Drought Impacts and Solutions in the Agricultural Sector
The third in a series of Western Governors’ Drought Forum workshops

November 13-14, 2014
Governor’s Office, Council Room – California State Capitol – Sacramento, California

Under the leadership of Western Governors’ Association Chairman, Governor Brian Sandoval of Nevada, industry leaders, state experts and stakeholders are sharing best practices for drought management through the Western Governors’ Drought Forum. A key element of the Drought Forum is an ongoing series of sector-specific workshops to identify drought impacts, solutions, success stories and case studies.

Workshop Take-Aways

For the third Drought Forum workshop, Drought Impacts and Solutions in the Agricultural Sector, findings can be summarized in the following categories:

**Policy**

*Communication:* There is a vast amount of information available on drought conditions, and it is essential for high-level planners to convey that information to producers on the ground. Lack of information on expected water availability conditions and water allocation puts producers at a distinct disadvantage. To minimize impacts on agricultural producers, water managers need to inform producers of water availability conditions at the earliest possible point to inform on-farm actions.

*Working with existing resources:* Government funding for agencies to monitor snowpack conditions, enhance data capability, and implement new water conservation programs will likely remain at low levels now and in the future. Agencies should focus on collaboration as a means of best utilizing scarce funding. Agencies are often siloed, with a unilateral vision of resource management; the more collaboration that occurs, the more effectively existing resources can be harnessed.

*One size doesn’t fit all:* The best solutions are often ones that are developed locally. Drought impacts communities first and foremost. Agencies should work with local producers to implement tailored solutions.

**Culture**

*Education:* Agricultural owners and operators are well aware of existing technology being utilized to reduce water usage. This knowledge does not always trickle down to laborers in the field, or up to state planners and water managers. Educating all levels of staff on drought
management information and fostering a culture of conservation is necessary to realize the existing benefits of improved technology.

Realizing that the future is now: There is a cultural tendency to put off tough decisions relating to water management, but the reality is that there are basins that are drastically over-appropriated now. Decision makers need to be prepared to make tough decisions when it comes to water resource management. A cultural shift needs to occur in which states and water users prepare for drought as an eventuality, not a rarity.

Workshop Notes and Highlights

The third workshop of the Drought Forum meeting series, focusing on drought management in the agricultural sector, was held on November 13-14, 2014 at the California State Capitol in Sacramento California. Introductory remarks were given by Governor Brian Sandoval of Nevada and Governor Jerry Brown of California.

Governor Sandoval reinforced the idea that drought will define the future of West when he stated, “Drought is the new normal. We have to plan for variability in water supplies and not just reference historical flows and assume that we will have the same median flows going forward.”

Alluding to the difficulties associated with efficiently managing water in California’s complex water delivery system, Governor Brown stated, “Water in our state is incredibly engineered. Our lives and resources are so highly interconnected through engineering that to move forward we need to embrace that fact, not turn away from it.”

Governor Brown went on to discuss the importance of groundwater management. “We need to take notice of how groundwater is being managed. The burden of that management will fall on local governments. They are the front line in terms of setting up and enforcing groundwater regulations,” Brown said.

A summary of key findings from the workshop follows. For more information, visit westgov.org/drought-forum or email WGA Policy Advisor Carlee Brown at cbrown@westgov.org.

Drought Development in California through the Lenses of Agriculture, Water Management and Environment

Findings and Observations

- “Many definitions of drought exist, but in terms of water availability, drought is a long-term accumulated deficit in a water budget expressed in the context of a reference period, in absolute or relative terms.” – Kelly Redmond, Regional Climatologist, Desert Research Institute
• “A deficit of water must lead to an impact on humans or a natural system to be considered drought.” – Kelly Redmond, Regional Climatologist, Desert Research Institute
• “Impacts of drought are difficult to quantify on a uniform basis. The same sequence of events has vastly different economic consequences for different sectors existing side-by-side. Irrigated agriculture is impacted by seasonal drought and lack of snowfall, whereas dry-land agriculture relies on immediate uptake of precipitation in a specific location.” – Kelly Redmond, Regional Climatologist, Desert Research Institute
• “Flood irrigation in the North Platte River of Wyoming recharges aquifers. This improves wetland health, aquifer recharge, and fisheries. We need to look at watersheds in a holistic sense and realize that they are interconnected systems. Small on-farm efficiency savings are important, but we can’t allow individual savings to detract from the watershed as a whole.” – Jack Berger, Rancher, Berger Ranches
• “When managing water resources during drought, early communication with stakeholders is key. Early communication about an impending water shortage – and the resulting groundwater pumping curtailments – allows stakeholders to transfer water usage to higher value crops, minimizing economic impacts of drought on producers.” – Jason King, State Engineer, State of Nevada

Possible Solutions
• “During times of drought, cattlemen are able to get a new permit for stock water as a temporary right, while major utilities are allowed to pump more groundwater than entitled by their water right, as long as their 10-year average use doesn’t exceed the permitted amount.” – Jason King, State Engineer, State of Nevada
• “Aquifer storage and recovery as a means of water conservation needs to be utilized moving forward. Water stored underground to be pumped for future use is extremely efficient, and does not suffer any sort of evaporation losses.” – Jason King, State Engineer, State of Nevada
• “The 12 year drought in Melbourne, Australia provided some insight into the political realities of drought. As is the case in the United States, there was finger pointing over water waste between urban and agricultural water users. Eventually, as the consequences of inaction became more dire, people began to realize that drought is a shared issue, and conservation needs to result from constructive collaboration.” – Jared Blumenfeld, EPA Region 9 Administrator
• “There is no silver bullet for drought. There are so many components that go in to dealing with drought. Some of the most important steps include fostering a culture of conservation, flexible policies to facilitate water transfers from wet to dry areas, and technology improvements to utilize alternate sources of water.” – Jason King, State Engineer, State of Nevada

Drought Impacts in the Agricultural Sector

Findings and Observations
• “The dairy industry in California has been hit hard by drought. Historically, the industry has enjoyed abundant silage and alfalfa production to support livestock. Water shortages are now forcing producers to shift water use to higher revenue crops. The reauthorization of USDA’s livestock disaster assistance program in the Farm Bill came at a crucial time for our dairy and cattle sector.” – Karen Ross, Secretary, California Department of Food and Agriculture

• “Over 30 years the agricultural industry in California managed to reduce water use by 14 percent while increasing production 80 percent. This serves as evidence for the large capacity and resilience in the system but, for production to continue, drought planning must improve, and groundwater resources must be protected.” – Karen Ross, Secretary, California Department of Food and Agriculture

• “Conservation is important, but conservation alone will not solve a water shortage. Using conserved water in one sector expands water use in another; all that is accomplished is hardened demand. Conserved water needs to be stored for future supply rather than redistributed.” – Paul Wenger, President, California Farm Bureau Federation

• “Drought stops food production. It is that simple. Agriculture has, thus far, had no issue maintaining food production in the face of uncertain water supplies, but we are starting to hit the wall on our ability to sustain increased food supplies. Drought is a large part of what is bringing that to bear.” – Chris Kraft, Western Dairy Association and Dairy Farmers of America

• “Marketing water on a value-added basis should not apply to agriculture. Agricultural water use will appear inefficient when compared to other sectors due to the high rate of usage and inefficiencies associated with delivery and evaporation. Deciding where water should go on a value-added approach is a dangerous prospect for agriculture and the nation’s food supply.” – Lynn Hettrick, Deputy Director, Nevada Department of Agriculture

Possible Solutions

• “There is a sense among California agricultural producers that the water market should be a short-term solution during times of drought, but not a long-term plan. California needs to create room for more water storage, not just improved sharing of existing water. Expanded water storage combined with regulatory flexibility will provide agricultural producers with the necessary drought resiliency and operational certainty.” – Bryce Lundberg, VP for Agriculture, Lundberg Family Farms

• “Up to now, Nevada farmers have been able to pump groundwater to supplement water shortages. That is coming to an end. Now, there is no option to pump deeper wells. Agriculture is running out of new water resources, so producers need to look to efficiency upgrades and conservation.” – Lynn Hettrick, Deputy Director, Nevada Department of Agriculture

• “When dealing with short-term water constraints, it is imperative to water the crop that will provide the most economic return. Additionally, producers need to start planning
now on how to cut variable costs. Reduced water will mean a reduction in planted acreage, so planning now on how to cover costs is essential. Finally, long-term financing needs to be considered. A poor crop year can hurt operation financing in future years, even if there is more available water.” – Lynn Hettrick, Deputy Director, Nevada Department of Agriculture

- “In terms of encouraging conservation, a crediting plan with extensive flexibility is needed. Some sort of credit system would help encourage producers to conserve more and give up water, because currently producers save water and get little to no benefit.” – Lynn Hettrick, Deputy Director, Nevada Department of Agriculture

Drought Data and Analysis

Findings and Observations

- “The issue with a water market right now is that most people don’t know what the going price of water is, where trades are occurring or what the going price of water is expected to be next year. We need to improve market flexibility by setting up trades in advance of drought and modifying them as time goes on depending on precipitation conditions.” – Richard Howitt, Professor Emeritus, UC Davis Center for Watershed Science
- “An overwhelming amount of data already exists regarding drought. The issue lies in making it accessible to those who need it, when they need it. A more organized system to guide water managers and agricultural producers through what data already exists, and how to access it is necessary for informed decision making.” – John Andrew, Assistant Deputy Director, California Department of Water Resources
- “A better understanding of the relationship between snowpack, rainfall, groundwater recharge and soil moisture and temperature is needed to inform better water availability predictions and decision-making.” – John Andrew, Assistant Deputy Director, California Department of Water Resources
- “Water supply data is not all that needs to improve. Information needs to improve on how water is actually used in both agricultural and urban settings. More informative demand side water data is necessary to portray the socioeconomic impacts of drought, as well as the broad impacts on ecosystems across the state.” – John Andrew, Assistant Deputy Director, California Department of Water Resources
- “There is an adequate amount of technology available to accurately monitor and manage water usage and drought, but much of this technology is stuck at a very high level of decision making and is not trickling down to the state or local level.” – Jay Famiglietti, Senior Water Scientist, NASA Jet Propulsion Laboratory, California Institute of Technology

Possible Solutions

- “Through satellite monitoring, quantification of fallowed farmland is possible. This information can be used to assess where the impacts of drought are most severe for local populations, leading to increased efficiency in mobilizing emergency aid for those out of work.” – Richard Howitt, Professor Emeritus, UC Davis Center for Watershed Science
• “Comparing cropping patterns with satellite-measured evaporation information provides insight into crop specific water use estimates. Increased understanding of crop water use allows producers to create more accurate water budgets.” – Richard Howitt, Professor Emeritus, UC Davis Center for Watershed Science

• “Some of the most innovative practices to manage agricultural water usage are not coming in the form of new irrigation technology, but rather in fostering soil health. Increasing organic matter gives soil the ability to absorb carbon and act like a sponge for water, reducing the amount of irrigation required to sustain a healthy crop.” – Daniel Fullmer, Western Project Coordinator, National Young Farmers Coalition

• “The difference between 1.5% organic matter and 2.5% in soil can make huge impacts on soil health. The best farmers are able to get up to 11% organic matter. Simply reducing tillage or implementing rotation grazing on a pasture allows for drastic reductions in water usage.” – Daniel Fullmer, Western Project Coordinator, National Young Farmers Coalition

• “NASA GRACE (Gravity Recovery and Climate Experiment) allows us to measure groundwater depletions using changes in gravity. Water management focuses more on surface water allocations than groundwater. This is evident by a recent GRACE study on the Colorado River Basin that found that groundwater depletions are exceeding surface water depletions at a rate of 6 to 1.” – Jay Famiglietti, Senior Water Scientist, NASA Jet Propulsion Laboratory, California Institute of Technology

Technology and Innovative Approaches

Findings and Observations

• “We utilize a variety of different high-tech tools to assess the water status of our vineyards and soil. The issue is that as soon as that measurement is taken, it becomes historical information. While historical information is useful, ideally we need to be able to plan irrigation using more accurate weather and climate forecasting and, if need-be, adjust irrigation practices to meet the forecasted water requirement of the vines.” These irrigation planning tools allow us to use the correct amount of water to achieve our quality goals and not over irrigate. – Keith Horn, Senior Director of Grape Management, Constellation Wines

• “Long-term water availability is governed by the volume of precipitation which is captured and stored. In periods of extended dryness, the precise management of stored water for maximum beneficial use becomes a very high priority.” – Damien Pearson, General Manager, North America, Rubicon Water

• “Pistachio growers are very data sensitive. The amount of water applied isn’t the only consideration; when it is applied is just as important. We have GIS systems and weather monitoring systems in place, but in terms of seasonal planning it comes down to predictions. We don’t use seasonal climate forecasts or weather forecasts that go beyond a week because the skill just isn’t there to inform farming preparation.” – Bill Phillimore, Executive Vice President, Paramount Farming
“Going forward, water needs to be allocated and managed to its highest and best use. The U.S. Fish and Wildlife Service deemed that Westland Irrigation District water canals were best used for migratory waterfowl habitat, and now we irrigators are dealing with the repercussions of that decision. Increased irrigation efficiency is decreasing the need for drainage and return flows, in turn creating a problem with saline water coming in from the Delta.” - John Diener, President, Red Rock Ranch

Possible Solutions

- “Our vineyards are irrigated by two independently-operated drip irrigation systems. One hose serves as baseline irrigation for the entire vineyard, while the second system targets areas that have been historically weak in production, or have an especially high rate of evapotranspiration. This allows us to efficiently target our water usage to areas that need it the most.” – Keith Horn, Senior Director of Grape Management, Constellation Wines

- “We use a pressure baum which measures the amount of gas pressure that it takes to move sap out of a leaf petiole in a vine. That indicates the plant’s water stress.” – Keith Horn, Senior Director of Grape Management, Constellation Wines

- “In Australia’s Murray-Darling Basin, there are now 1,875 miles of automated primary canals with nearly 12,000 automated gates and meters that inform the computer command control system. Increased efficiency and reduced spillage from system automation has made an additional 344,250 acre-feet of water per year available to irrigators.” – Damien Pearson, General Manager, North America, Rubicon Water

- “Additional science is needed to make farming more efficient. Land grant universities have an obligation to translate high level scientific research into a useable form on the farm. Many of these universities have strayed from that mission. A lot of time and money is being spent on science, but it is not being made relevant to the economics of agricultural operations.” – Bill Phillimore, Executive Vice President, Paramount Farming

- “In western California, there are millions of acre-feet of groundwater that are not being utilized due to a high level of total dissolved solids. In the past it was not economically feasible to desalinate this water, but now we have the ability to recover 80-90% of this water through desalination processes.” – John Diener, President, Red Rock Ranch

- “In Utah, certain river systems are automated and managed in real-time by a water users group. The automated system provides real-time measurements and monitoring of water conditions on the river. This measure was largely funded by private sources, and has drastically increased transparency of water use and reduced water related conflicts.” – Warren Peterson, Vice President, Utah Farmland Reserve Inc.

- “Our farms have GIS maps of each of the 128 pivots we use in irrigation. All of these pivots are computer-controlled and monitor soil conditions in real-time as they irrigate. As the pivot travels the composition of the soil is monitored and the amount of water used is adjusted in real-time to meet the needs of that specific soil.” – Sam Routson, Chief Administrative Officer, Winnemucca Farms

Policy Approaches and Obstacles
Approaches

- “In Nevada, the Piñon-Juniper woodland is a highly invasive nuisance on rangelands. It has not been managed well and is becoming a monoculture, taking over traditional sagebrush steppe habitat. 40% of rainfall is intercepted by juniper canopy, meaning less water available to those plants remaining native plants in the understory.” – J.J. Goicoechea, Nevada Sagebrush Ecosystem Council and Eureka County, Nevada
- “The time for difficult decisions is coming to bear. The Diamond Valley Basin in Nevada is drastically over-appropriated. To sustain water use in the future, roughly 60% of consumptive use in the basin must disappear. If that 60% comes in the form of fallow farm land, the economy will falter. The reality is decisions like this will need to be made in the future, and the sooner you can get ahead of them the better.” J.J. Goicoechea, Nevada Sagebrush Ecosystem Council and Eureka County, Nevada
- “There is almost no new money being appropriated, so agency collaboration needs to increase to make the most of the most of the current funds. The National Drought Resilience Partnership is a taskforce of seven federal agencies that meets weekly to discuss the best use of resources.” – Oscar Gonzalez, California State Executive Director, USDA, Farm Service Agency
- “The federal government certainly has a role to play in all of this, but it is going to take organization from the agricultural community as well. Local leaders need to know exactly where to go, and how to tap in to USDA resources.” – Oscar Gonzalez, California State Executive Director, USDA, Farm Service Agency

Obstacles

- “Due to increasing environmental rules and policies stemming from the federal government, in an average water year Westlands Water District irrigators may only receive 35-40% of their legal allotment of water. Today, the largest user of Central Valley Project (CVP) water is the U.S. Fish and Wildlife Service. More than 20% of water in the system is managed for environmental purposes. It’s not that there isn’t available water, it is just tied up in regulation.” – Tom Birmingham, General Manager, Westlands Water District
- “When you have multiple federal agencies all trying to manage the same area, each federal agency looks at its own responsibilities without regard to other impacts, even environmental ones. For example, the U.S. Fish and Wildlife Service found that CVP reservoirs would jeopardize delta smelt and recommended specific water management actions to combat that. Six months later, NOAA Marine Fisheries Service found that the actions recommended by U.S. Fish & Wildlife Service would impact salmon health. You are left with a situation where if the Bureau of Reclamation complies with one opinion, it will violate the other.” – Tom Birmingham, General Manager, Westlands Water District
- “The Drought Monitor represents only hydrologic drought, not vegetative drought. Vegetative drought is far more important to rangeland grazing than hydrologic drought. Unfortunately the BLM makes decisions to limit grazing permits based on what the
Drought Monitor says without taking the Vegetation Drought Response Index into account.” – J.J. Goicoechea, Nevada Sagebrush Ecosystem Council and Eureka County, Nevada

Initiatives and Opportunities

- **Central Valley Project and State Water Project Drought Operations Plan and Operational Forecast** – In the midst of historic drought in California, the need for increased agency coordination became evident. The Drought Operations Plan is a collaborative effort between multiple state and federal agencies aimed at creating a unified operational plan that balances multiple water needs in times of extreme drought. The plan emphasizes the need to treat drought as an emergency crisis similar to other natural disasters, and provides a framework for transparent, inter-operational work.

- **NRCS Environmental Quality Incentives Program (EQIP)** – The NRCS has a variety of programs available that are designed to provide financial and technical assistance to agricultural producers. The EQIP program provides financial and technical support for structural or management based programs that will improve water quality and availability.

- **California – Australia Drought Dialogue** – The program titled G’Day USA is a series of events meant to bring together industry leaders, policy makers, and academics from the United States and Australia to discuss industry best practices on a variety of subjects. Australia has suffered from devastating drought in the Murray-Darling Basin over the past decade. G’Day USA meetings will create a dialogue and share lessons learned in collaboration and adaptive management in response to drought.

Resources and Technology

- **Nevada groundwater transfers** and temporary permitting.
- **California Governor’s Drought Task Force**
- **Vegetation Drought Response Index (VegDRI)**
- **LANDSAT** satellite vegetation monitoring
- **GRACE (Gravity Recovery and Climate Experiment)** satellite groundwater monitoring
- **Normalized Digital Vegetation Index (NDVI)** aerial sensing for vegetation richness
- **California Irrigation Management Information System (CIMIS)** automated weather stations and soil moisture monitoring.
- **United States Drought Monitor**