BUREAU OF RECLAMATION

Environmental Assessment

Water Year 2021 Whiskeytown Lake Drought Action
CGB-EA-2021-042

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Section 1 Introduction

1.1 Background

The Bureau of Reclamation (Reclamation) received feedback from the State Water Resources Control Board (Water Board) on June 10, 2021, regarding the Water Rights Order 90-5 Final Sacramento River Temperature Management Plan (Appendix A). The Water Board approved Reclamation's Temperature Management Plan subject to the condition that Reclamation evaluate additional temperature control measures that could improve Reclamation's ability to control temperatures and minimize temperature dependent mortality for winter-run Chinook salmon. The need for this document is as an aid to agency planning.

This Environmental Assessment (EA) has been prepared in accordance with the National Environmental Policy Act (NEPA) (42 United States Code (USC) §4321 et seq.), the Council on Environmental Quality Regulations for implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations (CFR) Parts 1500-1508), and the Department of the Interior regulations for the Implementation of the NEPA (43 CFR Part 46). If there are no significant environmental impacts identified as a result of the analyses, and Reclamation decides to select one of the action alternatives, a Finding of No Significant Impacts (FONSI) may be signed to complete the NEPA compliance process. Reclamation is preparing this EA pursuant to 43 C.F.R. § 1505.1(b) which provides that "[a]n agency may prepare an environmental assessment on any action in order to assist agency planning and decision making." A NEPA analysis is not required to respond to the Water Board's request for information.

The No Action Alternative and action alternatives are located in Trinity and Shasta counties of California. **Figure 1** depicts pertinent locations for all of the alternatives, including:

- Sacramento River from Shasta Lake downstream to the Delta;
- Clear Creek from Whiskeytown Lake to its confluence with the Sacramento River;
- Trinity Lake and the Trinity River downstream of Lewiston Reservoir.

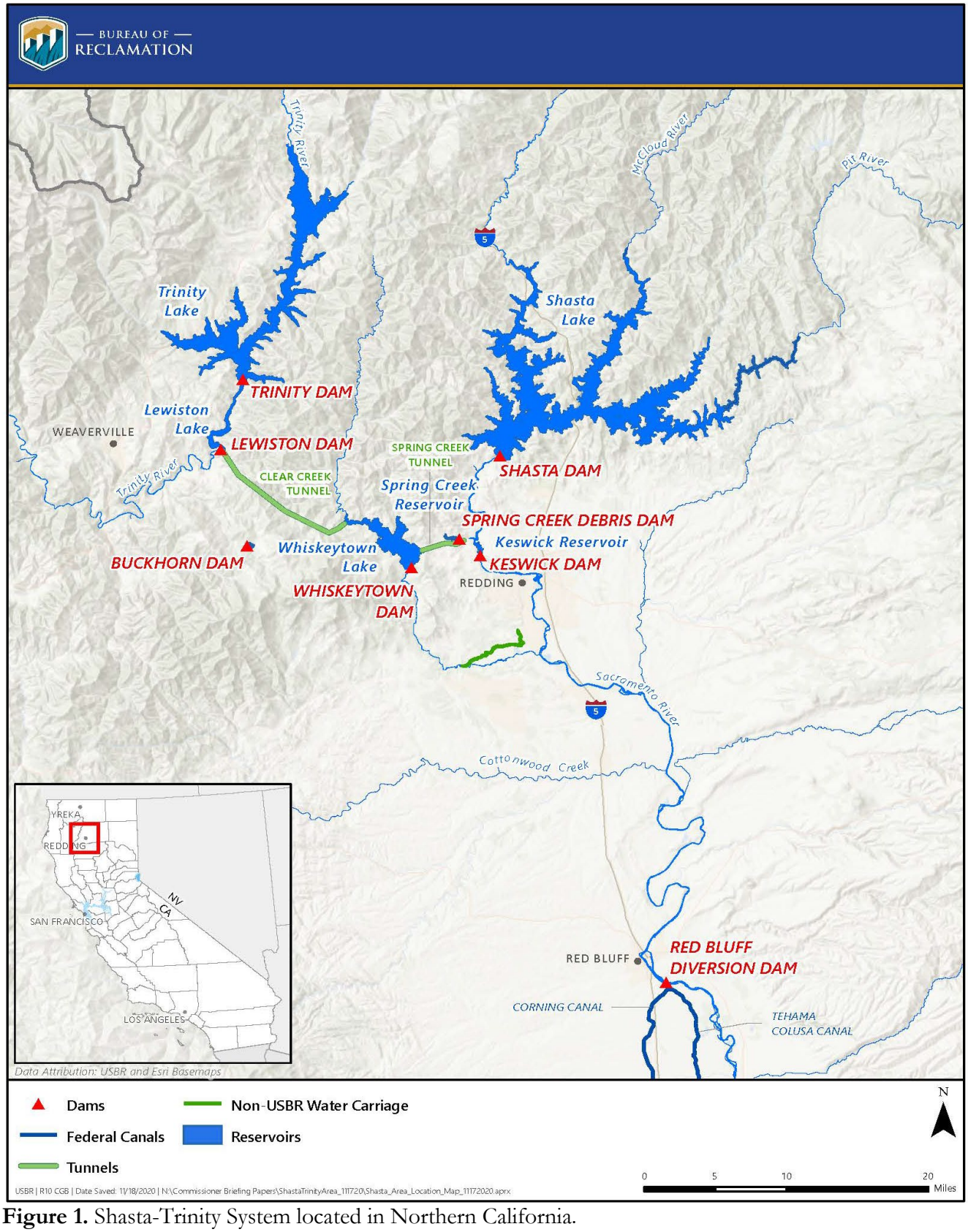

Figure 1. Shasta-Trinity System located in Northern California.

Shasta Lake, a CVP facility on the Sacramento River formed by Shasta Dam, was completed in 1945 and has a maximum storage capacity of 4.552 MAF. Shasta Dam is located on the Sacramento River just below the confluence of the Sacramento, McCloud, and Pit Rivers. The dam regulates the flow from a drainage area of approximately 6,649 square miles (sq mi). Water in Shasta Lake is released through or around the Shasta Powerplant to the Sacramento River, where it is re-regulated downstream by Keswick Dam. Keswick Reservoir was formed when Keswick Dam was completed in 1950. It has a capacity of approximately 23.8 TAF and serves as an afterbay for releases from Shasta Dam and for discharges from the Spring Creek Powerplant. Keswick Reservoir is used to regulate flow releases from the powerplant and other downstream uses and does not provide long-term water storage.

Whiskeytown Dam regulates runoff from Clear Creek and diversions from the Trinity River watershed. Flows from Lewiston Reservoir in the Trinity River watershed are diverted to Whiskeytown Lake through Clear Creek Tunnel. Clear Creek Tunnel between Lewiston Reservoir and Whiskeytown Lake has a capacity of 3,200 cfs. The majority of flow through Whiskeytown Lake is transported through the Spring Creek tunnels to the Spring Creek powerplant, and into Keswick Reservoir. Water also passes through Whiskeytown Dam into Clear Creek.

Whiskeytown Dam, a CVP facility constructed in 1963, is the only dam on Clear Creek and has a storage capacity of 0.241 MAF. Reclamation operates Whiskeytown Lake to: (1) regulate inflows for power generation and recreation; (2) support upper Sacramento River temperature objectives; and (3) provide for releases to Clear Creek. Whiskeytown Lake is annually drawn down by approximately 35 TAF during November through March to regulate flows for winter and spring flood management.

Trinity Lake is a 2.4 MAF CVP reservoir, constructed in 1962, on the Trinity River. Trinity Lake storage varies according to upstream hydrology, downstream water demands, and instream flow requirements. Lewiston Reservoir is a CVP facility, constructed in 1963, on the Trinity River and is seven miles downstream of Trinity Dam. Lewiston Reservoir is used as a regulating reservoir for downstream releases to the Trinity River and to Whiskeytown Lake.

1.2 Need for the Proposal

For WY 2021, the precipitation as of July 1 is below 50 percent of average, which ties this year for the third driest year on record (DWR 2021) and the driest since water right decision D-1641, Endangered Species Act (ESA), Central Valley Project Improvement Act (CVPIA) and many other environmental regulations were put in place. As a result of this record aridity, many reservoir levels throughout the state are experiencing drawdowns that pose significant challenges to operations of the CVP, including for environmental, water quality, water supply, and power generation purposes. In April 2021, projected reservoir inflows from snowmelt did not materialize. This was uncharacteristic and now believed to be due to warm conditions and dry soils soaking up snowmelt and substantially reducing runoff into CVP and SWP reservoirs.

In not objecting to Reclamation's Temperature Management Plan the Water Board requested that Reclamation evaluate additional temperature control measures that could improve Reclamation's ability to control temperatures and minimize temperature dependent mortality for winter-run Chinook salmon. Reclamation is voluntarily evaluating such measures through the NEPA process as an aid to inform agency planning.

CEQ NEPA regulations provide that tiering (40 CFR § 1501.11) includes incorporating by reference general discussions from broader EISs and focusing on specific issues to the document being prepared. The related

environmental documents listed below contain analysis and assumptions that are appropriate for the analysis in this EA, and are hereby incorporated by reference (43 CFR § 46.135).

- Long-Term Operation (LTO) of the Central Valley Project (CVP) and State Water Project (SWP) EIS (2019 LTO EIS) and Record of Decision (ROD), February 19, 2020.
    - https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=39181
- Trinity River Mainstem Fishery Restoration, Final EIS and ROD, December 2000
    - https://www.trrp.net/library/document/?id=227

Section 2 Alternatives

No Action Alternative

Under the No Action Alternative, Shasta Dam operations will balance downstream regulatory requirements, including D-1641 and 90-5 water temperature compliance locations, given WY 2021 hydrology, and consistent with the LTO ROD. Operations will follow the conditions stated in the Temporary Urgency Change Petition (TUCP) (Appendix B), the Drought Contingency Plan (Appendix C), and the Final Sacramento River Temperature Management Plan.

On May 21, 2021, DWR and Reclamation submitted a TUCP to the Water Board which included modified Delta requirements for June 1 through July 31. The Water Board provided conditional approval to the TUCP on June 1, 2021. On May 28, 2021, DWR and Reclamation prepared a Drought Contingency Plan for May 1 – September 30. The Drought Contingency Plan identified the actions intended to provide for operation of the CVP and SWP this year, including assumptions on conditions necessary to result in an end of September Shasta Lake storage of 1.25 MAF. A series of drought actions are being implemented or planned for implementation for WY 2021. These actions are described in more detail in the Drought Contingency Plan (Appendix C) and are briefly listed below for reference:

- TUCP to modify Delta requirements
- Emergency drought barrier to minimize Delta salinity intrusion
- Minimum exports to limit releases needed to support Delta needs
- Limited use of New Melones to meet delta outflow and salinity requirements
- Urban water conservation to limit releases needed to support system needs
- Curtailments from the Water Board to reduce demands throughout the system
- Low or zero allocations to CVP and SWP contractors

The combination of these actions may reduce the need for releases from Shasta Lake. A description of the system wide operation is included in the Drought Contingency Plan.

On May 28, 2021 Reclamation provided the final Temperature Management Plan to the Water Board. The final plan included monthly average Shasta and Keswick reservoir releases, estimated storage, and estimated temperature dependent mortality for winter-run Chinook salmon eggs based on assumed hydrologic conditions and the potential for drought-related actions.

Alternative 1

Under Alternative 1, Whiskeytown Lake would be lowered by approximately 35 TAF in September by making releases through the Spring Creek Power Plant to Keswick Reservoir in order to reduce the demand on Shasta Lake releases and, thus, contribute to the end of September storage in Shasta Lake. The early

drawdown of Whiskeytown Lake would occur over the course of three to four weeks, drawing down the reservoir to its normal wintertime elevation of approximately 1198 feet mean sea level (ft msl). Reclamation is anticipating maintaining the minimum flow rate from Whiskeytown Lake into Clear Creek as described in the LTO ROD. Imports from Trinity Lake to Whiskeytown Lake would remain the same as under No Action Alternative. Following the early drawdown, Whiskeytown Lake would remain at the normal wintertime level and follow the refill schedule identified in the LTO ROD utilizing transbasin diversions. However, if hydrology into WY 2022 remains dry refill may take longer.

Alternative 2

Under Alternative 2, Whiskeytown Lake would be lowered by approximately 51 TAF in September by making releases through the Spring Creek Power Plant to Keswick Reservoir in order to reduce the demand on Shasta Lake releases thereby contributing to the end of September storage in Shasta Lake. The early drawdown of Whiskeytown Lake would occur over the course of three to four weeks, drawing down the reservoir to an elevation of approximately 1192 ft msl, approximately 6 feet below the normal wintertime elevation. Reclamation is anticipating maintaining the minimum flow rate from Whiskeytown Lake into Clear Creek as described in the LTO ROD. Releases from Shasta Lake into Keswick Reservoir would be reduced compared to Alternative 1. Imports from Trinity Lake to Whiskeytown Lake would remain the same as under No Action Alternative. Following the early drawdown, Whiskeytown Lake would remain at 1192 ft msl during the winter and follow the refill schedule identified in the LTO ROD utilizing transbasin diversions. However, if hydrology into WY 2022 remains dry refill may take longer.

Alternative 3

Under Alternative 3, releases from Shasta Dam into Keswick Reservoir would be reduced in order to target 1.25 MAF end of September storage in Shasta Lake. Average monthly Keswick Dam releases used in modeling this alternative were changed in August from 7,848 cfs to 6,801 cfs and in September from 5,149 cfs to 4,067 cfs. These changes had the effect of reducing 64.4 TAF of outflow from Shasta Lake in each month, which resulted in an increase in storage in Shasta Lake sufficient to reach a 1.25 MAF end of September storage. This alternative assumes DWR does not increase releases from Oroville Reservoir; Reclamation does not increase releases from Trinity, Folsom, or New Melones reservoirs; and the Water Board does not curtail other users of water in the Central Valley and Delta. The aforementioned reservoirs' operations would not be altered under this alternative for the following reasons: Reclamation does not operate Oroville Reservoir; New Melones Reservoir releases cannot meet the same objectives as Shasta Lake releases; Folsom Reservoir storage is currently too low to support increased releases; and modifying Trinity Lake operations is explored under a separate alternative (Alternative 4).

Alternative 4

Under Alternative 4, an additional 35 TAF of water from the Trinity system would be imported to Whiskeytown Lake and then to Keswick Reservoir between August and September in order to reduce the demand on Shasta Dam releases and, thus, contribute to end of September storage in Shasta Lake. As of July 6, 2021, projections estimate this alternative would result in an end of September storage in Trinity Lake of approximately 581 TAF, which is below 600 TAF. The Trinity River ROD provides, "Implementation of drawdowns below the 600 TAF minimum end-of-year carryover level in Trinity Reservoir shall be determined by Reclamation, USFWS, and NMFS on a case-by-case basis in dry and critically dry water years" (USDOI 2000). Reclamation would confer with agencies prior to selecting the action.

This water would be diverted to the Sacramento River basin through the typical diversion pathway for release from Keswick Dam to the Sacramento River in lieu of the use of water stored in Shasta Lake. Reclamation is anticipating maintaining the minimum flow rate from Whiskeytown Lake into Clear Creek as described in the LTO ROD.

Alternatives Considered by Eliminated from Further Analysis

Prior to finalizing Alternatives 1 and 2, Reclamation explored drawing down Whiskeytown Lake by up to 100 TAF to contribute to the end of September storage in Shasta Lake. Drawing down Whiskeytown Lake beyond elevation 1192 ft msl (Alternative 2) would significantly impact Reclamation's operational capabilities. Elevation 1192 ft msl is the minimum elevation needed to maintain operation of both Carr Power Plant units; therefore, drawing down Whiskeytown Lake beyond elevation 1192 ft msl was not considered feasible. Additionally, alternatives were not considered whereby the releases from Whiskeytown Lake would go through Clear Creek rather than the Spring Creek Tunnel. In WY 2021, a record high number of ESA-listed spring-run Chinook salmon have been observed in Clear Creek. Drawing down the lake via Clear Creek would negatively impact the salmon because fluctuating flows may result in spring-run and fall-run Chinook salmon redd dewatering.

Section 3 Affected Environment and Environmental Consequences

This section identifies the potentially affected environmental resources and the environmental consequences that could result from the alternatives and the No Action Alternative. The affected environment is the same as described in the LTO EIS which is hereby incorporated by reference.

Reclamation analyzed the affected environment and determined that the No Action Alternative and the action alternatives do not have the potential to cause adverse effects to the resources listed in **Table 1**.

Table 1. Resources Eliminated from Detailed Analysis

Resource	Reason Eliminated
Air Quality	The action alternatives and the No Action Alternative would not involve physical changes to the environment or construction activities that could impact air quality.
Aesthetics	The action alternatives and the No Action Alternative would have no effect on scenic resources or public views.
Climate Change	The action alternatives and the No Action Alternative would not require additional diesel or electrical production beyond current conditions and would therefore not contribute to additional greenhouse gases.
Geology, Soils, and Mineral Resources	The action alternatives and the No Action Alternative would occur within existing facilities and there would be no ground disturbing activities.
Land Use	The action alternatives and the No Action Alternative would occur within existing facilities and there would be no ground disturbing activities or changes in land use.
Population and Housing	The action alternatives and the No Action Alternative would not result in changes to populations or population growth and will not displace existing people or housing, and therefore will have no effects on population and housing.

Transportation and Traffic	The action alternatives and the No Action Alternative would occur within existing facilities and there would be no changes in transportation or traffic.
Hazards & Hazardous materials	The action alternatives and the No Action Alternative would not utilize hazardous materials.
Terrestrial Resources	The action alternatives and the No Action Alternative would not have significant adverse impacts to terrestrial resources as lake levels would not be modified significantly. The study area is discussed in detail in the LTO EIS (Terrestrial Biological Resources Technical Appendix) which has incorporated by reference.

Department of the Interior regulations, Executive Orders, and Reclamation guidelines require a discussion of the following additional items when preparing environmental documentation.

Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in assets that are held in trust by the United States for federally recognized Indian tribes or individuals. The closest ITA to the project area is a public land allotment (a parcel of land or real estate holding, that may or may not be affiliated with a particular tribe or is in the process of being recorded) which is approximately 10 miles from the project area. The action alternatives do not have a potential to affect ITAs (Appendix D).

Indian Sacred Sites

Executive Order 13007 (May 24, 1996) requires that federal agencies accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites.

Under the No Action Alternative and Alternatives 1, 3, and 4, no outreach under Executive Order 13007 will be needed. Due to the potential relocation of the Oak Bottom boat ramp in Alternative 2, it's likely that consultations with tribes under Executive Order 13007 will need to occur prior to the FONSI being signed if that alternative is chosen. Consultation with tribes typically takes about six weeks.

Environmental Justice

Executive Order 12898 directs federal agencies to address disproportionately high and adverse human health and environmental effects on minority and low-income populations. Neither the action alternatives nor the No Action Alternative involve activities that will cause dislocation, changes in employment, or increase flood, drought, or disease, or disproportionately impact economically-disadvantaged or minority populations. Therefore, there will be no Environmental Justice-related effects.

3.1 Surface Water Resources

3.1.1 Affected Environment

As the affected environment for the LTO EIS has been incorporated by reference, the affected environment and environmental consequences will focus on updates or changes.

Sacramento River

During the summer, Shasta Dam's operational considerations are mainly flows required for Delta outflows, instream demands, temperature control, and exports. Shasta Lake storage varies according to upstream

hydrology, downstream water demands, and instream flow requirements. Water storage volumes in Shasta Lake for water years 1995-2021 are shown in **Figure 2**. As of July 11, 2021, Shasta Lake storage is 1.641 million acre-feet (MAF). The cold water pool volume of water less than or equal to 52 degrees Fahrenheit (F) in Shasta Lake for WY 2021 and select years is shown in **Figure 3**. As of early July 2021, the cold water pool volume less than or equal to 52 degrees F in Shasta Lake is similar to the volume observed in critical WY 2014. Historical Keswick Dam releases for critical water year types since 1992 are shown in **Figure 4**. For June, monthly average releases in WY 2021 were less than the average of critical water years since 1992.

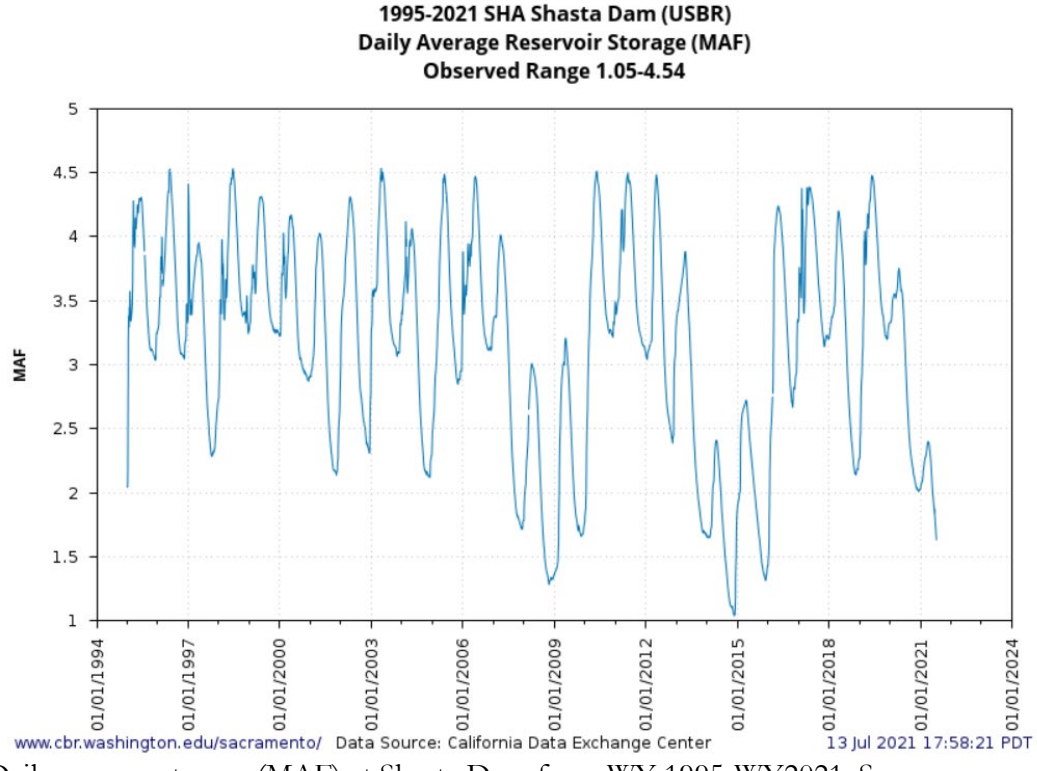

Figure 2. Daily average storage (MAF) at Shasta Dam from WY 1995-WY2021. Source: http://www.cbr.washington.edu/sacramento/data/query_river_allyears.html

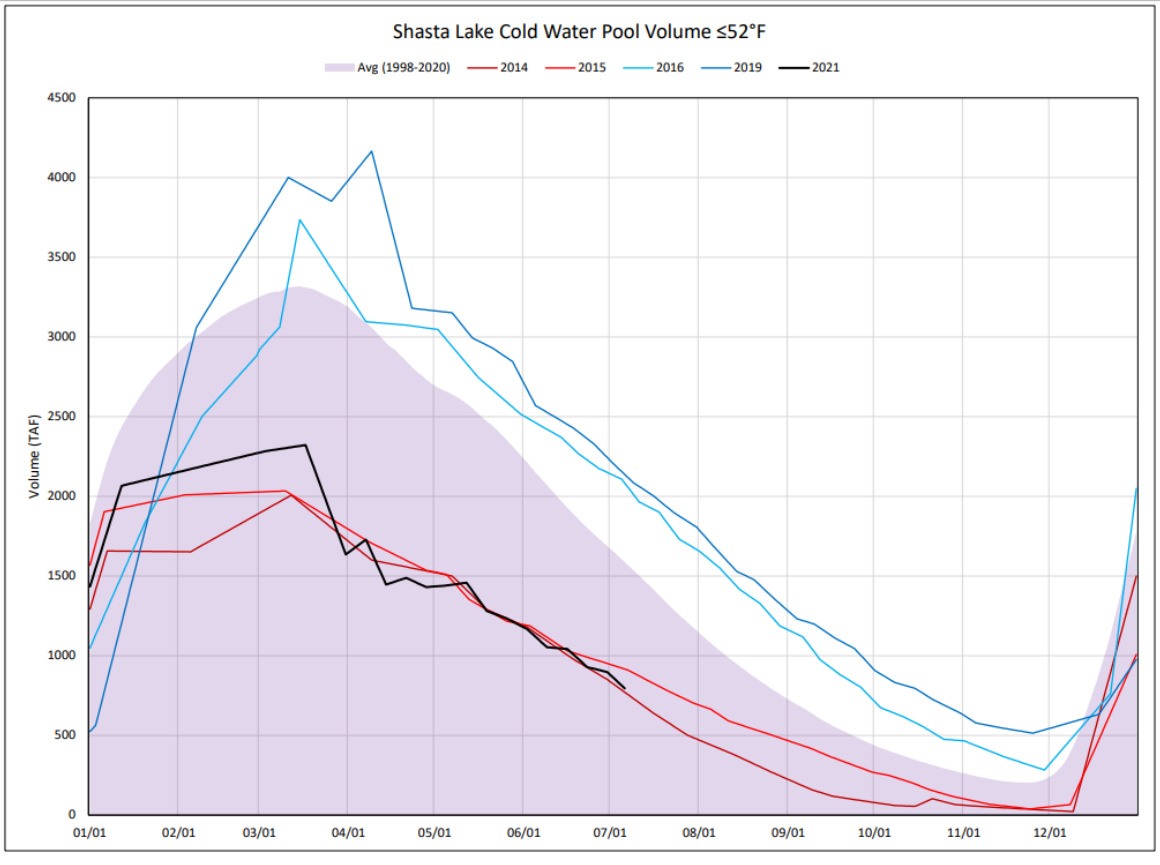

Figure 3. Shasta Lake Cold Water Pool Volume less than or equal to 52 degrees F. Source: https://www.usbr.gov/mp/cvo/vungvari/sactemprpt.pdf

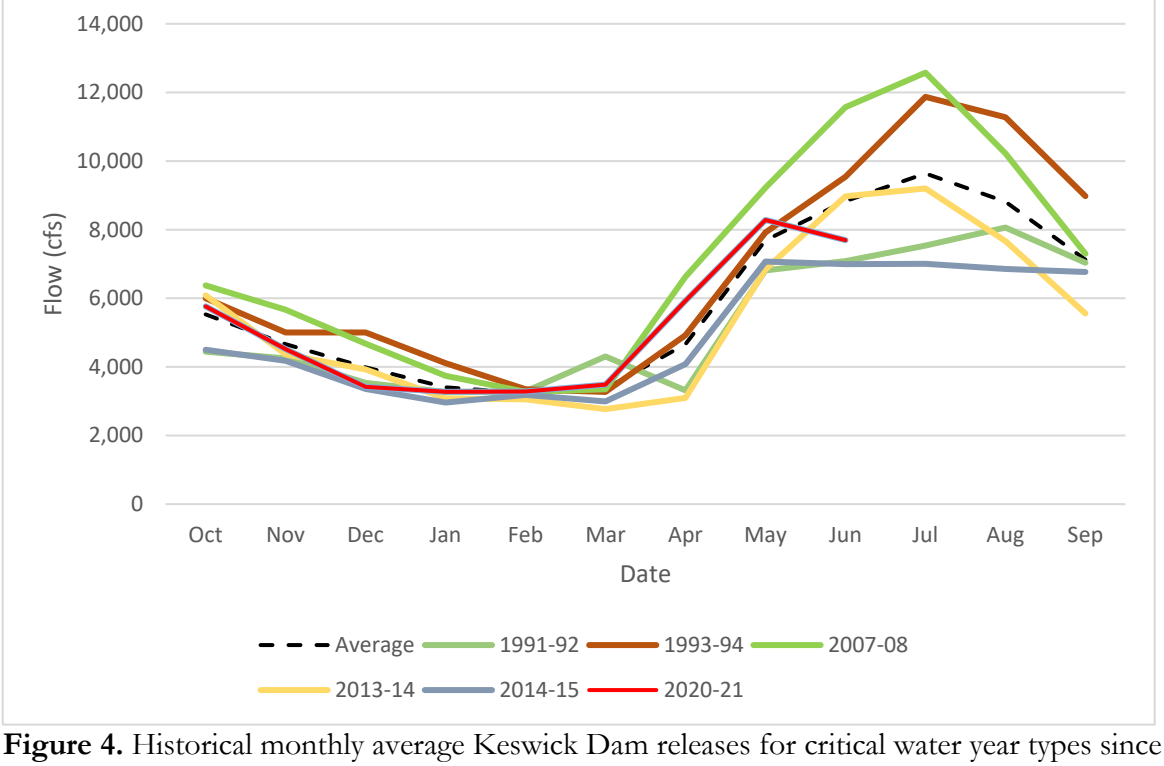

Figure 4. Historical monthly average Keswick Dam releases for critical water year types since 1992.

The Sacramento River between Keswick Dam and the City of Red Bluff flows through the northern foothills of the Sacramento Valley. Flows are influenced by outflow from Keswick Reservoir and inflows from Clear Creek and by Cow Creek, Bear Creek, Cottonwood Creek, Battle Creek, and Paynes Creek, which provide 15 to 20 percent of the flows in this reach as measured at Bend Bridge. Between Red Bluff and Colusa, the Sacramento River is a meandering stream, migrating through alluvial deposits between widely spaced levees. From Colusa to the northern boundary of the Delta near Freeport, flows increase due to the addition of the Feather and American Rivers flows. Mean daily flows in the Sacramento River at Bend Bridge (near Red Bluff) for 1995-2021 are shown in **Figure 5**.

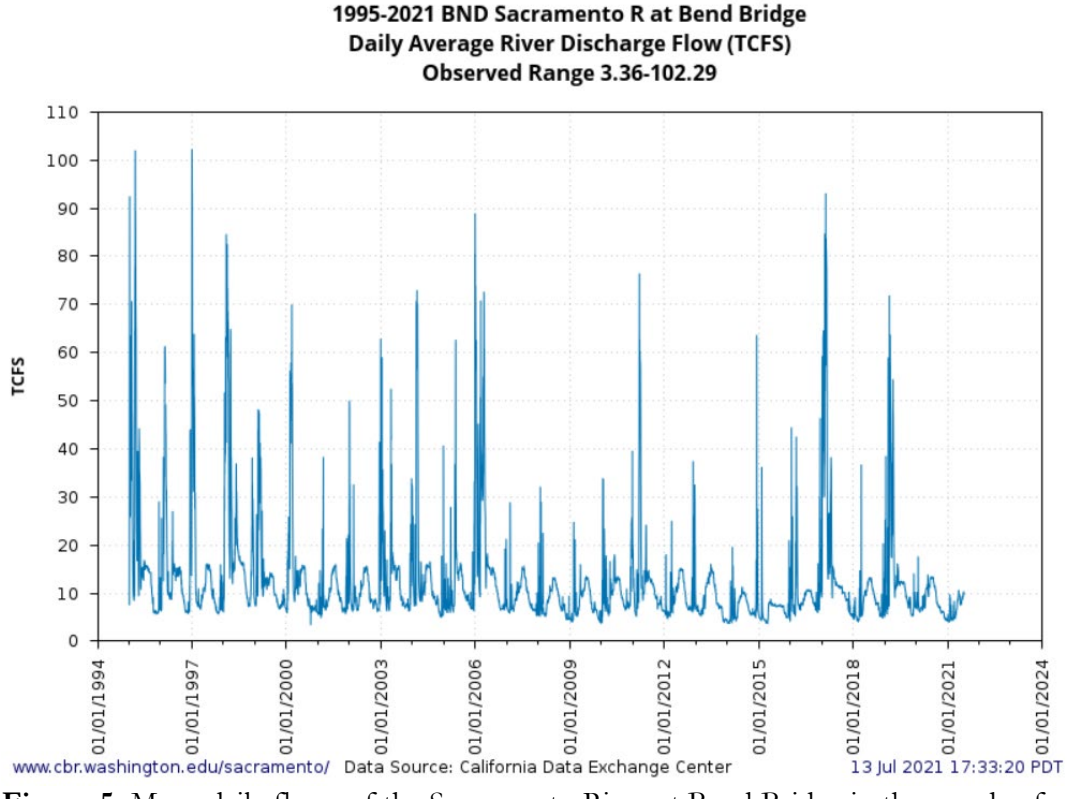

Figure 5. Mean daily flows of the Sacramento River at Bend Bridge in thousands of cubic feet per second (TCFS). Source: http://www.cbr.washington.edu/sacramento/data/query_river_allyears.html

Clear Creek

Whiskeytown Lake is primarily used as a conveyance system for transbasin transfers. Operations at both Carr and Spring Creek Power plants also maintain specified elevations for supporting recreation based on season. Storage is fairly constant from May through October in most years due to agreements between Reclamation and the National Park Service to maintain certain winter and summer lake elevations for recreation. Key operational elevations of Whiskeytown Lake and related facilities are shown in **Table 2**. Water storage volume in Whiskeytown Lake for water years 1995–2021 are shown in **Figure 6**. The cold water pool volume less than or equal to 56 degrees F in Whiskeytown Lake in 2021 is shown in **Figure 7**. The cold water pool volume is below the average for a period of record 2000-2020.

Table 2. Key operational elevations of Whiskeytown Lake and related facilities.

Location	Elevation (feet above sea level)	Storage (acre-feet)
Spillway (Glory hole)	1210	243,724
Normal summer water level (May – Oct)	1209	237,895
Normal winter water level (Nov – April)	1198	204,209
Oak Bottom boat ramps unusable	1198	204,209
Operation of both Carr Powerplant units	1192	187,044
Whiskey Cr and Brandy Cr boat ramps unusable	1190	181,513
Whiskeytown Dam upper guard gate	1110	36,197
Spring Creek outlet	1085	17,698
Whiskeytown Dam lower guard gate	975	136

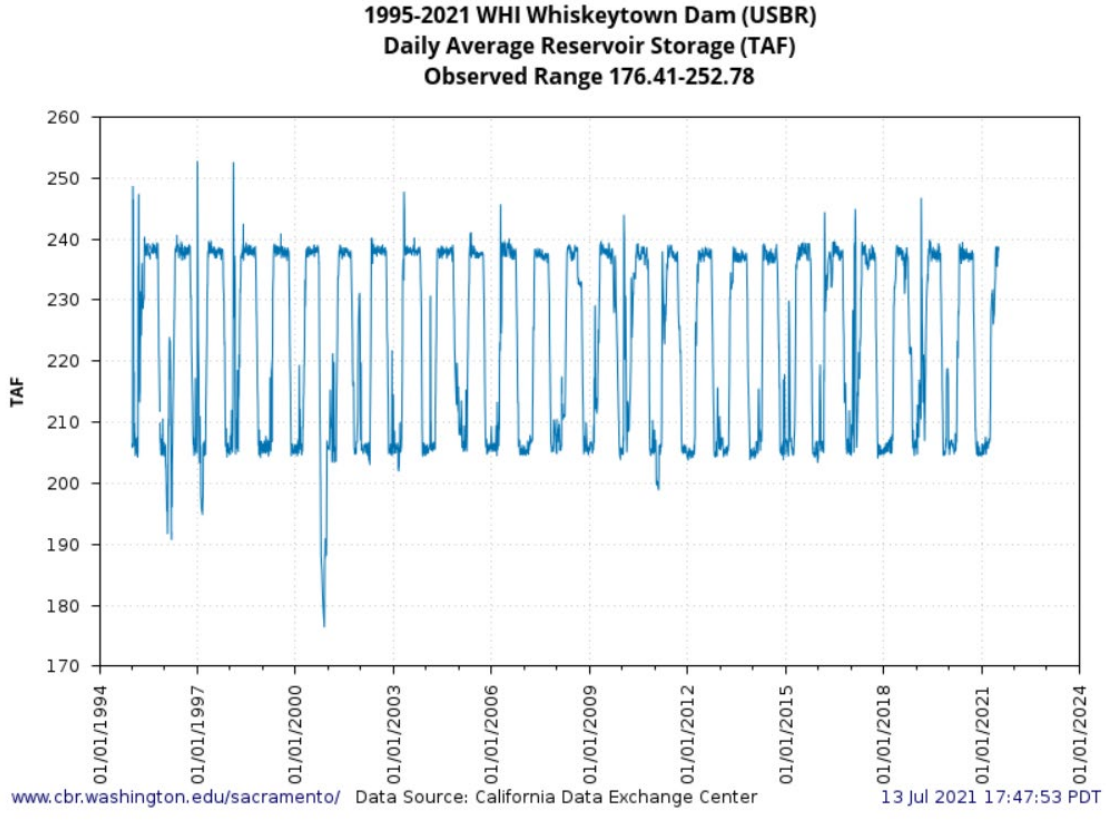

Figure 6. Daily average storage (TAF) at Whiskeytown Lake from WY 1995-2021. Source: http://www.cbr.washington.edu/sacramento/data/query_river_allyears.html

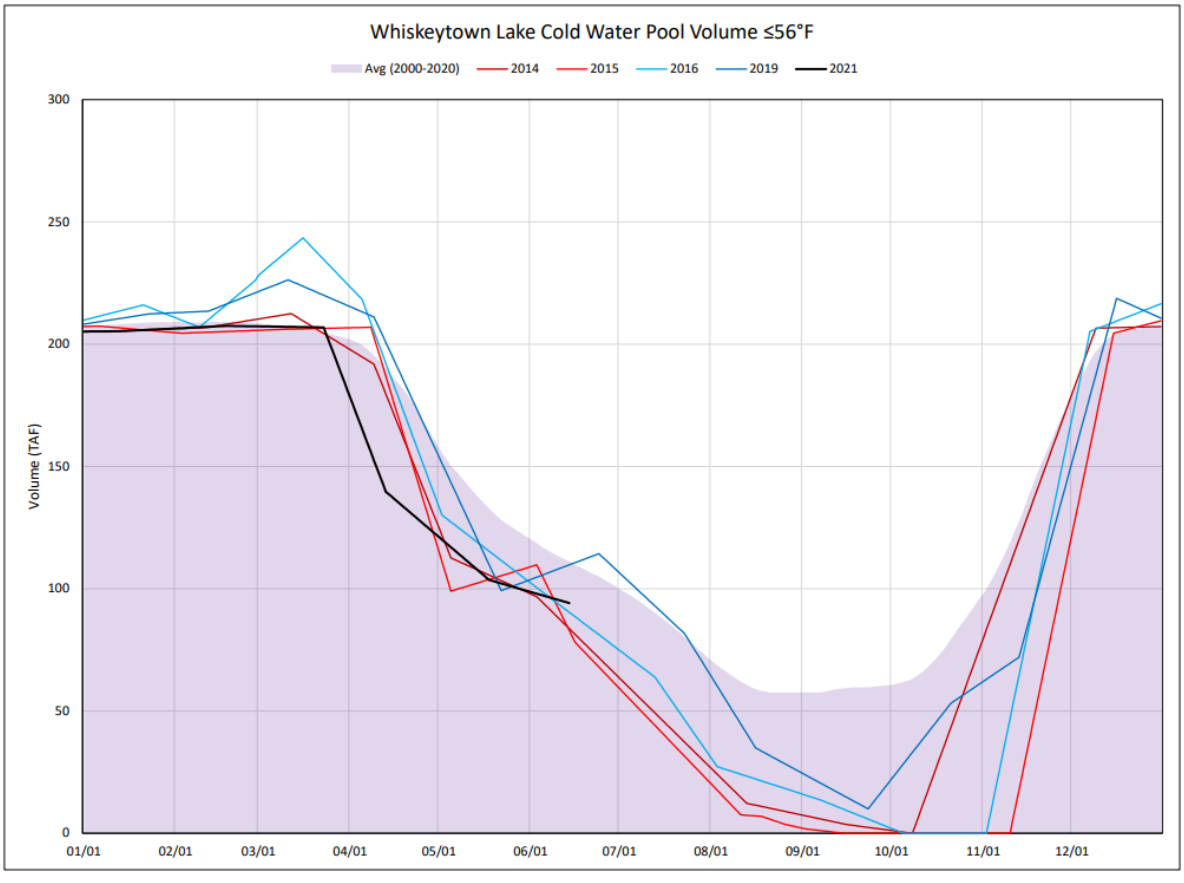

Figure 7. Whiskeytown Lake Cold Water Pool volume less than or equal to 56 degrees F. Source: https://www.usbr.gov/mp/cvo/vungvari/sactemprpt.pdf

Clear Creek flows approximately 17 miles from the Trinity Mountains into Whiskeytown Lake. Clear Creek continues for 18.1 miles downstream of Whiskeytown Lake into the Sacramento River downstream of the CVP Keswick Dam and south of the City of Redding. Reclamation releases Clear Creek flows in accordance with the 2000 agreement between Reclamation, USFWS, and CDFW and the April 15, 2002 Water Board permit, which established minimum flows to be released to Clear Creek at Whiskeytown Dam. Reclamation releases a minimum base flow in Clear Creek of 200 cfs from October through May and 150 cfs from June through September in all water year types except critical water year types. In critical years, Clear Creek base flows may be reduced below 150 cfs based on available water from Trinity Lake. Additional flow may be required for temperature management during the fall. In WY 2021, Clear Creek base flows ranged between 125 cfs and 200 cfs.

In addition, Reclamation creates pulse flows for both channel maintenance and spring attraction flows. For spring attraction flows, Reclamation would release up to 10 TAF (measured at the release), with daily release up to the safe release capacity (approximately 900 cfs, depending on reservoir elevation and downstream capacity), in all water year types except for critical water year types to be shaped by the Clear Creek Technical Team in coordination with Reclamation's Central Valley Operations Office. In WY2021, one spring pulse flow was released May 7 through 16, with a peak of 840 cfs. An emergency pulse was released June 20 through 24, with a peak of 500 cfs. No channel maintenance pulse flows were released in WY2021, as it was a critical year. Mean daily flows in Clear Creek near Igo for water years 1996-2021 are shown in **Figure 8**.

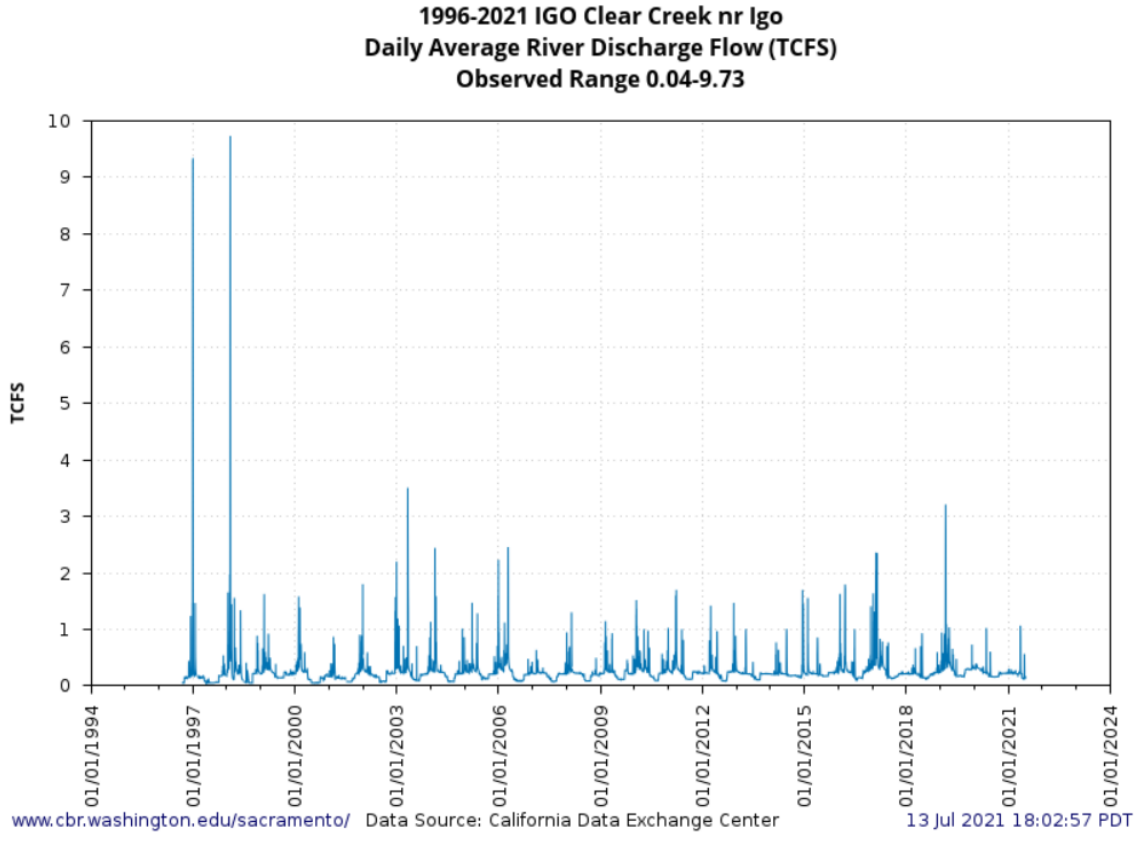

Figure 8. Mean daily flows in Clear Creek near Igo for WY 1996-2021. Source: http://www.cbr.washington.edu/sacramento/data/query_river_allyears.html

The Clear Creek tunnels import cold water stemming from Trinity Lake to Whiskeytown Dam. Two temperature curtains within Whiskeytown Lake inhibit this cold water from mixing with the warmer upper layer (epilimnion). These curtains force the cold water to flow deep under the surface (hypolimnion), so that water temperatures are maintained as it flows through the reservoir from the Clear Creek Tunnels to the outlets (Spring Creek tunnels and Whiskeytown Dam).

Trinity River

The Trinity River region includes Trinity Lake, Lewiston Reservoir, the area along the Trinity River from Trinity Lake to the confluence with the Klamath River, and the lower Klamath River from the confluence with the Trinity River. Trinity Lake is a 2.4 MAF CVP reservoir, constructed in 1962, on the Trinity River. Trinity Lake storage varies according to upstream hydrology, downstream water demands, and instream flow requirements. Water storage volume in Trinity Lake for water years 1995–2021 are shown in **Figure 9**. The cold water pool volume less or equal to 52 degrees F in Trinity Lake is shown in **Figure 10**.

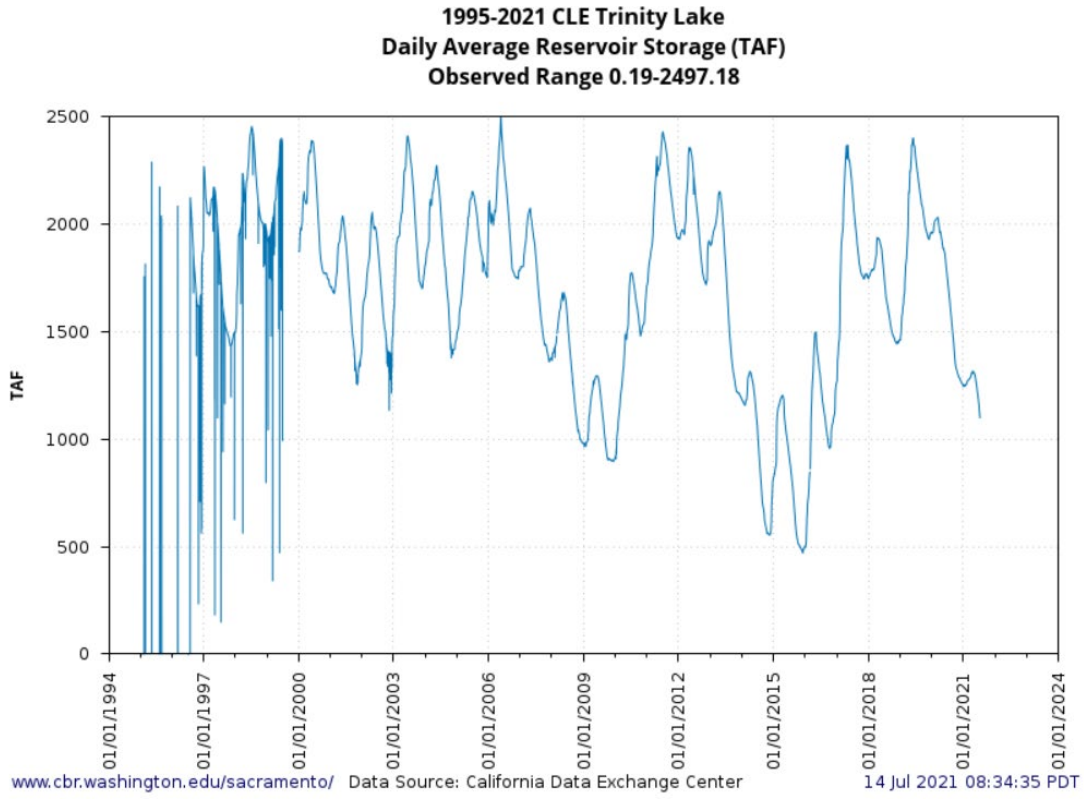

Figure 9. Water storage volume (TAF) in Trinity Lake for water years 1995-2021. Source: http://www.cbr.washington.edu/sacramento/data/query_river_allyears.html

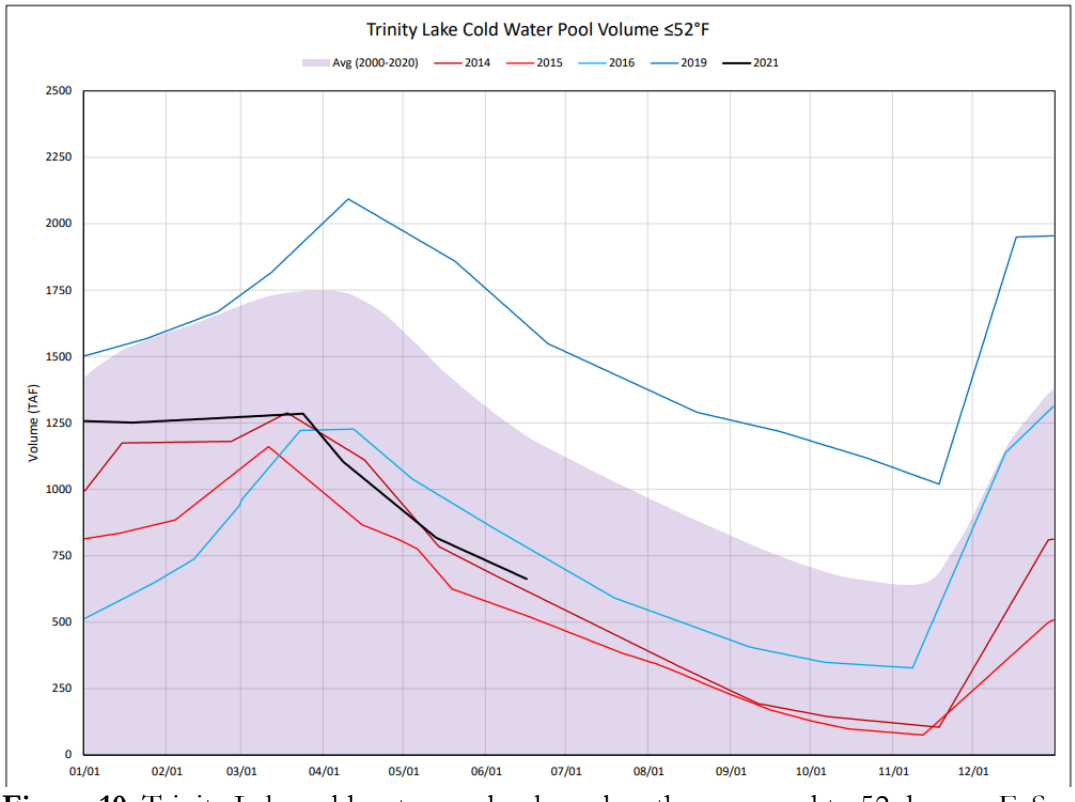

Figure 10. Trinity Lake cold water pool volume less than or equal to 52 degrees F. Source: https://www.usbr.gov/mp/cvo/vungvari/sactemprpt.pdf

Lewiston Reservoir is a CVP facility, constructed in 1963, on the Trinity River and is seven miles downstream of Trinity Dam. Lewiston Reservoir is used as a regulating reservoir for downstream releases to the Trinity River and to Whiskeytown Lake, which is located in the adjacent Clear Creek watershed. The Lewiston Reservoir water storage volume is more consistent throughout the year because this reservoir is used to regulate flow releases to the powerplant and other downstream uses and not to provide long-term water storage. Water is diverted from the lower outlets in Trinity Lake to Lewiston Reservoir to provide cold water to the Trinity River. Trinity River flows downstream of Lewiston Reservoir at Douglas City are shown in **Figure 11**.

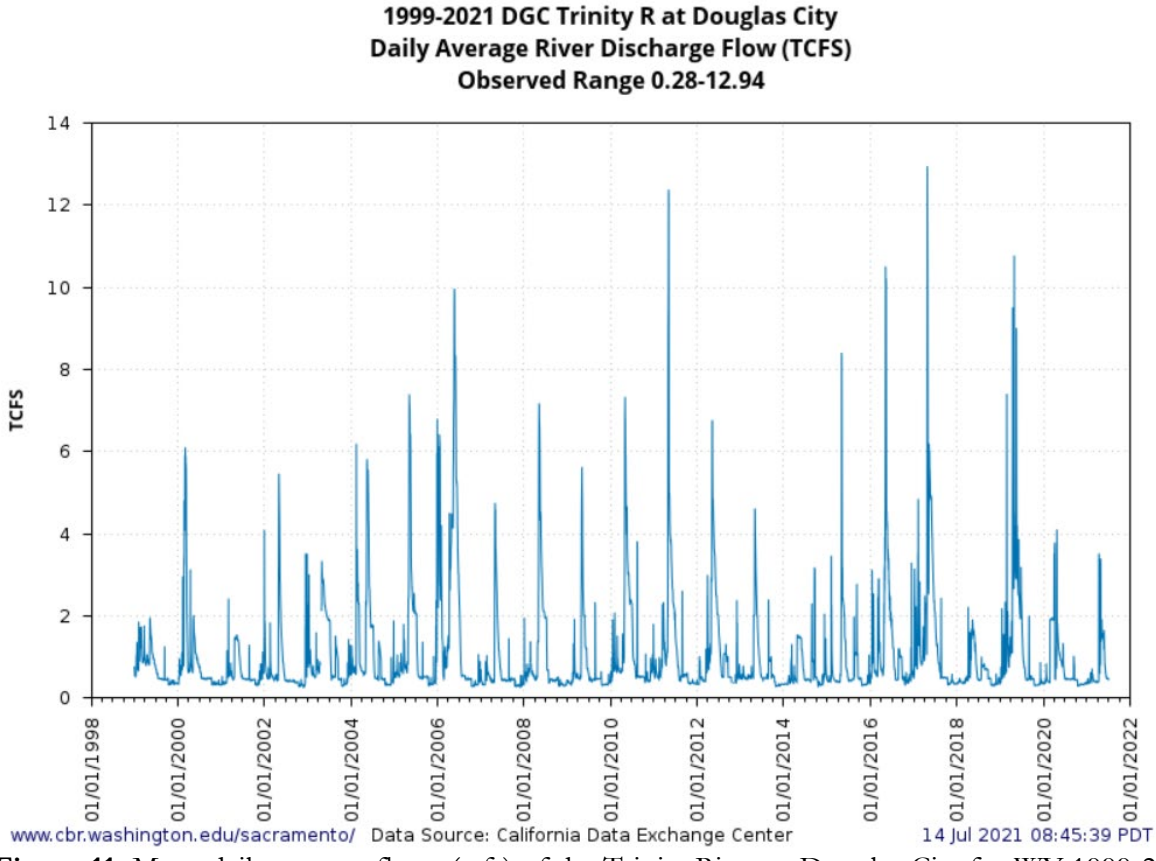

Figure 11. Mean daily average flows (tcfs) of the Trinity River at Douglas City for WY 1999-2021. Source: http://www.cbr.washington.edu/sacramento/data/query_river_allyears.html

Trinity River exports are first conveyed through Clear Creek Tunnel to Carr Powerplant, which discharges directly into Whiskeytown Lake, which is used heavily for recreation. The seasonal timing of Trinity River exports is a result of determining how to make best use of a limited volume of Trinity Lake exports (in concert with releases from Shasta Lake) to help conserve cold water pools and meet temperature objectives on the upper Sacramento and Trinity Rivers and manage power production economics. A key consideration in the export timing determination is the warming that typically occurs in Whiskeytown Lake as summer progresses. Summer residence time through the lake is about six to eight weeks, depending on flow rates, so notable heating can occur.

3.1.2 Environmental Consequences

Sacramento River

Under the No Action Alternative, Reclamation will continue to operate Shasta Dam and Keswick Dam under the TUCP, Drought Contingency Plan, LTO ROD, and Temperature Management Plan given hydrology, other regulatory requirements, and public health and safety needs. The June 90% exceedance forecast, dated July 6, 2021, estimated the end of September storage in Shasta Lake to be 1.106 MAF. The projected end of September cold water pool volume less than or equal to 52 degrees F is 155 TAF.

The projected end of September reservoir storage for Shasta, Whiskeytown, and Trinity reservoirs under all alternatives is shown in **Table 3**.

Table 3. End of September reservoir storage (TAF) based on the estimated CVP 90% exceedance forecast dated July 6, 2021 for the No Action Alternative and Alternatives 1 through 4.

Reservoir	No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Shasta	1106	1141	1157	1250	1141
Whiskeytown	238	203	187	238	238
Trinity	616	616	616	616	581

Under Alternative 1, water from Whiskeytown Lake would be used to supplement Keswick Dam releases and thus releases from Shasta Lake will be reduced. An estimated 35 TAF would be gained in Shasta Lake end of September storage for a total of 1141 TAF; the projected end of September cold water pool volume less than or equal to 52 degrees F would be 180 TAF. The expected date of first side gate use under this alternative is still July 31 which is the same as under the No Action Alternative. Since the date of first side gate use occurs before any potential action described under this EA would take place, this date does not change between alternatives. Keswick Dam releases would remain the same as under the No Action Alternative.

Under Alternative 2, water from Whiskeytown Lake would be used to supplement Keswick Dam releases and thus releases from Shasta Lake will be reduced. An estimated 51 TAF would be gained in Shasta Lake end of September storage for a total of 1157 TAF, and the projected end of September cold water pool volume less than or equal to 52 degrees F would be 193 TAF. The expected date of first side gate use under this alternative is still July 31 which is the same as under the No Action Alternative. Keswick Dam releases would remain the same as under the No Action Alternative.

Under Alternative 3, 1.25 MAF end of September storage in Shasta Lake would be met by reducing Keswick Dam releases. Average monthly Keswick Dam releases used in modeling this alternative were changed in August from 7,848 cfs to 6,801 cfs and in September from 5,149 cfs to 4,067 cfs. These changes had the effect of reducing 64.4 TAF of outflow from Shasta Lake in each month, which resulted in an increase in storage in Shasta Lake. The projected end of September cold water pool volume less than or equal to 52 degrees F is 244 TAF. The expected date of first side gate use under this alternative is still July 31 which is the same as under the No Action Alternative. This alternative would impact Reclamation's ability to meet Delta outflow requirements and other downstream demands. Under this alternative, the operational priority would be storage which may preclude or delay downstream objectives and Reclamation would not be able to meet water quality objectives. Additionally, irrigators on the Sacramento River may not be able to divert water from the river if flows at Wilkins Slough are less than 4,000 cfs.

Under Alternative 4, there would be similar water quantity impacts as Alternative 1 for Shasta Lake, Keswick Reservoir, and the Sacramento River. End of September storage for Shasta Lake would still be 1141 TAF; the projected volume of cold water pool less than or equal to 52 degrees F would be 176 TAF.

Clear Creek

Under the No Action Alternative, Reclamation will continue to operate Whiskeytown Dam as described in the LTO ROD, whereby the annual drawdown of 35 TAF from the reservoir will occur in October 2021. The anticipated drawdown schedule would likely be similar to WY 2020, which is shown in **Table 4**. As of July 6, 2021, the projected end of September storage volume in Whiskeytown Lake is 238 TAF based on the 90% exceedance forecast. The projected end of September cold water pool (<56 degrees F) is 42.8 TAF. Clear Creek flows and temperature management would operate consistent with the LTO ROD. Minimum flows would range from 150 cfs (June-September) and 200 cfs (October-May).

Table 4. Whiskeytown Lake Fall Draw-down Schedule from WY 2020

Date	Elevation (msl)*
9/28/2020	1209.0 +/- 0.5
10/05/2020	1206.4 +/- 0.5
10/12/2020	1203.8 +/- 0.5
10/19/2020	1201.1 +/- 0.5
10/26/2020	1198.5 +/- 0.5

*Target elevations are subject to change. Large inflows may result in temporary deviation from target and/or delay draw-down**.**

Under Alternative 1, Whiskeytown Lake would have an end of September storage of 203 TAF, 35 TAF lower than the No Action Alternative. Lower storage at the end of September in Whiskeytown Lake means a sooner-depleted cold water pool. The projected end of September cold water pool volume (<56 degrees F) for this alternative is 32.5 TAF. Under normal operations, the cold water pool within Whiskeytown Lake is often close to depletion in the fall months. Generally, it has been difficult or impossible to fully meet the 56 degree F temperature criteria, as the Whiskeytown Dam outlet water is often 56 degrees F or warmer.

Due to the shape of Whiskeytown Lake, the early drawdown would cause warm water to extend deeper into the reservoir. As of early July, the current warm water volume is approximately 150 TAF. When the cold water is drawn out from the bottom of the reservoir, the warm water pool will occupy a greater depth, as the reservoir is narrower at the bottom than the top. The non-linear relationship between Whiskeytown Lake storage and elevation is shown in **Figure 12**. Whiskeytown Lake can only be drawn down from its coldest depths (see gate elevations on the right axis in **Figure 13**); therefore, only cold water can be drawn out, leaving a greater proportion of warm water. This would increase the water temperature of releases into the Spring Creek tunnels (to Keswick Reservoir) and from Whiskeytown Dam (to Clear Creek).

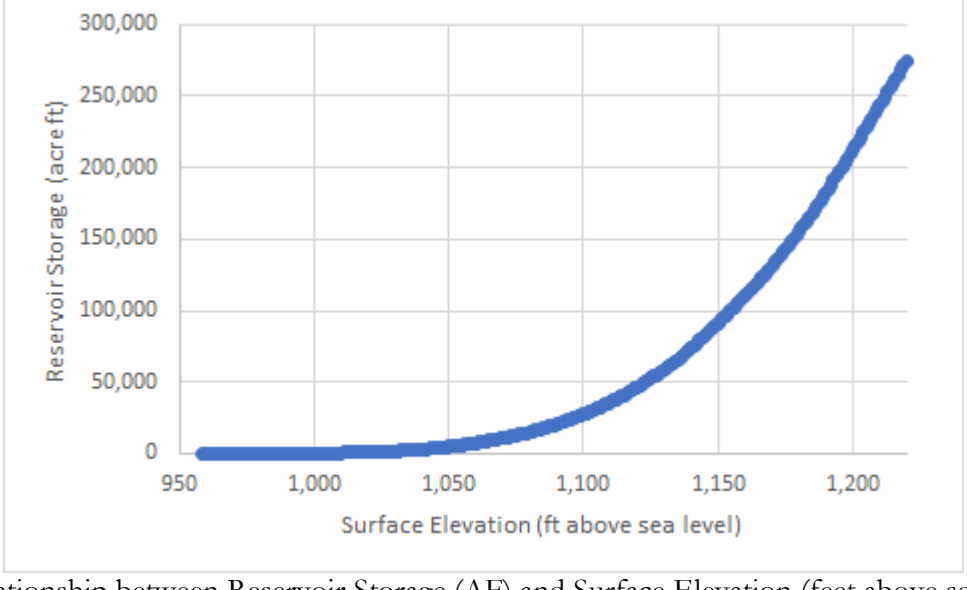

Figure 12. Relationship between Reservoir Storage (AF) and Surface Elevation (feet above sea level) in Whiskeytown Lake. The approximate end of September storage under Alternative 1 is 1198 ft msl and 1190 ft msl under Alternative 2.

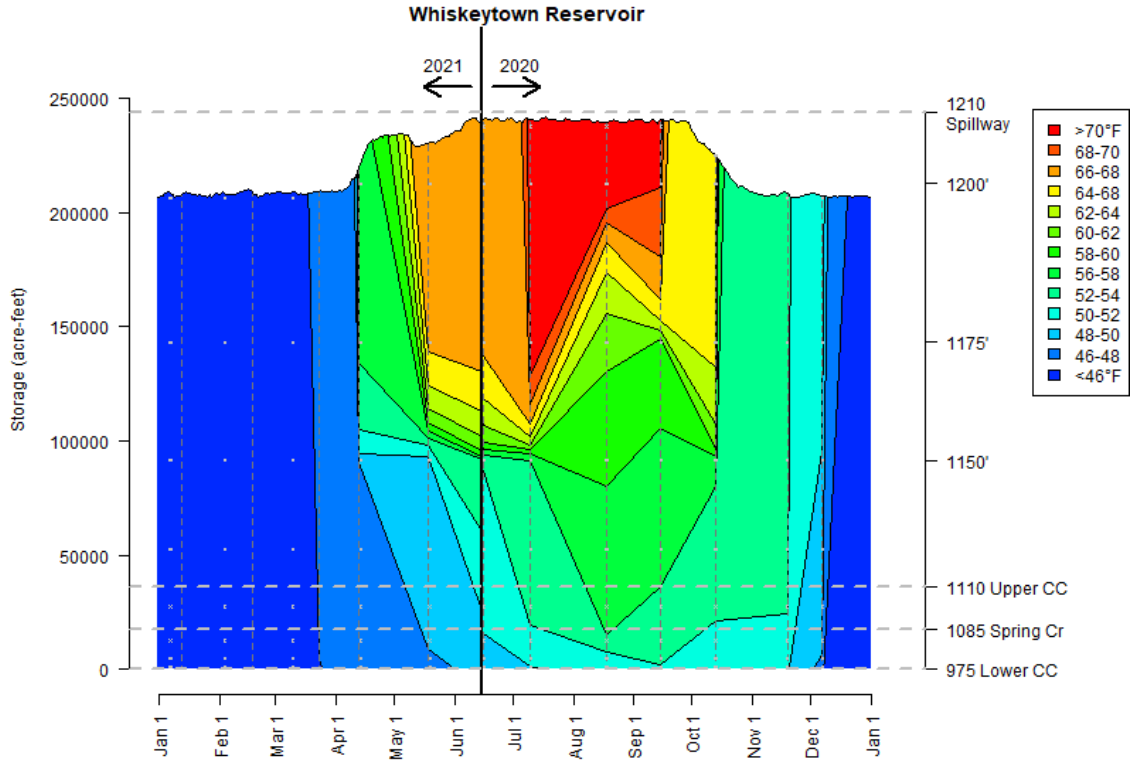

Figure 13. Thermal profile of Whiskeytown Lake taken in June 2021. From mid-June 2021 through January, the thermal profile from 2020 is shown as conditions are similar between water years and can be helpful for planning purposes.

Under Alternative 2, Whiskeytown Lake would have an end of September storage of 187 TAF, 21 TAF lower than Alternative 1. The projected end of September cold water pool volume (<56 degrees F) under this alternative is 24.6 TAF. The impacts associated with Alternative 1 would be amplified under Alternative 2. Under Alternative 3, Whiskeytown Lake operations would not be changed and, therefore, conditions would remain the same as under the No Action Alternative. Under Alternative 4, imports from the Trinity Division to Whiskeytown Lake would be increased by 35 TAF. End of September storage would be the same as under the No Action Alternative. The projected end of September cold water pool volume (<56 degrees F) under this alternative is 24.6 TAF.

Trinity River

As of July 6, 2021, the projected end of September storage in Trinity Lake under the No Action Alternative is 616 TAF, with a projected cold water pool volume (<56 degrees F) of 273 TAF. Alternatives 1 - 3 would have no change to Trinity River operations compared to the No Action Alternative.

Under Alternative 4, an additional 35 TAF would be diverted to Whiskeytown Lake during the end of August through September and thus the end of September storage would be 581 TAF; the projected end of September cold water pool would be 246 TAF. Less storage in September may result in less water available to meet temperature objectives on the Trinity River during WY 2021 and WY 2022. Temperature impacts are further described in the Section 3.2 Aquatic Resources.

The 2000 Trinity ROD provides that:

> "Implementation of drawdowns below the 600 TAF minimum end-of-year carryover level in Trinity Reservoir shall be determined by Reclamation, USFWS, and NMFS on a case-by-case basis in dry and critically dry water years."

If Alternative 4 is selected, Reclamation will need to meet and confer with USFWS and NMFS as soon as practicable. Reclamation is anticipating maintaining the same Trinity River flows under Alternative 4 as the No Action Alternative.

3.1.2.1 Water Quality

CVP operations, including Shasta Lake, impact downstream water quality in the Delta. Salinity and concentrations of constituents of concern can all be positively or negatively affected by increases or decreases in flow and reservoir levels. Generally, substantive increases in flow could increase dilution and benefit water quality, and substantive decreases in flow could reduce dilution and adversely affect water quality. Water temperature is discussed in the fisheries analysis (see Aquatic Resources).

Under Alternatives 1, 2, and 4 there would be no change in Sacramento River, Clear Creek, or Trinity River flows, and therefore would not affect the concentration of constituents of concern and affect overall water quality. Alternative 3 would reduce Keswick Dam releases in order to meet the end of September Shasta Lake storage target, and could result in downstream water quality degradation. Alternative 3 would change Sacramento River flows compared to the other alternatives. Keswick Dam releases for the months of August and September would be lowered compared to the No Action Alternative. The reduced flows would impact Reclamation's ability to meet Delta outflow and water quality objectives for fish and wildlife beneficial uses as well as for municipal and industrial (M&I) beneficial uses as specified in D-1641. Reduced flow would allow greater salinity intrusion into the central Delta which could have long term effects on M&I supplies. Under Alternative 3, the operational priority would be meeting the storage target which may preclude or delay meeting downstream objectives.

3.2 Aquatic Resources

3.2.1 Affected Environment

As the affected environment for the LTO EIS has been incorporated by reference into this Environmental Assessment, the affected environment and environmental consequences will focus on any updates or changes.

Many fish and aquatic species use the study area during all or some portion of their lives; however, certain fish species were selected to be the focus of the analysis of alternatives considered in this Environmental Assessment based on their sensitivity and their potential to be affected by changes in the operation of the CVP in the Sacramento River, Clear Creek, and Trinity River; these species are summarized in **Table 5**.

Table 5. Focal Fish Species in Study Area

Species or Population	Federal Status	State Status	Tribal, Commercial, or Recreational Importance	Occurrence within Area of Analysis
Winter-run Chinook salmon Sacramento River ESU	Endangered	Endangered	Yes	Sacramento River

Spring-run Chinook salmon Central Valley ESU	Threatened	Threatened	Yes	Clear Creek, Sacramento River
Steelhead Central Valley DPS	Threatened	None	Yes	Clear Creek, Sacramento River
Fall-run/late fall-run Chinook salmon Central Valley ESU	Species of concern	Species of Special Concern	Yes	Clear Creek, Sacramento River
Kokanee salmon (landlocked Sockeye salmon)	None	None	Yes	Whiskeytown Lake, Trinity Lake
Coho salmon Southern Oregon/Northern California Coast ESU	Threatened	Threatened	Yes	Trinity River

Access to approximately 58 percent of the original Winter-run Chinook salmon habitat has been blocked by the existence of dams (Reclamation 2008). The remaining accessible habitat occurs in the Sacramento River downstream of Keswick Dam and in Battle Creek. Adult winter-run Chinook salmon return to fresh water during winter but delay spawning until spring and summer. Adults enter fresh water in an immature reproductive state, similar to spring-run Chinook salmon, but winter-run Chinook salmon move upstream much more quickly, then hold in the cool waters downstream of Keswick Dam for an extended period before spawning. Spawning occurs May through August, with the peak in early June. Fry emergence occurs from mid-June through mid-October and fry disperse to areas downstream for rearing. Juveniles spend about 5–9 months in the river and estuary systems before entering the ocean. In WY 2021, aerial redd surveys detected the start of winter-run Chinook salmon spawning on May 17, 2021.

Within the study area, naturally spawning populations of spring-run Chinook salmon in the Sacramento River Basin currently are restricted to accessible reaches of the upper Sacramento River and Clear Creek, among others (CDFG 1998). During the summer months, spring-run Chinook salmon adults are holding in the Sacramento River basin and spawning begins in August and continues through October (NMFS 2019). WY 2021 has seen the record high number of spring-run Chinook salmon adults return to Clear Creek. During the survey conducted from June 28 to July 2, 2021, the USFWS counted nearly 1,500 spring-run Chinook salmon. The previous record for Clear Creek spring-run Chinook salmon was 651 adults.

The primary spawning area used by fall- and late fall–run Chinook salmon in the Sacramento River is the area from Keswick Dam downstream to Red Bluff Diversion Dam. Spawning densities for each of the runs are generally highest in this reach. Fall-run Chinook salmon migrate upstream past Red Bluff Diversion Dam on the Sacramento River between July and December, typically spawning in upstream reaches from October through March. Late fall–run Chinook salmon migrate upstream past Red Bluff Diversion Dam from August to March and spawn from January to April (NMFS 2009).

The primary spawning area used by steelhead in the mainstem Sacramento River is the area from Keswick Dam downstream to Red Bluff Diversion Dam. Adult steelhead migrate upstream past the Fremont Weir between August and March, primarily from August through October; they migrate upstream past Red Bluff Diversion Dam during all months of the year, but primarily during September and October (NMFS 2009).

Kokanee salmon, or landlocked Sockeye salmon, is a predominant sportfish in Whiskeytown Lake and Trinity Lake. Kokanee generally migrate into tributaries to spawn in the fall. Kokanee are sustained through a combination of natural reproduction and fish hatchery stocking practices. In Whiskeytown Lake, Kokanee migrate into Clear Creek, Whiskey Creek, and Brandy Creek.

Coho salmon exhibit a three-year life cycle in the Trinity River during which they spend the first year in fresh water before migrating to the ocean. In the ocean, they spend the next two years maturing before returning to their natal stream to spawn and die. This strategy makes Coho salmon especially dependent on freshwater conditions because juveniles remain in the river year-round. Adult Coho salmon typically enter the Trinity River between August and January. The timing of Coho salmon river entry is influenced by several factors, including genetics, stage of maturity, and river discharge. Coho salmon spawning occurs mostly in November and December. Spawning occurs in the mainstem Trinity River and its tributaries with peak Coho salmon spawning activities in the mainstem Trinity River occurring between Lewiston Dam and the North Fork Trinity River.

Sacramento River Temperature Criteria

During the summer, operational considerations for Shasta Lake are mainly flows required for Delta outflows, instream demands, temperature control, and exports. In river temperatures below Shasta Dam can be controlled via two methods. First is changing release volume or shifting releases between Trinity and Sacramento reservoirs, and the second is selective withdrawal through the Shasta Dam Temperature Control Device. Determination of which method to use is made on a daily basis as operators balance releases from multiple reservoirs to meet downstream needs.

Water Right Order 90-5 identified a 56 degrees F water temperature objective as *"the temperature that will protect the fishery from adverse thermal effects during salmonid spawning and egg incubation."* It further recognizes that Reclamation's ability to control temperatures is dependent on the amount of water in storage at Shasta Lake, ambient air temperatures, tributary inflow and other factors, and that the length of the reach to be protected must be flexible and requires careful planning. Order 90-5 provides that factors beyond Reclamation's reasonable control include conditions where protection of the fishery can best be achieved by allowing a higher water temperature in order to conserve cool water for a later release, and conditions where allowing a higher temperature is necessary to implement measures to conserve winter run Chinook salmon.

For WY 2021, Reclamation has determined that it cannot reasonably maintain 56 degrees F at Red Bluff Diversion Dam and that:

- Protection of the fishery can best be achieved by allowing a higher water temperature in order to conserve cool water for later release,
- A higher water temperature is necessary to implement measures to conserve winter-run Chinook salmon.

In the Temperature Management Plan, dated May 28, 2021, Reclamation determined that conserving cold water for the duration of the temperature management period and operating to a higher temperature at Red Bluff Diversion Dam would best protect the fishery from adverse thermal effects during salmonid spawning and egg incubation. More specifically, for WY 2021, Reclamation is operating to the temperatures and compliance locations included in the Temperature Management Plan which are upstream of Red Bluff Diversion Dam. Temperatures under Scenario 14 were identified by the Sacramento River Temperature Task Group were identified as the preferred alternative as shown in **Table 6**.

Table 6. WY 2021 temperatures targets and locations under Scenario 14 (S14), from the Temperature Management Plan.

Month	Keswick S14	Hwy 44 S14
May	56.2	56.1
June	55.7	55.6
July	55	55.1
August	55.2	55.2
September	54.9	54.8
October	54.6	54.4
November	52.7	52.3

Clear Creek Temperature Criteria

Reclamation operates Clear Creek flows in accordance with the 2000 agreement between Reclamation, USFWS, and CDFW and the April 15, 2002 SWRCB permit, which established minimum flows to be released to Clear Creek at Whiskeytown Dam. Reclamation manages Whiskeytown Dam releases to meet a daily average water temperature of (1) 60 degrees F at the Igo gauge from June 1 through September 15 and (2) 56 degrees F at the Igo gauge from September 15 to October 31. Two time frames for water temperature management link to the life stages of salmonids. From June through September 15, temperature management (60 degrees F mean daily at Igo) supports spring-run Chinook Salmon adults and steelhead juveniles. From September 16 through October, temperature management (56 degrees F mean daily at Igo) supports spring-run Chinook Salmon egg incubation and pre-emergent fry. and October temperatures (June – end of October). Temperatures are assumed to drop below reasonable levels (56 degrees F) following the end of October, due to colder nighttime air temperatures and reduced solar radiation (short days and low sun angle).

Trinity River Temperature Criteria

Temperature objectives for the Trinity River are set forth in Order 90-05 and vary by reach and by season. Between Lewiston Dam and Douglas City Bridge, the daily average temperature should not exceed 60 degrees F from July 1 to September 14 and 56 degrees F from September 15 to September 30. From October 1 to December 31, the daily average temperature should not exceed 56 degrees F between Lewiston Dam and the confluence of the North Fork Trinity River.

3.2.2 Environmental Consequences

The HEC-5Q water temperature model was used to represent the Trinity-Sacramento system, including the interbasin transfer through the Clear Creek and Spring Creek Tunnels from Lewiston Reservoir downstream of Trinity Lake to Whiskeytown Lake and on to Keswick Reservoir, downstream of Shasta Lake. Flows for the No Action Alternative used the 90th percentile CVO forecast from the end of June. In Alternatives 1 and 2, flows through Spring Creek Tunnel were increased in September and decreased in October to represent moving the annual drawdown of Whiskeytown from October to September. In Alternative 4, flows from Trinity into Lewiston and through the Clear Creek and Spring Creek Tunnels were increased in August and September to represent moving Trinity water into Keswick Reservoir. In these alternatives, Shasta releases to Keswick Reservoir were decreased by an equal amount, leaving Keswick Dam releases the same. In Alternative 3, Shasta and Keswick dams' releases were both decreased to represent a smaller volume of releases to the Sacramento River.

Sacramento River

Because of its longstanding use as a compliance point in river temperature management, HEC-5Q modeling results at the point of the gauge above Clear Creek was chosen as representative of modeled temperature differences between alternatives on the Sacramento River. The timeframe of July 7 - November 31 was modeled, the same timeframe as was modeled by Reclamation for reporting to the Sacramento River Temperature Task Group. The modeling results indicate that before mid-September, the differences in water temperature results on the Sacramento River were dominated by increases in temperature caused by an increase in the ratio of Spring Creek Tunnel flows to Shasta Dam releases, which together comprise inflows to Keswick Reservoir. The No Action Alternatives and the action alternatives saw an increase in this ratio; Alternatives 1, 2, and 4 because of increased Spring Creek Tunnel flows and Alternative 3 because of a decrease in Shasta releases. Spring Creek Tunnel flows as modeled in HEC-5Q are warmer than Shasta Dam releases until late in October, so an increase in the proportion of Keswick Reservoir inflows coming from this warmer source results in warmer Keswick Dam outflow temperatures. After mid-September, Sacramento River temperatures decrease from the No Action Alternative to the action alternatives. The decrease in water temperature changes from the No Action Alternative to the action alternatives on the Sacramento River are due to increased Shasta Lake storage increasing the volume of cold water pool. This trend is seen in both the raw HEC-5Q results (**Figure 14** and **Figure 15**) and in the regression relationship between end of September cold water pool less than 56 degrees F and Sacramento River temperatures at Keswick Reservoir and Clear Creek gauges used from September 15 onward to represent temperatures due to shortcomings of the HEC-5Q model at representing temperatures in this period (**Table 7**). Modeling assumptions are described in Appendix E.

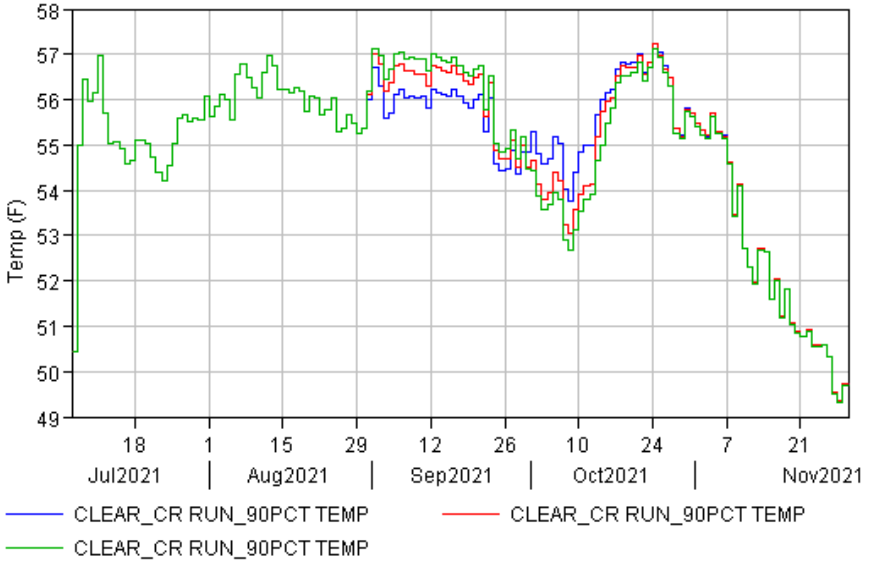

Figure 14. Water temperatures on the Sacramento River at the Clear Creek gauge for No Action Alternative (blue), Alternative 1 (red), and Alternative 2 (green) from the HEC-5Q model.

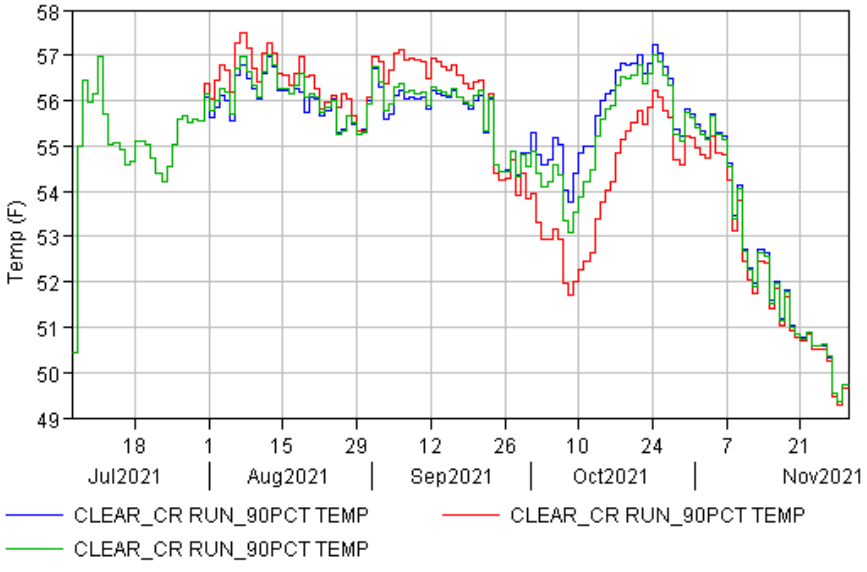

Figure 15. Water temperatures on the Sacramento River at the Clear Creek gauge for No Action Alternative (blue), Alternative 3 (red), and Alternative 4 (green) from the HEC-5Q model.

Key parameters under each alternative for winter-run Chinook salmon on the Sacramento River are shown in **Table 7**. Winter-run Chinook salmon egg mortality was modeled under each alternative. Winter-run Chinook salmon temperature dependent egg mortality were similar among the alternatives. Therefore, mortality modeling indicated that for all of the action alternatives, the increases in water temperatures during the first few weeks of September did not affect the overall estimates of temperature dependent mortality, nor did the colder water temperatures modeled later in the season. The similar temperature dependent mortality estimates among alternatives may be attributed to the modeled water temperatures for all alternatives exceeding the critical temperature threshold of 53.7 degrees F. The end of September cold water pool volume increased from the No Action Alternative to the action alternatives by 21 – 89 TAF. With a higher end of September storage in Shasta Lake, there is a greater chance of maintaining temperature control for the duration of the temperature management season (through October 31). However, temperature modeling indicated this increase in cold water pool would not reduce temperature dependent morality. Because the date of first side gate use and date of full side use occur prior to September under the No Action Alternative, these parameters remained unchanged for each action alternative.

Table 7. Summary of key parameters for winter-run Chinook salmon on the Sacramento River and Shasta Lake.

Metric/Scenario	No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
HEC-5Q TDM – Stage-dependent (%)	92	93	93	93	94
HEC-5Q TDM – Stage-independent(%)	86	86	87	88	88
End of Sept Cold Water Pool (TAF)	155*	180**	193**	244**	176**
First Side Gate Use	July 31*	July 31**	July 31**	July 31**	July 31**
Full Side Gate Use	Sept 1*	Sept 1**	Sept 1**	Sept 1**	Sept 1**

*Model run date is 7/8/2021.
**Model run date is 7/12/2021; however, the model was run starting on 7/7/2021, identical to the previous model run.

Spring-run Chinook salmon, fall-run and late-fall-run Chinook salmon would be negatively impacted by warmer temperatures in the Sacramento River prior to mid-September and would benefit from colder temperatures in the river after mid-September under the action alternatives. The modeled water temperatures for all alternatives exceed the critical temperature threshold of 53.7 degrees F for Chinook salmon eggs at Clear Creek. HEC-5Q modeled water temperatures for all the alternatives were below the 57 degrees F threshold associated with harmful impacts to adult holding or spawning Chinook salmon. Modeled water temperatures were also below the thresholds that support the relevant steelhead life stages (61 degrees F for juveniles; 68 degrees F for adult migration). It is unclear if there would be a net benefit from any of the action alternatives for these species. Livingston Stone National Fish Hatchery uses Sacramento River water for operations. Due to warm temperatures this year, the hatchery requires chillers to meet temperature targets for various life stage requirements.

Under Alternative 3, lower Keswick Dam releases during August and September may affect adult spring-run Chinook salmon habitat although records for spring-run Chinook salmon spawning are quite limited in the upper Sacramento River. These reduced flows may affect juvenile winter-run Chinook salmon rearing habitats in the upper Sacramento River, although disconnection of existing and restored side channels is not likely to occur. As described in Alternative 3, reduced Shasta Dam releases may result in downstream Delta requirements not being met and drought-linked Delta fish habitat degradation may increase further. The No Action Alternative, Alternatives 1, 2, and 4 are likely to have similar Chinook salmon redd dewatering impacts because the flow releases are anticipated to be similar.

Clear Creek

Impacts on Clear Creek temperatures at the Igo gauge were limited to a few tenths of a degree F during periods of increased diversion from Whiskeytown Lake to the Spring Creek Tunnel (**Figure 16**). Alternative 4 saw the largest differences due to increases in diversion from Lewiston to Whiskeytown through the Clear Creek Tunnel. These findings, as with the findings on the Sacramento River, used June 90th percentile forecasted flows and meteorologies. Because the HEC-5Q model must be calibrated to multiple rivers and the Sacramento River is the most important element of the model, other elements such as Clear Creek may

not be as fully represented in the model. The magnitude of interbasin transfer through the Clear Creek (Lewiston to Whiskeytown) and Spring Creek (Whiskeytown to Keswick) Tunnels affects the balance between the three river systems, Trinity, Clear Creek, and Sacramento, with more heat moving across the interbasin transfer during the May-September period with higher flows. This adds challenges to the effort of calibrating to historical data, as the magnitude of interbasin transfer and the ratio between Spring Creek Tunnel flows and Shasta Lake outflows in terms of total inflow to Keswick may be different from year to year. The direction of the modeling results appear reasonable, but the results may not capture the full magnitude of warming. Clear Creek temperatures at Igo during 2015 (a drought year) highlight the inability to meet spring-run Chinook salmon water temperature objectives (56 degrees F) during the September 16 – October 31 timeframe, when the cold water pool was depleted (**Figure 17**).

Whiskeytown Lake can only be drawn down from its coldest depths as discussed in the Surface Water Resources section. Depleting the lake of its coldest water in September, as would occur under Alternatives 1 and 2, would very likely increase temperature dependent mortality to Clear Creek spring-run Chinook salmon compared to the No Action Alternative. Spring-run Chinook salmon begin to spawn in Clear Creek in early September, with many fish spawning downstream of the Igo gage where temperatures may be warmer. In previous years, Reclamation has increased releases into Clear Creek to help meet water temperature objectives at Igo; however, if the cold water pool is depleted by the end of September this operational flexibility may not be available because the remaining water in Whiskeytown Lake would be too warm. Potential impacts to spring-run Chinook salmon eggs, juveniles, and adults in Clear Creek would be greater under Alternative 2 than Alternative 1.

Juvenile steelhead rearing in Clear Creek are not likely to experience negative water temperature effects between alternatives or the No Action Alternative since temperature during summer and fall remain are similar and remain below the 61 degrees F 7DADM necessary to support juvenile rearing (NMFS 2019) as indicated by the HEC-5Q results in **Figure 16**. Adult migration should not be affected since temperatures do not exceed 64 degrees F (NMFS 2019). Under Alternative 1 and 2, fall run Chinook salmon adult migration should not be impacted more than under the No Action Alternative, since the No Action Alternative also includes September temperatures slightly higher than the 42-57° F water temperature range supporting adult spawning initiation. Under all alternatives, fall run Chinook salmon egg incubation should not be further impacted more than under the No Action Alternative, since the No Action Alternative also includes September and October water temperatures slightly higher than the 43-54° F water temperature range supporting egg incubation. Redd dewatering impacts on Clear Creek should be the same for all alternatives and the No Action Alternatives because flows on Clear Creek are expected to be the same for all of these scenarios.

An early drawdown of Whiskeytown Lake may also negatively impact Kokanee salmon, an important recreational fishery. Kokanee spawn in Whiskeytown Lake tributaries in October and lower lake levels may inhibit spawning migration. Potential impacts to Kokanee salmon would be greater under Alternative 2 than Alternative 1.

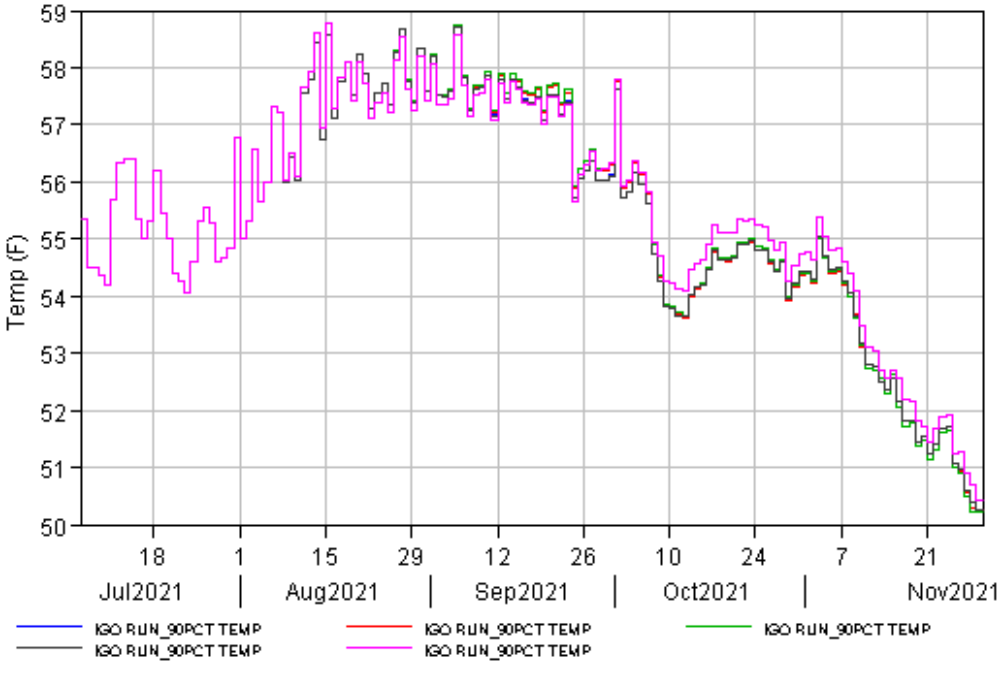

Figure 16. Temperatures on Clear Creek at the Igo gauge for No Action Alternative (blue), Alternative 1 (red), Alternative 2 (green), Alternative 3 (dark gray), and Alternative 4 (purple) from the HEC-5Q model.

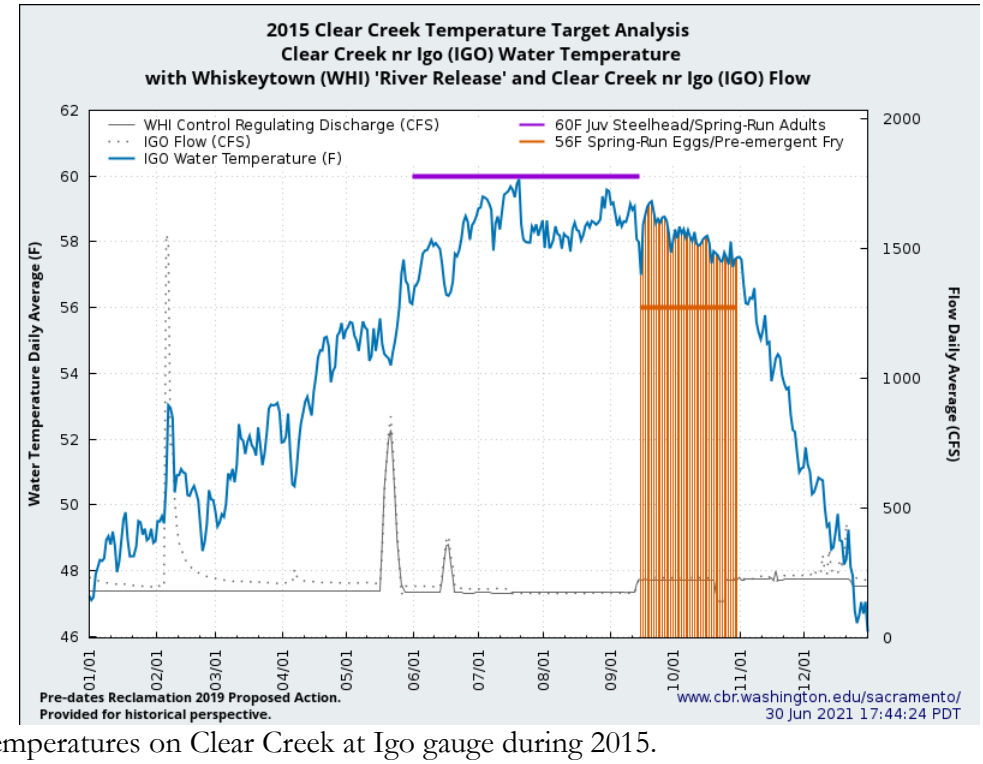

Figure 17. Temperatures on Clear Creek at Igo gauge during 2015.

Trinity River

Impacts on Lewiston Reservoir temperatures under Alternative 4 are shown in **Figure 18**. These findings, as with the findings on the Sacramento River and Clear Creek, used June 90th percentile forecasted flows and meteorologies. The calibration limitation of the HEC-5Q model described for Clear Creek also applies to the Trinity River; an additional modeling constraint for this river is that the modeling does not output for water temperatures at the Douglas City gauge, one of the temperature target locations on the Trinity River. Alternative 4 modeling estimates Trinity River at Lewiston gauge temperatures increase in September through November. The HEC-5Q models estimates of temperatures are not high enough to affect juvenile Coho salmon rearing during the fall. HEC-5Q modeled temperatures under Alternative 4 do not show an effect during the Coho salmon adult migration (August - January) or egg incubation (November - January) as modeled temperatures for the No Action Alternative and Alternative 4 remain below these criteria during this period. During the 2014 and 2015 drought period, water temperatures at Douglas City did not exceed these criteria in these relevant periods outside one or two days early in summer associated with hot meteorology during these periods. Similar conditions are likely to exist this fall and winter with water temperatures.

However, the Drought Contingency Plan, which is a part of the No Action Alternative, identifies that in Trinity Lake, *"…the storage forecasted for the end of September is extremely low at just over 600 TAF and does not leave a storage buffer in the event WY 2022 is also dry. In addition, low storages of this level also typically bring temperature management concerns both in this water year and in WY 2022"* (p. 11). Under Alternative 4, the low storage condition and the potential for negative temperature impacts in WY 2022 is exacerbated.

Another consideration is Water Right Order 90-5, which states, *"If the temperatures in the Trinity River exceed 56 degrees Fahrenheit at the specified locations during the specified periods,"* Reclamation shall *"demonstrate that the exceedance was not due to modifications of Trinity River operations for water temperature control on the Sacramento River"* (SWRCB 1990). HEC-5Q modeling for Alternative 4 estimates exceedance of this 90-5 criteria in September.

The Trinity River Hatchery is located on Trinity River near Lewiston. The hatchery produces Chinook salmon, Coho salmon, and steelhead. Due to drought and poor water conditions in the Klamath River, the California Department of Fish and Wildlife (CDFW) successfully relocated 1.1 million juvenile fall-run Chinook salmon from its Iron Gate Fish Hatchery in Siskiyou County. The fish were trucked to a nearby satellite facility and to the Trinity River Hatchery 122 miles away where the fish will remain until conditions in the Klamath River improve (CDFW 2021). Increases in Trinity River temperatures may negatively impact hatchery operations.

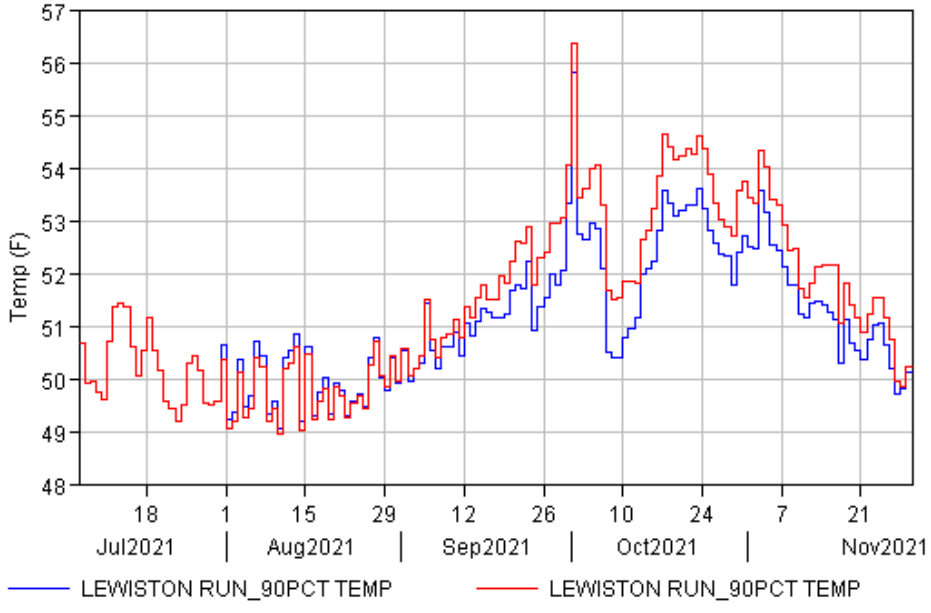

Figure 18. Water temperatures on Trinity River at Lewiston gauge for No Action Alternative (blue) and Alternative 4 (red). Alternatives 1-3 were identical to the No Action Alternative on the Trinity River from the HEC-5Q model.

3.3 Recreation

3.3.1 Affected Environment

As the affected environment for the LTO EIS has been incorporated by reference into this Environmental Assessment, the affected environment and environmental consequences will focus on any updates or changes.

Whiskeytown Lake is a CVP facility on Clear Creek that is located approximately eight miles west of Redding on the eastern slope of the Coast Range. Whiskeytown Lake is part of the Whiskeytown-Shasta-Trinity National Recreation Area and recreational facilities and activities are administered by the National Park Service (NPS). When water storage in the reservoir is at full capacity (water elevation is at 1,210 ft msl), Whiskeytown Lake has a surface area of 3,250 acres and 36 miles of shoreline (NPS 2012; Reclamation 2019b). Boating, waterskiing, sailing, kayaking, canoeing, swimming, and fishing occur at many locations at the lake. At full capacity, boat ramps are available at Oak Bottom, Brandy Creek, and Whiskey Creek, and at marinas at Oak Bottom and Brandy Creek (NPS 2012).

In 2020, Whiskeytown Lake had over 800,000 total recreation visits, with the lake generating almost $40,000,000 in total economic output for the local economy (NPS 2021). In 2021, visitation at Whiskeytown Lake has increased approximately 25 percent compared to a 10-year average; it is likely over 1,000,000 visitors can be expected by the end of the year. Based on historical data, approximately 8 percent of annual visitation occurs in the month of September when the action alternatives would take place; however, that percentage is temperature dependent and more visitors can be expected if fall temperatures are warm.

3.3.2 Environmental Consequences

The No Action Alternative, Alternative 3 and Alternative 4 would not impact recreational opportunities at Whiskeytown Lake. Alternative 1 would draw the lake down to elevation 1198 ft msl and Alternative 2 would draw the lake down to elevation 1192 ft msl. At elevation 1198 ft msl, the Oak Bottom ramp begins to become unusable - larger boats at the marina that are not taken out before dropping to this level (in particular sailboats with long keels) would become stranded as there is a ridge between the marina and lake entry point that would become more exposed. There are approximately 80-100 boats currently moored in the Oak Bottom Marina.

With more restricted access to the Oak Bottom and other areas, a decrease in visitors and revenue for the NPS is reasonably expected. Based on discussions with NPS staff, the concessioner at the Oak Bottom area would likely be negatively impacted; approximately 17 percent of their revenue is accrued during the month of September. No additional boat ramps would be dewatered under Alternative 2; Whiskey Creek and Brandy Creek boat ramps are usable to elevation 1190 ft msl.

Additionally, fueling stations may need to be moved. From a navigational and safety perspective, lower lake levels would require new boating hazards (e.g. rock piles or shallow humps) to be marked with buoys. Alternative 2 would require the most extensive review of the lake for such obstacles.

Fishing opportunities at Whiskeytown Lake may also be affected under Alternatives 1 and 2, particularly for the boat-based fishing. Shoreline fisherman would be afforded greater access to areas of the lake due to the exposed shoreline that are not available at 1210 ft msl. For impacts related to Kokanee salmon, see the Section 3.2 Aquatic Resources.

3.4 Cultural Resources

3.4.1 Affected Environment

The affected environment for this Environmental Assessment and the LTO EIS are the same; the LTO EIS has been incorporated by reference.

3.4.2 Environmental Consequences

The No Action Alternative and Alternatives 1, 3 and 4 are not expected to change the operations manual for any of Reclamation's reservoirs, and therefore these alternatives are not considered an undertaking under Section 106. None of these alternatives are expected to impact cultural resources.

Under Alternative 2, Whiskeytown Lake is drawn down to an elevation of 1192 msl, which is six feet below the normal wintertime drawdown elevation. Like the No Action Alternative and Alternatives 1, 3, and 4, no changes to the operations manual of Whiskeytown Lake are anticipated with this action, and therefore there is no Section 106 undertaking for the draw down. However, activities associated with relocating or providing access to the Oak Bottom boat ramp and the fueling stations are an undertaking under Section 106, and will require cultural resources survey and consultations with tribes and the State Historic Preservation Officer. If Alternative 2 is the selected alternative, potential impacts to historic properties will need to be analyzed prior to the FONSI being signed.

Section 4 Cumulative Effects

On July 16, 2020, CEQ published a final rule to update its regulations for Federal agencies to implement NEPA. The definition of effects or impacts was revised to mean "changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance from the proposed action or alternatives" (40 CFR § 1508.1(g)). Cumulative impact, defined in 40 CFR 1508.7 (1978), was repealed (40 CFR § 1508.1(g)(3)). On April 16, 2021, DOI released Secretarial Order (SO) 3399. SO 3399 directed departments to "not apply the 2020 Rule in a manner that would change the application or level of NEPA that would have been applied to a proposed action before the 2020 Rule went into effect on September 14, 2020."

In consideration of recent updates to federal regulations, orders, and guidance, cumulative effects of implementation of reasonably foreseeable projects are analyzed. Cumulative impacts have been defined by the Council on Environmental Quality (CEQ) regulations in 40 Code of Federal Regulations Section 1508.7 as *"the impact on the environment which results from the incremental impact of the [proposed] action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time."* Cumulative impacts include the direct and indirect impacts of a project together with the past, present, and reasonably foreseeable future actions of other projects. According to CEQ's cumulative impacts guidance, the cumulative impact analysis should be narrowed to focus on important issues at a national, regional, or local level. The analysis should look at other actions that have affected or could affect the same resources as the action alternatives. Actions considered in this cumulative analysis include the LTO ROD, the TUCP, Groundwater Actions to Offset Surface Water Diversions from the Sacramento River in Response to Drought in 2021, Emergency West False River Salinity Drought Barrier, and reasonably foreseeable Drought Contingency Plan Actions.

<u>Actions from the LTO ROD:</u>
Each of the following components of the LTO ROD may interplay with the action alternatives described in this EA by occurring within the timeframe of the study area:

- In the Upper Sacramento River: Shasta Cold Water Pool Management, Fall and Winter Refill and Redd Maintenance, Rice Decomposition Smoothing, Battle Creek Reintroduction Plan, Spawning and Rearing Habitat Restoration, Winter-Run Chinook Salmon Conservation Hatchery Production

- In the Trinity Division: Long-Term Plan to Protect Adult Salmon in Lower Klamath River, Clear Creek Minimum Flows, Clear Creek Spring Attraction Pulse Flows.

<u>Actions from the TUCP:</u>
On May 21, 2021 DWR and Reclamation submitted a TUCP to the Water Board. The Water Board provided conditional approval to the TUCP on June 1, 2021. The requested changes in operations described in the TUCP include:

- Reduction of outflow requirements (June 1 – June 30, 2021) - Beginning June 1, Reclamation and DWR request modification of D-1641 outflow. The requested changes would modify the minimum net delta outflow index (NDOI) described in Figure 3 of D-1641 during the month of June to no less than 3,000 cfs on a 14-day average, to allow for some storage conservation for fishery protection and improving carryover storage while meeting minimum CVP and SWP export levels.

- Reduction of outflow requirements (July 1 – July 31, 2021) - Beginning July 1, Reclamation and DWR request modification of D-1641 outflow. The requested changes would modify the minimum NDOI described in Figure 3 of D-1641 in July from a monthly average of 4,000 cfs to a monthly average of 3,000 cfs (Table 3, footnote 8 remains applicable) to allow for some storage conservation for fishery protection and improving carryover storage while meeting minimum CVP and SWP export levels.

- Exports (June 1 – July 31, 2021) - June 1 through July 31, the maximum combined SWP and CVP exports will be limited to 1,500 cfs when Delta outflow is less than 4,000 cfs. SWP and CVP exports may exceed 1,500 cfs when Delta outflow meets D-1641 or for moving transfer water (after July 1, 2021).

- Modification of the western Delta salinity compliance point (June 1 – August 15, 2021) - In a critical year, D-1641 requires the Agricultural Western Delta Salinity Standard at Emmaton have a 14-day running average of 2.78 millimhos per centimeter from April 1 to August 15. Reclamation and DWR petitioned the Water Board to modify this requirement by moving the compliance location from Emmaton to Threemile Slough on the Sacramento River from June 1 through August 15, 2021.

Groundwater Actions to Offset Surface Water Diversions from the Sacramento River in Response to Drought in 2021:
Reclamation is proposing to fund a pilot/demonstration project for use of existing groundwater wells during July through October 2021 to further offset surface water diversions from the Sacramento River in response to drought conditions, which is estimated to result in a reduction of up to approximately 60,000 acre-feet in surface water diversions by Sacramento River Settlement Contractors from the Sacramento River. This groundwater pumping in lieu of surface water diversions would only occur after the fulfillment of transfer commitments from those wells participating in the transfer programs to San Luis Delta Mendota Water Agency mand Tehama Colusa Canal Authority.

Emergency West False River Salinity Drought Barrier:
DWR installed the Emergency West False River Salinity Drought Barrier on West False River, approximately 0.4 mile upstream of the confluence with the San Joaquin River, to reduce the intrusion of high-salinity water into the central and south Delta to protect water supplies and beneficial uses of the Delta during the current drought. Installation of the temporary barrier is an effective tool in reducing the intrusion of salt water into the central and south Delta. Construction and placement of the temporary barrier across West False River commenced in June 2021. The barrier will be completely removed no later than November 30 and it is anticipated that removal will occur continuously for up to 60 days.

Actions from the Drought Contingency Plan:
In the Sacramento River watershed:

- Deploying a temperature curtain later in the summer to limit leakage of warmer water through the temperature control device and preserve the colder water for longer.
- Limited use of the higher-elevation river outlet/power bypass gates to release warmer water in the spring to conserve cooler water for releasing later in the year.
- Requesting that a portion of transfer water made available by the Sacramento River Settlement contractors be delivered in the fall months rather than the summer to maintain higher volumes of cold water through the summer months.

- Coordination on the timing of initial diversions to the Sacramento River Settlement Contractors to limit the impact on system performance and potentially reduce required spring releases.
- Continuation of the winter-run reintroduction program on Battle Creek
- Increased intake of winter-run at Livingston-Stone National Fish Hatchery with contingencies to maintain suitable hatchery water temperatures

In the Trinity River watershed:

- Spring flows on the Trinity River will be consistent with the annual allocation as prescribed by the Trinity River Main-stem Fishery Restoration Record of Decision.
- Consistent with fish health criteria, releases to augment flows in the Lower Klamath River will also be considered.

The No Action Alternative and action alternatives would have no effect to resources in **Table 1** and no cumulative effects to consider.

4.1 Surface Water Resources

The No Action Alternative would not generate changes to water operations or water availability compared to existing conditions. Alternatives 1, 2, and 4 would not change the releases from Keswick Dam, Whiskeytown Dam, or Lewiston Dam compared to the No Action Alternative; therefore, those alternatives would not contribute to a cumulative effect on water supply within the study area.

Alternative 3 would not change the releases from Whiskeytown Dam or Lewiston Dam. However, releases coming from Keswick Dam would be reduced in August and September 2021. The reduced flows would impact Reclamation's ability to meet Delta outflow and water quality objectives for fish and wildlife beneficial uses as well as for municipal and industrial (M&I) beneficial uses as specified in D-1641. Reduced flow would allow greater salinity intrusion into the central Delta which could have long term effects on M&I supplies. The Water Board has already approved a TUCP which relaxes D-1641 requirements. Under Alternative 3, the operational priority would be meeting the storage target which may further preclude or delay meeting downstream objectives. DWR has installed an emergency drought barrier in West False River to reduce salinity intrusion in the Delta associated with 2021 drought conditions. Also, the SRS Contractors are implementing voluntary groundwater pumping pilot project in 2021 to reduce surface water diversions in the Sacramento River, which may reduce pressure on water supply from the Sacramento River.

4.2 Aquatic Resources

Under the No Action Alternative and all action alternatives, increased hatchery production of ESA-listed species, including winter-run Chinook salmon, may help reduce the negative impacts of drought conditions in WY 2021.

Winter-run Chinook salmon, spring-run Chinook salmon, fall-run and late-fall run Chinook salmon, steelhead, Kokanee salmon, and Coho salmon in the Sacramento River, Clear Creek, and Trinity River are sensitive to flow and temperature changes during the late summer through early winter timeframe (**Table 5**). For Sacramento River winter-run Chinook salmon, the modeled temperature dependent mortality under the action alternatives is similar to that under the No Action Alternative. Spring-run Chinook salmon, steelhead, fall-run and late-fall-run Chinook salmon would be negatively impacted by warmer temperatures in the Sacramento River prior to mid-September associated with the action alternatives and would benefit

from colder temperatures in the river after mid-September under the action alternatives. Warmer temperatures in the Sacramento River prior to mid-September may affect Chinook salmon spawning, holding, and eggs, and may exacerbate already deleterious conditions associated with the 2021 drought.

Depleting the cold water pool in Whiskeytown Lake in September, as would likely occur under Alternatives 1 and 2, would likely increase the temperature dependent mortality for spring-run Chinook salmon spawning in Clear Creek. In WY 2021, pulse flows were utilized on Clear Creek in order to attract spring-run Chinook salmon adults upstream in Clear Creek. The pulse flow action successfully attracted fish upstream and a record number of spring-run Chinook salmon are currently in Clear Creek. The benefits realized from the pulse flow action may be reduced if river temperatures exceed 56 degrees F during the mid-September through end of October timeframe. Potential impacts to spring-run Chinook salmon eggs, juveniles, and adults in Clear Creek would be greater under Alternative 2 than Alternative 1.

Under Alternative 4, Coho salmon may be impacted from warmer temperatures on the Trinity River. Warmer river temperatures may also affect operation of important hatcheries that produce and maintain populations of ESA-listed species on the Sacramento River (Livingston Stone National Fish Hatchery) and on the Trinity River (Trinity River Hatchery).

4.3 Recreation

The implementation of Alternatives 1 and 2 would decrease recreational opportunities on Whiskeytown Lake. These recreational impacts would be short term, with lower than normal lake levels occurring only in September 2021. There would likely not be cumulative impacts since Whiskeytown Lake would follow the refill schedule identified in the LTO ROD. However, if dry conditions exist into WY 2022, refill may take longer and recreational impacts compounded with continued drought conditions.

4.3 Cultural Resources

Under the No Action Alternative, current cultural resource conditions would remain the same. Therefore, the No Action Alternative would not contribute to cumulative changes in cultural conditions. The No Action Alternative and Alternatives 1, 3 and 4, are not expected to change the operations manual for any of Reclamation's reservoirs, and therefore these alternatives are not considered an undertaking under Section 106. None of these alternatives are expected to contribute to cumulative changes in cultural resources.

Under Alternative 2, Whiskeytown Lake is drawn down to an elevation of 1192 msl, which is six feet below the normal wintertime drawdown elevation, and therefore activities associated with relocating or providing access to the Oak Bottom boat ramp and the fueling stations are an undertaking under Section 106 and will require cultural resources survey and consultations with tribes and the State Historic Preservation Officer. If Alternative 2 is the selected alternative, potential impacts to historic properties will need to be analyzed prior to the FONSI being signed. This analysis would determine if cumulative effects in cultural resources would occur.

Section 5 Consultation and Coordination

5.1 Public Review Period

This EA will be reviewed by the public from July 22, 2021 to July 29, 2021.

5.2 Agencies Consulted

Reclamation reviewed the proposed alternatives with the Sacramento River Temperature Task Group (SRTTG) on July 8, 2021. Reclamation received initial comments from members including NMFS, USFWS, CDFW, NPS, the Water Board, and representatives of the Yurok Tribe. Outside of SRTTG, Reclamation met with NPS staff to better understand the potential for Recreation and Cultural resource impacts associated with an early drawdown of Whiskeytown Lake.

Section 5 References

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