

**La Niña's Ending—What Next?
Another MJO Perhaps?
Prospects for an Active Wildfire Season
and the
April-May-June 2012
Outlook
For Colorado**

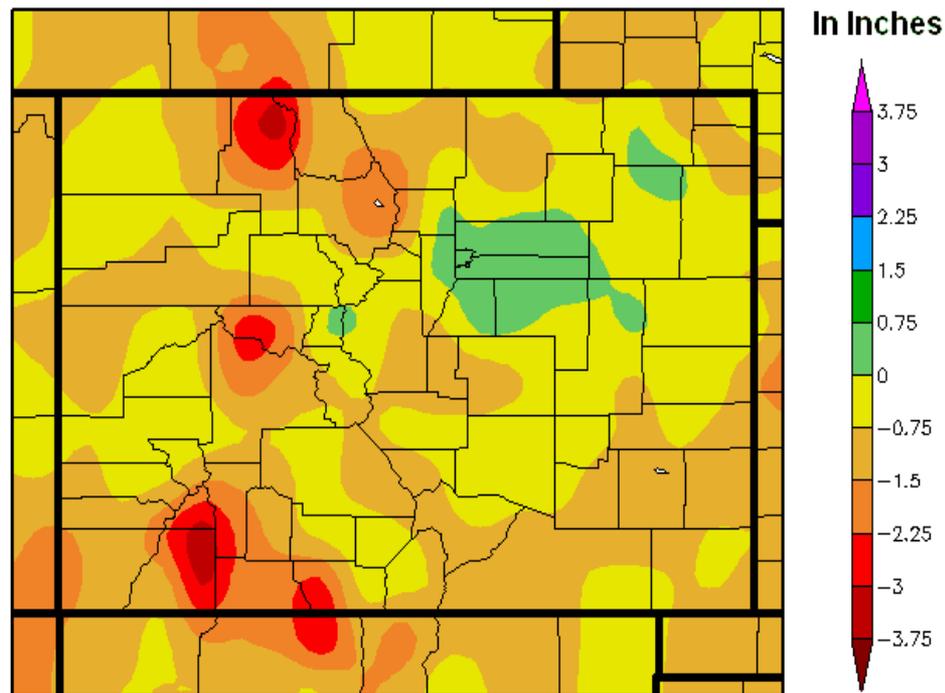
Mike Baker
National Weather Service
Boulder, Colorado
March 25, 2012

Next Issuance May 25, 2012



First...
A Review of
Weather and Drought Conditions
Across Colorado
During the
90-Day Period
Ending March 21, 2012

Departure from Normal Precipitation for Colorado December 23 2011 to March 21 2012



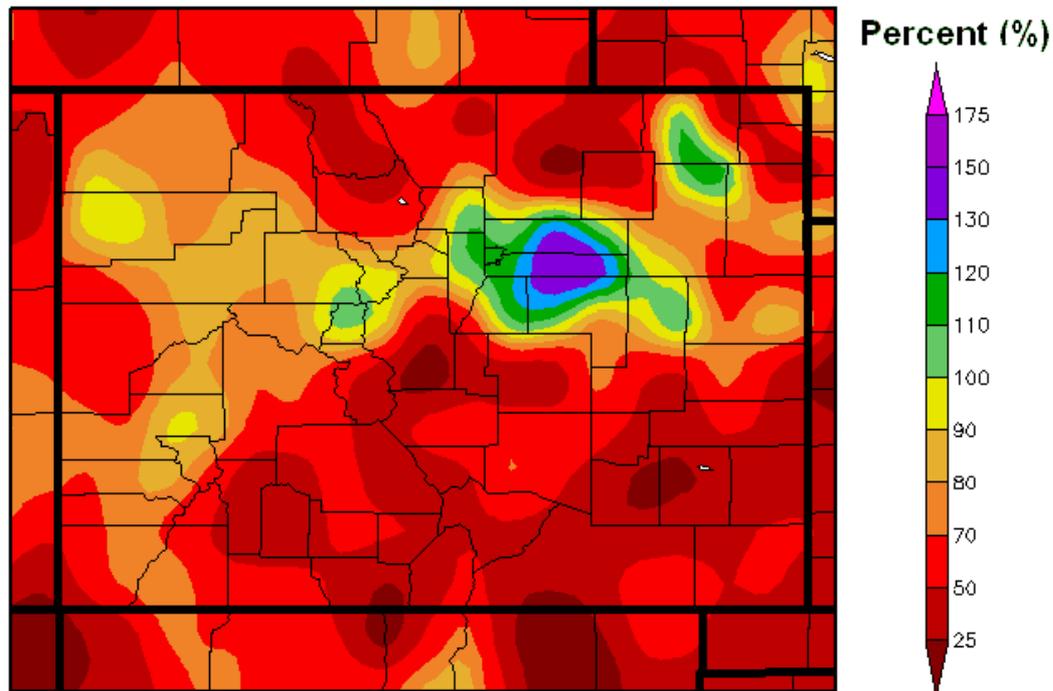
Generated 3/22/2012 at HPRCC using provisional data.

Regional Climate Centers

Precipitation across Colorado was for the most part below average during this 90-day period, with deficit amounts ranging from near 4 inches in the Upper Yampa River Basin, around Aspen in west central Colorado and portions of the San Juan Mountains in southwest Colorado. Precipitation departures up around 2 inches are indicated in the head water region of the Colorado River in north central Colorado and in the extreme southwest corner of the state.

Precipitation surpluses are indicated in northeast Colorado specially along the north facing aspect of the Monument Ridge/Palmer Divide in Douglas, Elbert and Lincoln Counties, as well as the greater Denver Metro Area including the nearby Front Range foothills.

Percent of Normal Precipitation for Colorado December 23 2011 to March 21 2012



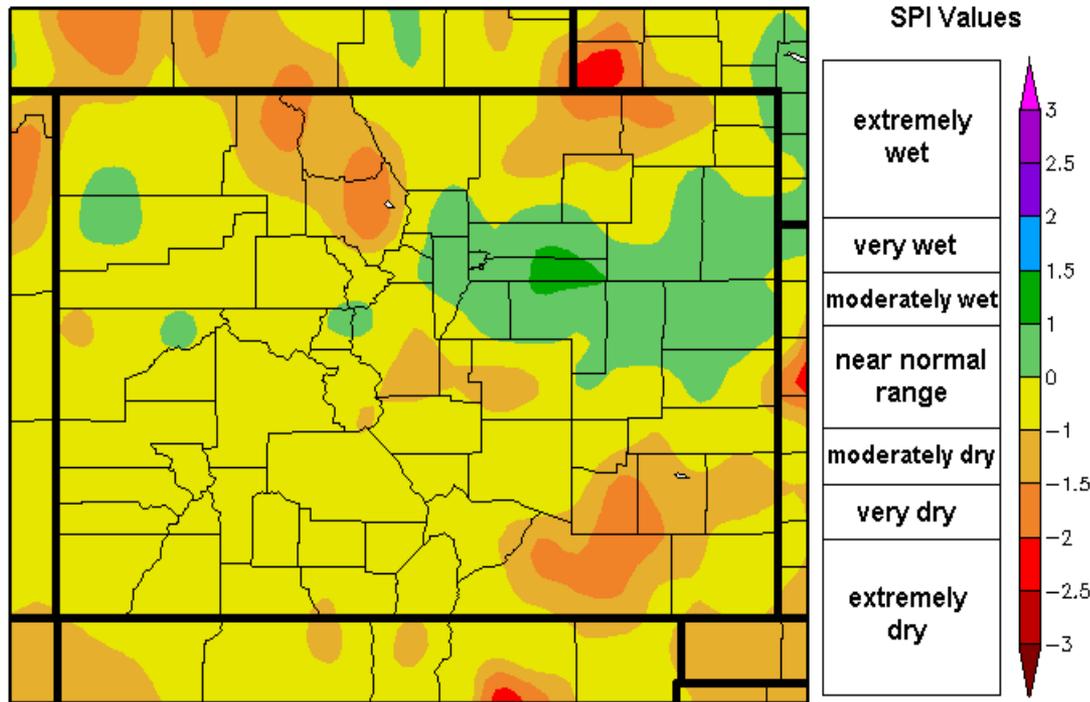
From a percentage perspective, precipitation was below to much below average across most of Colorado during this 90-day period, with percentages as low as 25 percent of normal in areas along the Wyoming, Nebraska and New Mexico borders, and on the south side of Middle Park in Park County.

Notable exceptions to this blanket of dryness include the area from the western suburbs of Denver to the city of Limon in northern Lincoln county, along the South Platte River in northeast Colorado, and around Leadville in the Lake County where precipitation amounts ranged from 110 to 150 percent of normal.

Generated 3/22/2012 at HPRCC using provisional data.

Regional Climate Centers

90 Day Standardized Precipitation (SPI) Index for Colorado December 23 2011 to March 21 2012



Generated 3/22/2012 at HPRCC using provisional data.

Regional Climate Centers

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.

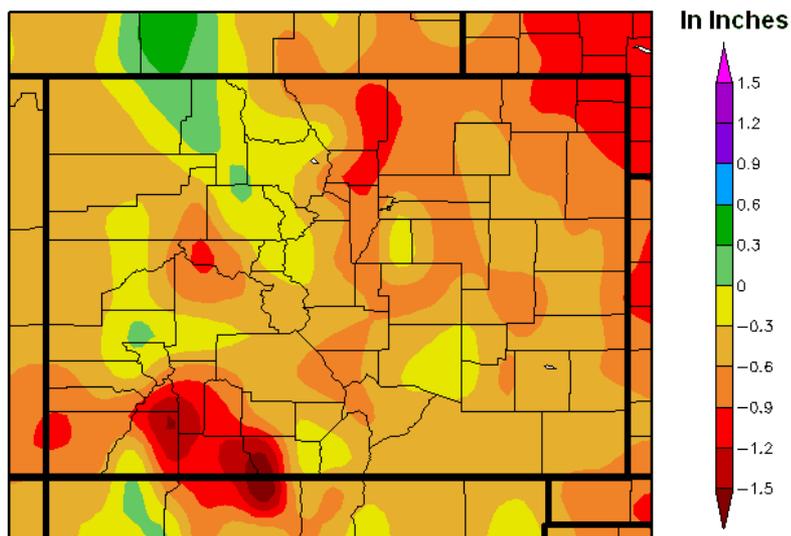
The **Standardized Precipitation Index (SPI)** for the 90-day period ending March 21, 2012, indicated dry to very dry soil conditions for nearly all of Colorado.

Furthermore, an area of very dry to extremely dry soils has recently appeared in northeast Colorado up along the Nebraska border.

Wet to moderately wet soils are scattered around the state including part of the Upper Yampa River Basin in northwest Colorado, the head water region of the Arkansas River around Leadville, and a wide swath of northeast Colorado from the Front Range to the Kansas border.

Comparing
Weather and Drought Conditions
Across Colorado for the
30-Day Periods of
January 18-February 16
and
February 21 to March 21, 2012

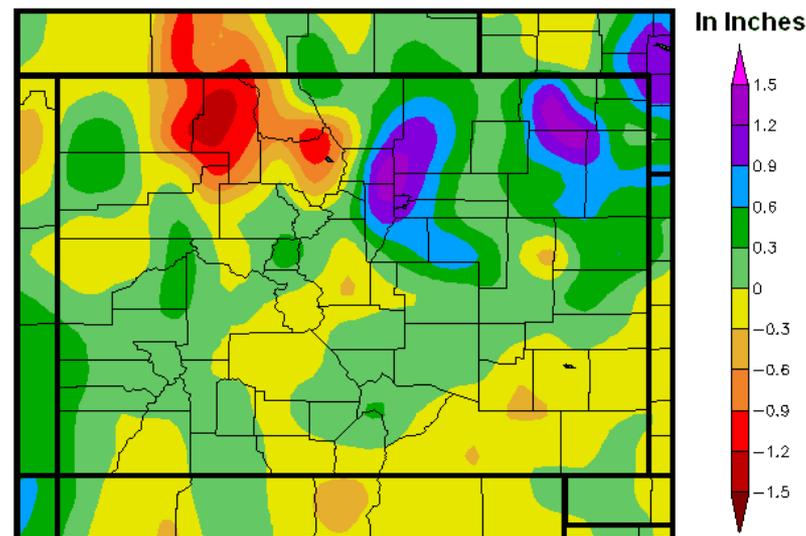
Departure from Normal Precipitation for Colorado February 21 to March 21, 2012



Generated 3/22/2012 at HPRCC using provisional data.

Regional Climate Centers

Departure from Normal Precipitation for Colorado Jan 18 2012 to Feb 16 2012



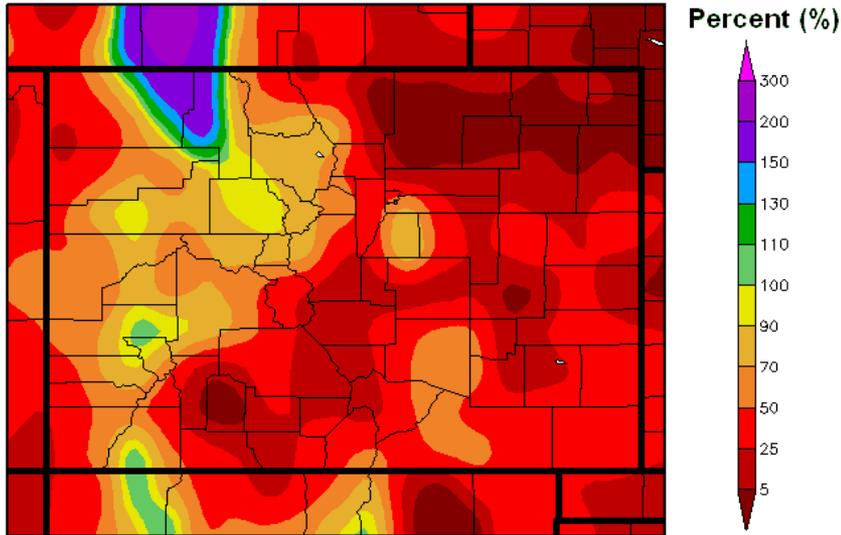
Generated 2/17/2012 at HPRCC using provisional data.

Regional Climate Centers

30-day precipitation totals ending March 21, 2012 (map in upper left) were below to much below average for most of Colorado, with 1 to 2 inch deficits in the San Juan Mountains in southwest Colorado, the Aspen area in west central Colorado, along the eastern slope of the Front Range in north central Colorado, and the far northeast corner of the state.

Precipitation totals ending March 21st are in sharp contrast to those observed 30 days earlier when the Steamboat Springs area in northwest Colorado was severely lacking precipitation, and the Front Range urban corridor around Denver and parts of the northeast plains were particularly wet (snowy). A dramatic shift in precipitation also occurred during this period in southwest Colorado.

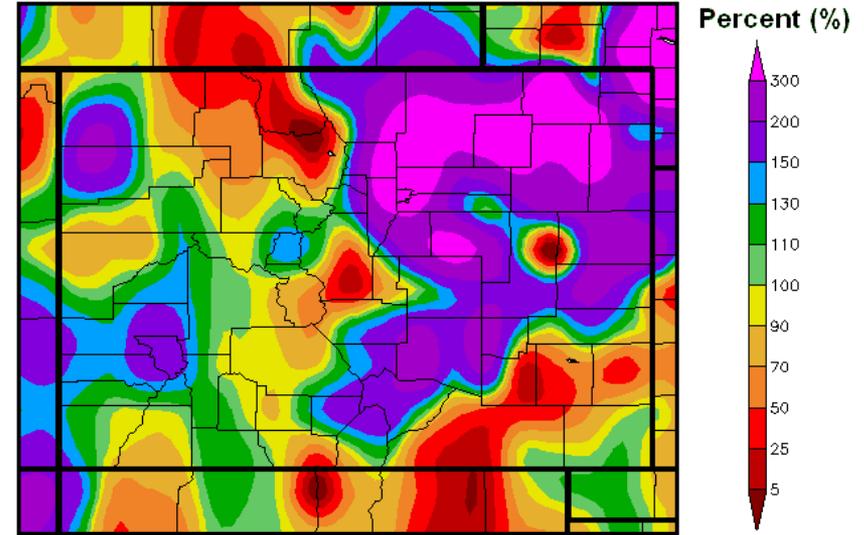
Percent of Normal Precipitation for Colorado February 21 to March 21, 2012



Generated 3/22/2012 at HPRCC using provisional data.

Regional Climate Centers

Percent of Normal Precipitation for Colorado Jan 18 2012 to Feb 16 2012



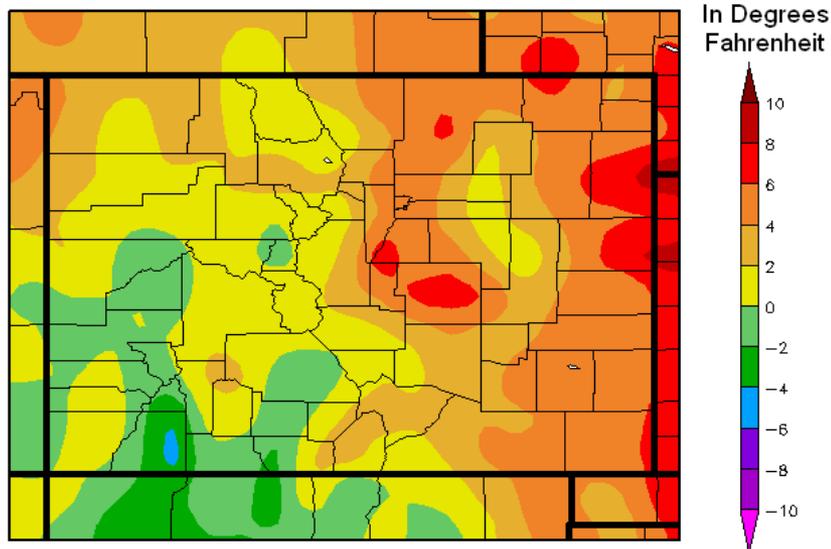
Generated 2/17/2012 at HPRCC using provisional data.

Regional Climate Centers

The dramatic month-to-month reversal in precipitation referred on the previous slide is quite evident on these percentage of normal precipitation maps (the most recent period at the upper left.)

The greatest change in precipitation during this two month period occurred in northeast and east central Colorado where several days of precipitation (snowfall) in February of this year resulted in 30-day precipitation totals from 150 percent to over 300 percent of normal.

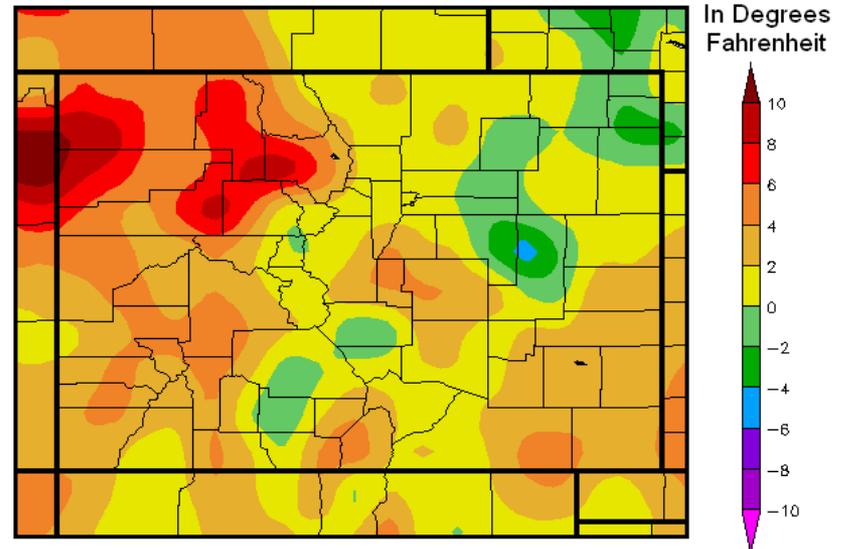
Departure from Normal Temperature for Colorado February 21 to March 21, 2012



Generated 3/22/2012 at HPRCC using provisional data.

Regional Climate Centers

Departure from Normal Temperature for Colorado Jan 18 2012 to Feb 16 2012



Generated 2/17/2012 at HPRCC using provisional data.

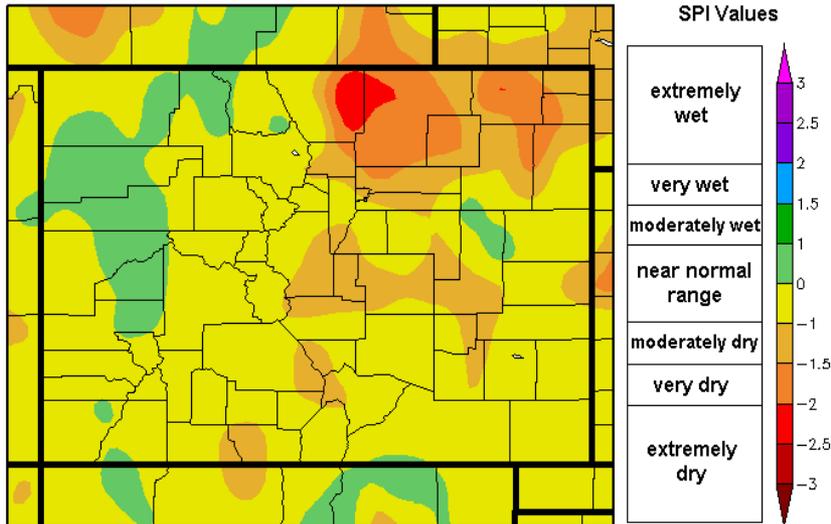
Regional Climate Centers

Temperatures across Colorado also underwent a big change during this two month period with the eastern half of the state going from 2 to 10 degrees F above average during the 30-day period ending March 21st (map in upper left) to as low as 6 degrees below average during the 30-day period ending February 16th (map in upper right).

A similar reversal in temperature occurred across western Colorado. Temperatures were generally below average during the 30-day period ending March 21st (map in upper left), and as much as 4 to 10 degrees F above average during the previous 30-day period ending February 16th of this year.

These month-to-month shifts in temperature are attributed to a significant shift in the precipitation distribution during the period.

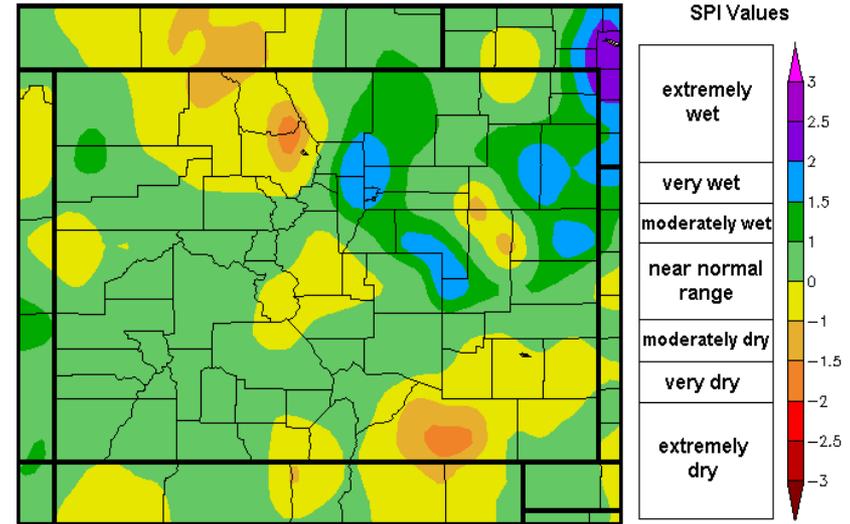
30 Day Standardized Precipitation Index (SPI) for Colorado February 21 to March 21, 2012



Generated 3/22/2012 at HPRCC using provisional data.

Regional Climate Centers

30 Day Standardized Precipitation Index (SPI) for Colorado Jan 18 2012 to Feb 16 2012

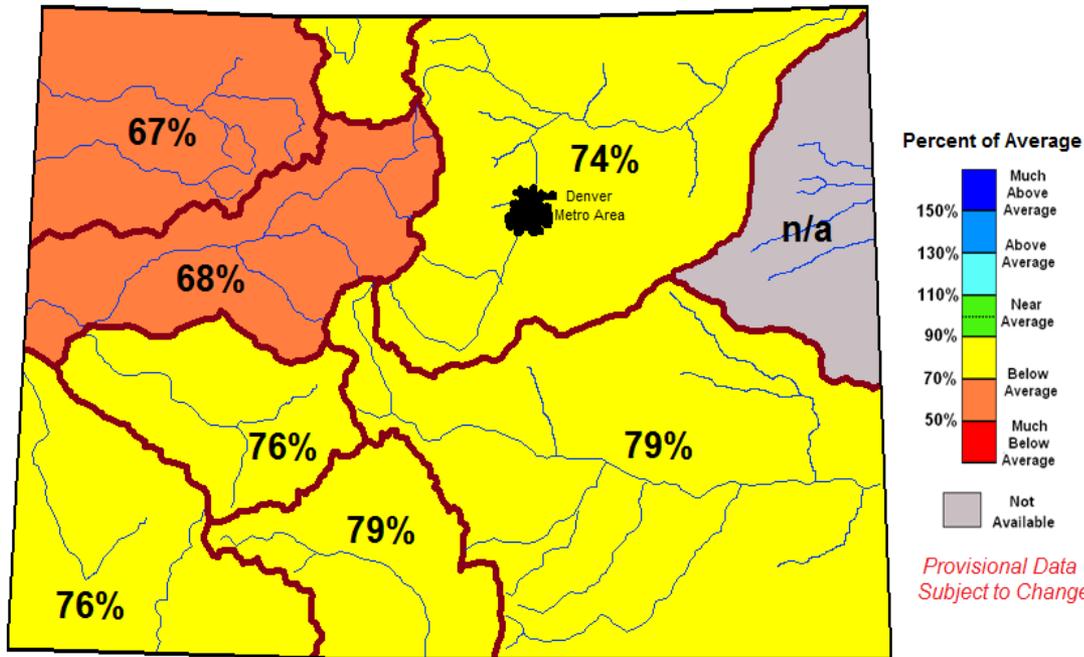


Generated 2/17/2012 at HPRCC using provisional data.

Regional Climate Centers

The **Standardized Precipitation Index (SPI)** indicates moderate to very dry conditions for nearly all of Colorado for the 30-day period ending March 21, 2012 (map in the upper left), with the driest soil conditions in northeast Colorado along the northern Front Range. Compare that to the significantly wetter conditions observed during the 30-day period ending February 16th of this year (map in the upper right) when the northeast plains of Colorado varied from very wet to extremely wet.

Colorado SNOTEL Snowpack Update Map



**Snow Water Equivalent as a Percent of Average (%)
for Colorado by River Basin as of Thursday Mar 22, 2012**

Basin Wide Percent of Average (%)

West Slope	East Slope
Yampa & White River Basins..... 67%	Laramie & North Platte Basin..... 71%
Upper Colorado River Basin..... 68%	South Platte River Basin..... 74%
Gunnison River Basin..... 76%	Arkansas River Basin..... 79%
San Miguel, Dolores Animas & San Juan River Basins..... 76%	Statewide Avg... 72%
Upper Rio Grande Basin..... 79%	

Source: USDA Natural Resources Conversation Service-Water and Climate, Portland, Oregon

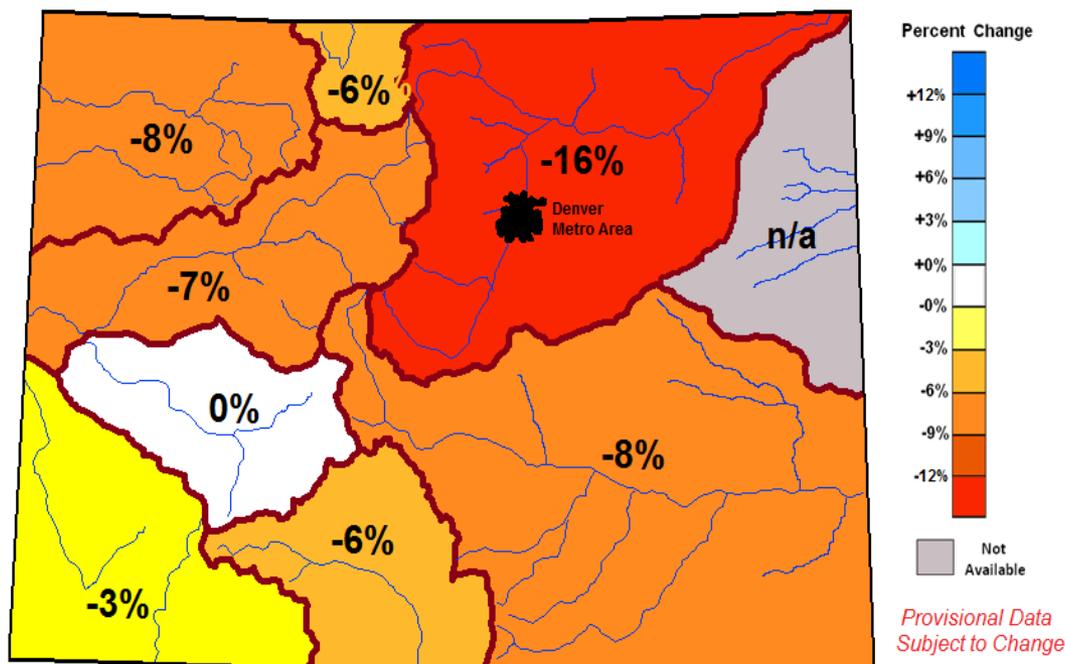
As of March 22, 2012, snowpack (snow water equivalent) for Colorado dropped to 72 percent of average. In comparison, the statewide snowpack last year at this time during the final stages of a strong La Niña was 113 percent of average.

Northwest Colorado continued to report the state's lowest average snowpack at around 67 percent. This is far below the near record snowpack of around 130 percent of average observed one year ago.

SNOTEL sites across the rest of Colorado also continued to report below average snowpack, although percentages were slightly greater over higher elevations in the Arkansas River and Upper Rio Grande basins.

The South Platte River basin snowpack was 45 percent lower than that one year ago.

Colorado SNOTEL Snow Water Equivalent Change Map



Percent Change in Snow Water Equivalent By Colorado River from Feb 24 to Mar 22, 2012

West Slope	East Slope
Yampa & White River Basins..... -8%	Laramie & North Platte Basin..... -6%
Upper Colorado River Basin..... -7%	South Platte River Basin..... -16%
Gunnison River Basin..... 0%	Arkansas River Basin..... -8%
San Miguel, Dolores Animas & San Juan River Basins..... -3%	
Upper Rio Grande Basin..... -6%	
	Statewide Avg... -7% Change

Source: USDA Natural Resources Conversation Service-Water and Climate, Portland, Oregon

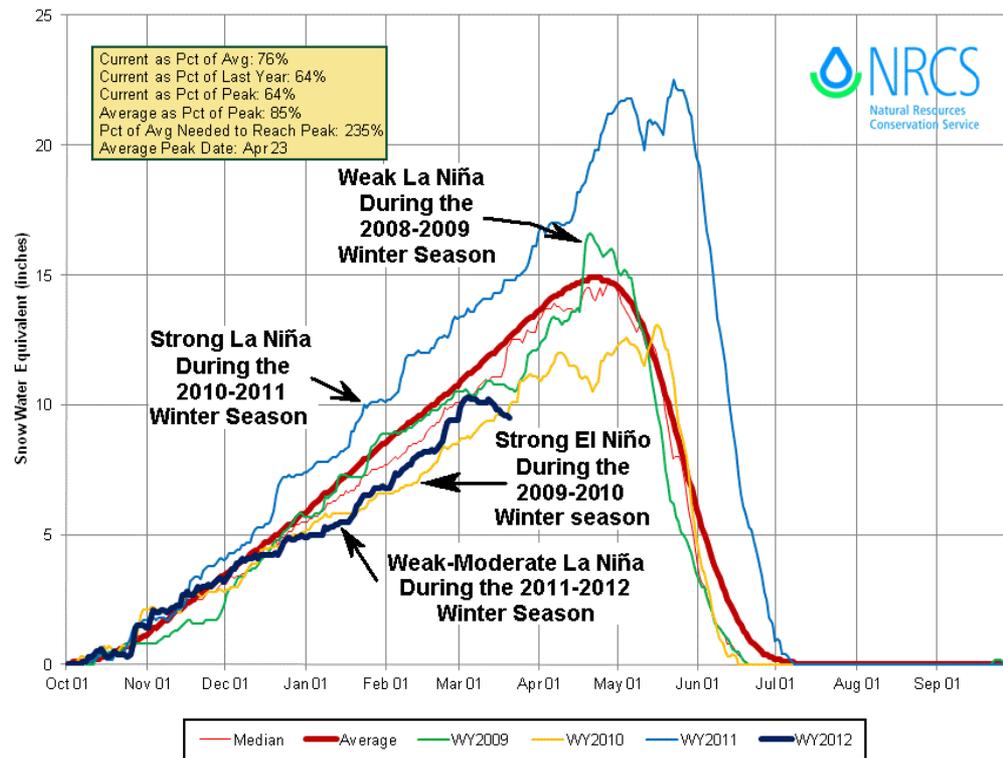
From February 24 to March 24 of this year, the snow water equivalent of the state's snowpack decreased by an average of 7 percent.

The South Platte River basin saw the greatest basin-wide decrease (16 percent) in snowpack during this 30 day period. Reasons for this significant reduction due to melting, sublimation and evaporation, include the lack of snowfall, greater insolation, unseasonably warm temperatures and low relative humidities, and frequent periods of strong winds.

Except for the Gunnison River basin where the snowpack remained about the same, snow water equivalents for the rest of the state decreased by an average of 7 percent, generally for the same reasons mentioned above.

South Platte River Basin Time Series Snowpack Summary

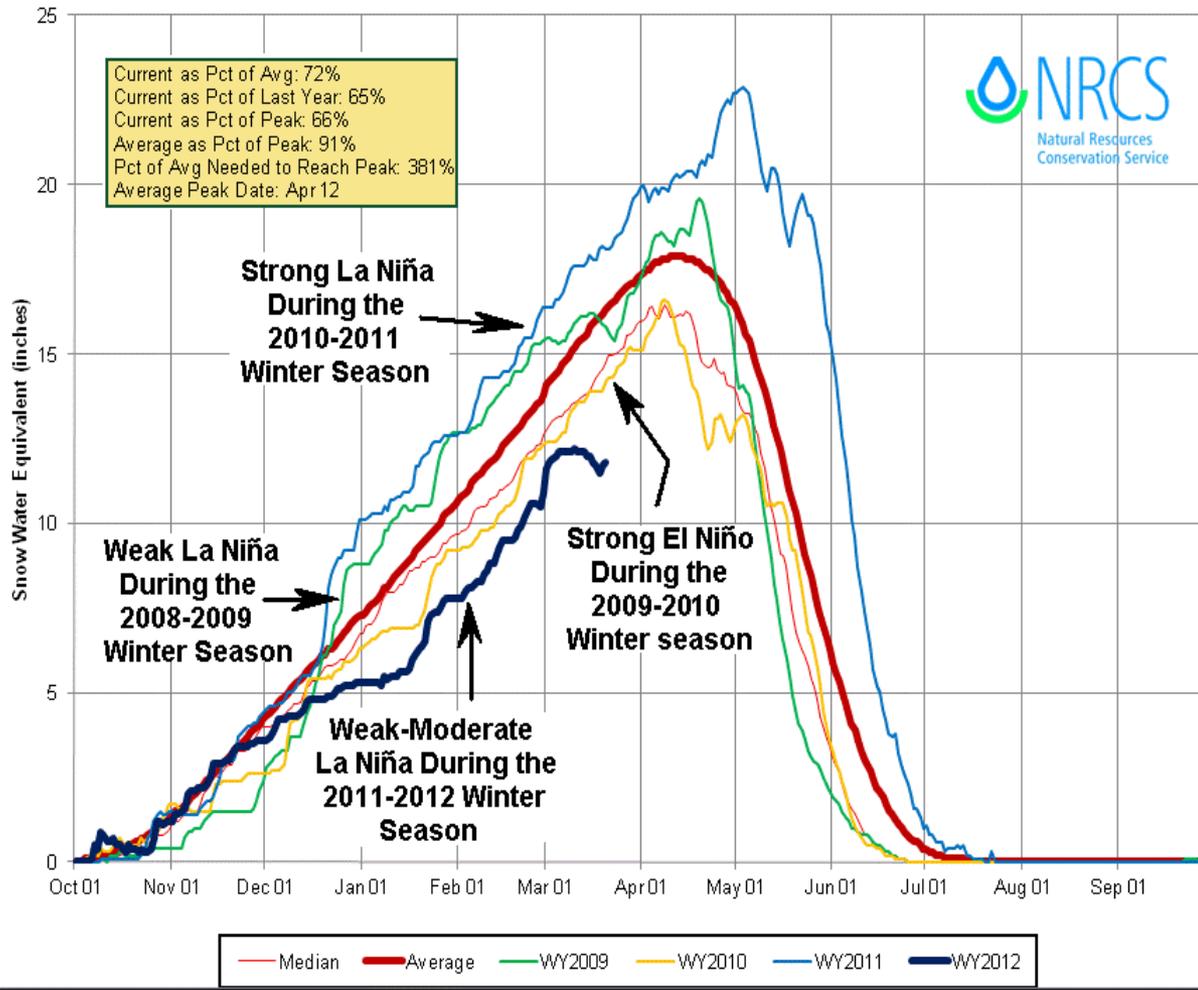
Based on Provisional SNOTEL data as of Mar 20, 2012



Yellow dots – reporting SNOTEL sites

The snow water equivalents are presented for the South Platte River Basin in northeast Colorado for the water years of 2009, 2010, 2011 and 2012. Each time series represents an average value based on observations taken at 27 SNOTEL sites (all mountain locations) within the basin (see map in upper right). As of March 20, 2012, near the conclusion of a weak to moderate La Niña, the basin average snow water equivalent (thick dark blue line) was approximately 3.5 inches below the 1971-2000 climatological average (thick red line). This was the lowest average value recorded for mid-March in the past four water years. However, the current average is only slightly less than the equivalent observed in March 2010 (yellow line) during a strong El Niño. The greatest basin wide average recorded on this date during these four water years was observed during the 2011 water year—a strong La Niña (blue line), followed by the 2009 water year—a weak La Niña (green line.)

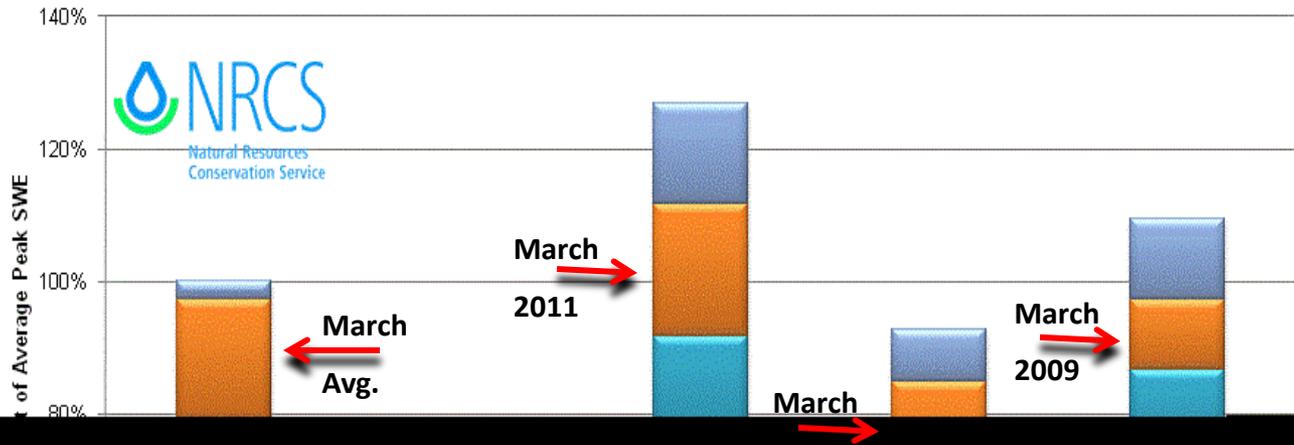
Colorado Statewide Time Series Snowpack Summary
 Based on Provisional SNOTEL data as of Mar 20, 2012



Average snowpack in Colorado as of March 20, 2012 continues to lag behind the pace observed in mid-March during the 2009, 2010 and 2011 water years.

Statewide snowpack (snow water equivalent) as of mid-March was greatest during the 2011 water year (a strong La Niña), followed by the 2009 water year (a weak La Niña), and the 2010 water year (a strong El Niño.)

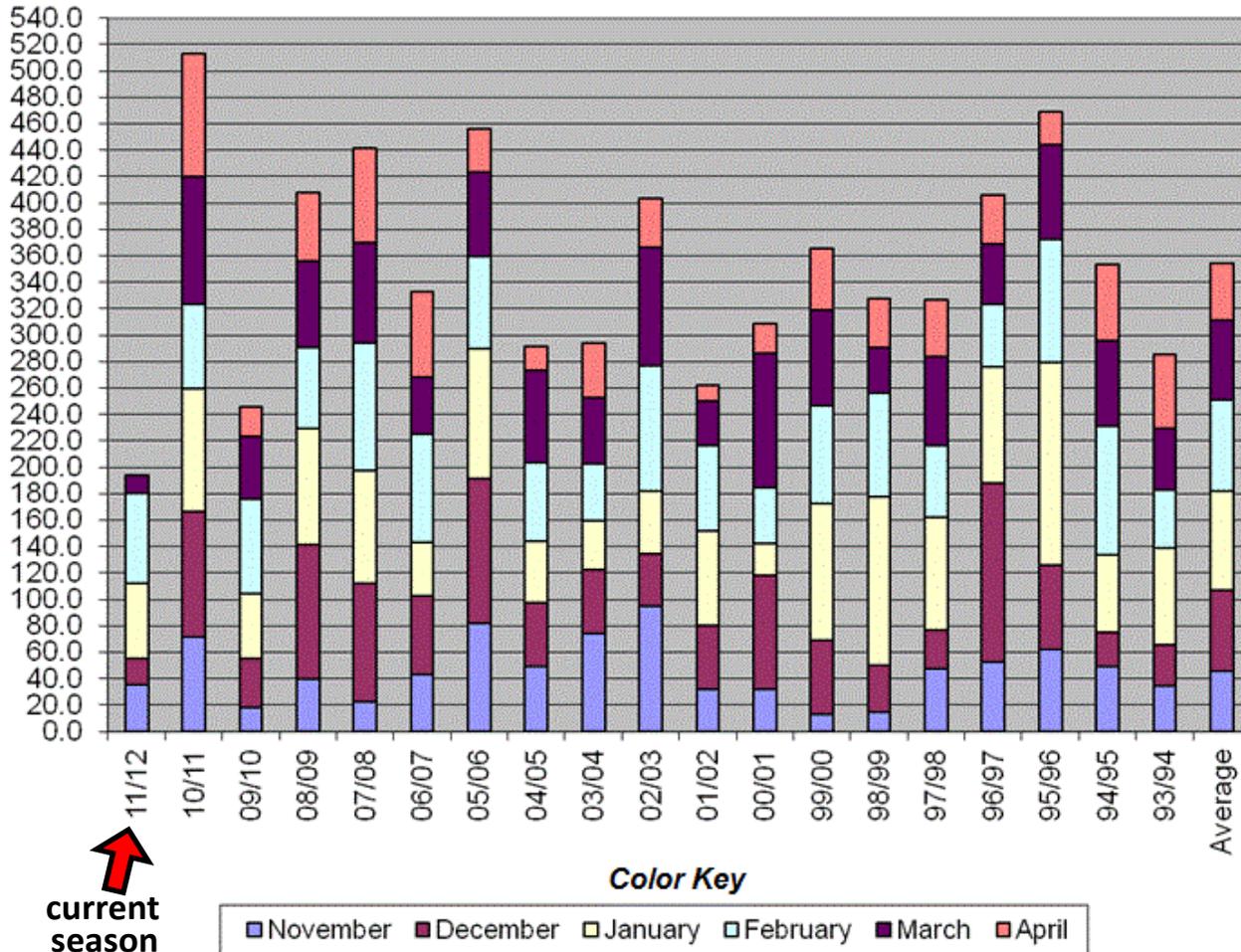
Colorado Statewide Time Series Monthly Snowpack Summary
Based on Provisional SNOTEL data as of Mar 20, 2012



March 2012 stands out as the least snowiest March in Colorado since to the winter season of 2008-2009.

Without the above average snowfall across southern and eastern Colorado in February, the winter season of 2011-2012 would be in line for the least snowiest water year on record for the state.

Back Bowl Station
at Breckenridge Ski Resort, Colorado
Season-to-Date Snowfall by month
Snowfall in Inches



**From Highest to
Lowest Over the
Last Two Seasons**

At the Breckenridge Ski Area west of Denver, this season's snow drought is quite evident in this time series of Seasonal snowfall totals. Going back to the 1993-1994 winter season (on the right side of this diagram.)

Of particular noteworthy, is the significant lack of snowfall during March of this year. Compare it to greatest snowfall in the past 20 years recorded just last winter.

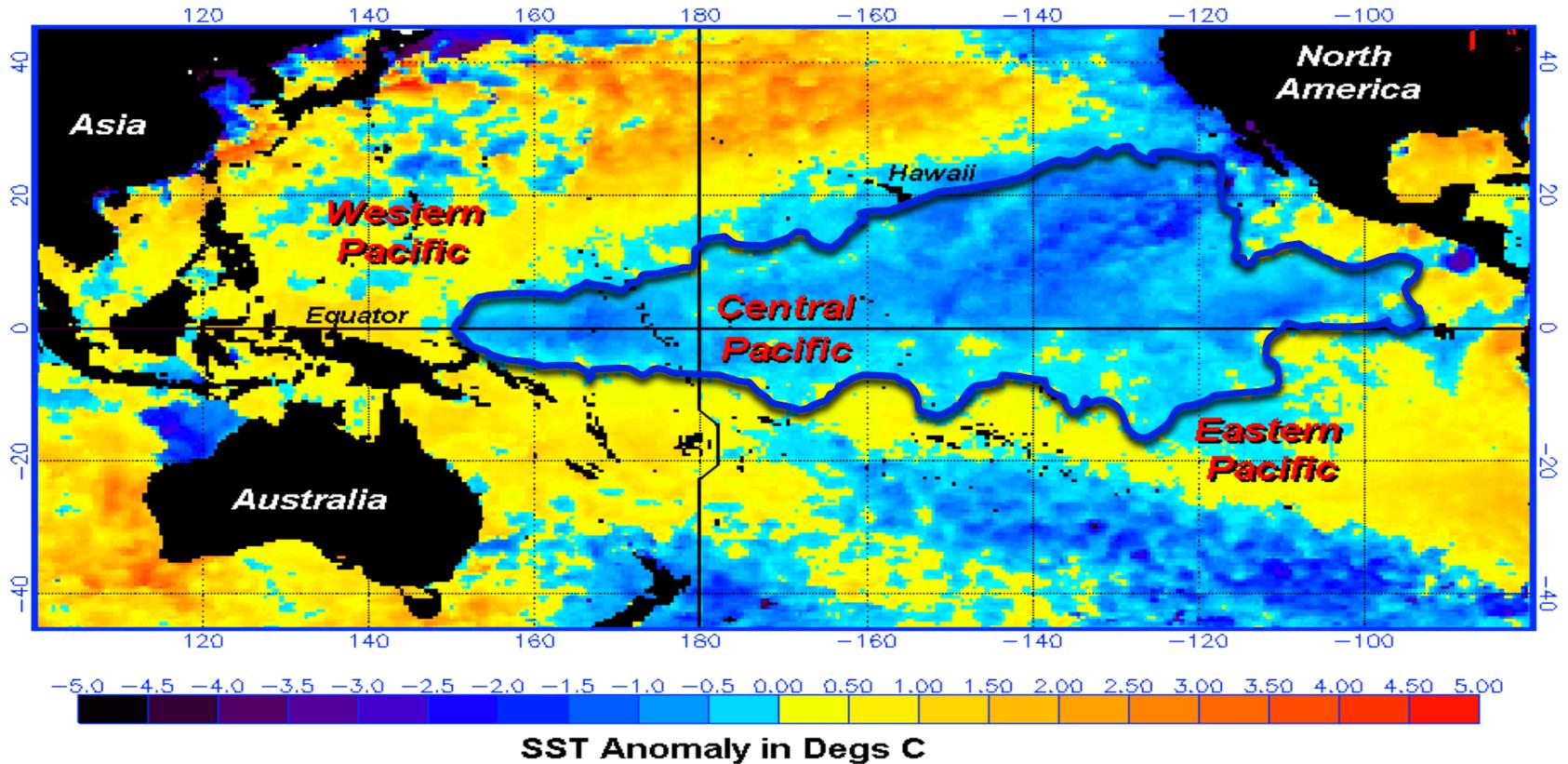
Source: Mark Beardsley, Breckenridge Ski Resort Ski Patrol

as of March 25, 2012



La Niña
Nearing An End

Pacific Ocean Sea Surface Temperature Anomalies for March 19, 2012



NOAA/National Environmental Satellite, Data and Information Service (NESDIS)

In February, above average sea surface temperatures (SSTs) appeared in the eastern tropical Pacific Ocean with the passage of a strong Madden-Julian Oscillation (MJO). During the first half of March SSTs returned to average or below average with the greatest negative anomalies observed in the central Pacific and off the west coast of Mexico. In the western tropical Pacific Ocean SSTs remained essentially unchanged. However a large pool of abnormally cold waters formed off the northwest coast of Australia, presumably in response to extensive convection associated with the MJO in the region. This Pacific basin-wide SST anomaly pattern is indicative of a weakening La Niña.

The Latest Oceanic Niño Index - ONI

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											

NOAA/CPC Updated 03-05-12

An ONI of -0.9 during the 3-month climate season of DEC-JAN-FEB 2011-2012 is an indication of a weak to moderate La Niña.

El Niño : ONI of +0.5 and higher
 Neutral ENSO : ONI lower than +0.5 and higher than -0.5
 La Niña: ONI of -0.5 and lower

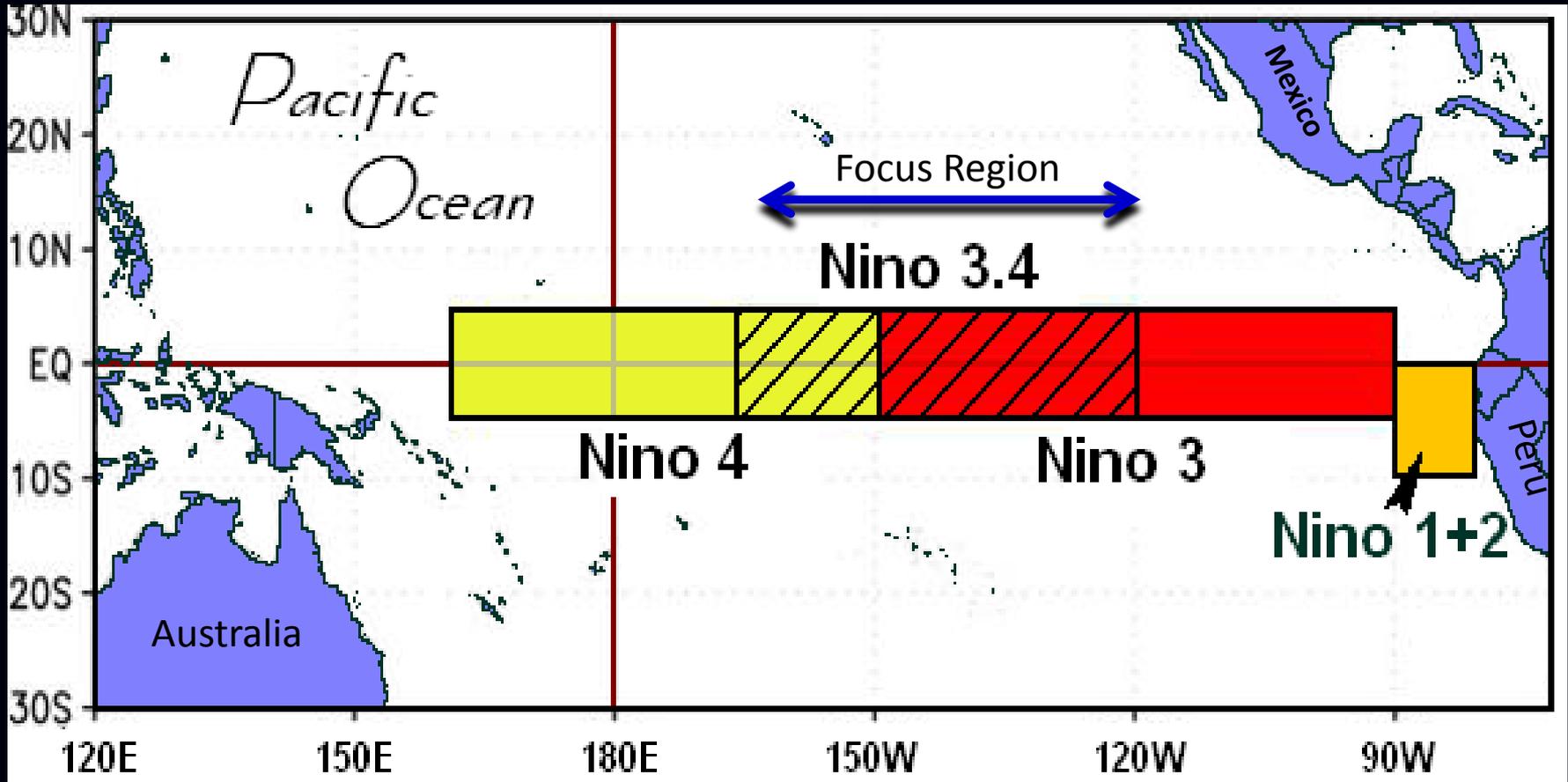
The ONI is based on sea surface temperature (SST) departures from average in the Niño 3.4 region of the eastern tropical Pacific Ocean. It is the principal measure used by NOAA's Climate Prediction Center (CPC) for monitoring, assessing and predicting El Niño/Southern Oscillation (ENSO.)

ONI is defined as the three-month running-mean SST departures in the Niño 3.4 region.

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

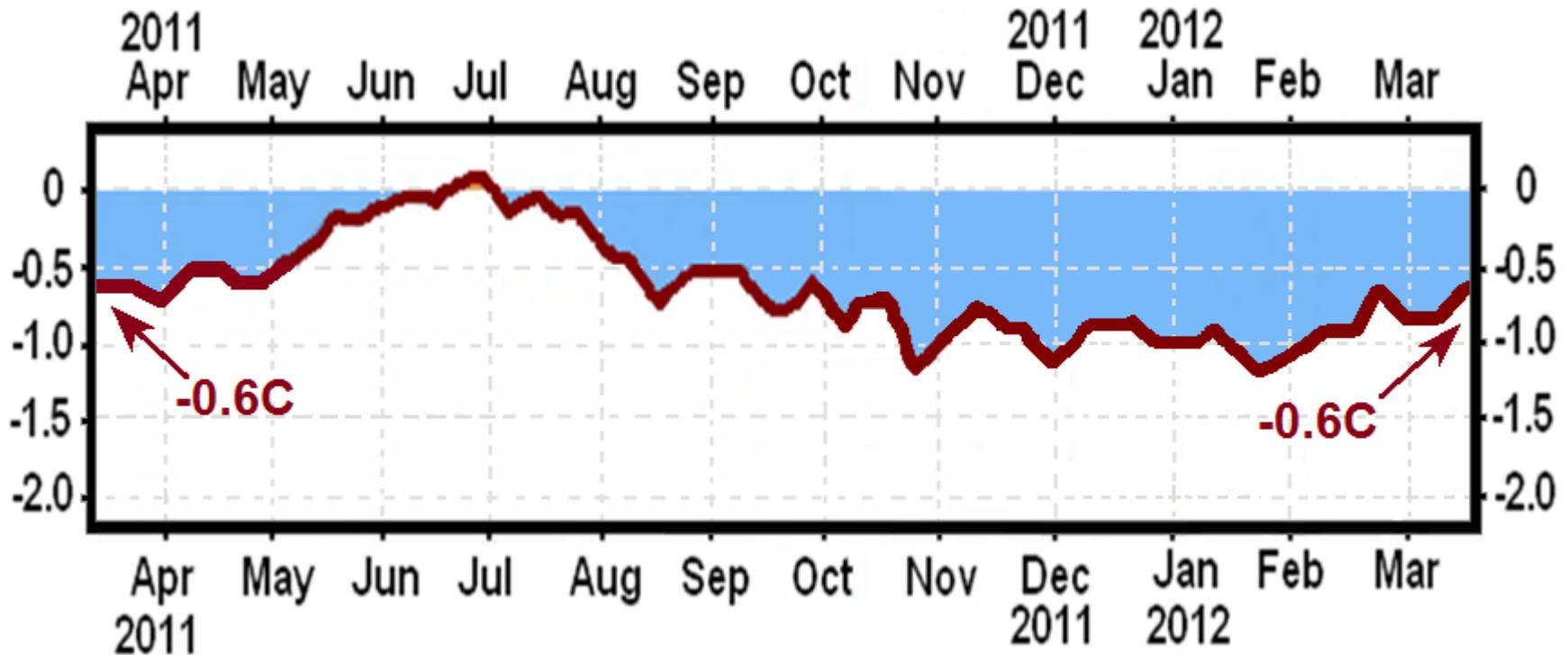
CPC's operational definitions of El Niño and La Niña are keyed to the ONI index.

Niño Regions in the Equatorial Pacific Ocean



Niño 3.4 – The principal region in the eastern Equatorial Pacific Ocean used by the Climate Prediction Center (CPC) for monitoring, assessing and predicting ENSO (hatched region on the above map) .

Weekly Sea Surface Temperature Anomaly (in Degs C) for the Equatorial Pacific Ocean Region Niño 3.4 as of March 14, 2012

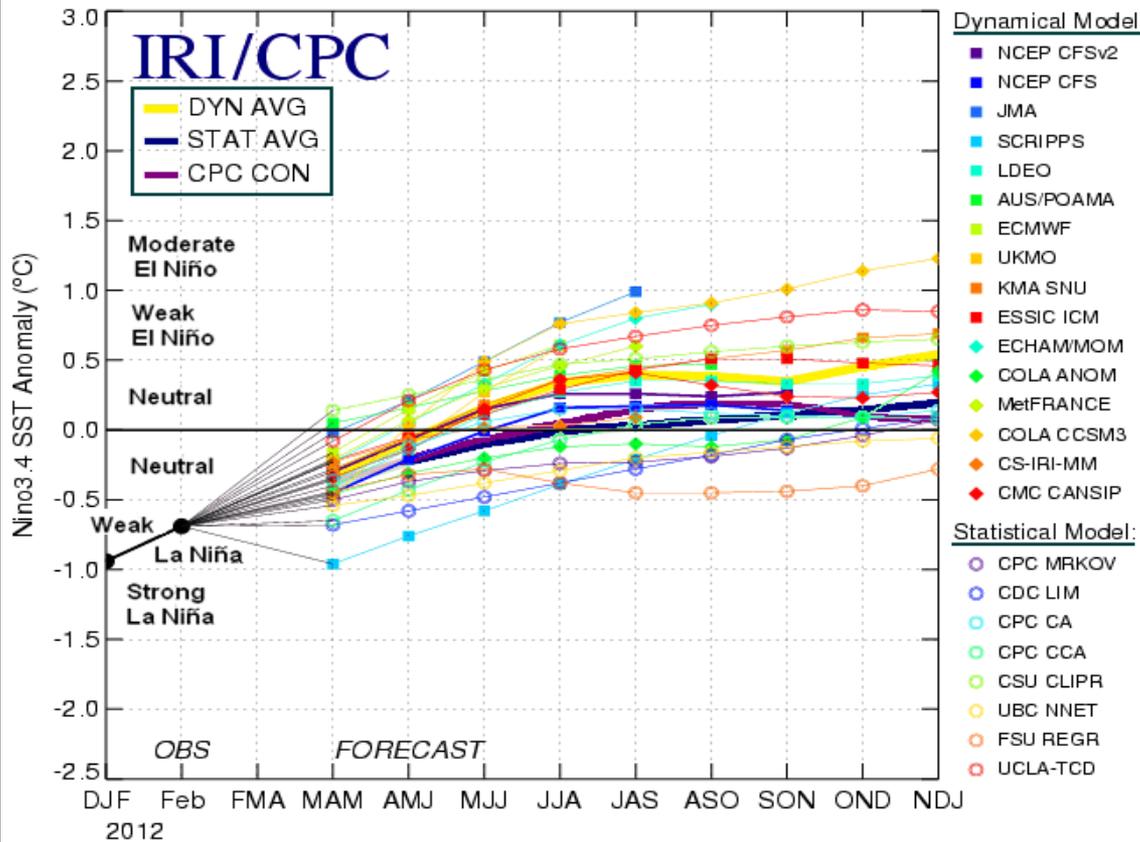


NCEP/CPC

As of March 14, 2012 the weekly SST anomaly for Niño 3.4 was -0.6°C . One year ago, the SST anomaly was also -0.6°C . Weekly SST anomalies in Niño 3.4 have steadily increased in the positive direction during the past four weeks. A SST anomaly of -0.45°C or lower in the eastern Pacific Ocean is an indicator of La Niña.

Outlook for ENSO

Mid-Mar 2012 Plume of Model ENSO Predictions



Forecast SST Anomalies (deg C) in the Niño 3.4 Region

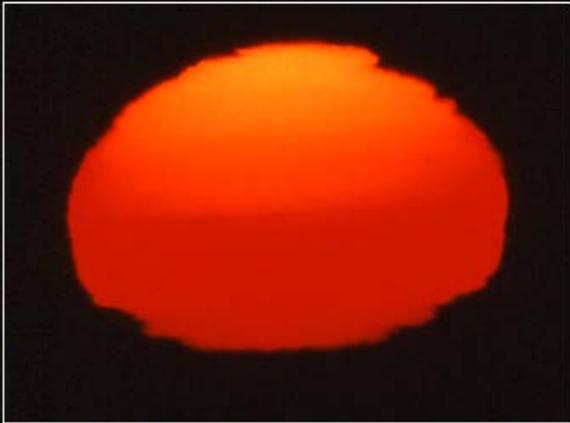
	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
Average, dynamic models	-0.3	-0.1	0.2	0.3	0.4	0.4	0.3		
Average, statistical models	-0.4	-0.2	-0.1	0	0	0.1	0.1	0.1	0.2
Average, for all models	-0.3	-0.1	0.1	0.2	0.3	0.3	0.2	0.3	

More than half of the dynamical and statistical ENSO (El Niño-Southern Oscillation) models predict below average sea surface temperatures (SSTs) in the east central tropical Pacific Ocean during the April-May-Jun climate season, but warm enough to be classified as ENSO neutral conditions.

A majority of the models indicate ENSO-neutral conditions at least through the summer of 2012. However, a handful of models predict the development of a weak El Niño during the Jun-Jul-Aug and Jul-Aug-Sep seasons.

Currently, for the second half of 2012, ENSO neutral conditions appear most likely, with the development of El Niño more likely than a return of La Niña.

During the Final Days of La Niña - What May We Expect Along the Colorado Front Range?



Above Average
Temperature?



Below Average
Precipitation
Possibly Resulting in
Water Shortages and
Drought?



Reduced Runoff from Below
Average Mountain Snowpack?



Greater Risk of
Wildland Fires?



Potentially Damaging
Wind and Dust Storms?



**Yes,
they are
all possible
along the
Front Range
this spring.**

Freeze / Frost Occurrence Data For Northeast Colorado

All probabilities in whole percent. See notes for probability level description.
- Indicates the probability of occurrence of threshold temperature is less than indicated probability.

State And Station Name	Threshold (F)	Spring (Date)			Fall (Date)			Freeze Free Period (Days)			Probability Level (4)
		Probability Level (1)			Probability Level (2)			Probability Level (3)			
		90	50	10	10	50	90	10	50	90	
Northeast Colorado											
AKRON 4 E (Washington County)	36 32 28	May01 Apr29 Apr19	May20 May11 May01	Jun07 May23 May13	Sep09 Sep15 Sep23	Sep21 Sep27 Oct08	Oct02 Oct08 Oct24	144 157 182	123 138 160	102 120 138	54 47 38
BAILEY (Park County)	36 32 28	Jun22 Jun05 May15	Jul06 Jun24 May31	Jul21 Jul13 Jun16	Aug01 Aug20 Aug30	Aug21 Sep06 Sep15	Sep09 Sep23 Sep30	69 99 127	45 73 106	20 47 84	75 66 57
BOULDER (Boulder County)	36 32 28	May02 Jun05 Apr08	May16 May22 Apr22	May31 May14 May07	Sep14 Sep18 Sep23	Sep26 Oct02 Oct11	Oct08 Oct16 Oct30	151 170 193	132 151 171	113 131 149	47 39 30
BRIGGSDALE (Weld County)	36 32 28	May08 Apr24 Apr17	Jun02 May19 May08	Jun28 Jun09 May30	Sep02 Sep13 Sep20	Sep17 Sep23 Oct03	Oct01 Oct03 Oct16	137 147 172	105 126 147	74 105 121	58 51 43
BYERS 5 ENE (Arapahoe County)	36 32 28	May11 Apr28 Apr22	May27 May10 May02	Jun13 May23 May12	Sep10 Sep14 Sep19	Sep21 Sep27 Oct03	Oct01 Oct09 Oct16	135 159 171	115 139 153	96 118 135	56 49 41
CASTLE ROCK (Douglas County)	36 32 28	May13 May03 Apr22	May30 May06 May06	Jun16 Jun11 May19	Sep05 Sep12 Sep19	Sep18 Sep24 Oct02	Sep30 Oct07 Oct14	132 151 170	110 124 148	88 98 126	58 51 41
CHERRY CREEK DAM (Denver County)	36 32 28	May10 Apr30 Apr23	May26 May17 May04	Jun11 Jun02 May15	Sep11 Sep15 Sep20	Sep22 Oct09 Oct05	Oct03 Oct09 Oct21	139 156 175	118 132 154	96 109 132	55 47 38
DENVER STAPELTON (Denver County)	36 32 28	Apr27 Apr16 Apr03	May12 Apr30 Apr20	May27 May13 May07	Sep15 Sep18 Sep28	Sep27 Oct04 Oct15	Oct09 Oct21 Nov01	158 182 200	137 157 177	115 132 154	50 42 32
EVERGREEN (Jefferson County)	36 32 28	Jun02 May18 May02	Jun21 Jun03 May18	Jul10 Jun18 Jun02	Aug20 Sep04 Sep12	Sep05 Sep18 Sep27	Sep20 Sep28 Oct11	98 123 154	75 105 131	52 86 108	68 61 52
FLAGLER 1 S (Kit Carson County)	36 32 28	May04 Apr28 Apr21	May24 May11 May03	Jun13 May24 May15	Sep10 Sep15 Sep21	Sep22 Sep28 Oct07	Oct04 Oct11 Oct23	143 160 179	120 139 156	97 118 134	55 48 40
FORT COLLINS (Larimer County)	36 32 28	Apr29 Apr23 Apr05	May13 May04 Apr18	May27 May15 May02	Sep15 Sep18 Sep24	Sep24 Oct02 Oct10	Oct04 Oct17 Oct26	150 171 195	134 151 174	118 130 154	51 43 35

Source: NOAA/National Climatic Data Center (NCDC), Asheville, North Carolina

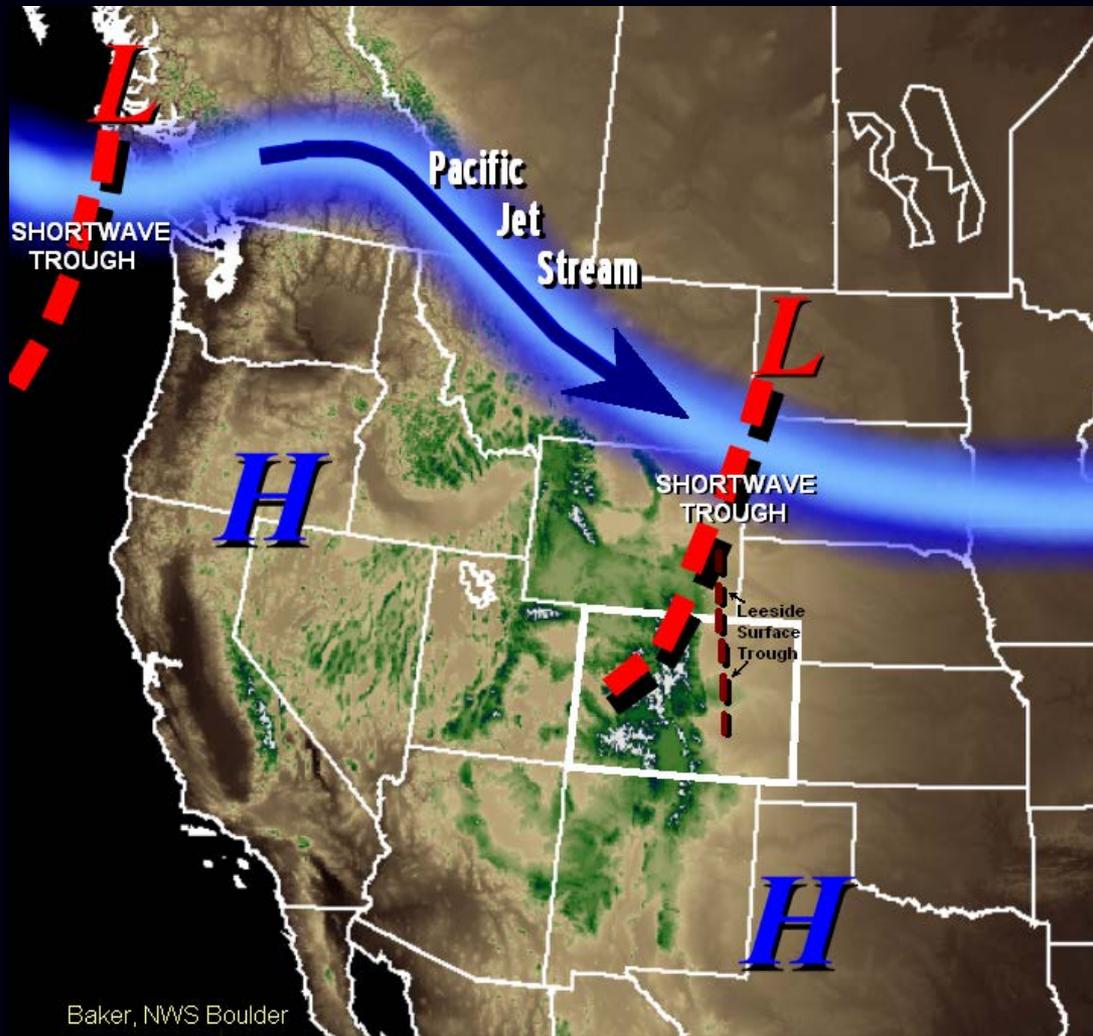
State And Station Name	Threshold (F)	Spring (Date)			Fall (Date)			Freeze Free Period (Days)			Probability Level (4)
		Probability Level (1)			Probability Level (2)			Probability Level (3)			
		90	50	10	10	50	90	10	50	90	
Northeast Colorado											
FORT MORGAN (Morgan County)	36 32 28	Apr30 Apr22 Apr04	May10 May02 Apr18	May20 May12 May03	Sep15 Sep21 Sep30	Sep26 Oct05 Oct15	Oct8 Oct18 Oct29	152 172 198	139 155 178	126 138 159	52 46 38
GREELEY UNC (Weld County)	36 32 28	Apr28 Apr21 Apr04	May12 May02 Apr18	May26 May13 May03	Sep15 Sep17 Sep25	Sep25 Oct10 Oct10	Oct4 Oct14 Oct25	153 169 195	135 151 174	117 133 153	51 44 35
HOLYOKE (Phillips County)	36 32 28	Apr30 Apr26 Apr13	May13 May05 Apr24	May26 May14 May06	Sep11 Sep19 Sep28	Sep23 Oct03 Oct13	Oct4 Oct16 Oct27	149 168 185	132 150 170	114 131 156	52 45 36
JULESBURG (Sedgwick County)	36 32 28	Apr30 Apr25 Apr10	May14 May07 Apr24	May28 May19 May09	Sep11 Sep15 Sep24	Sep23 Sep29 Oct10	Oct4 Oct13 Oct26	148 164 190	131 144 168	114 125 146	53 46 38
LAKEWOOD (Jefferson County)	36 32 28	May05 Apr24 Apr11	May20 May09 Apr29	Jun04 May24 May17	Sep13 Sep18 Sep24	Sep25 Oct01 Oct09	Oct6 Oct14 Oct24	148 168 187	127 144 163	105 121 139	51 43 33
LONGMONT 2 ESE (Boulder County)	36 32 28	May02 Apr22 Apr10	May17 May05 Apr24	May31 May18 May08	Sep10 Sep15 Sep22	Sep21 Oct03 Oct08	Oct2 Oct10 Oct24	145 165 189	127 145 166	108 125 144	55 49 41
NEW RAYMER (Weld County)	36 32 28	May07 Apr29 Apr23	May24 May14 May03	Jun10 May28 May13	Sep08 Sep14 Sep19	Sep18 Sep25 Oct03	Sep28 Oct07 Oct17	137 153 170	117 134 152	97 114 134	56 50 42
SEDGWICK 5 S (Sedgwick County)	36 32 28	Apr30 Apr24 Apr10	May13 May04 Apr22	May26 May15 May05	Sep13 Sep17 Sep25	Sep25 Oct03 Oct12	Oct6 Oct19 Oct29	151 172 193	134 151 172	117 130 151	50 43 35
STERLING (Logan County)	36 32 28	May02 Apr23 Apr08	May14 May06 Apr21	May25 May19 May05	Sep12 Sep18 Sep25	Sep20 Oct01 Oct09	Sep29 Oct14 Oct22	142 166 188	129 147 169	116 129 151	53 47 39

Based on the 1981-2010 Climatological Data Base

- Notes:
- (1) Probability of later date in spring (thru Jul 31) than indicated.
 - (2) Probability of earlier date in fall (beginning Aug 1) than indicated.
 - (3) Probability of longer than indicated freeze free period.
 - (4) Probability of Freeze/Frost in the yearly period (percent of days with temperatures at or below the threshold temperature).

Even with the unusually warm and dry weather lately, snowfall and freezing temperatures remain a possibility well into late spring for many parts of northeast Colorado. Before planting your outdoor garden, refer to the average latest freeze dates in the above table for your area. Dates with a 90 and 50 percent probability of occurrence appear reasonably safe for planning purposes this spring based on the seasonal outlook from the Climate Prediction Center presented later in this slide show.

The Seasonal Shift in the Jet Stream



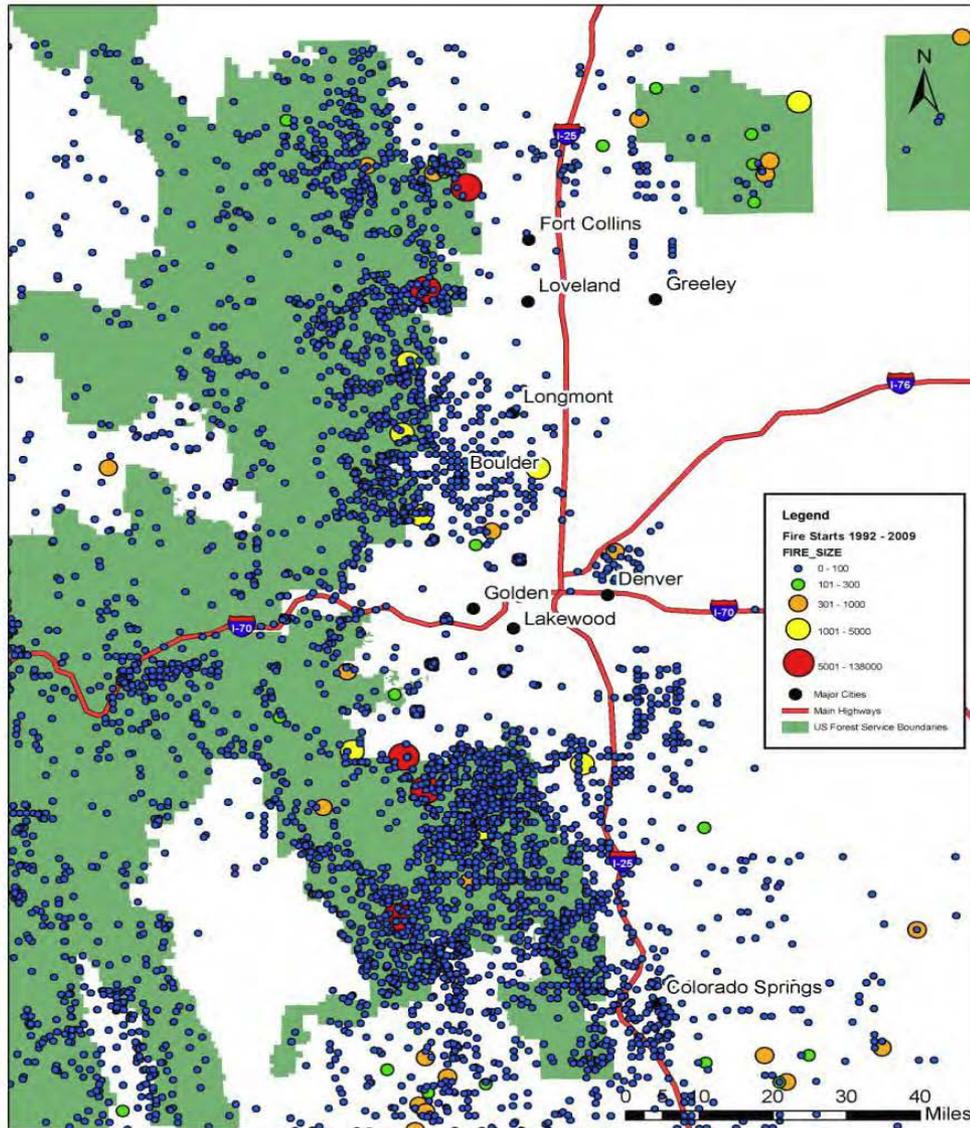
Baker, NWS Boulder

As La Niña weakens, so too will the Pacific Jet Stream as it slowly migrates northward to higher latitudes.

Strong heating of the desert southwest and Great Basin beneath an expanding ridge of high pressure aloft will shift the mean position of the Pacific Jet Stream northward over southern Canada in the next several weeks.

Consequently, weather disturbances or shortwave troughs of low pressure whisked along by the jet stream will play a diminishing role in the creation of precipitation in Colorado during the coming weeks. However, for the Front Range and points east, the passage of these mostly dry weather systems may still result in periods of strong and gusty downslope winds capable of damage, blowing dust and rapid fire spread.

Wildfire history of the Colorado Front Range from 1992 to 2009 expressed as fire start locations by final fire size.

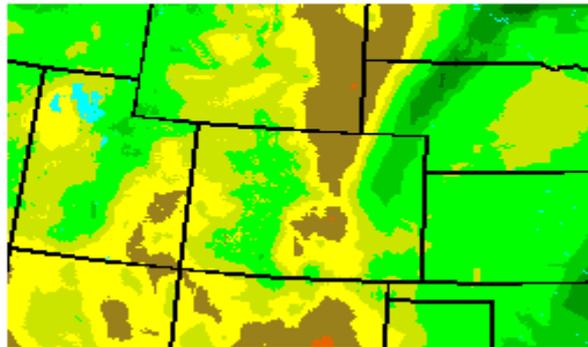


Fourmile Canyon Fire Preliminary Findings Report, USDA, Rocky Mountain Research Station, Oct. 2011

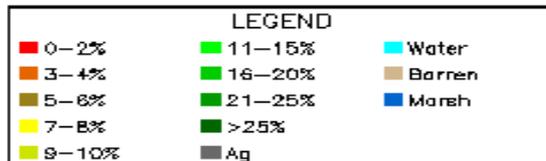
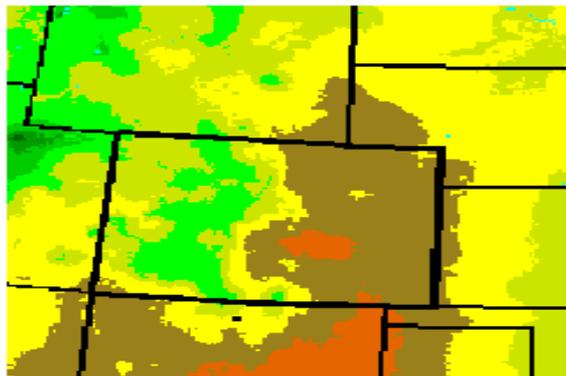
The Colorado Front Range is No Stranger to Wildland Fire

Under the right conditions, wildfires can form any time of the year along the Colorado Front Range. However, the threat for wildland fire is at its greatest in late winter, during spring prior to full green-up, and in late summer and autumn when the leaves are turning and the grasses have cured.

10-Hour Fuel Moisture Forecast for 3/22/12



10-Hour Fuel Moisture Forecast for 3/24/12



NFDRS - USFS Rocky Mountain Research Station,
Missoula, MT

The "fuel hour" corresponds to the diameter of the fuel and the amount of time it takes for an idealized cylinder of vegetation of that size to reach equilibrium moisture content (EMC).

Changing Fuel Moistures In Colorado

One-hour and 10-hour fuels (vegetation up to 1 inch in diameter such as short and long grasses, twigs, stems and small shrubs) respond readily to changes in the weather.

These fine and light fuels can quickly transition from wet (having a moisture level greater than 15 percent) to very dry (a level below 8 percent) within a day's time under hot, dry and windy conditions.

Notice the dramatic change in 10-hour fuel moistures in eastern Colorado in just two days based on guidance from the U.S. Forest Service National Fire Danger Rating System (NFDRS) fuel models. 10-hour fuel moistures in northeast Colorado went from a very moist 16 to 20 percent on the 22nd (upper map) due to recent precipitation, to a very dry 5 to 6 percent moisture content on the 24th (lower map).

Fuel moistures in the mountains and on the western slope have been slower to change due to cooler temperatures and a persistent snow cover. However, these areas are likely to see similar reduction in fuel moistures during the coming months.

U.S. Drought Monitor

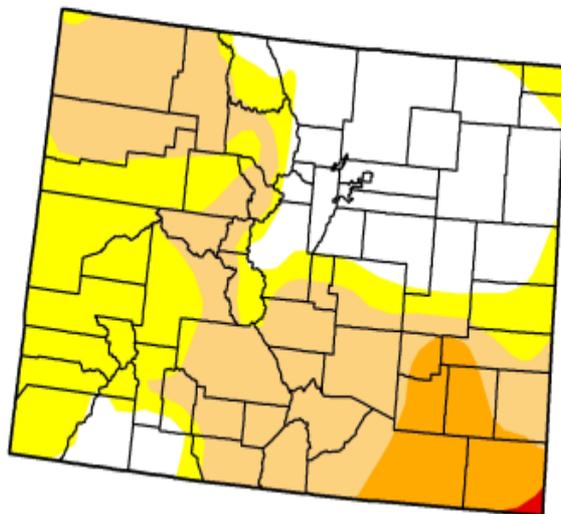
Colorado

March 20, 2012

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	28.97	71.03	42.60	8.37	0.21	0.00
Last Week (03/13/2012 map)	28.97	71.03	42.60	8.30	0.21	0.00
3 Months Ago (12/20/2011 map)	67.79	32.21	24.98	14.94	0.04	0.00
Start of Calendar Year (12/27/2011 map)	67.79	32.21	24.98	14.94	0.04	0.00
Start of Water Year (09/27/2011 map)	60.62	39.38	27.69	19.99	7.88	0.56
One Year Ago (03/15/2011 map)	41.65	58.35	51.50	35.33	0.00	0.00



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.

<http://droughtmonitor.unl.edu>



Released Thursday, March 22, 2012
Eric Luebbehusen, USDA

According to the Drought Monitor, drought conditions for Colorado as of March 20, 2012 varied from severe (D2) and extreme drought (D3) across the southeast corner of the state, to moderate (D1) from southeast Colorado and the San Luis Valley northward along the west side of the Continental Divide to the Yampa and White River basins in northwest Colorado. Abnormally dry conditions existed across west central and southwest Colorado and in small areas of the eastern plains. .

Drought was not indicated for the Front Range and the plains of northeast Colorado, as well as the San Juan River basin in southwest Colorado as of the 20th of March.

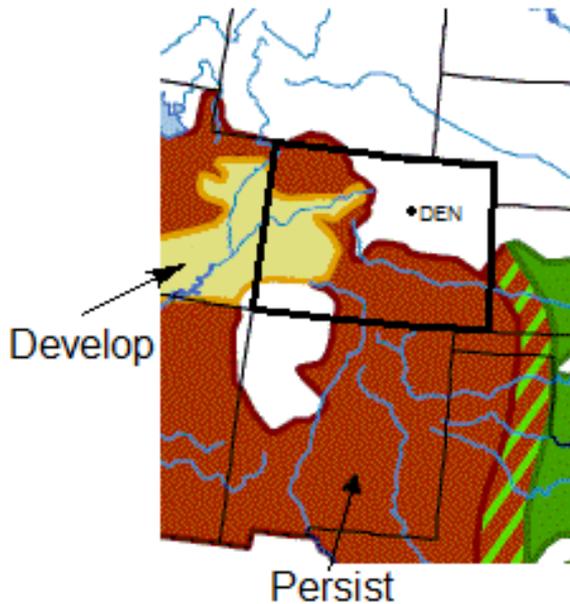


Seasonal Drought Outlook for Colorado

Drought Tendency During the Valid Period

Valid for March 15 - June 30, 2012

Released March 15, 2012



KEY:

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

www.cpc.ncep.noaa.gov/products/expert_assessment/season_drought.gif

The latest seasonal drought outlook for the 90-day period March 15 to June 15, 2012 calls for further development of drought conditions across northwest and southeast Colorado, and for drought to likely develop in west central and southwest Colorado. Due to recent wetting precipitation, the development of drought conditions along the south face the San Juan Mountains in southwest Colorado is not anticipated at this time.

Drought is also not expected to develop in the northern mountains, the Front Range foothills and high plains of northeast Colorado during this period.

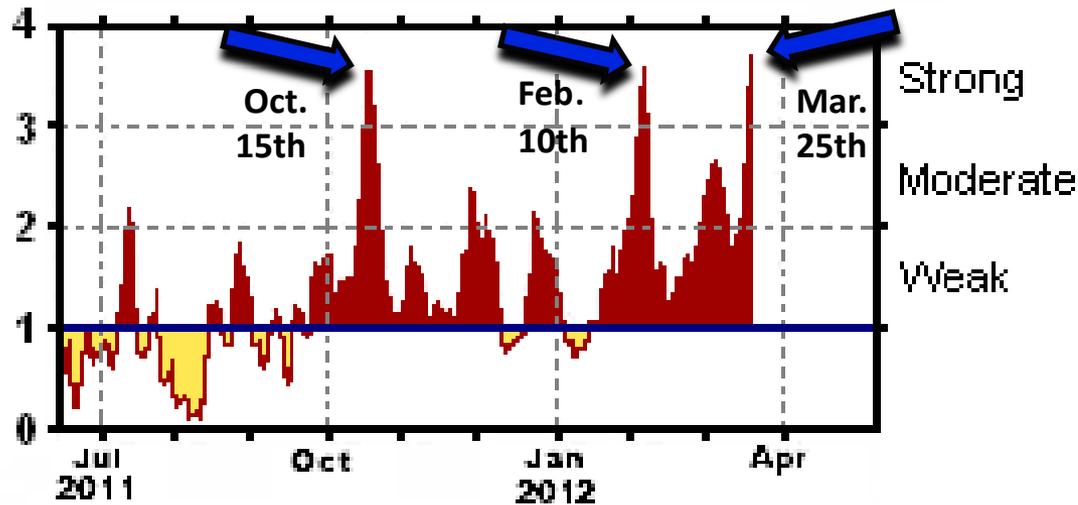


Could we see a reversal
in this unusually warm
and dry weather pattern?

Could the Madden-Julian
Oscillation (MJO)
currently in the Pacific
Ocean produce another
round of wet and snowy
weather for parts of
Colorado in the near
future?

Recent Cycle of MJOs

Amplitude of MJO Time Series



Climate Prediction Center

As of March 25, 2012

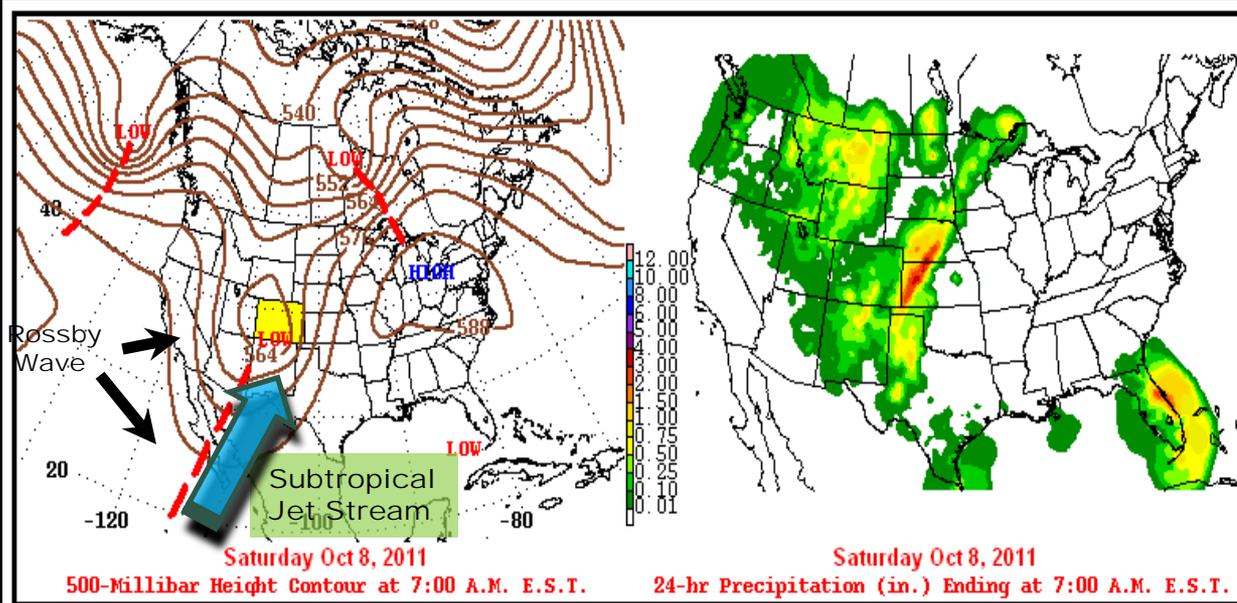
A time series of daily Madden-Julian Oscillation (MJO) amplitude (square root of $RMM1^2 - RMM2^2$) from 17 June 2011 to 17 March 2012.

MJO (indicated by red shaded areas) has remained active since the fall of 2011.

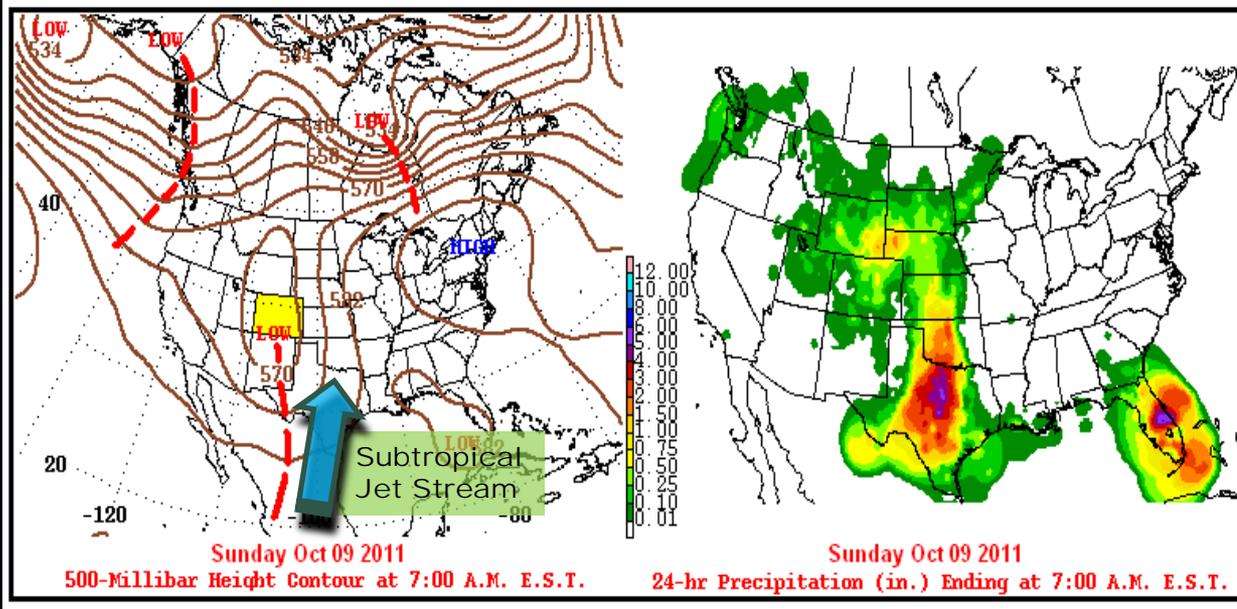
The current MJO is equally as strong as those in October 2011 and February 2012 (blue arrows).

So, what sort of influence did the first two MJOs have on Colorado weather?

MJO's Impact on Precipitation Across The Western U.S. in October 2011



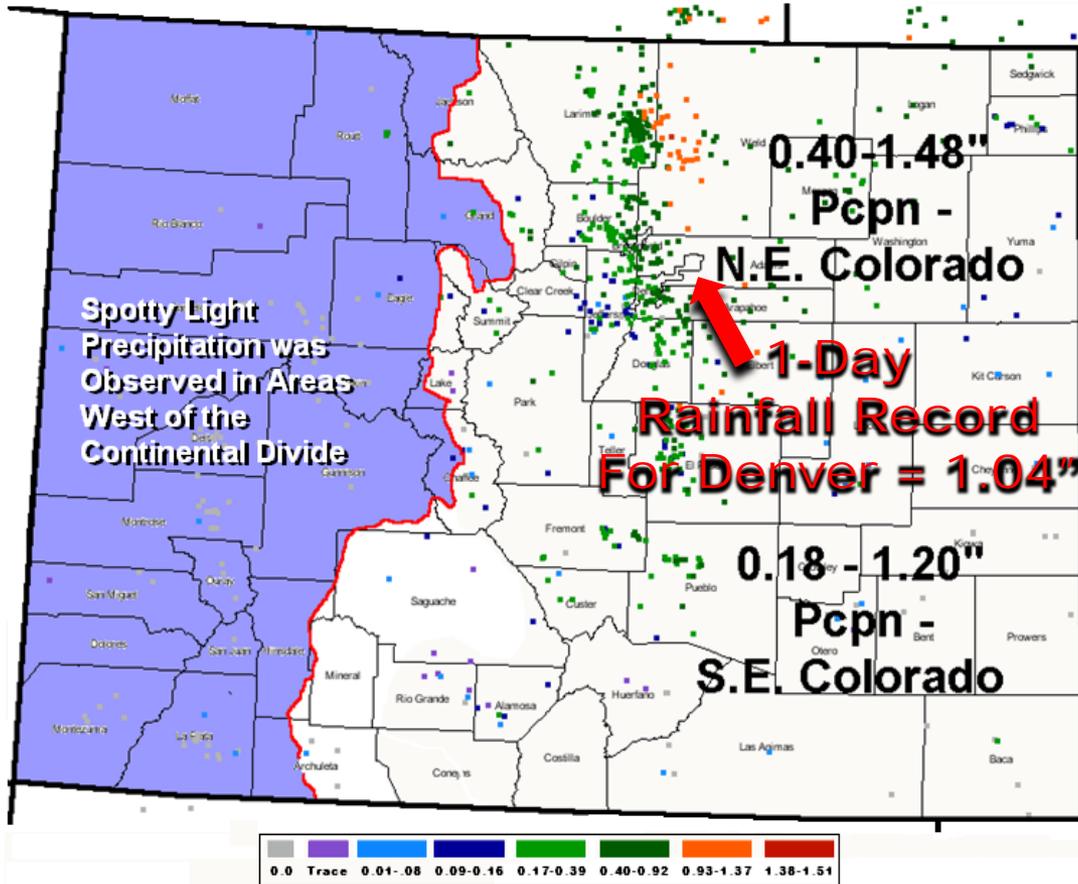
In October of 2011, portions of the desert southwest and Great Plains recorded the first measurable precipitation in several months. For several days around the 10th of the month, moist and unstable air streamed northward over the western U.S., originating from a complex of deep convection associated with a strong MJO crossing the eastern equatorial Pacific Ocean.



On October 9th and 10th, 2011 heavy rainfall produced severe flooding in portions of Texas and Oklahoma. Up to a foot of rain fell on parts of central and southern Texas which helped to relieve the extreme drought conditions gripping the region for over a year.

MJO's Impact on Precipitation in Eastern Colorado in October 2011

24-Hr CoCoRaHS Precipitation for Colorado



Precipitation in inches for the 24-hour period ending ~ 7:00 AM MDT Oct 9, 2011

Source: Community Collaborative Rain, Hail & Snow Network, Colorado Climate Center

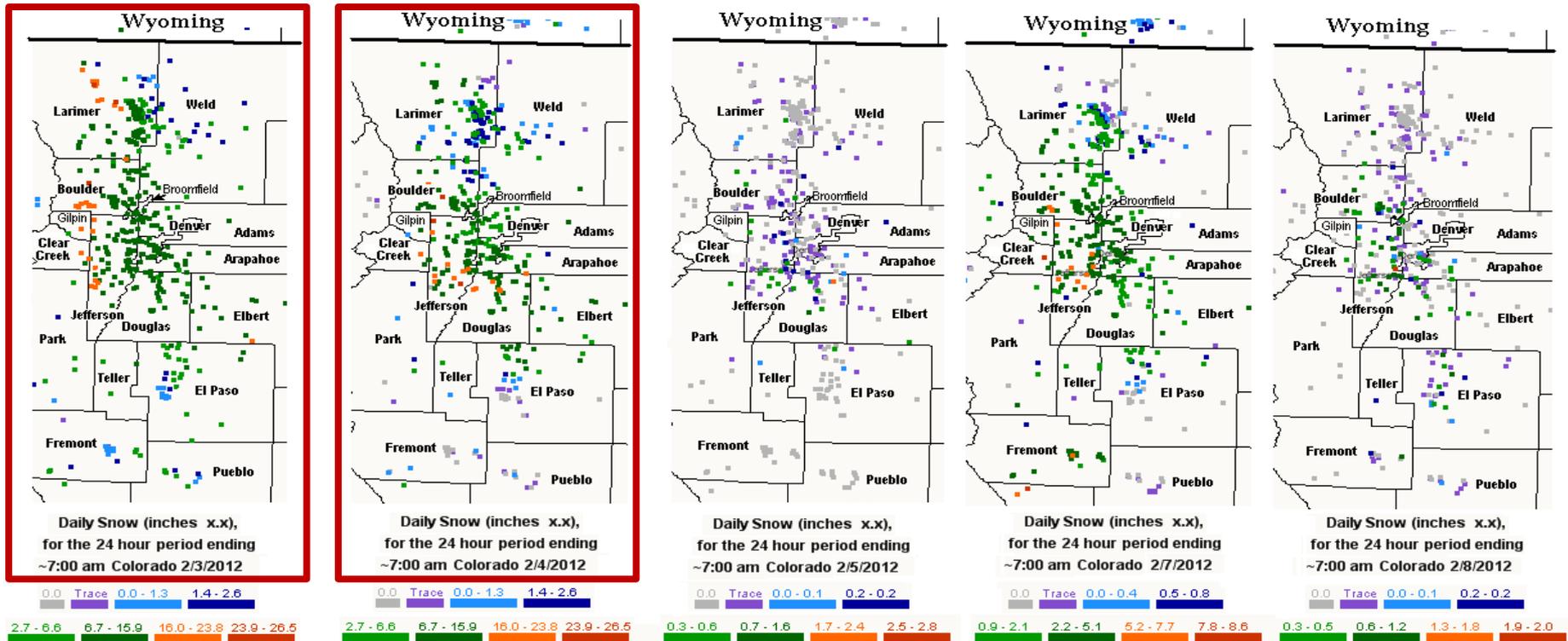
During the first half of October 2011, portions of Colorado saw the first measurable precipitation in many months. Rain heavy at times fell on the plains of eastern Colorado while heavy wet snow blanketed the east face of the Front Range mountains. Moist subtropical air streamed into eastern sections of the state around a deep low pressure system that had formed in northeast New Mexico.

This moist upslope flow produced precipitation along the Colorado Front Range for nearly 48 hours. The greatest rainfall accumulation occurred on the 8th of October with 24-hour totals as of 7 am MDT on the 9th ranging from 0.10 inch on the plains to around 1.5 inches against the Front Range foothills in northeast Colorado. Two day precipitation totals for many locations rivaled amounts normally observed for the entire month of October.

Denver International Airport set a new 1-day rainfall record of 1.04 inches.

MJO's Impact on Precipitation in Eastern Colorado in February 2012

CoCoRHS Snowfall Reports for the Colorado Front Range and Nearby Plains



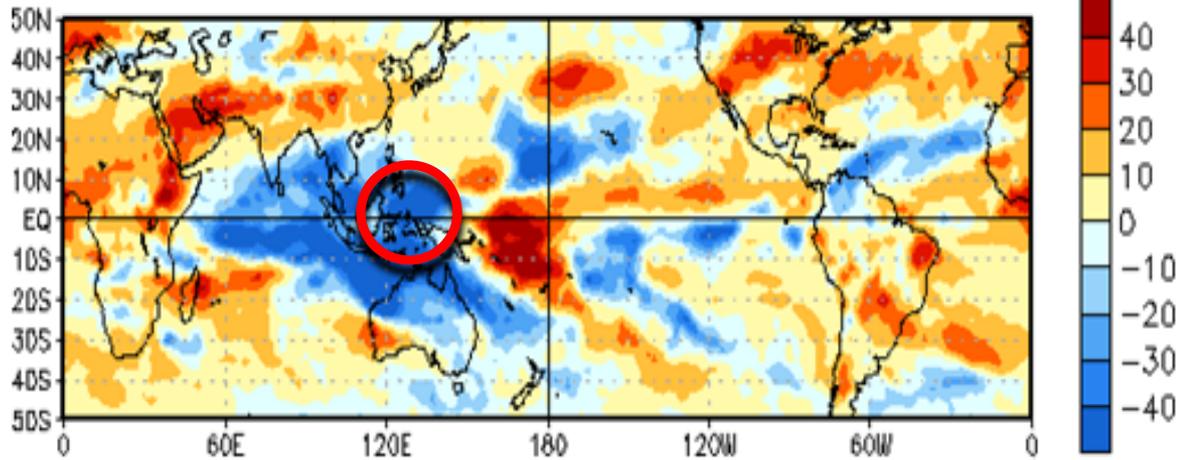
Source: Community Collaborative Rain, Hail & Snow (CoCoRHS) Network, Colorado Climate Center

During the first half of February 2012, a second MJO of strong amplitude crossed the eastern tropical Pacific Ocean. It was during this period that the Colorado Front Range and adjacent high plains observed 10 days of measurable snowfall. The greatest snowfall occurred on the 3rd and 4th when over 3 feet of snow buried portions of the Front Range foothills, and up to two feet of wet snow piled up at the foot of the Front Range from Castle Rock south of Denver north to Fort Collins. For many Front Range communities, February 2012 turned out to be the second snowiest February on record.

What is the Outlook for MJO and What Impact May It Have on Colorado Weather?

Outgoing Longwave Radiation (OLR) Anomalies

7 MAR 2012 to 16 MAR 2012

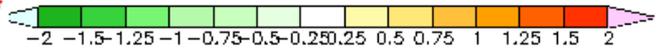
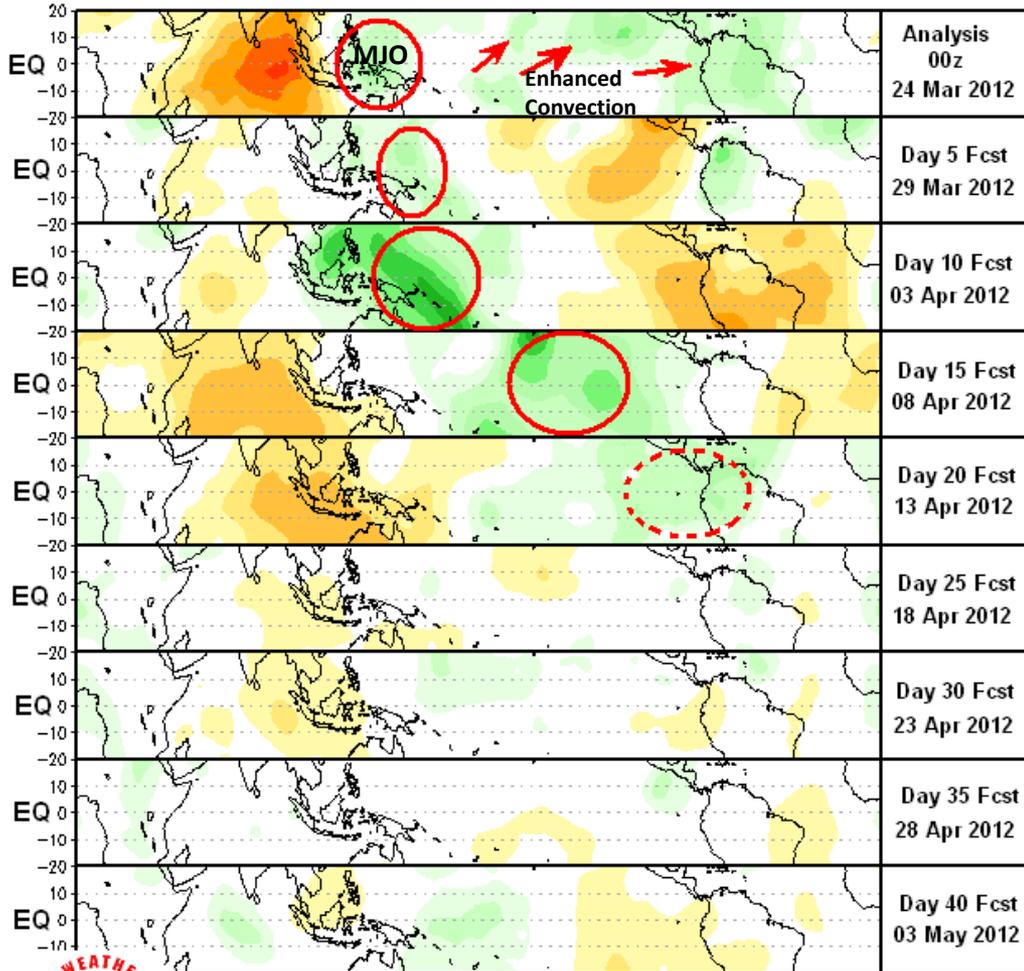


Drier-than-average conditions (or suppressed convection) are indicated by the yellow and red shading. Wetter-than-average conditions (or enhanced convection) are indicated by the blue shading.

Around the first of March 2012, another MJO formed in the Indian Ocean. During the first half of March MJO activity (i.e., convective rainfall) continued to increase with the center of this activity near Papua-New Guinea north of Australia (dark blue shaded area inside the red circle) as of mid-March.

Its growing presence **enhanced** convective rainfall (indicated by negative OLR anomalies) across the Indian Ocean and Maritime Continental region of the eastern Pacific Ocean, and **suppressed** convective rainfall (indicated by positive OLR anomalies) across the central and eastern Pacific Ocean, the Americas and Africa.

200 mb CHI (Velocity Potential) 40-Day Forecast (00z 24 Mar to 3 May 2012) for 20°N-20°S Latitude



HUUG VAN DEN DOOL, CPC/NCEP/NWS/NOAA

Issued 24 March 2012

Strong upper level wind divergence (indicated by the darker green shading inside the red circle) on this 200mb CHI (velocity potential) forecast time series corresponds to *enhanced* convective rainfall associated with the MJO crossing the Maritime Continent (Indonesia and Papua-New Guinea.)

The MJO is forecast to remain active as it slowly migrates eastward along the equator in the Pacific over the next few weeks. Circulations associated with the MJO will contribute to enhanced convection (red arrows) over the central and east Pacific that will potentially increase the odds for significant precipitation for the southwest and central United States including southern and eastern portions of Colorado.

Beyond the second week of April, the forecast is for MJO to weaken as it moves east into the tropical Atlantic Ocean, with a return to weak La Niña conditions across Colorado.



Baker Feb 4 2012

So....

Could we see a reverse in this unusually warm and dry weather pattern we have been in for sometime now?

Could the strong Madden-Julian Oscillation (MJO) moving across the Pacific Ocean play a role in producing another round of wet and snowy weather for parts of Colorado in the near future?

ANSWER:

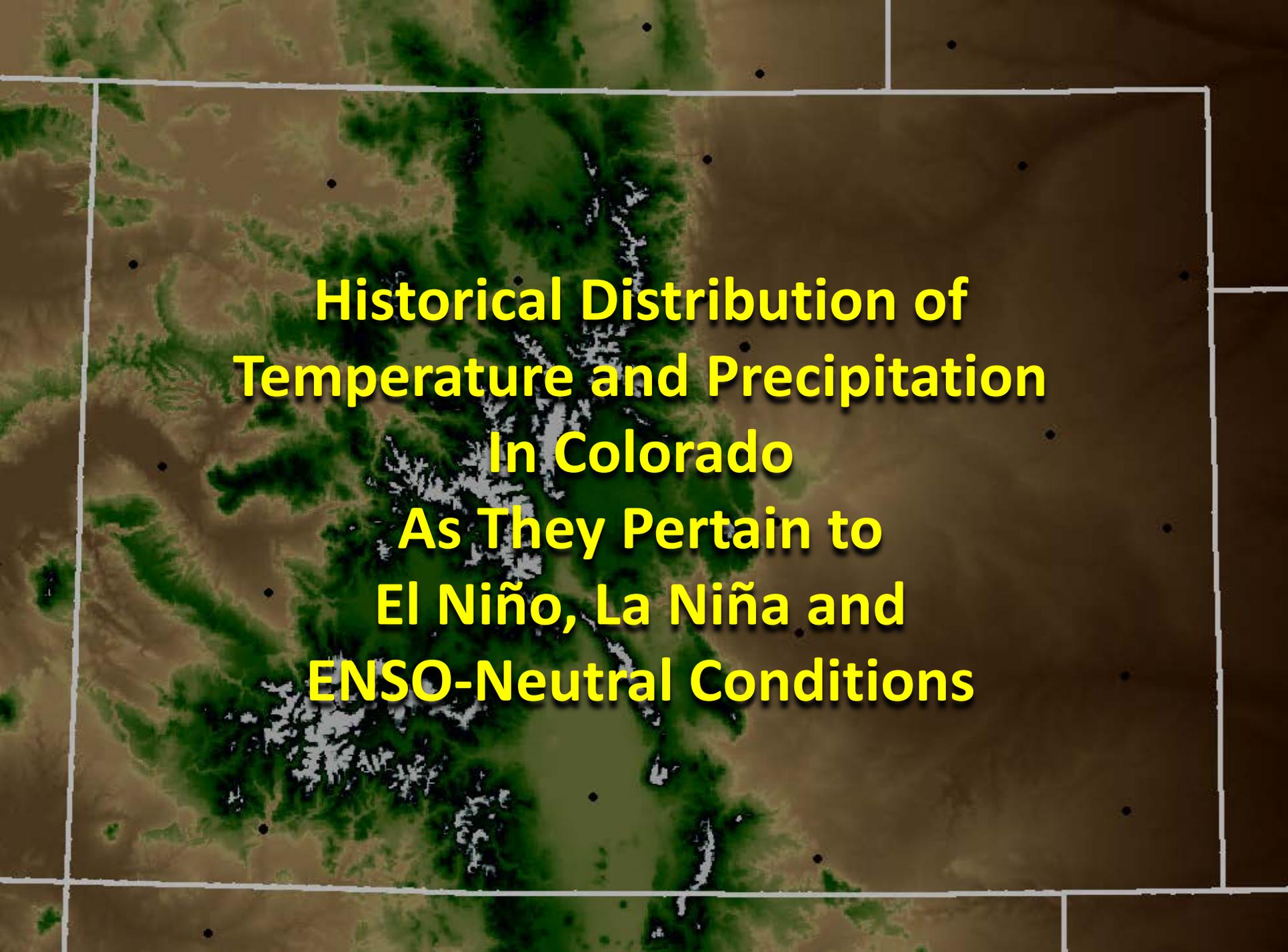
Yes, it is possible during the early half of April.

2012		APRIL							2012	
		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday		
1		2012 MAY 2012								
	8	2012 JUNE 2012								
		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday		
15	6							1	2	
22	13	3	4	5	6	7	8	9		
29	20	10	11	12	13	14	15	16		
	27	17	18	19	20	21	22	23		
		24	25	26	27	28	29	30		

Baker NWS
Baker NWS B
Baker NWS Boulder

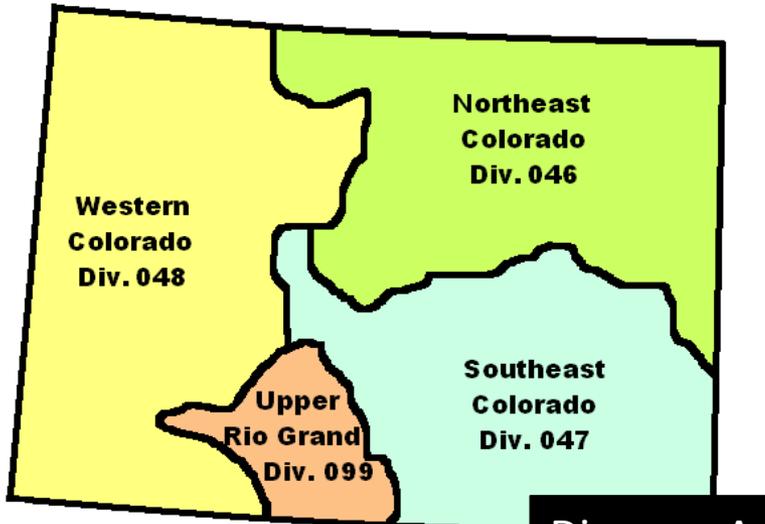
Looking Forward to the Next Three Months For Colorado

Historical Trends in
Temperature and Precipitation
and the Latest
One and Three-Month
Outlooks
From NOAA's
Climate Prediction Center

A topographic map of Colorado, showing the state's outline in white. The map uses a color gradient to represent elevation, with green for lower elevations and brown for higher elevations. The text is overlaid in the center of the map.

**Historical Distribution of
Temperature and Precipitation
In Colorado
As They Pertain to
El Niño, La Niña and
ENSO-Neutral Conditions**

Colorado Climate Divisions



NOAA/Climate Prediction Center

Diagram A

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 50th 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.

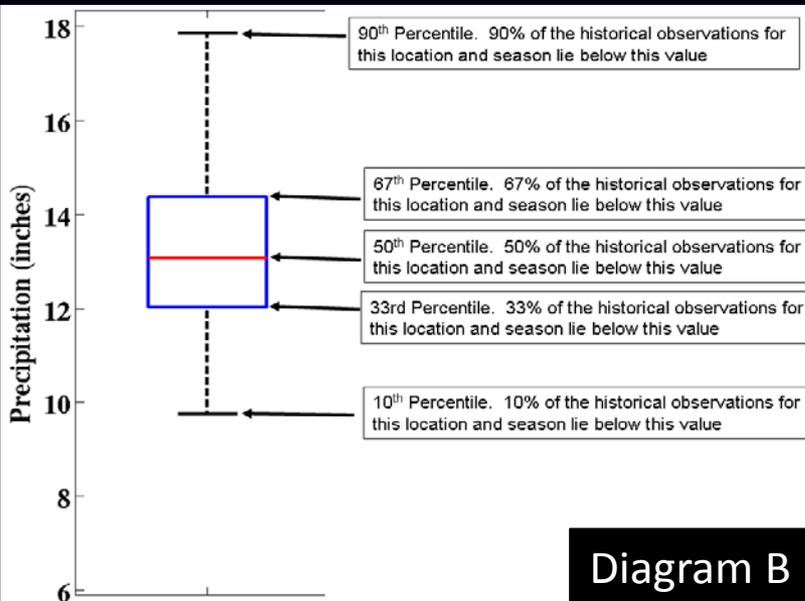
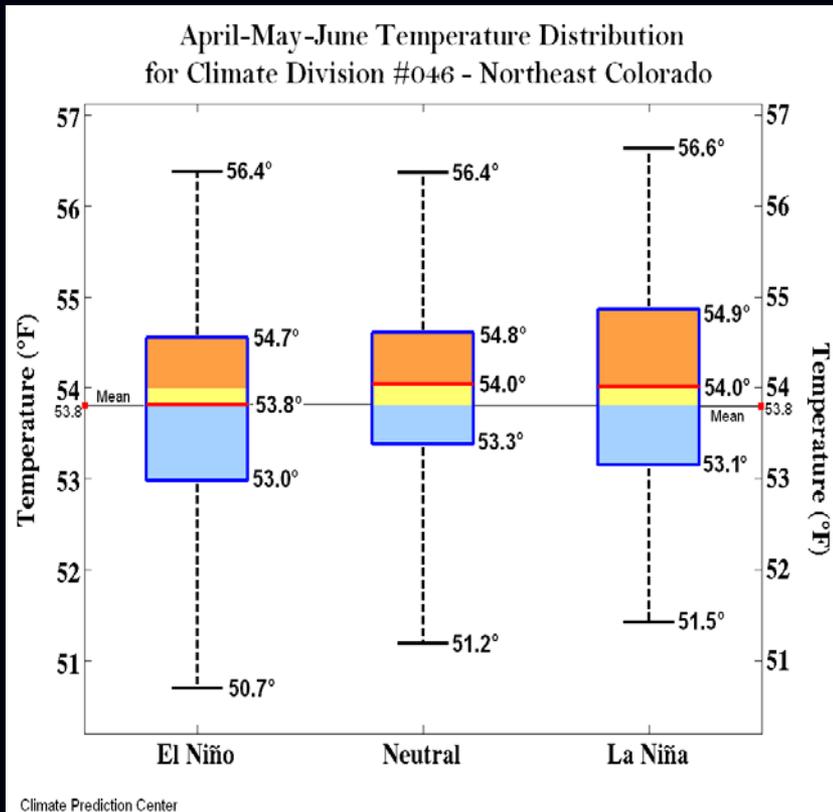
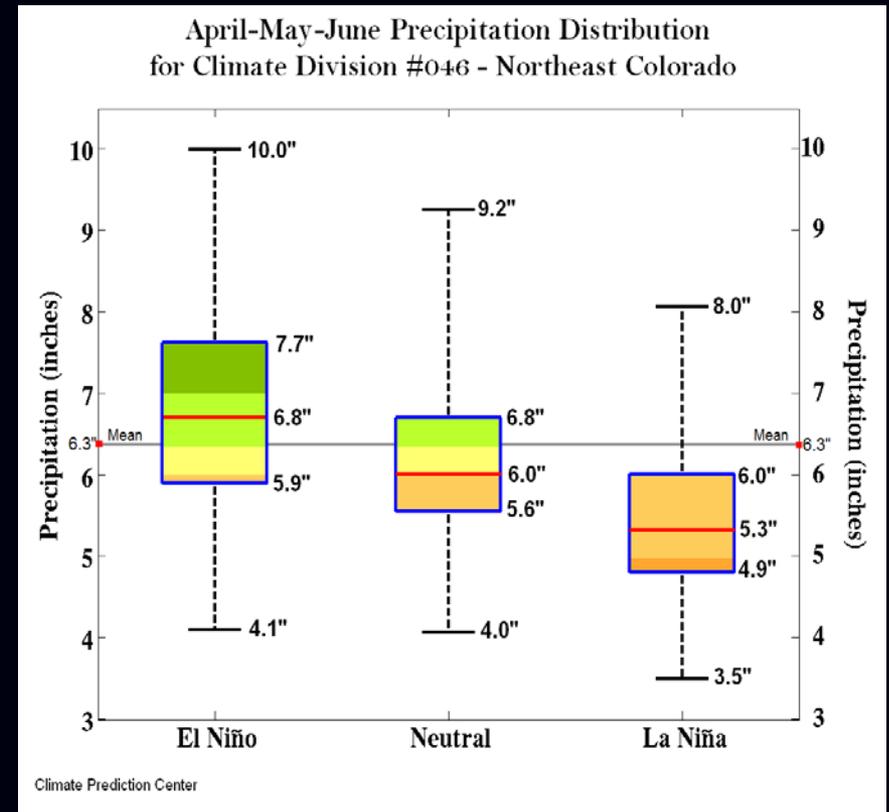


Diagram B

ENSO Box and Whisker Analysis Plots for the Northeast Colorado Climate Division #046 for the 3-Month Season April-May-June

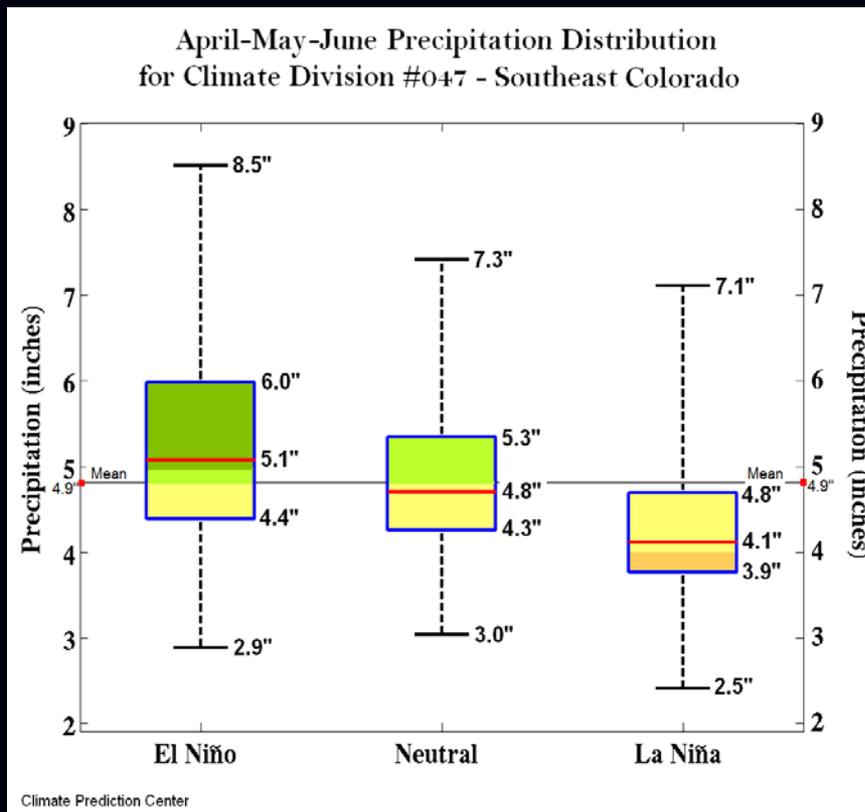
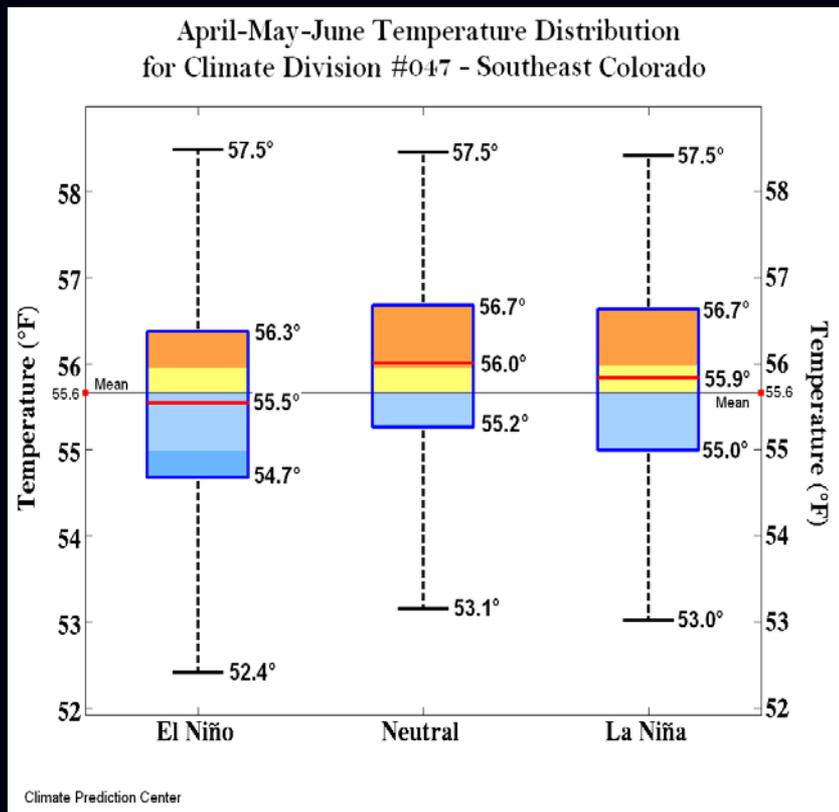


For the climate season April, May and June, temperatures in northeast Colorado historically have been near average during El Niño events, and slightly above average during ENSO-neutral and La Niña conditions.



For the same climate season, precipitation was slightly above average during El Niños, slightly below average during ENSO-neutral conditions, and below average during La Niña events.

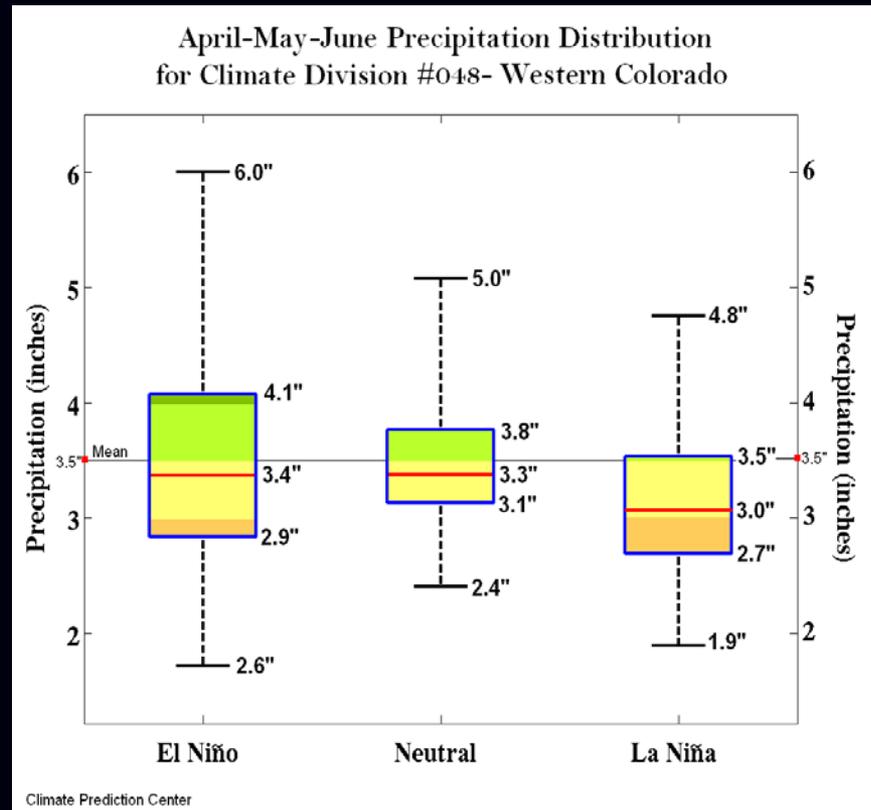
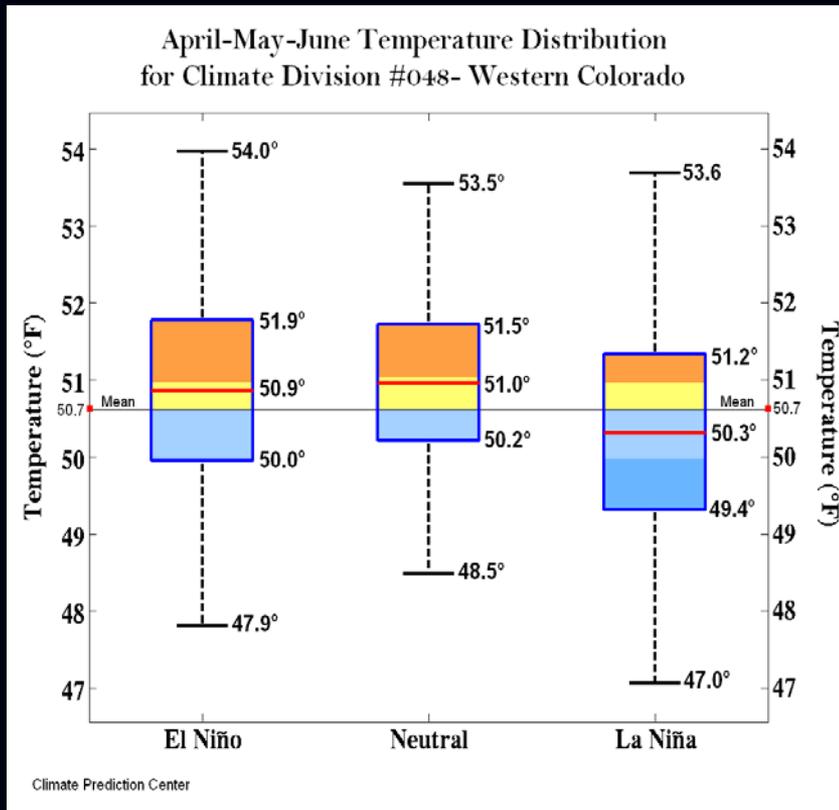
ENSO Box and Whisker Analysis Plots for the Southeast Colorado Climate Division #047 for the 3-Month Season of March-May



For the climate season April, May and June, temperatures in southeast Colorado historically have been near average during El Niño events, and slightly above average during ENSO-neutral and La Niña conditions.

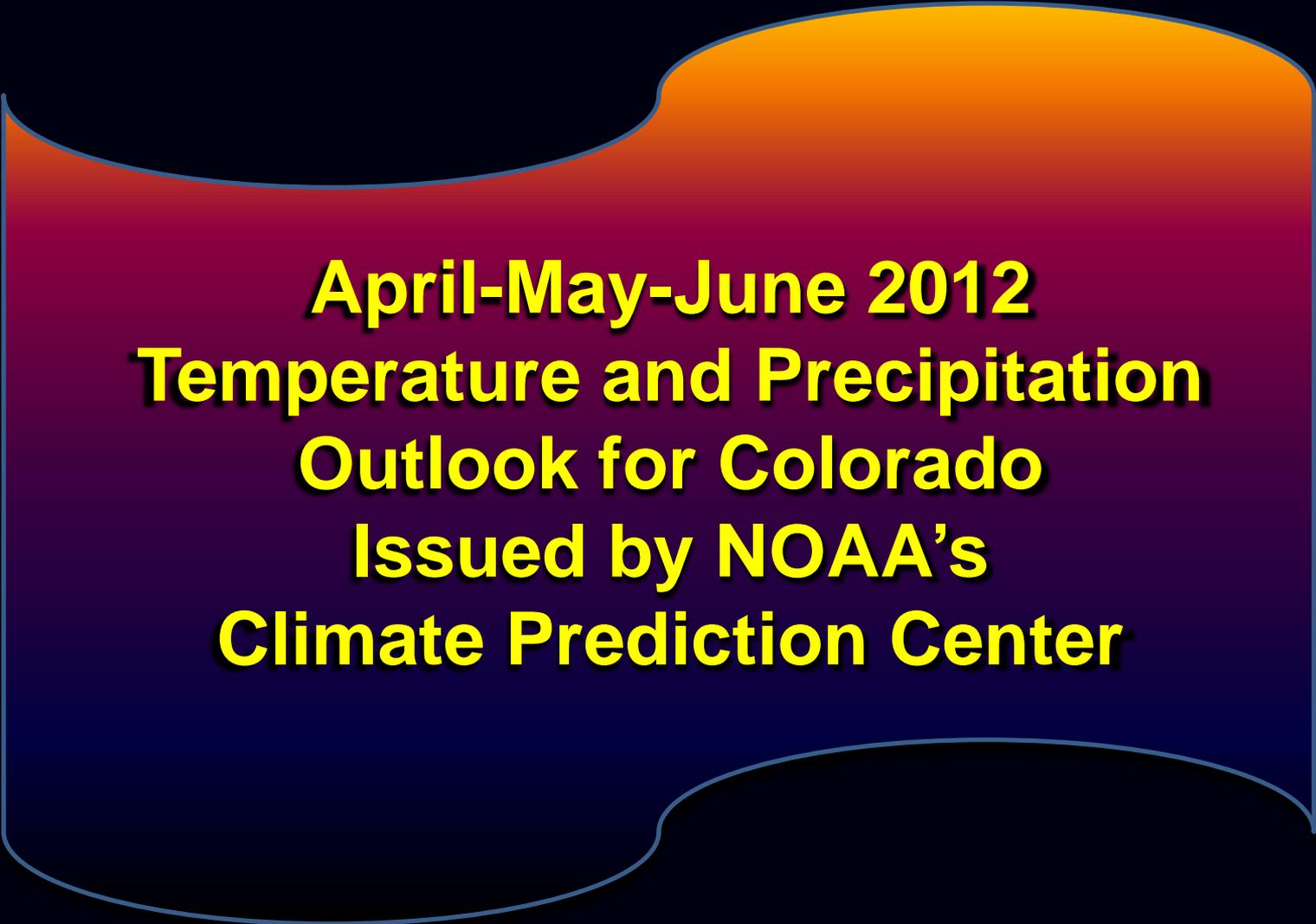
For the same three month climate season, precipitation was slightly above average during El Niños, near average during ENSO-neutral conditions, and slightly below average during La Niñas.

ENSO Box and Whisker Analysis Plots for the Western Colorado Climate Division #048 for the 3-Month Season of March-May



Temperatures in western Colorado during the April-May-June climate season historically have been slightly above average during El Niños and ENSO-neutral conditions, and slightly below average during La Niña events.

Finally, precipitation during this same period historically has been near average during El Niños and ENSO-neutral conditions, and below average during La Niñas. **Note, these climate distributions do not take into consideration the strength of the ENSO event (El Niño/La Niña).**



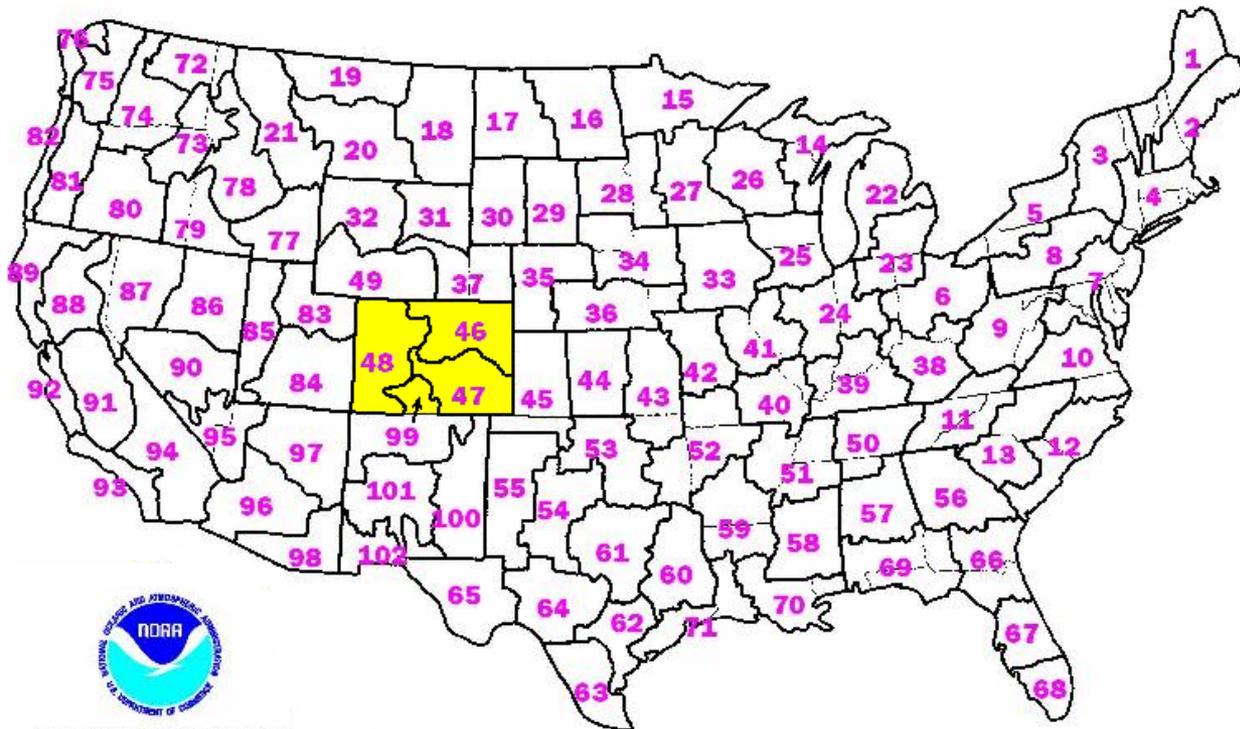
**April-May-June 2012
Temperature and Precipitation
Outlook for Colorado
Issued by NOAA's
Climate Prediction Center**

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.

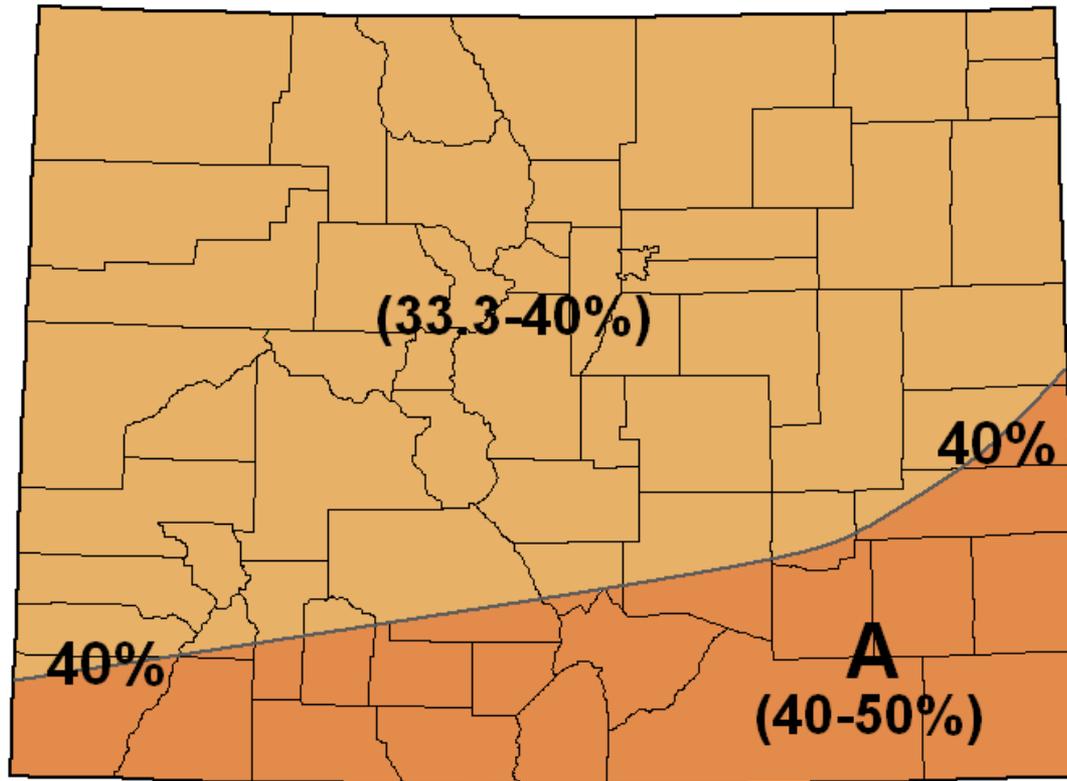
The outlooks indicate probability of being in three specific categories in reference to the 30-year climatology from 1981-2010. They are above, below and average.

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



CLIMATE PREDICTION
CENTER

April 2012 Temperature Outlook for Colorado



One-Month Outlook
Temperature Probability
0.5 Month Lead
Valid April 2012
Made: 15 March 2012

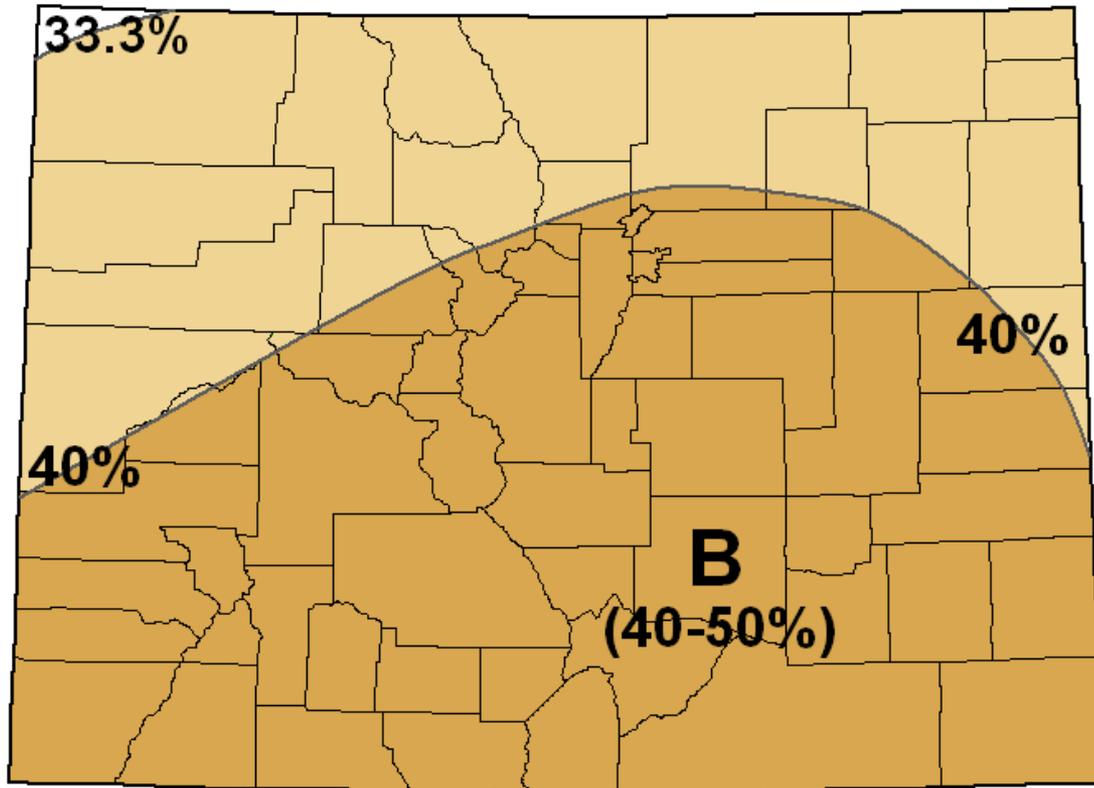
A Means Above Normal (Average)
N Means Normal (Average)
B Means Below Normal (Average)
EC Means Equal (or Undetermined)
Chances for A, N and B

Source: NOAA/Climate Prediction Center

April 2012 Temperature Outlook for Colorado

The March temperature outlook for Colorado from the Climate Prediction Center calls for a 33.3 to 40 percent chance for above average temperatures roughly west of the Continental Divide, a 40 to 50 percent chance for warmer than average temperatures for areas generally east of the Divide, with the highest odds (50-60 percent chance) for above average temperatures along the state's eastern border.

April 2012 Precipitation Outlook for Colorado



One-Month Outlook
Precipitation Probability
0.5 Month Lead
Valid April 2012
Made: 15 March 2012

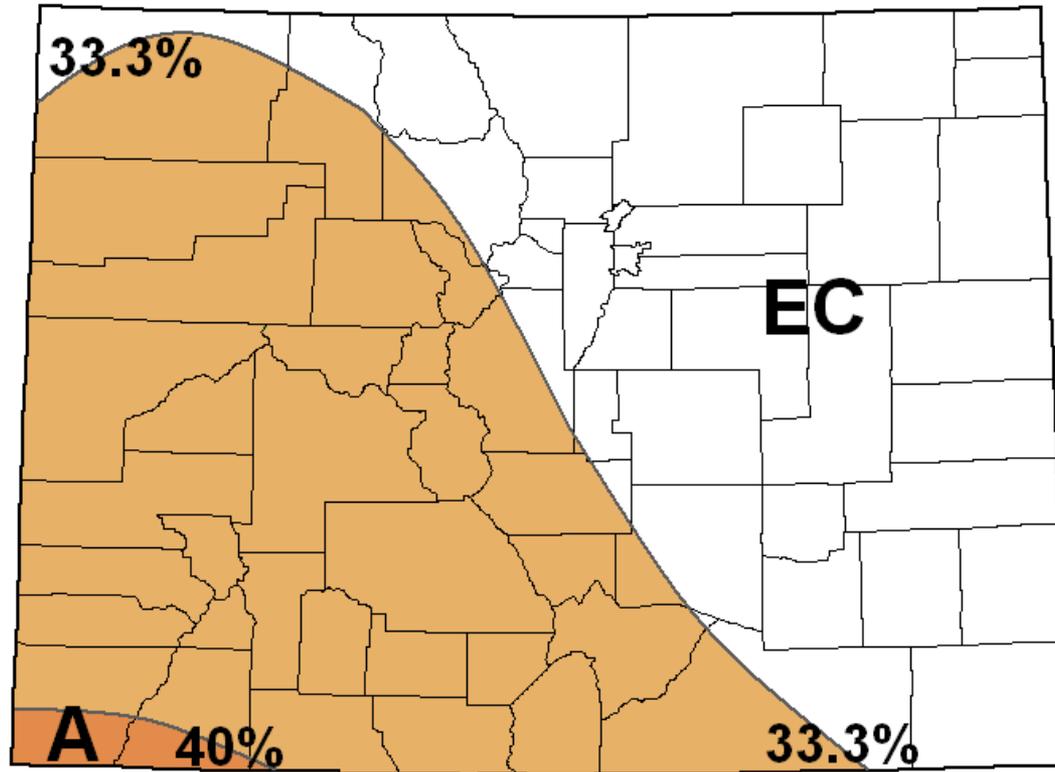
A Means Above Normal (Average)
N Means Normal (Average)
B Means Below Normal (Average)
EC Means Equal (or Undetermined)
Chances for A, N and B

Source: NOAA/Climate Prediction Center

April 2012 Precipitation Outlook for Colorado

The March outlook for Colorado calls for a 33.3 to 40 percent chance of below average precipitation for the entire state, except for the southwest and south central sections where the outlook is calling for a 40 to 50 percent chance of below average precipitation.

April-May-June 2012 Temperature Outlook for Colorado



Three-Month Outlook
 Temperature Probability
 0.5 Month Lead
 Valid AMJ 2012
 Made: 15 March 2012

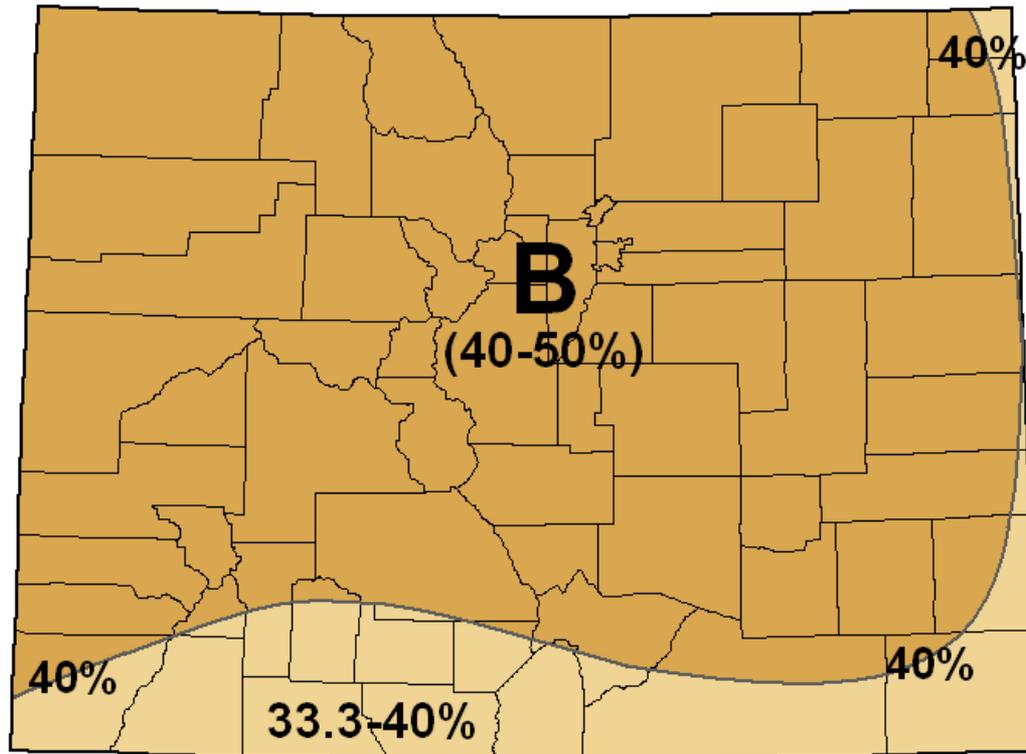
A Means Above Normal (Average)
 N Means Normal (Average)
 B Means Below Normal (Average)
 EC Means Equal (or Undetermined)
 Chances for A, N and B

Source: NOAA/Climate Prediction Center

March-May 2012 Temperature Outlook for Colorado

The temperature outlook for the three-month period March-May calls for an equal (or undeterminable) chance for above, below and near average temperatures (labeled EC) across the northern third of Colorado. The outlook also calls for a 33.3 to 40 percent chance for above average temperatures for the remainder of Colorado, except for the extreme southwest tip of the state where there is a 40 to 50 percent chance of above average temperatures.

April-May-June 2012 Precipitation Outlook for Colorado



Three-Month Outlook
Precipitation Probability
0.5 Month Lead
Valid AMJ 2012
Made: 15 Mar 2012

A Means Above Normal (Average)
N Means Normal (Average)
B Means Below Normal (Average)
EC Means Equal (or Undetermined)
Chances for A, N and B

Source: NOAA/Climate Prediction Center

April-May-June 2012 Precipitation Outlook for Colorado

Finally, CPC's outlook for Colorado calls for a 33.3 to 40 percent chance of below average precipitation for the northern third of the state and a 40-50 percent chance of below average precipitation for the lower two-thirds of Colorado.

Note: CPC outlooks do not imply any degree of warmness or coldness, or any amount of precipitation; *only* their probability of occurrence.

Summing It Up

- Since the middle of February this year, the weather has turned unseasonably warm and very dry across Colorado, especially in areas east of the mountains. New high temperature records have been set almost daily somewhere in Colorado since the first of March. For many locations, March 2012 will go down as the driest March on record. The lack of precipitation in March was in sharp contrast to the wet and very snow conditions observed in the mountains and at lower elevations in eastern Colorado during February.
- La Niña is forecast to continue to weaken as sea surface temperatures in Pacific Ocean continue to warm. Even with its decline, La Nina will probably continue to influence weather patterns across the western U.S. and Colorado until the end of spring.
- The strong Madden-Julian Oscillation (MJO) now in the western Pacific Ocean is forecast to cross the tropical Pacific Ocean in the next few weeks, however with some deduction in strength along the way. The enhanced convection associated with the MJO will potentially increase the odds for the first significant precipitation across southern and eastern portions of Colorado since early in February of this year.
- Much above average temperatures, low relative humidity, the lack of precipitation and very low fuel moistures have significantly increased the potential for wildland fire in many parts of Colorado. However, the threat of wildfire would decrease should significant precipitation occur in the next few weeks.
- The outlook for the next three months according the Climate Prediction Center calls for a heighten chance for above average temperatures across southern and western Colorado and a greater than a 1-in-3 chance for below average precipitation for the entire state. The temperature outlook for northeast Colorado is less certain.
-