Appendix K

"Conservation Before Shortage II" Proposal, July 7, 2006

A consortium of environmental NGOs developed and submitted the Conservation Before Shortage II proposal in a letter dated July 7, 2006. This proposal supplemented the original proposal (Conservation Before Shortage proposal) submitted on July 18, 2005. The consortium includes Defenders of Wildlife, Environmental Defense, National Wildlife Federation, Pacific Institute, Sierra Club, the Nature Conservancy, Rivers Foundation of the Americas, and the Sonoran Institute. The full text of the Conservation Before Shortage II proposal and supplemental information submitted therein is provided in this Appendix.

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K.1 Conservation Before Shortage II: Proposal for Colorado River Operations

Defenders of Wildlife * Environmental Defense * National Wildlife Federation
The Nature Conservancy * Pacific Institute * Sierra Club * Sonoran Institute

July 7, 2006

The Honorable Dirk Kempthorne
Secretary, U.S. Department of the Interior
1849 C Street, NW
Washington, DC 20240

via email: strategies@lc.usbr.gov

Dear Secretary Kempthorne:

With this letter, we submit our proposal "Conservation Before Shortage II" for your consideration in the "Development of Lower Basin Shortage Guidelines and Coordinated Management Strategies for Lake Powell and Lake Mead, Particularly Under Low Reservoir Conditions."

A year ago, we submitted our original proposal "Conservation Before Shortage" in anticipation of Reclamation's work to develop new shortage rules for the Colorado River. Since then, the Colorado River Basin States significantly changed the scope of Reclamation's deliberations with the submission of their own proposal. The new flexibility they propose with Intentionally Created Surplus (ICS), administered appropriately, could provide a framework for improving environmental conditions on the Colorado. We have therefore combined the ICS concept with a slightly modified version of our original proposal.

The original Conservation Before Shortage was a proposal to manage shortages in the Colorado River by asking water users to voluntarily engage in predictable, small-scale reductions in use – and receive compensation for those reductions – rather than face large-scale, involuntary, and uncompensated disruptions in water deliveries that could cut into municipal and agricultural water supplies and create unmitigated economic impacts. Conservation Before Shortage II combines such voluntary, market-based water conservation to protect against shortages on the Lower Colorado River with a voluntary, market-based mechanism to protect or enhance flow dependent environmental values.

With this letter, we submit a description of Conservation Before Shortage II (including relevant background, a description of the proposal itself, a rationale for the proposal, and the identification of several additional issues), as well as the original Conservation Before Shortage proposal, and an additional proposal to expand the ICS program to include Mexico.

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We appreciate the effort Reclamation staff have made to help us understand the hydrologic impacts of our proposals through the use of their expertise in river operations modeling. We hope to continue this dialogue about management of Colorado River shortages with Interior and Reclamation, as well as the Colorado River Basin States, the International Boundary and Water Commission and representatives of the Republic of Mexico.

Thank you for your consideration, and please do not hesitate to contact any one of us if you have questions.

Sincerely,

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July 7, 2006

Conservation Before Shortage II:

Proposal for Colorado River Operations

I. Background/Context

In August of 2005, various non-governmental conservation organizations introduced the "Conservation Before Shortage" proposal into the U.S. Bureau of Reclamation's (Reclamation) process for the "Development of Lower Colorado River Basin Shortage Guidelines and Coordinated Management Strategies for Lakes Powell and Mead Under Low Reservoir Conditions" (Shortage Guidelines). The "Conservation Before Shortage" proposal suggested an approach to the management of shortages in the Lower Colorado through the implementation of a tiered program of voluntary and compensated water conservation, tied to the surface elevation of Lake Mead.

Since the time of that proposal, the seven Basin States have reached agreement on a far-reaching proposal to transform management of Colorado River system water through conjunctive management of Lakes Mead and Powell, modification and extension of the existing Interim Surplus Criteria, and the adoption of shortage guidelines. Perhaps most significantly, the Basin States' proposal introduces a series of new mechanisms to increase flexibility within the Lower Basin delivery system and water allocations, including the creation of a new category of water: "Intentionally Created Surplus" (ICS). ICS can be generated through extraordinary conservation measures, funding of system efficiency improvements, and recognition of water exchanges.

As currently constituted, the Basin States' proposal is largely concerned with water deliveries between and among the Basin States, with ICS programs and related mechanisms confined to the states of the Lower Basin. While these programs will clearly benefit water management on the Colorado River system, we suggest that significant benefits for U.S. water users, Mexican water users, and the environment could be gained by expanding portions of the Basin States' proposal to include additional potential domestic water users, provide for direct federal participation, and leave the door open to potential international implementation of ICS programs.

In addition, we strongly suggest that there remain significant potential advantages to some of the concepts expressed in the original "Conservation Before Shortage" proposal, particularly the use of voluntary, market-based conservation as a method to mitigate involuntary shortages. By combining that proposal with an expanded ICS program we believe that "Conservation Before Shortage II" is a powerful tool for mitigating against shortages and helping to meet the federal government's bypass flow replacement obligations under the Colorado River Basin Salinity Control Act.

Conservation Before Shortage II meets the purposes identified in the Basin States' original proposal: delaying and minimizing the onset of shortage in the Lower Basin and the risk of curtailment in the Upper Basin through conservation, more efficient reservoir operations and water supply augmentation. It also meets multiple federal objectives on the Colorado River,

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including the watermaster's continued federal oversight and management of the river, the protection of important environmental resources, and replacement of the bypass flow.

Over the past several months, the conservation organizations that developed the original Conservation Before Shortage proposal have, with technical assistance from Reclamation's modeling staff, developed a revised version of the proposal (hereafter referred to as "CBS II"). This document describes the essential elements of the CBS II proposal, the rationale behind these elements, its relationship to the states' proposal, and the significant potential benefits associated with the CBS II approach.

II. Elements of Conservation Before Shortage II

A. Shortage Guidelines to Reduce Deliveries/Releases from Lake Mead

Shortage Conditions

At elevations below 1000 feet, the Secretary would impose involuntary shortage conditions to the extent necessary to maintain an elevation of 1000 feet (absolute protection of elevation 1000 feet).[1]

Conservation Conditions

In years when the August 24-month study projects the elevation of Lake Mead on January 1 will fall within the elevation ranges for "conservation conditions" identified below, on behalf of the Secretary of the Interior (Secretary), Reclamation will engage in a program to purchase ICS credits in the amounts corresponding to those ranges. To the extent permitted by law and through the appropriate authorities, Reclamation will also seek to generate such ICS credits by purchasing water from users in Mexico (temporarily reducing deliveries of Colorado River water to Mexico). Federal ICS creation requirements would follow identical triggers and reductions to the involuntary shortages proposed under the Basin States' alternative:

- Elevation greater than 1050 to 1075 feet: 400,000 acre-feet
- Elevation greater than 1025 to 1050 feet: 500,000 acre-feet
- Elevation greater than 1000 to 1025 feet: 600,000 acre-feet

Reclamation would maintain an accounting system to track cumulative Main Outlet Drain Extension bypass flow replacement obligations (to the extent not otherwise satisfied via other mechanisms) and banked federal ICS credits. ICS credits created when the elevation of Lake Mead is at or below 1075 feet would first be credited against the cumulative bypass flow "deficit." Federal ICS credits created in excess of this deficit would be credited to the federal ICS account up to the amount of the federal cap of 1.5 million acre feet (see below). Federal ICS credits created in excess of the federal cap would become system water.

[1] In the event that a shortage is declared when Lake Mead is at or below elevation 1000 feet, and a bi-lateral determination of an extraordinary drought is also made under the 1944 Treaty, deliveries to Mexico would be reduced in the same proportion as consumptive uses in the Lower Basin are reduced.

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All funding for creation of federal ICS up to the amount of the 1.5 million acre foot cap would be provided by the federal government in recognition of the bypass flow replacement and environmental benefits. Thereafter, 50% of funding would be provided by the federal government, with the remaining 50% derived from fees assessed against Lower Basin water and power users using the mechanisms described in the original CBS proposal (see Attachment A).

B. Coordinated Reservoir Operations (Lake Mead and Lake Powell).

CBS II does not address coordinated reservoir operations. However, for the purpose of highlighting the differences between CBS II and the Basin States' alternative in Reclamation's modeling exercise, reservoir operations at Lakes Mead and Powell would be coordinated as described in the Basin States Alternative.

C. Lake Mead Storage and Delivery of Conserved and Non-system Water

ICS credits generated via extraordinary conservation activities, tributary conservation, system efficiency projects, and other mechanisms would be handled under rules identical to the Basin States Alternative, except as follows:

- ICS credits could be generated by entities that are not current Colorado River delivery contract holders (although a delivery contract with the Secretary would be required for the storage and delivery of ICS credits). Entities eligible for participation in the ICS program would include:
    - U.S. federal agencies
    - State agencies
    - Private entities, including U.S. non-governmental organizations
    - Mexican federal agencies
    - Mexican water users
- All participating entities would follow the Basin States rules for storage and withdrawal of ICS credits (including restrictions on creation and use of ICS credits during shortage and surplus conditions, 5% system set-aside for creation of ICS[2], and reductions to stored ICS to account for evaporation losses), except:

[2] The Basin States' proposal provides that at the time ICS credits are created by extraordinary conservation, the entity creating the credits will dedicate 5% of the ICS credits to the system on a one-time basis to provide a water supply benefit to the system, while 10% of the ICS credits would be set aside under the Reservoir Storage Alternative. Quite possibly, the set-aside rate of 10% may be too modest. We suggest that Reclamation analyze the benefits and costs of a larger set-aside.

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- U.S. federal government would be permitted to purchase or create and bank ICS credits during Conservation Conditions (see below), but would be subject to the same rules for delivery and use of ICS credits as other users.

- Mexico would be permitted to create, bank, and deliver ICS credits during "Normal," "Full Domestic Surplus," and 70(r) surplus conditions but not during Conservation, Shortage or Flood Control Surplus conditions. Same-year ICS reallocations within Mexico that do not result in system storage would not be subject to the 5% system set-aside (as this would not alter Treaty deliveries). Water banked by Mexico in Lake Mead would be subject to the 5% system set-aside as well as evaporative loss charges. Mexico's participation in the ICS program would operate under a Treaty minute reflecting procedures to alter delivery schedules to accommodate transfers of ICS within Mexico, as well as procedures for temporary reductions and corresponding increases in Treaty deliveries to allow for banking in Lake Mead.

- The maximum amount of ICS credits that could be created in any one year would be limited to 950,000 acre-feet per year, allocated among the participants as follows:

  - California contractors: 400,000 acre-feet per year (state proposal)

  - Nevada contractors: 125,000 acre-feet per year (state proposal)

  - Arizona contractors: 100,000 acre-feet per year (state proposal)

  - United States: 100,000 acre-feet per year (except during Conservation Conditions, see above) (potentially allowing use of water for environmental projects)

  - Mexico (government/users): 125,000 acre-feet per year (enough water to bank and deliver 200,000 acre-feet of a 250,000 acre-foot flood flow every 5 years with the last 50,000 acre-feet scheduled as part of Mexico's annual delivery in the year of the flood flow release, plus allow for other environmental, municipal, industrial, and other uses, accounting for the 5% system set-aside and up to 5% annual evaporation loss for banked water)

  - All other users: 100,000 acre-feet per year

- The maximum cumulative amount of ICS credits that would available at any one time would be 4,200,000 acre-feet, allocated as follows:

  - California contractors: 1,500,000 acre-feet (state proposal)

  - Nevada contractors: 300,000 acre-feet (state proposal)

  - Arizona contractors: 300,000 acre-feet (state proposal)

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- United States: 1,500,000 acre-feet (3-5 years of Conservation Conditions acquisitions, 15 years of ICS recovery)
- Mexico: 400,000 acre-feet (enough water to bank 200,000 acre-feet of a 250,000 acre-foot flood flow every 5 years with the last 50,000 acre-feet scheduled as part of Mexico's annual delivery in the year of the flood flow release, plus approximately 2-3 years cumulative storage for other uses)
- All other: 200,000 acre-feet (2 years storage to allow for purchase and storage of water during cheaper market conditions)

- The maximum amount of ICS credits that could be recovered in any one year would be limited to 1.6 million acre-feet per year, allocated as follows:
  - California contractors: 400,000 acre-feet (state proposal)
  - Nevada contractors: 300,000 acre-feet (state proposal)
  - Arizona contractors: 300,000 acre-feet (state proposal)
  - United States: 100,000 acre-feet (maximum volume of federally-banked ICS that could be recovered each year for environmental use, including MSCP, at Mead elevations above 1075 feet) (10 years worth of recovery)
  - Mexico: 400,000 acre-feet (enough to provide for unlikely confluence of 250,000 acre-feet flood flow plus significant non-environmental use in one year)
  - All other: 100,000 acre-feet (enough to implement restoration in the limitrophe reach, plus water available for additional projects).
- During Conservation Conditions, the federal government is required to acquire ICS from U.S. and/or Mexican users pursuant to shortage guidelines in volumes of 400,000, 500,000, and 600,000 acre-feet (see II.A, above).

D. Interim Surplus Guidelines for deliveries/releases from Lake Mead and all other operation criteria

CBS II does not address the Interim Surplus Guidelines or other operating criteria. However, for the purpose of highlighting the differences between CBS II and the Basin States' alternative in Reclamation's modeling exercise, all other river operation criteria, including operation of the Interim Surplus Guidelines, would be the same as proposed in the Basin States Alternative.

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III. Rationale for Conservation Before Shortage II

Conservation Before Shortage II is founded on the principle that the Secretary should take greater responsibility to operate the Colorado River in a manner that minimizes shortages in the Lower Basin and avoids the risk of curtailment in the Upper Basin through conservation, more efficient reservoir operations, and increased flexibility in the management of river resources, while protecting or enhancing environmental values associated with the Colorado River. Three elements of CBS II highlight this principle:

> (1) voluntary, market-based water conservation as an alternative to and mitigation mechanism against involuntary, uncompensated shortages on the Lower Colorado River;
>
> (2) voluntary, market-based mechanisms to protect or enhance flow dependent environmental values, in close alignment with applying such mechanisms to mitigate against involuntary, uncompensated shortages; and
>
> (3) potential expansion of ICS programs (pending appropriate diplomatic consultations) to include water users in Mexico and to improve the management of Colorado River water supplies in both countries.

A. Voluntary, Market-Based Conservation as an Alternative to Involuntary Shortage

As discussed in the original Conservation Before Shortage proposal (see Attachment A), we believe that there are significant potential advantages to the use of voluntary, market-based conservation as an alternative to and as a means of mitigating against involuntary shortages.

- Based on extensive modeling performed for the Lower Basin states, reductions of 400,000, 500,000 and 600,000 acre-feet at Lake Mead elevations 1075 feet, 1050 feet and 1025 feet, respectively, appear to provide optimal results in preventing larger involuntary shortages that perform better than the 200,000, 400,000, and 600,000 acre-foot reductions proposed in the original CBS proposal.

- It is desirable to protect the elevation of Lake Mead at no less than 1000 feet under any condition to protect Southern Nevada Water Authority's lower intake structures, as well as the new minimum power pool if proposed low-pressure turbines are installed at Hoover Dam.

- It is preferable for Lower Basin water users to voluntarily engage in predictable, small-scale reductions in use – and receive compensation for those reductions – rather than face large-scale, involuntary and uncompensated disruptions in water deliveries that could cut into municipal and agricultural water supplies and create unmitigated economic impacts.

- There is a large volume of Colorado River water which could be temporarily conserved through voluntary, market-based mechanisms such as part-year fallowing or forbearance agreements, dry year options, or other similar arrangements to reduce Lower Basin

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consumptive use on an occasional, temporary basis as an alternative to involuntary shortages to low-priority users.[3]

- Users of Colorado River water in Mexico may wish to participate in short-term, voluntary and compensated conservation agreements, to reduce the probability of larger, uncompensated future reductions due to a declaration of shortage under the 1944 Treaty with Mexico.[4]

The ICS program suggested in the Basin States' proposal will likely result in the identification of numerous opportunities for extraordinary conservation activities that could be used to accomplish reductions in water use in the Lower Basin. These mechanisms could not be utilized by other water users when the elevation of Lake Mead is at or below 1075 feet, creating a readily available supply of ICS credit-eligible water that could instead be utilized by the federal government as a means of temporarily reducing water use on a voluntary, compensated basis.

CBS II would also create an obvious means of implementing a significant portion of the federal government's bypass flow replacement obligation. The recently published report led by the Central Arizona Water Conservancy District "Balancing Water Needs on the Lower Colorado River: Recommendations of the Yuma Desalting Plant/Cienega de Santa Clara Workgroup," includes recognition that replacement of the MODE bypass flow is primarily necessary during shortage conditions to ensure that accumulated system water deficits resulting from the bypass flow do not result in shortages to Lower Basin users. One of the primary recommendations in the report is the creation of a "shortage alleviation trust fund" which would be used, in combination with fallowing programs or other conservation mechanisms, to provide replacement water to compensate for accumulated bypass flow deficits during shortage conditions. The recommendations of the workgroup have been widely circulated among Lower Basin water users and have received significant support among both water users, water managers, and environmental interests.

Use of the ICS mechanism by the federal government when Lake Mead elevation is at or below 1075 feet would provide an ideal means of implementing this recommendation of the YDP/Cienega de Santa Clara workgroup. ICS credits that the federal government would be required to purchase when Lake Mead elevation is at or below 1075 feet could be retired for the benefit of the system to the extent necessary to eliminate any accumulated bypass flow replacement deficit; only after this deficit is extinguished would ICS credits accrue to the federal government for other uses.

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[3] Some 4.5 million acre-feet of Colorado River water are used to irrigate crops in the Lower Basin states, and more than 1 million acre-feet are used to irrigate crops in Mexico. Conservation of between 400,000 and 600,000 acre-feet through the use of part-year fallowing programs, dry year options, or other similar arrangements would constitute only 7-11% of total Lower Basin agricultural use in the United States and Mexico. (However, as even small-scale reductions in agricultural water use may have third-party impacts, provision should be made to support community economic development in affected areas.) Conversely, even under the Basin States' tiered shortage proposal, involuntary shortages could have significant economic consequences, disrupting water banking plans in Arizona and cutting low-priority municipal and agricultural use in the U.S. and Mexico (resulting in unpredictable loss of farm income, economic disruptions from municipal shortfalls, or requiring expensive municipal conservation efforts or efforts to secure agricultural water to support hardened municipal demand).

[4] Such an agreement would likely require a new Minute to the 1944 Treaty with Mexico. Fallowing agreements in Mexico would have to be administered by the appropriate authorities.

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B. Voluntary, Market-Based Conservation to Protect or Enhance Environmental Flows.

This proposal suggests two mechanisms for protecting and enhancing environmental flows in close alignment with the mechanisms to mitigate involuntary and uncompensated shortages, although other mechanisms may also be appropriate for consideration. First, extending the ICS program to include a broader range of participants than current Colorado River contractors provides an opportunity to ensure that some portion of the water developed via extraordinary conservation activities could be dedicated to environmental uses, via the participation of interested parties (such as conservation organizations) in ICS creation. There are several proposed restoration efforts in the United States – such as a restoration proposal for the limitrophe reach of the Colorado River – which could potentially benefit from access to ICS water supplies during normal conditions.

Second, direct participation of the federal government in the ICS program could be an excellent mechanism for purchasing water for environmental purposes or other public benefit uses by the federal government. Although these credits would only be available for use when the elevation of Lake Mead is greater than 1075 feet, they could be used to provide "bridge" supplies for restoration projects, run pilot restoration projects, or meet other interim water supply needs.

C. ICS for Mexico

As discussed in detail in a draft proposal entitled *Taking ICS to Mexico: International Opportunities in the Seven States Agreement* (see Attachment B), ICS credits could be used to firm urban water supplies in both countries, implement long-studied environmental restoration projects in the Colorado River Delta, and increase flexibility in Mexico's agricultural sector – creating economic, environmental, and social benefits in both countries while offering the United States and Mexico a venue for cooperation in the otherwise contentious area of water management at the border. In addition, during shortage conditions, extension of the ICS program to include Mexico would expand the pool of participants who could provide voluntary, compensated reductions in water use as an alternative to involuntary shortages in the United States.

An extension of the ICS program to include Mexico would likely require the adoption of a new Minute to the Treaty of 1944, and would obviously require diplomatic discussions and negotiations likely to occur in a different venue than Reclamation's domestic process to develop Shortage Guidelines. However, we strongly suggest that the current federal process should leave the door open to the eventual approval of a binational extension of the ICS program, to limit the costs of future review of such a program and encourage the initiation of binational discussions about such a program. Since critical elements of the Basin States' proposal – most notably the proposed shortage policy and proposed policies for water exchanges – will already require consultation with Mexico and/or the adoption of a new Minute, these opportunities could be considered in the same diplomatic process

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IV. Additional Issues

To characterize the impact that these concepts would have on river management outcomes, we have attempted to minimize the differences (and thus the number of modeling variables at play) between CBS II and the Basin States' proposal. While we do not necessarily agree with or endorse all of the approaches suggested in the Basin States' proposal, we have not attempted to alter many of its basic elements, including the proposed modification and extension of the Interim Surplus Guidelines, new conjunctive management of Lakes Mead and Powell, or the imposition of Shortage Criteria only through 2026. However, CBS II incorporates these elements of the Basin States' proposal for comparative and analytical purposes only.

We do not assume the various proposals under consideration, including CBS II and the Basin States' proposals, are consistent with the existing law. Reclamation should clarify, during the environmental review process, how or whether these proposals would function within existing laws.

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K.2 Attachment A: Original Conservation Before Shortage Proposal (Dated July 18, 2005)

Conservation Before Shortage

Proposed Shortage Criteria for
Colorado River Operations

I. Background/Context

The effects of a multi-year drought have had a tremendous impact on storage in the Colorado River basin. Although above-average precipitation in the Lower Basin has led to small recoveries in system storage over the winter of 2004-2005, total system storage on the Colorado River has decreased by more than 40% over the past several years. As a result, there is a real possibility that the Secretary of the Interior will declare an actual shortage on the lower Colorado River in the near future. A shortage declaration would reduce deliveries to the Central Arizona Project (CAP) and to southern Nevada (which are among the first in line for cuts in the event of a shortage).

The surface elevation of Lake Mead dropped more than 80 feet from the end of 2000 through the end of 2004; Lake Powell dropped by more than 115 feet in this period. The Bureau of Reclamation's (Reclamation's) Riverware model of the Colorado, based on historic flow records, projects that reservoir levels at Lake Powell could head quickly towards the minimum power pool if the drought continues, and reservoir levels at Lake Mead could fall below the elevation of southern Nevada's upper intakes or remain in a long-term decline that will be difficult to reverse until Powell begins to re-fill. In addition, the model predicts that even if precipitation levels returned to average today, it could take 10-20 years for the Colorado River reservoir system to recover fully (during which time continued development of water supplies in the Upper Basin will further shrink available supplies). As a result, it is time to begin a long-delayed discussion about the method for defining, mitigating, and sharing shortages on the Colorado River.

Although the Secretary of the Department of the Interior (Secretary) has the authority to declare a shortage on the Colorado River, thereby reducing deliveries to some Lower Colorado River contractors, to date no criteria exist for determining when such a shortage will be declared. In June 2005, the Department of the Interior (DOI) noticed its intent to begin a public scoping process for the development of "Lower Basin Shortage Guidelines," (70 Fed.Reg. 34794). In 2004, DOI initiated a series of technical meetings with the Colorado Basin states to discuss drought issues, and the seven Basin states met frequently among themselves throughout the winter of 2004-2005 to discuss potential shortage criteria. Non-governmental organizations (NGOs) were not invited to participate in these discussions; however, several NGOs with interest and expertise in Colorado River issues began meeting over the winter to develop an alternative shortage proposal. These organizations met with Reclamation staff to review the results of technical modeling runs developed in support of the states' discussions, and Reclamation has provided additional modeling data to these interested NGOs in response to their inquiries and to evaluate potential shortage criteria.

These meetings led to the development of this document, which proposes an approach to the management of shortages in the Lower Colorado through the implementation of a tiered conservation program that is tied to the surface elevation of Lake Mead.

II. Rationale for this Proposal

The basic rationale behind this "Conservation Before Shortage" proposal is that shortage criteria should attempt to maximize the reliability and predictability of water deliveries on the Lower Colorado by introducing increased flexibility into the management of river resources when shortage conditions are imminent.

Principles:

- It is desirable to protect the elevation of Lake Mead at 1050 feet (the current minimum power pool) to the extent feasible without implementing shortages that would involuntarily curtail deliveries to Lower Basin users.
- It is desirable to protect the elevation of Lake Mead at no less than 1000 feet under any condition in order to protect Southern Nevada Water Authority's lower intake structures, as well as the new minimum power pool if proposed low-pressure turbines are installed at Hoover Dam.
- It is desirable to avoid shortages in the Lower Basin above 500,000 acre-feet whenever possible (the approximate level at which shortages would cut into CAP's deliveries beyond those currently utilized for water banking).
- It is preferable for Lower Basin water users to voluntarily engage in predictable, small-scale reductions in use – and receive compensation for those reductions – rather than face large-scale, involuntary, and uncompensated disruptions in water deliveries that could cut into municipal and agricultural water supplies and create unmitigated economic impacts.
- Minimizing large, forced disruptions to normal deliveries as a result of shortage declarations will minimize the threat of unmitigated environmental impacts in the Lower Colorado River and Delta as a result of significantly decreased deliveries to low-priority users and corresponding return flows that support environmental values.
- Market-based programs, with low transaction costs and appropriate mitigation of third-party impacts, can offer a reasonable mechanism for minimizing the risk and impacts of shortage.[1]
- Users of Colorado River water in Mexico may wish to participate in short-term conservation agreements, to reduce the probability of larger, uncompensated future reductions due to a declaration of shortage under the 1944 Treaty with Mexico.
- Water can be obtained from agricultural users in the United States, and could be obtained in Mexico with an appropriate agreement,[2] through the use of voluntary, market-based forbearance programs. Economic studies of Lower Basin agricultural use, as well as recent leases of water from farmers in this area, suggest that there is a large volume of water in the basin that could be obtained for $20 - 100 per acre-foot (see Figure 9).

[1] Some 4.5 million acre-feet of Colorado River water are used to irrigate crops in the Lower Basin states, and more than 1 million acre-feet are used to irrigate crops in Mexico. Conservation of between 200,000 and 600,000 acre-feet through the use of part-year fallowing programs, dry year options, or other similar arrangements would constitute only 4-11% of total Lower Basin agricultural use in the United States and Mexico. (However, as even small-scale reductions in agricultural water use may have third-party impacts, some portion of funds accrued for the purchase of water should be set aside to support community economic development in affected areas.) Conversely, without these small-scale reductions, water users would likely be faced with the need to curtail large amounts of water quite abruptly, with significant economic consequences. (Shortages of nearly 2 million acre-feet in a single year are predicted by Reclamation's model when the 1000 feet elevation is protected at Lake Mead without conservation measures).

[2] Such an agreement would likely require a new Minute to the 1944 Treaty with Mexico. Fallowing agreements in Mexico would have to be administered by the appropriate authorities.

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III. Conservation Before Shortage Policy

The "Conservation Before Shortage" policy essentially consists of two sets of criteria tied to projected elevations at Lake Mead on January 1 of a given year, according to the Bureau of Reclamation's August 24-month study. These criteria consist of three "conservation triggers," which impose progressively increasing conservation goals as lake levels drop from 1100 feet to 1050 feet, and a "shortage trigger," which imposes involuntary shortages in the Lower Basin as are necessary to accomplish absolute protection of Lake Mead at a minimum elevation of 1000 feet.

(A) Normal Conditions

In years when the 24-month study projects the elevation of Lake Mead on January 1 will be at or above 1100 feet, the Secretary of the Interior (Secretary) shall determine a Normal or Surplus (as defined by the Interim Surplus Guidelines) year.

(B) Conservation Triggers

First Conservation Trigger: Below 1100 Feet at Lake Mead

In years when the 24-month study projects the elevation of Lake Mead on January 1 will be at or above 1075 feet but below 1100 feet, the Secretary will seek to conserve 200,000 acre-feet of water. On behalf of the Secretary, Reclamation will preferentially seek to achieve this 200,000 acre-feet of savings by means of voluntary conservation agreements (including forbearance agreements) with Lower Basin delivery-contract holders. Additionally, Reclamation will, to the extent permitted by law and through the appropriate authorities, seek forbearance or other such water conservation agreements with Colorado River users in Mexico. In the case of such agreements, U.S. deliveries of Colorado River water to Mexico at the Northerly International Boundary will be reduced by the total volume indicated by these binational agreements.

Second Conservation Trigger: Below 1075 Feet at Lake Mead

In years when the 24-month study projects that the elevation of Lake Mead on January 1 will be at or above 1050 feet but below 1075 feet, the Secretary will seek to conserve 400,000 acre-feet of water. Reclamation will preferentially seek to achieve this 400,000 acre-feet of savings by means of voluntary conservation agreements (including forbearance agreements) with Lower Basin delivery-contract holders. Additionally, Reclamation will, to the extent permitted by law and through the appropriate authorities, seek forbearance or other such water conservation agreements with Colorado River users in Mexico. In the case of such agreements, U.S. deliveries of Colorado River water to Mexico at the Northerly International Boundary will be reduced by the total volume indicated by these binational agreements.

Third Conservation Trigger: Below 1050 Feet at Lake Mead

In years when the 24-month study projects that the elevation of Lake Mead on January 1 will be below 1050 feet (minimum power pool absent the installation of low-pressure turbines), the Secretary will seek to conserve 600,000 acre-feet of water. Reclamation will preferentially seek to achieve this 600,000 acre-feet of savings by means of voluntary conservation agreements (including forbearance agreements) with Lower Basin delivery-contract holders. Additionally, Reclamation will, to the extent permitted by law and through the appropriate authorities, seek

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forbearance or other such water conservation agreements with Colorado River users in Mexico. In the case of such agreements, U.S. deliveries of Colorado River water to Mexico at the Northerly International Boundary will be reduced by the total volume indicated by these binational agreements.

(C) Shortage Trigger

Absolute Protection of Lake Mead Elevation 1000 Feet

The Secretary shall not permit the elevation of Lake Mead to drop below elevation 1000 feet (minimum low-pressure power pool and Southern Nevada Water Authority intakes) at any time. Shortages to Colorado River contractors shall be implemented in the Lower Basin and in Mexico[3] to the extent necessary to prevent such declines.

(D) Funding Mechanisms

In recognition of the federal government's continuing national obligation to replace the MODE bypass flow to Mexico, 43 U.S.C. § 1571(c), the federal government will assume responsibility for the cost of all conservation agreements up to the volume of the bypass flow that the Secretary has not otherwise replaced in the year that a conservation trigger becomes effective. Given the national interest in minimizing both environmental impacts and economic disruptions resulting from the involuntary curtailment of deliveries to Colorado River users, the federal government would also assume responsibility for half of the cost of any additional agreements required to generate conserved water for the "Conservation Before Shortage" policy, pursuant to the Secretary's authority under the Reclamation States Emergency Drought Relief Act of 1991 (Drought Relief Act),[4] conservation authorities in the Farm Bill, or other appropriate authority that may be granted by Congress.

To the extent that conservation of water is required beyond that to be funded by the federal government in the manner described above, conservation activities would be funded through one or both of the following:

Power Pool Protection Fund

The priority of water used for power generation is considered to be tertiary to that of irrigation and domestic use under the Law of the River. As a result, Hoover and Glen Canyon Dams are operated to maintain deliveries to water users regardless of the impact of declining reservoir levels on power production. However, one of the more significant corollary benefits of the conservation program described in this proposal, beyond the primary benefit of protecting water users from involuntary and uncompensated shortages, would be the preservation of power production at Hoover Dam at higher levels and for longer durations by reducing deliveries for irrigation, domestic use, and underground storage in a manner that would not otherwise occur under current practices.

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[3] In the event that a shortage is declared and is also considered to be an extraordinary drought under the 1944 Treaty, deliveries to Mexico will be reduced in the same proportion as consumptive uses in the United States are reduced.

[4] The Reclamation States Emergency Drought Relief Act of 1991, 43 U.S.C. §§ 2201 *et seq.*, provides the Secretary of Interior the authority to purchase water "from willing sellers, including, but not limited to, water made available by Federal Reclamation project contractors through conservation or other means with respect to which the seller has reduced the consumption of water." 43 U.S.C. § 2211(c).

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Given the significant loss in generating capacity that has already occurred as a result of declines in power pool elevations,[5] and the even more significant impacts that would be associated with a total loss of generating capacity, the implementation of "Conservation Before Shortage" would clearly benefit power purchasers and consumers. As such, it would seem reasonable to derive a percentage of the funding for the proposed voluntary conservation program from a modest, conditional surcharge on power rates under existing or renewed contracts for hydropower produced at Hoover Dam as a means to mitigate against the loss of power head and stave off the complete loss of power production at Hoover Dam.[6] This surcharge could be imposed in years when Reclamation's August 24-month study projects that the storage in Lake Mead falls below fifty percent of its active capacity. The revenues generated by this surcharge could be collected in a "power pool protection fund," to be maintained by Reclamation for expenditure when and if lake elevations reach a conservation "trigger."

Temporary Cost Recovery/Delivery Surcharges

Pursuant to the Drought Relief Act, the Secretary of Interior is authorized to engage in water purchases from willing sellers and to seek cost recovery for water delivered from the users of that water under temporary contracts. 43 U.S.C. §2211(c), §2212(a),(c). Reclamation could utilize this authority to purchase water through temporary, part-year fallowing arrangements, dry-year options, or similar mechanisms, and would seek cost recovery from Colorado River users. In recognition of the Basin-wide interest in alleviating the impacts of drought and reducing uncertainty on the Lower Colorado, and in the interests of encouraging extraordinary conservation to minimize the likelihood of significant delivery interruptions, the cost of some portion of conservation agreements, including those with Colorado River users in Mexico, could be funded through a conservation surcharge imposed on a per-acre-foot basis on all Lower Basin contractors.

Anticipated Cost of Conservation

Current short-term leasing agreements between farmers and irrigation districts or municipal water agencies, as well as recent research on the net returns per acre-foot of irrigation water, suggest that "Conservation Before Shortage" water could be obtained for $20 - 100 per acre-foot. To ensure that such water remains available in times of increased scarcity (when market forces might otherwise increase the cost), the Secretary should be granted the authority to enter into "Conservation Before Shortage option agreements," similar to existing dry-year leasing agreements/interruptible supply agreements that have been enacted within the basin states.

[5] Largely as a result of declining reservoir elevations, power production at Hoover and Glen Canyon has declined steadily since the onset of drought conditions in the Colorado River Basin. Annual power production at Hoover fell from 5,697 gigawatt-hours (GWh) in 1998 to 4,094 GWh in 2003, according to Western Area Power Administration (WAPA) Annual Reports, 1998 – 2003. A portion of hydropower revenues currently supports the two Upper Basin endangered fish recovery programs, the Glen Canyon Adaptive Management Program, and the Colorado River Salinity Control Program; alternative sources of revenue should be identified and implemented to fully fund these recovery programs. The Department of the Interior should also work proactively with WAPA to identify alternative sources of power for those Indian tribes that have experienced power shortages, or drastic increases in power costs, due to the declining production associated with falling reservoir levels.

[6] The rates for power produced at Hoover Dam have increased as reservoir levels and power production have declined, but may still remain well below open market rates. Although annual revenues tend to vary from year to year, revenues from Hoover Dam power production have generally been in the range of $50 million annually.

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IV. Analysis: Benefits of Conservation Before Shortage Policy

To date, actual shortage criteria for the Colorado River have not been defined. For the purposes of comparison, a 'baseline' was defined as the current operating conditions for the Colorado River, with the addition of a policy requiring the absolute protection of Lake Mead at 1000 feet (that is, Hoover Dam would not release any water to cause the elevation of Lake Mead to drop below 1000 feet). The baseline policy does *not* provide for the implementation of conservation measures. These 'baseline' conditions, reflecting current operating conditions, are depicted in the following figures.

Analysis of the "Conservation Before Shortage" policy suggests that this policy could produce significant benefits for Basin water users by:

- Consistently maintaining reservoir storage and power head above baseline conditions in average to low flow conditions, resulting in increased power production and improved power revenues;
- Significantly reducing the likelihood of involuntary, uncompensated shortages in the Lower Basin and corresponding, unmitigated economic impacts;
- Significantly reducing the likelihood of involuntary and uncompensated shortages in the Lower Basin at levels above 500,000 acre-feet (the approximate level at which a shortage imposed by the Secretary would cut into CAP deliveries, by exceeding the ability of the Arizona Water Bank to readily buffer the shortage); and
- Eliminating the risk that elevations at Lake Mead will drop below minimum power head, improving the reliability of power production and associated revenues.

The analyses below show the impacts of the "Conservation Before Shortage" (CBS) policy on reservoir operations based on historic flows in the Colorado River Basin.

Modeling Assumptions

The proposed "Conservation Before Shortage" policy was modeled using Reclamation's Riverware model, which is based on historical records of flows in the Colorado River Basin over approximately the past century. Conservation triggers, as described in Section III, were implemented at 1100 feet, 1075 feet and 1050 feet, with the assumption that required measures to reduce Lower Basin consumptive use by 200,000, 400,000, and 600,000 acre-feet, respectively, would be implemented in years when the January 1 elevation at Lake Mead is below the triggers. An absolute protection trigger was implemented at Lake Mead elevation 1000 feet, with releases from Lake Mead to meet delivery obligations to Lower Basin users reduced as necessary to maintain that level. To avoid even modestly under-predicting the elevations of Mead and Powell pools, particularly in the near term, this modeling has assumed that the schedule of Upper Basin depletions will effectively begin with the last reported actual level for CY 2000, will increase at a

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slower rate than projected by the Upper Colorado River Basin Commission through CY 2009, and will increase at the rate projected by the Commission thereafter.[7]

For purposes of the model, the minimum objective release out of Lake Powell was assumed to be 8.23 maf per year (reflecting current operating conditions).[8] Alternative scenarios for conjunctive management were not modeled, and the protection of a minimum power pool at Lake Powell was not incorporated into this proposal; either or both of these assumptions would affect the elevation of Lake Powell. Model runs used end-of-year 2004 elevations at Lake Mead and Lake Powell to establish initial conditions for 2005, and were run through year 2025.

Protection of Lake Mead

Figures 1 -3 show the potential value of implementing the CBS policy, under a range of average to extremely low flow conditions. **These and following figures show that the CBS policy would greatly benefit the elevation of Lake Mead.**

As shown in Figure 1 below, under average conditions, the CBS policy would maintain reservoir elevations at Mead approximately 30 feet above the baseline policy. As shown by Figures 2 and 3, the CBS policy would significantly reduce the rate of decline in the lower 25th and in the very low 10th percentile reservoir elevations for Mead and maintain even these lower reservoir elevations above the 1000 foot protection level. Model runs showed essentially no impact of the CBS on the higher 90th percentile Mead elevations, so no figure is provided.

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[7] *See* "Estimates of Future Depletions in the Upper Division States," Upper Colorado River Commission Memorandum, December 23, 1999. This schedule predicts a 440,000 acre-foot increase in Upper Basin depletions between 2000 and 2010 and a 542,000 acre-foot increase over actual CY2000 depletions, as reported in Reclamation's Consumptive Uses and Losses 1996-2000 report (see Tables UC-1 & UC-6). Actual increases in Upper Basin depletions water may not keep pace with this schedule, because water that would otherwise have been utilized has been and may continue to be physically unavailable for depletion in the Upper Basin due to drought conditions, and in other cases, projects that were proposed to have been constructed during this period may not yet have been or will not be completed through CY 2009. A slower rate of increase from 2000 to 2009 was modeled by subtracting four increments of 100,000 acre-feet from the Commission's schedule from CY 2005 to 2009. This and all other Riverware modeling exercises should be revised to reflect actual increases in Upper Basin depletions as soon as more current information becomes available.

[8] This assumption is not intended to endorse or reject the Secretary's current use of 8.23 maf as the minimum release objective for Powell, the protection of a minimum power pool at Powell, or proposals for the conjunctive management of the combined storage of Mead and Powell. Alternative release scenarios should be incorporated into the modeling for this proposal as they are developed. As a general matter, none of the assumptions used in this proposal should be construed as an interpretation of the 1922 Colorado River Compact, the 1944 Treaty with Mexico, or any other aspect of the Law of the River.

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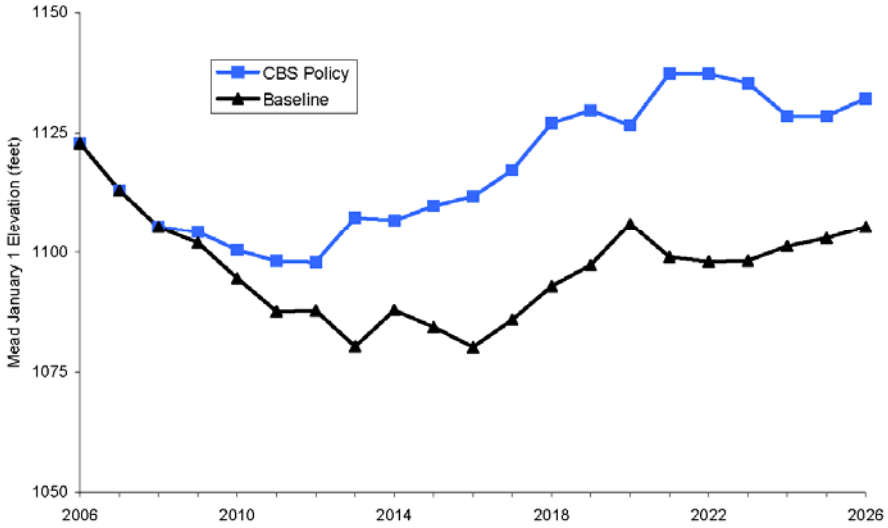

Figure 1. Impact of CBS policy on elevations at Lake Mead, at 50th percentile elevation.

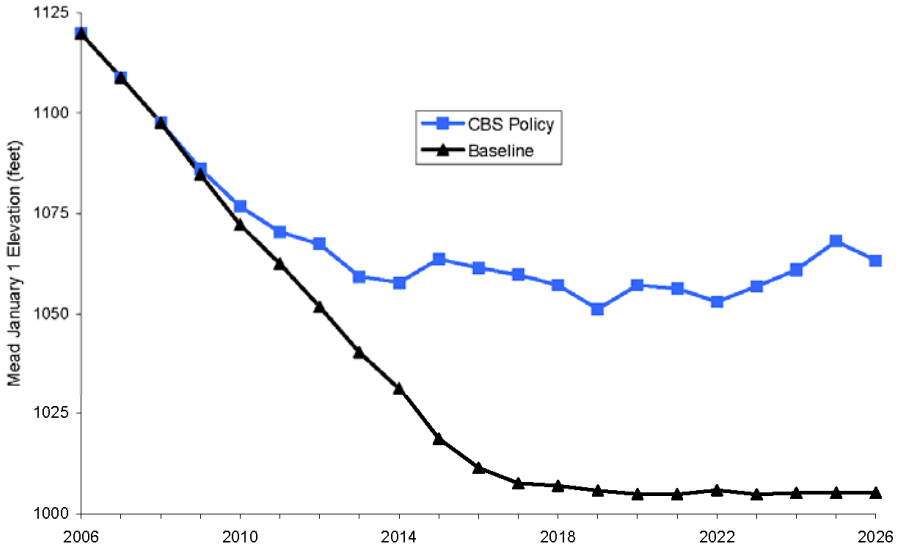

Figure 2. Impact of CBS policy on elevations at Lake Mead, at 25th percentile elevation.

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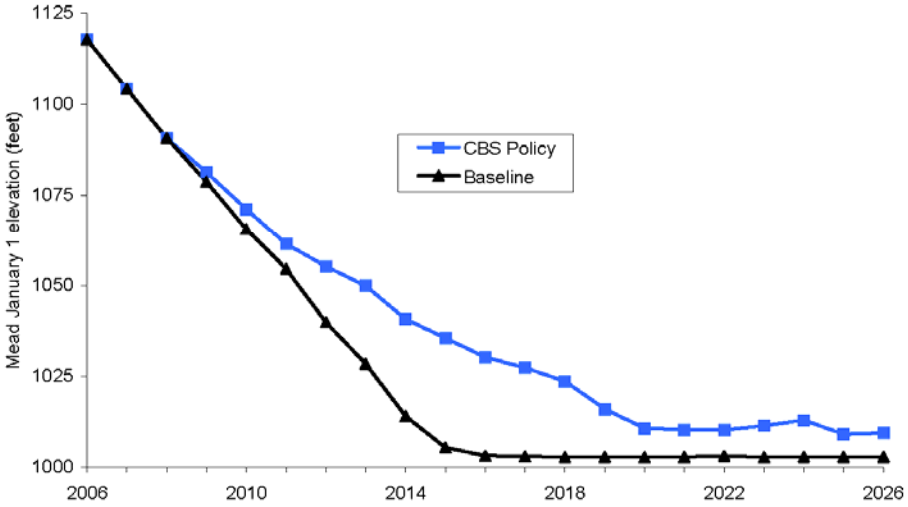

Figure 3. Impact of CBS policy on Lake Mead elevation, at 10th percentile elevation.

Probability of Shortages

As noted above, a primary goal of the CBS policy is to significantly reduce the probability of an involuntary, uncompensated shortage in excess of 500,000 acre-feet (the approximate level at which CAP deliveries would be reduced beyond that currently utilized for water banking). **As shown in Figure 4, below, the probability of shortages exceeding 500,000 acre-feet is reduced to 5% or less through the entire modeled period under the CBS policy. By contrast, the probability of shortage under the baseline policy rapidly approaches 30% during this same period. Furthermore, as shown in Figure 5, below, the CBS policy reduces the probability of any involuntary shortage by approximately 20% over the next 20 years.**

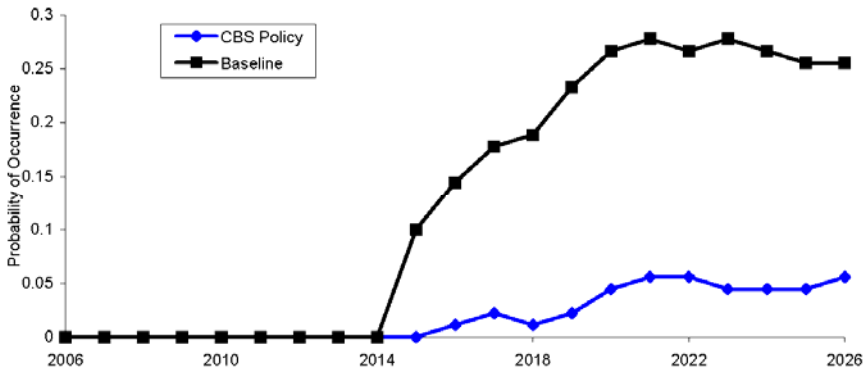

Figure 4. Impact of CBS policy on probability of involuntary Lower Basin shortage greater than 500,000 acre-feet.

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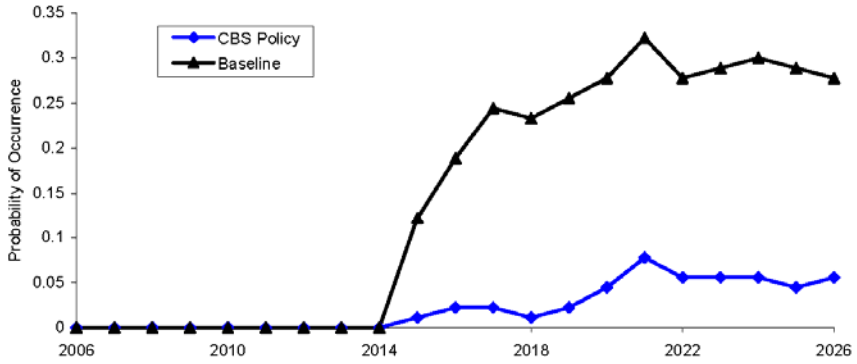

Figure 5. Impact of CBS policy on probability of any involuntary shortage in the Lower Basin.

Probability of Reaching Conservation Triggers

Figures 6 - 8, below, show the relative probability of reaching or exceeding any of the proposed conservation triggers at 1100 feet, 1075 feet and 1050 feet. As one might expect, the probability of reaching the first two triggers is highest in the earlier years of the modeled period, while the probability of reaching the third trigger is higher towards the end of the modeled period. However, the probability of reaching and continuing to remain below a given trigger for an extended period of time appears to be low because of the conservation measures tied to the triggers. For obvious reasons, trigger levels are most likely to be reached under low or very low flow conditions, and are rarely (if ever) reached under high flow conditions.

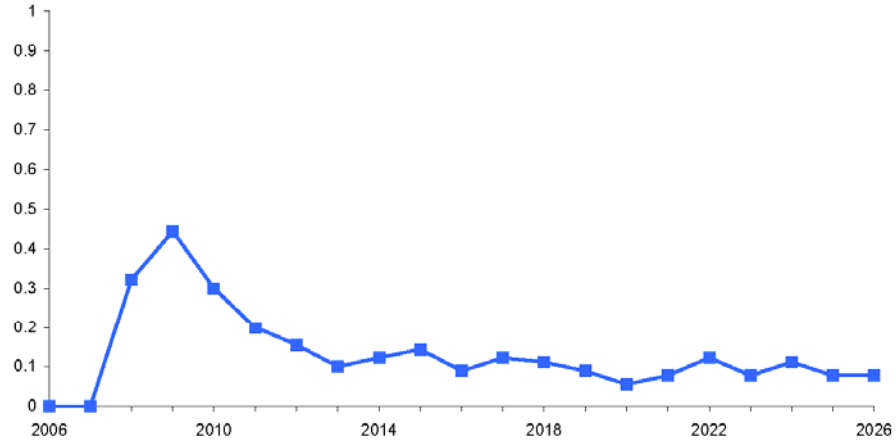

Figure 6. Probability of Lake Mead January 1 elevation occurring in a bounded range of 1100 feet to 1075 feet, with CBS policy in place.

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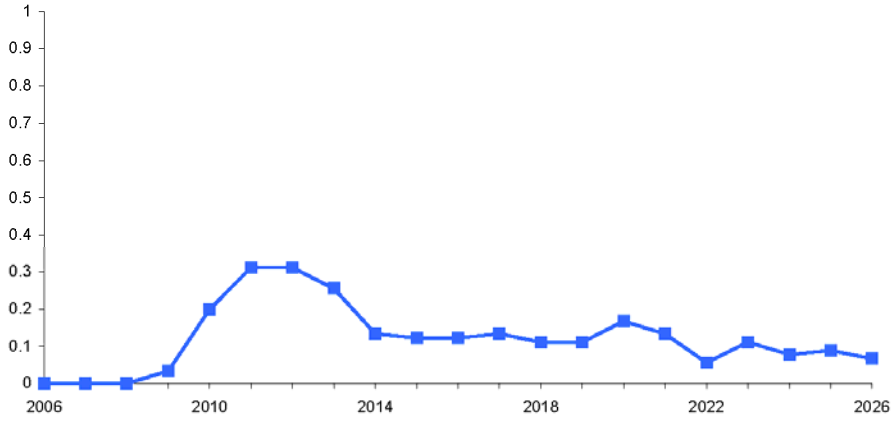

Figure 7. Probability of Lake Mead January 1 elevation occurring in a bounded range of 1075 feet to 1050 feet, with CBS policy in place.

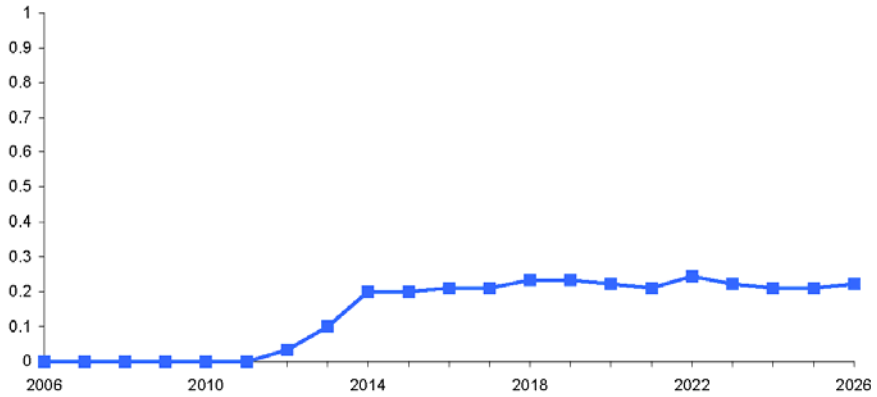

Figure 8. Probability of Lake Mead January 1 elevation occurring below 1050 feet, with CBS policy in place.

Cost of Implementing Conservation Triggers

The cost of implementing conservation triggers is directly related to the cost of obtaining water using the proposed voluntary, market-based conservation mechanisms. Recent purchases of water from farmers in the Lower Basin, as well as analysis of agricultural production in this area, suggest that there is a substantial volume of water used for irrigation which could potentially be obtained on a temporary basis for $20 - 100 per acre-foot. For example, in 2004, the Imperial Irrigation District acquired water from its farmers for less than $60 per acre-foot.

As shown in Figure 9, a recent economic study by Environmental Defense into the profits returned by field crops suggests that slightly more than 2.3 million acre-feet of agricultural water

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is being used by Lower Basin farmers in California and Arizona to produce profits of less than $100 per acre-foot; more than one million acre-feet of agricultural water is being used to produce profits of less than $20 per acre-foot. (Figures are based on the average volume of water applied to produce a crop unit and market rates for each crop, less costs of production.)

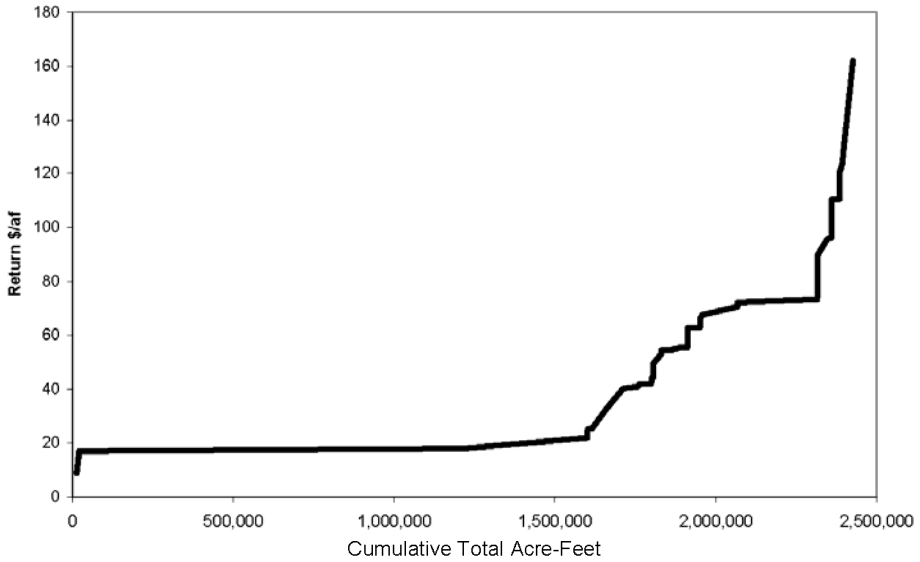

Figure 9. Profits per acre-foot returned on Colorado River water used in the production of selected crops in the Lower Colorado River Basin.[9]

While these figures do not necessarily reflect the amount at which any given water user would be willing to take part in a part-year fallowing program or agree to a dry-year option, they do suggest that if an open, market-based approach is used to identify potential participants, a number of water users in the Lower Basin would probably be willing to temporarily reduce or forgo the use of water for agricultural production in a price range between $20 and $100 per acre-foot (as the sale of water in this range would produce equal or greater monetary returns to the user than the use of water to irrigate crops).

In order to mitigate third-party impacts of fallowing, the federal government could establish a drought economic adjustment fund that would provide economic development grants to affected communities in the counties of origin. These funds preferentially would go to established county-based farm labor assistance programs to the extent that such programs exist, and could include lump sum payments to displaced workers based on a percentage of foregone annual income.

[9] This graph has not been published elsewhere. For methodology, please contact Jennifer Pitt at jpitt@environmentaldefense.org. A study using similar methodology, but limited to crop values in the Wellton-Mohawk Irrigation and Drainage District, has been published previously (Pitt et al., New Water for the Colorado River: Replacing the Bypass Flow, 6 U. Denver Water L. Rev. 68 (2002)). The study found a range of prices similar to that represented here for profits derived from water use in that area.

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Using these assumptions for water acquisition costs, Table 1 suggests the approximate range of costs for implementing each of the conservation triggers under the CBS policy.

Table 1. Approximate federal and power/water user cost of implementation of CBS policy conservation trigger levels (assumes that water can be acquired temporarily for $20 - $100/acre-foot, and that the annual federal bypass obligation of 110,000 acre-feet has not otherwise been satisfied).

Trigger	Conservation required	Federal obligation (bypass + 50%)	Federal cost (millions)	Remaining Obligation	Water user cost (millions)	Power Surcharge (millions)	User cost per af (all Lower Basin users)
1075-1100	200,000 af	155,000 af	$3 - $15.4	45,000 af	$0.45 - $2.3	$0.45 - $2.3	$0.06 - $0.30
1050-1075	400,000 af	255,000 af	$5 - $25.4	145,000 af	$1.5 - $7.3	$1.5 - $7.3	$0.19 - $0.97
Below 1050	600,000 af	355,000 af	$7 - $35.4	245,000 af	$2.5 - $12.3	$2.5 - $12.3	$0.33 - $1.63

Cost of Not Implementing "Conservation Before Shortage" Policy

Although the "Conservation Before Shortage" policy would impose notable costs on water and power users, and on taxpayers generally, these costs should be compared with the much larger financial costs that would occur if the Secretary were to impose involuntary, uncompensated shortages, as well as the costs due to the lack of certainty and reliability that would exist without the CBS policy. The recent drought and decrease in power production at both Hoover Dam and Glen Canyon Dam point to the dramatic costs imposed by the loss of reservoir storage.

If Lake Mead falls to 1050 feet, power rates will need to be increased to an approximate composite rate of 2.31 cents/kWh, which is a 44.3% increase over current rates. Replacement power purchases would be (depending on the user) 2.9 to 3.7 times the Hoover rate. In FY03, replacement power may have cost customers an additional $24 million.

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K.3 Attachment B: Taking ICS to Mexico: International Opportunities in the Seven States Agreement

Taking ICS to Mexico:
International Opportunities in the Seven States Agreement

Introduction

The Seven Basin states recently reached agreement on a far-reaching proposal to improve the management of Colorado River system water through conjunctive management of Lakes Mead and Powell, modification and extension of the existing interim surplus guidelines, and the adoption of shortage guidelines. Perhaps most significantly, this agreement introduces of a series of new mechanisms to increase flexibility within the Lower Basin delivery system and water allocations, including the creation of a new category of water: "Intentionally Created Surplus," which can be generated through extraordinary conservation measures or the funding of system efficiency improvements, and the recognition of water exchanges.

At the present time, the states' proposal is largely concerned with operations between and among the Basin states, particularly the states of the Lower Basin, although some elements of the proposal (such as water exchanges) have apparently contemplated Mexican participation. However, it would appear that significant benefits for U.S. water users, Mexican water users, and the environment could also be derived from expressly extending portions of the proposed agreement to water users in Mexico – while helping Mexican users to more readily bear burdens that could otherwise be imposed by the alterations proposed in the states' accord.

In particular, an extension of proposed policies related to Intentionally Created Surplus (ICS), system efficiency improvements, and water exchanges to include water users in Mexico could provide significant assistance in resolving difficult issues related to urban, agricultural, and environmental water supplies in Mexico, while opening enormous opportunities for both U.S. and Mexican water users to obtain water supplies via funding of irrigation efficiency improvements, the construction of urban water infrastructure, water supply replacement or enhancement, desalination, and other projects. These credits could be used to firm up urban water supplies in both countries, engage in long-studied environmental restoration projects in the Delta, and increase flexibility in Mexico's agricultural sector – creating economic, environmental, and social benefits in both countries while offering the United States and Mexico a venue for cooperation in the otherwise contentious area of water management at the border.

These outcomes would meet all three of the purposes identified in the Basin States' original proposal: improving cooperation and communication, providing additional security and certainty in the water supply of the Colorado River System, and avoiding circumstances which could otherwise form the basis for claims or controversies over the Colorado River Compact and other applicable provisions of the Law of the River.

While an extension of this agreement to include Mexico would likely need to occur on a different timeframe than for the domestic implementation of the agreement, the domestic process should at least not close the door on an international program, and would

preferably encourage the initiation of binational discussions on the issue. Since critical elements of the states' current proposal – most notably the proposed shortage policy and proposed policies for unilateral water exchanges – will already require consultation with Mexico and/or the adoption of a new Minute, these opportunities could be considered in the same diplomatic process.

Binational Challenges for the Seven States' Agreement

Mexico has no storage system for Colorado River water, and as such, is effectively dependent on the U.S. reservoir system to guarantee water deliveries to meet municipal and agricultural demands. In addition, although the Mexicali Valley has significant groundwater resources, Mexico does not currently operate a water bank or other shortage mitigation program comparable to those in place in the United States (e.g., the Arizona Water Bank). At the same time, the lack of storage in Mexico effectively prevents Mexico from accumulating reserve supplies that could be used to meet environmental needs in Mexico (such as pulse flooding the in Delta region, which has been identified as a necessary precondition to effective restoration of key riparian areas). In the face of a rapidly growing population, ongoing efficiency and water accounting issues in its agricultural sector, and increasing pressure to protect and restore critical environmental resources in the Delta, Mexico faces a uniquely challenging situation with regard to the management of its water resources.

Of particular concern for Mexico in the states' proposal could be the provisions related to the implementation of shortages on the Lower Colorado. Although the Treaty of 1944 provides that Mexico is to share "proportionately" with U.S. users in times of "extraordinary drought," the precise meaning of this provision remains unclear, and it has never been invoked since the time of the Treaty's execution. The states' agreement, for the first time, unilaterally and precisely defines a set of proposed parameters under which shortages would be implemented against the Mexican allocation. Because Mexico has no readily available mechanisms to reduce or mitigate against shortage impacts on its users (such as reservoir storage or water banking), the potential for shortages will cause understandable concern for Mexican water users – similar to those that have arisen among low-priority users in the U.S.

Similarly, although conjunctive management of Lakes Mead and Powell as proposed in the states' agreement will doubtless help to reduce the probability that such shortages will actually occur, this will potentially come at the cost of decreasing the probability of future spills from these reservoirs in the future, since reservoirs may be drawn down further in the event of drought, increasing available capacity to absorb flood events in the future. The states' proposal also appears likely to create incentives to further increase the efficiency of U.S. water delivery systems by providing opportunities to receive ICS credits for the funding of these projects (e.g., Southern Nevada Water Authority's proposed funding of the Drop 2 reservoir); these projects will further reduce normal-year deliveries to Mexico. Combined with gradually increasing efficiency in agricultural water use, this will continue to pose challenges for the maintenance of critical environmental

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values in the Delta, which receive virtually all of their current water supplies from agricultural return flows, excess deliveries, canal leakage, and occasional flood events.

However, the states' proposal also offers a potential opportunity to promote binational solutions to these concerns as well as a broader suite of water issues in the border region – particularly insofar as it could be used to promote improvements in agricultural efficiency, water infrastructure, and municipal water quality and supply in Mexico. A brief discussion of these opportunities is provided below, together with examples of how particular programs might work. Of course, any projects undertaken would require the review, approval, and continuing oversight of both countries. However, it is critical to note that each of these programs could be undertaken without altering Mexico's basic Treaty entitlement to Colorado River water; any decrease (or increase) in Treaty deliveries would be matched by a mutually agreed-to compensation program or a proportionate increase (or decrease) in water deliveries in a later year. None of these programs would change Mexico's right to Colorado River water deliveries under the 1944 Treaty.

Expanding Three Elements of the States' Proposal to Mexico: How It Could Work

Intentionally-Created Surplus (ICS)

Under the states' proposal, a contractor could generate "ICS credits" by engaging in extraordinary conservation activities that have the effect of reducing the use of Colorado River water. These activities could include land fallowing, canal lining, desalination, or other extraordinary conservation measures agreed to by the states, so long as they result in the savings of water that would otherwise have been beneficially used as a part of a state's basic entitlement (surplus water cannot be used), the contractor plans and identifies the intended savings in advance (by September 15 of the preceding year), and the credits are first used to offset any delivery overruns.

These ICS credits would then be stored in Lake Mead for use by the contractor at some future time, subject to annual reductions to account for storage losses to reservoir evaporation, and a 5% "system tax" that would accrue to the benefit of the river system as a whole.The remaining credits could then be used during any year with "normal" operating conditions. During shortage or surplus conditions, the credits could not be used, and they would be reduced on a pro-rata basis in the event of a spill. However, for the purposes of determining calendar year declarations of surplus, normal, and shortage conditions, stored water that is subject to ICS credits would be considered system water – helping to keep reservoir levels higher in Powell and Mead and avoid shortages in the Lower Basin.

ICS credits would be subject to both yearly and cumulative maximums for each state, with California limited to no more than 400,000 acre-feet per year and a total credit of 1.5 million acre-feet, and Arizona and Nevada to 100,000 and 125,000 acre-feet per year, respectively, and total credits of 300,000 acre-feet. Recovery of ICS credits is similarly

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limited to 400,000 acre-feet annually for California and 300,000 acre-feet annually for Arizona and Nevada.

- How it could work in Mexico:[1]
    - Mexican users could engage in extraordinary conservation activities in Mexico with the effect of reducing actual beneficial use such that deliveries to Mexico under the Treaty could be temporarily reduced below 1.5 million acre-feet in any one year. This would generate ICS credits that would be available for delivery to Mexico in later years, under the same rules applicable to U.S. users, resulting in temporary increases in deliveries above the 1.5 million acre-foot Treaty obligation.
        - Example: Pronatura Sonora pays to temporarily fallow low-productivity lands in the Mexicali Valley, saving 30,000 acre-feet of water a year over a period of years. Treaty deliveries in each year are accordingly reduced below 1.5 million acre-feet, resulting in increased storage in Lake Mead. Pronatura receives an ICS credit which it can deliver to Mexico in a future year as a pulse flow for a riparian restoration project (after reducing the ICS credit for reservoir evaporation and paying the 5% system tax).

System Efficiency Projects

In addition to creating ICS through extraordinary conservation activities for existing uses of Colorado River water, the states' proposal allows for Colorado River users to receive ICS credits in exchange for making capital contributions to projects that would increase the overall efficiency of the Colorado River delivery system. The credits would comprise a portion of the water saved through the efficiency project, and would not be stored, but would rather be provided to the user that developed the credit on a predetermined schedule for some period of years.

- How it could work in Mexico: Mexican or U.S water users could fund delivery system efficiency improvements and receive proportionate amounts of temporary ICS credits for their investments that could be used under the same rules applicable under the states' proposal. These temporary credits would have the effect of either increasing (if funded by a Mexican user) or reducing (if funded by a U.S. user) Treaty deliveries to Mexico for an agreed period of time. After the temporary ICS credits expired, the system efficiency improvement would accrue to the country in which the project was undertaken.
    - Example: Metropolitan Water District develops a cooperative program with CNA and the U.S. federal government to invest in upgrades to the Mexicali Valley irrigation system, including canal lining and water

[1] The legal mechanism for implementing the extension of ICS and water exchanges to Mexico is discussed below.

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accounting infrastructure, resulting in significant savings of water that would otherwise have been lost in the delivery system while improving or at least maintaining agricultural productivity. MWD receives a fixed amount of ICS credits for a period of years that can be used as a "bridge" supply until permanent water transfers from U.S. agricultural sources are completed. After the expiration of that period, all ICS credits revert to Mexico. Mexico, in turn, commits to dedicate a portion of the water saved to natural habitat restoration in the Colorado River Delta. With the approval of the U.S. Fish and Wildlife Service and appropriate international agreements, this could even result in some partial credit under the Multi-Species Conservation Program. Mexico uses the bulk of efficiency savings from the program to improve urban and agricultural water supplies, including offsetting expected impacts from the lining of the All-American Canal.

Water Exchanges

Finally, the states' proposal allows Colorado River users in the Lower Basin to secure additional water supplies by funding the development of a non-Colorado River System water supply in one state for use in another state by exchange. The new water supply would be used in place of the Colorado River water supply, allowing the user that provided the funding to use the Colorado River water that is no longer used through and agreement with the Secretary of the Interior. The states' proposal expressly contemplates exchanges with Mexico, albeit only unilateral exchanges in which non-Colorado River System supplies would be developed in Mexico, with the savings used in the United States.

- How it could work in Mexico: This program could be extended to a bilateral program in which water could be exchanged in either direction, with exchanges resulting in commensurate increases or decreases in Treaty deliveries (indeed, it is unclear why Mexico would agree to a purely unilateral program as proposed by the states).

Opportunities in Mexico

The examples cited above suggest just a few of the opportunities which could be explored if the states' proposal could be extended to users in Mexico - opportunities that could help not only to offset the impacts of the states' proposal, but also to meaningfully improve the tools available to meet human and environmental needs in the border region.

Over the years, there have been a number of proposals suggesting means by which the United States and Mexico might cooperate to improve both agricultural efficiency and municipal water quality in the border region. Notably, in 1991, the United States Bureau of Reclamation (BOR) and the Comisón Nacional del Agua (CNA) released a joint proposal entitled "International Cooperative Water Conservation and Irrigation Efficiency Improvement Program between the Republic of Mexico and the United States

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of America" that was championed by Dennis Underwood. This proposal noted similarities between cropping patterns and irrigation methods in the Imperial and Mexicali Valleys, and based on the experience of municipal and industrial users in California with investment in efficiency improvements (that were otherwise beyond the means of farmers in the region), suggested that similar investments in the Mexicali Valley could produce significant short and long-term water supply benefits.

Observations of water management in the Mexicali Valley suggest that there remain significant opportunities for improving water delivery and use through system automation, operational changes to improve the timing and quantity of deliveries, conversion to high capacity farm turnouts, canal lining, spill interception, land leveling, installation of canal turnouts for rapid delivery, improved cropping patterns, changed field irrigation practices and adaptation to low water-use technologies, improvements to drainage, and improved maintenance procedures. Water conserved from these efforts could be beneficial in terms of providing replacement supplies in the face of shortages, reducing dependence of local farmers on groundwater supplies, and providing environmental benefits.

For example, the Mexicali Irrigation District (DDR 0014) reports approximately 645,000 af/yr (800 mcm/yr) in conveyance losses that are recoverable (as opposed to conveyance losses that recharge groundwater supply[2]). Based on some extremely rough estimates, of this total conveyance loss, approximately 150,000 af/yr (200 mcm/yr) may be attributable to seepage from major canals. Much of this latter seepage apparently occurs along approximately 70 kilometers of unlined canal sections, which could potentially be lined, by one estimate, for around $600 million pesos (US $56 million). These include the Reforma canal (28 km, estimated lining cost $150 million pesos or US $13.7 million), the Revolución canal (20 km, no lining estimate available), the Alimenta del Sur canal (5.5 km, no lining estimate available), and the Nuevo Delta canal (16 km, lining cost $300 million pesos or US$27.4 million).[3] None of these sections reportedly cross or recharge aquifers from which significant amounts of groundwater are recovered or that support river flows or wetlands. The total estimated costs of all of these lining projects would likely be comparable to the $80-$90 million construction cost for the Drop 2 storage reservoir, but could potentially produce a far larger quantity of savings at a much lower cost per acre-foot.

The opportunities associated with an international expansion of the seven states proposal are not limited to agricultural water use. Mexico is currently experiencing increasing risks of shortages to municipal and industrial water supplies in the Mexicali Valley and the major communities to the west of the Valley – as well as significant concerns related to water quality due to high water salinity in the Mexicali Valley region and water

[2] The extent to which the aquifers are interconnected and to which such losses are recoverable without impacting groundwater recharge that is pumped for irrigation or that supports river flows or wetlands should be verified by geo-hydrologic investigation, modeling, and monitoring.
[3] These figures are rough estimates based on informal discussions with a former employee of CONAGUA and are provided for illustrative purposes only. The estimated costs for lining the Nuevo Delta canal reach are apparently high due the location of this reach over a geologic fault.

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pollution. These concerns create a significant opportunity for the use of tools such as ICS and system efficiency investments to improve these supplies – and perhaps just as significantly, opportunities to invest in desalination or other technologies to replace low-quality Colorado River supplies or otherwise improve water quality for municipal use.

Creating a Delta Water Supply

These proposals would necessarily require consideration of environmental needs in the Colorado River Delta. As numerous studies have pointed out, the remaining Delta ecosystem largely depends on "system inefficiencies" for its water supply – such as return flows from agriculture, effluent flows, canal leakage, and releases in excess of Treaty requirements from the U.S. These proposals would create inevitable incentives to reduce these inefficiencies in Mexico (just as the states' proposal creates incentives to reduce inefficiencies in the United States). As such, it is essential that any program in Mexico provide a mechanism for replacing (or improving) the Delta's water supplies while meeting critical agricultural and municipal needs.

To a certain extent, this issue could be addressed through implementation of an ICS mechanism in Mexico. Several recent studies, including a recent Packard Report, "Immediate Options for Augmenting Water Flows to the Colorado River Delta in Mexico," have investigated options related to taking existing, marginal agricultural lands in Mexico out of production and utilizing the water associated with those lands for environmental purposes. The Sonoran Institute and Pronatura Noroeste-Sonora, together with other NGO partners, are currently in the process of exploring just such an option, focusing on highly marginal lands in the southern portions of the Mexicali Valley where salt buildup and shallow groundwater create economic challenges for agricultural production. Although funding for these efforts has not yet been secured, mechanisms have been identified for holding water derived from these lands via water trusts, wheeling water to appropriate locations, and designating protected receiving areas in the riparian corridor to ensure that water is used for environmental benefit.

Nevertheless, reliance on non-governmental organizations alone will not guarantee the continued availability of water to support key ecosystem values in the Delta. To ensure the continued viability of the Delta ecosystem – and to avoid ongoing uncertainties for U.S. and Mexican water users associated with environmental challenges to water allocations – any international program should include a process for securing necessary environmental flows, such as the dedication of a portion of the proceeds of various water-saving programs to provide a permanent, reliable supply of water to replace current supplies and support environmental uses in the Delta.

Making a Binational Proposal Work: Changes to the States' Proposal and the Treaty of 1944

Implementation of a binational program for Intentionally-Created Surplus, efficiency improvements, and water exchanges would of course require an alteration to the current framework of the Treaty of 1944 between the United States and Mexico. Currently, the

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Treaty requires the delivery of 1.5 million acre-feet of water to Mexico annually, absent surplus or extraordinary drought.

It should be noted that none of the proposals discussed above would have the result of altering the basic entitlements of either the United States or Mexico under the Treaty; regardless of the program developed, Mexico would continue to have the same 1.5 million acre-foot entitlement to Colorado River water even if the precise timing (or the place) of the delivery of that entitlement was altered). As such, the implementation of such programs should not result in any conflict with other provisions of the Law of the River, and in particular the Colorado River Compact, since no change in position between the U.S. and Mexico would occur.

However, the implementation of the proposals discussed above would require temporary reductions or increases in deliveries above or below this basic number to the extent that water was stored or released from Lake Mead in response to programs generating ICS via extraordinary conservation or investment in system efficiency improvements, or else via water exchanges between parties in the U.S. and Mexico. As such, an appropriate alteration to the delivery rules under the Treaty would be required.

This could be effectively accomplished via the addition of a new Minute to the Treaty of 1944, adopted through the International Boundary and Water Commission (IBWC). Pursuant to the Treaty of 1944, IBWC is authorized to build and manage waterworks, to resolve problems and negotiate further agreements regarding international waters, and to settle treaty-interpretation disputes.[4] The Treaty grants broad jurisdiction to IBWC to "plan, build, and manage water works; to enter into further agreements regarding international waters," and to "settle all differences that may arise between the two Governments with respect to the interpretation or application of this Treaty, subject to the approval of the two Governments."[5] Assuming appropriate approvals could be obtained from the U.S. and Mexican federal governments, IBWC should thus have appropriate authority under the Treaty to implement a binational program for ICS, water efficiency improvements, and water exchanges based on the same rules applicable to the other Lower Basin states. In addition, any international agreement would need to address a number of technical issues that would be associated with these programs, including the development of appropriate accounting methods for water conservation, and the identification of conservation priorities and opportunities to which water generated for ecosystem use might be put.

Such a new Minute could be modeled after the new regulations or guidelines that would need to be adopted to implement the states' proposal in the U.S. As the shortage criteria for deliveries to Mexico and the states' existing proposal for unilateral water exchanges would also likely require implementation via a new Minute, these issues could be explored under the same diplomatic process.

[4] *See* Mexico-U.S. Water Treaty of 1944, Art. 24, 59 Stat. at 1255-1257.
[5] *See* Mexico-U.S. Water Treaty of 1944, Art. 24(d).

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Obviously, these proposals would require diplomatic discussions between the U.S. and Mexico before they could be appropriately implemented, which would place the implementation of an international ICS program on a different timeframe than that anticipated for the adoption of a domestic program. However, as the operation of such a program would likely require consideration of environmental concerns under the National Environmental Policy Act, as well as appropriate recognition in any guidelines that may be adopted by the Secretary to implement the states' agreement. For example, the rules used to guide the storage and release of ICS credit water would need to recognize the potential for delivery of ICS to Mexico pursuant to the Treaty of 1944, rather than solely by reference to Section II(B)(2) of the Decree and forbearance agreements between the states. Similarly, rules defining the maximum amount of ICS credits that could be generated in any one year, and the cumulative amount that could be subject to storage in Lake Mead, would also need to reference the potential for Mexican use of this system.

To ensure that a potential international program could be eventually implemented in conjunction with the states' proposed program, and assuming that there is interest among Mexican water users in such an international program, we suggest that the proposals discussed above should be appropriately considered as a part of the U.S. Bureau of Reclamation's ongoing public process for the "Development of Lower Colorado River Basin Shortage Guidelines and Coordinated Management Strategies for Lakes Powell and Mead Under Low Reservoir Conditions."

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