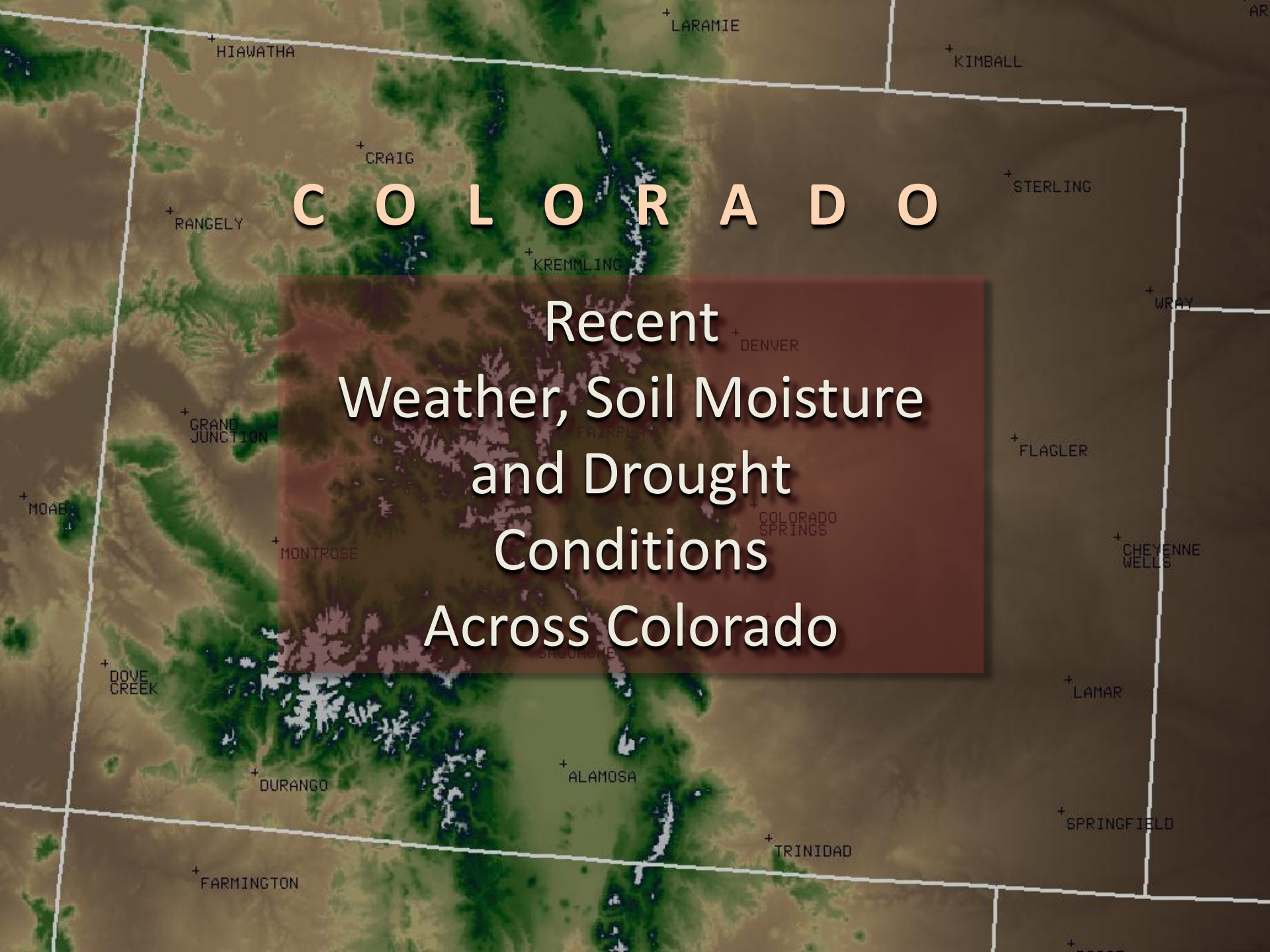
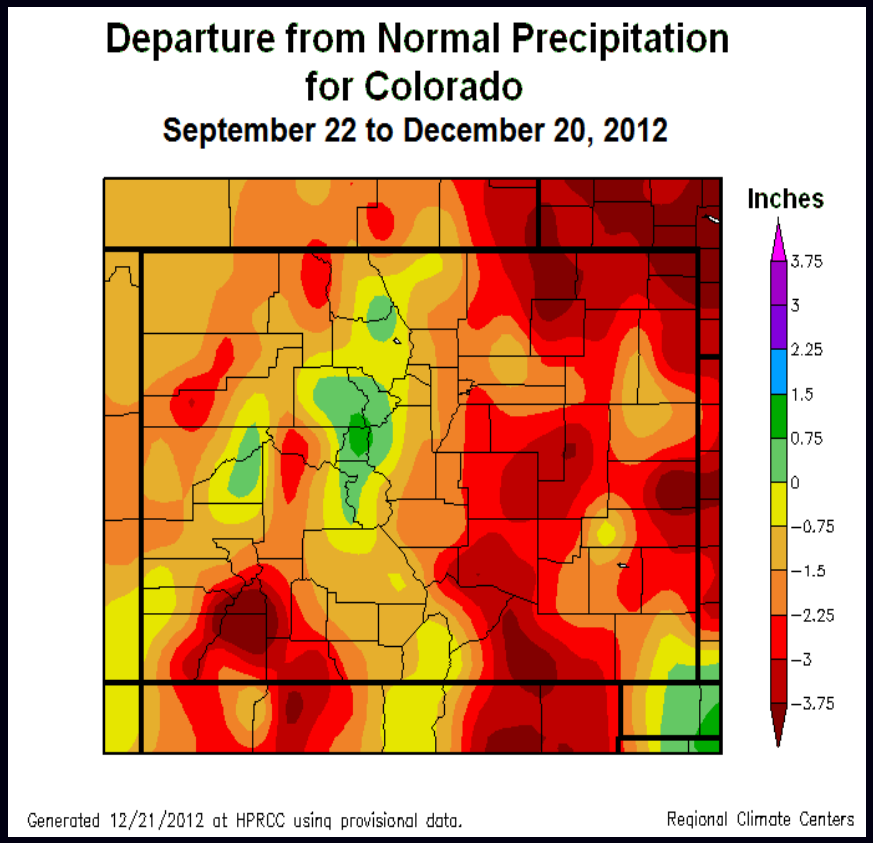
# Recent Weather and Drought Conditions, the Latest on ENSO and the January-March 2013 Outlook For Colorado

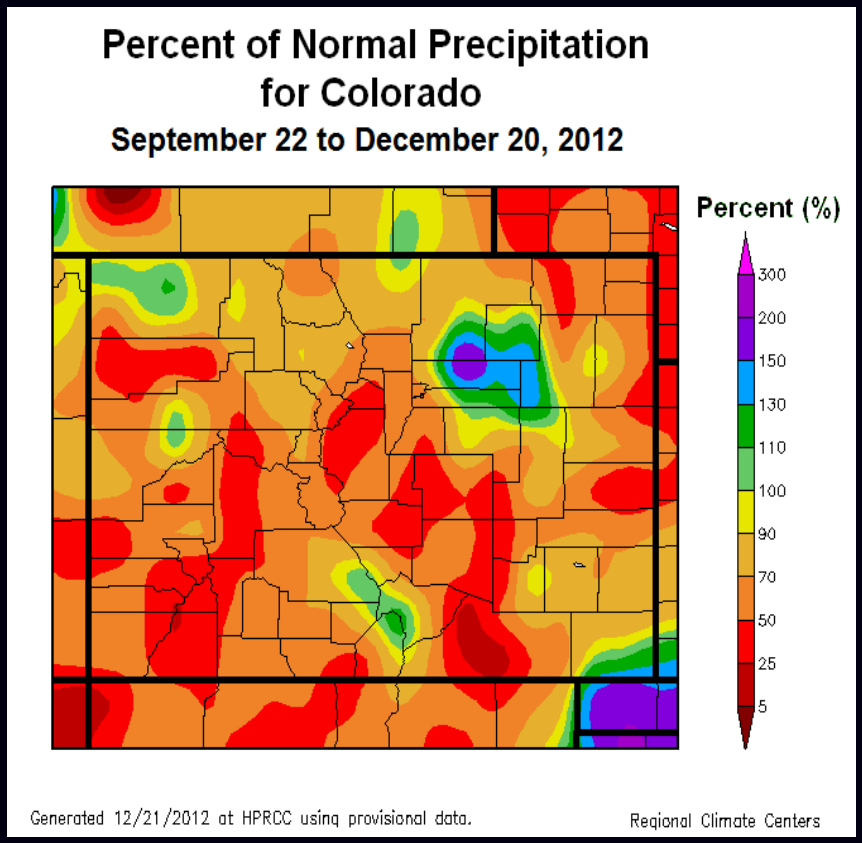
Mike Baker
National Weather Service
Boulder, Colorado
December 22, 2012
Revised


LARAMIE
HIAWATHA
KIMBALL
CRAIG
STERLING
C O L O R A D O
RANGELY
KREMMLING
WRAY
DENVER
GRAND JUNCTION
FAIRPLAY
FLAGLER
MOAB
COLORADO SPRINGS
MONTROSE
CHEYENNE WELLS
Recent
Weather, Soil Moisture
and Drought
Conditions
Across Colorado
DOVE CREEK
LAMAR
DURANGO
ALAMOSA
SPRINGFIELD
TRINIDAD
FARMINGTON

During the
90-Day Period
September 22 to December 20, 2012

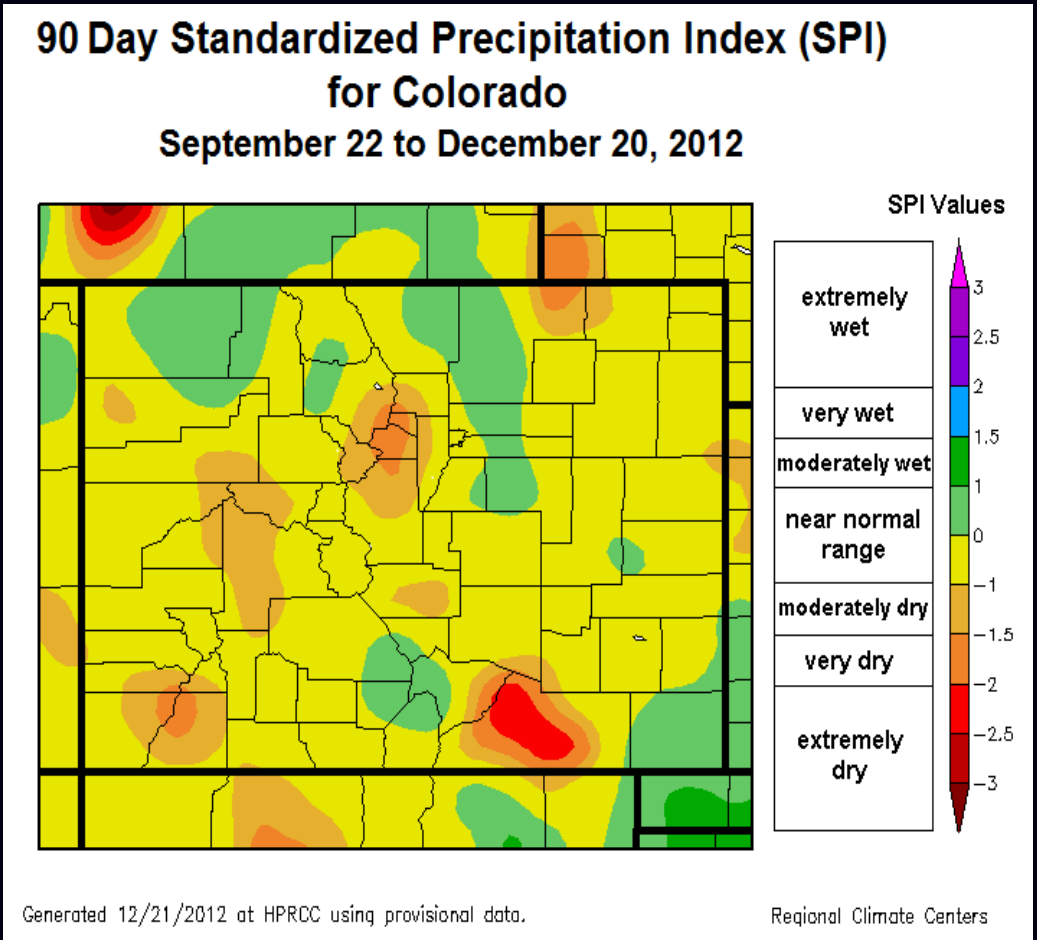
# Precipitation for the 90-Day Period Ending December 20, 2012




Other than scattered pockets of above to much above average precipitation east of Denver in northeast Colorado, in the extreme southeast corner of the state and on the west slope, precipitation overall during this recent 90-day period ranged from below to much below average across the Centennial State.

# Soil Moisture Conditions for the 90-Day Period Ending December 20, 2012

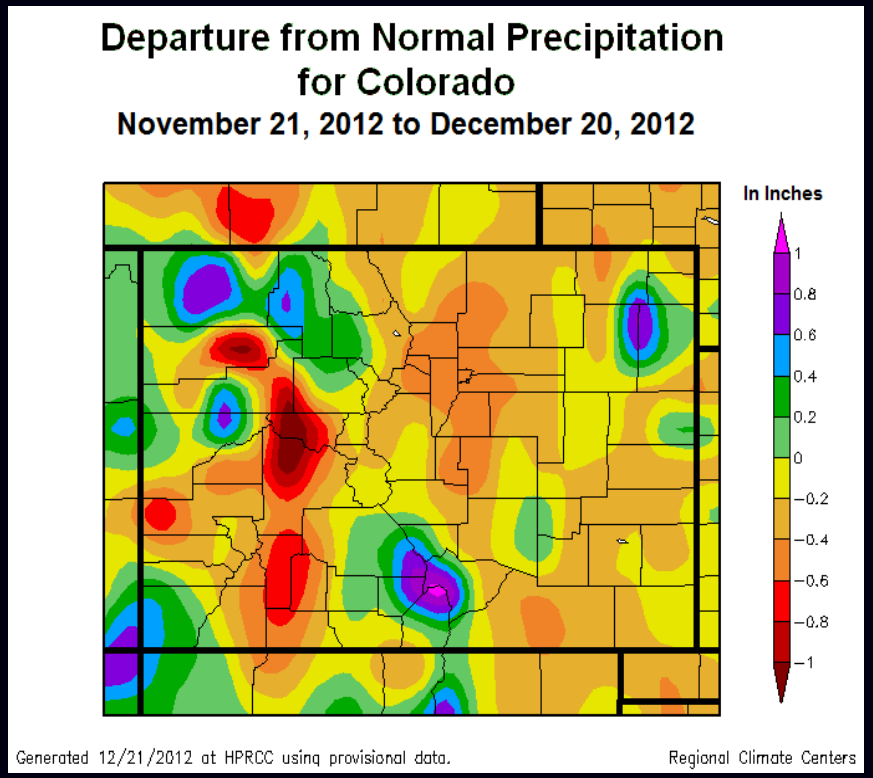


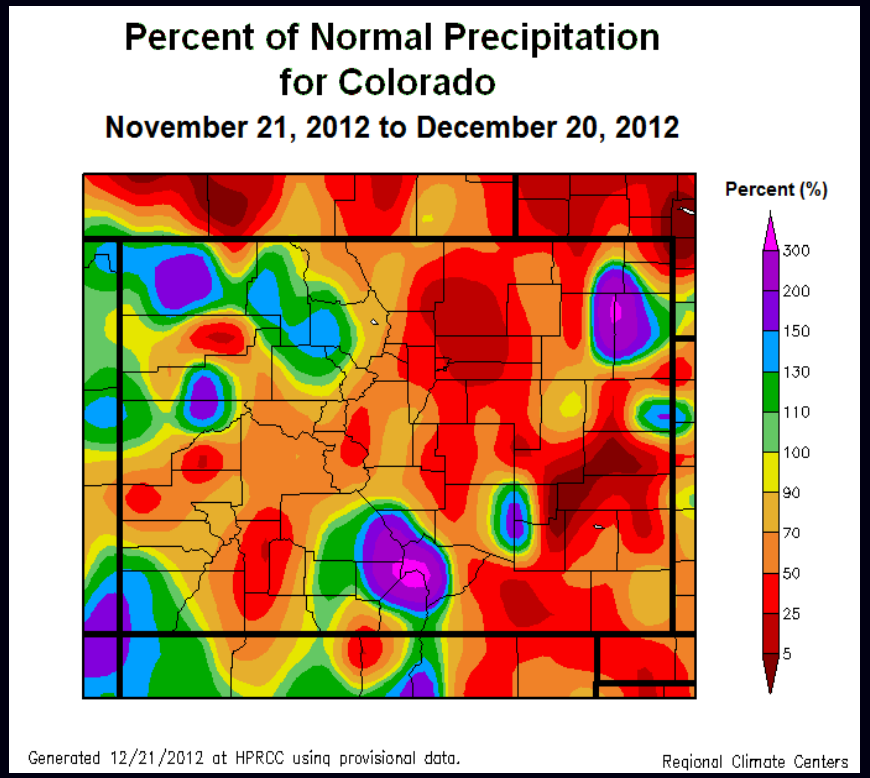

The Standardized Precipitation Index (SPI) during this 90-day period indicates near normal soil moisture conditions for most of the Colorado. Exceptions include the oblong area of extremely dry soil conditions along the east slope of the Sangre de Cristo mountain range in southeast Colorado and a scattering of moderate to very dry soils across western and extreme northeast Colorado.

The SPI was developed to monitor potential short term agricultural and long-term hydrological drought conditions. The SPI is a probability index that considers only precipitation.

During the
30-Day Period
November 21 to December 20, 2012

# Precipitation for the 30-Day Period Ending December 20, 2012

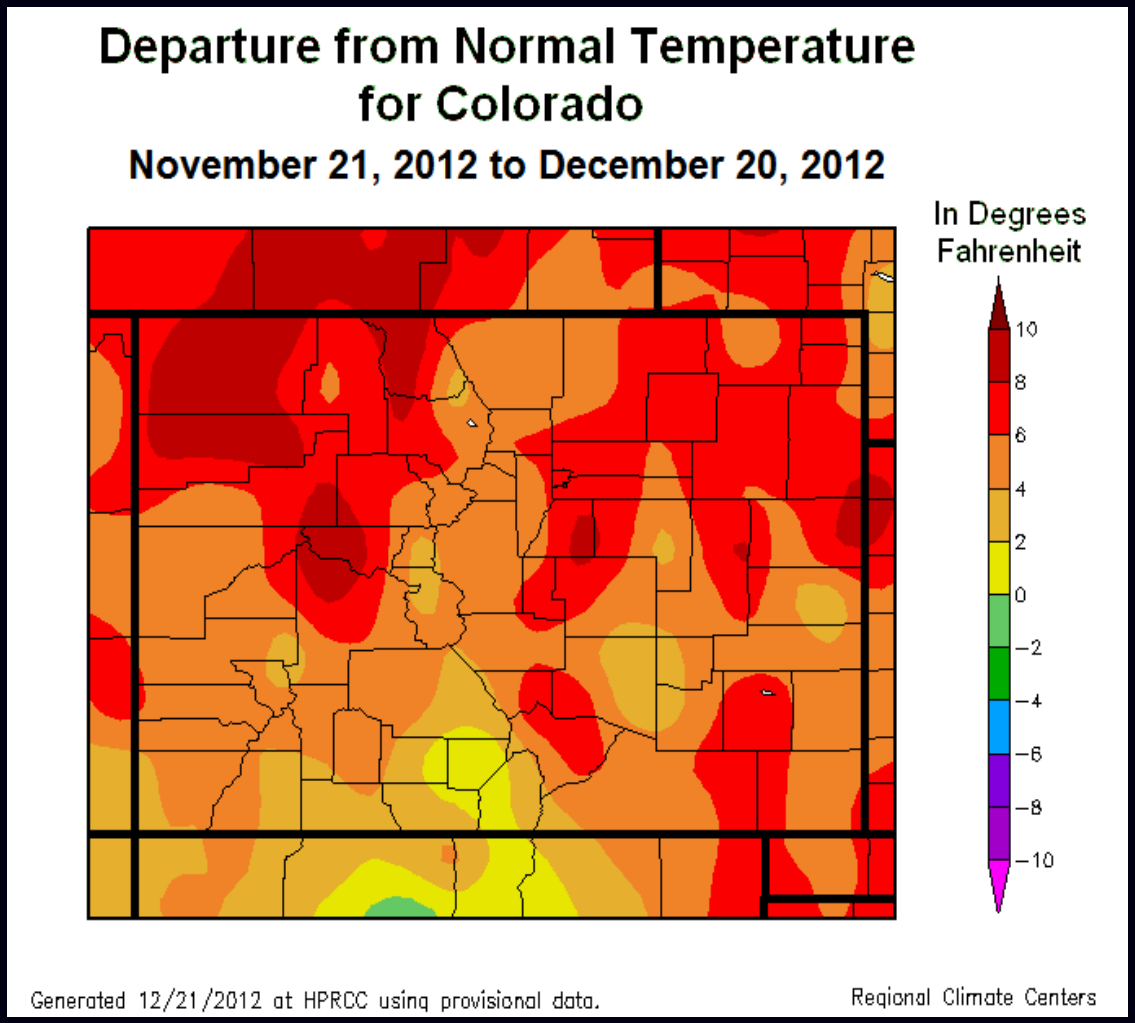



The above maps reveal a quilt work of above and below normal precipitation across Colorado during the recent 30-day period ending December 20, 2012. Overall, eastern Colorado continued to receive the least amount of precipitation, with a section of southeast Colorado receiving less than 5 percent of its normal allotment. At the same time, a few areas in eastern Colorado were fortunate to receive well over 150 percent of their seasonal average.

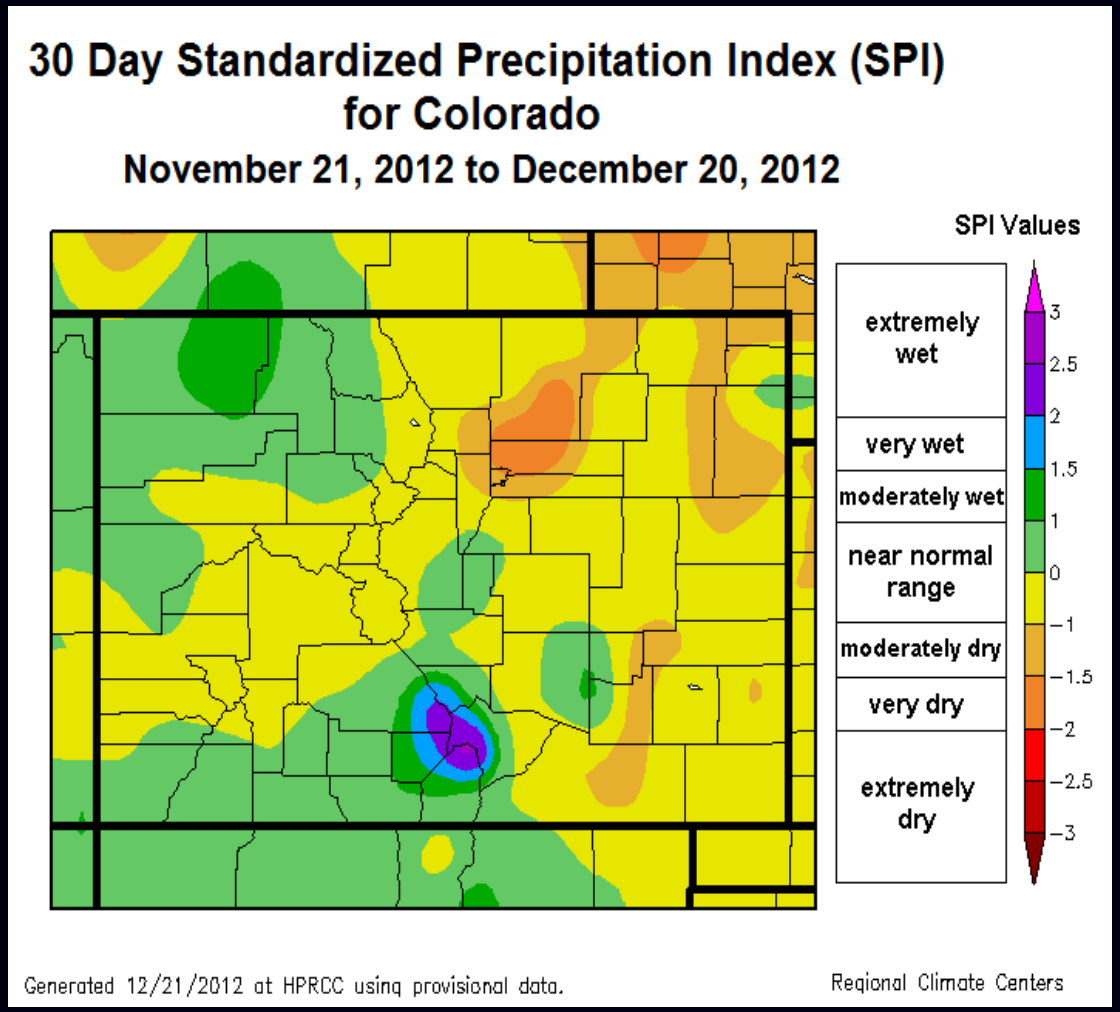
Western Colorado faired somewhat better, especially the northwest, the far southwest and south central parts of the state where a series of late autumn storms produced substantial precipitation in the form of snow. Precipitation in these areas ranged generally from 130 to around 300 percent of normal.

# Temperature for the 30-Day Period Ending December 20, 2012




Temperatures across Colorado during the 30-day period ending December 20, 2012 continued to run above average. For the most part, temperatures across northern and eastern Colorado ranged from 4 to 10 degrees (F) above average, and from zero to 4 degrees (F) above average for the remainder of the state.

# Soil Moisture Conditions for the 30-Day Period Ending December 20, 2012




The Standardized Precipitation Index (SPI) indicated near normal to moderately dry soil conditions in eastern Colorado, with the exception of an elongated area of very dry soils north and east of the Denver metropolitan area.

The SPI also indicated near normal to moderately wet soils across western Colorado, and a pocket of extremely wet soil conditions in and near the San Luis Valley in south central Colorado.

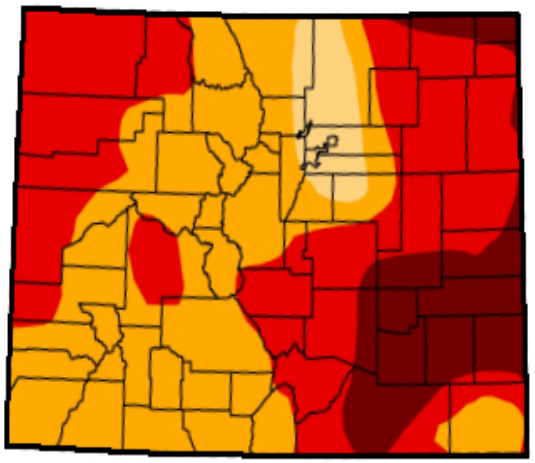
# U.S. Drought Monitor

**December 18, 2012**
Valid 7 a.m. EST

## Colorado

*Drought Conditions (Percent Area)*

| | None | D0-D4 | D1-D4 | D2-D4 | D3-D4 | D4 |
|---|---|---|---|---|---|---|
| Current | 0.00 | 100.00 | 100.00 | 95.06 | 53.47 | 13.48 |
| Last Week (12/11/2012 map) | 0.00 | 100.00 | 100.00 | 95.06 | 53.43 | 13.48 |
| 3 Months Ago (09/18/2012 map) | 0.00 | 100.00 | 100.00 | 100.00 | 61.75 | 16.89 |
| Start of Calendar Year (12/27/2011 map) | 67.79 | 32.21 | 24.98 | 14.94 | 0.04 | 0.00 |
| Start of Water Year (09/25/2012 map) | 0.00 | 100.00 | 100.00 | 100.00 | 61.75 | 16.89 |
| One Year Ago (12/13/2011 map) | 67.79 | 32.21 | 24.98 | 14.94 | 1.33 | 0.16 |



*Intensity:*

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements at the website below.*

http://droughtmonitor.unl.edu

*Released Thursday, December 20, 2012*
*Brian Fuchs, National Drought Mitigation Center*

As of December 18, 2012, the U.S. Drought Monitor indicated extreme (D3) to exceptional (D4) drought conditions for much of eastern Colorado, and extreme drought conditions (D3) across the northwest corner of the state.

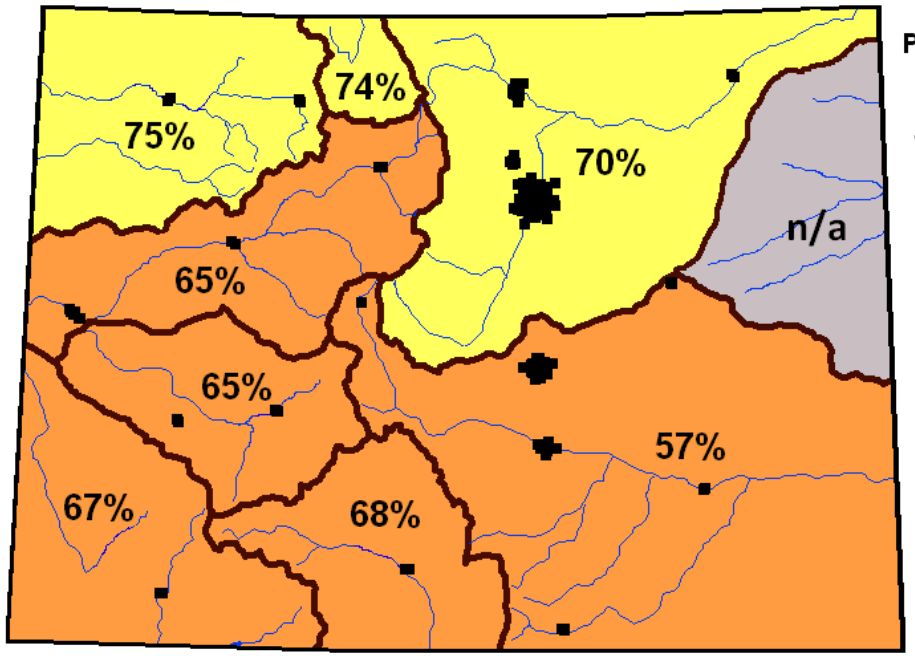
Furthermore, severe drought (D2) conditions were indicated across the southwest and along the spine of the Rocky Mountains. There was also an elongated area of moderate drought (D1) conditions on the state's northeast plains adjacent to the Front Range. This includes the greater Denver metropolitan area.

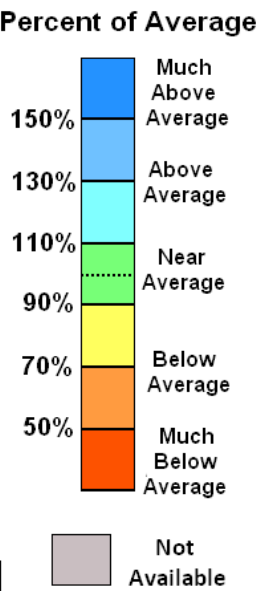
# Snowpack Across Colorado

As of

December 20, 2012

# Colorado SNOTEL Snowpack Update Map




**Snow Water Equivalent as a Percent of Average (%) for Colorado by River Basin as of Thursday Dec. 20, 2012**

Basin Wide Percent of Average (%)

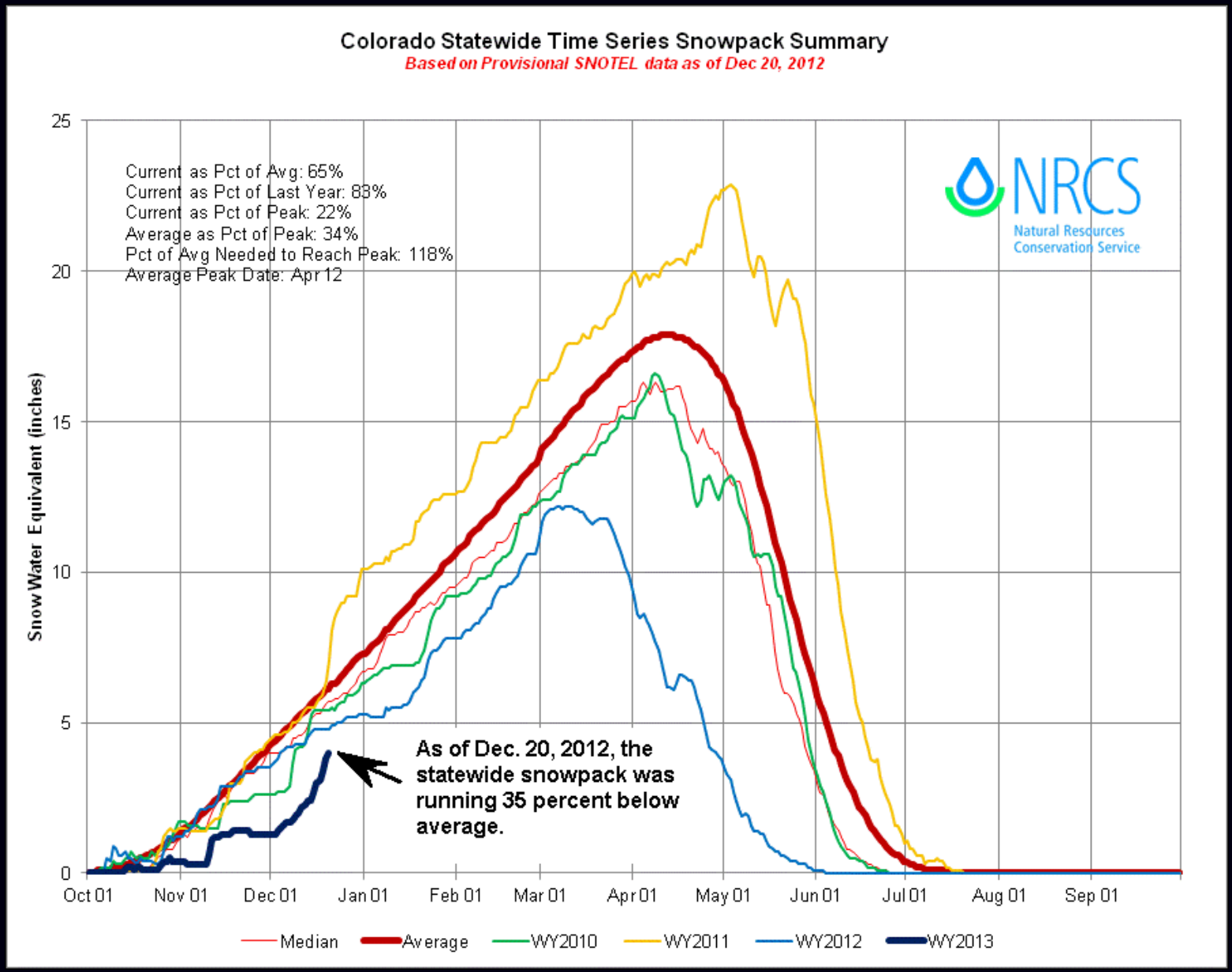
| WEST SLOPE | | EAST SLOPE | |
|---|---|---|---|
| Yampa and White River Basins | 75% | Laramie & North Platte Basin | 74% |
| Upper Colorado River Basin | 65% | South Platte River Basin | 70% |
| Gunnison River Basin | 65% | Arkansas River Basin | 57% |
| San Miguel, Dolores, Animas & San Juan River Basins | 67% | Statewide Avg.... | 68% |
| Upper Rio Grande Basin | 68% | | |

Source: USDA Natural Resources Conservation Service--Water and Climate, Portland, Oregon
provisional data, subject to revision

As of December 20, 2012, the Colorado snowpack continued to run below normal with a statewide average of 68 percent.

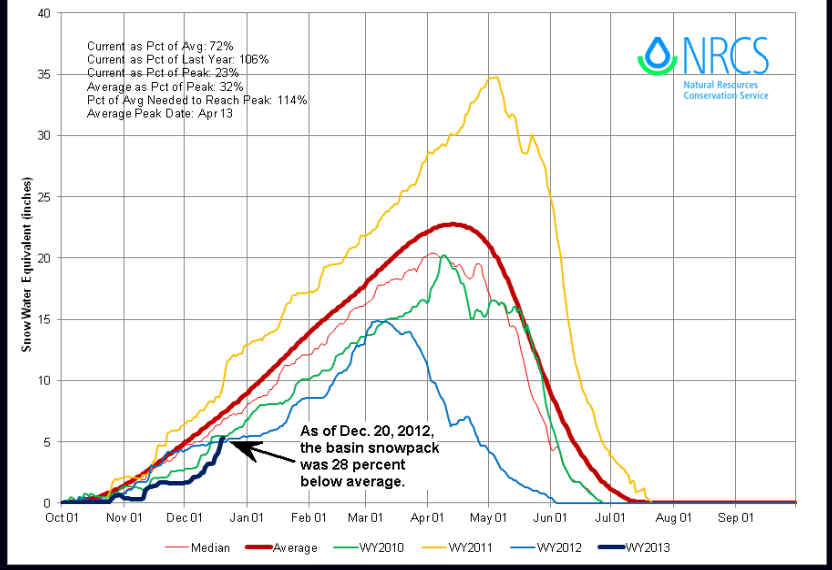
Northwest, southwest and south central portions of Colorado saw the greatest improvement in the snowpack, though not readily apparent from this map. A series of Pacific storm systems in late November and early December deposited a substantial amount of snow in these areas.

Meanwhile, the Arkansas River Basin in southeast Colorado continued to have the lowest average snowpack in the state.


Colorado Statewide Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Dec 20, 2012
Current as Pct of Avg: 65%
Current as Pct of Last Year: 88%
Current as Pct of Peak: 22%
Average as Pct of Peak: 34%
Pct of Avg Needed to Reach Peak: 118%
Average Peak Date: Apr 12
NRCS
Natural Resources Conservation Service
Snow Water Equivalent (inches)
25
20
15
10
5
0
Oct 01
Nov 01
Dec 01
Jan 01
Feb 01
Mar 01
Apr 01
May 01
Jun 01
Jul 01
Aug 01
Sep 01
As of Dec. 20, 2012, the statewide snowpack was running 35 percent below average.
Median
Average
WY2010
WY2011
WY2012
WY2013

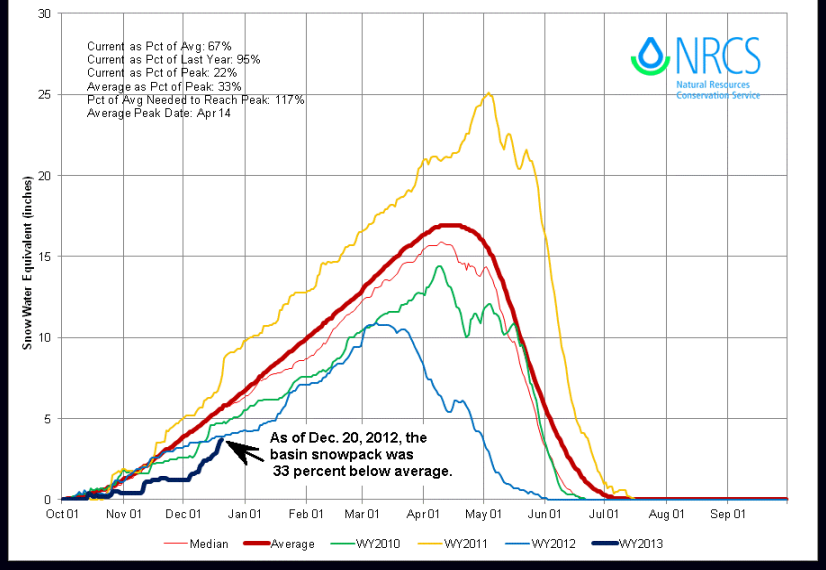
## Yampa and White River Basins Time Series Snowpack Summary

*Based on Provisional SNOTEL data as of Dec 20, 2012*



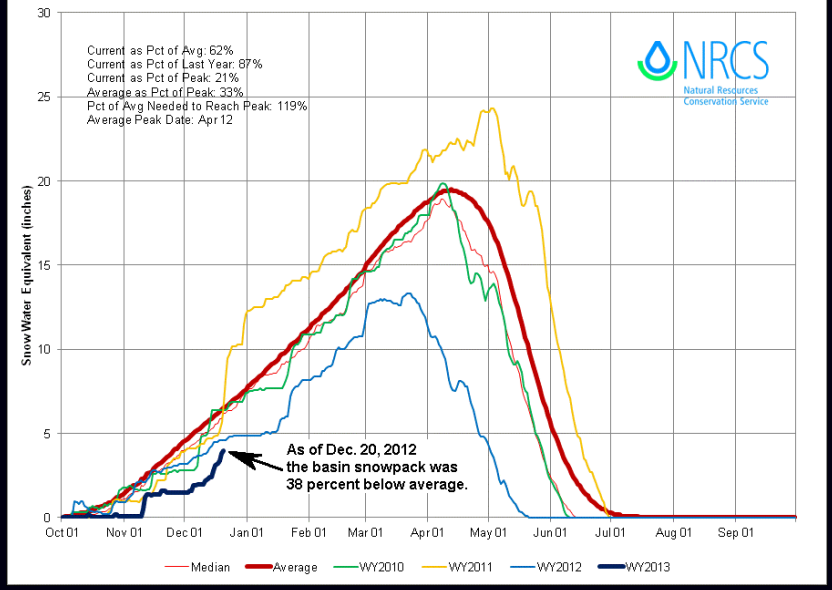

## Upper Colorado River Basin Time Series Snowpack Summary

*Based on Provisional SNOTEL data as of Dec 20, 2012*



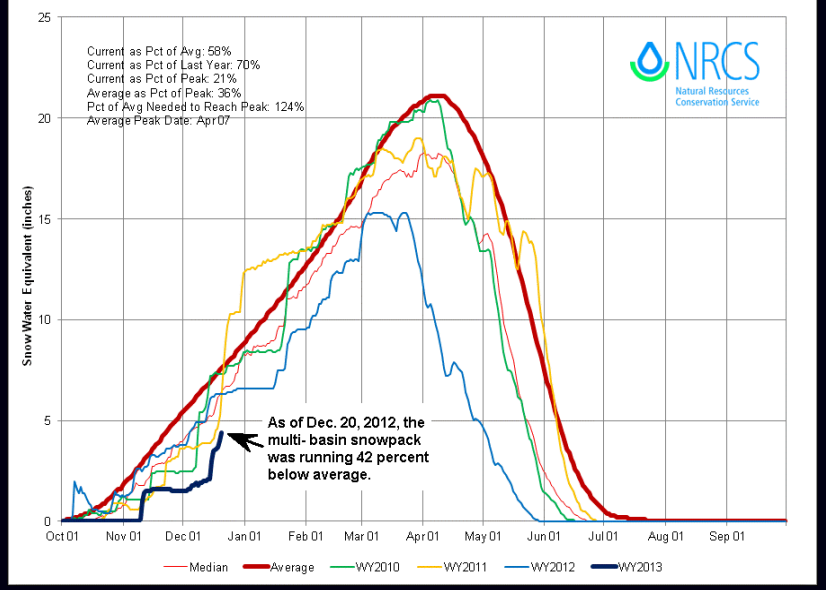

## Gunnison River Basin Time Series Snowpack Summary

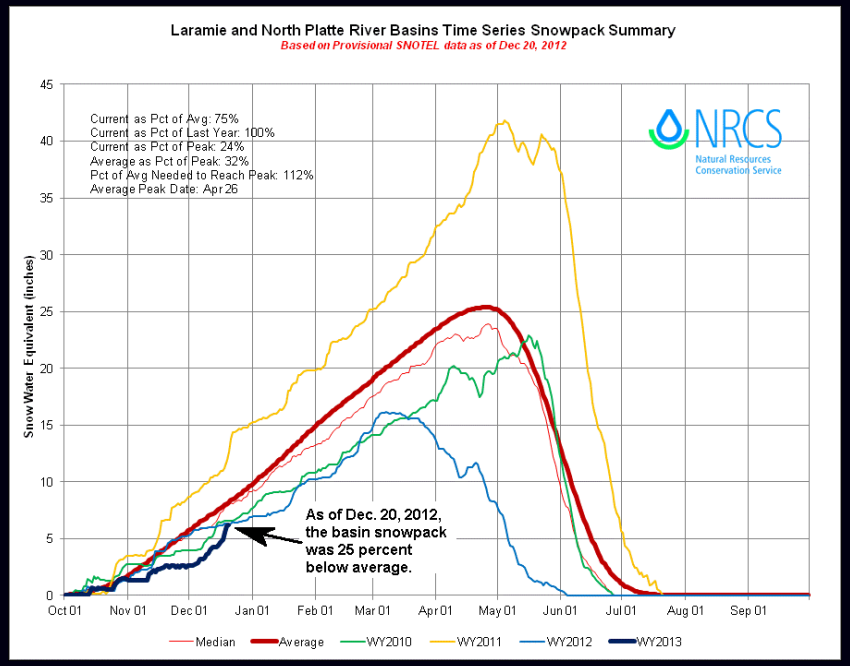
*Based on Provisional SNOTEL data as of Dec 20, 2012*

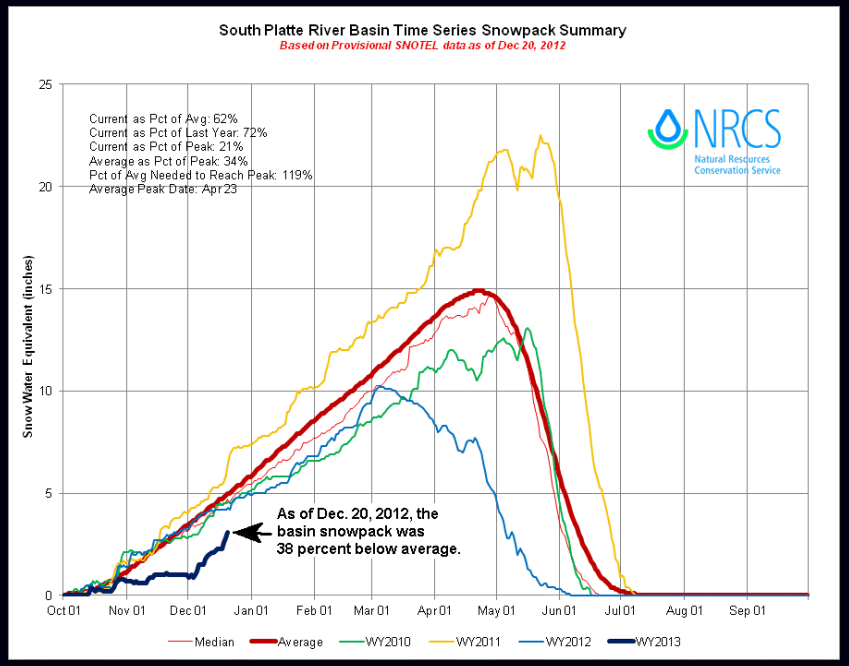


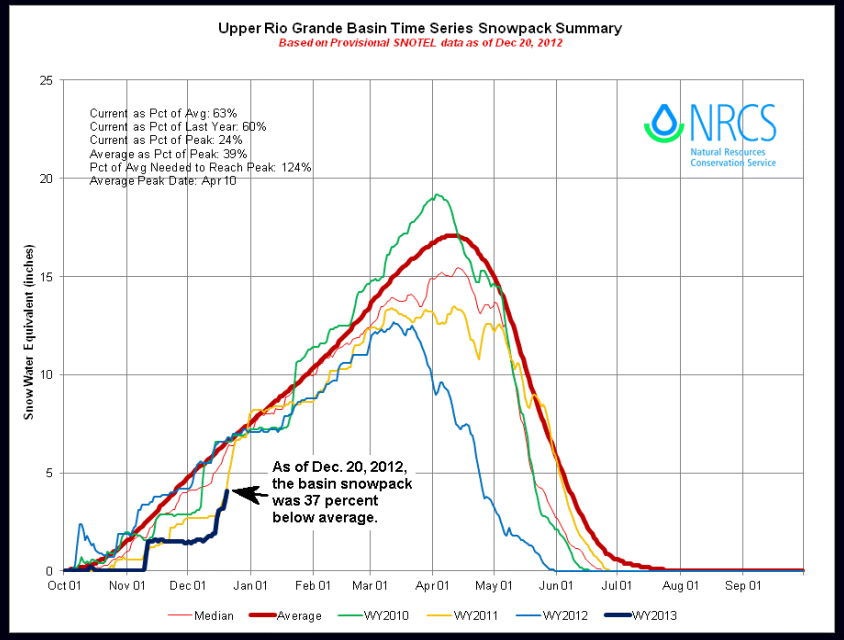

## San Miguel, Dolores, Animas & San Juan River Basins Time Series Snowpack Summary

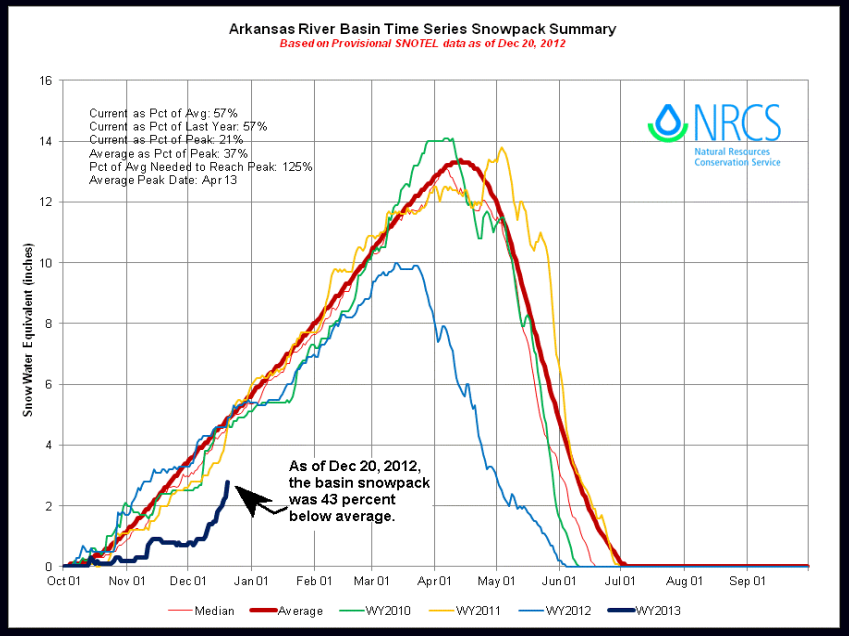
*Based on Provisional SNOTEL data as of Dec 20, 2012*



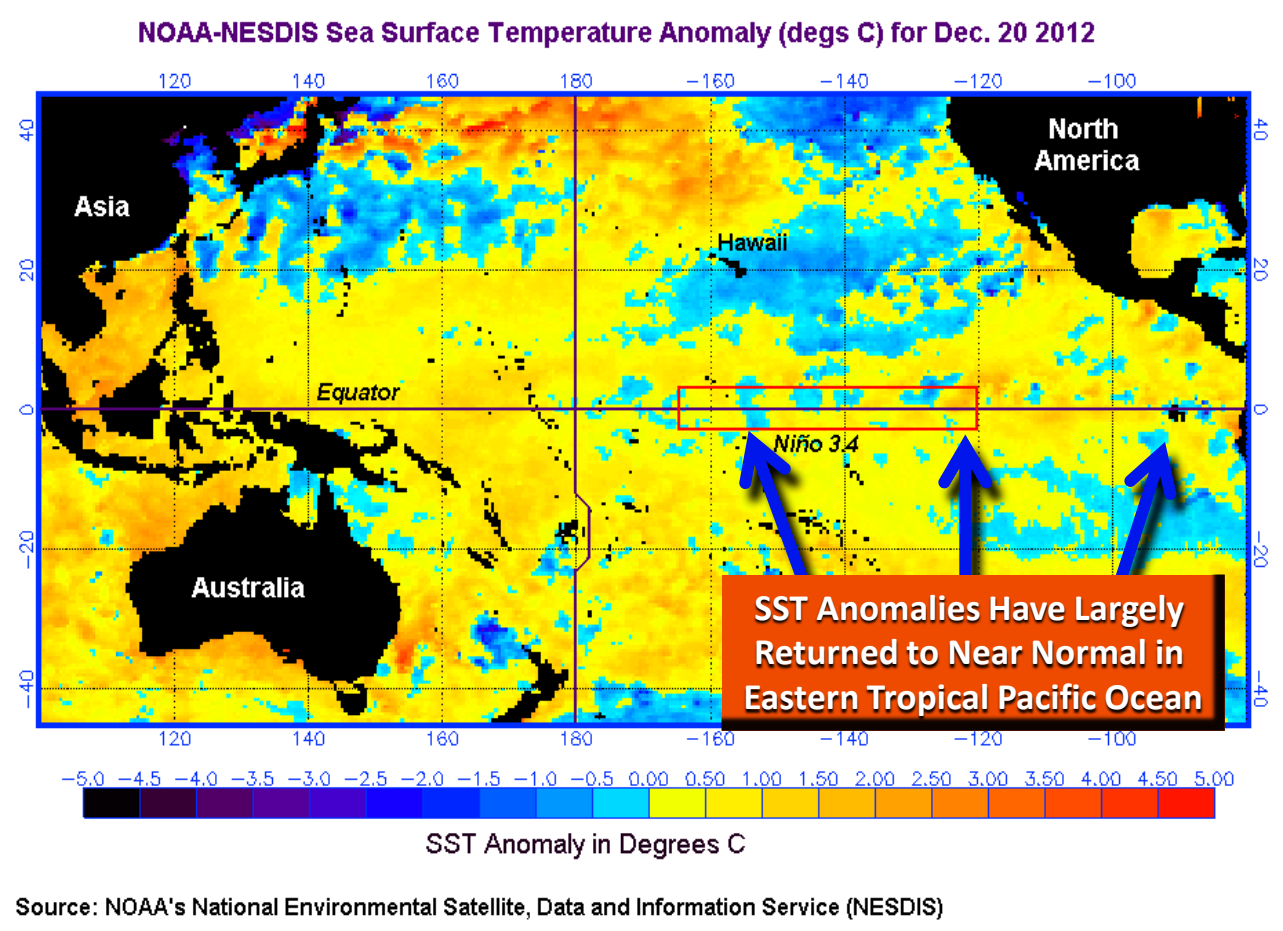

Laramie and North Platte River Basins Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Dec 20, 2012
Current as Pct of Avg: 75%
Current as Pct of Last Year: 100%
Current as Pct of Peak: 24%
Average as Pct of Peak: 32%
Pct of Avg Needed to Reach Peak: 112%
Average Peak Date: Apr 26
As of Dec. 20, 2012, the basin snowpack was 25 percent below average.
Snow Water Equivalent (inches)
Oct 01 Nov 01 Dec 01 Jan 01 Feb 01 Mar 01 Apr 01 May 01 Jun 01 Jul 01 Aug 01 Sep 01
Median Average WY2010 WY2011 WY2012 WY2013


South Platte River Basin Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Dec 20, 2012
Current as Pct of Avg: 62%
Current as Pct of Last Year: 72%
Current as Pct of Peak: 21%
Average as Pct of Peak: 34%
Pct of Avg Needed to Reach Peak: 119%
Average Peak Date: Apr 23
As of Dec. 20, 2012, the basin snowpack was 38 percent below average.
Snow Water Equivalent (inches)
Oct 01 Nov 01 Dec 01 Jan 01 Feb 01 Mar 01 Apr 01 May 01 Jun 01 Jul 01 Aug 01 Sep 01
Median Average WY2010 WY2011 WY2012 WY2013


Upper Rio Grande Basin Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Dec 20, 2012
Current as Pct of Avg: 63%
Current as Pct of Last Year: 60%
Current as Pct of Peak: 24%
Average as Pct of Peak: 39%
Pct of Avg Needed to Reach Peak: 124%
Average Peak Date: Apr 10
As of Dec. 20, 2012, the basin snowpack was 37 percent below average.
Snow Water Equivalent (inches)
Oct 01 Nov 01 Dec 01 Jan 01 Feb 01 Mar 01 Apr 01 May 01 Jun 01 Jul 01 Aug 01 Sep 01
Median Average WY2010 WY2011 WY2012 WY2013


Arkansas River Basin Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Dec 20, 2012
Current as Pct of Avg: 57%
Current as Pct of Last Year: 57%
Current as Pct of Peak: 21%
Average as Pct of Peak: 37%
Pct of Avg Needed to Reach Peak: 125%
Average Peak Date: Apr 13
As of Dec 20, 2012, the basin snowpack was 43 percent below average.
Snow Water Equivalent (inches)
Oct 01 Nov 01 Dec 01 Jan 01 Feb 01 Mar 01 Apr 01 May 01 Jun 01 Jul 01 Aug 01 Sep 01
Median Average WY2010 WY2011 WY2012 WY2013

# The Latest on ENSO




Niño 3.4 – The principal region in the eastern Equatorial Pacific Ocean (red outlined box along the equator) used by the Climate Prediction Center (CPC) for monitoring, assessing and predicting the interseasonal climate phenomena called El Niño/Southern Oscillation (ENSO).

Slightly warmer than normal waters continue to dominate the Pacific Ocean the third week of December 2012.

However, in the past few weeks, positive sea surface temperature (SST) anomalies in the eastern tropical Pacific Ocean region known as Niño 3.4 have weakened (cooled), and in some areas, have become negative in value (colder than average).

# The Oceanic Niño Index (ONI) for Niño 3.4

| Year | DJF | JFM | FMA | MAM | AMJ | MJJ | JJA | JAS | ASO | SON | OND | NDJ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | -1.7 | -1.5 | -1.1 | -0.9 | -0.8 | -0.7 | -0.6 | -0.5 | -0.5 | -0.6 | -0.8 | -0.8 |
| 2001 | -0.7 | -0.6 | -0.5 | -0.3 | -0.2 | -0.1 | 0.0 | 0.0 | -0.1 | -0.2 | -0.2 | -0.3 |
| 2002 | -0.2 | 0.0 | 0.1 | 0.3 | 0.5 | 0.7 | 0.8 | 0.8 | 0.9 | 1.2 | 1.3 | 1.3 |
| 2003 | 1.1 | 0.8 | 0.4 | 0.0 | -0.2 | -0.1 | 0.2 | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 |
| 2004 | 0.3 | 0.2 | 0.1 | 0.1 | 0.1 | 0.3 | 0.5 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| 2005 | 0.6 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.1 | 0.0 | -0.2 | -0.5 | -0.8 |
| 2006 | -0.9 | -0.7 | -0.5 | -0.3 | 0.0 | 0.1 | 0.2 | 0.3 | 0.5 | 0.8 | 1.0 | 1.0 |
| 2007 | 0.7 | 0.3 | -0.1 | -0.2 | -0.3 | -0.3 | -0.3 | -0.6 | -0.9 | -1.1 | -1.2 | -1.4 |
| 2008 | -1.5 | -1.5 | -1.2 | -0.9 | -0.7 | -0.5 | -0.3 | -0.2 | -0.1 | -0.2 | -0.4 | -0.7 |
| 2009 | -0.9 | -0.8 | -0.6 | -0.2 | 0.1 | 0.4 | 0.5 | 0.6 | 0.7 | 1.0 | 1.4 | 1.6 |
| 2010 | 1.6 | 1.4 | 1.1 | 0.7 | 0.2 | -0.3 | -0.8 | -1.2 | -1.4 | -1.5 | -1.5 | -1.5 |
| 2011 | -1.4 | -1.3 | -1.0 | -0.7 | -0.4 | -0.2 | -0.2 | -0.3 | -0.6 | -0.8 | -1.0 | -1.0 |
| 2012 | -0.9 | -0.7 | -0.5 | -0.3 | -0.1 | 0.0 | 0.1 | 0.3 | 0.4 | **0.6** | | |

*NOAA/CPC Last Update 12-05-12*

The ONI for the latest complete 3-month climate season (September-November) was +0.6; an increase of +0.2 from the previous overlapping 3-month season ASO.

El Niño : ONI higher than +0.45
Neutral ENSO : ONI of -0.45 to +0.45
La Niña: ONI lower than -0.45

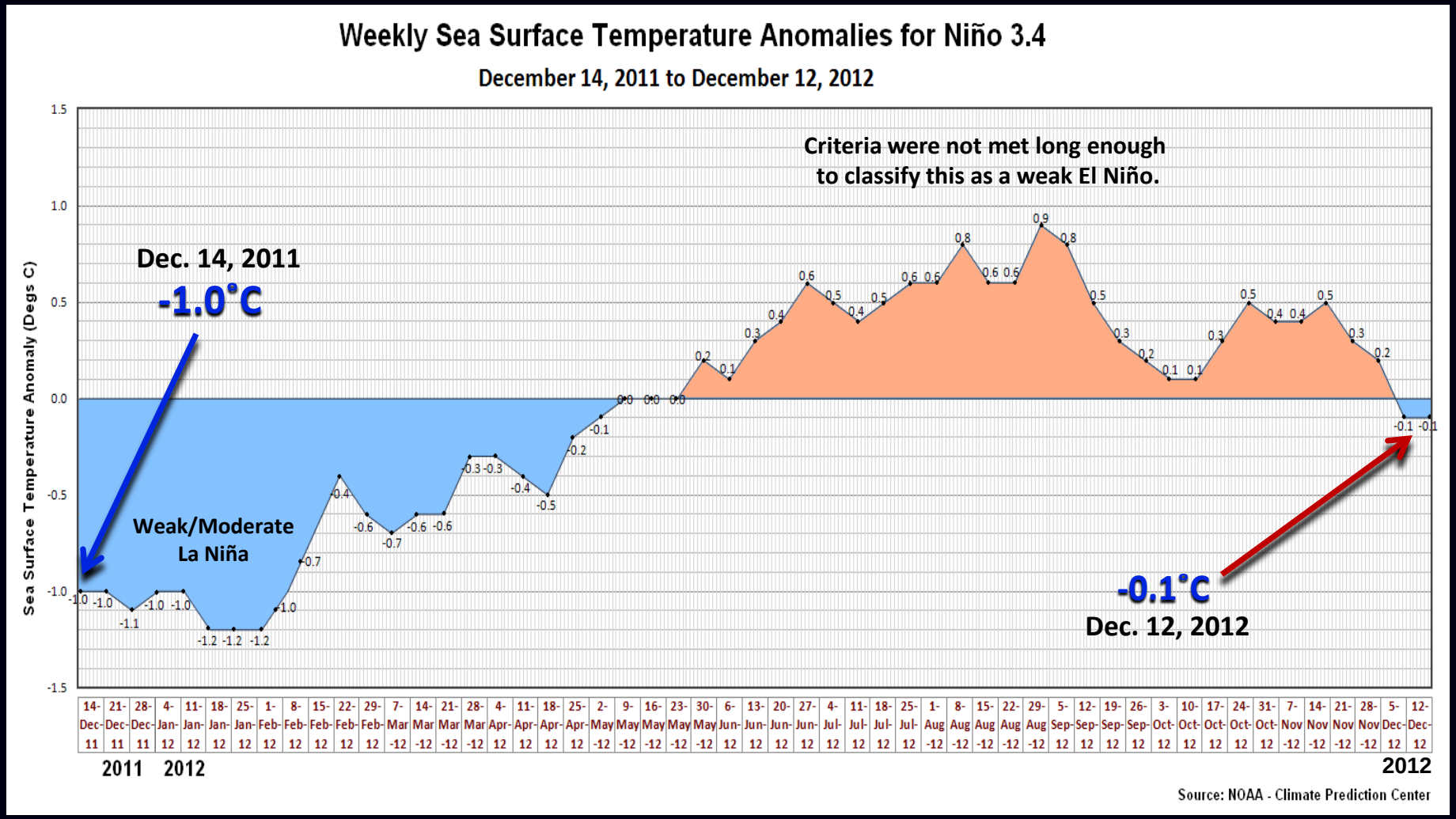
**The ONI is based on sea surface temperature (SST) departures from average in the Niño 3.4 region of the eastern tropical Pacific Ocean. It is the principal measure used by NOAA's Climate Prediction Center (CPC) for monitoring, assessing and predicting El Niño/Southern Oscillation (ENSO.)**

**ONI is defined as the three-month running mean SST departure in the Niño 3.4 region of the Pacific.**

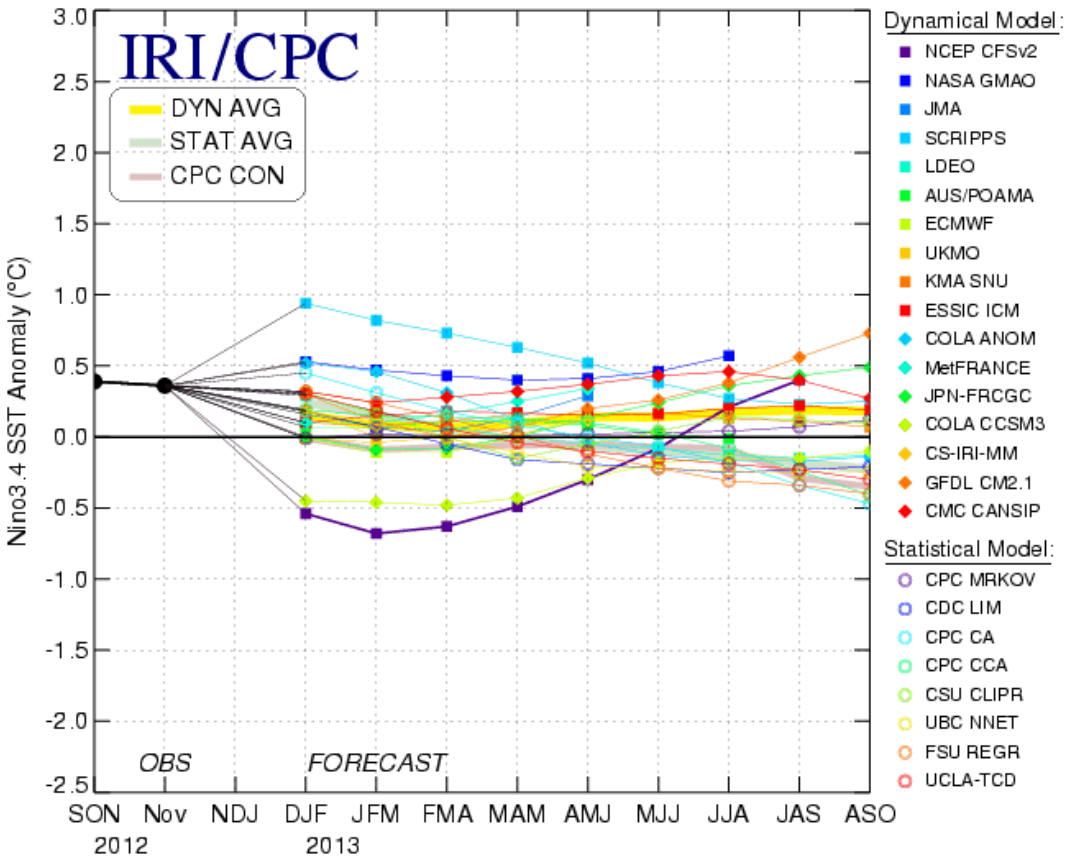
**ONI is used to place current ENSO and non-ENSO events into a historical perspective.**

**CPC's operational definitions of El Niño and La Niña are keyed to the ONI index.**

**For historical purposes, warm and cold phases of ENSO (the red and blue colored numbers) are defined when the threshold is met for a minimum of 5 consecutive over-lapping 3-month seasons.**




The weekly SST anomaly for ENSO 3.4 has trended negative (-0.1C ) since the start of December 2012, after being in positive territory since late May of 2012.




***Forecast SST Anomalies (deg C) for the Eastern Pacific Region Niño 3.4***

| Seasons (2012-2013) | DJF | JFM | FMA | MAM | AMJ | MJJ | JJA | JAS | ASO |
|---|---|---|---|---|---|---|---|---|---|
| Average, Dynamical Models | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 |
| Average, Statistical Models | 0.2 | 0.2 | 0.1 | 0 | -0.1 | -0.1 | -0.1 | -0.2 | -0.2 |
| Average, All Models | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0 | 0.1 | 0 | 0 |

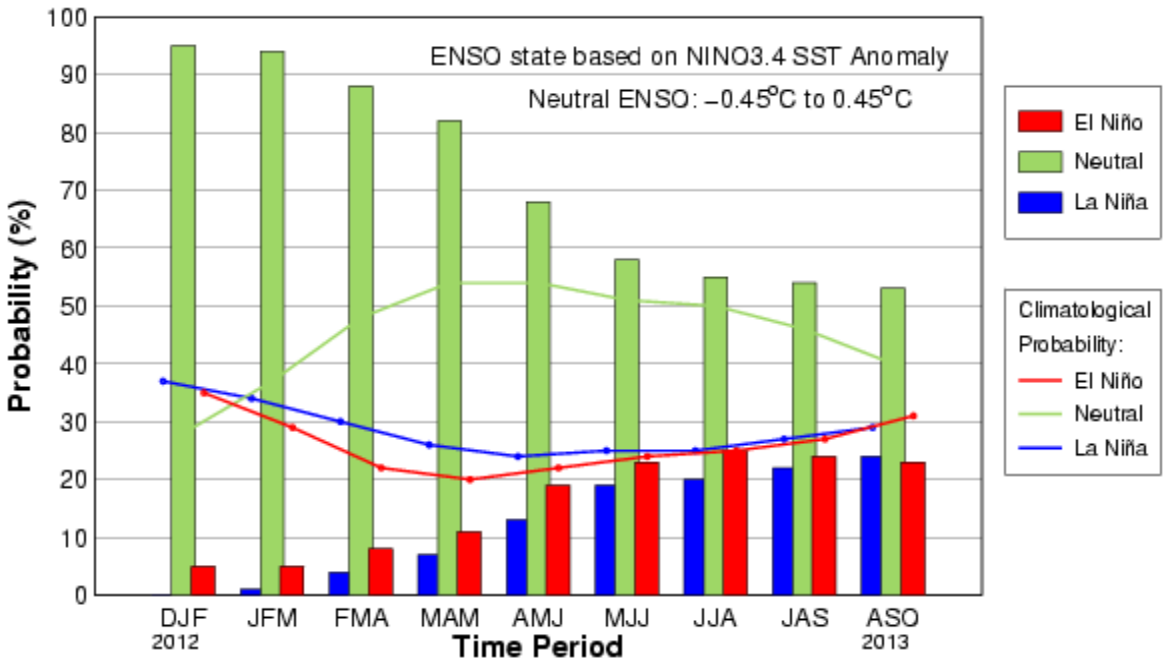
**Source: The International Research Institute for Climate and Society (IRI) - Dec 20 2012**

# The ENSO Outlook

An overwhelming majority of the dynamical and statistical climate models predict neutral or non-ENSO conditions in the Niño 3.4 region of the Pacific Ocean through the 2013 summer season.

The table in the lower left contains the cumulative average of sea surface temperature anomalies (SSTa) forecasted by 17 dynamical models and 8 statistical models, and a cumulative average for all 25 models for overlapping 3-month climate seasons ending August-September-October of 2013.

An SSTa value less than +0.45˚C and greater than -0.45˚C is a strong indicator of neutral ENSO conditions.



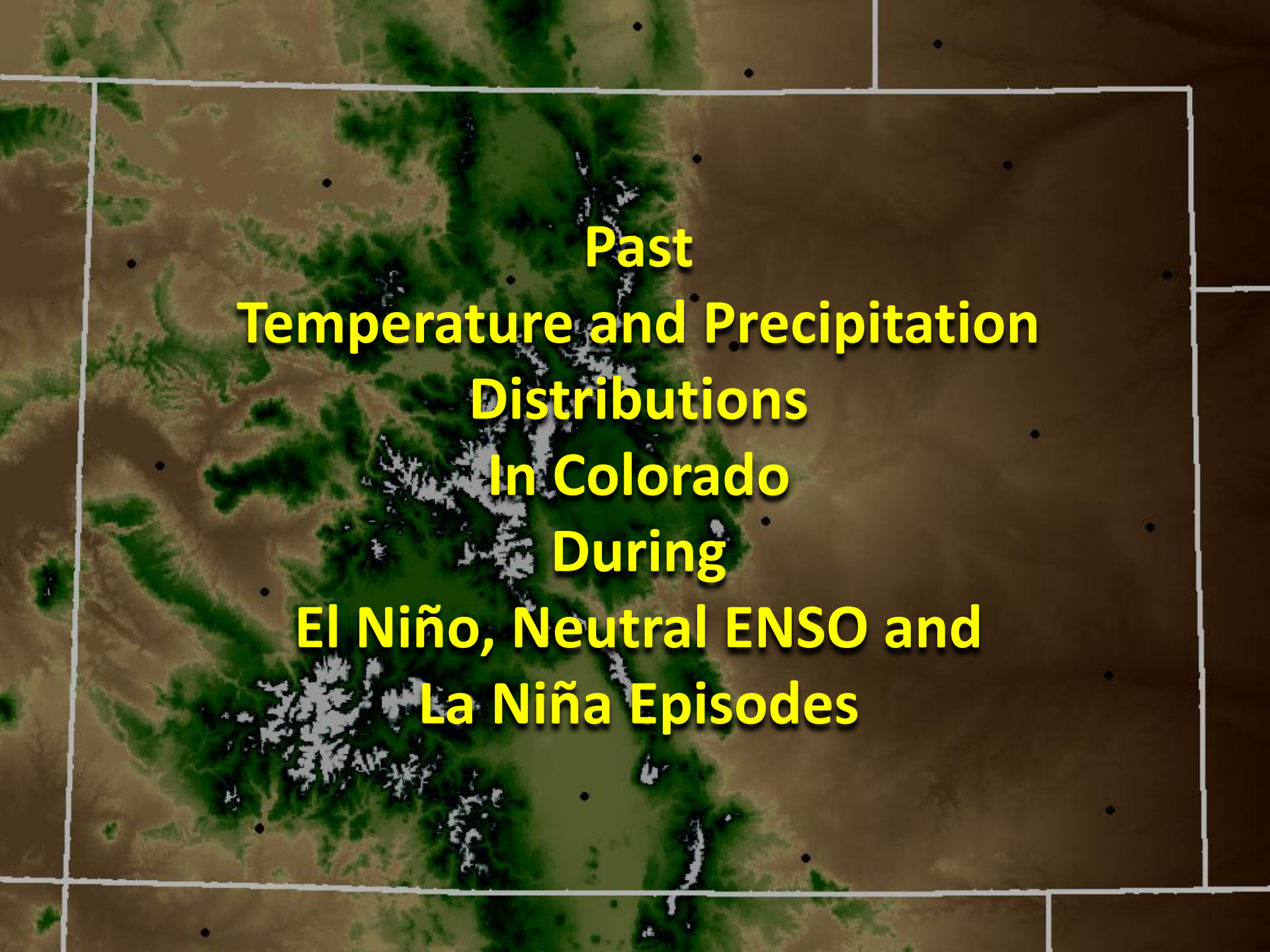

IRI Probabilistic ENSO Prediction for NINO3.4 Region

| Season | La Niña | Neutral | El Niño |
|---|---|---|---|
| DJF 2012 | ~0% | 95% | 5% |
| JFM 2013 | 1% | 94% | 5% |
| FMA 2013 | 4% | 88% | 8% |
| MAM 2013 | 7% | 82% | 11% |
| AMJ 2013 | 13% | 68% | 19% |
| MJJ 2013 | 19% | 58% | 23% |
| JJA 2013 | 20% | 55% | 25% |
| JAS 2013 | 22% | 54% | 24% |
| ASO 2013 | 24% | 53% | 23% |

Probabilistic ENSO Forecast for Nine Overlapping 3-Month Climate Seasons Out Through August-October 2013

So, what weather patterns might we see across Colorado during the next few months with neutral ENSO conditions in the Pacific Ocean?

**The following slides offer a reasonable answer to this question.**


Past
Temperature and Precipitation
Distributions
In Colorado
During
El Niño, Neutral ENSO and
La Niña Episodes

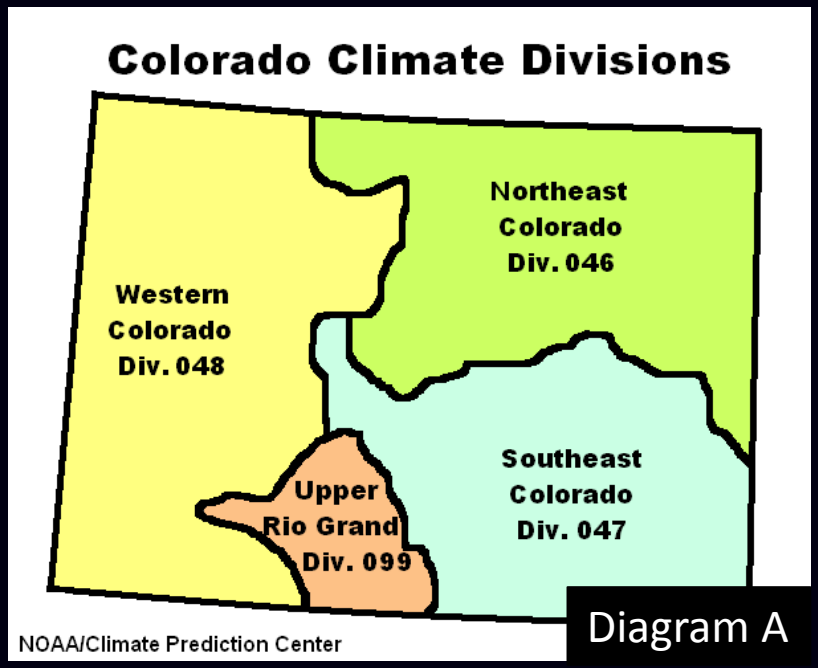



Diagram A

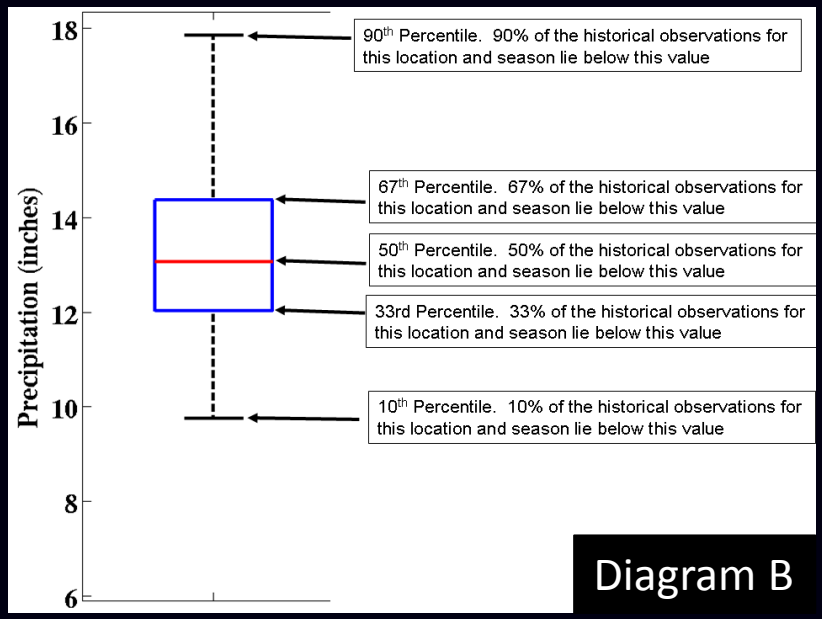



Diagram B

# *Interpreting ENSO Box and Whisker Plots*

**Diagram A** is a map of the four climate mega-divisions in Colorado used by the Climate Prediction Center (CPC)—Divisions 046, 047,048 and 099.

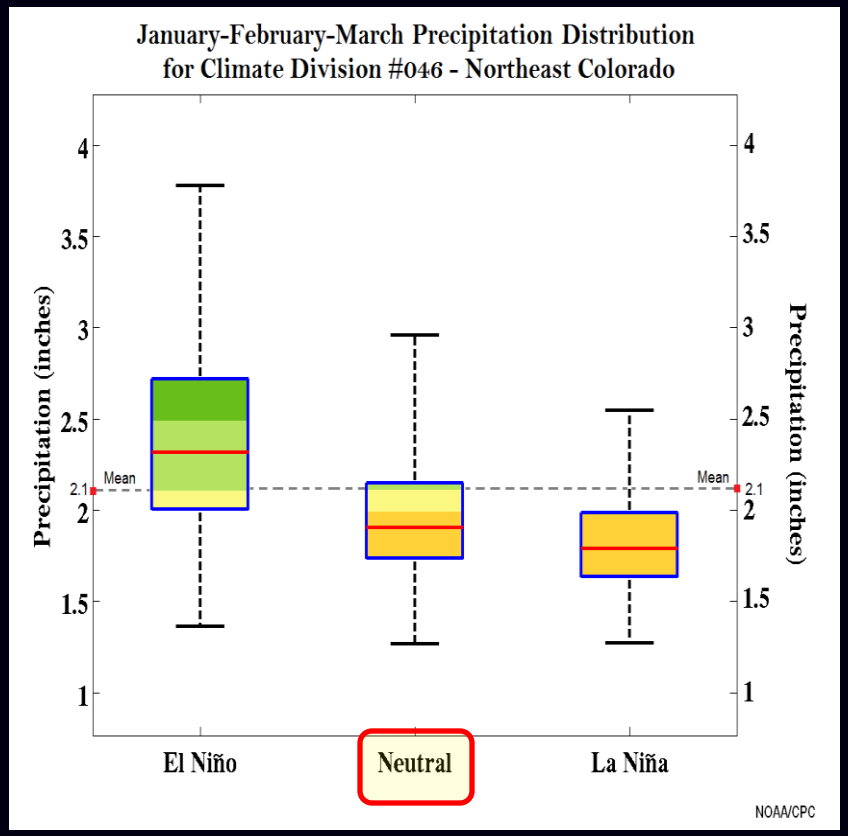
CPC has produced 3-month historical temperature and precipitation distribution plots for the three different ENSO categories –El Niño, La Niña and ENSO-neutral (non-ENSO) conditions for every climate mega-division in the United States.

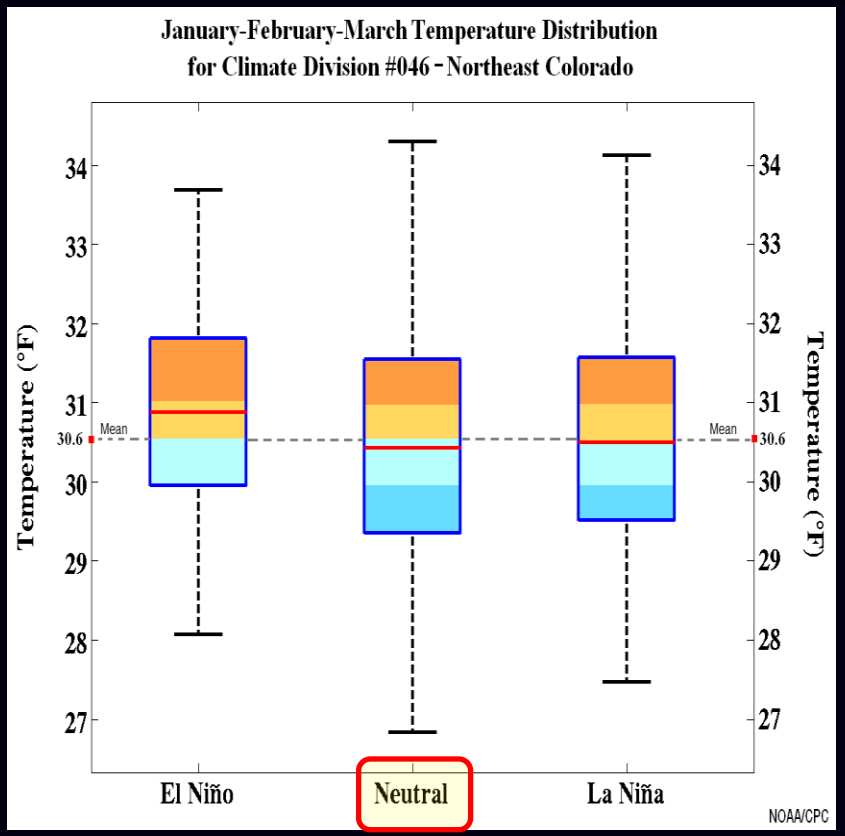
**Diagram B** is a description of the ENSO box and whisker analysis plot used by CPC to represent historical temperature and precipitation distributions for each ENSO category pertaining to each climate division.

The red line inside the ENSO box represents the mean or 50$^{th}$ percentile of the data (temperature or precipitation) distribution for each climate division. Approximately 34% of the total observations exist within the ENSO box, and the remaining observations (about 66%) lie outside of the box along the whiskers extending above and below the box.

**It should be pointed out that the following temperature and precipitation distributions do not differentiate between El Niño and La Niña events of weak, moderate and strong intensity.**

# Precipitation and Temperature Composites (ENSO Box and Whisker Analysis Plots) for the Northeast Colorado Climate Division #046 for January-March

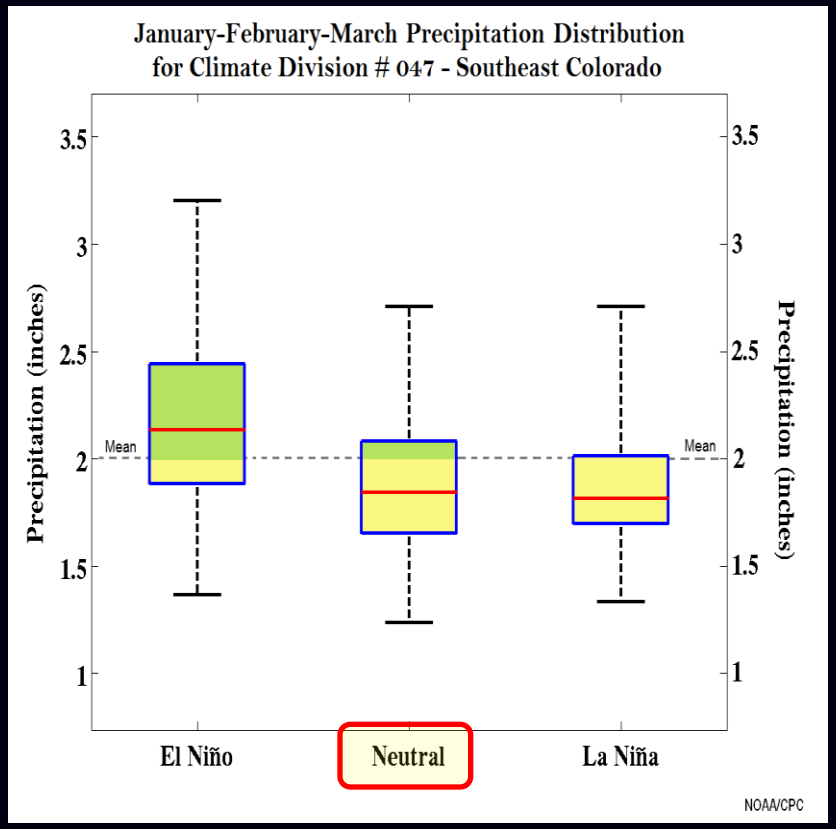


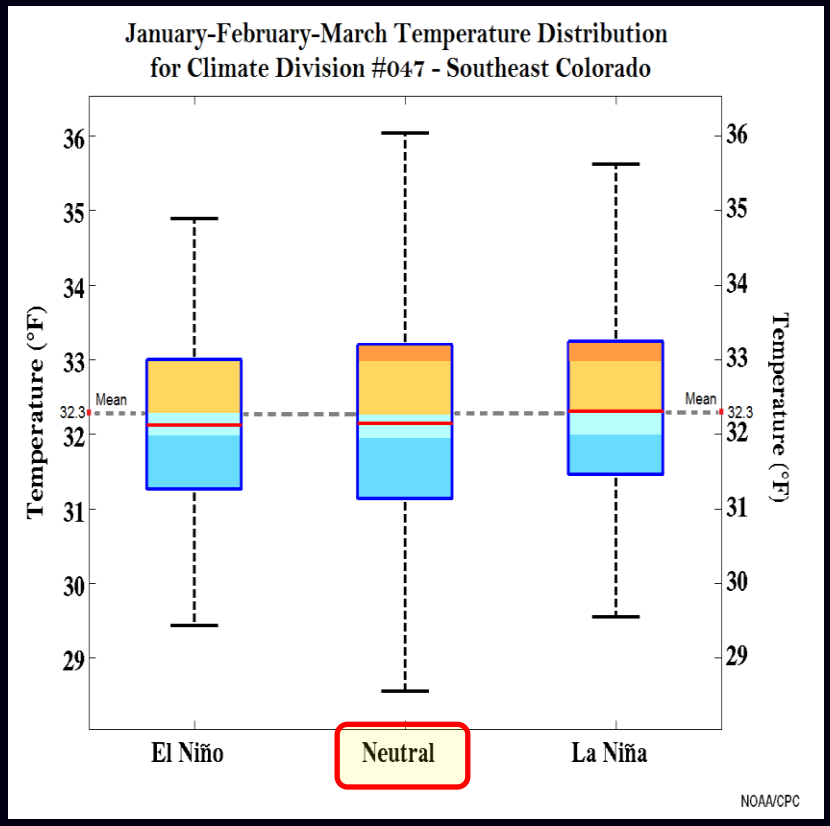




Precipitation in northeast Colorado during January through March have historically been ***near to below average during neutral or non-ENSO conditions,*** above average during El Niño events, and below average during La Niña episodes.

For the same three month period, temperatures were ***near average during neutral conditions*** and La Niña events, and near to above average during El Niño episodes.

# Precipitation and Temperature Composites (ENSO Box and Whisker Analysis Plots) for the Southeast Colorado Climate Division #047 for January-March

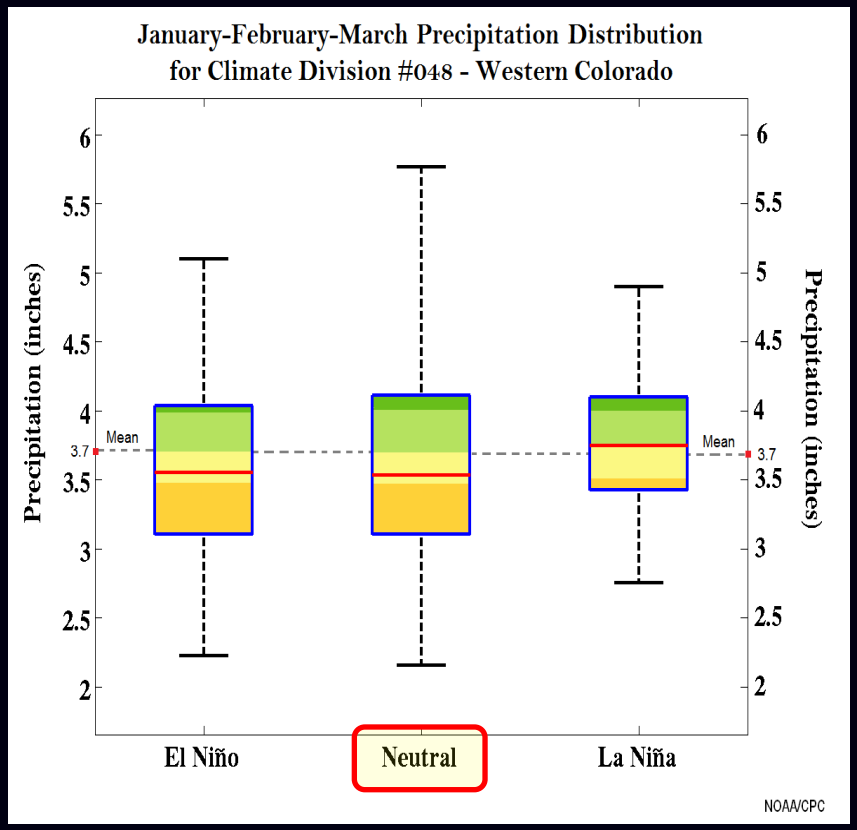


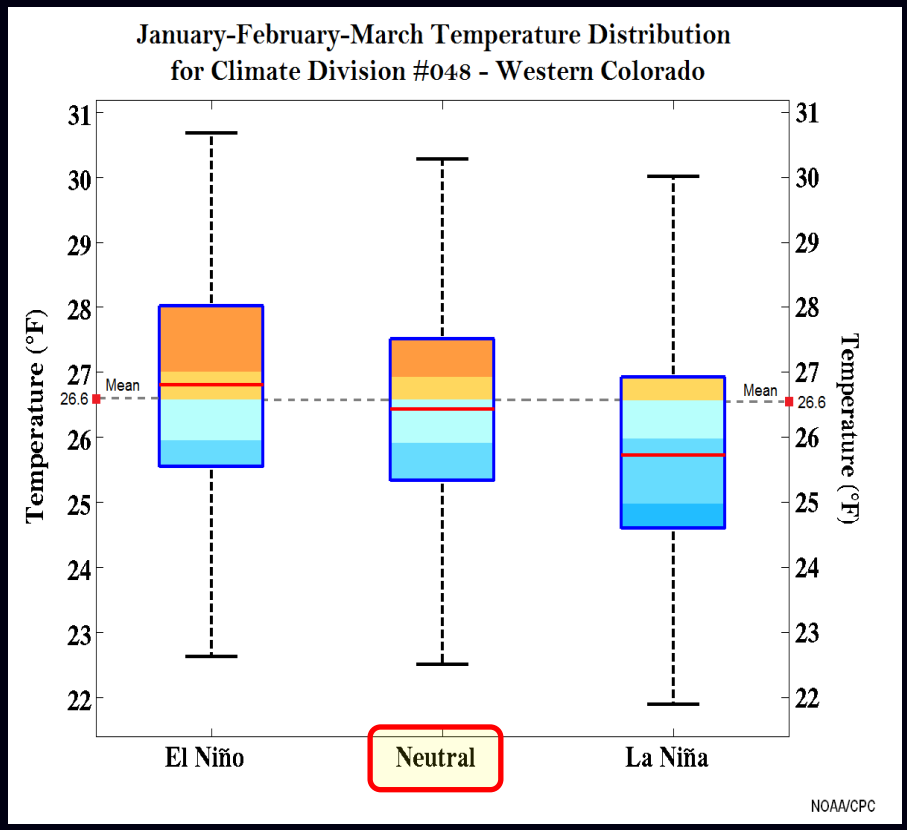




Precipitation in southeast Colorado during the climate season January through March has historically been ***near to below average during neutral conditions*** and La Niña periods, and near to above average during El Niño events.

For the same time period, temperatures were ***near average during neutral ENSO,*** El Niño and La Niña cycles.

# Precipitation and Temperature Composites (ENSO Box and Whisker Analysis Plots) for the Western Colorado Climate Division #048 for January-March




Precipitation across western Colorado was generally ***near to slightly below average during neutral*** and El Niño episodes, and near average during La Niña events.

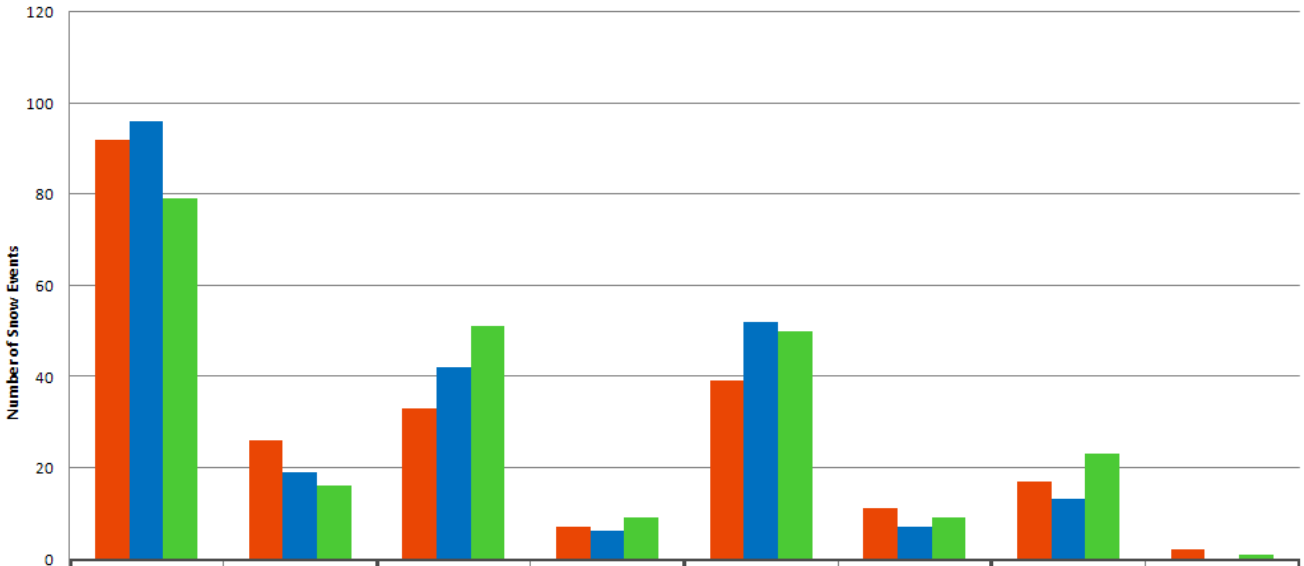
Finally, temperatures during past January through March periods were ***near average during neutral ENSO conditions,*** near to slightly above average during El Niños, and below average during La Niña episodes.

# Prospects For Significant Snowfall in Northeast Colorado This Winter

**Total Number of [1]Significant Snow Events for All El Niño, La Niña and Non-ENSO Episodes for Boulder, Denver, Fort Collins and Sterling, Colorado**

**Fall 1950 to Spring 2012**

[1]A significant snow event is defined as a storm total snow amount of at least 5 inches.




| | Boulder Snowfalls of at Least 5 Inches | Boulder Snowfalls of at Least 10 Inches | Denver Snowfalls of at Least 5 Inches | Denver Snowfalls of at Least 10 Inches | Ft. Collins Snowfalls of at Least 5 Inches | Ft. Collins Snowfalls of at Least 10 Inches | Sterling Snowfalls of at Least 5 Inches | Sterling Snowfalls of at Least 10 Inches |
|---|---|---|---|---|---|---|---|---|
| Total Number for All El Niño Events | 92 | 26 | 33 | 7 | 39 | 11 | 17 | 2 |
| Total Number for All La Niña Events | 96 | 19 | 42 | 6 | 52 | 7 | 13 | 0 |
| Total Number for All Non-ENSO Cycles | 79 | 16 | 51 | 9 | 50 | 9 | 23 | 1 |

Baker NWS Boulder

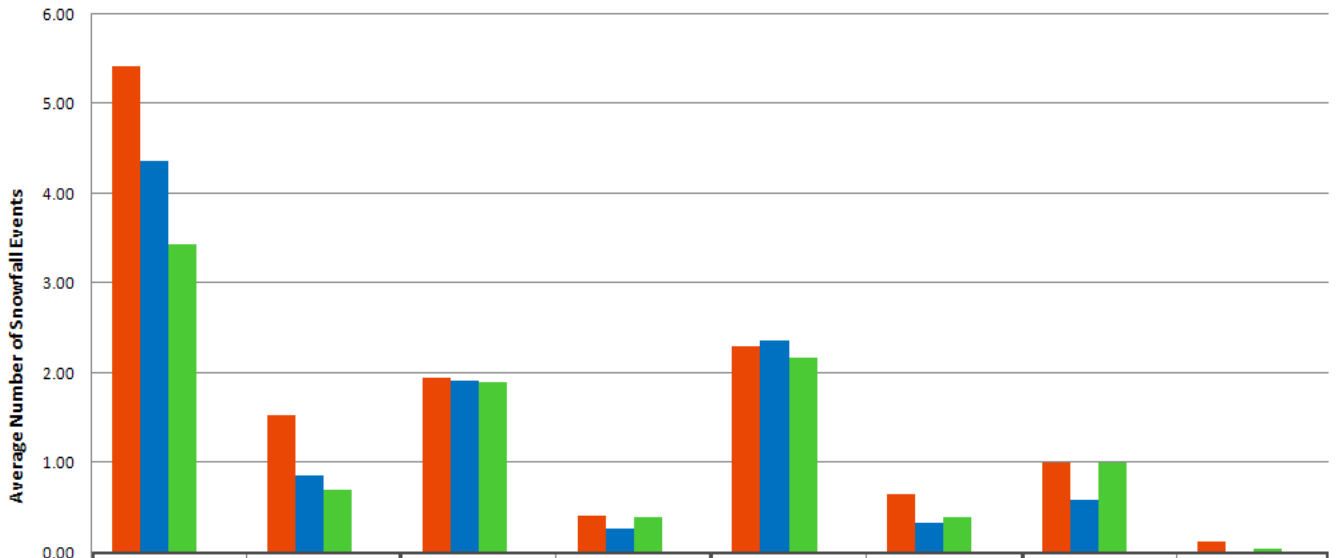
A majority of the 5 plus inch snowfall events in Boulder and Fort Collins happened during La Niña episodes. Denver and Sterling saw most of their 5 plus inch snowfalls during non-ENSO or neutral cycles.

A majority of the 10 plus inch snowfalls in Boulder, Fort Collins and Sterling occurred during El Niño events. While Denver saw a small majority of its 10 plus inch snowfalls during non-ENSO periods.

## Average Number of [1]Significant Snow Events Per El Niño, La Niña and Non-ENSO Episode for Boulder, Denver, Fort Collins and Sterling, Colorado

**Fall 1950 to Spring 2012**

[1]A significant snow event is defined as a storm total snow amount of at least 5 inches.




| | Average Number of Snowfalls of at Least 5 Inches in Boulder | Average Number of Snowfalls of at Least 10 Inches in Boulder | Average Number of Snowfalls of at Least 5 Inches in Denver | Average Number of Snowfalls of at Least 10 Inches in Denver | Average Number of Snowfalls of at Least 5 Inches in Fort Collins | Average Number of Snowfalls of at Least 10 Inches in Fort Collins | Average Number of Snowfalls of at Least 5 Inches in Sterling | Average Number of Snowfalls of at Least 10 Inches in Sterling |
|---|---|---|---|---|---|---|---|---|
| Per El Niño Event | 5.41 | 1.53 | 1.94 | 0.41 | 2.29 | 0.65 | 1.00 | 0.12 |
| Per La Niña Event | 4.36 | 0.86 | 1.91 | 0.27 | 2.36 | 0.32 | 0.59 | 0.00 |
| Per Non-ENSO Cycle | 3.43 | 0.70 | 1.89 | 0.39 | 2.17 | 0.39 | 1.00 | 0.04 |

Baker NWS Boulder

The *average number* of [1]significant snow events *per* ENSO and non-ENSO episode are referenced above for Boulder, Denver, Fort Collins and Sterling. These values may better indicate the connection between significant snowfall and ENSO/non-ENSO periods for these locations.

Overall, Boulder saw most of its 5 plus and 10 plus snowfalls during El Niño. Denver saw little difference in the number of 5 plus and 10 plus inch snowfalls observed during El Niño, La Niña and non-ENSO episodes. Fort Collins averaged its greatest number of 5 plus inch snowfall during La Niña, and averaged its greatest number of 10 plus inch snowfalls during El Niño events. Finally, 5 plus inch snowfalls in Sterling were evenly split between El Niño and non-ENSO periods, while the number of 10 plus inch snowfalls in Sterling was too small to be considered relevant.

# January-February-March 2013 Temperature and Precipitation Outlooks for Colorado Issued by the Climate Prediction Center

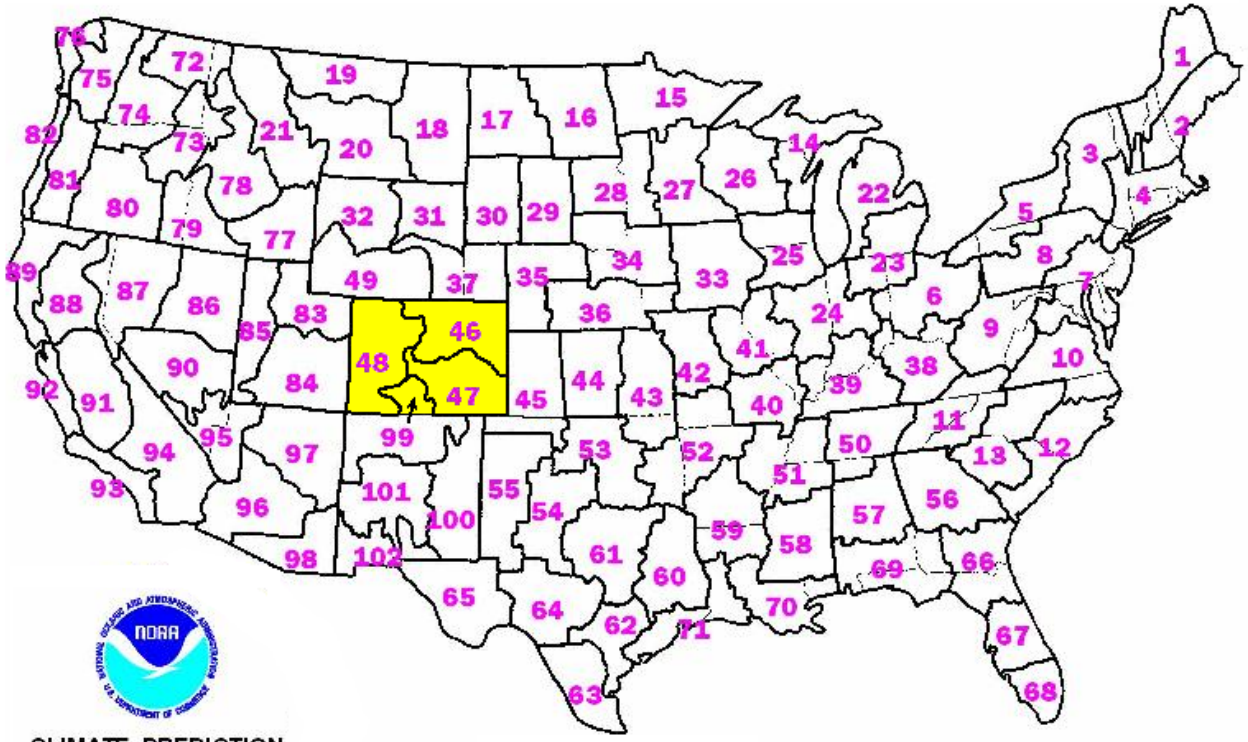
Baker - National Weather Service Boulder, Colorado

# Climate Prediction Center Seasonal Outlooks

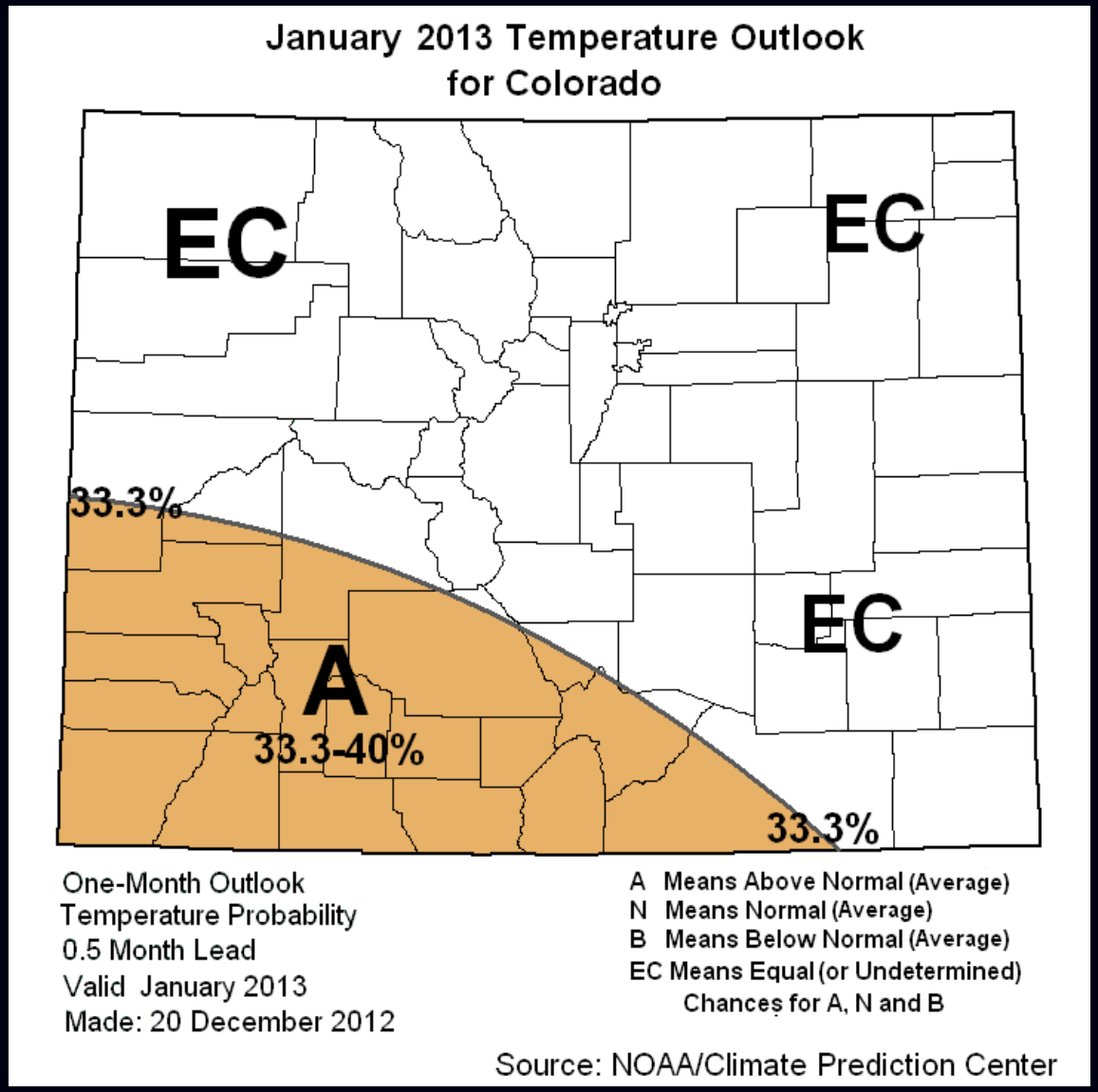
The National Weather Service Seasonal Climate Outlooks predict the probability of conditions being among the warmest/coldest or wettest/driest terciles of years compared to the period of record 1981-2010.

The outlooks indicate probability of being in three specific categories in reference to the 30-year climatology from 1981-2010. They are above, below and average.

Remember, Climate Predicition Center (CPC) outlooks are made at the scale of the climate megadividions (see the map below).

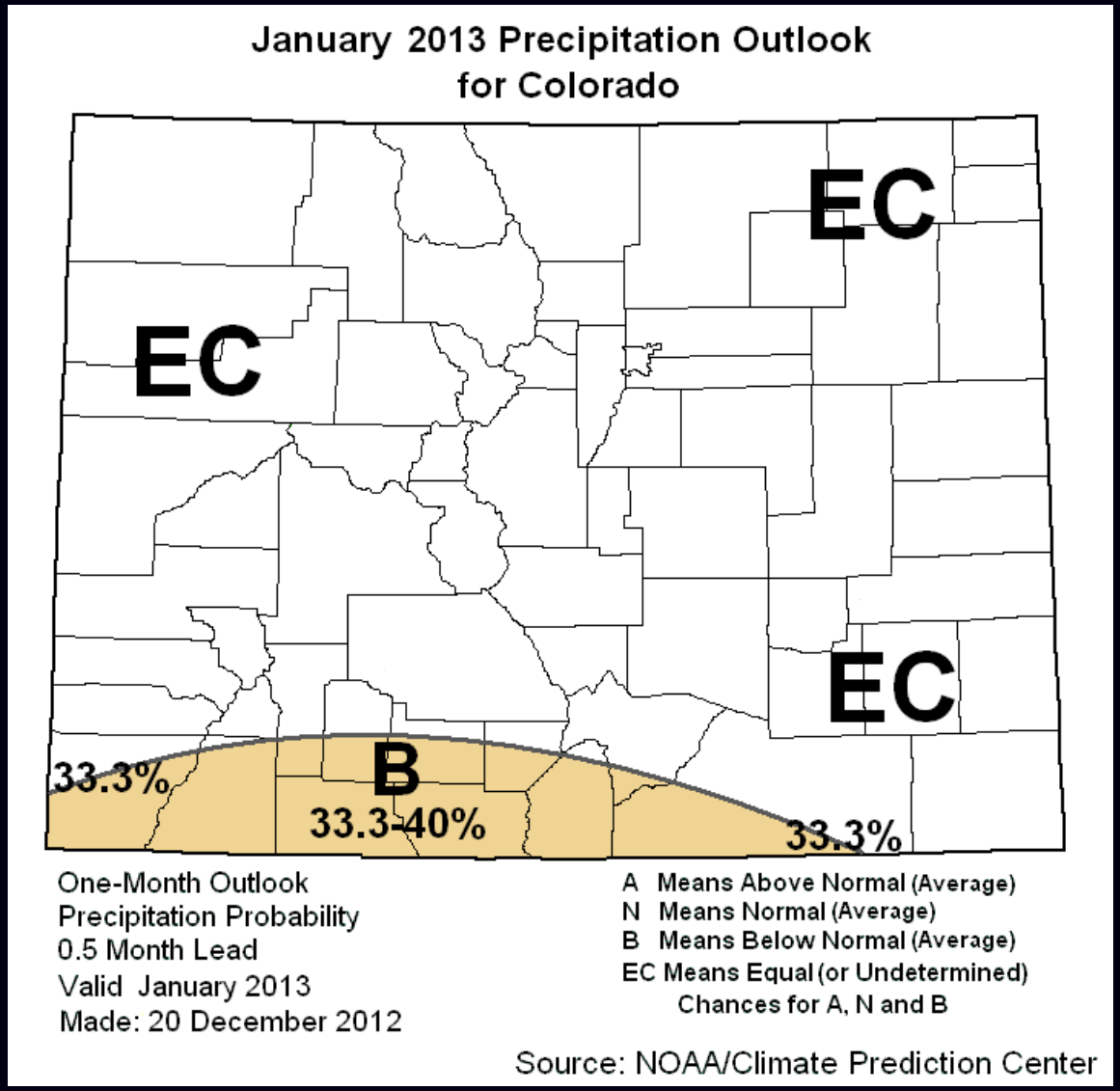



CLIMATE PREDICTION CENTER



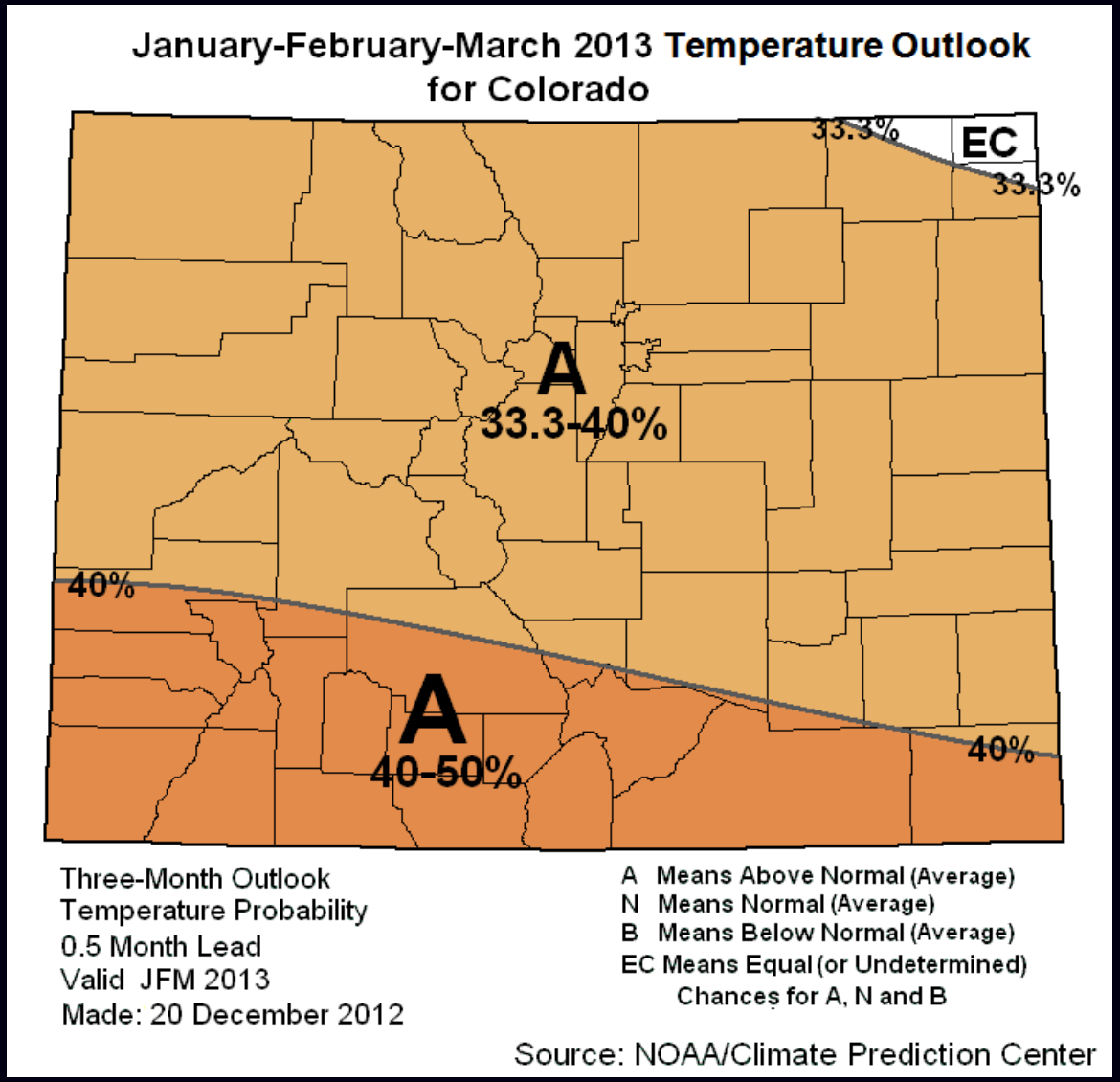

## January 2013 Temperature Outlook for Colorado

NOAA's Climate Prediction Center (CPC) is predicting a 33.3 to 40 percent chance of above average temperature across the southwest corner of Colorado, and an equal or undeterminable chance (EC) for above, below and near average temperature for the remainder of Colorado during January 2013.



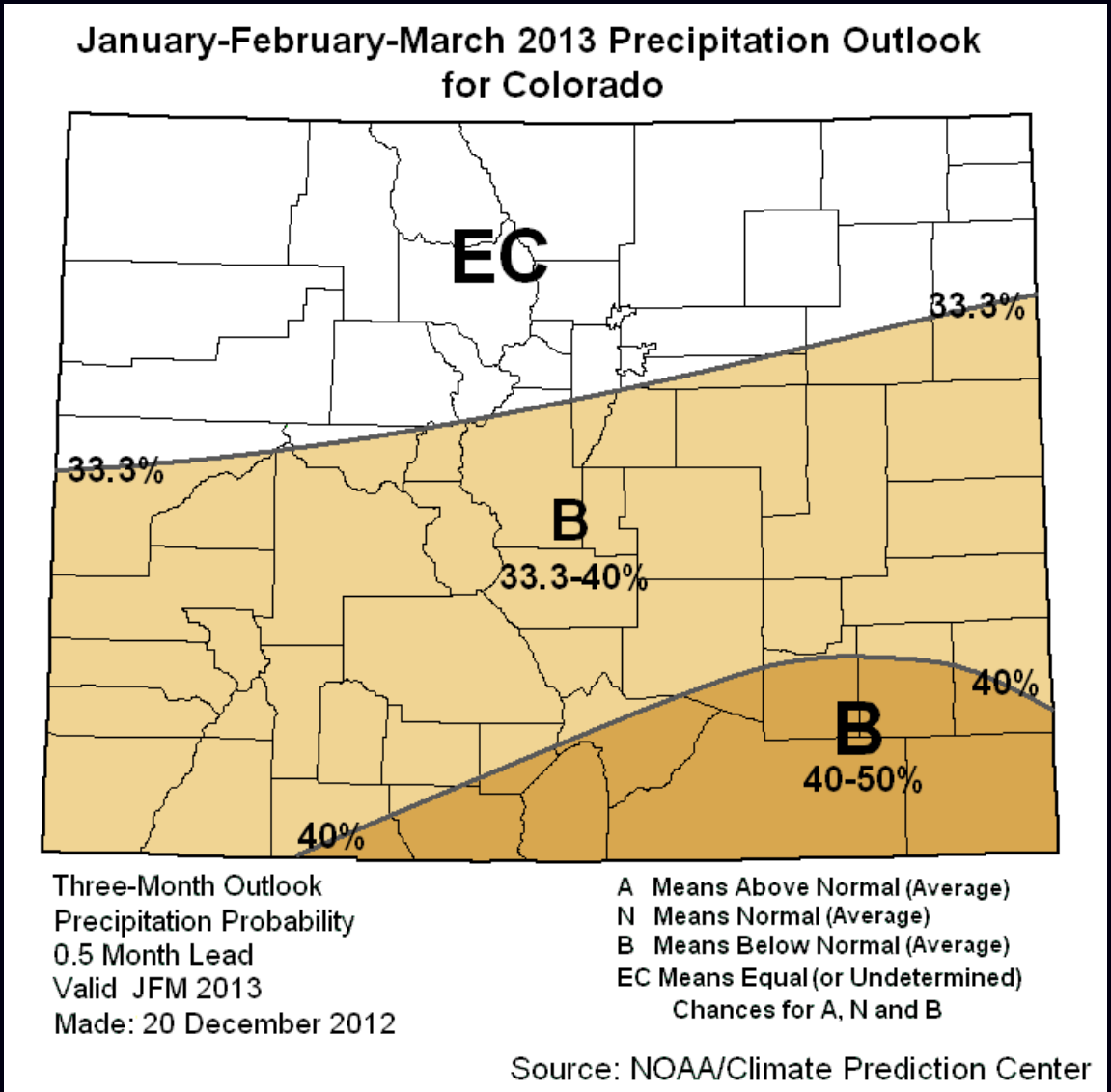

## January 2013 Precipitation Outlook for Colorado

CPC is calling for an equal or undeterminable chance (EC) for above, below and near average precipitation for all of Colorado during January 2013, except for the far southwest border region of the state where there is a 33.3 to 40 percent chance of below average precipitation.




# January-March 2013 Temperature Outlook for Colorado

For the climate season January through March of 2013, CPC is calling for a 40 to 50 percent chance of above average temperature across roughly the southern one-forth of Colorado, and except for a small area of EC in the far northeast corner, there is a 33.3 to 40 percent chance of above average temperature for the remainder of Colorado.




# January-March 2012 Precipitation Outlook for Colorado

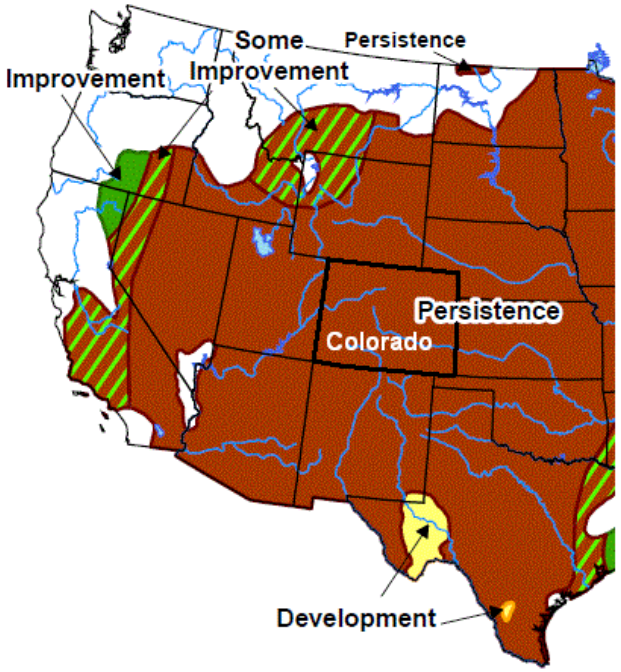
The precipitation outlook for this three month period calls for a 40 to 50 percent chance of below average precipitation across the southeast corner of Colorado and a 33.3 to 40 percent chance of below average precipitation central portions of the state. The latest outlook is also calling for an equal or undeterminable chance (EC) of above, below and near average precipitation for the northern third of Colorado.

# U.S. Seasonal Drought Outlook

## Drought Tendency During the Valid Period

*Valid for December 20, 2012 - March 31, 2013*

*Released December 20, 2012*




**KEY:**

- Drought to persist or intensify
- Drought ongoing, some improvement
- Drought likely to improve, impacts ease
- Drought development likely

Close-up of the Western Contiguous United States

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

Finally, the latest seasonal drought outlook for the period valid from December 20, 2012 to March 31, 2013 calls for drought conditions to continue and possibly intensify across nearly all in the western United States, including Colorado.

For an outlook for the entire U.S., go to www.cpc.ncep.noaa.gov/products/expert_assessment/season_drought.gif.

# Summing It Up

- Precipitation varied widely across Colorado during October and November. Monthly totals ranged from much below average in parts of southern and eastern Colorado, to much above average in portions of northwest and south central Colorado. During the same time period, the snowpack in Colorado ran below to much below average, with the Arkansas River Basin in southeast Colorado having the lowest average snowpack in the state.

- During December, a series of Pacific storm systems helped to relieve the snow drought for portions of southwest, south central and northwest Colorado. However, the statewide average snowpack remained below average (68 percent of average). Temperatures in Colorado for the same three month period were generally above average, and in some areas, as much as 10 degrees (F) above average. Northern Colorado saw the greatest positive temperature anomalies. The lack of precipitation and the unseasonably warm temperatures this fall continued to reduce soil moistures which further enhanced the ongoing drought in Colorado.

- An overwhelming majority of the ENSO-climate prediction models indicate neutral ENSO (non-ENSO) conditions in the Pacific Ocean through at least the summer of 2013.

- Historically, Colorado experienced near to above average temperatures and near to below average precipitation during neutral ENSO cycles. No one particular storm track pattern will dominate during neutral ENSO periods, unlike what often happens during El Niño and La Niña episodes. During a neutral ENSO winter, a storm may bring heavy snow and strong winds to southwest Colorado, and the next storm the same wintery mix to northwest Colorado. Eastern Colorado will normally see its share of winter storms during neutral ENSO periods, although these passing storms usually deposit most of their precipitation on the valleys and mountain ranges of western Colorado.

- The outlook for January 2013 from the Climate Prediction Center calls for a 33.3 to 40 percent chance of above average temperature and precipitation across southwest Colorado, and an equal or undeterminable chance of above, below and near average temperature and precipitation for the remainder of the state.

- The outlook for the three month climate season January-March 2013 calls for a 40 to 50 percent chance of  above average temperature for the southern one-fourth of  Colorado, and a 33.3 to 40 percent chance for above average temperature for the rest of the state. The precipitation outlook for this same three month period calls for a 33.3 to 40 percent chance of below average precipitation for the southeastern corner of Colorado, a 33.3 to 40 percent chance of below average precipitation for central Colorado, and equal chances of above, below and near average precipitation for the remainder of the state.

- Lastly, moderate to exceptional drought conditions in Colorado are predicted to persist through the spring of 2013.