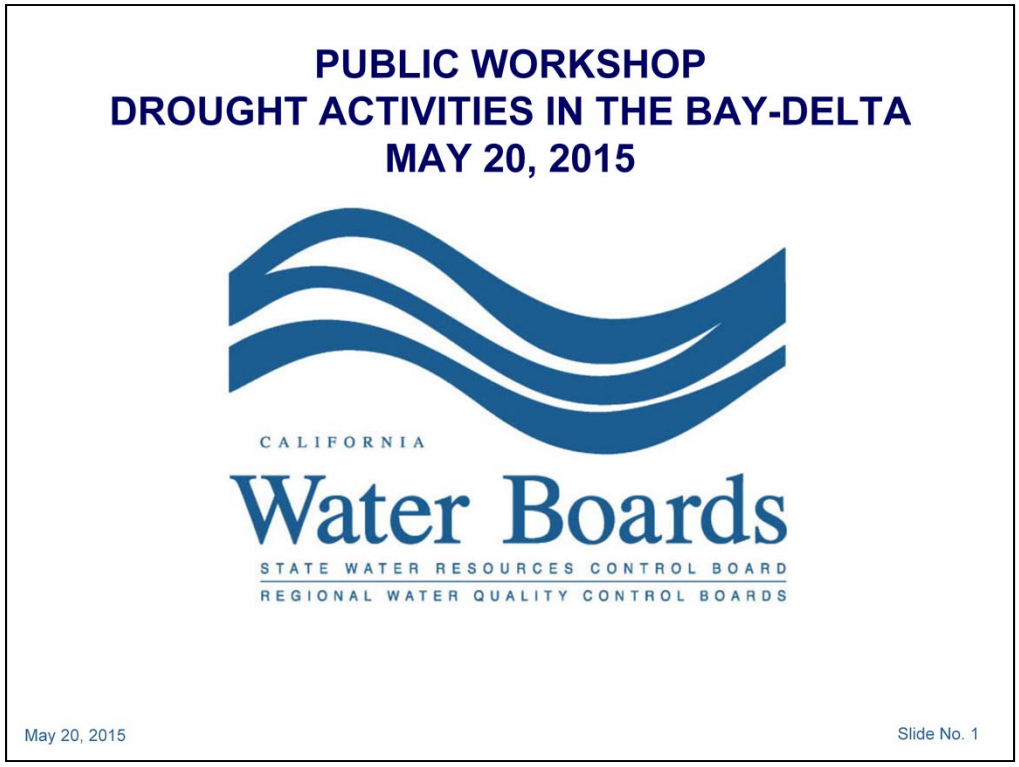
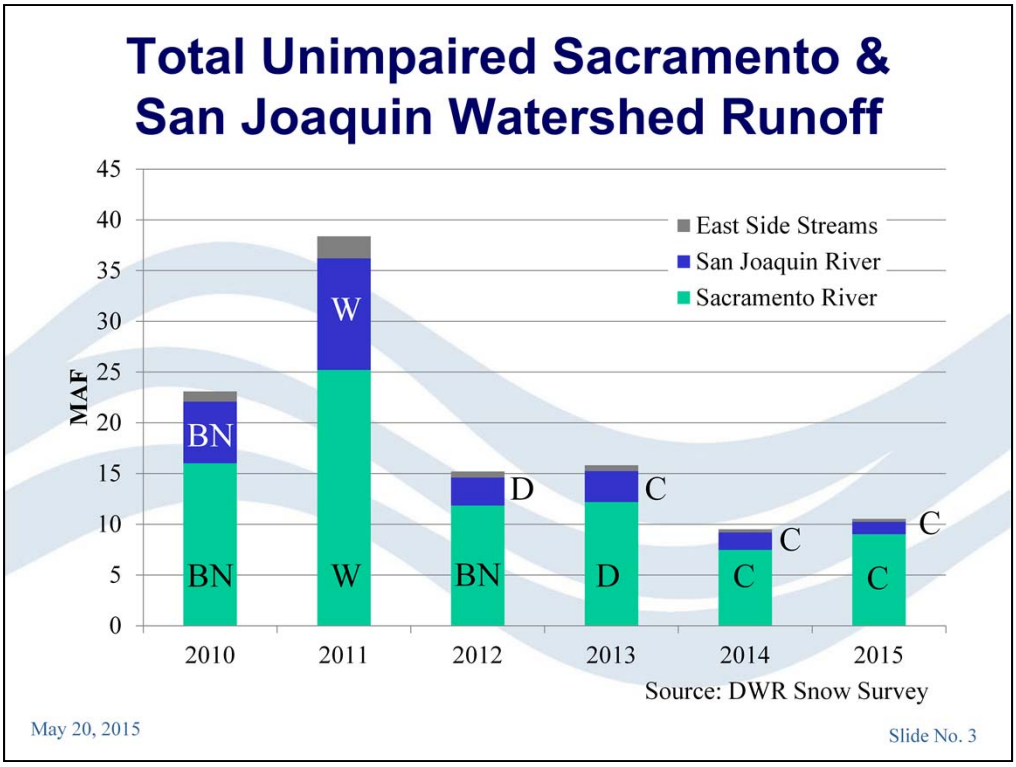


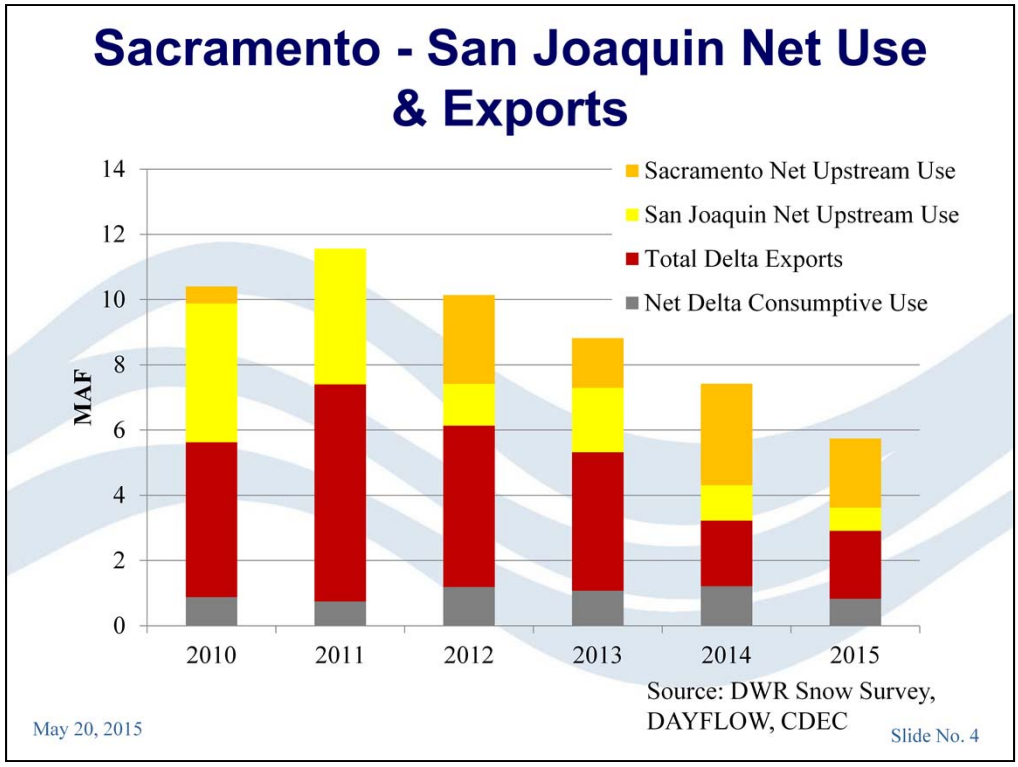
Presentation by Scott Ligare during the May 20th Public Workshop in the Byron Sher Auditorium, CalEPA.

Topics for Today



In the last five years we have observed great variability in unimpaired runoff into the Sacramento-San Joaquin Valleys ranging from extremely wet to extremely dry. 2010 was about average, followed by 2011 which was a very wet year. 2012 was the beginning of the dry period we are currently in. The Sacramento River provides about 65% of the total unimpaired runoff in a wet year but in a dry year provides about 85% of the total unimpaired runoff.

The following analysis was based on these recent years. The source for this data is Department of Water Resources, Snow Survey. For the most part it only includes inflow to rim reservoirs and does not include runoff from the valley floor. For 2015 I used the 50% exceedance forecast released May 12th.

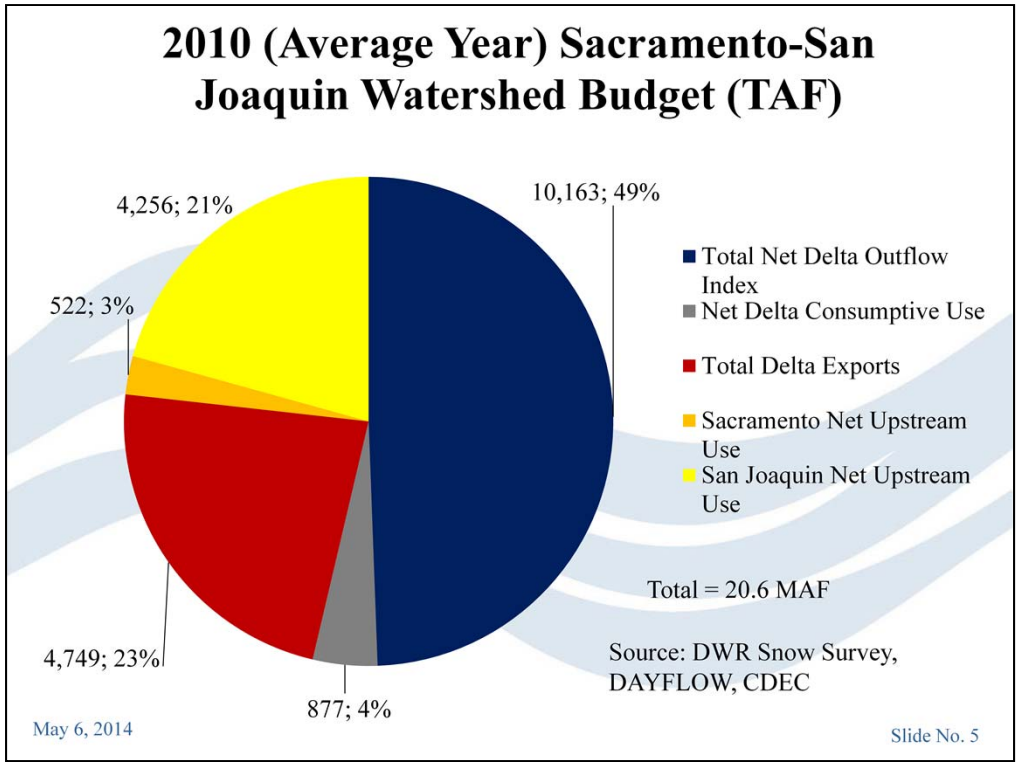


If we look at the net water use in the Sacramento-San Joaquin Watershed over the same previous years, we see a similar pattern of the greatest total use in 2011 and the lowest in 2014 and 2015. To estimate the "net upstream use", I took the unimpaired runoff plus imports such as from the Trinity, subtracted year over year change in project storage, and subtracted the volume of water reaching the Delta.

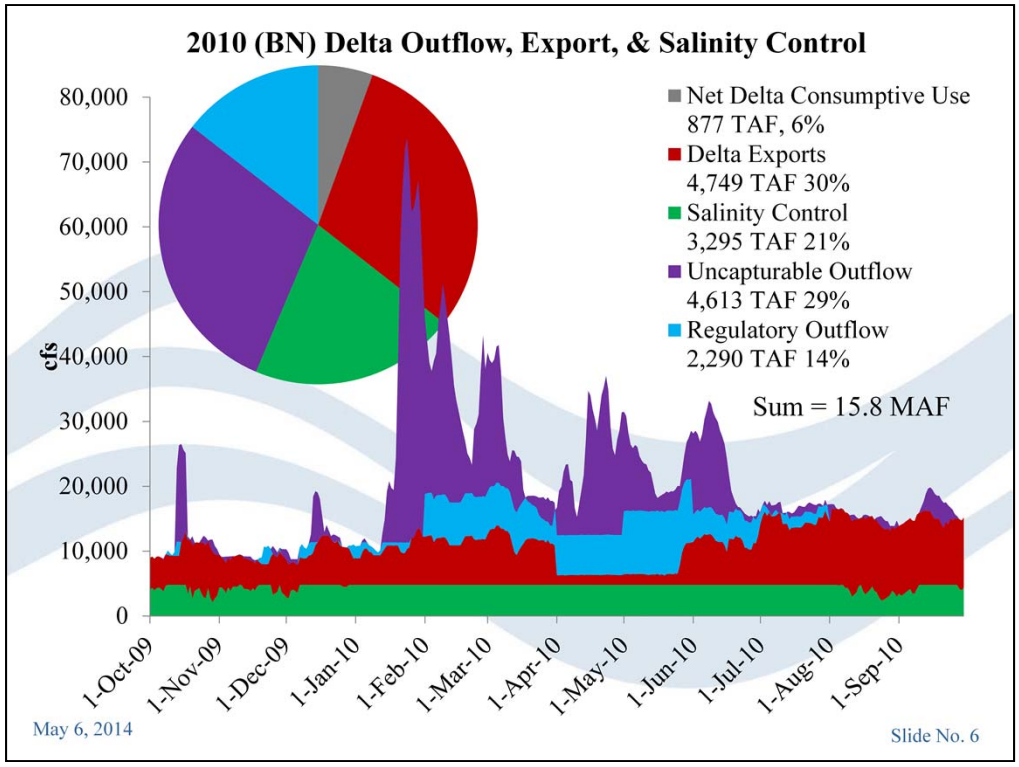
For 2015, exports, and flows were estimated from Reclamation's April 90% exceedance operations forecast. Total Delta exports include pumping from SWP, CVP, Contra Costa and the North Bay Aqueduct.

In 2011, the total annual accretions in the Sacramento Valley was nearly equal to the total use therefore the net use is about zero. The actual gross use is much higher, however large total annual runoff from the valley floor offsets the gross use. The large runoff in 2011 allowed for very high exports which decreased until 2014. This year, total Delta exports are forecasted to be slightly higher than last year.

Sacramento annual net upstream use is greater in drier years and lower in wet years because of the large contribution of valley accretions in wet years. Sacramento uses rely on project storage and imports in drier years. San Joaquin annual net upstream use is greater in wet years and is lower in drier years because surface supplies are simply not available in drier years.

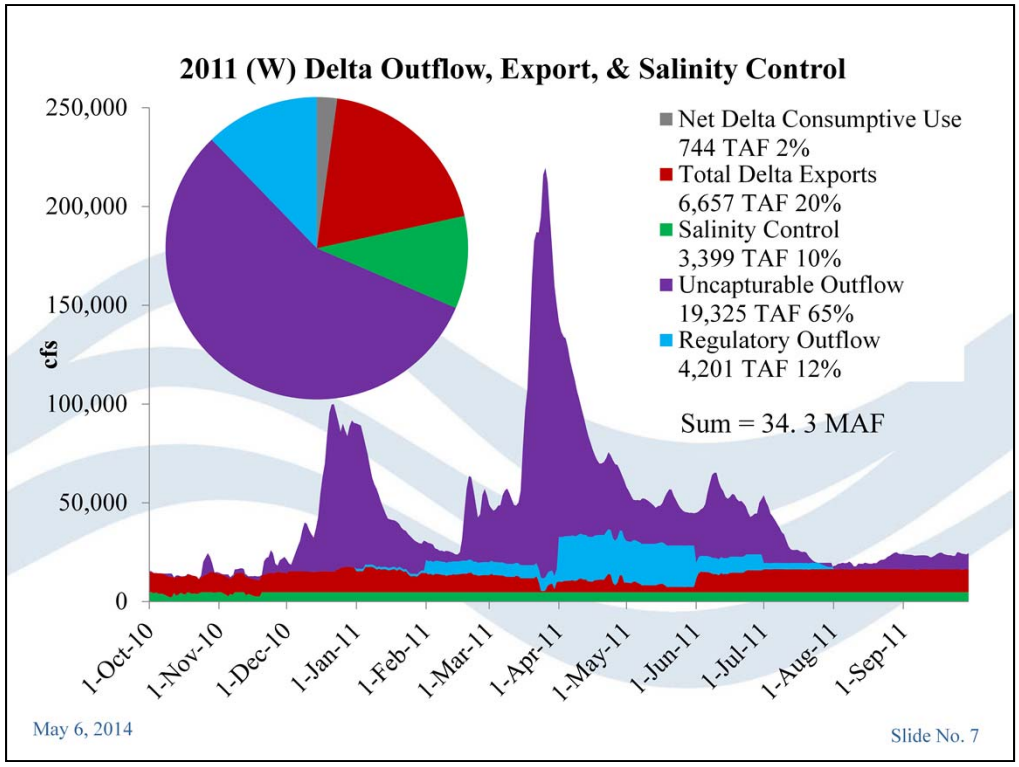


Examining the entire Sacramento – San Joaquin water budget for 2010, which is the most recent "average" year, we see the same net uses shown on the previous graph but with one more large piece of the pie, Delta outflow. Delta outflow makes up nearly half of the total budget for 2010. Now let's examine in more detail, Delta water use and outflow….



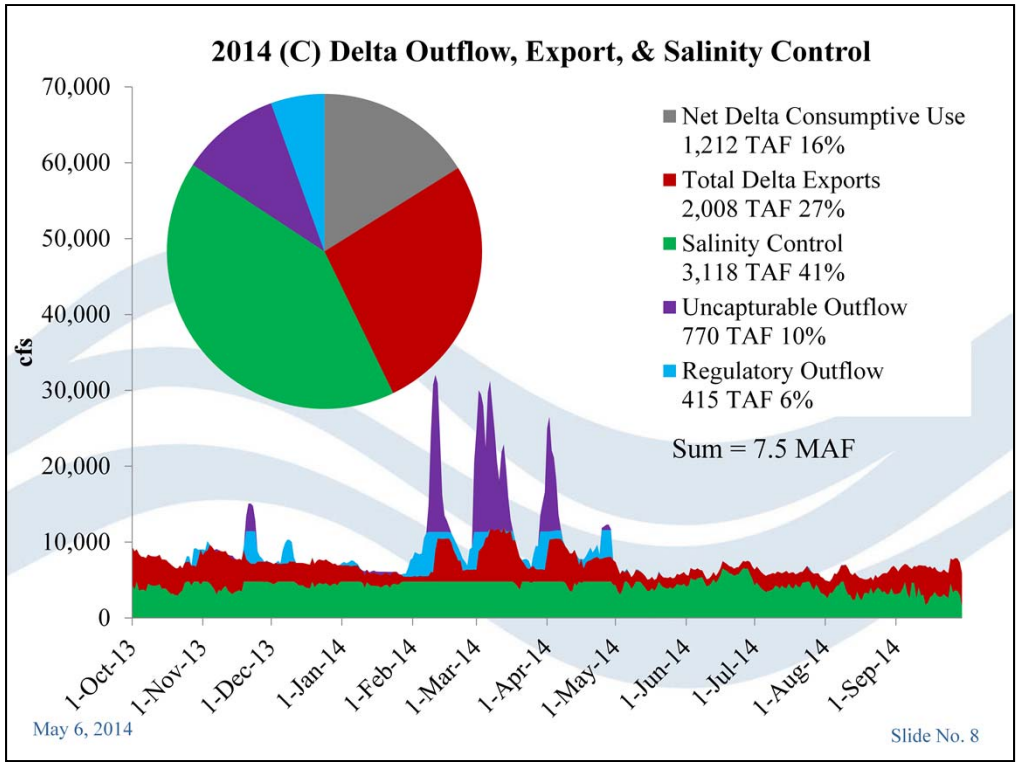
In the following slides I broke up Delta outflow into three categories; salinity control, regulatory outflow and uncapturable outflow. Salinity control is the base outflow that is required to maintain salinity control at the export locations. Regulatory outflow includes all water required under D-1641 objectives including Table 3 and X2 as well as other limitations on pumping such as OMR limits and E:I ratio. Uncapturable outflow is outflow that exceeds the capacity of the project export pumps that is not required under regulatory outflow requirements.

Outflow is often lowest in the fall where if there are not storm events, it is controlled by salinity. When storm events occur, some regulatory requirements may limit exports such as OMR. In February, D-1641 outflow requirements increase and storm events create uncapturable outflow. Exports are limited in the April-May period by San Joaquin I:E requirements. On July 1st , exports increase when the E:I ratio increases from 35% to 65% and regulatory outflow decreases. The pie chart shows annual totals.

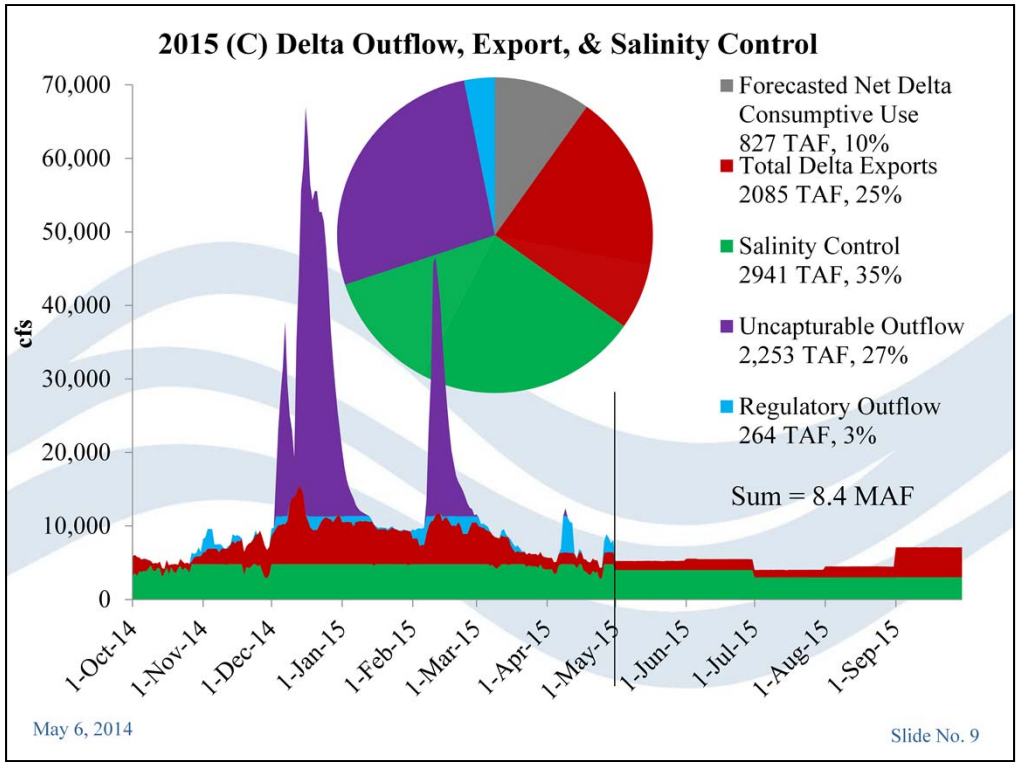


In 2011, uncapturable outflow dominated the annual total where outflow was above the capacity of the project export pumps nearly the entire water year. Notice the scale on the left, outflow peaked in 2011 at over 200 thousand cfs. High export rates were maintained throughout the year, except during April-June when regulatory requirements to protect fish and wildlife limited exports. It should be noted that outflow requirements under D-1641 in wet years such as this are met incidentally by high uncapturable outflow. Though other regulations such as OMR, E:I and I:E ratio could be limiting exports.

The next few slides show outflow and exports throughout the last two years of drought.



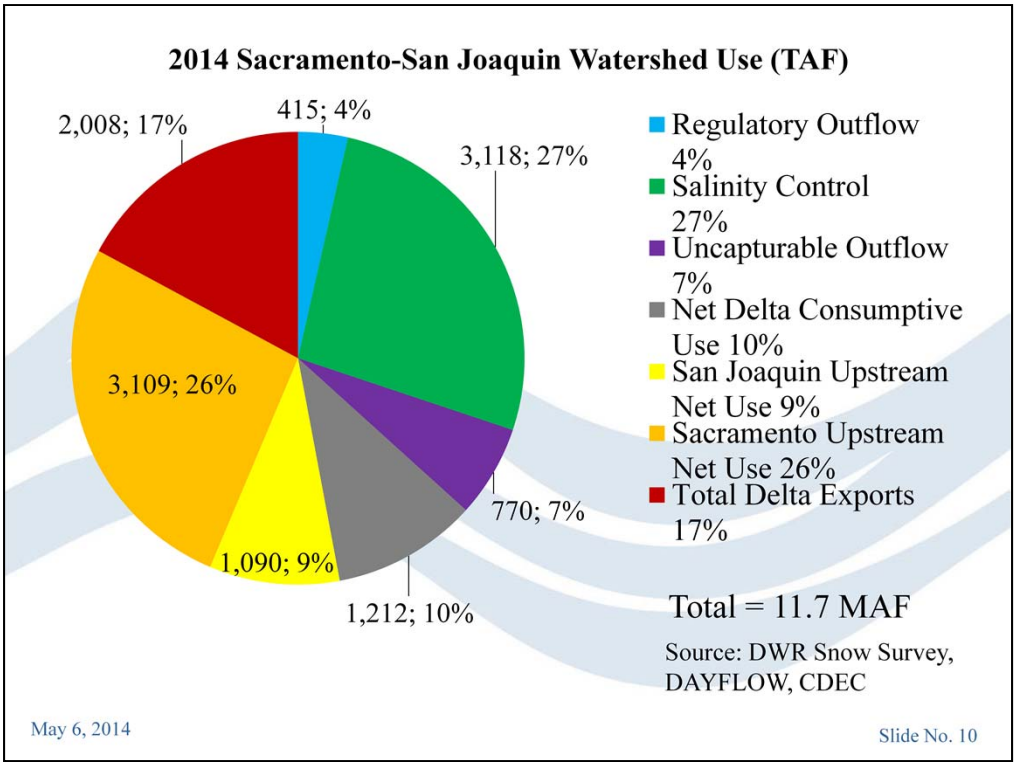
In 2014, the driest year we have experienced in recent decades, salinity control dominated outflow and total exports accounted for about 27% of the total Delta water budget. Regulatory outflow limited exports during some storm events. On February 1st a Temporary Urgency Change Petition was issued which reduced D-1641 requirements below what is required for long-term salinity control. In the pie chart you can see that regulatory outflow requirements accounted for only 6% of the total water budget in 2014.



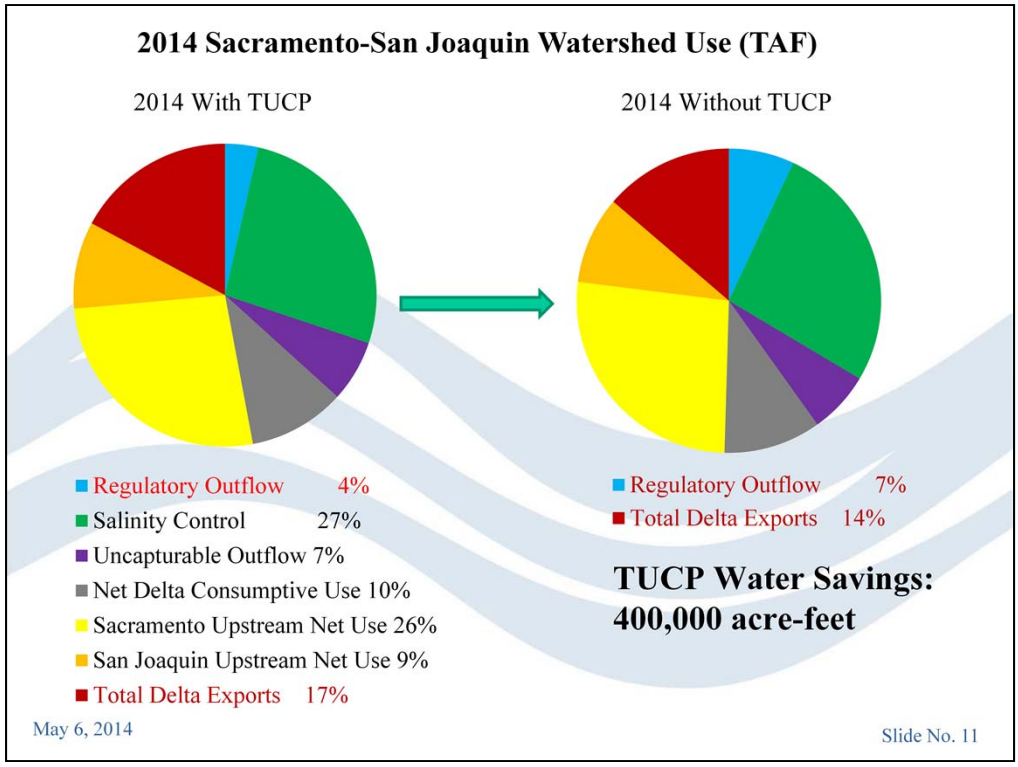
In water year 2015, I have shown observed data through April and forecasted flows for the remainder of the water year. Outflow is again dominated by salinity control for most of the year. Storms around the end of the calendar year and in the end of February produced some large uncapturable outflow events. Outflow is forecast to drop to around or below 3000 cfs for much of the summer. Even with barriers in place this may be an optimistic forecast seeing as how currently salinity control is a problem with average outflows around 5,000 cfs.

Annual totals are shown in the pie chart and the forecasted data from May 1st onward is shown with dots. In 2015, regulatory outflow is estimated to be only 3% of the total Delta water budget.

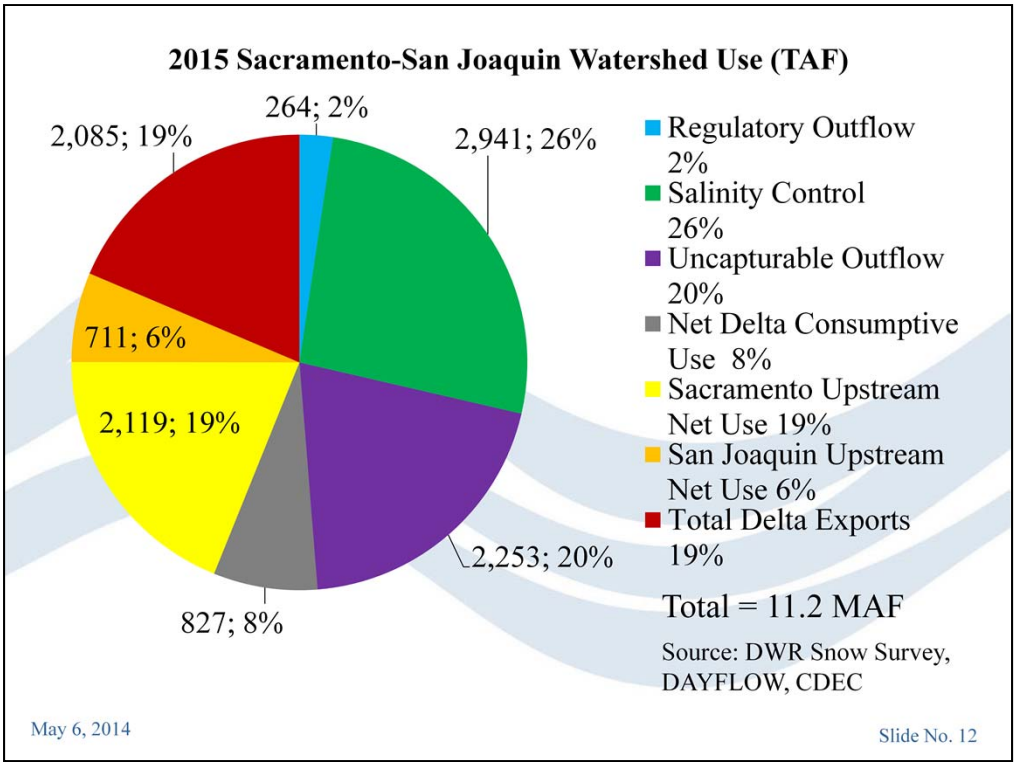
Now that I have described the Delta water use in detail I would like to put it back into perspective of the entire watershed scale.



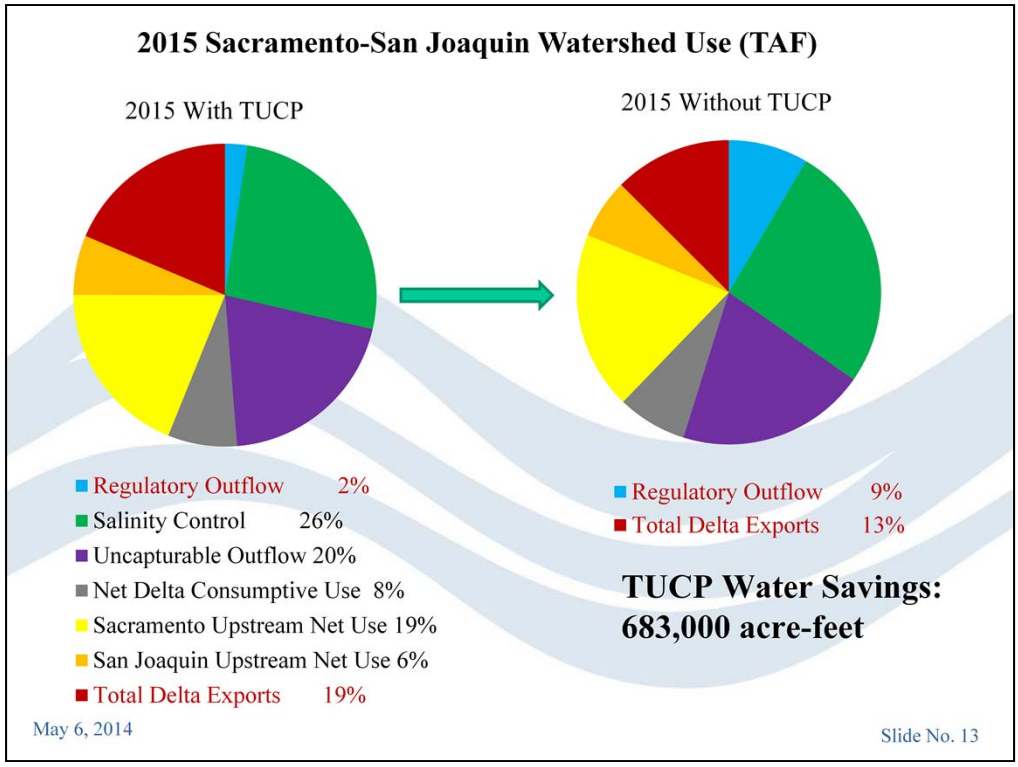
For 2014, upstream Sacramento net use made up over a quarter of the total watershed use along with Delta salinity control making up another quarter. Delta exports were over 2 MAF or 17%. San Joaquin upstream use and Delta consumptive use each made up about 10% of the total watershed use. A relatively small amount of Delta outflow can be categorized as regulatory outflow of less than 500 TAF. I also want to point out that other than some minor evaporation at refuges, this is the only water leaving the system specifically for environmental needs.



On Febuary 1st, 2014, the first drought related TUCP was issued to the Projects which modified various water quality objectives in D-1641 including outflow and X2 requirements. Under the 2014 TUCP it was estimated that about 400 thousand acre-feet was saved. On the left you see a chart of observed use in 2014 and on the right you see the increase in regulatory outflow and a decrease in total delta exports estimated without the TUCP in place. Some of the TUCP savings could have gone to increased upstream net use as well as exports, however for the ease of presentation I have shown them going to total delta exports.



This year we expect to see slightly higher exports than last year while we expect lower upstream net use and even less regulatory outflow. As others have reported, Delta outflow is forecasted to account for about 48% of the total watershed budget, however only a very small portion of the outflow is required by various regulations. In fact we estimate regulatory outflow to be only 2% of the total Sacramento – San Joaquin Watershed use in 2015.



In 2015 we estimate that the TUCPs have saved about 683 thousand acre-feet, that absent of the TUCP would have been regulatory outflow. Again on the left you see the same pie chart as on the previous slide, and on the right you see an estimated 2015 forecast without a TUCP. The TUCP has allowed for a decrease in regulatory outflow from 947 thousand acre-feet to only 264 thousand acre-feet. The TUCP has allowed for a forecasted increase in exports up to 683 thousand acre-feet in 2015.