Chapter 4

CUMULATIVE EFFECTS

Boca Reservoir

Photograph by Jim Bailey

Derby Diversion Dam

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CHAPTER 5 – CONSULTATION AND COORDINATION

Chapter 4
CUMULATIVE EFFECTS

This chapter addresses cumulative effects in the study area.

Of the numerous past, present, and reasonably foreseeable future actions identified in this cumulative effects analysis, the Truckee River Operating Agreement (TROA) is unique insofar as it relates to modifying reservoir operations. None of the other actions considered in this chapter has the objective, capacity, or legal authority to effect integrated management of major reservoirs in the Truckee River basin—specifically, rules for storing, exchanging, and releasing water. However, some of the actions may directly determine, to some degree, release schedules (amount and timing) for water stored pursuant to TROA (primarily Credit Water) based on water rights and beneficial uses, in addition to certain releases required for flood control, dam safety, and emergency purposes.

TROA would not affect, and is, in fact, prohibited by legislation from affecting, the satisfaction of the exercise of *Orr Ditch* and *Truckee River General Electric* Decree water rights; much of the analysis in this document relates to water rights issues. TROA would allow latitude in reservoir operations and exercise of water rights within recognized institutional authorities (State water law, judicial decrees, etc.). Also, TROA imposes no restrictions on urban planning or limitations on community development; rather, it is a tool for managing water resources in response to changing demands and conditions. Because no new water rights would be created by TROA and certain limitations on water use would be implemented, many of the cumulative effects of actions related to resources potentially affected by TROA are already presented in chapter 3. Some of these effects are repeated in this cumulative effects analysis to provide perspective on future conditions.

In the following analysis, identified potential future actions are grouped by category because they may affect the same water rights or water resources but to varying degrees depending on how they are exercised or distributed. In addition to those previously addressed effects, this analysis, therefore, focuses on those past, present, and reasonably foreseeable future actions that would (1) cumulatively affect streamflows associated with beneficial uses or (2) develop new water supplies in the study area.

I. DEFINITION OF CUMULATIVE EFFECTS

Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal) or person undertakes such actions (40 Code of Federal Regulations [CFR] section 1508.7)."

California Environmental Quality Act (CEQA) section 15355 defines cumulative impacts as follows:

> Two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts:
>
> > (a) The individual effects may be changes resulting from a single project or a number of separate projects.
> >
> > (b) The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.

This chapter briefly describes the major categories of actions in the study area that have a connection with TROA and their potential cumulative effects on affected resources. A connection with TROA is defined as an action:

- In the study area
- Affecting the use of Truckee River water
- Having environmental linkages to Truckee River operations

Section II describes the methodology used for the cumulative effects analysis. Section III identifies actions associated with Public Law (P.L) 101-618. Section IV describes the Department of the Interior's (Interior) Water 2025 initiative. Section V addresses the following seven action categories:

- **Urban development and land use:** Increasing populations increase demand for municipal and industrial (M&I) water and, as urban areas expand, agricultural lands are developed into residential and commercial properties.

- **Water rights acquisitions and transfers:** As demands for water for M&I, environmental, and water quality uses increase, acquisition of agricultural water rights continues.

- **M&I water plans:** Communities have developed and are developing water resources plans that address water rights transfers and groundwater use.

- **Ecosystem restoration:** Site-specific restoration projects are being implemented, and additional projects are likely to be implemented in the future.

- **Flood control:** Government entities are implementing flood control measures in portions of the study area.

- **Water quality:** Water quality standards have been developed and entities are taking actions to meet those standards.

- **Climate:** Seasonal water availability may shift due to climate change.

Section VI presents an analysis of the potential cumulative effects of each action category for each alternative and each affected resource (in the year 2033). Study area resources are analyzed using the same indicators and methodology presented in chapter 3. Finally, section VII presents a conclusion based on the analysis.

II. METHODOLOGY FOR ANALYZING CUMULATIVE EFFECTS

This section describes the methodology for analyzing cumulative effects.

A. Identify Actions

Requests were sent to resource management and other agencies for information on ongoing, planned, or proposed actions related to water resources in the study area. Based on responses to the requests, more than 150 actions were identified as potential future actions to address in this cumulative effects analysis. Those actions were then differentiated as to those:

(1) Included in the operations model and related environmental analyses or considered as part of the past cumulative effects or current conditions. These actions are discussed in chapter 3, and are not considered further in this analysis.

(2) Meeting all of the criteria listed in section II.B, and are considered further in this analysis.

The Cumulative Effects Appendix lists all of the actions identified in the study area (identified with a CE reference number) and how they were addressed in the cumulative effects analysis.

B. Criteria

The following criteria were used to determine which of the more than 150 actions merited further analysis relative to cumulative effects:

1. Reasonably Foreseeable (Actions That Are Likely to Happen)

CEQ regulations describe cumulative effects analysis in terms of "actions," rather than "proposals." Considering Cumulative Effects (page 19) states, "Commonly, analysts only include those plans for actions which are funded or for which other NEPA analyses are being

prepared" (CEQ, 1997). This guideline was expanded to include actions for which positive responses to the following questions could be made:

- Is the action likely to occur?
- Does the action have an identified sponsor proposing it?
- Does the action have identified sources of funding?
- Has the action initiated NEPA compliance or other regulatory procedures?
- Is the action defined in enough detail to allow meaningful analysis?

2. Relevance (Actions That Relate to TROA)

Considering Cumulative Effects (page 19) also states, "In general, actions can be excluded from analysis of cumulative effects if the action will not affect resources that are the subject for the cumulative effects analysis." Actions for which positive responses to the following questions could be made were included in the analysis:

- Does the action have aspects that are not already analyzed under the No Action Alternative (No Action)?

- Is the action defined in enough detail to determine if there would be any potential effect on indicators used in the analysis of the alternatives?

- Does the action affect any of the indicators used in the analysis of the alternatives?

3. Magnitude

Section 15130(a) of CEQA states, "An EIR shall discuss cumulative impacts of a project when the project's incremental effect is cumulatively considerable." Minor actions were not considered further; a minor action related to several similar actions was considered in the aggregate.

4. Determination

For the purpose of this analysis, implementation of TROA is considered significant if, in concert with other described past, present, or reasonably foreseeable future actions, it would exacerbate the declining status of an identified resource (i.e., a resource that is already adversely affected) or create a condition in which an effect is initially minor but is part of an irreversible declining trend.

III. ACTIONS AUTHORIZED BY PUBLIC LAW 101-618

Title II of P.L. 101-618, the Truckee-Carson-Pyramid Lake Water Settlement Act of 1990 (Settlement Act), was enacted by the Congress to provide the authorities and mechanisms for

resolving a number of issues involving water resources and water rights in the Truckee and Carson River basins, among other matters, including negotiation of TROA. The purposes of Title II are detailed in chapter 1.

A. Overview of Implementation Status and Cumulative Effects

Table 4.1 presents an overview of the status of selected actions authorized by Title II of P.L. 101-618. (Note: Interstate water allocation (section 204) is related to TROA (section 205), the proposed action, and so is not analyzed separately.)

Table 4.1.—Status of selected actions authorized by P.L. 101-618

Section and action	Status	Need for cumulative effects (CE) analysis
206(a)(1) Water Rights Acquisition Program (WRAP) for Lahontan Valley wetlands	Record of Decision (ROD) completed. Currently, 2.99 acre-feet per acre of acquired water rights is being transferred to Federal wetlands; remainder is not delivered. WRAP is active; objective is to secure 125,000 acre-feet of water per year for wetlands. To date, more than 41,000 acre-feet of water rights has been acquired, most has been transferred to wetland use; future conditions assume 75,000 acre-feet acquired.	CE analysis not required because TROA would not affect measures selected to fully implement WRAP.
206(b) Expansion of Stillwater National Wildlife Refuge (Stillwater NWR)	ROD for Comprehensive Management Plan completed. No legislative action currently scheduled.	Possible future water delivery schedules are not part of current conditions and No Actionin revised draft environmental impact statement/environmental impact report (DEIS/EIR). CE analysis depends on completion of Fish and Wildlife Service (FWS) 5-year study of effects of delivery schedule on Pyramid Lake fishes.
206(c) Naval Air Station Fallon (NASF) to develop Land Use Management Plan	Plan has been completed and excess water identified; use for Pyramid Lake fishes would have priority for use if Endangered Species Act (ESA) analysis identifies need. Operations model assumes NASF water rights exercised according to current use.	Pyramid Lake fishes may not use NASF water until TROA is implemented. Stillwater NWR, by agreement with the Pyramid Lake Paiute Tribe of Indians (Pyramid Tribe), is using water in the interim. Interim program is not part of current conditions and No Action. CE analysis depends on results of FWS 5-year study.
206(d) Interior and State of Nevada (Nevada) may share cost of protecting Lahontan Valley wetlands	Status uncertain.	No CE analysis required because this is a coordination action only with no effect on acquisitions.
206(e) Transfer of Carson Lake and Pasture to Nevada	Not completed.	CE depend on transfer conditions to be negotiated in the future.
206(f) Lahontan Valley and Pyramid Lake Fish and Wildlife Fund (LVPLFWF)	The fund has been established, but deposits to date have been minimal and no related programs have been implemented.	Potential CE would relate to ability to store Credit Water pursuant to TROA if the fund is used for a new or to extend existing water rights acquisition programs, or to changes in timing of

Table 4.1.—Status of selected actions authorized by P.L. 101-618

Section and action	Status	Need for cumulative effects (CE) analysis
		Carson Division demand pursuant to Operating Criteria and Procedures (OCAP) for the Newlands Project. Actions using the fund not covered under existing NEPA analysis would require new NEPA analysis.
206(g) Transfer of Indian Lakes to Nevada or Churchill County	Not completed.	No CE analysis required because there is no project, and implementation appears unlikely.
207(a) Develop and implement recovery plans for cui-ui and Lahontan cutthroat trout (LCT)	Recovery plans initially developed in early-mid 90s. FWS intends to create a new plan for both species; LCT Short-Term Action Plan for Truckee River has been approved.	FWS is testing water management options and recovery objectives, including the 6-flow regimes for LCT. No CE analysis needed absent approval of a final plan.
207(b) Incorporate Truckee River rehabilitation plan into U.S. Army Corps of Engineers (COE) reconnaissance level study	Pyramid Tribe and COE still negotiating plan and incorporation, financing, and implementation of findings. New plans addressing both species have yet to be developed.	Several plans have been proposed over the years, but none has been adopted or financed. No CE analysis required because there is no proposed action to analyze.
207(c) Water acquisition program for cui-ui and LCT	No acquisition program has been developed.	No CE analysis required because there is no proposed action to analyze.
208(a)(2) Pyramid Lake Fisheries Fund	Established in the early 1990s ($25 million). Interest used to operate and maintain Tribal fishery program	Action involves funding only and indirectly part of current conditions and No Action. No CE analysis required.
208(a)(3) Pyramid Lake Economic Development Fund	$40 million appropriated for the fund (1993-97). Fund may not be used until TROA is implemented. A plan for using the fund has not been developed.	No CE analysis required because there is no proposed action to analyze.
209(a) Expansion of Newlands Project purpose	In addition to agriculture, Newlands Project may also be operated for fish and wildlife, M&I, recreation, and water quality with valid water rights.	Part of current conditions and No Action. Stillwater NWR water rights are being served by the Newlands Project; no new water rights created. No CE analysis required.
209(b) Project efficiency study	Bureau of Reclamation (BOR) completed study in 1994.	No CE analysis required because this was a study only.
209(d) Water banking	Potential development of agreements to allow project water right holders to carry over water for drought protection.	No CE analysis required because no water banking program is proposed or planned.
209 (e) Recreation study	Potential study to identify measures to benefit recreational use of Lahontan Reservoir and downstream.	No CE analysis required because no study is planned.
209(f) Effluent reuse feasibility study	Potential study of application of sewage effluent on refuges and wetlands.	No CE analysis required because no study is planned.
209(h) Settlement of claims (recoupment)	Resolution to be determined by U.S. District Court.	No CE analysis required; implementation depends on settlement or other resolution of litigation.
209(j) Operating Criteria and Procedures (OCAP)	OCAP adjusted in 1997 to accommodate revised Newlands Project efficiency and variation in annual demand relative to Lahontan Reservoir storage targets. TROA would require modification of OCAP to accommodate Newlands	No CE analysis required; fine-tuning of diversion of Truckee River water to Newlands Project would not affect project water rights, although degree of NPCW use could cause potential seasonal variability in Lahontan

Table 4.1.—Status of selected actions authorized by P.L. 101-618

Section and action	Status	Need for cumulative effects (CE) analysis
	Project Credit Water (NPCW).	Reservoir storage and carryover. Additional NEPA analysis would be required to evaluate potential effects.
210(a) Claim settlement	1. Dismissal of water claims or other resolution is a prerequisite for implementing other actions associated with P.L. 101-618. 2. TROA must be approved before several actions may take place (section 204; section 206(c); section 207(c) and (d); and section 208(a)(3)). 3. Section 204 and TROA may not take effect until the Pyramid Tribe's claim to the remaining waters of the Truckee River has been resolved.	No CE analysis required because this provision of P.L. 101-618 pertains to the effectiveness of other provisions of the Settlement Act.
210(b)(2) Management of Anaho Island	The Pyramid Tribe and FWS reached an agreement in early 1990s.	Indirectly part of TROA, current conditions, and No Action; does not affect water resources.
210(b)(3) Beds and banks of the lower Truckee River	Nevada and the Pyramid Tribe reached an agreement ownership in early 1990s.	No CE analysis required because there is no identified effect on water resources.
210(b)(16) Groundwater study	Several groundwater studies have been conducted.	No CE analysis is required because these were only studies.
210(b)(18)	Authorizes the exchange of public lands in Nevada for land and water rights within or next to the Pyramid Tribe's reservation.	No CE analysis required because there is no identified effect on water resources, and exchanges previously have been completed.

B. Water Management Elements of P.L. 101-618 Actions

The following actions authorized by P.L. 101-618 could involve water management.

1. Section 206(a)(1) Water Rights Acquisition Program (WRAP)

Fish and Wildlife Service (FWS) released a final environmental impact statement in September 1996 and Record of Decision (ROD) November 1996 that described and analyzed a program to purchase up to 75,000 acre-feet of water from the Carson Division of the Newlands Project for Lahontan Valley wetlands (Water Rights Acquisition Program or WRAP), as referenced earlier in this document (FWS, 1996). In addition to water rights, water needed to sustain the wetlands may come from water leasing, reservoir spills, irrigation drainwater, water use reductions at Naval Air Station Fallon (NASF), groundwater pumping, or water purchases from segment 7 of the Carson River (upstream of Lahontan Reservoir).

Through a partnership of FWS, State of Nevada (Nevada), The Nature Conservancy, Nevada Waterfowl Association (NWA), Bureau of Indian Affairs (BIA), and Bureau of Reclamation (BOR), about 34,400 acre-feet of water rights from the Carson Division have been acquired

for Lahontan Valley wetlands to date—23,800 acre-feet by FWS, 1,800 acre-feet by BIA, and 8,800 acre-feet by Nevada and NWA. Most purchases in the Carson Division have occurred at the edges of the Newlands Project near Stillwater National Wildlife Refuge (NWR) and Carson Lake. FWS has purchased 4,300 acre-feet from segment 7 of the Carson River and received 2,900 acre-feet from NASF. Water rights are purchased from willing sellers at appraised market value.

Acquired water rights are currently transferred and exercised at Stillwater NWR at the consumptive use rate of 2.99 acre-feet per acre per year (compared to the entitlement of 3.5 and 4.5 acre-feet per acre per year for bottom and bench lands, respectively).

Potential Impacts: The WRAP ROD states, "The preferred alternative will result in the least amount of water rights purchased from the Carson Division. Under this alternative, the Service will rely more heavily on other water resources to fulfill the objective." None of the alternatives analyzed in this revised draft environmental impact statement/ environmental impact report (DEIS/EIR) would affect the measures implemented to achieve the WRAP objective. To the extent that additional water rights are acquired, transferred, and exercised at the consumptive use rate, Carson Division demand would decrease accordingly and, in some years, reduce demand for Truckee River water, in accordance with Newlands Project Operating Criteria and Procedures (OCAP). To the extent that reduced demand would increase flow in the lower Truckee River, TROA would provide opportunity to use such water to establish Credit Water to be managed for the benefit of Pyramid Lake fishes (i.e., cui-ui and Lahontan cutthroat trout [LCT]) and related resources. TROA in combination with this action would not, however, have a significant effect on Newlands Project water rights, which would continue to be served pursuant to OCAP. In combination with WRAP and OCAP, TROA would not have a significant effect on Newlands Project water rights because it would not affect the priority of water rights or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve monthly storage targets.

2. Section 206(b) Stillwater National Wildlife Refuge

Stillwater NWR has made recommendations regarding expansion of its authorized boundary for acquiring an interest in land. The proposed revised boundary would incorporate much of Stillwater Wildlife Management Area (WMA), Fallon NWR, and 32 sections south and north of Stillwater WMA. Lands acquired within the expanded boundary would be managed to restore and maintain the natural biological diversity associated with the lower Carson River and its delta, the sand dune complex along the southern shore of the Carson Sink, and salt desert shrub lands of Carson Desert. A ROD has been completed. FWS recently approved a Comprehensive Conservation Plan (CCP) to guide the management of the expanded refuge. To date, there has been no legislative action on the proposed expanded boundary, and legislation appears unlikely at this time. CCP requires that most of the refuge's water be delivered during early summer rather than under an agricultural delivery pattern as in the past. The effect of such a delivery pattern on Pyramid Lake fishes has yet to be determined. FWS (2002) is conducting a 5-year study on potential effects (Cumulative Effects Appendix reference number (CE#): PL2).

Potential Impacts: The only effect relative to TROA could be a modification of the water demand pattern, which could increase spring and early summer diversions from the Truckee River to achieve Lahontan Reservoir storage targets, in accordance with OCAP, and modify the storage and release pattern of water dedicated for the benefit of Pyramid Lake fishes if such management is not detrimental to Pyramid Lake fishes or trust resources of the Pyramid Tribe. TROA in combination with this action would not, however, have a significant effect on Newlands Project water rights, which would continue to be served pursuant to OCAP; TROA would not affect the priority of water rights or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve monthly storage targets.

3. Section 206(c) Naval Air Station Fallon

NASF has developed a Land Use Management Plan for conserving water used on lands surrounding the air base. P.L. 101-618 requires transfer of any excess water rights identified in the plan to the Secretary of the Interior (Secretary) for the benefit of the Pyramid Lake fishes or wetlands in Lahontan Valley. Though Pyramid Lake fishes would have priority to use this water for the conservation of the species in accordance with the Endangered Species Act (ESA), such benefits from this excess water may not be realized until TROA is implemented. In the meantime, the excess water is being used on Stillwater NWR.

Potential Impacts: Disposition of this water may affect the amount and timing of water diverted from the Truckee River to the Newlands Project via the Truckee Canal in certain years. Such diversions or lack thereof would be coordinated to ensure maximum benefits for endangered and threatened species and wetland habitat and to avoid adverse impacts to trust resources of the Pyramid Tribe. TROA in combination with this action would not, however, have a significant effect on Newlands Project water rights, which would continue to be served pursuant to OCAP; TROA would not affect the priority of water rights or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve monthly storage targets.

4. Section 206(e) Transfer Carson Lake and Pasture

The Secretary is authorized to negotiate an agreement to transfer Carson Lake and Pasture to the State of Nevada. Negotiations are ongoing.

Potential Impacts: The outcome of negotiations could affect the timing of water diverted from the Truckee River to Lahontan Reservoir to achieve monthly storage targets. TROA in combination with this action would not, however, have a significant effect on Newlands Project water rights, which would continue to be served pursuant to OCAP; TROA would not affect the priority of water rights or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve monthly storage targets.

5. Section 206(f) Lahontan Valley and Pyramid Lake Fish and Wildlife Fund (LVPLFWF)

Net payments for storage of water in upstream Federal reservoirs (i.e., amounts in excess of Stampede Reservoir) will be deposited to LVPLFWF for use on a 50/50 basis for (1) the Lahontan Valley wetlands restoration program and (2) protection and restoration of the Pyramid Lake fishery. The fund can also accept and fund projects from donations and projects funded by Nevada, although no such contributions have been received. The fund has been established, but deposits to date have been minimal and no related programs have been implemented. The amount of net payments under TROA will be the subject of future negotiations, but is expected to be positive (it is currently negative).

Potential Impacts: Within 2 years or so after TROA enters into effect, and subject to appropriations, additional funds likely would be available for restoration of Lahontan Valley wetlands and Pyramid Lake fishes. For Lahontan Valley wetlands, this restoration could take the form of physical restoration activities such as modifications of diking, installation of control structures, planting or removal of certain plants or animal species, and acquisition of water rights. In the case of water rights acquisitions, additional funds could potentially accelerate to some degree—probably modest—the rate of acquisition of water rights, but would not change the ultimate goal of 75,000 acre-feet of prime water rights available for the wetlands. For Pyramid Lake, funds could be used for such actions as fish spawning, rearing, stocking, placement, passage, research, and habitat improvement including the acquisition of water rights. Although this set of latter actions is authorized under ESA, restoration actions could potentially be accelerated with these funds. The amount of funding and the extent of acceleration are speculative at this time, and the extent of benefits or effects would depend on the magnitude of the fund as well as specific projects selected for funding. For both sets of uses, projects or programs not addressed under existing NEPA analyses would require new NEPA analysis.

6. Section 206(g) Transfer Indian Lakes

The Secretary is authorized to negotiate an agreement to transfer Indian Lakes to Nevada or Churchill County. There is no proposal to implement this action.

Potential Impacts: There is no water right associated with this area. Future uses will depend on Newlands Project water management consistent with OCAP.

7. Section 209(j) OCAP

Regulations governing long-term operations of the Newlands Project (43 CFR part 418) were revised most recently on December 18, 1997. Environmental analysis of implementation of OCAP was addressed most recently in the EIS for the Newlands Project Proposed Operating Criteria and Procedures (BOR, 1987) and the Environmental Assessment for Newlands Project Proposed Operating Criteria and Procedures (Interior, 1997).

Potential Impacts: TROA would not affect the priority of Newlands Project water rights, calculation of Newlands Project maximum allowable diversion, or the ability to divert water from the Truckee River to Lahontan Reservoir to achieve monthly storage targets; therefore, it would have no significant cumulative effect on implementation of OCAP. Additional modification would be required to accommodate implementation of Newlands Project Credit Water (NPCW) as described pursuant to the Draft Agreement. No significant impacts to the Newlands Project would be anticipated because any future modification to OCAP would be required to be consistent with its guiding principles, including providing "water deliveries sufficient to meet water right entitlements of Project water users." Potential benefits of NPCW are greater seasonal storage of Credit Water in Truckee River reservoirs, which would be available (if not needed to meet Newlands Project water rights) for Truckee River reservoir recreation (particularly during the winter through early summer period), Pyramid Lake fishes, higher Truckee River flows during the summer to enhance water quality and riverine and riparian habitat, and increased inflow to Pyramid Lake. To the extent this operation is implemented, potential effects are:

- Less storage in Lahontan Reservoir in late spring and early summer, which could affect recreation at that reservoir.
- Less carryover storage in Lahontan Reservoir.
- Lower flows in the Truckee River upstream of Derby Diversion Dam during winter and spring.
- Tributary flows that fluctuate or exceed maximum flow thresholds.

Less carryover storage could reduce the potential for spills (including flood flows) from Lahontan Reservoir. The reduced potential for spills could result either in a reduction of diversion from the Truckee River to benefit Pyramid Lake fishes or a reduction in occasional spill flows to Lahontan Valley wetlands, which could require acquisition of additional water or water rights depending on the sufficiency of WRAP in achieving program objectives. Exercise of the potential use of NPCW would require provisions for that in OCAP. Modification of OCAP to accommodate NPCW operations is a separate action not fully covered by this document, and would require a separate action and additional analysis pursuant to NEPA.

IV. WATER 2025 INITIATIVE

Water 2025 is an Interior problem-solving initiative being developed to address water conflicts. Water 2025 will encourage voluntary water banks and other market-based measures, improve technology for water conservation and efficiency, and remove institutional barriers to promote cooperation and collaboration among Federal, State, Tribal, and private organizations (CE#: GS-TN-1). No proposals or actions have yet been formulated to implement this policy initiative, although several of the types of measures and

strategies described for this initiative are already being implemented in or considered for the study area as part of or related to TROA, as described in this document.

V. EFFECTS OF OTHER WATER RESOURCE-RELATED ACTIONS

Many proposed and potential future actions related to water resources were identified for this part of the cumulative effects analysis. As noted previously, however, only a small portion of these actions would relate to or directly affect water management or reservoir operations in the study area. Therefore, only the most reasonably foreseeable future water-resource related actions or group of actions are described under each of the seven action categories. As appropriate, modeling of these actions or groups of actions for the chapter 3 analysis is discussed. In addition, a brief assessment of the potential individual effect of each action on affected resources (as identified in chapter 3) is presented, followed by an assessment of the effect of the action on resources in conjunction with TROA (i.e., cumulative effect). This information is then used in section VI to evaluate more broadly the cumulative effects of the action categories relative to the alternatives and affected resources (in the year 2033).

A. Urban Development and Land Use Changes

Local populations are increasing in the study area, primarily in urban areas. Urban areas (e.g., Truckee, Truckee Meadows and Fernley) are expanding and encroaching on rural areas. Some of the urban development is occurring in "rural areas," which are developing into satellite commuter communities. Some recreation-based areas (e.g., ski resorts) also are expanding. This urban development has caused a broad range of infrastructure and land use changes affecting wastewater treatment, transportation, water quality and rehabilitation drainage, and recreation sites. As urban areas expand, agricultural lands are developed into residential and commercial properties. Modeling addresses land use changes indirectly, as these changes may affect water quality and quantity and timing of flows. Water quality (point and nonpoint source pollution) is incorporated in the Watershed Analysis Risk Management Framework (WARMF) model (projected through the year 2020) and is addressed in chapter 3 in "Water Quality." Narrative treatment of development and land use is presented in chapter 3 in "Social Environment."

1. Urban Development Plans

Cities and counties in California and Nevada have urban development plans to accommodate the future development, including the following:

- The Martis Valley, California, Community Plan projects that the portion of the plan area identified in the Placer County final EIR (including more than 6,000 homes and infrastructure) could be 37 to 53 percent fully developed by 2020 (CE#: UD-TC-3).

- The town of Truckee, California, General Land Use Development Plan, proposes to redevelop the downtown area, subdivide undeveloped areas into

lots between ½ and 10 acres, and develop other sections at 6-12 dwelling units per acre. The Truckee-Donner Public Utility District Master Water Plan takes into account development identified in the General Plan.

- The draft 2002 Truckee Meadows, Nevada, Regional Plan projects 35 percent of the development will be in the already urbanized area within the McCarran Boulevard "beltway," and no more than 64 percent will be outside McCarran Boulevard (CE#: UD-LT-1, UD-TC-1, UD-TC-2, UD-TC-3, UD-TN-1).

- Numerous development projects (e.g., aggregate pits, buildings, residential units) are proposed for unincorporated areas, for example, on lands along the Truckee River in Storey County, Nevada (CE#: UD-TN-5).

- The Pyramid Tribe has drafted an Overall Economic Development Plan that anticipates continued development in the Wadsworth, Sutcliffe, and Nixon, Nevada areas. This draft plan includes the Wadsworth Master Plan for Drinking Water and Wastewater Treatment and will include feasibility studies for Sutcliffe and Nixon.

Potential Impacts: TROA would have no effect on community planning activities. Additional impervious surfaces would increase urban stormwater runoff; change runoff patterns and amounts from lawn irrigation and other urban uses; increase pollutants from development, domestic land uses, roads, and commercial facilities; and reduce groundwater recharge. As stated in the Water Quality Settlement Agreement: Federal Water Rights Acquisition Program EIS (BIA, 2002):

> Commercial and residential projects associated with urban development are likely to convert existing agricultural lands to residential or industrial parcels and to increase discharge of treated wastewater and non-point source material to the Truckee River. Additional discharges from facilities would be required to meet existing water quality standards or be mitigated to minimize adverse impacts to downstream users. Additional sources of water could be required to supplement the lower Truckee River flow to maintain or enhance water quality and riparian and riverine habitat.

TROA would provide opportunities to store and release water dedicated for water quality use directly within defined criteria. Other water, particularly that dedicated for Pyramid Lake fishes, indirectly could provide similar water quality benefits. TROA would not, however, affect the direction or strategy of local planning agencies or the implementation of development plans.

2. Transportation Improvements

Several projects are proposed for the Lake Tahoe and Truckee River basins to improve transportation by rehabilitating or widening roads, with possible rehabilitation of drainage.

Potential Impacts: Widening roads or increasing impermeable surfaces may change the magnitude and timing of runoff. Road and drainage rehabilitation could affect water quality by reducing or increasing pollutant loads. Intercepting and consolidating drains could allow for water treatment or could become a point source for pollution. These actions may potentially degrade water quality with or without TROA; conditions that arise as a result of precipitation or runoff events would be outside the water management capabilities of TROA.

3. Ski Resorts

Operations and facilities are likely to expand at ski resorts, such as Squaw Valley (CE#: SR-TC-1) and Mt Rose/Slide Mountain (CE#: SR-TN-1).

Potential Impacts: Snowmaking, pond expansion, and increased water demands would increase local groundwater and surface water use as well as facilities for water treatment and disposal. TROA would contain provisions related to accounting for water used for snowmaking but would have no direct effect on ski resort operations.

B. Water Rights Acquisitions and Transfer

Surface water in the Truckee River basin is fully appropriated. Demands for water to meet recovery objectives for threatened and endangered species and to meet the recreational and M&I demands of an increasing population are increasing. These increased demands are being met by acquiring agricultural water rights. As agricultural water rights are acquired and transferred and lands are taken out of production, there are fewer irrigated acres in the Truckee River basin, and the associated agricultural demand is decreasing.

Modeling for water rights acquisitions assumes that the pending water rights in California are limited to the allocation amount for TROA and a greater amount for No Actionand the Local Water Supply Alternative (LWSA), and that inactive Newlands Project water rights are retired in accordance with current State law (Assembly Bill [AB] 380).

1. California Surface Water Rights Applications

Surface water rights applications are pending before the California State Water Resources Control Board (SWRCB). There are 11 applications with a total face value of 56,612 acre-feet pending in the Lake Tahoe basin and 11 applications with a total face value of 17,715 acre-feet pending in the Truckee River basin (CE#: WS-LT-2 and WS-TC1-2).

Potential Impacts: In California, current water use is 18,700 acre-feet in the Lake Tahoe basin and 10,370 acre-feet in the Truckee River basin. The operations model assumes that under TROA, California will use 23,000 acre-feet in the Lake Tahoe basin and 22,700 acre feet in the Truckee River basin. The pending water rights applications exceed these amounts in both basins. Use of additional water rights could further affect the magnitude and timing of diversions from the Truckee River; the degree of the effect would depend on the amount granted. If these pending applications were granted and the water consumptively used, Truckee River water supplies could be affected, increasing the effects of drought and

reducing water supply in the Nevada portion of the basin as well as the Newlands Project and Lahontan Valley wetlands. The elevation of Pyramid Lake would further decline, and Pyramid Lake fishes would be further jeopardized.

While it is reasonable to assume that SWRCB would approve some additional applications in the absence of TROA, it is unlikely to approve all of the applications. The interstate allocation caps the total water rights usage in California at 23,000 acre-feet in the Lake Tahoe basin and 32,000 acre-feet in the Truckee River basin. In the Nevada portion of the Lake Tahoe basin, usage is assumed to be limited to the allocation amount of 11,000 acre-feet under both current and 2033 conditions. See chapter 2.

2. Assembly Bill 380

Nevada established the AB 380 program to resolve protests associated with abandoned or forfeited water rights on the Newlands Project, with the objective of retiring 6,500 acres of such water rights. Most, if not all, of these water rights are inactive (CE#: GS-TN-8).

Potential Impacts: A Finding of No Significant Impact (FONSI) for AB 380 was signed by BOR on September 12, 2000. TROA would have no adverse cumulative effect on this program.

C. M&I Water Demand

M&I demands include municipal, industrial, commercial, power, and mining. The study area in California and Nevada has seen substantial increases in population, residential development, and commercial and industrial projects in recent years, and this trend is expected to continue. M&I demand for water increases as the population increases. Conservation measures to reduce per capita demand and extend water supplies are being implemented and are expected to expand in the future. The operations model includes M&I demands associated with projected populations for the year 2033 and amounts supplied by surface and groundwater sources. See chapter 3, "Water Resources."

1. M&I Water Plans and Projects

a. Squaw Valley, California

Squaw Valley, California, Public Service District water demand is projected to be 1,600 gallons per minute. The district will probably build a well with annual production of 1,200 acre-feet out of the 1,640 acre-foot sustainable yield (CE#: WS-TC-2).

Potential Impacts: This project may potentially reduce the discharge of Squaw Creek. If the well is within the limits of sustainable yield, it should have no effect on creek flow.

b. Coldstream Canyon, California

This project is development a water extraction facility for bottled water in Coldstream Canyon, California. Wells and permit are in place (CE#: WS-TC-3).

Potential Impacts: This project may potentially reduce flows in Cold Creek, a tributary to Donner Creek downstream from Donner Lake. Minimum releases from Donner Lake are 2 or 3 cfs, depending on the flow from Cold Creek. Reduced flows in Cold Creek would result in a slight reduction in Donner Lake (1 cfs for 90 days is 178 acre-feet), which may have a measurable local impact.

c. Fernley, Nevada

Fernley has acquired surface water rights and is seeking additional water rights and storage. Fernley would have to convert agricultural water rights to M&I use. Fernley has some groundwater rights and wells (CE#: WS-TN-5).

Potential Impacts: Depending on the method selected for delivery of water to satisfy the exercise of acquired Truckee Division water rights, Truckee River diversions to the Truckee Canal would be reduced by a proportionate amount.

d. Pyramid Lake Indian Reservation, Nevada

The Pyramid Tribe has drafted an Overall Economic Development Plan that includes plans to improve municipal water systems in Nixon, Sutcliffe, and Wadsworth, Nevada. Included in the plan is the Wadsworth Master Plan for Drinking Water and Waste Water Treatment. The Pyramid Tribe is awaiting Public Utility authority before proceeding. A water feasibility study for Nixon and Sutcliffe also will be included in the overall plan.

Potential Impacts: TROA would have no direct adverse cumulative effect on development of local water systems. Improvements to rural water systems will benefit groundwater and surface water resources.

e. Churchill County, Nevada

The Final Report, Churchill County Water Resource Plan: 25 Year 2000-2025: 50 Year 2000-2050 (Water Research & Development, Inc., 2003) recommends, in part, the following measures (CE#: WS-LV-1):

- Continue use of historic groundwater resources for quasi-municipal development.

- Continue to require new quasi-municipal development to provide water rights as per the county water right dedication ordinance.

- Require new quasi-municipal development to provide appropriate water and wastewater systems, and dedicate them to the county.

- Establish a utility division within Churchill County to operate the newly created water and wastewater system.

- Establish processes and procedures to acquire and operate private water and wastewater systems.

Potential Impacts: TROA would have no direct effect on development of local water systems or on water rights on the Newlands Project.

f. Washoe County, Nevada

Washoe County is developing and implementing the Washoe County Comprehensive Regional Water Management Plan (Washoe County, 2004). Washoe County reports that:

> Nevada Law, Nevada Revised Statutes (NRS) 540A.150.2 requires that the Washoe County Comprehensive Regional Water Management Plan be consistent with and carry out or support the carrying out of all aspects of P.L. 101-618, 104 Statute 3324. The adopted plan as amended complies with this provision in the law. The plan and the current update (in progress) assume that TROA will be implemented. The adopted plan includes a definition for TROA in the glossary, a description in the constraints section and specific discussion in several other places, including sections on water resources, effluent reuse, instream flows, conservation, drought storage and drought yield.

Potential Impacts: Provisions of TROA that relate to local water management would be recognized in the regional plan.

g. South Truckee Meadows Water Treatment Plant (STMWTP)

STMWTP proposes to construct two water treatment plants with a total capacity of 9 million gallons per day to treat poor quality groundwater and water diverted from Galena, Whites, and Thomas Creeks (CE#: WS-TN-1).

Potential Impacts: TROA would have no direct affect on construction of water systems.

2. Groundwater Development Actions for M&I Demands

As water demands increase, groundwater becomes a more likely additional water source. Some areas depend entirely on groundwater, while many areas use groundwater as a supplemental water source in dry years. The Nevada State Engineer restricts the amount of groundwater use to the natural yield of the groundwater basin.

a. Maximizing South Truckee Meadows Well Field

South Truckee Meadows well field pumping capacity could be increased to 9,500 acre-feet per year for M&I water. The average pumping would be 6,900 acre-feet per year; the maximum amount would be used during droughts (CE#: WS-TN-2).

Potential Impacts: This action could potentially reduce tributary discharge to the Truckee River. TROA would have no direct effect on local water development.

b. North Valleys Water Importation Project

Two independent water supply companies have applied for rights-of-way across public lands for a pipeline, wells, and other infrastructure in order to import 11,500 acre-feet of water from a basin adjacent to the Truckee River basin for M&I use (CE#: WS-TN-3).

Potential Impacts: Although this water is proposed for use outside the Truckee River basin, the effects of groundwater withdrawal in adjacent basins on Pyramid Lake and of wastewater treatment have not yet been addressed. Public scoping for the project has been completed and a DEIS is expected to be available in 2004. TROA would have no direct effect on water development outside of the Truckee River basin.

c. Well Field Near Wadsworth, Nevada

A municipal water supply well field and system would be constructed near Wadsworth to serve non-Tribal and Tribal areas in the Fernley and Wadsworth areas (CE#: WS-TN-6).

Potential Impacts: This action may potentially substitute groundwater use for some surface water use. Depending on location of wells, quantity of water pumped, and surface water exchange provisions, groundwater withdrawals could reduce surface water flows in the Truckee River. TROA would have no direct effect on local water development.

D. Ecosystem Restoration

Human activities have degraded riparian, wetland, and lake and river habitats in the study area. Past development has not considered ecosystem impacts. Site-specific projects to improve some of these degraded areas have been implemented and proposed; these project likely will continue. The operations model did not incorporate assumptions about ecosystem restoration projects or diversion structure improvements.

1. Tahoe Regional Planning Agency (TRPA)

TRPA is implementing the Lake Tahoe Environmental Improvement Program (EIP) for erosion control, wetlands restoration, forest health projects, and similar efforts needed to control algae growth and other factors believed to cause the deterioration of overall water quality of the lake (CE#: WP-LT-2). Also see “Water Quality Trends” in this chapter.

Potential Impacts: Projects would result in protection of several Tahoe yellow cress sites and would restore wetland, riparian, and lake habitats. TROA would not affect implementation of any projects in watersheds tributary to Lake Tahoe.

2. Restoring Stream Banks and Riparian and Wetland Habitats

The following site-specific restoration projects have been identified:

- The Nature Conservancy is restoring river channels and wetlands on purchased lands, such as the McCarran Ranch (CE#: HR-TN-1).

- Washoe-Storey Conservation District's Steamboat Creek Restoration Plan proposes to restore up to 2.2 miles of Steamboat Creek. COE is developing alternatives (CE#: HR-TN-8).

- Recreation areas managed by California Department of Parks and Recreation (such as Tahoe State Recreation Area) are restoring native vegetation, removing non-native plants, and implementing Best Management Practices (BMP) to control erosion (CE#: R-LT-5).

- The Pyramid Tribe and FWS are cooperating on a program to reestablish cottonwoods and the riparian canopy along the lower Truckee River.

Potential Impacts: Project goals include enhanced water quality, habitat improvements, flood attenuation, and increased recreation opportunities, which could improve water quality, riparian habitat, and other habitat. TROA could enhance the benefits of riparian and riverine improvement projects through the creation and management of dedicated Credit Waters and coordination of reservoir releases. TROA provides for a habitat restoration fund but does not specify specific projects. Depending on the amount of revenues deposited in the fund, implementation of TROA could accelerate restoration activities associated with cui-ui, LCT, and Lahontan Valley wetlands.

3. Improving Diversion Structures

Improvements to water diversion facilities and structures to facilitate fish passage and improve water diversion efficiency are proposed.

a. Truckee Meadows Water Authority (TMWA)

TMWA proposes to replace the Glendale Diversion structure and riprap. The existing structure in Truckee Meadows diverts up to 25 million gallons per day. The new structure will divert up to 37.5 million gallons per day, which is the existing plant capacity (CE#: GS-TN-6).

Potential Impacts: The structure will incorporate a water bypass to benefit fish habitat in the Truckee River between the diversion and Pyramid Lake. This action may potentially enhance recreation opportunities and promote sediment transport. TROA could enhance the benefits of bypass improvement projects through the creation and management of dedicated Credit Waters and coordination of reservoir releases.

b. Sierra Pacific Power Company (Sierra Pacific)

Sierra Pacific proposes to replace the Farad diversion dam which washed out in 1997. The project includes a fish passage structure at Floriston and access roads (CE#: IP-TC-1).

Potential Impacts: The new dam will divert water into the hydroelectric plant more efficiently. This project may improve recreational opportunities for rafting and kayaking. Improved fish passage would be mitigation for construction of the new diversion. TROA could enhance the benefits of bypass improvement projects through the creation and management of dedicated Credit Waters and coordination of reservoir releases.

c. Derby Diversion Dam

BOR completed construction of a fish passage facility at Derby Diversion Dam and will add a fish screen, expected to be completed in 2007 (CE#: HR-TN-9).

Potential Impacts: Passage benefits resident and migratory fish, assists in recovery of cui-ui and LCT, and provides cultural and economic benefits to the Pyramid Tribe. TROA could enhance the benefits of bypass improvement projects through the creation and management of dedicated Credit Waters and coordination of reservoir releases.

E. Flood Control

Current flood control criteria are an integral part of current conditions and all alternatives. The following flood control measures are identified:

- COE is considering flood control and restoration projects under the Truckee River Management Project (previously the Truckee Meadows Flood Control Project; CE#: PW-TN-5).

- Washoe County is constructing flood control facilities on tributaries (CE#: PW-TN-6).

Potential Impacts: TROA would not affect any flood control criteria or operations. No construction is associated with TROA.

F. Water Quality

In the early 20th century, the mining and timber industries caused Truckee River water quality to decline drastically and become a serious human health and environmental problem. Over the years, many water quality problems have been identified and corrected. A variety of Federal and State water quality standards have been developed, and entities are acting to meet those standards. The Pyramid Tribe recently approved water quality standards for the lower Truckee River and Pyramid Lake. Projects and programs are being implemented to improve water quality. As development continues, additional and advanced measures will be needed. The operations model calculates flow and does not make any assumptions regarding water quality; stormwater is modeled as part of runoff to the river and WQSA is implemented relative to water storage and release. The WARMF model assumes changes in point source loading from Tahoe-Truckee Sanitation Agency (TTSA) and Truckee Meadows Wastewater Reclamation Facility (TMWRF) and that treated wastewater discharge will be proportionate to the future population (year 2033); it incorporates conditions of the Total Maximum Daily Load (TMDL) program.

1. Wastewater and Stormwater Discharge Permits

California and Nevada have wastewater discharge permit programs in place. Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. The U.S. Environmental Protection Agency (EPA) and COE jointly administer the program. Stormwater discharge permits are a developing trend. Effects on water quality will depend on compliance with and enforcement of regulations.

a. Lahontan Regional Water Quality Control Board (LRWQCB)

LRWQCB has more than 270 permit applications pending in the Lake Tahoe basin and 49 in the Truckee River basin in California. Most of these are stormwater, and most are related to temporary construction permits. LRWQCB requires applicants to comply with water quality standards. Monitoring is not required for all projects, but it is required for ski areas (CE#: WQ-TC-1 and WQ-LT-1).

Potential Impacts: Unless effects of wastewater discharge are totally mitigated, some adverse effects to water quality from these and future projects may occur. TROA operations could enhance seasonal water quality through management of dedicated Credit Water releases.

b. Nevada Division of Environmental Protection (NDEP)

NDEP has more than 15 wastewater or stormwater permit applications identified in Truckee Meadows (CE#: WP-TN-1).

Potential Impacts: Unless the effects of wastewater discharge are totally mitigated, some adverse effects to water quality from these and future projects may occur. TROA operations

could enhance seasonal water quality through management of dedicated Credit Water releases.

c. California State Water Resources Control Board (SWRCB)

SWRCB issued a National Pollutant Discharge Elimination System (NPDES) Permit to Caltrans for its construction program. The permit regulates discharges from projects with soil disturbance of 1 acre or more. Caltrans requires contractors to prepare and implement Water Pollution Control Plans for projects causing soil disturbance of less than 1 acre (CE#: PW-LT-3).

Potential Impacts: Effects would depend on how BMP and mitigation are implemented. TROA would not affect implementation of this program.

d. Nevada Department of Transportation (NDOT)

NDOT proposes to issue a Stormwater Permit for the Nevada State highway system in the Lake Tahoe basin (CE#: WP-LT-4).

Potential Impacts: BMP may potentially improve the quality of stormwater drainage. TROA would not affect implementation of this program.

e. Stormwater Control Programs in Nevada

The cities of Reno and Sparks, Washoe County, and the Nevada Department of Transportation adopted the Truckee Meadows Stormwater Quality Management Program in December 2001 to control stormwater quality and comply with the Phase 1 NPDES permit. The program addresses point source pollution from stormwater.

Washoe County proposes implementing stormwater pollution controls Phase II, including construction and post-construction BMP, industrial permitting and inspections, monitoring of illicit discharge, and prevention. This program addresses nonpoint source pollution from stormwater (CE#: WQ-TN-1).

Potential Impacts: Stormwater management is anticipated to reduce urban stormwater pollutants to the Truckee River and tributaries in Truckee Meadows. TROA would not affect implementation of this program.

f. Water Treatment Plants

The following water treatment plant actions have been proposed:

- Washoe County proposes to construct two potable water treatment plants to treat water from Galena, Whites, and Thomas Creeks. The total peak capacity would be 9 million gallons per day. Maximum withdrawal in any given year

would be 6,700 acre-feet. This project would treat groundwater that does not currently meet drinking water standards (CE#: WQ-TN-5).

- TMWRF is expanding its treatment capacity to 51.2 million gallons per day to meet planned treatment demand for the region (CE#: WW-TN-1).

- The Pyramid Tribe is planning to develop a consolidated wastewater system for Nixon (CE#: WW-TN-6).

- Washoe County and the Pyramid Tribe propose to construct a wastewater treatment plant and sewer collection system to serve both private and Tribal areas of Wadsworth, Nevada. (CE#: WW-TN-3)

Potential Impacts: These activities may potentially improve river water quality. TROA operations could enhance seasonal water quality through management of dedicated Credit Water releases.

g. Washoe County Sewer Interceptor

Washoe County proposes constructing a sewer interceptor to provide service to the Verdi/Lawton area to transport wastewater to TMWRF for treatment (CE#: WW-TN-2).

Potential Impacts: The interceptor would remove septic system discharge to groundwater that eventually reaches the Truckee River and transport this wastewater to existing facilities for treatment. This project could change the timing of flows, which may potentially improve water quality and quantity and reduce nitrogen loading to the Truckee River. TROA operations could enhance seasonal water quality through management of dedicated Credit Water releases.

h. South Truckee Meadows Water Reclamation Facility (STMWRF)

STMWRF project proposes expanding the facility to treat up to 10,000 acre-feet of wastewater a year (CE#: WS-TN-1).

Potential Impacts: This facility does not discharge to the Truckee River. All effluent is derived from sources not subject to return flow requirements of TROA and would be reused for irrigation and industrial purposes. TROA would have no effect on this action.

2. Other Water Quality Improvement Projects

With most point sources having been identified and being addressed under existing programs, future programs are likely to emphasize nonpoint source pollution (e.g., stormwater) control.

a. TRPA

TRPA is implementing the Environmental Improvement Program for erosion control, wetlands restoration, forest health projects, and similar efforts to control algae growth and other factors believed to cause the deterioration of water clarity and overall water quality of the lake (CE#: WP-LT-2).

Potential Impacts: These projects could improve quality of water draining to Lake Tahoe. TROA would not affect the implementation of projects in watersheds tributary to Lake Tahoe.

b. LRWQB

LRWQB identified actions to improve water quality at Squaw Valley. Squaw Valley Ski Corporation will undertake these actions through the year 2011 (CE#: WP-TC-2).

Potential Impacts: These actions could reduce erosion and sediment discharge to Squaw Creek. TROA would not affect the implementation of projects on tributaries to the Truckee River.

c. Idlewild Park, Nevada

The city of Reno proposes to make improvements to the Idlewild Park pond by dredging a channel through the lower pond to improve habitat for fish and installing an aerator for water circulation. The pond drains to the Truckee River (CE#: HR-TN-10).

Potential Impacts: These actions may improve water quality and fish habitat in the pond, but may potentially create a point source for nutrient loading to the Truckee River. TROA would have no direct effect on this action.

d. Ski Resort Runoff Control

Alpine Meadows (CE#: WP-TC-1), Sherwood Cliffs (CE#: SR-LT-2), and Squaw Valley (CE#: WP-TC-2) are retrofitting parking lots for erosion control and stormwater runoff.

Potential Impacts: By controlling erosion and stormwater runoff, these and similar projects may potentially improve water quality in tributaries to the Truckee River. TROA would have no direct effect on this action.

3. TMDL Program

Section 303(d) of the Federal Clean Water Act requires States to undertake specific activities to protect the quality of their rivers, streams, lakes, and estuaries, and to develop and update a list of water bodies that do not meet water quality standards. Section 305(b) requires states to conduct biennial assessments of the Nation's water resources to identify and list those

waters that are not achieving water quality standards. The resulting list is referred to as the 303(d) list. The list provides the States a way to identify problems and develop and implement pollution control plans to protect beneficial uses and attain applicable water quality goals. Section 303(d) requires the development of a pollution control plan called a "Total Maximum Daily Load" or TMDL for each identified water body and associated pollutant.

TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards. It allocates pollutant loadings to point and non-point sources such that standards will be met. Point sources include discharges from waste- water treatment plants, industrial facilities, and some stormwater collection systems. Nonpoint sources include runoff from farms, rangelands, timberlands, and urban areas.
For stream segments and water bodies that are not 303(d)-listed, Federal antidegradation regulations provide that, where degradation of water quality is permitted in exchange for socioeconomic benefits, beneficial uses must still be fully protected.

In California, LRWQCB has local responsibility for developing standards that protect the beneficial uses of water bodies and rivers. Its current 303(d) list can be viewed at <http://www.swrcb.ca.gov/tmdl/docs/2002reg6303dlist.pdf>. LRWQCB identified water quality problems and potential sources of pollutants for the Truckee River and Lake Tahoe hydrologic units. It is in the process of developing a TMDL to assess the water quality problems and sources of pollutant discharges, and to identify pollutant load reductions needed to attain water quality protection goals.

In Nevada, the Truckee River is 303(d)-listed for total phosphorus, total nitrogen, total dissolved solids, and turbidity; NDEP incorporated those TMDLs in the NPDES permit for TMWRF in 1994. As a result of noncompliance with the permit limit for total nitrogen, NDEP issued a Finding of Alleged Violation and Order to TMWRF on November 14, 1997.

Potential Impacts: The increasing population and urban development trend in the Lake Tahoe and Truckee River basin results in more point source and nonpoint source loadings to the Truckee River. As population increases, wastewater treatment plants upgrade to accommodate more wastewater, as required under the NPDES permitting process. Nonpoint source loadings tend to increase due to more nonpermeable surfaces, such as asphalt parking lots, which contain, for example, fluids leaked from automobiles, which are flushed directly into water bodies during storm events. BMP for nonpoint sources tend to be more cost-effective than additional point source reductions. Therefore, some pollution reduction trading among stakeholders is typically proposed to reduce costs. Stormwater BMP tend to be cost effective and desirable as they reduce the "first flush effect" of nutrients and organics from the watershed and may help prevent flooding as well. Many streams in the Lake Tahoe and Truckee River basins are section 303(d)-listed for sedimentation and siltation. Current TRPA regulations have reduced the problems associated with shoreline protection facilities at Lake Tahoe. Stream restoration plans on Snow Creek, Trout Creek, and the Truckee River should reduce sedimentation and erosion in the future. TROA operations could enhance seasonal water quality through management of dedicated Credit Water releases.

4. Truckee River Water Quality Settlement Agreement (WQSA)

WQSA, signed in October 1996, provided for the acquisition of Truckee River water rights and augmentation of the flow of the Truckee River to improve water quality and habitat conditions, increase nutrient assimilative capacity of the Truckee River, and reduce nonpoint source pollutant loading. WQSA calls for acquisition of $24 million of Truckee River water rights, with the Federal government and the local governments each responsible for the expenditure of $12 million. The local governments have initiated their acquisition program and have already purchased more than 2,000 acre-feet of water rights. The analysis completed for the combined case in the WQSA DEIS assumes 12,600 acre-feet of Truckee River water rights are acquired from Truckee Division, 1,500 acre-feet from the Truckee River corridor, and 2,900 acre-feet from Truckee Meadows. To date, nearly 4,200 acre-feet of Truckee Division water rights have been purchased pursuant to WQSA. The water associated with water rights acquired would be stored in upper Truckee River reservoirs when possible and generally released during periods of low flow (June-September) to improve water quality in the lower Truckee River. This action was analyzed in an EIS (BIA, 2002), with a ROD completed in December 2002.

Potential Impacts: Opportunity to store water associated with water rights acquired pursuant to WQSA is currently limited by reservoir operations and so, although such water may flow to Pyramid Lake, there is little opportunity to manage it to achieve the maximum benefits identified in WQSA. Implementation of TROA would allow a greater opportunity to store WQSA water (as Water Quality Credit Water) and manage its release to achieve the maximum benefits identified in WQSA as well as other riverine and riparian benefits that would be promoted by ensuring streamflow along the entire course of the Truckee River.

G. Global Climate Change

Recent research on global climate change indicates that the climate of the western United States may gradually become warmer as the century progresses (Lettenmaier and Gan, 1990; Snyder et al., 2002). Temperature increases could cause less snow and more rain during winter, reducing snowpack that feeds streams during warm months. Also the frequency of hot summer days could increase, thus increasing water demands.

Climate change models, however, do not indicate a measurable climate change for the northern Sierra Nevada (including the Lake Tahoe and Truckee River basins) until well after the end of the period of analysis. Snowpack and streamflows are expected to remain relatively unchanged up to the year 2033. By enhancing coordination and improving reservoir operation efficiencies, TROA would provide opportunities to address potential climate change impacts (CE#: GC-1).

VI. CUMULATIVE EFFECTS ON AFFECTED RESOURCES

In this section, the action categories described and evaluated in section V are evaluated in the context of the effects of TROA on individual resources (summarized from chapter 3).

Individual tables for each affected resource then summarize the cumulative effects of TROA and the other alternatives according to the seven action categories. Finally, a narrative summary presents the potential **cumulative effects** of TROA on each affected resource.

A. Water Resources

As presented in chapter 3, operations under TROA generally would increase the amount of water in storage in Truckee River reservoirs through the establishment of Credit Water; Credit Water establishment generally would reduce Truckee River flows during the higher runoff months for release during the lower flow months, although Credit Water could be released when requested consistent with the provisions of TROA. TROA would not create new water resources or water rights.

1. Comparison of Alternatives by Action Category

Table 4.2 summarizes the potential cumulative effects of TROA and the other alternatives on water resources according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

Table 4.2.—Cumulative effects on water resources by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	The current planned rate and pattern of urban and land development is expected to continue until the water demands and population levels associated with the year 2033 are achieved. Demographic or planning changes could alter the current water use rate; such changes would either hasten or delay the time of achievement of those demand levels. Expansion of non-permeable surfaces would reduce groundwater recharge potential in and increase stormwater runoff from developing urban areas.	Same as under No Action.	Same as under No Action.
Water rights acquisitions and transfers	Because the interstate allocation of Lake Tahoe and upper Truckee River basin water as provided in P.L. 101-618 would not be effective, there would be no interstate rules or supply limitations governing the issuance of water rights by California and Nevada. This could lead to priority conflicts between water users in the two States. If California water consumption increased above the P.L. 101-618 limits effective with TROA, commensurate increases in water shortages could occur in Nevada, which would be felt most keenly by the lower Truckee River, Pyramid Lake, Newlands Project,	Same as under No Actionfor interstate allocation and disposition of *Orr Ditch* water rights.	The interstate allocation would be in place, thereby limiting the amount of water from the Lake Tahoe and Truckee River basins for which California and Nevada could issue usage rights. Disposition of *Orr Ditch* water rights would be similar to that under No Action. Adverse downstream effects from exceeding the limits, as described under No Action, would be avoided.

Table 4.2.—Cumulative effects on water resources by action category and alternative

Action Category	No Action	LWSA	TROA
	and Lahontan Valley wetlands, which tend to have more junior water rights than Truckee Meadows; drought conditions in Truckee Meadows also could be exacerbated. Existing *Orr Ditch* agricultural water rights would continue to be acquired and transferred to urban areas for M&I use. The Truckee River would continue to be fully appropriated.		
M&I water	Demographic or planning changes could alter the current water use rate; such changes would either hasten or delay the time of achievement of M&I demand associated with the year 2033. Surface water and groundwater supplies would continue to be used to varying degrees depending on developing water use trends; the combination of measures would be the cumulative but unknown effect. Development rates may be higher or lower, and, thus, demands may be achieved earlier or later than 2033. Once M&I demands for the various population centers exceed the projected year 2033 levels, additional water supplies (e.g, pumping and recharging local aquifers, importing surface and groundwater, converting agricultural water rights to M&I use, pumping Sparks Marina Lake, and/or increased water conservation) would be required.	Same as under No Action.	Demographic and planning variables related to M&I demand would be the same as under No Action. Measures to supply M&I water up to the year 2033 demand levels would be implemented as specified in TROA. Additional water supplies to satisfy M&I demands or increased water conservation once demands exceed the projected year 2033 levels would be required and developed from available sources.
Ecosystem restoration	Ecosystem restoration projects could change the morphology of the river channel, providing deeper pools and narrower channels than currently exist, which would reduce evaporation. Restoration of riparian vegetation may increase consumptive use of river water; this could be offset in part by cooler temperatures associated with additional shading.	Same as under No Action.	Generally the same as under No Action.
Flood control	Continuation of existing flood control criteria would not affect water resources in the Truckee River basin; implementation of planned or potential flood control measures could have an effect but to an unknown degree.	Same as under No Action.	Same as under No Action.

Table 4.2.—Cumulative effects on water resources by action category and alternative

Action Category	No Action	LWSA	TROA
Water quality	Waste and stormwater discharge permits would not affect water supply. Any potential land application for treated wastewater would require purchasing water rights to offset the surface water portion of potential loss.	Same as under No Action.	Same as under No Action.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

2. Potential Cumulative Effects of TROA

The availability of water resources in the study area is determined to a great degree by the vagaries of weather. TROA would have no significant cumulative effect on water resources in the study area because no new water rights or water resources would be created, and procedures for the exercise of existing water rights (and for storage and release of related Credit Waters) using available water resources (storage and unregulated flow) would be specified in TROA. The pattern for the exercise of water rights to create and release Credit Waters would likely be the same under any future scenario, although the amount could vary depending on the intended benefits to be achieved for the respective Credit Waters.

B. Groundwater

As presented in chapter 3, Article 10 of TROA would include criteria for wells drilled in the Truckee River basin in California to minimize short-term reductions of surface streamflows, and a likely scenario for groundwater pumping in Truckee Meadows is identified. Because TROA would affect only the timing of storage and release of Truckee River flows but not the quantity, it would only have minor effects (either beneficial or adverse) on groundwater recharge in the study area.

1. Comparison of Alternatives by Action Category

Table 4.3 summarizes the cumulative effects of TROA and the other alternatives on groundwater according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

Table 4.3.—Analysis of effects on groundwater by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	Urban development in former agricultural areas could decrease infiltration of surface water into the aquifer, depending on the extent of non-permeable surfaces (e.g, paving) and lawn watering. Reduced flow in or closure of canals could also reduce recharge potential.	Same as under No Action.	Same as under No Action.
Water rights acquisitions and transfers	Absent interstate rules or supply limitations governing the issuance of water rights by California and Nevada, additional use of Lake Tahoe and upper Truckee River basin water could reduce Truckee River supply currently available for diversion to canals; this could reduce seepage losses that contribute to groundwater recharge.	Same as under No Action.	The interstate allocation would limit upper basin diversions to those analyzed in chapter 3 and avoid further impact.
M&I water	Use of groundwater beyond that assumed for the future condition could lower local water tables. Streams with nearby wells that are in the shallow alluvial aquifers could have greater stream seepage loss.	Similar to No Action with slightly more groundwater use in dry years and with additional aquifer recharge component.	Same as under No Action.
Ecosystem restoration	Restoration of deep-rooted riparian vegetation may increase consumptive use of groundwater; this could be offset in part by cooler temperatures and reduced evaporation associated with additional shading.	Same as under No Action.	Same as under No Action.
Flood control	Flood attenuation projects could enhance opportunities for groundwater recharge by increasing infiltration.	Same as under No Action.	Same as under No Action.
Water quality	Replacing septic systems with wastewater treatment could slightly decrease groundwater infiltration and slightly improve groundwater quality. Land application of treated wastewater could promote groundwater recharge.	Same as under No Action.	Same as under No Action.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

2. Potential Cumulative Effects of TROA

TROA would not implement or affect any current or proposed groundwater development or management plan; it would, however, through implementation of the interstate allocation,

and the provisions of Article 10 of TROA, condition groundwater development and limit upper basin diversions.

C. Water Quality

As presented in chapter 3, TROA would have no significant adverse effect on achievement of California water quality standards for the Truckee River from Lake Tahoe to Reno (with specific reference to operations of the Tahoe-Truckee Sanitation Agency wastewater treatment facility) with the major benefit to water quality occurring during dry years. Also, TROA would have no significant effect on achievement of Nevada water quality standards for the Truckee River from Reno to Pyramid Lake (with specific reference to operations of the Truckee Meadows Wastewater Reclamation Facility) with the major benefit to water quality in dry years.

1. Comparison of Alternatives by Action Category

Table 4.4 summarizes the cumulative effects of TROA and the other alternatives on water quality according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

2. Potential Cumulative Effects of TROA

Water quality in the Truckee River is largely affected by high runoff events that suspend sediments and associated salts and nutrients—events that would not be influenced by reservoir operations pursuant to TROA—and by point and nonpoint discharges, particularly in median or dry conditions. Water quality is increasingly affected by urban development, such as construction of impermeable surfaces, leakage of fluids from vehicles, and increased storm and wastewater treatment plant discharges. TROA would not affect the amount of storm or wastewater treated by a facility, degree of treatment, or quality of (or constituent loading by) its discharge. Water quality standards (e.g., TMDL) are established to protect current and planned future uses of water bodies, and are predicated on likely future flow regimes to provide adequate dilution for components of permitted discharges. Such standards are reviewed regularly to respond to changing social values and environmental conditions and to ensure that recognized beneficial uses are protected.

Generally, establishment of Credit Water in Truckee River reservoirs would reduce Truckee River flow associated with Floriston Rates; this would be most likely to occur from late winter to late spring or early summer. Such a reduction in conjunction with increased wastewater discharges in the California portion of the basin (from TTSA, for example) could cause concentrations of water quality constituents of concern to violate standards in certain months. Credit water releases during the lower flow months (late summer and early fall) would provide a source of dilution water and increase the likelihood that water quality standards would be met at those times; most Credit Water releases would flow to Nevada and a large portion would flow to Pyramid Lake. In addition to providing dilution for TTSA discharges, such water would also dilute the discharge from TMWRF. TROA would contain

Table 4.4.—Analysis of effects on water quality by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	Point and nonpoint sources of pollution would generally increase as population increases. Effects would depend on location of development and extent of management and treatment of flows.	Same as under No Action.	Trend of increase in discharges with population increase would continue. Opportunity would exist to manage streamflows to achieve standards more often in dry conditions.
Water rights acquisitions and transfers	Effects on water quality would depend on timing, amount, and location of additional diversions in the upper Truckee River basin.	Same as under No Action.	Additional diversion would be avoided by the interstate allocation; TROA operations could enhance seasonal water quality through management of dedicated Credit Water releases.
M&I water	Wastewater volumes or loadings in excess of the planned capacity of treatment plants would require upgrading or expansion of existing facilities or construction of additional facilities.	Same as under No Action.	Similiar to No Action, except certain Credit Waters under TROA would allow flexibility to manage streamflows to enhance Truckee River water quality.
Ecosystem restoration	Restoration projects could reduce local water temperature, increase dissolved oxygen, and reduce nutrients and sediment transport.	Same as under No Action.	Similar to No Action, except additional benefits could accrue from use of LVPLFWF and habitat restoration fund.
Flood control	BMP would attenuate nutrient, organic, and pollutant loading in the Truckee River basin.	Same as under No Action.	Same as under No Action.
Water quality	Expansion/improvement of wastewater treatment facilities and effective discharge permit system could assist in meeting water quality standards.	Same as under No Action.	Similar to No Action, except management of dedicated Credit Water releases could further improve water quality.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

provisions to maintain specified minimum flows in the Truckee River downstream from Truckee Meadows and Derby Diversion Dam. In addition, release of Credit Water dedicated for water quality purposes (pursuant to WQSA) in the lower Truckee River could not be diverted (and, thus, it would flow all the way to Pyramid Lake) and so would provide dilution for discharges all the way from the point of release. Also, there is a potential for Credit Water dedicated for Pyramid Lake fishes to be released consistent with recovery and habitat restoration plans to provide an additional water quality benefit.

Establishment of water quality standards and implementation of water treatment measures would be beyond the purview of TROA. Because of the capacity of TROA for flexible water management and requirements for certain minimum flows for the purpose of water quality, and the opportunities for water rights owners and water managers to coordinate releases of Credit Waters to provide multiple instream benefits, TROA, in conjunction with identified future actions relative to treatment facilities, could affect seasonal flows but would not have a significant effect on water quality in the study area. Water quality would be protected to the extent that TROA operations and dedicated Credit Water allow. Future reviews of water

quality standards could identify a need for more or less stringent standards which could require different water management strategies. The flexibilities included in TROA would provide water managers additional opportunities to modify flows to implement those strategies. Development and implementation of advanced water treatment technologies could also improve the quality or reduce the loading from storm and wastewater treatment facilities and further enhance the water management flexibility of TROA.

D. Sedimentation and Erosion

As presented in chapter 3, TROA would have no significant effect on erosion and resulting sedimentation in the study area; reservoir storage and streamflows would occur within the ranges of current operations. Erosion resulting from urban development would not be related to TROA. Erosion and sedimentation at Lake Tahoe likely would be less under TROA than No Action.

1. Comparison of Alternatives by Action Category

Table 4.5 summarizes the cumulative effects of TROA and the other alternatives on sedimentation and erosion according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

Table 4.5.—Analysis of effects on sedimentation and erosion by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	There is a potential for increased erosion and resulting sedimentation due to land disturbance and alteration of local stormwater runoff. Effects would depend on location and extent of development as well as efficacy of river restoration projects.	Same as under No Action.	Same as under No Action.
Water rights acquisitions and transfers	Diversion of water to use would not affect dynamics of erosion and sedimentation.	Same as under No Action.	Same as under No Action.
M&I water	Reduction of agricultural return flows would reduce sedimentation and turbidity.	Same as under No Action.	Same as under No Action.
Ecosystem restoration	Restoration projects could reduce erosion and sediment transport throughout the basin.	Same as under No Action.	Similar to No Action, except additional benefits could accrue from use of LVPLFWF and habitat restoration fund.
Flood control	COE flood control and restoration projects on the Truckee River could reduce erosion and sedimentation.	Same as under No Action.	Same as under No Action.
Water quality	California and Nevada's plans to implement section 303(d) of the Clean Water Act could reduce sediment and erosion in the Truckee River basin. Implementation of waste and	Same as under No Action.	Same as under No Action.

Table 4.5.—Analysis of effects on sedimentation and erosion by action category and alternative

Action Category	No Action	LWSA	TROA
	stormwater discharge plans for Truckee Meadows would reduce stormwater flows and thereby reduce erosion.		
Climate	No cumulative effects from climate change are identified for the foreseeable future.	No additional effect.	No additional effect.

2. Potential Cumulative Effects of TROA

No additional effects relative to erosion and water management were identified and so no significant cumulative effects would be anticipated. Indirect benefits of TROA relative to erosion and sedimentation could accrue as a result of riverine and riparian habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected.

E. Fish

As presented in chapter 3, TROA would have no significant adverse effect on brown or rainbow trout in the study area, and would have beneficial effects relative to preferred flows for those species and would reduce the likelihood of flushing or stranding flows in certain stream reaches. (Pyramid Lake fishes are addressed under "Special Status Species.")

1. Comparison of Alternatives by Action Category

Table 4.6 summarizes the cumulative effects of TROA and the other alternatives on fish according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

2. Potential Cumulative Effects of TROA

TROA would not affect any current or proposed fishery management plan and would have no adverse cumulative effect on fish or fishery resources in the study area. No additional effects relative to fish or fishery management were identified and so no significant cumulative effects would be anticipated. Indirect benefits of TROA relative to fish and fishery resources could accrue as a result of riverine and riparian habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected. TROA could also facilitate implementation of revised flow regimes for fish and fishery resources to the extent that Credit Water is available for that purpose.

Table 4.6.—Analysis of effects on fish by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	Effects would be related directly to impacts on habitat-related resources such as streamflow, water quality, sedimentation, and riparian canopy, and inversely related to recreation	Same as under No Action.	Same as under No Action.
Water rights acquisitions and transfers	Effects on fish would depend on timing, amount, and location of additional diversions in the upper basin.	Same as under No Action.	Similar to No Action.
M&I water	If M&I demands exceed projected amounts, lower streamflows could adversely affect fish populations.	Same as under No Action.	Similar to No Action, except TROA could enhance seasonal fish habitat through management of dedicated Credit Water releases.
Ecosystem restoration	Restoration projects could enhance fish habitat throughout the basin, particularly in the Truckee River from Truckee Meadows to Pyramid Lake.	Same as under No Action.	Similar to No Action, except additional benefits could accrue from use of LVPLFWF and habitat restoration fund, and from management of dedicated Credit Water releases (e.g., ramping of lower river flows to enhance cottonwood survival).
Flood control	Flood control could have little effect or could provide substantial benefits downstream from Reno if the emphasis is on ecosystem restoration.	Same as under No Action.	Same as under No Action.
Water quality	Reduction in loading to streams could enhance habitat conditions.	Same as under No Action.	TROA operations could enhance seasonal fish habitat through management of dedicated Credit Water releases.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

F. Waterfowl and Shorebirds

As presented in chapter 3, TROA would have no significant adverse effect on waterfowl or shorebirds in the study area.

1. Comparison of Alternatives by Action Category

Table 4.7 summarizes the cumulative effects of TROA and the other alternatives on waterfowl and shorebirds according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

Table 4.7.—Analysis of effects on waterfowl and shorebirds by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	Effects would be related directly to habitat-related resources such as streamflow, storage, water quality, and riparian canopy, and inversely related to recreation	Same as under No Action.	Same as under No Action.
Water rights acquisitions and transfers	Reservoir storage and related waterfowl habitat would not be affected.	Same as under No Action.	TROA operations would likely maintain greater storage in reservoirs than under No Action.
M&I water	Effects on waterfowl and shorebirds would depend on changes in volume and timing of reservoir storage and releases.	Same as under No Action.	Same as under No Action.
Ecosystem restoration	Benefits would accrue from projects dedicated to wetlands restoration.	Same as under No Action.	Same as under No Action.
Flood control	Some benefits could accrue from flood attenuation projects that promote wetlands.	Same as under No Action.	Same as under No Action.
Water quality	Reduction in loading to impoundments could enhance habitat conditions.	Same as under No Action.	Same as under No Action.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

2. Potential Cumulative Effects of TROA

TROA would not affect any current or proposed waterfowl or shorebird management plan and would have no cumulative effect on those resources in the study area. No additional effects relative to waterfowl or shorebird management were identified and so no significant cumulative effects would be anticipated. Indirect benefits of TROA relative to waterfowl or shorebird resources could accrue as a result of habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected.

G. Riparian Habitat and Riparian-Associated Wildlife

As presented in chapter 3, TROA would have no significant effect on riparian habitat and riparian-associated wildlife in the study area. TROA generally would provide benefits to these resources along reaches of the Truckee River, particularly in dry and extremely dry hydrologic conditions.

1. Comparison of Alternatives by Action Category

Table 4.8 summarizes the cumulative effects of TROA and the other alternatives on riparian habitat and riparian-associated wildlife according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

Table 4.8.—Analysis of effects on riparian habitat and riparian-associated wildlife by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	As riparian habitats within Truckee Meadows and Truckee urban areas have already been substantially affected, future degradation would be limited. Additional loss of riparian habitats along tributaries would be possible if not mitigated.	Same as under No Action.	Same as under No Action.
Water rights acquisitions and transfers	Effects on riparian habitat would depend on timing, amount, and location of additional diversions in the upper basin.	Same as under No Action.	TROA operations could enhance habitat conditions through management of dedicated Credit Water releases.
M&I water	If M&I demands exceed projected amounts, effects on riparian habitats and associated species along upstream reaches of Truckee River likely would be adverse.	Same as under No Action.	Similar to No Action, except TROA operations could enhance habitat conditions through management of dedicated Credit Water releases.
Ecosystem restoration	Restoration projects could enhance riparian habitat throughout the basin, particularly in the Truckee River from Truckee Meadows to Pyramid Lake.	Same as under No Action.	Similar to No Action, except additional benefits could accrue from use of LVPLFWF and habitat restoration fund, and from management of dedicated Credit Water releases (e.g., ramping of lower river flows to enhance cottonwood survival).
Flood control	Flood control could have little effect or could provide substantial benefits downstream from Reno if the emphasis is on ecosystem restoration.	Same as under No Action.	Same as under No Action.
Water quality	Reduction in loading to streams could enhance habitat conditions.	Same as under No Action.	Same as under No Action.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

2. Potential Cumulative Effects of TROA

TROA would have no significant adverse effect on riparian habitat and associated species and would directly benefit those resources in the study area. Cumulative effects of TROA relative to riparian habitat and associated species also would likely be beneficial as a result of habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected.

H. Special Status Species

As presented in chapter 3, TROA would have no significant adverse effect on special status species in the study area. In particular, TROA would generally provide benefits to cui-ui in the lower Truckee River and Pyramid Lake and LCT in the Truckee River by providing additional inflow to Pyramid Lake and improving riparian and riverine habitat in and along the river, particularly in dry and extremely dry hydrologic conditions. The extent of Tahoe yellow cress habitat would be about the same under TROA as under No Action. Effects on other wildlife and plant species would be as described for other biological resources.

1. Comparison of Alternatives by Action Category

Table 4.9 summarizes the cumulative effects of TROA and the other alternatives on special status species according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

Table 4.9.—Analysis of effects on special status species by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	Magnitude of adverse effects would depend on the extent and location of development activities.	Same as under No Action.	Same as under No Action.
Water rights acquisitions and transfers	Effects on special status species would depend on timing, amount, and location of additional diversions in the upper basin.	Same as under No Action.	TROA operations could enhance habitat through management of dedicated credit water releases.
M&I water	If M&I demands exceed projected amounts, effects on special status species along upstream reaches of Truckee River likely would be adverse.	Same as under No Action.	TROA would provide better assurance of meeting water needs, and operations could enhance habitat through management of dedicated Credit Water releases.
Ecosystem restoration	Restoration projects could enhance special status species throughout the basin, particularly in the Truckee River from Truckee Meadows to Pyramid Lake.	Same as under No Action.	Similar to No Action, except additional benefits could accrue from use of LVPLFWF and habitat restoration fund, and from management of dedicated Credit Water releases (e.g., ramping of lower river flows to enhance cottonwood survival).
Flood control	Flood control could have little effect or could provide substantial benefits downstream from Reno if the emphasis is on ecosystem restoration.	Same as under No Action.	Same as under No Action.
Water quality	Reduction in loading to water bodies could enhance habitat conditions.	Same as under No Action.	Same as under No Action.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

2. Potential Cumulative Effects of TROA

TROA would have no significant adverse effect on special status species and would directly benefit those resources in the study area. Cumulative effects of TROA relative to riverine and riparian habitat and associated species would also likely be beneficial as a result of habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected. Projects that improved habitat conditions in and provided additional water to the lower Truckee River and Pyramid Lake would provide direct benefits for the conservation of Pyramid Lake fishes.

I. Cumulative Effects on Recreation by Alternative

As presented in chapter 3, TROA would have no significant adverse effect on recreation in the study area.

1. Comparison of Alternatives by Action Category

Table 4.10 summarizes the cumulative effects of TROA and the other alternatives on recreation according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

2. Potential Cumulative Effects

TROA would not affect any current or proposed recreation management plan and would have no direct cumulative effect on recreation in the study area. No additional effects relative to fish or fishery management were identified and so no significant cumulative effects would be anticipated. Indirect benefits of TROA relative to recreation could accrue as a result of riverine and riparian habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected.

J. Cumulative Effects on Economic Environment by Alternative

As presented in chapter 3, TROA would have no significant adverse effect on the economic environment in the study area. Any reduction in hydropower revenues would be compensated pursuant to provisions of TROA.

Table 4.10.—Analysis of effects on recreation by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	Expanding populations and urban areas would restrict access to recreation sites and increase crowding and competition for the local resources; quality of the recreation experience would depend, in part, on resource management agencies.	Same as under No Action.	Recreational pool requirements in TROA, enhancement of minimum streamflows (releases), and the use of dedicated resource Credit Water could help meet some of the increased demands for recreation as the population increases, particularly in dry hydrologic conditions.
Water rights acquisitions and transfers	Effects on recreation would depend on timing, amount, and location of additional diversions in the upper basin.	Same as under No Action.	TROA operations would maintain greater upstream reservoir storage and enhance streamflows through minimum flows and management of Credit Water releases. Effects on Lahontan Reservoir would be minimal.
M&I water	Effects on recreation would depend on activity, location, season, and demographic trends.	Same as under No Action.	Same as under No Action.
Ecosystem restoration	Beneficial effects could accrue from additional areas for angling and river boating access, and enhanced fish habitat could enhance the angling experience.	Same as under No Action.	Implementation of additional projects using LVPLFWF and habitat restoration fund and management of dedicated Credit Water releases could provide additional benefits.
Flood control	Flood control projects could be developed to provide recreation opportunities, access, and facilities.	Same as under No Action.	Same as under No Action.
Water quality	Several projects in the study area could improve river water quality and, thus, enhance the quality of the recreation experience.	Same as under No Action.	Similar to No Action, except management of dedicated Credit Water releases could further enhance reservoir and stream-based recreation.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

1. Comparison of Alternatives by Action Category

Table 4.11 summarizes the cumulative effects of TROA and the other alternatives on the economic environment considered together with the actions previously identified according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

2. Potential Cumulative Effects of TROA

TROA would have no direct cumulative effect on the economic environment in the study area. While indirect benefits of TROA as identified in the recreation section could enhance local economies, no significant cumulative effects would be anticipated.

Table 4.11.—Analysis of effects on the economic environment by alternative and action category

Action Category	No Action	LWSA	TROA
Urban development and land use	Local economies and urban development likely would respond to regional economic and demographic trends.	Same as under No Action.	Same as under No Action.
Water rights acquisitions and transfers	No additional impacts would be expected because of the assumed demographic trend.	Same as under No Action.	Same as under No Action.
M&I water	No additional impacts would be expected because of the assumed demographic trend.	Same as under No Action.	Same as under No Action.
Ecosystem restoration	Local economies would benefit to the extent that recreation is enhanced.	Same as under No Action.	Same as under No Action.
Flood control	Benefits could accrue from avoidance of property damage or loss.	Same as under No Action.	Same as under No Action.
Water quality	Water quality projects could incrementally aid the regional economy by reducing costs of environmental improvement projects and promoting recreation.	Same as under No Action.	Same as under No Action.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

K. Cumulative Effects on Social Environment by Alternative

As presented in chapter 3, TROA would have no significant adverse effect on the social environment in the study area. Trends in water use changes, M&I demands, and urban development are projected to reflect the trend of population increase. TROA would not promote population growth, but would provide a more secure M&I drought supply than the other alternatives.

1. Comparison of Alternatives by Action Category

Table 4.12 summarizes the cumulative effects of TROA and the other alternatives on the social environment according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

2. Potential Cumulative Effects of TROA

As presented in chapter 3, TROA would have no direct cumulative effect on the social environment in the study area. Indirect benefits of TROA as identified in the riparian habitat section could enhance the aesthetic qualities of the study area, and no significant cumulative effects would be anticipated.

Table 4.12.—Analysis of effects on the social environment by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	Regional and local plans would be designed to accommodate projected increase in population.	Same as under No Action.	Similar to No Action, except TROA would provide a more secure drought supply for Truckee Meadows.
Water rights acquisitions and transfers	Regional and local plans would be designed to accommodate projected increase in population.	Same as under No Action.	Same as under No Action.
M&I water	M&I water demand is based on projected population.	Same as under No Action.	Same as under No Action.
Ecosystem restoration	Aesthetic appeal of stream reaches could be enhanced, but to an unmeasurable degree.	Same as under No Action.	Implementation of additional projects using LVPLFWF and habitat restoration fund could further enhance the aesthetic appeal of the Truckee River.
Flood control	Measures could enhance aesthetic appeal and provide a sense of public safety.	Same as under No Action.	Same as under No Action.
Water quality	Aesthetic appeal of stream reaches could be enhanced.	Same as under No Action.	Management of dedicated Credit Water releases could further enhance water quality, particularly during the summer.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

L. Cultural Resources

As presented in chapter 3, TROA would have no significant adverse effect on cultural resources in the study area.

1. Comparison of Alternatives by Action Category

Table 4.13 summarizes the cumulative effects of TROA and the other alternatives on cultural resources according to action category. The qualitative analysis is based on the analysis of indicators and effects discussed in chapter 3.

2. Potential Cumulative Effects of TROA

As presented in chapter 3, TROA would have no direct cumulative effect on cultural resources in the study area. Indirect benefits of TROA as identified in the riparian habitat section could stabilize stream banks in the study area and help protect cultural resources, and no significant cumulative effects would be anticipated.

Table 4.13.—Analysis of effects on cultural resources by action category and alternative

Action Category	No Action	LWSA	TROA
Urban development and land use	Most known cultural resources have either been mitigated and protected in urban areas or are distant from areas designated for development. If National Register of Historic Places (NRHP) properties or NRHP-eligible properties would be threatened by any proposed development, the responsible entities—governmental or private—must consult with the State Historic Preservation Office (SHPO) to negotiate protective measures.	Same as under No Action.	Same as under No Action.
Water rights acquisitions and transfers	Acquisitions, transfers, or exercise of water rights would not affect cultural resources.	Same as under No Action.	Same as under No Action.
M&I water	No direct effects to known or unknown cultural resources have been identified.	Same as under No Action.	Same as under No Action.
Ecosystem restoration	Effects would occur if any proposed restoration action(s) would threaten known or unknown cultural resources.	Same as under No Action.	Same as under No Action.
Flood control	Potential actions could expose or submerge resources, but to an unknown degree.	Same as under No Action.	Same as under No Action.
Water quality	No cumulative effects are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.
Climate	No cumulative effects from climate change are identified for the foreseeable future.	Same as under No Action.	Same as under No Action.

M. Indian Trust Resources

TROA would have no significant adverse effect on Indian trust resources, particularly with respect to biological resources in the lower Truckee River and Pyramid Lake, i.e., Pyramid Lake fishes and riparian habitat and associated species, and would directly benefit those resources in the study area. TROA would have no effect on water rights on Fallon Indian Reservation. Cumulative effects of TROA relative to Indian trust resources also would likely be beneficial as a result of habitat improvement projects that could be implemented at a future time using the habitat restoration fund provided for in TROA or using LVPLFWF; the extent of benefits would depend on the types and success of projects selected.

VII. CONCLUSION

TROA would allow parties to exercise water rights for their respective benefits individually while still in a prescribed, regulated, coordinated, and collaborative manner. The fact that substantial operational latitude is provided in the exercise of existing water rights would

allow opportunity to tailor operations to maximize (or at least enhance) benefits for specified resources. By creating credit storage and using existing facilities much more flexibly, TROA would allow opportunity to plan (i.e., store water) for future situations. By not constructing facilities, only providing operational flexibility, TROA would not preclude future (and technologically more advanced) measures to provide additional water or improve water quality from being implemented. TROA also would allow opportunity to enhance benefits for economic, social, biological, and trust resources in the study area which previously had no water rights or had water rights of junior priority. Establishment of the habitat restoration fund (firm amount) and opportunity to add measurably to LVPLFWF (variable amount) could assist in restoring, enhancing, and protecting environmental values and processes long affected by more narrowly focused operations. As no significant adverse cumulative effects have been identified for the implementation of TROA within the context of the Draft Agreement and TROA would have beneficial effects on resources in the study area, no mitigation would be necessary and none is proposed.