
Technical Appendix 18

Indian Trust Assets

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Acronyms and Abbreviations

Acronym or Abbreviation	Full Phrase
ADM	Alternative Distribution Model
afy	acre-feet per year
CAP	Central Arizona Project
CCS	Continued Current Strategies
DMDU	Decision Making under Deep Uncertainty
EIS	Environmental Impact Statement
ICS	intentionally created surplus
ITA	Indian trust asset
LB Priority	Lower Basin Priority
LB Pro Rata	Lower Basin Pro Rata
Lower Basin	Lower Colorado River Basin
maf	million acre-feet
M&I	municipal and industrial
NIA	non-Indian agriculture
PPR	present perfected right
Reclamation	Bureau of Reclamation
SAM	Shortage Allocation Model
U.S.	United States
Upper Basin	Upper Colorado River Basin

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TA 18. Indian Trust Assets

TA 18.1 Affected Environment

The United States (U.S.) has a trust responsibility to tribes as defined by statutes, court decrees, treaties, or other applicable law.¹ Indian trust assets (ITAs) are legal interests in assets held in trust by the federal government for the benefit of federally recognized Native American tribes or individual Native Americans (Reclamation 1994). ITAs can be located on or off established reservation lands and can consist of land or water entitlements²; natural resources; monies, such as trust funds; mineral rights; hunting, fishing, trapping, and gathering rights; and other assets. Beneficiaries of the Indian trust relationship are tribes and individual Native Americans; the U.S. is the trustee. ITAs are generally restricted against alienation (that is, they cannot be sold, transferred, abandoned, or lost without approval from the Secretary of the Interior). With federal authority and approval, ITAs may be leased to generate income for tribes or individual Native Americans (Department 2025).

It is the general policy of the Department of the Interior to carry out activities in a manner that protects ITAs and avoids adverse effects whenever possible (Reclamation 1993). In accordance with Bureau of Reclamation (Reclamation) ITA policy and guidance (Reclamation 1994), tribal consultation addressing trust assets should be initiated with appropriate tribal groups and the Bureau of Indian Affairs, and the presence or absence of ITAs should be addressed explicitly in all National Environmental Policy Act documents. Reclamation has consulted with tribes regarding the proposed Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead Environmental Impact Statement (EIS).

TA 18.1.1 Trust Lands

Indian trust lands are lands that the U.S. holds in trust for the benefit of a tribe (tribal trust land) or for an individual Native American (individual trust land). Trust lands may be located on or off a reservation. While reservations are not always synonymous with trust lands, the exterior boundaries of reservations are used to define the trust land assets for purposes of this National Environmental Policy Act analysis, to be inclusive. There are 30 federally recognized tribes in the Colorado River Basin; of these, 29 have established reservations (**Map TA 18-1**). The San Juan Southern Paiute Tribe does not have its own reservation. Tribal land uses include, but are not limited to, communal and spiritual uses, domestic use, and agriculture and economic development.

¹ Nothing in this technical appendix is intended to modify, abrogate, or create ITAs. Any particular ITA remains defined by and subject to applicable authority.

² Rights and entitlements may be used interchangeably in this technical appendix for simplicity, and no legal change to any ITA is intended.



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Map TA 18-1

Tribes and Reservations within the Colorado River Basin

01. Ute Indian Tribe of the Uintah and Ouray Reservation

02. Southern Ute Indian Tribe

03. Ute Mountain Ute Tribe

04. Jicarilla Apache Nation

05. San Juan Southern Paiute Tribe (federally recognized Indian Tribe, territory within the Navajo Nation)

06. Zuni Tribe

07. Hopi Tribe

08. Navajo Nation

09. Kaibab Band of Paiute Indians

10. Havasupai Tribe

11. Hualapai Indian Tribe

12. Paiute Indian Tribe of Utah

13. Moapa Band of Paiute Indians

14. Las Vegas Tribe of Paiute Indians

15. Fort Mojave Indian Tribe

16. Chemehuevi Indian Tribe

17. Colorado River Indian Tribes

18. Yavapai-Apache Nation

19. Yavapai-Prescott Indian Tribe

20. Tonto Apache Tribe

21. White Mountain Apache Tribe

22. San Carlos Apache Tribe

23. Fort McDowell Yavapai Nation

24. Salt River Pima-Maricopa Indian Community

25. Gila River Indian Community

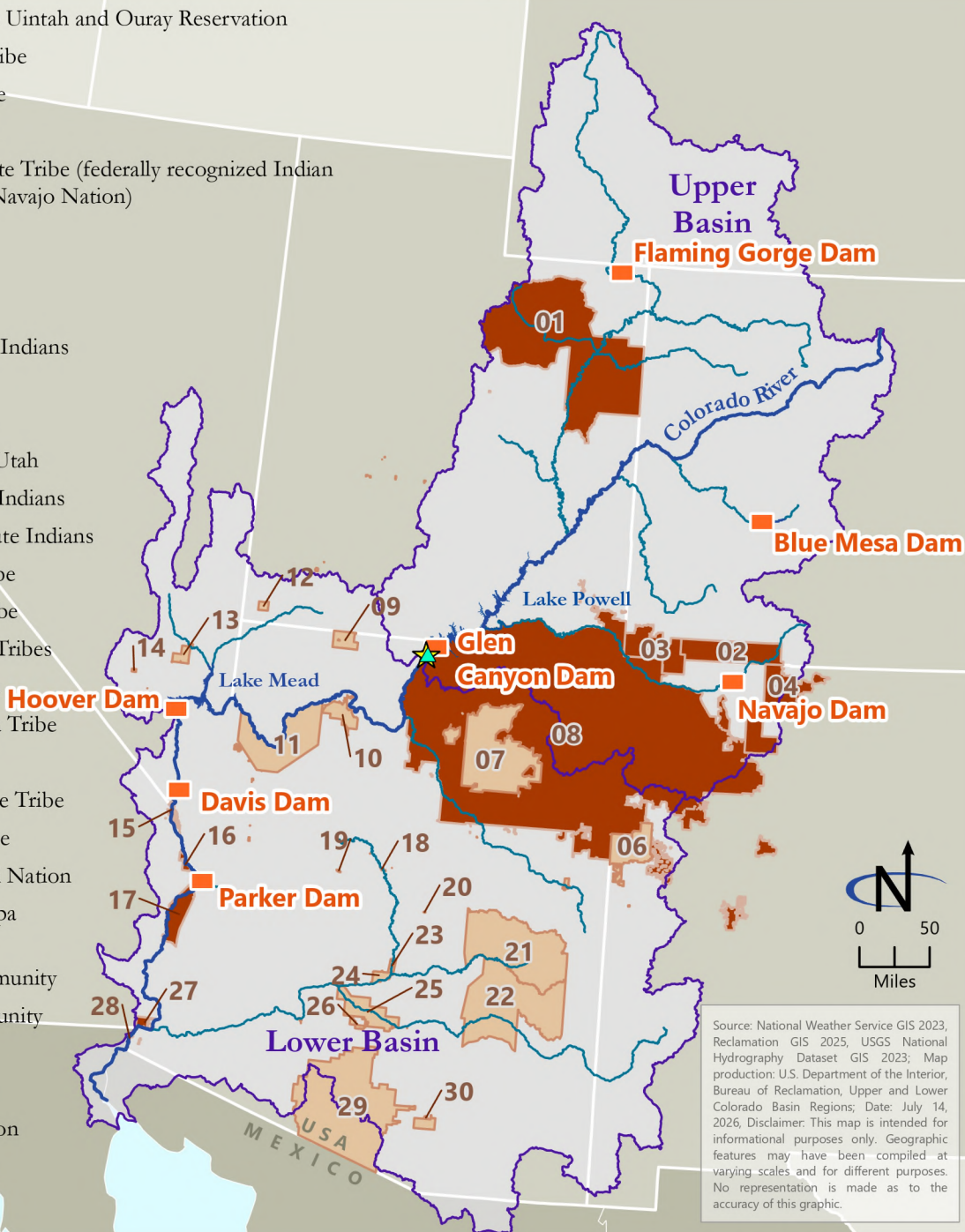
26. Ak-Chin Indian Community

27. Quechan Indian Tribe

28. Cocopah Indian Tribe

29. Tohono O'odham Nation

30. Pascua Yaqui Tribe



Source: National Weather Service GIS 2023, Reclamation GIS 2025, USGS National Hydrography Dataset GIS 2023; Map production: U.S. Department of the Interior, Bureau of Reclamation, Upper and Lower Colorado Basin Regions; Date: July 14, 2026. Disclaimer: This map is intended for informational purposes only. Geographic features may have been compiled at varying scales and for different purposes. No representation is made as to the accuracy of this graphic.

- Tribal Reservation and off-reservation trust land, Ten Tribes Partnership member
- Tribal Reservation and off-reservation trust land
- Major dam
- Lee Ferry Compact Point

- Lees Ferry Gaging Station
- Colorado River
- Major Colorado River tributary

- Colorado River Basin, Upper and Lower Basins
- States in the Colorado River Basin (Wyoming, Colorado, Utah, and New Mexico are Upper Division states, and Arizona, California, and Nevada are Lower Division states)

Native American reservations in the U.S. were created and modified through a complex history of statutes, treaties, executive orders, agreements, and federal policies (BIA 2025a). The Indian Removal Act of 1830 resulted in the forced removal of tribes from their ancestral lands east of the Mississippi River into the Western U.S. Lands inhabited by these relocated groups came to be known as “Indian territory”, which served as the precursor to federal reservations (BIA 2025a). The Indian Appropriations Act of 1851 resulted in further confinement of Native Americans to areas called “reservations” (Elliott 2025). The General Allotment Act (also known as the Dawes Act) of 1887 divided communal reservation lands into trust land allotted to individual Native Americans and their families (BIA 2025a). It also opened non-allotted land to non-tribal ownership, resulting in significant fractionalization and loss of tribal-controlled land (BIA 2025a). In the twentieth and twenty-first centuries, federal policies have attempted to help restore the self-determination of Native American tribes and reduce the effects of reservation fractionalization (BIA 2025a, 2025b). See the Tribal Treaties Database (OSU 2025) for detailed information on treaties, agreements, and executive orders.

Upper Basin

From approximately Northeast to Southeast, the Upper Colorado River Basin (Upper Basin) reservations include those associated with the Ute Indian Tribe of the Uintah and Ouray Reservation (Utah), the Southern Ute Indian Tribe (Colorado), the Ute Mountain Ute Tribe (Colorado, New Mexico, Utah), the Jicarilla Apache Nation (New Mexico), and the Navajo Nation (Arizona, New Mexico, Utah).

Lower Basin

From approximately Northeast to Southeast, Lower Colorado River Basin (Lower Basin) reservations include those associated with the Zuni Tribe (Arizona, New Mexico), the Navajo Nation (Arizona, New Mexico, Utah), the Hopi Tribe (Arizona), the Kaibab Band of Paiute Indians (Arizona), the Havasupai Tribe (Arizona), the Hualapai Indian Tribe (Arizona), the Shivwits Band of Paiute Indian Tribe (Utah), the Moapa Band of Paiute Indians (Nevada), the Las Vegas Tribe of Paiute Indians (Nevada), the Fort Mojave Indian Tribe (Arizona, California, Nevada), the Chemehuevi Indian Tribe (California), the Colorado Indian River Tribes (Arizona, California),³ the Yavapai-Apache Nation (Arizona), the Yavapai-Prescott Indian Tribe (Arizona), the Tonto Apache Tribe (Arizona), the White Mountain Apache Tribe (Arizona), the San Carlos Apache Tribe (Arizona), the Fort McDowell Yavapai Nation (Arizona), the Salt River Pima-Maricopa Indian Community (Arizona), the Gila River Indian Community (Arizona), the Ak-Chin Indian Community (Arizona), the Fort Yuma Quechan Indian Tribe (Arizona, California), the Cocopah Indian Tribe (Arizona), the Tohono O’odham Nation (Arizona), and the Pascua Yaqui Tribe (Arizona).

In addition, trust land includes the Fort Mojave off-reservation trust land in San Bernardino County, California. No other off-reservation trust land along the mainstream Colorado River has been identified.

³ Colorado River Indian Tribes is comprised of members of four distinct tribes: the Mohave, Chemehuevi, Hopi, and Navajo.

TA 18.1.2 Water Entitlements, Water Deliveries, and Storage and Conservation Options

The management and operation of the Colorado River and delivery of its waters to various users is governed by a complex set of treaties, statutes, Supreme Court decrees, and other settlements and agreements collectively known as the “Law of the River”. In general terms, the Law of the River establishes a priority system for the distribution of available water. Higher priority (senior) water entitlements are filled first, and lower priority (junior) entitlements are filled next. Some tribal water entitlements have higher priorities and others are lower priorities. **Appendix C**, Shortage Allocation Model and Alternative Distribution Model Documentation, provides more detail on the priority of each tribal water entitlement in the Lower Basin.

TA 4, Water Deliveries, provides more detail on the Law of the River. This appendix includes tables of tribal mainstream Colorado River water entitlements and Central Arizona Project (CAP) contracts.⁴ The entitlements included in this analysis are consistent with those in the Shortage Allocation Models (SAMs) and Alternative Distribution Models (ADMs; see **Appendix C**, Shortage Allocation Model and Alternative Distribution Model Documentation) and other sections of the Final EIS.⁵

Upper Basin

Water Entitlements

The five Upper Basin Tribes draw from various tributaries to the Colorado River (**Table TA 18-1**).

Table TA 18-1
Upper Basin Native American Water Rights

Tribe or Reservation	Basin	Diversion Right (Acre-feet per year [afy])	Depletion Right (afy)
Jicarilla Apache Nation	San Juan River	45,683	34,195
Navajo Nation	San Juan River	633,531	336,979
Navajo Nation	State of Utah		81,500
Southern Ute Indian Tribe	San Juan, Piedra, Pine, Florida, Animas, La Plata, and Mancos	137,090	74,138
Ute Indian Tribe of the Uintah and Ouray Reservation	Duchesne, Lake Fork, Yellowstone, Uinta, Whiterocks, White, and Green Rivers; Bitter, Sweet Water, Willow, and Hill Creeks	480,594	258,943
Ute Mountain Ute Tribe	San Juan, Animas, La Plata, Mancos, McElmo, and Dolores Rivers	88,358	51,081

Source: Reclamation 2012

⁴ While some entitlements are not ITAs, they are included for reference in this Appendix.

⁵ Tribes may have other sources of water, including groundwater and other surface water, which are not part of this analysis.

Lower Basin

Water Entitlements

Lower Basin Tribes have mainstream Colorado River water entitlements as determined and quantified under the 2006 Consolidated Decree, and water entitlements and settlements, including CAP water.

Water Entitlements Determined under Arizona v. California

The Consolidated Decree determined and quantified mainstream Colorado River water rights for five tribes— Chemehuevi Indian Tribe (Chemehuevi Indian Reservation of California), Colorado River Indian Tribes (Colorado River Indian Reservation of Arizona and California), Fort Mojave Indian Tribe (Fort Mojave Indian Reservation of Arizona, California, and Nevada), Fort Yuma Quechan Indian Tribe (Fort Yuma Indian Reservation of Arizona and California), and Cocopah Indian Tribe (Cocopah Indian Reservation of Arizona) water entitlements.

Table TA 18-2 summarizes water entitlements along the Colorado mainstream in the Lower Basin.

Table TA 18-2
Colorado River Mainstream Native American Water Entitlements

Tribe/Reservation	State	Entitlement (afy of Diversion)	Present Perfected Right (PPR) Number	Priority within State	Priority Date
Chemehuevi Reservation	CA	11,340	22	PPR	February 2, 1907
Cocopah Indian Reservation	AZ	1,140	8	1	1915
Cocopah Indian Reservation	AZ	7,681	1	1	September 27, 1917
Cocopah Indian Reservation	AZ	2,026	N/A	4	June 24, 1974
<i>Cocopah Indian Reservation</i>	<i>AZ subtotal</i>	<i>10,847</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Colorado River Indian Reservation	AZ	358,400	2	1	March 3, 1865
Colorado River Indian Reservation	AZ	252,016	2	1	November 22, 1873
Colorado River Indian Reservation	AZ	51,986	2	1	November 16, 1874
<i>Colorado River Indian Reservation</i>	<i>AZ subtotal</i>	<i>662,402</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
Colorado River Indian Reservation	CA	10,745	24	PPR	November 22, 1873
Colorado River Indian Reservation	CA	40,241	24	PPR	November 16, 1874
Colorado River Indian Reservation	CA	5,860	24	PPR	May 15, 1876

Tribe/Reservation	State	Entitlement (afy of Diversion)	Present Perfected Right (PPR) Number	Priority within State	Priority Date
<i>Colorado River Indian Reservation</i>	<i>CA subtotal</i>	56,846	N/A	N/A	N/A
<i>Colorado River Indian Reservation</i>	<i>AZ and CA total</i>	719,248	N/A	N/A	N/A
Fort Mojave Reservation	AZ	103,535	3	1	1890, 1911
Fort Mojave Reservation	CA	16,720	25	PPR	September 18, 1890
Fort Mojave Reservation	NV	12,534	81	1	September 18, 1890
<i>Fort Mojave Reservation</i>	<i>CA and NV total</i>	132,789	N/A	N/A	N/A
Fort Yuma (Quechan) Indian Reservation	AZ	6,350	3a	1	January 9, 1884
Fort Yuma (Quechan) Indian Reservation	CA	71,616	23	PPR	January 9, 1884
<i>Fort Yuma (Quechan) Indian Reservation subtotal</i>	<i>AZ and CA total</i>	77,966	N/A	N/A	N/A
Hopi Tribe ⁺	AZ	4,278	N/A	4	January 31, 1983
Hopi Tribe ⁺	AZ	500	N/A	5	January 31, 1983
Hopi Tribe ⁺	AZ	1,000	N/A	6	January 31, 1983
<i>Hopi Tribe subtotal⁺</i>	<i>AZ</i>	5,778	N/A	N/A	N/A
<i>Hualapai Tribe⁺</i>	<i>AZ</i>	1,110	N/A	4	February 17, 2006

Source: Reclamation 2012

⁺ Indicates that the entitlement is not an ITA.

Notes: Arizona (AZ); California (CA); Nevada (NV)

Notes: The diversionary entitlements, including equivalents, are listed for comparative analysis purposes, which is not intended to modify the entitlement as defined by the applicable establishing authority.

Central Arizona Project

Several tribes in Arizona hold CAP water entitlements, which may be held in trust in accordance with the applicable settlement. These tribal entitlements to CAP water or Colorado River water delivered through the CAP in central Arizona are administered pursuant to settlements and water delivery contracts between tribes and the Secretary of the Interior (**Table TA 18-3**).

Table TA 18-3
CAP Water Delivery Entitlements

Tribe or Reservation	Contract Delivery Volume (afy)	Arizona Priority	CAP Priority
Ak-Chin Community	50,000	3	N/A
Ak-Chin Community	58,300	4	Indian
Ak-Chin Community	10,000	Additional water	N/A
<i>Ak-Chin subtotal</i>	<i>72,000 to 85,000⁶</i>	<i>N/A</i>	<i>N/A</i>
Fort McDowell Yavapai Nation	18,233	4	Indian
Gila River Indian Community	191,200	4	Indian
Gila River Indian Community	120,600	4	Non-Indian Agriculture
<i>Gila River Indian Community subtotal</i>	<i>311,800</i>	<i>N/A</i>	<i>N/A</i>
Hualapai Tribe	4,000	4	Non-Indian Agriculture
Pascua Yaqui Tribe ⁺	500	4	Indian
Salt River Pima-Maricopa Indian Community ⁷	13,300	4	Indian
San Carlos Apache Tribe	12,700	4	Indian
San Carlos Apache Tribe	18,145	4	Municipal & Industrial
<i>San Carlos Reservation subtotal</i>	<i>30,845⁸</i>	<i>N/A</i>	<i>N/A</i>
Tohono O'odham Nation – San Xavier District	27,000	4	Indian
Tohono O'odham Nation – San Xavier District	23,000	4	Non-Indian Agriculture
Tohono O'odham Nation – Schuk Toak District	10,800	4	Indian
Tohono O'odham Nation – Schuk Toak District	5,200	4	Non-Indian Agriculture
Tohono O'odham Nation – Sif Oidak District ⁺	8,000	4	Indian
<i>Tohono O'odham Nation subtotal</i>	<i>74,000</i>	<i>N/A</i>	<i>N/A</i>
Tonto Apache Tribe ⁺	128	4	Indian
White Mountain Apache Tribe	23,782	4	Non-Indian Agriculture

⁶ The U.S. delivers between 72,000 to 85,000 afy to the Ak-Chin Indian Community in accordance with the terms of its settlement, even though Ak-Chin's total entitlement is greater than this amount. The San Carlos Apache Tribe is entitled to the CAP Indian Priority water not required for delivery to the Ak-Chin Indian Community, consistent with the terms of its settlement.

⁷ Other supplies are not listed in this appendix.

⁸ In addition, the San Carlos Apache Tribe is entitled to the Ak-Chin Community's CAP Indian Priority water not required for delivery to the Ak-Chin Indian Community, consistent with the terms of its settlement.

Tribe or Reservation	Contract Delivery Volume (afy)	Arizona Priority	CAP Priority
White Mountain Apache Tribe	1,218	4	Indian
<i>White Mountain Apache Tribe subtotal</i>	<i>25,000</i>	<i>N/A</i>	<i>N/A</i>
Yavapai-Apache Nation ⁺	1,200	4	Indian

Source: Reclamation 2012; CAP 2025

⁺ Indicates that the entitlement is not an ITA.

Unquantified and Undeveloped Water Rights

In the context of tribal water, unquantified water rights refer to federally reserved water rights that have not yet been determined and quantified through an adjudication or settlement. While recognizing this important issue, the water deliveries analysis only considers quantified tribal water rights. This analysis should not be construed to, in any way, preclude or limit any ongoing or future quantification of tribal water rights.

In the context of tribal water, undeveloped water rights refer to quantified rights that are not being fully utilized. Undeveloped water may be due to a lack of the infrastructure needed to divert, transport, and/or use water (Water and Tribes Initiative 2025). While recognizing this important issue, this analysis does not distinguish between developed and undeveloped rights in the water deliveries analysis. This analysis should not be construed to, in any way, preclude or limit any ongoing or future tribal development of water rights.

TA 18.1.3 Other Indian Trust Assets

ITAs can also include hunting, fishing, trapping, and gathering rights; mineral rights; and cultural, biological, and other resources. Whether or not specific rights or resources legally qualify as an ITA is complicated and depends on multiple factors, such as land status (Reclamation 1994). Reclamation consulted with tribes and the Bureau of Indian Affairs to identify ITAs. To date, potential changes in water deliveries and activities affected by potential changes in water deliveries (e.g., irrigated agriculture) have been the primary concerns related to ITAs.

Reclamation acknowledges that the 30 Basin Tribes depend on the Colorado River and its tributaries for a variety of purposes, including cultural and spiritual activities, wildlife, instream flows, recreation, and other purposes. See **TA 13**, Tribal Resources, and **TA 11**, Cultural Resources, for analysis of tribal and cultural resources, respectively. In general, those analyses apply to tribal and cultural resources that qualify as ITAs.

Although income derived from ITAs is not an ITA, Reclamation notes that income derived from ITAs such as agricultural products, water leases, and fees charged for outdoor recreation on tribal land can be an important source of income for tribes.

TA 18.2 Environmental Consequences

Following Reclamation ITA policy (Reclamation 1994), the following analysis discusses actions that affect the value, use, or enjoyment of ITAs.

TA 18.2.1 Methodology

The methodology varies for each type of ITA. Quantitative metrics are analyzed where possible; otherwise, qualitative discussion is provided.

- For trust lands, potential changes in irrigated acreage due to fluctuating water deliveries are a primary concern. The amount of tribal agricultural land (in acres) estimated to be fallowed under each alternative is presented.
- For water entitlements, the analysis focuses on changes in the quantity of water (in acre-feet) estimated to be delivered to tribes under each alternative. Changes in options to conserve and store water are also discussed.
- For other ITAs, analysis is qualitative.

Impact Analysis Area

The impact analysis area includes land within the boundaries of reservations and off-reservation trust land within the Colorado River Basin (29 reservations listed in **TA 18.1**⁹).

Assumptions

- Trust land includes land within the borders of established reservations and off-reservation trust land.
- For the water deliveries analysis, the assumptions of Colorado River Simulation System modeling (**Appendix A**, CRSS Model Documentation) and SAM modeling (**Appendix C**, Shortage Allocation Model and Alternative Distribution Model Documentation) apply.
- For potential impacts on agricultural land, the assumptions of the agricultural modeling apply (see **TA 16**, Socioeconomics, for more details).

Impact Indicators

- Percent of normal water entitlement delivered to Upper and Lower Basin Tribes.
- Changes in acres of irrigated tribal agricultural land.

TA 18.2.2 Issue 1: How Will Changes in Dam Operations Affect Tribal Water Entitlements, Water Deliveries, and Water Storage and Conservation Options?

The approaches to distributing shortages incorporated in all alternatives are designed to explore a wide range of potential concepts and impacts; they do not reflect an intention by Reclamation to alter apportionments or water entitlements. However, because the concepts would affect a range of

⁹ As discussed in **Section TA 18.1**, one of the 30 Basin Tribes does not have an established reservation; therefore, there are 29 reservations.

users, impacts on deliveries to different entities are analyzed, and addressed in **Appendix C**, Shortage Allocation Model and Alternative Distribution Model Documentation.

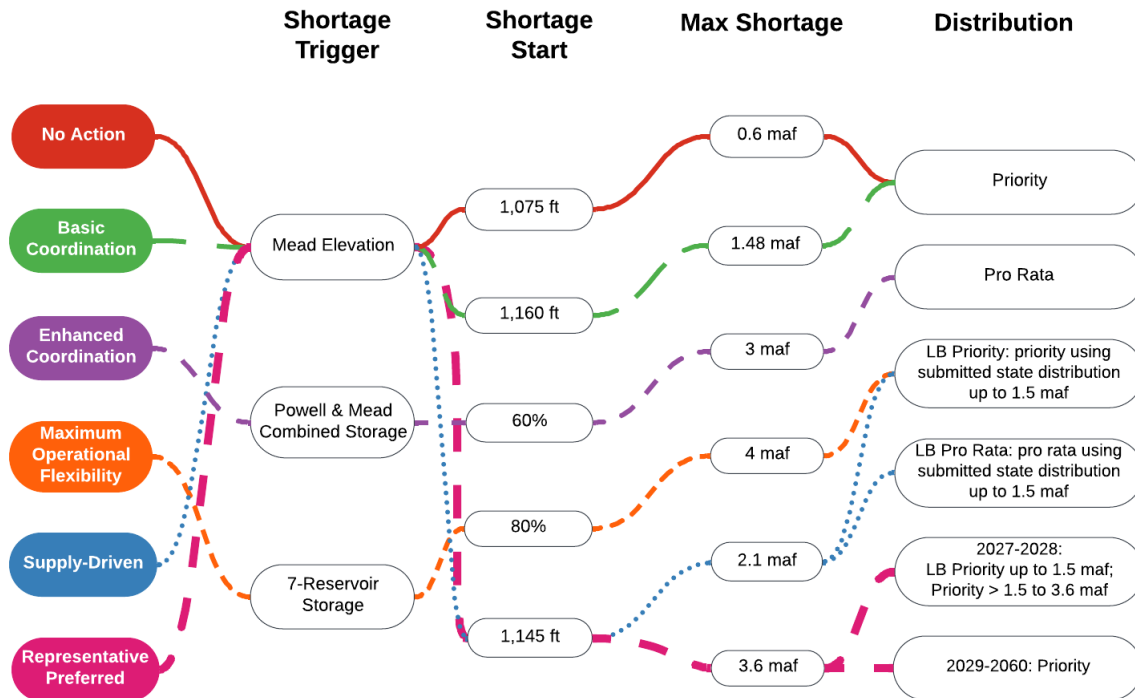
With respect to potential tribal water deliveries, the alternatives can be distinguished based on the following characteristics:

- The maximum shortage, which affects the relative frequency and severity of Lower Basin water shortages, including potential dead pool–related reductions (that is, releases reduced by low Lake Mead levels or outlet limits).
- The approach used to distribute Lower Basin water under shortages¹⁰.
 - The Priority distribution approach distributes shortages based on existing statutory, case law, and contractual provisions. It is used in the Continued Current Strategies (CCS) Comparative Baseline, the No Action Alternative, and the Basic Coordination Alternative. It is also used in the Preferred Alternative when no consensus distribution agreements exist that would alter the approach. Note that Reclamation and stakeholders would remain able to adopt consensus shortage distributions during the term of the Preferred Alternative.
 - The Pro Rata distribution approach distributes shortages pro rata (that is, in a determined proportion) across water users. It is used in the Enhanced Coordination Alternative.
 - The Lower Basin Priority (LB Priority) distribution approach follows specified state-specific distributions for the first 1.5 million acre-feet (maf) of shortage and then follows priority for larger shortages. It is used in the Maximum Operational Flexibility and the Supply Driven (LB Priority approach) Alternatives.
 - The Lower Basin Pro Rata (LB Pro Rata) approach follows specified state-specific distributions for the first 1.5 maf of shortage and then follows pro rata for larger shortages. It is used in the Supply Driven Alternative (LB Pro Rata approach).
- Options for tribes and other water users to conserve and store water in Lake Powell or Lake Mead.

Figure TA 18-1 and **Table TA 18-4** summarize the alternatives based on these characteristics. **Figure TA 18-1** provides summary information on the shortage triggering metric, when shortages start relative to that metric, maximum operational shortage volume, and modeled distribution method. **Table TA 18-4** provides information on the maximum shortage volume, distribution method, and water storage and conservation options. **Table TA 18-4** includes the CCS Comparative Baseline for comparison. See **Chapter 2**, Description of Alternatives, and **Appendix S**, Additional Description of Alternatives, for a more detailed discussion of the alternatives.

¹⁰ See **Appendix C**, Shortage Allocation Model and Alternative Distribution Model Documentation, for more information on the distribution methods.

Figure TA 18-1
Lower Basin Shortage Guidelines



Notes: Additional restrictions in water deliveries will occur when Lake Mead is near dead pool, resulting in large reductions (referred to as “dead pool-related reductions”). These are not considered an operational element of the alternatives. The “Representative Preferred Alternative” is a set of modeling assumptions designed around the Preferred Alternative sideboards. The specific operating guidelines for each operating interval during the term of the Preferred Alternative may differ. Shortage volumes include modeling assumptions for reductions in water deliveries to Mexico. Reclamation’s modeling assumptions are not intended to constitute an interpretation or application of the 1944 Water Treaty or to represent current U.S. policy or a determination of future U.S. policy regarding deliveries to Mexico. The U.S. will conduct all necessary and appropriate discussions regarding the proposed federal action and implementation of the 1944 Water Treaty with Mexico through the IBWC in consultation with the Department of State.

Table TA 18-4
Comparison of Key Factors Affecting Tribal Water Deliveries among Alternatives and the CCS Comparative Baseline

Scenario	Maximum Shortage (maf) ^b	Distribution Method	Water Storage and Conservation Options
CCS Comparative Baseline	1.375 ^a	Priority	Continued intentionally created surplus (ICS). No new mechanisms.
No Action Alternative	0.6	Priority	Water conserved under previous mechanisms that remains in Lake Mead in 2027 would be delivered in accordance with existing agreements. No new mechanisms.

Scenario	Maximum Shortage (maf) ^b	Distribution Method	Water Storage and Conservation Options
Preferred Alternative (Including Representation of Operational Elements)	3.6	In 2027-2028, shortages up to 1.5 maf are distributed based on LB Priority and shortages exceeding 1.5 maf are distributed based on priority. After 2028, shortages are distributed based on priority.	Yes, three new mechanisms in place of ICS (one conservation pool in Lake Powell and two in Lake Mead)
Basic Coordination Alternative	1.48	Priority	Water conserved under previous mechanisms that remains in Lake Mead in 2027 would be delivered in accordance with existing agreements. No new mechanisms.
Enhanced Coordination Alternative	3.0	Pro rata	Yes, three new mechanisms in place of ICS (one conservation pool in Lake Powell and two in Lake Mead)
Maximum Operational Flexibility Alternative	4.0	LB Priority	Yes, one new mechanism in place of ICS (a combined Lake Powell and Lake Mead conservation pool)
Supply Driven Alternative (LB Priority approach)	2.1	LB Priority	Yes, two new mechanisms in place of ICS (one conservation pool in Lake Powell and one in Lake Mead)
Supply Driven Alternative (LB Pro Rata approach)	2.1	LB Pro Rata	Yes, two new mechanisms in place of ICS (one conservation pool in Lake Powell and one in Lake Mead)

Source: **Chapter 2**, Description of Alternatives, **Appendix S**, Additional Description of Alternatives

^a Includes the 2007 Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead, Minute 323 Bi-national Water Scarcity Contingency Plan, and Drought Contingency Plans.

^b Shortage distributions include modeling assumptions for reductions in water deliveries to Mexico. Reclamation's modeling assumptions are not intended to constitute an interpretation or application of the 1944 Water Treaty or to represent current U.S. policy or a determination of future U.S. policy regarding deliveries to Mexico. The U.S. will conduct all necessary and appropriate discussions regarding the proposed federal action and implementation of the 1944 Water Treaty with Mexico through the IBWC in consultation with the Department of State.

Upper Basin

Water Deliveries

None of the alternatives would directly or indirectly affect Upper Basin tribal water entitlements. As discussed below, water storage and conservation mechanisms under some alternatives could indirectly affect the amount of stored conservation water available to Upper Basin Tribes.

Storage and Conservation Options

The No Action and Basic Coordination Alternatives have no new water storage mechanisms and would not affect water storage and conservation by Upper Basin Tribes. The other four alternatives do have new storage and conservation mechanisms, which are summarized below. See **Chapter 2** for a full description of these mechanisms and how they would operate. Note that in all cases, stored water would be available for water transactions with other Upper Basin water users, both within and across Upper Division States.

- Under the Preferred Alternative, up to 3.0 maf of water conserved by Upper Basin water users could be stored in Lake Powell. Upper Basin Tribes would receive credit for the contribution of conserved consumptive use stored in the pool. Under certain conditions, water in the pool could be released.
- Under the Enhanced Coordination Alternative, up to 2.0 maf of water conserved by Upper Basin water users could be stored in Lake Powell. Under certain conditions, the stored water would be made available to offset portions of Lower Basin shortages, thereby reducing the amount of stored water available to Upper Basin Tribes that have participated in the mechanism.
- Under the Maximum Operational Flexibility Alternative, up to 3.0 maf of water conserved by Upper Basin water users could be stored in a combined pool managed across both Lake Powell and Lake Mead. Under certain conditions, stored water could be converted to system water, thereby reducing the amount of stored water available to Upper Basin Tribes that have participated in the mechanism.
- Under the Supply Driven Alternative, Upper Basin water users could contribute up to 3.0 maf of water to a storage pool in Lake Powell. Water in the pool could be released if needed to meet the determined water-year volume, thereby reducing the amount of stored water available to Upper Basin Tribes that have participated in the mechanism.

In general, the four alternatives above that include new mechanisms for storage and conservation of water would provide additional options to Upper Basin Tribes. Assuming these methods could be implemented with appropriate authority, first, the mechanisms would allow tribes to store water as insurance against potential future changes in water demand or supply. Second, the mechanisms would create a new way for tribes to lease or transfer water from or to other Upper Basin water users.

Lower Basin

Water Deliveries

Some alternatives impact Lower Basin tribal entitlements by altering the shortage distribution methodologies. The alternatives also impact water deliveries to some degree. Reclamation modeled water deliveries in the Lower Basin using the SAM and ADM. There are three unique SAMs and five ADMs to capture the nuances of the alternatives and sensitivity analyses, which are further explained in **Appendix S**, Additional Description of Alternatives.

In this analysis, three main factors combine to determine potential Lower Basin tribal water deliveries in any given year:¹¹

1. The severity of potential shortages
2. The distribution method used to allocate water under shortages
3. The frequency of dead pool–related reductions¹²

This analysis focuses on the first two factors. The third factor, dead pool–related reductions, is not a focus of this analysis.¹³ In general, Reclamation anticipates acting to minimize dead pool–related reductions. However, the methods for doing so and the methods for allocating water under a dead pool–related release are unknown and too speculative to be included in this Final EIS.

Figure TA 18-2 illustrates how the percentage of water delivery changes as shortages become more severe. There are four tables in **Figure TA 18-2**, one for each of the different distribution methods included in the alternatives. For the purposes of this analysis, tribes are aggregated into four groups based on entitlement priorities, which are contained in the rows of **Figure TA 18-2**.¹⁴ Shortage impacts for specific entities are contained in **Appendix C**, Shortage Allocation Model and Alternative Distribution Model Documentation.

- The “AZ CAP NIA” group are the most junior entitlements and includes tribes with Arizona CAP non-Indian agriculture (NIA)-A and NIA-B priorities. This group consists of four tribes with contracts totaling approximately 177,000 acre-feet per year (afy).
- The “AZ CAP Indian, CAP municipal and industrial (M&I), AZ 4i” group includes tribes with Arizona CAP Indian, CAP Municipal & Industrial, and Arizona 4i priorities. This group consists of 13 tribes and 16 individual entitlements (including mainstream water reserved for future settlement and unallocated) totaling approximately 374,000 afy.
- The “AZ 3” includes one tribe with Arizona 3rd priority, totaling 50,000 afy.
- The present perfected right (PPR) group are the most senior entitlements; this group includes five tribes in all three Lower Division States. Five tribes with 15 discretely quantified entitlements totaling approximately 503,000 afy are included in this group.

The columns in **Figure TA 18-2** represent different total Lower Basin shortage levels. The cells in **Figure TA 18-2** show the percentage delivery of water entitlements for each group. Note that the cells in **Figure TA 18-2** are combined results for each group, not for any single tribe within a group; therefore, the data for individual tribes within a group may differ from the group’s data. Similar information on potential deliveries for individual tribes is presented in **Appendix C**, Shortage Allocation Model and Alternative Distribution Model Documentation.

¹¹ The phrase “potential water deliveries” is intended to recognize that some tribal entitlements are not fully developed and/or utilized. For simplicity, this analysis assumes that water deliveries and entitlements refer to the same quantities of water.

¹² Conditions that might cause a dead pool–related release are described in **TA 4**, Water Deliveries.

¹³ Modeling results related to the potential frequency of dead pool–related releases are discussed further below.

¹⁴ The number of tribes, water entitlements, and amounts listed below come from the SAM (see **Appendix C**, Shortage Allocation Model and Alternative Distribution Model Documentation, for modeling assumptions and descriptions of priority nomenclature).

Figure TA 18-2
Comparison of Water Deliveries by Distribution Method, Tribal Priority Group, and Shortage Amount

Percent Delivery by Total Shortage Volume (maf) under the Priority Distribution Method
 (Used in No Action, Basic Coordination, and Representative Preferred [2029-2060] Alternatives)

Tribal Priority Group	0.0	0.2	0.4	0.6	0.8	1.0	1.5	3.0	4.0	5.0	6.0	7.0
AZ CAP NIA	100.0	39.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AZ CAP Indian, CAP M&I, AZ 4i	100.0	100.0	95.5	82.7	68.0	53.3	16.5	0.0	0.0	0.0	0.0	0.0
AZ 3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	66.2	31.5	0.0	0.0	0.0
PPR	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Percent Delivery by Total Shortage Volume (maf) under the Pro Rata Distribution Method
 (Used in Enhanced Coordination Alternative)

Tribal Priority Group	0.0	0.2	0.4	0.6	0.8	1.0	1.5	3.0	4.0	5.0	6.0	7.0
AZ CAP NIA	100.0	97.8	95.5	93.3	91.1	88.8	83.2	66.5	55.3	44.1	33.0	21.8
AZ CAP Indian, CAP M&I, AZ 4i	100.0	97.8	95.5	93.3	91.1	88.8	83.2	66.5	55.3	44.1	33.0	21.8
AZ 3	100.0	97.8	95.5	93.3	91.1	88.8	83.2	66.5	55.3	44.1	33.0	21.8
PPR	100.0	97.8	95.5	93.3	91.1	88.8	83.3	66.5	55.4	44.2	33.1	21.9

Percent Delivery by Total Shortage Volume (maf) under the State-Specific up to 1.5 maf, then Priority Distribution
 Method (Used in the Maximum Operational Flexibility, Supply Driven [LB Priority approach], and Representative
 Preferred [2027-2028] Alternatives)

Tribal Priority Group	0.0	0.2	0.4	0.6	0.8	1.0	1.5	3.0	4.0	5.0	6.0	7.0
AZ CAP NIA	100.0	37.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AZ CAP Indian, CAP M&I, AZ 4i	100.0	100.0	97.5	91.3	83.5	75.2	54.6	0.0	0.0	0.0	0.0	0.0
AZ 3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.8	38.1	0.0	0.0	0.0
PPR	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Percent Delivery by Total Shortage Volume (maf) under the State-Specific up to 1.5 maf, then Pro Rata
 Distribution Method (Used in the Supply Driven [LB Pro Rata Distribution approach] Alternative)

Tribal Priority Group	0.0	0.2	0.4	0.6	0.8	1.0	1.5	3.0	4.0	5.0	6.0	7.0
AZ CAP NIA	100.0	94.3	89.9	86.8	83.7	80.6	72.9	58.3	48.6	38.9	29.1	19.4
AZ CAP Indian, CAP M&I, AZ 4i	100.0	94.3	89.9	86.8	83.7	80.6	72.9	58.3	48.6	38.9	29.1	19.4
AZ 3	100.0	94.3	89.9	86.8	83.7	80.6	72.9	58.3	48.6	38.9	29.1	19.4
PPR	100.0	95.3	91.5	88.7	85.9	83.0	75.9	60.7	50.6	40.5	30.4	20.2

Source: SAMs and ADMs.

It is important to note that the shortages depicted in **Figure TA 18-2** extend beyond the maximum shortages specified in the alternatives, which range from 0.6 maf to 4.0 maf (**Table TA 18-4**). The inclusion of larger shortages in **Figure TA 18-2** should not be taken to imply that these specific distributions would, in fact, apply to shortages higher than the maximum shortages (such as might happen during a dead pool–related release); rather, it is intended to better illustrate the implications of the different distribution methods. Please refer to the maximum shortages in **Table TA 18-4** when interpreting the information in **Figure TA 18-2**.

In **Figure TA 18-2**, the different influences that the priority and pro rata distribution methods (the first two tables) have on the percentage delivery of water are readily apparent. Under the priority distribution system, less water is delivered to groups with more junior water entitlements, and more water is delivered to groups with more senior water entitlements. The differences in the percentage of water delivered increase as the shortage volume increases. In contrast, the percentage of water delivered under the pro rata distribution method is the same across the groups for all levels of shortages.

The third table shows the LB Priority distribution approach (that is, state-specific percentages up to 1.5 maf of shortage, then the priority distribution method for larger shortages). It results in similar deliveries as the priority distribution for all priority groups except the AZ CAP Indian, CAP M&I, AZ4 group. This group receives more water under shortages up to 1.5 maf than the straight priority distribution method.

The fourth table shows the LB Pro Rata distribution approach (that is, state-specific percentages up to 1.5 maf, then the pro rata distribution method for larger shortages). It has a similar pattern to the pro rata distribution (the second table) but has differences in the specific numbers in each cell. Like the pro rata distribution, the LB Pro Rata distribution approach delivers more water to junior water entitlements holders and less water to senior water entitlements holders, compared to the priority distribution methods.

Decision Making under Deep Uncertainty (DMDU) is an approach used to expand on the quantitative analysis. It is a non-probabilistic evaluation framework that compares alternatives based on their ability to meet specific performance criteria in many potential future conditions and analyzes how the alternatives respond to specific hydrologic conditions. Additional background and technical details about the DMDU framework are provided in **Appendix E**, DMDU Overview and Approach.

DMDU analysis expands the above analysis by integrating information on the percentage of futures in which different amounts of shortages are estimated to occur under the different alternatives. For tribal water deliveries, deliveries of 20 percent, 40 percent, 60 percent, and 80 percent of normal deliveries are modeled. As explained further below, the results show the percentage of futures in which these thresholds are met in 90 percent or more of the years within each modeled future.

The DMDU figures are presented in **Figure TA 18-3** through **Figure TA 18-11**. The rows contain different percentages of normal water deliveries, where “normal” means under non-Shortage Conditions. The top row contains the highest modeled level of water delivery (80 percent of normal

deliveries), which is the hardest threshold to achieve. The columns contain the CCS Comparative Baseline, the No Action Alternative, and the action alternatives.

Cells are color-coded to indicate the percentage of modeled futures in which water deliveries exceed the thresholds in the row headers in at least 90 percent of the years of a future. The row indicating water deliveries of at least 80 percent of normal deliveries (the top row) has a purple border. Solely for the purposes of considering vulnerability within the DMDU modeling framework, a “preferred minimum performance” outcome is defined as a future trace in which at least 80 percent of normal water deliveries is estimated to be delivered in at least 90 percent of the years in a modeled future. In contrast, an “undesirable performance” future means that the preferred minimum performance criteria are not met. The 80 percent threshold was chosen as the “preferred minimum performance” because it is the model outcome with the largest quantity of water delivered.¹⁵ Within the purple-bordered row, the percentage of futures that meet the preferred criteria is presented.

Note that the non-gray cells (that is, those except the bottom row) in the DMDU figures present the percentage of futures associated with shortages only. A shortage is prescribed by each alternative. Another type of reduction in water delivery results from a dead pool–related release, which occurs when conditions do not support unconstrained releases.¹⁶ Different shortage volumes under the different alternatives affect the frequency of dead pool–related reductions.¹⁷ The percentage of futures in which dead pool–related reductions occur under each alternative is presented in the gray cells at the bottom of the DMDU figures.

The DMDU figures are discussed below, in order of the priority groups with the most senior water entitlements to the group with the most junior entitlements. Note that the DMDU analysis is summarized at the end of this section. The following points are helpful when interpreting DMDU results for the Representative Preferred Alternative:

- There is an important distinction between the Preferred Alternative and the *Representative Preferred Alternative*. As discussed in **Chapter 2**, the Preferred Alternative is a multi-year decision framework that establishes the process and criteria that would govern development and adoption of operating guidelines through 2036. The decision framework is anticipated to be implemented in two-year operating intervals. Unlike other alternatives, the operating guidelines for each interval are not specified in this Final EIS. The sideboards provide a basis for assumptions included in the Representative Preferred Alternative which captures the range of operating guidelines that may be adopted during each interval, but exact operations would be subject to the guidelines in place during each interval.
- The Preferred Alternative has a defined implementation timeframe of 10 years; however, the Representative Preferred Alternative is compared to the other alternatives for the entire modeling horizon of 34 years to enable comparison of potential long-term impacts.

¹⁵ In this context, “preferred minimum performance” and “undesirable performance” are terms selected to understand a modeling analysis, and they do not imply any policy, legal, or other conclusions about the analysis or ITAs.

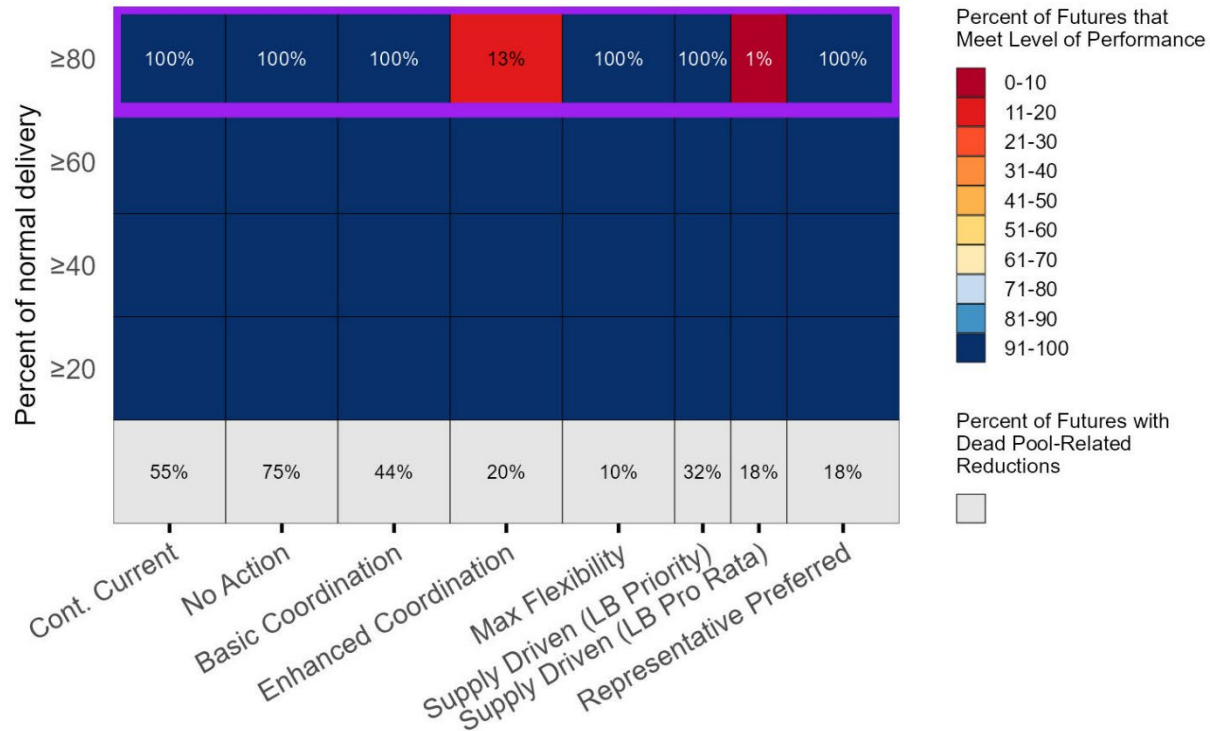
¹⁶ See **TA 4**, Water Deliveries for more information.

¹⁷ In general, more frequent dead pool–related reductions are associated with lower maximum shortages, and vice-versa.

- A key assumption affecting tribal water deliveries is the shortage distribution method that would be used under Lower Basin shortage conditions. To capture the May 1, 2026 proposal by the Lower Division States for distributing up to 1.5 maf of shortage, the best available information at time of publication, the Representative Preferred Alternative uses the LB Priority distribution method to distribute the first 1.5 maf or shortage for 2027-2028. While the Representative Preferred Alternative models shortages above 1.5 maf in 2028, consistent with the sideboards, under the Preferred Alternative, Reclamation would consult with stakeholders if Lake Mead elevation is projected below 1,000 feet. (See **Chapter 2** for more details on the sideboards under the Preferred Alternative). For 2029-2060, the Representative Preferred Alternative uses the Priority distribution method.
- The DMDU figures do not capture individual years within the modeling period, however, they are modeled. The modeling assumptions for the Representative Preferred Alternative in the first two years (2027–2028) are described in **Chapter 2** and the shortages up to 1.5 maf are distributed via LB priority. Refer to **Appendix C, Table C-28** for domestic shortage impacts for each entitlement holder under the LB Priority distribution (up to 1.5 maf shortage). **TA 4, Water Deliveries**, shows analysis of the Representative Preferred Alternative for 2027 and 2028 at the state distribution level. The potential 2027 and 2028 operating guidelines modeling is compared to the Representative Preferred Alternative in **Appendix T, Preliminary Description and Analysis of Anticipated Operating Guidelines for 2027 and 2028**. The results for the Representative Preferred Alternative in 2029–2036, in which the Priority distribution is applied, would result in more shortage impacts on Arizona junior entitlements. Impacts beyond 2028 under the Preferred Alternative may be different from what is shown in the DMDU figures for the Representative Preferred Alternative, as this alternative provides a framework that allows for shortages to be distributed based on agreements among states that may arise, consistent with sideboards described in **Chapter 2**.

Figure TA 18-3 contains the DMDU full analysis period modeling results for the PPR group. The PPR group contains the most senior water entitlements in the Lower Basin. As shown in the purple-bordered row (the top row), in the CCS Comparative Baseline and all alternatives other than the Enhanced Coordination and Supply Driven (LB Pro Rata approach) Alternatives, 100 percent of futures meet the assumed preferred minimum performance criteria, meaning that at least 80 percent of the normal water delivery is delivered in 90 percent of the years of a modeled future. This occurs because these are the most senior water entitlements in the Lower Basin, and all alternatives that have 100 percent in the purple-bordered row use a variation of the priority system. Because at least 80 percent of water is delivered in 100 percent of futures for these alternatives, the rows below the purple-bordered row for those alternatives (which indicate lower quantities of delivered water) are also 100 percent and thus are classified into the 91-100 percent category.

Figure TA 18-3
Present Perfected Rights: Robustness (Full Period).
 Percent of futures in which annual delivery is the percent of normal delivery specified in each row in 90 percent of years



For the Enhanced Coordination Alternative, the preferred minimum performance criteria (at least 80 percent of normal water delivery in 90 percent of the years of a future) is met in 13 percent of modeled futures. For the Supply Driven Alternative (LB Pro Rata approach), 1 percent of futures meet the preferred minimum performance criteria. The lower result for these two alternatives is likely due, in part, to these alternatives using a variation of the pro rata distribution, which fulfills these senior water entitlements as though they were equal in priority to other Lower Basin entitlements. While 80 percent of normal water deliveries in 90 percent of years of a future occur in 13 percent of modeled futures under the Enhanced Coordination Alternative, at least 60 percent of water deliveries in all years of a future occur in 91-100 percent of modeled futures. Similarly, at least 60 percent of normal water deliveries would occur in 91-100 percent of modeled futures for the Supply Driven Alternative (LB Pro Rata approach).

Importantly, the analysis does not conclude that all alternatives that meet the preferred minimum performance criteria (the purple-bordered row) in 100 percent of modeled futures perform equally in terms of water deliveries to the PPR priority group. This is because the alternatives have different frequencies of modeled futures in which there is a dead pool-related release, as shown in the gray row at the bottom of the table. Less frequent dead pool-related reductions are better in terms of water deliveries because it means that there are more consistent water deliveries, all else equal. Therefore, among options that meet the preferred minimum performance criteria in 100 percent of

futures, the Maximum Operational Flexibility Alternative would be the most robust (as it minimizes dead pool–related releases) and the No Action Alternative would be the least robust (as it maximizes dead pool–related releases). The Representative Preferred Alternative is the second best performing alternative for this priority group, behind the Maximum Operational Flexibility Alternative. Because the Representative Preferred Alternative assumes a version of the priority distribution method, it performs relatively well for this priority group, which has some of the most senior tribal water entitlements.

The DMDU modeling results for the PPR priority group by subperiod (**Figure TA 18-4**) indicate generally similar relative performance of the CCS Comparative Baseline and the alternatives as those for the full period. As with the full period, in all but the Enhanced Coordination and the Supply Driven (LB Pro Rata approach) Alternatives, at least 80 percent of normal water deliveries in 90 percent of years is estimated to occur in 100 percent of modeled futures. The breakdown by subperiod provides some additional insight into the Enhanced Coordination Alternative. In the 2027-2039 subperiod, 0 percent of futures meet the preferred minimum performance criteria. However, 52 percent and 46 percent of futures meet the preferred minimum performance criteria in the 2040-2049 and 2050-2060 subperiods, respectively. A similar pattern occurs for the Supply Driven Alternative (LB Pro Rata approach), with 0 percent, 28 percent, and 26 percent of futures meeting the preferred minimum performance criteria in the three subperiods, respectively. The lower result for the first subperiod for these two alternatives occurs because the modeled futures start at low reservoir conditions, making it more difficult to deliver full water deliveries under variations of the pro rata distribution method during the 2027-2039 subperiod.

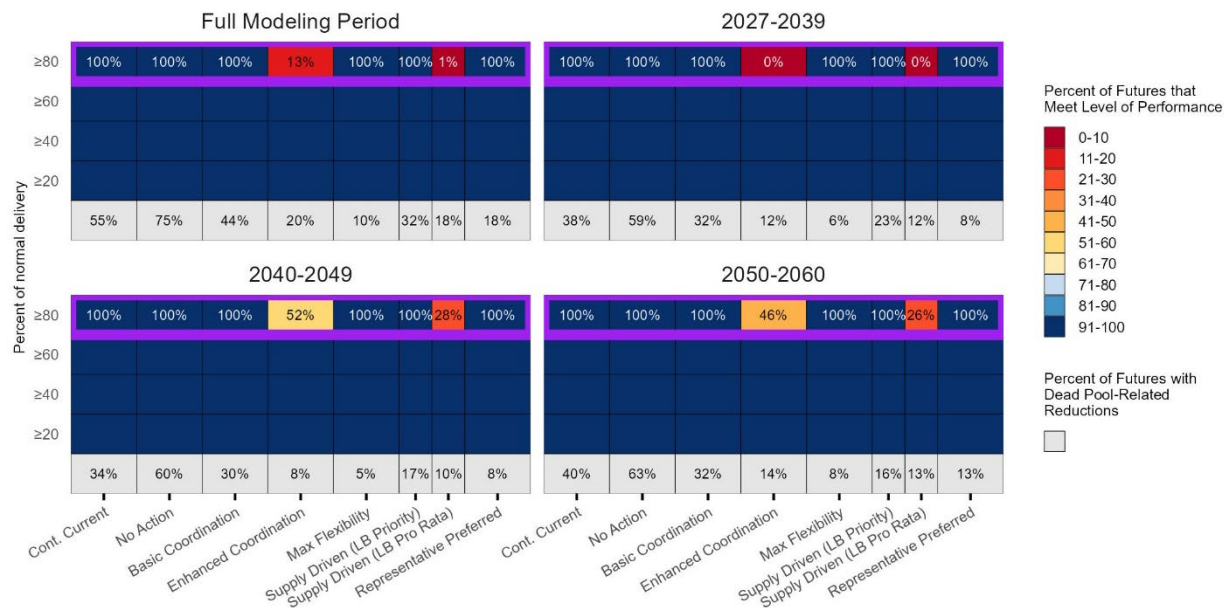
It is important to focus on the first decadal period (2027-2039), as this contains the implementation period of the Preferred Alternative. During this period, the Maximum Operational Flexibility Alternative performs the best, as it meets the preferred minimum performance criteria in 100 percent of modeled futures and has the lowest percent of futures with a dead pool–related release (6 percent). The Representative Preferred Alternative performs nearly as well for this priority group, meeting the preferred performance criteria in 100 percent of modeled futures and having the second-lowest percent of futures with a dead pool-related reduction (8 percent).

The Preferred Alternative provides a framework that allows for shortages to be distributed based on agreements among states that may arise, consistent with sideboards described in **Chapter 2**, which could yield different impacts than the distribution methods assumed for the Representative Preferred Alternative. The DMDU figures do not capture individual years within the modeling period, however, they are modeled. While the Representative Preferred Alternative does model shortages up to 1.5 maf using the LB Priority approach in 2027 and 2028, the results in the full modeling period and the first modeling period are heavily influenced by the Priority distribution method, which is modeled 2029-2060. Entity-specific shortage impacts under each shortage distribution method that was modeled for this EIS are presented in **Appendix C**, Shortage Allocation Model and Alternative Distribution Model Documentation.

Several alternatives meet the preferred minimum performance criteria less frequently in the first subperiod (2027-2039) compared to the later two subperiods (2040-2049 and 2050-2060). This

occurs because the first subperiod follows low flow conditions, reducing operational flexibility and making Lower Basin shortages more common during that time frame.

Figure TA 18-4
Present Perfected Rights: Robustness (by Subperiod).
Percent of futures in which annual delivery is the percent of normal delivery specified
in each row in 90 percent of years



The full period DMDU results for the Arizona Priority 3 group (**Figure TA 18-5**) are the same as for the PPR group except for the Maximum Operational Flexibility Representative Preferred Alternatives. For the Maximum Operational Flexibility Alternative, the preferred minimum performance criteria (at least 80 percent of normal water deliveries in 90 percent of years of a future) is estimated to be met in 64 percent of modeled futures, a decrease in its robustness relative to the PPR group.

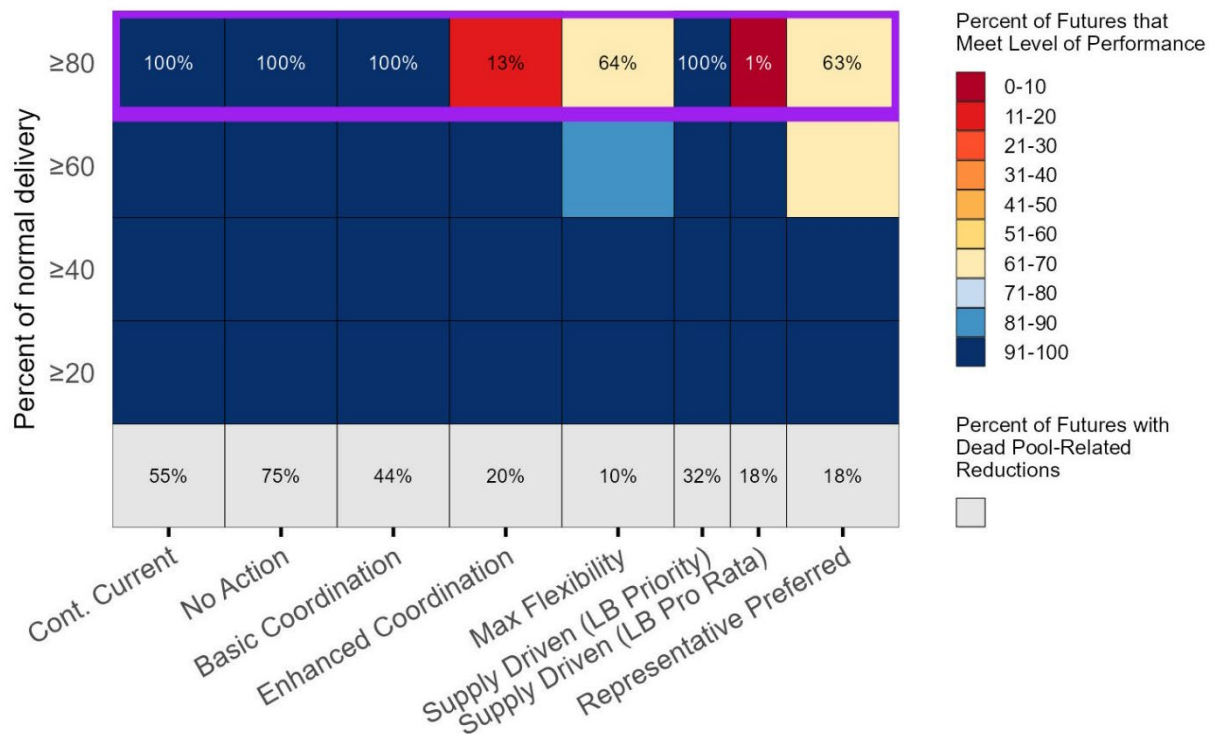
Note that the percentage of futures with a dead pool–related release is independent of the priority group and is therefore the same as in the PPR group results. Similar considerations as described for the PPR group apply.

No alternative is clearly more robust than the others for the Arizona Priority 3 group. Depending on whether one considers the percentage of futures that meet preferred minimum performance criteria or the percentage of futures in which dead pool–related reductions are avoided as more important, the most robust would be either the Supply Driven Alternative (LB Priority Approach; which delivers more water considering only shortages) or the Maximum Operational Flexibility Alternative (which minimizes the frequency of dead pool–related reductions).

The results for the Arizona Priority 3 group by subperiod (**Figure TA 18-6**) do not change the conclusions above concerning the relative robustness of the alternatives; the most robust alternative is either the Supply Driven Alternative (LB Pro Rata) or the Maximum Operational Flexibility

Alternative, depending on whether one prioritizes deliveries considering shortages only or the frequency of dead pool-related reductions.

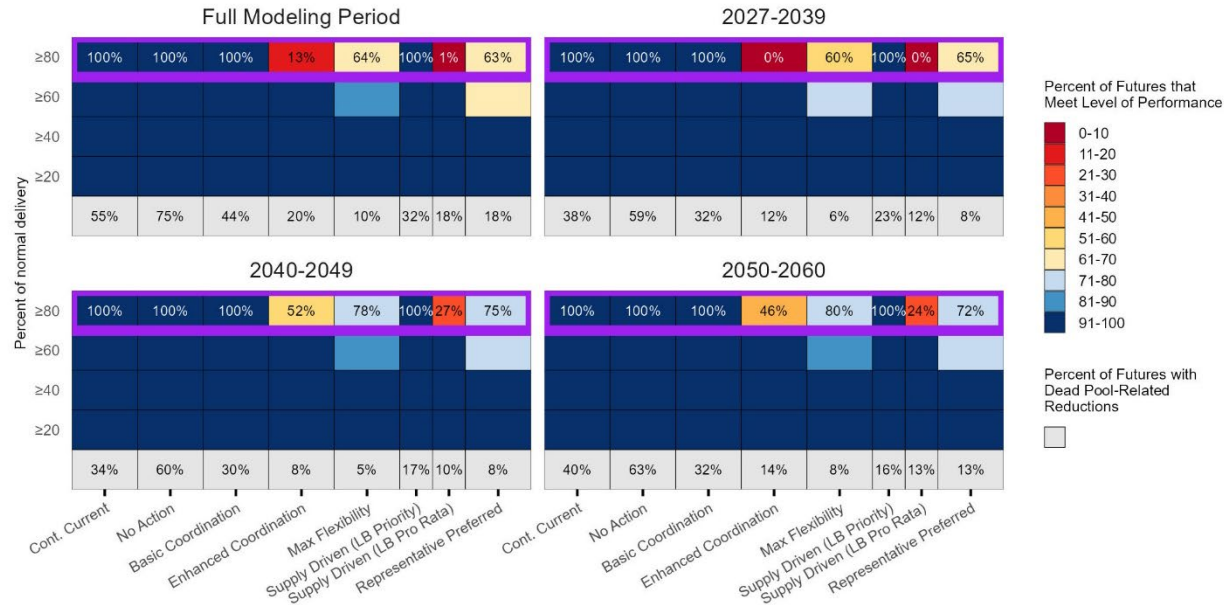
Figure TA 18-5
Arizona Priority 3: Robustness (Full Period).
 Percent of futures in which annual delivery is the percent of normal delivery specified in each row in 90 percent of years



For the first decadal period (2027-2039), which contains the implementation period of the Preferred Alternative, the Representative Preferred Alternative performs second-to-last among the alternatives for deliveries, meeting the preferred performance criteria in 65 percent of modeled futures; however, it has the second-lowest percent of futures with a dead pool-related reduction (8 percent).

The full period DMDU modeling results for the Arizona CAP Indian, CAP M&I, and Arizona Priority 4i group (**Figure TA 18-7**) are very different than the results for the PPR and Arizona Priority 3 groups. Under CCS Comparative Baseline, the preferred minimum performance criteria (at least 80 percent of water is delivered in 90 percent of years of a future) is met in only 13 percent of futures. The No Action Alternative meets the preferred minimum performance criteria in 100 percent of futures. However, as previously noted, this considers only shortages. The No Action Alternative has dead pool-related reductions in 75 percent of futures, implying that full water delivery is unlikely under the No Action Alternative. The Enhanced Coordination Alternative also meets the preferred minimum performance criteria in 13 percent of modeled futures. All other alternatives meet the preferred minimum performance criteria in less than 5 percent of modeled futures.

Figure TA 18-6
Arizona Priority 3: Robustness (by Subperiod).
 Percent of futures in which annual delivery is the percent of normal delivery specified in each row in 90 percent of years

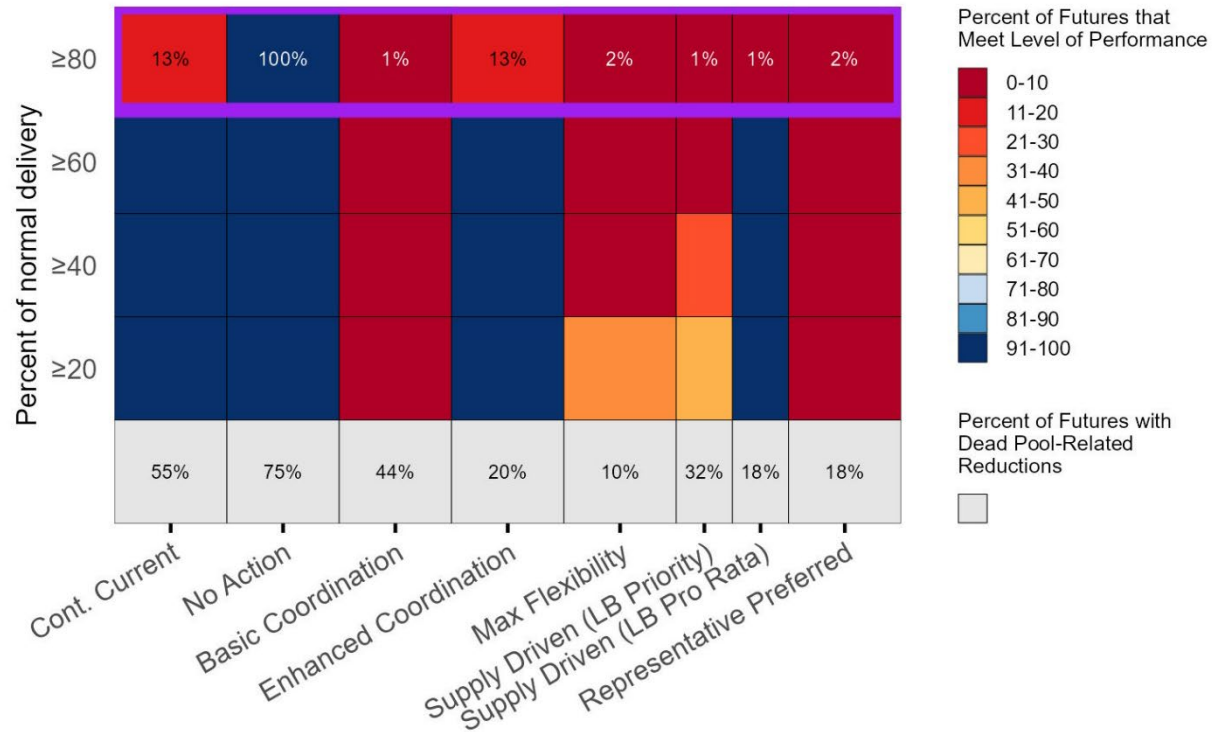


Dropping down to the next highest water delivery threshold (60 percent), the CCS Comparative Baseline and three alternatives (No Action Alternative, Enhanced Coordination Alternative, and Supply Driven Alternative [LB Pro Rata approach]) provide at least 60 percent of normal deliveries in 90 percent of years of a future in 91-100 percent of futures. Of these, the Enhanced Coordination and Supply Driven (LB Pro Rata approach) Alternatives have a lower percentage of futures with dead pool-related releases, which occur in 20 and 18 percent of futures, respectively.

The Representative Preferred Alternative is not robust for this priority group, meeting the preferred performance criteria in only 2 percent of modeled futures over the full modeling period, and 0 percent of modeled futures over the first decadal period (2027-2039), which contains the implementation period of the Preferred Alternative. In addition, the lowest amount of water delivery modeled (at least 20 percent of normal water delivery) occurs in only 1-10 percent of modeled futures. This is because the Representative Preferred Alternative assumes a version of the priority distribution method and this priority group has relatively junior water entitlements. However, the Representative Preferred Alternative still performs second best with respect to dead pool-related reductions.

No alternative is clearly the most robust for this priority group. Depending on whether one considers the percentage of futures that meet preferred minimum performance criteria or the percentage of futures in which dead pool-related releases are avoided as more important, the more robust alternative would be either the No Action Alternative (more water is delivered, considering only shortages) or the Enhanced Coordination Alternative (which meets the preferred performance criteria substantially less often but has a substantially lower frequency of dead pool-related reductions).

Figure TA 18-7
Arizona CAP Indian, CAP M&I, and Priority 4i: Robustness (Full Period).
 Percent of futures in which annual delivery is the percent of normal delivery specified
 in each row in 90 percent of years



Considering the DMDU modeling for the AZ CAP Indian, CAP M&I, and AZ 4i group results by subperiod (**Figure TA 18-8**), the same high-level performance rankings as the full period hold; the best performing alternatives are the No Action and the Enhanced Coordination Alternatives. However, the Enhanced Coordination Alternative appears more robust by subperiod than when considering only the full period, as it is estimated to be more robust in the two later subperiods compared to the first subperiod and the full period. While the Basic Coordination, Maximum Operational Flexibility, Supply Driven (both LB Priority and LB Pro Rata approaches), and Representative Preferred Alternatives would also be more robust in the later two subperiods compared to the first subperiod and full period, the Enhanced Coordination Alternative continues to be more robust than the other action alternatives for this priority group.

Figure TA 18-8

Arizona CAP Indian, CAP M&I, and Priority 4i: Robustness (by Subperiod).
Percent of futures in which annual delivery is the percent of normal delivery specified
in each row in 90 percent of years

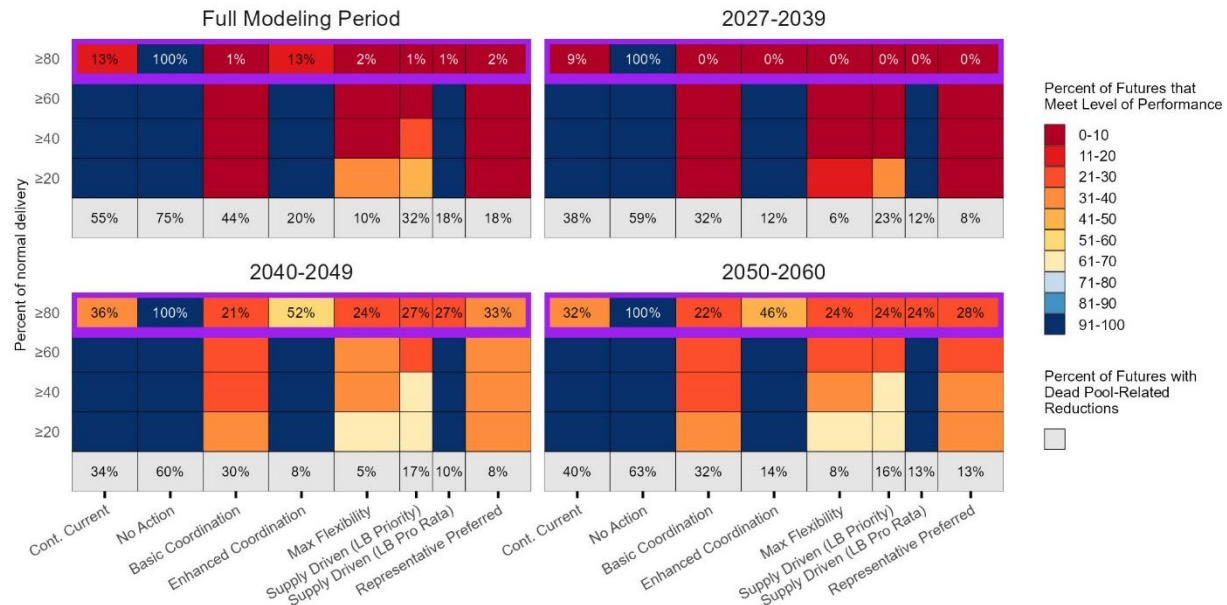


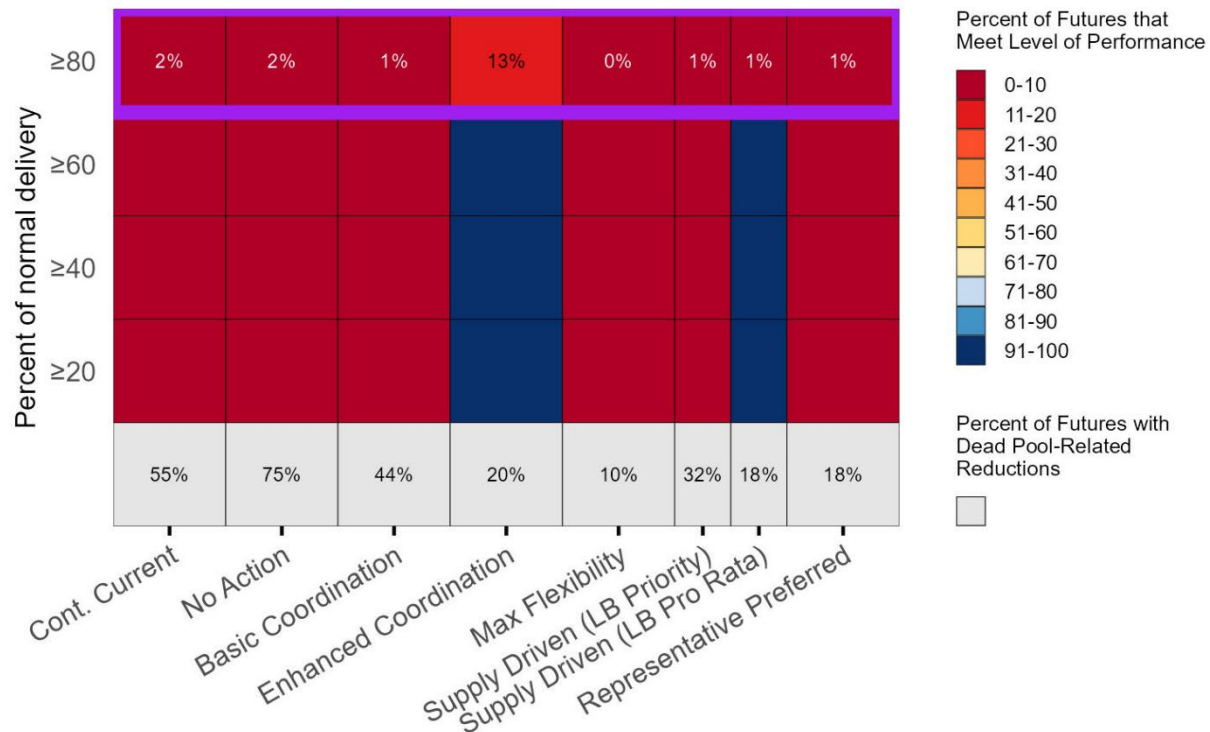
Figure TA 18-9 presents DMDU full period modeling results for the CAP Indian NIA group. These contracts are some of the most junior tribal entitlements in the Lower Basin. As such, it should be expected that deliveries will often be lower during Shortage Conditions compared to other priority groups. With one exception (the Enhanced Coordination Alternative), the CCS Comparative Baseline and the alternatives meet the preferred minimum performance criteria in less than 5 percent of modeled futures. The Enhanced Coordination Alternative meets the preferred minimum performance criteria in 13 percent of modeled futures.

The only two alternatives that consistently deliver water to this priority group are the Enhanced Coordination and Supply Driven (LB Pro Rata approach) Alternatives, which deliver at least 60 percent of normal water deliveries in 90 percent of years of a future in 91-100 percent of futures. This is likely due to their use of variations of the pro rata distribution method, which delivers more water to junior entitlements as shortages increase compared to the priority distribution, some variation of which is used by CCS Comparative Baseline and the other alternatives. Combined with its relatively low percentage of futures with a dead pool-related release (16 percent), the Enhanced Coordination Alternative is clearly the most robust alternative for this priority group.

As with the Arizona CAP Indian, CAP M&I, and Arizona Priority 4i group, the Representative Preferred Alternative is not robust for the CAP Indian NIA group, meeting the preferred performance criteria in only 1 percent of modeled futures for the full modeling period and delivering at least 20 percent of normal water deliveries in only 1-10 percent of modeled futures. For the first decadal period (2027-2039), which includes the implementation period for the Preferred Alternative, the Representative Preferred Alternative does not meet the preferred performance criteria in any

modeled futures. This is because the Representative Preferred Alternative assumes a version of the priority distribution method and this priority group has relatively junior water entitlements. However, for dead pool-related reduction, the Representative Preferred Alternative still performs second-best.

Figure TA 18-9
Arizona CAP Non-Indian Agriculture Priority: Robustness (Full Period).
 Percent of futures in which annual delivery is the percent of normal delivery specified in each row in 90 percent of years



The Preferred Alternative provides a framework that allows for shortages to be distributed based on agreements among states that may arise, consistent with sideboards described in **Chapter 2**, which could yield different impacts than the distribution methods assumed for the Representative Preferred Alternative. The DMDU figures do not capture individual years within the modeling period, however, they are modeled. While the Representative Preferred Alternative does model shortages up to 1.5 maf using the LB Priority approach in 2027 and 2028, the results in the full modeling period and the first modeling period are heavily influenced by the Priority distribution method, which is modeled 2029-2060. Entity-specific shortage impacts under each shortage distribution method that was modeled for this EIS are presented in **Appendix C**.

The subperiod DMDU modeling results for the CAP Non-Indian Agriculture priority group (Figure TA 18-10) show similarities to the subperiod results for other priority groups, specifically that several alternatives are more robust in the later two subperiods compared to the first subperiod and the full period. For this priority group, the rank of the alternatives is not affected by the subperiods; the Enhanced Coordination Alternative continues to be the most robust for this priority group.

Figure TA 18-10
Arizona CAP Non-Indian Agriculture Priority: Robustness (by Subperiod).
 Percent of futures in which annual delivery is the percent of normal delivery specified in each row in 90 percent of years

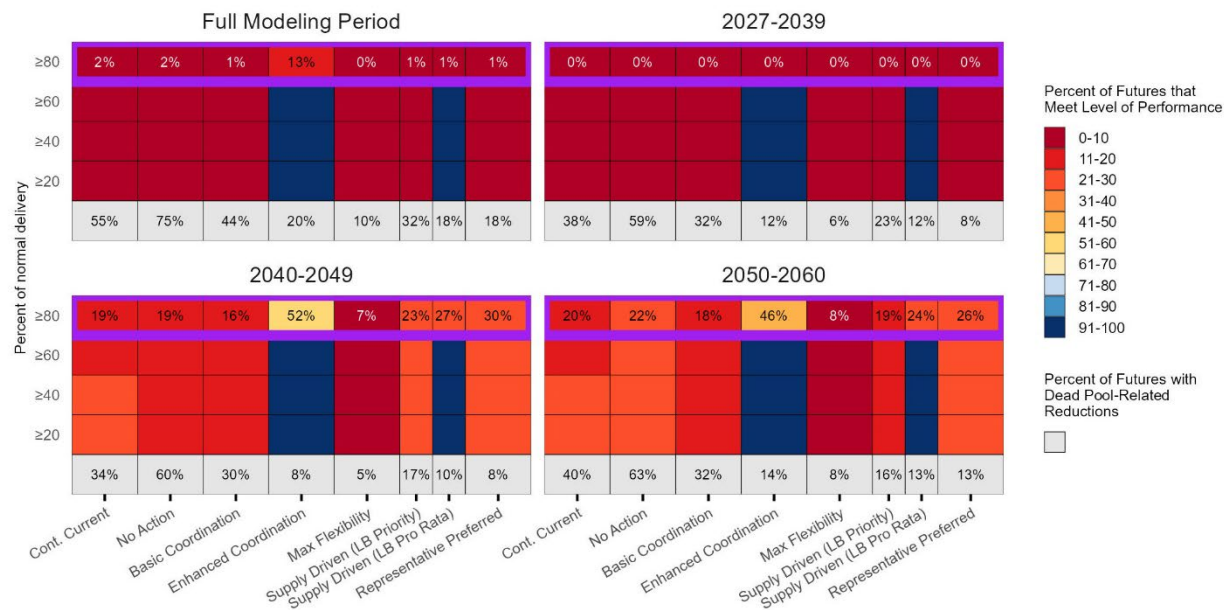


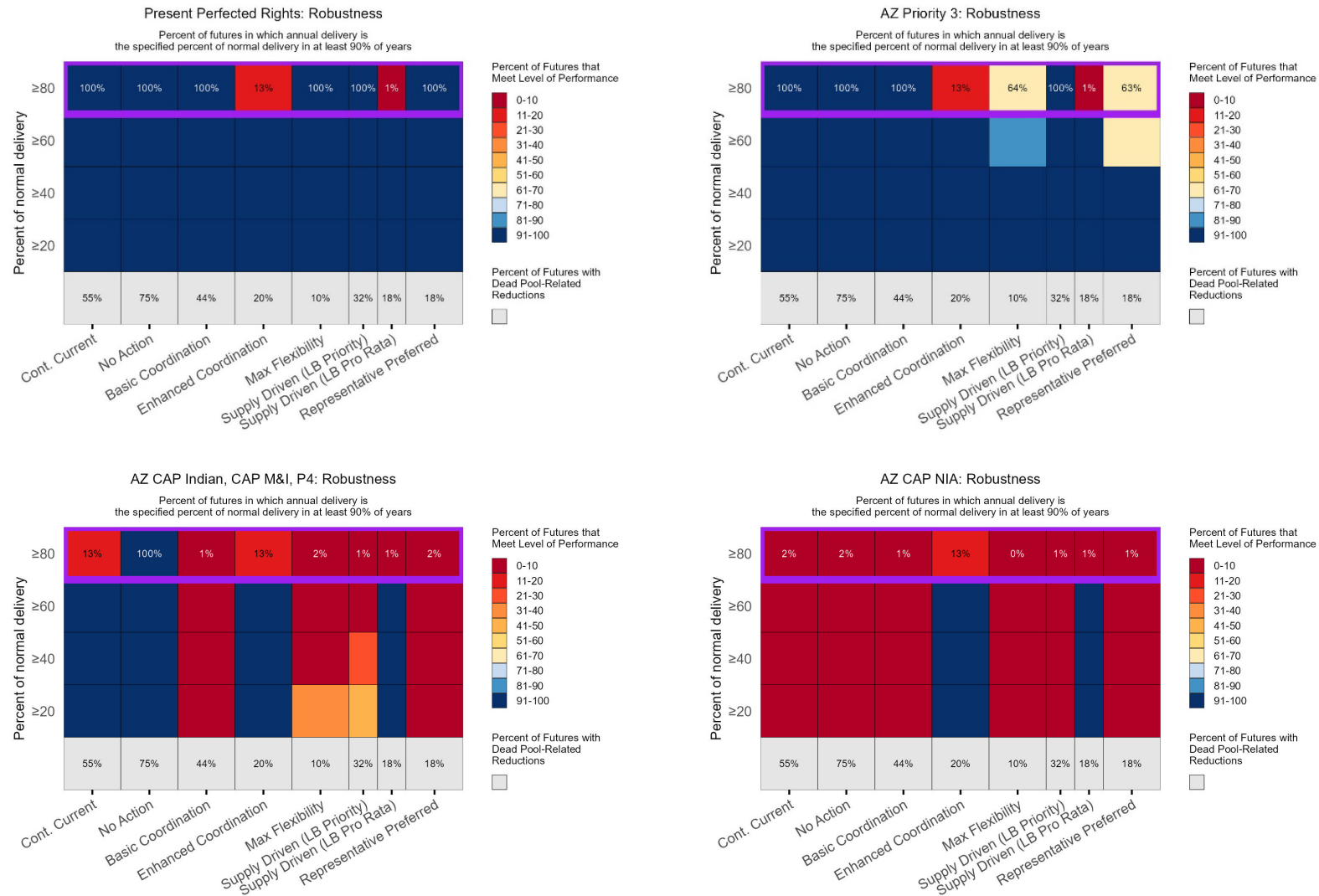
Figure TA 18-11 shows the full-period DMDU modeling results for all priority groups. Key findings differentiating the alternatives in terms of tribal water deliveries across the priority groups based on the full-period DMDU heat maps include the following:^{18, 19}

- There is no alternative that is the most robust across the priority groups in terms of maximizing water deliveries to all tribes. The alternatives perform differently for the priority groups and, for some priority groups, depend on the importance placed on results considering only shortages relative to the frequency of futures with dead pool-related releases.

¹⁸ Other key metrics are evaluated and discussed elsewhere in the EIS.

¹⁹ The Preferred Alternative provides a framework that allows for shortages to be distributed based on agreements among states that may arise, consistent with sideboards described in Chapter 2, which could yield different impacts than the distribution methods assumed for the Representative Preferred Alternative.

Figure TA 18-11
Robustness Comparison for All Priority Groups (Full Period)



- For the most senior water entitlements (the PPR group), the Maximum Operational Flexibility Alternative is the most robust. It meets the preferred minimum performance criteria in 100 percent of modeled futures and has the lowest percentage of futures with dead pool–related reductions. The Representative Preferred Alternative is the second best performing alternative for this priority group.
- For the next most senior water entitlements priority group (the Arizona Priority 3 group), a case could be made for either the Maximum Operational Flexibility or Supply Driven (LB Priority approach) Alternatives. Which is more robust depends on how this group trades off water delivery, considering only shortages (which favors the Supply Driven Alternative [LB Priority approach]) or minimizing the percentage of futures with a dead pool–related release (which favors the Maximum Operational Flexibility Alternative). The Representative Preferred Alternative is not one of the two top performing alternatives for this priority group.
- For the next most senior water entitlements priority group (the AZ CAP Indian, M&I, AZ 4i group), a case could be made for either the No Action or Enhanced Coordination Alternatives. Which is more robust depends on how this group trades off water delivery, considering only shortages (which favors the No Action Alternative) or minimizing the percentage of futures with a dead pool–related release (which favors the Enhanced Coordination Alternative). The Representative Preferred Alternative is not robust for this priority group.
- For the most junior water entitlements priority group (the AZ CAP NIA group), the Enhanced Coordination Alternative is the most robust. The Representative Preferred Alternative is not robust for this priority group.
- Considering shortages only (that is, not considering dead pool–related reductions), the No Action Alternative is estimated to meet the preferred minimum performance criteria in 100 percent of normal water deliveries to all priority groups except the AZ CAP NIA group. This result is likely due to a lower maximum shortage than other alternatives (**Figure TA 18-1** and **Table TA 18-4**). However, the No Action Alternative has the highest potential for dead pool–related releases of any alternative, with 75 percent of futures estimated to have a dead pool–related release. Therefore, water delivery would be unlikely under the No Action Alternative.
- The CCS Comparative Baseline is similar to the No Action Alternative, except 13 percent of futures meet preferred minimum performance criteria for the CAP Indian, CAP M&I, and AZ 4i priority group, and 2 percent of futures meet the preferred minimum performance criteria for the CAP NIA group. Dead pool–related reductions are estimated to occur in 55 percent of modeled futures, which is less frequent than the No Action Alternative.
- The Representative Preferred Alternative is the second best performer for the PPR priority group. It is not among the most robust alternatives for any other priority group.
- The Basic Coordination Alternative is not among the most robust alternatives for any priority group.
- The Enhanced Coordination Alternative has a more complicated pattern of robustness.
 - 13 percent of futures meet the preferred minimum performance criteria for all priority groups, fewer than some other alternatives. This is likely due to the fact that shortages

- start relatively early compared to other alternatives, and there is a high maximum shortage (see **Figure TA 18-1** and **Table TA 18-4**).
- However, it performs very well in terms of delivering at least 60 percent of normal water, as it does so in 91-100 percent of modeled futures for all priority groups. This result is likely due, in part, to its use of the pro rata distribution method.
 - Finally, it has 20 percent of futures with dead pool–related releases, among the fewest of the options modeled.
 - Considering only shortages, the Maximum Operational Flexibility Alternative is more robust than the Enhanced Coordination Alternative for the two more senior water entitlements groups (PPR, Arizona Priority 3) and less robust than the Enhanced Coordination Alternative for the two less senior water entitlements groups (AZ CAP Indian, M&I, and 4i; CAP NIA). It has the lowest percentage of futures with a dead pool–related release (10 percent) of all the options modeled.
 - The Supply Driven Alternative (LB Priority approach) generally is more robust than the Maximum Operational Flexibility Alternative with respect to shortages, but has a higher percentage of futures with a dead pool–related release (32 percent).
 - The Supply Driven Alternative (LB Pro Rata approach) is closest to the Enhanced Coordination Alternative but does not meet the preferred minimum performance criteria as often and therefore is less robust.

It is important to consider the first subperiod, as the Preferred Alternative is a 10-year decision framework. The conclusions above all hold for the first decadal subperiod with the one exception: for the Arizona Priority 3 group, a case could be made that either the Maximum Operational Flexibility, Supply Driven (LB Priority approach), or Representative Preferred Alternatives are the best performing.²⁰ These three alternatives have various trade-offs between water deliveries considering only shortages and the percentage of futures with a dead pool-related reduction.

Storage and Conservation Options

The No Action and Basic Coordination Alternatives have no water storage mechanisms that would affect Lower Basin Tribes or the quantities of water available to them. Under both alternatives, water conserved under previous mechanisms that remains in Lake Mead in 2027 would be delivered in accordance with existing agreements. The other four alternatives do contain new water storage and conservation mechanisms, which are summarized below. See **Chapter 2** and **Appendix S** for a full description of these mechanisms and how they would operate. Note that in all cases, stored water would be available for water transactions with other Lower Basin water users, both within and across Lower Division States.

- Under the Preferred Alternative, Lower Basin water users would be able to store up to 7.0 maf in conservation pool in Lake Mead, including the storage of pre-2027 intentionally created surplus (ICS). There would also be a Federally Managed Water Resources Pool. This

²⁰ In the full period results, the Maximum Operational Flexibility Alternative performs better than the Representative Preferred Alternative.

pool could potentially be filled by, among other mechanisms, compensated Lower Basin tribal water (conserved consumptive use).

- Under the Enhanced Coordination Alternative, water conserved by Lower Basin water users could be stored in a Lake Mead conservation pool. There would also be a Reclamation-controlled Federal Lake Mead conservation pool. Water for the Federally Managed Water Resources Pool could be voluntarily acquired by compensation for conserved water, among other mechanisms. Previously stored ICS water would be transferred into the non-Federal Lake Mead conservation pool and would be subject to the new provisions regarding the release of that water.
- Under the Maximum Operational Flexibility Alternative, water conserved by Lower Basin water users could be stored in a combined pool managed across both Lake Powell and Lake Mead. Previously stored ICS water would be transferred into this pool, and the new provisions regarding the release of that water would apply.
- Under the Supply Driven Alternative (both LB Priority and LB Pro Rata approaches), Lower Basin water users could contribute to a storage pool in Lake Mead. Previously stored ICS water would be converted into this conservation pool over 10 years, and then the new provisions regarding the release of that water would apply.

All else equal, the four alternatives that include new mechanisms for storage and conservation of water could provide additional options to Lower Basin Tribes. First, the mechanisms allow tribes to conserve water and participate in storage programs. Second, the mechanisms allow transactions with other Lower Basin water users. Third, tribes that participate could receive compensation for conserved consumptive use. However, whether these new mechanisms are better for any specific tribe compared to the current ICS mechanism is outside the scope of this analysis.

TA 18.2.3 Issue 2: How Will Changes in Dam Operations Affect Indian Trust Lands?

Changes in dam operations under the different alternatives would not affect the borders of established reservations or the definitions of any trust lands. Trust land will remain trust land. Future potential acquisitions of land into trust are not limited by the operations. Further, in addition to (uncontrollable) drought conditions in any given year, the different alternatives of various distributions of the available water could add an incremental impact to the use of trust lands. An important aspect of the use of trust lands involves agricultural land, as fluctuations in water levels are estimated to result in some tribal agricultural lands being fallowed. Other changes in the use of tribal land and resources are discussed in **TA 13**, Tribal Resources. The considerations therein generally apply to Trust and non-Trust resources.

Agricultural Land

The potential impacts of changes in dam operations on agricultural land are assumed to be inversely dependent on water deliveries, meaning agricultural impacts are estimated to increase as water deliveries decrease.

Upper Basin

As noted in the Upper Basin water deliveries section above, none of the alternatives would affect water deliveries to Upper Basin Tribes. However, changes in storage and conservation options under some

alternatives could provide opportunities for tribal participation. All else equal, the new mechanisms for conserving and storing water for Upper Basin Tribes (contained in the Preferred, Enhanced Coordination, Maximum Operational Flexibility, and Supply Driven [both LB Priority and LB Pro Rata approaches] Alternatives) would provide additional options for tribes in the Upper Basin.

Lower Basin

TA 16, Socioeconomics, discusses the potential impacts of changes in dam operations and resulting changes in water deliveries on tribal and non-tribal agricultural economies in the Lower Basin. Estimates are presented for several socioeconomic metrics: acres of fallowed agricultural land, direct market value, jobs, and economic output. Results are presented at the state level and by priority groups for Arizona, California, and Nevada. See **TA 16**, Socioeconomics, for a full discussion of the modeling and results. This section focuses on the acres of fallowed land as an indicator of potential impacts on Trust land.

Table TA 18-5 summarizes the modeling results for estimated changes in fallowed tribal agricultural land. For each state and alternative and the CCS Comparative Baseline, the table shows the estimated acres fallowed under two scenarios: a shortage of 0.6 maf, which is applicable to all alternatives and the CCS Comparative Baseline; and the acres of fallowed land under the maximum shortage, which varies across each alternative and the CCS Comparative Baseline. As discussed for Lower Basin water deliveries above, the results must also be understood in the context of the possibility for dead pool–related reductions. See the Water Deliveries section of this Final EIS for more information on dead pool–related releases. **Table TA 18-5** contains the percentage of dead pool–related releases for each alternative and the CCS Comparative Baseline.

Some key findings from **Table TA 18-5** include:

- Similarly to the Lower Basin water deliveries analysis above, the seniority of water entitlements combined with the distribution method makes a large difference in the results.
- Tribal agriculture in Arizona is estimated to experience the largest impacts in terms of the absolute changes in acres of fallowed land. This is likely because the majority of the reservation land is in Arizona (see **Map TA 18-1**). The Representative Preferred Alternative is modeled to fallow the second-least number of acres in Arizona, relative to the other alternatives.
- No alternative is clearly the most robust for Arizona. The different alternatives and the CCS Comparative Baseline have varying trade-offs between fallowed acreage under shortages and percent of futures with dead pool–related reductions.
- In California and Nevada, impacts are only associated with alternatives that use the pro rata distribution method (the Enhanced Coordination and Supply Driven [LB Pro Rata approach] Alternatives).
- All other alternatives, including the Representative Preferred Alternative, and the CCS Comparative Baseline use some variation of the priority distribution method and estimate no reductions in water deliveries, and therefore no fallowed agricultural land, in these states.
- The Maximum Operational Flexibility Alternative performs the best for California and Nevada, as there are zero fallowed acres and the percentage of futures with dead pool–related reductions is minimized. This would be true for PPRs in Arizona as well.

Table TA 18-5
Estimated Tribal Agricultural Land Fallowed under Lower Basin Water Shortages

State	Alternative (or CCS Comparative Baseline)	Acres Fallowed at Shortage of 0.6 maf	Acres Fallowed at Maximum Shortage	Percent of Futures with Dead pool-related Reductions
Arizona	CCS Comparative Baseline	15,586	22,254	55
Arizona	No Action	12,419	12,419	75
Arizona	Basic Coordination	12,419	49,582	44
Arizona	Enhanced Coordination	8,067	39,200	20
Arizona	Maximum Operational Flexibility	6,535	68,054	10
Arizona	Supply Driven (LB Priority approach)	6,535	53,560	32
Arizona	Supply Driven (LB Pro Rata approach)	15,794	38,605	18
Arizona	Representative Preferred Alternative	6,535	67,375	18
California	CCS Comparative Baseline	0	0	55
California	No Action	0	0	75
California	Basic Coordination	0	0	44
California	Enhanced Coordination	1,298	5,092	20
California	Maximum Operational Flexibility	0	0	10
California	Supply Driven (LB Priority approach)	0	0	32
California	Supply Driven (LB Pro Rata approach)	579	2,803	18
California	Representative Preferred Alternative	0	0	18
Nevada	CCS Comparative Baseline	0	0	55
Nevada	No Action	0	0	75
Nevada	Basic Coordination	0	0	44
Nevada	Enhanced Coordination	131	656	20
Nevada	Maximum Operational Flexibility	0	0	10
Nevada	Supply Driven (LB Priority approach)	0	0	32

State	Alternative (or CCS Comparative Baseline)	Acres Fallowed at Shortage of 0.6 maf	Acres Fallowed at Maximum Shortage	Percent of Futures with Dead pool–related Reductions
Nevada	Supply Driven (LB Pro Rata approach)	131	460	18
Nevada	Representative Preferred Alternative	0	0	18

Source: **TA 16** Socioeconomics, **Figure TA 16-1**

TA 18.2.4 Issue 3: How Will Changes in Dam Operations Affect Other Indian Trust Assets?

Changes in dam operations would not directly affect the status and corpus of other ITAs. Trust assets will remain trust assets. Future potential acquisitions of assets into trust are not limited by the operations. Further, in addition to (uncontrollable) drought conditions in any given year, changes in dam operations could incrementally affect water levels, vegetation, fish, and wildlife, and therefore could indirectly affect the use of ITAs. General changes in vegetation, fish, and wildlife are discussed in their respective sections of this Final EIS.

As noted in **Section TA 18.1.3**, income is not a trust asset, yet Reclamation recognizes that income derived from ITAs can be important to tribes. Impacts on specific income-generating activities depend on a complex array of legal, contractual, and environmental factors. Because income derived from ITAs varies for each tribe, the effects of changes in water levels and deliveries due to the alternatives will also vary by tribe.

However, several general conclusions can be drawn regarding tribes' ability to generate income from leasing water. All else equal, higher quantities of delivered water means more ability to fulfill existing lease agreements and/or enter into new agreements. From this perspective, the conclusions of the water deliveries analysis generally apply to water leases.

Fees for outdoor recreation and other services on tribal land that generate income could be affected by changes in dam operations that result in changes in access, changes in river flows, changes in water quality, changes in fish and wildlife, and other resources that affect outdoor recreation. **TA 14, Recreation**, discusses the expected impacts of the alternatives on recreation.

TA 18.2.5 Summary Comparison of Alternatives

Issue 1: Tribal Water Entitlements, Deliveries, and Storage and Conservation Options

Water Entitlements

The alternatives would not affect entitlements to any Upper Basin or Lower Basin Tribes. The approaches to distributing Lower Basin shortages incorporated in all alternatives are designed to explore a wide range of potential concepts and impacts; they do not reflect an intention by Reclamation to alter apportionments or water entitlements. However, because the concepts would affect a range of users, impacts on deliveries to different entities are analyzed, and addressed in **Appendix C**, Shortage Allocation Model and Alternative Distribution Model Documentation.

Water Deliveries

The alternatives would not affect deliveries to any Upper Basin water users, including tribes.

For water deliveries in the Lower Basin, the most robust alternative in terms of estimated water deliveries depends on the priority group.

- For the most senior water entitlements (the PPR group), the Maximum Operational Flexibility Alternative clearly is the most robust. It meets the preferred minimum performance criteria in 100 percent of modeled futures and has the lowest percentage of

futures with dead pool–related reductions. During the first modeling period, which includes the implementation period for the Preferred Alternative, the Representative Preferred Alternative performs second-best to the Maximum Operational Flexibility Alternative, with nearly the same performance.

- For the next most senior water entitlements priority group (the Arizona Priority 3 group), a case could be made for either the Maximum Operational Flexibility or Supply Driven (LB Priority approach) Alternatives. Which is more robust depends on how this group trades off water delivery, considering only shortages (which favors the Supply Driven [LB Priority approach] Alternative) or minimizing the percentage of futures with a dead pool–related release (which favors the Maximum Operational Flexibility Alternative). For the first decadal period, which contains the implementation period of the Preferred Alternative, the Representative Preferred Alternative performs second-to-last among the alternatives for deliveries, meeting the preferred performance criteria in 65 percent of modeled futures; however, it has the second-lowest percent of futures with a dead pool-related reduction.
- For the next most senior water entitlements priority group (the AZ CAP Indian, M&I, AZ 4i group), a case could be made for either the No Action or Enhanced Coordination Alternatives. Which is more robust depends on how this group trades off water delivery, considering only shortages (which favors the No Action Alternative) or minimizing the percentage of futures with a dead pool–related release (which favors the Enhanced Coordination Alternative). For the first decadal period, which contains the implementation period of the Preferred Alternative, the Representative Preferred Alternative is not robust for deliveries, meeting the preferred performance criteria in 0 percent of modeled futures; however, it has the second-lowest percent of futures with a dead pool-related reduction.
- For the most junior water entitlements priority group (the AZ CAP NIA group), the Enhanced Coordination Alternative is the most robust. For the first decadal period, which contains the implementation period of the Preferred Alternative, the Representative Preferred Alternative is not robust for deliveries, meeting the preferred performance criteria in 0 percent of modeled futures; however, it has the second-lowest percent of futures with a dead pool-related reduction.

Storage and Conservation Options

For Upper Basin Tribes, options for conserving and storing water vary among the alternatives. For the No Action and Basic Coordination Alternatives, there would be no new mechanisms to conserve and store water. However, the Preferred, Enhanced Coordination, Maximum Operational Flexibility, and Supply Driven (both LB Priority and LB Pro Rata approaches) Alternatives all have new mechanisms for Upper Basin Tribes to conserve and store water in either or both Lake Powell and Lake Mead.

For Lower Basin Tribes, options for conserving and storing water vary among the alternatives. For the No Action and Basic Coordination Alternatives, there would be no new mechanisms to conserve and store water. Water conserved under previous mechanisms that remains in Lake Mead in 2027 would be delivered in accordance with existing agreements. However, the Preferred, Enhanced Coordination, Maximum Operational Flexibility, and Supply Driven (both LB Priority and LB Pro Rata approaches) Alternatives all have new mechanisms for Lower Basin Tribes to

conserve and store water in either or both Lake Powell or Lake Mead. These four alternatives also have provisions for converting previously stored ICS water into the new conservation pools. The Enhanced Coordination and Preferred Alternatives are unique in that they would have both user-controlled and Reclamation-controlled conservation pools in Lake Mead, the latter of which could be filled in part by compensating tribes for voluntarily conserving water.

Issue 2: Indian Trust Lands

None of the alternatives would affect the boundaries of established reservations or Trust lands. However, the alternatives would affect the use of Trust lands. Changes in water deliveries could particularly affect the productivity of agricultural land, an important and valuable land use for tribes (Curtis et al. 2023). It is estimated that agricultural land would be fallowed under some alternatives.

In the Upper Basin, none of the alternatives would directly affect agricultural land. Some alternatives would provide new mechanisms for conserving and storing water for Upper Basin Tribes (the Enhanced Coordination, Maximum Operational Flexibility, and Supply Driven [both LB Priority and LB Pro Rata approaches] Alternatives).

The following summarizes state-level conclusions in the Lower Basin:

- There is no clear most robust alternative for Arizona. The different alternatives and the CCS Comparative Baseline have varying trade-offs between fallowed acreage under shortages and percent of futures with dead pool-related reductions. The Representative Preferred Alternative is modeled to fallow the second-least number of acres in Arizona, relative to the other alternatives.
- In California and Nevada, impacts are only associated with alternatives that use a pro rata distribution (the Enhanced Coordination and Supply Driven [LB Pro Rata approach] Alternatives). There are no impacts associated with alternatives, including the Representative Preferred Alternative, that use a variation of a priority distribution.

Issue 3: Other Indian Trust Assets

The alternatives would not generally affect other ITAs, but could affect the use of other ITAs. Because impacts are resource- and tribe-specific, no general comparison of alternatives for other ITAs can be made.

TA 18.3 References

- Bureau of Indian Affairs (BIA). 2025a. Federal Law and Indian Policy Overview: History of Indian Law and Policy. Internet website: <https://www.bia.gov/bia/history/IndianLawPolicy>.
- _____. 2025b. History of Indian Land Consolidation. Internet website: <https://www.bia.gov/bia/history/history-indian-land-consolidation>.
- Bureau of Reclamation (Reclamation). 1993. Indian Trust Policy. Internet website: https://www.usbr.gov/native/policies/pdf_trustresponsibility/BOR_IndianTrustAssetPolicyMemo_07-02-1993.pdf.
- _____. 1994. Indian Trust Asset Policy and NEPA Implementing Procedures: Questions and Answers about the Policy and Procedures. Internet website: https://www.usbr.gov/native/policies/pdf_trustresponsibility/BOR_NEPAImplementingProcedures_QandAaboutITAPolicy_08-31-1994.pdf.
- _____. 2012. Colorado River Basin Water Supply and Demand Study: Appendix C9.
- Central Arizona Project (CAP). 2025. CAP Allocations. Internet website: <https://library.cap-az.com/maps/capallocations>.
- Curtis, K., M. Kim, and T. Drugova. 2023. 4D: Drought and Water Access Heavily Impact Tribal Economies.” Internet website: [4D: Drought and water access heavily impact tribal economies | ILWA | USU](https://www.4dproject.org/4D-Drought-and-water-access-heavily-impact-tribal-economies-ILWA-USU).
- Department of the Interior (Department). 2025. Managing Indian Trust Assets. Internet website: <https://www.doi.gov/ost/managing-indian-trust-assets>.
- Elliott, S. K. 2025. How American Indian Reservations Came to Be. Internet website: <https://www.pbs.org/wgbh/roadshow/articles/how-american-indian-reservations-came-to-be/>.
- Oklahoma State University (OSU). 2025. Tribal Treaties Database. Internet website: <https://treaties.okstate.edu/>.
- Water and Tribes Initiative. 2025. Who We Are. Internet website: <https://www.waterandtribes.org/about-us>.