

Drought of 2012 in Colorado

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Introduction

As 2012 began in Colorado, about 50% of the state was already designated in drought based on the US Drought Monitor. Most of the dry areas were focused in the Rio Grande and Arkansas basins in south central and southeastern Colorado. These areas had shared in the extreme drought of 2011 experienced over Texas, New Mexico and Oklahoma. Conditions then gradually deteriorated statewide as winter snow accumulation in all of Colorado's mountainous areas fell well below normal. Starting in February (mainly on the west slope) and March for much of the rest of the state, temperatures soared well above average and precipitation totals were persistently much below normal. A tenuous situation quickly worsened. April and May also brought widespread above average temperatures and below average precipitation. Snowpack melted much earlier than usual, and streamflow response was limited.

By the end of May 2012, 100% of the state was in classified in drought, including the mountainous areas that supply roughly 80% of the state's water supply. Despite very wet weather in 2011 across northern Colorado and high stream flows just one year before, river levels all dropped precipitously. Streamflows were only slightly better than the extreme drought years of 1934, 1954, 1977 and 2002. The timing of these conditions in the spring created large deficits at the worse time of year possible and dried out soil moisture during the critical planting time of year. A dry spring on the plains coupled with low snowpack in the mountains set the stage for the widespread drought experienced in 2012. By June, vegetation was already brown. Temperatures soared in June, especially over the eastern half of the state, to levels not seen since the extreme drought and heatwaves of notable historic drought years – 1954 and 1934. Temperatures climbed well over 100F on many days. Denver and Colorado Springs both set daily and all-time records, and the all-time state record high temperature of 114 F was matched at Las Animas, in southeastern Colorado. Reference evapotranspiration rates measured by our agricultural weather network, CoAgMet, were the highest ever observed in the network's 20-year history. Forests

were incredibly dry by June. The table was set for two of Colorado's most destructive wildfires, the High Park fire in northern Colorado and the Waldo Canyon fire near Colorado Springs, both which ignited in June.

Colorado Drought Impacts

Wildfires

The devastating Colorado wildfire season of 2012 was the most publicized impact from the drought of 2012 and was responsible for an estimated 450 million dollars in insured losses and 5 fatalities. This does not include the costs of fighting the fires. The cost for fighting the High Park fire alone was around \$40 million. In total, there were twelve major wildfires reported starting with the Lower North Fork fire in March 2012 and continued straight into October with a wildfire in Rocky Mountain National Park. The Fern Lake fire, as it was called, burned through the fall and doubled in size at the end of November with 70 mph winds fueling the fire in inaccessible terrain. This fire burned into January when winter finally brought a blanket of snow to the area, only after burning nearly 3,500 acres. This was a strong indication of the extreme dry forest conditions observed in 2012.

The High Park and Waldo Canyon fires were the most explosive and destructive burning 87,284 and 18,247 acres, respectively. The proximity of these fires to large population centers and the large number of homes burned or threatened set these fires apart from typical Colorado wildfires. On June 26th alone 350 homes were lost to the Waldo Canyon fire making it the most destructive fire in Colorado's history. That title had been given to the High Park fire just a few weeks earlier for burning 259 homes. The High Park and Hewlett Gulch fires burned the "backyard" of the Colorado Climate Center. Smoke, flames and pyrocumulus clouds were visible from the Climate Center nearly all summer, but finally ended when the Southwestern Monsoon arrived in early July bringing much needed precipitation and high dew points to help fire crews extinguish the flames.

Wildfire was also a major problem across Colorado's eastern plains. Spring grass fires are not uncommon, but in 2012 the fire hazard continued into the summer. The Last Chance fire which ignited June 25th was the 2nd largest wildfire of the year by acreage, next to the High Park fire. It burned 45,000 acres and 23 structures were lost, that included 5 homes. The cause of this fire was thought to be a few sparks from a tire blowout. With conditions as dry as they were, just a few sparks were responsible for 45,000 acres of burned landscape in just 2 days compared to the High Park fire which burned for several weeks.

Agriculture

After being hit with drought in 2011, the southeastern portion of Colorado experienced its second consecutive year of severe drought conditions. In 2012, the Arkansas and Rio Grande basins were not alone as the rest of the state started feeling the effects of agricultural drought as well. The most extensive agricultural producing areas in Colorado are on the Eastern Plains in the South Platte,

Republican and Arkansas basins. The rest of the state is known for ranching and hay production while the Western Slope near Grand Junction is well-known for fruit growing. None of these areas were spared by the drought of 2012 with the state reporting 98,086 failed and 124,461 prevented planting acres. Where irrigation water supplies were adequate, some crops did well. For example, western Colorado's fruit growers experienced very early blossoming similar to the fruit areas of the Midwest and Great Lakes, but Colorado escaped the April freezes that so damaged fruit crops east of here.

Rangeland and the extensive irrigated pasturelands of Colorado were especially hard hit. By August of 2012, only 3% of the total pasture and rangeland acres in Colorado were rated "good" condition or better while 81% were rated "poor" or "very poor". Hay prices soared to two to three times their recent levels, and availability was scarce. Production was limited to 10-50% of average. Since drought also encompassed all neighboring states, there was no easy option for hay. Buyers were able to have hay trucked in from locations such as northern Montana and Idaho but also as far away as the Carolinas. In some areas, special provisions were required to exempt hay-hauling truckers from highway load size limits. This allowed some oversize loads to be delivered, making hay slightly more affordable.

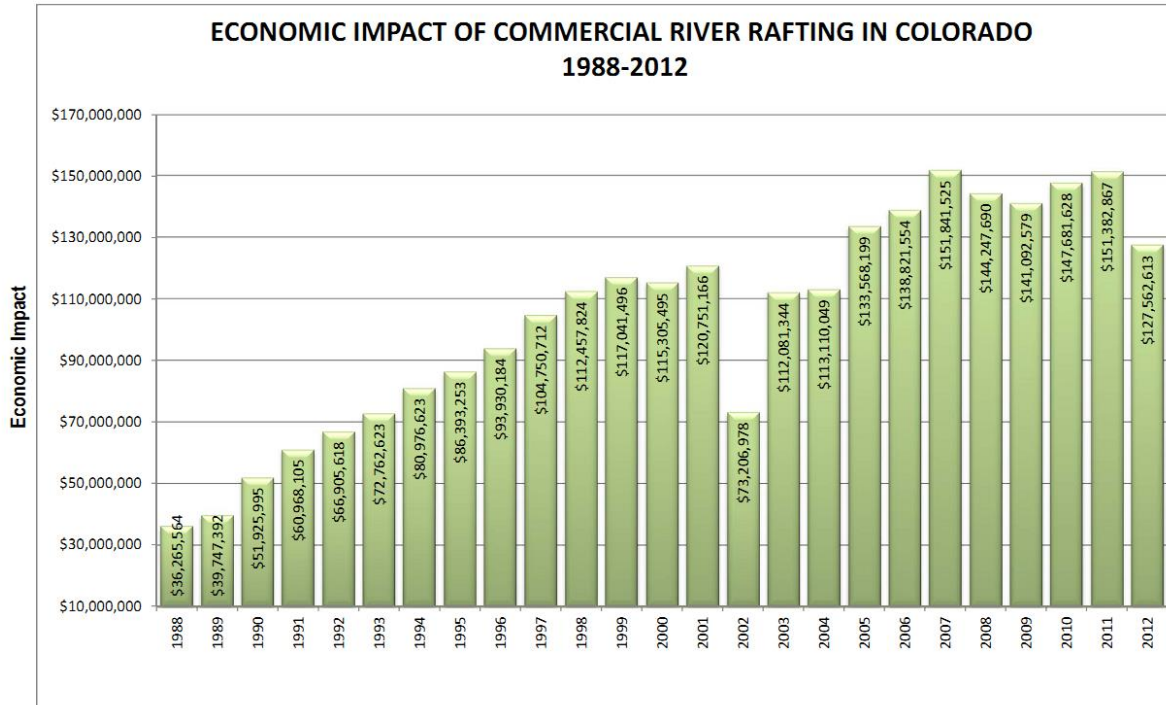
With continued drought across the state, corn prices increased in 2012 to roughly \$6.60/bushel which was up from 2010 corn prices of \$3.79/bushel, a 43% increase in price over just 2 years. The increased price of corn was not isolated to Colorado as much of the corn belt of the U.S. experienced exceptional drought conditions in 2012 which led to the large increase in prices with reductions in supply. Increased prices offset decreased yields for some producers, and for the few farmers with full irrigation allocations, this was a financial benefit.

The Colorado Drought Mitigation and Response Plan establishes lines of communications to send information up the chain of command when drought hits our state. This plan identifies impact task forces for each sector of the economy. The agricultural impact task force met for much of 2012, bringing together Farm Service Agency personnel and state water managers to report failed and prevented planting acreages, updates on CRP (Conservation Reserve Program) grazing availability as well as emergency loan status and disaster declarations status by county. Reports were also given on (although hard numbers were rarely available) cattle being sold, which mainly occurred in the Arkansas basin. These reports were integral for understanding impacts in different regions of the state.

Recreation and Tourism

It is no secret that drought brings impacts to the recreation and tourism industry, but it seems that this sector has done much in the recent years to make their industry more resilient when drought strikes. One such impact reported from the Colorado River Outfitters Association report for 2012 was a 17% decline in rafting visitation in the state from 2011. This decrease in visitors was a combination of both low water flows and inaccessibility of river reaches due to wildfire. The Cache la Poudre visitation dropped 40% from 2011 due to the river being closed for several weeks. They reported the statewide economic impact to be down 15.7% to \$127.6 million, compared to \$151.4 million in 2011. Although numbers were down, they were not as bad as 2002's rafting season and that was largely attributed to

changes in marketing and getting the word out that the rivers were open for rafting. Some outfitters changed to targeting more family oriented trips with the lower water levels being ideal for beginners. The graphic below shows the time series of economic impact by the rafting industry.



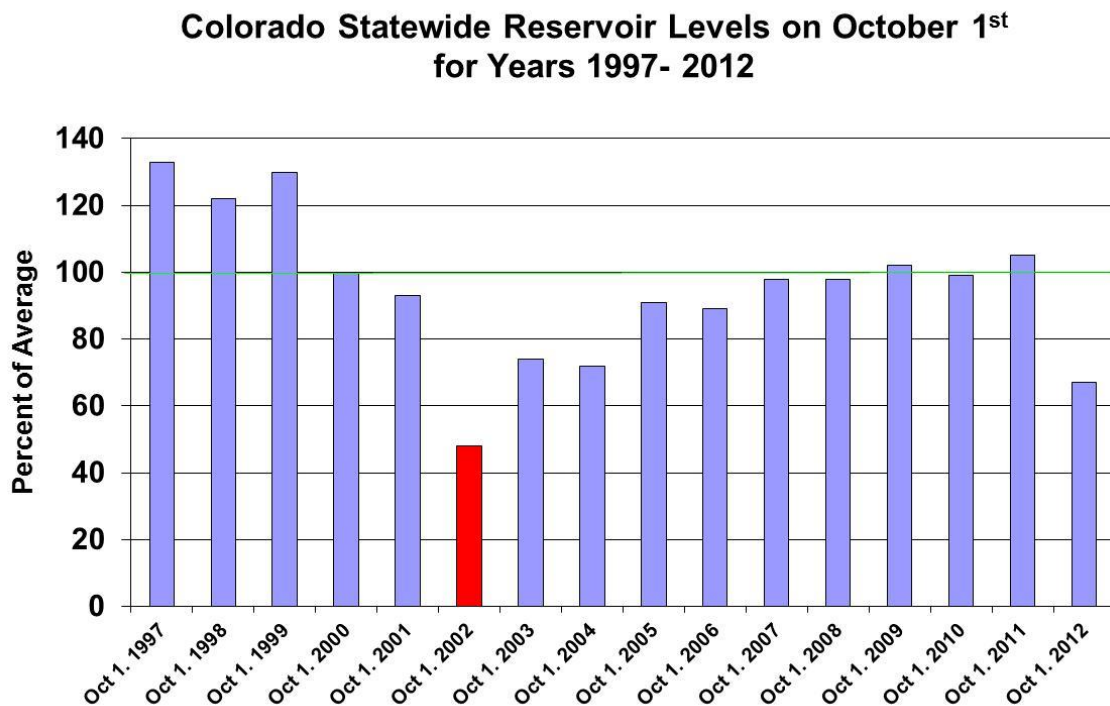
Source: Colorado River Outfitters Association 2012 report

The largest portion of Colorado’s tourism sector is the skiing industry. Colorado Ski Country USA reported visitation for the 2011-12 season to be down 11.9% compared to the 5 year average. The 2011-12 season proved to be challenging for many ski areas especially with March being an exceptional flop with high temperatures and very little moisture essentially ending the ski season several weeks early. The ski industry has steadily prepared itself for dry years they inevitably know are coming with large investments in snowmaking and slope grooming technology as well as diversifying the services they offer to include much more than just skiing to keep visitors coming back to experience winter in Colorado. Similar to the river recreation industry, they have developed marketing strategies to compensate to some degree. But in this industry a 12% drop is large.

Other summer recreation was impacted, especially near publicized wildfire areas. Specific numbers are not available. Again, marketing strategies were aggressively employed to compensate to some extent for the national and international media coverage of the drought and wildfires. Overall, the impact on Colorado’s huge recreation and tourism industry was modest but not severe.

Water Storage

In Colorado, approximately 80% of the state's water supply comes in the form of runoff from mountain snowpack which is captured as it melts in reservoirs for later use as municipal water supply, irrigation water, power generation and many other uses. Fortunately for reservoir operators, the 2011 water year in Colorado saw record breaking snowpack in some river basins which allowed reservoirs to fill. A longer than average runoff season resulted in more reservoir carryover into 2012 at least in the northern 2/3 of Colorado. But by May 2012, above average reservoir storage changed courses to below normal storage and has remained less than normal. The graphic below shows the October 1st end of growing season statewide time series of reservoir storage as a percentage of normal. Note how water year 2011 brought statewide storage up to 105% of normal and the large decrease in storage over just one year down to 67% of normal.



Another unique story about water supply in Colorado deals with in-stream flow rights. In 2012, the Colorado Water Trust launched the "Request for Water 2012" program and was able to purchase temporary water rights that were unclaimed in Stagecoach Reservoir. These rights were purchased within the Colorado water rights framework and used as in-stream flow to keep water flowing through the Yampa River near Steamboat Springs, CO during the summer recreation season. This was an unprecedented contract that utilized the 2003 short term water leasing statute and has spurred many other such water transfers. These types of transfers benefit streamflow, aquatic life and habitats, water users, fishermen, hydropower and much more by keeping water flowing in the river for all to enjoy.

Lessons Learned

The Colorado Climate Center has had the privilege to be a part of the NIDIS (National Integrated Drought Information System) Upper Colorado River Basin Drought Early Warning System since 2009. Since that time, Colorado has experienced some level of drought across the state every year. This project allowed the state climate office to be much more involved in drought monitoring and communication efforts than what had been done previously. Prior to this NIDIS pilot project, updates had been done monthly through the Colorado Water Availability Task Force (organized under the Colorado Drought Response and Mitigation Plan). Although these monthly meetings are still ongoing, the NIDIS project allowed for much more aggressive and timely weekly monitoring of conditions across the Upper Colorado River Basin and the rest of Colorado. This intense monitoring proved to be much more effective in identifying drought early enough so that water managers had more information sooner to help support decision making.. Response to exceptionally dry conditions in 2011-2012 in Colorado were much more coordinated than the 2002 drought in Colorado which had a false sense of security that conditions would improve when in fact they did not. The 2002 drought was a wake-up call that conditions could deteriorate rapidly and that is exactly what happened in 2012.

Increased monitoring was the key to closely tracking drought conditions and getting accurate changes made to the U.S. Drought Monitor, which people rely on heavily for tracking national conditions. This increased monitoring allowed for a more localized depiction of conditions in Colorado which give users of the USDM more confidence in the product for their location. Classifying drought is not cut and dry and takes into account a variety of perspectives. Consensus is not always easy and compromise is key.

Real-time data and long term observations are critical for putting current conditions into historical context. Recent satellite products are useful for depicting severity and spatial extent of drought, but have too short a history to provide perspective on the wide range of conditions experienced over the entire observed period of temperature and precipitation going back to the late 1800s. Those long term observations, mainly the National Weather Service Cooperative Network, are the backbone of drought monitoring across the U.S. and critically important. In the Western U.S., SnoTel stations maintained by the USDA Natural Resources Conservation Services are also critical for assessing and anticipating water supply conditions for the upcoming year. These stations provide early warning for reduced water supply by tracking snowpack in the high elevations of the Western U.S. Breakthroughs in remote sensing products, like VegDRI, are quite valuable for assessing drought conditions in data sparse areas that provide little information alone. Preliminary evaluation of these products suggests that with good data inputs these types of products provide a lot of value when there is little data available to make decisions on a finer spatial scale. The reporting of drought impacts is fairly lacking. These data help to understand how any categorization of drought relates to actual impacts seen, for example what does “exceptional” drought look like and what impacts does it trigger.

Understanding susceptibility to drought and developing mitigation plans is critical to make it through long term, widespread droughts. Several examples have been given in this report from non-profit organizations buying in-stream flow rights, to recreation outfitters investing in their infrastructure and diversifying their portfolios to keep business stable even during times of drought. These are just a few examples of the innovative solutions that can be developed. Drought is a frequent visitor to Colorado and being prepared for it is critical to mitigating the impacts from it.