Enhanced drought monitoring and early warning activities in the Upper Colorado River Basin

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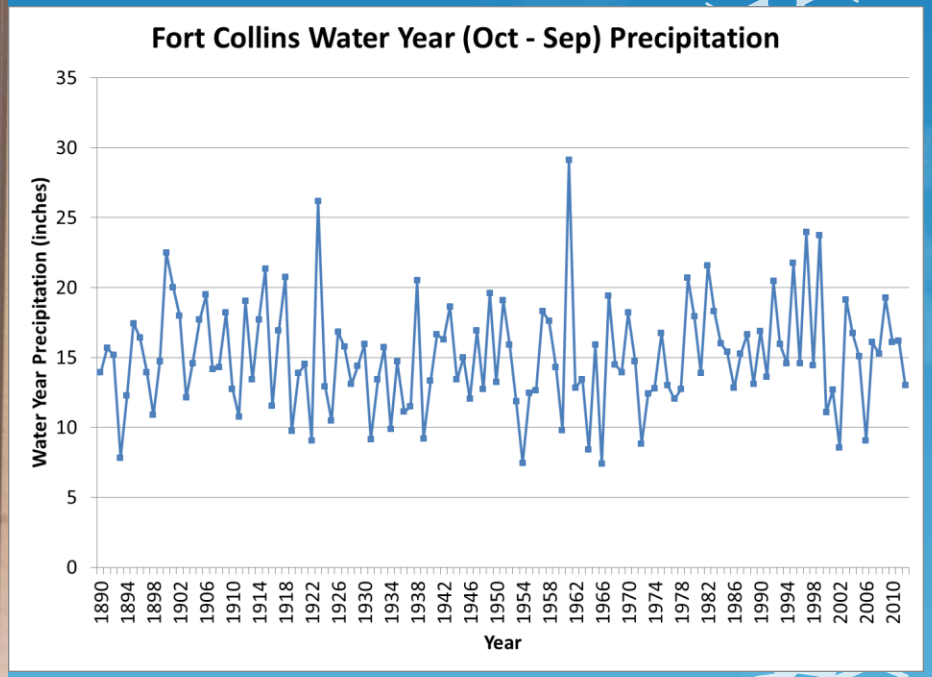
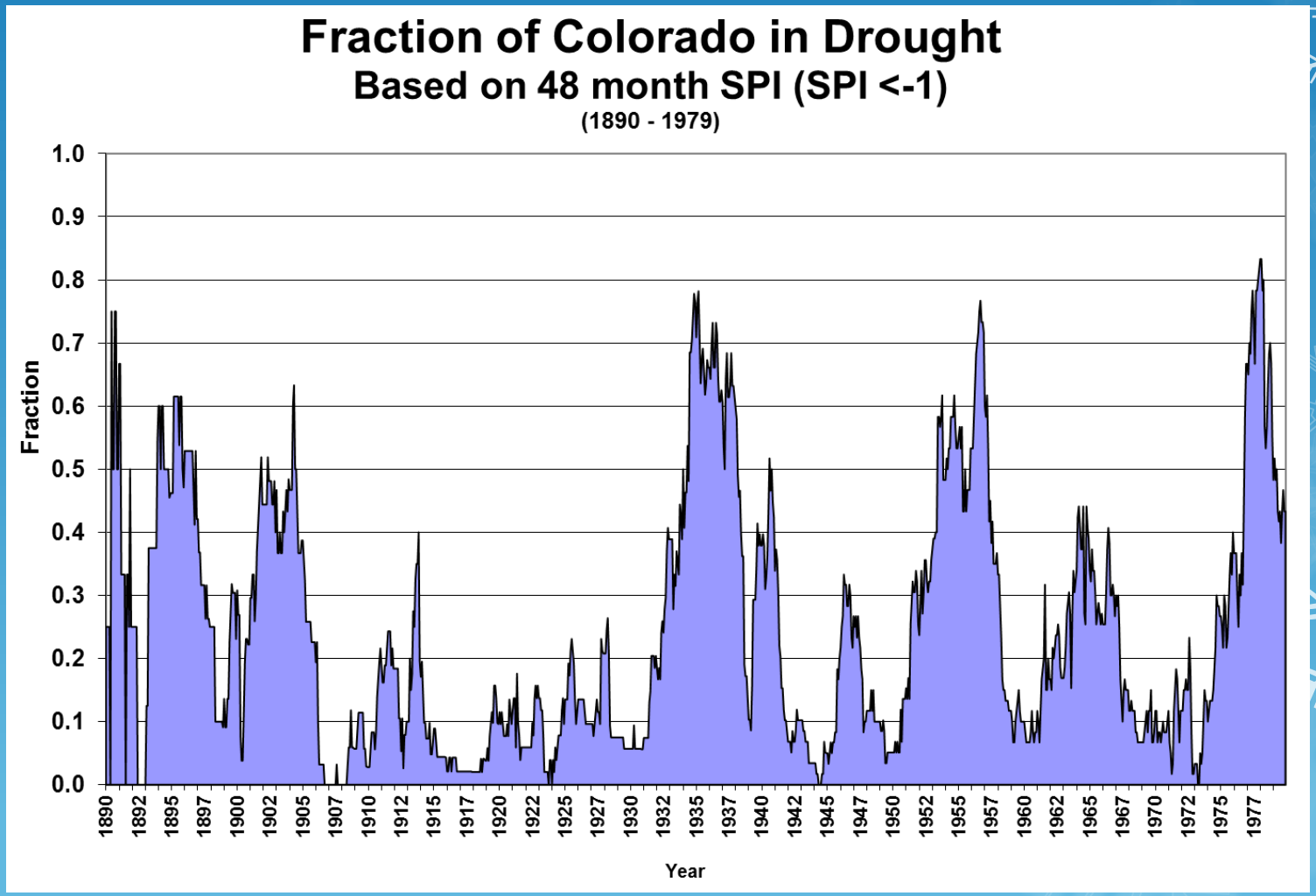
Colorado State University

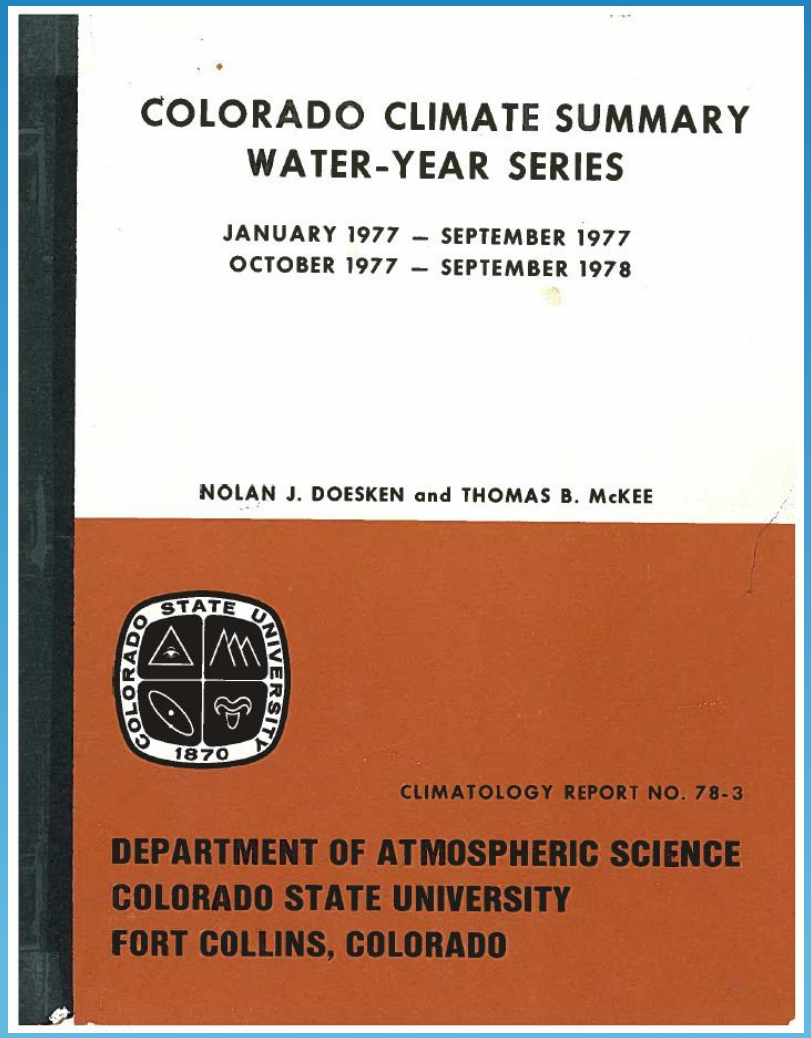
We've been involved in drought monitoring in Colorado for a long time.



The Colorado Climate Center was established in 1974 and soon faced another major Colorado drought episode

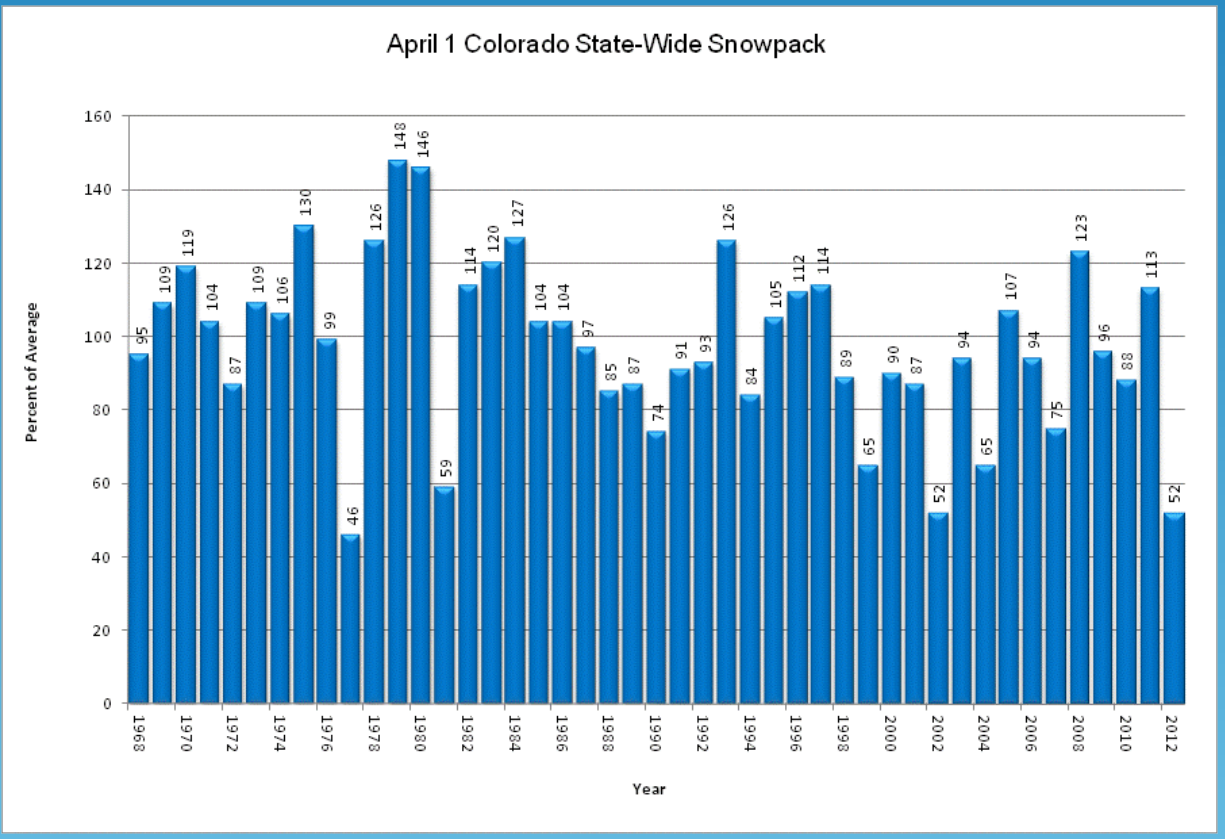


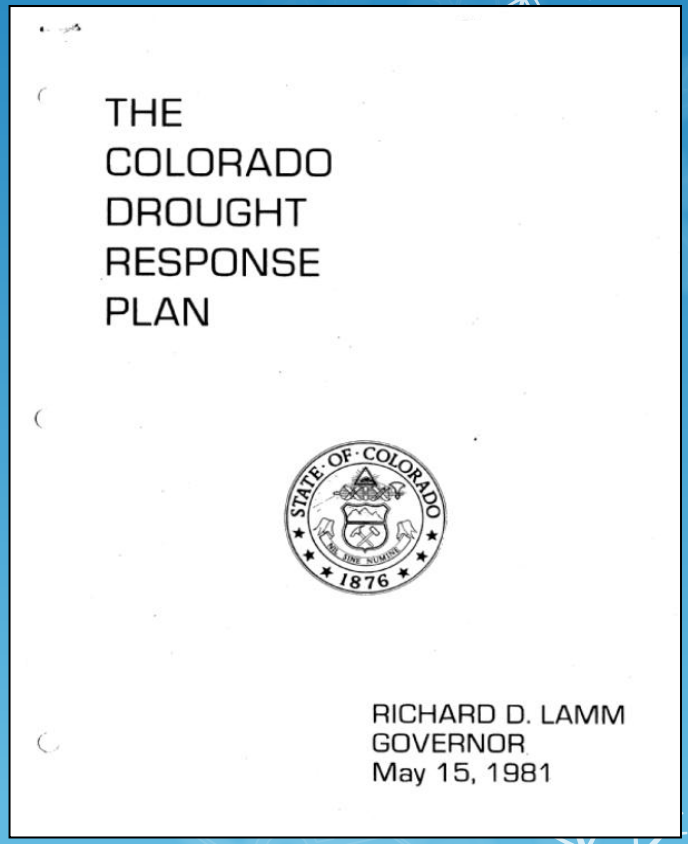
The drought of 1976 -77 motivated the beginning of monthly climate assessment reports.



I earned a shot at my job back in 1977 by writing a required job application essay on how to communicate drought to Colorado audiences

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).

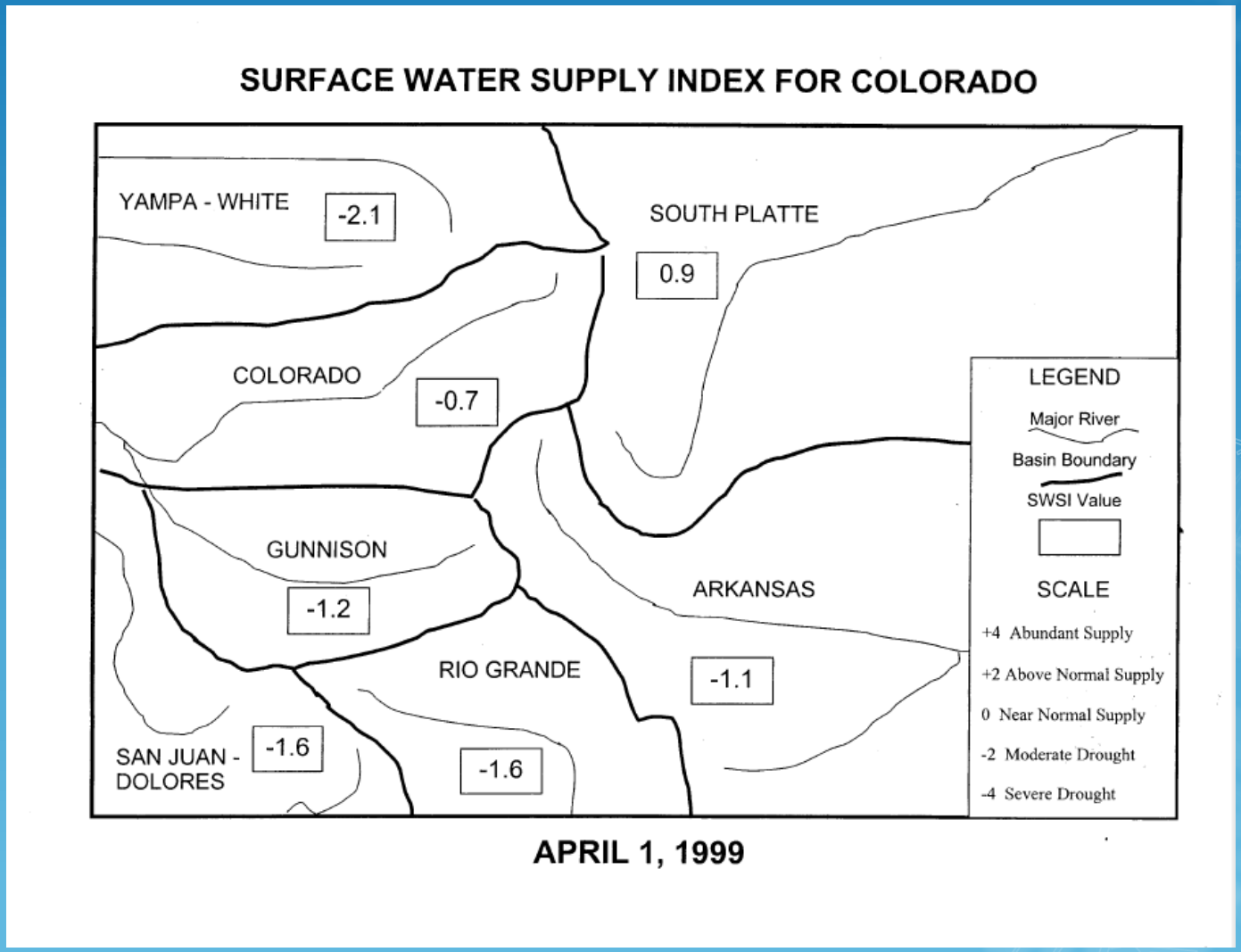




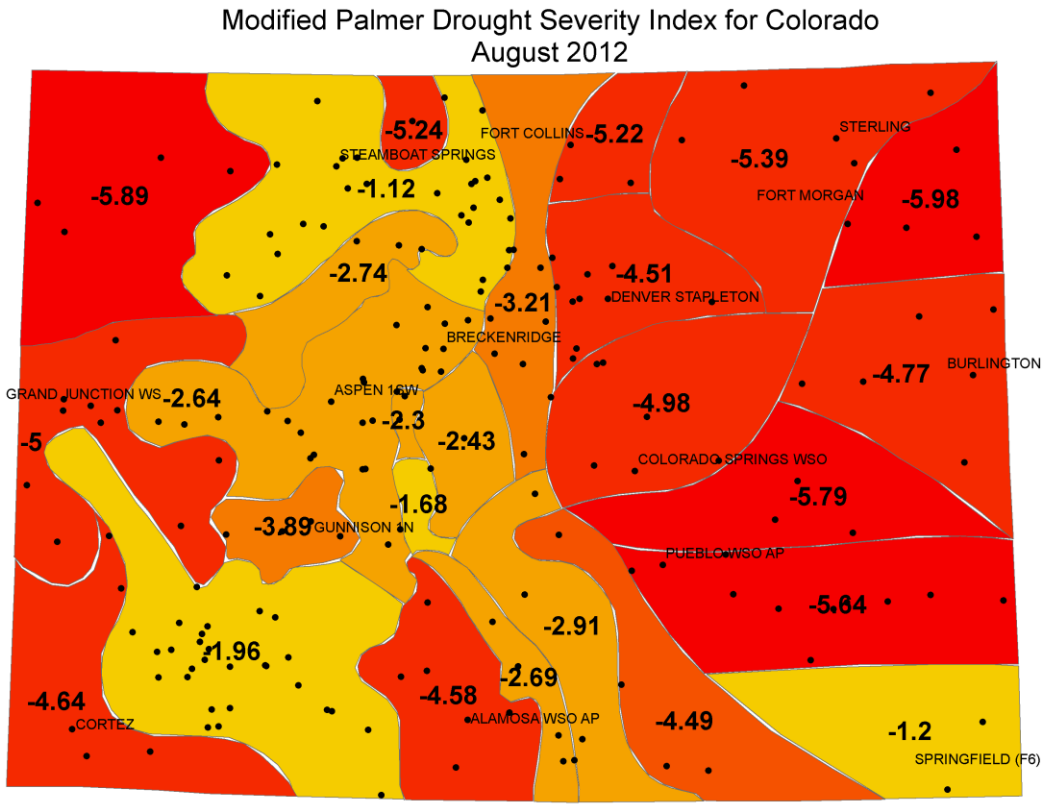
Systematic coordinated drought monitoring has been continuous ever since under the auspices of the Colorado Water Availability Task Force (WATF)

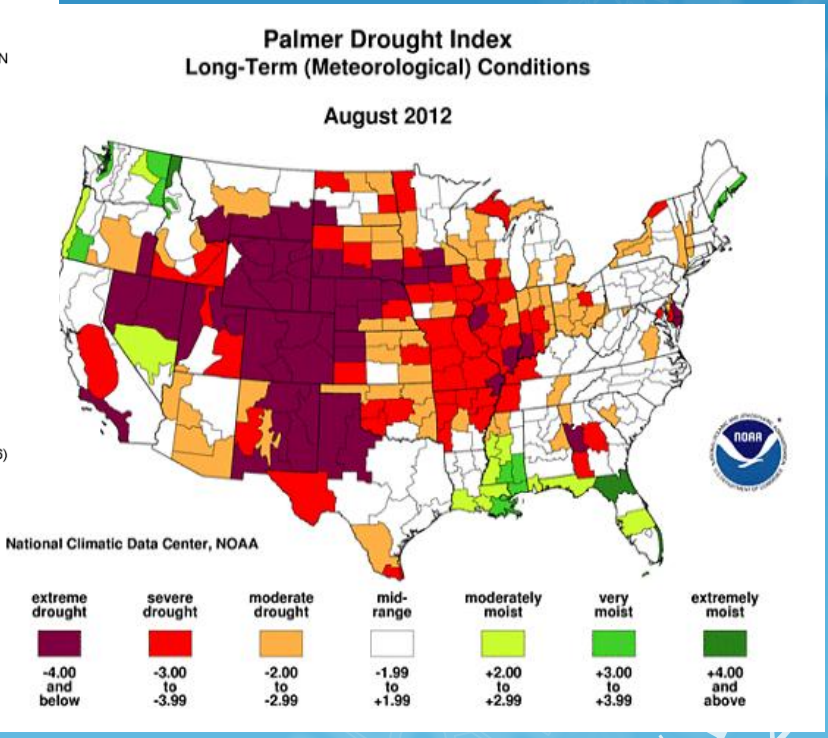
Throughout the past 3 decades we've seen steady improvement in drought monitoring

Development of Surface Water Supply Index for Colorado



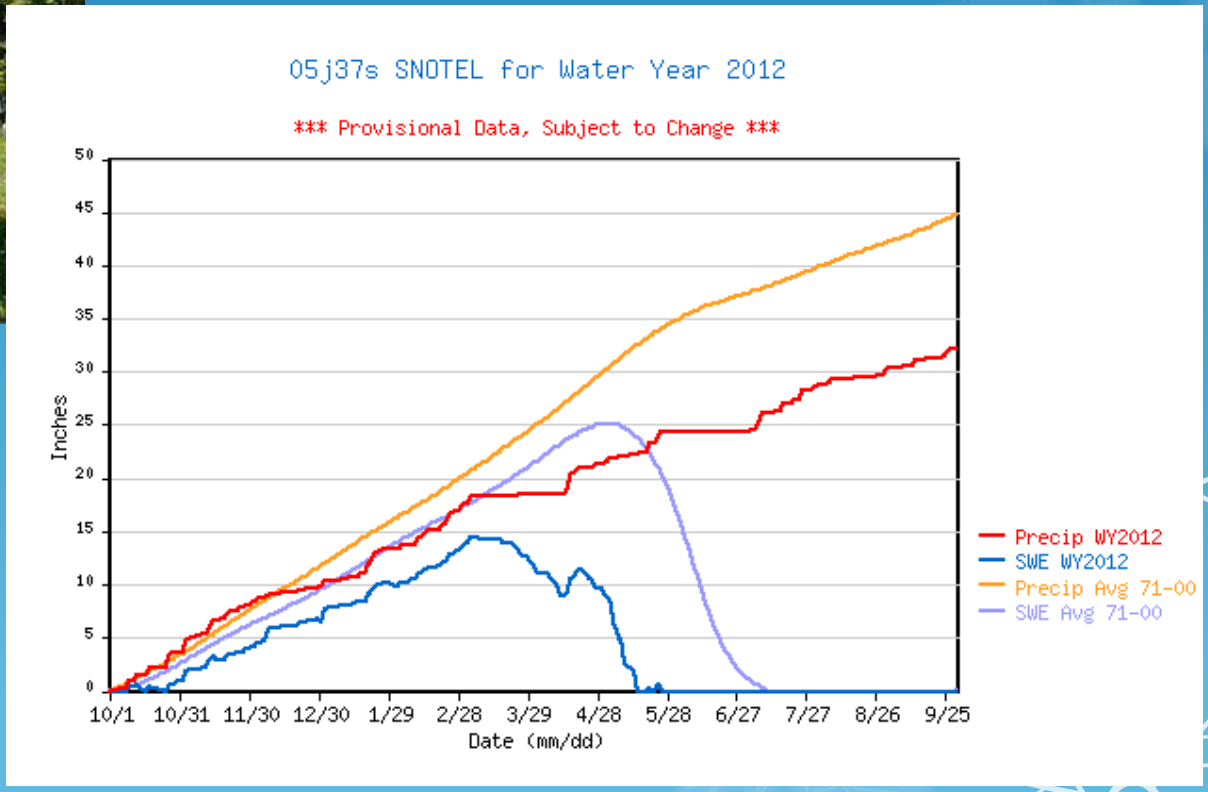
Customization of the Palmer Drought Severity Index for Colorado



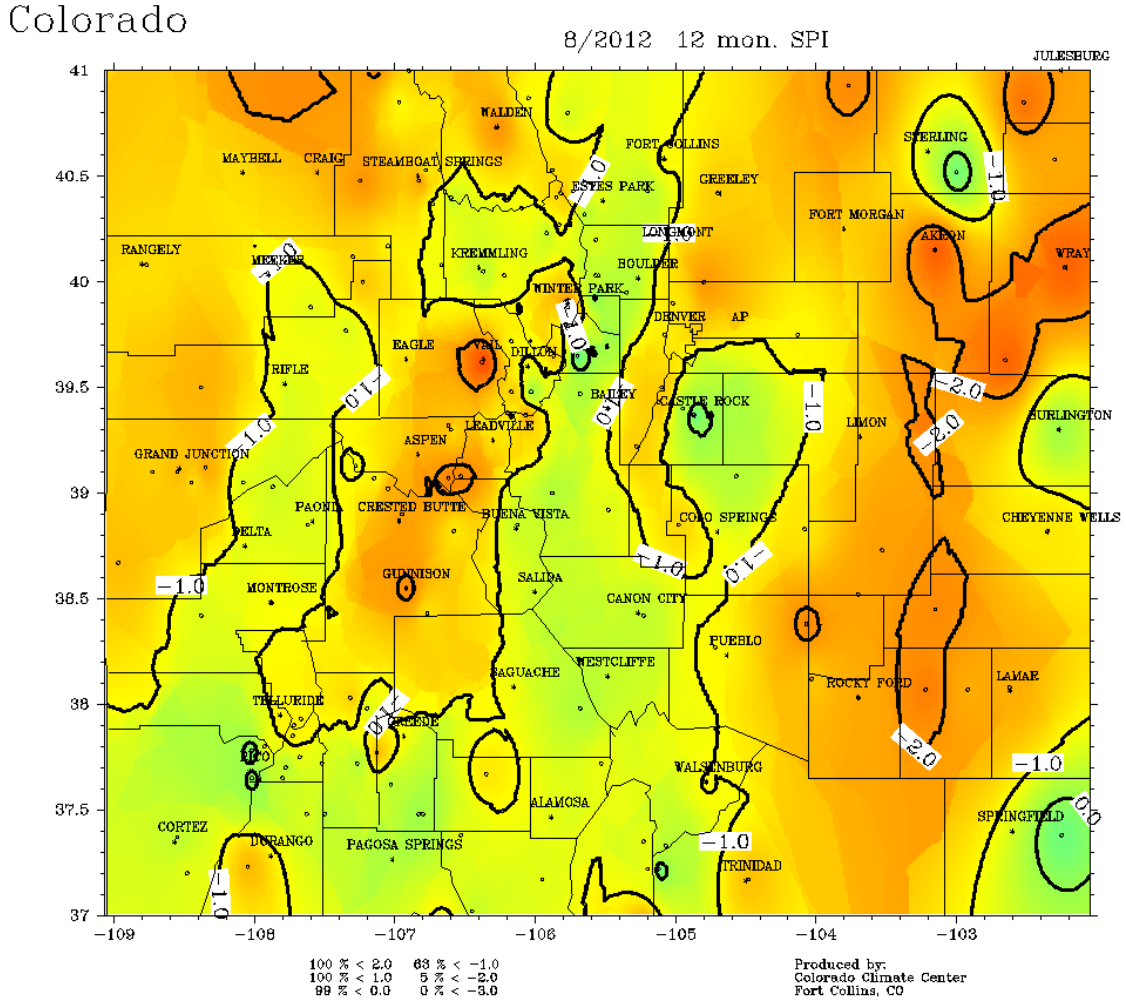


Steady enhancement of SNOTEL network, products and services.

Joe Wright Snotel

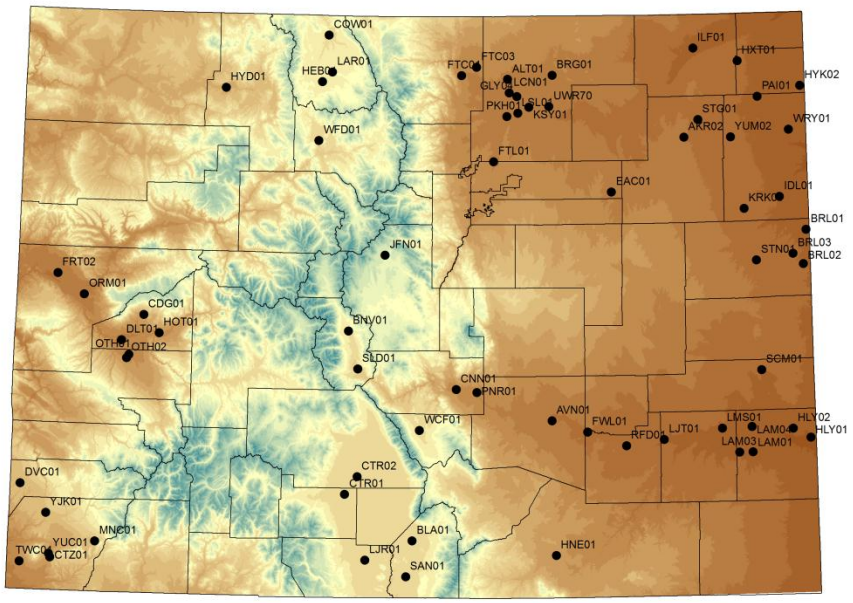


Development, testing and implementation of the Standardized Precipitation Index (SPI)

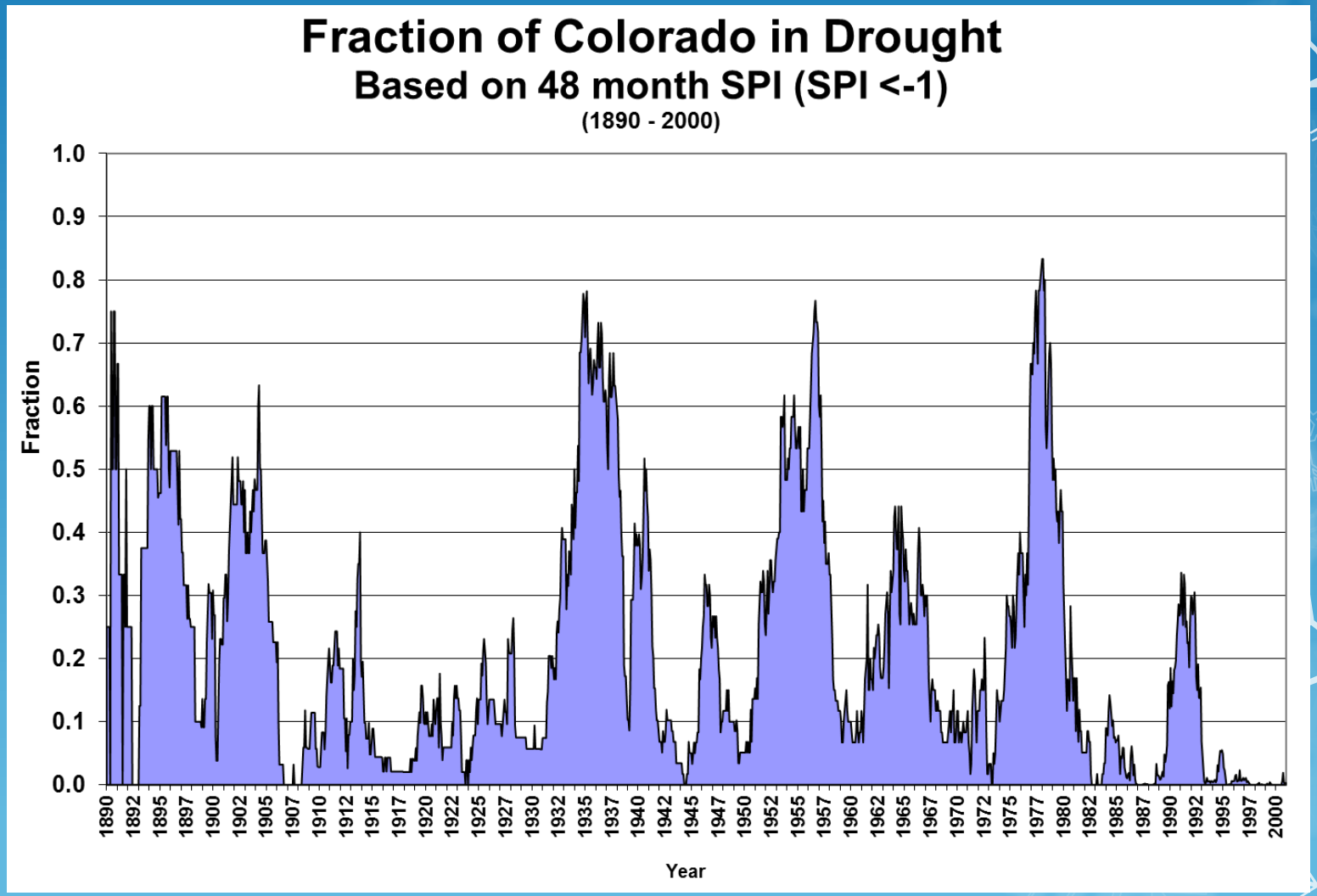


Deployment of a real time Ag weather observing network (CoAgMet)

Current CoAgMet Station Locations - July 2012



Most of this took place during the very persistently wet decades of the 1980s and 1990s.

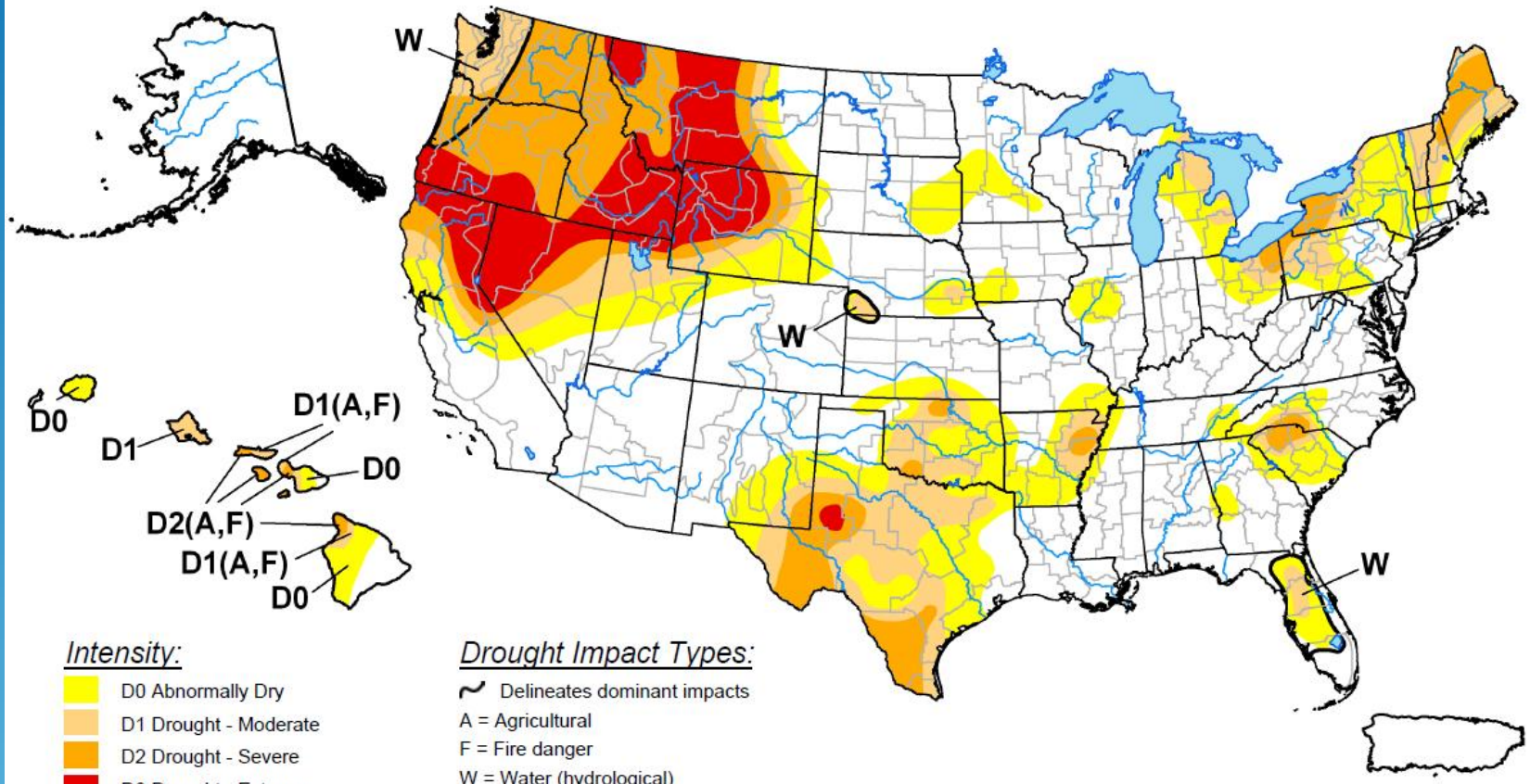


Despite all of these enhancements and gradual improvements, the drought of 2002 seemed to come as a surprise, despite some ardent warnings by Tom McKee in his last year as SC – 1999 – 2000.

Impacts were significant – particularly in our recreation and tourism sector and our ag and urban sectors.

U.S. Drought Monitor

August 28, 2001
Valid 7 a.m. EST



Intensity:

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

Drought Impact Types:

- Delineates dominant impacts
- A = Agricultural
- F = Fire danger
- W = Water (hydrological)

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

http://drought.unl.edu/dm

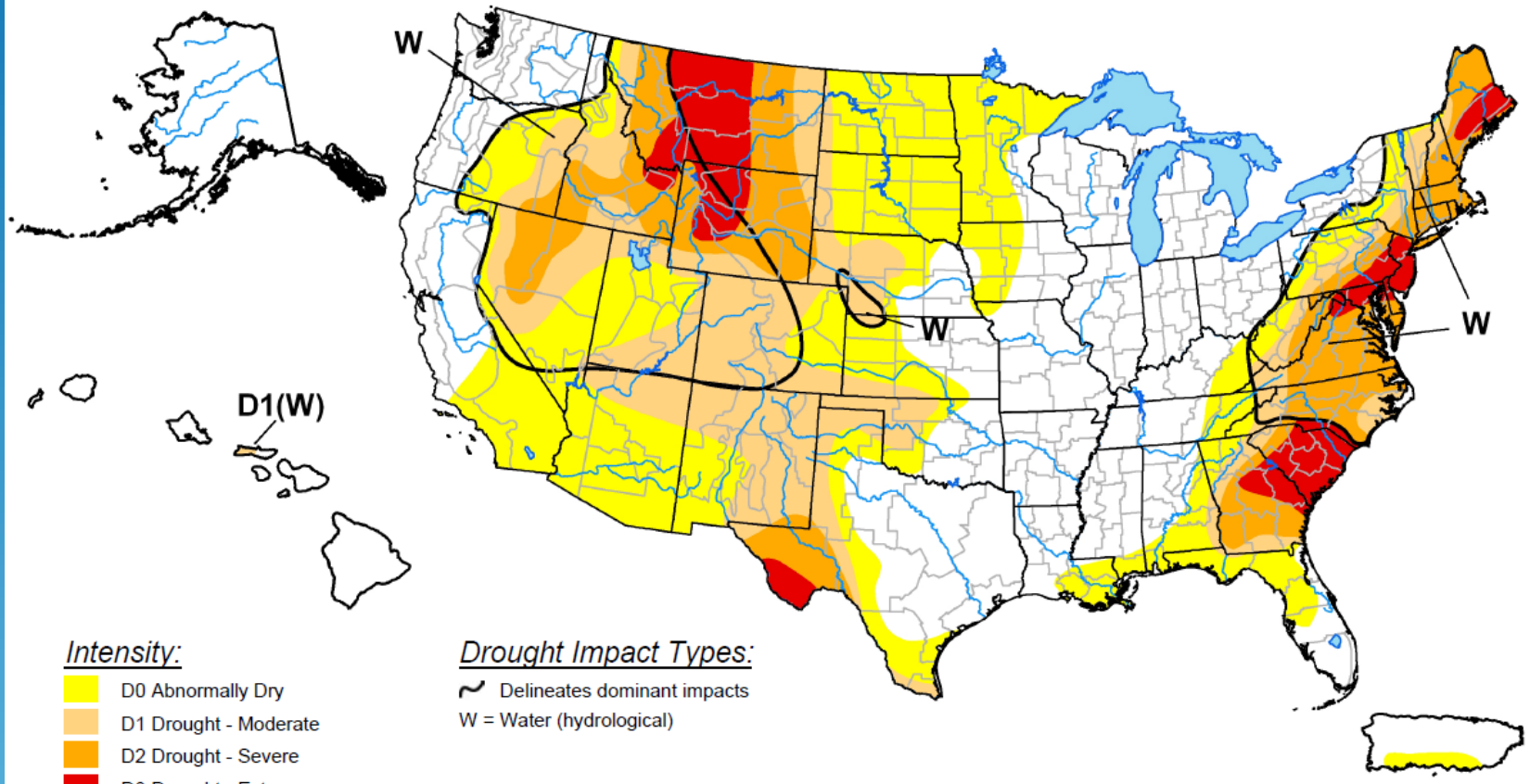
USDA National Drought Mitigation Center

Released Thursday, August 30, 2001

Author: David Miskus, NOAA/CPC/JAWF

U.S. Drought Monitor

February 26, 2002
Valid 7 a.m. EST



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USDA National Drought Mitigation Center

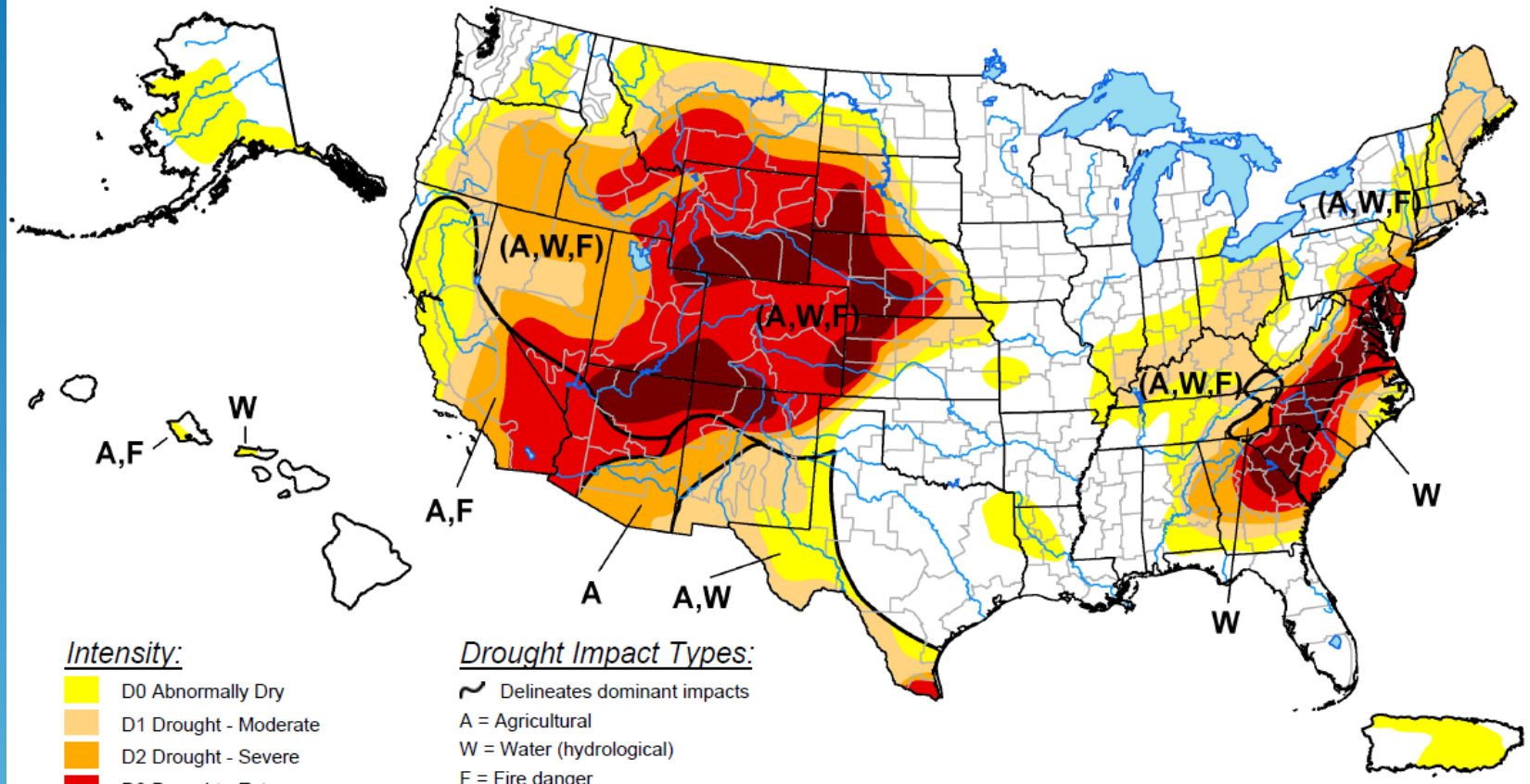
Released Thursday, February 28, 2002

http://drought.unl.edu/dm

Author: Michael Hayes, National Drought Mitigation Center

U.S. Drought Monitor

August 27, 2002
Valid 7 a.m. EST



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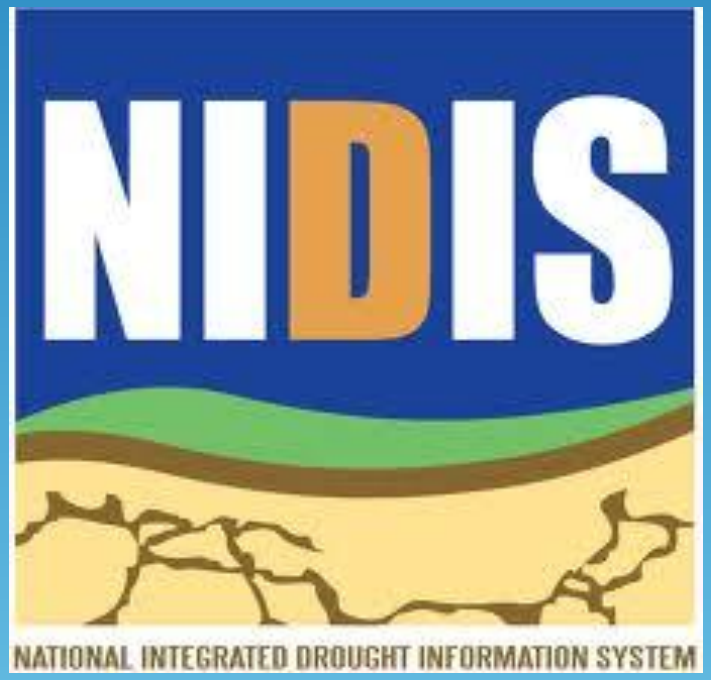
http://drought.unl.edu/dm

USDA National Drought Mitigation Center

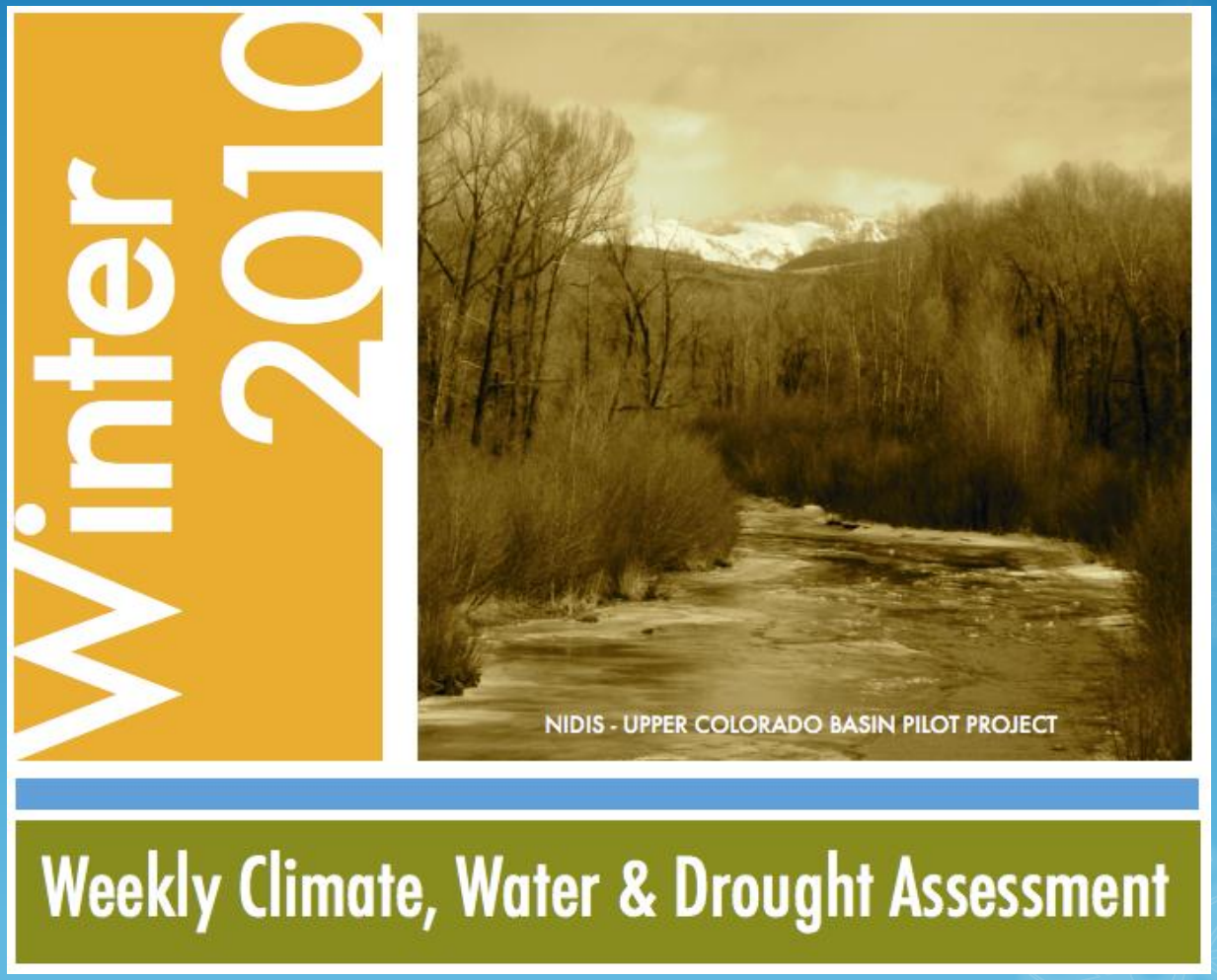
Released Thursday, August 29, 2002

Author: Richard Heim/Karin Gleason, NCDC

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

- Development of a drought early warning system.
- Enhance local, state, and regional expertise and capabilities.
- Address stakeholder needs by building better partnerships.
- Identify what a “drought portal” should be.
- Give local “expertise” to the USDM.

Accomplishments and Progress

- Conducted stakeholder interviews in 2009.
  - Water users and providers, resource managers and watershed protectors in the UCRB.
    - Drought Triggers and Indices
    - Monitoring Gaps
    - Favorite data, products, etc. Find out what they use.

Interviews and Focus Groups

conducted by the Colorado Climate Center between May and December 2009 exploring drought indicators, triggers and data needs by sector

- USBR (Grand Junction and Loveland offices)
- Colorado Division of Wildlife
- Colorado DNR (state and local)
- Denver Water and other smaller water providers
- Northwest Council of Governments (water quality)
- Watershed protection groups
- USDI (BLM, NPS) and other resource managers
- Colorado River Water Conservation District
- Northern Colorado Water Conservancy District
- EXCEL Energy
- Grand County interest group
- Summit County interest group
- Fraser Experimental Forest
- Water Availability Task Force
- Winter Park Resorts and other ski area representatives
- Other (discussed with WY and UT State Climatologists but did not conduct interviews with users outside of Colorado)

Interview Findings

- Responses vary by sector and individual user based on "exposure to drought risk".
- Most track widely 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

- 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”
- USDM is popular, but 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 want better long range forecasts (2 years) with skill.

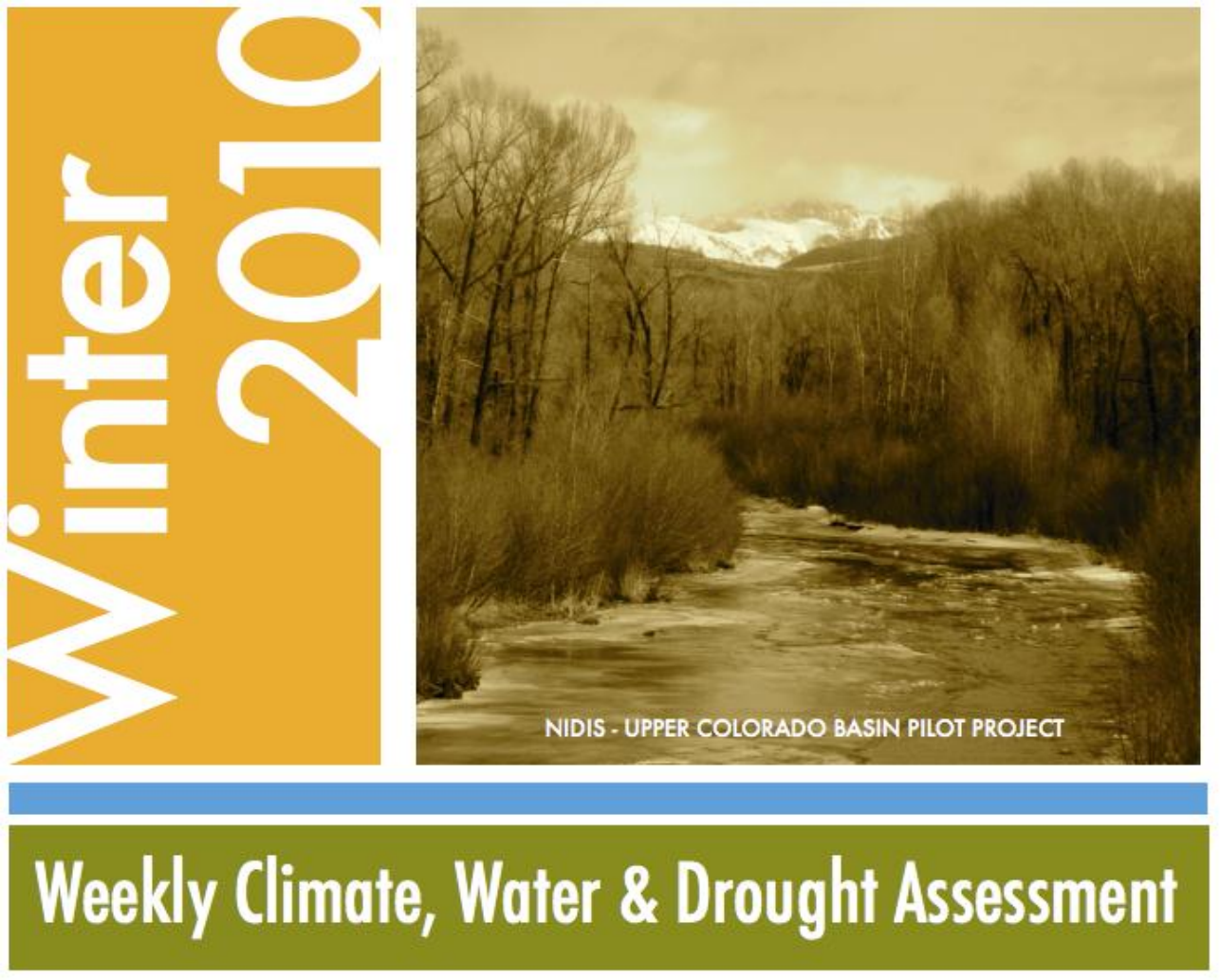
Interview Findings

- Different sectors have their own "drought triggers"
  - Lake Dillon reservoir levels:
    - Only depleted during very dry periods.
  - Colorado River summer water temperatures
  - Springtime dryness east of divide means greater demand for west slope water.
  - Forest and range conditions.

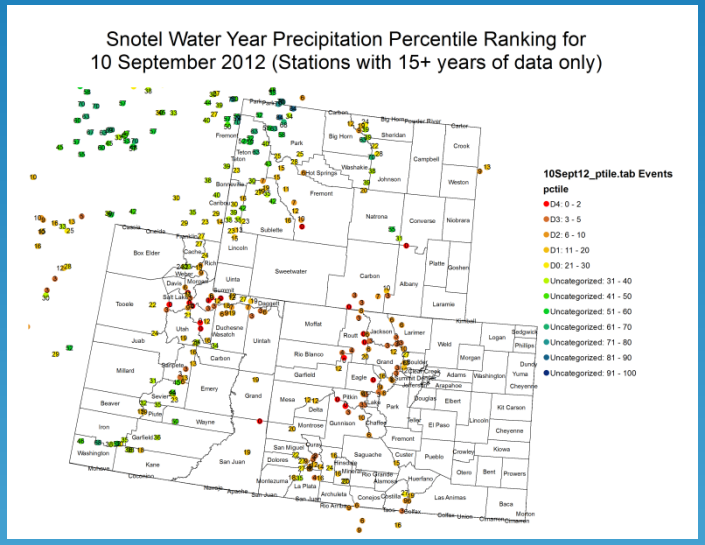
Requested Information from Users

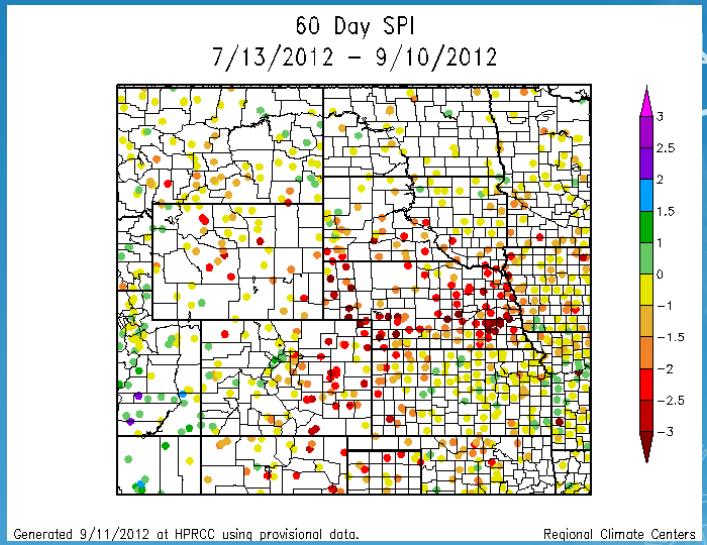
- More detailed and timely local monitoring.
- Better forecasts
- Interpretation of complex drought information (i.e. not everyone understands SPI)
- Better elevational depiction of precipitation.
- Historical perspective on streamflow and reservoir data.
- One-stop shopping for all information
- Information on water demand.

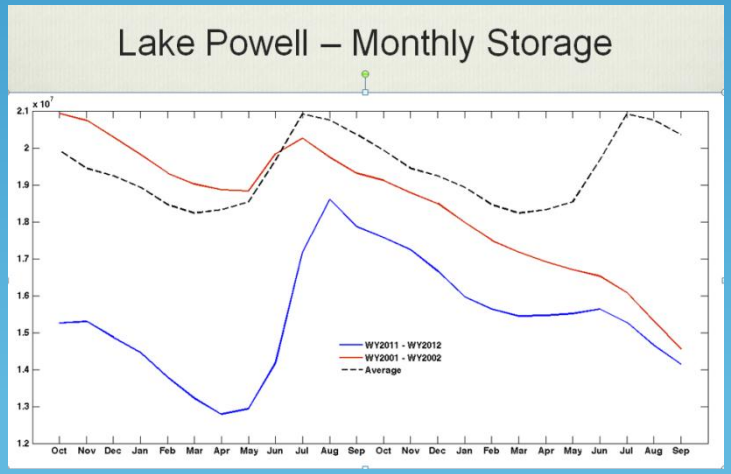
Weekly Drought and Water Assessment Webinars started February 2010

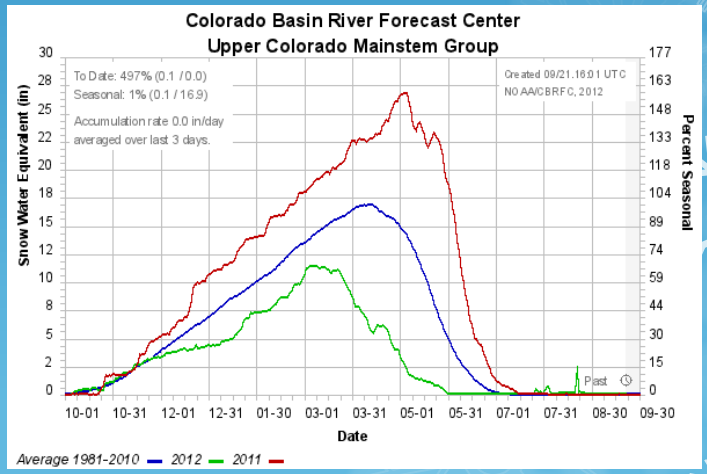


We put current conditions into historical perspective for diverse users



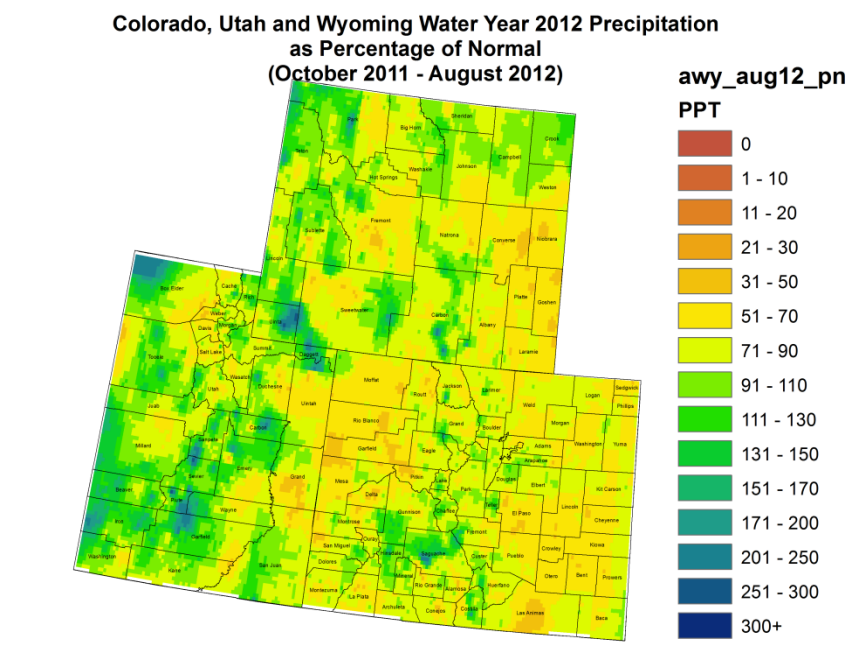


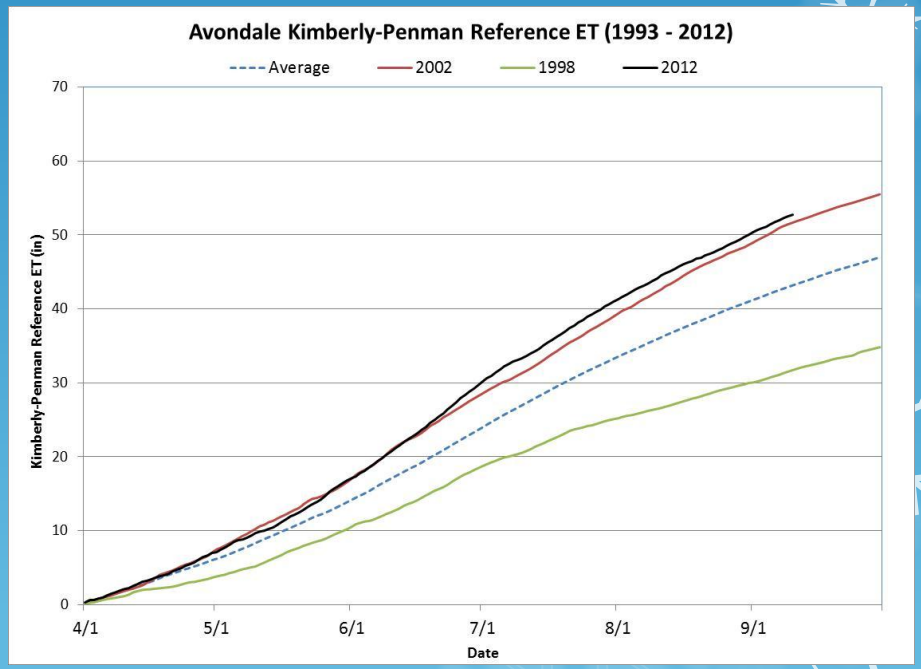




Local Expertise

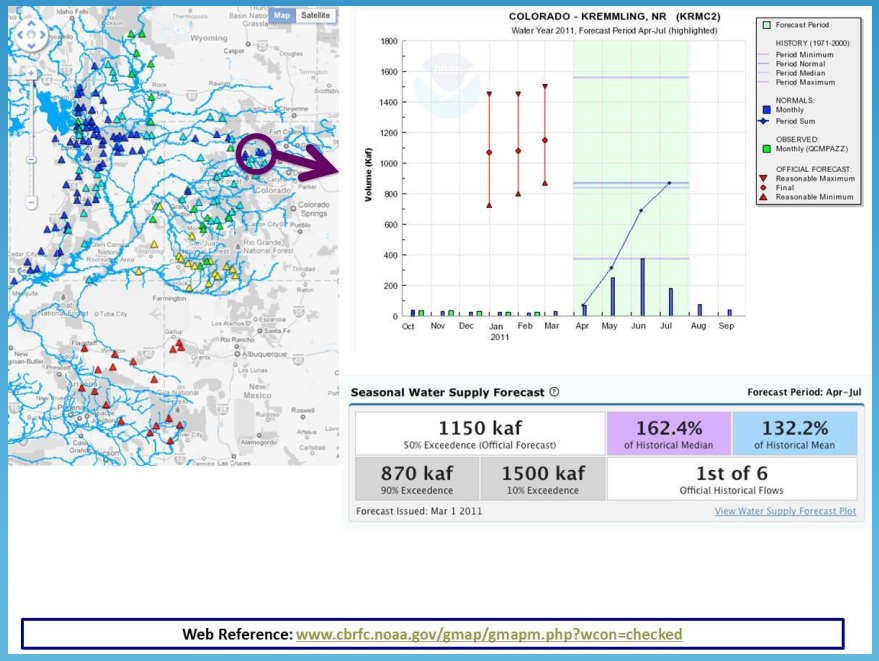
- Colorado Climate Center and other local agencies provide updates on current conditions.
  - USGS puts streamflow data into context.
  - NWS provides weather forecasts

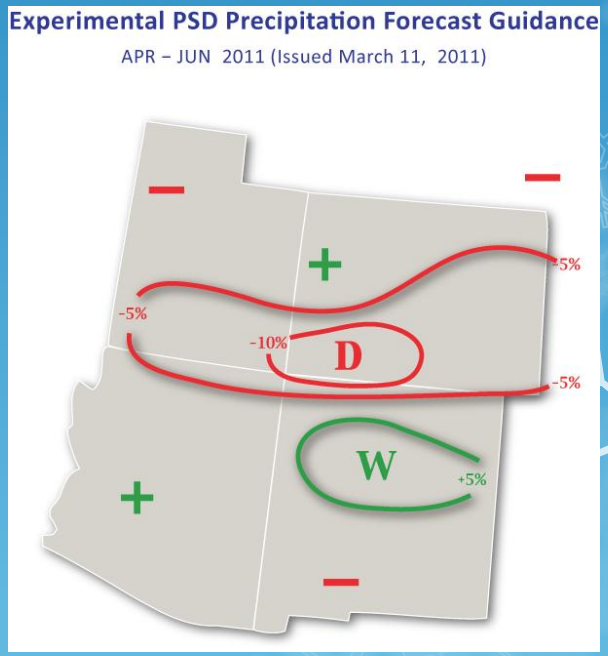




Regional Expertise

- Regional experts provide less frequent, but desirable updates.
  - CBRFC provides water supply and peak flow forecasts.
  - Klaus Wolter provides long range climate outlooks.





Weekly Drought and Water Assessments

- During critical times of year (Feb – June or times of drought), weekly webinars are held at 10AM on Tuesday.
- Normally 15-20 participate on the call and the USDM author is invited to attend.
  - Greater attendance with long range climate outlooks/streamflow forecasts.
- Approximately 15 minutes in length, covering precipitation, streamflow, reservoir levels, snowpack conditions, water demand and NWS forecast.
- Ends with discussions, sometimes contentious, of the USDM and any needed changes.

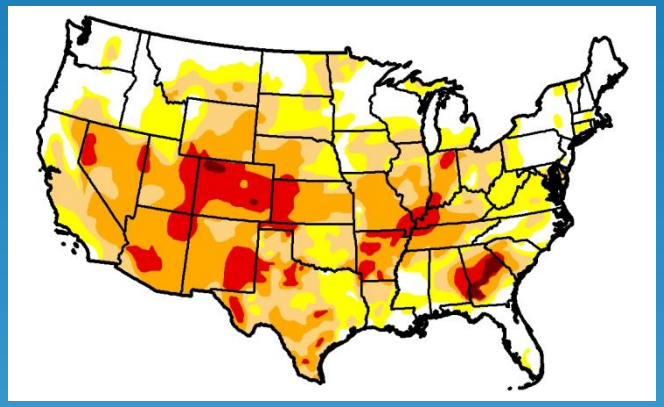
Weekly Drought and Water Assessments

- Content is dynamic, it changes based on user input and current conditions.
- Farm Service Agency contacts have been very useful for on the ground reports and indirectly provide evaluation of satellite/model derived products.
  - i.e. Does VegDRI depiction represent what is being observed on the ground?
- After the call, summaries are sent out to a larger email list of about 286 people (and growing!).
- Suggestions and feedback are suggested and encouraged!

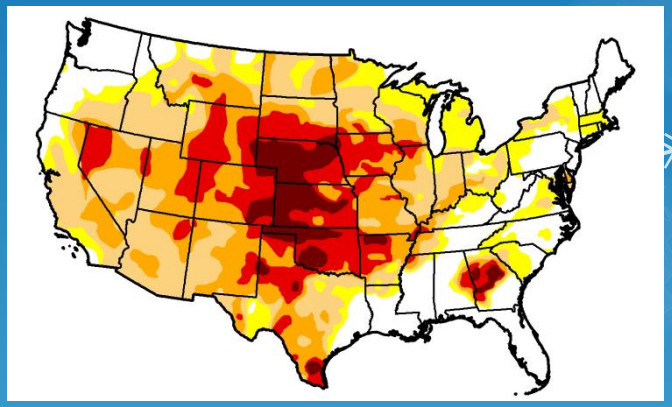
Challenges

- Competing needs, changing priorities.
- Difficult to maintain interest in certain sectors unless disaster is looming.
- Fundamental conflict between Rec/Tourism and Ag/Municipal
  - To the tourism sector, drought is a 4-letter word.
- Boundaries!
  - Tough for us to cross state lines
  - Tough for us to EXCLUDE half of Colorado, so we include it anyway!
- Water Law controls the distribution of surface water, but many scientists don’t fully understand it.

Experiences from 2012

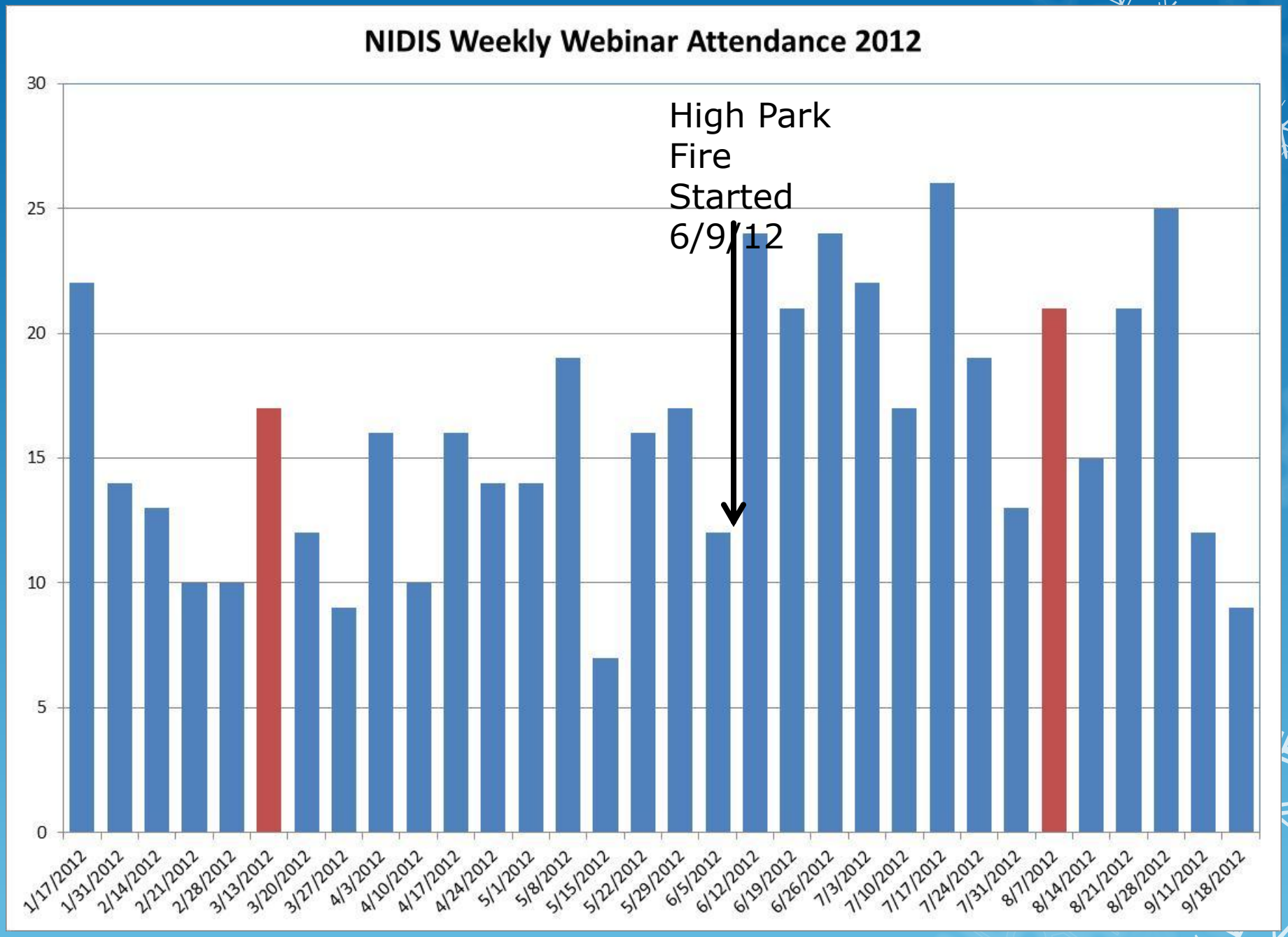


July 3, 2012



September 18, 2012

- Although it has shifted locations, the drought goes on for Colorado and our NIDIS drought monitoring efforts.
- Started webinars mid-January, by February we were weekly and stayed that way until this past week.
- D4 in two different areas of the state, it transitioned from NW Colorado to SE Colorado over just a few months.
- Highest attendance in June, July and August as conditioned continued to deteriorate.


NIDIS Weekly Webinar Attendance 2012
High Park Fire Started 6/9/12
30
25
20
15
10
5
0
1/17/2012
1/31/2012
2/14/2012
2/21/2012
2/28/2012
3/13/2012
3/20/2012
3/27/2012
4/3/2012
4/10/2012
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7/10/2012
7/17/2012
7/24/2012
7/31/2012
8/7/2012
8/14/2012
8/21/2012
8/28/2012
9/11/2012
9/18/2012

Experiences from 2012

- FSA input was invaluable for assessing ground conditions.
  - Dedicated to the calls as the growing season got worse.
  - Pasture and range updates, status of crops and winter wheat planting (or not planting), updates on prevented and failed acres.
- NWS offices are also dedicated to our calls and even took it upon themselves to develop a “Forecast rotation” as the weekly updates went on.
- The calls bring the right people together to discuss current conditions and tie all that information into the USDM.
  - Since the USDM is now used for disaster declarations, everyone has a vested interest in getting it right.

What's Next?

- Webinar evaluation and stakeholder follow-up
  - Follow up with initial interviews, are we addressing the gaps?
  - Is the USDM better now with more local input and contributions?
  - Survey to go out after the drought calms down.
  - Survey questions are still being finalized.