Colorado Climate Update

Nolan Doesken
Colorado State Climatologist
Colorado Climate Center
Atmospheric Science Department
Colorado State University

http://ccc.atmos.colostate.edu
Presented to the Colorado Farm Show
Wednesday, January 30, 2013
Prepared by Wendy Ryan and Zach Schwalbe
Topics we will cover today

• Background
• A review of state climate conditions over the past year
• Where 2012 fit in the historic perspective
• Recent climate and snowpack conditions
• 2013 climate predictions
• CoAgMet status report
• CoCoRaHS – Appeal for more rain gauge volunteers – more help still needed!
First -- A short background

- In 1973 the federal government abolished the “State Climatologist” program nationwide leaving Colorado without

- Later that same year, Colorado established the Colorado Climate Center at Colorado State University with support through the Colorado Agricultural Experiment Station.
Our Mission

• The Colorado Climate Center at CSU provides valuable climate expertise to the residents of the state through its threefold program of:

1) **Climate Monitoring** (data acquisition, analysis, and archiving),
2) **Climate Research**
3) **Climate Services** (providing data, analysis, climate expertise, education and outreach)
Monitoring our Climate

- Elements: temperature, precipitation, snow, wind, solar, evaporation, soil temperatures, humidity, clouds, etc.
Systematic weather data collection began in Colorado in the 1870s and 1880s.
Weather reports began on Pikes Peak in 1873

Reports were sent by telegraph every few hours.
Stories abounded in the national media of the rigors of Colorado Climate.
Colorado Weather Stations in 1890

Slower start in NW and SW Colorado
Since then, the U.S. Weather Bureau/National Weather Service has faithfully maintained an oft taken for granted network of weather stations in Colorado and across the country – the Cooperative Observer Network.
Many other sources of weather data have been added since the 1970s

CSU’s Colorado Agricultural Meteorological Network “CoAgMet”
What have we learned from over 120 years of continuous climate monitoring?
Colorado being an arid state, the amount of precipitation is at all times a vital question. Liability to a marked deficiency in rainfall in any region is a matter of grave concern to those engaged in agriculture and other interests. We often hear it stated that the rainfall is changing, that the settling up of the country and the planting of trees and building of reservoirs, forming lakes and wet places throughout the country, is causing an increase in the amount of our precipitation, but long series of observations taken at different places over the world, do not bear out that claim.

YEARS OF STUDY SHOWS CLIMATE NOT CHANGING
We often hear the statement made that the climate is changing, and the popular belief that such is the case can only be explained by the generally short and defective memories of people who through exposure to a few severe storms in the past, or inconvenience, or perhaps loss from a few of them, unintentionally exaggerate the severity and frequency of their occurrence. Although large fluctuations occur in different years with some indication of periodical terms, especially in Colorado, where the range of temperature is great, there seems to be no progressive change. These fluctuations are large and often in the same direction for several successive years.

In the meteorological data for the last one hundred years, the record of some places extending still further back, there...
We Have a Fascinating Climate

- High elevation (highest state in the Union – by far)
- Mid-Latitude location (lively seasonal changes)
- Interior Continental Location far from atmospheric moisture sources
- Complex Mountain topography
The Result?
Generous sunshine, low humidity, and moderate temperatures much of the time people like it here.
Annual Average Solar Radiation

Colorado is a part of the Southwest “Sunbelt” — especially southern Colorado
Large Seasonal Temperature Variations

Fruita, Colo.
Winters are consistently colder than summers – 😊

Average Monthly Temperature (9171-2000) for Selected Station

- Grand Junction
- Delta
- Palisade
- Collbran
- Vail
- Climax

Temperature (deg Fahrenheit)

Months: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec
Can you see the difference between southern CA and our part of Colorado?
Large diurnal temperature ranges and rapid changes

Kersey, Colo.

Temperature for KSY01 (01-29-2006 - 02-28-2006)

Blanca, Colo.

Temperature for BLA01 (08-08-2002 - 08-27-2002)
And this is how daily weather, over time, defines our climate.
For example, variations within Rocky Mountain National Park—Totally different climate west of the Continental Divide than east even
Relatively Large Year to Year Variations ("Interannual Variability")

Colorado Statewide Mean Annual Temperature (1895-2011)
Thanks to our high elevation and interesting topography, precipitation occurs fairly often.

But we’re a long way from primary moisture sources so precipitation is limited and highly variable.

Photo by Wendy Ryan
Where we fit in the national picture

Except for our mountains, we’re already very dry most of the time.
Highly seasonal precipitation patterns with considerable geographic diversity in “seasonality”

Water Year Average Precipitation for Selected Stations

- Grand Junction
- Vail
- Vail Pass
- Georgetown
- Denver
- Burlington
Large (actually “Huge”) Year-to-Year Variations in Precipitation

Are we ever “Average”? Probably not.
Snow is “Way Important” in our climate and hydrology
South Platte River Basin Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Apr 09, 2012

Current as Pct of Avg: 57%
Current as Pct of Last Year: 48%
Current as Pct of Peak: 54%
Average as Pct of Peak: 96%
Pct of Avg Needed to Reach Peak: 1133%
Average Peak Date: Apr 23

NRCS
Natural Resources Conservation Service
April 1 Colorado Statewide Snowpack
Drought is an unwelcome but frequent visitor to Colorado.
Short, local and regional drought is common.
Some portion of Colorado experiences drought conditions almost every year.
Severe and widespread drought is less frequent. But still impacts Colorado on a regular basis. Our severe drought of 2002 was relatively short in comparison to some past droughts.
Fraction of Colorado in Drought
Based on 48 month SPI (SPI < -1)
(1890 - August 2012)

Note – current drought just “gettin’
Recent upward trends in temperatures, especially in spring and summer, are only making matters worse.
Evolution of Drought Conditions Leading up to 2012
October 3, 2000  Valid 8 a.m. EDT

U.S. Drought Monitor

Map focuses on widespread drought. Local conditions may vary.

D0 Abnormally Dry
D1 Drought—First Stage
D2 Drought—Severe
D3 Drought—Extreme
D4 Drought—Exceptional

A = Agriculture
W = Water
F = Wildfire danger

Delineates Overlapping Areas

See accompanying text summary for forecast statements
http://enso.unl.edu/monitor/monitor.html

- Released Thursday, Oct. 5, 2000 -
U.S. Drought Monitor

September 30, 2003
Valid 8 a.m. EDT

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

http://drought.unl.edu/dm

Drought Impact Types:
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)
No type = both impacts
Delineates dominant impacts

Released Thursday, October 2, 2003

Author: Candace Tanhamley/Scott Stephens, NOAA/NCDC
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://drought.unl.edu/dm

Released Thursday, October 5, 2006
Author: Rich Tinker, Climate Prediction Center, NOAA
U.S. Drought Monitor

October 4, 2011
Valid 8 a.m. EDT

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

Drought Impact Types:
- Delineates dominant impacts
  - S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
  - L = Long-Term, typically >6 months (e.g. hydrology, ecology)

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, October 6, 2011
Author: Rich Tinker, CPC/NCEP/NWS/NOAA
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
A closer look at the 2012 Water Year in Colorado
Highlights of the 2012 Water Year in Colorado

• Relatively wintry start
• Very mild/dry January but a snowy February east of the mountains
• Remarkable March – warm and almost no snow
• Later spring storms ineffective
• Fiery hot, dry June
• Some localized relief in July
• August drought expanded again
• Enough fall moisture to plant wheat and pray
• Whimpy 2013 winter so far
Water Year 2012 Temperature Departures From 1971-2000 Average
CoAgMet Temperatures

Kersey, Colorado

Temperature for KSY01 (10-01-2011 - 10-01-2012)

Cowdrey, Colorado

Temperature for COW01 (10-01-2011 - 10-01-2012)

Generated by the Colorado Climate Center
WY2012 Snowpack Accumulation and Meltout

From top of Copper Mountain looking NW
March 24, 2012    Snowpack looking poor

Photo by Zach Schwalbe
05j08s SNOTEL for Water Year 2012

*** Provisional Data, Subject to Change ***

University Camp – 10,300′
Joe Wright Reservoir - 10,120’
Tower- 10,500′

06j29s SNOTEL for Water Year 2012

*** Provisional Data, Subject to Change ***

**Graph Details:**
- **X-axis:** Date (mm/dd)
- **Y-axis:** Inches
- **Legend:**
  - Red: Precip WY2012
  - Blue: SWE WY2012
  - Orange: Precip Avg 71-00
  - Lavender: SWE Avg 71-00
Upper San Juan- 10,200’
Reservoirs – our drought insurance
Imagine 2012 without reservoirs -- on the way down but not in deep trouble quite yet.
Colorado Statewide Reservoir Levels on October 1st for Years 1997-2012
Month by Month Precipitation
Colorado October 2011 Precipitation as Percentage of Normal

Oct11_PN_CO
%norm
- 0
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 70
- 71 - 90
- 91 - 110
- 111 - 130
- 131 - 150
- 151 - 170
- 171 - 200
- 201 - 250
- 251 - 300
- 300+
Colorado November 2011 Precipitation as Percentage of Normal

nov11_pn_CO

% norm

- 0
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 70
- 71 - 90
- 91 - 110
- 111 - 130
- 131 - 150
- 151 - 170
- 171 - 200
- 201 - 250
- 251 - 300
- 300+
Colorado December 2011 Precipitation as Percentage of Normal
Dec 2011 Percent of Normal

Precipitation Anomaly: Dec 2011
Final Data

Precipitation Anomaly (% of Normal)
- 0
- 1-10
- 11-20
- 21-30
- 31-50
- 51-70
- 71-90
- 91-110
- 111-130
- 131-150
- 151-170
- 171-200
- 201-250
- 251-300
- 301+

Copyright (c) 2012, PRISM Climate Group, Oregon State University
http://prism.oregonstate.edu - Map created Nov 15 2012
Jan 2012 Percent of Normal
Colorado March 2012 Precipitation as Percentage of Normal

mar12_pnCO

%Normal

- 0
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 70
- 71 - 90
- 91 - 110
- 111 - 130
- 131 - 150
- 151 - 170
- 171 - 200
- 201 - 250
- 251 - 300
- 300+
Mar 2012 Percent of Normal

Precipitation Anomaly: Mar 2012
Final Data

Precipitation Anomaly (% of Normal)
- 0
- 1-10
- 10-70
- 71-90
- 91-110
- 111-130
- 131-150
- 151-170
- 171-200
- 201-250
- 251-300
- 301+

Copyright (c) 2012, PRISM Climate Group, Oregon State University
http://prism.oregonstate.edu - Map created Nov 02 2012
Colorado April 2012 Precipitation as Percentage of Normal

apr12 pn co
% norm
- 0
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 50
- 51 - 70
- 71 - 90
- 91 - 110
- 111 - 130
- 131 - 150
- 151 - 170
- 171 - 200
- 201 - 250
- 251 - 300
- 300+
Apr 2012 Percent of Normal

Precipitation Anomaly: Apr 2012
Final Data

Precipitation Anomaly (% of Normal)
- 0
- 1-10
- 11-20
- 21-30
- 31-50
- 51-70
- 71-90
- 91-110
- 111-130
- 131-150
- 151-170
- 171-200
- 201-250
- 251-300
- 301+

Copyright (c) 2012, PRISM Climate Group, Oregon State University
http://prism.oregonstate.edu - Map created Nov 02 2012
May 2012 Percent of Normal

Precipitation Anomaly: May 2012
Final Data

Precipitation Anomaly (% of Normal)
- 0
- 1-10
- 11-20
- 21-30
- 31-50
- 51-70
- 71-90
- 91-110
- 111-130
- 131-150
- 151-170
- 171-200
- 201-250
- 251-300
- 301+

Copyright (c) 2012, PRISM Climate Group, Oregon State University
http://prism.oregonstate.edu - Map created Nov 13 2012
Colorado June 2012 Precipitation as Percentage of Normal
Jul 2012 Percent of Normal

Precipitation Anomaly: Jul 2012
Final Data

Precipitation Anomaly (% of Normal)

- Red: 0
- Dark Red: 1-10
- Maroon: 11-20
- Dark Purple: 21-30
- Green: 31-50
- Light Green: 51-70
- Yellow: 71-90
- Orange: 91-110
- Pink: 111-130
- Lilac: 131-150
- Light Yellow: 151-170
- Medium Yellow: 171-200
- Green: 201-250
- Dark Green: 251-300
- Light Blue: 301+

Copyright (c) 2013, PRISM Climate Group, Oregon State University
http://prism.oregonstate.edu - Map created Jan 10 2013
Colorado August 2012 Precipitation as Percentage of Normal
Fort Collins
2012 Water Year

Month

Accumulated Precipitation (inches)

- 30 Year Averages 1971-2000
- Period of Record Average 1890-2009
- 2012 Water Year
- Max Precip
- Min Precip
Burlington
2012 Water Year

Accumulated Precipitation (Inches)

Months

30 Year Averages-1971-2000
Period of Record Average - 1892-2009
2012 Water Year
Max Precip
Min Precip
Grand Junction WSFO
2012 Water Year

- 30 Year Averages-1971-2000
- Period of Record Average - 1893-2002
- 2012 Water Year Accumulated
- Max Precip
- Min Precip

Accumulated Precipitation (Inches)

Months

OCT  NOV  DEC  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP
Status at beginning of 2012 Water Year

U.S. Drought Monitor

September 27, 2011
Valid 8 a.m. EDT

Drought Impact Types:

- Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

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

http://droughtmonitor.unl.edu/
Drought Status at the end of 2012 Water Year

U.S. Drought Monitor

October 2, 2012
Valid 7 a.m. EDT

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

Drought Impact Types:

- Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

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

Released Thursday, October 4, 2012
Author: Anthony Artusa, NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/
2012 in Historical Perspective
At any given time of year, some portion of Colorado is usually experiencing drought.
Colorado Precipitation in Historic Perspective

**Colorado Statewide Water Year (Oct - Sep) Precipitation**

*Water Year 2012 5th driest (Period of Record 1895-2012)*

![Graph showing Colorado Statewide Water Year (Oct - Sep) Precipitation with a note indicating that Water Year 2012 was the 5th driest (Period of Record 1895-2012).]
Autumn 2011 was 32\textsuperscript{nd} Warmest (1895-2011)

47.3 degrees F, 1 degree above 1985-2011 average
Colorado Mean Winter (DJF) Temperatures

Winter 2012 was 39th Warmest Winter (1895-2012)

26.6 degrees F, 1.2 degrees above average
Spring 2012 was 2\textsuperscript{nd} Warmest (1895-2012)

49 degrees F, 5.7 degree above the average
Summer 2012 was the Warmest (1895-2012)

69.7 degrees F, 4.6 degree above the average
Fort Collins, CO Average Summer Temperature

- Summer Max Temp
- Summer Min Temp

Average Temperature (°F)

Year

Data points for the years 1885 to 2010 are plotted, showing a trend of increasing temperatures over time.
Cheyenne Wells, CO Average Summer Temperature

- Summer Max Temp
- Summer Min Temp
Calendar Year 2012 2\textsuperscript{nd} Warmest (1895-2011)

48.6 degrees F, 3.6 degrees above average
Water Year 2013 so far
Water Year 2013 Temperature Departures

Water Year 2013

Temperature Departure (deg F)

Eastern Plains
Foothills
Mountains
Western Valleys

Oct  Nov  Dec  Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep
December Average Temperature History for Colorado (NCDC)

25.4 Ranks as the 56th coolest on record 1895-2012.
Colorado October 2012 Precipitation as Percentage of Normal

% norm
0
1 - 10
11 - 20
21 - 30
31 - 50
51 - 70
71 - 90
91 - 110
111 - 130
131 - 150
151 - 170
171 - 200
201 - 250
251 - 300
300+
Colorado Precipitation as Percentage of Normal
December 2012

% Normal
0
1 - 10
11 - 20
21 - 30
31 - 50
51 - 70
71 - 90
91 - 110
111 - 130
131 - 150
151 - 170
171 - 200
201 - 250
251 - 300
300+
Dec 2012 Percent of Normal
Colorado Water Year 2013 Precipitation as Percentage of Normal
October 2012 - December 2012

awy_dec12pnco

%norm

0
1 - 10
11 - 20
21 - 30
31 - 50
51 - 70
71 - 90
91 - 110
111 - 130
131 - 150
151 - 170
171 - 200
201 - 250
251 - 300
300+
South Platte River Basin Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Jan 23, 2013

Current as Pct of Normal: 55%
Current as Pct of Avg: 54%
Current as Pct of Last Year: 59%
Current as Pct of Peak: 28%
Normal as Pct of Peak: 52%
Pct of Normal Needed to Reach Peak: 148%
Average Peak Date: Apr 28
Colorado State-Wide Time Series Snowpack Summary
Based on Provisional SNOTEL data as of Jan 23, 2013

Current as Pct of Normal: 62%
Current as Pct of Avg: 59%
Current as Pct of Last Year: 76%
Current as Pct of Peak: 33%
Normal as Pct of Peak: 53%
Pct of Normal Needed to Reach Peak: 143%
Average Peak Date: Apr 08

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
Climate divisions defined by Dr. Klaus Wolter of NOAA's Climate Diagnostic Center in Boulder, CO
Division 3 – Montrose

Montrose #2
2013 Water Year

- 30 Year Averages: 1971-2000
- Period of Record Average: 1893-2009
- 2013 Water Year Accumulated
- Max Precip
- Min Precip

Accumulated Precipitation (Inches)

Months

OCT  NOV  DEC  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP
Division 3 – Mesa Verde NP

Mesa Verde NP
2013 Water Year

- 30 Year Averages 1971-2000
- Period of Record Average 1893-2009
- 2013 Water Year Accumulated
- Max Precip
- Min Precip

Accumulated Precipitation (Inches)

Months

OCT  NOV  DEC  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP
Division 4 – Alamosa

Alamosa WSO
2013 Water Year

Accumulated Precipitation (inches)

Months

OCT  NOV  DEC  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP

- 2013 Water Year
- 30 Year Averages-1971-2000
- Period of Record Average - 1948-2010
- Max Precip
- Min Precip
Division 7 – Akron

Akon 4E
24 Month Precipitation Accumulation

Current Accumulation
Normal Accumulation

Date

Precipitation (in)
0 5 10 15 20 25 30 35 40 45
Modified Palmer Drought Severity Index for Colorado
December 2012
What Comes Next for Colorado?
• Let’s look at our current basin snowpack conditions and non-exceedence probabilities.
South Platte River Basin with Non-Exceedence Projections

Based on Provisional SNOTEL Data as of Jan 22, 2013

NRCS
Natural Resources Conservation Service
Colorado River Basin with Non-Exceedence Projections

Based on Provisional SNOTEL Data as of Jan 22, 2013

NRCS
Natural Resources Conservation Service
What about El Nino?
Pacific Ocean Sea Surface Temperatures
As of Mid-January 2013

ENSO-neutral conditions continue in the tropical Pacific Ocean even though equatorial sea surface temperatures east of the International Date Line have recently become colder than average. This anomalous cooling is partially due to an active Madden Julian Oscillation (MJO) in the western Pacific which has strengthened the easterly trade winds and as a consequence has enhanced the upwelling of colder deep ocean waters along the west coast of South America.
Niño Region SST Departures (C) for Mid-January 2013

The latest weekly SST departures are:

Niño 4       -0.2 C
Niño 3.4     -0.6 C
Niño 3        -0.6 C
Niño 1+2    -0.4 C
Last six years have seen two ‘double-dip’ Las Niñas in a row, followed by a brief excursion to what looked like an El Niño event in mid-2012, and a return to ENSO-neutral conditions in late 2012 – highly unprecedented (1953 featured a similar aborted El Niño event).

http://www.esrl.noaa.gov/psd/enso/mei
The ECMWF November 2012 forecast (left) settled on an ENSO-neutral outlook for this winter, with no ensemble member outside the +/-1°C range. There was a small hint of drifting towards El Niño again next spring.

The ECMWF January 2013 forecast (right) shows a drift from weakly-negative / neutral conditions towards El Niño by mid-2013. However, there are still a few ensemble members that show weak La Niña conditions to persist into the summer.
ENSO forecasts from 16 dynamical & 8 statistical forecast models in November 2012 (left): Dynamical models showed pretty much the same ENSO-neutral outlook as statistical models. The most interesting model output was the drop into weak La Niña territory by the CFS2 (CPC).

In its latest update (right), the difference between statistical and dynamical models is growing again – the former are slightly more positive (El Niño-ish) than the statistical models (which are all negative by JJA)... My own forecast drifts from ENSO-neutral in mid-'13 to weak La Niña in late '13.
**ENSO Model Probabilities as of Mid-January 2013**

There is approximately a 55 percent probability of ENSO-neutral conditions this spring and about a 55 percent chance during the summer of 2013.

Models also indicate increasing chances of a La Niña developing this fall.
How did the low <PDDO-AMO> composite work out in late 2012?

After being consistently low for much of the last decade, the difference in normalized anomalies between PDO and AMO reached its lowest value on record last summer. In the wake of that, late fall precipitation (left) tends towards the dry side in all of Colorado. In 2012, dry conditions prevailed as expected not just in Colorado, but also AZ&NM, from TX into MO, and from FL north to VA, while the greater Pacific Northwest wound up wet, as expected...
What can we expect in next half year with low summer <PDO-AMO>

After being consistently low for much of the last decade, the difference in normalized anomalies between PDO and AMO reached its lowest value on record last summer. In the wake of that initial condition, late winter (left) precipitation tends towards the dry side in all of Colorado, especially west of the divide. Late Spring (right) is neutral for the West slope, but still dry for the eastern plains, especially in the Arkansas Valley.
Put it all together and what do we get?
April, May, June Outlook

Temperature

Precipitation
Summer 2013 Outlook

Temperature

Probably on the Warm side again

Definitely

Precipitation

Uncertain

And don’t rule out Flooding!
U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period
Valid for January 17 - April 30, 2013
Released January 17, 2013

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

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.
If you are interested in weather and the variations in precipitation, please join the Community Collaborative Rain, Hail and Snow Network

http://www.cocorahs.org

or see me today
Please Help Us Monitor Colorado’s Climate!

Photos by H. Reg
U.S. Rainfall 9/12/2012 – based on CoCoRaHS volunteers
Today’s Precipitation
Please see me today if you’re interested

- Or sign up online at

http://www.cocorahs.org
CoCoRaHS

http://www.cocorahs.org
Is there time for a short story?

Nolan.Doesken@colostate.edu
Colorado Climate Center

Data and Power Point Presentations available for downloading

http://ccc.atmos.colostate.edu
- Click on “Presentations”