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February 21, 2024

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**Subject: MILL, DEER AND ANTELOPE CREEKS (TEHAMA COUNTY) BEST AVAILABLE SCIENTIFIC INFORMATION FOR INSTREAM FLOWS AND RECOMMENDATIONS TO INFORM A LONG-TERM FLOW-SETTING PROCESS**

Dear Eric Oppenheimer:

As the state agency responsible for holding fish and wildlife resources in trust for the people of the state, the California Department of Fish and Wildlife (CDFW) has engaged in an ongoing effort to pursue both voluntary and regulatory approaches to protect listed and non-listed fish species in Mill, Deer and Antelope Creeks, which are tributaries to the Sacramento River in Tehama County. During emergency drought conditions since 2014, CDFW, in collaboration with the National Marine Fisheries Service (NMFS), has supported the State Water Resources Control Board's (SWRCB) adoption of emergency drought regulations containing minimum instream flow requirements implemented through curtailment or voluntary solutions to address drought conditions and protect fish species in Mill, Deer and Antelope Creeks. However, these regulations were limited to providing bare minimum instream flows to address a drought emergency and fall short of providing minimum flows required to support and recover fish species, especially as California prepares for a hotter and drier climate.

Mill and Deer Creeks support two of only three remaining viable and independent populations of the state and federally listed threatened Evolutionarily Significant Unit (ESU) of Central Valley spring-run Chinook Salmon (*Oncorhynchus tshawytscha*) (spring-run). Spring-run populations on Mill and Deer Creeks have been in steep decline since 2015. Video passage monitoring of spring-run shows that only nine and 23 fish returned to Mill and Deer Creeks, respectively, in 2023. The 2023 adult cohort of these populations has failed.

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Access to and successful passage through impaired reaches of lower Mill, Deer and Antelope Creeks is a critical linkage to fish health and resiliency in these watersheds and it is clear that historical water diversion and irrigation practices are out of balance with the needs of fish. The purpose of this letter is to submit an instream flow recommendation to the SWRCB to inform a long-term flow-setting process for Mill, Deer and Antelope Creeks to support anadromous salmonids and year-round ecological stream function.

Once considered to be at low to moderate risk of extinction, Deer and Mill spring-run populations are now at a high risk of extinction. In addition to spring-run, Mill, Deer and Antelope Creeks provide aquatic habitat for all life-stages (migration, spawning, and rearing) of the ESU of Central Valley steelhead (*Oncorhynchus mykiss*) (steelhead; federally listed as threatened). In addition, the streams support populations of fall- and late-fall-run Chinook Salmon, and Pacific Lamprey (*Entosphenus tridentatus*), which are all identified as California Species of Concern.

In this letter, CDFW will describe threats facing all life-stages of anadromous salmonids in these tributaries due to impaired flow conditions, provide relevant data on presence and population trends, summarize efforts to secure short- and long-term solutions, and provide monthly flow recommendations by water year type on Mill, Deer and Antelope Creeks to support fish passage and ecological function. CDFW has broad local knowledge of biological water resource needs and is willing to assist the SWRCB in understanding the needs of fish species on Mill, Deer and Antelope Creeks. Throughout this process, CDFW will remain committed to working with the SWRCB, other State and federal agencies, water users, the public, and other interested organizations on Mill, Deer and Antelope Creeks to develop scientifically supported approaches to protect fisheries resources in this and other contexts, including the SWRCB's Bay-Delta Plan Update and voluntary agreements.

### **Threats to Anadromous Salmonids in Mill, Deer and Antelope Creeks Due to Low Flow Conditions**

Insufficient instream flow resulting from water diversions in lower Mill, Deer and Antelope Creeks has been identified by CDFW as a key stressor to spring-run and steelhead population viability. Increased instream flows during all life stages are needed to prevent further decline in populations and promote species recovery. Historical water diversion and water use practices have long been out of balance with ecological needs on these critical watersheds. The impacts of water diversions on spring-run and steelhead in Mill, Deer and Antelope Creeks is amplified in the present day because of climate change and the increased

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periodicity of droughts. Spring-run and steelhead viability in these watersheds is dependent upon balancing water diversions by water year type based on the best-available science regarding anadromous salmonid passage and year-round ecological stream function.

Water diversions on all three tributaries frequently de-water the creeks. In most years, water diversions from these tributaries can impede or prevent migration of anadromous salmonids during critical passage periods. In nearly all years, diversions create extreme low flow conditions during the summer that can result in disconnected stream sections and reduced ecological stream function and productivity. In addition, movement of adult and juvenile salmonids is impeded or blocked in the spring and early summer, and movement of salmonids into or out of these tributaries in the fall is prevented until water diversions are significantly reduced or cease altogether.

CDFW's concerns follow broad acknowledgement that conditions in the upper reaches of all three tributaries provide exceptional habitat for spring-run and steelhead even during drought periods, but access to this habitat is restricted by conditions in impaired stream reaches. The *Central Valley Chinook Salmon and Steelhead Recovery Plan* (NMFS 2014) categorizes all three tributaries as high priority Core 1 watersheds. Deer and Mill Creeks have the potential to support independent populations of both spring-run and steelhead, while Antelope Creek has the potential to support an independent steelhead population. All three tributaries are identified as priority streams in the U.S. Fish and Wildlife Service *Final Restoration Plan for the Anadromous Fish Restoration Program: A Plan to Increase Natural Production of Anadromous Fish in the Central Valley of California* (USFWS 2001). The California Natural Resources Agency's *Sacramento Valley Salmon Resiliency Strategy* (June 2017) includes providing sufficient instream flows in lower Mill, Deer and Antelope Creeks to provide spring-run and steelhead unimpaired access to upstream habitat in its suite of actions necessary to improve the immediate and long-term resiliency of Sacramento Valley salmonids.

### **Mill, Deer and Antelope Creek Spring-Run Chinook and Steelhead Presence and Population Trends**

CDFW monitors passage of adult spring-run and steelhead migrating through lower Mill, Deer and Antelope Creeks using video camera systems and monitors spawning success of spring-run in the upper watershed using redd and snorkel surveys. This monitoring is comprehensive and completed annually following standard operating procedures. The data collected goes through rigorous quality control processes and is reported annually by CDFW. NMFS evaluates

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“viable salmonid population” metrics when evaluating the status of an ESU, including census population criteria. A census population of 2,500 adult spring-run is one metric needed for a salmonid population to have a low risk of extinction. Census population size is the average number of the three most recent generations multiplied by the average generation time (three years for CV spring-run). A low risk of extinction for Mill and Deer Creek spring-run requires average annual escapement over the last three generations to be at least 834 fish. Mill and Deer Creek spring-run populations have fallen short of these metrics for several generations in a row now. With only nine and 23 adult spring-run returning to Mill and Deer Creeks respectively in 2023, the cohort has failed. The 2023 cohort reflects both low effective spawner populations in 2020 (80 fish on Mill Creek and 40 fish on Deer Creek) and drought conditions that negatively affected juveniles in all areas of the freshwater landscape, including impaired reaches of Mill, Deer and Antelope Creeks, in the winter and spring of 2021.

### *Spring-Run*

On Mill Creek, for the ten-year period 2000 through 2009, estimated populations of spring-run ranged from 237 to 1,594 and averaged 936 fish. For the ten-year period 2010 through 2019, estimated populations of spring-run ranged from 127 to 768 and averaged 383 fish. In 2022, the estimated population was 250 fish. Mill Creek video monitoring points to a historic low population estimate of nine spring-run in 2023, which equates to year class failure of this independent population. Spring-run follow a three-year life cycle from juvenile to returning adult. Not enough adults will have returned to Mill Creek in 2023 to produce the minimum number of juveniles needed to sustain this three-year life cycle for a generation, resulting in increased risk of extinction.

On Deer Creek, estimated populations of spring-run for the ten-year period 2000-2009 ranged from 140 to 2,759 and averaged 1,369 fish. For the ten-year period from 2010 through 2019 estimated populations of spring-run ranged from 159 to 830 and averaged 437 fish. In 2022, the estimated spring-run population was 127 fish. Deer Creek video monitoring points to a historic low return of 23 spring-run in 2023 which equates to year class failure of this independent population. Spring-run follow a three-year life cycle from juvenile to returning adult. Not enough adults will have returned to Deer Creek in 2023 to produce the minimum number of juveniles needed to sustain this three-year life cycle for a generation, resulting in increased risk of extinction.

Antelope Creek spring-run are considered to be a dependent population, meaning the population would not persist independently without supplementation from neighboring independent populations such as those

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found on Mill and Deer Creeks. Nonetheless, the Antelope Creek watershed is recognized by NMFS and CDFW as critical habitat for the ESU. Current and historical water diversion practices create fish passage issues that persistently negatively affect Antelope Creek spring-run population trends. For the ten-year period 2000-2009, Antelope Creek estimated spring-run populations ranged from zero to 102 and averaged 33 fish. For the ten-year period 2010 through 2019, estimated populations of spring-run ranged from zero to 17 and averaged six fish. In 2022, the estimated spring-run population was one fish. Zero spring-run returned to Antelope Creek in 2023. This is indicative of the 2023 cohort failure observed on Mill and Deer Creeks, whose spring-run populations serve as donor stock for the dependent Antelope Creek spring-run population.

### *Steelhead*

Adult steelhead migration into Mill, Deer and Antelope Creeks is continuous from October through June, with peak migration observed in the fall and in late winter and early spring.

Mill Creek steelhead population estimates for the period from 2014-2015 through 2021-2022 ranged from 68 to 431 and averaged 238 fish.

Deer Creek steelhead population estimates for the period from 2014-2015 through 2021-2022 ranged from 50 to 437 and averaged 177 fish.

Antelope Creek steelhead population estimates for the period from 2014-2015 through 2021-2022 ranged from 23 to 166 and averaged 78 fish.

CDFW recognizes that multiple stressors across the freshwater landscape affect the productivity of spring-run and steelhead populations in all three tributaries, including limited juvenile rearing habitat and poor migration survival in the mainstem Sacramento River and Delta. However, historically, water diversions have significantly reduced and even dewatered lower sections of these creeks at critical times for fish, resulting in impacts to salmon and steelhead. Successful passage of adults and juveniles through impaired reaches of each tributary is a critical linkage in the life cycle of spring-run and steelhead.

### **Emergency Drought Regulations, Associated Voluntary Efforts, and Curtailments Since 2014**

This section briefly outlines the history of emergency drought regulations on Mill, Deer and Antelope Creeks since 2014. CDFW and NMFS have worked with water users to develop voluntary solutions to provide sufficient flows in lieu of

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curtailment to protect these species during emergency drought conditions. Voluntary efforts to provide short-term minimum instream flows in lieu of curtailment have sometimes, but not always, been successful.

#### *Mill Creek*

The SWRCB adopted emergency regulations for Mill Creek in 2014, 2015, 2021, and 2022. In 2014 and 2015, Mill Creek water users signed a Voluntary Drought Agreement with NMFS and California Endangered Species Act (CESA) memorandum of understanding (MOU) with CDFW (collectively Agreements) to provide minimum instream flows in lieu of curtailment by the SWRCB. When drought conditions returned in 2021, and again in 2022, voluntary efforts for Mill Creek were unsuccessful and curtailment orders were issued to provide minimum instream flows.

#### *Deer Creek*

The SWRCB adopted emergency regulations for Deer Creek in 2014, 2015, 2021, and 2022. In 2014 and 2015, the Deer Creek Irrigation District (DCID) entered into Agreements with CDFW and NMFS, but negotiations with the Stanford-Vina Ranch Irrigation Company (SVRIC) were unsuccessful and the SWRCB issued curtailment orders. In 2021 and 2022, voluntary efforts were again unsuccessful and the SWRCB again issued curtailment orders.

#### *Antelope Creek*

The SWRCB adopted emergency regulations for Antelope Creek in 2014 and 2015. In 2014, Antelope Creek water users signed Agreements to provide minimum instream flows in lieu of curtailment. In 2015, voluntary efforts were unsuccessful and the SWRCB issued curtailment orders. In 2021 and 2022, the SWRCB did not adopt emergency regulations and Antelope Creek water users were not subject to curtailments, because their water diversion activities were subject to instream flow requirements outlined in a Lake and Streambed Alteration Agreement (LSAA) issued by CDFW. The instream flow requirements in the LSAA provide flows that are similar to the instream flow requirements in the emergency regulations adopted by the SWRCB for Antelope Creek in 2014 and 2015. However, the LSAA flows fall short of flows identified in subsequent flow studies (discussed below). The LSAA is a permit that will expire in 2025 and may be renewed once for a maximum of five years. As such, the LSAA ensures flows for a set term that are similar to the instream flows that CDFW would recommend in a drought emergency but does not represent a long-term solution in lower Antelope Creek.

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## **Overview of Efforts to Obtain Long Term Instream Flow on Mill, Deer and Antelope Creeks via Local Cooperative Agreements**

CDFW has negotiated with local water users on these three tributaries for years to secure reliable long-term instream flows for fish through voluntary efforts, largely without success. This section briefly describes these negotiations.

### *Mill and Deer Creeks*

To date, CDFW's single binding cooperative flow agreement on these tributaries is the Mill Creek Flow Exchange Agreement between CDFW, the Los Molinos Mutual Water Company (LMMWC), and the Department of Water Resources. The agreement provides a framework for CDFW to establish the amount of water that is desirable to remain in lower Mill Creek for Chinook salmon in the spring (May 1 through June 15) and fall (October 15 through November 30) and for CDFW to call upon that water at the appropriate times by submitting requests to LMMWC. The agreement allows for LMMWC to provide, within its ability to supply natural flows, an amount of water for Chinook salmon in lower Mill Creek equal to the proportion of its decreed water rights, matched by an instantaneous capacity of replacement groundwater. In practice, flows under the exchange agreement have taken the form of short (up to 60 hours) pulse flows in the spring and a 50 cfs base flow in the fall period. While this agreement has proven to be beneficial for fish passage, the restrictions on timing prevent this agreement from providing reliable and comprehensive minimum flows for salmonid passage and year-round ecological stream function.

In discussions on long-term solutions outside the context of the Mill Creek Flow Exchange Agreement, some water users and their legal counsel have consistently challenged or rejected minimum flow targets recommended by CDFW to voluntarily provide minimum passage flows, and have instead focused on the concept of physical channel modifications to provide fish passage in combination with bypassing significantly lower volumes of water than the flows identified by CDFW to maintain minimum passage needs for salmonids.

Beginning in 2014, Deer Creek water users asserted that modifying the channel of Deer Creek from SVRIC Dam to its confluence with the Sacramento River would protect both aquatic resources and the water users' ability to divert satisfactory quantities of water. In 2014, SVRIC presented a plan to excavate a narrow channel in Deer Creek through four miles of critical habitat, to provide fish passage down to an approximate 20 cfs base flow. CDFW replied in writing

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to identify potential impacts that SVRIC's proposed channel modification would have on salmonid spawning and critical juvenile rearing habitat in lower Deer Creek. CDFW also outlined the permits and approvals that would likely need to be obtained prior to implementation of the proposed work. Finally, as part of CDFW's commitment to collaboratively improve fish passage conditions in lower Deer Creek with SVRIC, the letter included a technical memorandum addressing the channel modifications proposed by SVRIC. The memorandum contained a technical review of proposed actions within a geomorphic and biological context, an annotated list of potential environmental impacts (including adverse alteration of the hyporheic ecotone within shallow riffles, spawning habitat, and elevated water temperatures), and recommendations to improve the project.

CDFW has not received a meaningful response to the technical memorandum. In response to requests to discuss voluntary efforts to provide minimum instream flows, starting around spring 2021, CDFW received letters from counsel for water users on both Mill and Deer Creeks that essentially duplicated the substance and intent of the 2014 channel modification proposal, failing to address the deficiencies and recommendations identified in CDFW's response letters.

In April 2021, CDFW met with SVRIC and LMMWC representatives and the Northern California Water Association (NCWA) on lower Mill Creek to discuss a framework to voluntarily provide instream flows for fish passage, non-flow projects such as stream channel rehabilitation, and conjunctive use wells. CDFW staff developed a draft framework of flow and non-flow actions based on those discussions and notes that NCWA provided from the site visit. Unfortunately, water users returned the framework with substantial deletions, including removal of language associated with increased instream flow contributions. Water users again turned to channel modification as the primary solution to addressing fish passage. The response proposed the trenching of shallow riffle segments of the lower Mill and Deer Creek channels at numerous locations in order to provide favorable fish passage conditions with substantially lower instream flows in a subset of months. While these proposals were based on the assertion that trenching shallow riffles would improve fish passage, the proposals lack substantial detail, design references, and hydraulic analysis to support determinations regarding potential benefits and adverse impacts.



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### *Antelope Creek*

As mentioned above, the SWRCB adopted emergency regulations for Antelope Creek in 2014 and 2015, but did not in 2021 and 2022, because water diversions on Antelope Creek were subject to instream flow requirements outlined in an LSAA. A new fish screen project was recently completed in 2021 that combined two separate stream diversions into one screened diversion point that included a fish bypass return to the creek. The LSAA and instream flow requirements therein were tied to the fish screen and fish bypass project. While efforts to improve flows and passage conditions in Antelope Creek serve as examples of successful collaboration, the LSAA and the project alone do not ensure sufficient flows for salmonid passage and year-round ecological stream function.

In summary, to date, local voluntary efforts have fallen short in providing durable long-term flows to protect aquatic species and ecological function in impaired reaches of Mill, Deer and Antelope Creeks.

### **Overview of Best Available Scientific Information on Instream Flow Needs for Fish Passage and Ecological Function in Lower Mill, Deer and Antelope Creeks**

CDFW completed instream flow studies and published Technical Reports for Mill and Deer Creeks in 2017. These reports can be found on our website at <https://wildlife.ca.gov/Conservation/Watersheds/Instream-Flow>. This letter includes tables identifying monthly flow recommendations, based on CDFW's Technical Reports, to support fish passage and ecological function in Mill and Deer Creeks in each water year type (see Appendix A, Tables 1 and 2).

In 2020, with funding from the SWRCB, Stillwater Sciences completed the Technical Memorandum: "Passage Assessment and Flow Recommendations for Chinook Salmon and Steelhead in Lower Antelope Creek". A copy of this report is enclosed with this letter. Also attached to this letter is a CDFW memorandum titled Instream Flow Investigation, Antelope Creek, January 15, 2020, identifying ecological flows for Antelope Creek. This letter includes a table displaying the flow recommendations based on information found in these two documents (see Appendix A, Table 3).

CDFW acknowledges that the SWRCB is tasked with balancing all beneficial uses of water. The monthly flow recommendations provided in Appendix A are comprehensive and supported by science and are needed to provide optimal fish passage and ecological function across all water year types. CDFW

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recommends that the SWRCB utilize these flow recommendations to inform a long-term flow-setting process.

### **Suggested Immediate Actions**


Considering current population trends of spring-run and steelhead on Mill, Deer and Antelope Creeks, observed changes in the climate and hydrologic regimes, and lack of success in developing long-term and scientifically defensible local voluntary agreements with water users despite considerable effort, there is an urgent need to protect listed fish populations and their habitat in these tributaries. CDFW is asking the SWRCB to review the Mill, Deer and Antelope Creek instream flow recommendations provided in Appendix A, and other pertinent fisheries monitoring data collected by CDFW, as the best available scientific information regarding fish passage and habitat requirements by month and water year type. CDFW recommends using these flow recommendations to inform a long-term flow-setting process, with the understanding that additional information and alternatives will emerge as part of the process. While drought emergency minimum flows were necessary to provide bare minimum fish passage in recent drought cycles, these flows were appropriate for an emergency situation only. Adult spring-run and steelhead must reside in the upper watersheds of Mill, Deer and Antelope Creeks for up to six months before spawning. Any injury to adult fish passing through critical riffles when insufficient flow is provided, including abrasions and punctures, can lead to reduced fitness, greater susceptibility to infection, and increased risk of pre-spawn mortality. It is clear to CDFW that action is needed based on best available scientific information in all year types to stabilize fish populations, promote species recovery, and prevent extirpation.

CDFW remains committed to working with Mill, Deer and Antelope Creek water users to protect fisheries resources and develop durable and long-term solutions to ensure salmonid passage and year-round ecological stream function in all water year types. Unfortunately, to date CDFW has been unable to achieve this through voluntary agreements with water users, and therefore, as the state's trustee agency for fish and wildlife, CDFW believes it is imperative that the SWRCB consider the information included with this letter to inform a long-term flow-setting process on these tributaries.

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If you have any questions regarding this letter, please contact Northern Region Manager Tina Bartlett at [tina.bartlett@wildlife.ca.gov](mailto:tina.bartlett@wildlife.ca.gov).

Sincerely,

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Enclosures (2)

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## Appendix A

**Table 1.** Mill Creek flow recommendations in cubic feet per second by month and water year type to support adult and juvenile salmonid passage and ecological function in lower Mill Creek from the Upper Diversion Dam to the Sacramento River confluence.

Month	Water Year Type				
	Critical	Dry	Below Normal	Above Normal	Wet
October	< 140 cfs → 80% UF*; ≥ 140 cfs → UF**				
November	< 140 cfs → 80% UF*; ≥ 140 cfs → UF**				
December	190	190	190	190	190
January	190	190	190	190	190
February	190	190	190	190	190
March	180	260	260	260	260
April	180	260	260	260	260
May	180	260	260	260	260
June	140	180	260	260	260
July 1 - 15	30	30	140	140	220
July 16 - 31	30	30	30	30	30
August	30	30	30	30	30
September	30	30	30	30	30

\* When USGS 11381500 is less than 140 cfs, 80 percent of the unimpaired flow (UF) is recommended.

\*\* When USGS 11381500 is equal to or greater than 140 cfs, the full amount of unimpaired flow (UF) is recommended. Once flow levels naturally recede below 140 cfs, flow reduction will not exceed 10 cfs with a minimum 3-hour period between adjustments until flow levels return to 80 percent of the UF (i.e., a maximum daily flow alteration of 20 percent or less).

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**Table 2.** Deer Creek flow recommendations in cubic feet per second by month and water year type to support adult and juvenile salmonid passage and ecological function in lower Deer Creek from the DCID Diversion Dam to the Sacramento River confluence.

Month	Water Year Type				
	Critical	Dry	Below Normal	Above Normal	Wet
October	< 145 cfs → 80% UF*; ≥ 145 cfs → UF**				
November	< 145 cfs → 80% UF*; ≥ 145 cfs → UF**				
December	180	180	180	180	180
January	180	180	180	180	180
February	180	180	180	180	180
March	200	290	335	335	335
April	145	290	335	335	335
May	145	175	200	335	335
June	145	145	145	175	200
July	23	23	23	23	23
August	23	23	23	23	23
September	23	23	23	23	23

\* When USGS 11383500 is less than 145 cfs, 80 percent of the unimpaired flow (UF) is recommended.

\*\* When USGS 11383500 is equal to or greater than 145 cfs, the full amount of unimpaired flow (UF) is recommended. Once flow levels naturally recede below 145 cfs, flow reduction will not exceed 10 cfs with a minimum 3-hour period between adjustments until flow levels return to 80 percent of the UF (i.e., a maximum daily flow alteration of 20 percent or less).

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**Table 3.** Antelope Creek flow recommendations in cubic feet per second by month and water year type to support adult and juvenile salmonid passage and ecological function in lower Antelope Creek from the Edwards Diversion Dam to the Sacramento River confluence.

Month	Water Year Type				
	Critical	Dry	Below Normal	Above Normal	Wet
October 16-31	34	34	34	34	46
November	34	34	46	46	46
December	46	46	46	46	76
January	46	46	46	46	46
February	46	46	46	46	46
March	60	76	76	76	76
April	60	76	76	76	76
May	46	60	76	76	76
June	34	34	46	60	76
July 1-15	34	34	34	34	60
July 16 – October 15	14	14	14	14	14