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Madame Chairman, Members of the Committee, thank you for the opportunity for the Congressional Research Service to provide testimony on western drought conditions and challenges facing water managers throughout the West. Ongoing western drought conditions present challenges to federal water managers – particularly the U.S. Department of the Interior's Bureau of Reclamation (Reclamation) – as well as to states, Indian tribes, localities, public and private utilities, and the private sector.

Following is a summary of West-wide drought conditions, a brief description of challenges water managers face in meeting the demands of the West's economy, population, and ecosystems, and a discussion of potential options for addressing some of these challenges. This testimony will focus on federal issues and options related to water management during drought. CRS does not take positions on legislative proposals or make recommendations to the Congress on legislative options or other action.

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West-wide Drought Conditions

Drought conditions vary greatly throughout the 17 Western states[2] – territory containing hundreds of Bureau of Reclamation (Reclamation) projects and millions of acres of federal land.[3] Drought conditions can persist for years or change rapidly with one large storm or high heat period.[4]

Current conditions:

As of May 26, 2015, roughly 51% of the contiguous 48-state land area of the United States of the country exhibited conditions ranging from abnormally dry to exceptional drought, and 26% of the area was experiencing levels of drought ranging from moderate to exceptional (see **Figure 1**).[5] However, much of the drought intensity is concentrated in the West. For example, nearly 75% percent of the land area in the 11 westernmost continental states is facing abnormally dry to exceptional drought conditions, and 57% of the area is facing moderate to exceptional drought.

Although the extent of drought has eased slightly from previous weeks, the number of people affected by drought has continued to grow. The U.S. Drought Monitor estimates that nearly 93 million people in the U.S. (nearly 30% of the population) are in areas affected by drought conditions; two weeks ago approximately 69 million (21%) were estimated to be in affected locations.[6]

[2] Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming.

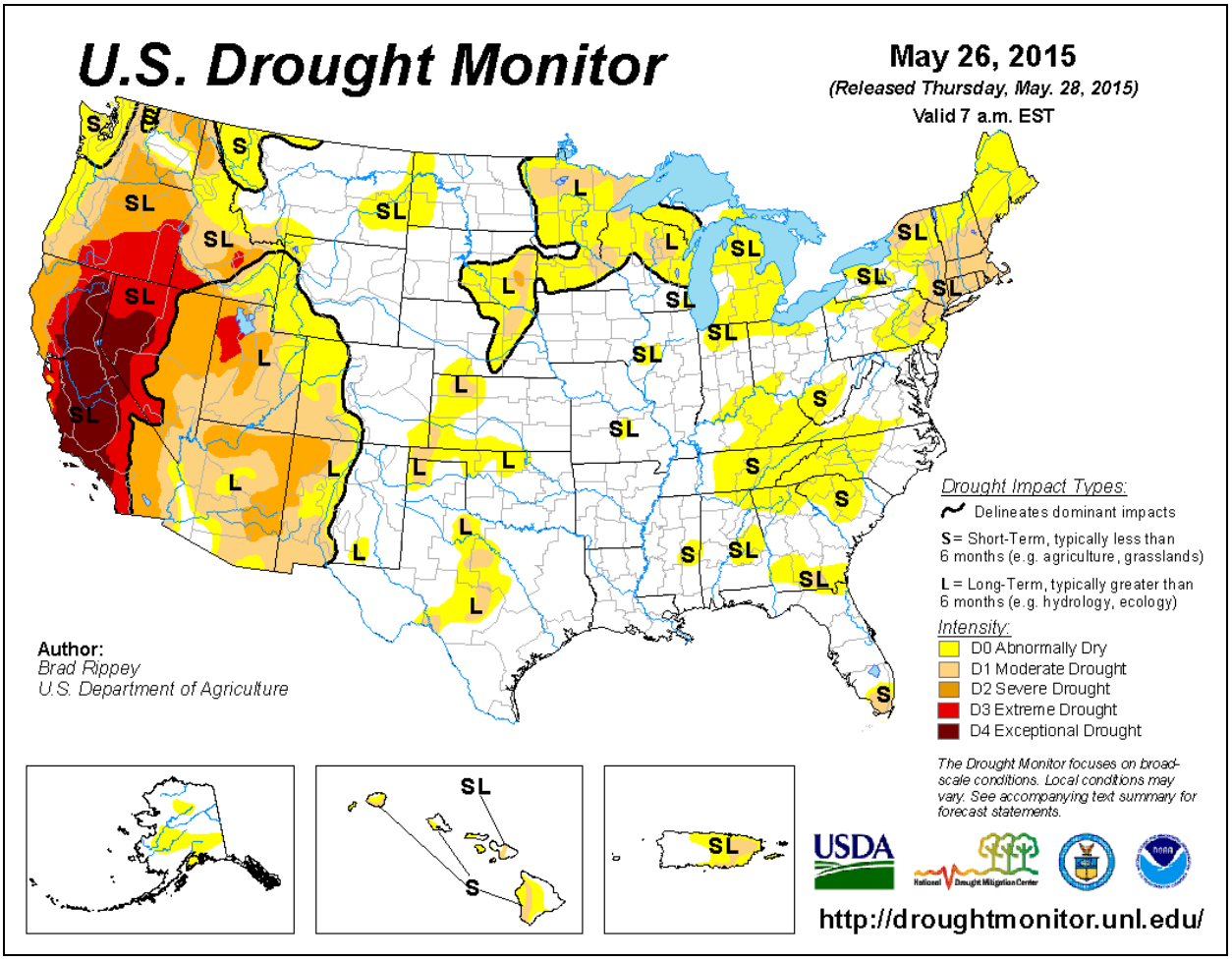
[3] Federal lands, especially in California and Nevada, have suffered multiple drought impacts including low water levels, growth in invasive species infestations, wildlife habitat damage, tree deaths, and a heightened risk of wildfire, among other effects. Tourist attractions such as Yosemite waterfalls and recreational boating at Lake Mead (NV) have also been affected, and water supply problems have temporarily closed some park facilities in recent years.

[4] U.S. Dept. of the Interior, Bureau of Reclamation, *Report on Western Water Conditions*, provided by e-mail to CRS on May 25, 2015.

[5] Approximately 46% of the land area including all 50 U.S. states and Puerto Rico were experiencing abnormally dry or worse conditions for the week of May 25, 2015, and 22.1% of all 50 U.S. states and Puerto Rico were experiencing moderate drought or worse.

[6] U.S. Drought Monitor and National Oceanic and Atmospheric Administration weekly congressional drought update, May 28, 2015 and May 21, 2015.

Figure 1. Drought in the United States

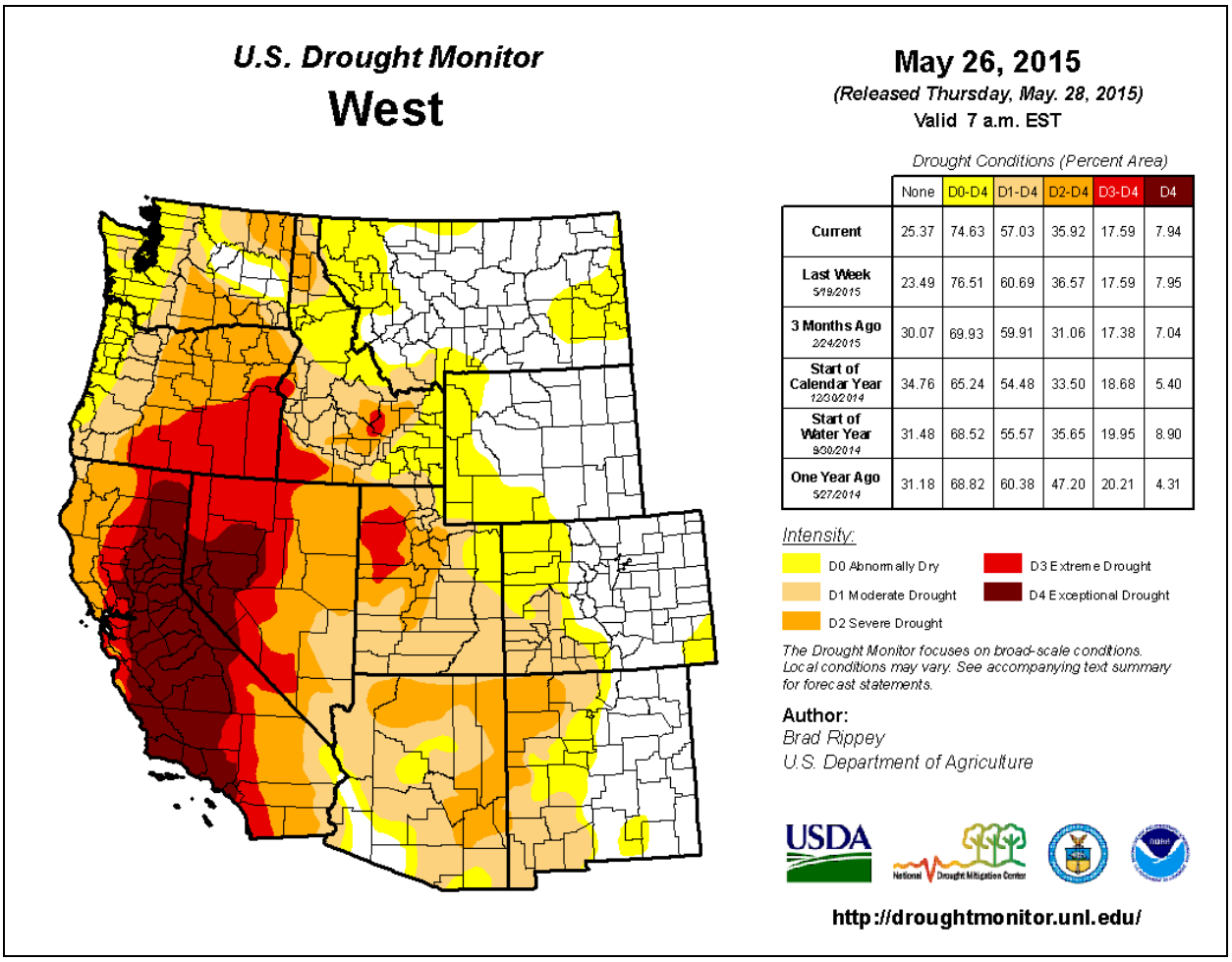


Source: The National Drought Mitigation Center, Univ. of Nebraska-Lincoln in partnership with the U.S. Dept. of Agriculture and the National Oceanic and Atmospheric Administration, Dept. of Commerce.

The most intense drought conditions are concentrated in California and western Nevada. Almost 47% of the land area in California is experiencing "exceptional" drought – the most intense category of drought described by the U.S. Drought Monitor (see **Figure 2**) – and nearly all of Nevada is experiencing at least moderate drought conditions, with 18% experiencing exceptional drought. Extreme drought conditions — the second-most intense category of drought — have extended to southern, central, and eastern Oregon, with pockets in Utah and Idaho as well. Moderate to severe drought conditions are affecting much of the remaining areas of the aforementioned states, as well as Arizona and Washington. The western edge of New Mexico is also experiencing moderate to severe drought, and the western edges of Colorado, Montana, and Wyoming are experiencing abnormally dry conditions with areas of moderate drought in

southwestern Colorado and southwestern Montana. By most metrics, however, California presently is the hardest hit by drought. Roughly 94% of the state is currently experiencing severe to exceptional drought conditions.

Figure 2. Drought in 11 Western States, May 26, 2015



Source: The National Drought Mitigation Center, Univ. of Nebraska-Lincoln in partnership with the U.S. Dept. of Agriculture and the National Oceanic and Atmospheric Administration, Dept. of Commerce.

While recent precipitation helped topsoil moisture conditions and reduced water demands in some areas, the relief provided by these storms to areas with entrenched long-term hydrologic drought, such as much

of California, is considered to be of negligible benefit.[7] In other areas, however, including parts of Colorado and Wyoming, some storms put a "meaningful dent" in drought conditions.[8]

Other recent observations put the nature of current western drought conditions in perspective. For example, the important overall set of conditions that has the longest-term impact is the combination of higher than average temperatures and lower than average precipitation. These two factors have contributed to record-low snowpack in some areas and early snowpack melting and runoff. For 7 western states (Arizona, California, Nevada, Oregon, Utah, Washington, and Wyoming), the 2015 statewide average temperature from January through March was the warmest on record in a 121 year period. In four others (Colorado, Idaho, Montana, and New Mexico), statewide average temperature was considerably above average.[9] At the same time, January through March precipitation was record driest or "much below average" in five western states and "below average" in six states (only two states were above average).[10] The combined effect of these conditions is exacerbating the effects of dry conditions from previous years, including low reservoir and groundwater levels and less water stored in snowpack, particularly for California, Nevada, Oregon and Washington.

Following are examples of how selected states are experiencing and coping with severe and extreme drought conditions:

- Following the record-low snow water content survey, the Governor of California on April 1, 2015, mandated a 25% reduction in water use for non-agricultural users. A statewide drought declaration made by the governor on January 17, 2014, also remains in effect and the U.S. Department of Agriculture (USDA) has announced disaster declarations for most California counties.

[7] U.S. Drought Monitor and National Oceanic and Atmospheric Administration weekly congressional drought update, May 28, 2015, p. 1.
[8] Ibid.
[9] http://www.ncdc.noaa.gov/sotc/service/national/statewidetavgrank/201501-201503.gif.
[10] http://www.ncdc.noaa.gov/sotc/service/national/statewidepcpnrank/201501-201503.gif.

- On May 15th, 2015, the Governor of Washington declared a statewide drought emergency. Within the state, 48 of 62 watersheds reported water supplies 75% of normal or below.[11] While the Puget Sound region (Seattle, Tacoma, and Everett) has sufficient water supplies and storage due to their reliance on rain rather than snowpack, agricultural areas in central and eastern areas will be strained by low water supplies, as will migrating fish in headwater streams. The state will be leasing water from some water rights holders to supplement in-stream flows for fish. A National Aeronautics and Space Administration (NASA) report states that Washington's snowpack is 16% of normal, and that will likely lead to the lowest yearly runoff in 64 years.[12]

- The Governor of Oregon has declared a drought emergency for 15 of Oregon's largest counties, covering approximately two-thirds of the state.[13] Oregon's snow surveys indicate that snowpack is 11% of normal, the lowest level since 1992.[14] Low snowpack raises concern for a water crisis that could lower crop yields, increase wildfire, and affect fisheries. According to the U.S. Drought Monitor, approximately 86% of the state is in some type of drought, with 34% in extreme drought.

- The Governor of Nevada has established a drought forum to coordinate drought information and response, and has called on state agencies to audit water usage and to conserve water. Local governments and private citizens are also encouraged to conserve water as the state endures its fourth year of drought.[15] All 17 counties of Nevada are under a USDA drought emergency declaration.

Drought Outlook:

Figure 3 shows the extended *seasonal* drought outlook for May 21, 2015, through August 31, 2015. The forecast is for drought conditions to persist or even intensify throughout the far West, and ease slightly or even ease completely in some areas as one moves east from western Idaho, Utah, and Arizona. Many areas of the far western states are entering their seasonally dry months – although this differs for central

[11] See: http://www.ecy.wa.gov/drought/.

[12] See: http://earthobservatory.nasa.gov/IOTD/view.php?id=85887&src=eorss-iotd.

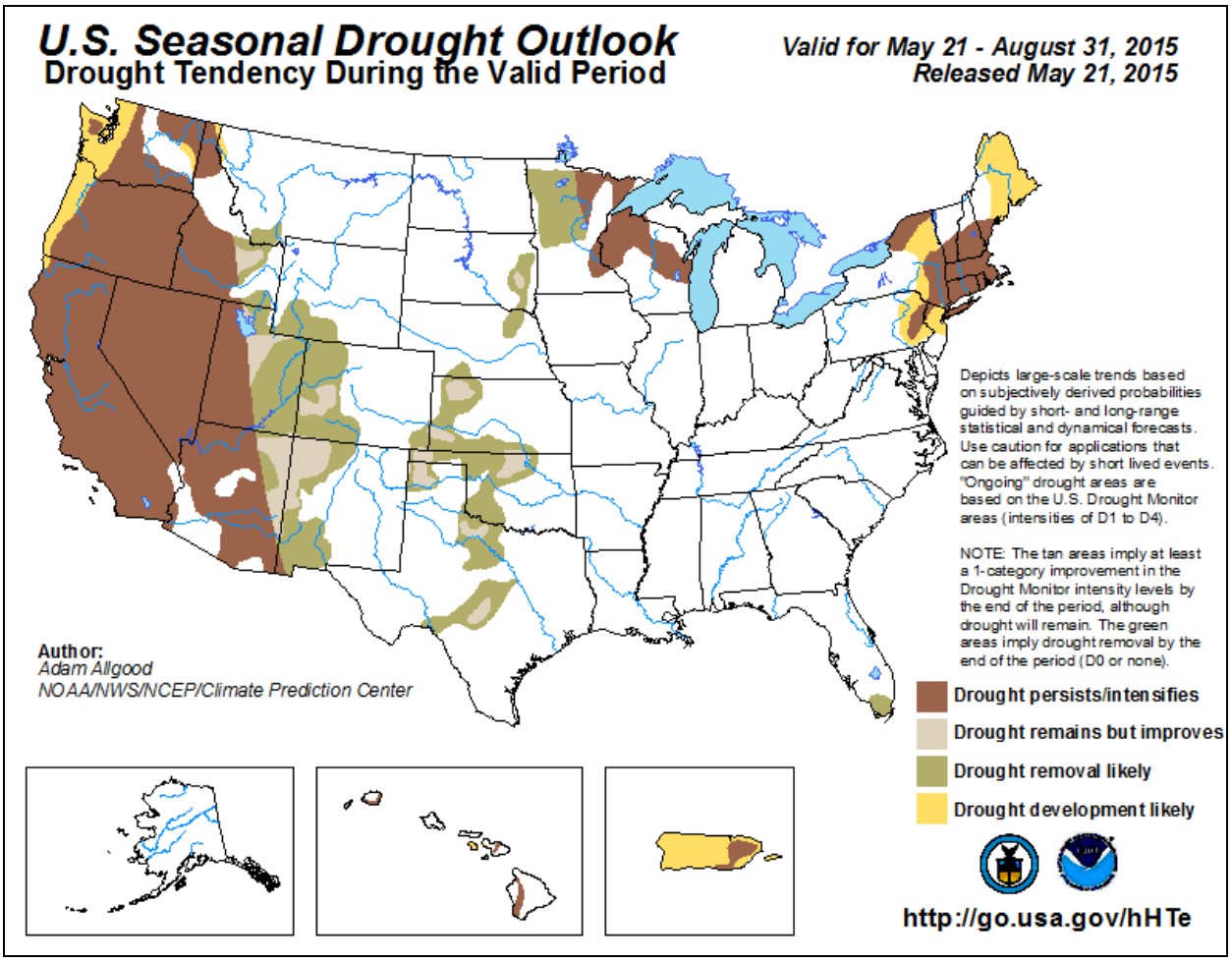
[13] See: http://www.oregon.gov/owrd/pages/wr/drought.aspx#Governor_Drought_Declarations.

[14] See: http://earthobservatory.nasa.gov/IOTD/view.php?id=85887&src=eorss-iotd.

[15] See: http://drought.nv.gov/uploadedFiles/droughtnvgov/Content/News/EO_2015-03_OrderEstablishingNevadaDroughtForum.pdf.

and northern plains states, where May is often one of the wettest months[16] and summer storms can also bring heavy precipitation.

Figure 3. U.S. Seasonal Drought Outlook



Source: U.S. Dept. of Commerce, National Weather Service, Climate Prediction Center, http://www.cpc.ncep.noaa.gov/products/expert_assessment/mdo_summary.html.

Long-term predictions (more than 3 months) are more difficult to make, due to the complexity in weather forecasting, including the large number of variables involved.

[16] U.S. Dept. of Commerce, National Weather Service, Climate Prediction Center, *Discussion for the Monthly Drought Outlook*, May, 2015: http://www.cpc.ncep.noaa.gov/products/expert_assessment/mdo_discussion.html. The June outlook will be available May 31st, 2015.

Additionally, the relationship between climate change and future drought trends is complex, and the scientific understanding of this dynamic appears to be evolving. While it is especially difficult to forecast droughts on a regional basis, many projections indicate that portions of the West are likely to get drier. Although parts of the United States have experienced severe and long-lasting droughts in the past, a combination of increased dryness and warmer temperatures with rising demand on supplies may magnify the effects of any particular drought.

Challenges for Western States

Western states, Indian Tribes, local governments, and the private sector face many challenges when addressing drought. In addition to challenges for municipal and industrial (M&I, or urban) water suppliers (including public health and safety) and agricultural water and irrigation districts, states and localities dependent on agricultural income, recreation (including boating, fishing, hiking, etc.), energy production, commercial fishing, and other industries that depend in part or heavily on water resources may suffer from reduced water supplies in times of drought. In addition, drought can alter natural systems such as wetlands, streams, lakes, and habitat for fish and wildlife, such as flyways used by migratory birds.[17] Additionally, there are often many indirect or unanticipated and long-lasting impacts of drought, such as soil compaction and subsidence, which can affect the capacity of groundwater aquifers, saline water intrusion at coasts and estuaries, changes to soil structure and health, wildfire potential, and expansion of invasive species.

Drought can take a fiscal toll on state budgets in terms of income and revenues, and also on expenditures to help workers, communities, and industries as they adjust to drought impacts. From a water

[17] Lack of open water concentrates migratory waterfowl into the remaining open water. The loss of migratory habitat in an important stopover area will affect waterfowl populations hundreds or thousands of miles away. The drought conditions in the West have resulted in fewer flooded rice fields, and less open water generally. Moreover, abnormally high concentrations of birds facilitate spread of disease such as avian influenza. According to USGS (see link below) the highest wildlife mortality from avian influenza in 2014 in the U.S. occurred at Tule Lake National Wildlife Refuge, where loss of over 6,000 waterfowl was documented. Survivors could spread the disease further; however, a cause was not cited in the press release. (http://www.nwhc.usgs.gov/publications/other/fwa/AFWA%202015%20Mar%20Report.pdf).

management standpoint, demands for state assistance in drought planning, mitigation, and response may greatly increase during times of drought, especially as drought intensifies. At the same time, public and private water utilities can see revenues decline at the local level since revenues are largely based on deliveries of water to consumers, which may be reduced during drought. States also are often called upon by local jurisdictions to issue county and state-wide drought declarations. U.S. Department of Agriculture (USDA) emergency drought declarations are made for counties based on conditions reported in the U.S. Drought Monitor.[18] Such federal declarations make available emergency loans designed to partially compensate for losses for producers who cannot obtain commercial credit.[19]

Because of the states' primary role in surface and groundwater allocation, states and local water entities typically lead efforts to prepare for drought. Such preparations usually fall primarily on state and local government planners, water managers, and public and private utilities.[20] Even without drought conditions, the Government Accountability Office (GAO) previously found that 80% of state water managers who were surveyed in an audit between 2012 and 2014 expected water shortages in some part of their respective states within 10 years.[21] According to these managers, their key concerns related to freshwater availability and use centered on:

- population growth;
- lack of information on water availability and use;
- energy sector water needs and effects on water quality;
- potential impacts of climate change; and,

[18] See: http://www.fsa.usda.gov/FSA/newsReleases?area=newsroom&subject=landing&topic=pfs&newstype=prfactsheet&type=detail&item=pf_20120720_insup_en_ed_desigp.html.

[19] For more on the topics of emergency drought declarations and agricultural and non-agricultural assistance, see CRS Report R40532, *Federal Crop Insurance: Background*, by Dennis A. Shields, and CRS Report R43408, *Emergency Water Assistance During Drought: Federal Non-Agricultural Programs*, by Nicole T. Carter, Tadlock Cowan, and Joanna Barrett. See also: http://www.usda.gov/wps/portal/usda/usdahome?navid=DISASTER_ASSISTANCE.

[20] The National Drought Mitigation Center provides and collects information on state drought plans. See, http://drought.unl.edu/Planning.aspx.

[21] U.S. Government Accountability Office, *Freshwater: Supply concerns Continue, and Uncertainties Complicate Planning*, GAO-14-430, May 2014, http://www.gao.gov/assets/670/663343.pdf.

- effects of extreme weather events (including droughts and floods).

With respect to drought, managing water supplies during scarcity, including groundwater resources, and ensuring public health and safety are perhaps the largest challenges for states and local water managers.

Challenges Facing the U.S. Bureau of Reclamation

Challenges facing the Bureau of Reclamation are similar to those facing state and local water resource managers – growing populations in its service areas, effects of extreme events, and uncertainties involving climate variations and climate change. However, what sets Reclamation apart is its widespread and diverse set of water projects and facilities, ranging from very large dams to smaller diversion dams and delivery facilities, throughout the 17 western states. Because of the diversity of these projects, Reclamation's challenges are likely to vary across regions. For example, large projects in many states (e.g., Arizona, California, and Washington) and water basins (e.g., Colorado, Columbia, Missouri, and Sacramento River Basins) may involve hundreds of stakeholders and multiple jurisdictions, while smaller projects – particularly single purpose projects – may involve fewer stakeholders and interests.

Drought challenges for Reclamation's large, multi-purpose projects are particularly notable because they may involve balancing multiple objectives across multiple states or parts of states, such as flood control (for acute rain events, even during drought), water supply for agriculture and urban use, energy production, recreation, and species needs.

For example, the size of the Colorado River Basin and number of people using its water and related resources present a management challenge even in times of no scarcity.[22] Current challenges facing

[22] The Colorado River Basin covers approximately 246,000 square miles in seven states. It provides water to approximately 40 million people and 4 million acres of farmland. Hydropower facilities on the river generate on average enough electricity to supply 5 million homes. Water from the river is shared among the seven upper and lower basin states, 23 Native American tribes, the federal government, and Mexico. Reclamation has multiple large dams and diversion facilities on the main stem of the Colorado River, as well as numerous projects throughout the Colorado Basin.

Reclamation with respect to the Colorado Basin are how to accommodate existing and new demands, including growing populations while complying with federal law, such as the Endangered Species Act (ESA) and Clean Water Act, all in the face of long-term water supply shortages.[23] Because of the successive drought years in the Colorado River Basin, Lake Mead as of May 26, 2015, was at 37% of historical capacity, just two feet above the elevation (175 feet above sea level) that would trigger shortages for some water users at the beginning of the calendar year. Lake Powell was at 46% of capacity.[24]

Recent projections by the Bureau of Reclamation indicate that by 2017, water levels in Lake Mead could be low enough to trigger a "level one" shortage on the river (a more definitive projection will be made in August 2015).[25] A level one shortage could result in significant reductions to Colorado River water diversions for Arizona and Nevada (11.4 % and 4.3 %, respectively) and would also affect California water users. Further, reductions in hydropower generation may occur if conditions worsened under some of the scenarios studied by Reclamation. Direct and secondary effects from these reductions would likely be significant. Previous studies by Reclamation have projected a long-term imbalance between Colorado River demand and the supplies available to meet them. A 2012 study by Reclamation projected long-term imbalances in supply and demand of approximately 3.2 million acre-feet per year.[26]

[23] Currently the Colorado Basin is in the midst of a long-term, 15-year drought. The combined water stored in system reservoirs has declined 50% since year 2000, and this trend has been observed to be persisting, if not worsening. Snowpack conditions in the Upper Basin this past winter were among the lowest on record, and average 2015 temperatures from January –March were the highest in the 121 year record for five of the seven basin states. As a result, record low runoff volume is expected in many areas through July.

[24] See: http://www.usbr.gov/lc/riverops.html, and http://www.usbr.gov/lc/region/g4000/weekly.pdf.

[25] See: http://www.eenews.net/greenwire/stories/1060018790/search?keyword=colorado+river.

[26] http://www.usbr.gov/lc/region/programs/crbstudy/finalreport/. define an acre-foot.

These scenarios represent huge challenges to Reclamation as it balances the competing uses and demands on water from its many facilities in the Colorado River Basin. Reclamation and the Secretary of the Interior, in coordination with Colorado River water users, have taken steps to address these challenges.[27]

Another example of challenges to large projects is the complexity of factors affecting management of the Central Valley Project (CVP) in California. Exceptional drought in much of the state has resulted in low reservoir levels, historically low snowpack, significant cutbacks to agricultural water users and municipal and industrial (M&I or urban) water users, and a lack of adequate in-stream flows and suitable water temperatures for migrating fish. For example, some water users – those with relatively junior state water rights – are projected to receive no water deliveries from the CVP this year. Senior water rights users have also had their water deliveries curtailed. Meanwhile, surveys show that Delta Smelt listed as threatened under the ESA are at record lows and 95% of one salmon runs' eggs are estimated to have been lost due to high water temperatures in California streams.[28]

Recent major reservoir levels in California are shown in **Figure 4**. In addition to hydrological conditions, major factors affecting CVP water deliveries include a complex combination of state and federal laws and regulations, many of which are related to protection of resources and water quality in the area known as the Bay-Delta (San Joaquin and Sacramento Rivers' confluence with San Francisco Bay). These laws and regulations include requirements for maintaining a salinity barrier and protecting fish and wildlife habitat, specific flow and reservoir release requirements of federal biological opinions on coordinated operations of CVP and the State Water Project (SWP), provisions of the federal Central Valley Project Improvement

[27] For example, recent efforts have been launched to reduce demand and increase supplies on the Colorado River, including a 2007 agreement among the seven basin states for improved coordination and balance of storage between Lakes Mead and Powell, that planned for shortage allocations among the lower basin states, and created a new category of surplus water (Intentionally Created Surplus, or ICS), which allows users to receive credit for conservation and fallowing. Reclamation and stakeholders have also started a new Colorado River System Conservation program, and recently released phase 2 of the "Moving Forward" report on the Colorado River, which documents opportunities and potential actions to address the future water supply and demand imbalances projected in the 2012 Colorado River Basin Water Supply and Demand Study.

[28] John McManus, Dick Pool, and Randy Repass, et al., *The Impact of the California Drought on Salmon*, Golden Gate Salmon Association, handout from presentation for congressional staff, April 15, 2015, p. 1. See also, infra 29.

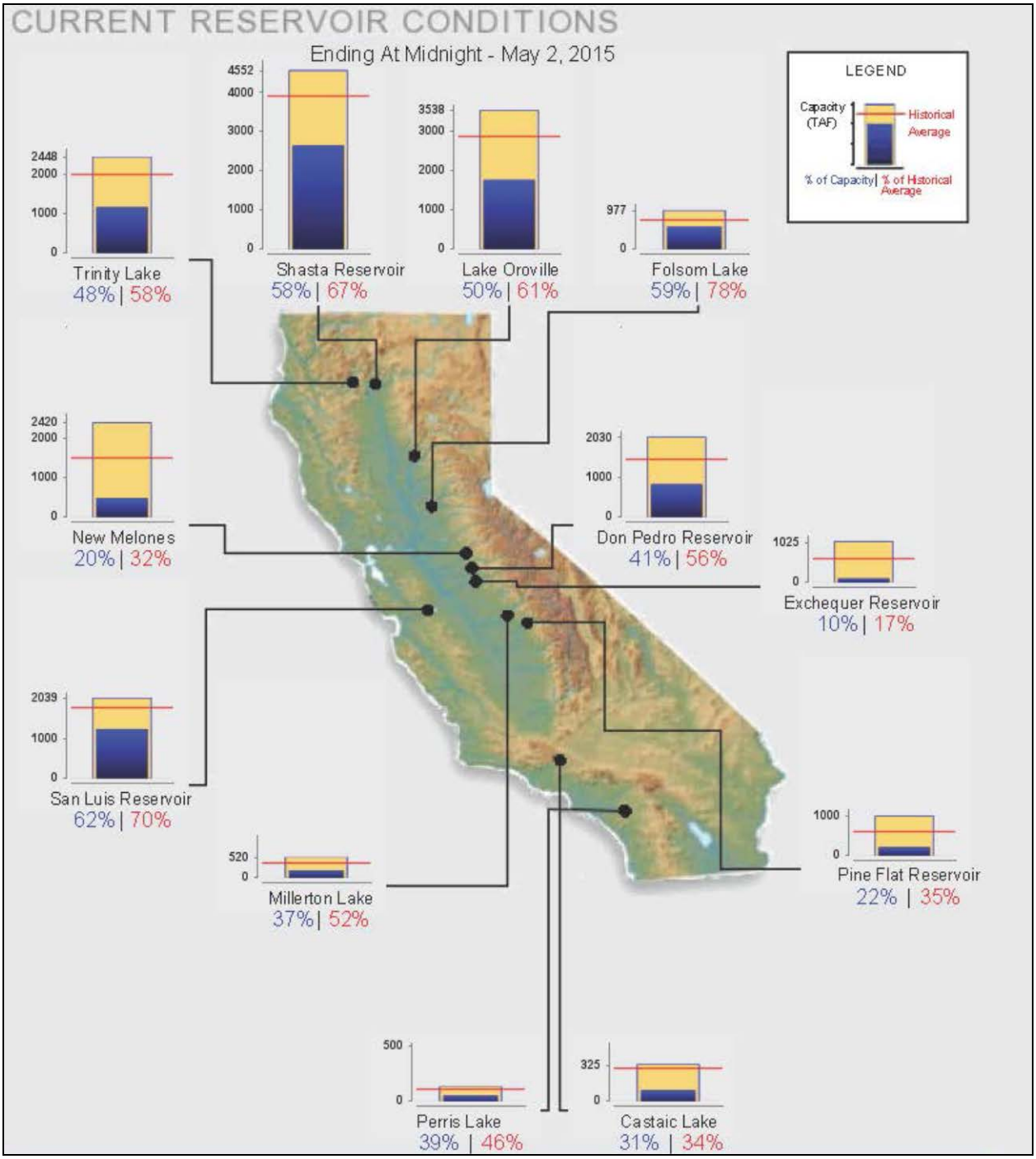
Act, and the state's system of water rights priorities, which in part underlie Reclamation contracts for water deliveries. The amount of influence that each of these factors has from year to year – and within the year – varies. For example, in some years, pumping regimes adopted for ESA compliance can significantly affect water diversions (exports) from the Bay-Delta to areas south; in other years, the percentage reduction due to ESA compliance is much smaller.[29] Relatedly, at many times during the year state water quality standards appear to be the controlling factor for Delta exports.[30] All of the combined factors above have contributed to some south-of-Delta water users consistently receiving less than full water deliveries from the CVP in recent years.[31]

[29] For example, see: response of Michael C. Connor, Deputy Secretary of the Dept. of the Interior at a House Interior, Environment, and Related Agencies Subcommittee budget hearing on February 25, 2015. (http://www.eenews.net/eedaily/2015/02/26/stories/1060014067.)

[30] See for example: California Water Boards, State Water Resources Control Board, Regional Water Quality Control Boards, *2015Drought Water Project Operations*, PowerPoint presentation, pp. 2-3.

[31] For example, regardless of the exact causes behind differences in annual export reductions, CVP agricultural water service contractors south-of-the-Delta have received less water than contracted for in most of the last 15 years, even with record high combined exports during this time. (See: U.S. Dept. of the Interior, Bureau of Reclamation, *Total annual Pumping at Banks, Jones, and Contra Costa Pumping Plants 1976-2014 (MAF)*.)

Figure 3. Status of Surface Water Storage in Reservoirs in California as of May 2, 2015



Source: California Department of Water Resources, California Data Exchange Center, Current Conditions for Major Reservoirs, http://cdec.water.ca.gov/cgi-progs/products/rescond.pdf.

Smaller Reclamation projects also are facing drought-related challenges. For example water delivery cutbacks have been announced or are projected for the Yakima basin (WA), the Rio Grande Project (NM), the San Juan-Chama Project (NM), and the Newland's Project (NV).

Legislative Options for Addressing Drought

There is a wide range of options for addressing drought. Observed broadly, options for addressing drought can be categorized as those that are supply-driven; those that address demand management; those that provide for coordination of federal agency activities or address governance or institutional issues; and those that fund research, planning, and monitoring activities that support state and local efforts.

Supply Options

Supply-driven options include developing or facilitating new water supplies or augmenting existing supplies, such as constructing surface and groundwater storage projects, water reuse projects, and desalination projects, and facilitating water conservation and efficiency programs.

Historically, the federal approach to addressing the arid West's seasonal and multi-year variability in water availability was to improve the reliability of supplies through construction of large federal water storage and conveyance systems – a supply driven approach. For example, the Bureau of Reclamation – whose original mission was to "reclaim the Arid West" – was established following a series of droughts in the late 1800s.

Today, the opportunities for such supply and conveyance systems are fewer than they once were, and their costs are significant. Any option to expand supplies – whether through surface or groundwater storage, desalination, or reuse – is likely to be considerably more expensive than water developed through decades-old Reclamation projects.[32]

[32] See for example ongoing surface water storage studies for California: California Department of Water Resources, *North-of-the-*
(continued...)

Project evaluations have also become more complex and lengthy as a result of increased public awareness of the environmental costs of large water supply projects and enactment of laws such as the federal ESA, Clean Water Act, and others. This has led some observers to suggest streamlining or removing federal regulations that may inhibit new water supply projects or restrict operations of existing projects. Different perspectives on how to balance water resource development and natural resource protection is often at the heart of the debate surrounding new surface storage proposals, as well as debate on changing implementation of federal laws and regulations.

Also on the supply-side are proposals for expanding the federal role or financing water reuse and desalination projects. Water reuse/recycling project costs are also expensive, with costs in California estimated to range from $300-$1,300 per acre-foot,[33] while for seawater desalination projects in California, the reported range per acre-foot is $1,600-$3,000. [34] A question often raised is what should be the federal role in such projects.

Options for developing new federal water supply projects also face the twin hurdles of enacting new appropriations and complying with earmark policies for site-specific projects. Because of these challenges, some have called for an annual report and authorization process for Reclamation similar to the requirements enacted for the Corps of Engineers in last year's Water Resources Reform and Development Act (P.L. 113-121). To address funding issues, some call for the formation of private-public partnerships,

(...continued)

Delta Offstream Storage Preliminary Engineering Design and Cost Estimate, Dec 2013, p. 4-9. http://www.water.ca.gov/storage/northdelta/prelim_admin_draft_EngineeringDesign_index.cfm; and, Bureau of Reclamation, *Upper San Joaquin River Storage Investigation Draft Feasibility Report*, Jan 2014, http://www.usbr.gov/mp/sccao/storage/docs/Draft_Feasibility_Report_2014/USJRBSI_Draft_FR_2014_Full_Report.pdf. For current CVP water rates see: Bureau of Reclamation, *Schedule of Irrigation Contract, Cost of Service, and Full Cost Water Rates per Acre-Foot by Contractor, 2015 Irrigation Water Rates*, Schedule A-1, 2015, http://www.usbr.gov/mp/cvpwaterrates/ratebooks/irrigation/2015/IRR_2015_Sch_A-1_F.Z17.pdf. These costs do not include certain "special" rates, which are explained in detail at http://www.usbr.gov/mp/cvpwaterrates/ratebooks/special/2015/index.html.

[33] California Natural Resources Agency, Department of Water Resources, *California Water Plan, 2013 Update*, Bulletin 160-13, p 12-25. http://www.waterplan.water.ca.gov/cwpu2013/final/index.cfm#Volume1. Hereafter *California Water Plan.*

[34] *California Water Plan*, Vol. 3, Ch. 10, p 10-37. Earlier estimates by the WateReuse Foundation estimate costs as low as $1,000 per acre-foot. Desalination costs are very location specific for a variety of reasons, including dependence on electricity or other and land costs. For more on this topic, see: CRS Report R40477, *Desalination and Membrane Technologies: Federal Research and Adoption Issues*, by Nicole T. Carter.

authorization of non-federal funding or private development of projects, and creation or reactivation of federal loan programs.

Demand Management Options

Options for demand management include providing incentives and technical and financial assistance for conservation programs (e.g., for irrigation and urban water use efficiency), water pricing reform (e.g., through tiered or increased block rate pricing, full-cost pricing, etc.), and restrictions or limits on water use. Often these options are pursued at the local level; however, they may be supported by federal programs.

Governance or Institutional Options

Other options include those that involve governance or institutional structures at various levels, such as drought task forces, commissions,[35] councils,[36] or water transfer mechanisms, such as water banks or water markets. Many observers have called on federal and state governments to facilitate water transfers or water markets and banking as a way of augmenting water supplies for those who are willing and able to pay more for their water. These mechanisms aim to match available water supplies with changing demands.

While several states (e.g., California, Colorado, Idaho, and Texas) support transfers and have active water markets, others do not. A difficulty when considering legislation involving the federal government in this issue area is that historically, although the federal government itself may hold water rights, it has largely deferred to states primacy in water allocation, and state water rights systems and water codes typically

[35] Congress established a National Drought Commission in 1998. The commission reported its findings in 2000 and was then disbanded.

[36] Congress considered, but did not enact, legislation in the 108th and 109th Congresses (The National Drought Preparedness Act, S. 1454 and S. 802, respectively), which would have established a National Drought Council to develop a national drought policy and fund development of drought preparedness plans for states, tribes, and local entities, as well as other recommendations of the 2000 National Drought Commission report. Some of the commission recommendations were enacted in separate legislation, which created the National Integrated Drought Information System (P.L. 109-430).

govern whether water can be leased or transferred and under what terms and conditions (although federal laws may also apply). Where the federal government may have a larger role to play is in policies or legislation affecting access to, transfer, or marketing of water from federal facilities (e.g., Bureau of Reclamation or U.S. Army Corps of Engineer reservoirs). For example, under the CVPIA, Congress authorized transfer of water outside the CVP service area and specified conditions and reporting requirements for such transfers, some of which water users have proposed streamlining or eliminating. A related option is to pay voluntary water users to forego water use (e.g., land fallowing or purchase of tainted lands) for use as in-stream flows or for use by other water users willing to pay such costs.[37]

Other Options for Supporting Local Efforts

Lastly, options that support research, planning, and monitoring activities that support state and local efforts might include financial support or incentives for improved water related technologies (e.g., improved desalination and water reuse technologies, efficient irrigation technologies, etc.), providing regulatory relief or streamlining of laws and regulations, and coordinating federal agency activities.

Conclusion

The challenges of cost, the differences in state and federal roles in water allocation decisions, and congressional budget and procedural issues in part highlight challenges in federal response to drought. In recent decades this federal response has been predominantly limited to providing financial assistance to farmers and ranchers through U.S. Department of Agriculture (USDA) programs; providing research, planning and technical assistance through various federal agencies; improving federal drought science and information collection and dissemination; and coordinating federal activities with states and local

[37] For example, the State of Washington is leasing back water rights from farmers in order to keep some water in streams for fish passage. Additionally, Reclamation has studied the option of voluntary buy-out of drainage lands impaired by selenium in the San Joaquin Valley. Such actions can free up water for other uses, depending on policy goals.

governments and entities. Whether the federal government should continue and/or expand these policies, or pursue other legislative options, is likely to be a matter of ongoing debate.

This concludes my testimony. I am happy to take questions.