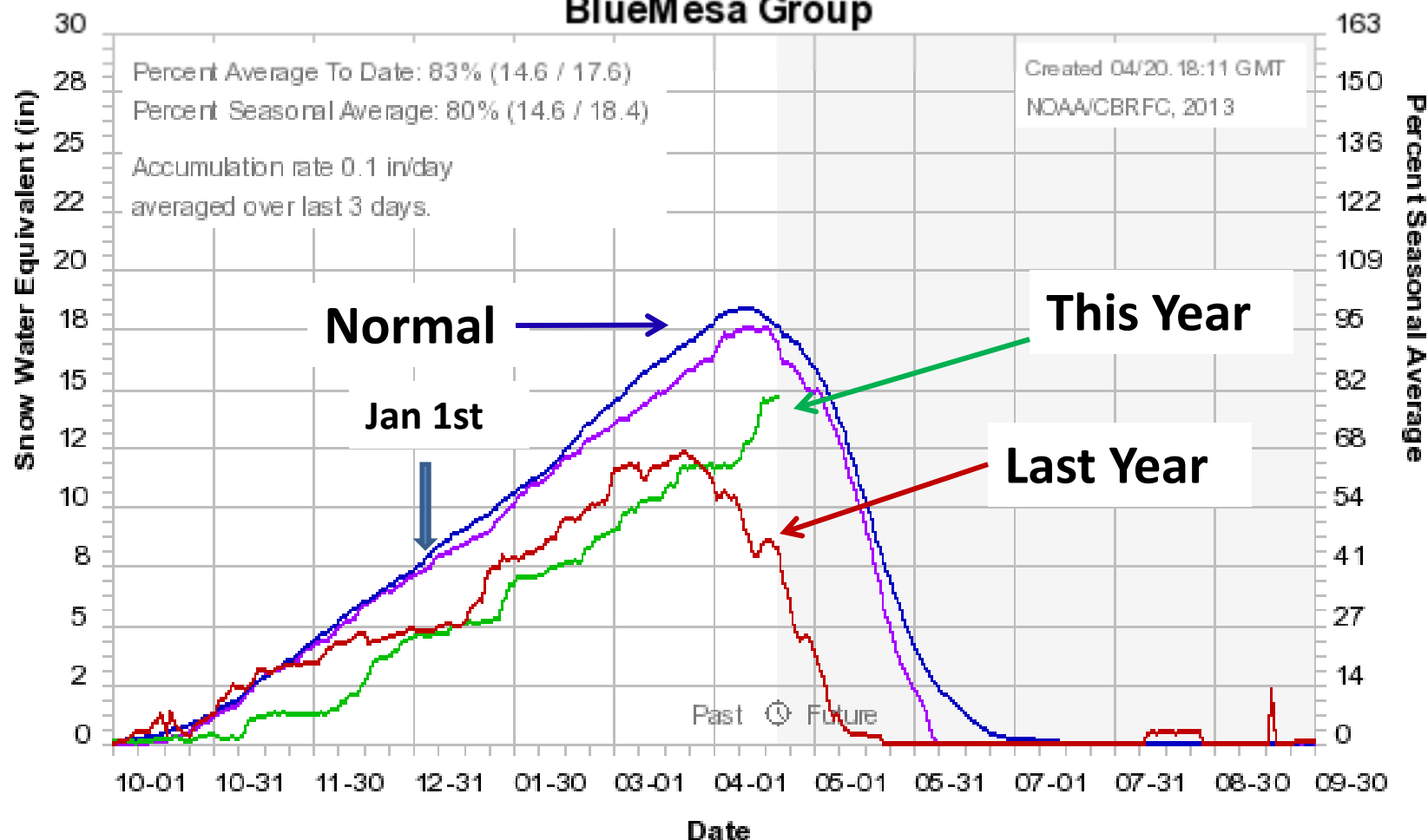
206 KAF

???

Primary Predictor as the Season Progresses:

Snow: Gunnison above Blue Mesa – JAN 1st

Colorado Basin River Forecast Center BlueMesa Group



Graph created 4/20/2013

RUNOFF PREDICTORS:



indicates better conditions

January Forecasts 2012 / 2013 Comparison

2012 Runoff Season

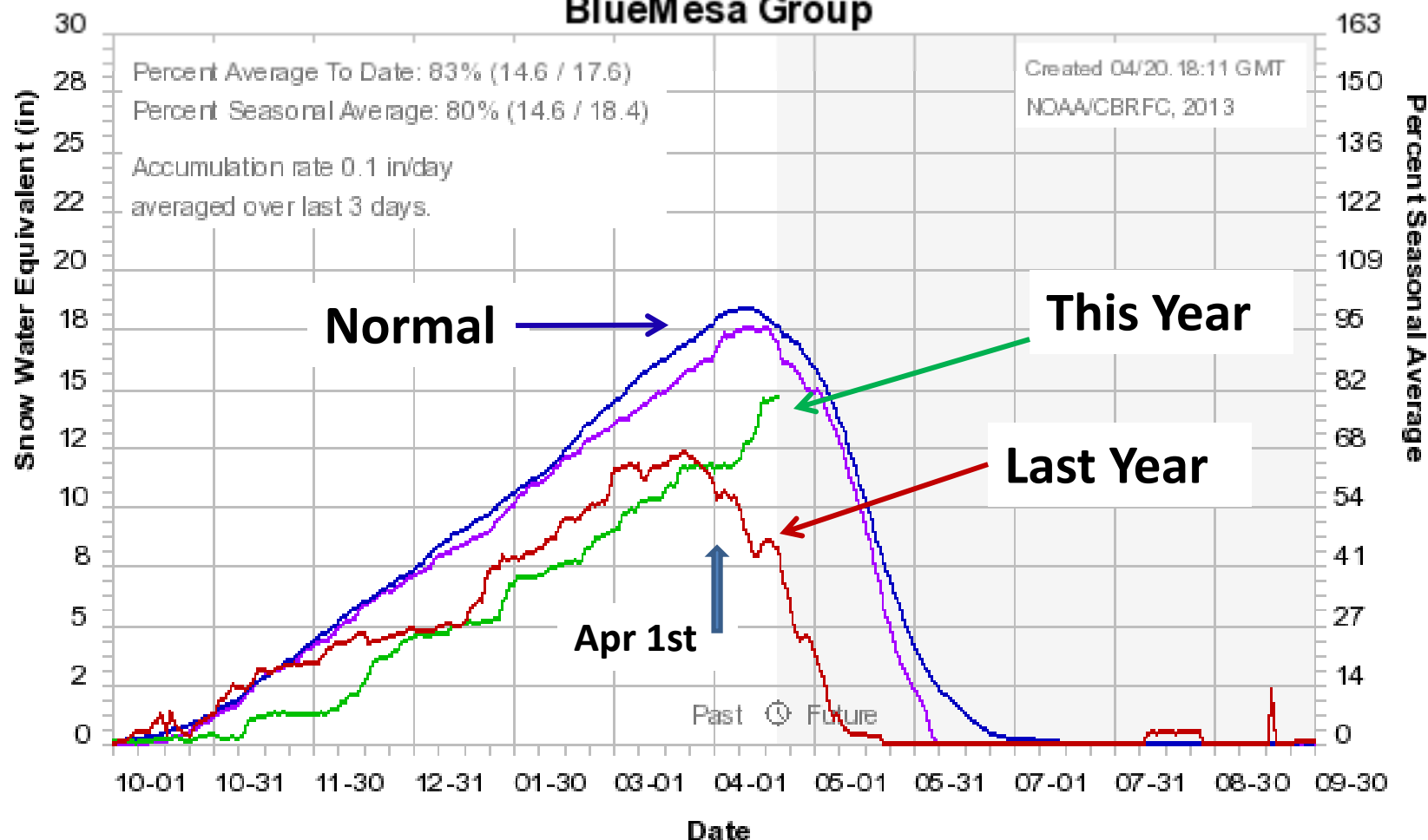
2013 Runoff Season

January 1 st SNOW	(~70%)	★	(~70%)
Soil Moisture at the start of season	★		
Antecedent/Current Streamflow	★		
<u>Apr-Jul Blue Mesa Inflow:</u>			
Oct 1 st Outlook	644 KAF		500 KAF
Jan 1 st Forecast	450 KAF		390 KAF
Observed	206 KAF		???

Primary Predictor as the Season Progresses:

Snow: Gunnison above Blue Mesa – APR 1st

Colorado Basin River Forecast Center BlueMesa Group



Graph created 4/20/2013

RUNOFF PREDICTORS:



indicates better conditions

April Forecasts 2012 / 2013 Comparison

	<u>2012 Runoff Season</u>		<u>2013 Runoff Season</u>
April 1 st SNOW	(64%)		 (71%)
January 1 st SNOW	(~70%)		(~70%)
Soil Moisture at the start of season			
Antecedent / Current Streamflow			

Apr-Jul Blue Mesa Inflow:

Oct 1 st Outlook	644 KAF		500 KAF
Jan 1 st Forecast	450 KAF		390 KAF
Apr 1 st Forecast	330 KAF		315 KAF
Observed	206 KAF		???

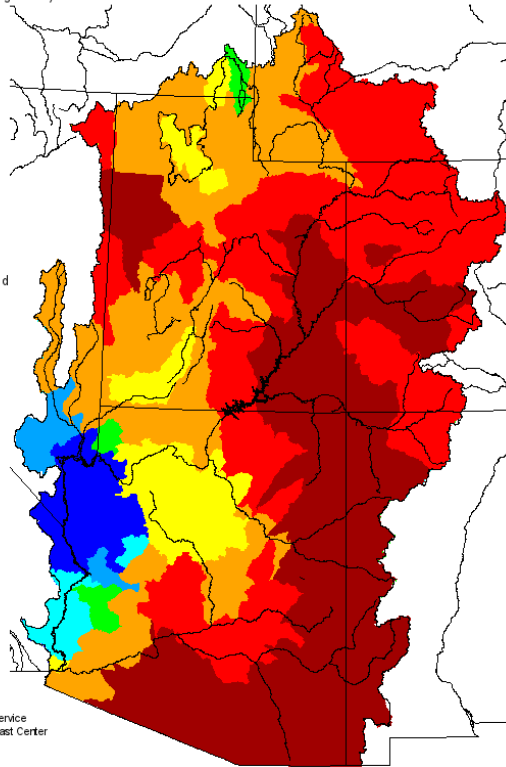
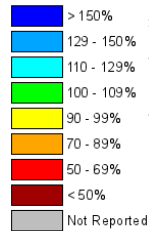
Very Dry Spring in 2012

On April 1st 2013 our model does not assume this will happen again

Monthly Precipitation for April 2012

(Averaged by Hydrologic Unit)

% Average

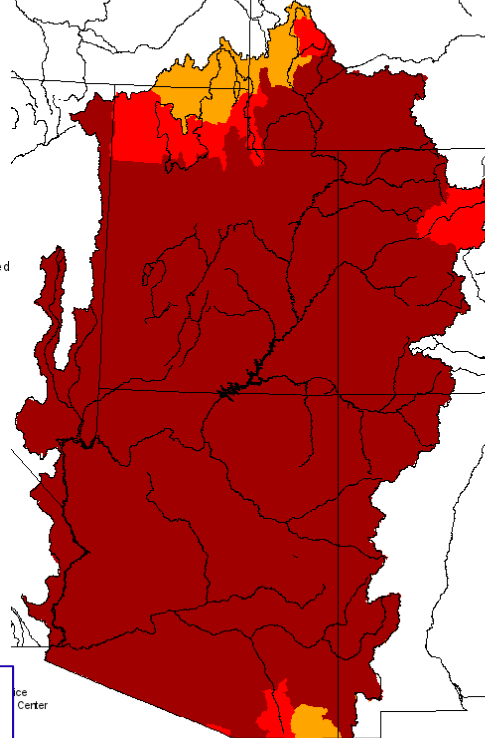
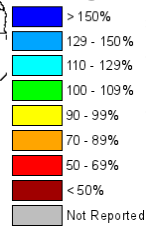


Prepared by
NOAA, National Weather Service
Colorado Basin River Forecast Center
Salt Lake City, Utah
www.cbrfc.noaa.gov

Monthly Precipitation for May 2012

(Averaged by Hydrologic Unit)

% Average

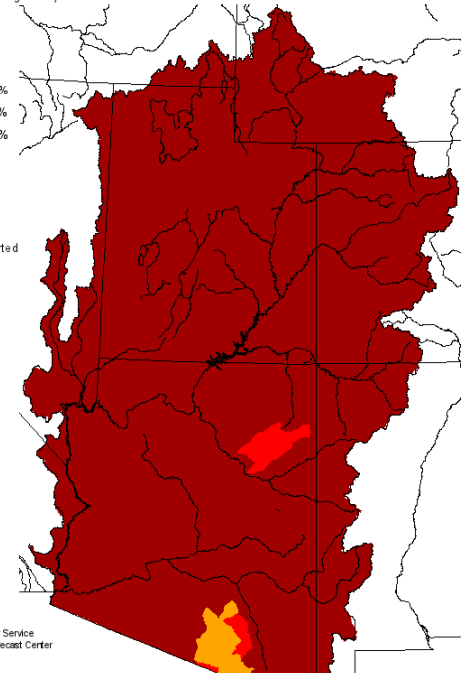
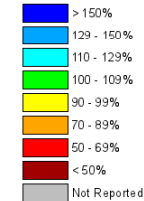


ice
Center

Monthly Precipitation for June 2012

(Averaged by Hydrologic Unit)

% Average



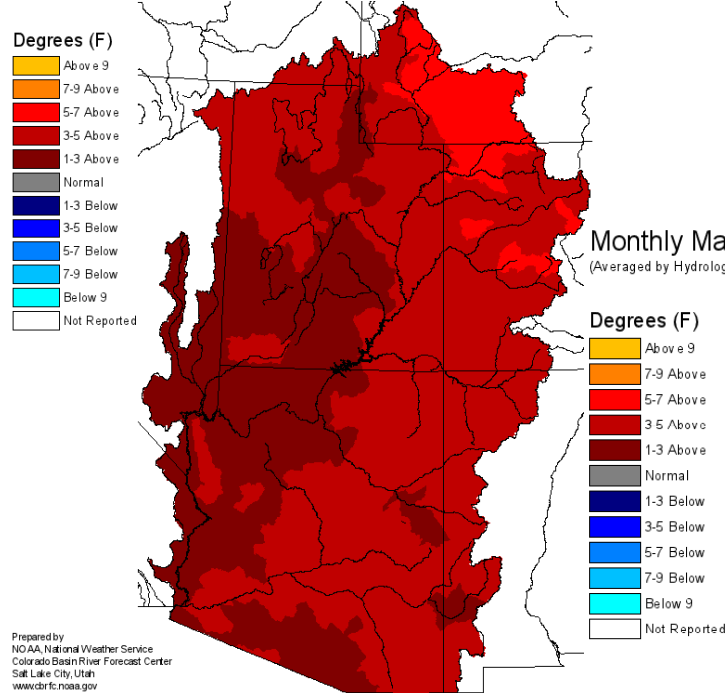
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NOAA, National Weather Service
Colorado Basin River Forecast Center
Salt Lake City, Utah
www.cbrfc.noaa.gov

Our model assumes average precipitation beyond 5 days into the future

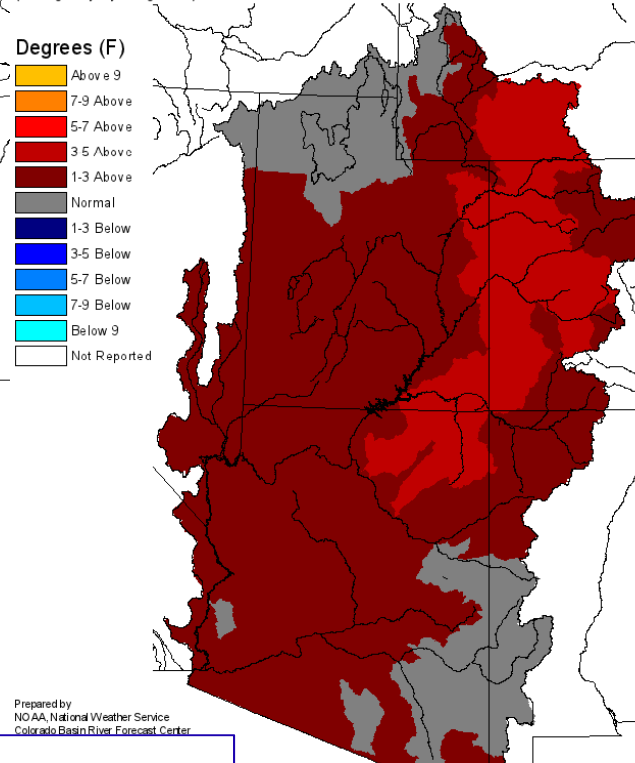
Very Warm Spring in 2012

On April 1st 2013 our model does not assume this will happen again

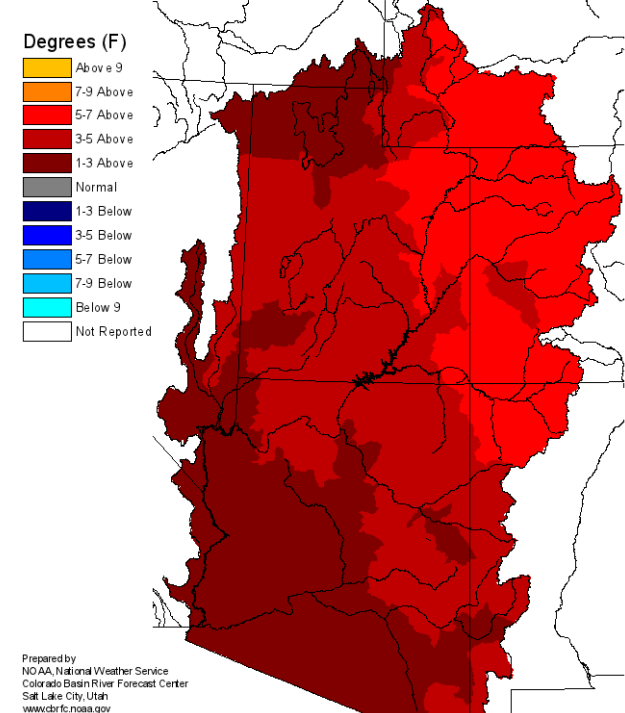
Monthly Max Temp Deviation for April 2012
(Averaged by Hydrologic Unit)



Monthly Max Temp Deviation for May 2012
(Averaged by Hydrologic Unit)

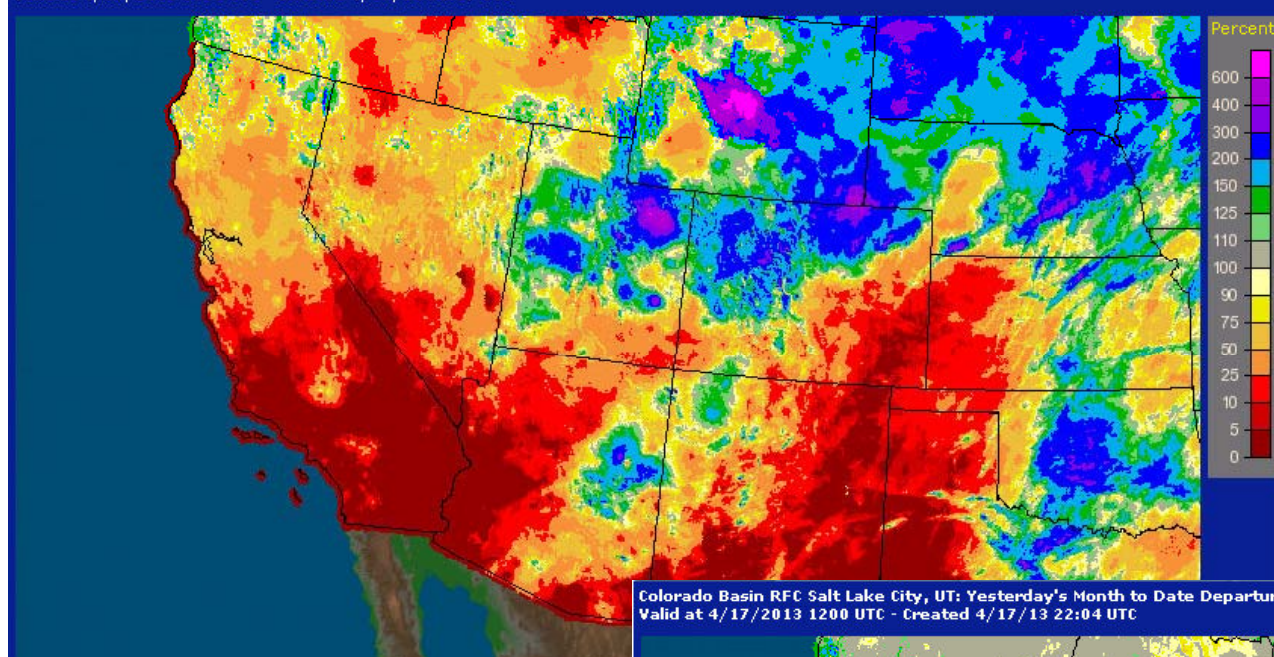


Monthly Max Temp Deviation for June 2012
(Averaged by Hydrologic Unit)



Our model assumes average temperature beyond 10 days into the future

Colorado Basin RFC Salt Lake City, UT: Yesterday's Month to Date Percent of Normal Precipitation
Valid at 4/17/2013 1200 UTC - Created 4/17/13 22:07 UTC



First Half of April Precipitation

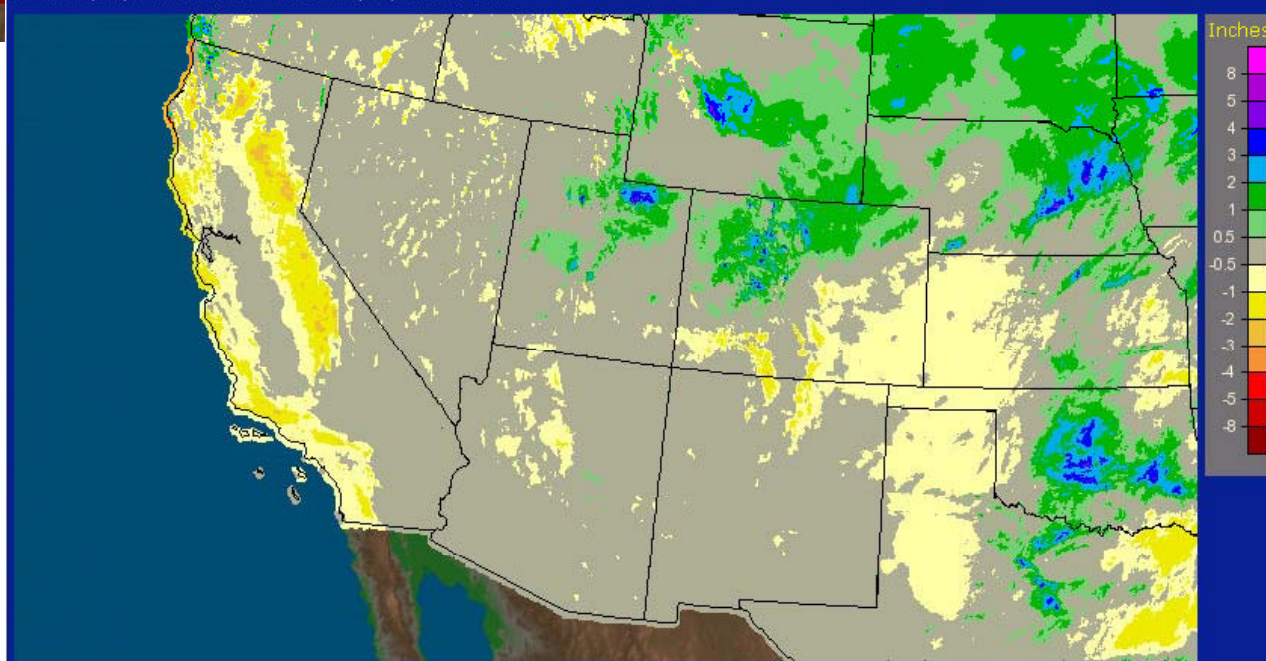
Percent of Average



Departure from Average



Colorado Basin RFC Salt Lake City, UT: Yesterday's Month to Date Departure from Normal Precipitation
Valid at 4/17/2013 1200 UTC - Created 4/17/13 22:04 UTC



Web Reference: <http://water.weather.gov/precip>

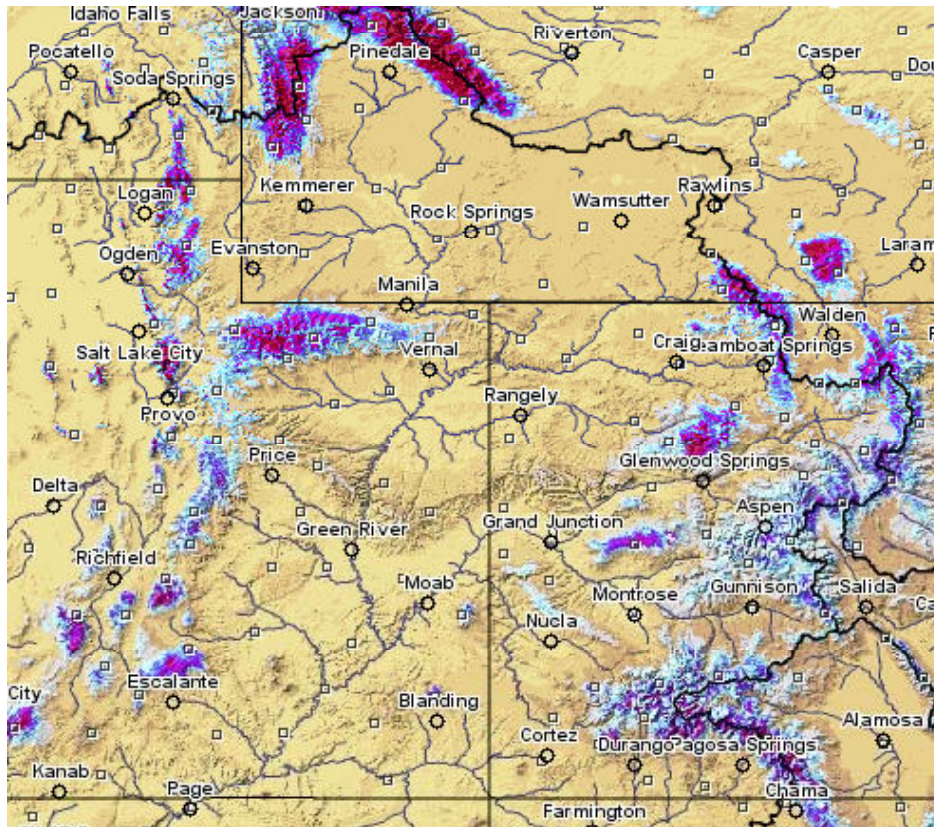
Snow: The impact of spring weather

Retained and added to the snowpack compared to 2012

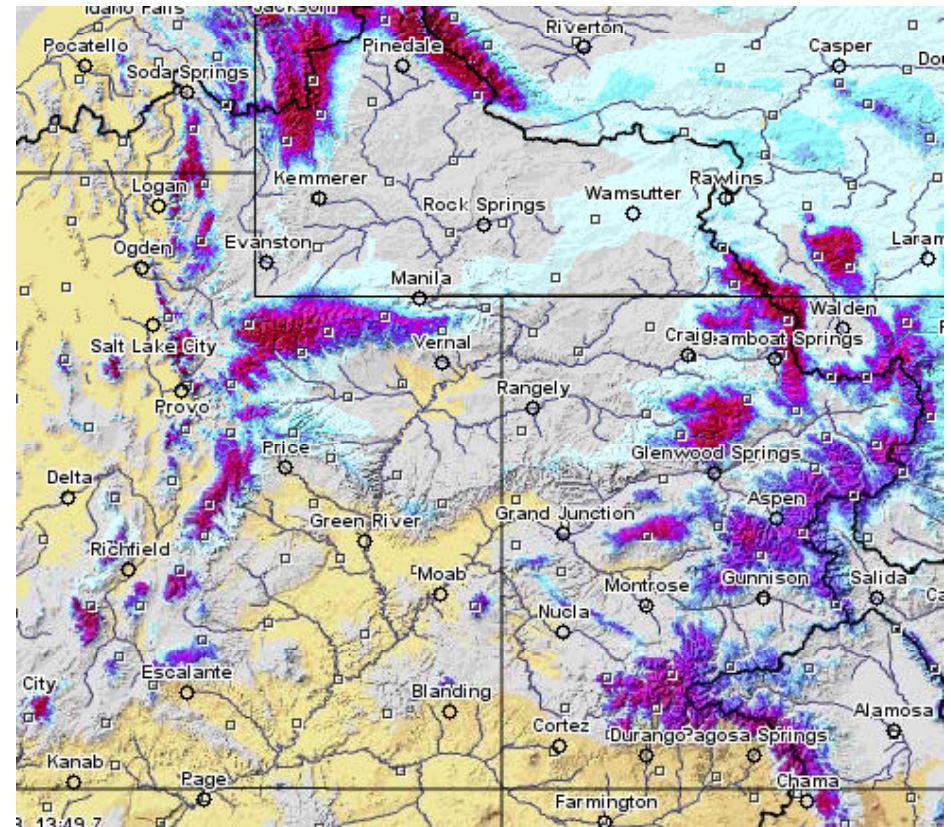
Inches of water equivalent



April 18 2012



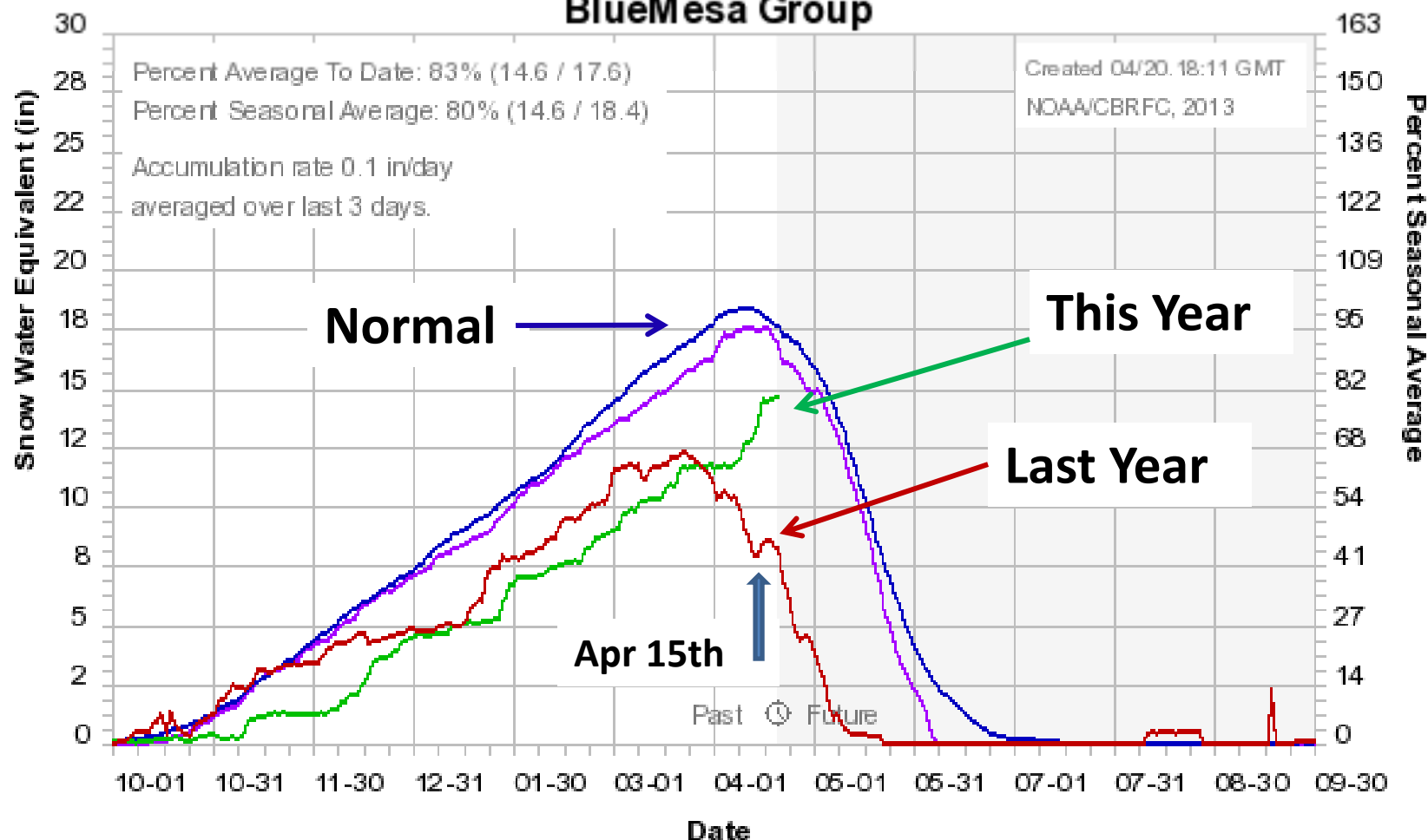
April 18 2013



Primary Predictor as the Season Progresses:

Snow: Gunnison above Blue Mesa – APR 15th

Colorado Basin River Forecast Center BlueMesa Group



Graph created 4/20/2013

RUNOFF PREDICTORS:



indicates better conditions

Latest Forecast
2012 / 2013 Comparison

2012
Runoff Season

2013
Runoff Season

April 15th SNOW

(44%)

 (78%)

April 1st SNOW

(64%)

 (71%)

January 1st SNOW

(~70%)



(~70%)

Soil Moisture at the start of season



Antecedent / Current Streamflow



Apr-Jul Blue Mesa Inflow:

Oct 1st Outlook

644 KAF

500 KAF

Jan 1st Forecast

450 KAF

390 KAF

Apr 1st Forecast

330 KAF

315 KAF

Apr 15th Forecast

315 KAF

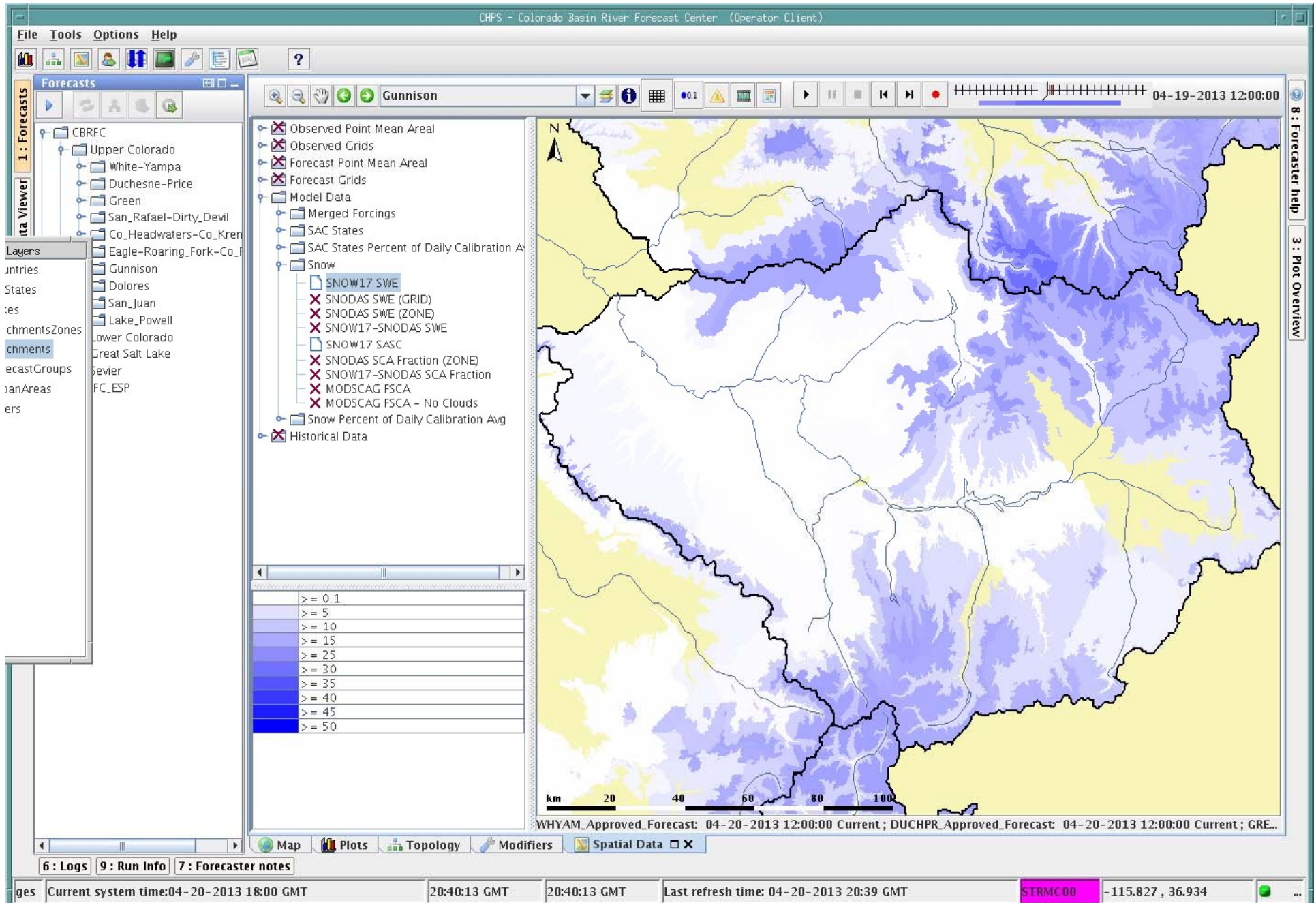
340 KAF

Observed

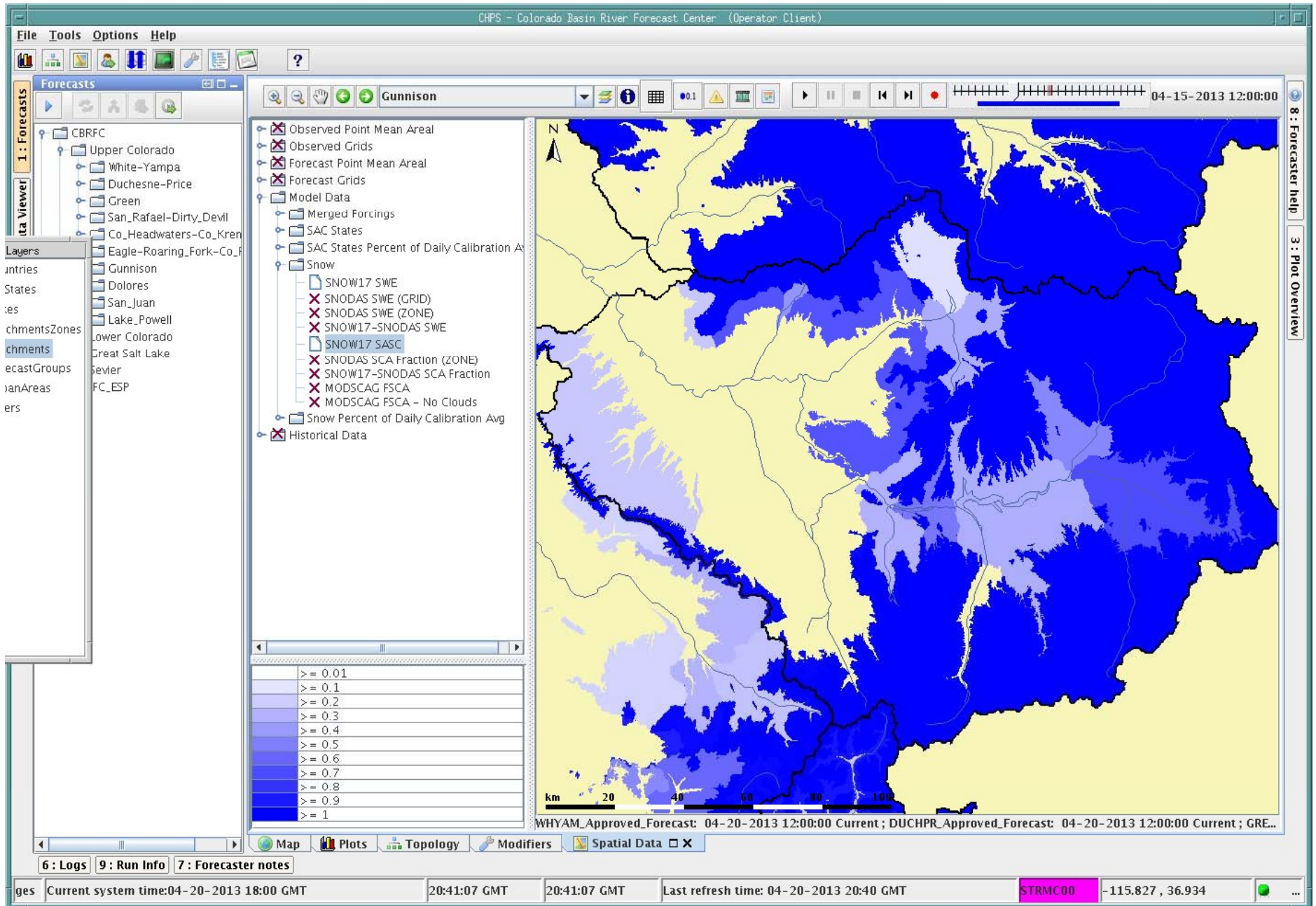
206 KAF

???

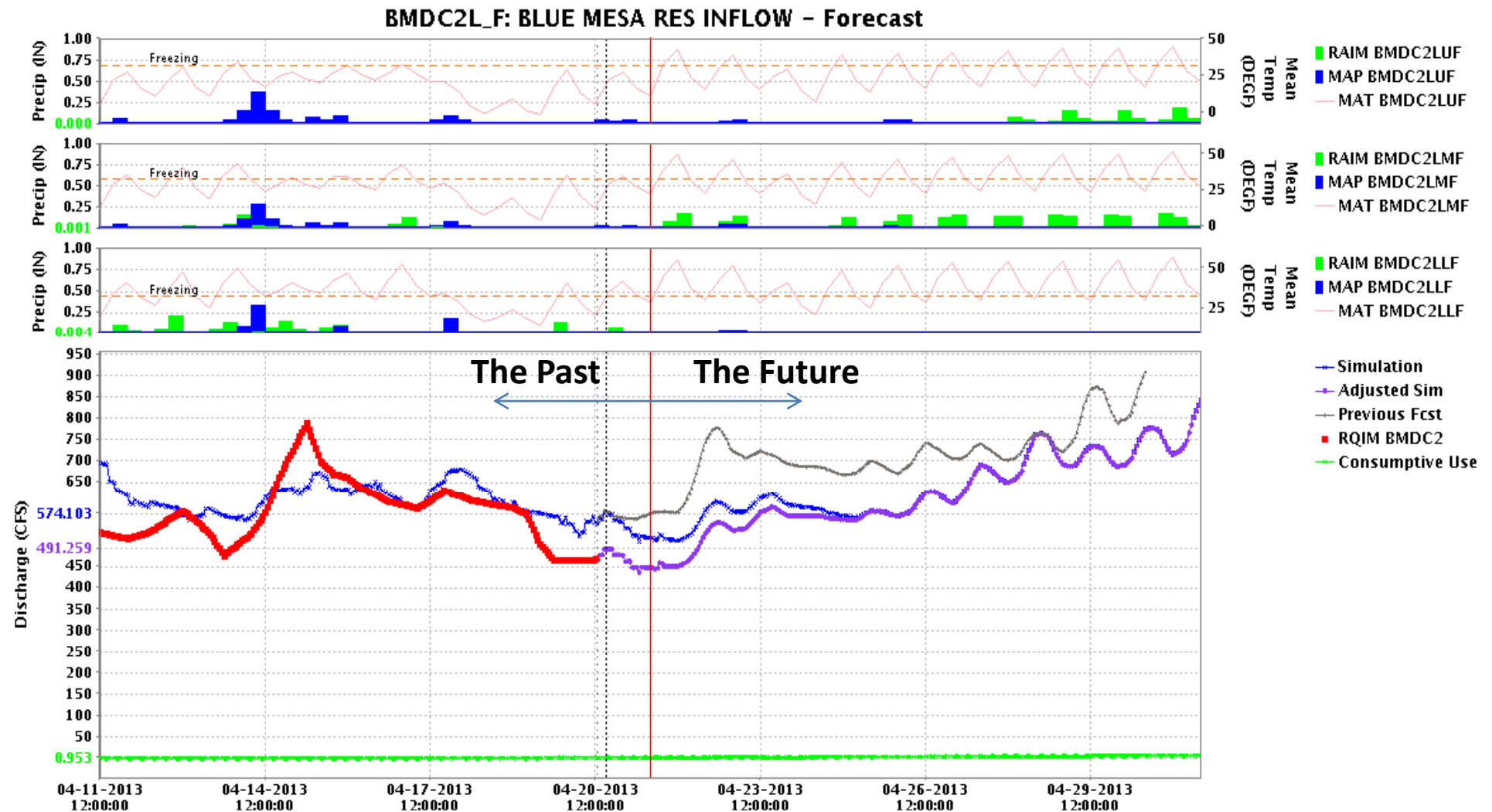
Largest Uncertainties: SNOW - Is the model correct (in amount and coverage) ?



Largest Uncertainties: SNOW - Is the model correct (in amount and coverage) ?



Largest Uncertainties: Future Weather ?



External: [1] 04-20-2013 13:00:00 GUN_Approved_Forecast: [2] 04-21-2013 12:00:00 Current MergeScalars_Forecast: [3] 04-21-2013 12:00:00 Current

Questions are welcome:

Greg Smith

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801-524-5130 ext 332