



Report on Voluntary Diversion Reduction Program among in-Delta Riparian Water Right Claimants

by

Michael Patrick George
Delta Watermaster

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Executive Summary

Facing a fourth consecutive year of drought in 2015 and consequential threat of curtailments, farmers in the Delta proposed a voluntary program to significantly reduce their surface water diversions during the critical summer growing season. This is a report describing the context, origin, objectives, regulatory framework, implementation and results of that program.

The diversion reduction program was open only to farmers in the Delta who claim riparian water rights to irrigate their crops. Participants in the program agreed to make or sustain significant changes in their farming practices aimed at cutting their summer diversions of water by 25% versus base year 2013. In consideration of that commitment, the State Water Resources Control Board (Water Board) and the Office of the Delta Watermaster (Watermaster) agreed not to enforce deeper curtailments against those participants, if such curtailments were later ordered as a result of the drought.

Participation in this program was concentrated within the central and southern areas of the Delta, based on hydrological, topographical, contractual and other factors. The majority of riparian claims within the boundaries of the Central Delta Water Agency and the South Delta Water Agency voluntarily enrolled in the program. More than 200 separate diversion reduction plans were submitted; collectively, those plans covered roughly two-thirds of the farmable land in the central and southern parts of the Delta. Those plans proposed a wide and creative array of strategies for achieving the objective of reducing surface water diversions by 25%. Among those strategies:

- Fallowing in 2015 land that had supported a crop in 2013;
- Moving to less water intensive crops;
- Reducing irrigation frequency; and
- Employing more efficient irrigation equipment and/or techniques.

Measuring the water conservation benefit of the program is difficult. The vast majority of diversions in the Delta are not measured, usually because water right claimants within the Delta have considered the purchase, installation, and maintenance of measuring devices “not locally cost effective.”

Notwithstanding the handicap associated with the inherent imprecision of estimating diversions, the program achieved its primary objective of producing significant reductions in diversions. Based on plan reviews, verification inspections conducted by the Watermaster, after-action reports prepared by participants and correlations with independent analyses of satellite images, diversions in 2015 were reduced by more than 25% versus 2013 and by a smaller percentage versus the amount of water that would have been diverted without the program.

In addition to relief for the State’s drought-stressed water system provided by the program, the organized, voluntary, flexible approach:

- allowed Delta farmers to make tangible sacrifices to “share the pain” of the drought, without waiving their fiercely defended water right claims;
- induced investment and experimentation among Delta farmers that may prove useful in response to future drought conditions;
- may have helped to avoid some regulatory responses that would have otherwise been required; and
- created a positive example of responsible action to address a common challenge, without a mandate by statute, regulation or court order.

Statistical Overview

Total acres in Central and South Delta:	268,000
Total acres enrolled in the diversion reduction program:	180,119 ¹
Number of conservation plans submitted:	217
Acre-feet reported as diverted in summer 2013:	486,754
Acre-feet reported as diverted in summer 2015:	333,082
Reductions in diversions reported from program implementation:	153,672
Percent of reduced diversions reported:	32%
Acre-feet diverted per acre of irrigated land in summer 2013:	2.70
Acre-feet diverted per acre of irrigated land in summer 2015:	1.91

Disclaimer: The data compiled and reported in the spreadsheet accompanying this report—from which these statistics are derived—are based on reports prepared by program participants and their advisors. However, the vast majority of diversions in the Delta are estimated, not measured. Although the Watermaster has attempted to resolve numerous anomalies in participants’ reports, the underlying diversion data should be viewed as approximations.

¹ A total of 15,005 acres enrolled in the program are located in Contra Costa County, outside the Central and South Delta Water Agencies boundaries.

Background: Drought with Threatened Curtailments

By April, 2015, it was evident that California was experiencing a fourth straight year of drought. The Sierra snowpack was anemic, and Governor Brown had renewed and extended statewide emergency drought proclamations.² The Central Valley Project (CVP) had announced zero allocations for its water service contracts;³ the State Water Project (SWP) anticipated delivery of only about 20% of its contractors' Table A orders.⁴ The Governor had ordered urban water users to reduce consumption by 25% measured against base year 2013, and the Water Board was in the process of developing implementing regulations.⁵ The Water Board's Division of Water Rights had already issued warnings that water supplies were forecast to be so meager over the course of the 2015 growing season that even relatively senior water rights might face curtailment.⁶

Although the 2015 drought's grip was statewide, its impacts varied widely by region. Agricultural areas dependent on exports from the Delta were among the hardest hit during 2015.⁷ Senior water right holders with settlement contracts from the CVP and SWP (together, the Projects) faced potential reductions, even below what their contracts called for under drought conditions. As the drought persisted, CVP and SWP contractors worked with the Projects to re-schedule the reduced water deliveries to better meet habitat needs and to facilitate transfers.⁸

Facing different constraints in a drier watershed, water rights holders on the San Joaquin River and its tributaries worked throughout the Spring of 2015 to avoid potential curtailments through negotiations

² The April 1, 2015, Executive Order B-29-15 is available

at: https://www.gov.ca.gov/docs/4.1.15_Executive_Order.pdf

³ The February 27, 2015 CVP water supply allocation summary is available at:

http://www.usbr.gov/mp/cvo/vungvari/water_allocations_historical.pdf

⁴ On March 2, 2015, SWP contractors were notified of updated allocations. Notice 15-03 is available at:

<http://www.water.ca.gov/swpao/docs/notices/15-03.pdf>

⁵ The regulation was adopted on May 15, 2015. The Water Board's Resolution 2015-032 is available at

http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/2015_notice.pdf

⁶ The Division's January 23, 2015 notice of potential curtailment is available at:

http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/2015_notice.pdf

⁷ See, e.g., "California Farmers Brace for More Water Cuts" *The Sacramento Bee*, June 2, 2015 available at:

<http://www.sacbee.com/news/state/california/water-and-drought/article22926591.html>

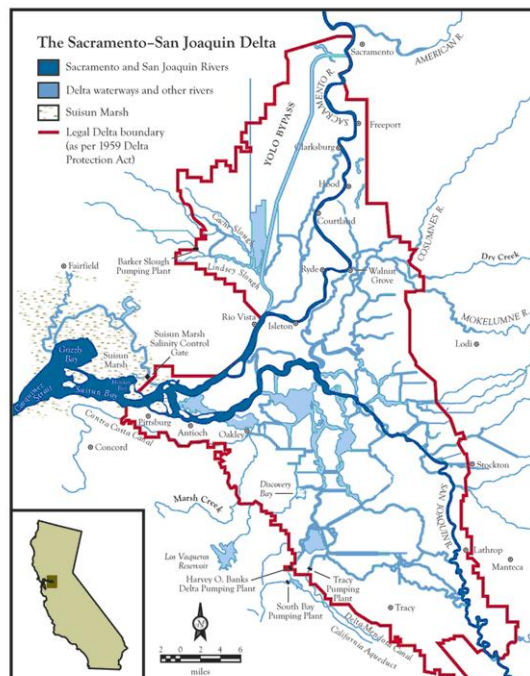
⁸ See Framework of Actions for Managing the Sacramento River for Multiple Beneficial Purposes in 2015 Fact Sheet, April 17, 2015 available at :

http://waterboards.ca.gov/water_issues/programs/delta_watermaster/docs/vwc15/sacriver_factsheet.pdf. As drought conditions evolved, contractors cooperated in making further adjustments. See, e.g., "Sacramento River Flow Decreased to Save Cold Water for Fish" *Chico Enterprise-Record*, June 17, 2015 available at: <http://www.chicoer.com/article/NA/20150617/NEWS/150619768>

seeking a series of agreements for mutual assistance and emergency drought management.⁹ Those negotiations were complicated not only by the different appropriation priorities of the parties along the San Joaquin River and its tributaries but also by fear of compromising complex and long-standing contractual arrangements and legal settlements.

The availability of water conveyed through the Delta was so limited that the U.S. Bureau of Reclamation (USBR) met contractual delivery obligations to the Exchange Contractors from the CVP's San Joaquin River Resources (Friant Division), the first time that has been necessary in more than 40 years. To alleviate some of the resulting conflict and hardship, USBR and several CVP contractors entered into an agreement to provide minimal supplies to critical needs within the Friant Division.¹⁰

Even within the Delta, there were divergent circumstances affecting how the drought impacted water users and Project operations.¹¹

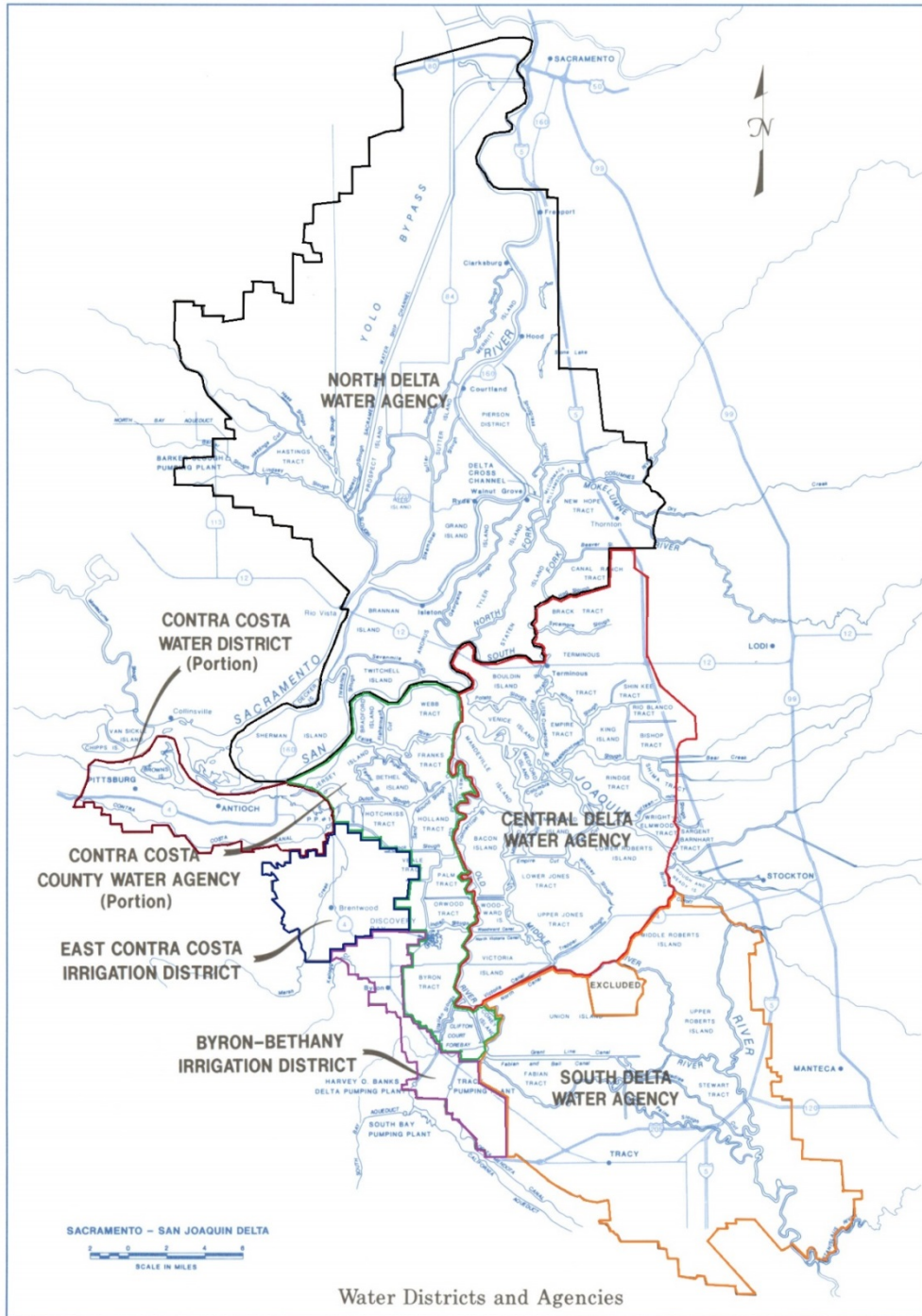


⁹ See, e.g., letter of June 3, 2015 from counsel for two San Joaquin River irrigation districts to the SWRCB's executive director proposing voluntary reductions in water use in lieu of potential regulatory curtailment. http://waterboards.ca.gov/water_issues/programs/delta_watermaster/docs/vwc15/regcurt_email.pdf.

¹⁰ See "Bureau and Water Users Reach Agreement to Provide CVP Water to Friant Division" May 14, 2015 available at: <http://www.acwa.com/news/water-supply-challenges/bureau-and-water-users-reach-agreement-provide-cvp-water-friant-divisio>

¹¹ The position of the Delta Watermaster was created by statute as part of the Delta Reform Act of 2009. Pursuant to Water Code §85230(b), the Watermaster is responsible for administering water rights within the legal Delta.

Map: Water Districts and Agencies in the Delta



Sacramento-San Joaquin Delta Atlas

Department of Water Resources

Map Adapted from The Delta Atlas.

North Delta

Since 1981, the North Delta Water Agency (NDWA) has had a contract with the Department of Water Resources (DWR) which assures water users within that part of the Delta a dependable water supply of suitable quality for irrigation.¹² Under that contract, DWR agrees to supplement natural flows available to NDWA users, if necessary, from SWP storage so as to assure that beneficial uses are served. As a result of the contract, north Delta water users can fall back on SWP supplies when and if their own senior water rights fall out of priority. As one of the Directors of NDWA explained, “We think of our contract with DWR as an insurance policy: we have been paying the premiums [contract payments] all these years, and this year, we’re entitled to rely on the policy to pay off, even if conditions continue to be dry.”¹³

Contra Costa

Roughly 15,000 acres out of 180,000 acres enrolled in the diversion reduction program are located in Contra Costa County. The enrolled acres are clustered along the western edge of the Delta/eastern edge of the County, where farming still predominates land use.¹⁴ As a small subset of the overall participants in the program, Contra Costa farmers met their diversion reduction objectives by employing many of the same techniques that prevailed elsewhere. However, the plans in Contra Costa County, reflect the efficiencies possible through consolidated ownership: four islands in the County (Jersey, Holland, Webb and Coney) are each owned by a single entity. In general, the unified ownership on each island seems to have fostered an integrated approach to diversion reduction that is inherently more challenging among multiple owners on other Delta islands.¹⁵ Taken together, the Contra Costa County participants reported achieving a 38% reduction in diversions, slightly greater than the program’s overall average.

Central and South Delta

Water users within the Central Delta Water Agency (CDWA) and South Delta Water Agency (SDWA) divert water for use under their own water rights, without support from a backstop contract from either

¹² The DWR/NDWA contract is available at: <http://www.northdeltawater.net/our-contract.html>

¹³ NDWA Director Topper Van Loben Sels to Michael George on September 1, 2015 in Courtland, CA.

¹⁴ The Counties’ urban diverters—Contra Costa Water District, the City of Antioch and other municipal service providers—generally do not rely on riparian rights to support their in-Delta water diversions.

¹⁵ The same beneficial aspects of scale and unified ownership were also reflected in the detailed plans prepared for and implemented on Victoria and McDonald Islands.

of the Projects.¹⁶ In general, water users in these areas claim very senior water rights, often dating back to the period when inundated and swampy lands within the Delta were “reclaimed” for agriculture by building dykes and draining the land behind those dykes.¹⁷ Much of the reclamation took place before the State began to regulate new surface water diversions (beginning in 1914).¹⁸ Because of the nature of the Delta, there are agricultural lands adjacent to natural water courses, which claim riparian water rights.¹⁹ In fact, most agricultural water diverters in the CDWA and NDWA claim both pre-1914 and riparian water rights.²⁰ Relying on this “portfolio” of water rights, Delta water right claimants generally take the position that in-Delta diversions for beneficial use is assured in nearly all hydrologic circumstances.²¹

The dire water shortages facing its member led the San Luis Delta Mendota Water Authority (SLDMWA) to enter into negotiations in early 2015 with certain Delta water right claimants. The basic idea behind the negotiations was that the in-Delta diverters would follow a portion of their irrigated acreage and

¹⁶ Formed under the same legislation as the NDWA, neither the CDWA nor the SDWA has secured a comparable contract, although negotiations toward a contract have been pursued from time to time and the authority to enter into such a contract still exists. Advocates for Delta water rights point out that (i) the combination of fresh water from the Delta’s inland watershed and tidal influence assures that there is always water in the Delta channels and (ii) the Projects bear practical, statutory and regulatory responsibility for maintaining adequate water quality throughout the Delta. A contrary view is embedded in a complaint of unlawful diversion filed with the Division of Water Rights by the State Water Contractors (served by the SWP) against central and south Delta diverters on June 16, 2015. The complaint is available at :

http://waterboards.ca.gov/water_issues/programs/delta_watermaster/docs/vwc15/swc_complaint.pdf

¹⁷ The State Lands Commission provides a general description of the disposition of reclaimed swamp and overflowed lands at: http://www.slc.ca.gov/Info/Swamp_Overflow.html

¹⁸ So-called “pre-1914” water rights are not regulated by the Water Board. However, water diverters have been required to report their diversion and use of water under pre-1914 water right claims since passage of the Delta Reform Act in 2009. Further, the Court of Appeal recently ruled that, “Although the [Water] Board has no authority to require such users to obtain a permit to divert, there is no question it has the power to prevent riparian users and early appropriators from using water in an unreasonable manner.” *Light V. SWRCB*, 226 Cal. App. 4th 1463, 173 Cal. Rptr. 3rd 200 (2014).

¹⁹ Statements of Diversion and Use are also required (since 2010) for water diverted pursuant to claims of riparian water rights.

²⁰ Although beyond the scope of this report, it is worth noting that there is unresolved controversy over whether a riparian water right may be “backed up” with a valid pre-1914 water right (or vice versa). For instance, in *dicta* (observation not necessary to support the decision), the First District Court of Appeal recently noted: “To acquire the right to appropriate water in the pre-1914 period, an owner of riparian land was required to establish the diversion of water for beneficial use on non-contiguous lands, as well as the quantity of water so used.” *Millview County Water Dist. v. SWRCB*, 229 Cal. App. 4th 879, 177 Cal Rptr. 3rd 735 (2014) [citing *Crane V. Stevinson* (1936) 5 Cal. 2nd 387, 398.].

²¹ Advocates also cite “area of origin,” “Delta protection,” and “Delta pool” theories to support diversion rights within the Delta. In addition, Water Code § 12201 reads, in part, “The Legislature finds that the maintenance of an adequate water supply in the Delta sufficient to maintain and expand agriculture...and to provide a common source of fresh water for export...is necessary to the peace, health, safety and welfare of the people of the State....”

forego exercising a corresponding portion of their pre-1914 right to divert water. The resulting conserved water would be available for transfer to and purchase by farmers within the SLDMWA service areas. For a variety of reasons, including the looming risk that even pre-1914 water rights might be impacted by the drought, the negotiations did not lead to an agreement.²²

Origin of the Voluntary Diversion Reduction Program

Notwithstanding that negotiations aimed at transferring water arising under in-Delta water rights did not result in a viable transaction with SLDMWA, those discussions prompted representatives of Delta farmers²³ to propose an alternative: a voluntary program to reduce in-Delta diversions. Although curtailment of water rights was a looming threat, the primary motivation for the proposal was to provide an organized way for Delta water users to relieve pressure on the State's water system and thus help to ameliorate the effects of the drought—and to do so without either relinquishing or fully exercising cherished water right claims.

Objectives: Conservation and Regulatory Certainty

The kernel of the proposal was to enlist in-Delta riparian water right claimants to help alleviate pressure on the drought-strained water system by voluntarily reducing their diversions by 25% measured against a 2013 base year. In exchange for reducing their diversions over four months (June, July, August and September), Delta representatives sought regulatory certainty regarding the impact of potential curtailment of diversions due to a lack of available water. In the event that riparian water rights faced curtailment during the course of the growing season, those who voluntarily cut diversion by 25% throughout the season would not face curtailment enforcement.

Following receipt of the initial conceptual proposal, the Watermaster, in consultation with the Division of Water Rights, took the lead in negotiating the terms for participation in the diversion reduction program. After fine tuning the parameters of the program and securing conceptual approval from the Water Board, the program was “rolled out” to an audience of more than 250 farmers at a presentation hosted by the Central and South Delta Water Agencies at the Roberts-Union Farm Center outside of Stockton on May 21.²⁴

²² The potential transfer was also contested by DWR on technical grounds. See email of April 15, 2015 from DWR's Bill Croyle to SLDMWA's Frances Mizuno available at:

http://waterboards.ca.gov/water_issues/programs/delta_watermaster/docs/vwc15/delta_cropidel.pdf

²³ Although other representatives became actively engaged in development and implementation of the program, the lead negotiators were attorneys George Hartmann of Stockton and Jennifer Spaletta of Lodi.

²⁴ “Farmers Agree to Water Cuts in California” *The New York Times*, May 22, 2015 available at:

http://www.nytimes.com/2015/05/23/us/some-california-farmers-to-cut-water-use-to-ease-drought.html?_r=0 .

The program was announced on May 22,²⁵ including the following terms:

- Participation was voluntary;
- Enrollment was offered only to riparian water right claimants within the Delta;²⁶
- Participants were required to file their plans for reducing diversions by 25% on or before June 1;
- Reduction strategies were kept flexible to accommodate the variety of circumstances;
- Plan implementation was subject to verification inspections during the program period; and
- Participants were required to file an “after-action” report on plan implementation in November.

The program explicitly aimed at reducing diversions, not reducing consumptive use. The distinction was important for several reasons. First, there is no reliable and approved method for measuring consumptive use in the unique setting of the Delta.²⁷ Second, the vast majority of water diversions within the Delta are not accurately measured.²⁸ Third, because a significant amount of Delta farm land is below the water level in surrounding channels, some water that is consumed by crops reaches their root zones by means of artesian flow or seepage rather than through surface water diversion.²⁹

“Voluntary cuts approved by state” *Stockton Record*, May 22, 2015 available at:

<http://www.recordnet.com/article/20150522/NEWS/150529883> .

²⁵ State Water Board Approves Voluntary Cutback Program for Delta Riparian Water Rights, May 22, 2015 available at : http://www.swrcb.ca.gov/press_room/press_releases/2015/pr052215_riparian_proposal.pdf .

²⁶ Participation in the program was limited to those claiming riparian water rights partly because water arising under riparian rights may not be transferred from the land contiguous to the water course from which the water is withdrawn. Thus, reduced diversion under a riparian right cannot be offset by increased diversion elsewhere, pursuant to a water transfer.

²⁷ An on-going study, launched in early 2015 under the auspices of the Watermaster, is designed to calibrate eight different methods for measuring consumptive use under Delta conditions and then to test the results as applied to common data sets. See “Comparative Study of Methods for Determining Consumptive Use of Water in the Delta” November 1, 2015, available at:

http://waterboards.ca.gov/water_issues/programs/delta_watermaster/docs/vwc15/study_cudelta.pdf .

²⁸ The prevailing method for estimating diversions in the central and southern Delta relies on computing planted acreage, extrapolating crop-specific evapotranspiration values and adding an estimate of conveyance and other water losses based on irrigation equipment and practices. The Watermaster and the Division of Water Rights announced in 2015 that this method of determining water diversions is inadequate because of its inherent inaccuracy and because it ignores the common practice in the Delta of periodically diverting surface water to flush salts from the soil. In June of 2015, the Governor signed into law Senate Bill 88 which calls for measurement of most agricultural water diversions. Regulations to implement SB 88 were adopted by the Water Board, pursuant to drought emergency authority, in January of 2016. The recent regulation is available at:

http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2016/rs2016_0005.pdf .

²⁹ The Watermaster observes a rebuttable presumption that all water use in the Delta is derived from surface water. The presumption is supported by the close connection among (i) water physically diverted (for instance, by pump or syphon) from Delta channels, (ii) water that seeps from the channels into the farmed areas behind the dykes, and (iii) water that is produced through relatively shallow wells with a near-immediate influence on the surface supply. The presumption may be rebutted by a site-specific showing that a well located within the Delta is constructed to avoid shallow water production and to produce only percolating groundwater.

Participation

Because the program was voluntary, there was no way to predict how many farmers and how many acres would be enlisted in the program. Further, because farmers within the NDWA had the “insurance policy” of a contract from DWR, there was little incentive for them to participate in the program. And, because the program was open only to those who had previously claimed a riparian water right, some in-Delta farmers could not participate. Initially, we reported that 221 applications to participate had been filed.³⁰ However, some of those applications overlapped, a few others were duplicates and some encompassed a group of farms within a single district or on a single island. In the end, we catalogued 217 discrete plans which enrolled a total of just over 180,000 acres, comprising roughly 67% of the total acreage in the Central and South Delta Water Agencies.

Methods Employed to Reduce Diversions

As anticipated, farmers in the Delta proposed and carried out a wide variety of strategies and combinations of efforts to reduce their overall diversions during the 2015 growing season. Some of the most frequently recurring methods are discussed below, but the real story behind these descriptions may be the creativity and cooperation elicited by this program and by water users’ overall attempts to manage through the drought. In addition, over the course of the summer we observed that farmers quickly adapted to evolving conditions, learned and applied lessons from experiments and experience within the Delta farming community, and took real pride in their shared commitment to ameliorating drought pressures. Tellingly, we did not observe any reduction in plan implementation after August 1 (half way through the program) when it began to appear that the need for riparian curtailments had been averted.³¹

³⁰ The standard program application form is available at:

http://waterboards.ca.gov/water_issues/programs/delta_watermaster/docs/vwc15/app_vwc15.pdf.

³¹ Ultimately, there were no orders curtailing riparian water rights. See the Observations section of this report.

Following³²

Although we had anticipated that fallowing land for at least part of the program's duration would account for a substantial amount of the reduced need for diversion, the land actually fallowed totaled only about 6,178 acres. In addition, farmers carefully selected the acres they elected to fallow to cut out their most difficult-to-farm or least-productive fields. In fact, they often fallowed only portions of fields—areas with short furrows, with troublesome seepage, with salty ground or with other conditions that could be fallowed to save water without a comparable sacrifice in crop yield and value. Although some plans proposed fallowing a straight 25% of acreage that was farmed in 2013, most fallowing was only one part of a more complex plan for reducing diversions. Even when large fields were fallowed, it was often done, in part, to facilitate a significant change in farm practice. For example, some farmers fallowed fields and used the time to prepare the ground for a permanent crop; others used the fallowed period to re-grade or install new irrigation equipment; still others decided to manage seasonal rotations that simply skipped a summer crop. Notwithstanding the motivation, the decision to fallow productive ag land during the summer growing season clearly resulted in reduced surface water diversion to irrigate that land and, thus, supported the program's overall objectives.

Crop Changes

Many farmers achieved their goal of reduced irrigation by growing less water intensive crops in 2015 than the crops they cultivated in 2013. Some plans proposed to keep the crop, but change the cultural process; for instance, irrigation of field corn was truncated and the corn harvested for silage instead of grain.³³ Because the water conservation program came together in late May, it seems likely that many cropping decisions had been made earlier—perhaps influenced by the specter of on-going drought—and then credited as part of the voluntary diversion reduction plan. Again, regardless of the timing and causality, changing from, say, melons to beans or from tomatoes to wheat allowed Delta farmers to

³² One reason that the program relied on the simple metric of reduced diversion is that farming in the Delta presents unique challenges in measuring consumptive use. Given the opportunity presented by fallowing in this program, we allocated resources from the on-going consumptive use study to measure the actual consumptive use savings on three separate fallowed fields. The data from that aspect of the study are still being analyzed, but they should yield valuable benchmarks for predicting relationships between fallowing and consumptive use savings.

³³ This water conservation technique seems to have had an unintended market effect. Corn is a commodity crop with a worldwide market. Silage, on the other hand, is a crop limited by storage and transportation logistics to local consumption for livestock feed. Because more corn was converted to silage in the Delta in 2015, the price dropped in the face of the localized glut—bad news for the growers who made that sacrifice in order to reduce diversions, but welcome news for local dairy operations.

significantly and measurably reduce their 2015 diversions of surface water, as compared to 2013 diversions.³⁴

Reduced Irrigation

One of the strategies for demonstrating reduced 2015 surface water diversions was to reduce the number of irrigations of alfalfa, one of the prevalent crops in the central and southern Delta. Many farmers who irrigated their alfalfa every two weeks in 2013—a normal summer time routine—reduced that to a single irrigation every four weeks in 2015. The reduced irrigation resulted in lower yields and, sometimes, in lower quality, but the multi-year alfalfa crop survived on the reduced surface irrigation supply. Also, field inspections revealed a pattern suggesting that older, more established alfalfa fields had developed a root system that captured and allowed the crop to consume water from the subsurface water table. Access to subsurface water by the deep root system offset at least a portion of the irrigation deficit created by the foregone surface water diversion. Potential connections between subsurface and surface water could have also offset conservation benefits of the program.

Regardless of field-to-field variation in how the alfalfa fared, to demonstrate the reduction in 2015 diversions versus 2013 diversions many farmers reported that they “sacrificed” alfalfa to “protect” tomatoes. That strategy allowed the farmers to concentrate on the more valuable crop, to preserve the investments that had already been sunk into the seedlings (which had been contracted for months before), and to meet the processing contracts they had already executed.

Changed Irrigation Methods

Precision Irrigation Systems

The migration from flood irrigation to more precise drip irrigation contributed to a portion of the reduced surface water diversions during 2015, as compared to 2013 diversions. Based on verification

³⁴ Of course, some farmers faced reverse circumstances: they had planted low-water-use crops in 2013 and planned more water-intensive crops this year. At least one farm migrated from the corn and tomatoes planted in 2013 to rice in 2015; diversions to that farm actually increased by 9%, failing to meet its conservation plan objective. Such anomalies, however, seem inherent in any arbitrary choice of a base year for comparison. The year 2013 was selected for several reasons: first, it was a dry year, so water use would not have been “profligate;” second, it was a recent year, so that market conditions and farming practices could be considered roughly comparable; third, it was before the declaration of the drought emergency, so there were no curtailment threats; and fourth, it was the same base year selected for making other California drought water use comparisons.

inspections conducted through the summer and the reports of participating farmers, it is clear that the spread of precision irrigation within the Delta is driven primarily by the quest for bigger yields and higher quality of crops. Reduced surface water diversion is a by-product of investing in systems to deliver water at the time, place and frequency needed to optimize crop outcomes. All of the participants who achieved their conservation goals by converting to more precise irrigation systems committed to the change well before the voluntary diversion reduction program was developed. The increase in irrigation precision between base year 2013 and program year 2015, however, produced significant reductions in diversions to support several crops, most notably tomatoes. The increased investment in precision irrigation is warranted for comparatively valuable crops like 2015 tomatoes but not for less valuable crops like 2015 alfalfa.³⁵

Alternate Furrow Irrigation

Installation and use of new irrigation equipment since 2013 was not the only change in irrigation methods that facilitated reduced diversion in 2015. Among a variety of experiments with changed irrigation techniques, some of the most interesting involved adjusting space between furrows in fields where flood irrigation was used. For example, some farmers went to 60" separation of parallel furrows instead of the more common 30" interval.³⁶ The corn crop or tomato crop was planted in the same density as with the traditional furrow set, but irrigation proceeded more quickly and required significantly less surface water diversion because of reduced carriage water losses. Farmers reported no loss in crop yields or crop quality by employing the 60" furrows; however, farmers noted that the technique was a drought response that likely would result in salt buildup in the soil if applied to the same field over successive years.

Field Reconfiguration

A few plans, primarily on the fringes of the Delta, relied on laser leveling fields to increase flood irrigation efficiency, limit the need for carriage water and, thus, allow for reduced surface water diversion. Because the laser leveling was accomplished between 2013 and 2015, the reduced diversions were credited under the program.

³⁵ Interestingly, however, one participant reported positive yield results in a field with a sub-surface drip irrigation system installed for a prior crop but used to irrigate alfalfa in 2015.

³⁶ A variation, though less common, was to irrigate using furrows separated by the traditional 30 inches but to irrigate the furrows alternately throughout the growing season.

Verification Inspections

As alluded to earlier in this report, the Watermaster conducted field inspections throughout the growing season to verify and learn from the farmers implementing their conservation plans. We generally tried to prioritize the larger programs in terms of acreage, figuring the bigger farms would account for the greatest potential for water conservation. By prioritizing according to size, those early inspections tended to be among farms with the scale to take advantage of capital investment in efficient equipment, in advanced farming practices, in legal counsel and in engineering support. Later in the growing season we were able to visit smaller farms, ones often owned and operated by extended families without the scale to access as much professional support (for instance, assistance with filling out report forms). However, all of the program participants, regardless of size or access to consultants, benefitted from the assistance in program and plan administration provided by the CDWA and SDWA.³⁷ Verification inspections were augmented by spot checks of satellite images and cross checks with after-action reports of plan implementation.

Among the other findings from those verification inspections and cross-checks:

- In terms of understanding agronomy at field-scale, there is no substitute for riding shotgun in a pickup driven by the guy who farms the field.
- Participants in the water conservation program generally operated to exceed the 25% target for reduced diversions embedded in their diversion reduction plans.
- Peer relationships were supportive of success in the program. Farmers traded strategies and experience with water conservation techniques—sometimes only by observation of a neighbor's practices, other times by swapping stories at the coffee shop, sometimes through intermediaries like lawyers, engineers, pest management advisors, regulators and vendors. In addition, over the course of the growing season, knowing that their friends and competitors were observing their practices proved a more significant factor in encouraging conscientious plan implementation than our spot inspections.
- Women contributed greatly to the water conservation program's success. Although it was predominantly (but not exclusively) men who worked the fields, their mothers, wives, daughters and helpers often wrote the plans, coordinated with their farm advisors, kept the records, fielded our calls and filed the reports.

³⁷ Administrative support staffs at the agencies provided benefits both to their constituents and to the Watermaster by assisting with record keeping, report preparation, data QA/QC, and translation of program requirements to the wide variety of circumstances presented in their service areas. Without the assistance of CDWA and SDWA, program implementation and administration would have been significantly more difficult and expensive. That assistance was particularly gracious in light of the reservations about the program expressed by counsel for those agencies.

- Delta farmers took pride in their efforts to ameliorate impacts of the drought. In fact, several farmers requested that we schedule and carry out inspections of their fields, because they wanted their efforts both understood and documented.
- Some farmers seized the opportunity presented by the program to conduct irrigation experiments or to test their “hunches” about the interplay of soil, water, nutrients and energy on their fields. Regardless of the outcome of those experiments, savvy farmers kept track of results, and they plan to use the insight to inform their farm practices going forward.
- Implementing their plans to reduce surface water diversions involved real costs to riparian farms: increased operational costs, reduced yields, market distortions, a higher record-keeping and reporting burden, time devoted to analyzing the program and responding to our verification and information requests, etc.
- Although they reported generally favorable views of the diversion reduction program once they got into it, farmers remain skeptical that we know enough about their practices to be intelligent regulators of their water rights. Fear of unfair or unequal water right enforcement is also a cause of (or excuse for?) unwillingness to provide full disclosure of farm practices.³⁸
- The farmers with whom we interacted over the course of the program—in the teeth of the drought, under the cloud of curtailments, enforcement actions and resulting litigation, and fearful that their water rights are under long-term attack—were almost universally eager to show us around, answer our questions, and help us understand their practices.

Reports

As a condition of participating in the program and enjoying the regulatory certainty it provided, farmers agreed to submit a report on the actual implementation of their plans by November 1, roughly a month after the conclusion of the program’s four-month term. In order to standardize the format of reports and to reduce the reporting burden, the Watermaster worked with the Water Board’s IT group to develop an electronic report format.³⁹ We then assigned a unique name and identification number to each of the plans submitted in June. Near the conclusion of the program, we sent individually-addressed letters to each participant expressing appreciation for the conservation efforts, providing the identifier assigned to the plan, reminding of the reporting obligation, providing a link to the form, and

³⁸ Often, the unwillingness to report water use in detail is couched in terms of maintaining the confidentiality of business and farm practices in a competitive industry or of avoiding the cost of precise measurement, recording and reporting. Implementation of the new water measurement regulation pursuant to SB 88 should dramatically improve the accuracy and timeliness of reports of water diversion in the Delta beginning in 2017, at an unavoidable increase in cost to diverters.

³⁹ The report format was posted on our website:

http://waterboards.ca.gov/water_issues/programs/delta_watermaster/docs/vwc15/report_vwc15.pdf .

offering support from our office through either phone or email contact points.⁴⁰ We also reached out to attorneys, engineers, CDWA and SDWA, all of whom provided assistance and support for timely filing. Most participants filed their reports by the November 1 due date. With a follow-up reminder process to those whose reports were not in, there were only twelve “stragglers” left by December 1; as of the date of this report only three participants have failed to meet their filing commitments.⁴¹

With the reports in hand, with our verification inspections completed, with all of the data submitted by participants correlated and cataloged for reference, and with other related information developed during the last several months, we have analyzed overall results for the program. Much of that analysis is summarized in the spreadsheet accompanying this report, although the significant variation in the quality of information embedded in the participants’ reports limits the reliability of statistical analysis.

- Implementation of the conservation plans proceeded in a manner that achieved overall reduction in reported diversions of 31% versus reported diversions to the same land during the same four months of 2013, significantly above the 25% goal of the voluntary program.
- Not all conservation plans were implemented as expected, and not all met their targets. In two instances, participating farmers brought to our attention that they were unable to implement their plans as proposed; in both instances, the farmers described how they planned to adjust, and both ended up meeting the target for reduced diversion by implementing adjusted strategies.⁴²
- Significant reductions in surface water diversions were achieved with far less proportional loss of farm productivity and income.

⁴⁰ A copy of the letter is available at:

http://waterboards.ca.gov/water_issues/programs/delta_watermaster/docs/vwc15/letter_vwc15.pdf.

⁴¹ The following people filed applications to participate in the voluntary water conservation program but have not yet filed the required reports, more than four months after the deadline:

- James Silveria, a single parcel of approximately 40 acres
- Thai Le, a single parcel of approximately 40 acres
- Vernon Arnaudo, various parcels totaling approximately 640 acres

Taken together, the 720 acres included in these plans for which reports have not been completed represent approximately four-tenths of one percent of the acres enrolled in the diversion reduction program.

⁴² In a few instances, post-program reports indicated that a participant failed to achieve the goal of reducing surface water diversions by 25%. In some instances, farmers who had already achieved significant efficiencies by cultivating low-water-use crops were unable to wring the full 25% savings anticipated in their plans, yet their 2015 diversions/acre were lower than some neighbors who reported more than 25% reductions in diversion. Results of all plans, as reported by their sponsors, are listed in the spreadsheet in the Appendix to this report.

Transparency

From inception, the voluntary diversion reduction program aimed at full transparency with all information filed and collected during the program available for review by any interested party. Nonetheless, we learned quickly that the amount of information provided by participants and the format in which it was delivered challenged our information management capacity. First, we received a large number of plans all at once, at the beginning of the four-month conservation period.⁴³ Second, although the form under which riparian water right claimants applied for participation in the program was standard, each of the diversion reduction plans was unique. Third, some plans included a significant volume of supporting information, including maps, spreadsheets, crop plans and such, while others were “bare bones,” so merely cataloging the plans in a consistent fashion to allow analysis proved a significant challenge. Fourth, in light of limited staff resources and the relatively short duration of the growing season, the Watermaster explicitly prioritized field visits over paper analysis—with the result that, during the summer, we relied more on anecdotal information than the analysis we have been able to do since the program concluded.

Legal Challenge

In a complaint filed in Contra Costa Superior Court on June 26, 2015,⁴⁴ the Byron-Bethany Irrigation District (BBID) alleged fatal legal defects in the voluntary diversion reduction program. Among other things, BBID complains that the Watermaster, as a condition to participation, was obligated to examine whether the underlying riparian water right claimed by each applicant was “colorable” under California’s water right system. Further, BBID alleges that the Watermaster and the Water Board are without authority to waive enforcement of potential curtailment orders against participating riparian water rights. BBID’s complaint is pending resolution.

⁴³ After our initial review, we reported that 221 plans had been submitted by the June 1 deadline. Further review identified some duplication among plans: instances where an irrigation district filed a plan but some of its constituents reported a portion of the same plan on their own, or where both a landowner and a tenant filed applications relating to the same land and conservation plan. Ultimately, the number of conservation plans has been determined to be 217, as listed above and supported by the spreadsheet accompanying this report.

⁴⁴ *Byron-Bethany Irrigation District v. SWRCB et al*, Case No: N15-0967.

Observations

No Verification of Water Rights

Development of the diversion reduction program explicitly avoided using the program to screen the underlying claim to a riparian water right. A California water right that is not granted through a Water Board license proceeding (subject to protest and hearing) can only be confirmed or validated through a complex evidentiary review and adjudication. In fact, most pre-1914 and riparian water right claims are routinely exercised, year in and year out, without such validation and without challenge. Beyond the impossibility of validating riparian claims as a condition of participation, the basic precept of the diversion reduction program was to induce practical, voluntary action to take pressure off the water system without provoking a water right contest.⁴⁵ As agreed at program inception, participation was open to any diverter with a prior recorded claim to a riparian water right. Every application for participation in the program met that entrance requirement.

Riparian Curtailments Narrowly Avoided

At the time the conservation program was implemented, it was widely anticipated that water supplies would be so constrained by the drought that riparian water rights in the Delta watershed would be curtailed at some point during the growing season. As it turned out, however, riparian water rights were never curtailed, although supply/demand curves almost triggered riparian curtailment in the San Joaquin River (SJR) watershed late in July. The voluntary program may have contributed a portion of enough demand reduction to barely avoid a notice of correlative curtailment of riparian water rights in the SJR watershed. Because the Division of Water Rights built the supply/demand curves based on monthly averages, the reduction in August demand versus July demand meant that the riparian curtailment threat actually passed at about the midway point in the diversion reduction program.

⁴⁵ The Delta Lands Voluntary Conservation Program, available at: http://waterboards.ca.gov/water_issues/programs/delta_watermaster/docs/vwc15/desc_vwc15.pdf, includes the following paragraph:

This program is not evidence of or admission as to the validity of any claimed water right and does not protect the riparian diverter from challenges to that water right from the State Board or any other party. Similarly, this program is not a waiver or admission by the participating riparians of the validity of any other claimed water right or its priority or of the merit of curtailments in the Delta. Rather, this program is a voluntary effort to achieve water conservation, participate in drought mitigation, avoid the potential for enforcement of deeper curtailment and gather useful information in an emergency situation.

Possible Influence on Delta Outflow

Over the course of the summer, the Project operators observed anecdotal evidence that diversion demand within the Delta was less than their operating models predicted: Delta outflow was greater than forecast. It is impossible to directly correlate the increased outflow to the in-Delta diversion reduction program, but it seems reasonable that the program was one of the reasons that Delta outflow was higher than anticipated by Project models, which are based on long-term averages of historic demand/outflow.⁴⁶

Long-term Concerns over Salt Build-up

It is tempting to think that farmers who reduced diversions by 31% in 2015 versus 2013 could repeat the results with the same effort in future years. However, some farmers' admonishments and our own observations suggest otherwise. Among the obstacles to employing the same tactics in the future is the risk of salt build-up in the Delta soils. Reduced diversions due to more efficient irrigation techniques—say, migration from surface furrow irrigation to sub-soil drip irrigation—may pose a long-term risk of salt-build-up if the reduction in irrigation does not allow for flushing of salts that naturally build up in irrigated farmland. The risk is most acute in the southern Delta, where salinity levels are elevated, at times, by various factors, including:

- low flows;
- salts imported to the San Joaquin River Basin in irrigation water;
- municipal wastewater discharges;
- subsurface accretions from salty groundwater;
- tidal influences;
- diversions of water by the Projects and local water users;
- channel capacity; and
- discharges from land-derived salts, primarily from agricultural drainage.

The circulation, concentration, sequestration and periodic flushing of salts from Delta soils deserve further study.⁴⁷

⁴⁶ The diversion reduction program, among other drought responses, supported adjustment of the Net Delta Outflow Index. The NDOI relied on an overestimate of in-Delta consumptive use in 2015 because the embedded formula uses an historic ten-year average. See the email of USBR's Ron Milligan to the Real Time Drought Operations Team dated June 23, 2016 available at:

http://waterboards.ca.gov/water_issues/programs/delta_watermaster/docs/vwc15/rtdot_letter.pdf

⁴⁷ Pursuant to Water Board Water Rights Order 2010-002 Requirement 7, USBR completed the "Special Study: Evaluation of Dilution Flow to Meet Interior South Delta Water Quality Objectives" dated April 8, 2011, which is available at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/spcl_stdy1.pdf. In addition, DWR has commissioned ICF International to conduct a review of contributors to a South Delta salinity

Need for Improved Measurement of Diversions

The prevailing method for estimating in-Delta diversions relies on applying a standardized algorithm based on each crop's reference evapotranspiration and then adding a factor for conveyance and other losses based on irrigation method. This method was developed and an application to apply the method is supported by the CDWA.⁴⁸ In the Spring of 2015, the Watermaster, in consultation with the Division of Water Rights, determined that this method is an unacceptable means of measuring diversions because of its inherent inaccuracy. The Watermaster and CDWA and SDWA representatives agreed to collaboratively investigate alternative measurement methodologies. However, in June, Governor Brown signed SB 88, which requires measurement of all diversions used to produce water under claims to more than 10 acre-feet of water per year. As a result, the Watermaster and the Delta representatives decided to suspend their collaborative investigation pending development of the regulation to implement SB 88. That regulation was adopted by the Water Board on January 19, 2016. Following such adoption, the Watermaster has initiated outreach to Delta representatives for the purpose of assisting with the implementation of the new measurement requirements. Over time, accurate measurement of diversions should improve the reliability of reports and forecasts of in-Delta diversion and use. Coupling this improved insight on water diversions with better ways to measure consumptive use of water (based on the on-going study described earlier) should:

- improve administration of water rights within the Delta;
- provide information to improve management of Project operations;
- support implementation of the Water Board's Water Quality Control Plan and the Delta Stewardship Council's Delta Plan; and
- assist in habitat restoration and agricultural practice improvement within the Delta.

Administration of Curtailment of both Appropriative and Riparian Water Rights

As noted above, curtailments of riparian water rights in the San Joaquin River watershed were narrowly averted in 2015. However, in anticipation of the looming risk of such curtailments, the Watermaster grappled with the challenges of legally allocating water shortages among both appropriative and riparian claims. Those challenges are embedded in the survival of a basic conundrum: appropriators take curtailments in order of their priority ("first in time is first in right") while riparians take curtailments on a correlative basis (i.e., all rights are equally but partially curtailed to the extent of the

"hot spot." ICF's draft report is currently in circulation among reviewers and the final report is expected to be released in the near future.

⁴⁸ <http://www.sjwater.org/Delta%20Water%20Diversion%20&%20Use%20Forms.htm>

water deficiency). Further, riparians have the right to divert only their proportionate share of “natural flow” of the adjoining watercourse. In the highly altered watersheds feeding the Delta it can be difficult to differentiate between natural flow and water imported from another watershed. The release and recovery of previously-stored water (for instance, irrigation and export deliveries from Project reservoirs) compounds the administrative challenge.

Where, as in the Delta, appropriative and riparian rights are asserted “side-by-side” in the same reaches of a common watershed, it is unclear whether or how curtailments can be administered. The problem is further complicated by instances in the Delta where an appropriative right dates from after some nearby riparian claims but prior to others. In a severe water shortage, the pre-1914 appropriator will challenge any order of curtailment until the riparians are appropriately required to share the shortage of natural flow; on the other hand, riparians will challenge a correlative curtailment influenced by the intervening pre-1914 appropriation. This circular argument is inherent in California’s long-standing but never-simultaneously-enforced contradictory water rights regimes. Having narrowly avoided facing the curtailment administration challenge in 2015, the State is on notice that the legal conundrum should be resolved before the next drought.

Appendix: Spreadsheet summary of plans

2015 Voluntary Diversion Reduction Program

Plan	2013 Acres	2015 Acres	2013 diversion	2015 diversion	Cumulative Reduction:	%	2013 AF/A	2013 crop	2015 Fallow	2015 AF/A	2015 crop
1 AbbateGaryS016448	296.7	296.7	427.2	286.61	140.59	33%	1.44	Wheat, Corn		0.97	Wheat, Tomatoes
2 AcostaRobertS016582	22	22	154	88	66	43%	7.00	Orchard Grass		4.00	Orchard Grass
3 AGSodFarmsIncS018662	305	225	1065.39	697.39	368	35%	3.49			3.10	Turf, Safflower
4 AGSpanosCorpS017072	340	339.78	1649.15	983.24	665.91	40%	4.85	Grain, Golf Course		2.89	Fallow, Golf Course
5 AMFarmsS019679	815	815.4	2259.08	1577.78	681.3	30%	2.77	Alfalfa, Asparagus, Grapes, Silage Corn, Wheat		1.93	Alfalfa, Asparagus, Grapes, Tomato, Wheat
6 AndersenVictorS008104	1441	1728	3668.57	2725.7	942.87	26%	2.55	Sudan, Oats, Alfalfa, Safflower, Tomatoes, Asparagus, Field Corn		1.58	Tomatoes, Sudan, Asparagus, Alfalfa, Field Corn, Almonds, Oats, Safflower
7 AramaninoJohnS01914	205	205	613.1	670.21	-57.11	-9%	2.99	Tomatoes, Corn		3.27	Rice
8 ArmstrongGordonS017176	38	38	32.96	23.68	9.28	28%	0.87	Wine Grapes		0.62	Wine Grapes
9 ArnaudoGregS017292	3692.41	3692.41	9436.79	7077.21	2359.58	25%	2.56	Tomatoes, Alfalfa, Corn, Asparagus		1.92	Tomatoes, Alfalfa, Corn, Asparagus
10 AufdermaurCarlsS017189	576.5	576.5	1625.27	1117.77	507.5	31%	2.82	Alfalfa, Tomatoes		1.94	Alfalfa, Safflower, Fallow, Tomatoes, Forage
11 BacchettiJoeS016208	235	235	458.85	340	118.85	26%	1.95	Alfalfa, Safflower, Tomatoes		1.45	Alfalfa, Grass
12 BagliettoSeedsIncS020970	143	143	500.85	0	500.85	100%	3.50	Corn	143.00		Fallow
13 BairdsLandsKisstS018109	480.16	480.16	1767.68	1300	467.68	26%	3.68	Almonds, Grass		2.71	Almonds, Alfalfa, Corn, Grass
14 BaldocchiThomasES019825	57	57	181	87	94	52%	3.18	Pasture		1.53	Pasture
15 BeroldoFarmsS016242	47	47	100.9	0	100.9	100%	2.15	Alfalfa	47.00	0.00	Fallow
16 BeroldoFarmsS016243	17	17	57.3	28.65	28.65	50%	3.37	Alfalfa		1.69	Alfalfa
17 BettencourtS016492	280	280	1008	305.11	702.89	70%	3.60	Alfalfa	120.00	1.91	Fallow, Alfalfa
18 BiagiGeorgeS017045	2134	2134	6308.52	4462.33	1846.19	29%	2.96	Field Corn, Alfalfa, Turf/Sod		2.09	Silage Corn, Alfalfa, Beans, Winer Wheat
19 BisciaAntonioS018172	604	566	1617.24	1211.98	405.26	25%	2.68	grain corn		2.14	grain corn
20 BloomfieldBixlerS013812	598.72	598.72	1200	900	300	25%	2.00			1.50	Wine Grapes, Sweet Corn, Almonds, Beardless Wheat, Pasture
21 BoncoreElsieTrustS02406	75	75	270	180	90	33%	3.60	Corn		2.40	Alfalfa, Safflower
22 BorgesMachadoS018650	1464.19	1464.19	4388.98	3087.46	1301.52	30%	3.00	Alfalfa, Corn, Tomato, Safflower, Wheat		2.11	Alfalfa, Corn, Almonds
23 BrasilAntonioS018081	691	691	1633.16	1224.11	409.05	25%	2.36	Silage Corn, Oats, Alfalfa, Pasture		1.77	Silage Corn, Oats, Alfalfa, Pasture
24 BRTeVeldeS017932	2849.3	2849.3	8290.95	5986.69	2304.26	28%	2.91	Corn, Alfalfa, Forage		2.10	Corn, Tomatoes, Alfalfa, Forage
25 BurginGlensS016471	1379	1379	3613.22	2709.75	903.47	25%	2.62	Grain, Corn, Alfalfa, Grapes		1.97	Grain, Corn, Alfalfa, Grapes
26 CaffeseFarmsGaryS019170	165	165	530.4	428.4	102	19%	3.21	Corn		2.60	Corn, Safflower
27 CardozaCarolynS019101	923	923	2797.47	2074.44	723.03	26%	3.03	Corn, Alfalfa, Pasture		2.25	Corn, Alfalfa, Pasture, Pumpkins
28 CecchinIncS016603	1653.3	1653.3	4747.49	3548.71	1198.78	25%	2.87	Corn, Sudan, Asparagus, Triticale, Alfalfa Safflower, Wheat, Alfalfa, Tomatoes, Corn, Melons		2.15	Corn, Tomatoes, Asparagus, Alfalfa
29 CelliRanchesIncS016199	1475	1475	4467.17	3122.24	1344.93	30%	3.03	Alfalfa, Almonds, Tomatoes, Wheat, Cucumbers		2.12	Wheat, Corn, Alfalfa Melons
30 CerriFarmsS016213	1115	1115	2279	1527.11	751.89	33%	2.04	Alfalfa, Almonds, Tomatoes, Wheat, Cucumbers		1.37	Alfalfa, Almonds, Tomatoes, Cucumbers, Wheat
31 CGFarmsS005306	328	328	365.18	189.03	176.15	48%	1.11			0.58	Winter Wheat, Garbanzo Beans, Alfalfa, Corn Silage
32 CityofTracyS019112	610	610	3091	1517.31	1573.69	51%	5.07	Alfalfa Hay, Silage Corn,		2.49	Alfalfa Hay
33 CliftonCourtLPS024638	540	540	2908	2181	727	25%	5.39	Alfalfa, Forage		4.04	Alfalfa
34 CoitPaulS020720	50.02	50.02	122.92	70.41	52.51	43%	2.46	Oats	12.93	1.90	Fallow, Trees
35 ColdaniSteveS020780	1157	1157	3252.45	2370.49	881.96	27%	2.81	Grain corn, Wheat, Alfalfa, Orchard grass, permanent pasture, olives		2.05	Silage corn, Alfalfa, Orchard grass, Permanent pasture, Olives, Tomatoes
36 ConeyIslandSpeckmanS020857	3391.6	3391.6	9534.22	6900.18	2634.04	28%	2.81	Alfalfa, Corn, Wheat, Pasture, Tomatoes		2.03	Alfalfa, Corn, Wheat, Pasture, Tomatoes

Report on Voluntary Diversion Reduction Program among in-Delta Riparian Water Right Claimants

March 11, 2016

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Plan	2013 Acres	2015 Acres	2013 diversion	2015 diversion	Cumulative Reduction:	%	2013 AF/A	2013 crop	2015 Fallow	2015 AF/A	2015 crop
37 CortopassiMuzioS018699	696.43	696.43	2495	1439.69	1055.31	42%	3.58	Rice, Alfalfa, Corn		2.07	Rice, Alfalfa, Wheat, Corn, Squash
38 CostaFarmsLLCS018789	2025	2025	3692	1732.92	1959.08	53%	1.82	Alfalfa, Tomatoes, Carrots, Corn		0.86	Alfalfa, Carrots, Tomatoes
39 CottaProplncS014702	693	693	2096.75	1404.82	691.93	33%	3.03	Corn, Alfalfa		2.03	Corn, Alfalfa
40 CutreraMattS023128	241	241	1036	756	280	27%	4.30	Tomatoes, Corn		3.14	Tomatoes, Corn
41 DeltaWetlandPropertiesS021039	16881	16881	45040	29320	15720	35%	2.67	Corn, Pasture, Alfalfa, Corn Silage	1189.00	1.87	Corn, Fallow, Alfalfa, Corn Silage, Pasture
42 DeRuyterTroyS017195	287	236	821.68	550.53	271.15	33%	2.86			2.33	
43 DeSnayerS018652	588	432	2206.16	1655.8	550.36	25%	3.75	corn, oats	109.50	5.13	corn, oats, fallow
44 DoumaFredAS019072	400	400	995.4	665.27	330.13	33%	2.49	Silage Corn		1.66	Silage Corn, Milo Silage
45 DuelVocationalA005153	416	416	491	367	124	25%	1.18	corn, alfalfa, sorghum, Sudan	30.00	0.95	corn, alfalfa, fallow
46 DutraFarmsS018877	1175.04	1175.04	3351.94	2494.73	857.21	26%	2.85	Alfalfa, Grain Corn, Oats		2.12	Alfalfa, Grain Corn, Oats
47 EberhardtDouglasMS018964	1541.5	1541.5	4347.75	2697.33	1650.42	38%	2.82	Grain Corn, Alfalfa		1.75	Grain Corn, Corn Silage, Alfalfa
48 ElmwoodPartnersS018855	643	643	1496.04	370.95	1125.09	75%	2.33	Grapes		0.58	Grapes
49 EmpireFieldsLLCS018518	196	196	878.82	0	878.82	100%	4.48	Corn	196.00	0.00	Fallow
50 EmpireIslandFarmingS019075	883.22	883.22	3090.43	1903.75	1186.68	38%	3.50	corn, seed		2.16	walnuts, silage corn, seed
51 EsherAlexanderBarsoomS018654	1930	1930	3236.41	2173.32	1063.09	33%	1.68	Field Corn, Wheat, Tomatoes, Alfalfa		1.13	Silage Corn, Wheat, Tomatoes, Alfalfa
52 EstateAnelinaMeroFrankMillsS018232	1090	1090	2629.13	1767.97	861.16	33%	2.41	Corn, Triticale		1.62	Corn, Squash, Safflower, Tomato
53 FayIslandFarmsS017736	90	90	448.84	320.6	128.24	29%	4.99			3.56	grass, habitat
54 FidlinDevelopmentS017031	1373.1	1373.1	4017.82	1574.12	2443.7	61%	2.93			1.15	Filed Corn, Habitat
55 FoleyJrColemanS016294	2483	2483	5417.9	3681.45	1736.45	32%	2.18	Corn, Wheat, Barley, Alfalfa, Tomatoes, Fallowed	322.00	1.70	Silage Corn, Alfalfa, Tomatoes, Fallowed, Wheat, Barley, Grain Corn
56 FonsecaFarmsIncS020582	656	656	2025.34	1373.91	651.43	32%	3.09			2.09	Alfalfa, Tomatoes, Pumpkins, Almonds, Carrots, Lima Beans
57 FoppianoHenryS019501	1476	1476	4416	3282.7	1133.3	26%	2.99	Corn, Walnuts		2.22	Corn, Walnuts
58 FosterMatthew	40	40	93.83	57.86	35.97	38%	2.35	almonds		1.45	Almonds
59 FurgusonFarmsS020085	1423.8	1423.8	3858.69	1596.67	2262.02	59%	2.71	Alfalfa, Asparagus, Corn, Wheat, Melon		1.12	Alfalfa, Asparagus, Corn, Wheat, Safflower
60 GalloVineyardsIncS016191	330	330	303	265.2	37.8	12%	0.92	Wine Grapes		0.80	Wine Grapes
61 GarciaTonyS016217	297	297	1000	386.77	613.23	61%	3.37	Alfalfa		1.30	Alfalfa, Corn, fallow
62 GiovannoniRobertS016494	514.6	514.6	1550	1156.33	393.67	25%	3.01	Corn, Alfalfa		2.25	Wheat, Alfalfa, fallow
63 GVFarmsS016454	926	926	2126.34	1584.15	542.19	25%	2.30	Grain, Corn, Tomato, Alfalfa	114.00	1.95	Grain, Corn, Tomato, Alfalfa, Almond, Fallow
64 HayesDarrielS019079	12	12	18.64	12.64	6	32%	1.55	Pasture		1.05	Pasture
65 HickenRanchS018978	25	25	98.04	30.24	67.8	69%	3.92	Walnuts		1.21	Walnuts
66 HofmanGerritS019054	208	208	832	624	208	25%	4.00	corn		3.00	corn
67 IronhouseSanitaryDistrictS023983	2800	2800	7500.36	4000.36	3500	47%	2.68	Pasture	708.00	1.91	Pasture, Fallow
68 J&DVineyardsS017937	117.98	117.98	85.66	60.96	24.7	29%	0.73	Grapes		0.52	Grapes
69 JacksonFamilyS017963	2080	2080	5665.86	4084.84	1581.02	28%	2.72	Alfalfa, Tomatoes, Grain Corn, Triticale, Sudan, Grapes		1.96	Tomatoes, Silage Corn, Wheat Hay, Sweet corn, Triticale, honeydew, cantaloupe, grapes
70 JaquesMario	1642.8	2022.8	4630.77	2308.26	2322.51	50%	2.82	Corn, Alfalfa, Tomato		1.14	Alfalfa, Tomato
71 JKTPS019489	7452.5	7464	20195.52	15163.16	5032.36	25%	2.71	Grain Corn, Asparagus, Wheat, Potatoes, Field Corn, Grapes, Alfalfa	368.80	2.14	Silage Corn, Alfalfa, Wheat, Carrots, Tomatoes, Grapes, Grain Corn Potatoes, Rice, Beans, Fallow
72 KammererRobS018020	339	339	797.74	600.93	196.81	25%	2.35	Grapes		1.77	Grapes
73 KelleyJohnS019147	1616	1210	3939.86	2950.02	989.84	25%	2.44	Alfalfa, Wheat, Walnut, Pasture		2.44	Alfalfa, Wheat, Walnut, Pasture
74 KolberFarmsS018801	180	180	606.67	355.67	251	41%	3.37	Alfalfa		1.98	Alfalfa
75 LarkinBrosS019686	198	198	632.26	390.34	241.92	38%	3.19	Alfalfa		1.97	Alfalfa, Rice
76 LouisMelloRanchS018238	750	750	2137.6	1094.84	1042.76	49%	2.85	Alfalfa, Grapes		1.46	Alfalfa, Grapes
77 LuceroFarmsS018805	934	934	2572.19	1922.49	649.7	25%	2.75	Alfalfa, Tomato, Corn, Triticale		2.06	Tomatoes
78 MachadoTrustDavidS023129	422	422	776.82	638.74	138.08	18%	1.84			1.51	Corn, Oats, Almonds
79 MantelliBrosDefremeryS019811	1291.3	1291.3	2918.04	1787.35	1130.69	39%	2.26	Alfalfa, Corn, Triticale		1.38	Alfalfa, Wheat, Safflower, Milo, Corn
80 MarchiniAgS019506	2869.5	2869.5	6726.59	5559.78	1166.81	17%	2.34	Walnuts, Tomato, Corn, Wheat, Asparagus, Safflower, Olives,		1.94	Walnuts, Tomato, Wheat Silage, Asparagus, Alfalfa, Olives, fallow
81 MarcucciRichardS019689	312.94	312.94	1000.99	741.84	259.15	26%	3.20	Wheat		2.37	Alfalfa, Grain Hay
82 MarnellAnthonyS020983	5288	5288	12300.89	9033.4	3267.49	27%	2.33	Grain, Alfalfa, Tomatoes, Potatoes, Grapes, Grass Hay		1.71	Grain, Alfalfa, Tomatoes, Grapes, Grass Hay

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Plan	2013 Acres	2015 Acres	2013 diversion	2015 diversion	Cumulative Reduction:	%	2013 AF/A	2013 crop	2015 Fallow	2015 AF/A	2015 crop
83 MingCentreS017046	710	710	1012.9	757.91	254.99	25%	1.43	Grapes		1.07	Grapes
84 MizunoFarmsIncS015968	1352.6	1352.6	2710.92	1600.08	1110.84	41%	2.00	Alfalfa, Sweet corn, Tomatoes, Asparagus, Wheat Hay	238.00	1.44	Alfalfa, Sweet corn, Tomatoes, Asparagus, Wheat Hay, Fallow
85 MoraisAbilioS020797	243.32	243.32	500.85	353.85	147	29%	2.06			1.45	
86 MossdaleAssociatesS013422	23	23	53.7	35.7	18	34%	2.33	Corn		1.55	Corn
87 MuelaMarvinA010233	60	60	182	117.5	64.5	35%	3.03	tomatoes		1.96	tomatoes
88 MungerS017304	1002	1002	2755.33	2058.35	696.98	25%	2.75	Blueberries		2.05	Blueberries
89 MussiRudyS017299	3396.47	3351.55	14548.2	7749.86	6798.34	47%	4.28	Almonds, Walnuts, Grapes, Tomato, Asparagus, Corn, Alfalfa, Oat Hay, Cucumber, Grain		2.31	Almonds, Walnuts, Grapes, Tomato, Corn Silage, Corn Alfalfa, Cucumber, Pumpkin, Fallow
90 Naglee Burk	4234	4234	16308.79	14073.98	2234.81	14%	3.85		114.88	3.42	
91 NaturalLandsManagementS018879	50	50	254	104	150	59%	5.08	wetland habitat		2.08	wetland habitat
92 NunesJohnS017899	375	375	1066.55	756.95	309.6	29%	2.84	Grain Corn		2.02	Silage Corn
93 NussDavidS020012	755	755	1983.7	1378.7	605	30%	2.63	Corn, Tomato, Beans		1.83	Tomato, Corn Silage, Wheat, Cucumbers, peppers
94 OhmBarbaraLorenS000137	346	346	755.49	397	358.49	47%	2.18	Alfalfa, Corn, Wheat, Safflower, Tomatoes		1.15	Alfalfa, Wheat
95 OlagarayBrothersS017177	865	865	2420.48	1790.11	630.37	26%	2.80	Alfalfa, Grapes with cover crop		2.07	Silage corn, grapes without cover crop
96 OliveraS019023	237	237	577.41	116.63	460.78	80%	2.44	tomatoes, corn	189.00	2.43	Almonds, fallow
97 PerryGeorgeSons	7178	7178	16547.84	11338.22	5209.62	31%	2.31	Alfalfa, Dry Beans, Corn, Grain, Fallow, Cucurbits, Pasture, Grapes, Tomatoes	603.00	1.72	Alfalfa, Dry beans, corn, Grain, fallow, cucurbits, pasture, grapes, tomatoes, peppers
98 Pescadero	5050	5050	12865.68	10190.6	2675.08	21%	2.55		205.11	2.10	
99 PhelpsLloydS017095	152	152	510.72	321.81	188.91	37%	3.36	Alfalfa		2.12	Alfalfa, Oats, Sudan, Grass
100 PimentelJoeS019135	50	50	168	130.32	37.68	22%	3.36	Alfalfa		2.61	Alfalfa
101 PortoStockton	702	702	1912.05	599.87	1312.18	69%	2.72	Oats, Teft, Corn, Misc Grasses	200.00	1.19	Wheat, Fallow, Misc Grasses
102 QaresmaS019060	107.72	107.72	225.4	170.3	55.1	24%	2.09	Corn		1.58	Corn, Winter Forage
103 QuersmaS016957	645	645	2580	2257.5	322.5	13%	4.00	corn		3.50	corn
104 RankinsAg4	2409.7	2409.7	7435.81	5347.76	2088.05	28%	3.09	Alfalfa, Wheat Hay, Grass Hay, Corn Silage		2.22	Alfalfa, Wheat Hay, Grass Hay, Corn Silage
105 RattoGregS016209	124	124	413	299	114	28%	3.33	Alfalfa		2.41	Alfalfa
106 RDCFarmsIncS016437	3484	3484	6913	4736.15	2176.85	31%	1.98	Tomatoes, Oat Hay, Cucumbers, Corn, Olive, Peppers, Pasture, Wheat, Asparagus		1.36	Wheat, Cucumbers, Olive, Tomatoes, Pasture, Asparagus
107 ReeseFarmsS020890	390	390	997.35	740.93	256.42	26%	2.56	Grass, Alfalfa		1.90	Grass, Alfalfa, Walnuts
108 ReinDoornenballS016257	297	297	1000	386.77	613.23	61%	3.37	Alfalfa	50.00	1.57	Alfalfa, Corn, fallow
109 RELMPropertiesS016285	1464.19	1464.19	4679.44	3255.93	1423.51	30%	3.20	Alfalfa, Wheat, Tomato, Safflower,	30.00	2.27	Alfalfa, Almonds, Corn, fallow
110 RiellaRanchesS019488	142	142	403.85	189.15	214.7	53%	2.84	Wheat, Corn		1.33	Wheat, Corn
111 RiellaRickMikkiS019146	300	300	690.07	83.07	607	88%	2.30	Tomatoes, Alfalfa, Squash	150.00	0.55	Almonds, fallow
112 RipkenNancyS018170	500	500	1142.36	882.36	260	23%	2.28	Grapes, Alfalfa		1.76	Grapes, Alfalfa
113 RipkenRobertsS016425	1355.47	1355.47	3593.79	2685.65	908.14	25%	2.65	Alfalfa, Grain Corn, Grain Wheat		1.98	Alfalfa, Silage Wheat, Silage Corn
114 RobinsonFarmsS009020	545.3	545.3	1219.69	818.31	401.38	33%	2.24	Wheat, Alfalfa		1.50	Alfalfa
115 RochaJohnS018244	325	325	1602.82	928.49	674.33	42%	4.93	Corn		2.86	Corn
116 RodgersManuelS023203	18.57	18.57	72.56	56.72	15.84	22%	3.91			3.05	
117 RonaldNunnFamilyS020718	508.5	508.5	1587.38	1118.34	469.04	30%	3.12	Alfalfa, Grain Corn	13.00	2.26	Garlic, Grain Corn, Processing tomatoes, fallow
118 RozaDanielS019041	883	883	2575.4	1769	806.4	31%	2.92			2.00	
119 SalmonChipS020411	1462	1462	4410.44	3456	954.44	22%	3.02	Grapes, Walnuts, Tomatoes, Wheat, Switchgrass, Alfalfa, Blueberries		2.36	Alfalfa, Almonds, Blueberries, Walnuts, Grapes, Tomatoes
120 SaraleFarmsS016263	2648	2648	4354	3226	1128	26%	1.64	Alfalfa, Asparagus, Corn, Grain, Melons, Tomatoes		1.22	Alfalfa, Asparagus, Melons, Tomatoes
121 ScrivenMichaelS019683	1938	1938	5151.29	3847.73	1303.56	25%	2.66	Grain Corn, Oats		1.99	Grain Corn, Silage Corn
122 SilvaMichaelS019878	92.24	92.24	435.54	289.33	146.21	34%	4.72	Blackeye Beans, Alfalfa		3.14	Alfalfa, Field Corn
123 SilvaRCFarmsS018890	3534	3534	5184	3888	1296	25%	1.47	Grain Corn, Alfalfa, Wheat, Cherry, Cucumber		1.10	Grain corn, safflower, silage corn, oats, cherry, alfalfa
124 SilvaRobertS019444	801	801	2019.5	898.98	1120.52	55%	2.52	Grain Corn, Alfalfa, Asparagus, Safflower		1.12	Silage Corn, Alfalfa, Wheat, Asparagus

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Plan	2013 Acres	2015 Acres	2013 diversion	2015 diversion	Cumulative Reduction:	%	2013 AF/A	2013 crop	2015 Fallow	2015 AF/A	2015 crop
125 SlayterLelandS020620	26.6	26.6	53.66	36.27	17.39	32%	2.02	Corn, Alfalfa	7.00	1.85	Fallow, Alfalfa
126 SoaresDuarteS019682	245.3	245.3	697.63	468.63	229	33%	2.84	Corn		1.91	Alfalfa
127 SolariS019348	438	438	1246.82	816.52	430.3	35%	2.85	Grain Corn, Walnuts, Asparagus, Wheat		1.86	Silage Corn, Walnuts, Asparagus
128 StocktonGolfCC	92	92	181.9	97.55	84.35	46%	1.98	sod		1.06	sod
129 StreckerDavidS016271	173	173	413.7	327.95	85.75	21%	2.39	Alfalfa		1.90	Corn Double Crop, fallow
130 TANCOS021244	1219	1219	3259.6	2318.6	941	29%	2.67		7.50	1.91	Corn, Wheat, Fallow
131 TeicheiraJFrankS017927	285	285	767.2	552.4	214.8	28%	2.69	Corn, Oats		1.94	Corn, Oats
132 TeicheiraTrustS02097	447.4	447.4	2000.33	1460.32	540.01	27%	4.47	Field Corn		3.26	Field Corn
133 TorlaiGregS019327	1391.6	1391.6	3429.74	1868.41	1561.33	46%	2.46	Alfalfa, Corn, Asparagus	51.60	1.39	Alfalfa, Corn, Fallow
134 UALagorioS021975	1124.7	1124.7	2824.19	2144.13	680.06	24%	2.51	Corn, Tomatoes		1.91	Corn, Rice, Wheat
135 UOPS019549	175.75	175.75	216.34	146.55	69.79	32%	1.23	grass		0.83	grass
136 VanExelHenryS016662	727	727	1925	1443	482	25%	2.65	Sorghum Corn Alfalfa	118.00	2.37	Sorghum Corn Alfalfa, fallow
137 VanTillJohnS023130	170	170	180.13	101.63	78.5	44%	1.06	Almonds		0.60	Almonds
138 VeniceIslandIncS017063	1297.2	1297.2	4387.06	1953.34	2433.72	55%	3.38			1.51	Grass, Field Corn, Habitat
139 VernalisEntIncS024461	283.8	283.8	1200	700	500	42%	4.23	Silage Corn		2.47	Silage Corn
140 VernalisLTD024490	285	285	532	0	532	100%	1.87	Silage Corn	285.00	0.00	Fallow
141 VictorialslandFarm	6105	6105	14802	11040	3762	25%	2.42	Corn, Wheat, Asparagus, Tomatoes, Blueberry, Alfalfa		1.81	Silage Corn, Wheat, Tomatoes, Blueberries, Alfalfa
142 VioletEhlersTrustS017733	374.5	374.5	1150.07	482.88	667.19	58%	3.07	Double crop grain with sudan, Grapes		1.29	Grain, Grapes
143 VitalFarmlandS014130	4811	4811	13493	10369	3124	23%	2.80	Asparagus, Pasture, Alfalfa, Grain, Corn, Tomato	108.00	2.20	Corn, Grain, Tomato, Cucumber, Pasture, Fallow
144 VotawS016520	40	40	69.39	60.32	9.07	13%	1.73	Alfalfa		1.51	Alfalfa
145 WenzelMark	95	95	168	80	88	52%	1.77	Oats, Alfalfa	50.00	1.78	Alfalfa, Fallow
146 WittTedS016382	69	69	196.24	136.73	59.51	30%	2.84	corn	7.00	2.21	corn, fallow
147 WMDFarmsS016279	3872	3879	9994.35	7344.34	2650.01	27%	2.58	Grain Corn, Silage Corn, Wheat Alfalfa, Tomatoes	111.00	1.95	Silage Corn, Sweet Corn, Alfalfa, Tomatoes, Rice, Beans, fallow
148 WrightTractParntersS021954	300	300	1739.9	1473.8	266.1	15%	5.80	Alfalfa, Rice		4.91	Alfalfa, Rice
149 ZuckermanHeritage	6589	6657	22982	15517	7465	32%	3.49	Potato, Sod, Tomato, Feed Corn, Corn Silage, Barley, Olive, Fallow, Triticale, Grape, Asparagus	280.00	2.43	Potato, Sod, Tomato, Feed Corn, Field Corn, Corn Silage, Barley, Olive, Fallow, Triticale, Grape, asparagus
150 SilveriaJames	40	40			0	#DIV/0!	0.00			0.00	
151 LeThaiS019034	40	40			0	#DIV/0!	0.00			0.00	
152 LambFrancisS016975	640	640			0	#DIV/0!	0.00			0.00	
Totals	180141.5	4180119.3	486753.78	333081.97	153671.81		2.70		6178.32	1.91	

Cumulative Reported Diversion Reduction in acre-feet: 153671.81

Percentage Reduction: 32%

South Delta Acres 148000
Central Delta Acres 120000
268000

% of South and Central Delta enlisted in program: 67%

Total Fallowed Acres: 6178.32

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Pescadero Plans

153	PereiraJohnS020589
154	BacchettiFagundesS021428
155	PhilipMartinS019064
156	LuceroFarmsS018805
157	PomboGregS020455
158	SilvaFrankS020081
159	SilvaBrosDairyS020400
160	BorgesWilliamS017206
161	ColliDavidS021944
162	KisstJohnS018106
163	MartinAlzirajoeTonyS017919
164	WilburS018106
165	CastroSRMAS018754
166	BaierBillS018976
167	PomboTomS019148
168	FunkhouserWilliamGS016854
169	LourencoPiresS024142
170	TiagoJoeS020297
171	BacchettiNatalinoS019613
172	SuvikFarmsS024137
173	SerranoFrankS023236
174	PelligriSonsS018185
175	TrigoManuelS024241
176	HedburgRonS024204
177	DiasJohnDianeS021136
178	CDutraFarms
179	PiresS024123
180	AlvesPerryS019081
181	BacchettiNatS018893
182	SheridanMariaTrS020082
183	SheridanMariaS020084
184	BacchettiFamilyMaryS018983
185	BacchettiFrankLindsayS108971
186	BacchettiLindyMaryS018446
187	BacchettiFamilyMaryS018977
188	SouzaS019114
189	CastenadaS024208
190	MartinS016659
191	MattosS0120113
192	MartinHenryS020203
193	PimentelTrustS017270
194	PimentelTrustS021421
195	MattosS016660
196	MattosS016659
197	CamEnterprisesS017793
198	PattersonWalterS024143
199	TracyAlianceS024200

Naglee Burk Plans

200	AlgereDennisS017238
201	OrnellasMatthewS01229
202	FagundesRonS017229
203	TostaHenryS017229
	PhilipMartinS019064
	PelligriSonsS018185
	CDutraFarms
204	BacchettiMarkS017229
205	WalkerJerry
206	AlegreStephenS019069
	PomboGregS020455
207	PomboDamonS017238
208	RankinsAg3
209	RankinsAg
210	RankinsAg2
211	WalkerJerry
212	MattosMonaBernardoS017229
	PhilipMartinS019064
213	PomboEarnieS017229
214	GallilouisS017253
215	MattosMikeBernedette
216	DeltaWoodsDairy
217	SimoniS017229

Highlight represents overlap plans within Pescadero.

Banta-Carbona Plans

TavakeTami
PachecoLucy
BorgesJohnCTrust
BakerCarol
PereiraFarms
AnandpurFarmsS018804

