Truckee River Operating Agreement

Basis for the 2018 California Guidelines for Truckee River Reservoir Operations

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Truckee River Operating Agreement

BASIS for the 2018 CALIFORNIA GUIDELINES for TRUCKEE RIVER RESERVOIR OPERATIONS

This informational document was prepared for use by the Truckee River Operating Agreement Administrator and all signatory parties to that Agreement pursuant to Public Law 101-618 and the Truckee River Operating Agreement (TROA)

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Part 5 — Appendix:

Acronyms and Abbreviations

ACEcaCred	Additional California Environmental Credit Water
BRMP	Biological Resources Monitoring Plan
CADSWES	Center for Advanced Decision Support for Water and Environmental Systems
CDEC	California Data Exchange Center
CDFW	California Department of Fish and Wildlife
CEcaCred	California Environmental Credit Water
cfs	cubic feet per second
CMICred	California M&I Water
DO	dissolved oxygen
DWR	California Department of Water Resources
EC	electrical conductivity
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
Guidelines	California Guidelines (used interchangably)
IWM	Integrated Water Management
JPFCW	Joint Program Fish Credit Water
LCT	Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*)
LRWQCB	Lahontan Regional Water Quality Control Board
M&I	municipal and industrial
NRCS	Natural Resources and Conservation Service
PL	Public Law
PLPT	Pyramid Lake Paiute Tribe
SNYLF	Sierra Nevada yellow-legged frog
TMDL	Total Maximum Daily Load
TMWA	Truckee Meadows Water Authority
TRBWG	Truckee River Basin Water Group
TROA	Truckee River Operating Agreement
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
WQMR	Water Quality Monitoring Report

Foreword

The United States Congress enacted Public Law (PL) 101-618, the Truckee-Carson-Pyramid Lake Water Rights Settlement Act, in 1990 as a Congressional apportionment of Truckee River waters among all water interests. Among other conditions, this act required that a new Truckee River Operating Agreement (TROA) be implemented before the provisions for the interstate allocations of PL 101-618 could take effect. TROA was conditionally approved in 2008; however, implementation was delayed pending resolution of all remaining conditions. TROA was officially implemented in December of 2015. The "Scheduling Parties" defined under TROA include the TROA Administrator; the federal Water Master; the U.S Department of the Interior; the Truckee Meadows Water Authority (TMWA); the Pyramid Lake Paiute Tribe (PLPT); the local governments of Reno, Sparks, Fernley, and Washoe County; and the State of California.

As California continues to plan and manage its water resources for sustainability, it is acknowledged that all water resources are interconnected. The governor's five-year California Water Action Plan, originally released in January 2014, describes this broader view of what is needed to meet the demands of the future. It spells out the challenges and the decisive actions required to put California on the path to more sustainable water resources, such as making conservation a way of life, ensuring that each region within the state does all it can to put its own water resources to efficient use, protecting and restoring important ecosystems, and expanding water storage capacity. PL 101-618 and TROA support several priority actions contained within the California Water Action Plan, such as Action 6, "Expand Water Storage Capacity and Improve Groundwater Management." PL 101-618 and TROA also support Action 4, as it improves fisheries by increasing and sustaining in-stream flows and implementing habitat restoration projects. Action 5 is also advanced under TROA by allowing the use of stored water for enhanced in-stream flows and providing emergency drought storage during dry periods.

These guidelines are consistent with existing environmental objectives aimed at improving the habitat of the threatened Lahontan cutthroat trout under the federal Endangered Species Act of 1973, as more specifically reflected in the Lahontan Cutthroat Trout Recovery Plan issued by the United States Fish and Wildlife Service in 1995, and the Short Term Action Plan for the Lahontan cutthroat trout in the Truckee River Basin, issued by the USFWS's Truckee River Basin Recovery Implementation Team in 2003. These guidelines similarly advance the goal of protecting beneficial aquatic life in the mainstem of the Truckee River under Section 303(d) of the federal Water Pollution Control Act, as more specifically reflected in Section 4.13 of the current Water Quality Control Plan for the Lahontan region, issued by the California Regional Water Quality Control Board, Lahontan Region.

In accordance with its responsibilities over interstate matters under California Water Code Section 123, the California Department of Water Resources (DWR) is the designated State agency responsible for performing the State's responsibilities under PL 101-618 and TROA, and for representing the State of California's interests in the interstate water management efforts, including those related to the Lake Tahoe, Truckee River, and Carson River basins. DWR implements these responsibilities in coordination with the California Department of Fish and Wildlife (CDFW), the State Water Resources Control Board, and other agencies as appropriate. Non-governmental organizations and stakeholders (including property owners) with environmental, recreational, or other interests in the basin are invited to participate, and such groups have regularly offered their insight and suggestions to DWR through local groups such as the Truckee River Basin Water Group (TRBWG).

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Introduction

This booklet, entitled *BASIS for the 2018 CALIFORNIA GUIDELINES FOR TRUCKEE RIVER RESERVOIR OPERATIONS,* was prepared to provide general background and supporting information for the preparation and use of the California Guidelines (or Guidelines), prepared in accordance with the Truckee River Operating Agreement (TROA). This 2018 update contains additional information and supersedes previous versions of this booklet. The 2018 California Guidelines, included in the Appendix of this booklet, indicates the preferred in-stream flows and reservoir level objectives prepared for Calendar Year 2018 (see Part 4, Table A). This booklet provides background and explains the reasons for these Guideline requests for preferred in-stream flows (including preferred flows, and minimum and maximum preferred flows) and preferred minimum reservoir levels for recreation. The 2018 California Guidelines, included in Part 4, will remain in effect until they are superseded by revised requests to the Water Master or replaced by updated information. The Guidelines are based on local environmental and recreational needs, known resource requirements, and anticipated hydrologic conditions. Preferred flow rates and lake levels reflect field observations, stakeholder requests, studies conducted by the California Department of Fish and Wildlife (CDFW) (previously known as the California Department of Fish and Game [CDFG]), and the requirements of other agencies. Maximum preferred channel flows are included in these Guidelines based on generally observed high-flow conditions and their effects. Flow rates higher than the noted maximum rates may cause damage to the existing channel and to aquatic organisms and their habitat. It is understood that the actual hydraulic capacities of individual channels and streams may be higher and may need to be utilized, if deemed necessary by proper authorities. A generous ramping schedule is requested whenever discretionary high flows are determined to be necessary. The minimum flows and enhanced minimum flows, mandated by TROA, are also noted in Table A for reference.

The purpose of this *Basis for the 2018 California Guidelines* booklet is to provide justification and background information to the Water Master, the TROA Scheduling Parties, and other Signatory Parties regarding California's preferred in-stream flows and reservoir conditions throughout the year. Updated California Guidelines, in the form of California TROA Scheduling Requests, are provided to the TROA Administrator and the Scheduling Parties whenever necessary, typically monthly. Therefore, a new or revised scheduling request may be submitted at any time if needs change or as current or forecasted hydrology and watershed conditions require. The current California Guidelines for Reservoir Operations or California TROA Scheduling Request is available upon request of DWR or the Water Master and may be available online as well.

The California Department of Water Resources (DWR), California's designated TROA representative, is responsible for preparing these Guidelines (and/or the California TROA Scheduling Requests) in coordination with CDFW and other State and federal agencies. Local agencies and special interest groups within the Truckee River Basin, including the Truckee River Basin Water Group (TRBWG), also contribute significantly to this effort. The intent, general content, and process for submittal and utilization of the California Guidelines is specifically described in TROA sections 9.F and 11.C.2 (b) (for the convenience of the reader, certain relevant excerpts from TROA have been included in the Appendix of this booklet).

The Guidelines are generally reconsidered and updated monthly (if necessary), and are provided to the TROA Administrator and the Scheduling Parties in order to share information, encourage their

consideration, and to the extent possible, implement the Guidelines in their own annual, monthly, and daily water operations' planning and scheduling.

DWR routinely reviews current weather forecasts, the Daily Water Master Report (http://www.troa.net/), the TROA operations scheduling forecast (provided by the TROA Administrator), and other reports as part of the effort to monitor the performance of the Lake Tahoe and Truckee River Basin watersheds. These reviews serve to confirm the effectiveness of the Guidelines and current monthly operations scheduling requests, or alternatively, may indicate that an update to a scheduling request or to the Guidelines is necessary. TROA forecasts are prepared under the direction of the TROA Administrator and are provided to DWR and the other Scheduling Parties monthly, or as needed. All TROA forecasts, especially those prepared early in the season (January through March), are generally considered preliminary estimates of anticipated future reservoir storage and releases. As the year progresses through the winter snowpack accumulation and spring runoff season, TROA operational forecasts are refined, and the variability generally decreases. Therefore, forecasts become more reliable through the summer season. Snowpack and weather conditions are typically more stable and predictable by April which allows for more reliable TROA operational forecasts to be prepared at that time. For this reason, updated Guidelines for any given year are generally developed after April 15.

Floriston Rates, Drought Status and Season Determination

TROA created two uniquely defined terms that measure drought severity and trigger different TROA provisions. One designation affects California interests directly, while the other may impact voluntary exchanges or drought-supply source opportunities available for meeting California in-stream flow and recreational storage targets. Both designations relate to the required Floriston Rate flows in the Truckee River.

Floriston Rates

Reservoirs in the Truckee River Basin are generally operated to capture and store runoff whenever flow in the river is greater than what is needed to serve downstream water rights in Nevada. Water is allowed to pass through or is released from these reservoirs in order to maintain prescribed streamflow requirements that will accommodate downstream water rights. This quantity of streamflow in the Truckee River is known as the *Floriston Rate*, and is measured at the Farad gage near the California-Nevada state line. Floriston Rates provide water to serve hydroelectric power generation, municipal and industrial (M&I) use in the Truckee Meadows (a large basin area in Nevada encompassing Reno and Sparks), streamflow, and agricultural water rights. Floriston Rates and Reduced Floriston Rates range from 300 cubic feet per second (cfs) to 500 cfs, dependent on the time of year and the corresponding elevation of Lake Tahoe. See Table 1, Floriston Rates, for more information. When the phrase "Floriston Rates" or "Reduced Floriston Rates" is used, it refers to whichever of these flow rates is in effect at the time. During a Water Master-determined "Dry Season" or an annual declaration of a "Drought Situation," there may be insufficient water to meet the required Floriston Rates, and shortages to downstream water rights holders may occur.

Table 1 Floriston Rates

	March 1 – September 31	October 1 – February 28	November 1 – March 31
Floriston Rate	500 cfs	400 cfs	
Reduced Floriston Rate (If Lake Tahoe is between 6226.0 and 6225.25)			350 cfs
Reduced Floriston Rate (If Lake Tahoe is below 6225.25)			300 cfs

While the development of TROA was commissioned to allow for Truckee/Tahoe operations to be more flexible and accommodating, it was prohibited from changing or having any negative effect on the exercise of existing water rights in the Truckee River Basin. Accumulating and releasing Floriston Rate water from Truckee Basin reservoirs to serve these water rights is the foundation of TROA. TROA introduced an alternative means to exercise a water right, which is to forego diversion at the place of use downstream and to store the consumptive use portion of the water right upstream in the reservoirs. This new way to exercise a water right is called *Changed Diversion Rights* or *Credit Water Establishment*. The timing and amount of Floriston Rate water retained in storage as credit water because of the exercise of these voluntary Changed Diversion Rights is dependent on the objectives of the respective water right

holder and the magnitude of the water year. This is important, as TROA provides opportunities for California to establish certain forms of credit water and further provides opportunities for this stored credit water to be exchanged between reservoirs, providing for multi-benefit reservoir operations.

"Drought Situation" Declaration

On April 15, 2018, the Water Master confirmed a Drought Situation will not exist for the period April 2018 – April 2019. Because the Drought Situation status for any given year is based on the watershed conditions and anticipated streamflows throughout the basin on April 15, the anticipated California Guidelines for the following 12 months are generally developed after this declaration is made.

By April 15 of each year, the TROA Administrator determines whether a Drought Situation will exist for the next 12 months. This determination is made when: (1) based on the Natural Resources Conservation Service (NRCS) median forecast for April 1 and/or other relevant forecasts (TROA sections 3.D and 3.E), there will be insufficient Floriston Rate Water to maintain Floriston Rates through October 31, or (2) Lake Tahoe water surface elevation is projected to be below 6223.5 feet on or before November 15.

If a Drought Situation is declared, this annual designation remains in effect until the following April 15. This designation results in different reservoir operations, but is most directly significant to municipal water agencies in TROA. In a Drought Situation, no Municipal and Industrial Credit Water (MICW) is converted to Fish Credit Water and MICW may be released for direct use.

"Normal" or "Dry" Season Determination

While a "Dry Season" determination was in effect during 2016 because of the severe drought, calendar year 2017 was considered "normal" all year long, and 2018 is also anticipated to be considered a "normal" season under TROA. During a "normal" season, TROA specifies higher "enhanced" minimum stream flows provided the additional flow can be exchanged to another reservoir. The minimum flow rates and "normal season" enhanced minimum flow rates for all Truckee River Basin streams are specified within TROA and are noted in Table A for convenience (see Part 4 – Reservoir Operations Tables). The TROA Administrator (currently, the federal Water Master) determines the season type ("Dry" or "Normal") per TROA Section 9.B. In general, this determination depends on both the amount of Floriston Rate Water in storage at that time and the current runoff forecast projected for the coming months of April through July. This determination by the Water Master directly sets the mandated "minimum" stream flow or provides the opportunity for the TROA-specified "enhanced minimum" releases for most Truckee River reservoirs (TROA Section 9.C.2 through 9.C.8), and so it is directly relevant to California's environmental interests.

The California Guidelines

TROA provides the State of California the opportunity to prepare California Guidelines. These Guidelines communicate preferences regarding reservoir operations within the Truckee River Basin, focusing on preferred instream flows, ramping rates, and minimum reservoir levels with respect to the State's environmental and recreational objectives. The State of California, represented by DWR and assisted by CDFW and other State and local agencies and local interest groups, including the Truckee River Basin Water Group (TRBWG), is responsible for the preparation of the Guidelines and their timely submittal to the TROA Administrator and the other Scheduling Parties, often in the form of Monthly California TROA Scheduling Requests. The general content and process for submittal of the California Guidelines (or Scheduling Requests) is described in TROA sections 9.F and 11.C.2(b). Selected excerpts from these sections are included in the Appendix for the convenience of the reader.

Under varying conditions of water availability and anticipated use, there is often more than one option for operating upstream reservoirs to meet operational objectives or requirements successfully. TROA (Section 9.F.2) states that the TROA Administrator shall "encourage" the Scheduling Parties to plan and schedule their operations in accordance with the California Guidelines, and engage in voluntary exchanges and re-storage options to the extent practicable and consistent with the exercise of water rights, assurance of water supplies, operational considerations, the Settlement Act (Public Law 101-618), and TROA. To help California meet its objectives for preferred flows and reservoir levels, it is anticipated that the Scheduling Parties will refer to TROA, the California Guidelines (or alternatively, the monthly California TROA Scheduling Requests), and this booklet. The Scheduling Parties are encouraged to confer directly with designated DWR TROA staff when scheduling their reservoir operations in order to ensure consideration for optimal multi-benefit management of upper Truckee River water resources for environmental, economic, and recreational purposes.

This *Basis for the California Guidelines* booklet is divided into five parts:

Part 1 — Goals and Objectives for Truckee River Reservoir Operations — Rivers and Streams

This section describes California's preferred operational goals and objectives for local streams within the basin. The Guidelines are based on these objectives and take into consideration the current-year projected hydrologic conditions, current reservoir storage and anticipated water use, environmental requirements, and preferred recreation conditions.

Part 2 — Goals and Objectives for Truckee River Reservoir Operations — Lakes and Reservoirs

This section describes California's preferred operational goals and objectives for reservoir storage, which are general in nature and do not usually change from year-to-year. These general objectives have been developed and are described here to provide guidance to the TROA Administrator and other TROA scheduling parties regarding preferred environmental and recreational conditions.

Part 3 — TROA Administration

This section describes California's responsibilities and opportunities under TROA and explains the role of the TROA Administrator.

Part 4 — RESERVOIR OPERATIONS – California Guidelines for 2018

Part 4 includes the California Guidelines (or Guidelines) referenced in TROA. The Guidelines reflected in these tables include California's preferred minimum flow rates, preferred flow rates, and preferred maximum flow rates (see Table A); and California's preferred minimum recreational pool and minimum fish pool lake levels (see Tables B and C). Mandated minimum and "normal season" enhanced minimum in-stream flow rates are defined within TROA and are referenced in Table A for reference.

The California preferred flow rates included herein were updated in April 2018 and are expected to form the general basis for California's 2018 TROA Scheduling Requests, which are presented to the TROA Administrator and to the scheduling parties monthly, or more often if needed. These monthly scheduling requests are available from DWR and may also be available online.

If a California Preferred Flow rate indicated in Table A (or in the latest California TROA Scheduling Request) cannot be provided or maintained for a specific stream, it is requested that the Preferred Minimum Flow rate be maintained as long as possible before reducing to lesser flows (including down to the TROA minimum flow). It is understood that releases may need to be higher under certain circumstances. If releases must exceed the noted Preferred Maximum Flow rate, the Water Master is requested to notify the appropriate public agencies and DWR TROA Staff.

California always requests that reservoir operations be scheduled far enough in advance to avoid rapid fluctuations, major variations, and the need to reduce flows to TROA minimum levels if possible. When fluctuations are required, a generous ramping schedule is always preferred over a sudden change, especially when decreasing flows.

As permitted in TROA, California may amend the Guidelines at any time. California TROA Scheduling Requests are submitted to the Water Master and the Scheduling Parties typically each month. These requests also indicate the latest Guidelines. Amendments or revisions to the Guidelines can be based on: (1) comments and recommendations by the **TROA Administrator** and **Scheduling Parties**, (2) changes in schedules for reservoir operations, or (3) changes in hydrologic conditions. Special requests by local agencies or stakeholders may also lead to changes in the Guidelines or to special scheduling requests.

Part 5 — Appendix

The appendix contains relevant studies and selected references for the convenience of the reader, including:

- Memorandum from California Department of Fish and Wildlife (November 8, 2016).
- Select Responses from Truckee River Basin Stakeholders regarding Preferred Reservoir Operations.
- Select Excerpts from TROA with references to the California Guidelines.
- The 1943 Donner Lake Indenture Agreement.
- Reference Study entitled *Instream Flow Requirements, Truckee River Basin, Lake Tahoe to Nevada (California Department of Fish and Game 1996).*

PART 1

GOALS AND OBJECTIVES FOR TRUCKEE RIVER RESERVOIR OPERATIONS

Rivers and Streams

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1.1 Truckee River Instream Flows and Priorities

The mainstem of the Truckee River is a California Fish and Game Commission-designated Wild Trout Water. The Designated Wild Trout section of the Truckee River is "from confluence with Trout Creek downstream to the Nevada state line (excluding the property owned by the San Francisco Fly Casters Club and Nevada and Sierra counties)." Current Fish and Game Commission policy for designated wild trout waters states: "Habitat protection is of utmost importance for maintenance of wild trout populations. All necessary actions, consistent with State law, shall be taken to prevent adverse impact by land or water development projects affecting designated wild trout waters." Additionally, Fish and Game Code 1726.1(d) states: "Habitat restoration and the protection of cold water ecosystems are both of utmost importance to maintaining healthy wild trout populations, ensuring and promoting angler opportunities, and the sustainability of the inland trout fishery."

The CDFW management goal for the Truckee River Basin is to provide a variety of high-quality recreational angling opportunities while conserving native fishes and other aquatic species. The following objectives support the achievement of this goal:

- Objective 1 — Manage stream flows, reservoir levels, and ramping rates to support quality wild trout fisheries in the Truckee, Little Truckee, and Prosser systems.
- Objective 2 — Manage stream flows, reservoir levels, and ramping rates to support Lahontan cutthroat trout (LCT) restoration and recovery actions and/or LCT populations, should populations become established.
- Objective 3 — Manage stream flows and ramping rates to support populations of the local native fish assemblage.

It is recognized that sustained maintenance of preferred flow conditions is difficult and often infeasible from year-to-year, especially during "Dry Season" and/or "Drought Situation" conditions. The intended goal for California is to maintain reasonably steady flows between the "Minimum Preferred Flows" (or Enhanced Minimum Flows whenever possible) and the "Preferred Flows" shown in "Table A Truckee River Basin — California Preferred Instream Flow Objectives" (see Part 4 — Table A). The preferred flows, noted in Table A, are the target conditions and reflect optimum conditions based on local recreational, economic, and environmental requirements. Understanding that these flows are not always possible or feasible because of existing water rights and demands, it is anticipated that California environmental credit water or Joint Program Fish Credit Water (JPFCW) may be available in future years to assist in meeting at least the California Minimum Preferred Flows and assist in negotiating with other TROA Scheduling Parties for these optimum preferred flows or to sustain at least the preferred minimum flows.

The 1996 CDFG study, *Instream Flow requirements, Truckee River Basin, Lake Tahoe to Nevada (August 1996),* is included in the Appendix. This study is often referenced when considering optimal stream flows for reservoir scheduling requests. Further instream studies are currently being conducted for optimum flows and ramping rates for various Truckee River basin streams, so the preferred instream flow requirements may be updated in the future as justified.

While all streams within the Truckee River Basin are valued by its stakeholders and responsible agencies, current reservoir operations management methods (including those provided by TROA) occasionally provide additional flow opportunities that cannot benefit all streams equally. If this becomes necessary,

the benefiting streams should be reasonably considered and prioritized in the order of current environmental resource value, defined by CDFW as follows:

1. Prosser Creek from Prosser Creek Dam to the Truckee River.
2. Little Truckee River from Stampede Dam to Boca Reservoir.
3. Independence Creek and the Little Truckee River from Independence Lake Dam to Stampede Reservoir.[1]
4. Donner Creek from Donner Lake Dam to the Truckee River.
5. Truckee River below Lake Tahoe.
6. Little Truckee River from Boca Dam to the Truckee River.

1.2 Rationale for Environmental In-Stream Flow Priority Ranking

Prosser Creek below Prosser Dam

Prosser Creek below Prosser Dam meets objectives 1, 2, and 3.

This 1.4-mile-long section of Prosser Creek is a tributary of the Truckee River. It serves as a spawning channel for rainbow trout, brown trout, and native mountain whitefish (*Prosopium williamsoni*); maintains a self-sustaining wild trout population; and provides recruitment to a large section of the mainstem Truckee River. Additionally, during summer months it can provide cold-water refugia for fish within the Truckee River and may reduce Truckee River temperatures below the confluence. When preferred flows from Lake Tahoe cannot be met, an increased volume of water in Prosser Creek will mitigate temperature-related impacts to aquatic biota in the Truckee River below the Prosser Creek confluence, particularly during summer months.

A relatively small volume of appropriately allocated water within this reach will enhance spawning habitat, continue to maintain cold-water refugia, and will sustain the benefits of a restoration project that was completed in 2015. Another objective in this reach is to avoid abrupt flow changes through proper ramping while maintaining the preferred flow to the extent possible.

Little Truckee River between Stampede Dam and Boca Reservoir

This section of the Little Truckee River between Stampede Dam and Boca Reservoir meets objectives 1 and 3. This 5-mile-long reach generally has adequate minimum flows to maintain its fish population. Wild rainbow trout and brown trout occur in this reach, and stocked Lahontan cutthroat trout (LCT) may also be present in the late spring months as they have been stocked in Boca Reservoir and could migrate up into the reach to spawn. Flows should be sufficient to permit passage of these trout from Boca Reservoir into the Little Truckee River, especially during the spring spawning season for rainbow trout and LCT and during the fall for brown trout.

[1]See the Independence Lake Reservoir Levels section of this report. Independence Lake should be operated in the best way to preserve and protect Lahontan cutthroat trout. This may conflict with priorities for instream flows below the reservoir. If there is a conflict, reservoir operations to protect cutthroat should take priority over recommended instream flows.

An especially important objective in this reach is to avoid abrupt flow changes, and this is achieved by the incorporation of ramping, especially when reducing flows. Spring-spawning trout habitat should be protected by avoiding significant rapid reductions in spring releases that may strand fish in side channels and expose spawning beds. Rainbow trout, which spawn in the spring, often use side-channel habitat for spawning, whereas brown trout are more likely to use the mainstem. Therefore, low flows of less than 65 cfs that disconnect side channel habitat are of more concern for fish in the spring during rainbow trout spawning (March, April, and May) than in the fall during brown trout spawning season (October, November, and December). Spring spawning sometimes occurs in the system as late as the end of May, and eggs may require up to 4–6 weeks to incubate and hatch because of the Little Truckee River's relatively cold water temperatures.

Independence Creek between Independence Dam and the Confluence with the Little Truckee River

Independence Creek below Independence Dam meets objectives 1, 2, and 3.

Independence Creek originates at Independence Lake and flows for approximately 5 miles to its confluence with the Little Truckee River near Highway 89. The Sierra Valley Diversion diverts up to 60 cfs from the Little Truckee River for a period during the spring and summer months, often leaving minimal flows in the Little Truckee River downstream of the diversion. Small releases from Independence Lake have the potential to benefit over 10 miles of trout habitat in Independence Creek and the Little Truckee River above Stampede Reservoir.

Future flow and reservoir-level decisions may take the Sierra Nevada yellow-legged frog (*Rana sierrae*) (SNYLF) into account. The SNYLF was federally listed as an endangered species on April 29, 2014. The Independence Lake drainage down to the confluence with the Little Truckee River is included in the proposed critical habitat for this species.

The preferred flows in Independence Creek may currently be at odds with LCT restoration efforts implemented at Independence Lake (for more information, see "Special Objectives for Independence Lake/Reservoir" in Section 2.3). In the future, when preferred flows in Independence Creek do not conflict with LCT recovery at Independence Lake, Independence Creek will likely increase in priority.

Combined streamflows exceeding 40 cfs in Independence Creek currently overtop the banks and leave the channel near Henness Pass Road, causing flooding and localized damage to the road and adjacent properties. This situation should be considered when planning voluntary releases.

Donner Creek between Donner Lake Dam and the Confluence with the Truckee River

Donner Creek meets objectives 1 and 3, but the flow regime is less flexible than in other reaches.
This section of Donner Creek is a relatively small, heavily modified reach. The reach below Donner Lake Dam is approximately 2.6 miles long. This is the first regulated stream to flow into the Truckee River, and has potential spawning and rearing habitat for rainbow trout, brown trout, mountain whitefish, and Lahontan cutthroat trout. Stocked LCT, likely from Donner Lake, are sometimes present in Donner Creek. Restoration has occurred on a tributary reach (Cold Creek), and future projects are likely within this reach. Additional releases from Donner Lake above the minimum, if available, enhance fish habitat,

particularly in summer months. Releases from Donner Lake after Labor Day should be scheduled over a long period of time to meet preferred flows and to avoid large short-term releases of water. Any Summer releases, through Labor Day, should consider the Donner Lake homeowner's needs and the preferred minimum reservoir levels for summer recreational interests.

Truckee River from Lake Tahoe to the State Line

The Truckee River below Lake Tahoe meets objectives 1, 2, and 3, but the flow regime is less flexible in this reach than in others because of highly regulated Lake Tahoe Dam operations. The water retained in Lake Tahoe is used primarily to meet Floriston Rates and is coordinated with Floriston Rate water released from Boca Reservoir. TROA allows other water, such as California's Joint Program Fish Credit Water, to be stored in Lake Tahoe and other reservoirs, if there is additional capacity.

When Lake Tahoe is above the natural rim of 6223.0 feet, minimum flows in this reach are generally acceptable for fish. Habitat complexity in this reach is low until after the confluence with Bear Creek. Recreational rafting is a very popular activity on the Truckee River during the summer months and is a primary economic driver for the region from July 1 through Labor Day. The popularity and economics of rafting should be considered in decision-making whenever possible. That being said, it is recognized that sustained optimum rafting flows during the peak season may or may not be possible because of the Water Master's responsibility to maintain Floriston Rates.

The mandated maximum lake level of 6229.1 feet is a significant concern in operations, as higher levels caused by possible late-season storms, snowmelt, or wind-wave action can cause damage to shorelines and adjacent properties. Maximizing the reservoir storage while ensuring the lake stays below its maximum level is a serious challenge and responsibility for the Water Master during most non-drought years.

Little Truckee River from Boca Dam to the Confluence with the Truckee River

Flows in the Little Truckee River below Boca Reservoir meet objectives 1 and 3 by augmenting flows in the mainstem Truckee River.

This section of the Little Truckee River is approximately 1/3-mile long. When flowing, this reach provides cold-water contribution to the Truckee River during warm summer months, especially in years when flows from Lake Tahoe are low and the Lake Tahoe epilimnion is warm. Gradual ramping is important in this reach at all times, but especially when ramping down during warm summer months, because salmonids and other cold-water species (sculpins, mountain whitefish, etc.) are likely to use the stretch as cold-water refugia. Multi-day ramping can avoid potential fish stranding in this reach, as fish can move either downstream into the Truckee River or into one of two large isolated pools. To the extent possible, a small minimum flow is preferred over zero-flow, especially during the summer months.

During TROA negotiations, this reach was considered the lowest priority because benefits of water releases from Boca impact a relatively small section of the Little Truckee River and the mainstem Truckee River when compared with the other creeks and streams. That is not to say that this section is unimportant to California. Maintaining a small minimum flow is always requested. Nevertheless, it is understood that a minimum flow here has never been required and requesting a minimum or preferred instream flow for this section when there is no downstream demand may require the use of California credit water or impact the water rights of others.

1.3 Flow Ramping Rates

Avoiding rapid fluctuations when increasing or decreasing flows for these stream reaches is both an important objective and a significant California request. Avoiding rapid fluctuations is done through a gradual "ramping" of flow rates and reservoir releases. Appropriate ramping rates should be assumed to be requested at all times and should always be encouraged by the TROA Administrator to the extent practicable and consistent with exercise of water rights, assurance of water supplies, operational considerations, the requirements of the Settlement Act, and other requirements of the Truckee River Operating Agreement.

Abrupt flow reductions can contribute to stranding aquatic biota of all life stages. Studies have shown that abrupt flow increases can dramatically escalate benthic macroinvertebrate drift, potentially changing the aquatic food base. Additionally, large flow pulses may move fish eggs and fry downstream, possibly into less optimal habitats. Studies conducted throughout regulated rivers show that hydropeaking, caused by fluctuations in hydraulically produced power generation, results in life history bottlenecks that preclude viable populations of many aquatic insects from inhabiting these regulated rivers and streams. This creates a major limiting factor for the aquatic food web. While an extended ramping plan is most critical when reducing flow rates, the rate of flow increase should also be limited to the smallest feasible steps.

Snowmelt recession in unregulated Sierra Nevada rivers averages an 8 percent per day decrease at the beginning of the recession period, and a 4 percent per day decrease at the end of the recession period[2] (see Section 1.4 for more information). The native aquatic species have evolved with this recession. To protect all life stages of aquatic species, preferred ramping rates would be a maximum of 10 percent +/- 5 percent decrease per day. If the reduction is greater than 10 percent — *and there is water available* — the rate should be held at the lower rate for at least a day to allow aquatic species to equilibrate. At times, extending ramping rates may be infeasible because of other requirements on the system; therefore, the TROA Administrator is requested to determine the volume of water available and the time frame required for the recession, and step the flows down as slowly as possible, following the above guidelines to the extent possible.

Rapid changes in releases from Boca Dam are sometimes necessary in greater magnitudes and are often difficult to plan. Gradual ramping is still requested for these fluctuations, to the extent feasible.

Owing to the manpower limitations of the TROA Administrator, the United State Bureau of Reclamation (Reclamation), and other dam operators, manual reservoir release adjustments are generally limited to two to three adjustments per day; however, one time per day should be sufficient in most instances.

In general, and if possible, increasing flows should be ramped up smoothly by, preferably, no more than 100 percent of the beginning flow rate over a 24-hour period. Ramping down flows should be accomplished over longer periods whenever possible. Gradual ramping of flows not only helps to protect fish and the local habitat, but can help avoid possible safety concerns to people as well.

[2] Epke Gerhard. 2011. "Spring Snowmelt Recession in Rivers of the Western Sierra Nevada Mountains." Hydrologic Sciences. Master of Sciences:67. https://watershed.ucdavis.edu/library/spring-snowmelt-recession-rivers-western-sierra-nevada-mountains.

Rationale for Flow Ramping Rates

The following article by Robert A. Bachman, PhD, provides a solid rationale as to why flow ramping should be seriously considered when increasing or decreasing flow rates in these streams.

The Effects of Low Flows and Rapid Changes of Flow on Wild Trout Populations

*Robert A. Bachman, PhD**

One of the most harmful effects of rapid changes in flow on wild trout populations resulting from abrupt changes in releases from reservoirs, commonly referred to as the "YO-YO" effect, is the way that these changes unnaturally concentrate the trout in relatively small areas during periods of low flow. It has been well documented that the factor that limits the number of adult trout in a stream is low summer flow. Trout compete for space in a flowing system and establish well-defined dominance hierarchies within specific areas of the stream. When trout are unnaturally concentrated during the time of year when they are aggressively feeding, they fight with each other. As a result, individuals within the hierarchy or pecking order are driven out, fail to find suitable feeding sites, and ultimately die through stress, starvation, or the combination of the two. Because not all of the trout affected die at the same time, "fish kills" are rarely observed, but the loss is nevertheless severe.

A more dramatic result of a rapid decrease in releases from a reservoir is the unnatural rapid increase in water temperature during hot weather. Although trout grow more rapidly if they can remain within their established summer home range, as temperatures rise and approach 68 F, the trout first feed less, and if the temperature continues to rise, they will move, usually upstream, in search of colder water. If such a temperature rise is too rapid and is accompanied by a sudden decrease in flow, the effects of the concentration of trout mentioned above is compounded. Rapid and large decreases in flow "trap" trout in areas that get too warm after the flow is decreased and the trout are unable to migrate as they would under normal circumstances. Although they may be able to find temporary refuge in cold spring "pockets", they are unable to feed adequately, lose weight, and eventually die.

Trout have evolved over millions of years to adapt to certain changes in their environment. Sudden increases in flow, for example, are common events in trout streams, typically associated with a sudden rain storm. Trout rarely have any problem adjusting to rapid increases in flow. They simply find refuge along the edge of the stream and behind boulders and because the suitable area for feeding usually increases with an increase in flow, the trout are little affected by such changes. On the other hand, a large, rapid DECREASE in flow is an unnatural event to which the trout are unable to adapt, for the reasons given above. The rapid decreases in releases from the Delaware River reservoirs along with low flows and high temperatures are the major causes of the decline in the trout

population. Even short periods of low flows in spring and summer have a devastating and long term impact on the number of trout that the river can sustain. Consequently, any release strategy designed to protect trout populations must necessarily avoid rapid, unnatural decreases following abrupt increase. Natural flows decline in a trout stream over a period of days or weeks after a storm event, depending upon the severity of the storm. Low summer flows, even for just a few days, will inevitably result in much reduced numbers of trout, and must be eliminated if the trout population is to be sustained at its normal carrying capacity. If the amount of water becomes scarce, if the trout population is to be sustained, the low flow condition must be approached gradually in order for the trout to be able to adjust and adapt to this new condition.

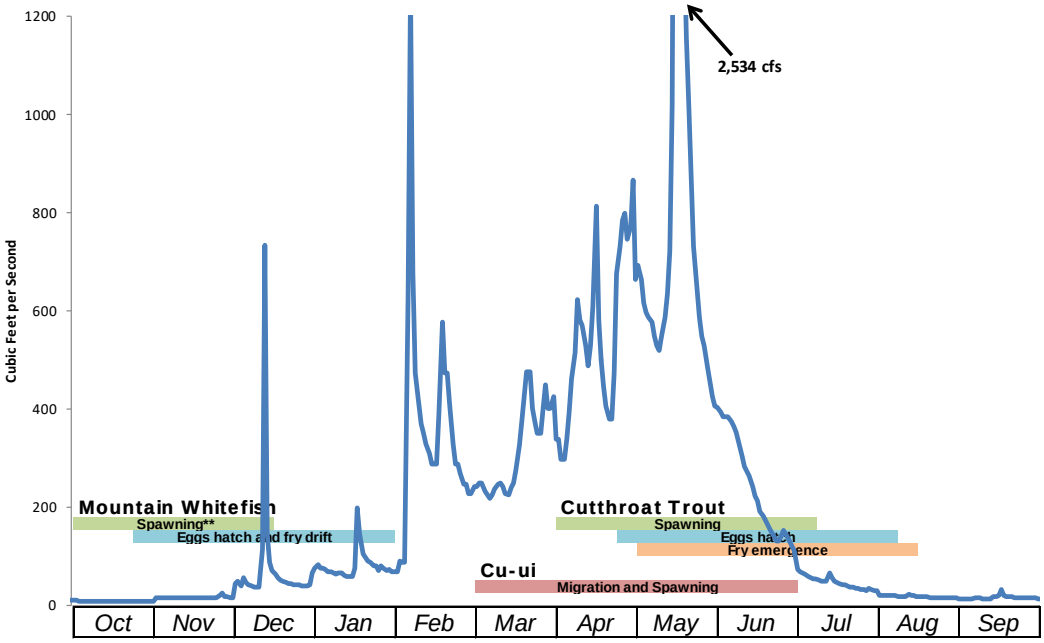
**Robert A. Bachman, PhD, Pennsylvania Fish and Boat Commission.*

Mr. Bachman earned his PhD from Penn State. He has many years of experience in managing trout and other fish, including Director of Maryland's Fishery Service and Director of Fish and Wildlife in Maryland. He gained considerable expertise in the management of trout downstream of major reservoirs, working with the US Army Corps of Engineers and various local communities and agencies, to find a balance between the needs of the fish and other competing water uses.

1.4 Truckee River Watershed Natural Hydrograph

The prime CDFW objective in determining the California-preferred flows is to attempt to mimic the natural hydrograph of these streams as much as possible. Native species in the Truckee River Basin, including mountain whitefish (*Prosopium williamsoni*); Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*), federally listed as "Threatened;" and the cui-ui (*Chasmistes cujus*), federally and State of Nevada-listed as "Endangered," evolved with a spring snowmelt runoff hydrology — higher flows in the spring receeding to low flows in the summer and fall. For more information, see Exhibit A on the following page.

Exhibit A Mountain Whitefish and Cutthroat Trout Life History



Mountain Whitefish and Cutthroat trout life history timing adapted from Moyle, 2002.
Cui-ui life history timing from U.S. Fish and Wildlife Service http://www.fws.gov/nevada/protected_species/fish/species/cuiui.html
Hydrology data from the TROA Planning Model - Local inflow to Stampede Reservoir without inflow from Independence - 1995-1996 water year
**Mountain whitefish spawn in waters with temperatures between 1°C and 11°C. High embryo mortality occurs above 9°C (Moyle, 2002)

Lahontan cutthroat trout and rainbow trout spawn between February and July, depending on streamflow, elevation, and water temperature. Cui-ui spawn between March and June, depending on water temperature and flow characteristics.[3] Mountain whitefish spawn between October and early December, when water temperature is below 11 °C[4] and the flows are typically lower. Brown trout spawn in fall or winter months, once water levels rise and when water temperatures drop to between 6 °C and 10 °C[5].

The preferred flows noted in the in-stream flow objectives tables located in Part 4 are intended to mimic a natural hydrograph, to the extent possible. The 1996 DFG study, *Instream Flow requirements, Truckee River Basin, Lake Tahoe to Nevada (August 1996)*, is included in the Appendix and was also used as a basis for many of the recommendations included in these Guidelines.

[3] http://www.fws.gov/nevada/protected_species/fish/species/cuiui.html.
[4] Moyle, P. B. 2002. *Inland Fishes of California*. Berkeley: University of California Press. 502 pp.
[5] Moyle, P. B. 2002. Ibid.

1.5 River and Stream Recreation Activities and Targets

Recreational Stream Fishing

Working closely with the California Department of Fish and Wildlife and local stakeholders, California TROA scheduling requests strive to optimally manage stream flows to benefit fish life cycles, preserve and enhance stream environments and habitat, and improve the overall fishing and outdoor experience.

The State of California encourages optimally managed flows in the mainstem Truckee River and its tributaries to both enhance habitat in the mainstem and ensure that successful spawning and incubation occurs. This will be an important challenge to managing the Truckee River fishery under the Truckee River Operating Agreement. TROA and the California Guidelines encourage a more sustainable and optimistic future for the Truckee River fishery. Management of reservoir releases for multi-benefit values, including providing for preferred flows and optimum ramping rates, should result in improved habitat that will produce a higher-quality fishery and angling experience in the years to come.

The general fishing season in the Truckee River Basin area is from the last Saturday in April through November 15. This season restriction applies to the Truckee River from Lake Tahoe to the Trout Creek confluence, Prosser Creek below Prosser Creek Reservoir, Donner Creek below Donner Lake, and the Little Truckee River below Boca Dam. The Little Truckee River below Stampede Dam and the Truckee River from Trout Creek confluence to the Nevada state line are open all year. Preferred flows are requested to be maintained during the general fishing season in all of the reaches listed above, to the extent necessary to sustain the natural habitat and to enhance the recreational experience.

To better describe the stream fishing activity in the area, the following discussion is provided. The following information was provided by the Truckee River Chapter of Trout Unlimited — Charter Chapter #103.

> *The Truckee River watershed offers a diverse fishing experience. Native Lahontan cutthroat trout are found in the headwaters above Lake Tahoe in the Upper Truckee River and in Independence Lake in the Little Truckee River watershed[6]. Additionally, Anglers come from all over the country to fish for wild brown and rainbow trout in the Truckee River that begins immediately downstream of Lake Tahoe and continues for some 100 miles in California and Nevada before warming considerably and terminating at Pyramid Lake. Main food sources for trout in the Truckee River include Paiute sculpin, crayfish, scuds, aquatic worms, leeches, stoneflies, mayflies, caddis, midges and carpenter ants. The Truckee River in California, Little Truckee below Stampede Dam, Prosser Creek below Prosser Creek Dam and Martis Creek below Martis Creek Dam are not stocked with hatchery trout, providing a popular wild trout angling experience. Furthermore, the Truckee River from the confluence with Trout Creek downstream to the Nevada State line (excluding the property owned by the*

[6] CDFW Note: CDFW has been stocking Lahontan cutthroat in all the reservoirs and the Little Truckee River. They are now found throughout the watershed.

San Francisco Fly Casters Club) (Nevada and Sierra counties) is managed under the California Department of Fish and Wildlife's Heritage and Wild Trout Program with special regulations (refer to the California Freshwater Sport Fishing Regulations for details). The Truckee River fishery supports a strong economic engine that benefits the Tahoe/Truckee region, Sacramento and Reno, NV. There are an estimated 50 full-time fishing guides that make their living on the Truckee River and tributaries, including several local Fly Shops.

Tributaries

Fly fishing is very popular in the Truckee's tributaries. Short dam-controlled tributaries — also known as "tail waters" — including the Little Truckee River, Prosser Creek and Martis Creek support some of the most productive waters in the State of California and offer outstanding fishing opportunities for trophy trout with exceptional growth rates. Periods of minimum release cycles with short ramping rates have limited the fishery potential in the Truckee River and its dam-controlled tributary reaches, which has reduced access to quality fishing during certain seasons, and sometimes resulted in localized fish stranding. Flows are often either too high or too low during critical spawning and incubation periods for wild trout occurring in the spring for rainbows and cutthroats, fall for brown trout and winter for mountain whitefish. During critical spawning periods, generous ramping rates should be achieved to avoid stranding fish or exposing redds. Dam-controlled bottom release tributaries at Prosser Creek and the Little Truckee River below Boca Dam have the ability to extend cold-water habitat in the Truckee River as far as Derby Dam during the hot summer months, and conversely prevent anchor ice forming during cold spells during the winter. Martis Creek, Prosser Creek and Donner Creek are critical spawning reaches that act as sources of natural recruitment and reproduction for the middle Truckee River. Prosser Creek offers the best habitat and is the most productive spawning and nursery habitat of the three tributaries, and critically low flows and exceptionally high flows should be avoided during spawning seasons if possible.

River Rafting

Rafting on the Truckee River is an extremely popular recreational activity with a relatively short season, typically in the summer between Memorial Day and Labor Day. Further downstream, the rafting season can be extended, especially when Floriston Rates are met or exceeded.

Several companies operate rafting concessions at Tahoe City for self-guided rafting experiences on the upper section of the River. The most popular section is the first 4 miles beginning below the Lake Tahoe Dam in Tahoe City and ending at the River Ranch/Alpine Meadows Road in Placer County. Between the two largest commercial raft rental companies, seasonal employment is provided for between 150 and 200

people each summer, serving a total of 1,400 to 2,000 rafters per day. Up to 2,000 additional rafters are estimated to float this section of the river, daily.

The rafting experience draws tourists from all around the Lake Tahoe region, including day trippers from Reno/Carson City as well as from the Sacramento/Auburn area. These visitors provide significant economic stimulus for local businesses throughout the Tahoe Basin, including restaurants, supermarkets, retail outlets, sports shops, gas stations, and bike rentals. Sports shops and gas stations supply private rafters with retail equipment as well as other supplies. The rafting businesses encourage and provide significant environmental stewardship opportunities to the area. It is no wonder that rafting is strongly and passionately supported by the local community.

Recreational river-rafting opportunities exist on the Truckee River and are concentrated in two sections: (1) just below Lake Tahoe, and (2) below the Little Truckee confluence near Boca Reservoir. The quality of the rafting experience near Lake Tahoe is based entirely on releases from the lake. Since these releases are dependent upon the lake level and federally mandated release schedules for downstream users, it is understood that optimum flows (even minimum flows) for rafting this section are not always available. During dry years, the lake level may be near or below the rim, resulting in insufficient releases for rafting. For other years, there may be no Floriston Rate demand for Lake Tahoe water, resulting in the minimum summer release of 70 cfs from Lake Tahoe. Additionally, during wet years, flows may be too high during optimal rafting times because of necessary releases being made to prevent water damage around the shoreline. The Water Master must ensure appropriate releases are made to not exceed the maximum lake elevation of 6229.1 feet (Truckee River Operating Agreement 5.A.3(d)).

Local commercial rafting companies indicate that the preferred range of releases out of Lake Tahoe for rafting the upper section of the Truckee River just below Lake Tahoe are as follows:

- **Minimum Flow**
  200 cfs. For flows below 200 cfs, the river can become too rocky for the use of larger rafts and therefore less enjoyable and possibly dangerous. Flows between approximately 180 cfs and 200 cfs may still be adequate for individuals and smaller parties to enjoy a day on the river using smaller rafts and toys; however, the commercial companies typically limit the use of their equipment to small rafts during these periods.

- **Preferred Flow**
  250-300 cfs. The ideal flow for a safe and enjoyable rafting experience. While this flow is ideal for rafting below Lake Tahoe, and is the preferred flow during the peak rafting season of July 1 through Labor Day, the actual release at any given time from Lake Tahoe will be linked to the Floriston Rate and other release requirements and managed by the federal Water Master.

- **Maximum Flow**
  400 cfs. The flow is considered too high and swift for the general public to safely use the Truckee River for recreation and self-guided floating trips below Tahoe City. At this flowrate, adequate bridge clearances are also a concern for safety.

Additional rafting and kayaking opportunities exist further downstream, below the confluence of the Little Truckee River, at Boca Reservoir. This downstream section supports commercial rafting

experiences when flows below the Boca confluence are between 450 cfs and 700 cfs, with 700 cfs being considered the "ideal" rafting flow for this section. During the summer months, the flow in this section is typically controlled to meet the Floriston Rate demand at the time plus any other demands from downstream parties, such as additional fish water demand by the PLPT. During other seasons, the river can fluctuate wildly, being affected by seasonal natural flows, snowmelt, and high reservoir releases for flood control purposes. During dry periods, it is not uncommon for flows in this section to be significantly less than the Floriston Rate.

Regulating flows solely for recreational purposes in the upper Truckee River is rarely, if ever, practical, because the legal constraints and mandates regarding the management of Lake Tahoe reservoir storage and releases for Floriston Rates. Because of this, management of flow in this reach of the Truckee River, for purposes of rafting, is difficult. That being said, DWR TROA staff is available to work with rafting-related businesses to share information, current schedules, and reservoir operations projections regarding anticipated releases from Lake Tahoe and other reservoirs that could affect Truckee River rafting opportunities during the commercial rafting season. Under TROA, certain mechanisms are now available to address certain operational limitations to the point that preferred rafting flows may be possible more often now than before.

1.6 Water Quality Monitoring

DWR and CDFW staff are working together with local organizations to implement and manage a water quality monitoring effort for the Truckee River watershed to identify possible water quality trends and/or effects from TROA implementation. Although not a specific requirement of TROA, this monitoring effort is important to California and Truckee River Basin stakeholders, and is consistent with the environmental analysis and findings in the final TROA Environmental Impact Statement/Environmental Impact Report (EIS/EIR).

The Lahontan Regional Water Quality Control Board (LRWQCB) adopted Total Maximum Daily Loads (TMDLs) and listed parts of the Truckee River watershed under Clean Water Act Section 303(d) in 2009. The TMDLs address sedimentation/siltation concerns in three streams within the Truckee River watershed, including the Truckee River between the outlet of Lake Tahoe and the California/Nevada state line. Grey Creek and Bronco Creek are also listed but are not affected by TROA reservoirs. While DWR will share information and coordinate as appropriate with the LRWQCB, this effort by DWR is not intended to monitor water quality standards under the TMDL established by the LRWQCB.

This monitoring effort will provide certain water quality data to identify and evaluate possible effects of TROA implementation on water quality in the Truckee River, and certain tributaries, before it flows into Nevada. An EIS/EIR was certified by Reclamation and DWR in 2008, and found no significant impacts to water quality in the Truckee River watershed within California resulting from TROA. Although that environmental review revealed no significant or cumulative effects on water quality, DWR agreed to continue its water quality monitoring effort post-TROA. In anticipation of TROA implementation, DWR collected more than 10 years of water quality data during the pre-TROA period as baseline data for comparing water quality conditions during the TROA implementation period. The post-TROA monitoring period is currently planned to include five consecutive water years to capture a range of hydrologic conditions and observe their effects on water quality compared to similar pre-TROA conditions. The water quality monitoring effort will help reinforce the findings of the EIS/EIR and

confirm there are no unanticipated adverse effects of water quality in California's Truckee River Basin watershed resulting from the implementation of TROA.

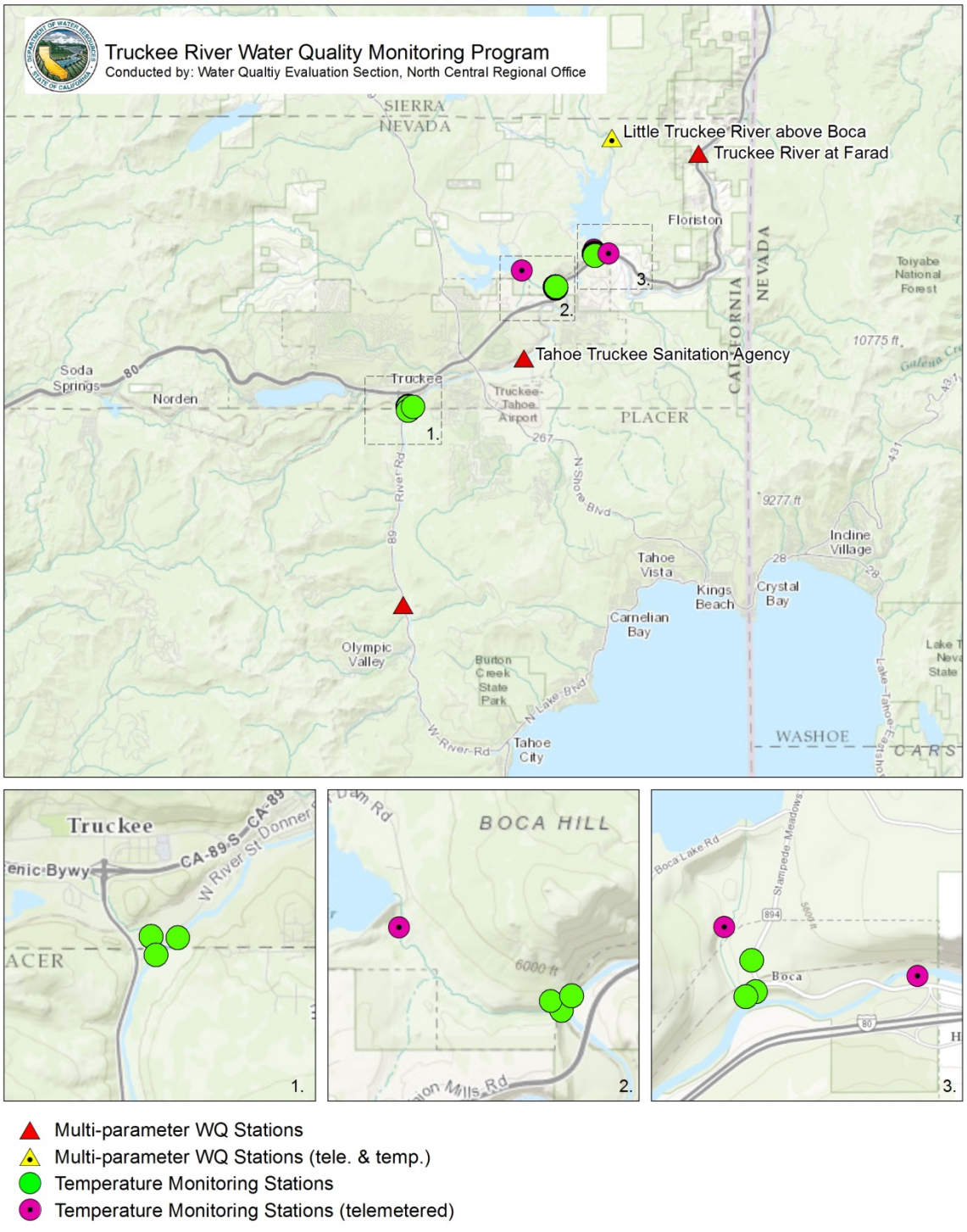
The data and reports from this effort are available to interested parties through the Water Data Library (http://wdl.water.ca.gov/waterdatalibrary/), the California Data Exchange Center (CDEC) (http://cdec4gov.water.ca.gov/index.html), U.S. Geological Survey (USGS) websites, and annual DWR reporting.

For this effort, DWR annually evaluates water quality trends based on an assessment of observed differences between historical data and post-TROA implementation data. While monitoring efforts have been in process for many years, this latest DWR/CDFW effort officially began for Water Year 2016 and generally includes the following:

- Preparation of the annual water quality monitoring report (WQMR). The annual WQMR covers the preceding Water Year (October 1 to September 30) and includes an executive summary, accomplishments, descriptions of data obtained, observations, analysis and trends, photos, etc.
- Maintenance and management of a monitoring network, including telemetered and non-telemetered temperature monitoring probes along each tributary of three confluences along the Truckee River, totaling nine stations.
- Continued full service operation and management of four multi-parameter water quality stations, including one at Farad. These multi-parameter stations monitor specific conductance, temperature, dissolved oxygen (DO), hydrogen ion concentration or acidity (pH), and turbidity.
- Maintenance and management of four temperature sensor probes at USGS stations along Prosser Creek, Little Truckee River, and the Truckee River. These sensors send continuous 15-minute temperature data to CDEC via USGS telemetry, enabling interested parties to view this data in real-time.
- Annual presentation to the Truckee River Basin Water Group (TRBWG).

The general locations of multi-parameter and temperature monitoring stations installed and regularly monitored by DWR staff for this effort are shown on Exhibit B, Truckee River DWR Water Quality Monitoring Program Map.

Exhibit B Truckee River DWR Water Quality Monitoring Program Map



PART 2

GOALS AND OBJECTIVES FOR TRUCKEE RIVER RESERVOIR OPERATIONS

Lakes / Reservoirs

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2.1 Truckee River Basin Reservoirs

The objective for all Truckee River basin reservoirs is to operate them in a manner that respects water rights and provides appropriate and legal storage of water for a continuous water supply to downstream users. This must be done in accordance with applicable rights and requirements administered by the California State Water Resources Control Board and other related legal ordinances and agreements. TROA, the most recently adopted agreement, establishes a flexible framework by which the major beneficiaries, water operators and the Scheduling Parties, can coordinate reservoir storage and scheduled releases in a manner that provides multi-benefits to the entire Truckee River system. In addition to satisfying downstream demands and Lower Truckee River fish water demands, significant benefits under many different hydrologic scenarios can now be realized in the upper watershed, including maintaining desirable streamflows to provide for healthy habitats, recreational needs, and maintaining appropriate lake levels for environmental, recreational, and economic needs.

TROA provides certain mechanisms to help coordinate reservoir storage and releases, which can benefit all users of the Truckee River streams and reservoirs. To the extent practicable and consistent, water rights, assurance of water supplies, operational considerations, and the requirements of TROA must always be respected, and at certain times these criteria may take precedence over other important goals. It is understood that reservoir use is popular in the summertime for recreation, especially during the vacation season between Memorial Day and Labor Day. Reservoirs are generally managed to maintain appropriate recreational water levels during that period, and minimum pool levels are respected during the remainder of the year, if possible.

Reservoir operations and management options for meeting demand targets and maintaining the California preferred flow rates and the optimum reservoir levels (See Guidelines; Part 4, Tables A and B) are discussed regularly with the Scheduling Parties.

2.1.1 Stampede Reservoir

Stampede Reservoir is home to several USFS campgrounds and is the most highly utilized camping area in the Truckee River basin. The reservoir is a popular spot for water recreation of all kinds, including fishing, swimming, motorized boat and personal watercraft use, and water skiing. Ice fishing is also popular during winter, depending on conditions.

A boat ramp is located on the west end of the lake; however, because of fluctuations in the reservoir water level, boat launching facilities may not always be operable. Often, the paved ramps are exposed above the water level. In these conditions, it is usually possible to launch using a four-wheel drive vehicle. This can be done at various locations around the lake as designated in the Tahoe National Forest Motor Vehicle Use Map. Courtesy docks are sometimes placed in the water if water levels are high.

Water skiing is popular at Stampede Reservoir when the boat ramps are accessible. The minimum lake level for optimal use of the existing launch ramp is approximately 5,900 feet (94,535 acre-feet storage).

2.1.2 Boca Reservoir

Boca Reservoir is a popular spot for water recreation of all kinds. Motorized boat use, personal watercraft use, and water skiing are all very popular. Windsurfing is commonplace on the east shore. Kayaking,

canoeing, swimming, and fishing are also extremely popular at this reservoir. Ice fishing is often possible during winter, depending on conditions.

An improved boat ramp, managed by USFS, is located less than a mile from the campground on the west side of the lake, but may be closed when the water level is low. The reservoir is often accessed by launching watercraft from the east shore when the USFS ramp in not usable.

The nearest roadway access to the boat ramp and campground is from Stampede Meadows Road and the Boca Dam Reservoir Road crossing. Currently, this crossing is subject to closure by the U.S. Bureau of Reclamation if the lake exceeds a certain level, requiring the use of alternative forest service roads to access the west side of the lake.

Boca Reservoir is a highly regarded facility used by ski clubs and the general public. A water ski club holds a permit with the USFS for use of the reservoir and has a dedicated cove set up for a water ski course. Reservoir levels ranging between 5595.4 and 5596.5 feet (32,000 to 33,000 acre-feet) are preferred. The optimal operating level for water skiing at Boca Reservoir is 5596.5 feet (33,000 acre-feet). The minimum level to operate is 5591.8 feet (29,000 acre-feet), as the boat ramp becomes unusable below that level and the preferred areas in the lake for water skiing may not be safe. The water-skiing season is weather dependent, but generally runs from late May through September, though the primary use period is Memorial Day through Labor Day.

A federal Safety of Dams modification project to Boca Dam is planned for the spring of 2019 through fall of 2020. This construction project will help protect the dam from overtopping and strengthen the dam by constructing a shear key and stability berm. Construction will require the reservoir to be maintained at no more than 50 percent reservoir capacity for 2019. Full capacity is 40,900 acre-feet so the temporary reservoir restriction will limit the lake to approximately 20,000 acre-feet. Once construction is completed, the current policy of closing the road over Boca Dam when the reservoir is close to full will no longer be necessary.

2.1.3 Prosser Reservoir

Prosser Creek Reservoir is popular for canoeing, paddle boarding, kayaking, fishing, and swimming. Year-round fishing is enjoyed, and ice fishing is possible in the winter, depending on conditions. Single family campsites and group camping opportunities exist on the northwest side of the reservoir.

A boat ramp is located at Prosser Ranch Group Campground at the end of Prosser Road and Lakeside Campground Road, on the west side of Prosser Reservoir. Hand-off launching is possible at Lakeside Campground and other areas on the north and south ends of the reservoir, depending on water level. Because of fluctuations in the reservoir water level, boat launching facilities may not always be operable. Often, the paved ramps are exposed above the water level. In these conditions, it is usually possible to launch using a four-wheel drive vehicle. This can be done at various locations around the lake as designated in the Tahoe National Forest Motor Vehicle Use Map.

Prosser Reservoir has a speed restriction on the lake. Power boating is allowed; however, a 10-mph speed limit is enforced. There is no water skiing permitted on Prosser Reservoir because of this speed limit restriction.

2.1.4 Donner Lake

Donner Lake is a natural lake and reservoir, with the upper 12 feet (approximately 9,500 acre-feet) controlled by a dam owned and operated by the Truckee Meadows Water Authority (TMWA). All stored water in the reservoir is controlled through water rights belonging entirely to TMWA.

The lake is home to permanent and seasonal residents and businesses, and the numerous activities around the lake attract many summer visitors. Many shops, marinas, restaurants, businesses, and services operate near the lake and depend on it for their success. Local activities include fishing, swimming, boating and water skiing, camping, picnicking, and hiking. Donner Lake holds good populations of rainbow trout, brown trout, and lake trout, as well as kokanee salmon.

Private boat docks, operated at various lakefront properties, are in high demand and provide temporary and seasonal mooring opportunities to residents and seasonal guests. A public boat ramp, operated by the Truckee-Donner Recreation & Park District, is available in the northwest corner of Donner Lake.

Over the years, improvements have been made in and around the lake based on traditional and historical lake levels. According to local property owners, the preferred lake level for optimal use during the high-use summer months is between 5934.0 feet and 5935.8 feet. These lake levels correspond to reservoir storage of 7,967 acre-feet and 9,495 acre-feet, respectively. Lake levels below this range during the high-use summer season make many of the boat launching and temporary docking facilities difficult or impossible to use, and as a result, negatively affect the local economy.

The 1943 Donner Lake Indenture Agreement (included in the Appendix) governs the operation of Donner Lake and contains provisions to restrict the maximum lake level to 5935.8 feet. It also prohibits any releases above minimum flows during the summer months of June, July, and August if the lake level falls below 5932.0 feet (United States Coast and Geodetic Survey 1925). But it is often recognized and noted by residents that the minimum level, set in the 1943 agreement, is often too low for the high-use summer months because of the fixed elevations of existing ramps and docks and the sediments that have deposited over the years at various locations around the lake. Lake levels maintained at the higher levels of the allowable range are always preferred by the local users. Current levels of silt accumulation from incoming streams, particularly on the west end of the lake, significantly restricts use of the boat launching facilities, except when the lake is at higher levels (above 5934.0 feet). Occasional properly permitted dredging operations by local interests may help maintain boat ramp access in certain areas during lower water conditions. DWR will continue to coordinate with TMWA, and will request that, as the sole owner and operator of the reservoir resources in Donner Lake, they balance their necessary operations to serve its downstream customers with the needs of the local Donner Lake economy, including property owners, seasonal visitors, businesses, and recreational and environmental interests.

While the Donner Lake Indenture Agreement mandates the minimum reservoir level through the summer months of June, July, and August, the high-use summer recreation season extends each year through the Labor Day holiday weekend, therefore TMWA is always encouraged to schedule its late-season releases to accommodate the additional use and boat traffic over that final holiday week of the season.

2.1.5 Independence Lake

Independence Lake is a natural lake and reservoir, holding approximately 17,500 acre-feet of useable storage, and is controlled by a dam operated by the Truckee Meadows Water Authority (TMWA). Although there are many local environmental and recreational interests, all stored water in the reservoir is ultimately controlled and managed through water rights belonging entirely to TMWA.

To assist in reservoir management, CDFW staff works with DWR, The Nature Conservancy, TMWA, the U.S. Geological Survey, the U.S. Fish and Wildlife Service, and the TROA Administrator to identify beneficial reservoir operations for Independence Lake and make recommendations to TMWA that will conserve and hopefully improve the lake's Lahontan cutthroat trout population.

Currently, the desired operations at Independence Lake to benefit LCT are:

- The lake should be at maximum elevation by May 15, so that adult LCT can get through the Independence Creek delta and into the creek to spawn, and to ensure that LCT do not spawn lower in the creek where the salmonid spawning gravel nests (commonly known as "redds") could become inundated by the lake and "drowned." LCT redds need flow through the gravel for the eggs and recently hatched trout (alevins) to remain viable.
- Kokanee salmon (*Oncorhynchus nerka*) may compete with juvenile LCT for food. It is believed that Kokanee in Independence Lake generally spawn in shallow water along the lake margins during the fall. CDFW has requested that TMWA hold the lake level relatively high until December 1, and then rapidly draw the reservoir level down about 3 to 5 feet (while considering downstream channel capacity) to de-water kokanee redds. This drawdown would be repeated for several seasons as deemed necessary, and could dramatically reduce kokanee recruitment to the lake population.
- CDFW takes eggs from kokanee salmon that spawn in the Little Truckee River above Stampede Reservoir, and hatches and raises them for stocking purposes. To do this, Independence Lake is drawn down during September to increase flows and attract kokanee salmon out of Stampede Reservoir and into a CDFW trap on the Little Truckee River. This September drawdown must be restricted in non-drought years to hold water back for the requested drawdown during December.

PART 3

TROA ADMINISTRATION

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3.1 California's Responsibilities under TROA

A) Monitoring of Operations

TROA is a complex agreement that reflects the complexity of the many storage, release, and exchange opportunities that exist among the federal and private reservoirs and between the multiple parties. For operations under TROA, California DWR is responsible for reviewing and monitoring current and proposed operations to try to maximize California's environmental and recreational benefits. Regular management review and monitoring may include the following:

- Implementation of the California Guidelines.
- Operation plans, including statements describing the annual goals and seasonal objectives of the Scheduling Parties.
- Project Water Operations or Credit Water Operations requested by Scheduling Parties, including exchanges or re-storage, and the timing, quantity, and location of requested accumulations.
- Establishment of credit water.
- Spill priorities, establishment priorities, storage priorities, release priorities, accounting, and evaporation.
- Management of Joint Program Fish Credit Water, California Environmental Water, Additional California Environmental Credit Water, and California M&I Credit Water.
- Daily operations.
- Storage and release accounting.
- RiverWare Simulations.
- Weather forecasts.
- Setting preferred in-stream flows and reservoir target storage levels in the California Guidelines.
- Identifying and giving clear guidance on possible conflicts between Minimum Releases, Enhanced Minimum Releases, Preferred Releases, and Storage requirements.
- Ramping rates.
- Other Truckee River Basin water resource issues, requirements, opportunities, or requests as they occur.

B) RiverWare Operations Model

RiverWare is a river-system modeling tool developed by the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) at the University of Colorado at Boulder. The Truckee-Carson RiverWare Basin model was developed by the TROA Scheduling Parties and is maintained by the TROA Administrator. It incorporates the TROA operational policies for reservoir releases, reservoir storage, instream flows, and diversions. It is used by the TROA Administrator and the TROA Parties to coordinate operations, monitor delivery of water rights, and to maintain a water accounting system for the entire watershed. The reports and charts generated by RiverWare provide useful exhibits showing past reservoir operations as well as projected events and conditions based on the operations schedules provided by the Scheduling Parties. RiverWare is also being used to generate necessary water accounting reports required by the California State Water Resources Control Board to demonstrate compliance with current licensing and water rights.

C) Operations Scheduling

California develops the California Guidelines (scheduling requests) for preferred operations in California, including the accrual and use of credit water accounts (Joint Program Fish Credit Water, California Environmental Credit Water, Additional California Environmental Credit Water, and California M&I Credit Water).

The TROA Administrator (currently the federal Water Master) is responsible for consulting with the Scheduling Parties and integrating all schedules, to the extent feasible, into the daily operations. Currently, operations and scheduling meetings with the Water Master and all scheduling parties occur monthly in Reno, Nevada, and occasionally at other times on an as-needed basis.

D) The California Guidelines

California Department of Water Resources staff, in cooperation with CDFW, prepares the California Guidelines on a monthly basis and provides them to the TROA Administrator and to the Scheduling Parties. The Guidelines include preferred streamflow, reservoir storage levels, and other environmental objectives for reservoir operations to enhance fish habitat, riparian vegetation, water quality, and recreational opportunities in California's Truckee River Basin. Although not mandatory, the TROA Administrator encourages the parties to consider these guidelines in their daily, weekly, monthly, and annual scheduling, consistent with all water rights and the provisions of TROA. California may revise and reissue the California Guidelines or other special scheduling requests at any time, based on: (1) comments and recommendations by the TROA Administrator, Scheduling Parties, or local stakeholders, (2) changes in scheduling for reservoir operations, or (3) changes in current or forecasted hydrologic conditions.

E) California Credit Waters

California is the Scheduling Party for Joint Program Fish Credit Water, California Environmental Credit Water, and Additional California Environmental Credit Water when/if water in these categories has been established.

Operational plans (scheduling requests) typically include the annual goals and seasonal objectives to be achieved by California. In addition, the scheduling request shall specify the Project Water Operations or Credit Water Operations requested by California, including any exchanges or re-storage, and the timing, quantity, and location of any requested accumulation.

Joint Program Fish Credit Water is managed by California to enhance instream flows and recreational pools in reservoirs. California Environmental Credit Water and Additional California Environmental Credit Water are also managed by California, but may only be used for the following environmental purposes: (1) maintaining instream flows, (2) restoring, maintaining, or enhancing riparian vegetation areas along the Truckee River or its tributaries, or (3) maintaining or enhancing instream water quality. The intent of establishing these categories of credit water is to make water available for future environmental uses that arise out of currently unforeseen circumstances.

California or its designee may also establish California M&I Credit Water in Lake Tahoe and other Truckee River reservoirs, as specified in TROA. California M&I Credit Water may be used only to serve M&I uses in California. If and when California M&I Credit Water occurs, M&I storage objectives may be coordinated with instream flow and recreation objectives in the California Guidelines.

F) Financial Obligations

California's share of the annual expenses for administration of TROA is 20 percent of the total cost for the TROA Administrator (designated by the federal Orr Ditch Court). The United States and the State of Nevada also share in the cost for administration of TROA by each paying 40 percent. California executed a contract with the TROA Administrator to pay for its proportionate share of the total annual cost, beginning in December 2015.

3.2 California's Opportunities under TROA

A) TROA Benefits to California

The passage of the Settlement Act (Public Law 101-618) and the implementation of TROA established the total future Lake Tahoe and Truckee River basins' water allocations between California and Nevada, and modified the operation of the federal and non-federal reservoirs in the Truckee River Basin. Prior to the passage and implementation of PL 101-618 and TROA, a moratorium on granting new water rights in California was in place for over 40 years, a result of complex litigation and interstate water use controversies going back over 100 years. In addition to resolving numerous long-standing legal challenges and legally establishing California's proportionate share of this water, TROA has the capability to improve Truckee River water quality, enhance instream flows and recreational opportunities, and provide for increased municipal, industrial, and environmental drought protection. The Agreement enhances conditions for the endangered cui-ui and the threatened Lahontan cutthroat trout in the Lower Truckee River Basin, species vital to the Pyramid Lake Paiute Tribe and the Pyramid Lake fishery. TROA provides increased drought protection for all Truckee River water users by facilitating the use of credit water storage and cooperative exchanges of this credit water between basin reservoirs to maintain the most beneficial flows and reservoir levels. TROA enables opportunities for true multi-beneficial use of this water as it is conveyed through California and into Nevada.

TROA provides California an opportunity to prepare these California Guidelines and submit scheduling requests, as deemed necessary, to encourage other TROA signatories to plan their own water management and reservoir operations to achieve mutual benefits by helping California meet its water management objectives for the Truckee River Basin.

B) California Credit Water and Objectives

Credit waters are specific types of water defined in TROA. Credit waters that may be stored under TROA are: Additional California Environmental Credit Water, California Environmental Credit Water, California M&I Credit Water, Fernley Municipal Credit Water, Fish Credit Water, Joint Program Fish Credit Water, Newlands Project Credit Water, Other Credit Water, Water Authority M&I Credit Water, Project Water in Another Reservoir, and Water Quality Credit Water.

Credit water may be accumulated in all Truckee River Basin reservoirs primarily by retaining or by capturing water that would have otherwise been diverted downstream. It may also be accumulated by: (1) trading water that has been released or is in storage for water that is stored in another reservoir or has been released, (2) converting water in storage from one category to another, and (3) with consent, using the water rights of another party. Imported water and private water may also be used to accumulate credit water. Credit water may be stored in any Truckee River reservoir without interfering with that reservoir's

project water and generally would be retained until released for that specific credit water's beneficial use, or spilled. Credit waters which are managed by California for its own interests include:

1. Joint Program Fish Credit Water

Objective: Accrue Joint Program Fish Credit Water (JPFCW) at the maximum rate of 50 percent of Fish Credit Water, with a goal to attain and maintain the maximum possible. California will coordinate and schedule the release of JPFCW while taking into account the California Guidelines, various seasonal recreational requirements, and other operational considerations and priorities.

Up to 50 percent of Fish Credit Water accumulated annually by PLPT under TROA sections 7.C.1 and 7.C.2 (Fish Credit Water established by holding back Floriston Rate water that would flow past Derby Dam) can be established as JPFCW, but this amount is limited by the portion of California's surface water allocation (10,000 acre feet/year) that is not used to supply a direct diversion and is not also used to establish California M&I Credit Water storage. California makes the determination if and when Joint Program Fish Credit Water is established, while the Pyramid Lake Paiute Tribe and the United States (Reclamation and USFW) are generally responsible for making the determination if and when Fish Credit Water is established. The most likely scenario is that California will request and designate its maximum allowable JPFCW as soon as possible, except in those cases where there is an unacceptable risk of spill. The total amount of JPFCW in storage at any time in Truckee River reservoirs cannot exceed 20,000 acre-feet, per TROA Section 7.C.6(c).

2018 Operations — JPFCW was established for the first time under TROA operations from December 29, 2017, to January 6, 2018, for a total of 326 acre-feet. Forecasts indicate there will be limited, if any, opportunities to establish JPFCW until the fall of 2018. California staff will still request and encourage the PLPT and the TROA Administrator to utilize every opportunity to establish JPFCW. The current limited amount of JPFCW will be used to help meet certain instream flow objectives noted in the California Guidelines or will be carried over into next year. California staff will also investigate the effectiveness of utilizing portions of JPCFW for stabilizing fluctuations in releases and extending ramping schedules to mitigate extreme changes in stream flows.

2. California Environmental Credit Water

Objective: Establish and utilize California Environmental Credit Water (CEcaCred) for instream flows, riparian vegetation, and water quality.

CEcaCred may be established under certain conditions by: (1) storing in Lake Tahoe, all or a portion of California's Truckee River surface water allocation not derived from Changed Diversion Rights, (2) storing in Lake Tahoe, water derived from Changed Diversion Rights with an original place of use in California, (3) storing in Donner Lake, Independence Lake, and Truckee River reservoirs other than Lake Tahoe, water derived from Changed Diversion Rights with an original place of use in California, (4) storing in Donner Lake, Independence Lake, and Truckee River reservoirs, water derived from Changed Diversion Rights with an original place of use in Nevada pursuant to a flexible 12-month diversion schedule, and (5) storing in Donner Lake, Independence Lake, and Truckee River reservoirs other than Lake Tahoe, water derived from water rights adjudicated under the Sierra Valley Decree. The total

combined amount of California M&I Credit Water and CEcaCred in storage at any time is limited to 8,000 acre-feet with no more than 3,000 acre-feet of storage in reservoirs other than Tahoe.

2018 Operations — There will not be any CEcaCred water established in 2018 because there are no current water rights available for this purpose. DWR will investigate future options for accrual and use of this credit water option in the future, including the possibility of purchasing water rights.

3. Additional California Environmental Credit Water

Objective: Establish and utilize Additional California Environmental Credit Water (ACEcaCred) for instream flows, riparian vegetation, and water quality.

ACEcaCred water may be established under certain conditions by: (1) storing in Donner Lake, Independence Lake, and Truckee River reservoirs, water derived from Changed Diversion Rights with an original place of use in California, (2) storing in Donner Lake, Independence Lake, and Truckee River reservoirs, water derived from Changed Diversion Rights with an original place of use in Nevada pursuant to a flexible 12-month diversion schedule, (3) storing in Donner Lake, Independence Lake, and Truckee River reservoirs other than Lake Tahoe, water derived from water rights adjudicated under the Sierra Valley Decree, and (4) storing imported water in Donner Lake, Independence Lake, and Truckee River reservoirs. The amount of ACEcaCred in storage shall not exceed 10,000 acre-feet.

2018 Operations — There will not be any ACEcaCred water established in 2018 because there are no current water rights available for this purpose. DWR will investigate options for establishment and use of this water in the future, including possibly purchasing water rights to implement this credit water option in the future.

4. California M&I Water

Objective: California M&I Water (CMICred) serves future Municipal and Industrial water demands in California using surface water.

Water may only be established under certain conditions by: (1) storing in Lake Tahoe, all or a portion of California's Truckee River surface water allocation not derived from Changed Diversion Rights, (2) storing in Lake Tahoe, water derived from Changed Diversion Rights with an original place of use in California, (3) storing in Donner Lake, Independence Lake, and Truckee River reservoirs other than Lake Tahoe, water derived from Changed Diversion Rights with an original place of use in California, and (4) storing in Donner Lake, Independence Lake, and Truckee River reservoirs other than Lake Tahoe, water derived from water rights adjudicated under the Sierra Valley Decree. The total combined amount of California M&I Credit Water and CEcaCred in storage at any time is limited to 8,000 acre-feet with no more than 3,000 acre-feet of storage in reservoirs other than Tahoe.

2018 Operations — There are no current plans for establishing or utilizing this California M&I Water benefit. Current M&I use in the area is served primarily by groundwater sources and will likely continue that way at least into the near future.

C) Local Participation

The Truckee River Basin Water Group (TRBWG) was formed in 1996 as a local forum to represent the interests of Truckee River Basin stakeholders and local agencies and to ensure that local citizens and stakeholders could be effectively engaged in the development of TROA and with the subsequent TROA implementation.

Monthly TRBWG meetings conducted in Truckee, California, currently address many topics related to water resources issues within the Truckee River Basin, including the implementation of TROA and providing related assistance to DWR. This assistance currently includes providing insight and suggestions on the Annual Guidelines, the monthly scheduling requests, and other related TROA issues.

California TROA representatives from DWR attend the monthly meetings to discuss recent TROA updates and current reservoir operations and scheduling. Participation by a diverse membership with varying interests enables TRBWG to be a useful forum to actively discuss and build consensus among stakeholders regarding local water issues before presenting official recommendations or requests to DWR.

Agencies, organizations, and individuals that participate or have previously participated in TRBWG activities include, but are not limited to, the following:

- Truckee River Basin Water Group.
- Truckee River Watershed Council.
- California Department of Water Resources.
- Placer County, Nevada County, and Sierra County.
- Town of Truckee.
- Local citizens and commercial business owners.
- Tahoe-Truckee Sanitation Agency.
- Local rafting and other recreational interests.
- Local fishery and environmental interests, including Trout Unlimited.
- Local water supply interests.
- Other State of California agencies, including the Departments of Fish and Wildlife, Parks and Recreation, State Water Resources Control Board, and the Lahontan Regional Water Quality Control Board.
- Federal agencies, including the U.S. Fish and Wildlife Service, U.S. Forest Service, and U.S Bureau of Reclamation.

3.3 Role of the TROA Administrator

The office of the TROA Administrator is an independent entity that oversees operations of the Truckee River and Truckee River reservoirs. The TROA Administrator is responsible for carrying out the terms and conditions of TROA, and the primary responsibilities of this position are to: (1) classify credit waters, (2) keep records of, and prepare reports covering water storage, release, exchange, and use, (3) schedule and coordinate operations, (4) ensure credit waters are used for their designated purposes, and (5) coordinate with the federal Water Master to avoid conflicts with water rights under the *Orr Ditch* decree. Under current administration by the federal Orr Ditch Court in Nevada, the position of TROA Administrator and the federal Water Master are filled by the same person.

A) Scheduling

Water managers from the Scheduling Parties formulate water storage and release schedules to suit their operational needs. The TROA Administrator integrates these schedules into an operating plan for the Truckee River reservoirs to satisfy the exercise of water rights and provide mandated minimum streamflows. The California Guidelines and scheduling requests are considered and incorporated whenever feasible.

B) Accounting

The TROA Administrator oversees daily operations and maintains an integrated schedule for projected future river and reservoir operations, including storage, flow control, accounting, and diversions. The scheduling and water accounting process is managed by the TROA Administrator through the use of a complex model of the Truckee River Basin using the RiverWare program. The TROA RiverWare model takes into account the complexities of the Truckee River Operating Agreement, water rights, current watershed forecasts, and Scheduling Party requests.

The TROA Administrator prepares daily reports documenting the operation of the Truckee River system carried out under TROA. The daily report is prepared and made available to the TROA Parties each working day through the website, www.troa.net. The daily report provides the status of all stream flow, reservoir levels, and other hydro-meteorological data used for operations. The TROA Administrator evaluates and summarizes operations on a monthly, annual, and ten-year basis.

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PART 4

RESERVOIR OPERATIONS OBJECTIVES

California Guidelines for 2018

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Table A (1) Truckee River Basin — 2018 California Preferred Instream Flow Objectives (CFS)

Prosser Creek Reservoir	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
TROA Minimum	5	5	5	5	5	5	5	5	5	5	5	5
TROA Enhanced Minimum	16	16	16	16	16	16	16	16	16	16	16	16
CALIF MIN Preferred Flow	30	30	30	30	30	30	30	30	30	30	30	30
CALIF PREFERRED Flow	100	100	75	75	60	60	45	30	30	30	30	75
CALIF MAX Preferred Flow [4]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Stampede Reservoir	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
TROA Minimum	30	30	30	30	30	30	30	30	30	30	30	30
TROA Enhanced Minimum	45	45	45	45	45	45	45	45	45	45	45	45
CALIF MIN Preferred Flow	125	125	75	75	45	45	45	45	45	45	45	45
CALIF PREFERRED Flow	250	250	150	150	100	100	75	45	45	45	75	150
CALIF MAX Preferred Flow [4]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Independence Lake [5, 6, 14]	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
TROA Min. (Regime 1) [6]	2	2	2	2	2	2	2	2	2	2	2	2
TROA Min. (Regime 2) [6]	4	4	4	4	2	2	3.5	3.5	3.5	3.5	2	2
TROA Min. (Regime 3) [6]	8	8	8	8	4	4	7	7	7	7	4	4
CA MIN and PREFERRED Flows [5]	California Preferred Flows deferred to the Nature Conservancy, CDFW, TMWA, USFWS, USGS.											
CALIF Max Preferred Flow [4, 14]	40	40	40	40	40	40	40	40	40	40	40	40

Table A (2) Truckee River Basin — 2018 California Preferred Instream Flow Objectives (CFS)

Donner Lake [7,8,9]	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
TROA Minimum Release	2	2	2	2	2	2	2	2	N/A	N/A	N/A	N/A
TROA Alt. Minimum [9]	3	3	3	3	3	3	3	3	N/A	N/A	N/A	N/A
TROA Enhanced Min	8	8	8	8	8	8	8	8	N/A	N/A	N/A	N/A
CALIF MIN Preferred Min Flow	8	8	8	3	3	3	8	8	N/A	N/A	N/A	N/A
CALIF PREFERRED Flow [7, 8]	100	75	8	8	8	8/10	10	10	N/A	N/A	N/A	N/A
CA MAX Preferred Flow[4]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Boca Reservoir[10]	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
TROA Minimum Release	0	0	0	0	0	0	0	0	0	0	0	0
CALIF MIN Preferred Flow[10]	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
CALIF PREFERRED Flow	While TROA requires no minimum flow in this reach, California prefers any flow at or above the CA Minimum Preferred Flow, shown above.											
CA MAX Preferred Flow [4]	No California Preferred Maximum Flow for this reach.											
Truckee River below Lake Tahoe [11, 12, 13]	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
TROA Minimum [11]	70	70	70	70	70	70	50	50	50	50	50	50
TROA Enhanced Min	75	75	75	75	75	75	75	75	75	75	75	75
CALIF MIN Preferred Flow	75	75	150	200	200	200	75	75	75	75	75	75
CALIF PREFERRED Flow [12, 13]	300	300	270	270	270	270/150	150	150	150	150	150	200
CALIF MAX Preferred Flow [4]	1200	1200	400	400	400	400	1200	1200	1200	1200	1200	1200

Notes for Table A:

1. The shaded boxes in Table A indicate the California “preferred” flows, projected at the time of printing and may change at any time. Updated preferred flow requests are provided to the federal Water Master and to the scheduling parties monthly, or as appropriate. The white (non-shaded) boxes indicate mandated flows per TROA and are included in the table for reference only.

2. Enhanced minimum releases are required only to the extent the category of water designated for enhanced minimum release can be exchanged or re-stored in a Truckee River reservoir per TROA Section 9.

3. Generous ramping schedules are requested and strongly encouraged, especially when reducing from high flow rates to minimize the risk of fish stranding and harm to habitat.

4. Maximum preferred flows are noted for certain reaches based on previously observed instances of high flows where it is believed that higher flows may have negative effects to existing stream banks and habitat. It is understood that it may be necessary to exceed these preferred maximums at certain times. In those situations, it is requested that DWR TROA Staff and USFS be notified in advance. Maximum preferred flow from Lake Tahoe during the summer months reflects public safety concerns.

5. The operations and scheduling of releases from Independence Lake is the responsibility of TMWA. To the extent practicable and consistent with water rights, CDFW, The Nature Conservancy, U.S. Geological Survey, U.S. Fish and Wildlife Service, and DWR may request certain reservoir operations that will enhance and protect the Lahontan Cutthroat Trout population in the lake.

6. Independence Reservoir minimum releases are determined by the Regime Schedule in TROA Section 9.C.6 and dependent on the current reservoir storage and season designation.

7. Preferred releases from Donner Lake are requested to the extent the preferred lake levels can be maintained through Labor Day of each year and, at a minimum, limited by the 1943 Indenture Agreement.

8. Minimum, maximum, and preferred flows from Donner Lake for the months of December through March are not applicable (N/A) because all inflows to the lake are required to be passed through from mid-November into April (California Division of Safety of Dams requirement).

9. The minimum release from Donner Lake is 2 cubic feet per second (cfs); however, the alternative minimum release is 3 cfs if the flow below the confluence of Donner Creek and Cold Creek is less than 5 cfs (Truckee River Operating Agreement Section 9.C.3(a)).

10. To maintain a wetted habitat, a minimum flow of 5 cfs downstream from Boca Reservoir is requested at all times (without the use of California credit waters, unless specified). To minimize the risk of fish stranding, a generous ramping schedule is strongly encouraged when reducing from high flow rates.

11. Lake Tahoe minimum releases of 50 cfs and 70 cfs are mandated in accordance with Section 5.B.6(b).

12. The release rates and reservoir operations scheduling from Lake Tahoe are dependent on the flow required to meet Floriston Rates. California preferred flows shown in Table A indicate the optimal flows for environmental habitat, fish, and for recreational needs in the Truckee River reach immediately below Lake Tahoe only.

13. Lake Tahoe releases scheduled for August for habitat and recreation are requested to continue through Labor Day.

14. The maximum preferred flow of 40 cfs noted for Independence Creek is the downstream flow that has been observed to overtop the channel and cause damage to Henness Pass Road and adjacent properties.

15. While TROA requires no minimum flow in this reach below Boca Reservoir, California always prefers any flow at or above the California Minimum Preferred Flow to zero-flow.

Table B 2018 Reservoir Storage Objectives for Recreation

Lake/Reservoir	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum Storage in Donner (See Note 1)	—	—	—	—	—	6.3 5932.0’	6.3 5932.0’	6.3 5932.0’	—	—	—	—
Preferred Min. Storage in Donner Lake (See Note 2)	—	—	—	—	—	9.4 5935.8’	9.4 5935.8’	8.0 5934.0’	—	—	—	—
Preferred Min. Storage in Prosser Creek Res.	—	—	—	—	—	19.0 5725.9’	19.0 5725.9’	19.0 5725.9’	—	—	—	—
Preferred Min. Storage in Stampede Res.	—	—	—	—	—	127.0 5914.7’	127.0 5914.7’	127.0 5914.7’	—	—	—	—
Preferred Min. Storage in Boca Res. (See Note 3)	—	—	—	—	—	33.0 5596.5’	33.0 5596.5’	33.0 5596.5’	—	—	—	—

Note: Lake storage level is expressed in thousands of acre-feet and the Equivalent Lake Level is expressed in feet.

Table C 2018 Reservoir Storage Objectives to Protect Reservoir Fisheries

Lake/Reservoir	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum Fish Storage — Prosser Creek Res.	5.0 5686.1	5.0 5686.1	5.0 5686.1	5.0 5686.1	5.0 5686.1	5.0 5686.1	5.0 5686.1	5.0 5686.1	5.0 5686.1	5.0 5686.1	5.0 5686.1	5.0 5686.1
Minimum Fish Storage — Stampede Res.	15.0 5829.0	15.0 5829.0	15.0 5829.0	15.0 5829.0	15.0 5829.0	15.0 5829.0	15.0 5829.0	15.0 5829.0	15.0 5829.0	15.0 5829.0	15.0 5829.0	15.0 5829.0
Minimum Fish Storage — Boca Res.	10.0 5562.7	10.0 5562.7	10.0 5562.7	10.0 5562.7	10.0 5562.7	10.0 5562.7	10.0 5562.7	10.0 5562.7	10.0 5562.7	10.0 5562.7	10.0 5562.7	10.0 5562.7
Min. Fish Storage in Independence Lake (See Note 4)	—	—	—	7.5 6934.1	7.5 6934.1	7.5 6934.1	7.5 6934.1	—	—	—	—	—

Note: Lake storage level is expressed in thousands of acre-feet and the Equivalent Lake Level is expressed in feet.

Notes for Table B and Table C:

1. The 1943 Donner Lake Indenture Agreement (May 3, 1943) prohibits flows above the minimum release if the lake elevation is below 5,932 feet during June, July, and August. While the optimum preferred lake level is always significantly higher than this indenture limit (see Note 2), the effective termination date for this indenture is requested to extend through Labor Day whenever possible, as that is the typical end to the high-use summer season.

2. The Donner Lake preferred lake level for optimal use during the high-use summer season is between 5,934.0 and 5,935.8 feet (7,967 acre-feet and 9,495 acre-feet, respectively) from Memorial Day through Labor Day.

3. The optimal preferred operating level for boat launching and water skiing at Boca Reservoir is between 32,000 and 33,000 acre-feet. However, it is understood the road over Boca Reservoir Dam is often subject to closure by USBR (Reclamation) when the lake level is in this range.

4. Minimum reservoir storage in Independence Lake is required for spawning access to upper Independence Creek for the lake population of Lahontan Cutthroat Trout.

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PART 5

APPENDIXES

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Appendix 5.1

Memorandum from California Department of Fish and Game

November 8, 2016

State of California
Department of Fish and Game

Memorandum

Date: November 8, 2016

To: Eric Hong, Chief
North Central Region Office
Division of Integrated Regional Water Management
Department of Water Resources
3500 Industrial Boulevard
West Sacramento, CA 95691

From: Tina Bartlett
Regional Manager
North Central Region

Subject: TRUCKEE RIVER OPERATING AGREEMENT CALIFORNIA GUIDELINES

The Truckee River Operating Agreement (TROA) designates the California Department of Water Resources (DWR) as the State of California's TROA representative. DWR is responsible for the preparation of annual California Guidelines for Truckee River and Reservoir Operations (Guidelines) to be submitted to the TROA Administrator and the other TROA scheduling parties (the U.S. Department of Interior, the State of Nevada, the Pyramid Lake Paiute Tribe, and the Truckee Meadows Water Authority).

The Department of Fish and Wildlife (DFW) staff have coordinated closely with DWR staff and other interested stakeholders to ensure that the Guidelines have been developed inclusive of measures that will protect fish and wildlife resources. While DFW has provided input on various parts of the document, sections specific to DFW's interest are:

Part 1

- 1.1 Truckee River Instream Flows and Priorities
- 1.2 Rationale for Priority Ranking
- 1.3 Flow Ramping Rates
- 1.4 Truckee River Watershed Natural Hydrograph

Part 2

- 2.3 Objectives for Independence Lake / Reservoir

Table A

The Department of Fish and Wildlife will continue to work closely with DWR on the preparation of these annual Guidelines, and understands that, although the Guidelines are submitted annually, any of the recommendations described in these Guidelines may be modified at any time.

It is important that coordination with DWR and other interested parties continue if the need for a modification arises.

If you have any questions about this memo please contact Laurie A. Hatton at (916) 358-2847 or Laurie.Hatton@wildlife.ca.gov.

Appendix 5.2

Stakeholder Request Invitation

March 25, 2016

To all interested Truckee River and Truckee River Basin Stakeholders:

As you may be aware, the Truckee River Operating Agreement (TROA) entered into effect in December, 2015. Under TROA, the California Department of Water Resources (DWR) is responsible for preparing and submitting annual guidelines and requested schedules to the TROA Administrator, including preferred operational objectives for streamflows and reservoir levels throughout the Truckee River Basin. This document is called the California Annual Guidelines for Truckee River Reservoir Operations (Guidelines). In addition, TROA allows California to amend the Guidelines and modify the scheduling objectives and requests as necessary, based on special needs, recommendations from the TROA Administrator or based on changes in hydrologic conditions.

DWR is currently preparing the first official submittal of the Guidelines in cooperation with the California Department of Fish and Wildlife (DFW) and representatives from the Truckee River Basin Water Group (TRBWG). As a part of developing these Guidelines and preparing for future TROA scheduling, DWR is assembling a list of special requirements and requests from local Truckee River Basin special interest groups and stakeholders. This list will include preferred flows and/or reservoir storage levels and the related schedule for optimal beneficial use for each of these stated purposes or activities.

DWR invites you to submit your initial anticipated requirements and requests for this upcoming season. Please notify DWR no later than April 15, 2016 to allow time for DWR and DFW to consider your request and to incorporate it into this year's Annual Guidelines. Additional future requests may be submitted to DWR for consideration at any time. Each individual request should include a detailed description of the use or activity, the minimum, maximum and preferred (or ideal) stream flow or reservoir level as appropriate, and the location and specific date or range of dates most beneficial to the activity. TROA provides California with the opportunity to make reasonable requests and to negotiate with the other TROA signatories, as necessary. However, there is no guarantee these requests will be fully satisfied. The final conditions are ultimately based on legal water rights, the requirements of TROA, the results of negotiations with other TROA scheduling Parties and, of course, Mother Nature.

If you have questions or need assistance in determining optimal flow or reservoir storage level values for your activity, please feel free to contact either Dave Willoughby at (916) 376-9637 or David.Willoughby@water.ca.gov or Paul Larson at 916-376-9658 or Paul.Larson@water.ca.gov.

Thank you,

Paul Larson, P.E.
Chief, California – Nevada & Watershed Assessment Section
California Department of Water Resources
3500 Industrial Boulevard
West Sacramento, CA 95691

Appendix 5.3

Stakeholder's Responses

California Department of Fish and Game

August 1996

Larson, Paul@DWR

From: Beth Christman <bchristman@truckeeriverwc.org>
Sent: Tuesday, March 29, 2016 11:01 AM
Subject: TRBWG: Invitation to Truckee River and Truckee River Basin Stakeholders
Attachments: Invitation to Truckee River Basin Stakeholders.pdf

Dear Truckee River Stakeholder:

As you probably already know, the Truckee River Operating Agreement is a reality, and California interests now have an enhanced ability to influence stream flows and lake levels in our section of the Truckee River watershed. Staff of the California Department of Water Resources are currently developing guidelines for flows and reservoir levels, and would like to receive recommendations from stakeholders here. Attached is an e-mail from DWR, inviting you to tell them your preferences. (The PDF in particular lists the information that State staff would like to receive.) Please note the April 15th deadline.

This e-mail is being sent to everyone on the recipient list of the Truckee River Basin Water Group. Please feel free to forward it to others whose opinions should be known. Making sure our various needs are articulated is the first step in helping ensure that this complex water system maximizes benefits for California and for us locally (to the extent it can within the parameters of TROA).

Your involvement is important. Thank you in advance for it.

Richard Anderson
Chair, TRBWG
Supervisor, District 5, Nevada County

Forwarded message from Department of Water Resources:

Greetings Richard,

As you are aware, the Department of Water Resources (DWR) represents the State of California's interests in the implementation of the Truckee River Operating Agreement (TROA). TROA is the result of many years of technical and legal negotiations between the major signatory parties, including the United States, the State of Nevada, Truckee Meadows Water Authority, The Pyramid Lake Paiute Tribe and the State of California. Many agencies and groups assisted and played a role in the development of TROA over the years, including the Truckee River Basin Water Group (TRBWG). DWR is appreciative of the role TRBWG continues to serve by informing the public and assisting DWR in facilitating the development of California's goals and opportunities under TROA.

The attached letter was prepared to invite the Truckee River and Truckee River Basin stakeholders and special interest groups to offer specific requests to DWR based on their own known special needs or preferences regarding local stream flows or reservoir levels. As described in the attached letter, DWR is currently preparing Annual California Guidelines to assist in the management of Truckee Basin water resources through TROA. These Guidelines will be referenced by the Federal Water Master and other agreement signatories when planning and scheduling their own reservoir releases to meet their downstream demands throughout the year.

DWR requests that TRBWG distribute the attached letter to your local membership and associates, inviting them to offer their input to DWR in developing the Annual Guidelines and future scheduling requests.

Larson, Paul@DWR

From: Willoughby, David@DWR
Sent: Tuesday, February 16, 2016 3:10 PM
To: Larson, Paul@DWR
Subject: FW: Independence Lake levels - TROA

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From: Christopher Fichtel [mailto:cfichtel@TNC.ORG]
Sent: Tuesday, February 16, 2016 3:06 PM
To: David Lass; Willoughby, David@DWR; Hatton, Laurie@Wildlife; Beth Christman; Somer, William@Wildlife; Lockhart, Mitch@Wildlife; Hanson, John@Wildlife
Subject: Independence Lake levels - TROA

Hi all,

Here are the desired conditions for annual water levels at Independence Lake to benefit Lahontan cutthroat trout (LCT):

- The lake should be at maximum elevation by May 15 so that adult LCT can get through the Independence Creek delta and into the creek to spawn, and to insure that redds lower in the creek do not become inundated by the lake with no flow through the gravels.

- Restrict September drawdown for downstream kokanee spawning in non-drought years to hold water back for a December drawdown.

- CDFW has requested that TMWA hold the lake level relatively high to December 1, then rapidly draw the reservoir level down ~ 3-5 feet in order to dewater kokanee redds. It is thought this drawdown could dramatically reduce kokanee recruitment to the lake population since the majority of kokanee redds are in shallow water.

Thanks. Chris

Chris Fichtel
Independence Lake Project Director

cfichtel@tnc.org
(775) 322-4990 Ext.3114 (Phone)
(775) 313-8646 (Mobile)
(775) 322-5132 (Fax)

The Nature Conservancy
Nevada Field Office
1 East First Street
Suite 1007
Reno, NV 89501

The Nature Conservancy
Protecting nature. Preserving life.

nature.org

Larson, Paul@DWR

From: Richard <rcc12345@aol.com>
Sent: Tuesday, April 05, 2016 3:22 PM
To: Larson, Paul@DWR
Cc: rcc12345@aol.com
Subject: Truckee River Rafting

2

Dear Mr. Larson:

Truckee River Rafting (Tahoe's Mountain Air Sports Inc.) is a family owned and operated, self guided, rafting business on the Truckee River. We float along the first four miles beginning at the Dam in Tahoe City and ending at the River Ranch/Alpine Meadows Road in Placer County. We have been operating during the short summer season between Memorial Day to Labor Day for over 40 years.

Our self guided rafting business has grown into one of the top summer recreation businesses in all of Lake Tahoe! Between the two permitted commercial raft companies, we employee between 150-200, mostly local people and college students during their summer break. Our company, on average draws between 700- 1000 customers per day, along with an additional 700 to 1000 customers per day for the other commercial raft company, for a combined total of 1400 to 2000 rafters per day! Adding this total with approximately 2000 private rafters who are also floating the river daily....for an overall combined total of approximately 3400 to 4000 rafters enjoying the recreation on the river daily!

With the Truckee River being the only outlet out of Lake Tahoe, this has become a very big tourist draw to our area. We draw tourists from all around the Lake, including many day trippers from the Reno/Carson City as well as as well as Sacramento/Auburn area. As I am sure you can appreciate, our rafters, whether they are day trippers, or short or long term vacationers, are drawn into the Tahoe City area, and they provide economic stimulus throughout the Tahoe Basin for many of the local businesses which include restaurants, supermarkets, retail outlets, sports shops, gas stations and bike rentals. Sport Shops and Gas Stations supply private rafters with retail equipment that they purchase consisting of rafts and paddles as well as other supplies.

Over the last 40 years, we have determined that the ideal water flow out of Lake Tahoe, for an enjoyable and safe float down the Truckee River, is approximately 300 CFS. The minimum flow where the river becomes too low and rocky, therefore dangerous and unenjoyable, is approximately 250 CFS...and when the flow of the Truckee River out of Lake Tahoe reaches approximately 400 CFS , then that level is too high and swift for the public to safely use the Truckee River for recreation and self-guided floats!

We are hopeful that the DWR will consider the implementation of controls regulating the flow of the Truckee River out of Lake Tahoe to ensure that summer-time rafting and water related activities take place throughout the summer. We are more than happy to make ourselves available for further discussions, input and recommendations, and we would appreciate any feedback that you and/or the DWR has with respect to this letter. Please feel free to view our website and or contact us via email or telephone.

Sincerely,

Richard Courcier

Truckee River Rafting.com

cell 530-320-1656

email: Rcc12345@aol.com

Larson, Paul@DWR

3

From: Cindy Gustafson <cindyg@tcpud.org>
Sent: Friday, April 08, 2016 8:34 AM
To: Larson, Paul@DWR
Cc: Ron Treabess (ron@gotahoenorth.com); Stacie Lyans (stacie@visittahoecity.com); Judy Friedman - Paper Trail (judy@tahoepapertrail.com); Richard Courcier (rcc12345 @aol.com); Aaron Rudnick (aaronrudnick@gmail.com)
Subject: Truckee River Flows

Hi Paul –

TCPUD provides trail and recreational access along the Truckee River from the outlet of Lake Tahoe to Squaw Valley Road. This stretch of the river hosts hundreds of thousands of recreational users each summer, both on the river and along the trail. Hikers, bikers, walkers, fishermen and women, rafters, swimmers all share this corridor. The area becomes highly impacted and with multiple agencies who have jurisdiction (including USFS, Placer County, TCPUD, as well as private property owners) it is challenging to assign responsibility for the impacts along this corridor.

We strongly support the commercial/private rafting companies in their pursuit of additional flows during the peak months of July – August. Their operations assist us in clean-up, monitoring and care for the river and are a very **critical** component of our local economy. Please consider their requests in drafting your operational objectives for streamflows and reservoir levels throughout the Basin.

Thanks for your effort and support,

Cindy Gustafson
General Manager
Tahoe City Public Utility District
530.580.6326 Direct Line
530.583.3796 Main Line ext. 326
www.tahoecitypud.com

Larson, Paul@DWR

From: Rob Weston <robweston203@gmail.com>
Sent: Friday, April 08, 2016 4:23 PM
To: Larson, Paul@DWR
Subject: TROA Guidelines input

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Hi Paul,

The Lake Tahoe West Shore Association is in support of revising the TROA Guidelines and would ask that consideration be given to allowing the flow levels of the Truckee River to be altered during the season as needed to support river rafting in Tahoe City.

This recreational activity provides a healthy avenue for our visitors and locals as well as providing a huge economic boost, not only to the rafting companies, but to local cafes, delis & markets, restaurants, and gift shops. The loss of this activity the past few seasons has had an intense negative impact on these same businesses and perhaps with better flexible monitoring of Truckee River flow, can be avoided in the future.

Respectfully submitted

Rob Weston
West Shore Association, Treasurer

Larson, Paul@DWR

From: Jennifer Campbell <jencafe@me.com>
Sent: Friday, April 08, 2016 11:50 AM
To: Larson, Paul@DWR
Subject: Input regarding TROA DWR Preferred Operational Objectives

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Dear Paul,

Thank you for considering our input regarding TROA and DWR formation of guidelines.

We are Jen and Glenn Campbell, owners of The Dam Cafe located at the Wye in Tahoe City.

While our business is completely separate from Truckee River Rafting, the impact of rafting upon our business is significant.

Through 14 years of operations, we have determined our Gross Revenue averages -23% when rafting is closed.

Many other local business owners have reported similar impacts which leads us to believe rafting is the most critical element of our local, summer economy.

Rafting business is also one of the only major entities responsible for environmental protection and preservation on the Truckee River.

Each year, they remove and recycle thousands of pounds of trash created by both private and commercial rafters. They also provide and maintain critical services such as restroom facilities every mile which are waterless and/or low-flow facilities, saving approximately 60,000 gallons of fresh water annually.

Without commercial rafting, the entire Truckee River would certainly be a wasteland of trash and sewage unless the responsibilities and costs were placed upon State and/or Federal agencies.

Please consider rafting company requests for streamflows and reservoir levels with highest priority while preparing your guidelines.

Rafting will occur regardless, so please consider commercial rafting as essential to our success and sustainability at The Dam Cafe, for all Tahoe City businesses and the Truckee River basin as a whole.

Thank you for your consideration.

Sincerely,
Jen and Glenn Campbell, The Dam Cafe

The Dam Cafe

Larson, Paul@DWR

From: rossecollins@gmail.com on behalf of Ross Collins <rcollins@chaseinternational.com>
Sent: Monday, April 11, 2016 10:45 AM
To: Willoughby, David@DWR
Subject: Re: Water Ski Club

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Dave, per our conversation, our preferred operating level for Boca is 33,000 acre feet. 32,000 to 33,000, works very well. Our minimum level to operate is 29,000. There is no maximum. Our season is weather dependent but generally runs from late May to middle of October, the primary use period is Memorial Day thru Labor Day. Our interest in Stampede is really only as it relates to use in Boca. If Stampede is able to be accessed by the boat ramp, that draws recreational use to Stambede and reduces use on Boca, which is in our interest.

We would love to have the projected levels and actually require that we know when the minimum is anticipated so we can remove our course prior to that level being reached.

Let me know if this is what you needed, if you need further clarification, I am happy to help.

On Mon, Apr 11, 2016 at 9:51 AM, Willoughby, David@DWR <David.Willoughby@water.ca.gov> wrote:

Ross,

I'm trying to get a contact for the Water Ski Club up in the Truckee area so I can represent them in a recreation request for preferred reservoir levels in the area. I specifically need times of year and reservoir levels that are required for the club to operate? Would greatly appreciate any input.

David Willoughby

Department of Water Resources

North Central Regional Office

3500 Industrial Blvd.

West Sacramento, CA 95691

916-376-9637

Larson, Paul@DWR

From: Willoughby, David@DWR
Sent: Tuesday, May 03, 2016 9:23 AM
To: Larson, Paul@DWR
Subject: FW: Truckee meeting agenda

7

This is the last one I got.

From: Aaron Rudnick [mailto:aaronrudnick@gmail.com]
Sent: Thursday, April 14, 2016 12:17 PM
To: Willoughby, David@DWR
Subject: Re: Truckee meeting agenda

Hello David,

Thank you again for your time and assistance. I wanted to make sure I got back to you with flow requests, and the names of the other companies you wanted to reach out to. Our typical season is from around Memorial Day through the end of Labor Day weekend. If we could request specific flows, they would go as follows; Minimum flow - 250cfs. Ideal flow - 300cfs. Maximum flow - 400cfs.
Richard already did a wonderful job of introducing what commercial rafting is and it's benefits to the area, so I will spare you the redundancy. As for the other two companies that operate further down the Truckee, the first is Tahoe WhiteWater Tours (530) 587-5777, run by Mike Miltner, or "Milty." The other company is named I.R.I.E. run by Erik Anderson and Mike Wholfahrt, (530) 582-4900. I hope that helps.
Richard from Mtn Air, and myself would like to attend the April 27th TRBWG, if you would be able to make that one. If not, please let me know, we'd love to meet you. Thank you and have a great day.

-Aaron Rudnick
Truckee River Raft Co.
(530) 583-0123
Cell: (509) 251-2237

On Wed, Apr 13, 2016 at 3:41 PM, Willoughby, David@DWR <David.Willoughby@water.ca.gov> wrote:

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DONNER LAKE PROPERTY OWNERS' ASSOCIATION

PO BOX 8387
TRUCKEE, CA 96162

www.dlpoa.org
Gardner Combs, President

June 15, 2016

Paul Larson, P.E.
Chief, California – Nevada & Watershed Assessment Section
Regional Planning and Coordination Branch
IRWM - North Central Region Office
California Department of Water Resources
3500 Industrial Boulevard
West Sacramento, CA 95691

Re: **Donner Lake Operations Interests and Concerns.**

Mr. Larson:

As President and authorized representative of the DLPOA, I am writing to express our interests in and the importance of Donner Lake level to homeowners, businesses and the general public that use this beautiful resource.

The DLPOA represents over 700 property owners around Donner Lake. In addition to the DLPOA there are several more homeowner associations with private beaches, floating docks and piers, with Tahoe-Donner being the largest with 7,800 home sites associated with their beach facility. Donner Lake, through incorporation, became part of the town of Truckee in 1994 and the Town has spent millions of dollars on bike paths, mass transit bus lines and improvements of their own 10 acre public beach which is also at the West end. The Town also maintains approximately 40 public boat docks that are always full. All summer long there are organized triathlons, paddle board and sailboat races along with swimming competitions that utilize the entire length of Donner. But the largest beach frontage by far is owned by the state of California at the east end of the lake known as the Donner Memorial State Park. Along with the Private, the Town and the State Beach interests there are numerous businesses that are accustomed to and depend on high lake levels throughout the summer recreation season. "During winter holiday periods and a majority of the summer, the population of the Lake can swell to over 6,000 people. In addition, day visitors at the beaches and State Park can almost match that number. "*Donner-lake.com*/oncearoundourlake.asp"

It is our understanding that the new TROA and changes in ownership of storage water will offer new options in management of lake level and new, increased minimum release requirements. We would like to take the opportunity to emphasize the legal requirement of continuing to honor

provisions of the 1943 Donner Lake Indenture, specifically paragraph 5 and in addition, to extending the intent or spirit of that agreement to recognize and maintain the historic practice of not using Donner Lake storage to meet water supply demands until after Labor Day, during years when other alternatives exist. The 1943 agreement was the legal recognition that Donner Lake is the only residential reservoir in the area, and requires a nearly full lake for the 3 months of June, July, and August, which have always been associated with summer recreation. It is our hope that with the new TROA, stored water in Donner Lake will always be the last water taken from the system of multiple reservoirs.

Boat launching and use of the DLPOA marina facilities at the west end of the lake currently (2016) require a minimum lake elevation/storage of approximately 5935.50 ft. or 9238 AF. The relatively high, minimum water surface elevation may have increased somewhat over many years due to sediment deposition at the inlet mouth and west end of the lake in general. Up until 10 years ago, about every 3 years, the DLPOA would remove sand from the lake bottom in the marina area in the late fall after September. We would simply bring the sand up to the beach and evenly distribute it. This method and the timing of it was always useful to our beach operation and we would certainly be in favor of going through the permit process and hopefully having an "open" permit to be allowed to continue this practice. It should also be noted that the DLPOA owns to the legal "low water mark" and in the winter the area of sand removal is completely high and dry.

Turbidity of the lake can be greatly increased, and clarity reduced, as observed in the 2015 summer when lake level is lowered by early releases. This negative impact was observed and commented on by many visitors during the 2015 summer. The impact is thought to be caused by wave action breaking on the lower shoreline, which is not exposed at typically higher lake levels. We believe this negative environmental impact can be avoided or reduced by observing the historic practice of not making water supply releases from Donner before Labor Day.

Lastly, we understand that the new TROA greatly increases the drought water supply for TMWA and adds many more options for meeting TMWA's water supply demands during drought conditions. We respectfully request that our lake level interests and needs be taken into account by considering the broader intent and historical implementation of the 1943 Indenture and relying on abundant new TROA based drought water supplies before September 1 of future years.

We would very much appreciate your support in this reservoir operation request in 2016 and future years. Thank you.

Sincerely,

Gardner Combs
President , DLPOA

Sent by postal mail and email.

Cc: DLPOA Board of Directors (by email)

Larry Heywood
Conservation Chair
Tahoe Truckee Fly Fishers
P.O. Box 222
Homewood, CA 96141

June 29, 2016

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Paul Larsen, P.E.
Chief California - Nevada Watershed Assessment Section
California Department of Water Resources
3500 Industrial Boulevard
West Sacramento, CA 95619

Dear Mr. Larsen

Re: Truckee River Operating Agreement

The Tahoe Truckee Fly Fishers is a non profit sportsman group dedicated to the sport of fly fishing and protecting the trout rich waters of the Truckee -North Tahoe area. Since 1984 TTFF has advocated for and helped fund better land use management for local waters and fisheries, restoration projects to enhance local fisheries and special regulations to protect local fisheries. Given the TTFF's geographic location in the center of some of California's best and well known and most visited trout fishing waters, it also represents the interests of countless anglers who visit and fish the area's waters. As advocates for the fish, fisheries and the fly fishing interests of countless anglers, the TTFF requests that the DWR consider and prioritize these interests in the development of its Guidelines for stream flow releases and reservoir levels.

We request that you consider adequate and consistent stream flows in the following streams to provide for fish spawning and incubation, juvenile fish rearing and healthy adult trout. Additionally, we request that any changes in flows be gradually ramped to allow for migration of fish and bio mass. We request the following considerations for these specific streams:

Truckee River: Provide adequate summer flows to maintain healthy trout populations.

Little Truckee River: The Little Truckee River is one of the best tail-water wild trout fisheries in the west. As a result, it is very popular with fly fishers and receives significant pressure from both local and visiting anglers. To maintain the streams healthy fish population and to provide a continued high quality angling experience it is important that springtime and early summer flows be adequate for successful Rainbow trout spawning and incubation. We suggest a minimum flow of 250 - 300 CFS (the historical flows). This will also provide a flushing of weeds that can choke the stream and decrease the angling experience. Summer and fall flows should be a minimum of 80-100 CFS to maintain a healthy fish population.

Lower Prosser Creek: The section of Prosser Creek below Prosser Dam is an important fish spawning area for Truckee River Rainbows. It is critical that springtime and early summer flows

be adequate for successful trout spawning and incubation. It is also important that flows remain constant and adequate during summer months to maintain a healthy resident trout population.

Thank you for your time and consideration and we hope that DWR's recommendations appropriately prioritize the fish and fisheries.

Sincerely,

Larry Heywood

Larry Heywood
Conservation Chair
Tahoe Truckee Fly Fishers

Instream Flow Recommendations for the California Guidelines

Enhancing fishery and recreation potential through the Truckee River Operating Agreement

10

July 1st, 2016

David W. Lass
California Field Director -Trout Unlimited
10356 Donner Pass Rd.
Truckee, CA 96161

Paul Larsen, P.E.
Chief California - Nevada Watershed Assessment Section
California Department of Water Resources
3500 Industrial Boulevard
West Sacramento, CA 95619

Dear Mr. Larsen,

On behalf of Trout Unlimited (TU) and the more than 15,000 TU members residing in California and 170,000 members nationwide, we submit the following recommendations to enhance instream flow in the Truckee River and regulated tributary reaches to better develop the California Guidelines that represent the State of California's best interests for improving both biologic and recreation interests under the Truckee River Operating Agreement (TROA).

Organization Background

Trout Unlimited is dedicated to conserving, protecting, and restoring native trout and salmon and their watersheds in North America. TU has almost 170,000 members organized into 35 state councils and 450 local chapters, with some 15,000 members in California. Our members invested more than 650,000 volunteer hours in 2014. Our headquarters are in Arlington, Virginia, and we have field offices in many states, including California. We operate largely through collaboration and partnerships, and emphasize innovative, practical, on-the-ground problem-solving over litigation.

TU accomplishes our mission through a simple formula: protect, reconnect, restore, and sustain. TU's conservation framework is to protect intact habitat, then reconnect this habitat to downstream stream reaches we restore by improving streamflows and removing migration barriers, and sustaining our sporting legacy by building a durable constituency of sportsmen-stewards.

In California, our staff work with our members, other sportsmen's groups, and with environmental organizations to better conserve and protect public lands and waters, on habitat restoration projects and land stewardship, on reform of state water law, on the science of fisheries management, and on development and completion of large-scale projects such as dam removals, river and alpine meadows restoration, and "habitat-friendly" energy production. TU

has five core programs in these states: our North Coast Coho Project (NCCP); our California Water Project; our Sportsmen's Conservation Project, our Watersheds Program, and; our Science Program. TU has thirteen staff in California responsible for implementing these programs, located in Emeryville, Ft. Bragg, San Juan Bautista, Carmel Valley, Fresno, Mammoth and Truckee. Many of our members' fish in the streams and lakes and hunt in lands of the Truckee River Watershed and have a vested interest in the outcomes of TROA.

I. Lower Prosser Creek

Site Description

Lower Prosser Creek is a short 1.6 mile tributary to the Truckee River below Prosser Dam and is a very popular fishery for local and regional anglers. The popularity of Lower Prosser Creek can be attributed to its ability to consistently support some of the largest wild trout found within the immediate Tahoe region (Rainbow and Brown trout 20-30" long). The water released from the bottom of Prosser Reservoir is consistently cold and loaded with nutrients supporting rich and diverse aquatic insect life trout depend on. Freshwater shrimp, also known as scuds, represent a significant portion of resident fishes diet. Also important are benthic macro invertebrate life (especially from the Phylum anthropoda), supported by consistent cold water releases. This is a very special place that has the opportunity to become even more exceptional through instream restoration and improved releases from Prosser Dam.

The water and habitat types found in Lower Prosser Creek are also what make the Truckee River wild trout fishery so productive. Truckee River fish find refuge in Lower Prosser Creek from extreme thermal thresholds in the Truckee River during hot summer and cold winter months, so adequate flows during these periods are especially important. Improving instream flows in Lower Prosser Creek will create a significant amount of additional habitat that these fish will utilize for shelter, food and reproduction.

The following are daily averages for Prosser Creek compiled from USGS data from October 1968-September 2013:

Nevada County, California Hydrologic Unit Code 16050102 Latitude 39°26'09", Longitude 120°05'00" NAD27 Drainage area 146 square miles Gage datum 5,618.67 feet above NGVD29	Output formats HTML table of all data Tab-separated data Reselect output format

00060, Discharge, cubic feet per second,

Mean of daily mean values for each day for 44 - 45 years of record in, ft3/s (Calculation Period 1968-10-01 -> 2013-09-30)

Calculation period restricted by USGS staff due to special conditions at/near site

Day of month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	81	81	104	247	426	399	179	140	72	71	46	46
2	124	80	116	252	443	384	182	135	72	72	42	48
3	119	78	120	250	444	387	187	131	71	73	41	49
4	100	79	117	248	450	397	190	128	69	75	43	52
5	96	80	122	246	460	393	197	125	67	74	44	59
6	97	83	117	238	484	391	207	123	65	74	44	68
7	104	89	111	233	500	393	202	122	64	73	44	73
8	119	95	111	227	495	384	207	121	64	74	43	71
9	127	96	109	223	495	377	203	140	66	74	43	72
10	127	92	110	217	504	361	190	156	65	72	43	74
11	135	88	114	224	512	352	183	134	64	71	44	75
12	148	82	116	236	519	349	191	118	62	71	45	81
13	155	79	120	240	527	353	194	114	61	72	44	90
14	143	82	117	248	532	349	189	113	62	72	44	84
15	116	85	117	256	525	339	191	107	56	71	44	80
16	97	88	130	264	526	320	183	106	51	71	44	80
17	90	94	142	271	523	301	188	110	50	73	44	79
18	84	96	148	279	541	273	182	110	51	75	44	76
19	84	94	153	290	540	248	185	110	52	74	46	73
20	90	97	157	313	525	229	170	110	52	72	48	71
21	97	100	156	334	510	219	177	101	52	71	49	73
22	93	99	145	357	528	218	173	99	52	71	49	72
23	95	93	147	374	538	215	172	95	55	71	51	72
24	97	90	150	366	531	212	144	95	57	72	54	72
25	87	93	161	368	513	207	127	95	59	70	52	70
26	78	94	181	362	497	201	132	92	59	70	46	69
27	80	103	201	367	485	195	137	89	61	62	44	74
28	86	105	218	381	476	193	137	86	63	56	44	80
29	84	99	215	391	464	192	135	81	64	53	45	81
30	80		209	407	453	186	137	76	68	52	44	76
31	81		230		433		141	74		51		81

The following are daily averages for Prosser Creek compiled from USGS data from October 2004-September 2013:

Nevada County, California Hydrologic Unit Code 16050102 Latitude 39°22'24", Longitude 120°07'50" NAD27 Drainage area 52.9 square miles Gage datum 5,572.62 feet above NGVD29	Output formats
	HTML table of all data
	Tab-separated data
	Reselect output format

00060, Discharge, cubic feet per second,

Mean of daily mean values for each day for 8 - 9 years of record in, ft3/s (Calculation Period 2004-10-01 -> 2013-09-30)

Period-of-record for statistical calculation restricted by user

Day of month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	61	43	116	113	115	120	145	50	85	82	25	26
2	77	45	129	114	108	109	144	52	86	83	18	34
3	202	45	88	118	111	105	141	55	88	84	20	75
4	230	45	73	126	121	120	139	56	89	84	24	86
5	161	44	75	130	125	136	142	56	91	84	23	78
6	66	47	66	124	132	137	139	56	92	85	21	70
7	39	48	56	121	132	136	129	56	92	89	21	66
8	39	48	56	120	131	129	121	59	91	88	22	59
9	39	45	57	121	129	115	116	61	89	89	23	50
10	44	43	55	117	120	111	105	63	86	94	24	42
11	50	44	52	108	122	110	96	65	84	95	24	38
12	49	46	53	103	124	113	88	67	83	94	26	35
13	46	46	55	101	120	121	83	68	83	94	23	35
14	46	43	62	99	117	119	84	69	82	94	20	38
15	46	42	77	98	113	121	80	72	81	94	21	47
16	46	38	87	99	111	120	75	72	80	91	26	58
17	44	37	86	102	111	117	73	73	79	89	27	55
18	42	37	84	108	118	122	70	77	78	87	26	48
19	41	38	85	113	133	128	67	79	77	84	26	53
20	38	41	89	108	159	131	66	81	80	78	27	56
21	38	39	89	106	176	138	65	81	81	67	27	53
22	37	37	89	112	180	138	60	81	81	66	27	69
23	36	37	88	116	184	139	56	83	81	63	27	81
24	36	38	87	115	174	139	55	85	81	62	26	83
25	36	40	87	117	158	139	53	84	80	62	26	82
26	36	45	87	111	141	137	51	83	80	63	25	82
27	39	65	95	118	132	135	49	82	80	58	25	76
28	42	65	101	121	134	139	48	78	80	50	24	86
29	42	35	99	120	137	145	49	78	80	42	24	96
30	41		102	118	138	144	48	79	81	40	27	92
31	40		110		134		50	83		35		31

Flow Observations

Lower Prosser Creek generally suffers from greater than maximum flows in the late winter and very early spring (March and April) and sub-minimum flows in the mid-summer, fall and early winter months (mid July-August, late October-February). See above. Sub-minimum flows are measured as flows below the 16cfs CDFW recommended minimum release. In actuality, these flows historically measured from 3-12 cfs due to restrictions in dam conveyance (Prosser could not release flows between 14-25 cfs). One consistent observation is that instream flows in Prosser annually drop at the end of April and/or early May, to around 12 cfs, or once spring run-off starts, given Stateline rates are met with natural runoff. Coincidentally, this impacts the start of the general fishing season on Prosser Creek, which is the last Saturday in April, and provides sub-optimal recreational opportunities for anglers until runoff subsides, usually in July. These reduced flows also impact any successful Rainbow trout spawning that occurred at elevated flows during March and early April, specifically by stranding, disconnecting backwaters and exposing redds, which are observed at any rate below 16 cfs. Anecdotal observations find the channel of Prosser Creek and side channel habitat is entirely wetted (not bankful) at 30 cfs and above.

Recommendations:

- Avoid extreme fluctuations and allow for generous ramping rates that negatively affect the aquatic community (not to exceed 100% of beginning rate <24 hours) by moving water between facilities using joint program fish credit water, doing voluntary exchanges, etc. (i.e. blend Fish Water and Floriston Rate water releases between Boca and Prosser)
- Avoid dropping flows below 30cfs. Never drop flows below 16 cfs. At flows below 16 cfs, there is limited habitat for fish at any life history stage, and snagging/poaching occurs and water temperatures significantly rise.
- Run calculations and modeling to estimate the greatest amount of water over the longest period of time from Prosser than historically observed during the annual reservoir draw down for flood protection, as opposed to dumping water over a small period of time and then flatling a much smaller release for a longer period of time.

II. Little Truckee River below Stampede Dam

Site Description

The section of the Little Truckee River between Stampede and Boca Reservoirs has always been a favorite spot for local anglers. Short in length – only 5 miles – and highly technical in its demands on the angler, the "LT" is unique and beloved by anglers around the country for good reason. The LT is no longer stocked with hatchery trout, and since its conversion to a special regulation water in 1999, it has emerged as one of the most popular and productive wild trout fisheries in the State of California. On any day of the week you will find vehicles with license plates from a handful of different western states filling the parking lots that access the river's eastern bank. This is a nationally recognized destination trout river that brings significant revenue to the north Tahoe region, attracting sportsmen looking to pursue some of the State's largest wild trout in one of the prettiest Northern Sierra meadow settings.

Since there are no major tributaries that enter the river through this reach, this section of the river is entirely controlled by dam operations from Stampede Dam. A large restoration project was recently completed by California Department of Fish and Wildlife (CDFW), Trout Unlimited, and the US Forest Service that increased instream structures and large woody debris to increase cover for adult trout and rearing habitat for juvenile trout. There is a lot of good energy and partnership work happening along this stretch of river to improve the fishery and meadow habitat, and flow is one of the major limiting factors.

The Little Truckee River is particularly a great river for natural reproduction of resident trout and adfluvial fish that migrate up from Boca Reservoir. Flows dictate successful and unsuccessful spawning years, and stranding and exposed redds during short periods in May, which is not reflected on the graph(s) below that show averages, are the primary concern for Trout Unlimited. These have been isolated incidences observed by guides in the area that might be less than a 24-hour period in length, but which have great impact to aquatic community. Wetted side channel habitat during March, April and May are extremely important to this fishery. Most side channel habitat is wetted and suitable for spawning at 75 cfs and greater. Ideal spawning flows and flows which remove aquatic weeds from the system that build up over the winter months are estimated between 250-400 cfs (study in progress).

The following are daily averages compiled from USGS data from October 1968-September 2013:

00060, Discharge, cubic feet per second,												
Day of month	Mean of daily mean values for each day for 45 - 45 years of record in, ft3/s (Calculation Period 1968-10-01 -> 2013-09-30) Calculation period restricted by USGS staff due to special conditions at/near site											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	83	82	105	247	424	395	176	139	72	71	46	47
2	124	80	116	251	442	380	179	133	71	72	42	48
3	119	79	120	250	444	382	184	130	70	73	41	50
4	101	80	118	248	450	393	186	127	67	74	43	55
5	97	81	122	246	460	389	194	124	67	74	44	62
6	98	83	117	238	483	387	204	123	65	73	44	71
7	105	90	112	233	499	389	198	121	64	73	44	75
8	120	96	112	227	494	380	203	120	64	73	44	73
9	128	96	110	223	494	373	199	139	66	73	43	74
10	128	93	111	217	503	357	187	154	65	71	43	76
11	135	89	115	225	511	349	180	133	64	70	44	77
12	147	82	117	236	517	346	187	118	62	71	45	83
13	154	80	121	240	525	350	190	114	61	71	44	91
14	143	83	118	247	530	346	186	112	62	71	44	85
15	116	86	118	256	523	336	188	106	56	71	44	82
16	97	89	130	263	524	318	180	106	51	71	44	81
17	91	94	142	270	522	299	185	110	50	72	44	81
18	85	96	148	278	539	272	180	109	51	74	44	78
19	85	95	153	289	538	247	182	110	52	73	46	74
20	91	97	158	311	523	229	168	109	52	71	48	73
21	97	100	157	332	509	219	174	101	52	71	50	74
22	94	100	146	354	526	218	171	99	52	70	50	74
23	96	94	148	371	536	215	169	95	55	71	52	74
24	97	91	151	364	529	212	143	95	56	71	55	74
25	87	94	162	366	510	207	126	95	58	69	53	72
26	78	94	182	359	495	202	131	92	58	70	46	71
27	81	104	201	364	483	194	135	89	60	61	45	75
28	86	105	219	378	474	191	135	86	63	56	46	81
29	84	99	215	388	460	190	134	81	64	53	46	83
30	81		210	404	449	184	135	76	67	52	46	77
31	82		230		429		139	73		51		83

The following are daily averages compiled from USFS data from October 2003-September 2013:

00060, Discharge, cubic feet per second,

Mean of daily mean values for each day for 9 - 10 years of record in, ft3/s (Calculation Period 2003-10-01 -> 2013-09-30)

Period-of-record for statistical calculation restricted by user

Day of month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	81	87	170	206	311	255	173	118	95	59	48	70
2	78	88	211	205	307	231	176	111	97	59	46	66
3	90	88	223	207	319	218	183	107	98	59	47	71
4	131	90	199	237	334	198	187	102	95	59	53	79
5	146	91	202	257	342	191	194	99	97	59	58	82
6	134	94	182	236	334	200	200	97	95	58	59	82
7	120	96	159	208	341	197	204	96	92	58	59	80
8	120	94	148	203	346	198	203	95	86	58	59	80
9	113	93	147	202	346	203	209	93	81	58	59	81
10	106	91	148	198	361	211	204	89	80	58	59	81
11	108	90	149	191	366	211	197	89	78	58	59	81
12	108	90	149	186	365	214	200	91	69	57	59	80
13	109	88	150	188	371	210	203	92	56	57	59	77
14	108	87	150	201	375	210	203	93	56	56	58	78
15	108	93	151	202	376	214	201	93	50	56	58	78
16	107	97	158	200	385	215	197	94	50	55	57	78
17	108	98	158	207	374	214	188	94	50	65	56	76
18	103	99	157	216	385	207	184	93	50	70	53	74
19	97	102	159	222	403	202	186	93	49	63	53	75
20	91	103	163	222	408	203	179	93	48	63	55	71
21	88	99	164	223	404	208	175	92	48	70	60	71
22	87	102	163	223	410	213	168	90	48	73	63	72
23	90	107	160	224	413	223	163	93	55	73	64	69
24	93	113	161	232	402	223	159	94	61	74	64	67
25	90	117	165	244	388	214	155	95	61	70	67	58
26	89	118	164	248	375	203	149	94	60	67	67	56
27	88	136	174	270	343	198	145	94	59	62	68	58
28	88	147	189	305	319	183	142	94	58	56	71	66
29	89	90	195	301	301	180	134	94	58	51	71	67
30	88		200	303	290	176	127	94	58	50	72	74
31	87		205		279		124	96		49		96

Flow Observations

The Little Truckee River is a great place to focus additional water given the historic flows are not far from what a natural hydrograph would look like in this kind of system (see above). The main problems with the Little Truckee River are sudden fluctuations and ramping. Anglers have witnessed the Little Truckee flow almost double within hours, just to come back down in another few hours, typically occuring during summer months. Suitable spawning flows in the spring (250-400 cfs) can suddenly drop to as low as 30-45 cfs stranding fish and exposing redds. Rainbow trout in the Little Truckee River spawn from the first week in March through as late as the first week in June. Keeping flows higher than 125 cfs through June is essential to keeping redds wetted and ensuring the incubation of eggs during the spawn, because rainbow trout eggs incubate for approximately 3 weeks in 55 degree water (average Little Truckee temperature from March-June). In 2016, we observed that the likelihood of releases from Boca Reservoir during drought periods is extremely unlikely, directly limiting releases from Stampede Dam due to limited storage capacity in Boca during the spring and early summer months prior to release. This limited release in 2016 had deleterious impacts on the rainbow trout spawn as traditionally suitable habitat exposed and unavailable, and many spawning fish were prey to osprey and bald eagles that congregated along the river.

Recommendations:

- Avoid critically low flows <75 cfs during the spring spawn (March 1-June 30)
- Avoid extreme dropping and ramping rates, and meter water out of Stampede to allow for more consistent releases over a longer period of time (if water is planned to be moved for fish water, plan releases early and store water in Boca Reservoir to allow for greater flexibility in releases from Stampede to meet Tribal needs).
- Consider an annual pulse flow in February to initiate rainbow trout spawning and remove aquatic weeds from the channel.
- Consider decreasing the flow to 30 cfs from December 15th-February 15th during drought years to allow for additional storage in Boca Reservoir to initiate a pulse flow for weed management (February) and elevated spawning flows (March-June)
- Optimal recreation flow during the summer (June-September) is between 125-150 cfs.
- Avoid dropping flows below 75 cfs, as this is the flow TU and Balance Hydrologics, Inc. measured the majority of the channel and side channel habitat is entirely wetted. Never drop flows below 45 cfs, as exposed substrate and stranding occurs during these flows.

III. Little Truckee River (below Boca)

Site Description

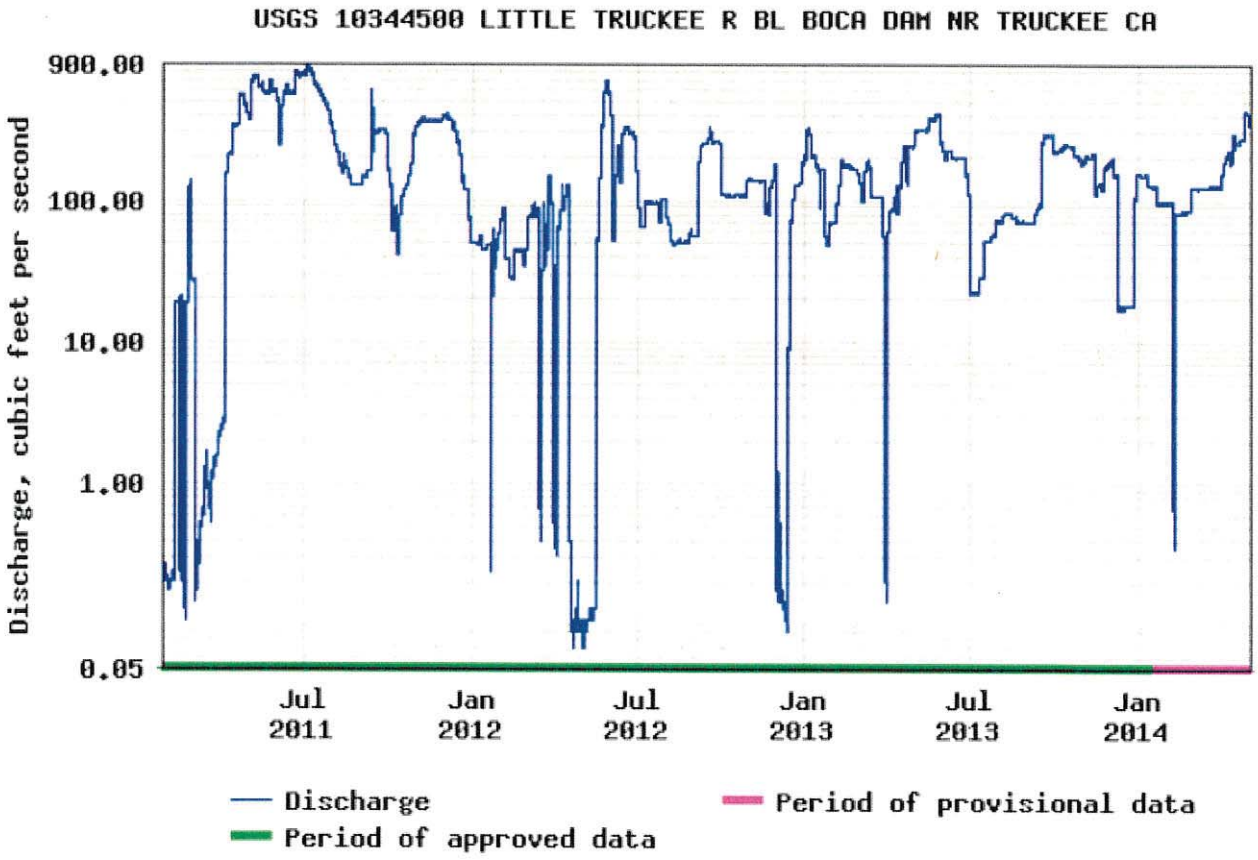
This section of the Little Truckee River below Boca Reservoir is roughly ¼ mile in length and is an underutilized fishery that TU feels has potential to grow large fish and provide refugia for Truckee River wild trout. This is a bottom release source of coldwater that can positively benefit the Truckee River fishery during the critically warm late-summer season. TU believes that aside from managing this short section of the Little Truckee River as viable fishery option, the value of

cold water for the 50 miles of wild trout water in the Truckee below the confluence to just below Derby Dam should be considered and enhanced if at all possible.

Since 2002, the flows have improved out of Boca Reservoir and instream flow in the Truckee River downstream have benefited. A major limiting factor for the Little Truckee fishery below Boca Reservoir are times when the flow is dropped to almost nothing, generally during December and June and intermittently throughout the year (see below).

Discharge, cubic feet per second

Most recent instantaneous value: 346 05-05-2014 19:00 PDT



The following are daily averages below Boca Dam compiled from USGS data from October 1969-September 2013:

Day of month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	00060, Discharge, cubic feet per second, Mean of daily mean values for each day for 44 - 44 years of record in, ft3/s (Calculation Period 1969-10-01 -> 2013-09-30) Period-of-record for statistical calculation restricted by user											
1	101	89	112	204	375	374	196	165	126	134	94	99
2	98	86	123	197	397	361	197	159	127	129	91	103
3	108	85	126	190	398	358	205	156	126	125	91	104
4	139	88	118	192	401	364	212	159	121	123	92	103
5	159	89	117	195	403	357	212	161	121	124	92	94
6	160	84	111	196	397	348	219	159	124	127	91	86
7	150	85	105	189	399	355	223	160	127	133	94	84
8	148	97	94	187	398	337	223	161	129	135	92	84
9	148	106	94	193	403	321	217	175	133	134	89	89
10	147	103	92	191	416	313	209	178	135	136	92	88
11	148	90	97	189	434	310	199	163	134	134	92	87
12	142	81	102	194	448	313	191	156	130	127	93	96
13	140	78	99	198	459	322	195	151	129	126	94	104
14	140	77	95	212	454	310	196	150	129	122	94	105
15	136	76	100	237	462	295	202	144	127	127	94	102
16	102	75	105	248	464	279	206	141	130	128	94	103
17	86	80	111	252	463	266	216	145	130	123	91	105
18	87	86	114	260	468	254	214	143	131	124	93	105
19	84	88	115	267	471	237	211	141	135	127	100	96
20	84	103	122	281	467	219	202	138	139	132	104	91
21	81	117	124	292	458	212	205	133	143	128	106	85
22	81	113	110	305	451	220	205	128	148	125	102	77
23	88	106	106	311	447	220	205	124	146	122	99	75
24	102	95	109	308	434	208	177	129	144	118	100	76
25	90	95	119	317	423	204	162	130	142	117	96	79
26	75	96	137	323	418	194	166	130	142	111	91	85
27	85	98	154	334	412	188	169	128	144	99	89	90
28	98	90	177	341	403	197	170	123	145	96	93	92
29	101	56	189	344	397	194	172	122	148	97	95	95
30	88		190	356	389	193	175	122	151	100	93	106
31	88		199		383		170	122		101		109

The following are daily averages below Boca Dam compiled from USFS data from October 2003-September 2013:

00060, Discharge, cubic feet per second,

Mean of daily mean values for each day for 9 - 10 years of record in, ft3/s (Calculation Period 2003-10-01 -> 2013-09-30)

Period-of-record for statistical calculation restricted by user

Day of month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	99	82	204	80	250	245	164	132	153	156	145	103
2	103	84	240	75	246	212	167	130	156	141	132	109
3	111	86	240	69	231	185	173	128	155	138	130	107
4	130	90	193	111	246	156	200	128	154	136	135	105
5	176	90	191	156	251	161	222	125	153	129	135	106
6	166	96	176	146	242	176	220	125	160	131	138	97
7	141	100	141	122	258	182	222	123	168	135	143	94
8	136	98	142	119	261	197	221	118	170	140	142	95
9	136	96	128	121	257	197	214	119	171	142	138	95
10	132	100	124	128	259	202	208	117	175	145	135	92
11	139	99	122	116	263	202	201	117	176	148	134	90
12	132	99	121	110	259	200	208	121	175	151	137	89
13	132	97	114	121	249	200	208	126	178	152	140	86
14	128	97	104	144	246	202	201	125	181	139	138	80
15	120	97	92	159	249	200	196	125	190	147	138	83
16	117	98	83	174	256	205	193	126	207	147	138	90
17	112	99	81	172	260	206	182	125	220	144	138	94
18	107	99	77	174	266	207	179	123	227	146	137	97
19	94	98	69	180	297	193	174	124	237	148	140	94
20	93	102	70	186	316	192	165	126	241	154	138	86
21	83	98	68	197	320	210	165	124	245	158	138	78
22	86	98	63	205	321	221	163	124	247	163	125	77
23	89	101	60	208	327	235	161	126	226	166	122	74
24	89	107	62	220	319	231	156	128	214	162	125	71
25	89	112	65	235	316	220	153	132	216	146	124	71
26	88	114	66	232	304	201	149	136	219	143	124	71
27	86	131	71	236	296	189	147	140	220	141	124	71
28	86	104	91	250	289	176	146	145	219	145	126	73
29	87	32	106	249	285	171	140	146	218	155	128	73
30	84		106	247	276	164	137	148	207	162	105	82
31	83		89		266		135	151		160		93

Recommendations:

- Avoid extreme fluctuations and allow for generous ramping rates that negatively affect the aquatic community (not to exceed 100% of beginning rate <24 hours) by moving water between facilities using joint program fish credit water, doing voluntary exchanges, etc. (i.e. blend Fish Water and Floriston Rate water releases between Boca and Prosser)
- Optimal recreation flows are between 45-100 cfs.
- Keep flows out of Boca at least 100 cfs from July 1st-September 1st.
- Add temperature gauges above and below confluence of the Little Truckee and Truckee River to quantify the impact that flows have on thermal thresholds in the system that limit various salmonids (done).

IV. Donner Creek

Recommendations:

- Avoid critical low releases from Donner Lake (<8cfs).
- Optimal recreation flow during the summer (June-September) is between 15-20 cfs.
- Run calculations and modeling to estimate the greatest amount of water over the longest period of time from Prosser than historically observed during the annual reservoir draw down for flood protection, as opposed to dumping water over a small period of time and then flatling a much smaller release for a longer period of time.

V. Independence Creek

Recommendations:

- Follow the lead of TNC, CDFW and TMWA for kokanee suppression for first 5 years.
- Implement findings in Alternative 1 from Independence Creek Water Investigation Study (Boyer, 2015)
- Optimal recreation flow during the summer (June-September) is between 15-25 cfs.

Trout Unlimited is committed to protecting and restoring the unique fish and wildlife and habitat values across California. We appreciate the opportunity to participate in this public process and would like to work cooperatively with DWR on the issues discussed above, and to help achieve ecologically sustainable, fiscally realistic, and enforceable management of public resources for the future that help to accelerate restoration of landscapes for species recovery.

Please contact David Lass, California Field Director, at dlass@tu.org or 530.388.8261 if you have any questions about Trout Unlimited, our positions on resource management issues, or our work on California public lands.

Respectfully,

David Lass
California Field Director
Trout Unlimited
10356 Donner Pass Rd. Suite B
Truckee, CA 96161
530.388.8261
dlass@tu.org

Appendix 5.4

California Guidelines — Excerpts from TROA

5.3 California Guidelines- Excerpts from TROA:

SECTION 9.F - CALIFORNIA GUIDELINES CONCERNING PREFERRED RESERVOIR OPERATIONS FOR INSTREAM FLOWS AND RECREATION

Section 9.F.1 California Guidelines.
California shall timely submit operating guidelines including any revisions to the **Administrator** for instream flow, reservoir level and other environmental objectives. California shall transmit the **California Guidelines** to the **Administrator** and others in accordance with Section 11.C.2(b).

Section 9.F.1(a) Content of California Guidelines.
The following are appropriate resource management considerations which may be included in the **California Guidelines**: (1) preferred instream flows downstream from reservoirs; (2) reservoir storage targets (for recreation, resident fish, or other environmental objectives); (3) other environmental objectives including, but not limited to, restoring, maintaining and enhancing riparian vegetation, fish habitat, and water quality; (4) priorities to be followed by the **Administrator**, insofar as practicable, in the event that not all preferred instream flow and reservoir storage targets can be attained; and (5) recommendations for voluntary **Exchanges**, maximum instream flows, ramping rates, scheduling of **Releases**, and other adjustments to river operations for instream flow and reservoir-based recreation. The **California Guidelines** shall not specify a preferred instream flow below Donner Lake during a **Dry Season**.

Section 9.F.1(b) Resolution of Conflict or Ambiguity in California Guidelines.
In the event that the **Administrator** finds a conflict or ambiguity in the **California Guidelines**, the **Administrator** shall, as appropriate, request that California clarify the **California Guidelines**, or consult with California and other affected parties to resolve the conflict.

Section 9.F.1(c) Additional Proposals for Adjustments to River Operations.
In addition to transmittal of the **California Guidelines** pursuant to Section 11.C.2(b) California may request adjustments to river operations in accordance with Section 8.R.

Section 9.F.2 Use of California Guidelines for Preferred Instream Flows, for Recreation, to Limit Maximum Flows, and to Provide Ramping of Flows.

To the extent practicable and consistent with the exercise of water rights, assurance of water supplies, operational considerations, the requirements of the **Settlement Act** and all other requirements of this **Agreement**, the **Administrator** shall:

(a) encourage **Scheduling Parties** to schedule in accordance with the **California Guidelines**;

(b) encourage voluntary **Exchanges** and re-storage, scheduling of **Releases**, and other available water management opportunities to increase reservoir **Releases** to help maintain the preferred instream flows specified in the **California Guidelines**;

(c) encourage voluntary **Exchanges** and re-storage, scheduling of **Releases**, and other available water management opportunities to meet the recreation-based reservoir storage objectives specified in the **California Guidelines**;

(d) encourage voluntary **Exchanges** and re-storage, scheduling of **Releases**, and other available water management opportunities to prevent or minimize **Releases** which result in any maximum flow criteria in the **California Guidelines** being exceeded; and

(e) encourage voluntary **Exchanges** and re-storage, scheduling of **Releases**, and other available water management opportunities to limit the rates of increase or decrease (ramping) of reservoir **Releases** consistent with the **California Guidelines**.

Section 11.C.2 Contents of Operational Plans.

Scheduling Parties' operational plans shall include a statement of the annual goals and seasonal objectives intended to be achieved by the **Scheduling Party** with respect to its operations schedule. In addition, **Scheduling Parties**' operational plans shall specify the **Project Water Operations** or **Credit Water Operations** requested by the **Scheduling Party**, including any **Exchanges** or re-storage, the timing, quantity and location of any requested **Accumulation** and whether such operation is required pursuant to this **Agreement**.

Section 11.C.2(a) Scheduling Establishment of Credit Water. A **Scheduling Party** intending to **Establish Credit Water** shall identify any water rights to be used for that purpose. **Scheduling Parties** may identify the total number of acre-feet of water rights assigned to a combination of direct use and to use for **Establishing Credit Water**. The quantity of water used for **Establishing Credit Water** may be changed pursuant to subsequent schedules submitted in accordance with this Section 11.C.

Section 11.C.2(b) Transmittal and Review of California Guidelines. As part of the scheduling process, insofar as practicable, California shall annually transmit the **California Guidelines** to the **Administrator** and each **Scheduling Party** in a timely manner such that the **Administrator** can encourage implementation of the **California Guidelines** in scheduling activities and integration of schedules pursuant to Section 11.C.3. Upon receipt of the **California Guidelines**, the **Administrator** shall timely review and transmit any comments on the **California Guidelines** to each **Scheduling Party**. California may revise and resubmit the California **Guidelines** to the **Administrator** and each **Scheduling Party** as necessary based on:
(1) comments and recommendations by the **Administrator** and **Scheduling Parties**, (2) changes
in schedules for reservoir operations or (3) changes in hydrologic conditions.

Section 11.C.2(c) Management of Joint Program Fish Credit Water. As part of the scheduling process**,** California shall provide instructions to the **Administrator** with a copy to each of United States and Pyramid Tribe on the management of **Joint Program Fish Credit Water**. Such instructions shall take into account the **California Guidelines**.

Section 11.C.3 Administrator's Schedule Integration Process. Using **Scheduling Parties**' operational plans and other adjustments to river operations as provided in this **Agreement**, the **Administrator** shall timely prepare, issue, administer, and oversee daily, weekly, monthly and annual **Integrated Schedules** which coordinate operations of water supply, storage, control and diversion facilities on the Truckee River and its tributaries in accordance with this **Agreement**.

Section 11.C.3(a) Activities During Schedule Integration Process. During the schedule integration process, the **Administrator** shall consult with the **Scheduling Parties** regarding the objectives of each with respect to their submitted schedule. To the extent practicable and consistent with exercise of water rights, assurance of water supplies, operational considerations, the requirements of the **Settlement Act** and all other requirements of this **Agreement**, the **Administrator** shall recommend and

encourage changes to submitted schedules, including voluntary **Exchanges**, to reduce or avoid conflicts in submitted schedules and to improve instream flows and reservoir operations in accordance with the **California Guidelines** and proposed adjustments to river operations pursuant to Section 9.F, while still meeting the objectives of the **Scheduling Parties**. Any proposed change to a **Scheduling Party**'s submittal agreed to by the **Scheduling Party** shall be resubmitted by such **Scheduling Party** and included in the integration process by the **Administrator**. Accompanying each **Integrated Schedule** will be a statement by the **Administrator** describing the extent to which the schedule meets or fails to meet the objectives of each **Scheduling Party**.

Section 11.C.3(b) Conflicts among Submitted Schedules. In the event of a conflict between or among schedules submitted by **Scheduling Parties**, the **Administrator** shall resolve the conflict by applying the express provisions of this **Agreement**, including, without limitation, the provisions of Article Eight. If a **Scheduling Party** disputes the **Administrator**'s decision, it may be subject to further review pursuant to Section 2.

Appendix 5.5

1943 Donner Lake Indenture Agreement

Revenue Stamps in the sum of $6.00 affixed to counterpart recorded in Nevada County.

THIS INDENTURE, made this 3rd day of May one thousand nine hundred and forty-three by and between DONNER LAKE COMPANY (a corporation), the party of the first part, and SIERRA PACIFIC POWER COMPANY (a corporation) and TRUCKEE-CARSON IRRIGATION DISTRICT (an irrigation district organized and existing under the laws of the State of Nevada), the parties of the second part,

W I T N E S S E T H:

That the said party of the first part, in consideration of the sum of ten (10) dollars, lawful money of the United States of America, to it paid by the said parties of the second part (the receipt whereof is hereby acknowledged) does by these presents grant, bargain and sell, unto the said parties of the second part, as tenants in common, and to their successors and assigns, forever:

1. All of the right, title and interest of the party of the first part in and to all waters now or hereafter in, of or pertaining to Donner Lake and its tributaries, situate in Nevada and Placer Counties, in the State of California (including the non-assignable right in favor of the parties of the second part, their officers and employees to the use of the surface of said Lake, in subordination, however, to the rights reserved to the party of the first part, its successors and assigns, in and by the Reservation Clause hereof), subject to the right of the party of the first part, its successors and assigns, to divert and use such amount of said waters as shall be necessary for domestic use upon or in connection with the lands and the Resort now owned by the party

of the first part, its successors, grantees and assigns, adjacent to or in the vicinity of Donner Lake;

2. The dam and controlling works situate in or on Donner Creek in said County of Nevada, near the lower end of said Donner Lake, together with the dam site appertaining thereto, and the exclusive rights to rebuild, reconstruct, alter and/or replace said dam and controlling works (at approximately the present site thereof) either with like or different materials, and to maintain and operate the same, subject to the conditions hereof;

3. All such permanent easements and rights over, upon or across the lands of the party of the first part, its successors or assigns, surrounding, underlying or adjacent to Donner Lake and/or Donner Creek, in said Counties of Placer and Nevada, as may be necessary or convenient for the construction, maintenance and operation of a channel, both above said dam and controlling works and below the same, (which shall follow the general course of the present channel), to such depth as to allow the proper draining and diverting of the waters of Donner Lake into Donner Creek; and also all such other rights as are or may be necessary for the convenient operation, use and maintenance of said dam and controlling works and channel and the use of said Donner Lake as a reservoir of such capacity as the parties of the second part may determine;

3. A perpetual easement and right of way for the construction, operation and maintenance of a

canal over and through the following described property of the party of the first part, situate in said Counties of Placer and Nevada, to-wit:

> Lot 5, NE 1/4 of SE 1/4 and SE 1/4 of SE 1/4 of Section 18; SW 1/4 of NW 1/4 and NW 1/4 of SW 1/4 of Section 17, all in township 17 North, Range 16 East, M.D.B. & M.,

sufficient, in the judgment of the parties of the second part, for use as a diversion canal to divert the waters of Cold Stream into Donner Lake; it being understood that the location of said easement and right of way shall be selected by the parties of the second part, their successors or assigns, and notice thereof shall be given to the party of the first part, not later than December 31,1943; provided that the maximum width of said canal, measured at a height of four feet above the bottom thereof, shall be twenty-five (25) feet, together with such additional areas adjacent thereto as may be required for bank slopes, spoil banks and necessary clearance and rights for construction, operation and maintenance thereof, it being understood that the parties of the second part, at their own expense, shall, so far as practicable, smooth down said spoil banks;

5. The right to use said Donner Lake perpetually as a reservoir for the storage of water and to release water therefrom, including such easements of overflow and otherwise as may be necessary or proper to the exercise of such rights; provided that the parties of the second part, their successors and assigns, shall so operate said dam and controll-

ing works as to prevent, so far as reasonably practicable, the water surface of said Lake from exceeding the elevation of 5935.80 feet above sea level; and provided further that the parties of the second part, their successors and assigns, shall not release any water from said Lake which they control, during the months of June, July and August of any year, if the water surface of said Lake at the time of the proposed release thereof, is less than 5932.0 feet above sea level: it being understood that said elevations are referred to and based upon bench mark on said dam, the elevation of the top of which is conclusively presumed for the purpose of this indenture to be 5936.865 feet above sea level as referred to U.S.C.& G.S. bench mark U-10, described in Bulletin 766, Publication 1925, Spirit Leveling in California - 1896-1923 - as being a red metal disc located 30 meters (98.4 feet) west of the Southern Pacific R.R. Co. passenger station in the Town of Truckee, California, on top surface of northwestern one of four central pillars under water tank, about 1.2 meters (3.94 feet) above rail, the elevation of which U.S.C. & G.S. bench mark is therein stated to be 5819.739 feet above sea level;

6. The right to enter upon any of the lands of the party of the first part adjacent to or in the vicinity of said Lake or Donner Creek, in so far as may be necessary for the convenient exercise of the rights granted hereby;

EXCEPTING AND RESERVING unto the party of the first part, its successors and assigns, the right to

the use of the surface of said Lake for boating, fishing, swimming and such other uses as shall not be inconsistent with the rights herein granted by the party of the first part to the parties of the second part and subject to all easements and rights of way now of record.

This indenture shall not be construed as creating, as between the party of the first part, on the one hand, and the parties of the second part, on the other, the relation of principal and agent, master and servant, partners, or joint adventurers; and the parties of the second part, in the enjoyment of such rights and the operation of said dam and controlling works shall occupy the status of owners thereof; and the party of the first part shall not be responsible for or on account of any of the acts of the parties of the second part, their servants, agents or employees, in the operation of said dam or in the enjoyment of the rights herein granted.

TOGETHER with all and singular the tenements, hereditaments and appurtenances thereunto belonging, or in any wise appertaining, and the reversion and reversions, remainder and remainders, rents, issues and profits thereof.

TO HAVE AND TO HOLD the said property, together with the appurtenances, unto the said parties of the second part, as tenants in common and to their successors and assigns forever.

IN WITNESS WHEREOF, the party of the first part, by its President and Secretary there-

unto duly authorized by resolution of its Board of Directors, has caused its corporate name to be hereunto subscribed and its corporate seal to be hereunto affixed, the day and year first above written.

DONNER LAKE COMPANY

By _____
Its President.

By _____
Its Secretary

State of California }
City and County of San Francisco } ss.

On this 3rd day of May in the year One Thousand Nine Hundred and Forty-~~Two~~ Three before me, KATHRYN E. STONE, a Notary Public in and for the said City and County of San Francisco, residing therein, duly commissioned and sworn, personally appeared

WM. E. KLEINSORGE and A. R. MORROW,

known to me to be the President and Secretary, respectively,

of DONNER LAKE COMPANY,

the Corporation described in and that executed the within instrument, and also known to me to be the person who executed the said instrument on behalf of the Corporation therein named and acknowledged to me that such Corporation executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my Official Seal in the City and County of San Francisco, the day and year in this certificate first above written.

_____
Notary Public in and for the City and County of San Francisco, State of California.
My Commission Expires March 16, 1946.

TELEPHONE SUtter 6956

Appendix 5.6

Relevant Study:

Instream Flow Requirements
Truckee River Basin
Lake Tahoe to Nevada

California Department of Fish and Game

August 1996

CALIFORNIA DEPARTMENT OF FISH AND GAME
Environmental Services Division
Stream Flow and Habitat Evaluation Program

INSTREAM FLOW REQUIREMENTS

TRUCKEE RIVER BASIN

LAKE TAHOE TO NEVADA

Prepared for

U.S. Fish and Wildlife Service
Reno, Nevada

August 1996

SUMMARY

The Truckee River system downstream of Lake Tahoe, has been significantly altered by various water projects and their operation. These alterations have resulted in deterioration and loss of many instream resources. Public Law 101-618 authorizes renegotiation of the operation of these water projects, in part, to correct existing impacts (e.g., recovery of the federally listed Cui-ui).

For any new operating agreement to be acceptable to California, it must maintain instream public trust resources of the Truckee River system in good condition, per California Fish and Game Code Section 5937 - requiring the correction of existing, water development related problems.

The water project related impacts upon California's instream resources can be generalized as alteration to flow regimes, deterioration of instream habitats and isolation of historic spawning and rearing habitats. The results of the instream habitat investigations summarized in this report, indicate that mitigation of these impacts cannot be feasibly achieved solely through project reoperation. To do so would compromise water supply and other project purposes.

We propose a strategy integrating reoperation with habitat restoration to provide the foundation for a new operating agreement to resolve water project impacts. This approach includes: 1) the establishment of minimum flow conditions for each of the impacted stream reaches; 2) modification of operating criteria to balance flow conditions throughout the impacted area; and, 3) habitat rehabilitation (to reduce the instream flows that would otherwise be needed to maintain appropriate instream habitat conditions) (Table 1).

The management objectives are to maintain habitat within **ALL** reaches in as good as condition as is practical, to prevent alternating high and low flow conditions between reaches that effectively negate short lived good conditions with prolonged poor conditions, and to eliminate the negating effect of extreme, high flow releases upon sustained habitat conditions. Flow management would ideally be targeted to sustain preferred flows within all identified reaches. Continuous maintenance of preferred flow conditions, however, is obviously infeasible. Therefore, flow conditions will be maintained in all reaches at or above identified minimum flow conditions with the preferred flow being a targeted flow condition. Since minimum flow conditions will likely dominate the flow regime of the impacted streams, the management objectives can only be achieved by improving the quality of channel-habitat conditions to increase habitat availability at low flow; by balancing flow releases among the reaches to sustain comparable, suitable flow-habitat conditions within all reaches; and, by ramping flow releases to ameliorate impacts, or, where high flow releases are unavoidable, improve channel conditions to protect resident fishes from flushing and stranding.

Table 1. Instream flow recommendations for fishery resources in the Truckee River system, California

REACH	BROWN TROUT				RAINBOW TROUT			
	OCT - JAN		FEB - MAR		APR - JUL		AUG-SEP	
	SPAWNING & INCUBATION		REARING		SPAWNING & INCUBATION		REARING	
	PREFERRED	MINIMUM	PREFERRED	MINIMUM	PREFERRED	MINIMUM	PREFERRED	MINIMUM
Truckee R - Reach 1 Nevada to Boca	200	150	250	150	200	150	250	150
Truckee R - Reach 2 Boca to Donner Ck.	300	100	250	100	300	100	250	100
Truckee R - Reach 3 Donner Ck. to Lake Tahoe	250	75	150	75	300	75	150	75
Donner Ck., Donner Lake to Truckee R.	50	8	20	8	50	8	10	8
Prosser Ck., Prosser Reservoir to Truckee R.	50	16	35	16	75	16	30	16
Lower Little Truckee R, Stampede Reservoir to Boca Reservoir	125	45	100	45	125	45	100	45
Upper Little Truckee R, upstream of Stampede Reservoir	90	30	50	14	90	35	30	14
Independence Ck., Independence Lake to Little Truckee R	20	7	10	4	20	8	10	4

Minimum flow conditions require improved spawning and rearing conditions at low flows within the mainstem and listed tributaries.

Preferred flows represent optimum flow versus habitat conditions.

Controlled releases exceeding twice the highest, preferred flows in the Little Truckee River downstream of Stampede Reservoir and in Prosser Creek will require channel modifications to prevent stranding in secondary channels and shelter from high flows.

Target flows should be identified based upon storage and projected runoff conditions such that flow conditions will be sustained during the life stage period to as close to preferred conditions as possible.

Balanced system should be pursued to ameliorate fluctuation in flow conditions resultant from the alternating, exclusive use of reservoirs to accommodate downstream needs. Percent variation in flow between regulated reaches should be minimized. Percent variation is the percentage difference between minimum and preferred flow.

INTRODUCTION

Flow in the Truckee River and most of its tributaries is regulated by a series of dams and diversions for water supply, power production and flood protection. This regulation has altered seasonal hydrologic patterns causing unseasonable flow reductions and flow increases throughout most of the drainage. Regulation has also caused extreme, unnatural rates of flow change throughout the drainage. The dams have blocked access to trout spawning and rearing areas. The combination of flow regulation and impoundment with various land use activities has also induced changes in channel form. These physical alterations have changed the system's fish biota and have significantly affected the general health of remaining fisheries.

Competition for water from the Truckee River drainage continues to raise conflict between water users. Litigation, negotiation and legislation attempting to resolve conflicts have and will continue to change water use patterns throughout the drainage. Fish and wildlife resources dependent upon the streams' various habitats will be affected. Resolution of many of these conflicts is the subject of Federal Legislation (P.L. 101-618). Operation changes of existing facilities to protect Pyramid Lake and its fishery resources and to provide a more secure municipal water supply in western central Nevada are intended results of this legislation. But, before any water management changes can be made, evaluation of their environmental consequences and consideration of potential alternatives must be done. Informed decision-making will require technical information that identifies the environmental requirements necessary to protect public trust resources. Many basic questions concerning conditions necessary to protect such resources in the Truckee River system have been the subject of investigations conducted by the California Department of Fish and Game and the US Forest Service, Tahoe National Forest.

Historically, water development in the Truckee River system completely ignored fish resources. As a result, the Pyramid Lake cutthroat has become extinct and the Cui-ui, endemic only to Pyramid Lake, is endangered and potentially on the brink of extinction. Recent concern for the latter's continued existence has forced significant changes in operation of the system, causing further changes in stream habitat conditions in the Truckee River system. In California, rapid change in flow downstream of reservoirs has caused massive losses of fish and other aquatic resources. Chronic, long term modification of flow and channel have severely reduced the abundance and diversity of the fish population.

The California portion of the Truckee River system has supported a diverse assemblage of fish resources including many endemic fishes unique to the Truckee River system. Unfortunately, a severe decline in these fish resources has occurred during the past century, coinciding closely with increased water development (Snider, DFG file report). The Truckee River and its tributaries once supported superlative trout fisheries. The potential to restore such fisheries still exists, and, as such, part of the

Truckee River is a state designated Wild Trout Stream. Strong public support exists to extend designation to the entire Truckee River and many of its tributaries. Designated waters require utmost protection to promote naturally, self-sustaining trout fisheries through progressive fishery management and intensive environmental protection.

The value of the Truckee River system's fishery resources required a comprehensive evaluation of the system's fish habitat relationships including the potential and existing impacts of water development and management. The opportunity to improve instream habitat conditions and the potential effect of operation changes resulting from the new federal legislation and the resultant Truckee River Operating Agreement (TROA) need to be adequately assessed. Alternatives potentially available to protect and restore instream habitat conditions need to be properly identified and adequately evaluated. Potentially, a combination of flow and instream habitat modifications should be identified to allow optimum water allocation for both instream and consumptive uses. A comprehensive fish habitat relationship evaluation was therefore conducted to provide such determinations.

The California Department of Fish and Game and the U.S. Forest Service recently (1987-1995) conducted fish habitat evaluations throughout the Truckee River system. The evaluations identified: 1) basin wide habitat distribution, using a channel and habitat typing procedure developed for this study, 2) species-life stage distribution relative to channel and habitat type and 3) the relationship between flow and habitat utility. A model was developed to predict changes in habitat utility as a function of habitat availability and flow. Results from these evaluations have been used to identify habitat conditions potentially limiting Truckee River basin fish populations. Much of this information has been integrated into this report to identify general affects of water development and management upon habitat conditions and to make recommendations on modifying channel and flow conditions to optimize available flow.

MANAGEMENT GOALS AND OBJECTIVES

The overall management goal is to provide flow and channel habitat conditions necessary to protect stream dependent public trust resources in the Truckee River system. We believe this goal would be achieved by providing habitat conditions necessary to support self-sustained rainbow and brown trout fisheries throughout the study area. We identified two stream types relative to this goal: streams providing habitat for all life stages necessary to sustain a healthy trout population and streams providing spawning and nursery rearing habitats essential to maintaining healthy trout populations downstream. Two primary objectives were based upon the overall function of the individual streams or stream reaches: 1) maintain self-sustaining brown and rainbow trout populations, and 2) provide recruitment to other, tributary trout populations. Streams being managed per Objective 1 included the three reaches of the Truckee River and lower Little Truckee River below Stampede Reservoir. Streams managed to meet Objective 2 included Donner and Prosser creeks (both supporting

spawning and nursery habitats essential to the mainstem Truckee River), and upper Little Truckee River, above Stampede Reservoir, and Independence Creek (both supporting spawning and nursery habitats for Stampede Reservoir).

METHODS

General Location

The study area encompassed all stream reaches within the California portion of the Truckee River system that are presently flow regulated (Figure 1). The study streams included the mainstem Truckee River from Lake Tahoe to the California-Nevada state-line (35 miles) and various reaches of three of its primary tributaries: Donner Creek, downstream of Donner Lake, Prosser Creek downstream of Prosser Reservoir and the Little Truckee River between Stampede and Boca Reservoir and between the confluence of Independence Creek and Stampede Reservoir. Independence Creek downstream of Independence Lake was also included.

Study Reaches

Study reaches within each stream were defined generally based upon flow and channel morphology. Points of significant accretion or flow manipulation were primarily used to designate the study reach boundaries. Significant changes in channel morphology, such as stream gradient and confinement were secondarily used to delineate study reaches.

General Approach - Flow versus Habitat Availability

The relationship between flow and habitat availability was developed using the physical habitat simulation model (PHABSIM)[1/] developed by the US Fish and Wildlife Service (FWS), Instream Flow Group (Bovee 1982). Our approach involved establishing modeling transects across representative habitats to collect hydraulic and physical data to define habitat availability. We identified the representative transect sites by: 1) classifying habitat types within the study reach to identify dominant and critical habitat types, 2) selecting at least three replicate habitat types to represent the dominant and critical types, and 3) systematically establishing transects across the selected sites to collect the required data. Data were collected at each transect at three distinct flows. Transect data were then entered into the PHABSIM model (segregated by habitat type), calibrated, then modeled to identify flow versus habitat relationships for each habitat type. The model results were then combined using a spreadsheet to identify flow versus habitat relationships for the entire study reach.

1/ PHABSIM = Physical Habitat Simulation modeling system developed by the FWS, National Ecology Research Center, Ft. Collins, CO.

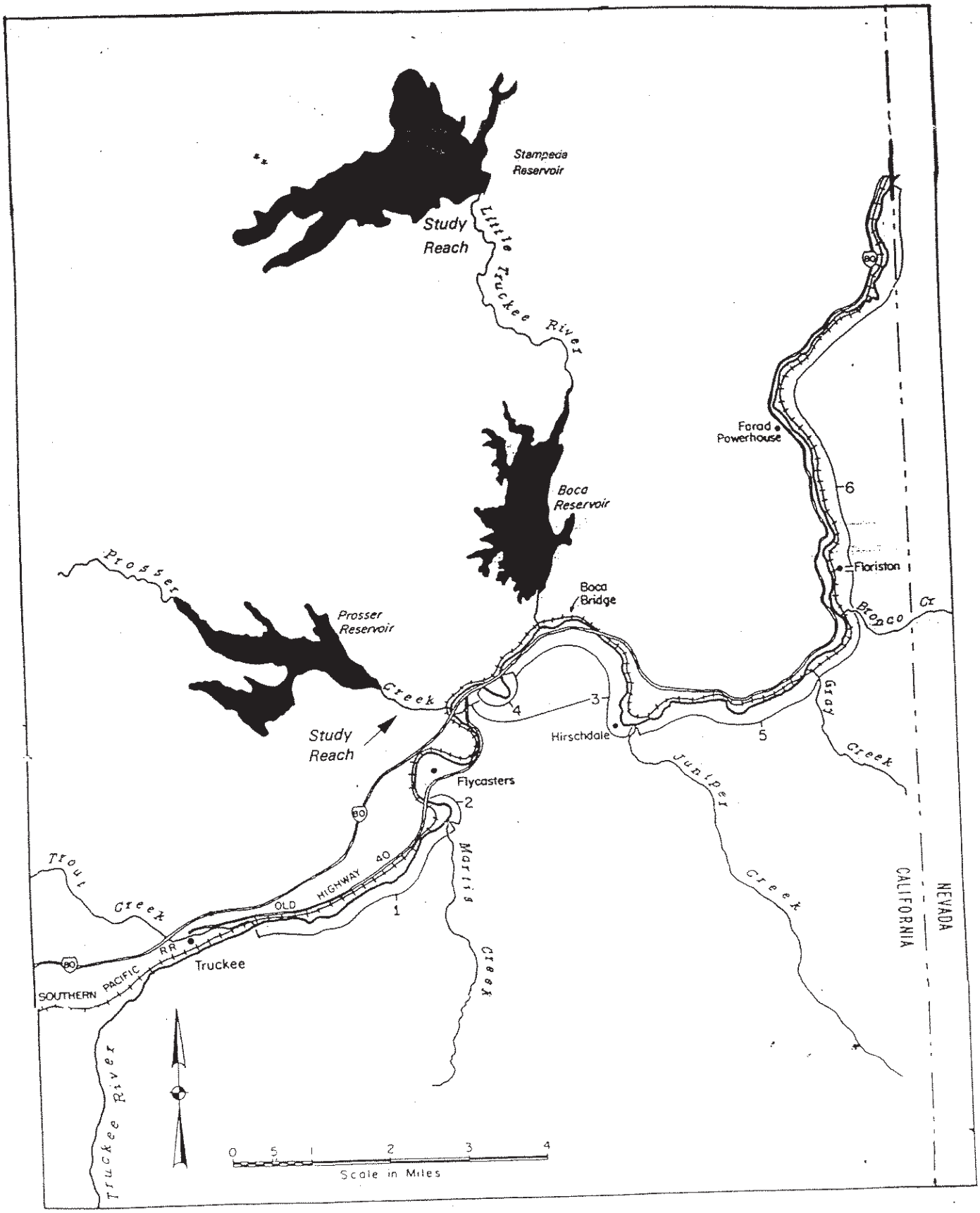


FIGURE 1. Truckee River Drainage

Field Methods

Habitat Classification

A geomorphically-based classification system was used to delineate instream habitat in each study stream.

Three hierarchical levels of classification were used to characterize instream habitat:

Level 1 - *general channel morphology* (geomorphically determined)
Level 2 - *major channel feature* (geomorphically determined)
Level 3 - *habitat unit* (geomorphically determined)

The **general channel morphology** classification followed the procedures outlined by Rosgen (1994). The stream channels were generally categorized as: 1) *A-type* - steep and well confined, 2) *B-type* - low gradient and slightly confined, or 3) *C-type* - low gradient and unconfined.

The ***major channel features*** classification includes: 1) *bar complexes* - the repeated sequence of depositional areas forming hydraulic controls; 2) *flat-water areas* - low gradient, intervening areas between the controls, and 3) run areas - steep gradient, intervening areas between the controls. This level of classification was only used on the Truckee River where these features were large enough to allow further classification at the third level.

The smallest scale of classification involved stratification of channel features into ***habitat units***, defined as *riffle, run, glide,* or *pool*. Classification of *habitat units* was based on channel morphology and gradient, substrate composition, and hydraulic characteristics. Representatives of all the *habitat units* were typically found in most major-channel features types (riffles are not found in flat-water areas). Pools were further classified as lateral scour pools, main channel pools or backwater pools. Pool structure was also described to define habitat complexity.

The Truckee River was classified as to habitat type using a combination of aerial photographs and ground surveys. Major channel features (e.g., bar complex, flatwaters and runs) were first identified on aerial photographs (scale 1:1200). The photographs were taken into the field and adjustments to major-channel feature boundaries were made on the aerial photographs as needed. Each habitat unit (i.e., *riffle, run, glide, pool*) was classified and delineated on the base maps in the field. Habitat units were delineated on the copies of the aerial photographs. The smaller, tributary streams were classified from ground surveys.

Transect Selection and Placement

At least three representatives each of the three habitat types identified in each study reach were selected as PHABSIM study sites. These were termed *Transect Areas*. Transects were numbered sequentially within areas. Most habitat types were generally represented by a single transect. The more complex habitats, typically pools, were represented by up to three transects.

Data Acquisition

The hydraulic data required for PHABSIM modeling were measured at three nominal flow levels. Water depth, water velocity, water surface elevations (WSL), water surface elevations at the stage of zero flow [2/] (SZF), and bed elevation profile were measured at low and high flow, when possible (Trihey and Wegner 1981). Only WSL's were collected at high flow in most of the Truckee River study reaches due to extreme flow conditions.

Hydraulic data acquisition and data recording format followed guidelines established for IFIM field techniques by the FWS (Trihey and Wegner 1981; Milhous *et al.* 1981). Techniques for measuring discharge followed the guidelines outlined by the U.S. Geological Survey Water Supply Paper No. 2175 (Rantz *et al.* 1982). A permanent benchmark and permanent head-stakes were installed for all transects. The cell boundaries along each transect were usually distributed at even increments, but significant changes in water velocity and depth occasionally required additional cell stationing.

Total water depth was measured to the nearest 0.1 ft with a top-setting wading rod. The standard method of determining mean column velocity was a single measurement at the proportional 0.6 depth from the water surface in depths less than 2.0 ft, and at proportional 0.2 and 0.8 depths from the water surface for total water depths between 2.0 and 4.0 ft (Buchanan and Somers 1969). Water velocities at all three proportional depths (i.e., 0.2, 0.6, and 0.8) were measured when total water depth exceeded 4 ft, when water velocity distribution in the water column was highly variable, or when one or two points of measurement were not adequate to derive an accurate mean column water velocity (Bovee and Milhous 1978).

2/ SZF is the water surface elevation when the flow equals zero. This is either the elevation of the deepest point of the cross section (i.e., thalweg) or the downstream hydraulic control.

Marsh McBirney Flowmate Model 2000 electromagnetic velocity meters (can provide both instantaneous readout of positive and negative water velocity values) were used to measure water velocity to the nearest 0.001 feet per second, rounded to the nearest 0.01 feet when recorded.

Temporary staff gages were installed and frequently monitored for changes in stream discharge (water surface elevation); discharge remained constant during transect measurements. Headpin, tailpin, dry bed elevation and water surface elevations (WSL) were measured to the nearest 0.01 feet using a surveyor's auto level, tripod, and stadia rods.

Analytical Techniques

Data Proofing & Quality Control

Field data sheets were proofed by the field crew leader at the end of the field day, or on the first available work day immediately following a period of field work. Field data sheets in various formats for dry-land profiles, velocity/depth profiles, and WSL surveys were transcribed onto one data entry sheet in the lab, and cross-checked immediately by the transcriber. Two separate data-entry sheets were developed for a low-flow and mid-flow calibration data deck. These data sheets were made from a combination of the dry-land profiles, stage-discharge data, and the individual respective subsurface profile and velocities from either the low or mid-flow velocity data set.

Two IFG4 data decks (low flow and mid or high-flow) were created for each individual transect using IFG4IN. The keypunch operator proofed for data entry errors during the keypunching process. If the discharge calculated by IFG4IN was more than 5% off from the one calculated in the field, the keypunch operator rechecked the velocity computations on the original field data sheet, making corrections to all paper and computer records as necessary.

Data Screening & Adjustments

Each individual transect's IFG4 data deck was run through TREVI4, which runs the subroutines CKI4 and REVI4. Fatal formatting errors uncovered by CKI4 were corrected. The graphical output from REVI4 was reviewed to detect aberrant: 1) trends in velocity with depth, 2) trends in roughness with depth, 3) channel profiles, such as mid-channel points above the WSL, and 4) velocity distributions across the channel, 5) trends in WSL with discharge. Anomalies were noted and the raw data and data entry sheets were checked for errors that could have created the observed aberration. Errors were corrected on all paper and computer records, as necessary.

Stage - Discharge Calibrations & WSL Modeling

Stage-discharge calibrations and predictions of WSL's at modeled flows were made for each individual transect using either IFG4 or MANSQ. Those transects that spanned only one individual arm of a divided channel (split-channel transects) were modeled separately using a range of modified calibration and modeling flows calculated for each split-channel transect. Transects with only two stage-discharge measurements were calibrated via MANSQ and those with three stage-discharge measurements were calibrated via IFG4.

Interpolation of Split-Channel Flows

We measured actual discharges in each split-channel transect at low and mid-flows, and took full-channel discharge measurements at nearby transects during the same period. At high flows, discharge was measured for general reaches of habitat in a full-channel section of the river. The fraction of full-channel flow measured in each split-channel transect at low and mid-flows was used to compute a linear interpolation for the fraction of flow predicted to pass through that transect at high flow. We calculated the slope of a line between two points describing the relationship between "Y = fraction of flow in a split channel transect" and "X = the actual full channel discharge measured for that area." This slope value was multiplied by the full channel discharge at high flow, measured for the split-channel area, to compute the fraction of flow in the split channel at high flow.

A simplified example is as follows: If a split-channel transect has 1 cfs of flow when full-channel flow is 10 cfs (fraction = 10%), and 4 cfs flow when full-channel flow is 20 cfs (fraction = 20%), linear interpolation using the slope of this relationship predicts that the transect will have 40% of the full channel flow at 40 cfs, which is a predicted flow of 16 cfs.

Tolerances Used for Modeling Decisions

Residual Error Levels in IFG4

The mean square error term (MSE) from REVI4 and IFG4 were reviewed to determine the degree to which the transects with three sets of stage-discharge data fit the IFG4 model for WSL prediction. Standard FWS criteria suggest that transects with MSE's greater than 10% be recalibrated with MANSQ.

WSL Predicted vs. Measured in MANSQ

Transects with only two sets of stage-discharge data were calibrated with MANSQ. Initial runs of MANSQ were made using the exponent from the conveyance factor (CFAC) equation in REVI4 as an estimate for Beta. Adjustments were made to Beta until WSL-predicted differed from WSL-measured by less than or equal to 0.1 ft.

Velocity Calibrations

Velocity calibration is composed of two general screening and evaluation approaches. First is a review of the pattern and magnitude of the velocity values and Manning's N (roughness) values produced during the calibration and production runs of IFG4. Excessive roughness values along any portion of the transect, except the shallow water edges, are a potential problem and should be modified. Excessive roughness values are defined as N values that greatly exceed the common level of roughness values seen in areas other than very shallow, channel-edge cells. Velocity distributions are also reviewed for any abnormal or inconsistent patterns. If anomalies are detected, the raw data is cross-checked for accuracy and N values are checked to see if they are inconsistent with the range of N's in the rest of the transect and may have caused an abnormal velocity. This process is often a qualitative one. For the second part of a velocity calibration, the two velocity data sets for each transect (low or mid-flow) are used to predict each other's velocities. If the pattern and amount of the predicted velocities were not similar to the measured values (using each velocity data set to predict values at the discharge measured in the complementary data set) then the appropriate approach to velocity modeling would be to split the range of flows to be modeled in two. Separate ranges of flows would then be modeled with each low or mid-flow data set.

No anomalous trends were observed in the velocities predicted by IFG4. Adjacent cells had similar, but gradually changing velocities. Rapid changes in velocity and roughness only occurred where there were abrupt changes in substrate elevation, as expected.

Highly elevated N values only occurred in shallow water over mid-channel bars or in lateral, shallow-water habitats, as is appropriate. Thus, no attempt was made to limit them. Artificially restricting N values (roughness) in lateral, shallow-water habitats has the effect of accelerating modeled water velocities in the habitat areas most valuable to juvenile fish, and functions to depress the value the model assigns to these areas for the juvenile life stage.

IFG4 Production Runs

Actual habitat lengths measured for each transect in the field were used on the XSEC line for each transect's IFG4 run, except for pools. Since pools typically had three transects for each habitat unit, the length of the habitat unit was apportioned equally (1/3) to each sub-transect in that pool habitat.

We used IOC codes 5=1 and 8=0 for production runs with data decks whose WSL's were calibrated and predicted via IFG4, and the default IOC codes for MANSQ runs with data decks whose WSL's were calibrated and predicted via MANSQ. Then

we used WSEI4 and Tape 4 output from IFG4 and MANSQ runs with to merge the WSLs produced by these tow separate programs back into the original IFG4 data deck. All IFG4 data decks with WSL cards were merged with a text editor and run through a final production run of IFG4 using IOC codes 5=1 and 8=1 to produce tape3 and TP4 files necessary for our HABTAT modeling runs. We set IOC code numbers 1, 2, & 13 equal to 1 during the calibration phases to get expanded model output and Velocity Adjustment Factors (VAFs) to use in the screening process. All other IOC codes were left at their default values.

The FWS guidelines recommend that VAFs range between 0.6 and 1.4 for calibrations using a single velocity set. However, these are guidelines **not** binding rules or fixed assumptions, which if violated would invalidate the model. Some PHABSIM/IFIM practitioners advocate a wider range of acceptable VAFs (0.1 to 1.9), and are only truly concerned with VAFs greater than 3.0. We used a VAF criteria of 3.0.

Habitat Suitability Curves

Habitat suitability curves developed by Bovee (1978) were used to define habitat criteria in the PHABSIM model.

Habitat Modeling Runs

We used HABTAT to model weighted usable area (WUA), and made separate runs with each of the two types of data sets produced by the IFG4 production runs (split-channel transects with WSL's from MANSQ or IFG4, and full-channel transects with WSL's from MANSQ and IFG4). We ran HABTAT with ZHABIN IOC Code numbers 2, 3, 8, 10, and 19 = 1. The two sets of WUA curves produced by this output were combined in a Quattro Pro spreadsheet. This was done by multiplying each set of WUA data by the decimal percent of total habitat in the study reach.

Flow Management Criteria

Optimum Flow Determination - To optimize conditions under Objective 1 we identified flows that would maximize habitat availability for brown and rainbow trout spawning and incubation and for adult rainbow trout. Rainbow trout adult rearing was identified as the critical life stage occurring between spawning periods due to a substantial decline in rainbow trout populations that has apparently occurred throughout the Truckee River system beginning in the 1960's. To optimize habitat conditions per Objective 2, we identified flows that would maximize spawning and incubation and fry habitats. Since flow influences habitat availability differently for all life stages, we wanted to make sure that the selected, optimizing flow did not severely affect the amount of habitat available for the other life stages present at the time. Therefore, we compared the amount of habitat that would be available for each life stage at the selected flow with the maximum amount potentially available. We concluded that reductions should not drop below 50% of optimum for any life stage in order to maintain minimum habitat conditions for the overall population. These latter criteria were not applied to adult rearing habitat for streams being managed to meet Objective 2.

Minimum Flow Determination - Minimum flow conditions were also identified for each stream and stream reach based upon the stream's management objective. Minimum flows in streams being managed per Objective 1 were determined based primarily on juvenile rainbow trout habitat availability and secondarily on maintaining at least 50% of optimum conditions for all other life stages. Studies conducted by the Forest Service and Department of Fish and Game in the Truckee River basin have shown that spawning and incubation habitats can substantially limit potential trout production. These studies also showed that when spawning and incubation conditions are sufficient, juvenile rearing habitat is the primary factor limiting eventual adult production. Therefore, we identified minimum flow conditions within every period as the flow required to maximize juvenile rearing habitat availability - often substantially reducing habitat available under optimum flow conditions. In streams managed per Objective 2, we identified minimum flow conditions that would not reduce any life stage (except adult rearing habitat availability) below 50% of optimum during any period (see Appendix 1).

Due to the substantial reduction in habitat availability at minimum flows (to 50% of optimum), it is imperative that flow management providing other than optimum flow conditions be accompanied by a spawning and rearing habitat improvement program. The specific needs of such a program are discussed under the individual stream recommendation sections below.

The life stage periods and criteria used to determine optimum flow conditions for streams being managed to meet Objective 1 were:

October through January - Maximize brown trout spawning and incubation (assumed equal to spawning habitat). No life stage less than 50% of optimum.

February through March - Maximize rainbow trout adult rearing. No life stage less than 50% of optimum.

April through July - Maximize rainbow trout spawning and incubation. No life stage less than 50% of optimum.

August through September - Maximize rainbow trout adult rearing. No life stage less than 50% of optimum.

The criteria used to determine minimum flow conditions for streams being managed to meet Objective 1 were:

All Year - Maximize rainbow trout juvenile rearing. No life stage less than 50% of optimum.

The life stage periods and criteria used to determine optimum flow conditions for streams being managed to meet Objective 2 were:

October through January - Maximize brown trout spawning and incubation (assumed equal to spawning habitat). No life stage less than 50% of optimum (except adult rearing).

February through March - Maximize rainbow trout fry rearing. No life stage less than 50% of optimum (except adult rearing).

April through July - Maximize rainbow trout spawning and incubation. No life stage less than 50% of optimum (except adult rearing).

August through September - Maximize rainbow trout fry rearing. No life stage less than 50% of optimum (except adult rearing).

The criteria used to determine minimum flow conditions for streams being managed to meet Objective 2 were:

All Year - Maintain at least 50% of optimum habitat for all life stages except adult rearing habitat.

RAMPING AND MAXIMUM FLOWS

High flows can cause stranding and isolation of trout and other fishes. This problem has been observed in Prosser Creek, downstream of Prosser Creek Reservoir and the Little Truckee River downstream of Stampede Reservoir when unseasonably high flows were released for various water management needs. Rapid changes in flow can exacerbate the stranding and isolation problems. Such conditions have been observed in Donner Creek, downstream of Donner Lake, in the Truckee River, downstream of Lake Tahoe and downstream of the Floriston and Fleisch hydropower diversions.

High flows that can force fish out of the main channel resulting in stranding and isolation are, for the purposes of this report, considered to occur at twice the highest, optimum flow, unless otherwise noted below. When flows are greater than this flow, ramping can occur essentially at any rate without causing additional damage. When flow changes occur at flows less than this threshold the following ramping schedule should apply:

Increasing flows - Flows should not be increased more than 100% during a 24-hour period; the change during the 24-hour period should occur in a minimum of three, proportional amounts(i.e., one-third the total 24-hour change per 8 hours).

Decreasing flows - Flows should not be decreased more than 50% during a 24-hour period; the change during the 24-hour period should occur in a minimum of three, proportional amounts (i.e., one-third the total 24-hour change per 8 hours).

BALANCED SYSTEM

A balanced system will be achieved when percent variation between preferred and minimum flows is comparable and sustained in all regulated reaches. Percent variation is defined as the percentage difference between minimum and high flow. A balanced system should be maintained to avoid higher than necessary, or lower than necessary flows in any regulated reach. The present practice of providing downstream water needs through exclusive use of the various reservoirs has resulted in the localized cycling of extremely high flows followed by extremely low flows throughout the regulated portion of the system.

RECOMMENDATIONS

The flow versus habitat results obtained from the PHABSIM model that met the criteria discussed above are presented for each stream and stream reach based upon the corresponding management objective.

MAINSTEM TRUCKEE RIVER

EXISTING PROBLEMS

- Loss of historic spawning and rearing habitats in the major tributaries: Donner Creek, Martis Creek, Prosser Creek, Little Truckee River and its tributaries.

- Deterioration of spawning and rearing habitat within the mainstem including loss of habitats critical to juvenile survival (e.g., complex pool habitats)

- Reduced flow, especially above Boca and between hydropower diversions.

- Fluctuating flow downstream of Lake Tahoe and hydropower diversions.

GENERAL RECOMMENDATIONS

Study reaches have been defined relative to the location of storage facilities. Flows are to be maintained at or above the minimum conditions described below. These minimum flow requirements are acceptable, contingent upon incorporation of a spawning and rearing habitat improvement program in TROA for the mainstem and the remaining spawning tributaries (Prosser and Donner creeks). These improvements will increase the amount of useable habitat available for critical life stages at flows lower than preferred (i.e., at minimum flow conditions).

Habitat improvement will include spawning, fry and juvenile habitats in tributaries and spawning, juvenile and adult habitats in the mainstem. Gravel and cover (structure management) will be necessary.

Careful ramping of flows is essential especially under controlled conditions when flow is within the minimum to preferred range (i.e., non-flood or spill conditions). During the non-spawning periods, controlled flow fluctuations should be ramped as described above. During spawning seasons, flows must be maintained through incubation.

FLOW RECOMMENDATIONS

Reach 1 - Nevada State Line to Boca

Management Objective 1 was applied to this reach of the Truckee River. Optimum flows were identified for brown and rainbow trout spawning and incubation and adult rainbow trout rearing as listed. Minimum flow conditions were identified based upon juvenile rainbow trout rearing.

Maximizing flow conditions:

Brown trout spawning and incubation - 200 cfs
Rainbow trout spawning and incubation - 200 cfs
Rainbow trout adult rearing - 250 cfs
Rainbow trout juvenile rearing - 150 cfs

Flows providing 50% of optimum habitat conditions

Life stage	Rainbow trout	Brown trout
Spawning and incubation	55 cfs	60 cfs
Fry rearing	10 cfs	10 cfs
Juvenile rearing	20 cfs	65 cfs
Adult rearing	60 cfs	10 cfs

Recommended Flows for mainstem Truckee River - Reach 1

PERIOD	OPTIMUM FLOW	CRITERIA	MINIMUM FLOW	CRITERIA
October - January	200 cfs	Brown trout spawning	150 cfs	Juvenile rainbow trout rearing
February - March	250 cfs	Adult rainbow trout rearing	150 cfs	Juvenile rainbow trout rearing
April - July	200 cfs	Rainbow trout spawning	150 cfs	Juvenile rainbow trout rearing
August - September	250 cfs	Adult rainbow trout rearing	150 cfs	Juvenile rainbow trout rearing

Reach 2 - Boca to Donner Creek

Management Objective 1 was applied to this reach of the Truckee River. Optimum flows were identified for brown and rainbow trout spawning and incubation and adult rainbow trout rearing as listed. Minimum flow conditions were identified based upon juvenile rainbow trout rearing.

Maximizing flow conditions:

Brown trout spawning and incubation - 300 cfs
Rainbow trout spawning and incubation - 300 cfs
Rainbow trout adult rearing - 250 cfs
Rainbow trout juvenile rearing - 100 cfs

Flows providing 50% of optimum habitat conditions

Life stage	Rainbow trout	Brown trout
Spawning and incubation	95 cfs	100 cfs
Fry rearing	15 cfs	10 cfs
Juvenile rearing	20 cfs	65 cfs
Adult rearing	75 cfs	30 cfs

Recommended Flows for the mainstem Truckee River - Reach 2

PERIOD	OPTIMUM FLOW	CRITERIA	MINIMUM FLOW	CRITERIA
October - January	300 cfs	Brown trout spawning	100 cfs	Juvenile rainbow trout rearing
February - March	250 cfs	Adult rainbow trout rearing	100 cfs	Juvenile rainbow trout rearing
April - July	300 cfs	Rainbow trout spawning	100 cfs	Juvenile rainbow trout rearing
August - September	250 cfs	Adult rainbow trout rearing	100 cfs	Juvenile rainbow trout rearing

Reach 3 - Donner Creek to Lake Tahoe

Management Objective 1 was applied to this reach of the Truckee River. Optimum flows were identified for brown and rainbow trout spawning and incubation and adult rainbow trout rearing as listed. Minimum flow conditions were identified based upon juvenile rainbow trout rearing.

Maximizing flow conditions:

Brown trout spawning and incubation - 250 cfs
Rainbow trout spawning and incubation - 300 cfs
Rainbow trout adult rearing - 150 cfs
Rainbow trout juvenile rearing - 250 cfs

Flows providing 50% of optimum habitat conditions

Life stage	Rainbow trout	Brown trout
Spawning and incubation	15 cfs	40 cfs
Fry rearing	<10 cfs	<10 cfs
Juvenile rearing	20 cfs	25 cfs
Adult rearing	45 cfs	40 cfs

Recommended Flows for the mainstem Truckee River - Reach 3

PERIOD	OPTIMUM FLOW	CRITERIA	MINIMUM FLOW	CRITERIA
October - January	250 cfs	Brown trout spawning	75 cfs	Juvenile rainbow trout rearing 1/
February - March	150 cfs	Adult rainbow trout rearing	75 cfs	Juvenile rainbow trout rearing
April - July	300 cfs	Rainbow trout spawning	75 cfs	Juvenile rainbow trout rearing
August - September	150 cfs	Adult rainbow trout rearing	75 cfs	Juvenile rainbow trout rearing

1/ Maximum juvenile rainbow trout habitat occurs at 250 cfs, however since this flow was nearly equal to optimum flows for all period (higher than adult rainbow trout rearing) and since the flow versus habitat relationship for this reach showed two peaks for juvenile rainbow trout rearing, we selected the first (lower flow) peak which provides nearly 90% of optimum juvenile rearing for both rainbow and brown trout.

DONNER CREEK

Donner Creek is one of only two major tributaries with potential to provide spawning and nursery rearing areas for trout resident to the mainstem Truckee River. Such habitat conditions are critically lacking for the mainstem fishery resources.

EXISTING PROBLEMS

- Below minimum low flow conditions
- Severely degraded channel/habitat conditions
- Highly variable flow fluctuations

GENERAL RECOMMENDATIONS

Identified preferred and minimum flow conditions are based upon providing spawning and nursery rearing habitat critical to mainstem brown and rainbow trout per PHABSIM results. Minimum flow conditions are based upon improved spawning and rearing conditions at low flow. Habitat rehabilitation will be required, including gravel and structure management, to provide acceptable habitat conditions at the recommended flows. Sustained spawning flows will be required through incubation, Flow fluctuation outside the identified spawning periods will follow the guidelines defined above.

FLOW RECOMMENDATIONS

Management Objective 2 was applied to Donner Creek downstream of Donner Lake. Optimum flows were identified for brown and rainbow trout spawning and incubation and fry rearing dependent upon the season (e.g., brown trout fry following brown trout spawning). Minimum flow conditions were identified based upon providing at least 50% of optimum habitat availability for all life stages, except adult rearing.

Maximizing flow conditions:

Brown trout spawning and incubation - 50 cfs
Rainbow trout spawning and incubation - 50 cfs
Brown trout fry rearing - 20 cfs
Rainbow trout fry rearing - 10 cfs

Flows providing 50% of optimum habitat conditions

Life stage	Rainbow trout	Brown trout
Spawning and incubation	6 cfs	5 cfs
Fry rearing	3 cfs	2 cfs
Juvenile rearing	8 cfs	~1 cfs

Recommended Flows for Donner Creek

PERIOD	OPTIMUM FLOW	CRITERIA	MINIMUM FLOW	CRITERIA
October - January	50 cfs	Brown trout spawning	8 cfs	50% juvenile rainbow trout rearing
February - March	20 cfs	Brown trout fry rearing	8 cfs	50% juvenile rainbow trout rearing
April - July	50 cfs	Rainbow trout spawning	8 cfs	50% juvenile rainbow trout rearing
August - September	10 cfs	Rainbow trout fry rearing	8 cfs	50% juvenile rainbow trout rearing

PROSSER CREEK

Prosser Creek is one of only two major tributaries with potential to provide spawning and nursery rearing areas for trout resident to the mainstem Truckee River. Such habitat conditions are critically lacking for the mainstem fishery resources.

EXISTING PROBLEMS

- Below minimum low flow conditions

- Severely degraded channel/habitat conditions

- Extremely variable flow fluctuations

GENERAL RECOMMENDATIONS

Identified preferred and minimum flow conditions are based upon providing spawning and nursery rearing habitat critical to mainstem brown and rainbow trout per PHABSIM results. Minimum flow conditions are based upon improved spawning and rearing conditions at low flow. Habitat rehabilitation will be required, including gravel and structure management, to provide acceptable habitat conditions at the recommended flows. Sustained spawning flows will be required through incubation, Flow fluctuation outside the identified spawning periods will follow the guidelines defined below.

Prosser Creek fish are extremely vulnerable to the potentially high, controlled releases from Prosser Creek Reservoir. Stranding in secondary channels and flushing will occur if flows exceed twice the preferred flow conditions. Increased structure abundance and complexity will provide shelter from high flows. Channel modifications to isolate fish from secondary channels will reduce or prevent stranding. Such modifications will be necessary to sustain Prosser Creek as a viable spawning and nursery stream and potentially, a high quality resident trout fishery. The proposed flow regime and spawning and rearing habitat rehabilitation will only be effective if stranding and flushing are avoided.

FLOW RECOMMENDATIONS

Management Objective 2 was applied to Prosser Creek downstream of Prosser Creek Reservoir. Optimum flows were identified for brown and rainbow trout spawning and incubation and fry rearing dependent upon the season (e.g., brown trout fry following brown trout spawning). Minimum flow conditions were identified based upon providing at least 50% of optimum habitat availability for all life stages, except adult rearing.

Maximizing flow conditions:

Brown trout spawning and incubation - 50 cfs
Rainbow trout spawning and incubation - 75 cfs
Brown trout fry rearing - 35 cfs
Rainbow trout fry rearing - 30 cfs

Flows providing 50% of optimum habitat conditions

Life stage	Rainbow trout	Brown trout
Spawning and incubation	28 cfs	25 cfs
Fry rearing	<10 cfs	<10 cfs
Juvenile rearing	16 cfs	<10 cfs

Recommended Flow for Prosser Creek

PERIOD	OPTIMUM FLOW	CRITERIA	MINIMUM FLOW	CRITERIA
October - January	50 cfs	Brown trout spawning	16 cfs	50% juvenile rainbow trout rearing
February - March	35 cfs	Brown trout fry rearing	16 cfs	50% juvenile rainbow trout rearing
April - July	75 cfs	Rainbow trout spawning	16 cfs	50% juvenile rainbow trout rearing
August - September	30 cfs	Rainbow trout fry rearing	16 cfs	50% juvenile rainbow trout rearing

LITTLE TRUCKEE RIVER - BELOW STAMPEDE

EXISTING PROBLEMS

- Below minimum low flow conditions

- Severely degraded channel/habitat conditions

- Extremely variable flow fluctuations

RECOMMENDED MODIFICATION

Identified preferred and minimum flow conditions are based upon providing spawning and rearing habitat for brown and rainbow trout per preliminary PHABSIM results. Minimum flow conditions are based upon improved spawning and rearing conditions at low flow. Habitat rehabilitation will be required, including gravel and structure management to provide acceptable habitat conditions at the recommended flows. Sustained spawning flows will be required through incubation. Flow fluctuation outside the identified spawning periods will follow the guidelines in Table 1.

Little Truckee River fish are extremely vulnerable to the potentially high, controlled releases from Stampede Reservoir. Stranding in secondary channels and flushing will occur if flows exceed twice the preferred flow conditions. Increased structure abundance and complexity will provide shelter from high flows. Channel modifications to isolate fish from secondary channels will reduce or prevent stranding. Such modifications will be necessary to sustain the Little Truckee River as a high quality resident trout fishery. The proposed flow regime and spawning and rearing habitat rehabilitation will only be effective if stranding and flushing are avoided.

FLOW RECOMMENDATIONS

Management Objective 1 was applied to this reach of the Little Truckee River. Optimum flows were identified for brown and rainbow trout spawning and incubation and adult rainbow trout rearing as listed. Minimum flow conditions were identified based upon juvenile rainbow trout rearing.

Maximizing flow conditions:

Brown trout spawning and incubation - 125 cfs
Rainbow trout spawning and incubation - 125 cfs
Rainbow trout adult rearing - 100 cfs
Rainbow trout juvenile rearing - 45 cfs

Flows providing 50% of optimum habitat conditions

Life stage	Rainbow trout	Brown trout
Spawning and incubation	20 cfs	20 cfs
Fry rearing	<20 cfs	<10 cfs
Juvenile rearing	20 cfs	25 cfs
Adult rearing	25 cfs	<20 cfs

Recommended Flows for Little Truckee River (downstream of Stampede Reservoir)

PERIOD	OPTIMUM FLOW	CRITERIA	MINIMUM FLOW	CRITERIA
October - January	125 cfs	Brown trout spawning	45 cfs	Juvenile rainbow trout rearing
February - March	100 cfs	Adult rainbow trout rearing	45 cfs	Juvenile rainbow trout rearing
April - July	125 cfs	Rainbow trout spawning	45 cfs	Juvenile rainbow trout rearing
August - September	100 cfs	Adult rainbow trout rearing	45 cfs	Juvenile rainbow trout rearing

LITTLE TRUCKEE RIVER - ABOVE STAMPEDE

EXISTING PROBLEMS

Below minimum low flow conditions

Severely degraded channel/habitat conditions

GENERAL RECOMMENDATIONS

Identified preferred and minimum flow conditions are based upon providing spawning and rearing habitat for brown and rainbow trout per PHABSIM results. Minimum flow conditions are based upon improved spawning and rearing conditions at low flow. Habitat rehabilitation will be required, including gravel and structure management, and bank restoration to provide acceptable habitat conditions at the recommended flows. Sustained spawning flows will be required through incubation.

Minimum flow conditions could be sustained downstream of Independence Creek by spreading the amount of controlled flow generally released over a longer period, increasing the duration by suitable flow conditions in Independence Creek and the Little Truckee River downstream. from Independence Creek. The Sierra Valley diversion severely reduces flow-habitat conditions in the reach between Independence Creek and the diversion. The minimum flow requirements at this diversion should be increased. Channel restoration within this reach would increase the spawning and rearing habitat available under low flow conditions.

FLOW RECOMMENDATIONS

Management Objective 2 was applied to this reach of the Little Truckee River. Optimum flows were identified for brown and rainbow trout spawning and incubation and brown and rainbow trout fry rearing, as listed. Minimum flow conditions were identified based upon maintaining at least 50% of optimum habitat for all life stages (except adult).

Maximizing flow conditions:

Brown trout spawning and incubation - 90 cfs
Rainbow trout spawning and incubation - 90 cfs
Brown trout fry rearing - 50 cfs
Rainbow trout fry rearing - 30 cfs

Flows providing 50% of optimum habitat conditions

Life stage	Rainbow trout	Brown trout	Kokanee
Spawning and incubation	35 cfs	30 cfs	12 cfs
Fry rearing	7 cfs	<5 cfs	na
Juvenile rearing	14 cfs	<5 cfs	na
Adult rearing	35 cfs	20 cfs	na

Recommended Flows for Little Truckee River (upstream of Stampede Reservoir)

PERIOD	OPTIMUM FLOW	CRITERIA	MINIMUM FLOW	CRITERIA
October - January	90 cfs	Brown trout spawning	30 cfs	50% brown trout spawning
February - March	50 cfs	Brown trout fry rearing	14 cfs	50% rainbow trout juvenile rearing
April - July	90 cfs	Rainbow trout spawning	35 cfs	50% rainbow trout spawning rearing
August - September	30 cfs	Rainbow trout fry rearing	14 cfs	50% rainbow trout juvenile rearing

1/ Since the flow optimizing juvenile rainbow trout rearing (100 cfs) equaled the highest, optimum flow recommended, we used the 50% of optimum criteria applied to Objective 2 to determine the minimum flow requirement.

INDEPENDENCE CREEK

EXISTING PROBLEMS

- Below minimum low flow conditions

RECOMMENDED MODIFICATION

The proposed flow conditions (TABLE 1) are based upon estimated flows required to sustain resident trout spawning and rearing conditions and on flow releases required to sustain necessary flow in the Little Truckee River between Independence Creek and Stampede Reservoir.

FLOW RECOMMENDATIONS

Management Objective 2 was applied to Independence Creek. Optimum flows were identified for brown and rainbow trout spawning and incubation and brown and rainbow trout fry rearing, as listed. Minimum flow conditions were identified based upon maintaining at least 50% of optimum habitat for all life stages (except adult).

Maximizing flow conditions:

Brown trout spawning and incubation - 20 cfs
Rainbow trout spawning and incubation - 20 cfs
Brown trout fry rearing - 10 cfs
Rainbow trout fry rearing - 10 cfs

Flows providing 50% of optimum habitat conditions

Life stage	Rainbow trout	Brown trout
Spawning and incubation	8 cfs	7 cfs
Fry rearing	<2 cfs	<2 cfs
Juvenile rearing	4 cfs	<1 cfs
Adult rearing	6 cfs	6 cfs

Recommended Flows for Independence Creek

PERIOD	OPTIMUM FLOW	CRITERIA	MINIMUM FLOW	CRITERIA
October - January	20 cfs	Brown trout spawning	7 cfs	50% brown trout spawning
February - March	10 cfs	Brown trout fry rearing	4 cfs	50% rainbow trout juvenile rearing
April - July	20 cfs	Rainbow trout spawning	8 cfs	50% rainbow trout spawning
August - September	10 cfs	Rainbow trout fry rearing	4 cfs	50% rainbow trout juvenile rearing

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APPENDIX 1

Rationale used to determine minimum flows

Institutional Approach - Since evaluation of project impacts upon instream resources requires the ability to measure relative impacts of various project options, some form of measurement equating habitat to project impacts is essential. No absolute, biological means presently exists that accurately identifies habitat conditions necessary to maintain fish populations in good condition. Various tools have been developed to measure relative changes in habitat condition versus changes in phsyical conditions. These tools have been developed using assumptions, concepts and some biological validation to allow attching a number to habitat condition as a function of some physical condition. IFIM is such a tool. It provides an approach to determining the relative change in habitat quality versus flow for the purpose of identifying relative impacts. However, the accuracy and precision of the approach in defining habitat conditions, and and even more so, how to use the results of the tool in making flow impact determinations, continue to be the subjects of debate.

Maintenance of conditions that provide 100% of optimum habitat availability is the best one can do per IFIM; similarly, providing 0% habitat availabilty would not sustain a population. In terms of probability of providing sufficient habitat conditions to maintain a population in good conditions, 100% habitat availability would have a probability of 1, 0% would have a probability of 0. The lowest, reasonable probability for the maintenance of a fish population would be 0.5 - i.e., a 50% chance that conditions would be sufficient to maintain fish population in good condition. A 0.5 probability equates to 50% habitat availability.

Biological Approach - Studies conducted in the Truckee River basin between 1987 and 1995 included evaluation of survival of various trout life stages. Mark and recapture investigations on the Little Truckee River, downstream of Stampede Reservoir indicate that survival from spawning to adult is strongly influenced by juvenile and subadult habitat availbility. Survival rates for juvenile to fry were typically less than 5%, often less than 3%. Based upon the results of the studies and studies reported in the literature, we developed a survival model. Assuming that conditions that would support production of less than 1 adult per spawning pair would not sustain a population equal to the initial population, the model indicates that reductions in habitat to less than 50% of habitat available to the original population. Assuming that at 100% habitat availability (per IFIM) represents the conditions required to maintain the population in good condtion (i.e., 1 pair of adults would produce 1 pair of adults), less than 50% habitat availability of any life stage would not maintain the population in good condition.

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DEPARTMENT OF WATER RESOURCES

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