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DEPARTMENT OF FISH AND WILDLIFE
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GAVIN NEWSOM, Governor
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May 24, 2021

Ms. Diane Riddle, Assistant Deputy Director
Division of Water Rights
California State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

2021 TEMPORARY URGENCY CHANGE PETITION REGARDING DELTA WATER QUALITY

Dear Ms. Riddle:

This letter is in response to your e-mail on May 20, 2021, consistent with Water Code section 1437, requesting consultation with the California Department of Fish and Wildlife (CDFW) regarding potential effects to fish and wildlife resources as a result of the 2021 Temporary Urgency Change Petition Regarding Delta Water Quality (TUCP) submitted by the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) on May 17, 2021. In the TUCP, DWR and Reclamation request modifications to requirements of Water Right Decision 1641 (D-1641) to enable changes to operation of the State Water Project (SWP) and Central Valley Project (CVP) (collectively Projects) from June 1 to August 15, 2021. Specifically, DWR and Reclamation have requested the following modifications to the terms of the Project's water rights permit:

- June 1 – June 30, 2021: Reduce net Delta outflow index (NDOI) requirements for salinity control from 4,000 cubic feet per second (cfs) to 3,000 cfs on a 14-day running average
- July 1 – July 31, 2021: Reduce NDOI requirements for salinity control from 4,000 cfs to 3,000 cfs on a monthly average. D-1641, Table 3, footnote 8 would remain applicable.
- Cap the combined SWP and CVP exports at 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).
- June 1 – August 15, 2021: Relocate the Western Delta Agricultural standard compliance point from Emmaton to Threemile Slough.

Background

The 2021 water year (WY) has been exceptionally dry, with total precipitation to date ranking third driest in the historic record (CDEC 2021a). In addition to historically low precipitation in WY 2021, WY 2020 was also dry, with approximately half the historic average total annual precipitation (CDEC 2021a). As a result of the dry conditions in the current and preceding year, storage in the primary SWP and CVP northern California reservoirs is currently well below average, with Shasta at 54% of average, Oroville at 48% of average, and Folsom at 47% of average, the sole exception being New Melones, currently at 93% of average (CDEC 2021b). Further compounding the impact of low precipitation levels in WYs 2020 and 2021, inflow into the reservoirs has been very low, with a statewide average runoff estimated at only 30% of average (DWR 2021). In their TUCP, DWR and Reclamation note that the unexpectedly low levels of inflow observed in WY 2021 were likely due to a variety of factors including “parched watershed soils”, which led to increased ground infiltration of snowmelt, requiring revision of surface run-off projections into reservoirs and corresponding revisions to longer term Project operations planning through WY 2021. In response to the exceptional combination of factors observed in WY 2021, Governor Newsom issued an Emergency Proclamation on drought conditions for the Sacramento-San Joaquin Delta and other watersheds on May 10, 2021. The Emergency Proclamation identified reasons for consideration of such changes: “to conserve water upstream later in the year in order to protect cold water pools for salmon and steelhead, improve water quality, protect carry over storage, or ensure minimum health and safety water supplies.” In addition, on May 19, 2021, DWR submitted a request for a minor amendment to the incidental take permit covering the operations of the SWP, to address the operations changes of the TUCP. CDFW is currently reviewing this amendment request.

CDFW focuses this letter on our area of scientific and management expertise for listed fish species, consistent with the Water Code requirement that the Board consult with CDFW on temporary urgency changes. Notwithstanding this focus, CDFW acknowledges these proposed temporary urgency changes are designed to be responsive to the unprecedented factors observed so far in WY 2021 and can assist preparations in the event WY 2022 remains dry.

Assessment of Effects on Listed Fish Species in the Bay-Delta

Four fish species listed as endangered or threatened under the California Endangered Species Act are known to occur in portions of the Sacramento-San Joaquin Delta and San Francisco Bay (Bay-Delta): Delta smelt (*Hypomesus transpacificus*), longfin smelt (*Spirinchus thaleichthys*), and winter- and spring- run Chinook salmon (*Oncorhynchus tshawytscha*). As a part of their TUCP, DWR and Reclamation conducted a biological review to assess the potential impacts of the requested changes to D-1641 (TUCP Biological Review). CDFW staff have reviewed the TUCP, TUCP Biological Review, and other available scientific literature and data to provide the following remarks on the potential effects on these four species as a result of the TUCP.

A. Delta Smelt

Delta Smelt Distribution (June – August)

Through much of its life, a large contingent of the Delta smelt population inhabits the low salinity zone (Dege and Brown 2004; Feyrer et al. 2007; Feyrer et al. 2011; Sommer et al. 2011). The location of the low salinity zone is indexed by X2 (Kimmerer 2004). The distribution of Delta smelt juveniles in the summer is strongly related to freshwater outflow and the location of the low salinity zone (Dege and Brown 2004; Moyle 2002; Sweetnam 1999). Recent otolith chemistry analyses indicate three predominant life history phenotypes: 1) a freshwater resident contingent (23% of the population; mean across 7 years examined); 2) a brackish water resident contingent (7% of the population); and 3) a migratory contingent (70% of the population) that moves to freshwater to mature and spawn, and subsequent larvae and young rear in freshwater prior to dispersing/migrating to brackish water in the low salinity zone to rear during summer and fall (Bush 2017; Hobbs et al. 2019).

Recent data reported from CDFW's 20 mm survey have only detected one Delta smelt in the Sacramento Deep Water Ship Channel thus far in 2021. Catches in the U.S. Fish and Wildlife Service (USFWS) Enhanced Delta Smelt Monitoring have been sparse, with seven recent detections in the Sacramento Deep Water Ship Channel and one in the Lower Sacramento River as of May 11th. Because catches of Delta smelt are rare, we rely on habitat proxies and historical data to inform our description of Delta smelt distribution between June and July for WY 2021. Therefore, we assume that the bulk of the Delta smelt population will be centered around the position of the low salinity zone between June and August, with a smaller portion of the population staying in freshwater habitats of the Cache Slough complex and neighboring Sacramento Deep Water Ship Channel, provided water temperatures do not reach lethal levels.

Potential Effects of Outflow and Salinity TUCP Elements

The main effect of reducing outflows during this period for Delta smelt is the change in the position of the low salinity zone. In the wild, low salinity zone habitat for Delta smelt is defined as areas with salinities ≥ 0.5 psu but ≤ 6 psu. Salinity is an important Delta smelt habitat attribute during the summer. Komoroske et al. (2014) found that Delta smelt mortality in the laboratory was greatest at high salinities (34 ppt) with little difference between 2 ppt and 18 ppt treatments. However, field studies have demonstrated that Delta smelt are mostly observed in low salinity conditions during the summer (Nobriga et al. 2008), indicating that while individuals may tolerate more saline habitats, their preference appears to be for areas where salinity is ≤ 6 psu. Salinity and freshwater flows are highly correlated, and the position of the low salinity zone is dependent on the amount of freshwater leaving the Delta. As outflows are reduced, the low salinity zone moves eastward, and Delta smelt experience different physical habitat conditions as their distribution shifts eastward with the low salinity zone. Specifically, Delta smelt are most likely to experience warmer water temperatures, reduced bathymetric complexity, and decreased turbidity.

Water Temperature: Initial temperature tolerance experiments found that small juveniles are sensitive to water temperatures approaching 25ºC and above (Swanson et al. 2000). Although subsequent investigations showed increased temperature tolerance, few juvenile DS have been caught at temperatures exceeding 25ºC in field surveys (Komoroske et al. 2014). Findings from a retrospective analysis of historical water temperature data (1975-2012) show that the coolest average and maximum temperatures occurred in Suisun Bay and San Pablo Bay during the July to August period (average 19-21ºC, maximum 24ºC) while the western Delta was slightly warmer (average 21-23 °C, maximum 25 °C) (IEP-MAST 2015). These regional differences in water temperature are also supported by Wagner et al. (2011). Together these analyses indicate that more eastward positions of the low salinity zone will generally expose Delta smelt to warmer water temperatures than what they would have experienced downstream during the summer. Recent studies indicate that Delta smelt occupy habitat close to their upper thermal limit and that they may be unable to utilize higher salinity habitat which is cooler in temperature (Davis et al. 2019; Jefferies et al. 2016).

Turbidity: Turbidity is also an important Delta smelt habitat attribute during the summer (IEP-MAST 2015), and has been associated with observations of juvenile and subadult Delta smelt in survey data (Nobriga et al. 2008; Sommer and Mejia 2013). Increased turbidity has been hypothesized to increase survival (Hasenbein et al. 2013) and reduce Delta smelt predation risk (Ferrari et al. 2014; IEP 2015). Studies have shown that turbidity is generally higher in Suisun Bay and Marsh (Durand 2014; Nobriga et al. 2008) relative to upstream regions because dynamic variables, such as wind (Rhul and Schoellhamer 2004), interact with static variables, such as the high levels of baythymetric complexity and increased erodible sediment supply found in the Suisun Region (Brown et al. 2014). More eastward positions of the low salinity zone will expose Delta smelt to less turbid conditions and increase their vulnerability to predation.

Uncertainties in Analysis of Outflow and Salinity TUCP Elements

The magnitude of effect associated with the proposed changes under the TUCP will be difficult to quantify. This is in part because it may not be possible to observe the species' response to these changes. Instead of relying on changes in detections in surveys, we generalize the description of habitat and how it changes based on varying flows. Here we posit that Delta smelt are going to experience warmer water temperatures and increased water clarity from June 1 to July 31st based on an eastward movement of salinity in the Delta. However, the magnitude of increase in water temperature and water clarity is uncertain. Additionally, it is uncertain if these changes are significantly different than what Delta smelt would have experienced in the low salinity zone under D-1641 requirements in a critically dry year. Therefore, our assessment of these impacts is qualitative and specific to fish within the low salinity zone, it does not represent what fish in the Cache Slough complex and Sacramento Deep Water Ship Channel would be experiencing, as the proposed TUCP is unlikely to affect habitat conditions in those areas.

Potential Effects of Export Restriction in TUCP

Implementation of this proposed change under the TUCP would likely maintain or potentially reduce entrainment risk to young of the year Delta smelt during the month of June. Delta smelt may be transitioning into downstream habitats during June and may still be present in the south Delta until temperatures become too warm. However, because combined Project exports would be no more than 1,500 cfs, and the Smelt Management Team would continue to convene through the month of June, entrainment risk is not expected to increase. No change in effects is anticipated as a result of export restrictions in July because historical data indicate that entrainment risk is minimal during this time period when temperatures in the zone of entrainment are typically higher than thermal tolerances for Delta smelt. In addition to potential benefits as a result of reduced entrainment risk in June, the export restrictions have the benefit of preserving upstream storage, which will be important for species if another TUCP is anticipated in WY 2021, or if WY 2022 continues to be dry.

B. Longfin Smelt

Longfin Smelt Distribution (June – August)

Longfin smelt typically mature at age-2, while some individuals may reach age-3. As a result, multiple age classes are typically present in the Bay-Delta, though adults and immature sub-adults are rare or not present in the Delta during summer (CDFW 2020). The distribution of age-0 juveniles is initially centered around X2 in spring and gradually shifts seaward as the season progresses (Dege and Brown 2004). Most disperse into marine habitat by summer, however some rear in San Pablo Bay and Suisun Bay through fall (Baxter et al. 2010; Eakin et al. 2020). Because of this, our analysis will focus on the age-0 juvenile longfin smelt that are present within the area and timeframe relevant to this TUCP. Recent catch data from CDFW's 20-mm Survey indicates that juvenile longfin smelt are present from Chipps Island upstream through the lower Sacramento River as well as in Montezuma Slough and the Sacramento Deep Water Ship Channel (CDFW 2021a). Preliminary data from the 20-mm Survey 4 (5/3/2021 to 5/6/2021) show a similar distribution with the highest catch per unit effort occurring in the lower Sacramento River between Sherman Lake and Decker Island in both surveys.

Potential Effects of Outflow and Salinity TUCP Elements

Summer distribution and survival of juvenile longfin smelt has not been examined in detail. Most research has focused on the relationship between winter-spring outflows (January through June) and longfin smelt abundance (Jassby et al. 1995; Kimmerer et al. 2009; Nobriga and Rosenfield 2016; Thomson et al. 2010). The TUCP proposes changes within the month of June, and changes in outflow during this time may exacerbate the negative effects of a critically dry year on longfin smelt abundance in the fall.

Reduced outflow is expected to shift low salinity habitat upstream and may reduce food subsidies for juvenile longfin smelt. Low salinity habitat, whether in Suisun Bay or San Pablo Bay contains important longfin smelt food sources, including the mysid *Neomysis mercedis* (Kimmerer and Orsi 1996; Orsi and Mecum 1996; Winder and Jassby 2011). The introduced calanoid copepod, *P. forbesi,* and introduced mysids, primarily (*Hyperacanthomysis longirostrus*) now provide important longfin smelt diet components from late spring through fall (Baxter et al. 2010). The abundance of *Pseudodiaptomus forbesi* in the low salinity zone during summer and fall is subsidized from upstream and influenced by freshwater outflow (Durand 2010; Hennessy and Burris 2017; Kimmerer et al. 2018). This food subsidy in Suisun Bay replaces some of the local zooplankton production lost to feeding by the overbite clam, *Potamocorbula amurensis* (Kimmerer et al. 2018). These authors note that this subsidy decreases as outflow decreases (reported as X2 advancing upstream; see also Mac Nally et al. (2010)) and the *P. forbesi* population shifts east placing it at greater risk of entrainment and loss to south Delta and in-Delta water exports.

<u>Water Temperature</u>: Longfin smelt have been shown to exhibit thermal stress when exposed to water temperature in excess of 20°C and are rarely detected in monitoring surveys above 22°C (Jeffries 2016). Water temperature is believed to both cue emigration of age-0 juveniles in the spring and limit their distribution within the Bay-Delta during the summer and fall (Baxter et al. 2010). During the dry year 2001, and the critically dry year 2013, 20-mm Survey observed juveniles in Suisun Bay and Suisun Marsh at water temperatures above 22°C as late as mid-June (in 2001) and early July (in 2013) (CDFW 2021b). These observations indicate that some portion of the population may remain in habitat considered thermally unsuitable, however it is uncertain if fish detected in such conditions are surviving to the next life-stage. In 2015, abundance of longfin smelt hit a record low. This is consistent with the hypothesis that survival of the 2013 cohort was poor, generating few fish to contribute to the 2015 adult cohort. The Summer Townet Survey (CDFW 2021c) samples twice a month June through August and regularly collects small numbers of longfin smelt in Suisun Bay and Marsh, and in the lower Sacramento River in most years, though rarely at water temperatures above 22°C (CDFW unpublished data).

<u>Turbidity</u>: Turbidity has been found to be an important predictor for other pelagic species such as Delta smelt, however its importance to longfin smelt is less clear. Kimmerer et al. (2009) found the combination of salinity and Secchi depth substantially improved the model fits as compared to salinity alone or salinity and water depth, suggesting that both salinity and reduced water clarity were important constituents of habitat for young longfin smelt (Baxter et al. 2010). Water clarity and spring X2 have

been identified as strong correlates for longfin smelt abundance though the authors point out that the effect of water clarity after accounting for the effect of spring X2 was weak (Thomson et al. 2010).There is strong evidence that adult stock size also influences the outflow abundance relationship (Nobriga and Rosenfield 2016) and particularly poor recruitment years, such as those observed during periods of drought, are likely to have a cumulative effect if there are not enough intervening wet years in which the population can recover.

Uncertainties Associated with Outflow and Salinity Effects

The degree to which the outflow elements of the TUCP would affect longfin smelt abundance as compared to baseline conditions during a critically dry year is uncertain. The underlying mechanism(s) driving the flow/abundance relationship is not well understood and would benefit from an effort similar to what was outlined in the Drought Ecosystem Monitoring and Synthesis Plan that was included in the April 2021 update to the SWP and CVP Drought Contingency Plan prepared by DWR and Reclamation. Juvenile longfin smelt can tolerate increasing salinity as they age (MacWilliams et al. 2016; Parker et al. 2017) but it is uncertain what proportion of the population remains in upstream habitat during summer or how reduced outflow affects summer survival in habitat further downstream.

Potential Effects of Export Restriction in TUCP

Implementation of this proposed change under the TUCP would likely maintain or potentially reduce entrainment risk to young of the year longfin smelt during the month of June. Historically, juvenile longfin smelt salvage peaks in May and decreases substantially in June (Grimaldo et al. 2009). Longfin smelt are largely absent from Old and Middle River by June based on data collected by 20-mm and Summer Townet Surveys (CDFW unpublished data). Because exports would be no more than 1,500 cfs, and the Smelt Management Team would continue to convene through the month of June, entrainment risk is not expected to increase. No change in effects is anticipated as a result of export restrictions in July because historical data indicate that entrainment risk is minimal during this time period when temperatures in the zone of entrainment are typically higher than thermal tolerances for longfin smelt. In addition to potential benefits as a result of reduced entrainment risk in June, the export restrictions have the benefit of preserving upstream storage, which will be important for species if another TUCP is anticipated in WY 2021, or if WY 2022 continues to be dry.

C. Winter-run Chinook salmon

Winter-run Chinook Salmon Distribution (June – August)

Juvenile winter-run Chinook salmon entry into the Delta has historically been informed with upstream rotary screw trap monitoring on the Sacramento River at Knights Landing

(River Mile [RM] 88). While the timing of emigration varies due to changes in river flows, dam operations, and water year type, CDFW has detected juvenile winter-run Chinook salmon at Knights Landing beginning as early as August and as late as April (CalFish 2021; Allison et al. 2020: Figures 24 and 25). SacPAS uses Sacramento River Trawl catch data at Sherwood Harbor (RM 55) as an indicator of salmonid entry into the Delta. Historical presence of juvenile winter-run Chinook salmon at Sherwood Harbor for brood years 1994 through 2018 begins as early as September and ends in late April (Allison et al. 2020: Figures 24 and 25). Juvenile ocean entry from the lower Sacramento River and Delta into the San Francisco Bay is monitored using trawl surveys at Chipps Island (RM 18). USFWS trawl data collected at Chipps Island show juvenile winter-run Chinook salmon leaving the Delta from December to May, with a peak in March and April (del Rosario et al. 2013; SacPAS 2020 [brood year 1994 through 2019]). Historical entrainment data for SWP and CVP facilities for brood years 1994 through 2018 show juvenile winter-run Chinook salmon loss beginning as early as December and extending through June (Allison et al. 2020: Tables 19 and 29). On May 18, 2021 the Salmon Monitoring Team estimated that 94-95% of brood year 2020 young-of-year winter-run Chinook salmon had exited the Delta.

Adult winter-run Chinook salmon enter the Bay-Delta in November to begin their upstream spawning migration and continue to proceed up the Sacramento River through August (Allison et al. 202; Yoshiyama et al. 1998; NMFS 1998; Moyle 2002). Adult winter-run Chinook salmon presence in the Delta may extend through June and potentially into July at very low numbers (NMFS 2019; Moyle 2002; Yoshiyama et al. 1998). Juvenile and adult winter-run Chinook salmon are not historically present in the Delta in August; therefore, it is highly unlikely that the TUCP will impact winter-run Chinook salmon in August.

Potential Effects of Outflow and Salinity TUCP Elements on Young-of-year Life Stage

Rearing: Juvenile winter-run Chinook salmon present in the Delta in June will experience impacts associated with reduced net Delta outflows as a result of changes in Delta outflow and salinity requirements included in the TUCP. Reduced outflows may increase reverse flows in tidal reaches and increase travel time through the Delta due to reduced velocities. This increased exposure in the Delta during poor outflow conditions (e.g., higher temperatures, lower turbidity, increased aquatic vegetation) may cause an increase in predation risk as conditions become more conducive for invasive predators. In contrast, higher flows and the associated cooler water temperatures reduce predator metabolic rates and may also reduce the presence of predators in juvenile salmon habitats (Munsch et al. 2019).

Increased residence time in the Delta coupled with higher temperatures, consistent with drought conditions, may increase the susceptibility of juveniles to pathogens, parasites, and reduced growth (Allison et al. 2020; Carter 2008). Carter (2008) indicates that as temperatures exceed 19°C, juvenile Chinook salmon growth becomes negative and respiration rates become stressed. Additional studies show that juveniles reared in temperatures 17°C to 24°C experience significantly decreased growth rates, impaired smoltification indices, and increased predation vulnerability compared to juveniles reared at 13°C to 16°C (optimum temperatures 10-15.6°C; Marine and Cech 2004). Figure WR5 in the TUCP Biological Review indicates that temperatures in the Delta exceeded lethal thresholds for juvenile Chinook salmon during the June through August timeframe in 2014 and 2015 (25°C for greater than seven days for adults and juveniles; USEPA 2003). However, the temperature forecast for June 2021 is uncertain based on available information provided in the TUCP Biological Review. The likelihood of Delta temperatures exceeding lethal temperatures for juvenile rearing in June is currently not well understood. As a result, it is not possible at this time to determine whether temperatures are likely to differ between the baseline condition and the TUCP scenario.

Routing: Reclamation and DWR used DSM2 modeling to compare a baseline condition and a scenario that includes the TUCP modified D-1641 objectives in addition to installation of an Emergency Drought Barrier. DSM2 modeling results for Sacramento River flow at Freeport and the Delta Cross Channel gate opening status were then incorporated into the Perry et al. (2018) model to estimate the probability of juveniles entering the Delta through Georgiana Slough and the Delta Cross Channel from the Sacramento River. The TUCP Biological Review found “slightly greater” (2% in June) juvenile salmon routing into these two low-survival pathways using the Perry et al. (2018) model for the TUCP scenario.

Survival: In addition to routing risk, the Perry et al. (2018) model also evaluates through-Delta survival by incorporating flow-survival and routing relationships. The TUCP Biological Review found that differences in Delta inflow between the baseline condition and the TUCP scenario may result in “relatively small differences” (3% in June) in through-Delta survival probability of juvenile Chinook salmon. This reduction in through-Delta survival may impact life history diversity for brood year 2020 by reducing survival of late emigrating juveniles.

Potential Effects of Outflow and Salinity TUCP Elements on Adult Life Stage

Adult winter-run Chinook salmon present in the Delta in June and July may experience impacts associated with reduced net Delta outflows as a result of changes in Delta outflow and salinity requirements included in the TUCP. Reduced outflows may result in increased water temperatures and decreased dissolved oxygen within the Delta at the same time adults are migrating upstream to natal spawning grounds. Boles et al. (1988) characterizes water temperatures less than 18.3°C as preferable for adult Chinook salmon migration. Additionally, Lindley et al. (2004) reports that higher water temperature acts as a migration barrier and leads to stress when reaching 21.1°C. Studies have also shown that adult exposure to constant or average temperatures greater than 15.5°C result in a detrimental effect on adult survival and egg viability (Windell et al. 2017). In addition to temperature barriers, dissolved oxygen concentrations can also create barriers to migration, with adult Chinook salmon on the San Joaquin River exhibiting avoidance response when dissolved oxygen is below 4.2 mg/L (Carter 2008; Hallock et al. 1970). Warm water temperatures and decreased dissolved oxygen can increase physiological stress and metabolic rates in adult Chinook salmon, while also reducing their immune response to pathogens (Windell et al. 2017).

The likelihood of Delta temperatures exceeding lethal temperatures for adult migration in June or July (25°C for greater than seven days for adults and juveniles; USEPA 2003) is currently not well understood. It is also uncertain if temperatures under baseline conditions would differ from temperatures under the TUCP scenario. Figure WR5 in the TUCP Biological Review indicates that temperatures in the Delta exceeded lethal thresholds for adult Chinook salmon during the June through August timeframe in 2014 and 2015. Figure WR6 indicates that historical dissolved oxygen concentrations for the same timeframe were consistently higher than the 6 mg/L water quality compliance target for San Joaquin River under D-1641.

Uncertainties Associated with Outflow and Salinity Effects

The degree to which the outflow and salinity elements of the TUCP would affect winter-run Chinook salmon as compared to baseline conditions during a critically dry year is uncertain. It is important to consider that upstream operations associated with reduced net Delta outflow can also cause impacts to winter-run Chinook salmon present upstream of the Delta. However, reducing reservoir releases has the benefit of preserving storage throughout the remainder of the water year and subsequent water year, which could benefit winter-run Chinook salmon.

Potential Effects of Export Restriction in TUCP

Modeled increases in juvenile routing into the interior Delta demonstrate the TUCP is unlikely to result in an increase in entrainment of juvenile winter-run Chinook salmon into the SWP or CVP export facilities due to export restrictions included in the TUCP and the relatively low number of winter-run juveniles present in the Delta in June. Additionally, the Salmon Monitoring Team will continue to meet through June to monitor real-time distribution and entrainment loss of juvenile winter-run Chinook salmon and continually assess whether additional measures may be implemented to minimize impacts to the species. No change in effects is anticipated as a result of export restrictions in July because historical data indicate that entrainment risk is minimal during this time period. In addition to minimizing potential effects of entrainment in June, the export restrictions have the benefit of preserving upstream storage, which will be important for species if another TUCP is anticipated in WY 2021, or if WY 2022 is dry.

D. Spring-run Chinook Salmon

Spring-run Chinook Salmon Distribution (June – August)

CDFW has detected juvenile spring-run Chinook salmon at Knights Landing from November through May (CalFish 2020; Allison et al. 2020). Historical presence of juvenile spring-run Chinook salmon at Sherwood Harbor for brood years 1994 through 2018 begins as early as November and ends in late June (Allison et al. 2020). USFWS trawl data collected at Chipps Island show juvenile spring-run Chinook salmon leaving the Delta from December through June, with a peak in April and May (Brandes and McLain 2001; Williams 2006; SacPas 2020 [brood year 1994 through 2019]). Historical entrainment data for SWP and CVP facilities for brood years 1994 through 2018 show young-of-year spring-run Chinook salmon loss beginning as early as January and extending through June (Allison et al. 2020: Tables 20 and 30). On May 18, 2021 the Salmon Monitoring Team estimated that 55-70% of brood year 2020 young-of-year spring-run Chinook salmon have exited the Delta. Yearling spring-run Chinook salmon downstream emigration occurs in the fall and winter, which is outside the timeframe of the requested TUCP (Allison et al. 2020).

Adult spring-run Chinook salmon enter the Bay-Delta in late January to begin their upstream spawning migration and continue to proceed up the Sacramento River through October (Allison et al. 2020; Yoshiyama et al. 1998; NMFS 1998; Moyle 2002). Adult spring-run Chinook salmon presence in the Delta may extend through June and potentially into September at very low numbers (NMFS 2019; Johnson et al. 2011; Moyle 2002; Yoshiyama et al. 1998).

Potential Effects of Outflow and Salinity TUCP Elements on Young-of-year Life Stage

Young-of-year spring-run Chinook salmon present in the Delta in June will experience impacts associated with reduced net Delta outflows as a result of changes in Delta outflow and salinity requirements included in the TUCP. Impacts to young-of-year spring-run Chinook salmon are anticipated to be similar to those impacts discussed previously for young-of-year winter-run Chinook salmon. The Perry et al. (2018) model results provided in the winter-run section are applicable to spring-run Chinook salmon, indicating “slightly greater” (2% in June) juvenile salmon routing into Georgiana Slough and the Delta Cross Channel from the Sacramento River as well as “relatively small differences” (3% in June) in through-Delta survival probability of juvenile Chinook salmon for the TUCP scenario.

Potential Effects of Outflow and Salinity TUCP Elements on Adult Life Stage

Adult spring-run Chinook salmon present in the Delta in June and potentially into August may experience impacts associated with reduced net Delta outflows as a result of changes in Delta outflow and salinity requirements included in the TUCP. Effects on adult spring-run Chinook salmon are anticipated to be similar to, or slightly greater than, effects discussed previously for adult winter-run Chinook salmon due to the greater likelihood of presence during this time.

Uncertainties Associated with Outflow and Salinity Effects

The degree to which the outflow and salinity elements of the TUCP would affect spring-run Chinook salmon as compared to baseline conditions during a critically dry year is uncertain. It is important to consider that upstream operations associated with reduced net Delta outflow can also cause impacts to spring-run Chinook salmon present upstream of the Delta. However, reducing reservoir releases has the benefit of preserving storage throughout the remainder of the water year and subsequent water year, which could benefit spring-run Chinook salmon.

Recommended Actions to Reduce Uncertainty and Inform Future Planning

CDFW recognizes the urgent and ongoing challenges such serious drought conditions present. The Emergency Proclamation requires monitoring and evaluation of modified requirements such as this TUCP, to inform future actions. CDFW recommends convening a multi-agency drought synthesis team(s) in association with the Interagency Ecological Program, and funded by the Projects, to collaboratively develop and conduct the following data synthesis efforts:

1. Reduced Delta outflow under the TUCP relative to baseline drought conditions will decrease habitat quality for Delta smelt by shifting the low salinity zone into warmer, clearer areas of the Delta. However, the magnitude of such a change remains uncertain until environmental data is collected and further analysis is conducted to understand whether or not the proposed changes under the TUCP significantly change habitat conditions for Delta smelt in or near the low salinity zone. Quantitative methods should be applied post facto to better inform the magnitude of effects of critically dry years and the TUCP on Delta smelt. 3D hydrodynamic models, specifically ones which can inform changes in water temperature, salinity, and turbidity, could be applied to assess the relative change in conditions with and without the TUCP.
2. CDFW suggests leveraging the USFWS Delta Smelt Life Cycle Model and the Winter-Run Life Cycle Model to conduct a comparative analysis between scenarios with and without the TUCP. This could provide a quantitative method for understanding Delta smelt and winter-run Chinook salmon response to the

TUCP that is more informative than relying upon infrequent detections in field survey data. This modeling would also inform operational decision making in subsequent dry and critically dry years.

3. The relationship between spring outflow and longfin smelt abundance is well documented in scientific literature, however, the specific mechanism(s) underlying this relationship remain unknown. We recommend investigating potential mechanisms driving longfin smelt population reductions observed during droughts using the comparative approach outlined in the Drought Ecosystem Monitoring and Synthesis Plan. This comparative approach could be used to identify stressors that are exacerbated during periods of drought as well as elucidate how important resources, such as high-quality prey items or suitable habitat, increase during wet years when longfin smelt populations increase. A better understanding of patterns of variation and interaction in stressors and resources under drought and wet conditions could aid in understanding the flow/abundance relationship.
4. Entrainment risk is commonly associated with Old and Middle River (OMR) flows. CDFW suggests modeling changes in OMR as a result of the TUCP, relative to baseline conditions, for the month of June. This modeling could facilitate improved understanding of changes in entrainment risk as a result of the TUCP and inform operational decision making in subsequent dry and critically dry years.

In addition to convening the drought synthesis team(s) described above, CDFW suggests that Reclamation and DWR confirm contracts are executed and funding is secured to support all ongoing abiotic and biotic monitoring in the Sacramento-San Joaquin Delta that is described in the TUCP Biological Review and associated Drought Ecosystem Monitoring and Synthesis Plan. These commitments would provide assurances that uncertainties identified here and in the TUCP Biological Review may be resolved and will facilitate recommended data syntheses and improved drought planning and response through the end of WY 2021, and moving forward into subsequent water years.

We appreciate the coordination and communication between our two departments during these exceptionally dry conditions. If you have questions regarding this letter, please contact Brooke Jacobs, Environmental Program Manager, at (916) 903-6426, or by email at Brooke.Jacobs@wildlife.ca.gov.

Sincerely,

DocuSigned by:
Josh Grover
703E59B6647A482...

Joshua Grover, Chief
Water Branch

ec: California Department of Fish and Wildlife

Chad Dibble, Deputy Director
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