

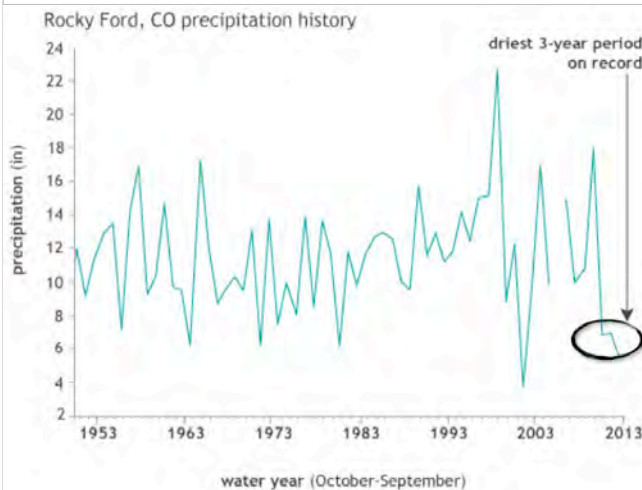
Colorado: Turning around severe protracted drought

Aquiess response to meet client appeal in the South East

Analysis period 1 July - 31 July, 2014



Image 1.1 Rocky Ford CO, Precipitation history from 1950 - 2013



Precipitation in Rocky Ford, Colorado, for "water years"—October-September periods—since 1950. Complete Graph by NOAA.Climate.gov, based on data provided by Wendy Ryan, at URL: http://www.climate.gov/sites/default/files/Rocky_Ford_1893-2014_lrg.jpg

Background

According to Colorado's climatologist, Nolan Doesken (Feb 2014), the past three years and eight months have been the driest stretch ever recorded for some parts of the state, including Rocky Ford, La Junta and Ordway. "It was drier than the worst consecutive drought period of the 30s and of the 50s," said Doesken. (See charted Rocky Ford precipitation, left)

"Rocky Ford has gotten just 19.7 inches since October 2010", according to the state climatologist. While this is a serious dry spell, there were more prolonged droughts in the 1930s and 1970s – it's just that they were interspersed with some rainfall relief, which much of the southeastern part of the state hasn't seen over three and a half years.

The 'Exceptional Drought' status of the surrounding region - from lack of precipitation is subsequently borne out in the Drought Monitor image 1.4 (below).

Outlook

In April 17 Climate.gov had produced a Seasonal Outlook through July 31 (see Image 1.2 below), offering little hope to Ranchers depending on rainfall continued to recover from historic drought. At that time and more recently, in their June 30 U.S. Monthly Outlook, drought conditions in southeastern Colorado would "improve slightly, but likely persist or worsen" through July 31, 2014. (Client grp target overlaid by Aquiess)

Image 1.2 Climate Outlook

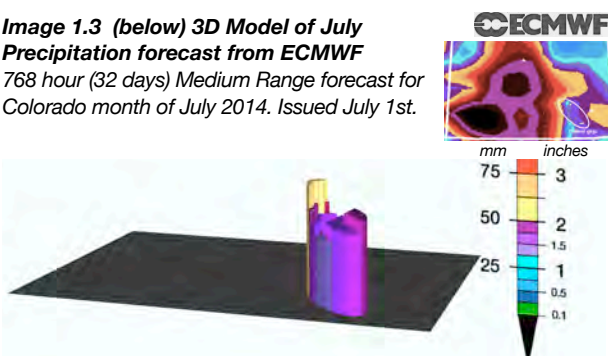
(Released April 17, 2014 Valid through July 31)



Numerical modeling, run via advanced supercomputing, embraces multiple datasets including: sea surface temperatures, wave behavior, historic data, live atmospheric conditions and patterns, etc. European Centre for Medium-range Weather Forecasts (ECMWF), anticipated on July 1st (as per image 1.3 below) that the entire month of July 2014 would have had **less than 2-inches rainfall in the client target (target overlaid)**

Image 1.3 (below) 3D Model of July Precipitation forecast from ECMWF

768 hour (32 days) Medium Range forecast for Colorado month of July 2014. Issued July 1st.



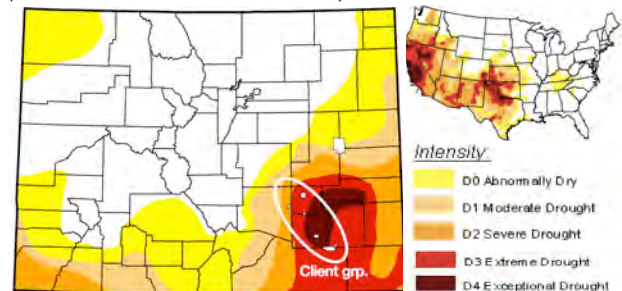
Data from ECMWF, 3D Model by Aquiess. Data avail. on request

Status

On June 24th 2014, USDA issued the Drought Monitor chart (Image 1.4 below), confirming the Extreme and Exceptional drought status of South Eastern Colorado, including the client area shown in white oval.

Image 1.4 Drought Monitor

(Released June 24, 2014 Valid 8am)



Appeal for Action

On June 21st Mrs Kimmi Lewis, former President of Colorado Grower - Ranchers association, wrote to the CEO of Aquiess (operating in USA under the wings of USRAIN) requesting urgent intervention as spelled out in the extract below from her correspondence:

"Hello David,
 ...I'm hoping that right after July 1st you can make some strides in getting us some good rainfall here... If we could get good rainfall right after July the first and then again within a week of the rain, it would really make a difference... So, I guess I'm hoping and asking for good rainfall the first two or three weeks of July. That 2.3 inch rain last summer in August was great (details about this previous operation by Aquiess are available upon request)."

Aquiess response

Based on an agreement reached with the client group on June 25th, Aquiess commenced to develop algorithms, inherent codes and to "launch the signals" for modification of the prevailing atmospheric patterns, with the main objectives of 1-"opening a rain gateway for SE Colorado" (larger than client target - see Image 2.1); 2- drawing oceanic moisture from the southwestern (sourced) monsoonal surge; 3- 'co-opting'

REVIEW

northern jet stream alignment; 4- driving resultant rain towards the target area.

This operation was explained during a conference call on July 7th with the clients, - a group representing a dozen Cattle-Growers whose properties are located on the map (Image 1.5 right). Aquiess presented the anticipated first-rainfall of around 2-3 inches to occur within 5-7 days, with an additional major rainfall event lasting up to five days, expected within two more weeks, ie. 25- 29th July.

Image 1.5 Client Map



Google Map Overlaid from client supplied coordinates

Colorado: Results - When images speak louder than words

Image 1.6 (Below) June 23rd, "BEFORE"

From Original article by Stephanie Page, Photograph: Luke Runyon KUNC.



Image 1.7 (Below) July 29th, "AFTER"

Photograph by Kathy Wallin.



Image 1.8 (Below) Drought Monitor "BEFORE"

July 1st Drought Monitor Chart

(Released June 24, 2014 Valid 8am)

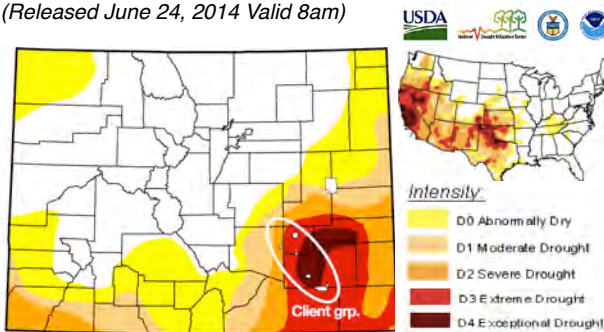


Image 1.9 (Below) "AFTER" July 29th Drought Monitor Chart

reveals all Client properties are "Removed from Extreme Drought Designation"

(Released August 7, 2014 Valid 8am)

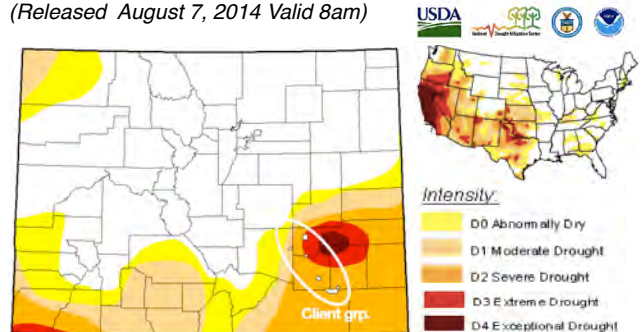


Image 2.0 (Below) 3D Model of 30-year July Average Precipitation for Client Group - (Valid at 8/1/2014 1200 UTC)

NOAA National Weather service

URL: <http://water.weather.gov/precip/>

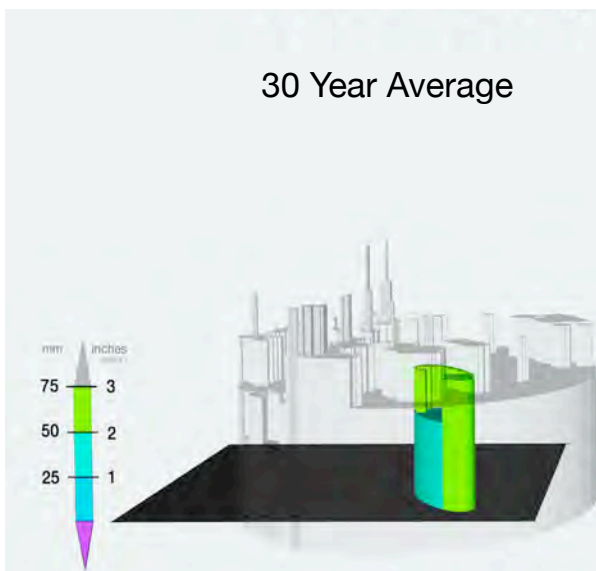
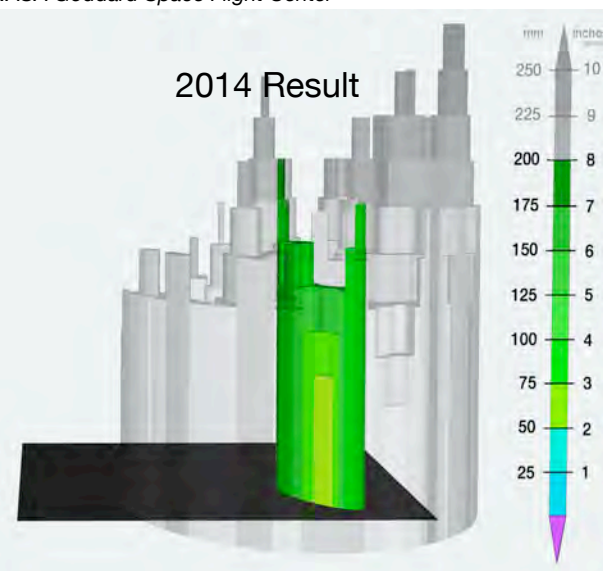


Image 2.1 (Below) 3D Model of July 2014 Precipitation for Client Grp - Geospatial rainfall analysis & visualization by Aquiess

produced using Experimental Real-Time TRMM Multi-Satellite Precipitation Analysis (TMPA-RT): 3B42RT

NASA Goddard Space Flight Center



Colorado: Data

Monthly Rainfall Data for ROCKY FORD 2SE

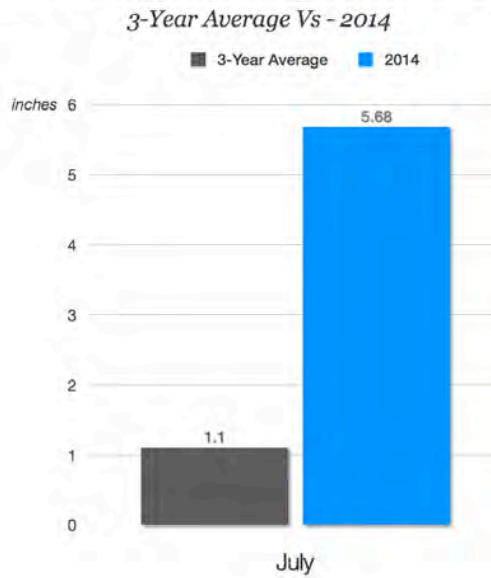


Image 2.2 (above) July (2011, 2012, 2013 averaged) Vs 2014 (blue) rainfall at Rocky Ford during 2014.

Data provided from Colorado Climate Centre courtesy of Wendy Ryan. - Ref. Applied Climate Information System (ACIS)

Conclusion

Data from NOAA National weather Service and NASA (Experimental Real-Time TRMM Multi-Satellite Precipitation Analysis (TMPA-RT)), for **Rocky Ford Colorado USA**, reveals that the July Rains have brought:

- Change to the devastating drought trend of the last three years
- Far more rain than officially forecast and anticipated, ie: 5.68 inches were delivered in July compared to a total of 1.1 inches average from previous 3-years (2011, 2012, 2013) and compared to rather looming scenario in the April 17 Outlook, anticipating protracted drought.

To be able to deliver 5.68 inches in one month into Rocky Ford (*affected by chronic rain shadow, as per image 2.0 above*) a much larger target area, of up to 20-times the size had to be designed/programmed. (See *Image 2.1 above - grey area*).

The results obtained are twice more striking, not only because of the rain-shadow affecting Rocky Ford, but most importantly because of the very limited size of the target area. This to say that had the latter been wider, a much larger rainfall volume, (*with flow-rate & risk management*), could have been delivered.