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# **Ad-hoc Drought Management on an Overallocated River: The Stanislaus River, Water Years 2014-15**

*Philip Womble\**

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## **Introduction**

Like many rivers in California, the Stanislaus River is heavily overallocated. The river faces substantial demands from established agricultural users and environmental needs. When persistent drought strikes and supplies drop to a level where needs cannot all be met, no blueprint exists for allocating water among these competing demands. Water users and regulators disagree regarding which water uses hold the highest priority, and no court has resolved this issue. No specific criteria establish when and how state water quality objectives may be relaxed when supplies become scarce, and reducing water volumes for federally endangered species likely involves a lengthy regulatory process. Likewise, state water quality objectives and regulatory criteria for federally endangered species on the Stanislaus institutionalize little in the way of contingency or scenario planning requirements when water supplies drop below important thresholds.

This uncertainty does not provide a good platform for effective water management. During California's recent drought, water allocation decisions on the Stanislaus have been primarily ad hoc. Water sales that moved water

downstream, provided benefits for water quality and endangered species along the way, and generated income for irrigators have helped to stave off some direct conflict between uses. The State of California relaxed water quality objectives tied to Stanislaus River flow releases to enable more storage for consumptive and environmental uses. And an interagency Stanislaus Operating Group, created to adaptively manage water for federally endangered fish, has worked with other agencies to apply limited water to meet both federal endangered species and state water quality goals.

Water resources planning has not been completely absent. For example, in 2015, the State required the U.S. Bureau of Reclamation to generate contingency plans for the largest reservoir on the Stanislaus River when storage reached critically low levels. Similarly, the 2014 Drought Operations Plan for the entire Central Valley and State Water Projects influenced management on the Stanislaus. But the State required these plans as a response during drought—it did not develop them in advance.

Solutions to the Stanislaus's water woes roughly follow two tracks: 1) easily attainable actions, such as ad-hoc water sales, that can quickly be implemented with low transaction costs; and 2) challenging and costly actions, such as litigation or negotiation to resolve water use priorities or change water requirements for federally endangered species. As in many other prominent river systems, in response to drought, water users and regulators on the Stanislaus have harnessed more easily attainable, shorter-term solutions without directly confronting systemic problems. While the achievement of less costly and contentious solutions should be applauded, and where possible, extended, the Stanislaus experience in water years 2014 and 2015 shows that severe drought can quickly exhaust easy solutions. Consequently, overallocated river systems like the Stanislaus may weather future droughts more successfully if they confront looming, systemic problems before the next drought occurs.

This paper explores the Stanislaus response to extreme drought. In particular, it focuses on how the stress of extreme water shortage affected environmental protection requirements. In Part I, the paper introduces the geography and water resources of the Stanislaus River, its competing environmental and consumptive demands, and environmental regulatory requirements for the system. Next, Part II details specific regulatory and management responses made by federal and state agencies and water users in the midst of severe supply constraints, primarily focusing on decisions made in water years 2014 and 2015. Then, after detailing various water demands and how they fared, Part III concludes that the following four actions could enhance drought response on the Stanislaus: 1) establishing criteria that trigger contingency planning and control relaxation of water quality and endangered species standards, all of which contemplate potential multi-year droughts; 2) clearly defining in advance of drought water use priorities and how (or if) environmental flow targets will be met in

severe drought years; 3) setting attainable environmental targets; and 4) using non-flow restoration where it is ecologically effective and complements the flow regime. Some of these actions, like expanded contingency planning, represent options that are attainable without protracted regulatory, legislative, or judicial proceedings, while others, like relaxing endangered species standards or litigating water use priorities, are likely more expensive and contentious. Finally, based on the Stanislaus experience, the paper also concludes that giving environmental agencies veto power over the regulatory decisions of other agencies allows for effective environmental protection and that regulators should continue to encourage less contentious solutions, such as water transactions that benefit downstream users while also providing environmental benefits.

## **I. Water supplies, demands, and regulatory requirements for the Stanislaus River**

I.A. *System overview.* The Stanislaus River drains an area of about 980 square miles on the western side of the Sierra Nevada Mountains in east-central California. As one of the largest tributaries to the San Joaquin River, the Stanislaus River comprises one of several important sources of freshwater to the Sacramento-San Joaquin River Delta. The Stanislaus River's average annual flow totals around 1,000,000 acre-feet ("AF").<sup>1</sup>

The Stanislaus River contains substantial storage facilities. New Melones Dam comprises the largest reservoir on the Stanislaus River, with a storage capacity of 2.4 million AF. The Bureau of Reclamation operates New Melones Dam as part of its Central Valley Project ("CVP"). In addition to New Melones Dam, the Oakdale and South San Joaquin Irrigation Districts own and operate three additional storage projects on the river: the Goodwin Diversion Dam; the Tri-Dam Project, which includes Donnell's and Beardsley Dams upstream of New Melones; and Tulloch Dam downstream of New Melones (Figure 2).<sup>2</sup>

I.B. *Water demands.* The Stanislaus River faces significant demands from irrigators and the environment. Between large senior water rights held by irrigation districts, water contracts between Reclamation and other irrigation districts, and substantial environmental flow demands, the Stanislaus is overappropriated. A recent study, which only considered water rights held by consumptive users, estimated that water rights alone allocate 391 percent of annual natural runoff on the Stanislaus.<sup>3</sup> New Melones Reservoir

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1. *New Melones Unit Project*, BUREAU OF RECLAMATION, U.S. DEP'T OF INTERIOR, [http://www.usbr.gov/projects/Project.jsp?proj\\_Name=New+Melones+Unit+Project](http://www.usbr.gov/projects/Project.jsp?proj_Name=New+Melones+Unit+Project) (last visited Mar. 18, 2016).

2. *Id.*

3. Theodore E. Grantham & Joshua H. Viers, *100 years of California's water rights system: patterns, trends and uncertainty*, 9 ENVTL. RESEARCH LETTERS 084012, 084012 (2014).

does add substantial storage capacity to the system to buffer interannual variability in water supplies, with a capacity of nearly two and a half times the mean annual flow of the Stanislaus River.<sup>4</sup> But when inflow to New Melones Reservoir falls below 600,000 AF, two irrigation districts—the Oakdale and South San Joaquin Irrigation Districts—hold an agreement with Reclamation to receive more than the entire annual inflow of the Stanislaus River at New Melones.<sup>5</sup> Reclamation and the districts signed this agreement to protect the districts’ senior water rights, which pre-date New Melones Reservoir. Inflow to New Melones Reservoir fell below 600,000 AF in 21 years between 1909 and 2012 (Figure 1).<sup>6</sup>

In addition, in critically dry years, federal endangered species protections for the Stanislaus River currently add demands of 185,259 AF.<sup>7</sup> This demand reflects minimum instream flow releases measured at Goodwin Dam (see Table 1, Figures 2, 3). In 40 of the years between 1909 and 2012, the annual inflow of the Stanislaus River at New Melones would not have been sufficient to satisfy the districts’ rights and these federal endangered species flows (Figure 1).<sup>8</sup> Finally, the California State Water Resources Control Board also requires additional environmental releases from New Melones to satisfy water quality objectives for salinity, flow, and dissolved oxygen, which total at least 70,000 AF.<sup>9</sup> While some water released from New Melones jointly satisfies federal endangered species and state water quality requirements, much of it does not. Accordingly, prolonged droughts may result in major irrigation and environmental demands exceeding available supplies.

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4. BUREAU OF RECLAMATION, *supra* note 1.

5. BUREAU OF RECLAMATION, U.S. DEP’T OF INTERIOR, OAKDALE IRRIGATION DIST., & SOUTH SAN JOAQUIN IRRIGATION DIST., AGREEMENT AND STIPULATION (1988), *available at* <http://www.oisw.org/app/download/9316354/OID+1972+,1988+Water+Agreements.pdf>.

6. Independent analysis based on data in DAVID M. MEKO ET AL., KLAMATH/SAN JOAQUIN/SACRAMENTO HYDROCLIMATIC RECONSTRUCTIONS FROM TREE RINGS (2014), *available at* [http://www.water.ca.gov/waterconditions/docs/tree\\_ring\\_report\\_for\\_web.pdf](http://www.water.ca.gov/waterconditions/docs/tree_ring_report_for_web.pdf); *Stanislaus River inflow to New Melones Lake*, TREEFLOW, <http://treeflow.info/content/stanislaus-river-inflow-new-melones-lake> (last visited Mar. 18, 2016).

7. NAT’L MARINE FISHERIES SERV., U.S. DEP’T OF COMMERCE, LONG-TERM OPERATIONS OF THE CENTRAL VALLEY PROJECT AND STATE WATER PROJECT, APPENDIX 2-E: STANISLAUS RIVER MINIMUM FLOWS FOR FISH NEEDS (2009), *available at* [http://www.westcoast.fisheries.noaa.gov/publications/Central\\_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/appendix\\_2-rpa\\_supporting\\_documents\\_compiled.pdf](http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/appendix_2-rpa_supporting_documents_compiled.pdf).

8. *Supra* note 6.

9. CAL. STATE WATER RES. CONTROL BD., DECISION 1422: IN THE MATTER OF APPLICATIONS 14858, 14859, 19303 AND 19304 TO APPROPRIATE FROM THE STANISLAUS RIVER IN CALAVERAS AND TUOLUMNE COUNTIES 11 (1973), *available at* [http://www.waterboards.ca.gov/waterrights/board\\_decisions/adopted\\_orders/decisions/d1400\\_d1449/wrd1422.pdf](http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1400_d1449/wrd1422.pdf). The water rights permit that the Board issued for the Bureau’s withdrawals from the Stanislaus River system expresses these water quality objectives. *Id.*

1.B.1. *Water rights, contracts, and agreements.* Four major water users rely on the Stanislaus River: the Central San Joaquin Water Conservation District, Oakdale Irrigation District, Stockton East Water District, and South San Joaquin Irrigation District.<sup>10</sup> The Oakdale and South San Joaquin Irrigation Districts share pre-1914 appropriative direct flow rights to Stanislaus River water that entitle them to 908.3 cubic feet per second (“cfs”) of water each.

These two districts also share a pre-1914 3,600 AF storage right in Goodwin Diversion Dam and post-1914 storage rights to 112,500 AF in the original Melones Reservoir, which the New Melones Reservoir submerged, and 230,400 AF for the Tri-Dam Project. Oakdale also holds small post-1914 direct flow rights that entitle it to less than 10 cfs of direct flow near the city of Oakdale.<sup>11</sup> Unlike the Oakdale and South San Joaquin Irrigation Districts, the Stockton East Water District and Central San Joaquin Water Conservation District own no state water rights on the Stanislaus River. They do, however, hold contracts with Reclamation to receive up to 155,000 AF of water each year, though Reclamation has no obligation to deliver this water in drought years.<sup>12</sup>

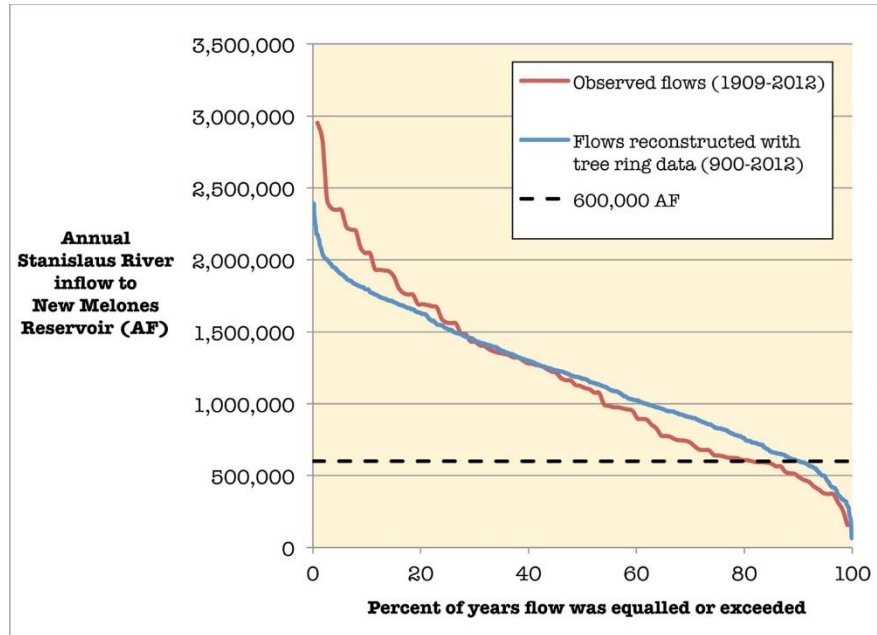
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10. BUREAU OF RECLAMATION, *supra* note 1.

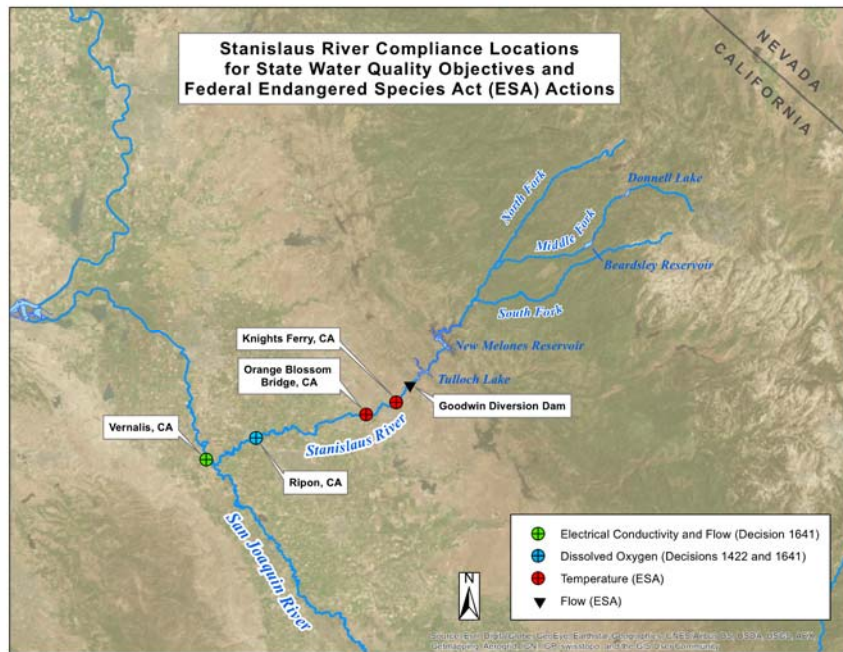
11. OAKDALE IRRIGATION DIST., OAKDALE IRRIGATION DIST. WATER RESOURCES PLAN, APPENDIX B: WATER RESOURCES INVENTORY 1-4 (2004), *available at* [http://www.oidwaterresources.org/\\_pdf/OID\\_tech\\_App\\_B.pdf](http://www.oidwaterresources.org/_pdf/OID_tech_App_B.pdf).

12. BUREAU OF RECLAMATION, *supra* note 1.

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**Figure 1:** Stanislaus River inflow to New Melones Reservoir falls below 600,000 AF threshold in 19 percent of years in observed record and 10 percent of years in reconstructed paleoclimate record.



**Figure 2:** Stanislaus River compliance locations for state water quality objectives and federal ESA actions.

Because Reclamation's construction of New Melones Dam threatened legal injury to the Oakdale and South San Joaquin Irrigation Districts' senior water rights, in 1972 these two districts and Reclamation entered into an agreement for delivery of water for the districts' senior rights. Reclamation and the districts revised this agreement in 1988. Under the terms of the 1988 Agreement, the districts receive the first 600,000 AF of inflow into New Melones each year. In drier years when annual inflow falls below 600,000 AF, however, the districts receive the following volume of water:

### Inflow to New Melones Reservoir

$$+ \left( \frac{600,000 \text{ AF} - \text{inflow to New Melones Reservoir}}{3} \right)$$

This formula, accordingly, relies on water in storage to provide the districts more water than the inflow to New Melones in these drier years. The 1988 Agreement also allows the districts to bank unused stored water up to a cumulative volume of 200,000 AF for use in future years in New Melones Reservoir. But their ability to use banked water in their conserved water account during drought years is heavily circumscribed. The 1988 Agreement restricts the districts' use of their conserved water accounts during years when Reclamation does not completely fulfill CVP users' firm water contracts. In these years, the districts often may not use conserved water to exceed 450,000 AF in diversions.<sup>13</sup>

1.B.2. *Environmental requirements.* Substantial environmental water requirements also drive management of the Stanislaus River. Environmental requirements affecting water use on the Stanislaus River derive from two primary legal sources: the federal Endangered Species Act ("ESA") and water quality objectives written into state water rights permits. While federal ESA requirements on the Stanislaus primarily seek to protect federally listed species, including Central Valley steelhead and spring-run Chinook salmon, the state's water quality objectives also seek to protect commercially important species, such as fall-run Chinook salmon.

First, to comply with Section 7 of the ESA, Reclamation must pursue certain actions—known as reasonable and prudent alternative ("RPA") actions—to avoid jeopardizing spring-run Chinook salmon and steelhead, among other fish. A Biological Opinion that the National Marine Fisheries Service ("NMFS") completed in 2009 and amended in 2011 for the CVP

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13. BUREAU OF RECLAMATION, OAKDALE IRRIGATION DIST., & SOUTH SAN JOAQUIN IRRIGATION DIST., *supra* note 5. The districts may only use conserved water to exceed 450,000 AF of diversions in years when Reclamation shorts firm contractors and the following inequality is satisfied: (CVP users' shortage percentage) x (districts' annual entitlement) > 450,000 AF. *Id.*

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stipulates that Reclamation perform three flow-related RPA actions on the Stanislaus River: 1) maintain water temperatures sufficient for steelhead rearing, spawning, egg incubation, smoltification, and adult migration; 2) implement a minimum flow schedule that supplies minimum base flows, fall pulse flows, winter instability flows, outmigration flow cues, and late spring flows; and 3) limit CVP and State Water Project (“SWP”) exports based on San Joaquin River flows at Vernalis, California, located just downstream of the San Joaquin River’s confluence with the Stanislaus (Table 1).<sup>14</sup> Flow-related actions in the RPA vary based on water availability in the Stanislaus River in a particular year, with lower flows required in drought years. For example, while pulse flows include around 589,000 AF of water in a wet year, during a critically dry year, they include just 185,259 AF.<sup>15</sup> The RPA also includes non-flow restoration actions, such as gravel augmentation to improve spawning habitat and floodplain and side-channel restoration.<sup>16</sup>

<b>Standard</b>	<b>Location of measurement</b>	<b>Source of requirement</b>
Dissolved oxygen shall not be reduced below 7.0 mg/L.	Ripon, CA	Decision 1422 <sup>17</sup>
Maximum 30-day running average of mean daily electrical conductivity is 0.7 millimhos/cm from April to August and 1.0 millimhos/cm from September to March.	Vernalis, CA	Decision 1641 <sup>18</sup>
Minimum monthly average flow rate (for critically dry years per San Joaquin Valley Hydrologic Classification): <ul style="list-style-type: none"> <li>• <b>Feb. 1-Apr. 14 and May 16-June 30:</b> 710 or 1,140 cfs<sup>19</sup></li> </ul>	Vernalis, CA	Decision 1641 <sup>20</sup>

14. NAT’L MARINE FISHERIES SERV., U.S. DEP’T OF COMMERCE, LONG-TERM OPERATIONS OF THE CENTRAL VALLEY PROJECT AND STATE WATER PROJECT 46-55 (2011), *available at* [http://www.westcoast.fisheries.noaa.gov/publications/Central\\_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711\\_ocap\\_opinion\\_2011\\_amendments.pdf](http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/040711_ocap_opinion_2011_amendments.pdf).

15. NAT’L MARINE FISHERIES SERV., *supra* note 7.

16. NAT’L MARINE FISHERIES SERV., *supra* note 14.

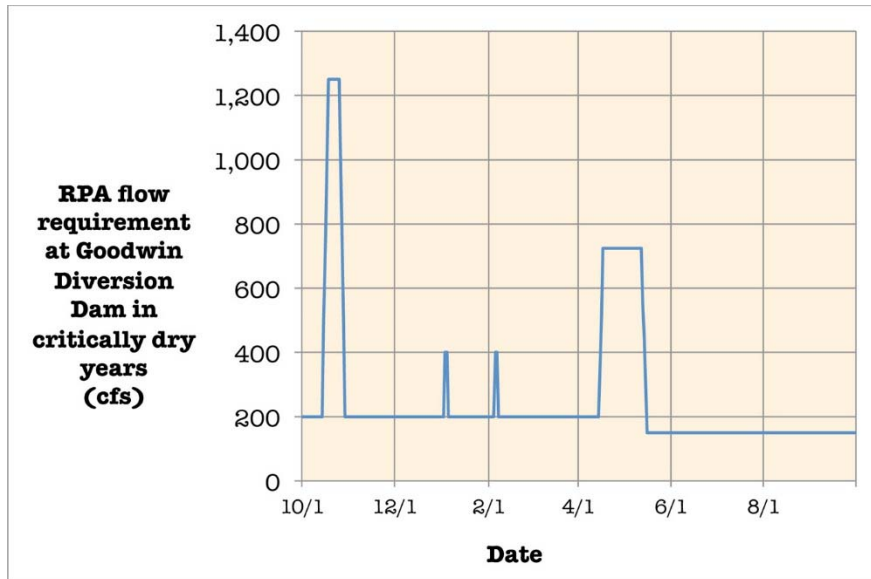
17. CAL. STATE WATER RES. CONTROL BD., *supra* note 9, at 35; CAL. REG’L WATER QUALITY CONTROL Bd., THE WATER QUALITY CONTROL PLAN FOR THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD CENTRAL VALLEY REGION III-5.00 (2004), *available at* [http://www.waterboards.ca.gov/centralvalley/water\\_issues/basin\\_plans/newpages200409.pdf](http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/newpages200409.pdf).

18. CAL. STATE WATER RES. CONTROL Bd., REVISED WATER RIGHT DECISION 1641, IN THE MATTER OF: IMPLEMENTATION OF WATER QUALITY OBJECTIVES FOR THE SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA ESTUARY 182 (2000), *available at* [http://www.waterboards.ca.gov/waterrights/board\\_decisions/adopted\\_orders/decisions/d1600\\_d1649/wrd1641\\_1999dec29.pdf](http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1649/wrd1641_1999dec29.pdf).

19. The “or” in both requirements reflects whether higher flows on the San Joaquin River are needed to help DWR and the Bureau meet X2 estuarine objective requirements in Table 4 of Decision 1641. *Id.* at 186.

20. *Id.* at 184.

<ul style="list-style-type: none"> <li>• <b>Apr. 15-May 15:</b> 3,110 or 3,540 cfs</li> <li>• <b>October:</b> 1,000 cfs</li> </ul>																	
<p>Reclamation shall manage the cold water supply within New Melones Reservoir and make cold water releases from New Melones Reservoir to provide suitable temperatures for Central Valley steelhead rearing, spawning, egg incubation, smoltification, and adult migration in the Stanislaus River downstream of Goodwin Dam in order to maintain the following temperature compliance schedule:</p> <table border="1"> <thead> <tr> <th>Criterion and Temperature Compliance Location</th> <th>Duration</th> <th>Steelhead Life Stage Benefit</th> </tr> </thead> <tbody> <tr> <td>Temperature below 56°F at Orange Blossom Bridge (OBB)</td> <td>Oct 1*-Dec 31</td> <td>Adult migration</td> </tr> <tr> <td>Temperature below 52 °F at Knights Ferry and 57°F at OBB</td> <td>Jan 1-May 31</td> <td>Smoltification</td> </tr> <tr> <td>Temperature Below 55°F at OBB</td> <td>Jan 1-May 31</td> <td>Spawning and incubation</td> </tr> <tr> <td>Temperature below 65°F at OBB</td> <td>June 1-Sept 30</td> <td>Juvenile rearing</td> </tr> </tbody> </table> <p><small>*This criterion shall apply as of October 1 or as of initiation date of fall pulse flow as agreed to by NMFS.</small></p> <p>Temperature compliance shall be measured based on a seven-day average daily maximum temperature.</p>	Criterion and Temperature Compliance Location	Duration	Steelhead Life Stage Benefit	Temperature below 56°F at Orange Blossom Bridge (OBB)	Oct 1*-Dec 31	Adult migration	Temperature below 52 °F at Knights Ferry and 57°F at OBB	Jan 1-May 31	Smoltification	Temperature Below 55°F at OBB	Jan 1-May 31	Spawning and incubation	Temperature below 65°F at OBB	June 1-Sept 30	Juvenile rearing	Orange Blossom Bridge and Knights Ferry	Biological Opinion RPA <sup>21</sup>
Criterion and Temperature Compliance Location	Duration	Steelhead Life Stage Benefit															
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Temperature Below 55°F at OBB	Jan 1-May 31	Spawning and incubation															
Temperature below 65°F at OBB	June 1-Sept 30	Juvenile rearing															
<p>In critically dry years, Reclamation shall operate releases from the East Side Division reservoirs to achieve the minimum flow schedule in Figure 3, unless NMFS approves an alternative schedule.</p>	Goodwin Diversion Dam	Biological Opinion RPA <sup>22</sup>															
<p>In critically dry years, from April 1-May 31, the ratio of Vernalis flow to CVP and SWP combined exports should not exceed 1:1, although exceptions allow additional exports if Reclamation and the California Department of Water Resources ("DWR") cannot meet required deliveries for human health and safety under some circumstances.</p>	Vernalis, CA	Biological Opinion RPA <sup>23</sup>															



**Figure 3:** Flow requirements for critically dry years in RPA for Goodwin Diversion Dam.

21. NAT'L MARINE FISHERIES SERV., *supra* note 14, at 47-48.  
 22. *Id.* at 49.  
 23. *Id.* at 70.

The RPA affords Reclamation some flexibility to implement flow schedules and to deviate slightly from mandated targets. Under the RPA, an interagency Stanislaus Operating Group may adaptively manage RPA flows.<sup>24</sup> At a minimum, the Stanislaus Operating Group consists of representatives from Reclamation, NMFS, the U.S. Fish and Wildlife Service (“USFWS”), the California Department of Fish and Wildlife (“CDFW”), and the State Water Resources Control Board (“SWRCB”).<sup>25</sup> Specifically, the RPA provides that “[b]ased on the advice of the [Stanislaus Operating Group] and the concurrence by NMFS, the flows may be implemented with minor modifications to the timing, magnitude, and/or duration, as long as NMFS concurs that the rationale for the shift in timing, magnitude, and/or duration is deemed by NMFS to be consistent with the intent of the action.”<sup>26</sup> The RPA explains that “[f]or example, Reclamation may execute shorter duration pulses more frequently (e.g., 2-4 times) during the longer pulse period.”<sup>27</sup> Changes to the RPA action that sought to alter the volume of water released for RPA flows, however, might require re-initiation of ESA Section 7 consultation. *See* Nat’l Marine Fisheries Serv., Long-Term Operations of the Central Valley Project and State Water Project (2011) at 8 (providing that “[r]ecommended changes outside the range of flexibility specified in the implementation procedures must receive written review and concurrence by NMFS and may trigger re-initiation.”).

The RPA also allows Reclamation to exceed the temperature criteria. Similar to adaptive management of flows, the RPA establishes an exception procedure for temperature exceedances. If, based on three-day average daily maximum temperature values, Reclamation exceeds or expects to exceed any temperature criterion in the RPA, it must “immediately notify NMFS of this condition and shall submit to NMFS a written documentation that, after taking all actions within its authorities, it is unlikely to meet the above temperature requirement and the extent and duration of the expected exceedance.”<sup>28</sup> Then, if “Reclamation determines that other nondiscretionary requirements . . . conflict with attainment of the temperature requirement, Reclamation will convene [the Stanislaus Operating Group] to obtain recommendations.”<sup>29</sup> As with modifications to the RPA environmental flow schedule, NMFS must ultimately approve temperature exceedances.<sup>30</sup>

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24. *Id.* at 50.

25. *Id.* at 47.

26. *Id.* at 50.

27. *Id.*

28. *Id.* at 47-48.

29. *Id.* at 48.

30. *Id.* If the Stanislaus Operating Group cannot reach consensus about the temperature exceedances, the “[Stanislaus Operating Group] shall advise NMFS, and NMFS will make a recommendation to the [Water Operations Management Team],”

Water quality objectives that the SWRCB inserted in water rights permits for New Melones Dam and the CVP also heavily affect management of the Stanislaus. State Board Decision 1422, which assigns state water rights for New Melones to Reclamation, establishes that Reclamation must release water from New Melones to satisfy the dissolved oxygen standard of 7.0 mg/L at Ripon, California specified in the Water Quality Control Plan for the Sacramento-San Joaquin River Delta.<sup>31</sup> Meanwhile, State Board Decision 1641 specifies that Reclamation must meet additional water quality objectives for salinity and streamflows at Vernalis, California, which sits on the San Joaquin River just downstream of its confluence with the Stanislaus (Table 1).<sup>32</sup>

Similar to NMFS' authority to alter RPA actions, the SWRCB holds authority to temporarily modify these water quality objectives in urgent situations. California Water Code section 1435 lends the SWRCB authority to issue orders approving temporary urgency change petitions ("TUCP orders" or "temporary change orders") for holders of water rights permit or licenses who face an "urgent need to change a point of diversion, place of use, or purpose of use."<sup>33</sup> These water right permittees or licensees must petition the SWRCB for approval of their temporary change, and the SWRCB may issue the order without following the procedures or provisions that would typically apply to these changes.<sup>34</sup> Nonetheless, before issuing a temporary change order, the SWRCB must make four findings:

- 1) The permittee or licensee has an urgent need to make the proposed change.
- 2) The proposed change may be made without injury to any other lawful user of water.

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another interagency team that makes operational decisions for the CVP and the State Water Project. *Id.* The Water Operations Management Team may either concur with NMFS' recommendation or suggest an alternative. *Id.* at 8-9. NMFS then must make a final determination that the temperature exceedances are consistent with ESA obligations. *Id.*

31. CAL. STATE WATER RES. CONTROL BD., *supra* note 9, at 35; CAL. REG'L WATER QUALITY CONTROL BD., *supra* note 17, at III-5.00.

32. CAL. STATE WATER RES. CONTROL BD., *supra* note 18, at 184.

33. CAL. WATER CODE § 1435(a) (West 2015). For purposes of a temporary change order, the Water Code defines "urgent need" as "the existence of circumstances from which the [SWRCB] may in its judgment conclude that the proposed temporary change is necessary to further the constitutional policy that the water resources of the state be put to beneficial use to the fullest extent to which they are capable and that waste of water be prevented; except that the [SWRCB] shall not find a petitioner's need to be urgent if the [SWRCB] in its judgment concludes, if applicable, that the petitioner has not exercised due diligence either (1) in petitioning for a change pursuant to provisions of this division other than this chapter, or (2) in pursuing that petition for change." CAL. WATER CODE § 1435(c) (West 2015).

34. *Id.*

3) The proposed change may be made without unreasonable effect upon fish, wildlife, or other instream beneficial uses.

4) The proposed change is in the public interest, including findings to support change order conditions imposed to ensure that the change is in the public interest, and may be made without injury to any other lawful user of the water, and without unreasonable effect upon fish, wildlife, and other instream beneficial uses.

Cal. Water Code § 1435(b).

In evaluating whether a temporary change would cause unreasonable environmental impacts, the SWRCB considers a broader set of fish and wildlife interests that the federal ESA or California Endangered Species Act (“CESA”) would not explicitly protect, such as commercially important fall-run Chinook salmon.<sup>35</sup> Nevertheless, if the SWRCB makes the four required findings, it may approve much more drastic changes to its own water quality objectives than NMFS may under the RPA. For example, the SWRCB may completely waive or heavily reduce certain environmental flow requirements through a temporary change order.<sup>36</sup>

## **II. Water resource management decisions during the drought: water years 2014-15**

From 2011 to 2016, California experienced the worst multi-year drought since instrumental records began in 1895.<sup>37</sup> As a response to the drought, during water years 2014 and 2015 on the Stanislaus, the SWRCB relaxed water quality objectives for dissolved oxygen and environmental flows via a series of temporary change orders. Likewise, within the procedures and limits set in the RPA, Reclamation proposed and NMFS approved environmental flow schedules during this period that differed from the RPA actions; NMFS also allowed consistent exceedances of the RPA’s temperature criteria. Water sales from upstream users—the Oakdale and South San Joaquin Irrigation Districts—to buyers downstream of the federal

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35. See, e.g., CAL. STATE WATER RES. CONTROL BD., CAL. ENVT’L PROTECTION AGENCY, APRIL 6, 2015 ORDER MODIFYING AN ORDER THAT APPROVED IN PART AND DENIED IN PART A PETITION FOR TEMPORARY URGENCY CHANGES TO LICENSE AND PERMIT TERMS AND CONDITIONS REQUIRING COMPLIANCE WITH DELTA WATER QUALITY OBJECTIVES IN RESPONSE TO DROUGHT CONDITIONS 32 (2015), available at [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/docs/tucp/2015/tucp\\_order040615.pdf](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/tucp/2015/tucp_order040615.pdf) [hereinafter APRIL 6, 2015 ORDER].

36. See, e.g., *id.* at 37-42.

37. Rebecca Lindsey, *California Facing Worst Drought on Record*, CLIMATE.GOV, NAT’L OCEANIC AND ATMOSPHERIC ADMIN. (Jan. 29, 2014), <https://www.climate.gov/news-features/event-tracker/california-facing-worst-drought-record>.

and state compliance point at Vernalis also played a significant role in the Stanislaus drought response.

This Part details these specific decisions and the rationale that agencies provided for them. In non-drought years, the SWRCB does not usually issue sweeping temporary change orders like it did in 2014 and 2015. But before the drought, NMFS did regularly approve temperature exceedances and environmental flow schedules that differed from the RPA actions. NMFS' approval of different environmental flow schedules in previous years and throughout much of the drought did not shortchange the volume of water released for listed steelhead and Chinook; instead, these changes retimed releases in a manner that ecologists expected would improve their effectiveness.<sup>38</sup> At times during the drought, however, Reclamation used this flexibility to retime pulse flows so that they simultaneously satisfied both federal ESA requirements and state water quality objectives,<sup>39</sup> which may have resulted in less water for the environment. Likewise, during the winter of 2015, NMFS allowed Reclamation to substitute natural storm flows for winter flow releases.<sup>40</sup>

II.A. SWRCB *changes to state water quality objectives*. In a series of temporary change orders for state water rights in water years 2014 and 2015, the SWRCB relaxed required flows at Vernalis and dissolved oxygen standards at Ripon.<sup>41</sup> These lower flow and dissolved oxygen standards held back water

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38. STANISLAUS OPERATING GRP., ANNUAL REPORT OF ACTIVITIES: OCTOBER 1, 2013 TO SEPTEMBER 30, 2014 8-22 (2014), <http://deltacouncil.ca.gov/sites/default/files/2014/10/SOG-Annual-Report-final-pdf-with-Appendix-A-10-3-2014.pdf> [hereinafter 2014 SOG REPORT]; STANISLAUS OPERATING GRP., ANNUAL REPORT OF ACTIVITIES: WATER YEAR 2015 7-10 (2015), <http://deltacouncil.ca.gov/sites/default/files/2015/10/Item%205%202015%20SOG%20Annual%20Report%20with%20Attachments.pdf> [hereinafter 2015 SOG REPORT]; Telephone Interview with Tim Heyne, Senior Scientist, Cal. Dep't of Fish and Wildlife (Mar. 2, 2016); Telephone Interview with Barbara Byrne, Biologist, Nat'l Marine Fisheries Serv., Nat'l Oceanic and Atmospheric Admin., Kristin White, Program Manager, Bureau of Reclamation, U.S. Dep't of Interior, & Janice Piñero, Endangered Species Compliance Specialist, Bureau of Reclamation, U.S. Dep't of Interior (Mar. 4, 2016).

39. CAL. STATE WATER RES. CONTROL BD., CAL. ENVT'L PROTECTION AGENCY, OCTOBER 7, 2014 ORDER MODIFYING AN ORDER THAT APPROVED A TEMPORARY URGENCY CHANGE IN LICENSE AND PERMIT TERMS AND CONDITIONS REQUIRING COMPLIANCE WITH DELTA WATER QUALITY OBJECTIVES IN RESPONSE TO DROUGHT CONDITIONS 10-14 (2014), *available at* [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/docs/tucp/10072014\\_tucp\\_order.pdf](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/tucp/10072014_tucp_order.pdf) [hereinafter OCTOBER 7, 2014 ORDER].

40. 2015 SOG REPORT, *supra* note 38, at 8-9.

41. With the exception of the TUCP order for dissolved oxygen on the Stanislaus, all of these TUCP orders packaged many changes for CVP and SWP operations into a single order. *See State Water Project and Central Valley Project Temporary Urgency Change Petition*, CAL. STATE WATER RES. CONTROL BD., [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/tucp/index.shtml](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/tucp/index.shtml) (last visited Mar. 18, 2016). This paper only lists the TUCP orders for the CVP and SWP that change water quality objectives that are directly relevant to the Stanislaus River.

that otherwise would have been released. Meanwhile, in 2014 and 2015, the SWRCB allowed some of this water to be reserved for consumptive users, while some was stored for the environment. In finding that the relaxed standards did not cause unreasonable effects for fish, wildlife, or other instream beneficial uses, the SWRCB typically stated that its orders struck a reasonable balance between environmental and non-environmental water uses. In some orders, the SWRCB explicitly acknowledged that relaxing water quality objectives to fulfill consumptive water needs could have negative ecological consequences.<sup>42</sup> For example, the Board's order relaxing water quality standards in February and March of 2015 acknowledged that it could reduce survival of steelhead, salmonids, and green sturgeon migrating through the San Joaquin River. Because relaxing the flow and dissolved oxygen standards helped to fulfill the demands of senior water rights holders and contractors on the Stanislaus River, however, the SWRCB found any remaining environmental impacts to be reasonable.<sup>43</sup>

Meanwhile, due to extreme drought conditions, strict enforcement of the State's flow and dissolved oxygen standards could also have impeded environmental goals. On more than one occasion, the SWRCB explained in its orders that relaxing flow and dissolved oxygen standards kept more cold water in storage to aid future temperature and salinity management.<sup>44</sup> The Board also noted that relaxing its flow and dissolved oxygen standards helped to maximize coordination of state water quality objectives with federal ESA releases, and that its orders required Reclamation and the California Department of Water Resources ("DWR") to coordinate in real time with fisheries agencies and the Board to avoid unreasonable environmental impacts.<sup>45</sup> Coordination of state and federal water requirements may promote more efficient use of water, but it may also simply mean that the environment receives less water.

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Moreover, the SWRCB technically only issued two TUCP orders for the CVP and SWP—one TUCP each for water years 2014 and 2015—and then modified these orders on multiple occasions throughout both of these water years. And because California Governor Jerry Brown's January 17, 2014 Drought Emergency Proclamation suspended the California Environmental Quality Act ("CEQA") and its implementing regulations to the extent they would apply to SWRCB actions to mitigate the effects of the drought, CEQA did not apply to these orders.

42. See *infra* Table 2 and associated notes.

43. CAL. STATE WATER RES. CONTROL BD., CAL. ENVT'L PROTECTION AGENCY, ORDER APPROVING IN PART AND DENYING IN PART A PETITION FOR TEMPORARY URGENCY CHANGES TO LICENSE AND PERMIT TERMS AND CONDITIONS REQUIRING COMPLIANCE WITH DELTA WATER QUALITY OBJECTIVES IN RESPONSE TO DROUGHT CONDITIONS 12, 17-19 (2015), available at [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/docs/tucp/2015/tucp\\_order020315.pdf](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/tucp/2015/tucp_order020315.pdf) [hereinafter FEB. 3, 2015 ORDER].

44. See *infra* Table 2 and associated notes.

45. See, e.g., OCTOBER 7, 2014 ORDER, *supra* note 39, at 10-14.

Finally, although the SWRCB made its own, slightly different findings regarding the reasonableness of environmental impacts, it emphasized in each of its TUCP orders that fisheries agencies, including NMFS and CDFW, concurred that the changes SWRCB approved complied with the federal ESA and CESA.<sup>46</sup> Table 2 catalogues temporary changes that the SWRCB approved to water quality objectives alongside synopses of the SWRCB's legal findings for why the changes met two of the criteria for approving a TUCP: findings of 1) urgency; and 2) no unreasonable effects on fish, wildlife, or other instream beneficial uses.

**Table 2:** Temporary changes to water quality objectives directly relevant to Stanislaus River management approved by the SWRCB during water years 2014 and 2015

April 11, 2014 – June 30, 2014

- **Changes approved by the SWRCB:**
  - The State Board reduced minimum monthly average flow rate requirements from 710 or 1,140 cfs<sup>47</sup> to 700 cfs (before pulse flow) and 500 cfs (after pulse flow).<sup>48</sup>
  - The State Board reduced the required pulse flow from a month-long pulse with a minimum monthly average flow rate of 3,110 or 3,540 cfs to a 31-day pulse that consisted of 16 days at 3,300 cfs and 15 days at 1,500 cfs.<sup>49</sup>
- **SWRCB rationale for existence of “urgent needs”**
  - The SWRCB first approved this TUCP order for the CVP and SWP on January 31, 2014 but did not approve changes to management of the Stanislaus until April 11, 2014. The SWRCB's January 31 TUCP order emphasized the dire nature of the California drought, noting that “California is experiencing unprecedented dry conditions that were not foreseen or accounted for in the

46. CAL. STATE WATER RES. CONTROL BD., CAL. ENV'T'L PROTECTION AGENCY, APRIL 11, 2014 ORDER MODIFYING AN ORDER THAT APPROVED A TEMPORARY URGENCY CHANGE IN LICENSE AND PERMIT TERMS AND CONDITIONS REQUIRING COMPLIANCE WITH DELTA WATER QUALITY OBJECTIVES IN RESPONSE TO DROUGHT CONDITIONS 6 (2014), *available at* [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/docs/20140411\\_revised\\_tucp\\_order.pdf](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/20140411_revised_tucp_order.pdf) [hereinafter APRIL 11, 2014 ORDER]; OCTOBER 7, 2014 ORDER, *supra* note 39, at 8; FEB. 3, 2015 ORDER, *supra* note 43, at 8; APRIL 6, 2015 ORDER, *supra* note 35, at 32; CAL. STATE WATER RES. CONTROL BD., CAL. ENV'T'L PROTECTION AGENCY, ORDER APPROVING TEMPORARY URGENCY CHANGE 9 (2015), *available at* [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/applications/transfers\\_tu\\_notices/usbr/docs/stan\\_order080415.pdf](http://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/transfers_tu_notices/usbr/docs/stan_order080415.pdf) [hereinafter AUGUST 4, 2015 ORDER].

47. CAL. STATE WATER RES. CONTROL BD., *supra* note 18, at 186. Again, the “or” in both requirements reflects whether higher flows on the San Joaquin River are needed to help DWR and the Bureau meet X2 estuarine objective requirements in Table 4 of Decision 1641.

48. APRIL 11, 2014 ORDER, *supra* note 46, at 7-10.

49. *Id.*



development of [the water quality objectives that the SWRCB has set for CVP and SWP water rights permits].<sup>50</sup> The April 11 modification to this order found that the urgency for its new changes was consistent with the prior TUCP Order. The April 11 modification also emphasized that the SWRCB expected hydrologic conditions in the San Joaquin River basin to remain critical for the rest of 2014, that below-average storage existed in San Joaquin River reservoirs, and that Reclamation had no opportunity to purchase water. Finally, the April 11 modification noted that water supplies for New Melones contractors had been decreased and that Reclamation needed remaining supplies in the reservoir to “meet multiple purposes this year and in 2015, including temperature management and salinity control.”<sup>51</sup>

- **SWRCB rationale for lack of unreasonable effects on fish, wildlife, or other instream beneficial uses**
  - Emphasizing that the April 11, 2014 modified TUCP order still raised Stanislaus River flows above lower requirements in the RPA, which the Board felt would help fall-run Chinook salmon, steelhead and other species in the Stanislaus and lower San Joaquin Rivers, the SWRCB found that its modified order struck a reasonable balance between protecting environmental and other water uses. The SWRCB also noted that the modified order allowed more cold-water storage to support temperature management on the Stanislaus River in 2014 and 2015.<sup>52</sup>

October 1, 2014 – November 30, 2014

- **Changes approved by the SWRCB:**
  - The State Board lowered flows for the October pulse flow from a minimum monthly average flow of 1,000 cfs to 800 cfs, and it expanded the period during which the pulse could be released to a 31-day period during October and November to allow for releases of cooler water alongside storm events.<sup>53</sup>
- **SWRCB rationale for existence of “urgent needs”**
  - In addition to its prior rationale for urgency, because New Melones Reservoir storage had dropped to 39 percent of its historical average during the late fall (520,000 AF), the SWRCB found this October 7, 2014 modified TUCP order to be urgent. The SWRCB emphasized that this order would conserve approximately 12,000 AF of water, and that the change would conserve water in storage for fish, wildlife, and other beneficial uses in 2014 and 2015.<sup>54</sup>
- **SWRCB rationale for lack of unreasonable effects on fish, wildlife, or other instream beneficial uses**

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50. CAL. STATE WATER RES. CONTROL BD., CAL. ENV'T'L PROTECTION AGENCY, ORDER APPROVING A TEMPORARY URGENCY CHANGE IN LICENSE AND PERMIT TERMS AND CONDITIONS REQUIRING COMPLIANCE WITH DELTA WATER QUALITY OBJECTIVES IN RESPONSE TO DROUGHT CONDITIONS 8 (2014), *available at* [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/docs/tucp/bd\\_change\\_order.pdf](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/tucp/bd_change_order.pdf) [hereinafter JAN. 31, 2014 ORDER].

51. *Id.* at 5.

52. APRIL 11, 2014 ORDER, *supra* note 46, at 6.

53. OCTOBER 7, 2014 ORDER, *supra* note 39, at 10-14.

54. *Id.* at 7.

- The SWRCB provided many reasons explaining why the October 7, 2014 modified TUCP order did not cause unreasonable environmental effects. The Board's rationale included saving 12,000 AF in New Melones Reservoir for fisheries and other purposes; later pulse flows would support adult fall-run Chinook salmon migration when water temperatures were colder; the order maximized coordination of state water quality objective releases with federal ESA releases; and the order required Reclamation and DWR to coordinate in real time with fisheries agencies and the SWRCB to avoid unreasonable environmental impacts. Because the State had entered its third year of drought, the SWRCB also noted that the order appropriately balanced current and future needs.<sup>55</sup>

February 3, 2015 – March 31, 2015

- **Changes approved by the SWRCB:**
  - The State Board reduced the minimum monthly average flow rate from 710 or 1,140 cfs to 500 cfs.<sup>56</sup>
- **SWRCB rationale for existence of “urgent needs”**
  - Because California had experienced unprecedented, prolonged drought conditions, the SWRCB emphasized that conserving stored water in case drought persisted made Reclamation and DWR's petition urgent. In this finding, the SWRCB also clarified that the primary beneficiaries of this change would be consumptive water users. Because water users had faced substantial shortages in the prior year, the SWRCB found the change petition to be urgent.<sup>57</sup>
- **SWRCB rationale for lack of unreasonable effects on fish, wildlife, or other instream beneficial uses**
  - Despite noting that “life history diversity of steelhead may be affected due to reduced survival through the San Joaquin River migration corridor” and “modification of . . . Vernalis flows may reduce survival of juvenile listed salmonids, steelhead and green sturgeon,” the SWRCB found that its February 3, 2015 order would not cause unreasonable impacts to fish, wildlife, or other instream beneficial uses.<sup>58</sup> The SWRCB's finding appears to have primarily been driven by the needs of water users. *See* Feb. 3, 2015 Order at 17-18 (acknowledging that “existing regulatory requirements . . . would likely ensure that . . . minimal requirements [for temperature control for fish and salinity control in the Delta] are met regardless of the changes. . . . the changes will primarily benefit water supplies.”). The Board's finding expressly states that increased water supplies will benefit senior water rights holders and contractors on the Stanislaus River. Nevertheless, because the order would meet temperature control requirements while balancing consumptive, wildlife refuge, and salinity control uses of stored water in CVP and SWP reservoirs, the Board found that any environmental impacts of the order were reasonable.<sup>59</sup>

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55. *Id.* at 8-9.

56. FEB. 3, 2015 ORDER, *supra* note 43, at 21-25.

57. *Id.* at 15-16.

58. *Id.* at 12, 17-19.

59. *Id.* at 17-19.

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March 25, 2015 – June 30, 2015

- **Changes approved by the SWRCB:**
  - The State Board shifted the spring pulse flow from April 15 through May 15 to March 25 through April 25 and reduced the pulse flow from a minimum monthly average flow rate of 3,110 or 3,540 cfs to 710 cfs.<sup>60</sup>
  - The State Board reduced minimum flows from a minimum monthly average flow rate of 710 or 1,140 cfs to 300 cfs (April 26 through May 31) and 200 cfs (June).<sup>61</sup>
  
- **SWRCB rationale for existence of “urgent needs”**
  - Similar to prior modifications, the SWRCB found this proposed modification to be urgent given the severity of the drought, which California had experienced for four years when the SWRCB approved this order. When changes to the Vernalis flow requirements were coupled with changes to Delta outflow and salinity compliance requirements, the SWRCB estimated that the TUCP would save 1.2 million AF from February to June of 2015. Because the dire drought conditions created a need for the State to conserve and protect water supplies and enable flexibility in making water available for different uses, the SWRCB found this modified order to satisfy the urgency criterion for TUCPs.<sup>62</sup>
  
- **SWRCB rationale for lack of unreasonable effects on fish, wildlife, or other instream beneficial uses**
  - After balancing short-term impacts to fish and wildlife with long-term impacts to all beneficial uses of water—such as irrigated agriculture and storage of water for temperature and salinity control—the SWRCB found the proposed change to be reasonable. See April 6, 2015 Order at 34 (“[t]he requested changes to requirements of the San Joaquin River are intended to conserve water in New Melones Reservoir to help balance the competing needs of the Stanislaus River . . . and conditions on the San Joaquin River.”). Again, however, although the SWRCB noted that reducing Vernalis flow requirements and other water quality objectives would allow for more storage of water for future salinity control and cold-water flow needs, it reiterated that “the changes will primarily benefit water supplies.”<sup>63</sup> The SWRCB clarified that “[w]ater supply benefits include allocations to senior water rights holders and senior water supply contractors on the . . . Stanislaus . . . River[]], as well as refuges.”<sup>64</sup> The SWRCB did highlight some environmental benefits of this modified order. In particular, it relayed that NMFS had conveyed concerns about New Melones Reservoir storage levels at the end of water year 2015 and associated risks to steelhead and fall-run Chinook salmon from high temperatures, which supported the SWRCB’s modified Vernalis flow requirements. NMFS had also conveyed concerns

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60. APRIL 6, 2015 ORDER, *supra* note 35, at 37-42.

61. *Id.*

62. *Id.* at 28-30.

63. *Id.* at 33.

64. *Id.*

about poor water quality due to sediment and low dissolved oxygen, among other water quality parameters.<sup>65</sup>

August 4, 2015 – November 30, 2015

- **Changes approved by the SWRCB:**
  - The State Board lowered the required minimum dissolved oxygen concentration at Ripon from 7.0 mg/L to 5.0 mg/L.<sup>66</sup> Even with this changed requirement, however, dissolved oxygen concentrations remained at or above 7.0 mg/L for all but two days.<sup>67</sup>
  
- **SWRCB rationale for existence of “urgent needs”**
  - Again, the SWRCB found this temporary change to be urgent given the severity of the drought. In particular, the Board noted that New Melones Reservoir seasonal peak storage had reached its lowest volume since 1992 and that Reclamation projected water year 2015 inflow to New Melones to be only 300,000 AF—the lowest inflow in the lifetime of the reservoir. Reclamation asserted that its deliveries to the Oakdale and South San Joaquin Irrigation Districts could not be reduced further; that it was providing no water to CVP contractors; and that it could not meet the Ripon dissolved oxygen objective while maintaining sufficient water for critical fishery needs later in the year.<sup>68</sup>
  
- **SWRCB rationale for lack of unreasonable effects on fish, wildlife, or other instream beneficial uses**
  - In this TUCP order, the SWRCB balanced short- and long-term impacts to fish and wildlife in finding a lower dissolved oxygen requirement to be reasonable. This TUCP order more explicitly balanced different ecological water needs, noting that “[w]hile maintaining [a dissolved oxygen] requirement of 7.0 mg/L . . . would provide some short-term benefit to salmonids . . . meeting the [dissolved oxygen] requirement of 7.0 mg/L would reduce the storage available in New Melones Reservoir later in the year when releases would be more beneficial to spawning Stanislaus river fish species.”<sup>69</sup> Reclamation had acknowledged in its petition that salmonids may experience reduced swimming ability and growth at dissolved oxygen concentrations below 6.5 mg/L. The SWRCB emphasized that the spring 2015 TUCP provided pulse flows to encourage outmigration of steelhead and fall-run Chinook salmon before temperature, dissolved oxygen, and other conditions degraded. But the SWRCB acknowledged that oversummering steelhead and other fish and wildlife and adult fall-run Chinook salmon returning to the Stanislaus would experience degraded conditions, though it did expect more suitable habitat to exist upstream of Ripon and below Tulloch Reservoir for oversummering steelhead and other fish.<sup>70</sup>

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65. *Id.* at 31-35.

66. AUGUST 4, 2015 ORDER, *supra* note 46, at 1.

67. Telephone Interview with Diane Riddle, Manager, Cal. State Water Res. Control Bd. (Apr. 4, 2016).

68. AUGUST 4, 2015 ORDER, *supra* note 46, at 8-9.

69. *Id.* at 10.

70. *Id.* at 9-10.

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In addition to changing the water quality objectives identified in Table 2, the SWRCB imposed new planning requirements for New Melones on Reclamation beginning on April 6, 2015. Because of concerns that New Melones would lack sufficient storage to provide reasonable fish and wildlife protections, the SWRCB required Reclamation to develop and implement a plan for operating New Melones in 2015.<sup>71</sup> Specifically, this plan required Reclamation to “identify needed storage and flow levels for the protection of fish and wildlife throughout water year 2015 going into water year 2016 to ensure adequate temperature and water quality conditions for salmonid species inhabiting the Stanislaus River . . . .”<sup>72</sup> The SWRCB stipulated that the plan should reasonably protect fish and wildlife on the Stanislaus River at the 99 percent hydrologic exceedance level for March.<sup>73</sup> This new planning requirement primarily arose from concerns that old Melones Dam—which the Oakdale and South San Joaquin Irrigation Districts operated before Reclamation submerged it with the larger New Melones Dam—would trap colder water and disconnect storage in old Melones from New Melones, causing the remaining water in New Melones to heat. The SWRCB also worried that sediment and debris might block the outlet to old Melones and prevent releases of water trapped behind it.<sup>74</sup> The SWRCB required Reclamation to update its plan later in 2015.<sup>75</sup>

II.B. NMFS *changes to RPA actions*. Similarly, Reclamation proposed and NMFS approved departures from the minimum flow schedules specified in

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71. APRIL 6, 2015 ORDER, *supra* note 35, at 3-4.

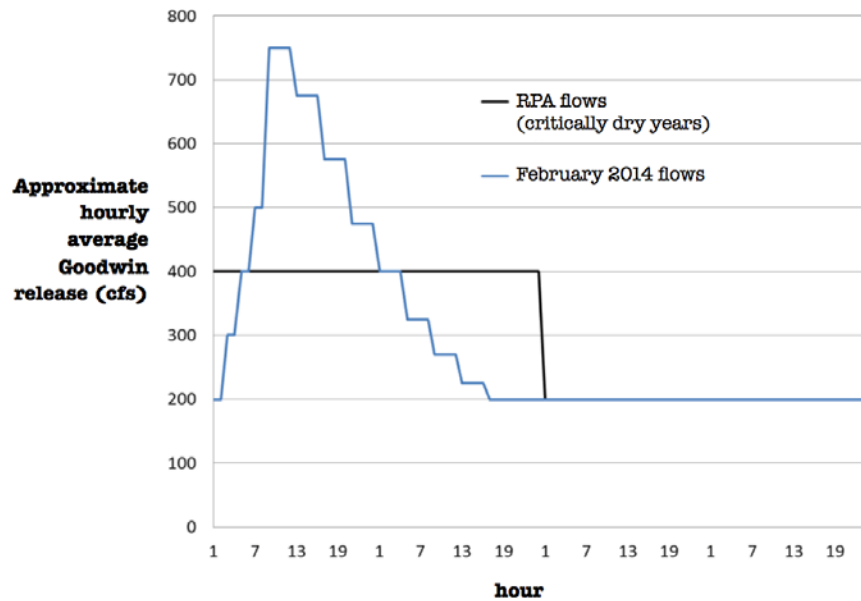
72. *Id.* at 38.

73. *Id.*

74. *Id.* at 4.

75. CAL. STATE WATER RES. CONTROL BD., CAL. ENVT'L PROTECTION AGENCY, ORDER CONDITIONALLY APPROVING A PETITION FOR TEMPORARY URGENCY CHANGES IN LICENSE AND PERMIT TERMS AND CONDITIONS REQUIRING COMPLIANCE WITH DELTA WATER QUALITY OBJECTIVES IN RESPONSE TO DROUGHT CONDITIONS 30 (2015) [hereinafter JULY 3, 2015 ORDER], *available at* [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/docs/tu\\_cp/2015/tucp\\_order070315.pdf](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/tu_cp/2015/tucp_order070315.pdf). On May 15, 2015, Reclamation submitted an initial version of this plan, which called for use of a low-level outlet in New Melones Reservoir beginning in July. This outlet, however, could only be operated safely with reservoir storage under 300,000 AF, and because storage levels in July exceeded expectations, delaying projected use of the low-level outlet until late August, the SWRCB required Reclamation to reevaluate its initial plan. Moreover, while temperature modeling indicated that the low-level outlet could reduce water temperatures in the late summer, the SWRCB expressed concern that this modeling still showed high temperature releases in the fall. Accordingly, on July 3, 2015, the SWRCB required Reclamation to revise the plan in consultation with fisheries agencies, the Oakdale and South San Joaquin Irrigation districts, and SWRCB staff. Using updated hydrologic and storage information and revised temperature modeling, the SWRCB tasked Reclamation with planning to minimize fish and wildlife impacts in the summer and fall of 2015. *Id.*

the RPA actions.<sup>76</sup> With the exception of the winter of 2015, however, these changes simply retimed and reshaped pulse flows that used the same volume of water as the flow schedule in the RPA (*see, e.g.*, Figure 4).<sup>77</sup> For example, in the fall of 2013 (water year 2014), the Stanislaus Operating Group advised and NMFS approved use of a shorter, higher flow rate pulse with a longer pulse “tail” to simultaneously reduce straying of returning steelhead and buffer water temperatures through mid-November.<sup>78</sup> Even before the worst of the drought, these shorter pulses were common. Since at least 2011, the Stanislaus Operating Group has regularly departed from the minimum flows set forth in the RPA to release pulse flows in a way that it feels better serves the steelhead and salmon populations that the RPA is designed to benefit.<sup>79</sup>



**Figure 4:** Comparison of February 2014 winter instability flow schedule approved by NMFS and winter instability flows in the RPA.

During the spring of 2014, however, the Stanislaus Operating Group coordinated its pulse flow with the Drought Operations Plan created by the SWRCB. This coordination allowed the Stanislaus Operating Group to

76. 2014 SOG REPORT, *supra* note 38, at 8-22; 2015 SOG REPORT, *supra* note 38, at 7-10.

77. 2014 SOG REPORT, *supra* note 38, at 8-22; 2015 SOG REPORT, *supra* note 38, at 7-10.

78. 2014 SOG REPORT, *supra* note 38, at 9-14.

79. Heyne, *supra* note 38; Byrne, White, & Piñero, *supra* note 38.

concurrently achieve spring outmigration pulse flow objectives and the modified spring state flow objective at Vernalis.<sup>80</sup> And during the winter of 2015, the Stanislaus Operating Group advised and NMFS agreed that the February pulse flow that Reclamation typically releases as part of winter instability flows should be replaced by natural storm flows.<sup>81</sup>

NMFS also exempted Reclamation from the water temperature standards it set for Orange Blossom Bridge and Knights Ferry in water years 2014 and 2015.<sup>82</sup> During water year 2014, water temperatures at Orange Blossom Bridge exceeded applicable temperature standards for a brief time in late October and early November and from early March through the end of the summer. Water temperatures also exceeded the Knights Ferry standard from late February through May.<sup>83</sup> Then, during water year 2015, water temperatures at Orange Blossom Bridge exceeded the temperature standard for the entire year with the exception of a brief time in October and January. The Knights Ferry standard was also exceeded from early February through June.<sup>84</sup> According to Stanislaus Operating Group members, however, while Reclamation faced severe water temperature problems due to the drought in New Melones Reservoir and the Stanislaus River, exemptions from the Orange Blossom Bridge and Knights Ferry temperature standards are also commonplace in non-drought years.<sup>85</sup>

<b>RPA criterion</b>	<b>Modified requirements</b>
pSpring pulse flow	<p><b>WY 2014</b></p> <ul style="list-style-type: none"> <li>Spring pulse flows on the Stanislaus were implemented in the context of a broader Drought Operations Plan for the CVP and SWP generated by Reclamation, DWR, the USFWS, NMFS, CDFW, and the SWRCB. The Drought Operations Plan committed Reclamation to providing the Stanislaus RPA spring pulse flow but envisioned coordinating this outmigration pulse flow with other San Joaquin basin flow releases, including releases to meet the modified Vernalis base flow and pulse flow requirements (<i>see</i> Table 2). The Drought Operations Plan envisioned scheduling RPA releases sometime between April 7 and April 15 alongside releases on other San Joaquin River tributaries to help meet the modified Vernalis flow targets. The Drought Operations Plan, however, noted that “the exact timing and duration will be developed through the [Stanislaus Operating Group] in coordination with the [Water Operations Management</li> </ul>

80. 2014 SOG REPORT, *supra* note 38, at 19-22.

81. 2015 SOG REPORT, *supra* note 38, at 8-9.

82. 2014 SOG REPORT, *supra* note 38, at 32-33; 2015 SOG REPORT, *supra* note 38, at 18-19.

83. 2014 SOG REPORT, *supra* note 38, at 32-33.

84. 2015 SOG REPORT, *supra* note 38, at 18-19.

85. Heyne, *supra* note 38; Byrne, White, & Piñero, *supra* note 38.

	<p>Team] and [Real-Time Drought Operations Management Team] processes.”<sup>86</sup> At the request of Reclamation and the SWRCB, the Stanislaus Operating Group “convened an urgent meeting on April 9, 2014, and provided the advice for implementation of a spring outmigration pulse flow schedule on the Stanislaus that was consistent with the commitments in the DOP for both Stanislaus and Vernalis flow targets.”<sup>87</sup> At the April 9 meeting, the Stanislaus Operating Group advised a spring pulse flow that provided the same or greater pulse flow volume as spring RPA flows in April and May; “at least 2-3 consecutive weeks of inundated floodplain habitat which will provide additional food resources and inundate shallow habitats that should provide additional rearing habitat for juvenile salmonids”; “relatively stable flows for two separate two week periods,” which would allow USFWS to continue studies of fish survival at certain instream flow levels; and provided the spring 2014 Vernalis pulse flow described in Table 2; among other features.<sup>88</sup> The Stanislaus Operating Group acknowledged that “[t]his shaping helps to meet the Vernalis commitment in the [Drought Operations Plan] while also meeting the objectives listed above.”<sup>89</sup> Then, based on April 24, 2014 and May 5, 2014 meetings between the Stanislaus Operating Group and the Water Operations Management and Real-Time Drought Operations Management Teams for the entire CVP and SWP, these three groups advised adding a more gradual rampdown of releases in May than those allowed in the 2009 Biological Opinion—around 500 cfs per day—from Goodwin Diversion Dam to reduce the risk of juvenile stranding.<sup>90</sup> These three groups also advised providing flow variability during at least one day at 2,900 cfs for three reasons: “(a) variable flow is expected to spur outmigration, (b) a slightly higher flow may bring in some additional leaf litter and nutrients that could boost food production, and (c) an increase in flow may increase turbidity which might also spur</p>
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86. 2014 SOG REPORT, *supra* note 38, at A-13. The Real-Time Drought Operations Management Team represents a team that Reclamation and DWR had convened as a condition of the initial TUCP order for the CVP and SWP, and that included the same agencies that designed the Drought Operations Plan. BUREAU OF RECLAMATION, U.S. DEP’T OF INTERIOR & CAL. DEP’T OF WATER RES., CENTRAL VALLEY PROJECT AND STATE WATER PROJECT DROUGHT OPERATIONS PLAN AND OPERATIONAL FORECAST: APRIL 1, 2014 THROUGH NOVEMBER 15, 2014 3 (2014), *available at* <http://www.water.ca.gov/water-conditions/docs/2014-Operations-Plan.pdf>. The Water Operations Management Team is a pre-existing interagency team that advises Reclamation and DWR with guidance on CVP and SWP operations, and also includes the same agencies that designed the Drought Operations Plan. *See, e.g., Water Project Operations*, CAL. DEP’T OF FISH AND WILDLIFE, <https://www.wildlife.ca.gov/Conservation/Watersheds/Water-Operations> (last visited Mar. 19, 2016).

87. 2014 SOG REPORT, *supra* note 38, at 19.

88. *Id.* at A-8 – A-9.

89. *Id.* at A-9.

90. *Id.* at A-3.



	<p>outmigration and provides some protection to juvenile salmonids from visual predators.<sup>91</sup> This three-group team left Reclamation discretion to make final adjustments as necessary to this advised May flow schedule.<sup>92</sup></p> <p><b>WY 2015</b></p> <ul style="list-style-type: none"><li>• Reclamation, with the advice of the Stanislaus Operating Group and approval from NMFS, began the 2015 spring pulse flow earlier than usual (in March instead of April). The Stanislaus Operating Group advised completing the spring pulse earlier because of concerns regarding warming water temperatures. Reclamation completed the spring pulse flow in late April.<sup>93</sup></li></ul>
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II.C. *Water sales that provided streamflow benefits.* To simultaneously raise district funds and provide streamflow benefits, in 2015, the Oakdale and South San Joaquin Irrigation Districts sold 23,000 AF of water to the San Luis and Delta-Mendota Water Authority and the DWR. The districts sold this water for \$500 per acre-foot. Because the water sale facilitated the flow of these 23,000 AF of water down the Stanislaus River and by Vernalis on the San Joaquin River, it helped to meet RPA and state flow objectives.<sup>94</sup> While no regulatory obligation required this water sale, a representative from Oakdale Irrigation District reported that the districts partially sold water out of concern that if they did not exhibit a “spirit of cooperation” in improving the river, the State would begin curtailing senior water rights holders as it has on Deer and Antelope Creeks.<sup>95</sup> Oakdale and South San Joaquin Irrigation Districts have regularly sold excess water in past years. For example, Oakdale sold 40,000 AF of water at \$100 per acre-foot to the San Luis and Delta-Mendota Water Authority in 2013.<sup>96</sup>

Because formal transfers of non-project water through CVP or SWP facilities require compliance with strict requirements set out in a Water Transfer White Paper compiled by the DWR and Reclamation, in 2015, the districts opted to simply abandon their 23,000 AF of water at the Goodwin Diversion Dam and allow it to flow into the Sacramento-San Joaquin River

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91. *Id.* at A-14 – A-15.

92. *Id.* at A-1 – A-3.

93. 2015 SOG REPORT, *supra* note 38, at 10.

94. Telephone Interview with Steve Knell, General Manager, Oakdale Irrigation Dist. (Mar. 3, 2016); *see also* Garth Stapley, *OID Reveals Big-money Water Sale to Outside Buyers*, *MODESTO BEE* (Oct. 13, 2015), <http://www.modbee.com/news/article39016221.html>.

95. E-mail from Steve Knell, General Manager, Oakdale Irrigation Dist. to Philip Womble, Student, Stanford Law School (Mar. 16, 2016, 13:48 PDT) (on file with author) (stating that no regulatory obligation existed, but that the district did hold “‘concern’ . . . that the State may pull a Deer Creek action if we didn’t show a ‘spirit of cooperation’ in trying to make things better on the river.”).

96. Telephone Interview with Steve Knell, General Manager, Oakdale Irrigation Dist. (Mar. 16, 2016).

Delta. The San Luis and Delta-Mendota Water Authority and the DWR each acquired half of the 23,000 AF. The San Luis and Delta-Mendota Water Authority acquired water for CVP contractors, while the DWR acquired water for SWP contractors, including the Metropolitan Water District of Southern California.<sup>97</sup> The districts avoided use of the Water Transfer White Paper because they only began shopping their water in mid-August, had only about 90 days to sell the water before they would lose their rights to it under the 1988 Agreement, and according to a district representative, a White Paper transfer takes months to set up. The districts began shopping their water late in the year because farmers used less water or used water more efficiently than anticipated during the irrigation season. The districts also wanted to transfer the diversion amount of their water—not only the consumptive use—and the White Paper often limits transfer to their consumptive use to avoid injury to other legal water users.<sup>98</sup> Under the terms of the acquisition, the San Luis and Delta-Mendota Water Authority and the DWR paid the districts for water released from the Goodwin Diversion Dam, and the buyers held the risk of losses of this abandoned water, including to intervening water users, between the Goodwin Dam and the Delta. Nevertheless, because NMFS and the USFWS had restricted Delta pumping but allowed an exception for this water sale agreement,<sup>99</sup> this risk may have been lower than in years without these restrictions.

### III. Lessons learned from water years 2014-15

Water resource management decisions for the Stanislaus River during the drought provide an opportunity to identify both effective and ineffective drought response tactics that may serve as lessons for other regions. Based on interviews with an environmental group, an irrigation district, and state and federal environmental agencies, this section gathers suggested changes that could improve future drought management on the Stanislaus and elsewhere. It also highlights successful decisions and recommends that they be maintained or expanded.

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97. E-mail from Elizabeth Kiteck, Chief, Water Operations Div., Bureau of Reclamation, U.S. Dep't of Interior to Philip Womble, Student, Stanford Law School (Mar. 23, 2016, 7:44 PDT) (on file with author).

98. Knell, *supra* note 94; Knell, *supra* note 95; Knell, *supra* note 96; BUREAU OF RECLAMATION, U.S. DEP'T OF INTERIOR & CAL. DEP'T OF WATER RES., DRAFT TECHNICAL INFORMATION FOR PREPARING WATER TRANSFER PROPOSALS (WATER TRANSFER WHITE PAPER): INFORMATION FOR PARTIES PREPARING PROPOSALS FOR WATER TRANSFERS REQUIRING DEPARTMENT OF WATER RESOURCES OR BUREAU OF RECLAMATION APPROVAL 1-3, 19 (2015), available at [http://www.water.ca.gov/watertransfers/docs/2016\\_Water\\_Transfer\\_White\\_Paper.pdf](http://www.water.ca.gov/watertransfers/docs/2016_Water_Transfer_White_Paper.pdf).

99. Kiteck, *supra* note 97.

*Lesson #1: Establish plans and processes that better contemplate multi-year droughts.* It is evident that state and federal agencies did not have adequate criteria, planned out in advance, for making difficult decisions about water allocation and environmental protection during a multi-year drought. Representatives of an environmental group and an irrigation district both voiced the criticism that agencies' existing plans inadequately anticipated multi-year droughts.<sup>100</sup> These individuals, however, voiced criticisms about different planning processes. The environmental group representative expressed that RPA actions adequately contemplated drought but that the State's many waivers of water quality objectives reflected poor planning for persistent drought. The environmental group representative asserted that waiving provisions of the State Water Code, such as Governor Brown's waiver of the Water Code section requiring implementation of the Delta Water Quality Control Plan, does not represent a long-term solution to multi-year droughts. This environmental representative advocated for establishing specific criteria that control when and how the State Board can waive standards during droughts. This individual also asserted that delivering hundreds of thousands of acre-feet of water to irrigation districts does not constitute responsible planning during a multi-year drought.<sup>101</sup> In 2014, the Oakdale and South San Joaquin Irrigation Districts received 355,000 AF and junior contractors on the Stanislaus received 85,000 AF.<sup>102</sup> Meanwhile, in 2015, the Oakdale and South San Joaquin districts received 450,000 AF.<sup>103</sup> Accordingly, this individual promoted more management like the NMFS RPA actions for Shasta Dam, which require contingency planning, specify processes for altering standards, and assign hard constraints on changing the RPA when forecasts project noncompliance with a temperature standard or storage below a pre-defined level.<sup>104</sup> A NMFS representative also acknowledged that more explicit multi-year drought planning exists in the Sacramento River portion of the RPA.<sup>105</sup>

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100. Knell, *supra* note 94; Telephone Interview with Doug Obegi, Staff Attorney, Natural Res. Def. Council (Mar. 1, 2016).

101. Obegi, *supra* note 100.

102. KATE POOLE, NATURAL RES. DEF. COUNCIL & THE BAY INST., NRDC AND TBI REQUEST FOR URGENT RECONSIDERATION OF APRIL 11, 2014 ORDER APPROVING TEMPORARY URGENCY CHANGE PETITION (VERNALIS FLOW OBJECTIVE) 3 (2015), *available at* [http://www.swrcb.ca.gov/waterrights/water\\_issues/programs/drought/docs/tucp/comments/nrdc\\_bayinstitute042814.pdf](http://www.swrcb.ca.gov/waterrights/water_issues/programs/drought/docs/tucp/comments/nrdc_bayinstitute042814.pdf).

103. DOUG OBEGI, NATURAL RES. DEF. COUNCIL & GARY BOBKER, THE BAY INST., PROTEST AND OBJECTIONS TO THE TUCP FILED ON MARCH 24, 2015 BY THE BUREAU OF RECLAMATION AND DEPARTMENT OF WATER RESOURCES 3-4 (2015), *available at* [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/comment\\_s\\_tucp2015/docs/nrdctbi\\_obegi033015.pdf](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/comment_s_tucp2015/docs/nrdctbi_obegi033015.pdf).

104. NAT'L MARINE FISHERIES SERV., *supra* note 14, at 26-27.

105. Byrne, White, & Piñero, *supra* note 38.

Meanwhile, the irrigation district representative found fault with the inflexible water demands in the RPA actions, but thought the State Board's TUCP orders reflected a responsible drought response. This representative conveyed that an Interim Operations Plan that Reclamation used in the past to manage environmental releases on the Stanislaus would have saved substantial water when compared to releases in the RPA.<sup>106</sup> Federal agency representatives disagreed with this assertion, however, noting that the existing RPA actions call for substantially lower releases in critically dry years than in wet years.<sup>107</sup>

Regardless of how one comes down on the agencies' decisions, it seems clear that those decisions could have benefited from more planning, particularly contingency planning for longer, more severe droughts that established clearer guidelines upfront. While state water quality objectives may have been too flexible during water years 2014 and 2015, the RPA actions may have been overly inflexible. More detailed contingency planning for both sets of environmental requirements could have generated more forward-thinking water management on the Stanislaus. Clear criteria for changing water quality standards that reflect input from many stakeholders paired with clear pathways or planning requirements, like the triggered planning requirements in the NMFS RPA for Shasta Dam, could have reduced the SWRCB's reliance on more ad-hoc decision-making. Indeed, robust drought planning could have resulted in more detailed flow criteria pegged to specific drought conditions.

Similarly, pre-existing criteria and processes that allow changes in the volume of flow released for RPA actions—not only the timing, magnitude, or duration of RPA flows—could instill more flexibility for the Stanislaus Operating Group to balance flows among various ecological and human needs during drought years. If NMFS maintained veto power over Reclamation proposals to alter RPA flows, this added flexibility might retain environmental protections for federally listed species. Instituting this flexibility, however, may be constrained by the federal ESA itself. RPA actions must be “reasonably certain to occur”<sup>108</sup> and changing the RPA action to allow lower volume flows might involve re-initiation of Section 7 consultation.<sup>109</sup>

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106. Knell, *supra* note 94.

107. Byrne, White, & Piñero, *supra* note 38.

108. Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv., 481 F.3d 1224, 1241, fn. 17 (9th Cir. 2007) (holding that “[i]t may well be that the agencies lack the power to guarantee the improvements in question. However, if this is the case, the proper course is to exclude them from the analysis and consider only those actions that are in fact under agency control or otherwise *reasonably certain to occur.*”) (emphasis added).

109. NAT'L MARINE FISHERIES SERV., *supra* note 14, at 8.

The operations plan that the SWRCB required Reclamation to complete in the April 6 and July 3, 2015 TUCP orders may represent a step in the right direction. Moreover, unlike the lengthy, contentious processes that likely accompany new restrictions on departures from water quality standards or more flexibility to reduce federal ESA flows, these operations plans show that the SWRCB can readily impose at least some contingency planning requirements swiftly. When New Melones Reservoir levels became dangerously low, the SWRCB began requiring Reclamation to consult with key stakeholders on the Stanislaus to generate plans to prevent unreasonable fish and wildlife impacts under very low inflow scenarios.<sup>110</sup> Similarly, the Drought Operations Plan that Reclamation and DWR assembled for managing the CVP and SWP from April to November of 2014, which, among other decisions, resulted in interagency groups coordinating the RPA and Vernalis pulse flows, may provide an example of more successful contingency planning.<sup>111</sup> Nonetheless, earlier and improved contingency planning, such as the requirements in the Sacramento River portion of the RPA, might have mitigated concerns that prompted SWRCB to require operations plans for New Melones in 2015.

*Lesson #2: Encourage water transactions that provide environmental benefits.* The Oakdale and South San Joaquin Irrigation Districts have contributed water towards RPA actions and Vernalis and Ripon water quality objectives by selling it to CVP exporters like the San Luis and Delta-Mendota Water Authority and to SWP contractors. These win-win opportunities simultaneously allow the districts to make money and satisfy streamflow requirements. Because the Oakdale Irrigation District reinvests all proceeds from water transactions into its district—for example, to increase water use efficiency by lining canals<sup>112</sup>—these sales can help to build resilience for future droughts. The relatively small volume of water the districts sold in 2015—23,000 AF—and their ad-hoc nature reveal that water transactions probably cannot independently resolve conflicts on the Stanislaus or San Joaquin. But, as recent drought years have demonstrated, multiple-benefit water transactions can comprise an important component of broader solutions, especially if they are built into planning and regulatory compliance efforts.

Likewise, an irrigation district representative suggested that expanded use of instream flow transactions similar to those pursued under the Vernalis Adaptive Management Plan that ended in 2012 could help in future droughts.<sup>113</sup> Under the Vernalis Adaptive Management Plan, Reclamation

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110. APRIL 6, 2015 ORDER, *supra* note 35, at 3-4; JULY 3, 2015 ORDER, *supra* note 75, at 30.

111. BUREAU OF RECLAMATION & CAL. DEP'T OF WATER RES., *supra* note 86.

112. Knell, *supra* note 94.

113. *Id.*

regularly paid Oakdale Irrigation District between \$60 and \$75 per acre-foot to release water to augment streamflows at Vernalis.<sup>114</sup> While Oakdale has sold water on the spot market during the last few years at higher prices, the reliability of payments under the Vernalis Adaptive Management Plan proved enticing. After this program ended, however, federal offers to pay for instream flows decreased dramatically. An Oakdale representative reported Reclamation offering around \$5 per acre-foot after 2012.<sup>115</sup> Reinitiating competitive payments for instream flow sales might help to satisfy the RPA actions and Vernalis and Ripon requirements.

Nevertheless, some interviewees disagreed with the premise that the districts should be paid for their water, and instead advocated that, like other users bearing water shortages during drought, they should contribute water for free.<sup>116</sup> One interviewee also expressed concern that paying the districts for instream flows would set dangerous precedent for potential takings lawsuits.<sup>117</sup>

Lengthy approval requirements for water transfers frustrate quick decisions about them during droughts. An irrigation district representative reported that Reclamation and the DWR's Water Transfers White Paper discourages formal water rights transfers that contribute to meeting streamflows.<sup>118</sup> Reclamation and DWR must approve transfers of non-project water through the CVP and SWP, and the White Paper sets standards for these two agencies to evaluate transfers.<sup>119</sup> In 2015, for example, because of the long approval time and high costs associated with completing the White Paper's requirements, the Oakdale and South San Joaquin Irrigation Districts chose to abandon their water and allow the buyers to pump it from the Delta rather than pursue a formal transfer. To the extent possible, Reclamation and DWR should simplify requirements in their Water Transfers White Paper to encourage, rather than discourage, water transfers that legally protect streamflows during droughts. While the agencies already intend the White Paper to accommodate temporary transfers that last up to one year instead of longer-term transfers,<sup>120</sup> the districts' recent experience on the Stanislaus suggests that White Paper approval still takes too long. The agencies might implement changes as simple as setting expedited

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114. *The San Joaquin River Agreement*, SAN JOAQUIN RIVER GRP. AUTH., <http://www.sjrg.org/agreement.htm> (last visited Feb. 28, 2017).

115. Knell, *supra* note 94.

116. Obegi, *supra* note 100.

117. *Id.*

118. Knell, *supra* note 94.

119. BUREAU OF RECLAMATION & CAL. DEP'T OF WATER RES., *supra* note 98, at 1-3.

120. *Id.* at 1 (providing that "[w]hile the technical information contained in this document may be used to inform the development of longer-term transfer proposals, multi-year or long-term transfers typically require the transfer proponents to provide a more rigorous analysis than that requested for temporary transfers.").

approval timelines, as other states have done,<sup>121</sup> to ensure applicants can formally transfer water without waiting on a lengthy regulatory approval.

Reclamation and DWR might also consider more involved changes to their Water Transfers White Paper, such as explicitly allowing or promoting transfers of diversionary entitlements, and not just consumptive entitlements, upstream of the location where return flows typically accrue to a river or stream.<sup>122</sup> If return flows typically accrue to a river or stream after a water quality or other environmental compliance point, allowing transfers of diversions and not just depletions could provide substantial streamflow benefits at the compliance point. For example, although they divert water at the Goodwin Diversion Dam on the Stanislaus River, some return flows from Oakdale Irrigation District likely do not accrue to the Stanislaus River until after the Ripon dissolved oxygen compliance point, and some return flows from the South San Joaquin Irrigation District likely do not accrue to the San Joaquin River until after the Vernalis salinity and flow compliance point. Accordingly, allowing the districts to transfer the entire diversionary amount of their water right, and not only its consumptive amount, up to the point of return flows could result in meaningful streamflow and water quality improvements at these compliance points while also avoiding injury to other legal users of water. In addition, these transfers could increase incentives for the districts to pursue irrigation efficiency projects that reduce their diversions but do not change their consumptive use. Finally, stakeholders could, in advance of drought, plan for and negotiate transfers to take place if drought occurs. These deals could then be built into drought planning and regulatory compliance efforts.

*Lesson #3: Clearly define how (or if) environmental flow targets will be met in severe drought years.* The Stanislaus River—and New Melones Reservoir specifically—is overallocated. No blueprint exists for managing severe water shortages, and the demands on New Melones have expanded dramatically since it was originally built. In years like water year 2015 where

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121. LEON F. SZEPTYCKI ET AL., STANFORD UNIV. WOODS INST. FOR THE ENV'T, ENVIRONMENTAL WATER RIGHTS TRANSFERS: A REVIEW OF STATE LAWS 13 (2015), available at <http://waterinthewest.stanford.edu/sites/default/files/WITW-WaterRightsLawReview-2015-FINAL.pdf>.

122. Because transfers of diversions up to the historic point of return flow can avoid injury to other water users, and the White Paper evaluates all transfers on a case-by-case basis, these types of transfers may already be permissible. See BUREAU OF RECLAMATION & CAL. DEP'T OF WATER RES., *supra* note 98, at 3 (stating that “each transfer is unique and must be considered on its individual factual merits”); *id.* at 2 (stating that the White Paper’s chief criterion for approval of transfers is the “avoidance of injury to other legal users of water, through the determination of whether the water proposed for transfer is transferable.”). Nonetheless, the White Paper does not explicitly approve of these types of transfers, and approving of them and setting forth specific standards for implementing them while avoiding injury could better facilitate them in the future.

inflow does not reach 600,000 AF, the 1988 Agreement between Reclamation, the Oakdale Irrigation District, and the South San Joaquin Irrigation District entitles the districts to receive more than the annual inflow to New Melones.<sup>123</sup> The RPA actions in a critically dry year place an additional annual demand of over 185,259 AF on New Melones.<sup>124</sup> And the Vernalis and Ripon water quality and flow objectives call for additional environmental demands in critically dry years like 2015.<sup>125</sup> When Reclamation originally built New Melones Dam, the only anticipated demands in addition to its 1988 Agreement with the districts were 70,000 AF of water in normal water years to satisfy state water quality objectives.<sup>126</sup> Reclamation simply cannot meet these three conflicting demands in a year such as 2015 that is part of a multi-year, severe drought. Making matters worse, there are no clear rules for resolving this conflict.

Several interviewees suggested that clearly designating who will contribute water for the environment in severe drought years would improve water management in future droughts.<sup>127</sup> The legal uncertainty regarding who bears responsibility for meeting flow targets—and what minimum flow targets must legally be attained—hindered water management in 2014 and 2015, resulting in ad-hoc solutions that set little precedent for the future. During 2014 and 2015, the tension was resolved by relaxing the RPA actions and Vernalis and Ripon water quality objectives and satisfying them through a combination of water sales by the districts and releases of Reclamation water from New Melones.<sup>128</sup>

While the 1988 Agreement has never been litigated, both the districts and Reclamation appear to hold the position that the districts' senior rights hold a higher priority than water for RPA actions.<sup>129</sup> A Reclamation representative reported that while no court has settled whether the Oakdale or South San Joaquin districts' water is of a higher priority, because the 1988 Agreement settled the districts' senior water rights, Reclamation views its agreement to deliver water to the districts as a nondiscretionary obligation.<sup>130</sup> The districts also point to a 2011 federal district court decision

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123. BUREAU OF RECLAMATION, OAKDALE IRRIGATION DIST., & SOUTH SAN JOAQUIN IRRIGATION DIST., *supra* note 5.

124. NAT'L MARINE FISHERIES SERV., *supra* note 7.

125. *See supra* notes 31-32.

126. CAL. STATE WATER RES. CONTROL BD., *supra* note 9.

127. Heyne, *supra* note 38; Obegi, *supra* note 100; Knell, *supra* note 94; Telephone Interview with Elizabeth Kiteck, Chief, Water Operations Div., Bureau of Reclamation, U.S. Dep't of Interior (Mar. 4, 2016).

128. Knell, *supra* note 94; E-mail from Elizabeth Kiteck, Chief, Water Operations Div., Bureau of Reclamation, U.S. Dep't of Interior to Philip Womble, Student, Stanford Law School (Mar. 17, 2016, 14:51 PDT) (on file with author).

129. Knell, *supra* note 95; Kiteck, *supra* note 128.

130. Kiteck, *supra* note 128 (stating that "[a]s far as I know, no court has



that held that Reclamation could not place the burden for RPA flows on their senior water rights without reinitiating consultation. *In re Consol. Salmonid Cases*, 791 F. Supp. 2d 802, 940 (E.D. Cal. 2011) (holding that “neither NMFS nor the Bureau has discretion to violate the [districts’] water rights. . . . If . . . Reclamation’s predictions prove incorrect and make the RPAs’ implementation infeasible, the burden cannot be imposed on senior water rights holders. Rather, Reclamation must then re-initiate consultation.”). Meanwhile, the SWRCB has exercised its authority to curtail pre-1914 rights elsewhere in the State, and although Oakdale Irrigation District has joined litigation challenging these curtailment orders, it has recognized that the State might attempt similar curtailments on the Stanislaus.<sup>131</sup> And at least one interviewee indicated that this legal uncertainty may have been compounded by the fact that the Vernalis Adaptive Management Plan, a management program in place from 2000 to 2012 and intended to protect outmigrating juvenile Chinook salmon on the San Joaquin River, expired. Accordingly, managing RPA flows without the Vernalis agreement was a new experience for Reclamation and NMFS from the start of the drought.<sup>132</sup>

Interviewees disagreed about how responsibility for meeting environmental water requirements should be divided. An environmental group representative advocated for an unimpaired flows standard similar to that included in the proposed Bay-Delta Water Quality Control Plan, which would guarantee a certain percentage of unimpaired or natural flows for the environment throughout the year, arguing that this standard requires all

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established if the District[|s|’] water has higher priority or not, however, a condition of our water rights for New Melones was that we settled the District[|s|’] prior rights with an operating agreement, so we believe that the obligation is nondiscretionary.”); E-mail from Elizabeth Kiteck, Chief, Water Operations Div., Bureau of Reclamation, U.S. Dep’t of Interior to Philip Womble, Student, Stanford Law School (Mar. 17, 2016, 15:01 PDT) (on file with author) (stating that “Reclamation’s position has been that we only have discretion over water deliveries provided to water-service contractors, i.e. contractors that had no pre-existing water rights and who receive water under contract under Reclamation’s rights.”); e-mail from Elizabeth Kiteck, Chief, Water Operations Div., Bureau of Reclamation, U.S. Dep’t of Interior to Philip Womble, Student, Stanford Law School (Mar. 17, 2016, 15:14 PDT) (on file with author) (stating that “Reclamation would [] see its obligation to the District[|s|] as being a priority. Without a settlement/guarantee of the District[|s|’] prior rights, New Melones could not have been built, therefore, fulfillment of that agreement is a priority.”). Recent case law, however, could be construed as holding that Reclamation holds discretionary authority here. *See Nat. Resources Def. Council v. Jewell*, 749 F.3d 776, 784 (9th Cir. 2014) (holding that Reclamation’s renewal of 41 CVP settlement contracts—which, similar to the 1988 Agreement between Reclamation, Oakdale Irrigation District, and South San Joaquin Irrigation District, allowed Reclamation to operate the CVP while providing senior water rights holders who predate the CVP with stable water supplies—constituted a discretionary action.).

131. Knell, *supra* note 95.

132. Byrne, White, & Piñero, *supra* note 38.

water uses, including the environment, to share burdens of drought.<sup>133</sup> Indeed, the State Board's 2016 proposed updates to the Bay-Delta Water Quality Control Plan suggest a 40 percent unimpaired flows standard from February through June with a 30 to 50 percent adaptive range for all San Joaquin River tributaries, including the Stanislaus River.<sup>134</sup> Because historical median flows on the Stanislaus River from 1984-2009 comprised 40 percent of unimpaired flows,<sup>135</sup> this unimpaired flows target would probably matter most during drought years. However, because the Stanislaus currently bears a heavier burden for Delta water quality objectives than two other San Joaquin River tributaries,<sup>136</sup> the Merced and Tuolumne Rivers, and since these two rivers' historical median flows from 1984-2009 comprised just 26 and 21 percent of unimpaired flows,<sup>137</sup> the Board's unimpaired flows standard might actually work to reduce pressure on the Stanislaus for meeting Vernalis targets in many years. Meanwhile, an irrigation district representative strongly disagreed with use of an unimpaired flows standard. Instead of releasing flows for all fish and other aquatic species that could possibly live on a river, this irrigation district representative advocated for tailoring environmental flow requirements to the types of fish that best thrive on particular rivers.<sup>138</sup>

Two paths exist for resolving uncertainty surrounding how environmental flow targets may be met on the Stanislaus. First, a less contentious solution would be to implement programs like the Vernalis Adaptive Management Program that put in place sufficient environmental water transactions before drought arrives. While this approach would not resolve the underlying legal uncertainty regarding which water uses ultimately have the highest priority on the Stanislaus, through contractual agreements, it would resolve uncertainty about how at least some environmental flows will be provided. Second, the more contentious and longer-term solution would be for the districts, Reclamation, NMFS, and possibly the SWRCB to initiate litigation or reach a negotiated solution regarding water use priorities on the Stanislaus. Although such litigation or negotiation would undoubtedly prove costly and contentious, it provides an avenue to designate how environmental flows will be provided in future instances of severe drought.

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133. Obegi, *supra* note 100.

134. CAL. STATE WATER RES. CONTROL BD., SUMMARY OF PROPOSED UPDATES TO THE BAY-DELTA WATER QUALITY CONTROL PLAN 4 (2016), available at [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/bay\\_delta/bay\\_delta\\_plan/docs/091516\\_bay\\_delta\\_plan\\_update.pdf](http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/docs/091516_bay_delta_plan_update.pdf).

135. *Id.*

136. Kiteck, *supra* note 127.

137. CAL. STATE WATER RES. CONTROL BD., *supra* note 134, at 4.

138. Knell, *supra* note 94.

Harder environmental flow targets for use during drought, which mostly likely would come from the State Board,<sup>139</sup> could spur resolution of water use priorities on the Stanislaus. The Board's proposed unimpaired flows standard could accomplish this goal. Harder flow targets would likely provoke litigation from the districts, but clearer targets might also prompt negotiations that lead to workable solutions that the parties do not currently have any incentive to explore. Flow targets elsewhere in California for the Yuba River and Deer, Mill and Antelope Creeks have produced some level of certainty, which in turn has promoted more proactive, negotiated resolutions.

*Lesson #4: Set attainable environmental targets.* Many interviewees reported that the water temperature standards in the RPA were unattainable in all years—not just drought years.<sup>140</sup> NMFS has regularly exempted Reclamation from meeting these temperature standards, even in years before the recent drought.<sup>141</sup> One interviewee noted that NMFS' temperature model is designed for rivers and streams in the Pacific Northwest, and that while the water temperatures in the model would be attainable in the Cascade Mountains, they are not on the Stanislaus.<sup>142</sup> Accordingly, many interviewees suggested that setting attainable temperature standards would be a helpful improvement to the RPA.<sup>143</sup> Targets that are violated during normal years are easier to suspend during drought years. In addition, without attainable temperature objectives, regulators, other agencies, and the public lack a reliable basis for evaluating environmental performance on the Stanislaus.

*Lesson #5: Giving an environmental agency veto power advances environmental protection.* The RPA gives NMFS veto power over alterations that Reclamation proposes to any RPA standard. Although NMFS has never denied a Reclamation proposal to alter the RPA actions on the Stanislaus River, Reclamation commonly discusses potential alterations with NMFS before proposing them, allowing NMFS to exert influence over Reclamation's alterations before they are formally proposed.<sup>144</sup> Multiple interviewees expressed the view that granting this veto power to NMFS was helpful for effectively representing environmental viewpoints in the Stanislaus Operating Group.<sup>145</sup> Indeed, under prior versions of NMFS' Biological Opinion, NMFS did not hold this veto power and, as a result, one interviewee reported that Reclamation commonly overruled fishery agency

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139. Kiteck, *supra* note 127.

140. Heyne, *supra* note 38; Knell, *supra* note 94; Kiteck, *supra* note 127.

141. Heyne, *supra* note 38.

142. Knell, *supra* note 94.

143. Heyne, *supra* note 38; Knell, *supra* note 94; Kiteck, *supra* note 127.

144. Byrne, White, & Piñero, *supra* note 38.

145. Heyne, *supra* note 38; Obegi, *supra* note 100.

concerns.<sup>146</sup> Accordingly, where an environmental agency holds veto power and wields this power based on thorough consideration of input from other stakeholders—as NMFS appears to have done on the Stanislaus River—this veto power may help to achieve pragmatic solutions that maintain environmental protections.

*Lesson #6: Non-flow restoration that complements flow restoration efforts may reduce drought vulnerability.* Multiple interviewees emphasized that fully pursuing non-flow restoration before and during droughts could increase the resilience of aquatic ecosystems to low flows.<sup>147</sup> RPA actions in NMFS' Biological Opinion call for various non-flow restoration projects, such as gravel augmentation and floodplain and side-channel restoration.<sup>148</sup> While some of these RPA actions have been successful—for example, multiple interviewees emphasized a project on the Honolulu Bar floodplain along the Lower Stanislaus River that restored over two acres of floodplain habitat<sup>149</sup>—others lag behind schedule due to funding shortfalls or slow environmental permitting. For example, because New Melones Dam reduces natural downstream transport of gravel, which provides spawning habitat, the RPA sets goals for gravel augmentation. One RPA action states that 50,000 cubic yards of gravel should be added for spawning habitat restoration by 2014 and that 8,000 cubic yards of gravel should be added each year after 2014, but the 2015 Stanislaus Operating Group Annual Report states that only 18,666 cubic yards of gravel have been added so far.<sup>150</sup> A Reclamation representative reported that Central Valley Project Improvement Act budgetary shortfalls and Clean Water Act permitting delays from the U.S. Army Corps of Engineers have slowed gravel augmentation.<sup>151</sup> But budget shortfalls are not inevitable. Indeed, these budget shortfalls during drought years may underscore the need for policymakers to explicitly set aside and protect funding during non-drought years for non-flow restoration that helps to buffer negative impacts of drought.

Predator suppression has been advocated by some as a non-flow restoration tactic for the Stanislaus, but it remains controversial. Although some academic scientists dispute its effectiveness, the irrigation districts favor it. Adult striped bass, among other fish, eat young steelhead and salmon in the Stanislaus and San Joaquin Rivers. One study conducted by Fishbio, a fisheries consulting firm, found that 94 percent of steelhead and salmon smolts in the Stanislaus are lost to predation before its confluence

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146. Obegi, *supra* note 100.

147. Knell, *supra* note 94; Obegi, *supra* note 100.

148. 2014 SOG REPORT, *supra* note 38, at 3-4.

149. Knell, *supra* note 94; Byrne, White, & Piñero, *supra* note 38.

150. 2015 SOG REPORT, *supra* note 38, at 3, 11-12.

151. Byrne, White, & Piñero, *supra* note 38.

with the San Joaquin, and another Fishbio study found that 95 to 98 percent of salmon and steelhead are lost to predation on the Tuolumne River just south of the Stanislaus. As a result, California Senator Dianne Feinstein and Representative Jeff Denham have proposed predation suppression legislation in the U.S. Congress.<sup>152</sup> But academic scientists caution that suppressing bass would not cause meaningful improvements. One recent study published in the peer-reviewed journal *San Francisco Estuary & Watershed Science* concluded that “[a]lthough it has been suggested that a reduction in the Striped Bass population be implemented to reduce predation mortality of Chinook Salmon, the large number of salmon predators in the Delta make it unlikely that this effort will significantly affect salmon mortality.”<sup>153</sup> Similarly, Dr. Peter Moyle at the University of California-Davis stated that “if you reduce the striped bass population, quite likely other predators will just fill in the space.”<sup>154</sup> And proposals to swap Stanislaus pulse flows for predation suppression at least partially discount the multiple benefits provided by the pulse flows, including improved water quality, salinity control in the Delta, and some downstream agricultural use.

Non-flow restoration efforts should also complement the river’s flow regime,<sup>155</sup> and ideally would work hand in hand with flow restoration. The

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152. Knell, *supra* note 94; *Predators take a huge bite out of fish population*, SAVE THE STAN, <http://www.savethestan.org/predation/> (last visited Feb. 28, 2017).

153. Gary D. Grossman, *Predation on Fishes in the Sacramento-San Joaquin Delta: Current Knowledge and Future Directions*, 14 *SAN FRANCISCO ESTUARY AND WATERSHED SCI.* 1, 1 (2016).

154. Matt Weiser, *Suit: Rules favor stripers over salmon*, SACRAMENTO BEE (Feb. 27, 2010), <http://www.sacbee.com/site-services/archives/>.

155. See, e.g., F. Douglas Shields, Jr. et al., *Design for stream restoration*, 129 *J. OF HYDRAULIC ENG’G* 575, 576-578 (1996) (discussing how stream discharge influences the design of channel reconstruction projects); Laura S. Craig et al., *Stream restoration strategies for reducing river nitrogen loads*, 6 *FRONTIERS IN ECOLOGY AND THE ENV’T* 529, 529, 532 (2008) (recommending that nitrogen-reducing stream restoration target smaller-order streams with low or moderate flows, and stating that “[t]he flow at which most of the [nitrogen] is delivered will dictate the most suitable restoration design for enhancing [nitrogen] removal.”); G. Mathias Kondolf, *Lessons learned from river restoration projects in California*, 8 *AQUATIC CONSERVATION: MARINE AND FRESHWATER ECOSYSTEMS* 39, 39, 42 (stating that “[i]n California, the spatial variability [in stream power and sediment transport] means that a technique successful in one locality may not work in another, depending upon how flow regime, stream power and sediment transport vary from site to site. . . . [t]o forecast the performance of a restoration technique at a particular site requires that the geomorphology of the site (and catchment influences) be understood and that the stream power experienced at the site in the future be forecast from analysis of the hydrologic regime,” and noting “altered hydrology and sediment supply below reservoirs has implications for restoration channel design and minimum instream flow requirements. Flow requirements . . . often . . . assum[e] fixed channel boundaries. However, if the channel is adjusting to changed conditions (such as [a] dam), the relation between flow and hydraulic conditions is likely to change. These changes must be understood in setting

success of different types of non-flow restoration efforts, such as floodplain restoration, reconstructing degraded stream channels, gravel augmentation, increased shade, or reducing polluted runoff, to name a few options, depends intimately on the flow regime of the target waterbody.<sup>156</sup> More degraded river systems will prove more vulnerable and difficult to protect during drought. While non-flow restoration may help during drought, if fish populations and riverine habitat have already been substantially degraded before the drought, opportunities to offset low flows and poor water quality with non-flow restoration may prove limited. For example, if fish populations have fallen so low that they cannot saturate available gravel in a system, adding more gravel will provide little benefit. Similarly, during drought years, if flows fall so low that they cannot saturate gravel beds, gravel will provide little additional benefit. Accordingly, better maintenance of fish populations and riverine habitat on a river like the Stanislaus during non-drought years with both flow and non-flow restoration can improve the system's drought resilience. These steps may also provide more opportunities to offset low flows and poor water quality with non-flow restoration when drought strikes.

## Conclusion

The Stanislaus River's experience during California's recent drought underscores the importance of resolving legal, regulatory, and other programmatic uncertainty before drought arrives. Clear standards for when and how environmental requirements may be relaxed and shared understanding of priorities among water uses can help to resolve this uncertainty. More active contingency planning can also help to manage uncertainty associated with drought.

Resolving legal and regulatory uncertainty is often difficult. Litigating priorities between senior water rights and environmental water requirements would take years. Similarly, changing standards for relaxing environmental requirements—either by adding criteria for relaxing water quality objectives to the Bay-Delta Water Quality Control Plan or by inserting more flexibility to reduce volumes of water for federally endangered fish on the Stanislaus—could also require years. The considerable time needed to reduce these uncertainties highlights the urgency of starting to do so now.

The considerable time needed to resolve some legal and regulatory uncertainty also makes solutions that can be implemented now that much more important. As Reclamation's 2015 New Melones planning

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instream flows and designing and evaluating restoration projects.”).

156. See *supra* note 169 and associated text.

demonstrates, setting criteria that trigger contingency planning for potential multi-year droughts may represent an attainable near-term goal. Similarly, reviving standing payments from Reclamation for environmental water transactions, such as those instituted under the now-defunct Vernalis Adaptive Management Program, can reduce uncertainty regarding how environmental flow targets will be met. Option contracts that set environmental water acquisition terms before a drought, for example, would shift drought risk from the environment to the user selling the option. Setting aside finances for flow or non-flow restoration and adequately protecting ecosystems before drought would also enhance drought resilience.

While California's most recent drought has been especially severe, multi-year droughts have occurred in California in the past and should not be a surprise. Reducing ad-hoc decision-making can help the Stanislaus to weather the next one.