Progress Under Duress: NIDIS Drought Early Warning in the Upper Colorado River Basin

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Brief Background --
The Colorado Climate Center was established in 1974 and soon faced another major Colorado drought episode.
The severe drought of 1976-77 motivated the beginning of monthly climate assessment reports.
Two winter droughts in quick succession (1977 and 1981) under the same governor (Richard Lamm) – both having considerable impact on our huge recreation industry – stimulated the creation of our first Colorado Drought Response plan (1981).
Systematic coordinated drought monitoring has been continuous ever since under the auspices of the Colorado Water Availability Task Force (WATF)
Throughout the past 3 decades we’ve seen steady improvement in drought monitoring
Development of Surface Water Supply Index for Colorado
Customization of the Palmer Drought Severity Index for Colorado
Steady enhancement of SNOTEL network, products and services.
Development, testing and implementation of the Standardized Precipitation Index (SPI)
Deployment of a real time Ag weather observing network (CoAgMet)
Most of this took place during the very persistently wet decades of the 1980s and 1990s.
Despite all of these enhancements and gradual improvements, the drought of 2002 seemed to come as a surprise, despite ardent warnings by Tom McKee in his last year as SC – 1999 – 2000.

2002 impacts were huge in our wildfire, recreation, tourism, ag and urban sectors.
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
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Drought Impact Types:
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

W = Water (hydrological)

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Author: Michael Hayes, National Drought Mitigation Center

http://drought.unl.edu/dm
Soon after, NIDIS (National Integrated Drought Information System) was authorized in 2006.
The Upper Colorado Basin was selected as the first NIDIS Pilot project.
By 2009, our group was selected to lead the monitoring portion and was charged with developing a drought early warning system for the region.
Pilot Focus

- Enhance local, state, and regional drought expertise and monitoring capabilities.
- Identify and address stakeholder needs.
- What should a “drought portal” be.
- Give local input to the USDM.
- Develop and test drought early warning activities.
Accomplishments and Progress

- 2009 – Stakeholder interviews
  (Water users and providers, resource managers and watershed protectors in the UCRB).
  - Drought Triggers and Indices
  - Monitoring Gaps, Data needs
  - Favorite data, products, etc. Find out what they use.
Interview Findings (2009)

- Responses vary by sector and individual user based on “exposure to drought risk”.
- Most but not all stakeholders track available data sources at critical times of year.
- Remote sensing products not trusted for LOCAL drought monitoring and water management.
- Water law, water rights and the prior appropriation doctrine dictates “exposure and potential risk and impacts” for pretty much all surface water users. River “calls” are the ultimate drought triggers.
Interview Findings (2009)

- Reservoir operators: “Our jobs are easiest during drought, but our critical decisions and errors are made during high flows, affecting our capability to deal with future drought”

- Surface Water Interests: “Not worried about a drought until it is a 3-year drought” *(Note – this perspective changed in 2012!)*

- USDM is popular, but mostly used to assess drought in *OTHER* areas.

- Users want more data all in one place “one stop shopping”
  - More SNOTEL
  - Better gages on unmanaged, representative streams.

- Users crave long range forecasts (out to 2 years) with useful skill – but will take anything delivered with expertise.
Requested Information from Users

- More detailed and timely local monitoring.
- Better forecasts
- Interpretation of complex drought information (i.e. not everyone understands SPI)
- Better elevational depiction of precipitation.
- Historical perspective on streamflow and reservoir data.
- One-stop shopping for all information
- Information on water demand.
This led to Weekly Drought and Water Assessment Webinars starting in 2010.
We put current conditions into historical perspective for diverse users with local data.
Local Expertise

- Colorado Climate Center and other local agencies provide updates on current conditions.
- USGS puts streamflow data into context.
- NWS provides weather forecasts
Regional Expertise

- Regional experts provide less frequent, but desirable updates.
- CBRFC provides water supply and peak flow forecasts.
- Klaus Wolter provides long range climate outlooks.
2012 – a “Dry Run” for NIDIS Regional Drought Early Warning System
March 2012 – get ready for drought
March 2012 Precipitation as percent of Average – DRY!
Bare ground showing way too early…

Looking NE from Copper Mountain -- March 24, 2012

-- trouble brewing --

And we never caught up
Then came June, and we were immediately engulfed by midsummer heat.
Water Year Temperature Departure

Note the extreme warmth in March, April and June.

Warm springs and early summers take a big bite out of Colorado’s surface water supplies.
Highest potential evapotranspiration (alfalfa reference) on record since CoAgMet data collection began in 1992.
Yampa River Near Maybell, CO Water Year Streamflow

Climate Variability at it’s best  2011 vs 2012
Harsh Impacts!
Colorado Statewide Reservoir Levels on October 1st for Years 1997-2012

![Bar chart showing reservoir levels from October 1, 1997 to October 1, 2012. The chart includes data for each year, with some years highlighted in red.](image-url)
Relentless rain gauge recruiting – engage stakeholders in monitoring

Daily Precipitation (inches x.xx), for the 24 hour period ending ~7:00 am
USA 9/12/2012
Grassroots approach -- Please Help Us Monitor Our Climate!
2012 Outreach -- Around 60 Drought Talks and 25 Webinars

“Give me your business card today and we’ll get you on this Drought Monitoring e-mail list”

“You will never again go all week without getting e-mail 😊”
REFLECTIONS

- Recreation and Tourism vs Ag -- interesting
- Working across state lines presents challenges
- "Western Water Law" – major factor
- Gathering drought impact reports is not a trivial undertaking
- NWS involvement has become substantial
- US Drought Monitor – more used, more trusted!

- The PILOT is now a "Regional Drought Early Warning System"
- It made a difference in 2012
2013 -- a nervous start!
We’ll be on it!
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