

April 29, 2016

**NOTICE OF REGULAR MEETING OF THE
COLORADO RIVER BOARD**

NOTICE IS HEREBY GIVEN pursuant to the call of the Chairperson, Dana B. Fisher, Jr., by the undersigned Executive Director of the Colorado River Board of California that a regular meeting of the Board Members is to be held as follows:

Date: Wednesday, May 11, 2016
Time: 10:00 a.m.
Place: Vineyard Room Holiday Inn Ontario Airport 2155 East Convention Center Way Ontario, CA 91764-4452 Tel: (909) 212-8000; FAX: (909) 418-6703

The Colorado River Board of California welcomes any comments from members of the public pertaining to items included on this agenda and related topics. Oral comments can be provided at the beginning of each Board meeting; while written comments may be sent to Mr. Dana B. Fisher, Jr., Chairperson, Colorado River Board of California, 770 Fairmont Avenue, Suite 100, Glendale, California, 91203-1068.

An Executive Session may be held in accordance with provisions of Article 9 (commencing with Section 11120) of Chapter 1 of Part 1 of Division 3 of Title 2 of the Government Code and in accordance with Sections 12516 and 12519 of the Water Code to discuss matters concerning interstate claims to the use of Colorado River System waters in judicial proceedings, administrative proceedings, and/or negotiations with representatives from other states or the federal government.

Requests for additional information may be directed to: Ms. Tanya M. Trujillo, Executive Director, Colorado River Board of California, 770 Fairmont Avenue, Suite 100, Glendale, CA 91203-1068, or 818-500-1625. A copy of this Notice and Agenda may be found on the Colorado River Board's web page at www.crb.ca.gov.

A copy of the meeting agenda, showing the matters to be considered and transacted, is attached

Tanya M. Trujillo
Executive Director

attachment: Agenda

Regular Meeting
COLORADO RIVER BOARD OF CALIFORNIA
Wednesday, May 11, 2016
10:00 a.m.

Vineyard Room
Holiday Inn Ontario Airport
2155 East Convention Center Way
Ontario, CA 91764-4452

At the discretion of the Board, all items appearing on this agenda, whether or not expressly listed for action, may be deliberated upon and may be subject to action by the Board. Items may not necessarily be taken up in the order shown.

1. Call to Order
2. Opportunity for the Public to Address the Board (Limited to 5 minutes)
In accordance with California Government Code, Section 54954.3(a)
3. Administration
 - a. Consideration and Approval of the Minutes of the Meeting held March 9, 2016
(Action)
4. Colorado River Basin Water Reports
 - a. Reports on current reservoir storage, reservoir releases, projected water use, and forecasted river flows
 - b. State and Local Water Reports
5. Update regarding the 2016 California Drought
6. Staff reports regarding Colorado River Basin Programs
 - a. Review status of Basin States drought contingency planning
 - b. Review status of the Colorado River Basin Water Supply and Demand Study
 - c. Review status of Minute 319 and Minute 32x
 - d. Review status of the Salinity Control Forum, Workgroup, and Advisory Council
 - e. Review status of the Glen Canyon Dam Adaptive Management Work Group and Long-Term Experimental Management Plan EIS
 - f. Review status of the Lower Colorado River Multi-Species Conservation Program
7. Announcements/Notices
8. Executive Session
An Executive Session may be held by the Board pursuant to provisions of Article 9

(commencing with Section 11120) of Chapter 1 of Part 1 of Division 3 of Title 2 of the Government Code and Sections 12516 and 12519 of the Water Code to discuss matters concerning interstate claims to the use of Colorado River system waters in judicial proceedings, administrative proceedings, and/or negotiations with representatives from other states or the federal government.

9. Other Business

- a. Next Board Meeting: Regular Meeting
June 15, 2016
10:00 a.m.
Vineyard Room
Holiday Inn Ontario Airport
2155 East Convention Center Way
Ontario, CA 91764-4452
Tel: (909) 212-8000, Fax: (909) 418-6703

Minutes of Meeting
COLORADO RIVER BOARD OF CALIFORNIA
Wednesday, March 9, 2016.

A meeting of the Colorado River Board of California was held on Wednesday, March 9, 2016.

Board Members and Alternates Present

Brian Brady
Dana Bart Fisher, Jr., Chairman
Peter Nelson
David Pettijohn
Jack Seiler

David Vigil
Doug Wilson
Jeanine Jones, Designee
Department of Water Resources

Board Members and Alternates Absent

Stephen Benson
James Hanks
Henry Kuiper
Glen Peterson
John Powell Jr.
Michael Touhey

Chris Hayes, Designee
Department of Fish and Wildlife

Others Present

Steve Abbott
Tim Blair
Allen Carlisle
Javier Carlos
Robert Cheng
Martin Coghill
Dan Denham
Karen Donovan
Betty Evans
Lois Fong-Sakai
Christopher Harris
Bill Hasencamp
Michael Hughes
Lisa Johansen
Eric Katz
Lindia Liu
Kara Mathews
Jan Matusak
Jim Murtland
Jessica Neuwerth
Ken Olsa

Autumn Plourd
Angela Rashid
Eric Ruckdaschel
Tom Ryan
Peter Silva
Mark Stuart
Tanya Trujillo
Meena Westford
Donnell Wilcox
Jerry Zimmerman

CALL TO ORDER

Chairman Fisher announced the presence of a quorum and called the meeting to order at 1:31 A.M.

OPPORTUNITY FOR THE PUBLIC TO ADDRESS THE BOARD

Mr. Fisher asked if there was anyone in the audience who wished to address the Board on items on the agenda or matters related to the Board. Hearing none, Mr. Fisher moved to the next agenda item.

Welcome from the San Diego County Water Authority

Vice Chairman Doug Wilson welcomed the Board to San Diego and thanked the San Diego County Water Authority (SDCWA) staff who had organized the Board's tour of the Carlsbad Desalination Plant. Mr. Wilson acknowledged SDCWA staff and Board members in attendance at the meeting and welcomed speakers Dan Denham and Martin Coghill.

Presentation from the San Diego County Water Authority

Mr. Dan Denham, Director of the Colorado River Program of the SDCWA, described to the Board SDCWA's Water Plan, which includes significant investments in reliable and diverse water resources. Mr. Denham noted that SDCWA was investing \$3.5 billion in a variety of capital improvement projects and supply diversification, such as the All-American and Coachella lining projects and the water transfers of the Quantification Settlement Agreement (QSA). Mr. Denham reported that infrastructure investments such as the San Vicente Dam raise have led to nearly 200,000 acre-feet of new storage for the Authority. An additional \$1 billion was spent to build the new Carlsbad Desalination Plant, which will provide SDCWA with as much as 56,000 acre-feet of new water supply per year. Expansions in recycled water programs will also contribute to a more diverse and local water portfolio for San Diego in coming years.

Mr. Martin Coghill, Senior Water Resources Specialist, provided an overview of the system maintenance program at the SDCWA, which is estimated to cost \$800 million. Mr. Coghill described the lifespan and maintenance of the pipelines used to move water in SDCWA's system. A new method called magnetic flux leakage is being deployed to detect anomalies and defects in steel pipelines, preventing leaks and failures in pipelines as they age. Mr. Coghill reported that 14 miles of pipeline were recently analyzed and that SDCWA plans to deploy this method on other stretches of pipeline.

ADMINISTRATION

Consideration and Approval of the Minutes

Mr. Fisher asked for a motion to approve the February 10, 2016 meeting minutes. Mr. Wilson moved that the minutes be approved, seconded by Mr. Nelson, and by unanimous support, the February 10, 2016 meeting minutes were approved.

Request for Approval of a Joint Funding Agreement with the USGS for stream-gaging work at specific locations along the Lower Colorado River

Executive Director Tanya Trujillo explained that the cooperative funding agreement would provide for the Board to cost share \$20,290 for stream gaging at six gage stations along the Colorado River. Ms. Trujillo provided background information on the utility of the stream gaging system and the continued advocacy for increased funding from the Federal government for stream gaging projects. Mr. Wilson moved to approve the agreement and Board Member Jeanine Jones seconded the motion. By unanimous support, the funding agreement was approved.

COLORADO RIVER BASIN WATER REPORTS

Colorado River Basin Water Reports and State and Local Water Reports

Ms. Trujillo reported that as of February 29, 2016, the Colorado River system storage was 49% of capacity, similar to where it was last year. Lake Mead storage was 40% of capacity, while storage in Lake Powell was 46% of capacity. The Water Year 2016 precipitation to date is 94% of average, and the current Basin snowpack is 96% of average. As of February 16, the Colorado River Basin Forecast Center forecasted an April to July 2016 runoff inflow of 91% of average. However due to low precipitation and above average temperatures in February, the runoff forecasts for the end of the month have been revised to 80% of average.

Ms. Trujillo reported that the Upper Colorado Region snowpack conditions range from 80% to 120% of average. As of February 29, the Upper Basin reservoirs, other than Lake Powell, were 43% of capacity at Fontenelle and 83% of capacity of Flaming Gorge in Wyoming, 67% of capacity at Blue Mesa and 92% of capacity at Morrow Point in Colorado and 83% of capacity at Navajo in New Mexico.

Ms. Trujillo reported that as of late February, Brock Reservoir has captured approximately 27,000 acre-feet and 11,000 acre-feet at Senator Wash Reservoir. Excess flows to Mexico were 632 acre-feet. Ms. Trujillo also noted that Chris Harris is actively involved in the Bypass Flows Workgroup which is evaluating options to utilize flows sent to Mexico through the bypass drain to meet the requirements of the salinity differential.

Ms. Trujillo reported that 38% of the State was still in the exceptional drought category. As of March 1, the snowpack was 83% of average. The cumulative water savings to date pursuant to the Governor's Executive Order has been 24.8% (1.1 million acre-feet), slightly under the 25% (1.2 million acre-feet) mandatory water savings target set by the State Water Resources Control Board. Ms. Trujillo reported on the SWRCB

continuing effort to reevaluate, and possibly modify the mandatory conservation targets, taking into consideration the upcoming snowpack data. At the end of February, the State Water Project (SWP) allocation was increased from 15% to 30%.

Mr. Mark Stuart, of the California Department of Water Resources, reported that accumulated precipitation for Water Year 2016 at the Los Angeles Civic Center is about 5 inches, or 46% of average. Of the six major precipitation stations in Southern California, the precipitation to date for the Water Year has been below normal, with San Diego station tracking the highest level of precipitation at 79% of normal and the lowest level is 37% in Imperial. The Los Angeles station received nearly eight-tenths of an inch in February. For the Northern Sierra Precipitation 8-Station Index, the total received 35.5 inches as of February 28, increasing to over 40 inches over the last few days. As of February 29, the Snow Water Equivalent for the Northern, Central, and Southern Sierras are 90%, 87%, and 74% of normal, respectively, with a statewide total of 85% of normal. The water storage in Lake Oroville is 1.86 million acre-feet, or 52 percent of capacity. Mr. Stuart noted that Lake Oroville's storage increased by 120,000 acre-feet since this time last year and, since March 1, the total capacity has increased to 2.16 million acre-feet. Mr. Stuart reported that some reservoirs such as Folsom, located in the Sacramento region, have been making flood control releases.

Ms. Jones stated that although the State has received good storm activity last week in Northern California, the drought is not over, noting that the snowpack in some regions, such as the Southern Sierra has decreased. However, Ms. Jones reported that upcoming storm activity may bring in more precipitation. Referring to a graphic by Scripps Research Center showing forecasted atmospheric rivers, Ms. Jones stated that the forecast has a 16-day timeline and that the first six to seven days of the forecast provide the most accuracy. Ms. Jones also noted that atmospheric river storms provide much of our water supply. According to the graphic, there are two significant atmospheric river storms coming to Northern California within the next few days. The storms are moderately cold and may create an opportunity to improve the snowpack. Ms. Jones stated a similar storm brought a significant amount of rain to Northern California in early February, however rainfall in Southern California and parts of the Valley floor remain below normal.

Board member David Pettijohn reported that as of March 1, that snowpack in Mammoth Pass is below the historical average, at 33.9" and conditions slightly increased to 39" by March 9. He added that the Mammoth Pass snowpack is currently 90% of normal for April 1. He added that a normal snowpack does not necessarily translate into normal runoff and normal flow through the Los Angeles aqueduct.

Mr. Wilson reported that over the last eight months the San Diego area conserved 21%, exceeding the state mandated conservation target of 20%. Mr. Wilson also reported that San Diego area will receive water conservation credit for the operation of the Carlsbad Desalination Project, reducing their water conservation mandate to 13%.

Broad member Peter Nelson reported that the Coachella area has received some relief from the state water conservation mandate of 36%, decreasing to 32%, effective March 1. He also noted that the Coachella Valley Water District has been working with the SWRCB to create a program that would augment their conservation program. This year CVWD has spent approximately \$6.7 million on water conservation programs and has collected \$13.9 million in fines from customers that overuse water beyond their land based water budgets.

STAFF REPORTS REGARDING THE COLORADO RIVER BASIN PROGRAMS

Review status of the Basin States Drought Contingency Programs

Mr. Harris provided the Board with a brief power-point presentation updating the status of the on-going Yuma Bypass Flows Workgroup process. Mr. Harris reminded the Board that the goal of the workgroup was to identify and develop a range of options that can conserve, replace or reduce up to 100,000 acre-feet annually of the amount of water that is currently being bypassed to the Cienega de Santa Clara wetlands in Mexico. The workgroup is comprised of representatives of Reclamation, Arizona, California and Nevada, as well as Yuma area agricultural entities. He indicated that replacing some amount of bypass flows has the benefit of reducing the amount of mainstream water that must be released from storage in the reservoir system to meet Mexican Water Treaty delivery obligations each year. Mr. Harris reported that the workgroup intends to issue its final recommendations to Reclamation and the State of Arizona in April 2016.

Mr. Harris described the source of the brackish drainage water supplies that are collected in the Yuma region and then conveyed, via the Wellton-Mohawk Main Outlet Drain Extension and Bypass Drain to the Cienega de Santa Clara. Mr. Harris also explained that, on average, approximately 110,000 acre-feet of this brackish water comes from the Wellton-Mohawk Irrigation and Drainage District on the Lower Gila River east of Yuma, Arizona. The remaining drainage is pumped by Reclamation and collected in the Yuma area and is related to agricultural irrigation practices. He explained that some of this saline drainage can be blended with mainstream water supplies and delivered to Mexico at both Northerly and Southerly International Boundaries, but that over time it has become more difficult to manage water quality and continue compliance with the Minute 242 salinity differential and as a consequence more of the saline drainage water is bypassed to the Cienega.

Mr. Harris indicated that the workgroup has developed a range of options that can collectively help to conserve or replace water that is currently being bypassed to the Cienega. The options are categorized as “infrastructure related,” and “binationally focused,” and a third category that combines different options. He reported that infrastructure related options could include various permutations of Yuma Desalting Plant operation, and increased pumping at the Minute 242 wellfield near the Southerly International Boundary. An example of a binationally focused option might include receiving some measure of Treaty delivery obligation credit for water supplies delivered to the Cienega as a habitat and environmental enhancement benefit. Mr. Harris reported

that it was likely that it would require a “toolbox” approach to meeting the annual goal of conserving or replacing a minimum of 100,000 acre-feet annually.

Board member Peter Nelson asked who would pay for implementation of the options. Mr. Harris stated that many of the proposed projects or activities are largely federal responsibilities tied to both salinity management and drought contingency obligations. Ms. Trujillo reported that operation of the Yuma Desalting Plant, for example, would require additional federal appropriations for Reclamation’s Lower Colorado Region. Mr. Nelson also pointed out that much of the saline drainage water is generated as a result of agricultural practices and operations in the Yuma region, and that California needs to exercise caution in assuming any potential cost-sharing relationship associated with implementation of the recommended projects or programs. Ms. Trujillo reminded the Board of the federal government’s role and responsibilities identified in Title I of the 1974 Colorado River Basin Salinity Control Act, and that any steps that can be taken to assist Reclamation in continuing to comply with the Minute 242 differential and reduce releases from Lake Mead ultimately benefits all water users in the Lower Division States.

Mr. Harris indicated that the final report and recommendations would be submitted to Reclamation’s Regional Director, Terry Fulp and Arizona Department of Water Resources Director, Tom Buschatzke for their review. Ms. Trujillo and Mr. Harris indicated that they would keep the Board and agencies apprised as the process moves forward, as well as distributing the report and recommendations to the agencies for their review and comment.

Review Status of the Implementation of Minute 319 and Preparation for Minute 32X

Ms. Trujillo provided the Board with a brief overview of the status associated with implementation of the existing Minute 319. She noted that Mexico still maintained an account of “deferred delivery” water volume in storage in Lake Mead, noted that Mexico had conducted the Spring 2014 Pulse Flow, and that Minute 319 established a process for Mexico to create, store, and utilize Intentionally Created Mexican Apportionment, but that Mexico has not yet done so. Minute 319 also established a binational exchange process that would allow for the exchange of ICMA to Intentionally Created Surplus (ICS) through U.S. participation in ICMA conservation activities and programs, and that Mexico and the United States continue to discuss and analyze salinity management between the two countries. Ms. Trujillo also indicated that Minute 319 included a series of domestic agreements among the Department of the Interior, the International Boundary and Water Commission and participating agencies and entities among the Basin States, and that a similar set of agreements would likely be required in the context of a new Minute.

Mr. Harris reported on the status of the five work groups that are currently working on elements associated with a proposed follow-up Minute to Minute 319, referred to as Minute 32x. The five work groups include two that are carry-overs from Minute 319, of the Basin Conditions and Hydrology Team and the All-American Canal

Turn-Out Team. The other Minute 32x work groups cover Projects, Salinity and Environmental flows.

With respect to the Salinity Work Group, Mr. Harris reported that the goal was to evaluate impacts on the salinity of the Colorado River waters delivered to Mexico from the projects proposed for inclusion in a new Minute. The Work Group will use compliance with Minute 242 as a starting point. He indicated that the Work Group's tasks included:

1. Looking at options to calculate and manage salinity associated with ICMA or deferred delivery water;
2. Formalize actions taken by U.S. at SIB to decrease salinity variability and accommodate Mexican salinity requests during the critical agricultural months of October November, December and January;
3. Receive binational presentations associated with salinity control programs and efforts, including system-wide and on-farm, and identify potential joint actions; and
4. Looking at opportunities for operational changes at NIB and SIB that can have mutual binational salinity benefits.

Mr. Harris reported that the current status is that the two countries continue to exchange information related to (1) salinity calculations related to ICMA and deferred deliveries; (2) recognize U.S. SIB activities that reduce salinity variability, and the potential for inclusion of Sanchez-Mejorada Canal forebay capacity increase project as a binational project; and (3) development of a proposed binational data-collection pilot project between Imperial Dam and SIB to evaluate compatibility and comparison of various water quality data collection techniques.

Mr. Harris then reported on the progress being made in the Projects Work Group. He indicated that the goals of the Projects Work Group were to identify binational water conservation opportunities and new water sources that could be included in a new Minute, and to determine the term of those projects that can be scoped for implementation in the next Minute and those that may require additional study. He reported that the Work Group's tasks included:

1. Develop a framework for exchange of ICMA to binational ICS;
2. Develop a list of potential projects, look at costs, feasibility, schedule, water savings, etc.;
3. To interface with other WGs as appropriate; and
4. Potential projects could include canal lining, fallowing, regulating reservoirs, agricultural district system and on-farm efficiency improvements, desalination, other options.

Mr. Harris reported that the current status of the Projects Work Group was that the two countries continue to exchange information related to (1) potential projects that could be included in a new Minute, as well as continuing work on Minute 319 projects;

(2) identifying projects that may require additional evaluation and study; and (3) continuing to work on potential exchange agreement language.

In the context of the Environmental Work Group, Mr. Harris reported that the goal of the Work Group was for the U.S., Mexico and NGO partnerships to provide recommendations for the preservation of viable ecosystems through environmental projects and associated flows for the Limitrophe and Delta. The Work Group was also tasked to develop “lessons learned” from the 2014 Pulse Flow and on-going base flows. The Work Group was also directed to “anticipate that U.S. federal investment in water conservation projects for environmental purposes should continue.” Mr. Harris indicated that the Work Group’s tasks included:

1. Developing binational lessons learned from M319 implementation related to planning, delivery and operations associated with the pulse flow;
2. Defining prioritized environmental projects for annual flow volumes of (a) 15,000 af/yr; (b) 30,000 af/yr; (c) 45,000 af/yr; and (d) 60,000 af/yr;
3. With respect to those flow scenarios, evaluate maintenance (funding and water), for environmental projects, identify future environmental projects; and
4. Developing binational monitoring plan and data interpretation program for future binational environmental projects and flow scenarios.

Mr. Harris reported that Work Group has (1) shared the “lessons learned” associated with planning and delivering the pulse flow; (2) the Work Group has developed environmental projects associated with each of the flow scenarios, and is defining impacts and benefits under each scenario, and evaluated canal capacities and conveyance issues; (3) developed reports on current and future environmental projects, including water budgets; and (4) binational scientists are finalizing a report documenting the monitoring efforts, as well as developing a future binational monitoring plan.

Mr. Harris next reported on the status of the Basin Conditions and Hydrology Team. He reported that the goal of this team was to perform analyses needed to share results and propose mechanisms to assess Lake Mead reservoir elevations and correlation with drought indicators for potential future applicability for operational agreements. Tasks for the team included:

1. Develop a binational exchange of information associated with natural flow regime in the Basin; and trend behavior for runoff;
2. Conduct a binational evaluation of the correlation of Lake Mead elevations and drought indicators;
3. Evaluate the “goodness of fit” of the 24-Month Study; and
4. Mexico will develop and evaluate a forecast system based on natural runoff.

With respect to the current status of the team, Mr. Harris stated that the group continues to exchange and evaluate data and information; and it issued a draft report in January 2016 “Correlation of Lake Mead Elevations and Drought Indicators” which Mexico is now is reviewing.

Finally, Mr. Harris reported on the status of the All-American Canal Turn-Out Team. This team was established pursuant to Minute 319 and was asked to establish processes and timelines to work through issues that must be addressed for construction of a connection between the All-American Canal (AAC) and Mexico's Rio Colorado-Tijuana Aqueduct that could be "used for deliveries in emergency situations." He indicated that the tasks for this team included the following:

1. The Team is working on defining "emergency situations;"
2. Characterizing capacity and timing issues;
3. Identifying any salinity management issues;
4. Describing any project, construction and operational issues;
5. Identifying legal issues; and
6. Developing plans, and schedule and coordination needs.

He stated that the current status of the Team's tasks included that the Team continues to (1) exchange and evaluate data and information about the proposed project; (2) currently focusing on a unidirectional turnout, i.e., to Mexico; (3) Mexico is working on defining "emergency situation(s);" (4) Capacity and conveyance timing data is being collected; (5) salinity impacts will be evaluated; and (6) continuing to develop design criteria and plans, operational, legal and contractual issues.

Ms. Trujillo stated that she would ensure that as the process moves forward that she will keep the Board and agencies updated on the progress of the negotiations. She also reported that as it was this Administration's desire to finalize a new Minute by the end of 2016, that there would likely be a lot of activity associated with developing the domestic agreements and seeking agency and board approvals in each of the three Lower Basin States.

Mr. Wilson asked whether any base flows had been delivered to the environmental restoration areas established under Minute 319 since the 2014 Pulse Flow event. Ms. Trujillo and Mr. Harris explained the process by which the Delta Water Trust utilizes NGO funding to procure water supplies among the Mexican agricultural districts and how that water has been made available for targeted delivery to various habitat restoration sites along the riverine corridor in Mexico.

Review Status of the Salinity Control Forum, Workgroup, and Advisory Council

Lindia Liu provided an update regarding the program's Work Group meeting. Ms. Liu reported that the injection pressure at the Paradox Valley Unit has not increased much since July of 2013 when it was around 4,740 psi. The maximum permitted pressure is 5,350 psi. There were no indications of any issues with the well operations.

Ms. Liu also reported that the Paradox EIS alternative study is still anticipated to be completed in 2018. The EIS is looking at three alternatives: the evaporation pond, a new injection well, and commercial use of the brine. Reclamation has awarded a contract

to do the four studies recommended by the Evaporation Pond Consultant Review Board. The studies were the hydrogen sulfide management study; salt disposal options, which would answer if there is a market for the by-products, pond optimization study; which would determine if there is a need to do a pilot pond; and an ecological risk assessment for the migratory bird issue. These studies are underway and should be completed by July of this year without affecting the EIS schedule.

Ms. Liu reported that Reclamation has put contracts in place and is in the process of evaluating surface infrastructure, drilling, and ranking of potential sites for the new injection well alternative. They are looking at several factors that will come into play in identifying a suitable location, such as good subsurface geology, minimizing seismicity impacts, and be operationally feasible. Reclamation hopes to have feasibility study on surface infrastructure in place by early next year. Ms. Liu reported that Reclamation is also looking at potential technologies of brine crystallization. Reclamation has received about seven responses so far from companies with such technology and will see whether any of these will work. Brine crystallization eventually leaves a smaller footprint than an evaporation pond but may require more energy use. This effort came out of looking for commercial use of the salt, which did not get responses but receive responses from companies that have brine crystallization technologies. The next cooperating agencies meeting will be in the June/July timeframe when Reclamation will be getting back some draft reports from the different studies going on with the EIS process.

Reclamation reported good responses from this last summer's Funding Opportunity Announcement. There were 30 applications, of which 15 projects were selected for funding out of total of \$40 million available for the program. The projects average about \$50 per ton of salt removal and will have removed approximately 35,000 tons of annual salt control over the next few years. The projects will start the NEPA and design process this year.

Ms. Liu reported that the Work Group is in the process of updating the 2017 Review of Water Quality Standards for Salinity in the Colorado River System, which is updated every three years and sets the numeric criteria for salinity levels in the Basin and identifies a plan of implementation for meeting the standards. A subcommittee was formed to review and update the Forum's NPDES permit policies. The Subcommittee has drafted a questionnaire to be answered by each state's permit writers to review the efficiency of the policies.

The Salinity Economic Impact Model subcommittee continues to work with Reclamation on updating the model with better data and making it more user-friendly. MWD is assisting in restructuring the model for users to navigate more easily around it, and they hosted a webinar on February 22 to present their effort on that. The Board staff continues to work with Reclamation on including non-MWD service areas within California in the damages calculations.

The Work Group is creating a short video that explains the Salinity Control Program and concepts such as the importance of the Colorado River as a water supply,

causes of salt load increase in the River, impacts of high salt levels, and the success and the need for this program. A draft video will be produced for the June Forum meeting. Ms. Trujillo asked the Board for images and footages either in the municipal or agricultural context associated with salinity damages that may be used in the video.

Ms. Liu reported that the next Work Group meeting is in Salt Lake City, Utah from April 11-13. And the Forum and Advisory Council will meet in June 8-9 in Keystone, Colorado.

Review Status of the Glen Canyon Dam Adaptive Management Work Group and Long-Term Experimental and Management Plan EIS

Board staff Jessica Neuwerth reported that the Glen Canyon Dam Adaptive Management Work Group met February 24-25 in Tempe, Arizona. Ms. Neuwerth noted that the group heard stakeholder presentations from the Hopi Tribe on tribal monitoring and the Upper Colorado River Commission. The group also received an update on the expansion of endangered razorback suckers in the Western Grand Canyon. Ms. Neuwerth reported that a spring high flow experiment (HFE) is possible this year but unlikely to occur due to low inputs of the sediment needed to trigger the high flow.

Ms. Neuwerth provided an update on the Long-Term Experimental and Management Plan (LTEMP) EIS, which was released for public comment on January 8, with the comment period closing on April 7. Ms. Neuwerth reported that a series of public meetings and webinars had been held on the EIS and that the Basin States were working in concert with the Department of the Interior to address issues of importance to the states.

Finally, Ms. Neuwerth noted that the next meeting of the Technical Work Group would be April 19-20 in Phoenix, Arizona.

Review Status of Lower Colorado River Multi-Species Conservation Program

Ms. Neuwerth reported that the Lower Colorado River Multi-Species Conservation Program (LCR MSCP) had a Financial Workgroup conference call on February 25 to discuss the FY15 expenditures and the budget for upcoming years. The FY15 expenditures were approximately \$2 million less than budgeted, primarily due to lower-than-expected construction costs. Ms. Neuwerth noted that the FY16 budget is \$30 million, with an \$8.3 million withdrawal from the Land and Water Conservation Fund to purchase the Planet Ranch property as a new conservation area. The FY17 budget is estimated to be \$30.9 million.

Additionally, Ms. Neuwerth reported that the Steering Committee of the LCR MSCP would meet April 27 in Las Vegas, Nevada, with a Work Group meeting on May 11-12 in Phoenix, Arizona.

ANNOUNCEMENTS

Ms. Trujillo reported that the Department of National Resources established a website for its Salton Sea Management activities. Ms. Trujillo also reported that the Department of Water Resources will be releasing a report regarding the “shovel-ready” projects at the Salton Sea by the end of the month.

Ms. Trujillo reported that several funding opportunities are currently being offered by the Bureau of Reclamation. A total of \$13 million would be available for water efficiency or drought responsive projects. Ms. Trujillo reported that \$5 million in funding will be available for the next phase of the System Conservation Pilot Program. Ms. Trujillo also reported that Congressional hearings have begun to examine the FY16-17 budget that was released on February 9, 2016.

Ms. Trujillo reported that the Board will be tracking the licensing program process anticipated in April concerning the Lake Powell Pipeline Project in Utah.

ADJOURNMENT

With no further items to be brought before the Board, Chairman Fisher asked for a motion to adjourn the meeting. Upon the motion of Mr. Wilson, seconded by Mr. Pettijohn, and unanimously carried, the meeting was adjourned at 3:36 P.M.

May 02, 2016

LOWER COLORADO WATER SUPPLY REPORT

River Operations
Bureau of Reclamation

Questions: BCOOWaterops@usbr.gov

(702)293-8373

<http://www.usbr.gov/lc/region/g4000/weekly.pdf>

	PERCENT	Content 1000 ac-ft (kaf)	Elev. (Feet above mean sea level)	7-Day Release (CFS)
CURRENT STORAGE	FULL			
LAKE POWELL	45%	11,026	3592.26	11,200
* LAKE MEAD	37%	9,690	1076.10	18,000
LAKE MOHAVE	96%	1,739	644.46	15,700
LAKE HAVASU	96%	596	448.82	10,800
TOTAL SYSTEM CONTENTS **	48%	28,595		
As of 05/01/2016				
SYSTEM CONTENT LAST YEAR	48%	28,344		
* Percent based on capacity of 26,120 kaf or elevation 1219.6 feet.				
** TOTAL SYSTEM CONTENTS includes Upper & Lower Colorado River Reservoirs, less Lake Mead exclusive flood control space.				
Salt/Verde System	57%	1,306		
Painted Rock Dam	0%	0	535.10	0
Alamo Dam	5%	48	1085.74	25
Forecasted Water Use for Calendar Year 2016 (as of 05/02/2016) (values in kaf)				
NEVADA			270	
SOUTHERN NEVADA WATER SYSTEM				237
OTHERS				33
CALIFORNIA			4,153	
METROPOLITAN WATER DISTRICT OF CALIFORNIA				658
IRRIGATION DISTRICTS				3,348
OTHERS				146
ARIZONA			2,633	
CENTRAL ARIZONA PROJECT				1,437
OTHERS				1,196
TOTAL LOWER BASIN USE				7,056
DELIVERY TO MEXICO - 2016 (Mexico Scheduled Delivery + Preliminary Yearly Excess ¹)				1,521
OTHER SIGNIFICANT INFORMATION				
UNREGULATED INFLOW INTO LAKE POWELL - APRIL MID MONTH FORECAST DATED 04/18/2016				
		MILLION ACRE-FEET	% of Normal	
FORECASTED WATER YEAR 2016		8.441	78%	
FORECASTED APRIL-JULY 2016		5.300	74%	
MARCH OBSERVED INFLOW		0.553	83%	
APRIL INFLOW FORECAST		0.750	71%	
		Upper Colorado Basin	Salt/Verde Basin	
WATER YEAR 2016 PRECIP TO DATE		97% (20.7")	82% (14.8")	
CURRENT BASIN SNOWPACK		103% (12.5")	NA% (NA)	

¹ Delivery to Mexico forecasted yearly excess calculated using year-to-date observed and projected excess.

**U.S. BUREAU OF RECLAMATION
LOWER COLORADO REGION
CY 2016**

ARIZONA, CALIFORNIA, NEVADA, MEXICO
FORECAST OF END OF YEAR CONSUMPTIVE USE
FORECAST BASED ON USE TO DATE AND APPROVED ANNUAL WATER ORDERS ¹
(ACRE-FEET)

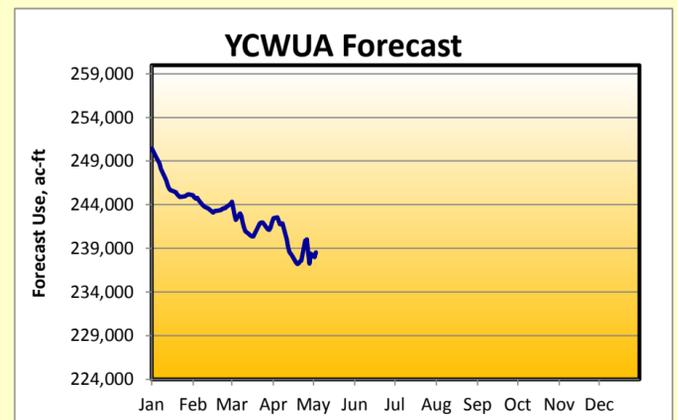
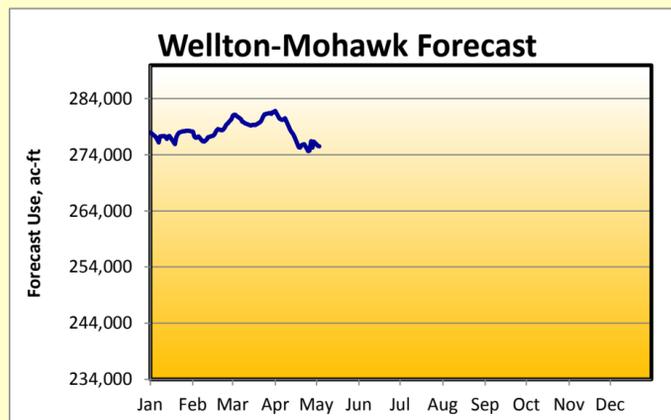
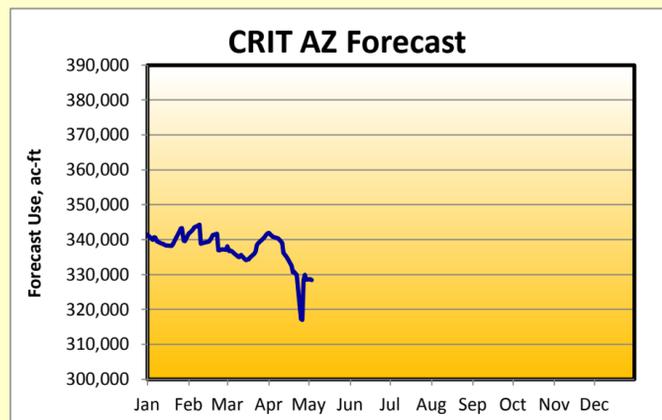
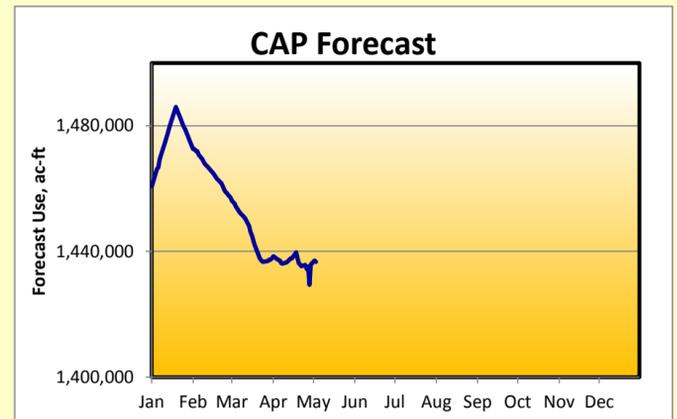
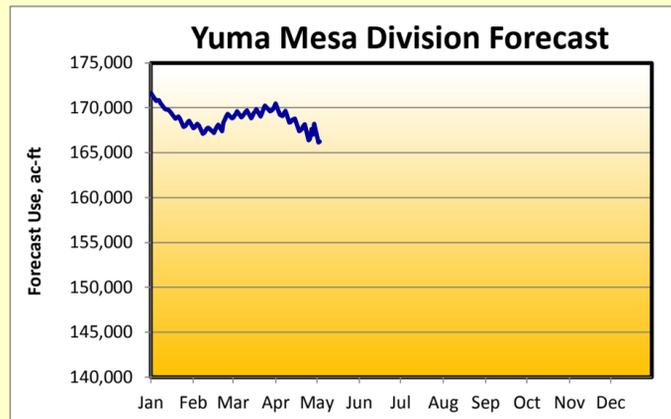
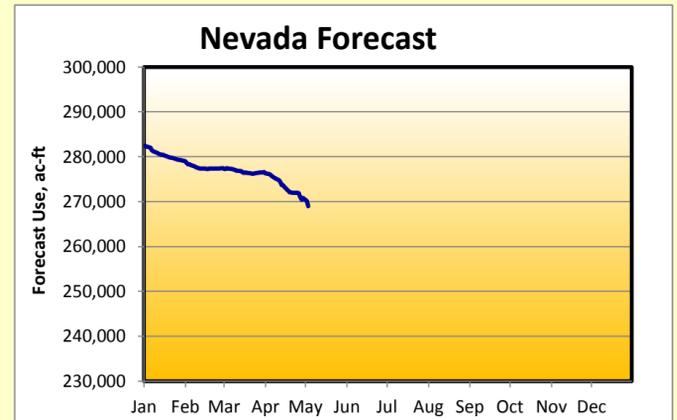
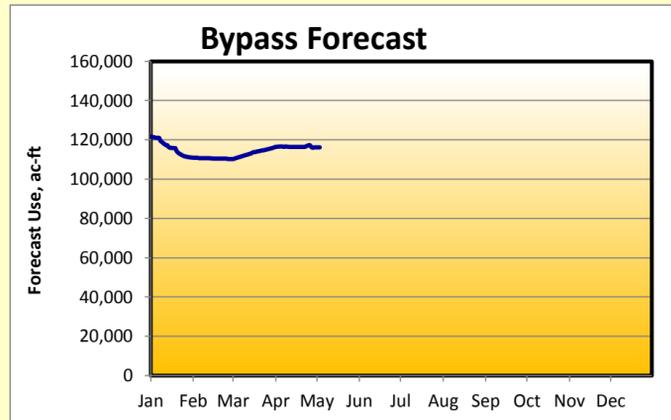
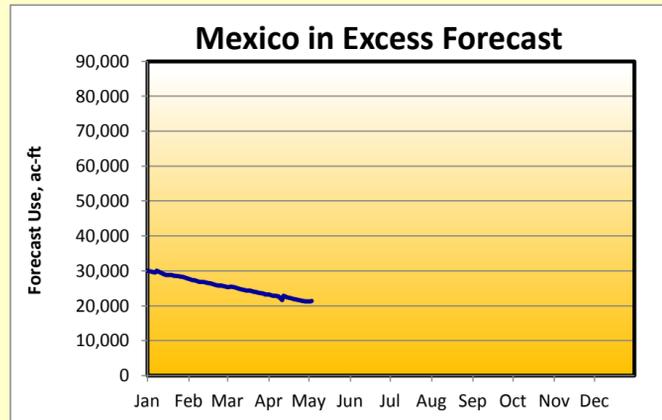
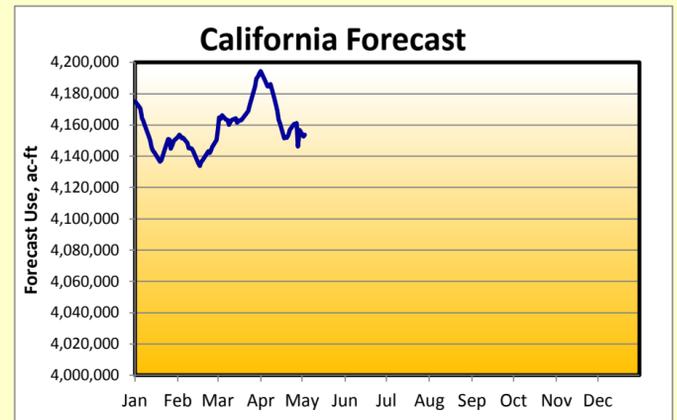
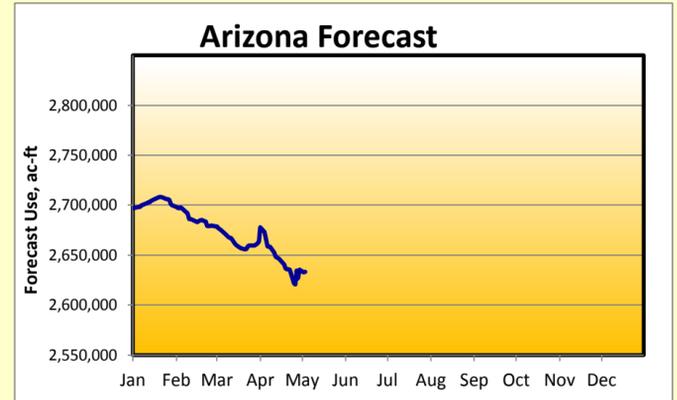
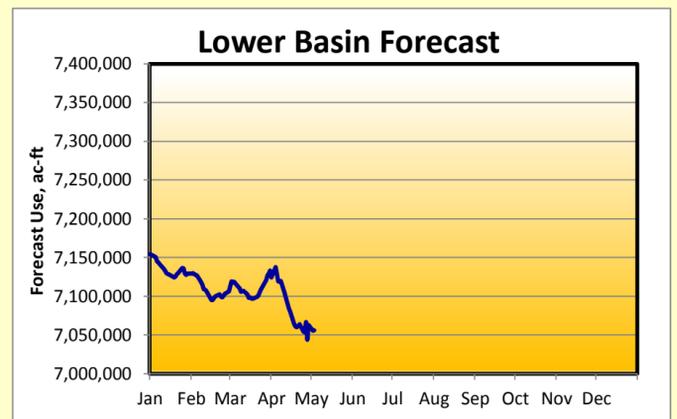
WATER USE SUMMARY

	Use To Date CY2016	Forecast Use CY2016	Approved Use ² CY2016	Excess to Approval CY2016
ARIZONA	922,463	2,633,116	2,697,000	-63,884
CALIFORNIA	1,354,297	4,153,854	4,175,000	-21,146
NEVADA	58,175	268,984	282,500	-13,516
STATES TOTAL ³	2,334,935	7,055,954	7,154,500	-98,546
MEXICO IN SATISFACTION OF TREATY (Including downward delivery) TO MEXICO AS SCHEDULED	764,442 762,946	1,521,335 1,500,000	1,500,000	21,335
MEXICO IN EXCESS OF TREATY BYPASS PURSUANT TO MINUTE 242	1,496 29,058	21,335 116,146		
TOTAL LOWER BASIN & MEXICO	3,128,435	8,693,435		

1/ Incorporates January USGS monthly data and 80 daily reporting stations which may be revised after provisional data reports are distributed by the USGS. Use to date estimated for users reporting monthly and annually.

2/ These values reflect adjusted apportionments. See Adjusted Apportionment calculation on each state page.

3/ Includes unmeasured returns based on estimated consumptive use/diversion ratios by user from studies provided by Arizona Department of Water Resources, Colorado River Board of California, and Reclamation.



Graph notes: Jan 1 forecast use is scheduled use in accordance with the Annual Operating Plan's state entitlements, available unused entitlements, and over-run paybacks. A downward sloping line indicates use at a lower rate than scheduled, upward sloping is above schedule, and a flat line indicates a use rate equal to schedule. Lower priority users such as CAP, MWD, and Robt.B.Griffith may adjust use rates to meet state entitlements as higher priority use deviates from schedule. Abrupt changes in the forecast use line may be due to a diversion schedule change or monthly updating of provisional realtime diversions.

**U.S. BUREAU OF RECLAMATION
LOWER COLORADO REGION
CY 2016**

NOTE:

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- Water users with a consumptive use entitlement - **Excess to Estimated Use** column indicates overrun/underrun of entitlement. Dash in this column indicates water user has a diversion entitlement.
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**CALIFORNIA WATER USERS
FORECAST OF END OF YEAR CONSUMPTIVE USE
FORECAST BASED ON USE TO DATE AND APPROVED ANNUAL WATER ORDERS**

[California Schedules and Approvals](#)
[Historic Use Records \(Water Accounting Reports\)](#)

WATER USER	Use To Date CY2016	Forecast Use CY2016	Estimated Use CY2016	Excess to Estimated Use CY2016	Diversion To Date CY2016	Forecast Diversion CY2016	Approved Diversion CY2016	Excess to Approved Diversion CY2016
CALIFORNIA PUMPERS	598	1,761	1,761	---	1,083	3,191	3,191	0
FORT MOJAVE INDIAN RESERVATION, CA	1,655	7,658	8,995	---	3,078	14,236	16,720	-2,484
CITY OF NEEDLES (includes LCWSP use)	655	1,931	1,931	0	923	2,720	2,720	0
METROPOLITAN WATER DISTRICT	295,974	660,415	591,360	---	295,973	662,427	594,451	---
COLORADO RIVER INDIAN RESERVATION, CA	1,098	3,237	3,237	---	1,820	5,362	5,362	0
PALO VERDE IRRIGATION DISTRICT	78,819	378,774	400,192	---	206,047	827,305	868,000	-40,695
YUMA PROJECT RESERVATION DIVISION	18,264	51,768	57,009	---	32,593	100,072	107,359	-7,287
YUMA PROJECT RESERVATION DIVISION - INDIAN UNIT	---	---	---	---	16,087	47,701	52,359	-4,658
YUMA PROJECT RESERVATION DIVISION - BARD UNIT	---	---	---	---	16,506	52,371	55,000	-2,629
YUMA ISLAND PUMPERS	1,541	4,540	4,540	---	2,788	8,215	8,215	0
FORT YUMA INDIAN RESERVATION - RANCH 5	225	663	663	---	408	1,201	1,201	0
IMPERIAL IRRIGATION DISTRICT	795,044	2,556,309	<i>2,612,400</i>	-56,091	770,333	2,621,620	<i>2,727,875</i>	---
SALTON SEA SALINITY MANAGEMENT	57,905	130,000	130,000	0	59,319	136,420	136,420	---
COACHELLA VALLEY WATER DISTRICT	102,210	355,887	362,000	-6,113	104,807	371,958	378,869	---
OTHER LCWSP CONTRACTORS	247	728	728	---	391	1,152	1,152	0
CITY OF WINTERHAVEN	23	68	68	---	33	98	98	0
CHEMEHUEVI INDIAN RESERVATION	39	115	115	---	3,848	11,340	11,340	0
TOTAL CALIFORNIA	1,354,297	4,153,854			1,483,444	4,767,317	4,862,973	

CALIFORNIA ADJUSTED APPORTIONMENT CALCULATION

California Basic Apportionment	4,400,000
Conservation for Salton Sea Restoration - 2010 ¹	
Creation of Extraordinary Conservation ICS (IID)	-25,000
Creation of Extraordinary Conservation ICS (MWD)	-200,000
Total State Adjusted Apportionment	4,175,000
Excess to Total State Adjusted Apportionment	-21,146

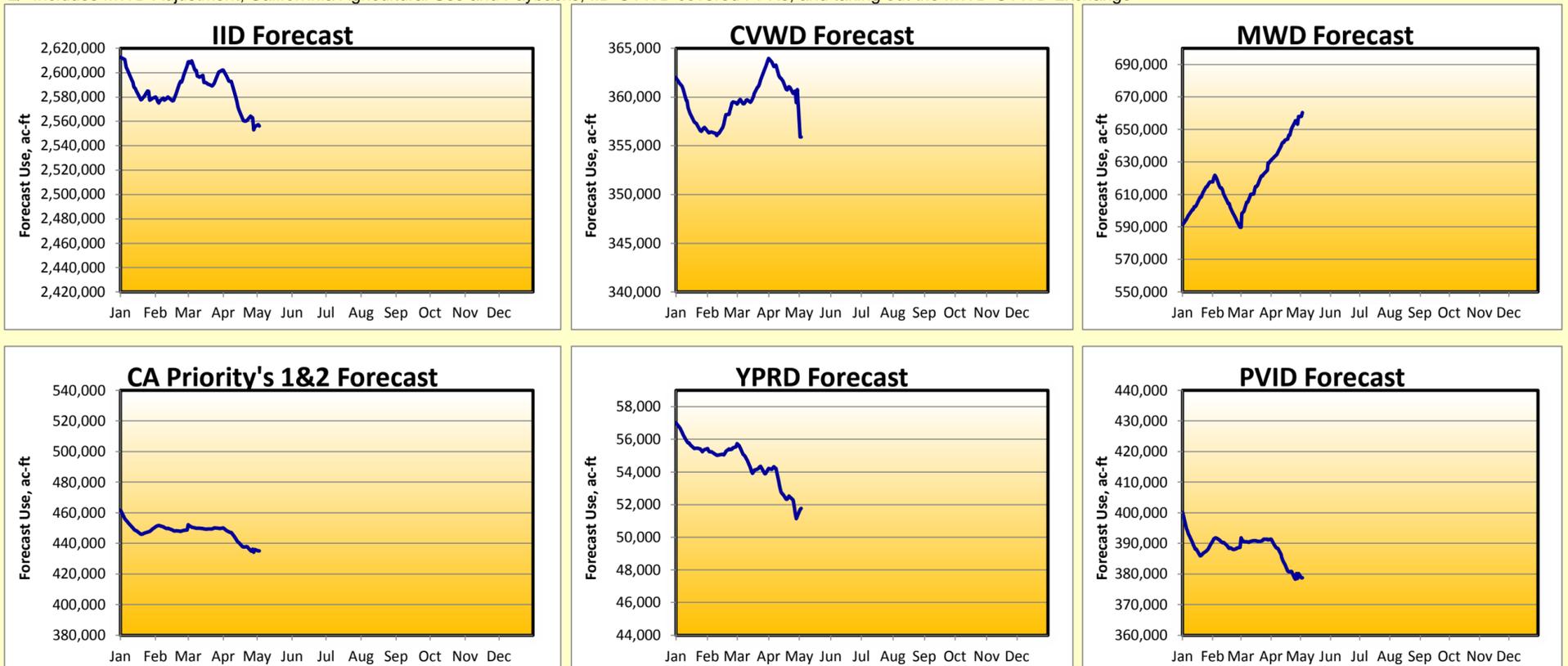
ISG ANNUAL TARGET COMPARISON CALCULATION

Priorities 1, 2, 3b Use (PVID+YPRD+Island+PVID Mesa)	435,082
MWD Adjustment	-15,082
Total California Agricultural Use (PVID+YPRD+Island+IID+CVWD)	3,347,278
California Agricultural Paybacks	0
Misc. PPRs Covered by IID and CVWD	14,500
California ICS Creation (IID ICS)	25,000
Total Use for Target Comparison ²	3,371,696
ISG Annual Target (Exhibit B)	3,440,000
Amount over/(under) ISG Annual Target	-68,304

NOTES: Click on California Schedules and Approvals above for incoming diversion schedules and approvals.

1/ Pending approval by Imperial Irrigation District's Board of Directors.

2/ Includes MWD Adjustment, California Agricultural Use and Paybacks, IID-CVWD covered PPRs, and taking out the MWD-CVWD Exchange



**U.S. BUREAU OF RECLAMATION
LOWER COLORADO REGION
CY 2016**

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ARIZONA WATER USERS
FORECAST OF END OF YEAR CONSUMPTIVE USE
FORECAST BASED ON USE TO DATE AND APPROVED ANNUAL WATER ORDERS

[Arizona Schedules and Approvals](#)
[Historic Use Records \(Water Accounting Reports\)](#)

WATER USER	Use To Date CY2016	Forecast Use CY2016	Estimated Use CY2016	Excess to Estimated Use CY2016	Diversion To Date CY2016	Forecast Diversion CY2016	Approved Diversion CY2016	Excess to Approved Diversion CY2016
ARIZONA PUMPERS	5,594	16,484	16,484	---	8,662	25,525	25,525	0
LAKE MEAD NRA, AZ - Diversions from Lake Mead	29	150	150	---	29	150	150	0
LAKE MEAD NRA, AZ - Diversions from Lake Mohave	42	175	175	---	42	175	175	0
DAVIS DAM PROJECT	1	2	2	---	19	56	56	0
BULLHEAD CITY	1,956	8,089	8,523	---	2,919	12,071	12,720	-649
MOHAVE WATER CONSERVATION	201	592	592	---	299	881	881	0
BROOKE WATER LLC	71	210	210	---	107	314	314	0
MOHAVE VALLEY IDD	5,486	20,485	21,549	---	10,158	37,934	39,905	-1,971
FORT MOJAVE INDIAN RESERVATION, AZ	9,810	45,101	47,790	---	18,166	83,521	88,500	-4,979
GOLDEN SHORES WATER CONSERVATION DISTRICT	107	316	316	---	160	472	472	0
HAVASU NATIONAL WILDLIFE REFUGE	1,743	4,143	3,563	---	14,525	42,695	41,820	875
LAKE HAVASU CITY	2,276	8,213	8,370	---	3,672	13,248	13,500	-252
CENTRAL ARIZONA PROJECT	575,488	1,436,654	---	---	575,488	1,436,654	---	---
TOWN OF PARKER	90	385	392	---	236	899	916	-17
COLORADO RIVER INDIAN RESERVATION, AZ	84,576	328,360	341,393	---	172,195	636,275	662,402	-26,127
EHRENBURG IMPROVEMENT ASSOCIATION	77	226	226	---	108	318	318	0
CIBOLA VALLEY IRRIGATION DISTRICT	5,843	17,218	17,218	---	8,169	24,074	24,074	0
CIBOLA NATIONAL WILDLIFE REFUGE	4,324	12,741	12,741	0	6,973	20,550	20,550	0
IMPERIAL NATIONAL WILDLIFE REFUGE	1,024	3,019	3,019	0	1,652	4,868	4,868	0
BLM PERMITEES (PARKER DAM to IMPERIAL DAM)	334	984	984	---	514	1,516	1,516	---
YUMA PROVING GROUND	105	535	550	---	105	535	550	-15
GILA MONSTER FARMS	1,385	4,761	5,271	---	2,473	8,335	9,156	-821
WELLTON-MOHAWK IDD	84,694	275,505	278,000	-2,495	122,606	412,538	424,350	-11,812
BLM PERMITEES (BELOW IMPERIAL DAM)	29	86	86	0	45	132	132	0
CITY OF YUMA	3,681	14,495	16,036	-1,541	7,333	25,842	27,583	-1,741
MARINE CORPS AIR STATION YUMA	402	1,402	1,385	---	402	1,402	1,385	17
UNION PACIFIC RAILROAD	8	24	24	---	16	48	48	0
UNIVERSITY OF ARIZONA	179	669	690	---	179	669	690	-21
YUMA UNION HIGH SCHOOL DISTRICT	30	148	151	---	40	196	200	-4
DESERT LAWN MEMORIAL	30	87	87	---	42	123	123	0
NORTH GILA VALLEY IDD	3,563	10,930	10,929	---	12,336	42,481	44,000	-1,519
YUMA IRRIGATION DISTRICT	14,047	40,076	40,822	---	25,051	73,196	75,100	-1,904
YUMA MESA IDD	25,630	115,243	119,859	---	50,498	193,888	202,464	-8,576
UNIT "B" IRRIGATION DISTRICT	4,156	20,375	21,037	---	6,975	28,715	29,800	-1,085
FORT YUMA INDIAN RESERVATION	472	1,392	1,392	---	726	2,140	2,140	0
YUMA COUNTY WATER USERS' ASSOCIATION	84,284	238,549	250,443	---	124,796	369,344	386,000	-16,656
COCOPA INDIAN RESERVATION	687	5,266	5,778	---	718	7,837	8,960	-1,123
RECLAMATION-YUMA AREA OFFICE	9	26	26	---	9	26	26	0
RETURN FROM SOUTH GILA WELLS	---	---	---	---	---	---	---	---
TOTAL ARIZONA	922,463	2,633,116	2,696,986		1,178,443	3,509,643	3,612,092	
CAP	575,488	1,436,654	---	---	---	1,436,654	---	---
ALL OTHERS	346,975	1,196,462	1,236,263	---	---	2,072,989	2,151,369	---
YUMA MESA DIVISION, GILA PROJECT	43,240	166,249	171,610	-5,361	---	309,565	---	---

ARIZONA ADJUSTED APPORTIONMENT CALCULATION

Arizona Basic Apportionment	2,800,000
Creation of Protection Volume ¹	-103,000
Total State Adjusted Apportionment	2,697,000
Excess to Total State Adjusted Apportionment	-63,884
Estimated Allowable Use for CAP	1,501,136

1/ In 2016, CAWCD intends to conserve no less than 103,000 AF of Colorado River water as part of its commitment under the 2014 Memorandum of Understanding for Pilot Drought Response Actions.

NOTES: Click on Arizona Schedules and Approvals above for incoming diversion schedules and approvals.

**U.S. BUREAU OF RECLAMATION
LOWER COLORADO REGION
CY 2016**

NOTE:

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NEVADA WATER USERS
FORECAST OF END OF YEAR CONSUMPTIVE USE
FORECAST BASED ON USE TO DATE AND APPROVED ANNUAL WATER ORDERS

[Nevada Schedules and Approvals](#)
[Historic Use Records \(Water Accounting Reports\)](#)

<u>WATER USER</u>	<u>Use To Date CY2016</u>	<u>Forecast Use CY2016</u>	<u>Estimated Use CY2016</u>	<u>Excess to Estimated Use CY2016</u>	<u>Diversion To Date CY2016</u>	<u>Forecast Diversion CY2016</u>	<u>Approved Diversion CY2016</u>	<u>Excess to Approved Diversion CY2016</u>
ROBERT B. GRIFFITH WATER PROJECT (SNWS)	122,899	435,097	438,176	-3,079	122,894	435,091	438,176	-3,085
LAKE MEAD NRA, NV - Diversions from Lake Mead	105	378	403	---	105	378	403	-25
LAKE MEAD NRA, NV - Diversions from Lake Mohave	47	154	152	---	47	154	152	2
BASIC MANAGEMENT INC.	1,622	7,601	8,208	---	1,622	7,601	8,208	-607
CITY OF HENDERSON (BMI DELIVERY)	4,589	15,379	15,878	---	4,589	15,379	15,878	-499
NEVADA STATE DEPT. OF FISH & GAME	4	12	12	0	182	427	405	---
PACIFIC COAST BUILDING PRODUCTS INC.	299	920	928	---	299	920	928	-8
BOULDER CANYON PROJECT	59	173	173	---	102	300	300	0
BIG BEND WATER DISTRICT	749	4,659	5,355	---	1,662	8,748	10,000	-1,252
FORT MOJAVE INDIAN TRIBE	707	3,486	3,886	---	1,056	5,204	5,800	-596
LAS VEGAS WASH RETURN FLOWS	-72,905	-198,875	-190,671	---				
TOTAL NEVADA	58,175	268,984	282,500	-3,079	132,558	474,202	480,250	-6,070
SOUTHERN NEVADA WATER SYSTEM (SNWS)	49,994	236,222				435,091		
ALL OTHERS	8,181	32,762				39,111		
NEVADA USES ABOVE HOOVER	56,719	260,839				460,250		
NEVADA USES BELOW HOOVER	1,456	8,145				13,952		

Tributary Conservation & Imported Intentionally Created Surplus

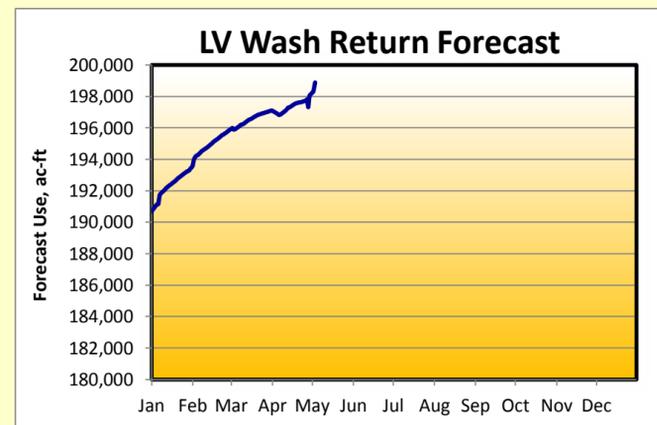
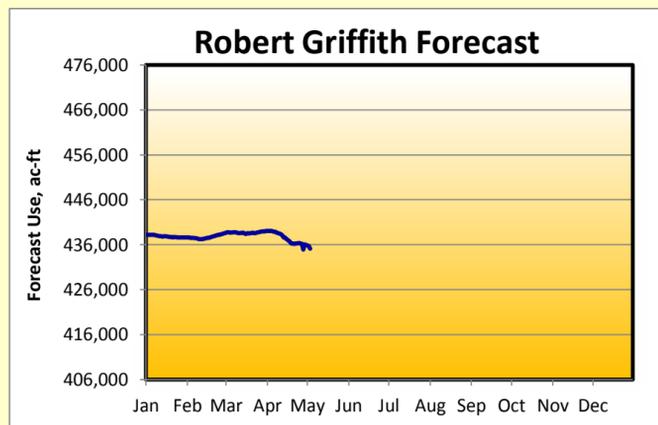
Total Requested Tributary Conservation Intentionally Created Surplus	29,500
Total Requested Imported Conservation Intentionally Created Surplus	9,000
5% System Cut for Creation of Intentionally Created Surplus	-1,925
Total Intentionally Created Surplus Left in Lake Mead	36,575

Pilot System Conservation Program

Tributary Conservation - Left in Lake Mead ¹	7,500
---	-------

NEVADA ADJUSTED APPORTIONMENT CALCULATION

Nevada Basic Apportionment	300,000
Creation of Protection Volume ²	-17,500
Total State Adjusted Apportionment	282,500
Excess to Total State Adjusted Apportionment	-13,516



1/ On June 4, 2015, Reclamation and SNWA entered into a System Conservation Implementation Agreement in which SNWA agreed to conserve 7,500 AF of Colorado River water from its Tributary Conservation projects to create System Conservation Water.

2/ In 2016, Nevada anticipates leaving 17,500 AF of its basic apportionment in Lake Mead by forgoing off-stream storage as part of SNWA's commitment under the 2014 Memorandum of Understanding for Pilot Drought Response Actions.

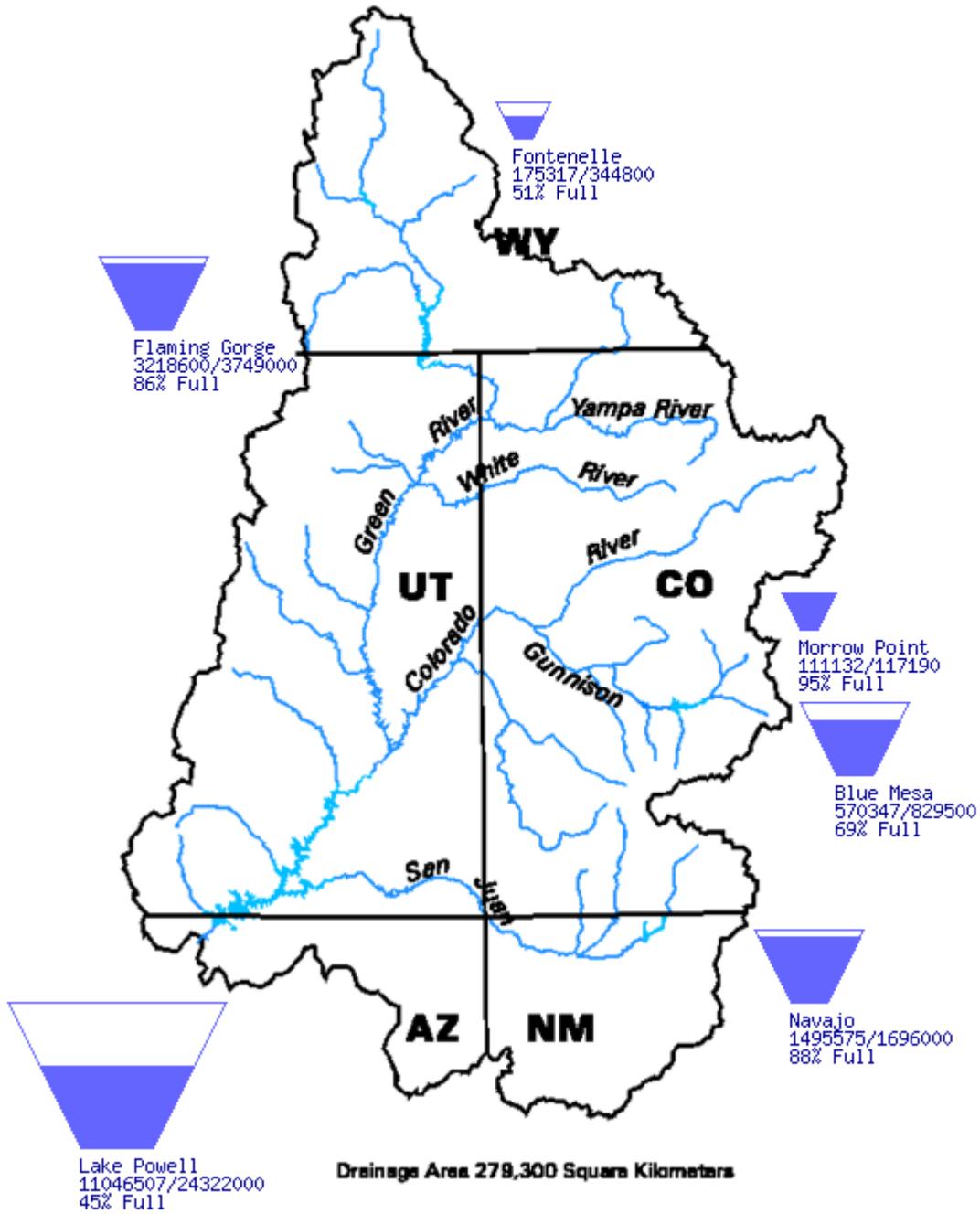
NOTES: Click on Nevada Schedules and Approvals above for incoming diversion schedules and approvals.

Upper Colorado Region Water Resources Group

River Basin Tea-Cup Diagrams

Data Current as of:
05/03/2016

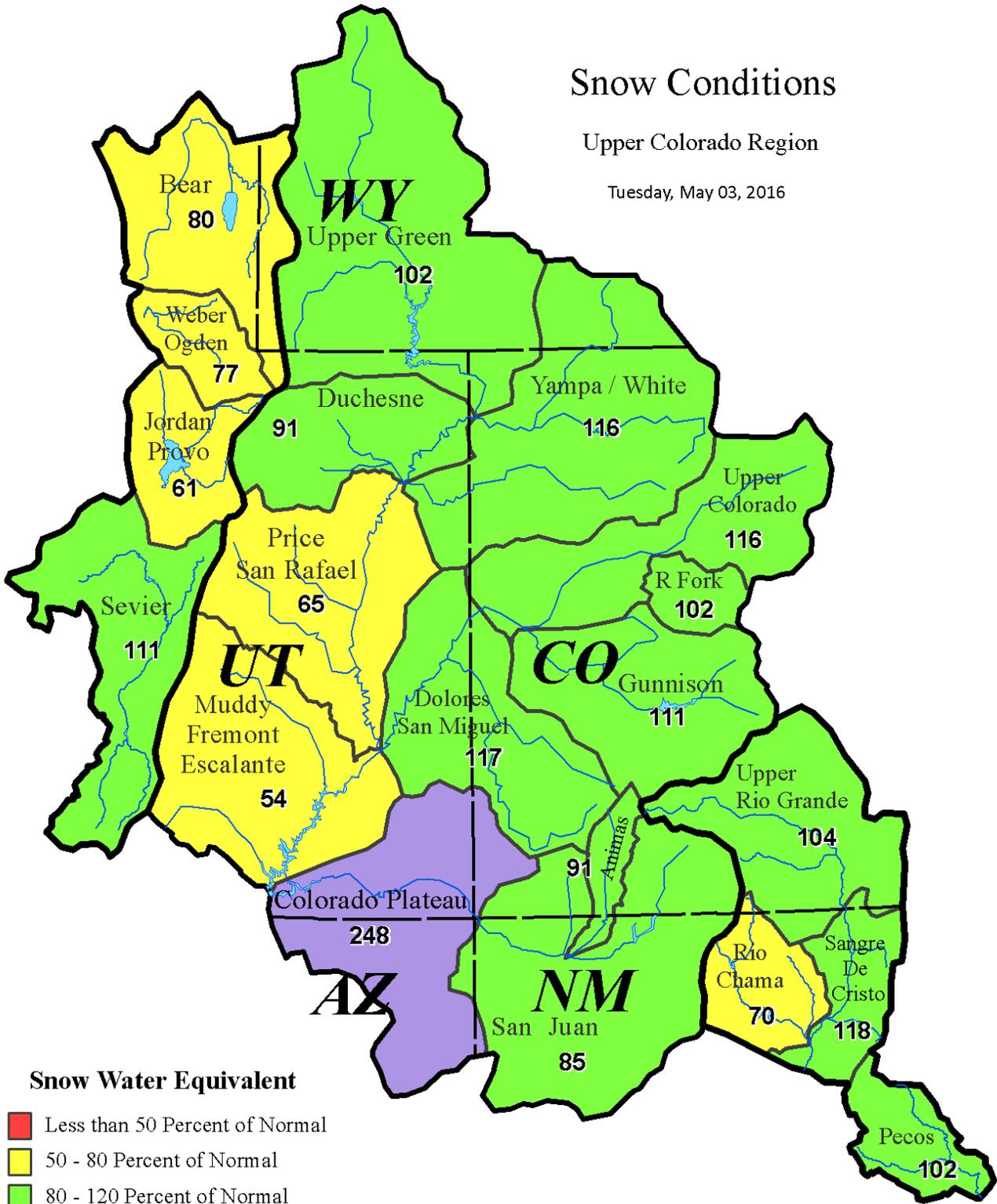
Upper Colorado River Drainage Basin



Snow Conditions

Upper Colorado Region

Tuesday, May 03, 2016



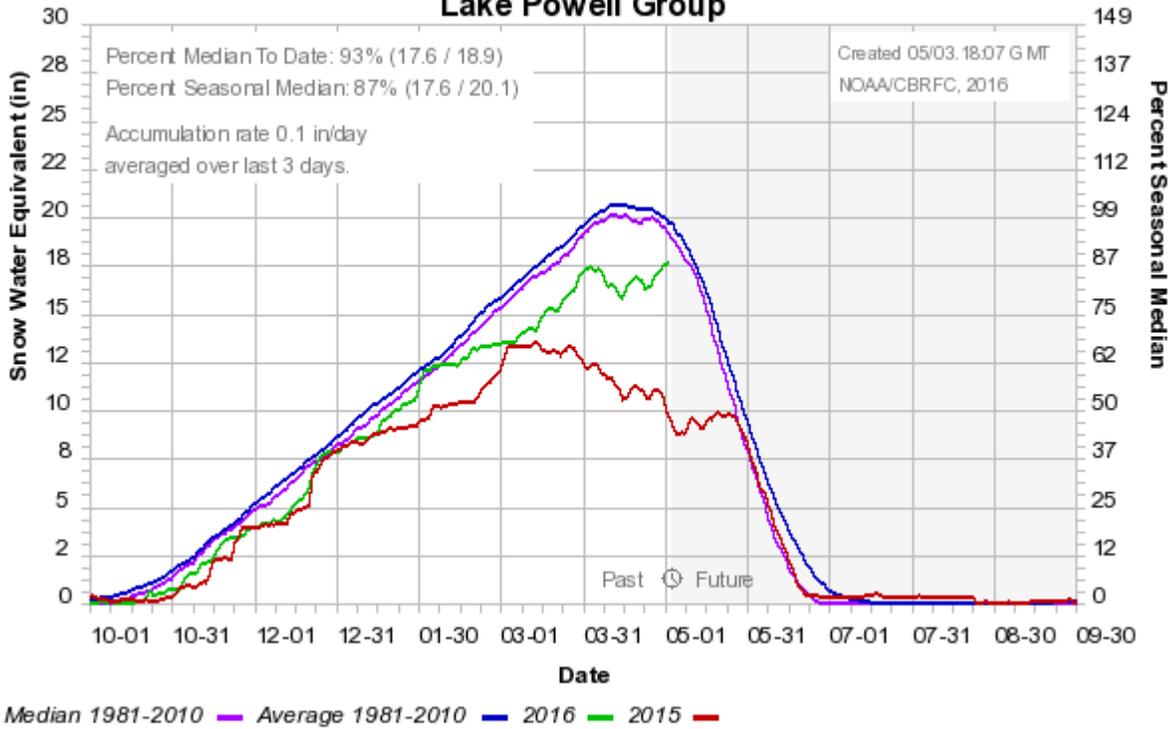
Snow Water Equivalent

- Less than 50 Percent of Normal
- 50 - 80 Percent of Normal
- 80 - 120 Percent of Normal
- 120 - 150 Percent of Normal
- Greater than 150 Percent of Normal

Upper Colorado
GIS
Region

Data Provided by the Natural Resource Conservation Service

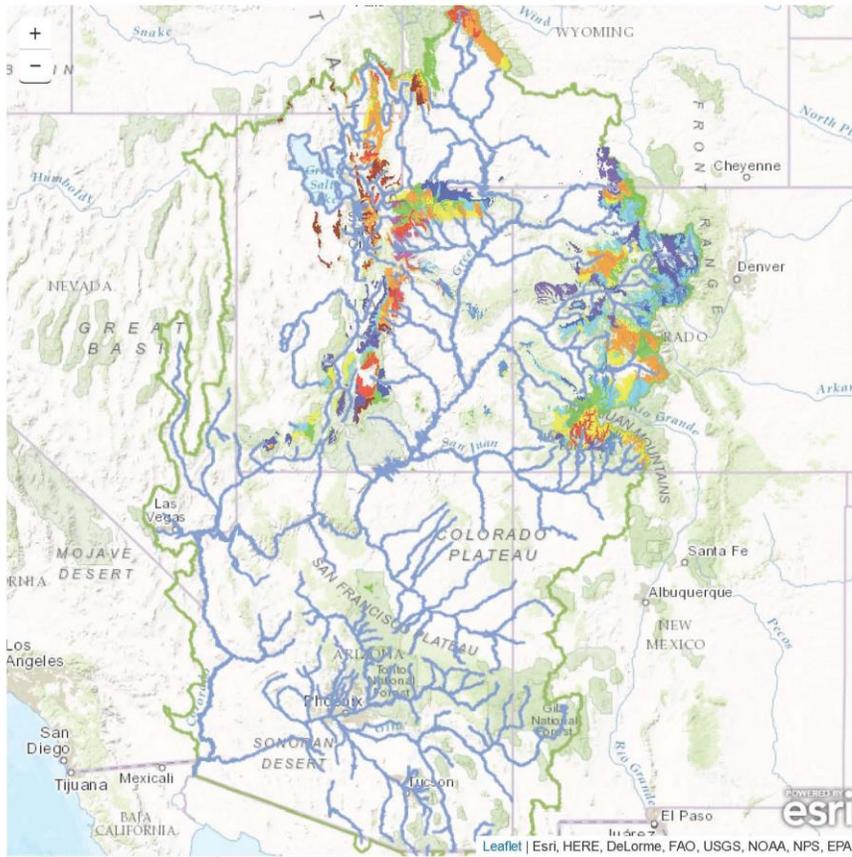
Colorado Basin River Forecast Center Lake Powell Group



NOAA Colorado Basin River Forecast Center – Snow Conditions Map

Conditions Map

[Help](#)



Lat: 37.6 Lng: -110.5, Zoom: 6

River Conditions

Snow Conditions

Points

Grids

- Modeled SWE 2016-05-02
- Percent Median
- Percent Median - Significant Areas

% Median SWE

- >500%
- 300-500%
- 200-300%
- 150-200%
- 130-150%
- 110-130%
- 100-110%
- 90-100%
- 70-90%
- 50-70%
- 30-50%
- 0-30%

Water Supply Forecasts

Peak Flood Probability

Reservoir Conditions

Daily Precipitation

Monthly Precipitation

Soil Moisture

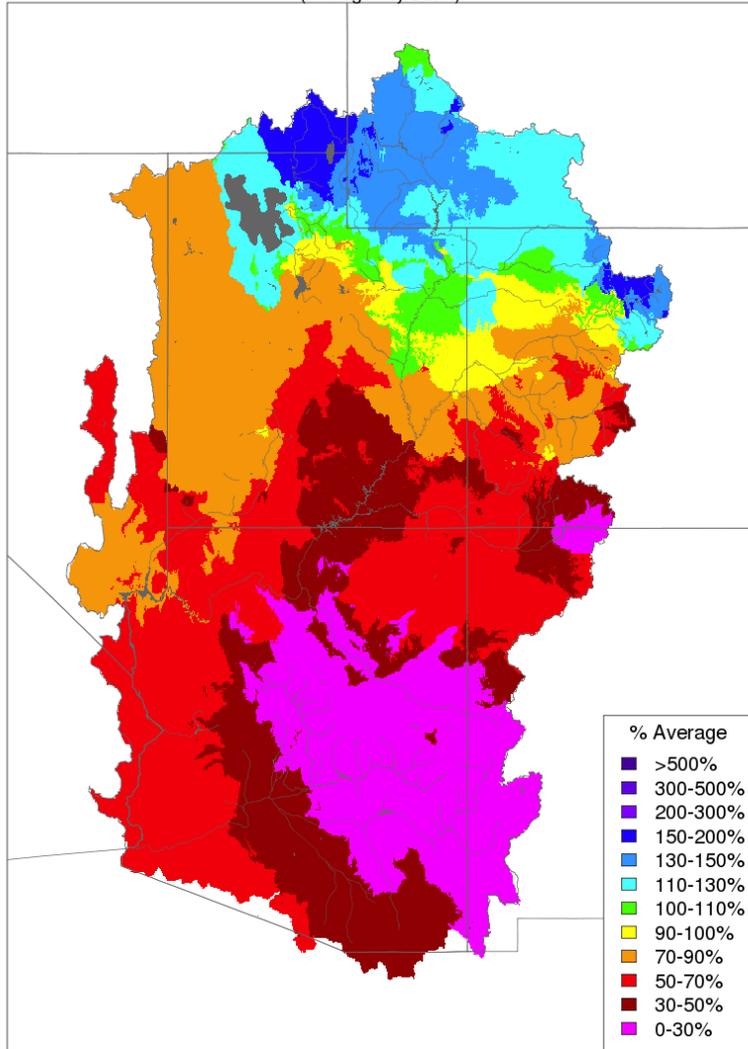
Map Options

Search Points

NOAA National Weather Service Monthly Precipitation Maps for March and April 2016

Monthly Precipitation - March 2016

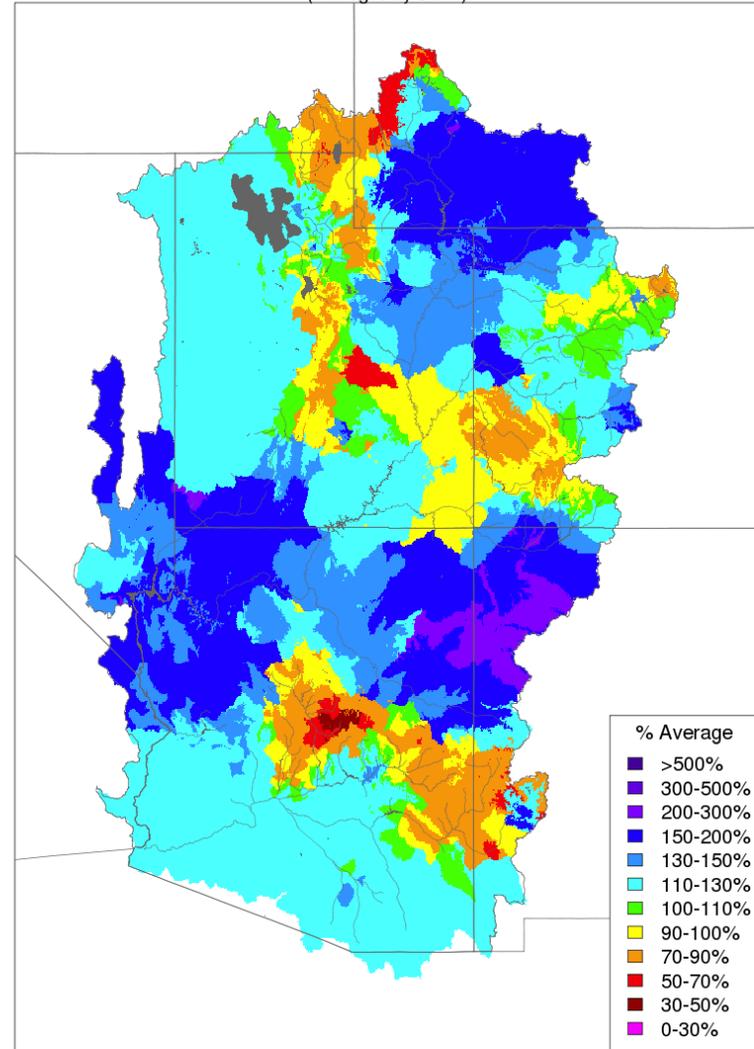
(Averaged by Basin)



Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbafc.noaa.gov

Monthly Precipitation - April 2016

(Averaged by Basin)

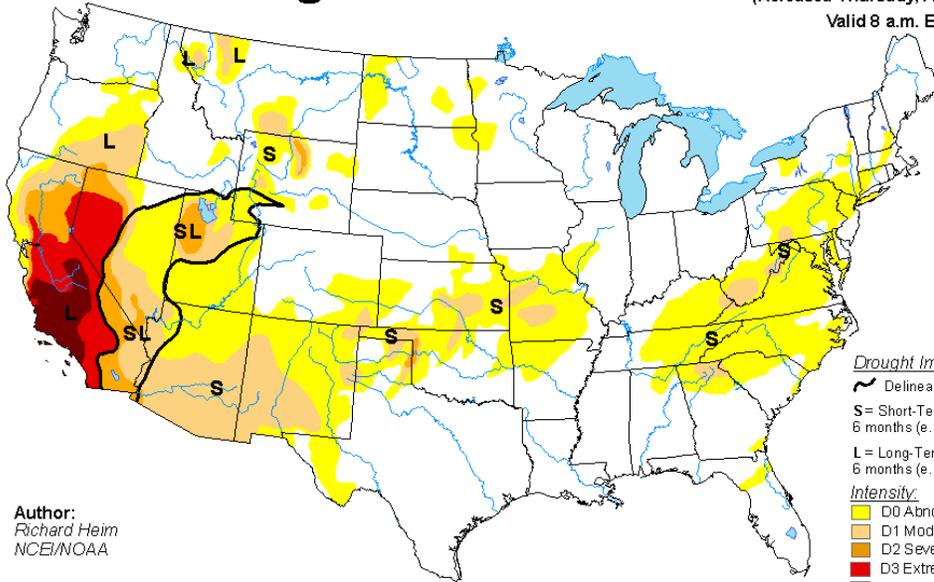


Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbafc.noaa.gov

USDA United States Drought Monitor Map

U.S. Drought Monitor

April 26, 2016
 (Released Thursday, Apr. 28, 2016)
 Valid 8 a.m. EDT

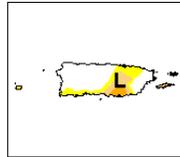
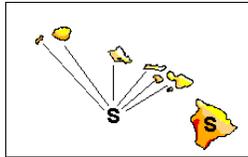
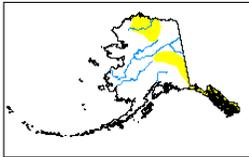


Author:
 Richard Heim
 NCEI/NOAA

Drought Impact Types:
 ~ Delineates dominant impacts
 S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
 L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

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

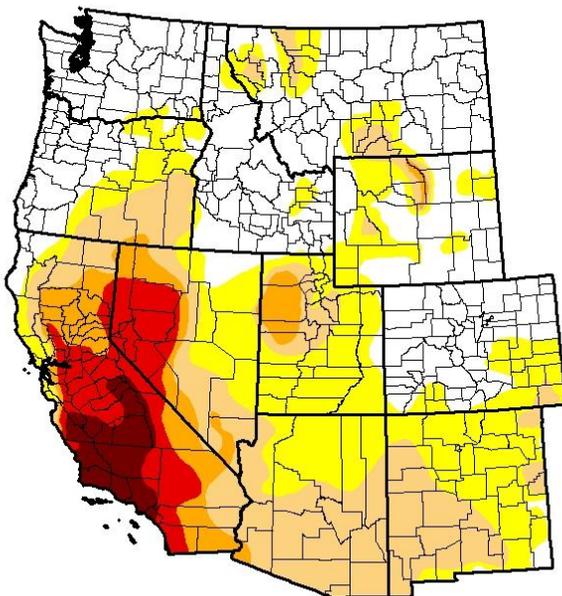
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

U.S. Drought Monitor West

April 26, 2016
 (Released Thursday, Apr. 28, 2016)
 Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	38.85	61.15	34.76	14.79	8.71	2.81
Last Week 4/19/2016	40.56	59.44	34.76	14.89	8.71	2.81
3 Months Ago 12/8/2015	37.80	62.20	38.45	21.59	11.69	5.81
Start of Calendar Year 12/29/2015	33.17	66.83	45.07	29.30	15.92	6.85
Start of Water Year 9/29/2015	22.77	77.23	57.81	42.42	26.50	7.62
One Year Ago 4/26/2015	26.14	73.86	62.12	39.33	17.64	7.95

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

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

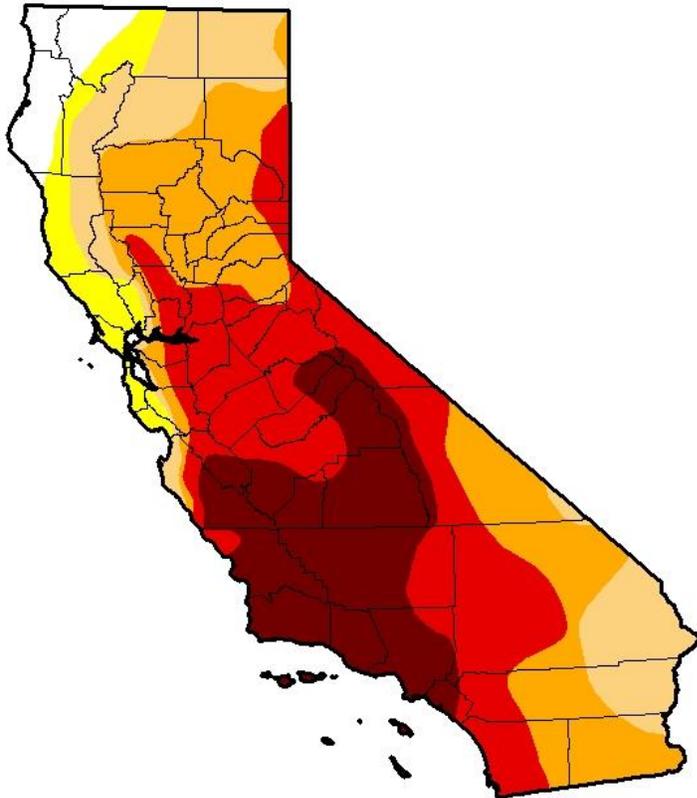
Author:
 Richard Heim
 NCEI/NOAA



<http://droughtmonitor.unl.edu/>

U.S. Drought Monitor California

April 26, 2016
(Released Thursday, Apr. 28, 2016)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	4.24	95.76	90.09	74.37	49.15	21.04
Last Week <i>4/19/2016</i>	4.24	95.76	90.09	74.37	49.15	21.04
3 Months Ago <i>1/26/2016</i>	0.00	100.00	95.35	86.13	63.96	40.21
Start of Calendar Year <i>12/29/2015</i>	0.00	100.00	97.33	87.55	69.07	44.84
Start of Water Year <i>9/29/2015</i>	0.14	99.86	97.33	92.36	71.08	46.00
One Year Ago <i>4/28/2015</i>	0.14	99.86	98.11	93.44	66.60	46.77

Intensity:

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

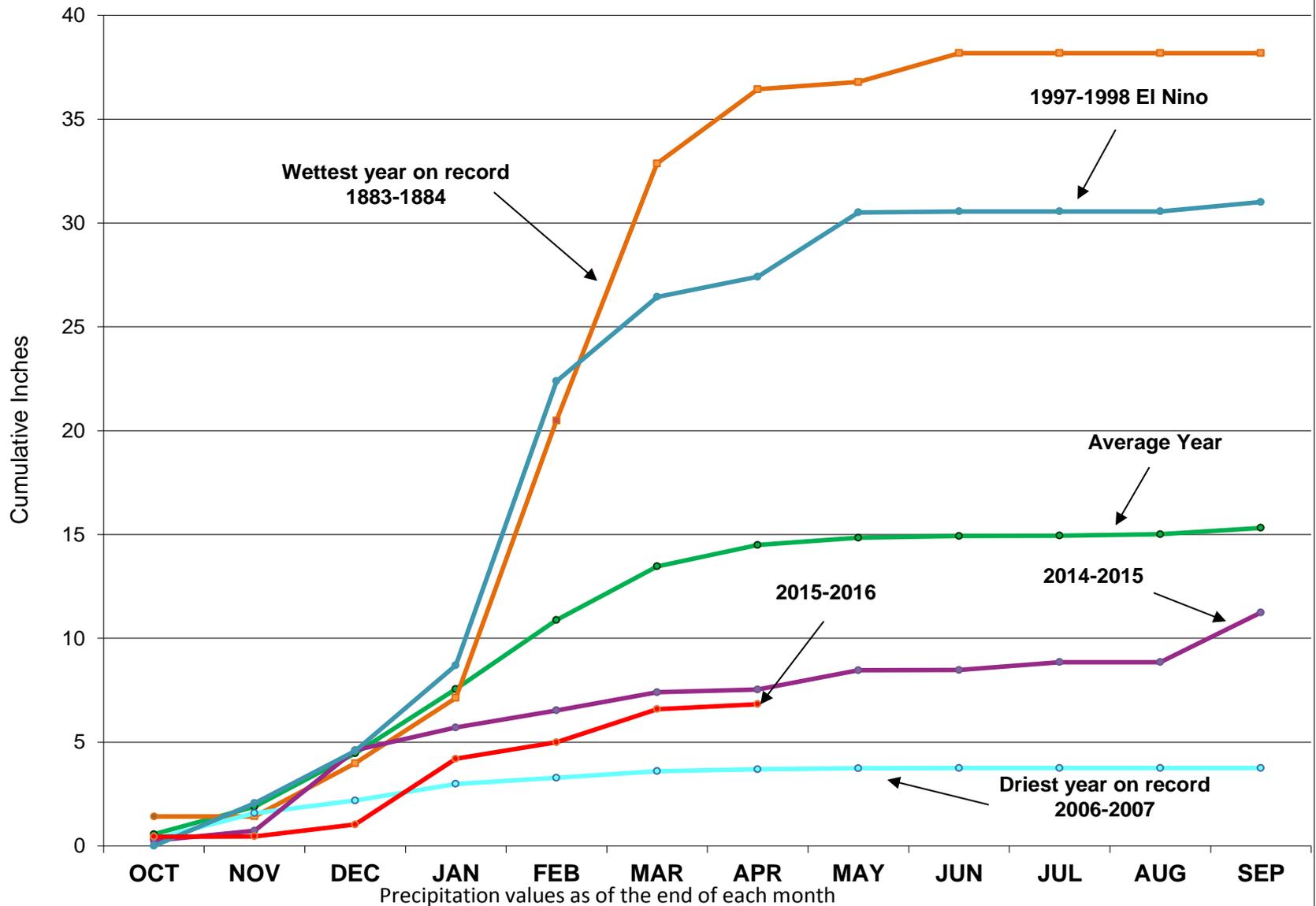
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Richard Heim
NCEI/NOAA



<http://droughtmonitor.unl.edu/>

Los Angeles Civic Center Precipitation

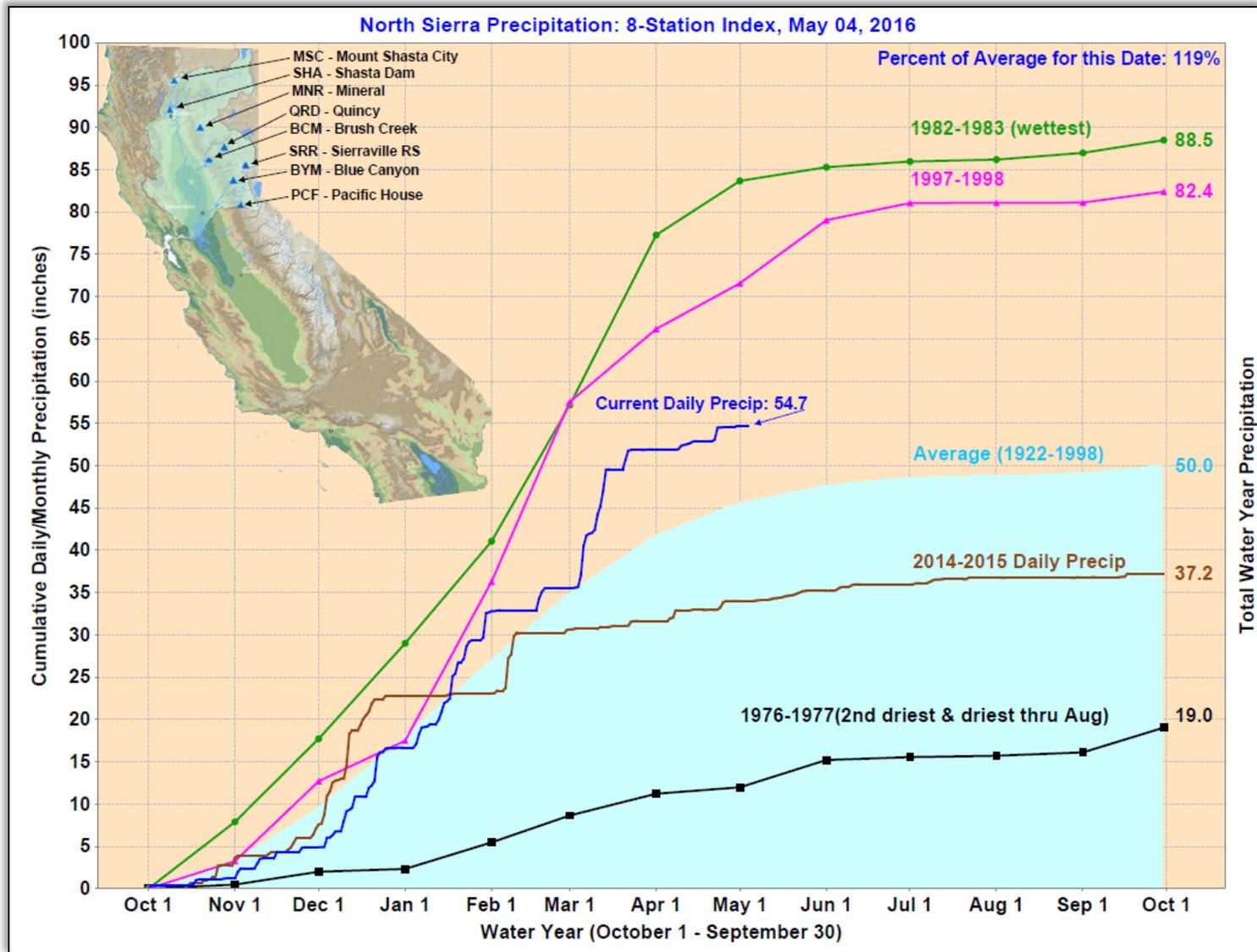


Precipitation at Six Major Stations in Southern California

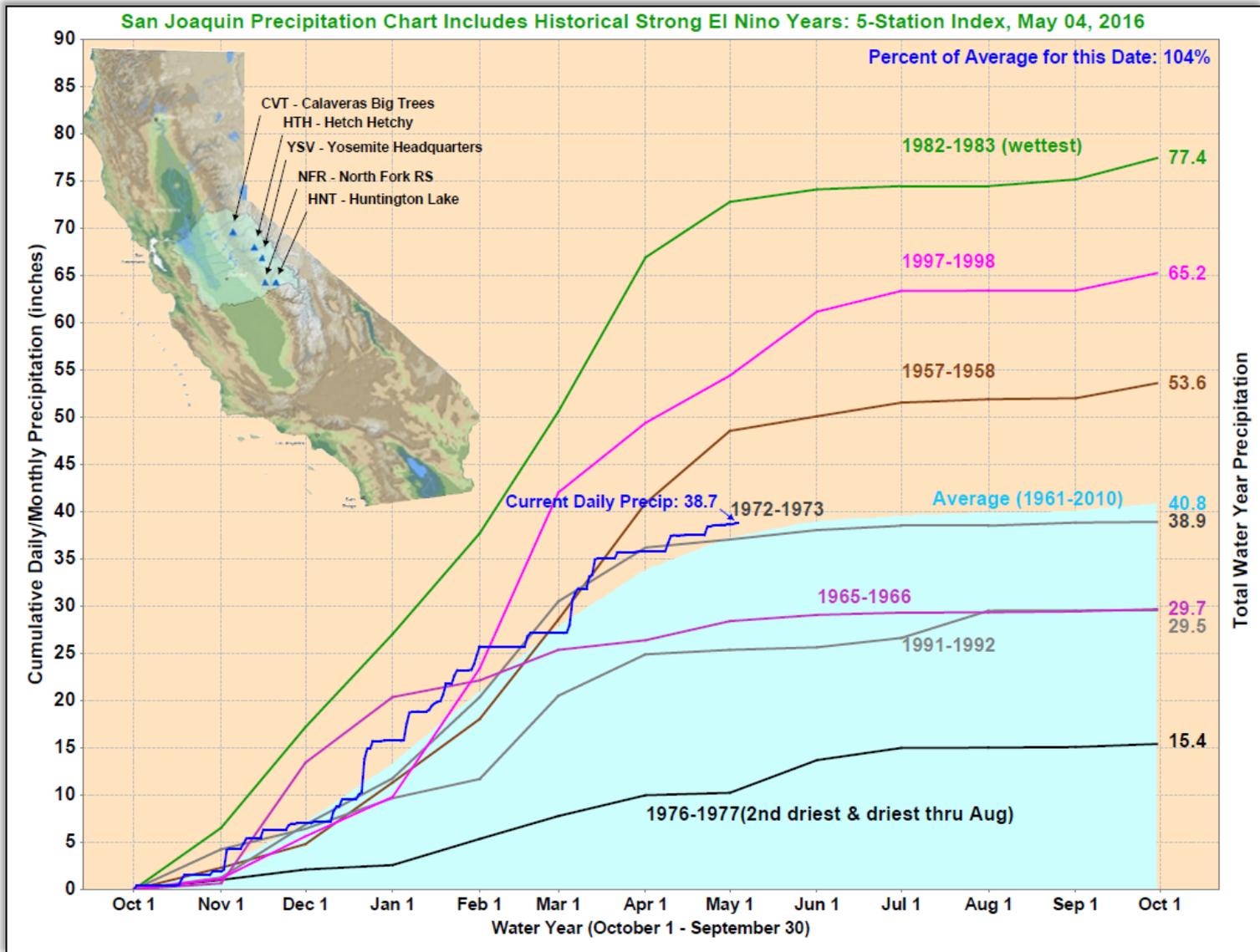
From October 1, 2015 to May 1, 2016

Station	Precipitation in inches		Average to Date	Percent of Average
	Apr	Oct 1 to May 1		
San Luis Obispo	0.21	12.54	21.57	58%
Santa Barbara	0.54	10.19	17.07	60%
Los Angeles	0.24	6.83	14.49	47%
San Diego	0.50	6.53	9.64	68%
Blythe	0.14	1.59	2.54	63%
Imperial	0.16	0.83	2.16	38%

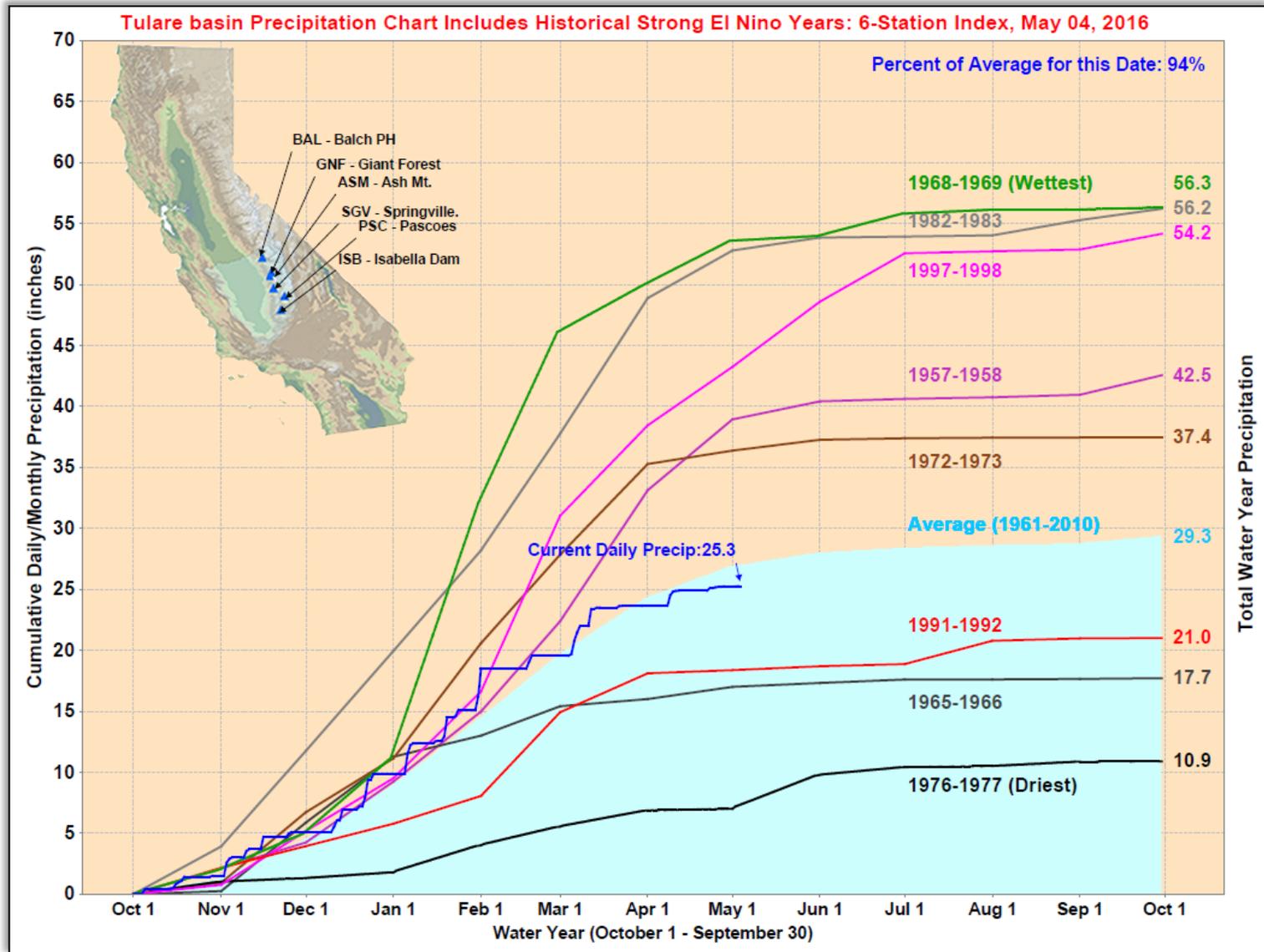
Northern Sierra Precipitation-8 Station Index



San Joaquin Precipitation: 5-Station Index



Tulare Basin Precipitation: 6-Station Index



Snow Water Equivalents (inches)

% of April 1 Average / % of Normal for This Date



Statewide Average: 43% / 59%

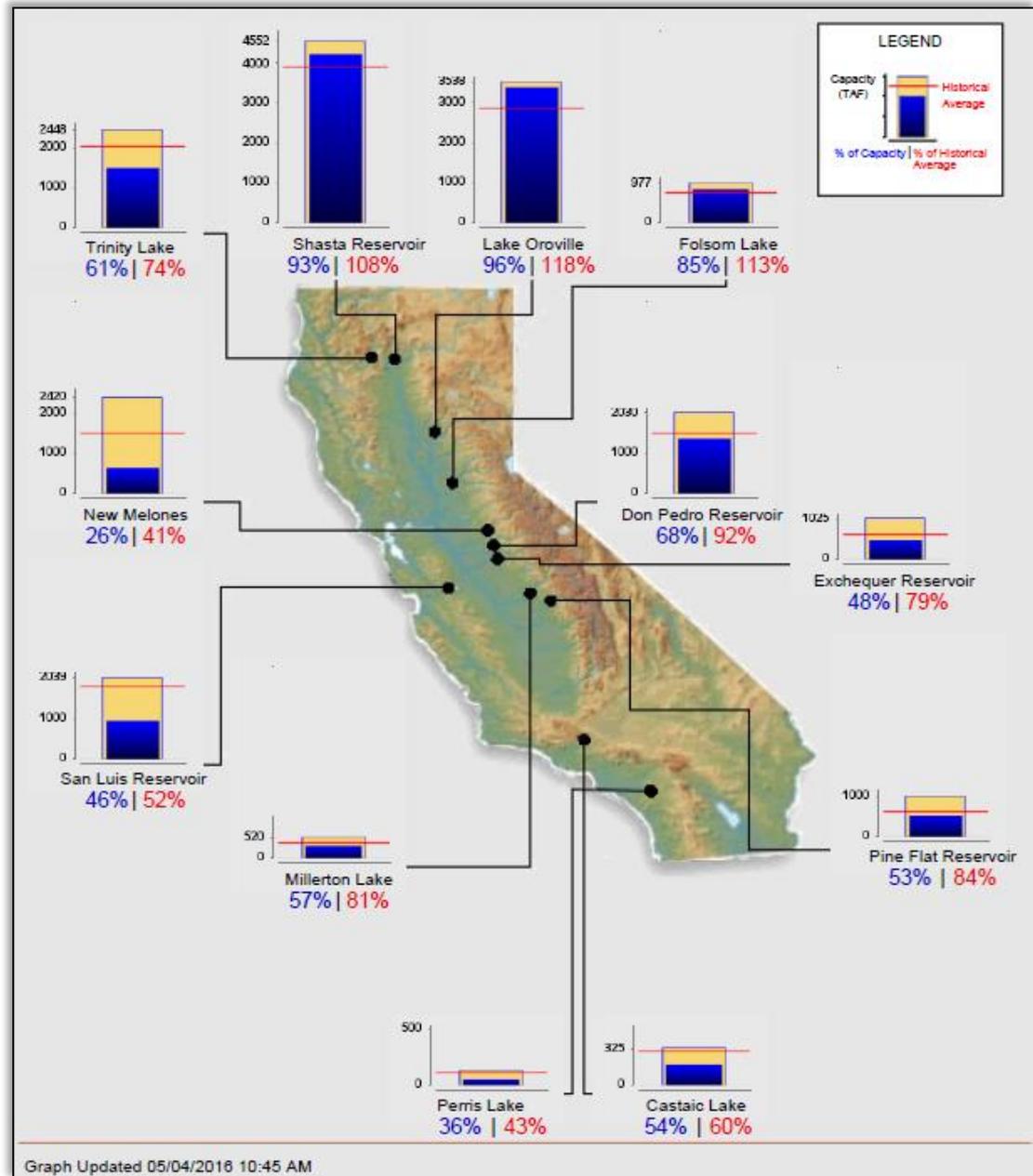
NORTH	
Data as of May 4, 2016	
Number of Stations Reporting	28
Average snow water equivalent (Inches)	11.3
Percent of April 1 Average (%)	40
Percent of normal for this date (%)	60

CENTRAL	
Data as of May 4, 2016	
Number of Stations Reporting	40
Average snow water equivalent (Inches)	14.5
Percent of April 1 Average (%)	50
Percent of normal for this date (%)	66

SOUTH	
Data as of May 4, 2016	
Number of Stations Reporting	27
Average snow water equivalent (Inches)	9.1
Percent of April 1 Average (%)	34
Percent of normal for this date (%)	45

STATE	
Data as of May 4, 2016	
Number of Stations Reporting	95
Average snow water equivalent (Inches)	12.0
Percent of April 1 Average (%)	43
Percent of normal for this date (%)	59

Current Reservoir Conditions



Comparison of SWP Water Storage

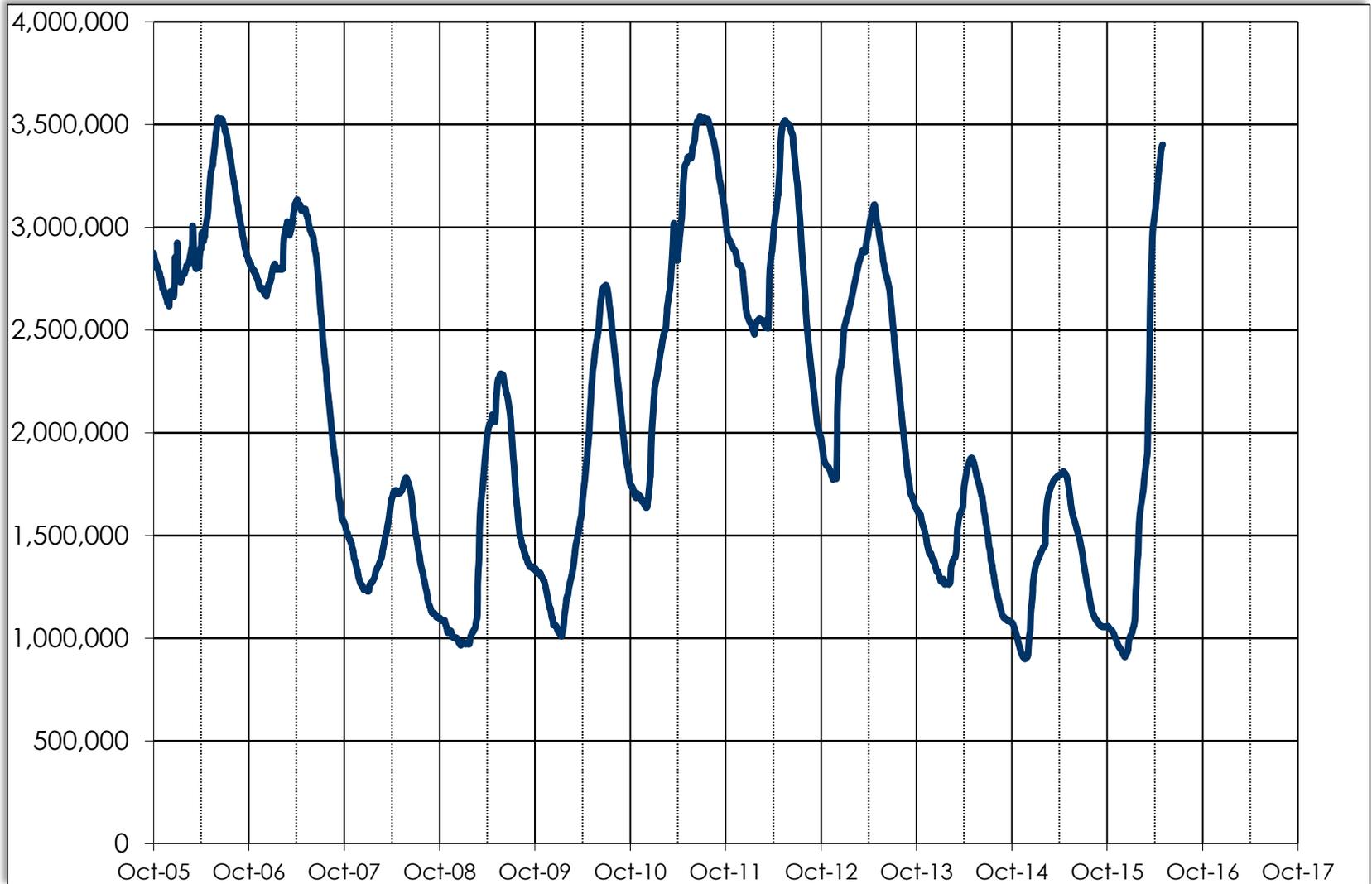
Reservoir	Capacity	2015 Storage (acre-feet)		2016 Storage (acre-feet)	
		As of May 1	% of Cap.	As of May 1	% of Cap.
Frenchman	55,475	20,081	36%	24,193	44%
Lake Davis	84,371	46,845	56%	56,744	67%
Antelope	22,564	22,704	101%	23,182	103%
Oroville	3,553,405	1,777,442	50%	3,403,205	96%
TOTAL North	3,715,815	1,867,072	50%	3,507,324	94%
Del Valle	39,914	40,704	102%	40,106	100%
San Luis (DWR)	1,062,180	893,373	84%	550,284	52%
Pyramid	169,901	164,864	97%	163,753	96%
Castaic	319,247	100,539	31%	177,890	56%
Silverwood	74,970	70,733	94%	66,548	89%
Perris	126,841	51,378	41%	47,280	37%
TOTAL South	1,793,053	1,321,591	74%	1,045,861	58%
TOTAL SWP	5,508,868	3,188,663	58%	4,553,185	83%

State Water Project Projected Deliveries:

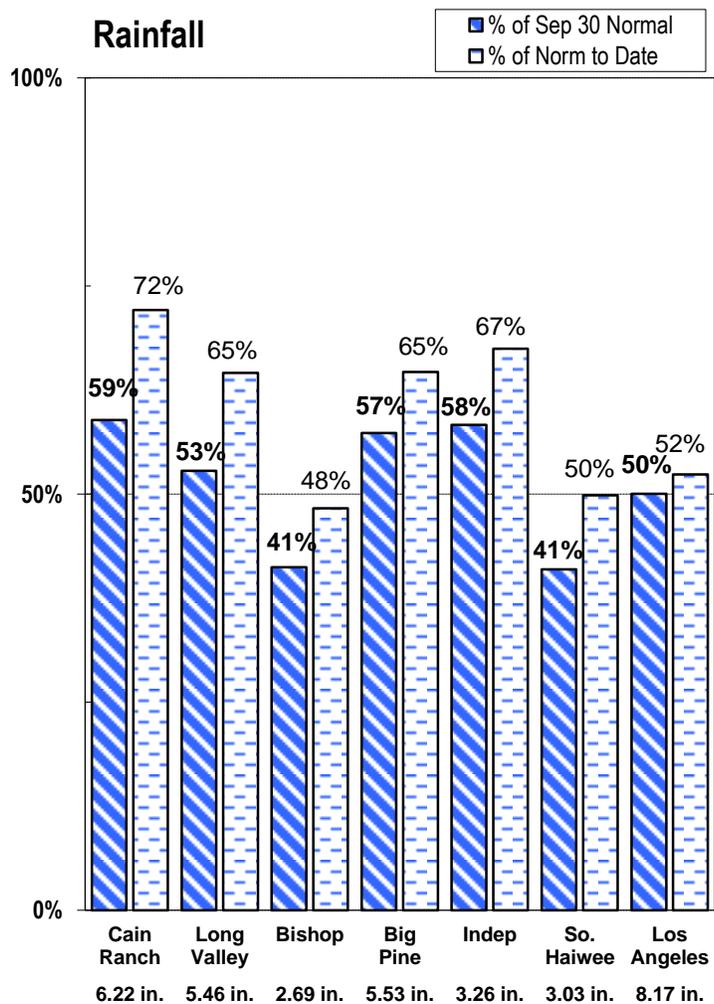
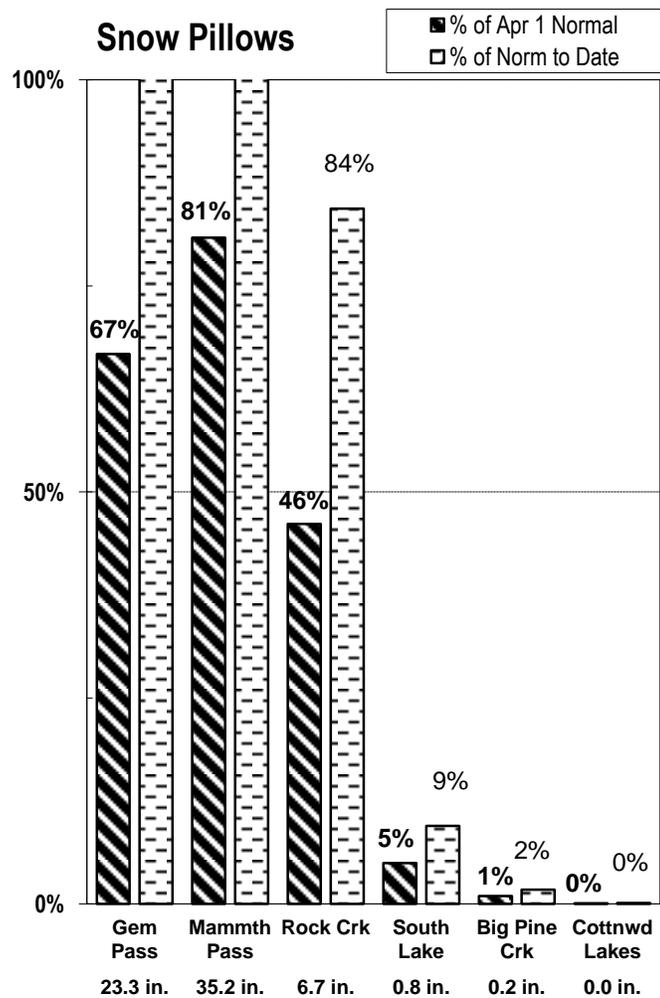
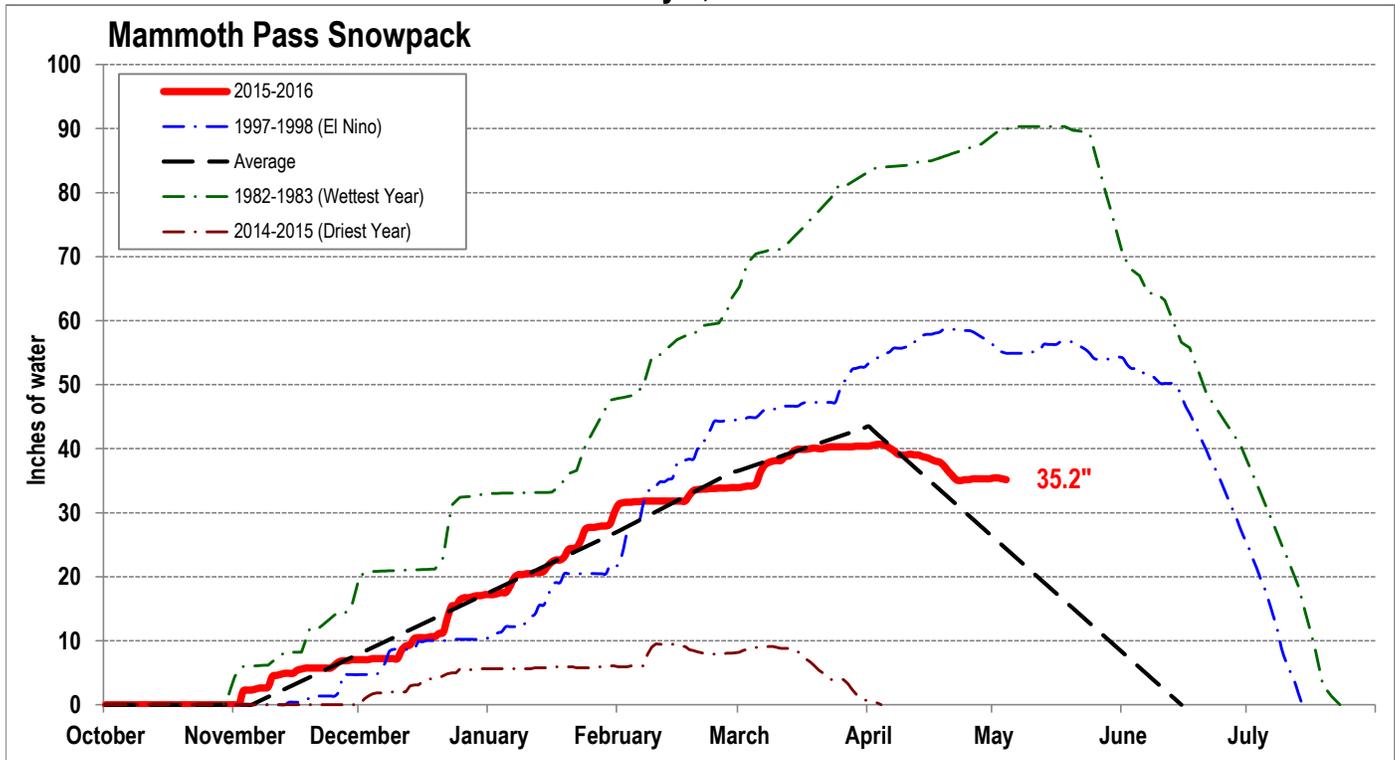
As of April 21, 2016, the Table-A allocations for 2016 is 60%

Oroville Storage (acre-feet)

October 1, 2007 - May 1, 2016



EASTERN SIERRA CURRENT PRECIPITATION CONDITIONS May 4, 2016



Measurement as Inches Water Content; Precipitation totals are cumulative for water year beginning Oct 1



RECOMMENDATIONS OF THE BYPASS FLOWS WORKGROUP

April 2016

**Co-chaired by:
Arizona Department of Water Resources
and U.S. Bureau of Reclamation**

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ACRONYMS AND ABBREVIATIONS

2007 Guidelines	<i>Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead</i>
Basin Study	<i>Colorado River Basin Water Supply and Demand Study</i>
ADWR	Arizona Department of Water Resources
AF	acre-feet
CAWCD	Central Arizona Water Conservation District
Cienega	Cienega de Santa Clara wetland
GDP	Gross Domestic Product
IBWC	International Boundary and Water Commission
ICMA	Intentionally Created Mexican Allocation
MWD	Metropolitan Water District of Southern California
MOU	Memorandum of Understanding
NIB	Northerly International Boundary
Reclamation	Bureau of Reclamation
SIB	Southerly International Boundary
SNWA	Southern Nevada Water Authority
U.S.	United States
Workgroup	Bypass Flows Workgroup
WMIDD	Wellton-Mohawk Irrigation and Drainage District
YDP	Yuma Desalting Plant

1. BACKGROUND

The Colorado River System is in a drought that began 16 years ago, leading to substantially decreased water surface elevation levels in both Lakes Mead and Powell. Colorado River System modeling projections show an increasing near-term risk that water surface elevations in both Lakes Mead and Powell could decline to levels that would not only trigger shortage conditions in Lake Mead operations as set forth in the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead¹ (2007 Guidelines), but could also reach critical levels impacting the ability to draw or benefit from water in the lakes, including severely impacting hydropower resources.

In response to this situation, the Bureau of Reclamation (Reclamation), the States of Arizona, California, Nevada and municipal water agencies (Central Arizona Water Conservation District [CAWCD], Metropolitan Water District of Southern California [MWD] and Southern Nevada Water Authority [SNWA]) executed a Memorandum of Understanding² (MOU) in December 2014 for drought response action plans. The plan includes voluntary development of additional quantities of water stored in Colorado River reservoirs, in particular Lake Mead, to reduce the risk of Lake Mead reaching critical reservoir elevations. The MOU sets forth a shared goal of developing between 1.5 and 3.0 million acre-feet (maf) of additional water by 2019. The MOU also indicates that planning is needed to address long-term system sustainability, a component of which is to replace, recover and reduce system losses from the Colorado River System.

These losses include the “bypass flows” which are pumped agricultural drainage water that bypass the River and cannot be included in water deliveries to Mexico due to salinity management constraints. These flows have averaged over 100,000 acre-feet annually since 1974 when the United States (U.S.) initiated actions to comply with Minute 242³ of the 1944 Water Treaty⁴ with Mexico. To focus on the bypass flows, in early 2015 Reclamation partnered with the Arizona Department of Water Resources (ADWR) to co-chair and convene a Bypass Flows Workgroup (Workgroup) in order to identify approaches to reduce, replace or recover a like

¹ 2007 Guidelines are available at: <http://www.usbr.gov/lc/region/programs/strategies.html>

² MOU is available at: http://www.usbr.gov/lc/region/g4000/LB_DroughtResponseMOU.pdf

³ “Permanent and definitive solution to the international problem of the salinity of the Colorado River,” August 30, 1973.

⁴ Water Treaty for the "Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande," February 3, 1944.

amount of the bypass flows that contribute to declining reservoir levels at Lake Mead (see Appendix A).

2. NATURE OF THE BYPASS FLOWS

There are six irrigation districts⁵ in Yuma County, Arizona that divert Colorado River water for commercial agriculture. According to Yuma County Agriculture Water Coalition, “agricultural and supporting services are the single largest private sector contributor to Yuma’s Gross Domestic Product (GDP). With a GDP of nearly \$5.4 billion, Yuma County’s economy would rank 151 out of 192 countries, globally.”⁶

The use of Colorado River water in the Yuma area raises the groundwater table and in many areas the table is so high that without wellfield operations to lower the water table, crop production would be harmed. Reclamation and the Wellton-Mohawk Irrigation and Drainage District (WMIDD) operate over 180 high capacity wells to pump water from the ground as agricultural drainage. This pumped agricultural drainage is too saline to return to the Colorado River and deliver to Mexico while continuing to meet the Minute 242 salinity differential.

Mexico and the U.S. adopted Minute 242 on August 30, 1973 after more than a decade of negotiations between the two countries to resolve Mexico’s protests about higher salinity water arriving at Morelos Dam. The primary source of the salinity is from pumped agricultural drainage that originated in the WMIDD beginning in the 1950’s after construction of the Wellton Canal and farm operations that came into production thereafter. The district was discharging its brackish drainage water into the Gila River, which joins the Colorado River near Yuma. To improve water quality to Mexico the U.S. agreed to adopt measures in Minute 242 to ensure that the water delivered to Mexico upstream of Morelos Dam has an annual average salinity of no more than 115 parts per million +/- 30 parts per million greater than the annual average salinity of Colorado River water at Imperial Dam.

⁵ North Gila Valley Irrigation District, Unit B Irrigation & Drainage District, Yuma (or South Gila) Irrigation District, Yuma County Water Users Association, Yuma Mesa Irrigation and Drainage District, Wellton-Mohawk Irrigation and Drainage District.

⁶ “A Case Study in Efficiency – Agriculture and Water Use in the Yuma, Arizona Area”, Yuma County Agriculture Water Coalition, February 2015.

To implement the necessary actions to comply with Minute 242, Congress enacted the Colorado River Basin Salinity Control Act⁷ (Salinity Control Act) in 1974. Title I of the Salinity Control Act authorized a program of works “for the enhancement and protection of the quality of water available in the Colorado River for use in the United States and the Republic of Mexico” and enables the United States to comply with the obligations of Minute 242. Title I of the Salinity Control Act authorized the Secretary of the Interior to undertake specific measures including: “Extension of the Bypass Drain, reduction of WMIDD irrigable acreage, development of well fields to furnish water for use in the United States and for delivery to Mexico, lining or construction of a new Coachella Canal in California, and construction and operation of a desalting plant and appurtenant works.” In 1978, the extension of the Bypass Drain was completed in Mexico and reached the northern end of the Santa Clara Slough (now known as the Cienega de Santa Clara wetland [Cienega]). Thereafter, WMIDD brackish drainage water was pumped and discharged into the Bypass Drain instead of the Colorado River. These brackish drainage flows that make up the bypass flows do not count toward the Mexican Water Treaty delivery allocation. In order to make-up for the volume of bypass flows not discharged into the Colorado River an equivalent volume of water must be released from Lake Mead, which contributes to declining reservoir levels.

Collected brackish drainage water from WMIDD is the primary source of flows in the Bypass Drain. Recently however, reduced flows in the Colorado River during the drought, lower salinity water arriving at Imperial Dam⁸ and efforts to operate as efficiently as possible (e.g., minimize excess flows to Mexico), have resulted in less water available to dilute the salinity of collected agricultural drainage being discharged into the River. Consequently, additional pumped drainage from wells in the Yuma area; specifically, wells located in the South Gila and Yuma Valleys have been added to the flow in the Bypass Drain to stay within the Minute 242 salinity differential. For the 20-year period 1995 through 2014, the bypass flows totaled approximately 2.25 maf.⁹ For the recent five-year period 2010 through 2014 the bypass flows totaled an average 125,958 acre-feet (AF) annually (see Figure 1). Prior to that, flows averaged 110,419 AF annually for the previous five-year period 2005 through 2009 (see Figure 1).

⁷ Colorado River Basin Salinity Control Act of June 24, 1974 (Public Law 93-320).

⁸ Since the creation of the Colorado River Salinity Control Forum in 1973 and passage of the Colorado River Basin Salinity Control Act in 1974 measures have been put in place that reduce the annual salt load of the Colorado River. The salinity of Colorado River water arriving at Imperial Dam has been reduced by about 90 parts per million.

⁹ Source: IBWC for 1995 through 2012; Reclamation for 2013 and 2014. 2013 and 2014 are provisional values.

Figure 1. Total Bypass Flows by year

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Acre-Feet	107,433	107,514	106,944	115,435	114,770	117,465	130,612	126,225	110,910	144,579

2013 and 2014 are provisional values based on Reclamation data; final values provided by the International Boundary and Water Commission are typically two years in arrears

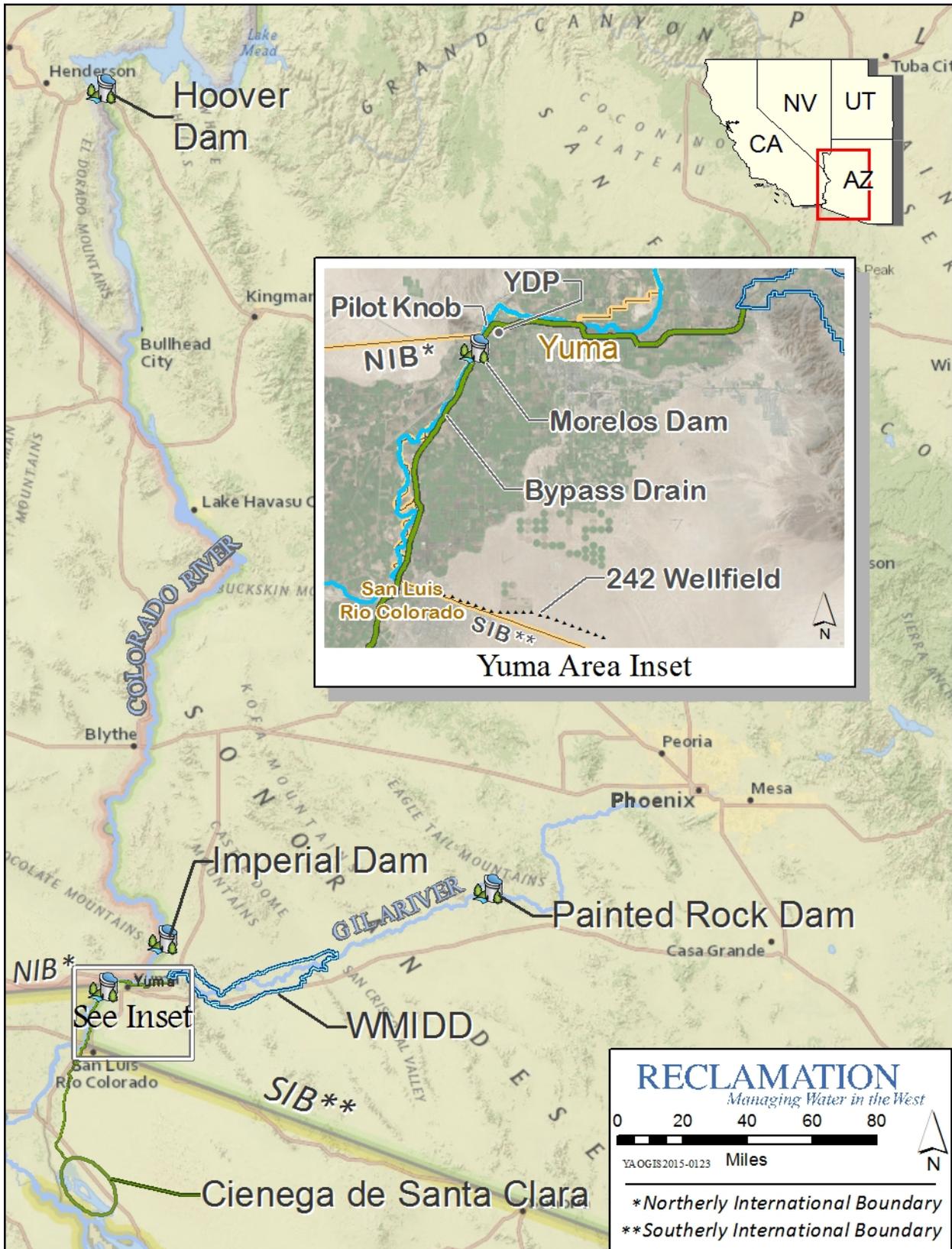
Since construction of the Bypass Drain was completed in 1978, except for brief periods of Yuma Desalting Plant¹⁰ (YDP) operation, bypass flows in their entirety have reached the Cienega and are the primary water source for the wetland. The 52,300-acre¹¹ Cienega is part of the 2.3 million acre¹¹ Upper Gulf of California and Colorado River Delta Biosphere Reserve, the highest category of protection that Mexico assigns to a wetland. This area provides wetland habitat for migratory birds of the Pacific Flyway and for various species, including threatened and endangered species.

Figure 2 provides an overview of the geographic area focused on by the Bypass Flows Workgroup.

¹⁰ Due to agency budget constraints as well as surplus and normal conditions on the lower Colorado River prior to the drought, the YDP has been maintained, but not operated except for periods in 1992 – 1993, 2007 and 2010 – 2011.

¹¹ Source: “Conservation Priorities in the Colorado River Delta, Mexico and the United States”, Sonoran Institute, Environmental Defense, et al., 2005.

Figure 2. Area focused on by the Bypass Flows Workgroup



3. BYPASS FLOWS WORKGROUP

As noted earlier, the Workgroup was co-chaired and convened by the ADWR and Reclamation (see Appendix B, Figure 8 for the list of Workgroup members). It was created to focus on the bypass flows “in a sustainable manner that conserves the limited water supplies of the Colorado River, recognizes the environmental values of the Cienega, and integrates local, regional and international concerns.”¹² The Workgroup was aware that “any water management actions contemplated by this Workgroup that are funded or implemented by Reclamation would, of course, need to be fully analyzed and vetted through public review processes including, for example, environmental reviews.”¹³ Consistent with this guidance and the MOU, the Workgroup began by defining its objective and sub-objectives.

The Workgroup’s objective, developed by its members was:

To aid in reducing further decline of Colorado River Reservoirs by identifying, analyzing and recommending a set of options that collectively conserve at least 100,000 AF of water annually in Lake Mead by reducing, replacing, or recovering a like amount of the bypass flows in a fiscally, legally, bi-nationally, and environmentally responsible manner.

In addition, the Workgroup members developed five sub-objectives to further assist their work:

- Avoid involuntary impact to any contract holder’s full use of its respective entitlement of Colorado River water;
- Obtain voluntary acceptance of impacts associated with options;
- Ensure consistency with the Law of the River;
- Implement solution(s) at a reasonable cost and as soon as possible but preferably within 5 years¹⁴ (by December 31, 2019); and
- Prioritize achieving bypass flows reduction/offset during low reservoir conditions (i.e. greater reduction/offset may not be as critical during high-normal/surplus conditions).

¹² Letter from ADWR to Reclamation dated December 9, 2014 (see Appendix A).

¹³ Letter from Reclamation to ADWR dated December 29, 2014 (see Appendix A).

¹⁴ Timing and date reflects the MOU of December 2014.

4. OPTIONS, ANALYSIS AND RATING PROCESS

The Workgroup evaluated all of the water flows and existing infrastructure in the Yuma area and identified possible options to reduce, replace, or recover the flows.

The Workgroup recognized at the outset of the analysis that many of the options would require consideration of potential impacts in Mexico including those to the flows to the Cienega and accordingly would involve discussions with Mexico to fully analyze those options. However, the focus of the Workgroup was to develop a preliminary consensus in the U.S. before beginning those discussions. As a result, the Workgroup only evaluated domestic considerations of each option. Matters related to water users and natural resources in Mexico are matters of foreign policy that are addressed through the International Boundary and Water Commission (IBWC), the international body responsible for addressing Colorado River matters between the U.S. and Mexico, pursuant to the 1944 Water Treaty.

The Workgroup also recognizes that additional joint cooperative actions with Mexico could be necessary to reduce impacts for many of the options and that such specific joint cooperative actions would be subject to consultations with Mexico through the IBWC. For example, options that reduce the volume or increase the salinity of the bypass flows to the Cienega could be combined with other options and/or joint cooperative actions to address those changes in volume and salinity.

The Workgroup proposed and considered 13 options that it believed could positively impact the bypass flows and aid in stabilization of the elevation of Lake Mead while meeting the Workgroup's objective and sub-objectives (see Figure 3). It is likely that a combination of options may be required in order to meet the Workgroup's objective and sub-objectives. Development and implementation of a combination of options, including constructive consultation with Mexico and efforts to manage potential impacts that could result from the options will be key to ensuring that these objectives and sub-objectives are fully accomplished.

Figure 3. Options developed and considered by the Workgroup

Option	Description
1. YDP 1/3 – As authorized	One-third capacity YDP operation as it is currently configured, desalinating the bypass flows
2. YDP 1/3 – Existing wells and conveyances	One-third capacity YDP operation desalinating other Yuma area groundwater, using existing wells and conveyances
3. YDP 1/3 – New wells and conveyances	One-third capacity YDP operation desalinating other Yuma area groundwater, using new wells and conveyances
4. YDP 1/3 – Industrial water use	One-third capacity YDP operation; ultra-low salinity product water provided to industrial water users
5. YDP 1/3 – Municipal water use	One-third capacity YDP operation; product water provided to U.S. and/or Mexico municipalities
6. YDP 2/3 – Shared with Mexico	Two-thirds capacity YDP operation; additional capacity in excess of Mexico’s annual Colorado River water entitlement
7. 242 Wellfield expansion project	Returning the Wellfield to recent historic pumping levels; lower salinity water to the Northerly International Boundary (NIB)
8. System Conservation in the U.S.	Voluntary, compensated reductions in Colorado River water use by U.S. water users
9. Bi-national responsibility for bypass flows	Certain flows to Cienega maintained by U.S.; in light of environmental benefits in Mexico, Mexico charges a portion of flows against its 1.5 MAF Treaty allocation
10. Leverage salinity differential	Modifications to salinity compliance by converting to real-time salinity measurement and a fixed or partially fixed monthly salinity limit
11. System Conservation in Mexico	Voluntary, compensated reductions in Colorado River water use by Mexican water users
12. SIB-NIB bypass flows exchange via 242 pumping	More low salinity 242 Wellfield water to the Southerly International Boundary (SIB) for reduced water delivery at NIB or more water to the Cienega
13. Maintain ICMA storage levels	Further enhance Intentionally Created Mexican Allocation (ICMA) provisions

Options 2, 7 and 10 create water that is intended to become system water to maintain and enhance elevations at Lake Mead and provide overall system benefit. Additional agreements and consultations with ADWR would be required for these options where water agencies receive return flow credits that reduce the irrigation districts consumptive use, or if new wells are anticipated.

After considering each option relative to the Workgroup's objective and sub-objectives, the Workgroup analyzed the 13 options by applying a wide range of evaluation criteria to each option. Evaluation criteria ranged from technical criteria such as quantity of yield and cost, to subjective criteria such as implementation risk and policy considerations.

For each criterion associated with each bypass flows option, a quantitative and/or qualitative description was developed. Recommendations were developed by the Workgroup based on the degree to which each option met the group's objective and sub-objectives as well as the outcome of the application of the evaluation criteria.

5. RECOMMENDATIONS OF THE WORKGROUP

The Workgroup recommends that some combination of the following eight options be used (see Figure 4). While the options require additional analysis, the Workgroup is confident that they collectively represent reasonable choices for methods to resolve the bypass flows in a fiscally, legally, bi-nationally, and environmentally responsible manner. All of these options, except “System Conservation in the U.S.” likely require consultations with Mexico through the IBWC and may result in a supporting binational agreement. Subject to additional analysis, those options may be considered for potential inclusion in discussions with Mexico for a successor agreement to Minute 319. All eight options may not be implemented; some options overlap in aspects of how the bypass flows might be reduced, replaced or recovered. Also, further analysis as well as consultations with U.S. parties and with Mexico will also result in some options proving more advantageous than others.

Figure 4. Options Recommended by the Bypass Flows Workgroup

Option	Estimated annual water yield (acre-feet)
1. YDP 1/3 – As authorized	33,000
2. 242 Wellfield expansion project	25,000
3. System Conservation in the U.S.	10,000
4. System Conservation in Mexico	10,000
5. Leverage salinity differential	40,000
6. Bi-national responsibility for bypass flows	50,000
7. SIB-NIB bypass flows exchange via 242 pumping	25,000
8. Maintain ICMA storage levels	20,000

The estimated yields for options 1 and 2 are based on the physical operating characteristics while yields for options 3 through 8 reflect the collective judgment of the Workgroup

A description of each of the recommended options follows. In addition, Section 6 of this report suggests and describes potential portfolios, combinations of options that are recommended.

Yuma Desalting Plant Operations as Authorized

The YDP is a brackish water reverse osmosis desalination plant located on the outskirts of Yuma, Arizona. The plant was designed and constructed for desalination of bypass flows. This option is operation of the YDP at one-third of full capacity as the plant is currently configured and using the bypass flows as feed water for the YDP.

Such plant operations would yield approximately 33,000 AF annually. Preparing the plant for long-term sustained operations would cost an estimated \$26.5 to \$28.5 million and would require 3 years from the date funding is received to implement. Operating costs are an estimated \$350 to \$380 per acre-foot, though could vary outside of that range based on the cost of chemicals and electricity.¹⁵ Plant operation results in decreased volume and increased salinity of the bypass flows reaching the Cienega; operation of the YDP would require consultations with Mexico. A new Minute to the 1944 Water Treaty was required for operation of the YDP in 2010 and 2011.

242 Wellfield Expansion Project

The 242 Wellfield (formally called the Protective and Regulatory Pumping Unit) lies within a strip of land called the “5-Mile Zone.” Minute 242 of the 1944 Water Treaty limits U.S. and Mexico pumping within the “5-Mile Zone” to no more than 160,000 AF of water annually by each country. During the past five years (2010-2014) the U.S. has pumped an average of 28,025 AF of water annually from the 242 Wellfield. During the previous five-year period (2005-2009) an average of 43,087 AF of water was pumped annually from the 242 Wellfield. This option is the pumping of lower salinity water from the 242 Wellfield and routing it north to the Colorado River for inclusion in water deliveries to Mexico at the NIB.

This project could yield approximately 25,000 AF annually.¹⁶ One-time capital costs are an estimated \$17 to \$19 million and the project could be completed within 2.5 years of receipt of full funding. On-going costs are an estimated \$9 per acre-foot (primarily electricity associated with groundwater pumping).¹⁵ Since the 242 Wellfield lies within the “5-mile Zone” consultations with Mexico would be required in order to facilitate this project.

¹⁵ Exclusive of amortization of one-time capital costs.

¹⁶ Bureau of Reclamation would work with Arizona parties to ensure water conservation can be achieved (return flow credits).

System Conservation in the U.S.

System conservation is the implementation of projects that result in voluntary, compensated reductions in water uses by agricultural, municipal or industrial water users. Participating entities would be compensated on a per acre-foot basis for measureable reductions in the use or loss of lower Colorado River water that help increase the water surface elevation of Lake Mead.¹⁷ Examples of such projects include, but are not limited to: land fallowing, increased system efficiency, and water re-use. Expanded system conservation efforts could be used as a mechanism to replace bypass flows and offset the impact to Lake Mead. Any water conserved through system conservation for purposes of bypass flows replacement would need to be specifically designated as such.

For purposes of this analysis, system conservation projects were assumed to yield approximately 10,000 AF annually, but could be larger. The lead-time associated with these projects varies between approximately 18 months and 2.5 years. Six to 12 months is typically required to solicit and evaluate proposals, make awards, and execute necessary contracts and ancillary agreements. Subsequently the implementation of projects or programs typically requires 12 to 24 months. \$100 to \$500 per acre-foot is a reasonable expectation for the cost of new system conservation projects.

System Conservation in Mexico

As noted earlier, system conservation is the implementation of projects that result in a voluntary, compensated reduction in water use by agricultural, municipal or industrial water users; compensation on a per acre-foot basis for water preserved in Lake Mead. In this case the participating entities would be in Mexico. Estimated costs were assumed to be similar to the anticipated range for system conservation activities in the U.S.

For purposes of this analysis, system conservation projects in Mexico were assumed to yield approximately 10,000 AF annually, though the actual yield (and implementation lead-time) would depend on the outcome of consultations with Mexico and the specific nature of the projects implemented.¹⁸ Any water conserved through system conservation

¹⁷ A System Conservation Pilot Program was initiated under a MOU between CAWCD, MWD, SNWA, Denver Water and Reclamation signed July 30, 2014. Experience gained from this Pilot could be used for a new program.

¹⁸ To date Mexico has not elected to participate in the System Conservation Pilot Program initiated in mid-2014.

for purposes of bypass flows replacement would need to be specifically designated as such.

Leverage salinity differential

This option proposes modifications to salinity compliance under Minute 242 of the 1944 Water Treaty by converting from the current approach (an annually calculated average salinity differential) to real-time salinity measurement and possibly a fixed or partially fixed monthly salinity limit. The modification would likely include:

- A modification to Mexico's monthly water order at the NIB to increase the amount of water delivered at the NIB during the lowest delivery months during which time salinity management is most challenging.
- The U.S. could agree to reduce pumping levels during these lowest delivery months.
- To offset this impact and also generate additional water¹⁹, the U.S. would increase pumping levels (possibly requiring additional infrastructure) during the highest water delivery months to Mexico when salinity is of less concern.
- Both countries would adopt real-time salinity measurement and management.

These modifications could result in mutual bi-national benefits:

- Additional use of Yuma drainage flows to meet Mexico's water order would result in additional water savings that would benefit the system and users in both countries.
- Mexico could better meet daily changes in water demands through more real-time coordination and operations with the U.S.

For purposes of this analysis, this option was assumed to yield approximately 40,000 AF annually, though the actual yield (and implementation lead-time) would depend on the outcome of consultations with Mexico.

¹⁹ Additional agreements and consultations with the ADWR would be required for any new wells and where water agencies receive return flow credits that reduce irrigation districts consumptive use.

Shared bi-national responsibility for bypass flows

In connection with a new Treaty Minute addressing cooperative approaches to Colorado River management, the U.S. and Mexico would agree to maintain some level of flows to the Cienega de Santa Clara wetland. The two countries would provide more certainty regarding the defined amount of water going to the Cienega. Given the environmental benefits and potential interest in ensuring a reliable water flow to the Cienega into the future, consideration would be given to account for a portion of the flows as part of Mexico's annual Treaty allocation. For purposes of this analysis, this option was assumed to yield approximately 50,000 AF annually, though the actual yield (and implementation lead-time) would depend on the outcome of consultations with Mexico.

SIB-NIB bypass flows exchange via 242 pumping

In association with the option for shared bi-national responsibility for the bypass flows Mexico would agree to accept a larger quantity of higher quality water from the 242 Wellfield at the SIB in exchange for one of the following:

- A reduced delivery of water at the NIB (e.g., accepting a reduced amount of water at the NIB with a modestly increased salinity in exchange for lower salinity water at the SIB); or
- Additional Yuma agriculture drainage directed into the Bypass Drain in connection with an agreement to count a portion of the bypass flow water as part of Mexico's annual Treaty allocation.

For purposes of this analysis, this option was assumed to yield approximately 25,000 AF annually, though the actual yield (and implementation lead-time) would depend on the outcome of consultations with Mexico.

Maintain ICMA storage levels

Minute 319 to the 1944 Water Treaty is a five-year agreement between the U.S. and Mexico expiring in 2017. Under one provision of this Minute, Mexico adjusts its Colorado River water delivery schedule during low Lake Mead elevations, while having access to additional Colorado River water during high reservoir conditions. Under Minute 319 Mexico may store a maximum 250,000 acre-feet of water annually in Lake

Mead through 2017 by creating Intentionally Created Mexican Allocation (ICMA).²⁰ Mexico may use its ICMA for any purpose, including offsetting shortage reductions, based on reservoir conditions. Water stored in Lake Mead through ICMA helps to maintain and enhance Lake Mead elevations and may partially offset the present risk of the bypass flows drawing down Lake Mead water surface elevations.

Under Minute 319 when Lake Mead elevations are at 1,145 feet or higher, but below flood control conditions, Mexico may take up to 80,000 acre-feet per year of additional water from the River. If Lake Mead elevation drops to 1,075 feet or below, Mexico must reduce its 1.5 MAF allocation by 50,000 to 125,000 acre-feet of water. Minute 319 also allows U.S. entities to invest in water infrastructure improvements in Mexico in return for a share of the water such projects would save.

This option proposes the continuation of ICMA beyond the timeframe associated with Minute 319 pursuant to a new Minute. Mexican ICMA could be used as a mechanism to replace bypass flows and offset the impact to Lake Mead.

For purposes of this analysis, this option was assumed to yield approximately 20,000 AF annually, though the actual yield (and implementation lead-time) would depend on the outcome of consultations with Mexico and the salinity management framework.

²⁰ Any water that Mexico defers (originating under Minute 318) pursuant to Section III.1 of Minute 319 counts towards Mexico's annual maximum storage of 250,000 AF.

6. POSSIBLE PORTFOLIOS OF OPTIONS

As indicated in Figure 4, the Workgroup has estimated water yields for each recommended option. The actual yield will depend on further analysis, the outcomes of consultations, options selected, and how an option actually performs. All eight options recommended by the Workgroup may not be implemented nor are all eight necessary to achieve the goal of conserving at least 100,000 AF of water annually in Lake Mead. Certain portfolios, combinations of options may be possible; descriptions of those portfolios follow.

The first such potential portfolio is a collection of options that would require one-time capital infrastructure investment (see Figure 5). That infrastructure investment would deliver a measure of performance certainty (i.e., water yield) because yield estimates are based on the physical operating characteristics of infrastructure. This portfolio is dependent on funding and bi-national consultations. There is a foundation for bi-national consultation for the YDP in Minute 316 that could be leveraged for such consultations.

Figure 5. Infrastructure Focused Portfolio

Option	Estimated annual water yield (acre-feet)
1. YDP 1/3 – As authorized	33,000
2. 242 Wellfield expansion project	25,000
3. System Conservation in the U.S.	10,000
4. System Conservation in Mexico	10,000
5. <i>To be determined</i>	22,000
Total AF	100,000

The second potential portfolio is a collection of options that would require bi-national negotiations (see Figure 6). The actual water yield of the options would be dependent on the outcome of those negotiations. This portfolio would require limited capital investment for infrastructure development and has lower on-going operations and maintenance expenses than the previous portfolio. This portfolio is highly dependent of bi-national consultations with Mexico.

Figure 6. Bi-national Focused Portfolio

Option	Estimated annual water yield (acre-feet)
5. System Conservation in Mexico	10,000
6. Leverage salinity differential	40,000
7. Bi-national responsibility for bypass flows	50,000
Total AF	100,000

The third potential portfolio is a collection of options that would require investments and bi-national negotiations (see Figure 7). The YDP was successfully operated for a nearly one-year Pilot Run completed in 2011, recovering a portion of the bypass flows while protecting the Cienega through Minute 316. Pumping of the 242 Wellfield to recent historic levels and negotiated changes to Mexico’s Colorado River water delivery schedule such that Mexico would accept delivery of the bypass flows as part of the annual Treaty delivery amount would allow for additional water to remain in Lake Mead while improving water quality in Mexico’s Mexicali Valley.

Figure 7. Combination Portfolio

Option	Estimated annual water yield (acre-feet)
1. YDP 1/3 – As authorized	33,000
7. Bi-national responsibility for bypass flows	50,000
8. SIB-NIB bypass flows exchange via 242 pumping	25,000
Total AF	108,000

The current drought has led to substantially decreased water surface elevations in both Lakes Mead and Powell. The bypass flows, over 100,000 acre-feet of pumped agricultural drainage water that bypass the river, are not included in water deliveries to Mexico due to salinity management constraints and therefore contribute to declining water surface elevations at Lake Mead. The Workgroup was created to identify, analyze and recommend options that collectively conserve at least 100,000 AF of water annually in Lake Mead by reducing, replacing or recovering a like amount of bypass flows in a fiscally, legally, bi-nationally and environmentally responsible manner. The Workgroup's recommended options can create at least 100,000 AF annually and constructively contribute to reducing the risk of reaching critical reservoir elevations.

APPENDIX A

Letters exchanged between the Arizona Department of Water Resources and Bureau of Reclamation establishing the Bypass Flows Workgroup

JANICE K. BREWER
Governor



Michael J. Lacey
Director

ARIZONA DEPARTMENT of WATER RESOURCES
3550 North Central Avenue, Second Floor
Phoenix, Arizona 85012-2105
602.771.8426
azwater.gov

December 9, 2014

Sent via e-mail to tfulp@usbr.gov and via U. S. Postal Service on December 9, 2014

Mr. Terry Fulp, Ph.D.
U.S. Bureau of Reclamation
P.O. Box 61470
Boulder City, NV 89006

Dear Dr. Fulp,

As you are well aware, drought conditions in the Colorado River Basin are the worst in over a century of record-keeping and are both unprecedented and unforeseen even when examining longer-term metrics. On behalf of the State of Arizona, the Arizona Department of Water Resources is dedicated to proactively addressing Colorado River supply and management challenges now to protect the viability and resiliency of the Colorado River system and sustain economic development in Arizona and the rest of the Basin for decades to come.

In addition to our work with Reclamation and our Lower Basin neighbors in California and Nevada, we are pursuing a number of proactive water management strategies, such as demand management, the increased use of reclaimed water and brackish groundwater, revised watershed management practices, weather modification, and other actions. As we face these unprecedented drought conditions, we recognize that the key to identifying and implementing creative solutions to our water challenges will come through robust partnerships with local, tribal, regional and federal entities.

One water management challenge that can no longer be unaddressed is the ongoing "bypass" of water from the Colorado River through the Modified Outlet Drainage Extension. We believe that the continued bypass of flows needs to be addressed in a sustainable manner that conserves the limited water supplies of the Colorado River, recognizes the environmental values of the Cienega de Santa Clara, and integrates local, regional and international concerns. Recognizing the broad range

Mr. Terry Fulp, Ph.D.
December 9, 2014
Page 2 of 2

of interested stakeholders, in early 2015, we will be launching a workgroup focused on identifying approaches to implement a sustainable program to reduce, reuse or replace approximately 100,000 acre feet of the Colorado River water currently considered "bypass flow." This letter requests your participation, as a partner with the State of Arizona through my office, on this multi-entity workgroup.

Past stakeholder-based efforts have led to improvements to Colorado River system management. Arizona has worked cooperatively to identify and implement a number of proactive water management actions, including work that was critical to the strategies recommended by the Seven Colorado River Basin States, and ultimately adopted in the 2007 Record of Decision: *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead*. Arizona has also been fully engaged in the U.S.-Mexico cooperative efforts on the Colorado River, which have led to the adoption of Minutes 316, 317, 318 and 319 during the period from 2010-2012. Of note, inclusive stakeholder efforts led to a successful pilot run of the Yuma Desalination Plant, conserving thousands of acre-feet of Colorado River water while preserving flows to the Cienega.

We are fully cognizant that any successful effort to implement a sustainable program to reduce, reuse or replace approximately 100,000 acre feet of the Colorado River water "bypass flow" will ultimately have to include stakeholders from the Republic of Mexico and engagement by and with the International Boundary and Water Commission, among others. While we recognize their important interests and equities, we believe that as stewards of Arizona's water resources, we should first initiate a domestic conversation before expanding to international discussions.

We hope that we can partner with your office on this effort. I have asked Tom Buschatzke, ADWR's Assistant Director for Water Planning to chair this high-priority matter. Thank you for your attention to this matter and we look forward to working with you to successfully resolve this water management challenge.

Sincerely,



Michael J. Lacey, Director

Cc: Thomas Buschatzke, Assistant Director, Arizona Dept. of Water Resources



IN REPLY REFER TO:
LC-1000
PRJ-29.00

United States Department of the Interior

BUREAU OF RECLAMATION
Lower Colorado Regional Office
P.O. Box 61470
Boulder City, NV 89006-1470

DEC 29 2014

Mr. Michael J. Lacey
Director
Arizona Department of Water Resources
3550 North Central Avenue
Phoenix, AZ 85012

Subject: Response to Letter Dated December 9, 2014 Regarding "Bypass Flow" Workgroup

Dear Mr. Lacey:

Thank you for your letter dated December 9, 2014, regarding your request on behalf of the Arizona Department of Water Resources (ADWR) that the Bureau of Reclamation's Lower Colorado Regional Office participate in a workgroup focused on identifying approaches to implement a sustainable program to reduce, reuse, or replace approximately 100,000 acre-feet of the Colorado River water currently considered "bypass flow." Subject to and recognizing a number of important limitations and considerations as articulated below, we would appreciate the opportunity to work with you in this matter and would be pleased to partner with your office on this effort beginning early next year.

As background, and as you know, Reclamation is currently engaged in a number of planning efforts to identify and implement strategies to reduce or minimize the adverse effects of the ongoing historic drought in the Colorado River Basin. These efforts include our work to implement the proactive elements of the 2007 Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, the work we initiated in 2004 to investigate strategies to offset and replace bypass flows through voluntary reductions in water use in the Lower Basin, and our investigations of operational options for use of the Yuma Desalting Plant conducted in 2007 and 2010-2011.

We value the partnerships we have with a broad range of interests - both domestically and in Mexico - on the Colorado River, and believe that your plan to convene a workgroup to assess approaches and options to reduce, reuse, or replace approximately 100,000 acre-feet of the Colorado River water that is currently considered "bypass flow" is both a timely and appropriate initiative.

Before embarking on this effort, it is appropriate to expressly state some considerations that are unique to Reclamation's engagement in this effort. First and foremost, any water management actions contemplated by this workgroup that are funded or implemented by Reclamation will, of course, need to be fully analyzed and vetted through public review processes including, for

example, environmental reviews. Additionally, in light of the applicable requirements that apply to the United States (U.S.) Government and are contained in the International Boundary and Water Commission's (IBWC) Minute 242, adopted in 1973 ("*Permanent and Definitive Solution to the Problem of the Salinity of the Colorado River*"), all actions contemplated for implementation will ultimately need to be coordinated with the IBWC, through its U.S. Section.

In order to ensure proper coordination and appropriate transparency with the IBWC, we have consulted with the U.S. and Mexican Sections regarding your request in order to highlight the importance of your focus to prioritize the efforts of the workgroup, and the importance of Reclamation's engagement on this issue, along with our commitment to work cooperatively with the IBWC as ideas and concepts are developed by and through the workgroup. While we recognize the importance of beginning this dialogue with domestic stakeholders, we cannot overemphasize the importance of protecting and enhancing the cooperative partnerships we have developed with the Republic of Mexico on Colorado River matters in recent years.

We hope and are optimistic that our participation with ADWR on the workgroup will lead to further breakthroughs on Colorado River management in a manner that respects the broad range of viewpoints and needs on these and other related Colorado River management issues. I am pleased to give you our commitment to work with you to co-chair this matter in coming months and would ask that your designee, Mr. Tom Buschatzke, coordinate the work with Ms. Jennifer McCloskey, our Deputy Regional Director who I have asked to chair Reclamation's efforts on this very important matter. Jennifer, as you know, is extraordinarily familiar with the issues and challenges associated with bypass flows and operations in the border region.

We look forward to working with your staff and other affected stakeholders in this effort.

Sincerely,



Terrance J. Fulp, Ph.D.
Regional Director

APPENDIX B

Members of the Bypass Flows Workgroup

Figure 8. Members of the Bypass Flows Workgroup

Member	Affiliation
Chuck Cullom	Central Arizona Water Conservation District
Peter Culp	Squire Patton Boggs LLP
Tom Davis	Yuma County Water Users Association
Pat Graham	The Nature Conservancy
Elston Grubaugh	Wellton-Mohawk Irrigation and Drainage District
Vineetha Kartha	Arizona Department of Water Resources
Jennifer McCloskey (co-chair)	Bureau of Reclamation
Wade Noble	Wellton-Mohawk Irrigation and Drainage District, Yuma Irrigation District, Yuma Mesa Irrigation and Drainage District, Unit B Irrigation & Drainage District
Colby Pellegrino	Nevada (Southern Nevada Water Authority)
Jennifer Pitt	National Audubon Society
Maria Ramirez	Bureau of Reclamation
Tanya Trujillo	California (Colorado River Board of California)
Gerry Walker (co-chair)	Arizona Department of Water Resources

APPENDIX C

The following options were considered by the Workgroup, but not recommended for further consideration at this time. While these options have merit, the recommended options were preferred by the Workgroup based on the objective, sub-objectives and the evaluation criteria.

Yuma Desalting Plant Operations – Existing wells and conveyances

The YDP could potentially desalinate other groundwater in the Yuma area besides the bypass flows; feed water for the YDP could originate from existing Reclamation wells and conveyances outside of the WMIDD (e.g., in the South Gila or Yuma Valleys).

Yuma Desalting Plant Operations – New wells and conveyances

Feed water for desalination by the YDP could also originate from the development of new wells and construction of new pipelines outside of the WMIDD, but in the Yuma area.

Yuma Desalting Plant Operations – Industrial water use

Instead of discharging YDP product water to the Colorado River for inclusion in water deliveries to Mexico, the plant's product water would be piped from the YDP to an industrial water user that requires a high volume of water that is very low in total dissolved solids (e.g., petrochemical, beverage, pharmaceutical, microelectronics, and pulp/paper).

Yuma Desalting Plant Operations – Municipal water use

YDP product water could also be used to serve municipal potable needs in communities near the YDP instead of discharging product water into the Colorado River. Product water produced by the YDP would undergo additional processing to meet potable water standards and subsequently be piped to population centers such as San Luis and/or Algodones, Mexico or Yuma, Arizona.

Yuma Desalting Plant Operations – Two-thirds capacity shared with Mexico

This is operation of the YDP at two-thirds of full capacity instead of one-third; as the plant is currently configured and using the bypass flows as feed water for the plant.

Water from the YDP would be discharged into the Colorado River for inclusion in water deliveries to Mexico. One-half of YDP's production would be designated as replacement of the bypass flows; the remaining half would be considered a new water supply for Mexico, above and beyond its 1.5 maf annual entitlement.