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# The Influence of Lewiston Dam Releases on Water Temperatures of the Trinity River and Lower Klamath River, CA. April to October, 2013

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Key words: Trinity River, Lewiston Dam, flow, water temperature

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# The Influence of Lewiston Dam Releases on Water Temperatures of the Trinity and Klamath Rivers, CA April to October 2013

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*Abstract* — Water temperatures were monitored at several locations along the Trinity and lower Klamath rivers from April to mid-October 2013 to evaluate the influence of Lewistown Dam releases on downstream water temperatures. We compared observed values to water temperature objectives specified in the Trinity River Record of Decision, including the spring-summer water temperature targets established for outmigrating salmonids and the objectives for the 64-kilometer reach located downstream of Lewiston Dam to protect holding and spawning adult salmonids. Additionally, we document the influence of Lewiston Dam releases on water temperatures in the lower Klamath River downstream of the confluence of the Trinity River. This document is the twelfth consecutive annual water temperature report generated for the Trinity River Restoration Program.

## Introduction

Water temperature is one of the most important environmental variables affecting salmonid biology (Carter 2005). Water temperature influences feeding rates and growth (Hicks 1999; USEPA 2003), metabolism (Fry 1971; Beitinger and Fitzpatrick 1979), development (ODEQ 1995), timing of migration (Hicks 1999; USEPA 1999; Beeman et al. 2012), spawning and freshwater rearing (USEPA 2001a, 2003), and the availability of food (Ligon et al.1999). Changes in temperature can also cause stress and lethality (Elliot 1981; Li et al. 1994; USEPA 1999; Myrick and Cech 2001; USEPA 2001b). Water temperatures in the lower Klamath River have been found to block migration (CDFG 2004), stress fish (Barthalow 2005), and create disease problems in juvenile (True et al. 2010) and adult salmonids ( Guillen 2003; Lynch and Risley 2003; CDFG 2004). Discharge from Lewiston Dam can play an important role in regulating water temperatures downstream in the mainstem Trinity River. Problems associated with decreased flows on the Trinity River after Trinity and Lewiston Dam construction and other anthropogenic activities, led to restoration efforts by the Trinity River Restoration Program (TRRP; USDOI 2000).

The TRRP was authorized with the signing of the Record of Decision (ROD) of the Final Trinity River Mainstem Fishery Restoration Environmental Impact Statement in December of 2000 (USDOI 2000). Since the signing of the ROD, the TRRP has worked aggressively to achieve its over-arching goal of restoring natural production of salmon and steelhead below Lewiston Dam. As part of the TRRP's Adaptive Environmental Assessment and Management (AEAM) process, monitoring is conducted to evaluate progress towards achieving restoration objectives and to improve our understanding of the river's response to

differing management actions (e.g. dam releases or gravel augmentation). A major objective of the TRRP's flow management is to improve thermal regimes for all life stages of anadromous salmonids that use the mainstem Trinity River. Specific temperature targets have been developed for holding and spawning adult salmonids and for outmigrating juvenile salmonids (USFWS and HVT 1999). Additionally, supplemental flows were released in August and September 2013 to improve conditions in the lower Klamath River to decrease the potential for an adult fish kill (TRRP - Fall Flow Subgroup 2013). This report supports the AEAM process in that it briefly describes the influence that Lewiston Dam releases had on the downstream thermal environment during the spring, summer, and fall of 2013 and whether or not the water temperature objectives identified in the ROD were achieved (Table 1).

This report presents the temperature monitoring data collected for April to October during water year (WY) 2013, and beginning of WY 2014, and is the twelfth consecutive year a report of this type has been written for the TRRP. Reports describing the thermal regimes for the years 2002 to 2012 (Zedonis 2003, 2004, and 2005; Zedonis and Turner 2006, 2007, and 2008; Zedonis 2009; Scheiff and Zedonis 2010, 2011, and 2012; Magneson 2013) are available in electronic format from the TRRP or the Arcata Fish and Wildlife Office (AFWO) of the U.S. Fish and Wildlife Service (USFWS) (http://www.fws.gov/arcata/fisheries).

## Study Area

The Trinity River is located in northwestern California and is the largest tributary to the Klamath River (Figure 1). Trinity and Lewiston dams were constructed in the early 1960s (USFWS and HVT 1999). Trinity Dam creates Trinity Reservoir that can store up to 2.45 million acre-feet of water. Lewiston Reservoir is located immediately downstream of Trinity Dam, and is formed by Lewiston Dam, which serves as a re-regulating reservoir for flow to the Trinity River and diversion to the Sacramento River Basin. From Lewiston Dam, the Trinity River flows for approximately 180 river kilometers (rkm) before joining the Klamath River at Weitchpec, CA. From Weitchpec, the Klamath River flows for 70 rkm before entering the Pacific Ocean.

## Methods

The influence of Lewiston Dam releases on downstream water temperature was assessed using water temperature data collected by telemetered gauging stations operated by the U.S. Geological Survey (USGS), the California Department of Water Resources (DWR), and from probes deployed by the AFWO, U.S. Bureau of Reclamation (USBR), and the Yurok Tribe's Environmental Program (YTEP; Table 2). Data from telemetered gauging stations were downloaded from the California Data Exchange Center (CDEC) website available at http://cdec.water.ca.gov.

Data obtained from CDEC sites are labeled "preliminary and subject to revision", meaning the accuracy of the data has not been verified by USGS. To correct for possible errors, we

Table 1. Water temperature objectives for the Trinity River, California.

| Water year type | Target area | Rkm | Dates | Temperature objective[1] (°C) |
|---|---|---|---|---|
| Adult Salmonid Holding and Spawning Temperature Criteria[2] | | | | |
| All types | Lewiston to Douglas City | 178.2-148.5 | Jul 01 - Sep 14 | ≤ 15.6 |
| | | | Sep 15 - Sep 30 | ≤ 13.3 |
| | Lewiston to confluence North Fork Trinity River | 178.2-118.0 | Oct 01 - Dec 31 | ≤ 13.3 |
| Outmigrant Salmonid Temperature Criteria [3] | | | | |
| Normal and wetter | Lewiston to Weitchpec | 178.2- 0.1 | Apr 22 - May 22 | ≤ 13.0 |
| | | | May 23 - Jun 04 | ≤ 15.0 |
| | | | Jun 05 - Jul 09 | ≤ 17.0 |
| Dry and critically dry | Lewiston to Weitchpec | 178.2- 0.1 | Apr 22 - May 22 | ≤ 15.0 |
| | | | May 23 - Jun 04 | ≤ 17.0 |
| | | | Jun 05 – July 9 | ≤ 20.0 |

[1] = Average daily water temperature in degrees Centigrade
[2] = Basin Plan for the North Coast Region (NCRWQCB 1994; USFWS and HVT 1999)
[3] = Spring-time objectives of the Record of Decision for the Trinity River EIS (USDOI 2000; USFWS and HVT 1999).

conducted graphic evaluations to identify potential erroneous data points that were subsequently deleted. These "preliminary" labeled data have been used in prior years (2004 thru 2011) as they have generally been shown to be accurate when compared to independent certified thermistors (Zedonis 2003).

AFWO used temperature probes manufactured by Onset Computer Corporation® to collect water temperature data every 30 min from April to October. Prior to and after deployment, each probe was subjected to a performance test to verify it was recording within the manufacturer's accuracy specification of ± 0.2 degrees Celsius (˚C). The instruments proved accurate and reliable for all tests conducted in 2013, and no adjustments to temperature data were necessary due to "probe drift" based on graphical evaluations. A copy of the AFWO quality assurance protocol is available upon request.

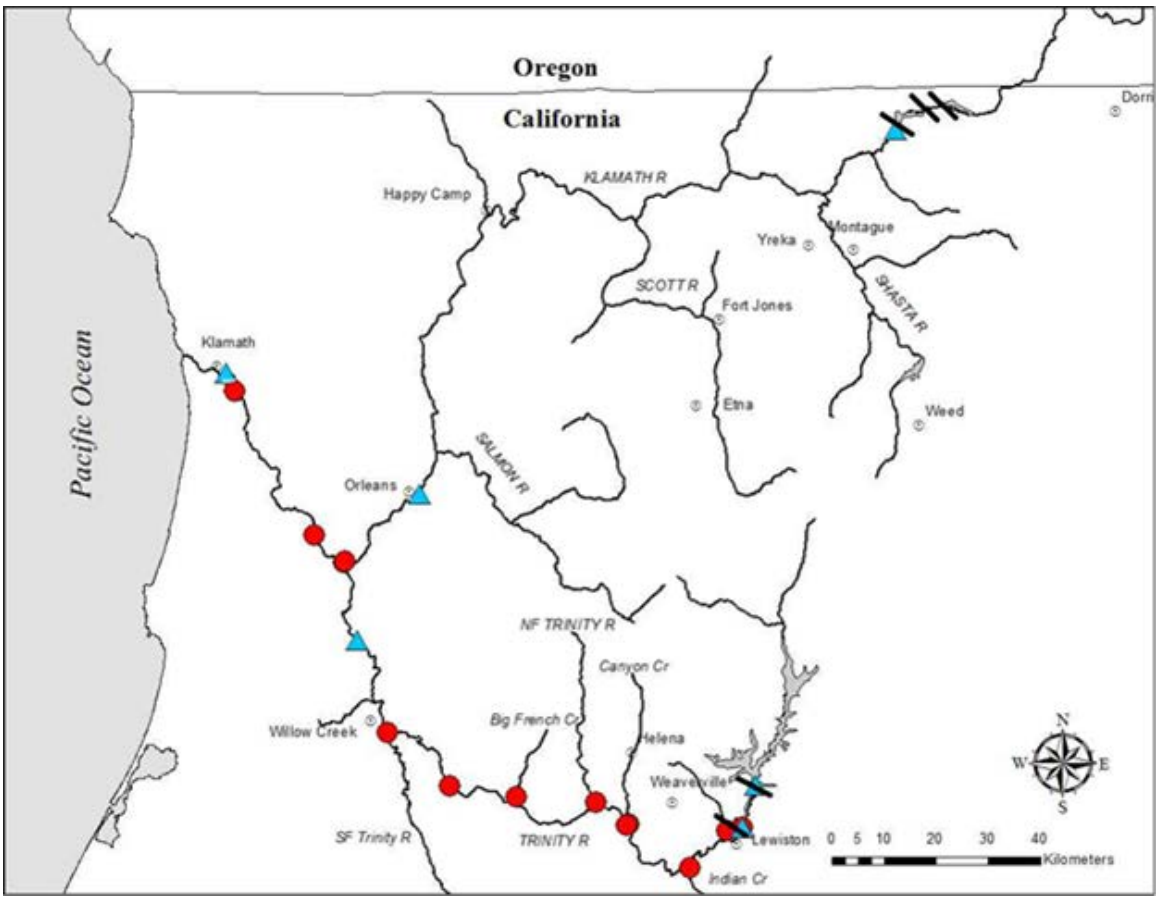


Figure 1. Location of water temperature monitoring sites of the Trinity River and lower Klamath River in 2013. Circles = water temperature sites, Triangles = discharge gauging sites, Bars = dams. Specific site information is presented in Table 2.

Air temperature data were also obtained from the CDEC. These data were also labeled "preliminary and subject to revision" and were reviewed and corrected using the same standards established for downloaded water temperature data. Estimates of river flow at several sites on the Trinity River at Lewiston (rkm 178.2), Hoopa (rkm 20.0) and on the Klamath River at Iron Gate Dam (rkm 305.5), Orleans (rkm 95.1) and in the lower river near Klamath (rkm 13.0), were obtained from the USGS website (http://water.usgs.gov). Efforts were made to use "final" flow data from USGS, which was dependent on the timing of its release and the timing of completion of this report. Although water temperature data were collected from more locations than are presented, only key sampling locations will be discussed in this report.

Table 2. Water temperature monitoring sites of the Trinity River (TR) and the Klamath River (KR) below Weitchpec, 2013. Note: Not all data identified in this table are presented in the report but are available upon request.

| **Mainstem Trinity River Water Temperature Monitoring Sites** | | | |
|---|---|---|---|
| **Site name (abbreviation)** | **Location (rkm)** | **Data source** | **Operator** |
| TR @ Lewiston Gauge (LWS) | 178.2 | CDEC | USGS and USBR |
| TR above Rush Ck (TRRC1) | 173.0 | USFWS | USFWS |
| TR@ Limekiln Gulch Gauge (TLK) | 158.7 | CDEC | USGS |
| TR @ Douglas City Gauge (TRDC2) | 148.5 | CDEC | USGS |
| TR above Canyon Ck (TRCN1) | 127.4 | USFWS | USFWS |
| TR above N.F. Trinity R. (NFH) | 118.0 | CDEC | USGS |
| TR above Big French Creek (TRBF1) | 94.2 | USFWS | USFWS |
| TR @ Burnt Ran. Trans Sta (TRBR1) | 76.4 | USFWS | USFWS |
| TR above S. Fork Trinity R. (TRSF1) | 50.6 | USFWS | USFWS |
| TR @ Willow Creek Trap (TRWC1) | 34.1 | USFWS | USFWS |
| TR @ Hoopa Gauge (HPA) | 20.0 | CDEC | USGS/DWR |
| TR @ Weitchpec (TRWE1) | 0.1 | USFWS/YTEP/USBR | USFWS/YTEP/USBR |
| **Mainstem Klamath River Water Temperature Monitoring Sites** | | | |
| KR at Weitchpec (KRWE1) [a] | 70.2 | YTEP/USFWS | USFWS/YTEP |
| KR below Weitchpec (KBW3) | 68.7 | YTEP/USFWS | USFWS/YTEP |
| KR near Klamath (KRTG2) [b] | 13.0 | YTEP/USFWS | USFWS/YTEP |
| **Trinity River Tributary Water Temperature Monitoring Sites** | | | |
| Canyon Ck (CNTR1) | 127.3 + 0.1 | USFWS | USFWS |
| N. F. Trinity R (NFTR1) | 116.7 + 0.1 | USFWS | USFWS |
| Big French Ck (BFTR1) | 94.1 + 0.1 | USFWS | USFWS |
| S. F. Trinity R (SFTR1) | 50.5 + 0.1 | USFWS | USFWS |

a = This site is located immediately above the confluence of the Trinity River and refers to the distance from the Klamath River mouth.
b = Data are available from multiple sources

## Results and Discussion

### Hydrology

Water year 2013 was designated as a Dry WY in the Trinity Basin. A total of 479,975 acre-feet (AF) of water was released from Lewiston Dam to the Trinity River in WY 2013. This total exceeded the prescribed flow of 452,600 AF for a Dry water year under the ROD (DOI 2000) due to the increased releases in the fall to prevent a fish kill (TRRP - Fall Flow Subgroup 2013). Notable differences from a standard ROD normal hydrograph included: (1) an earlier increase to a flow bench, (2) an increase to a shortened peak flow, (3) three habitat monitoring benches during the descending limb, and (4) the augmented flow from late August to mid-September (Figure 2). Detailed description of the decisions used to establish the flow pattern during the spring and summer period are provided in a Technical Brief titled *Development of the Trinity River Restoration Flow Release Schedule for Water Year 2013* released by the TRRP (2013).

Contributions of flow from Lewiston Dam to the lower Trinity River and Klamath River varied throughout WY 2013 (Figure 3; Appendix A). During early April, the contributions of flow from Lewiston Dam to the total discharge measured at the Klamath gauge were small (e.g. 2 %) due to low base flows (e.g. 300 cfs) from Lewiston and the comparatively high tributary accretions between these gauges. By early May, peak spring flow releases from Lewiston Dam resulted in a greater contribution of flow to the lower Trinity River and lower Klamath River as compared to values for early April. The greatest contributions occurred in May and again in late-August to mid-September when Lewiston Dam releases comprised a very large proportion of the total discharge measured at the Klamath gauge (Appendix A). The large contribution during late-August to mid-September was due to the augmented fall flows described above. The 104% on August 26 is due to the dramatic increase in flows from Lewiston Dam, the approximately two day travel time for these increased flows to reach the lower Klamath River, and peak flow attenuation.

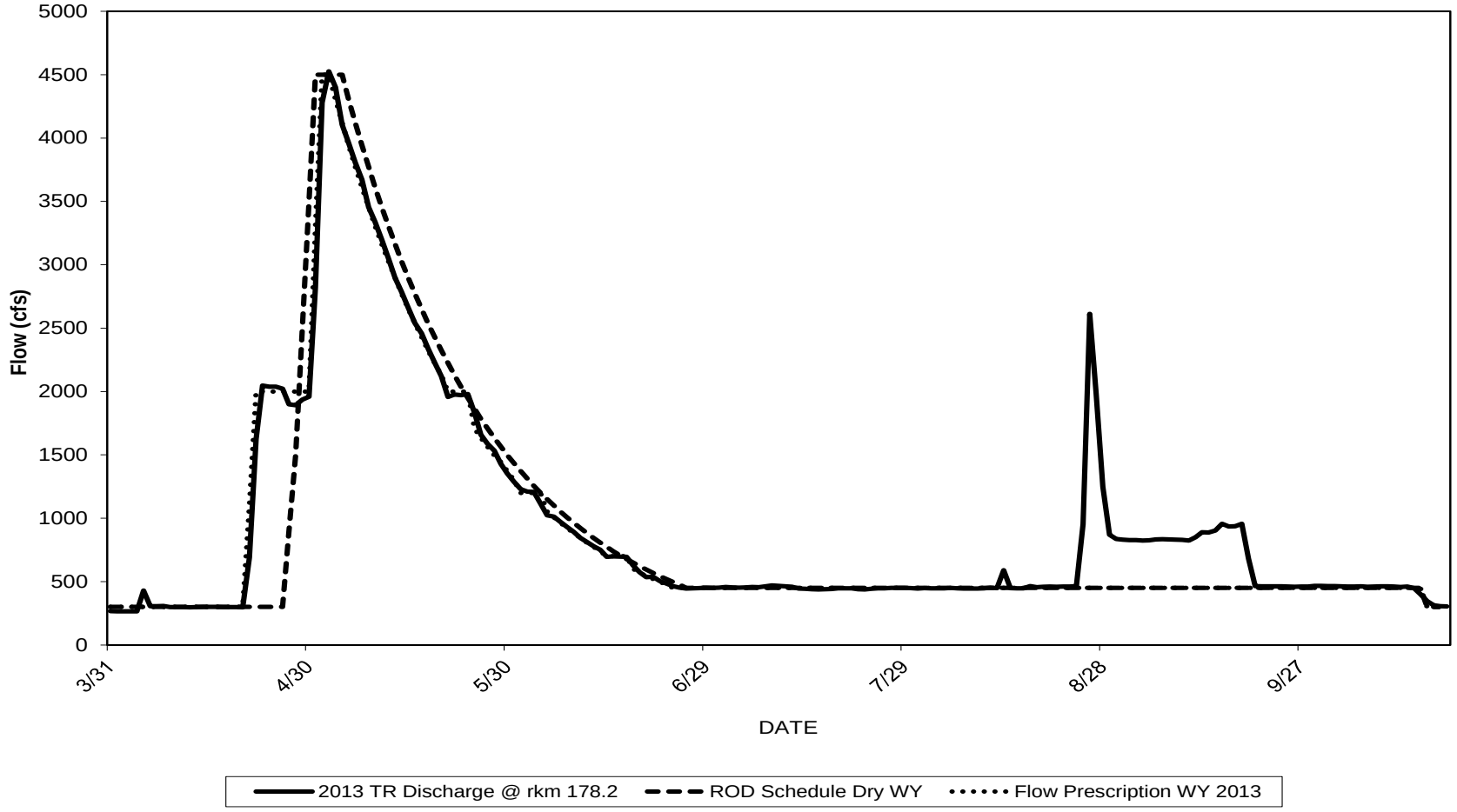


Figure 2. Spring and summer flow releases from Lewiston Dam (rkm 178.2) to the Trinity River (TR) in 2013 compared to the flow schedule for a dry hydrologic water year identified in the Record of Decision (USDOI 2000).

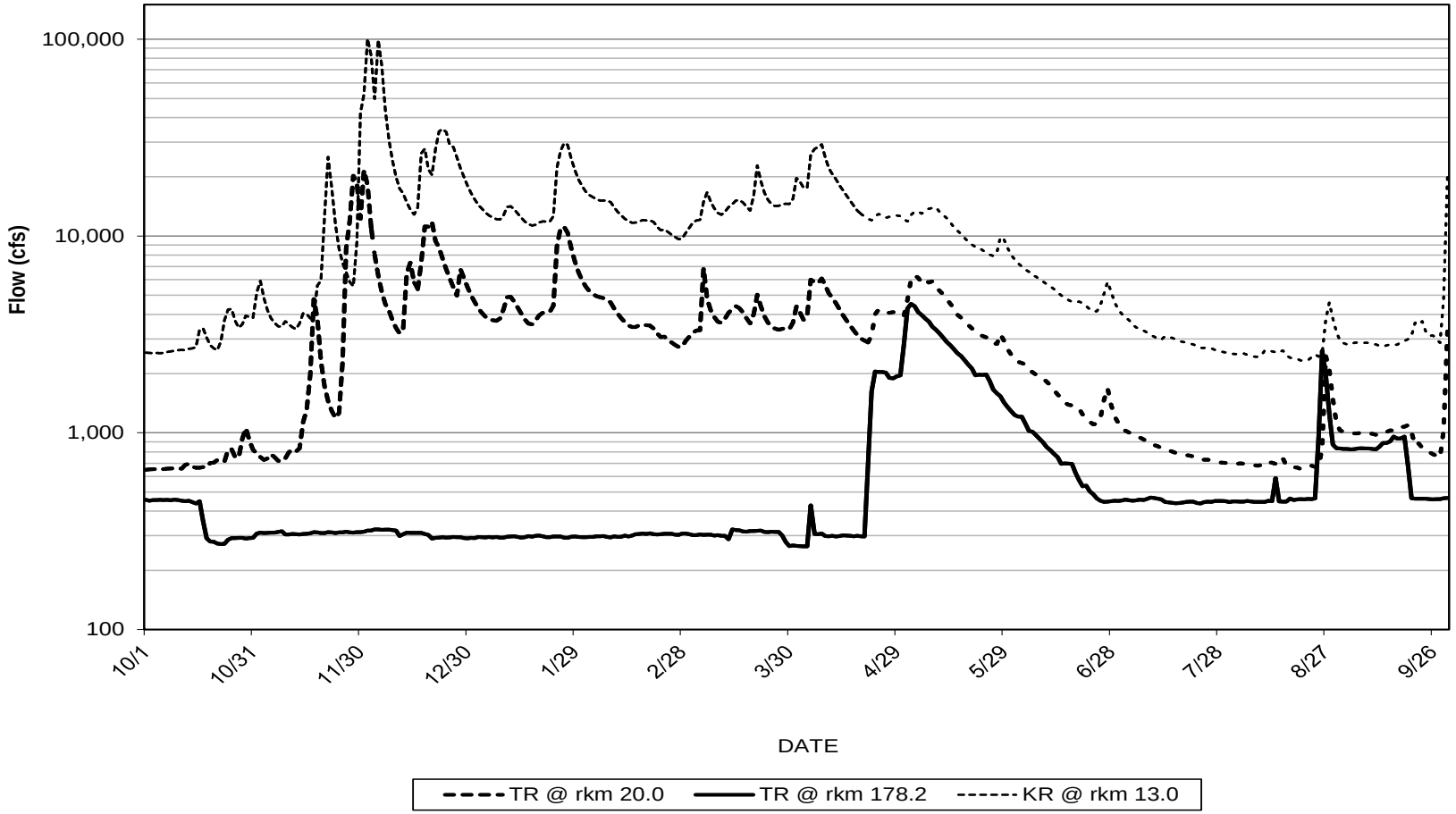


Figure 3. Average daily flow of the Trinity River (TR) at Lewiston gauge (rkm 178.2), the Hoopa gauge (rkm 20.0), and the Klamath River (KR) near Klamath gauge (rkm 13.0), WY 2013.

## Water Temperatures of the Trinity River

*Lewiston Gauge (rkm 178.2)*

Average daily water temperatures of Lewiston Dam releases ranged between 8.3 ˚C and 11.1 ˚C between mid-April and mid-October (Figure 4). The warmest release temperatures occurred in late June to late July, mid-August and mid- to late September. The late June to late July warming trend coincided with typical warming trends. The mid-August and mid- to late September warming trends coincided with a decrease in releases from Trinity Reservoir which increases the residence time, and subsequent heating in Lewiston Reservoir prior to release into the Trinity River. In contrast, some of the coldest release temperatures occurred during times of high flow releases due to short hydraulic residence times in Lewiston Reservoir, most notably from early to late May (Figure 4).

*Douglas City Gauge (rkm148.5)*

Water temperatures at Douglas City ranged between 8.8 ˚C and 15.2 ˚C from mid-April to mid-October (Figure 5). Water temperature remained below the water temperature objective ($\leq$15.6 °C and $\leq$13.3 °C) for the period when Douglas City is the compliance point for the summer/fall water temperature objectives (Table 1). Water temperatures at this site also exhibited an inverse relationship with discharge from Lewiston Dam, most notably during high flow periods from late April to late May and in late August. Water temperature was also influenced by air temperature, especially at lower flows.

*Trinity above the North Fork Trinity (rkm 118)*

Average daily water temperatures of the Trinity River above the North Fork Trinity were warmer in comparison to the upstream Douglas City site, but followed a similar trend (Figure 6). Similar to the Douglas City site, water temperatures above the North Fork Trinity River confluence exhibited an inverse relationship with flow and were also influenced by air temperature. Average daily temperatures at this site ranged from 9.6 to 19.0 ˚C and peaked on July 26. Temperatures remained below the temperature objective of $\leq$13.3 °C (Table 1) for this compliance point which extends from October 1 through December 31.

*Above Big French Creek to Weitchpec (rkm 94.2 to 0.1)*

The peak daily average temperature was 22.0 ˚C measured just upstream of Big French Creek at rkm 94.2 and 25.5 ˚C at Weitchpec, rkm 0.1 (Figure 7). By late August water temperature at Weitchpec was as much as 7.2 °C warmer than water temperature above Big French Creek, largely due to thermal heating along the mainstem as well as warm water accretion from the South Fork Trinity River. Review of average daily water temperatures from previous years suggest that water temperatures typically peak between 24 ˚C and 25˚C within this reach (Zedonis 2003, 2004, and 2005).

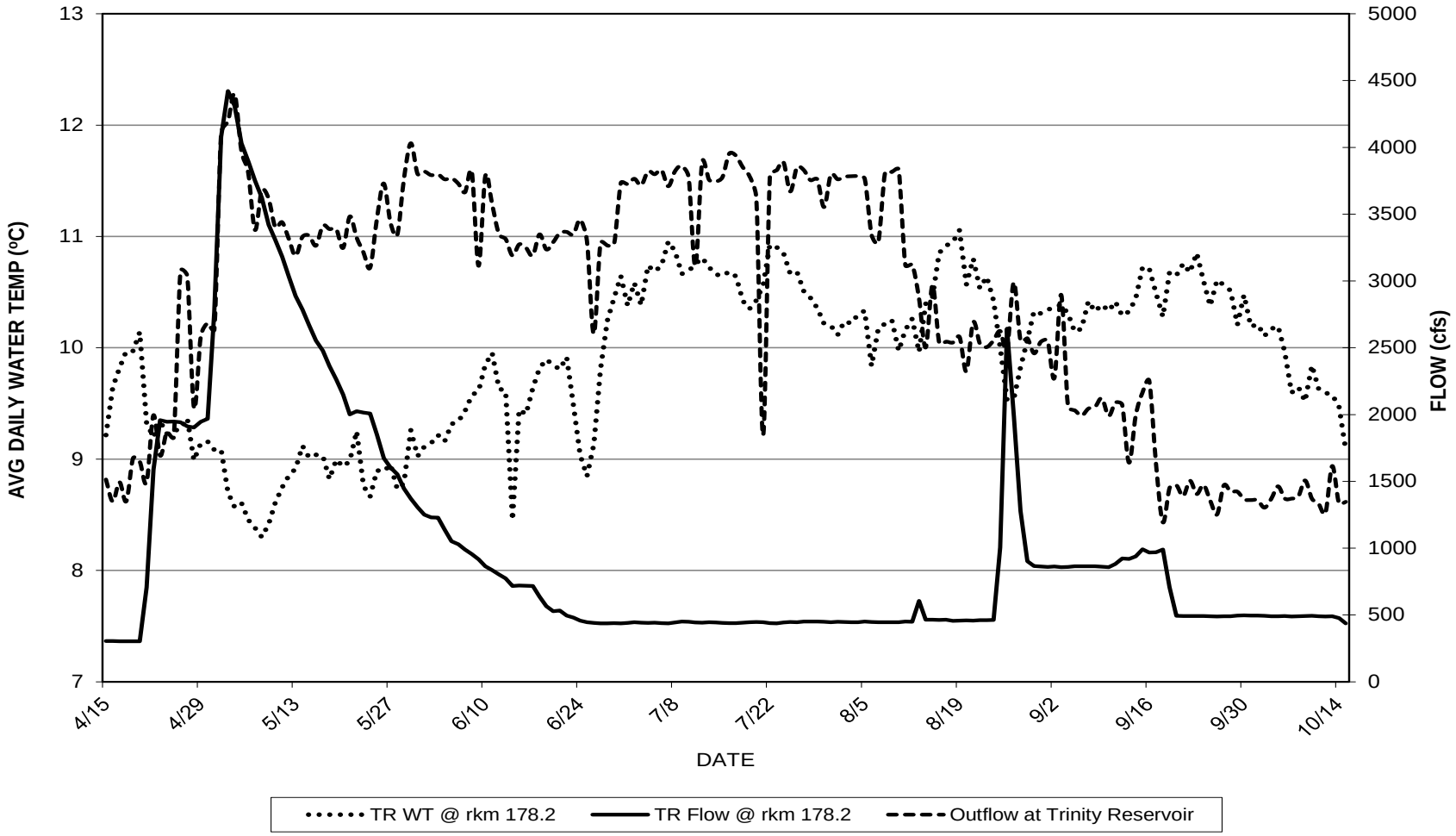


Figure 4. Water temperature (WT) and flow of the Trinity River (TR) at Lewiston (rkm 178.2) and Trinity Reservoir outflow in 2013. Trinity Reservoir outflow supplies water to the Trinity River and diversions to the Sacramento River Basin.

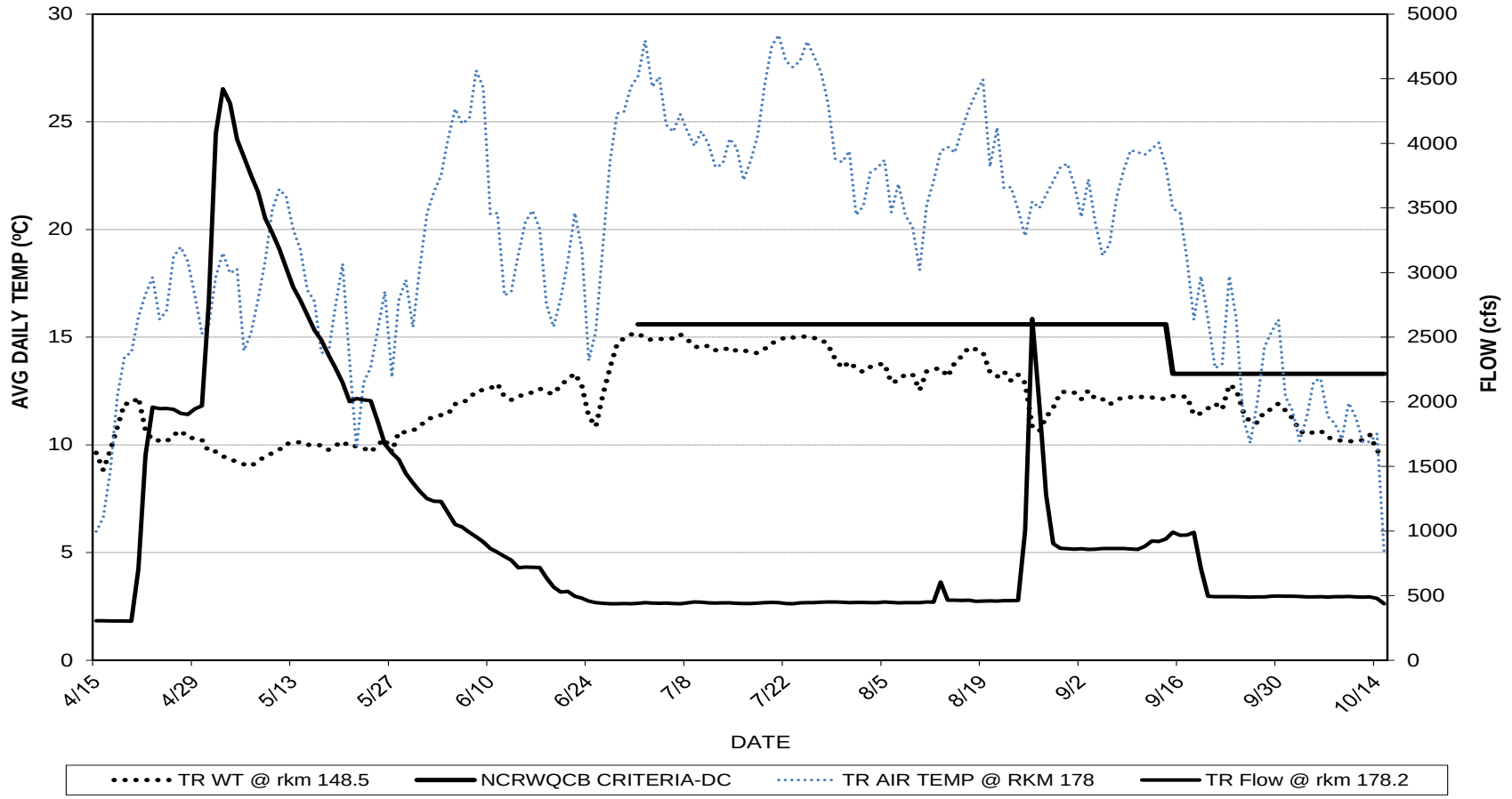


Figure 5. Comparison of average daily water temperatures (WT) of the Trinity River (TR) at the Douglas City gauge (rkm 148.5) in 2013 and the water temperature objectives of the North Coast Regional Water Quality Control Board (NCRWQCB Criteria-DC). Air temperature (AT) data are from the Lewiston Fish Hatchery (rkm 178).

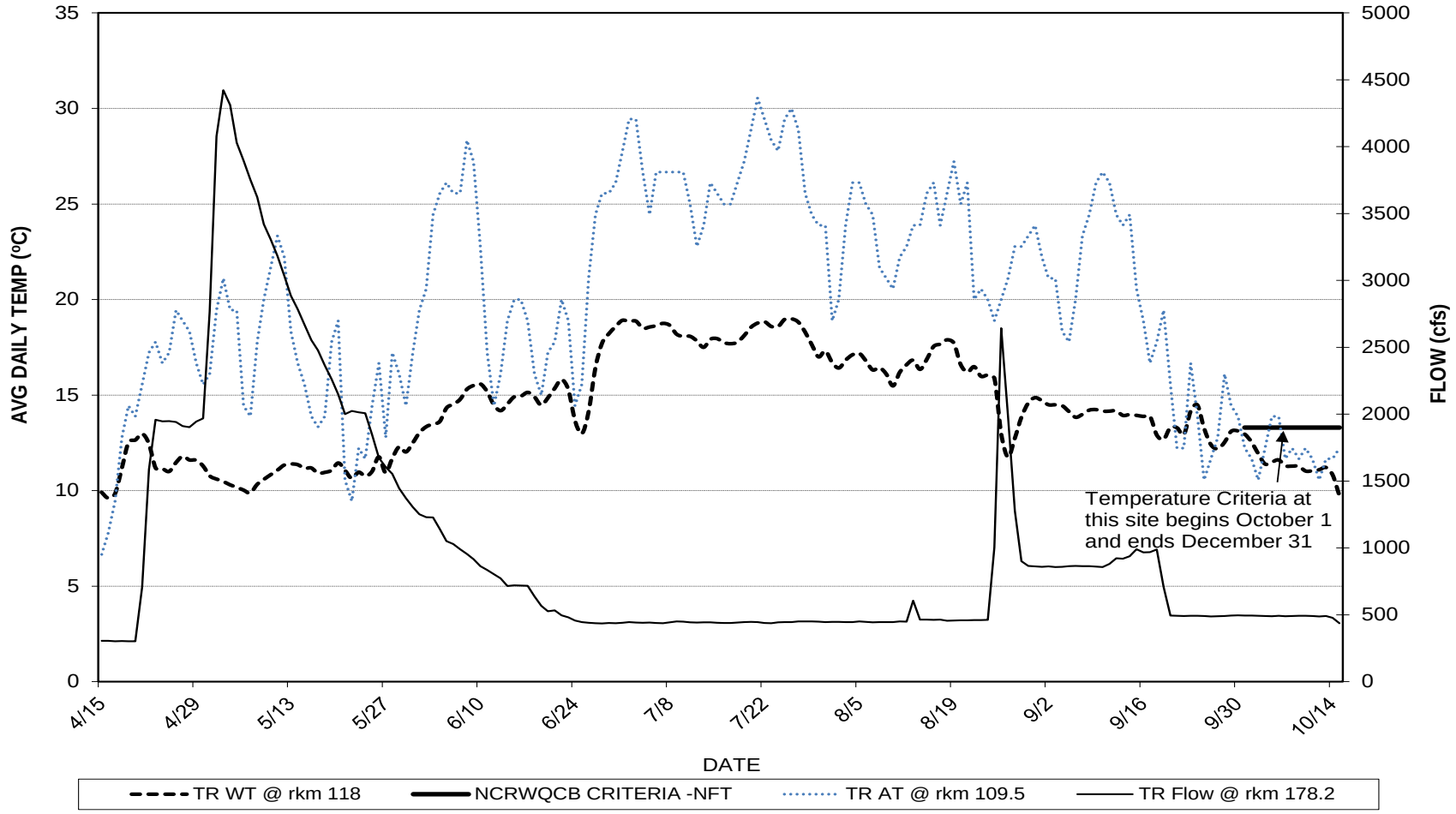


Figure 6. Comparisons of average daily water temperatures (WT) of the Trinity River (TR) above the confluence of the North Fork Trinity River (rkm 118.0) in 2013 and the water temperature objective of the North Coast Regional Water Quality Control Board (NCRWQCB-NFT). Air temperature (AT) data are from the Trinity River at Big Bar (rkm 109.5).

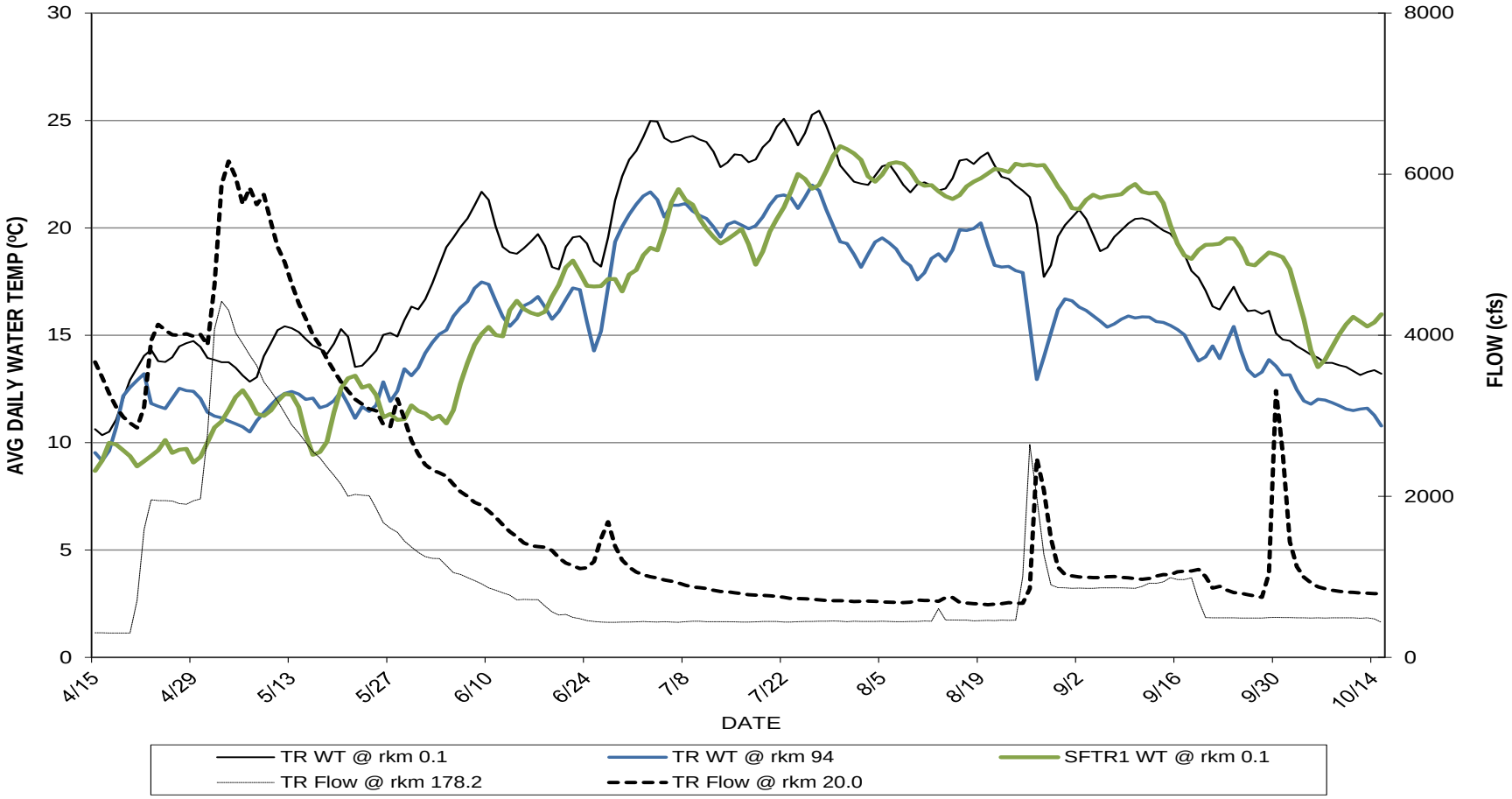


Figure 7. Comparisons of average daily water temperatures of the Trinity River (TR) above Big French Creek (rkm 94.0), and at Weitchpec (rkm 0.1), in the lower South Fork Trinity River (SFTR; rkm 0.1) and flow at Lewiston (rkm 178.2) and Hoopa Gage (rkm 20.0) in 2013.

## Weitchpec- Outmigrant Temperature Objectives

"Marginal smolt temperatures" (MST) are the temperature objective for Weitchpec during Dry and Critically Dry Water Years (USFWS and Hoopa Valley Tribe 1999, USDOI 2000). Between mid-April and May 22, 2013, daily average water temperatures recorded in the Trinity River at Weitchpec were generally within the MST range for steelhead (Figure 8). MST during the coho salmon criteria were met except for the end of this period; while MST for Chinook salmon was met in the middle of the criteria period but water temperatures reached the "unsuitable smolt temperature" (UST) range at the beginning (early June) and the end of this period (late June). Unlike previous years, water temperature in the lower Trinity River reached the UST range five times between May 11 and July 9. Periods where the UST threshold was exceeded can be, at least in part, attributed to warming air temperatures coupled with decreasing flow from Lewiston Reservoir (Figure 9) and decreasing tributary accretion.

## Water Temperatures of the Klamath River above and below the Trinity River Confluence

Average daily water temperatures of the Trinity River at Weitchpec were generally cooler than the Klamath River at Weitchpec (130 of 183 days), except for nine time periods (Figure 10). From the end of May through the end of August, water temperatures at these two sites were very similar. From April 15 to May 2 the Trinity was warmer than the Klamath by as much as 1.5 °C. After August 25, the Trinity River was up to 4.3 °C cooler than the Klamath River. This cooling trend was related to the increase in flow from Lewiston Dam from August 25 to September 19, which was intended to reduce the possibility of a fish kill. This temperature reduction was similar to that observed in 2009 and 2011 when peak flow releases from Lewiston Dam occurred for the biennial Hoopa Valley Tribal Boat Dance ceremony (Scheiff and Zedonis 2010 and 2012) and in 2012 when augmented flows were made to reduce the possibility of a fish kill in the lower Klamath River (Magneson 2013).

The difference between water temperatures and the magnitude of flows of the Trinity and Klamath rivers during the augmented flow had a noticeable influence on the thermal regime of the Klamath River below the confluence (Figure 10). The thermal dilution from cooler Trinity River resulted in average water temperature reductions of about 2.3 °C just below Weitchpec (rkm 62.0) and 1.9 °C near Klamath, CA (rkm 13.0, Figure 10). Following the augmented flow, water temperature differences between the Trinity River at Weitchpec (rkm 0.1) and the Klamath River above Weitchpec (rkm 70.2) decreased back to less than 1.0 °C until mid-October.

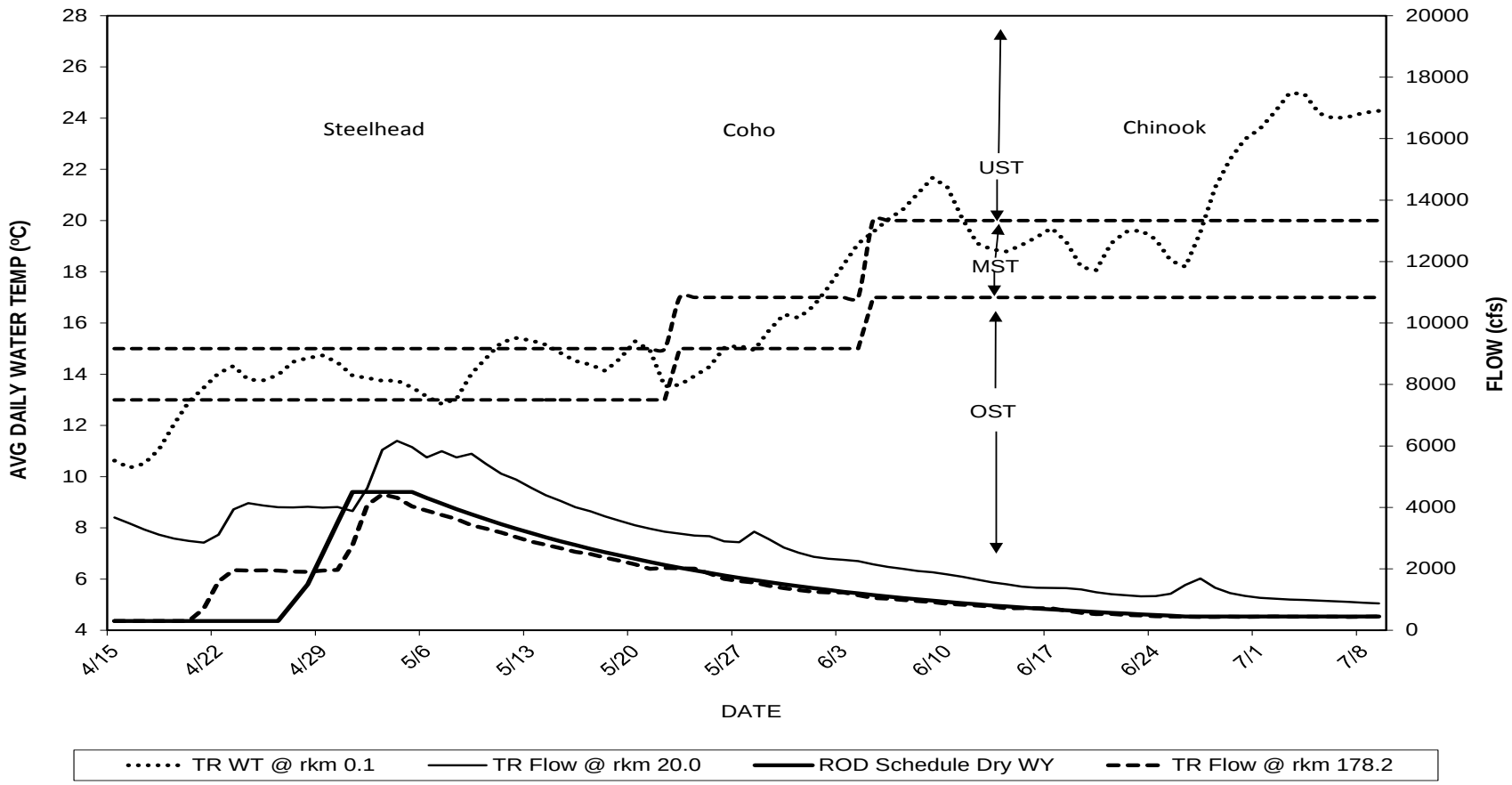


Figure 8. Average daily water temperatures (WT) of the Trinity River (TR) recorded at Weitchpec in 2013, with spring-time temperature objectives established by the Record of Decision (USDOI 2000) for steelhead, coho salmon, and Chinook salmon smolts. Smolt objectives: UST = unsuitable smolt temperatures; MST = marginal smolt temperatures, OST = optimal smolt temperatures. Marginal smolt temperatures were sought from April 22 to July 9 in 2013 due to the Dry Water Year classification.

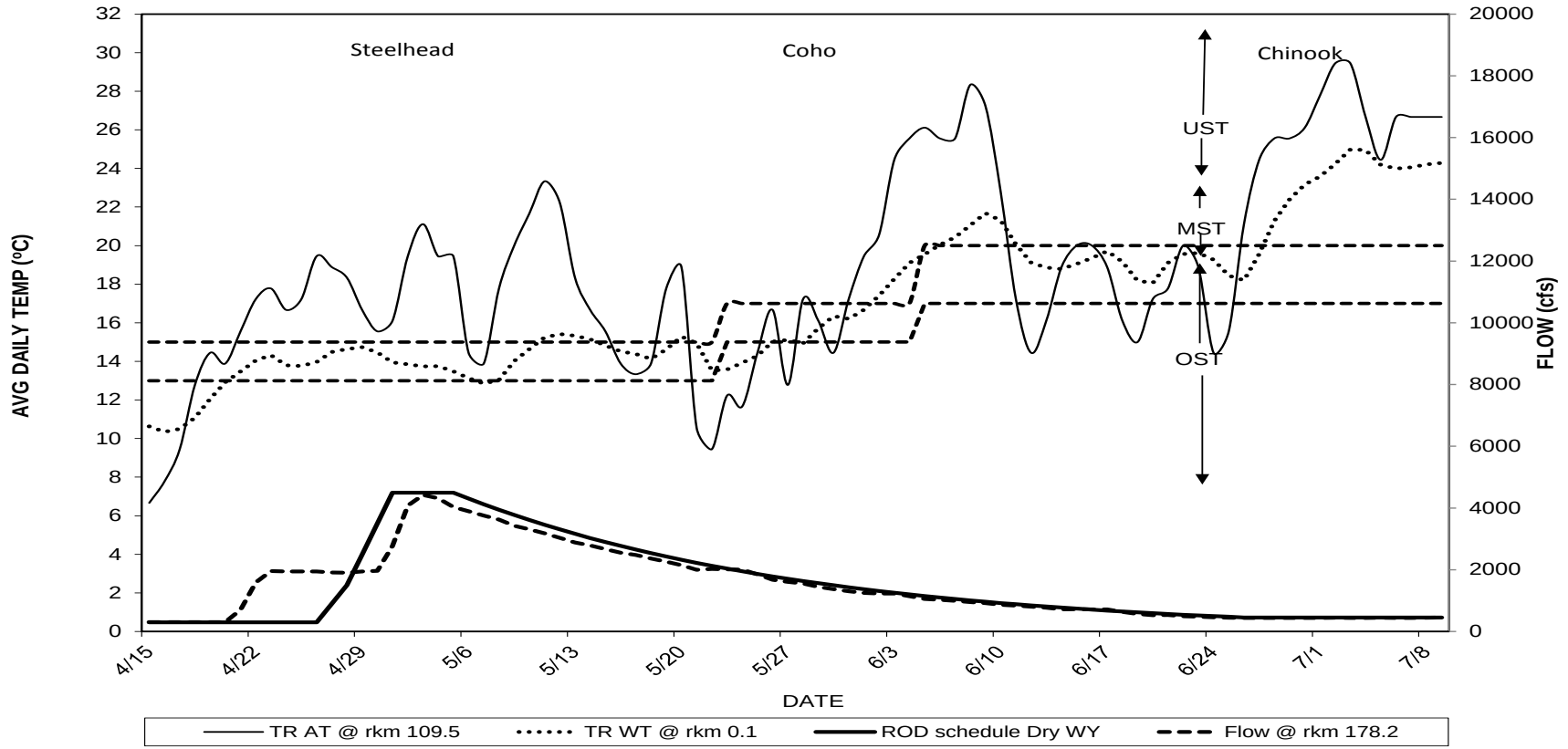


Figure 9. Air temperature (AT) and its influence on water temperature (WT) of the Trinity River (TR) at Weitchpec from April 15 to July 9, 2013, with spring-time water temperature objectives established by the Record of Decision (USDOI 2000) for steelhead, coho salmon, and Chinook salmon smolts. Smolt criteria: UST = Unsuitable temperatures; MST = Marginally suitable temperatures; OST = Optimally suitable temperatures. Marginal smolt temperatures were sought from April 22 to July 9 in 2013 due to the Dry Water Year classification. Air temperature (AT) data are from the Trinity River at Big Bar (rkm 109.5).

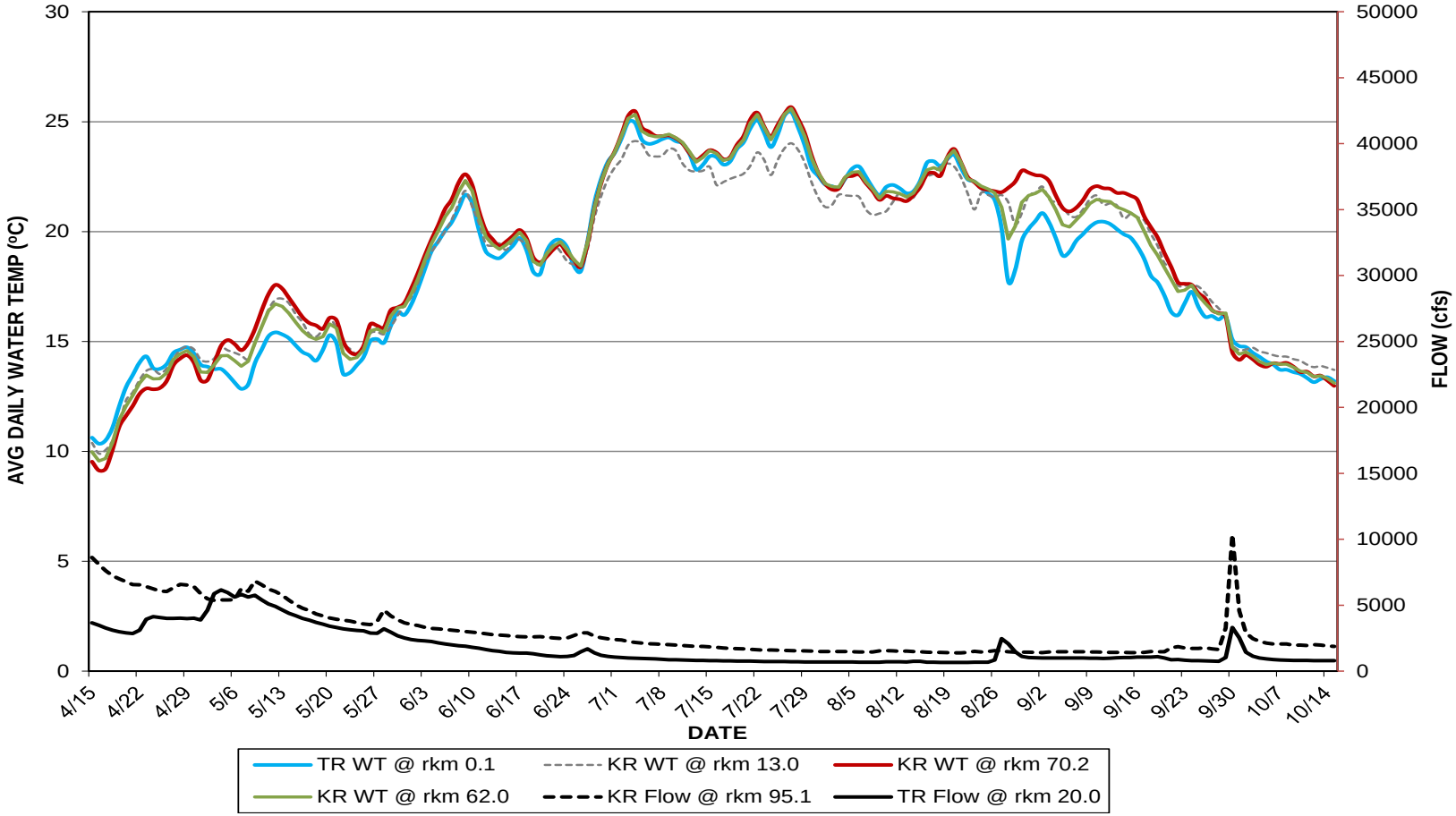


Figure 10. Comparison of water temperatures (WT) of the Trinity River (TR) at Weitchpec (rkm 0.1) and the Klamath River (KR) above (rkm 70.2) and below (rkm 62.0 and rkm 13.0) the confluence of the Trinity River relative to stream flow in 2013. See Appendix A in this report for daily information.

## Summary

Water year 2013 was designated as a Dry WY with a total of 479,975 acre-feet of water released from Lewiston Dam to the Trinity River. This total exceeded the prescribed flow of 452,600 AF for a Dry WY due to the additional releases in the fall to reduce the possibility of a fish kill in the lower Klamath River.

Basin Plan water temperature objectives for adult salmon set by the NCRWQCB (1994) were met for the reach from Lewiston to Douglas City for July 1 to September 30 and for the reach from Lewiston to the North Fork Trinity River confluence from October 1 through October 14. Generally, spring time objectives established by the ROD for juvenile outmigrant salmonids fell into the marginal temperature range which is the range sought during a Dry WY. Water temperature at Weitchpec fell into the unsuitable range for steelhead smolts for two periods, coho salmon smolts for one period, and Chinook salmon smolts for two periods between April 15 and July 9.

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## References

Bartholow, J.M. 2005. Recent Water Temperature Trends in the Lower Klamath River, California. North American Journal of Fisheries Management. 25:152-162.

Beeman, J., S. Juhnke, , G. Stutzer, and K. Wright. 2012, Effects of Iron Gate Dam discharge and other factors on the survival and migration of juvenile coho salmon in the lower Klamath River, northern California, 2006–09: U.S. Geological Survey Open-File Report 2012-1067, 96 p.

Beitinger T.L., and L.C. Fitzpatrick. 1979. Physiological and ecological correlates of preferred temperature in fish. American Zool. 19:319-329.

Carter, K. 2005. The effects of temperature on steelhead trout, coho salmon, and Chinook salmon biology and function by life stage: implications for Klamath basin TMDLs:NCRWQCB, August, 2005.

California Department of Fish and Game (CDFG). 2004. September 2002 Klamath River fish-kill: final analysis of contributing factors and impacts. Northern California-North Coast Region. Redding, California.

Elliot, J. 1981. Some aspects of thermal stress on freshwater teleosts. In Pickering, A.D. ed., Stress and Fish: Academic Press, London, p. 209-245.

Fry, F.E.J. 1971. The effect of environmental factors on the physiology of fish. W.S. Hoar and D.J. Randall, editors. Fish physiology. Volume 6. Academic Press, New York.

Guillen, G. 2003. Klamath River Fish Die-off September 2002. Causative Factors of Mortality. Report Number AFWO-F-02-03. 115pp.

Hicks, M. 1999. Evaluating Standards for Protecting Aquatic Life in Washington's Surface Water Quality Standards: Temperature Criteria. Preliminary Review Draft Discussion Paper, Washington State Department of Ecology, Olympia, WA, 95 pp.

Li, H.W., G.A. Lamberti, T.N. Pearsons, C.K. Tait, J.L. Li, and J.C. Buckhouse. 1994. Cumulative effects of riparian disturbances along high desert trout streams of the John Day Basin, Oregon. Transactions of the American Fisheries Society. 123:627-640.

Ligon, F.A., A. Rich, G. Rynearson, D. Thornburg, and W. Trush. 1999. Report of the Scientific Review Panel on California Forest Practice Rules and Salmonid Habitat: Prepared for the Resource Agency of California and the National Marine Fisheries Service, Sacramento, California 22 p.+ appendices.

Lynch, D.D., and J.C. Risley. 2003. Klamath River basin hydrologic conditions prior to the September 2002 die-off of salmon and steelhead. U.S. Geological Survey, Water-Resources Investigations Report 03-4099, Portland, Oregon.

Magneson, M.D. 2013. The Influence of Lewiston Dam Releases on Water Temperatures of the Trinity River and Lower Klamath River, CA, April to October 2012. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Data Series Report Number DS 2013-30, Arcata, California.

Myrick C.A., and J.J. Cech. 2001. Temperature Effects on Chinook Salmon and Steelhead: a Review Focusin on California's Central Valley Populations. Bay-Delta Modeling Forum. Technical Publication 01-1. 57 pp.

North Coast Regional Water Quality Control Board (NCRWQCB). 1994. Basin Plan for the North Coast Region, Santa Rosa, CA.

Oregon Department of Environmental Quality (ODEQ). 1995. Temperature: 1992-1994 Water quality standards review. Final Issue Paper. 122pp.

Scheiff, T., and P. Zedonis. 2010. The Influence of Lewiston Dam Releases on Water Temperatures of the Trinity and Klamath Rivers, CA. April to October, 2009. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Data Series Report Number DS 2010-17, Arcata, California.

Scheiff, T., and P. Zedonis. 2011. The Influence of Lewiston Dam Releases on Water Temperatures of the Trinity and Klamath Rivers, CA. April to October, 2010. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Data Series Report Number DS 2011-22, Arcata, California

Scheiff, T., and P. Zedonis. 2012. The Influence of Lewiston Dam Releases on Water Temperatures of the Trinity and Klamath Rivers, CA. April to October, 2011. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Data Series Report Number DS 2012-24, Arcata, California.

Trinity River Restoration Program (TRRP). 2013. Development of the Trinity River Restoration Flow Release Schedule for Water Year 20132. Technical Report TR-TRRP-2012-3. Trinity River Restoration Program. Weaverville, California.

Trinity River Restoration Program (TRRP) - Fall Flow Subgroup. 2013. Memorandum to Brian Person, Reclamation Northern California Area Manager. 2013 fall flow release recommendation. Available from the Trinity River Restoration Program: www.trrp.net

True, K., J.S. Foott, A. Bolick, S. Benson and R. Fogerty. 2010. FY 2009 Investigational Report: Myxosporean Parasite (Ceratomyxa Shasta and Parvicapsula minibicornis) Incidence and Severity in Klmaath River Basin Juvenile Chinook Salmon, April-August 2009. U.S. Fish and Wildlife Service California-Nevada Fish Health Center, Anderson, CA. http://www.fws.gov/canvfhc/reports.asp.

U.S. Department of the Interior (USDOI). 2000. Record of Decision Trinity River Mainstem Fishery Restoration Final Environmental Impact Statement/Environmental Impact Report, December 2000. 43 pp.

U.S. Environmental Protection Agency (USEPA). 1999. National recommended water quality criteria, correction. EPA 822-Z-99-001. U.S. Environmental Protection Agency, Washington DC.

U.S. Environmental Protection Agency (USEPA). 2001a. Salmonid Behavior and Water Temperature. Issue Paper 1, Prepared as part of EPA Region 10 Temperature water quality criteria guidance development project EPA-910-D-01-001, Environmental Protection Agency Region 10.

U.S. Environmental Protection Agency (USEPA). 2001b. Temperature Interaction. Issue Paper 4, Temperature Water Quality Criteria Guidance Development Project EPA-910-D-01-004, Environmental Protection Agency Region 10.

U.S. Environmental Protection Agency (USEPA). 2003. EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards. EPA 910-B-03-002. Region 10 Office of Water, Seattle, WA.

U.S. Fish and Wildlife Service (USFWS) and Hoopa Valley Tribe (HVT). 1999. Trinity River Flow Evaluation Final Report. June 1999. 513 pp.

Zedonis, P. 2003. Lewiston Dam releases and their influence on water temperatures of the Trinity River, CA, WY 2002. Report AFWO-F-04-03. U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata, CA 95521. 16 pp.

Zedonis, P. 2004. Lewiston Dam releases and their influence on water temperatures of the Trinity and Klamath Rivers, CA, April to October, 2003. Report AFWO-F01-04. U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata, CA 95521. 34 pp.

Zedonis, P. 2005. The influence of Lewiston Dam releases on water temperatures of the Trinity and Klamath Rivers, CA, April to October, 2004. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Technical Report Number TR2005-03, Arcata, California. 31 pp.

Zedonis, P. 2009. The Influence of Lewiston Dam Releases on Water Temperatures of the Trinity and Klamath Rivers, CA, April to October, 2008. U. S. Fish and Wildlife

Service, Arcata Fish and Wildlife Office, Arcata Fisheries Data Series Report Number DS 2009-15, Arcata, California. 24 pp.

Zedonis, P., and R. Turner. 2006. The influence of Lewiston Dam releases on water temperatures of the Trinity and Klamath Rivers, CA, April to October, 2005. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Data Series Report Number DS2006-08, Arcata, California. 29 pp.

Zedonis, P., and R. Turner. 2007. The Influence of Lewiston Dam Releases on Water Temperatures of the Trinity and Klamath Rivers, CA, April to October, 2006. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Data Series Report Number DS 2007-01, Arcata, California.

Zedonis, P., and R. Turner. 2008. The Influence of Lewiston Dam Releases on Water Temperatures of the Trinity and Klamath Rivers, CA, April to October, 2007. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Data Series Report Number DS 2008-01, Arcata, California.

Appendix A. Water temperature and flow comparisons of the Trinity and Klamath rivers, April 15 to October 15, 2013.Station locations: TR = Trinity River, WE = Klamath River at Weitchpec, KBW = Klamath Below Weitchpec, and KNK = Klamath near Klamath (A = approved data for publication; P = provisional data subject to change).

| Date | Flow (CFS) | | | | | | | | | Average Daily Water Temperatures (°C) | | | | Differences in Water Temps (°C) of the Klamath R. at RKm 70.2 and: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trinity R. | | Klamath R. | | | Contributions of Flow to the Klamath Gage (%)[a] | | | Trinity R. | Klamath R. | | | Trinity R. | Klamath R. | |
| | Lewiston (rkm 178.6) | Hoopa (rkm 20.0) | Iron Gate (rkm 305.5) | Orleans (rkm 95.1) | Klamath (rkm 13.0) | Lewiston Dam (rkm 178.2) | Hoopa (rkm 20.0) | Iron Gate Dam (rkm 305.5) | TR (rkm 0.1) | WE (rkm 70.2) | KBW (rkm 68.7) | KNK (rkm 13.0) | TR (rkm 0.1) | KBW (rkm 62.0) | KNK (rkm 13.0) |
| 04/15/13 | 306 A | 3667 A | 1627 A | 8625 A | 16008 A | 2 | 23 | 10 | 10.6 | 9.5 | 10.0 | 10.4 | -1.1 | -0.4 | -0.9 |
| 04/16/13 | 305 A | 3481 A | 1675 A | 8108 A | 15123 A | 2 | 23 | 11 | 10.4 | 9.1 | 9.6 | 9.9 | -1.2 | -0.4 | -0.8 |
| 04/17/13 | 303 A | 3278 A | 1621 A | 7627 A | 14227 A | 2 | 23 | 11 | 10.5 | 9.2 | 9.7 | 10.1 | -1.3 | -0.5 | -0.9 |
| 04/18/13 | 304 A | 3108 A | 1543 A | 7232 A | 13479 A | 2 | 23 | 11 | 11.1 | 10.1 | 10.4 | 10.5 | -1.0 | -0.3 | -0.4 |
| 04/19/13 | 303 A | 2987 A | 1427 A | 7004 A | 12953 A | 2 | 23 | 11 | 12.1 | 11.1 | 11.4 | 11.2 | -0.9 | -0.3 | -0.1 |
| 04/20/13 | 303 A | 2911 A | 1317 A | 6784 A | 12579 A | 2 | 23 | 10 | 12.9 | 11.6 | 12.1 | 12.3 | -1.3 | -0.4 | -0.7 |
| 04/21/13 | 707 A | 2850 A | 1234 A | 6569 A | 12220 A | 6 | 23 | 10 | 13.5 | 12.1 | 12.5 | 12.7 | -1.4 | -0.5 | -0.6 |
| 04/22/13 | 1588 A | 3109 A | 1200 A | 6547 A | 12029 A | 13 | 26 | 10 | 14.0 | 12.6 | 13.1 | 13.2 | -1.4 | -0.5 | -0.6 |
| 04/23/13 | 1959 A | 3934 A | 1170 A | 6421 A | 12652 A | 15 | 31 | 9 | 14.3 | 12.9 | 13.5 | 13.7 | -1.5 | -0.6 | -0.8 |
| 04/24/13 | 1946 A | 4136 A | 1149 A | 6240 A | 12947 A | 15 | 32 | 9 | 13.8 | 12.8 | 13.3 | 13.7 | -1.0 | -0.5 | -0.9 |
| 04/25/13 | 1948 A | 4065 A | 1150 A | 6076 A | 12663 A | 15 | 32 | 9 | 13.8 | 12.9 | 13.3 | 13.5 | -0.9 | -0.4 | -0.6 |
| 04/26/13 | 1942 A | 4006 A | 1150 A | 6039 A | 12405 A | 16 | 32 | 9 | 14.0 | 13.2 | 13.6 | 13.8 | -0.8 | -0.4 | -0.6 |
| 04/27/13 | 1911 A | 3999 A | 1152 A | 6336 A | 12502 A | 15 | 32 | 9 | 14.5 | 13.9 | 14.2 | 14.2 | -0.6 | -0.3 | -0.3 |
| 04/28/13 | 1902 A | 4018 A | 1154 A | 6589 A | 12748 A | 15 | 32 | 9 | 14.6 | 14.2 | 14.4 | 14.6 | -0.4 | -0.2 | -0.4 |
| 04/29/13 | 1946 A | 3988 A | 1155 A | 6533 A | 12739 A | 15 | 31 | 9 | 14.7 | 14.4 | 14.6 | 14.8 | -0.4 | -0.2 | -0.4 |
| 04/30/13 | 1968 A | 4011 A | 1154 A | 6419 A | 12632 A | 16 | 32 | 9 | 14.5 | 14.0 | 14.3 | 14.6 | -0.4 | -0.3 | -0.6 |
| 05/01/13 | 2767 A | 3877 A | 1150 A | 5891 A | 12160 A | 23 | 32 | 9 | 13.9 | 13.2 | 13.6 | 14.2 | -0.7 | -0.4 | -0.9 |
| 05/02/13 | 4078 A | 4628 A | 1151 A | 5492 A | 11891 A | 34 | 39 | 10 | 13.9 | 13.2 | 13.6 | 14.1 | -0.6 | -0.3 | -0.8 |
| 05/03/13 | 4422 A | 5869 A | 1150 A | 5367 A | 12805 A | 35 | 46 | 9 | 13.7 | 14.0 | 13.9 | 14.2 | 0.3 | 0.1 | -0.2 |
| 05/04/13 | 4311 A | 6161 A | 1153 A | 5397 A | 13313 A | 32 | 46 | 9 | 13.8 | 14.8 | 14.4 | 14.7 | 1.0 | 0.4 | 0.1 |
| 05/05/13 | 4030 A | 5963 A | 1170 A | 5396 A | 13317 A | 30 | 45 | 9 | 13.5 | 15.1 | 14.4 | 14.6 | 1.6 | 0.7 | 0.5 |
| 05/06/13 | 3895 A | 5627 A | 1156 A | 5426 A | 12984 A | 30 | 43 | 9 | 13.1 | 14.9 | 14.1 | 14.5 | 1.8 | 0.8 | 0.4 |
| 05/07/13 | 3753 A | 5829 A | 1132 A | 6260 A | 13488 A | 28 | 43 | 8 | 12.8 | 14.6 | 13.9 | 14.4 | 1.8 | 0.7 | 0.2 |
| 05/08/13 | 3624 A | 5623 A | 1171 A | 6061 A | 13680 A | 26 | 41 | 9 | 13.0 | 14.9 | 14.1 | 14.2 | 1.9 | 0.8 | 0.7 |
| 05/09/13 | 3420 A | 5748 A | 1169 A | 6829 A | 13847 A | 25 | 42 | 8 | 14.0 | 15.6 | 14.9 | 14.9 | 1.5 | 0.6 | 0.7 |
| 05/10/13 | 3308 A | 5408 A | 1145 A | 6545 A | 13917 A | 24 | 39 | 8 | 14.6 | 16.4 | 15.7 | 15.7 | 1.8 | 0.7 | 0.8 |
| 05/11/13 | 3183 A | 5097 A | 1176 A | 6234 A | 13160 A | 24 | 39 | 9 | 15.2 | 17.2 | 16.4 | 16.5 | 1.9 | 0.8 | 0.7 |
| 05/12/13 | 3035 A | 4909 A | 1167 A | 6036 A | 12722 A | 24 | 39 | 9 | 15.4 | 17.6 | 16.7 | 16.9 | 2.2 | 0.9 | 0.7 |
| 05/13/13 | 2886 A | 4641 A | 1140 A | 5764 A | 12249 A | 24 | 38 | 9 | 15.3 | 17.4 | 16.6 | 16.9 | 2.1 | 0.8 | 0.5 |
| 05/14/13 | 2785 A | 4395 A | 1165 A | 5377 A | 11672 A | 24 | 38 | 10 | 15.1 | 17.0 | 16.3 | 16.7 | 1.8 | 0.7 | 0.2 |
| 05/15/13 | 2669 A | 4205 A | 1140 A | 5026 A | 11004 A | 24 | 38 | 10 | 14.8 | 16.5 | 15.9 | 16.2 | 1.7 | 0.7 | 0.3 |

Appendix A (Continued). Water temperature and flow comparisons of the Trinity and Klamath rivers, April 15 to October 15, 2013.Station locations: TR = Trinity River, WE = Klamath River at Weitchpec, KBW = Klamath Below Weitchpec, and KNK = Klamath near Klamath (A = approved data for publication; P = provisional data subject to change).

| Date | Flow (CFS) | | | | | | | | | Average Daily Water Temperatures (°C) | | | | Differences in Water Temps (°C) of the Klamath R. at RKm 70.2 and: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trinity R. | | Klamath R. | | | Contributions of Flow to the Klamath Gage (%)[a] | | | Trinity R. | Klamath R. | | | Trinity R. | Klamath R. | |
| | Lewiston (rkm 178.6) | Hoopa (rkm 20.0) | Iron Gate (rkm 305.5) | Orleans (rkm 95.1) | Klamath (rkm 13.0) | Lewiston Dam (rkm 178.2) | Hoopa (rkm 20.0) | Iron Gate Dam (rkm 305.5) | TR (rkm 0.1) | WE (rkm 70.2) | KBW (rkm 68.7) | KNK (rkm 13.0) | TR (rkm 0.1) | KBW (rkm 62.0) | KNK (rkm 13.0) |
| 05/16/13 | 2554 A | 4005 A | 1162 A | 4775 A | 10568 A | 24 | 38 | 11 | 14.5 | 16.1 | 15.5 | 15.9 | 1.6 | 0.6 | 0.2 |
| 05/17/13 | 2479 A | 3875 A | 1137 A | 4595 A | 10164 A | 24 | 38 | 11 | 14.4 | 15.8 | 15.2 | 15.3 | 1.5 | 0.6 | 0.5 |
| 05/18/13 | 2364 A | 3705 A | 1164 A | 4348 A | 9708 A | 24 | 38 | 12 | 14.1 | 15.7 | 15.1 | 15.2 | 1.6 | 0.6 | 0.5 |
| 05/19/13 | 2262 A | 3558 A | 1163 A | 4183 A | 9307 A | 24 | 38 | 12 | 14.6 | 15.6 | 15.2 | 15.5 | 1.0 | 0.4 | 0.0 |
| 05/20/13 | 2149 A | 3420 A | 1176 A | 4034 A | 8974 A | 24 | 38 | 13 | 15.3 | 16.1 | 15.8 | 16.1 | 0.8 | 0.3 | 0.0 |
| 05/21/13 | 2001 A | 3307 A | 1149 A | 3935 A | 8722 A | 23 | 38 | 13 | 14.9 | 16.0 | 15.6 | 15.6 | 1.0 | 0.4 | 0.4 |
| 05/22/13 | 2024 A | 3207 A | 1147 A | 3868 A | 8668 A | 23 | 37 | 13 | 13.5 | 15.0 | 14.5 | 14.9 | 1.5 | 0.5 | 0.1 |
| 05/23/13 | 2014 A | 3144 A | 1152 A | 3801 A | 8390 A | 24 | 37 | 14 | 13.6 | 14.5 | 14.2 | 14.7 | 0.9 | 0.3 | -0.1 |
| 05/24/13 | 2008 A | 3086 A | 1152 A | 3676 A | 8170 A | 25 | 38 | 14 | 13.9 | 14.4 | 14.3 | 14.4 | 0.5 | 0.2 | 0.0 |
| 05/25/13 | 1848 A | 3063 A | 1150 A | 3579 A | 8011 A | 23 | 38 | 14 | 14.3 | 14.8 | 14.6 | 14.8 | 0.5 | 0.2 | 0.0 |
| 05/26/13 | 1673 A | 2894 A | 1149 A | 3531 A | 7894 A | 21 | 37 | 15 | 15.0 | 15.8 | 15.5 | 15.4 | 0.8 | 0.3 | 0.4 |
| 05/27/13 | 1605 A | 2866 A | 1149 A | 3775 A | 8190 A | 20 | 35 | 14 | 15.1 | 15.7 | 15.6 | 15.4 | 0.6 | 0.1 | 0.3 |
| 05/28/13 | 1554 A | 3212 A | 1150 A | 4628 A | 9855 A | 16 | 33 | 12 | 14.9 | 15.6 | 15.4 | 15.3 | 0.7 | 0.2 | 0.3 |
| 05/29/13 | 1446 A | 2961 A | 1147 A | 4183 A | 9525 A | 15 | 31 | 12 | 15.7 | 16.4 | 16.2 | 15.7 | 0.7 | 0.3 | 0.8 |
| 05/30/13 | 1372 A | 2694 A | 1142 A | 3905 A | 8653 A | 16 | 31 | 13 | 16.3 | 16.5 | 16.5 | 16.2 | 0.2 | 0.0 | 0.4 |
| 05/31/13 | 1305 A | 2526 A | 1150 A | 3671 A | 7986 A | 16 | 32 | 14 | 16.2 | 16.8 | 16.6 | 16.6 | 0.5 | 0.2 | 0.1 |
| 06/01/13 | 1251 A | 2394 A | 1074 A | 3548 A | 7589 A | 16 | 32 | 14 | 16.7 | 17.4 | 17.1 | 17.0 | 0.7 | 0.3 | 0.4 |
| 06/02/13 | 1230 A | 2326 A | 1028 A | 3461 A | 7276 A | 17 | 32 | 14 | 17.4 | 18.1 | 17.9 | 17.6 | 0.7 | 0.3 | 0.5 |
| 06/03/13 | 1229 A | 2293 A | 1029 A | 3321 A | 7034 A | 17 | 33 | 15 | 18.3 | 18.9 | 18.7 | 18.5 | 0.6 | 0.2 | 0.4 |
| 06/04/13 | 1140 A | 2249 A | 1026 A | 3243 A | 6801 A | 17 | 33 | 15 | 19.1 | 19.6 | 19.5 | 19.1 | 0.5 | 0.2 | 0.6 |
| 06/05/13 | 1051 A | 2149 A | 1027 A | 3202 A | 6633 A | 16 | 32 | 15 | 19.6 | 20.3 | 20.0 | 19.5 | 0.7 | 0.3 | 0.8 |
| 06/06/13 | 1030 A | 2060 A | 1028 A | 3163 A | 6394 A | 16 | 32 | 16 | 20.0 | 21.0 | 20.7 | 20.0 | 1.0 | 0.3 | 1.0 |
| 06/07/13 | 990 A | 2000 A | 1028 A | 3107 A | 6287 A | 16 | 32 | 16 | 20.4 | 21.5 | 21.1 | 20.5 | 1.0 | 0.4 | 0.9 |
| 06/08/13 | 955 A | 1927 A | 1030 A | 3058 A | 6102 A | 16 | 32 | 17 | 21.0 | 22.2 | 21.8 | 21.3 | 1.2 | 0.4 | 1.0 |
| 06/09/13 | 915 A | 1890 A | 1030 A | 3008 A | 5961 A | 15 | 32 | 17 | 21.7 | 22.6 | 22.3 | 21.9 | 0.9 | 0.3 | 0.8 |
| 06/10/13 | 864 A | 1818 A | 1029 A | 2956 A | 5811 A | 15 | 31 | 18 | 21.3 | 22.1 | 21.8 | 21.1 | 0.8 | 0.3 | 1.0 |
| 06/11/13 | 836 A | 1740 A | 1027 A | 2899 A | 5663 A | 15 | 31 | 18 | 20.1 | 20.9 | 20.7 | 20.4 | 0.9 | 0.3 | 0.6 |
| 06/12/13 | 802 A | 1648 A | 1027 A | 2831 A | 5506 A | 15 | 30 | 19 | 19.1 | 20.1 | 19.8 | 19.4 | 0.9 | 0.3 | 0.6 |
| 06/13/13 | 773 A | 1563 A | 1029 A | 2769 A | 5313 A | 15 | 29 | 19 | 18.9 | 19.7 | 19.4 | 19.4 | 0.8 | 0.2 | 0.3 |
| 06/14/13 | 716 A | 1499 A | 1030 A | 2734 A | 5152 A | 14 | 29 | 20 | 18.8 | 19.3 | 19.2 | 19.5 | 0.6 | 0.1 | -0.1 |
| 06/15/13 | 721 A | 1421 A | 1031 A | 2698 A | 5028 A | 14 | 28 | 21 | 19.1 | 19.5 | 19.4 | 19.2 | 0.5 | 0.1 | 0.4 |

Appendix A (Continued). Water temperature and flow comparisons of the Trinity and Klamath rivers, April 15 to October 15, 2013.Station locations: TR = Trinity River, WE = Klamath River at Weitchpec, KBW = Klamath Below Weitchpec, and KNK = Klamath near Klamath (A = approved data for publication; P = provisional data subject to change).

| Date | Flow (CFS) | | | | | | | | | Average Daily Water Temperatures (°C) | | | | Differences in Water Temps (°C) of the Klamath R. at RKm 70.2 and: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trinity R. | | Klamath R. | | | Contributions of Flow to the Klamath Gage (%)[a] | | | Trinity R. | Klamath R. | | | Trinity R. | Klamath R. | |
| | Lewiston (rkm 178.6) | Hoopa (rkm 20.0) | Iron Gate (rkm 305.5) | Orleans (rkm 95.1) | Klamath (rkm 13.0) | Lewiston Dam (rkm 178.2) | Hoopa (rkm 20.0) | Iron Gate Dam (rkm 305.5) | TR (rkm 0.1) | WE (rkm 70.2) | KBW (rkm 68.7) | KNK (rkm 13.0) | TR (rkm 0.1) | KBW (rkm 62.0) | KNK (rkm 13.0) |
| 06/16/13 | 718 A | 1388 A | 1032 A | 2657 A | 4906 A | 15 | 28 | 21 | 19.4 | 19.8 | 19.7 | 19.6 | 0.4 | 0.1 | 0.2 |
| 06/17/13 | 717 A | 1377 A | 1031 A | 2624 A | 4813 A | 15 | 29 | 21 | 19.7 | 20.1 | 20.0 | 19.6 | 0.4 | 0.1 | 0.4 |
| 06/18/13 | 638 A | 1369 A | 1029 A | 2600 A | 4767 A | 13 | 29 | 22 | 19.2 | 19.7 | 19.6 | 19.3 | 0.5 | 0.1 | 0.4 |
| 06/19/13 | 566 A | 1329 A | 1028 A | 2598 A | 4813 A | 12 | 28 | 21 | 18.2 | 18.8 | 18.6 | 18.7 | 0.7 | 0.2 | 0.1 |
| 06/20/13 | 527 A | 1238 A | 1025 A | 2612 A | 4745 A | 11 | 26 | 22 | 18.1 | 18.6 | 18.5 | 18.5 | 0.5 | 0.1 | 0.1 |
| 06/21/13 | 533 A | 1173 A | 1022 A | 2569 A | 4601 A | 12 | 25 | 22 | 19.1 | 18.9 | 19.0 | 19.0 | -0.2 | -0.1 | -0.2 |
| 06/22/13 | 496 A | 1139 A | 1020 A | 2521 A | 4443 A | 11 | 26 | 23 | 19.6 | 19.2 | 19.4 | 19.4 | -0.4 | -0.2 | -0.2 |
| 06/23/13 | 480 A | 1103 A | 1021 A | 2483 A | 4339 A | 11 | 25 | 24 | 19.6 | 19.4 | 19.5 | 19.1 | -0.2 | -0.1 | 0.3 |
| 06/24/13 | 457 A | 1115 A | 1022 A | 2517 A | 4351 A | 11 | 26 | 23 | 19.3 | 19.0 | 19.2 | 18.6 | -0.3 | -0.2 | 0.3 |
| 06/25/13 | 446 A | 1192 A | 1023 A | 2711 A | 4654 A | 10 | 26 | 22 | 18.4 | 18.7 | 18.7 | 18.5 | 0.3 | 0.0 | 0.2 |
| 06/26/13 | 440 A | 1475 A | 1022 A | 2905 A | 5255 A | 8 | 28 | 19 | 18.2 | 18.4 | 18.4 | 18.5 | 0.2 | 0.0 | -0.1 |
| 06/27/13 | 437 A | 1684 A | 1022 A | 2905 A | 5950 A | 7 | 28 | 17 | 19.6 | 19.5 | 19.5 | 19.2 | -0.1 | 0.0 | 0.3 |
| 06/28/13 | 436 A | 1383 A | 1023 A | 2658 A | 5342 A | 8 | 26 | 19 | 21.3 | 21.0 | 21.1 | 20.6 | -0.3 | -0.1 | 0.4 |
| 06/29/13 | 439 A | 1210 A | 1023 A | 2536 A | 4765 A | 9 | 25 | 21 | 22.4 | 22.2 | 22.2 | 21.6 | -0.2 | 0.0 | 0.6 |
| 06/30/13 | 438 A | 1120 A | 1022 A | 2459 A | 4438 A | 10 | 25 | 23 | 23.2 | 23.1 | 23.1 | 22.4 | -0.1 | 0.0 | 0.7 |
| 07/01/13 | 440 A | 1060 A | 961 A | 2404 A | 4235 A | 10 | 25 | 23 | 23.6 | 23.6 | 23.6 | 22.9 | 0.1 | 0.0 | 0.7 |
| 07/02/13 | 446 A | 1026 A | 904 A | 2366 A | 4108 A | 11 | 25 | 22 | 24.2 | 24.4 | 24.4 | 23.3 | 0.2 | 0.1 | 1.1 |
| 07/03/13 | 442 A | 1002 A | 907 A | 2255 A | 3950 A | 11 | 25 | 23 | 25.0 | 25.3 | 25.2 | 23.9 | 0.3 | 0.1 | 1.3 |
| 07/04/13 | 440 A | 987 A | 906 A | 2179 A | 3748 A | 12 | 26 | 24 | 24.9 | 25.5 | 25.3 | 24.1 | 0.5 | 0.1 | 1.4 |
| 07/05/13 | 443 A | 963 A | 905 A | 2122 A | 3640 A | 12 | 26 | 25 | 24.2 | 24.7 | 24.6 | 24.0 | 0.6 | 0.2 | 0.8 |
| 07/06/13 | 440 A | 947 A | 906 A | 2085 A | 3556 A | 12 | 27 | 25 | 24.0 | 24.6 | 24.4 | 23.5 | 0.6 | 0.2 | 1.1 |
| 07/07/13 | 437 A | 924 A | 907 A | 2070 A | 3518 A | 12 | 26 | 26 | 24.1 | 24.4 | 24.3 | 23.4 | 0.3 | 0.0 | 0.9 |
| 07/08/13 | 444 A | 896 A | 907 A | 2030 A | 3440 A | 13 | 26 | 26 | 24.2 | 24.3 | 24.4 | 23.5 | 0.1 | 0.0 | 0.9 |
| 07/09/13 | 451 A | 873 A | 904 A | 2012 A | 3352 A | 13 | 26 | 27 | 24.3 | 24.4 | 24.4 | 23.8 | 0.1 | 0.0 | 0.6 |
| 07/10/13 | 448 A | 865 A | 907 A | 1975 A | 3287 A | 14 | 26 | 28 | 24.1 | 24.2 | 24.3 | 23.7 | 0.1 | 0.0 | 0.6 |
| 07/11/13 | 444 A | 855 A | 908 A | 1937 A | 3205 A | 14 | 27 | 28 | 24.0 | 24.0 | 24.1 | 23.1 | 0.0 | 0.0 | 0.9 |
| 07/12/13 | 443 A | 834 A | 908 A | 1906 A | 3144 A | 14 | 27 | 29 | 23.6 | 23.6 | 23.6 | 22.8 | 0.0 | -0.1 | 0.8 |
| 07/13/13 | 445 A | 819 A | 910 A | 1884 A | 3096 A | 14 | 26 | 29 | 22.8 | 23.3 | 23.2 | 22.7 | 0.4 | 0.1 | 0.5 |
| 07/14/13 | 444 A | 817 A | 910 A | 1871 A | 3065 A | 14 | 27 | 30 | 23.0 | 23.5 | 23.4 | 22.8 | 0.4 | 0.1 | 0.7 |
| 07/15/13 | 440 A | 804 A | 909 A | 1839 A | 3037 A | 15 | 26 | 30 | 23.4 | 23.7 | 23.7 | 22.9 | 0.3 | 0.0 | 0.8 |

Appendix A (Continued). Water temperature and flow comparisons of the Trinity and Klamath rivers, April 15 to October 15, 2013. Station locations: TR = Trinity River, WE = Klamath River at Weitchpec, KBW = Klamath Below Weitchpec, and KNK = Klamath near Klamath (A = approved data for publication; P = provisional data subject to change).

| Date | Flow (CFS) | | | | | | | | | | Average Daily Water Temperatures (°C) | | | | Differences in Water Temps (°C) of the Klamath R. at RKm 70.2 and: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trinity R. | | Klamath R. | | | Contributions of Flow to the Klamath Gage (%)[a] | | | Trinity R. | Klamath R. | | | Trinity R. | Klamath R. | |
| | Lewiston (rkm 178.6) | Hoopa (rkm 20.0) | Iron Gate (rkm 305.5) | Orleans (rkm 95.1) | Klamath (rkm 13.0) | Lewiston Dam (rkm 178.2) | Hoopa (rkm 20.0) | Iron Gate Dam (rkm 305.5) | TR (rkm 0.1) | WE (rkm 70.2) | KBW (rkm 68.7) | KNK (rkm 13.0) | TR (rkm 0.1) | KBW (rkm 62.0) | KNK (rkm 13.0) |
| 07/16/13 | 438 A | 791 A | 907 A | 1802 A | 2982 A | 15 | 27 | 30 | 23.4 | 23.6 | 23.5 | 22.1 | 0.2 | 0.1 | 1.5 |
| 07/17/13 | 440 A | 779 A | 905 A | 1753 A | 2936 A | 15 | 27 | 31 | 23.1 | 23.3 | 23.2 | 22.3 | 0.2 | 0.1 | 1.0 |
| 07/18/13 | 443 A | 774 A | 906 A | 1726 A | 2896 A | 15 | 27 | 31 | 23.2 | 23.4 | 23.3 | 22.4 | 0.2 | 0.1 | 1.0 |
| 07/19/13 | 446 A | 770 A | 906 A | 1708 A | 2876 A | 16 | 27 | 32 | 23.8 | 23.9 | 23.8 | 22.5 | 0.2 | 0.1 | 1.4 |
| 07/20/13 | 447 A | 765 A | 905 A | 1685 A | 2844 A | 16 | 27 | 32 | 24.1 | 24.3 | 24.2 | 22.6 | 0.3 | 0.2 | 1.7 |
| 07/21/13 | 446 A | 758 A | 903 A | 1656 A | 2810 A | 16 | 27 | 32 | 24.7 | 25.1 | 24.9 | 23.0 | 0.4 | 0.2 | 2.1 |
| 07/22/13 | 439 A | 746 A | 903 A | 1623 A | 2755 A | 16 | 27 | 33 | 25.1 | 25.4 | 25.3 | 23.6 | 0.3 | 0.1 | 1.8 |
| 07/23/13 | 438 A | 731 A | 906 A | 1598 A | 2701 A | 16 | 27 | 34 | 24.5 | 24.8 | 24.8 | 23.3 | 0.3 | 0.0 | 1.5 |
| 07/24/13 | 444 A | 731 A | 919 A | 1600 A | 2700 A | 16 | 27 | 34 | 23.8 | 24.3 | 24.2 | 22.6 | 0.5 | 0.1 | 1.7 |
| 07/25/13 | 447 A | 729 A | 920 A | 1598 A | 2714 A | 16 | 27 | 34 | 24.4 | 24.8 | 24.7 | 23.2 | 0.4 | 0.1 | 1.6 |
| 07/26/13 | 446 A | 723 A | 922 A | 1581 A | 2684 A | 17 | 27 | 34 | 25.3 | 25.4 | 25.3 | 23.8 | 0.1 | 0.0 | 1.6 |
| 07/27/13 | 450 A | 714 A | 930 A | 1557 A | 2638 A | 17 | 27 | 35 | 25.5 | 25.7 | 25.6 | 24.0 | 0.2 | 0.1 | 1.6 |
| 07/28/13 | 450 A | 708 A | 928 A | 1547 A | 2601 A | 17 | 27 | 36 | 24.8 | 25.1 | 25.0 | 23.7 | 0.4 | 0.1 | 1.4 |
| 07/29/13 | 451 A | 704 A | 913 A | 1535 A | 2583 A | 17 | 27 | 35 | 23.9 | 24.5 | 24.3 | 23.1 | 0.6 | 0.1 | 1.3 |
| 07/30/13 | 449 A | 704 A | 901 A | 1527 A | 2560 A | 18 | 27 | 35 | 22.9 | 23.5 | 23.3 | 22.2 | 0.6 | 0.1 | 1.2 |
| 07/31/13 | 445 A | 703 A | 901 A | 1497 A | 2549 A | 17 | 28 | 35 | 22.5 | 22.7 | 22.7 | 21.5 | 0.1 | 0.0 | 1.1 |
| 08/01/13 | 448 A | 695 A | 901 A | 1484 A | 2519 A | 18 | 28 | 36 | 22.1 | 22.2 | 22.2 | 21.1 | 0.0 | 0.0 | 1.1 |
| 08/02/13 | 447 A | 695 A | 902 A | 1491 A | 2512 A | 18 | 28 | 36 | 22.1 | 21.9 | 22.1 | 21.2 | -0.1 | -0.1 | 0.7 |
| 08/03/13 | 446 A | 700 A | 900 A | 1492 A | 2536 A | 18 | 28 | 35 | 22.0 | 22.0 | 22.0 | 21.7 | 0.0 | -0.1 | 0.3 |
| 08/04/13 | 446 A | 698 A | 901 A | 1483 A | 2531 A | 18 | 28 | 36 | 22.4 | 22.5 | 22.5 | 21.6 | 0.0 | 0.0 | 0.8 |
| 08/05/13 | 451 A | 689 A | 904 A | 1468 A | 2492 A | 18 | 28 | 36 | 22.9 | 22.5 | 22.7 | 21.6 | -0.3 | -0.2 | 0.9 |
| 08/06/13 | 448 A | 685 A | 908 A | 1463 A | 2455 A | 18 | 28 | 37 | 23.0 | 22.6 | 22.7 | 21.6 | -0.4 | -0.1 | 1.0 |
| 08/07/13 | 445 A | 684 A | 906 A | 1454 A | 2437 A | 18 | 28 | 37 | 22.5 | 22.2 | 22.3 | 21.0 | -0.3 | -0.1 | 1.2 |
| 08/08/13 | 445 A | 681 A | 899 A | 1452 A | 2439 A | 18 | 28 | 37 | 22.0 | 21.9 | 21.9 | 20.8 | -0.1 | -0.1 | 1.1 |
| 08/09/13 | 446 A | 685 A | 893 A | 1545 A | 2467 A | 18 | 28 | 36 | 21.7 | 21.4 | 21.5 | 20.8 | -0.2 | -0.1 | 0.6 |
| 08/10/13 | 446 A | 713 A | 903 A | 1558 A | 2632 A | 17 | 27 | 34 | 22.0 | 21.6 | 21.8 | 20.9 | -0.4 | -0.2 | 0.7 |
| 08/11/13 | 451 A | 708 A | 908 A | 1544 A | 2629 A | 17 | 27 | 35 | 22.1 | 21.5 | 21.8 | 21.4 | -0.6 | -0.3 | 0.2 |
| 08/12/13 | 448 A | 706 A | 906 A | 1512 A | 2588 A | 17 | 27 | 35 | 22.0 | 21.5 | 21.7 | 21.8 | -0.5 | -0.3 | -0.3 |
| 08/13/13 | 605 A | 695 A | 908 A | 1528 A | 2564 A | 24 | 27 | 35 | 21.7 | 21.4 | 21.6 | 21.6 | -0.4 | -0.2 | -0.2 |
| 08/14/13 | 465 A | 745 A | 905 A | 1494 A | 2540 A | 18 | 29 | 36 | 21.8 | 21.6 | 21.8 | 21.5 | -0.2 | -0.1 | 0.1 |
| 08/15/13 | 465 A | 744 A | 903 A | 1470 A | 2627 A | 18 | 28 | 34 | 22.3 | 22.0 | 22.2 | 22.2 | -0.3 | -0.2 | -0.1 |

Appendix A (Continued). Water temperature and flow comparisons of the Trinity and Klamath rivers, April 15 to October 15, 2013. Station locations: TR = Trinity River, WE = Klamath River at Weitchpec, KBW = Klamath Below Weitchpec, and KNK = Klamath near Klamath (A = approved data for publication; P = provisional data subject to change).

| Date | Flow (CFS) | | | | | | | | | Average Daily Water Temperatures (°C) | | | | Differences in Water Temps (°C) of the Klamath R. at RKm 70.2 and: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trinity R. | | Klamath R. | | | Contributions of Flow to the Klamath Gage (%)[a] | | | Trinity R. | Klamath R. | | | Trinity R. | Klamath R. | |
| | Lewiston (rkm 178.6) | Hoopa (rkm 20.0) | Iron Gate (rkm 305.5) | Orleans (rkm 95.1) | Klamath (rkm 13.0) | Lewiston Dam (rkm 178.2) | Hoopa (rkm 20.0) | Iron Gate Dam (rkm 305.5) | TR (rkm 0.1) | WE (rkm 70.2) | KBW (rkm 68.7) | KNK (rkm 13.0) | TR (rkm 0.1) | KBW (rkm 62.0) | KNK (rkm 13.0) |
| 08/16/13 | 463 A | 682 A | 900 A | 1442 A | 2474 A | 19 | 28 | 36 | 23.1 | 22.6 | 22.8 | 22.5 | -0.5 | -0.2 | 0.1 |
| 08/17/13 | 464 A | 675 A | 903 A | 1430 A | 2412 A | 19 | 28 | 37 | 23.2 | 22.7 | 22.9 | 22.6 | -0.5 | -0.2 | 0.0 |
| 08/18/13 | 456 A | 668 A | 903 A | 1428 A | 2389 A | 19 | 28 | 38 | 23.0 | 22.5 | 22.8 | 23.0 | -0.4 | -0.2 | -0.4 |
| 08/19/13 | 458 A | 665 A | 903 A | 1408 A | 2377 A | 19 | 28 | 38 | 23.3 | 23.4 | 23.4 | 23.1 | 0.1 | 0.0 | 0.3 |
| 08/20/13 | 460 A | 655 A | 907 A | 1386 A | 2332 A | 20 | 28 | 39 | 23.5 | 23.8 | 23.7 | 23.0 | 0.3 | 0.1 | 0.8 |
| 08/21/13 | 459 A | 662 A | 917 A | 1390 A | 2318 A | 20 | 29 | 40 | 22.9 | 23.2 | 23.2 | 22.5 | 0.2 | 0.0 | 0.7 |
| 08/22/13 | 462 A | 668 A | 909 A | 1419 A | 2337 A | 20 | 29 | 39 | 22.4 | 22.5 | 22.4 | 21.7 | 0.1 | 0.1 | 0.7 |
| 08/23/13 | 461 A | 680 A | 904 A | 1512 A | 2418 A | 19 | 28 | 37 | 22.3 | 22.2 | 22.3 | 21.0 | 0.0 | 0.0 | 1.2 |
| 08/24/13 | 463 A | 673 A | 905 A | 1464 A | 2505 A | 18 | 27 | 36 | 22.0 | 22.0 | 22.1 | 21.8 | 0.0 | -0.1 | 0.2 |
| 08/25/13 | 998 A | 673 A | 903 A | 1486 A | 2433 A | 41 | 28 | 37 | 21.7 | 21.9 | 21.9 | 21.7 | 0.2 | 0.0 | 0.2 |
| 08/26/13 | 2632 A | 852 A | 909 A | 1549 A | 2541 A | 104 | 34 | 36 | 21.4 | 21.8 | 21.8 | 21.6 | 0.4 | 0.1 | 0.3 |
| 08/27/13 | 1968 A | 2471 A | 908 A | 1516 A | 3795 A | 52 | 65 | 24 | 20.2 | 21.8 | 21.1 | 21.7 | 1.6 | 0.7 | 0.1 |
| 08/28/13 | 1256 A | 2079 A | 910 A | 1475 A | 4586 A | 27 | 45 | 20 | 17.7 | 22.0 | 19.7 | 21.3 | 4.3 | 2.3 | 0.7 |
| 08/29/13 | 883 A | 1480 A | 909 A | 1446 A | 3790 A | 23 | 39 | 24 | 18.3 | 22.3 | 20.2 | 20.3 | 4.0 | 2.0 | 1.9 |
| 08/30/13 | 850 A | 1120 A | 908 A | 1437 A | 3254 A | 26 | 34 | 28 | 19.6 | 22.8 | 21.3 | 20.9 | 3.2 | 1.4 | 1.9 |
| 08/31/13 | 847 A | 1027 A | 909 A | 1433 A | 2931 A | 29 | 35 | 31 | 20.1 | 22.7 | 21.6 | 21.7 | 2.6 | 1.0 | 1.0 |
| 09/01/13 | 843 A | 1012 A | 967 A | 1418 A | 2856 A | 30 | 35 | 34 | 20.5 | 22.6 | 21.7 | 21.8 | 2.1 | 0.8 | 0.8 |
| 09/02/13 | 845 A | 999 A | 1011 A | 1398 A | 2809 A | 30 | 36 | 36 | 20.8 | 22.5 | 21.9 | 22.1 | 1.7 | 0.6 | 0.5 |
| 09/03/13 | 838 A | 995 A | 1010 A | 1460 A | 2807 A | 30 | 35 | 36 | 20.4 | 22.3 | 21.6 | 21.5 | 1.9 | 0.7 | 0.8 |
| 09/04/13 | 842 A | 992 A | 1010 A | 1477 A | 2869 A | 29 | 35 | 35 | 19.7 | 21.6 | 21.0 | 21.3 | 1.9 | 0.6 | 0.3 |
| 09/05/13 | 849 A | 992 A | 1010 A | 1477 A | 2877 A | 29 | 34 | 35 | 18.9 | 21.1 | 20.3 | 21.1 | 2.2 | 0.8 | 0.0 |
| 09/06/13 | 849 A | 1002 A | 1010 A | 1472 A | 2874 A | 30 | 35 | 35 | 19.1 | 20.9 | 20.2 | 20.7 | 1.8 | 0.7 | 0.2 |
| 09/07/13 | 849 A | 1005 A | 1010 A | 1473 A | 2872 A | 30 | 35 | 35 | 19.6 | 21.1 | 20.5 | 20.7 | 1.5 | 0.6 | 0.4 |
| 09/08/13 | 848 A | 994 A | 1010 A | 1472 A | 2864 A | 30 | 35 | 35 | 19.9 | 21.4 | 20.9 | 21.0 | 1.5 | 0.6 | 0.4 |
| 09/09/13 | 843 A | 988 A | 1010 A | 1462 A | 2840 A | 30 | 35 | 36 | 20.2 | 21.9 | 21.3 | 21.5 | 1.7 | 0.6 | 0.4 |
| 09/10/13 | 839 A | 979 A | 1009 A | 1449 A | 2809 A | 30 | 35 | 36 | 20.4 | 22.1 | 21.5 | 21.6 | 1.6 | 0.6 | 0.4 |
| 09/11/13 | 863 A | 971 A | 1005 A | 1432 A | 2770 A | 31 | 35 | 36 | 20.5 | 22.0 | 21.4 | 21.2 | 1.5 | 0.6 | 0.7 |
| 09/12/13 | 901 A | 980 A | 1003 A | 1426 A | 2740 A | 33 | 36 | 37 | 20.3 | 21.9 | 21.4 | 21.3 | 1.6 | 0.6 | 0.7 |
| 09/13/13 | 898 A | 1011 A | 1004 A | 1417 A | 2781 A | 32 | 36 | 36 | 20.1 | 21.8 | 21.1 | 21.2 | 1.7 | 0.6 | 0.6 |
| 09/14/13 | 913 A | 1029 A | 999 A | 1416 A | 2816 A | 32 | 37 | 35 | 19.9 | 21.8 | 21.0 | 20.6 | 1.9 | 0.8 | 1.2 |
| 09/15/13 | 972 A | 1026 A | 998 A | 1411 A | 2800 A | 35 | 37 | 36 | 19.7 | 21.6 | 20.9 | 20.8 | 1.9 | 0.8 | 0.8 |

Appendix A (Continued). Water temperature and flow comparisons of the Trinity and Klamath rivers, April 15 to October 15, 2013. Station locations: TR = Trinity River, WE = Klamath River at Weitchpec, KBW = Klamath Below Weitchpec, and KNK = Klamath near Klamath (A = approved data for publication; P = provisional data subject to change).

| Date | Flow (CFS) | | | | | | | | | | Average Daily Water Temperatures (°C) | | | | Differences in Water Temps (°C) of the Klamath R. at RKm 70.2 and: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trinity R. | | Klamath R. | | | Contributions of Flow to the Klamath Gage (%)[a] | | | Trinity R. | Klamath R. | | | Trinity R. | Klamath R. | |
| | Lewiston (rkm 178.6) | Hoopa (rkm 20.0) | Iron Gate (rkm 305.5) | Orleans (rkm 95.1) | Klamath (rkm 13.0) | Lewiston Dam (rkm 178.2) | Hoopa (rkm 20.0) | Iron Gate Dam (rkm 305.5) | TR (rkm 0.1) | WE (rkm 70.2) | KBW (rkm 68.7) | KNK (rkm 13.0) | TR (rkm 0.1) | KBW (rkm 62.0) | KNK (rkm 13.0) |
| 09/16/13 | 943 A | 1064 A | 998 A | 1402 A | 2806 A | 34 | 38 | 36 | 19.3 | 21.5 | 20.6 | 20.7 | 2.1 | 0.8 | 0.8 |
| 09/17/13 | 944 A | 1071 A | 999 A | 1425 A | 2893 A | 33 | 37 | 35 | 18.8 | 20.7 | 20.0 | 20.5 | 1.9 | 0.7 | 0.2 |
| 09/18/13 | 967 A | 1074 A | 999 A | 1484 A | 2926 A | 33 | 37 | 34 | 18.0 | 20.2 | 19.4 | 19.9 | 2.2 | 0.8 | 0.3 |
| 09/19/13 | 694 A | 1093 A | 1001 A | 1478 A | 2994 A | 23 | 37 | 33 | 17.7 | 19.7 | 18.9 | 19.3 | 2.0 | 0.8 | 0.4 |
| 09/20/13 | 482 A | 1003 A | 1004 A | 1473 A | 3118 A | 15 | 32 | 32 | 17.1 | 19.0 | 18.4 | 18.6 | 1.9 | 0.7 | 0.5 |
| 09/21/13 | 481 A | 862 A | 1009 A | 1783 A | 3261 A | 14 | 24 | 28 | 16.3 | 18.4 | 17.8 | 18.4 | 2.0 | 0.6 | 0.0 |
| 09/22/13 | 480 A | 882 A | 999 A | 1866 A | 3544 A | 15 | 28 | 32 | 16.2 | 17.7 | 17.3 | 17.6 | 1.5 | 0.4 | 0.1 |
| 09/23/13 | 480 A | 838 A | 998 A | 1762 A | 3171 A | 15 | 27 | 32 | 16.8 | 17.6 | 17.3 | 17.5 | 0.9 | 0.3 | 0.1 |
| 09/24/13 | 480 A | 805 A | 998 A | 1728 A | 3038 A | 16 | 27 | 33 | 17.3 | 17.6 | 17.6 | 17.6 | 0.3 | 0.0 | 0.0 |
| 09/25/13 | 478 A | 798 A | 1000 A | 1729 A | 3113 A | 17 | 28 | 35 | 16.6 | 17.2 | 17.1 | 17.5 | 0.6 | 0.1 | -0.3 |
| 09/26/13 | 476 A | 778 A | 1000 A | 1779 A | 3122 A | 10 | 16 | 20 | 16.1 | 17.0 | 16.7 | 17.2 | 0.8 | 0.2 | -0.2 |
| 09/27/13 | 478 A | 763 A | 995 A | 1696 A | 3006 A | 2 | 4 | 5 | 16.2 | 16.4 | 16.4 | 16.8 | 0.3 | 0.0 | -0.4 |
| 09/28/13 | 479 A | 747 A | 997 A | 1647 A | 2866 A | 4 | 5 | 7 | 16.0 | 16.3 | 16.3 | 16.5 | 0.3 | 0.0 | -0.2 |
| 09/29/13 | 483 A | 1041 A | 1000 A | 3276 A | 4886 A | 7 | 14 | 14 | 16.1 | 16.2 | 16.3 | 16.1 | 0.0 | -0.1 | 0.1 |
| 09/30/13 | 485 A | 3313 A | 1001 A | 10360 A | 20089 A | 9 | 61 | 19 | 15.1 | 14.5 | 14.7 | 14.9 | -0.6 | -0.2 | -0.3 |
| 10/01/13 | 483 A | 2538 A | 997 A | 4577 A | 13607 A | 10 | 55 | 22 | 14.8 | 14.2 | 14.4 | 14.6 | -0.6 | -0.3 | -0.4 |
| 10/02/13 | 483 A | 1439 A | 997 A | 2899 A | 7209 A | 12 | 34 | 24 | 14.7 | 14.4 | 14.5 | 14.6 | -0.4 | -0.1 | -0.3 |
| 10/03/13 | 481 A | 1127 A | 997 A | 2475 A | 5388 A | 12 | 29 | 26 | 14.5 | 14.2 | 14.3 | 14.7 | -0.3 | -0.1 | -0.5 |
| 10/04/13 | 479 A | 997 A | 996 A | 2263 A | 4615 A | 13 | 27 | 27 | 14.3 | 13.9 | 14.1 | 14.6 | -0.4 | -0.1 | -0.6 |
| 10/05/13 | 478 A | 927 A | 1019 A | 2138 A | 4178 A | 13 | 25 | 28 | 14.1 | 13.9 | 14.0 | 14.5 | -0.2 | -0.1 | -0.6 |
| 10/06/13 | 480 A | 878 A | 1116 A | 2070 A | 3895 A | 13 | 25 | 31 | 14.0 | 14.0 | 14.0 | 14.4 | 0.1 | 0.0 | -0.4 |
| 10/07/13 | 477 A | 854 A | 1058 A | 2056 A | 3726 A | 14 | 24 | 30 | 13.7 | 14.0 | 14.0 | 14.3 | 0.3 | 0.0 | -0.3 |
| 10/08/13 | 479 A | 835 A | 1057 A | 2068 A | 3693 A | 14 | 24 | 31 | 13.7 | 14.0 | 14.0 | 14.3 | 0.3 | 0.1 | -0.3 |
| 10/09/13 | 481 A | 821 A | 1040 A | 1956 A | 3567 A | 14 | 24 | 30 | 13.6 | 13.9 | 13.8 | 14.2 | 0.2 | 0.0 | -0.3 |
| 10/10/13 | 481 A | 812 A | 1117 A | 1984 A | 3488 A | 14 | 23 | 32 | 13.5 | 13.6 | 13.7 | 14.1 | 0.1 | 0.0 | -0.5 |
| 10/11/13 | 479 A | 807 A | 1132 A | 1946 A | 3423 A | 14 | 24 | 34 | 13.3 | 13.6 | 13.6 | 13.9 | 0.3 | 0.0 | -0.3 |
| 10/12/13 | 476 A | 801 A | 1066 A | 2016 A | 3453 A | 14 | 24 | 32 | 13.1 | 13.4 | 13.4 | 13.8 | 0.3 | 0.0 | -0.4 |
| 10/13/13 | 479 A | 796 A | 1033 A | 1984 A | 3460 A | 14 | 23 | 30 | 13.3 | 13.4 | 13.4 | 13.9 | 0.2 | 0.0 | -0.4 |
| 10/14/13 | 465 A | 792 A | 1014 A | 1917 A | 3366 A | 14 | 24 | 30 | 13.4 | 13.2 | 13.3 | 13.8 | -0.1 | -0.1 | -0.6 |
| 10/15/13 | 419 A | 792 A | 999 A | 1884 A | 3286 A | 13 | 24 | 30 | 13.2 | 13.0 | 13.1 | 13.7 | -0.2 | -0.1 | -0.7 |

[a] The percent contribution estimates are most accurate during periods of stable flow. The calculated percent contribution of dam-released flow to the total flow of the Klamath River at Klamath is predicated assuming an instantaneous response of dam-released flow to the Klamath gage (rkm 17). During periods of varying flows, however, the accuracy of the estimates are diminished since it takes time (up to a few days) for a change in dam-released flow from either Lewiston or Iron Gate Dam to reach the USGS Gage at Klamath. As such, estimates of dam-release contributions presented here may be in error during period of highly variable flows.