Glenn-Colusa Irrigation District
Serving Our Lands and Environment Sustainably
Water Rights Established in 1883

Statement of Thaddeus Bettner, PE
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Before the
Committee on Natural Resources
Subcommittee on Water, Power and Oceans
United States House of Representatives

The 2016 California Water Supply Outlook During El Nino and Three Years of Restricted Water Deliveries

February 24, 2016

Chairman Fleming, Ranking Member Huffman and Members of the Subcommittee, I am Thaddeus Bettner, the General Manager of the Glenn-Colusa Irrigation District (GCID), the largest irrigation district in the Sacramento Valley. Thank you for the opportunity to provide GCID's perspective on the issue of how the federal government can help address the challenge of this coming 2016 water supply limitations and impacts of a multi-year drought in California.

GCID covers approximately 175,000 acres in Glenn and Colusa Counties, and is located about 80 miles north of Sacramento. Our district contains a diverse working landscape including a variety of crops such as rice, tomatoes, almonds, walnuts, orchards, vine seeds, cotton, alfalfa, and irrigated pasture. Just as important, we convey water to three Federal wildlife refuges totaling more than 20,000 acres, private wetland and habitat lands of approximately 1,500 acres, and in the fall and winter deliver water to more than 50,000 acres of seasonally flooded irrigated lands that also serve as surrogate wetlands for the Pacific Flyway. GCID is a Sacramento River Settlement Contractor and diverts water directly from the Sacramento River through the largest flat plate fish screen in the world. GCID's Settlement Contract was first entered into in 1964 and it resolved disputes with the United States related to the seniority of GCID's rights over those of the United States and, in fact, allowed the US Bureau of Reclamation (Reclamation) to obtain water rights from the State Water Resources Control Board (SWRCB) for the Central Valley Project (CVP). GCID's water rights originated with a filing in 1883 for 500,000 miner's inches under 4 inches of pressure, one of the earliest and largest water rights on the Sacramento River.

Other water right holders on the Sacramento River also entered into Settlement contracts with Reclamation. The Sacramento River Settlement Contractors (SRSC), covering approximately 480,000 acres, are various irrigation districts, reclamation districts, mutual water companies, partnerships, corporations, and individuals situated in the Sacramento Valley, and formed under the provisions of California law. Among Reclamation's hundreds of CVP water supply contracts, the SRSC have a unique history and nature. The SRSC divert water from the Sacramento River, miles upstream from the Bay-Delta and the boundaries of the delta habitat, under water rights that were vested under California law well before the construction of the CVP began. The SRSC own and operate their own diversion facilities, and their water rights are not dependent in any way upon the operations or facilities of the CVP. The SRSC every year manage water for various beneficial purposes in the Sacramento Valley, including farms, birds and the

Pacific Flyway, cities and rural communities and fisheries. This requires creative management and tradeoffs by water resources managers.

Notwithstanding the seniority of our water rights on the Sacramento River, the multi-year drought has significantly reduced natural inflow into reservoirs, including Lake Shasta, putting extreme pressure on our water supply and the CVP. The drought has also greatly complicated the management of the system to benefit endangered species, like winter-run Chinook salmon. These pressures will continue to mount in dry years and likely exist even in normal water years.

In this context, I want to focus on the following issues:

(1) how winter-run salmon fishery monitoring limitations are affecting CVP operations;
(2) a summary of CVP operations in 2014/2015 and the plan for 2016;
(3) SRSC initiatives and experience in actions and restoration projects to benefit salmon; and,
(4) recommendations on how the federal government can help address the fishery-related water supply challenges of 2016 and beyond.

Winter-Run Salmon Fishery Monitoring Limitations Are Affecting CVP Reservoir Operations

For the 2016 water year, fishery agencies have already expressed concern that winter-run salmon losses in 2014 and 2015 have put this species at the risk of extinction and, therefore, will necessitate even greater protection. As stated in the National Oceanic, and Atmospheric Administration (NOAA) Fisheries *Species in the Spotlight*[1] document, "California's current drought began in 2012, and winter-run Chinook salmon are experiencing the consequences of low water storage and a limited volume of cold water in Shasta Reservoir. Monitoring data indicated that approximately 5.6% of winter-run Chinook salmon eggs spawned in the Sacramento River in 2014 survived to the fry life stage." For 2015, the fishery agencies are predicting only a 3% survival, again based on monitoring data only.

Unfortunately, this factoid has now become the "bumper sticker" of the current state of winter-run salmon, without much critical evaluation of the underlying data or science. The following discussion will focus on two main points:

- the estimated survival rates are based on interpreted fish trap monitoring data not temperature modeling; and
- late-fall run salmon estimated survival comparison.

<u>Fish Monitoring versus Temperature Modeling</u>

The estimated high mortality of 95% for winter-run eggs in 2014 and the estimated 97% mortality for 2015 were not based on modeling of thermal impacts on eggs, but instead were based on comparing the estimated total numbers of eggs laid in the river gravels in upstream spawning areas near Keswick Dam to the numbers of fish captured 50 river miles downstream at Red Bluff Diversion Dam (RBDD), see attached Figure 1. The *Species in the Spotlight* document states, "The extremely limited production in 2014 *is hypothesized* [emphasis added] to

[1] *Species in the Spotlight*, http://www.nmfs.noaa.gov/stories/2016/02/docs/sacramento_winter_run_chinook_salmon_spotlight_species_5_year_action_plan_final_web.pdf

be the result of warm water temperatures that caused egg and newly hatched fry mortality and low flows that led to increased predation." In fact, however, detailed analyses of water temperature effects on incubating winter-run Chinook eggs, using three independent models, revealed that some mortality did occur but was far less than hypothesized. Depending on the model, egg mortality from time of deposition to fry emergence from the river gravels, based solely on water temperatures, ranged only from 9% to 19% in 2014 and 2% to 18% in 2015. So, why the difference?

These widely divergent egg mortality estimates are likely due to the manner in which the fishery agencies interpolate the downstream fish monitoring data. In this regard, the U.S. Fish and Wildlife Service (USFWS) operates three to four eight-foot diameter rotary screw traps at Red Bluff Diversion Dam (RBDD) that filter a small percentage of the Sacramento River flow, see Figure 2. The number of fish caught in the traps is then extrapolated to determine the total number of fish that would have passed in the river. While the traps function well during stable flows, the fish traps cannot operate during high-flow and turbid events due to debris and safety issues. GCID has its own fish trap at its screened diversion facility, and during very high flow events we also have to stop operating our trap due to safety and debris issues. Unfortunately, however, these events are when large numbers of juvenile winter-run Chinook would be expected to migrate downstream, particularly under hydrologic conditions present in 2014 and 2015.

This circumstance is problematic because large numbers of young winter-run salmon display a pattern of holding and rearing in upstream areas during summer and fall low-flow conditions then exhibit a large-scale, episodic outmigration when the first seasonal storms cause increased flows and turbidity. During 2014, when large numbers of winter-run salmon would be expected to migrate downstream during increased flows, the RBDD fish traps were not in operation much of the time and, undoubtedly, many fish passed RBDD undetected. To account for these data gaps, the USFWS estimates the numbers of fish not sampled (when traps are not in operation) by interpolating numbers of fish captured prior to and after un-sampled time periods. This interpolation method to estimate the numbers of salmon migrating past RBDD during un-sampled days is probably satisfactory ***if*** riverine conditions (e.g., flow and turbidity) are relatively stable, the period of consecutive un-sampled days is short, and expansion factors are appropriate.

However, in December 2014, the upper Sacramento River experienced major storms and runoff leading to 24 un-sampled days and just seven sampled days (see Figure 3, which shows the daily flows (cfs) and turbidity (NTUs) measured at the Bend Bridge gauge upstream from RBDD during the periods when no fish sampling occurred at RBDD). The present interpolation method is likely to bias the estimates too low, possibly extremely low, because of large-scale salmon outmigration occurring during high, turbid flows. As a consequence, the overall estimates of fish survival were likely underestimated (or mortality overestimated). Additionally, factors used to expand the actual numbers of fish captured in the fish traps at RBDD to estimate total daily numbers of fish passing the dam possess questionable reliability and accuracy to compare annual fish survival estimates.

Late-Fall Run 3% Survival Example

The problem with the use of the existing RBDD fish trapping data to estimate fish survival is evident by comparing annual survival estimates for late-fall-run Chinook salmon with winter-run Chinook salmon. An examination of past estimates for late-fall-run Chinook survival revealed the 11-year average of survival from 2002 through 2012 was just 3% (lower than the purported winter-run survival in 2014 and 2015), see Table 1. If late-fall-run Chinook experienced such a consistent extremely high level of mortality in the earliest life stages solely in the reach upstream of RBDD for 11 consecutive years, it is doubtful the run would have persisted. Or conversely, since 3% survival is adequate for the existence of the late-fall run species, the concern of extinction for winter-run is unfounded. Further examination of the data, however, shows biologically implausible results. For example, the late-fall-run egg-to-fry survival in 2004 was only 1.2% (or 98.8% mortality), yet three years later when most of that brood year would be expected to return and spawn, the numbers of adults increased enormously to 13,939 fish (Table 1). This indicates that the population survival cannot be this low and, as such, the monitoring data must not be providing an accurate enough escapement number at RBDD, which is the same issue on the low survivability of winter-run in 2014 and 2015. Improvements must be made in the monitoring locations and calculations to more accurately estimate fish survival rates, particularly if those estimates continue to impact how the CVP is operated to meet all project purposes.

Summary of Operations in 2014/2015 and Plan For 2016

2014 Summary

In 2014 and 2015, the SRSC and Reclamation continued coordination efforts related to diversions, water transfers, and general CVP operations through regular conference calls and meetings. As part of the water made available under the Settlement Contracts by Reclamation, the SRSC voluntarily committed to shift their diversion pattern to better align with the timing of releases for fishery needs. By voluntarily delaying SRSC diversions in April and May, Reclamation was able to conserve additional storage in Shasta Reservoir to benefit the cold water pool and the Upper Sacramento River temperature control operation for fishery needs. In addition to the meetings with Reclamation, the SRSC met with members of the SWRCB, Division of Water Rights staff, the National Marine Fisheries Service (NMFS), the California Department of Fish and Wildlife (CDFW), the Department of Water Resources (DWR), and other CVP contractors to discuss operations, including the technical details of Reclamation's forecasting modeling and Sacramento River temperature planning.

In 2014, the unprecedented effort undertaken by the SRSC to voluntarily reduce and minimize diversions in April and May, and the subsequent benefits to Shasta Reservoir levels and operations received from this effort, were substantial. The efforts by the SRSC coordination group shifted more than 125,000 acre-feet (AF) of diversions out of April and May, again, to benefit the fisheries by expanding the Shasta cold water pool and Upper Sacramento River temperature control operations. By delaying planting, this shifted the highest crop demand for water to later in the season to align with fishery releases. Our landowners were concerned about the delay in planting due to postponing harvest and the increased potential for precipitation causing complications, increased costs, and reduced crop yields. Nevertheless, throughout the period April through October, the SRSC were able to limit diversions to less than the scheduled diversions coordinated with Reclamation, except for October. In October, it was recognized that

the remaining water supply was available to decompose rice straw while at the same time providing a valuable food source for migratory birds and the Pacific Flyway.

Related to the Settlement Contract provisions, 2014 was classified as a Critical Water Year for the Sacramento Valley, and the SRSC received a 75% Contract Supply. In addition to this 25% reduction in Contract Supply, the SRSC through careful management and coordination, diverted approximately 82% of their reduced 75% Contract Supply (or 61% of a full 100% Contract Supply) for agricultural purposes and to incidentally benefit wildlife habitat during the period April through October. *Through these voluntary actions by the SRSC, the CVP was able to operate more efficiently and allowed for better management for the winter-run salmon.*

The SRSC also agreed to transfer approximately 113,400 AF to areas in need of water supplies. After accounting for losses and considering demands, approximately 35,500 AF was delivered to CVP water contractors in the Sacramento Valley on a similar pattern to which it was made available. Transfer water is typically conveyed through the delta from July through September. However, this was not possible due to the restrictive operations required to address worsening drought conditions and cold-water pool management at Shasta Reservoir. Therefore, Reclamation entered into consultation with USFWS and NMFS, to propose modifications describing the drought response measures and requested extension of the period transfer water may be pumped at Jones Pumping Plant, allowing for delivery to the CVP water service contractors south-of-delta. Reclamation received concurrence from the USFWS and NMFS, and water was transferred at a time that allowed for stabilizing river flows to help with fall-run salmon spawning and preventing red de-watering on the Sacramento River.

2015 Summary

In the spring of 2015, the SRSC again worked closely with Reclamation to voluntarily shift diversion patterns to better align with the timing of releases from Shasta and Keswick Reservoirs for fishery needs. Reclamation requested the total diverted quantity in April and May be similar to the total April and May quantity diverted during 2014, but be more evenly distributed between the two months. An increase of 10% above the total April and May quantities was believed to be needed due the even drier spring months experienced in 2015 compared to 2014. The SRSC developed estimated schedules to meet this goal to delay and minimize diversions for planting until later. The SRSC provided daily diversion schedules to Reclamation on a regular basis and held weekly coordination calls with Reclamation to closely monitor Keswick releases, Sacramento River flows (particularly at Wilkins Slough), and diversions, making adjustments as necessary.

In addition to the meetings with Reclamation, the SRSC met with members of the SWRCB, the NMFS, DWR, and CDWFW to develop an even more stringent plan for 2015[2].

Due to the SRSC voluntarily delaying diversions from April and May, Reclamation was able to hold more water in Shasta Reservoir to benefit the cold-water pool and temperature management on the Upper Sacramento River. As in 2014, due to the effort voluntarily undertaken by the SRSC to reduce and minimize diversions in April and May, Reclamation allowed the

[2] Joint Agency Press Release on "Drought Conditions Force Difficult Management Decisions For Sacramento River Temperatures", http://www.waterboards.ca.gov/press_room/press_releases/2015/pr061615_shasta.pdf

rescheduling of water not diverted in April and May into later months including July, August, and September.

As in 2014, 2015 was classified as a Critical Water Year, and the SRSC received a 75% Contract Supply. In addition to this 25% reduction in Contract Supply, the SRSC coordinated the timing and reduction of diversions throughout the period of April through October. In total, the group diverted approximately 78% of their reduced 75% Contract Supply (or 58% of a full 100% Contract Supply) for agricultural purposes and to concurrently benefit wildlife habitat during the April through October period, and extending through December 10, 2015. Figure 4 shows the SRSC contract diversion rate, estimated/scheduled diversions, and actual diversions on a daily basis from April 1 through December 2015.

Additionally, at the request of Reclamation and the SWRCB, the SRSC agreed to pursue water transfers to areas of critical need through crop idling/shifting and groundwater substitution to further reduce spring diversions to maximize and preserve cold water in Shasta Reservoir. As a result, the SRSC transferred a total of approximately 207,000 AF to areas in need of water supplies, including the San Luis & Delta-Mendota Water Authority, the East Bay Municipal Utility District, and the Tehama-Colusa Canal Authority. Additionally, with limited diversion capacity from the Sacramento River in the summer to protect winter-run salmon, the SRSC also voluntary pumped groundwater to meet local demands. Later in the year, the SRSC again voluntarily deferred diversions to help Reclamation manage cold water and transferred water in Lake Shasta, while providing water for approximately 50,000 acres of critical bird habitat during the fall before the rains started.

2016 CVP Upstream Operations

According to Maria Rea, Assistant Regional Administrator of the NOAA Fisheries West Coast Region, "With the loss of two out of three cohorts of endangered wild winter-run, it is also critical that we develop cold water pool resources this winter and spring to support temperature management needed later in the year for this third wild winter-run year class."[3] The focus on perceived poor 2014 and 2015 survival rates is leading the fishery agencies to make extremely protective decisions on the operations of the entire CVP project, including releases from Shasta Reservoir, diversions by SRSC, flows in the delta, and water available for export to south of delta CVP contractors. To date, the agencies have solely focused on temperature management as the key factor, yet other factors that likely have a larger impact on salmon, from physical habitat improvements to predation, are not being considered or implemented. As an example, the *Salmon in the Spotlight* document states, "In addition to the drought, another important threat to winter-run Chinook salmon is a lack of suitable rearing habitat in the Sacramento River and Delta to allow for sufficient juvenile growth and survival."

For 2016, the SRSC are coordinating with Reclamation on diversions in order to maximize the efficient operation of the CVP while also protecting winter-run salmon. However, we are concerned that excess protections being requested by the fishery agencies could result in limited diversions in the spring, which will lead to mass fallowing of land within the SRSC service area.

[3] Letter from Maria Rea, NMFS to Ron Milligan, USBR.
http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/winter-run_juvenile_production_estimate__jpe_-_january_28__2016.pdf

While not a drought impact, these actions by the federal agencies will cause significant harm to this region, the local economies, and affect other species like the giant garter snake and the Pacific Flyway. Additionally, this will result in decreased flows to the delta impacting operations of the other CVP assets, and minimizing exports since most of the remaining flow will be delta outflow or meet delta consumption.

Initiatives and Experience in Actions and Restoration Projects to Benefit Salmon

Working with our biologist, Dave Vogel, the SRSC and the Northern California Water Association (NCWA), with participation by several environmental groups, have developed a Salmon Recovery Program[4] for the Sacramento Valley. There has been tremendous progress on projects that have had a positive impact on salmon, yet more work is ahead. The Program focuses on fish passage improvements, re-managing flows, and habitat improvements. These priorities were originally developed as part of Dave Vogel's 2011 comprehensive report, *Insights into the Problems, Progress and Potential Solutions for Sacramento River Basin Native Anadromous Fish Restoration*[5].

Unfortunately, we have seen few projects completed by the fishery agencies in the Upper Sacramento River that benefit winter-run salmon. The SRSC have completed fish screens on all larger diversions along the Sacramento River at a cost of nearly $600 million, which according to some, should have restored the winter-run salmon populations. In absence of projects being completed (or even initiated) by the fishery agencies, the SRSC have begun implementing the Salmon Action Plan, including funding the projects wholly or in part, securing all the necessary permits, and completing the restoration activities on our own. The SRSC have completed two projects and two new projects are currently underway, including the following:

- Painters Riffle – completed;
- Knights Landing Outfall Gates – completed;
- Market Street Spawning Habitat – under construction; and
- Wallace Weir Rescue Facility (Yolo Bypass) – planned for construction in July 2016

Painters Riffle

A unique partnership of GCID, Reclamation, Golden Gate Salmon Association, NCWA, CDFW, and the City of Redding developed and designed the Painter's Riffle restoration project, see Figure 5. With Reclamation staff's technical assistance and support from the Central Valley Project Improvement Act (CVPIA), GCID used its own staff and assets to obtain final permits and construct the proposed Painter's Riffle Project in December of 2014. Once the permits and agreements were received from numerous agencies including CDFW, U.S. Army Corps of Engineers (in consultation with NMFS and USFWS), Central Valley Regional Water Quality Control Board, Central Valley Flood Protection Board, California State Lands Commission, and the City of Redding, GCID staff spent over 500 hours preparing and moving approximately 8,000 cubic yards of gravel to reestablish the spawning habitat in the side channel. The cost of

[4] Sacramento Valley Salmon Recovery Program, http://www.norcalwater.org/wp-content/uploads/Salmon.version.FINAL-6.17.15.pdf

[5] Vogel Report, http://www.norcalwater.org/wp-content/uploads/2011/07/vogel-final-report-apr2011.pdf

the project, including obtaining the permits, actual construction and completion tasks was approximately $300,000. Salmon are now spawning in this restored side channel.

Knights Landing Outfall Gates

In 2015, Reclamation District 108 (RD 108) constructed a fish barrier at the Knights Landing Outfall Gates (KLOG) to prevent adult salmon from entering the Colusa Basin Drain (CBD) through the KLOG, see Figure 6. Before the barrier was constructed, adult salmon were able to enter the CBD through the KLOG when certain flow velocities were met that attracted migrating salmon. Once salmon enter the CBD, there is no upstream route for salmon to return to the Sacramento River and, absent fish rescue operations, the fish perish and are lost from production. To address this, RD 108 constructed a positive fish barrier with new concrete wing walls and metal picket weirs on the downstream side of the existing KLOG in the CBD, and placed a small amount of riprap on the right bank of the CBD immediately downstream of the KLOG to address levee erosion. Construction began in the latter part of August and was completed in November 2015. The total cost of the project was $2.454 million. Funding for the project was provided by Reclamation ($1.45M), DWR ($300,000), CDFW ($304,000), and the SRSC ($400,000).

Market Street Spawning Habitat

Reclamation, in partnership with GCID, Western Shasta Resource Conservation District, DWR, and CDFW are currently placing salmonid spawning gravel in the Sacramento River, immediately below the Anderson Cottonwood Irrigation District Diversion Dam and Market Street Bridge, in Redding, see Figure 7. From February 15 through March 18, 2016, GCID will be placing approximately 8,500 cubic yards of gravel into the river to help improve spawning habitat for Chinook salmon and steelhead trout. The project is a continuing effort to help meet requirements of the CVPIA to restore and replenish spawning gravel and rearing habitat for salmonid species. Environmental documentation was recently completed for the project[6].

Wallace Weir Rescue Facility

Under certain flow regimes, adult salmon migrating upriver are attracted to enter the CBD from the Yolo Bypass through the Knights Landing Ridge Cut (Ridge Cut), see Figure 8. Once salmon enter the CBD, there are no upstream routes to return to the Sacramento River and absent fish rescue operations, the fish perish and are lost from production. Each year at the confluence of the Yolo Bypass and the Ridge Cut, a temporary 450-foot long earthen berm, known as the Wallace Weir, is installed to create an irrigation backwater. This temporary berm blocks fish passage until it is compromised by flood flows each year. Once the weir is compromised, fish have free passage into the CBD via the Ridge Cut.

This project proposes to replace the temporary berm with a permanent earthen weir that will be hardened to withstand winter floods. A fish rescue facility will be incorporated into the weir so fish that arrive at the Wallace Weir via the Yolo Bypass can be safely and effectively rescued and returned to the Sacramento River to resume their migration to upriver spawning grounds. An inflatable dam and positive fish barrier will also be incorporated into the new weir structure to better control water releases and fish attraction flows through the weir while blocking fish passage. The Wallace Weir Fish Rescue Facility will complement the Knights Landing Outfall Gate (KLOG) Fish Barrier Project completed in 2015 by RD 108.

[6] http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=23758

Given RD 108's success in expediting implementation of the KLOG Fish Barrier project, DWR has requested that RD 108 take the lead in implementing the Wallace Weir Fish Rescue Facility on DWR's behalf. This project serves as a fish passage improvement action that will impede salmon entry into the CBD while also providing for safe and effective fish rescue. The project is one of several being pursued by DWR and others to be consistent with the NMFS's 2009 Operations Biological Opinion, Reasonable and Prudent Alternative Action, I.7. In addition to improving fish passage, the project will also be designed to maintain appropriate irrigation water surface elevations without impeding outflows during flood season. The weir, inflatable dam and fish barrier will be owned and operated by DWR with a construction cost of approximately $8,560,000.

Water Storage

Finally, to help address the longer term water supply needs of our region and the state as a whole, we need new federal assistance tools to help local agencies better manage and develop new water supplies critical to a more drought resilient economy.

Sites Reservoir, for example, is foundational to the long-term economic health of our region and the state. Sites will bring 1.8 million AF of new water storage to California. The Sites Project represents the kind of new, smart storage that our State needs, one that will not only create additional supplies behind the dam itself, but will allow significant additional water to be stored in other upstream reservoirs (Trinity, Shasta, Oroville and Folsom) due to coordinated operations and integration efficiencies. In a year like 2015, if Sites were in place, it is estimated there would have been an extra 400,000 AF of water in storage north of the Delta to meet the water needs of agriculture and our cities, as well help meet the Central Valley Project obligations for environmental water for fish and waterfowl. For 2016, DWR has estimated that an additional 346,000 AF of water could have been diverted during the storms through February 9.

GCID, SRSC, and NCWA strongly support the work of Rep. LaMalfa, working with Congressman Garamendi and others, through the introduction of H.R. 1060 and their work on other bills to advance the Sites Project. We support the work of this Committee to seek new ways to streamline the environmental review process for new water supply infrastructure investments, such as the Sites Project, including the water infrastructure environmental review streamlining provisions included in H.R. 2898, sponsored by Rep. Valadao. While delays in the water supply project environmental review and permitting process are due, in part, to the complexities associated with multiple state and federal agencies being involved in the project, other delays are attributable to shifting environmental requirements.

H.R. 2898 seeks to address many of these challenges by establishing a lead agency to coordinate all federal environmental reviews related to a surface water storage project and directing that a schedule be established and strictly adhered to by Reclamation for the completion of all environmental review processes. And, we appreciate that the environmental streamlining process proposed in H.R. 2898 includes projects, like the Sites Project, which are being

developed by non-federal entities in cooperation with Reclamation and other Federal agencies on non-federal lands.

In addition, we encourage the Committee to give favorable consideration to proposals like those included in S. 2533, introduced by Senator Dianne Feinstein, and other bills that seek to authorize new funding and financing opportunities to support non-federal investments in needed water supply projects, like the Sites Project. Specifically, we strongly support language authorizing the Reclamation Infrastructure Finance and Innovation Act (RIFIA), which would provide local agencies with access to low-cost, long-term financing for much needed water infrastructure investments. If a RIFIA loan program were in place today, the program would provide water project sponsors with access to loans with a repayment period of up to 35 years at a rate of approximately 2.9 percent. For the Sites Project, this would drive down the cost of water by approximately $131 an acre-foot, dropping the cost from a projected $571 dollars an acre-foot to $440 an acre-foot, an overall 23 percent reduction in the cost of water from the project.

Recommendations

The perceived lack of survival of winter-run Chinook salmon in 2014 and 2105 has impacted every aspect of California's water system and caused friction in decisions made by federal, state, and local agencies. More must be done to better understand the state of winter-run salmon, and ensure that the best available science is being utilized to determine what projects and actions should be taken to ensure the survival of winter-run in the managed system in which we operate. The following recommendations are actions that can be taken immediately:

1. Monitoring. If the RBDD fish sampling program will continue to be used to estimate fish survival, an improved method is necessary to account for fish passage during un-sampled periods when flow and turbidity are high. Alternatively, an additional fish sampling site farther upstream where channel and riverine conditions are more stable would provide more-accurate estimates of fish survival, and would be more effective in monitoring annual winter-run survival and the effectiveness of salmon habitat restoration projects in the upper river.
2. Funding and Permitting. As stated previously, little if any salmon habitat restoration projects have been done by fishery agencies on the upper Sacramento River. The agencies need to prioritize funding and expedite permitting for local, state, and federal efforts on the river.
3. Predation and Other Factors Impacting Survival. The agencies need to look at all factors that affect winter-run salmon like predation, lack of spawning habitat, lack of rearing habitat, timing of flows, etc. and not focus on temperature alone.
4. Habitat. The monitoring of physical habitats utilized by winter-run Chinook should be an important component of future monitoring programs. Additionally, there needs to be a concerted effort to improve rearing habitat quality for young winter-run Chinook salmon, which appears to be of poor quality and severely deficient.
5. Storage. The evaluation and construction of new water storage that can provide additional cold water benefits during normal and drought years needs to be expedited.

FIGURES AND CHARTS

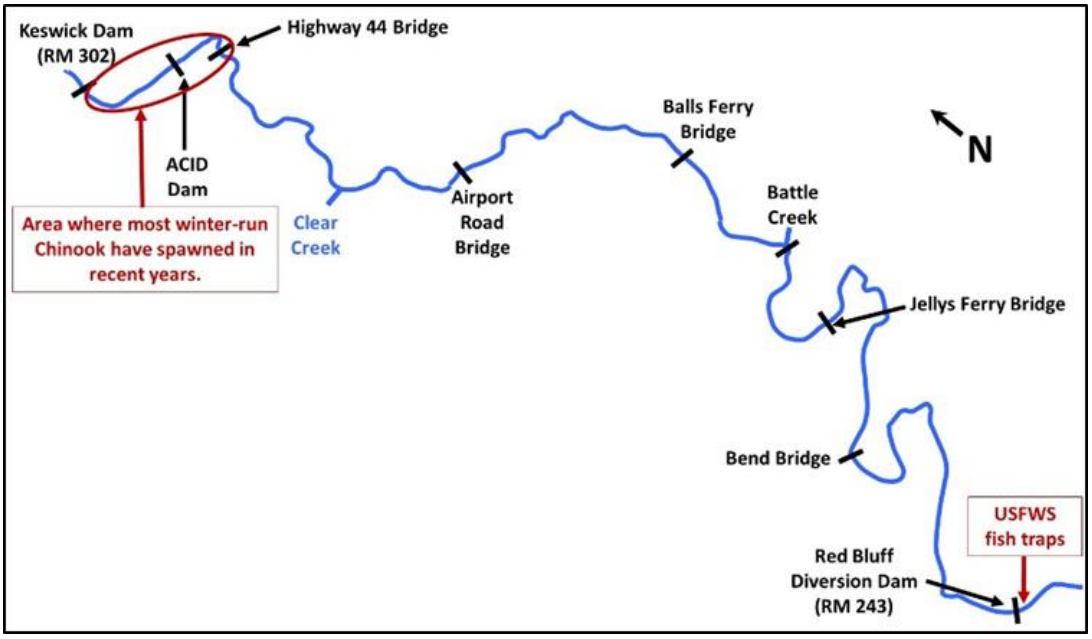

Figure 1. The upper Sacramento River between Keswick Dam (River Mile 302) and Red Bluff Diversion Dam (River Mile 243).

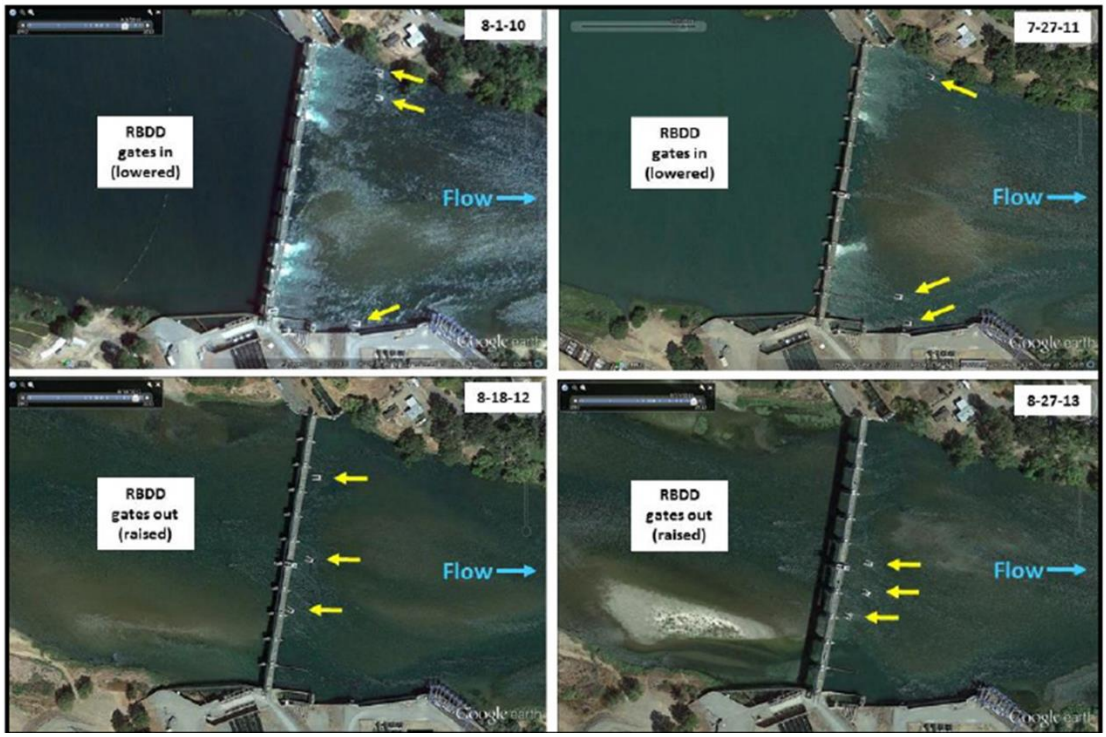

Figure 2. Location of Rotary Screw Traps at Red Bluff Diversion Dam

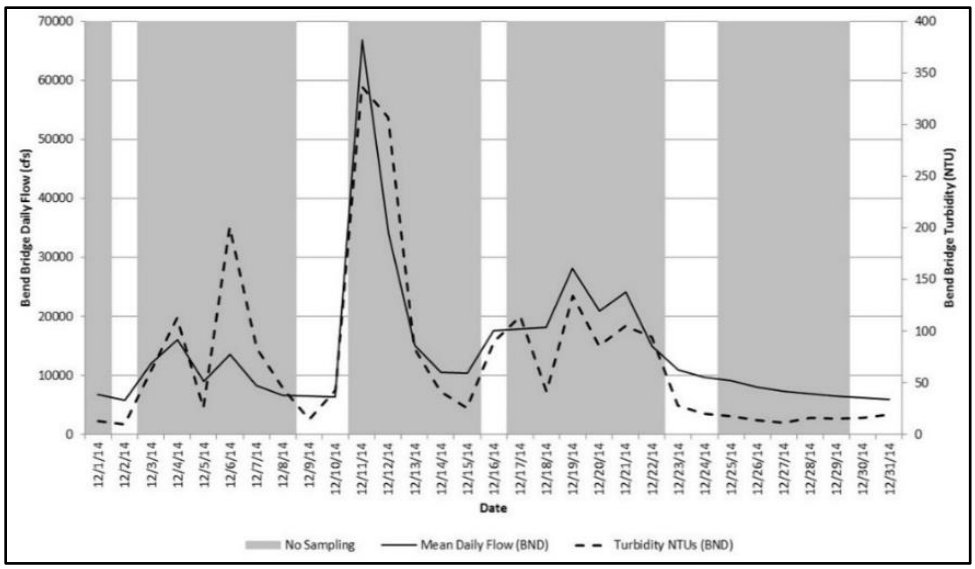

Figure 3. Daily flows (cfs) and turbidity (NTUs) measured at the Bend Bridge gauge upstream from RBDD during December 2014 and the periods when no fish sampling occurred at RBDD (which is used to estimate juvenile salmon production).

Table 1. Annual estimates of late-fall-run and winter-run Chinook adult salmon upstream of RBDD and corresponding egg-to-fry survival estimates (data obtained from Poytress et al. 2014).

Year	Late-Fall-Run Chinook			Winter-Run Chinook		
	Adult Estimate	Egg-to-Fry Survival	Egg-to-Fry Mortality	Adult Estimate	Egg-to-Fry Survival	Egg-to-Fry Mortality
2002	36,220	5.2 %	94.8%	7,337	27.4 %	72.6%
2003	5,513	3.8 %	96.2%	8,133	23.0 %	77.0%
2004	8,924	1.2 %	98.8%	8,635	20.9 %	79.1%
2005	9,610	1.0 %	99.0%	15,730	18.5 %	81.5%
2006	7,770	3.5 %	96.5%	17,205	15.4 %	84.6%
2007	13,939	2.7 %	97.3%	2,488	21.1 %	78.9%
2008	3,747	1.9 %	98.1%	2,850	17.5 %	82.5%
2009	3,792	4.3 %	95.7%	4,537	33.3 %	66.7%
2010	3,961	2.7 %	97.3%	1,533	37.5 %	62.5%
2011	3,777	1.4 %	98.6%	824	48.6 %	51.4%
2012	2,931	3.0 %	97.0%	2,581	26.6 %	73.4%
Average	9,108	2.8 %	97.2%	6,532	26.4 %	73.6%

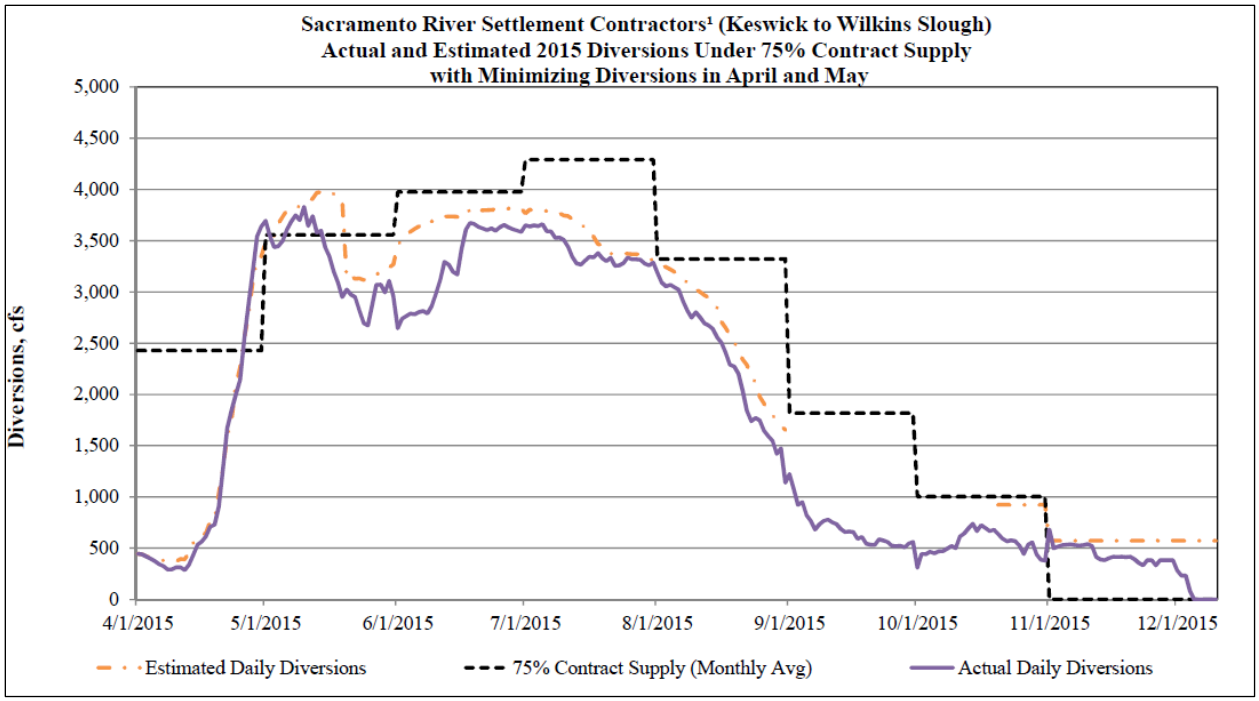

Figure 4. Sacramento River Settlement Contractor diversion schedule.

Figure 5. 2015 Diversions Painters Riffle Restoration Project completed by GCID. Project Video can be seen at http://www.gcid.net/#!painters-riffle-project/qs7o8

Figure 6. Knights Landing Outfall Gates (KLOG)

Figure 7. Market Street Gravel Placement Project for salmon spawning habitat.

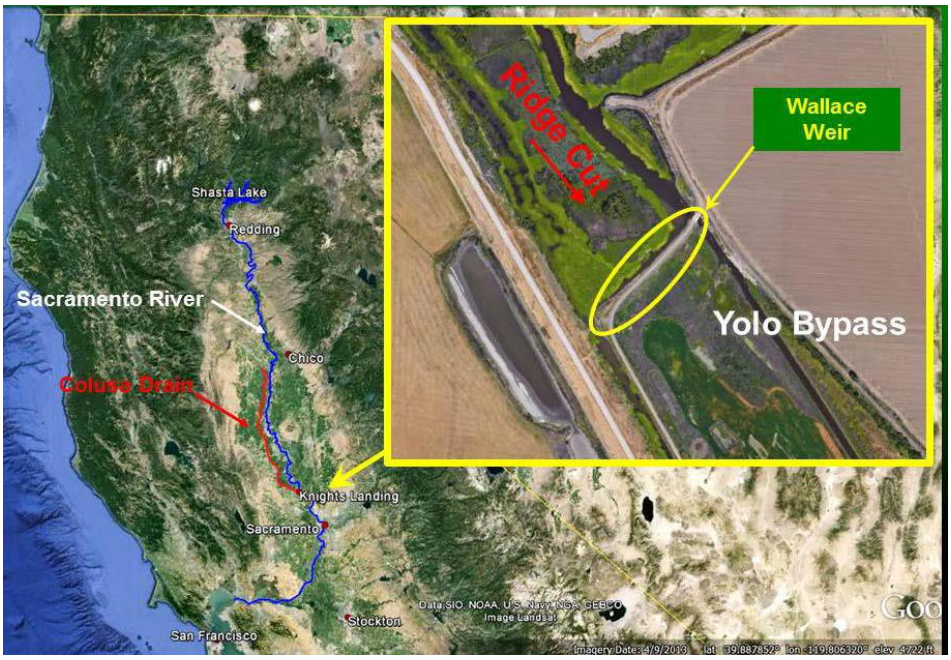

Figure 8. Yolo Bypass Ridge Cut Project