

LAKE CACHUMA OAK TREE RESTORATION PROGRAM

2018 ANNUAL REPORT

with

Fiscal Year 2018-2019 Financials and Water Usage



Prepared for: Cachuma Operation and Maintenance Board

Prepared by: Timothy H. Robinson (COMB), Scott J. Volan (COMB), Daniel Razo (COMB) and Kenneth A. Knight (Kenneth A. Knight, Consulting)

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Executive Summary

The following is the annual report for the Lake Cachuma Oak Tree Restoration Program that contains the results of the 2018 annual inventory of all planted mitigation oak trees and the Fiscal Year 2018-2019 financial and water usage details. The results of the 2015 Lakeshore Survey set the mitigation number for the Lake Cachuma Oak Tree Restoration Program at 4,721 (COMB, 2016). This number included the established mitigation ratio of two to one (2:1) and an 18% mortality rate that was determined from the 2015 and 2016 annual survey reports (COMB, 2017a; COMB, 2017b). As of the end of this year's inventory, 4,714 oak trees have been planted and 3,741 are alive which is a survival rate of 78.48%. The number of mitigation trees still to be planted is **980** trees (mitigation number minus total alive trees). The cost of the program during Fiscal Year 2018-2019 was \$120,573 with a total cost of the program since it started in 2005 of \$1,627,602. Water usage for irrigation over the year was 1.41 acre-feet.

Introduction/Background

This Annual Report presents the results of the 2018 oak tree inventory and Fiscal Year 2018/2019 (FY18/19) maintenance with water use and financials for the Lake Cachuma Oak Tree Restoration Program (Program). For Program details and objectives, see the 2-Year Plan for Fiscal Years 2013/14 and 2014/15 (COMB, 2014). This annual report contains oak tree survival rates, maintenance with water usage, financials, and suggested program improvements.

There were 300 oak trees planted during FY18/19 at Lake Cachuma County Park that are referenced as YR 10 trees. The survey results for this reporting period are presented by the year of the program that they were planted, and include the financials and maintenance effort.

Results

The 2018 inventory (or survey) of the oak trees planted through the Lake Cachuma Oak Tree Restoration Program was completed in March 2019 with the data entry and quality-assurance/quality-control occurring during the following month. The objective of the annual survey is to determine the status and success rate of the trees planted since the beginning of the program with ten years of plantings; Year 1 (2005-2006), Year 2 (2006-2007), Year 3 (2007-2008), Year 4 (2008-2009), Year 5 (2009-2010), Year 6 (2010-2011), Year 7 (2014-2015), Year 8 (2015-2016), Year 9 (2016-2017), the DT trees (approximately 2001 through 2010), and Year 10 (2018-2019). Annual surveys traditionally are conducted in the late fall and early winter to best document the survival after the dry season and growth since the last survey. With the increased number of planted trees in recent years, the annual inventory takes longer with the objective now of completion by middle of the spring of the following year. Methods for reducing the survey time continue to be investigated.



Year-ID	Fiscal Year	# Planted Trees
1	2005-2006	375
2	2006-2007	375
3	2007-2008	375
4	2008-2009	375
5	2009-2010	379
6	2010-2011	377
7	2014-2015	909
8	2015-2016	824
9	2016-2017	301
DT	2005-2018	124
10	2018-19	300
Total:		4714

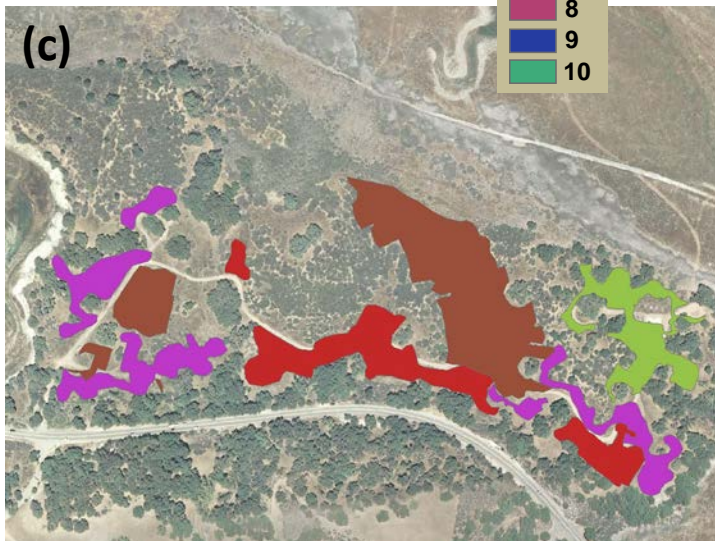
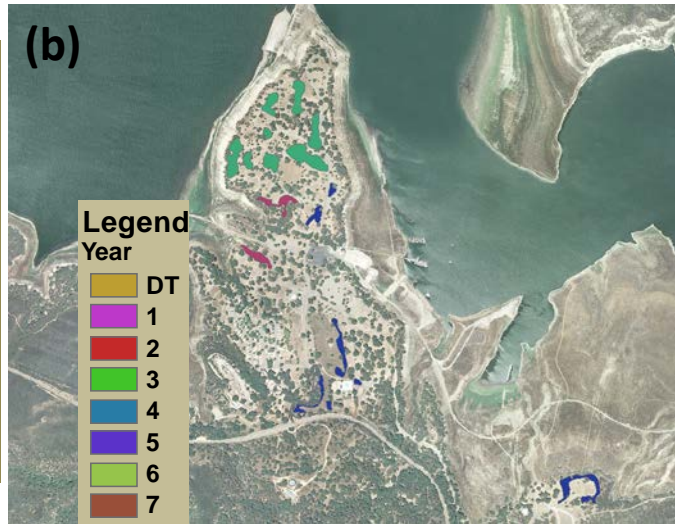


Figure 1: Oak tree planting locations by year planted (Year-ID) at; (a) Bradbury Dam area, (b) Cachuma Lake Recreation Area (County Park), and (c) Storke Flats.



Figure 2: Year 10 trees within Lake Cachuma County Park as mapped in FY18/19.

The following figures and tables are the results of the survey in 2018 with 2017 results included for comparison; overall success rates in 2017 and 2018 (Figures 3 and 4) and success by planting year in 2017 and 2018 (Figures 5-12). The overall success rate went from 82.21% in 2017 to 78.48% in 2018; the decrease is most likely due to the prolonged drought. Year 10 trees have a 100% success rate and had no comparison to the previous year; hence figures were not included for those years for this report.

Prior to this year, seven years of below average rainfall that has made it difficult for planted trees to survive particularly in the Year 1 through Year 6 trees that were thought to be self-sustaining by now at a minimum of seven years since planted. The number of required mitigated trees from the Lake Cachuma Surcharge Project was set in 2015 and reported in the 2015 Lakeshore Survey Report (COMB, 2016). The required mitigation ratio is two to one (2:1) survival rate (self-sustaining) in 2025. The results of the 2015 Lakeshore Survey found there were 879 dead and 1,122 at-risk oak trees. With a 2:1 mitigation ratio and an estimated 18% mortality rate, it was estimated that 4,721 trees would need to be planted to meet our mitigation requirements in 2025. To date, there are 3,741 planted alive trees suggesting that **980** trees (mitigation number minus total alive trees) still need to be planted and soon to get established and be self-sustaining within six years (2025).

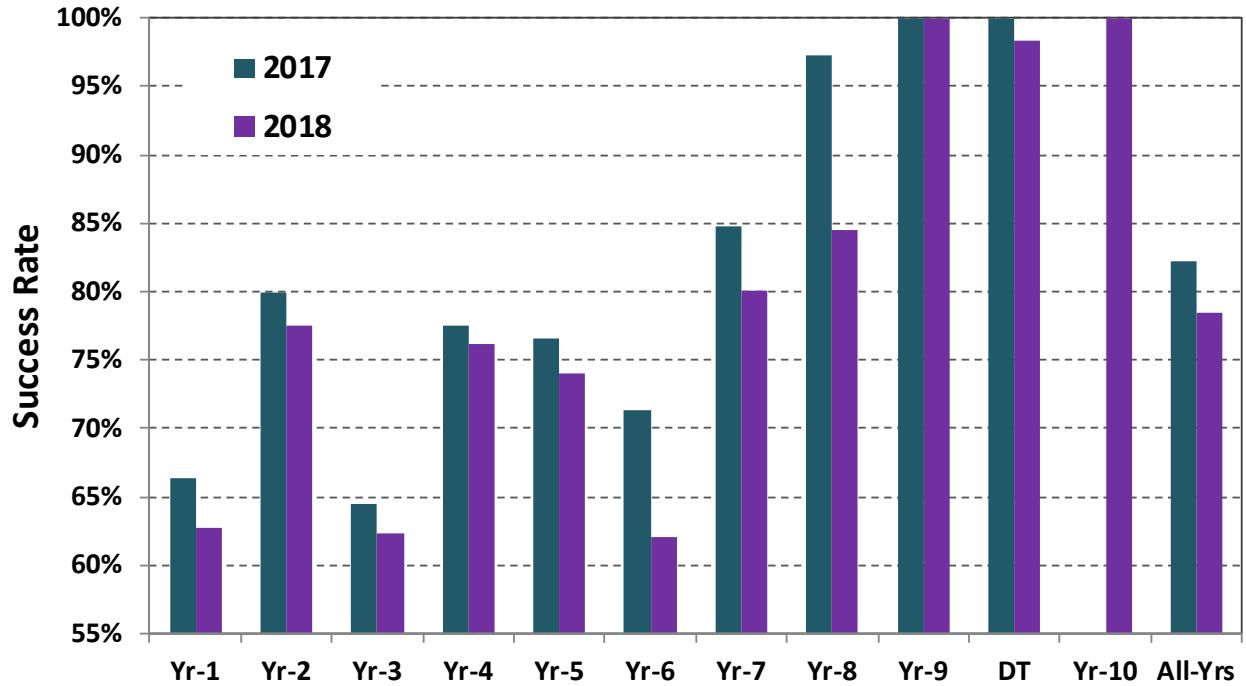
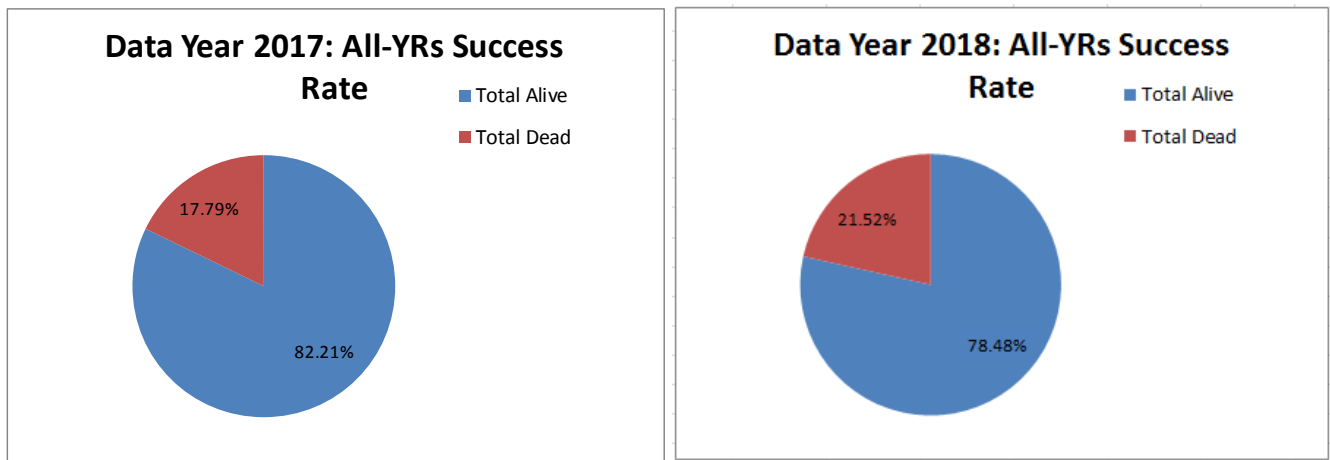


Figure 3: Success rate comparison from 2017 to 2018 for each and all tree years (Yr).



All Years - Total Observed in 2017				Percent of Total		All Years - Total Observed in 2018				Percent of Total	
Total Coast Live Oak (alive)	3272	Total Alive	3674	82.21%	Total Coast Live Oak (alive)	3323	Total Alive	3741	78.48%		
Total Valley Oak (alive)	402	Total Dead	795	17.79%	Total Valley Oak (alive)	418	Total Dead	1026	21.52%		
Ratio Coast/Valley	8.1	Total	4469	100.00%	Ratio Coast/Valley	7.9	Total	4767	100.00%		

Figure 4: 2017 and 2018 status of oak trees from all years (Years 1 through 9) planted; including DT trees.

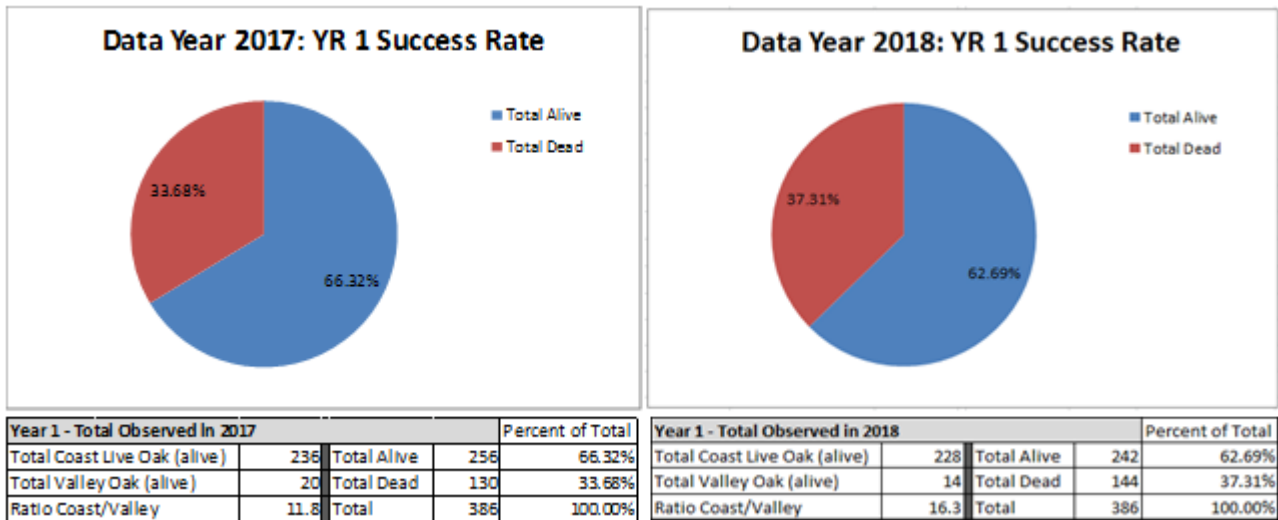


Figure 5: Status comparison of Year (YR) 1 trees from 2017 to 2018.

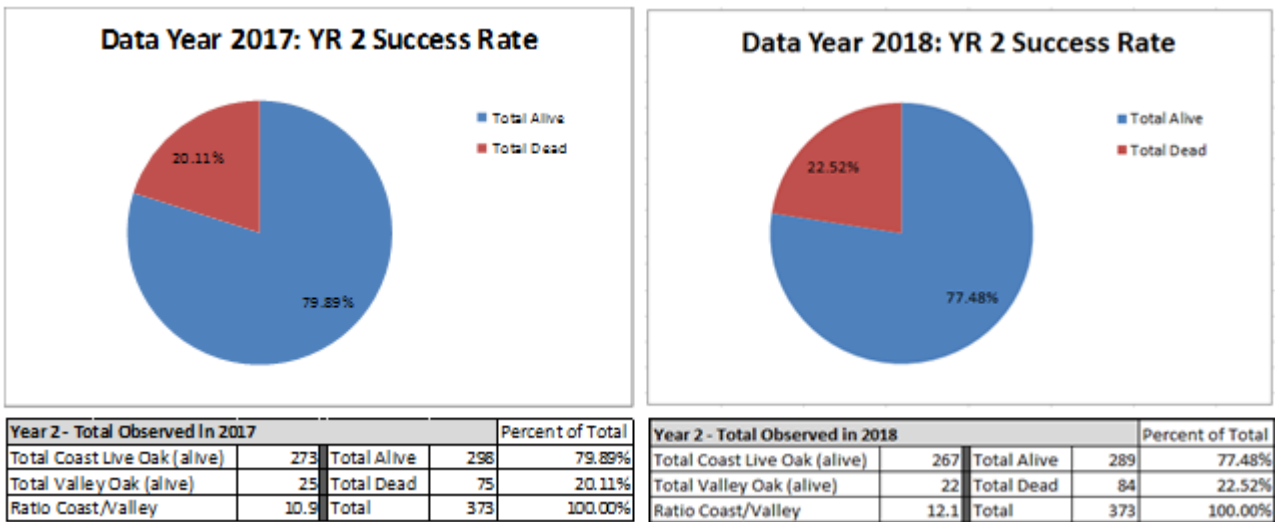
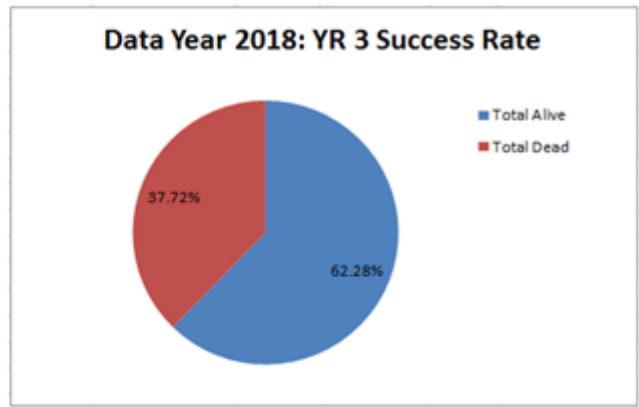
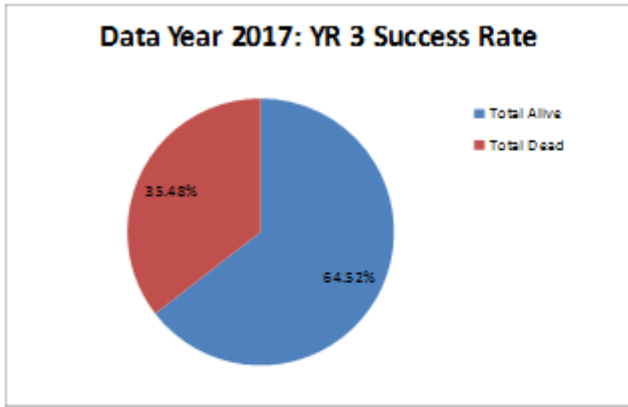


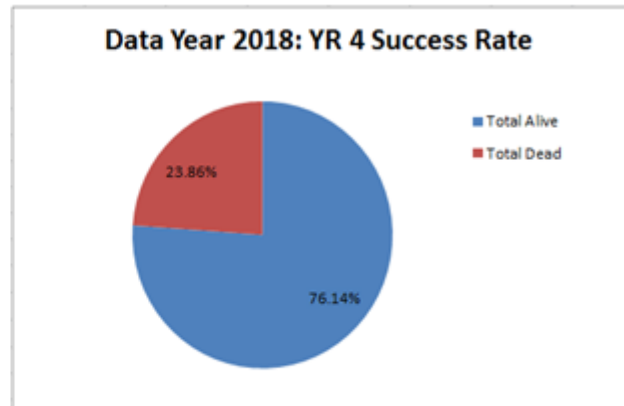
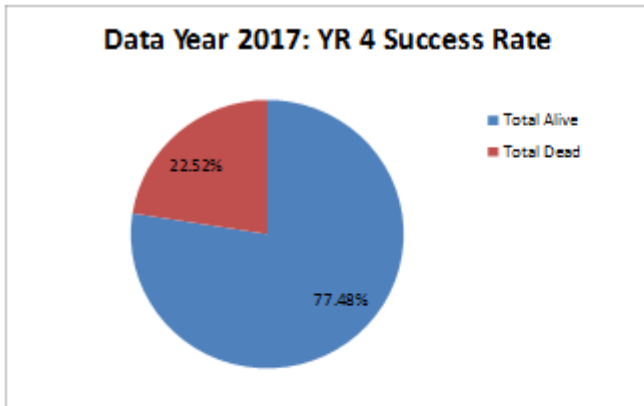
Figure 6: Status comparison of Year 2 trees from 2017 to 2018.



Year 3 - Total Observed In 2017			Percent of Total	
Total Coast Live Oak (alive)	237	Total Alive	260	64.52%
Total Valley Oak (alive)	23	Total Dead	143	35.48%
Ratio Coast/Valley	10.3	Total	403	100.00%

Year 3 - Total Observed in 2018			Percent of Total	
Total Coast Live Oak (alive)	227	Total Alive	251	62.28%
Total Valley Oak (alive)	22	Total Dead	152	37.72%
Ratio Coast/Valley	10.3	Total	403	100.00%

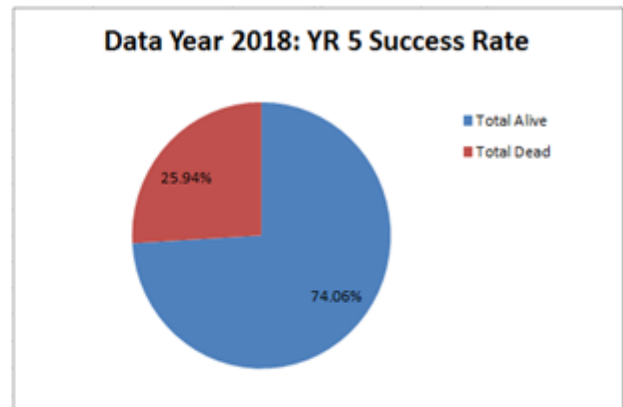
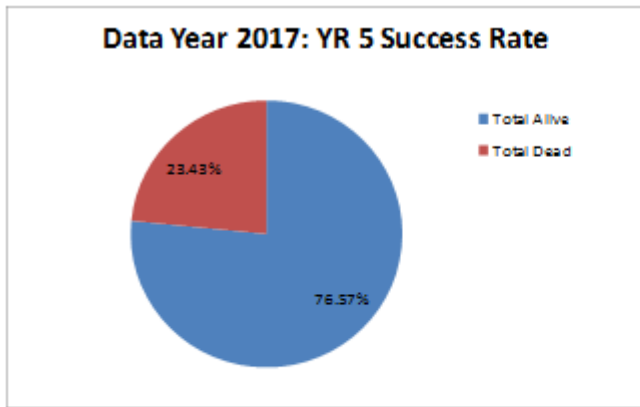
Figure 7: Status comparison of Year 3 trees from 2017 to 2018.



Year 4 - Total Observed In 2017			Percent of Total	
Total Coast Live Oak (alive)	260	Total Alive	289	77.48%
Total Valley Oak (alive)	29	Total Dead	84	22.52%
Ratio Coast/Valley	9.0	Total	373	100.00%

Year 4 - Total Observed in 2018			Percent of Total	
Total Coast Live Oak (alive)	256	Total Alive	284	76.14%
Total Valley Oak (alive)	28	Total Dead	89	23.86%
Ratio Coast/Valley	9.1	Total	373	100.00%

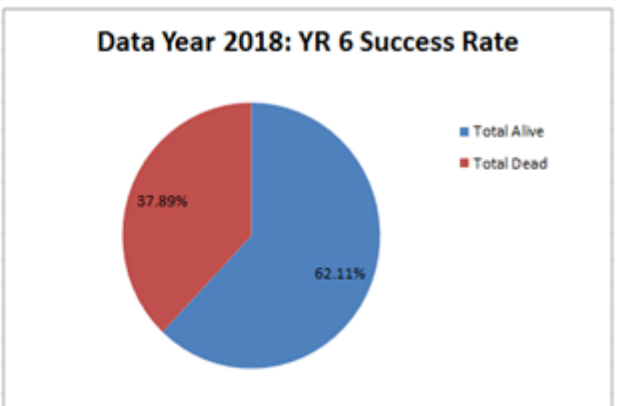
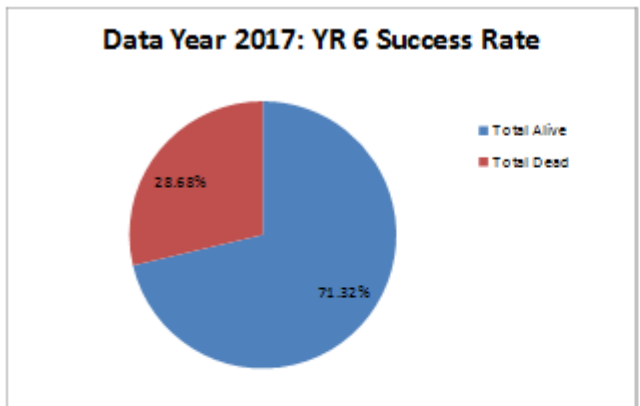
Figure 8: Status comparison of Year 4 trees from 2017 to 2018.



Year 5 - Total Observed In 2017				Percent of Total
Total Coast Live Oak (alive)	259	Total Alive	304	76.57%
Total Valley Oak (alive)	45	Total Dead	93	23.43%
Ratio Coast/Valley	5.8	Total	397	100.00%

Year 5 - Total Observed in 2018				Percent of Total
Total Coast Live Oak (alive)	249	Total Alive	294	74.06%
Total Valley Oak (alive)	45	Total Dead	103	25.94%
Ratio Coast/Valley	5.5	Total	397	100.00%

Figure 9: Status comparison of Year 5 trees from 2016 to 2017.



Year 6 - Total Observed In 2017				Percent of Total
Total Coast Live Oak (alive)	234	Total Alive	271	71.32%
Total Valley Oak (alive)	37	Total Dead	109	28.68%
Ratio Coast/Valley	6.3	Total	380	100.00%

Year 6 - Total Observed in 2018				Percent of Total
Total Coast Live Oak (alive)	208	Total Alive	236	62.11%
Total Valley Oak (alive)	28	Total Dead	144	37.89%
Ratio Coast/Valley	7.4	Total	380	100.00%

Figure 10: Status comparison of Year 6 trees from 2017 to 2018.

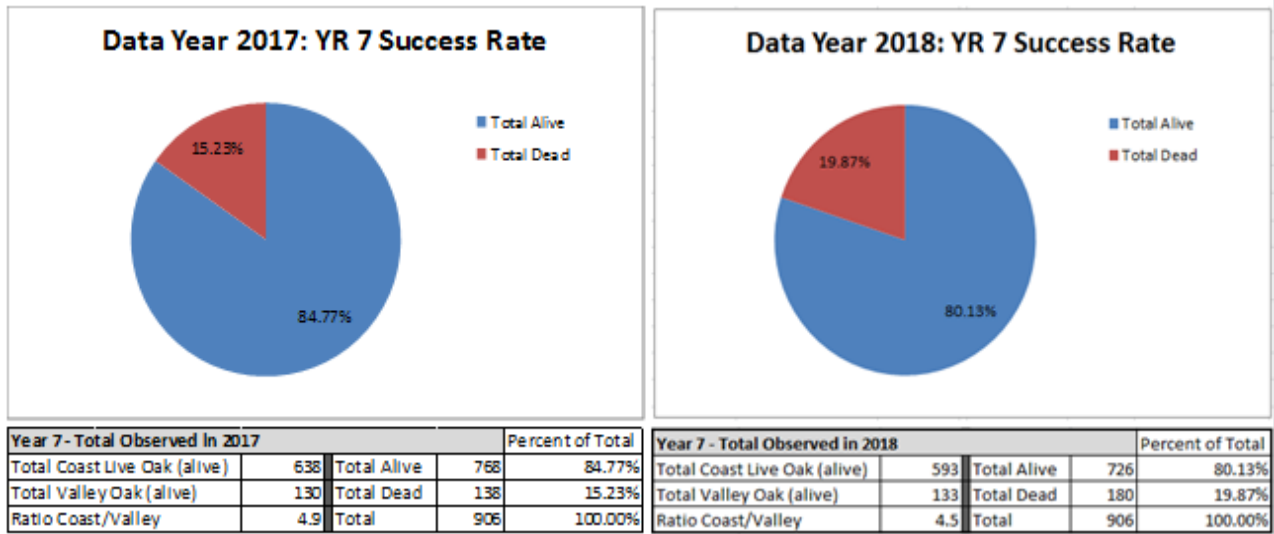


Figure 11: Status comparison of Year 7 trees from 2017 to 2018.

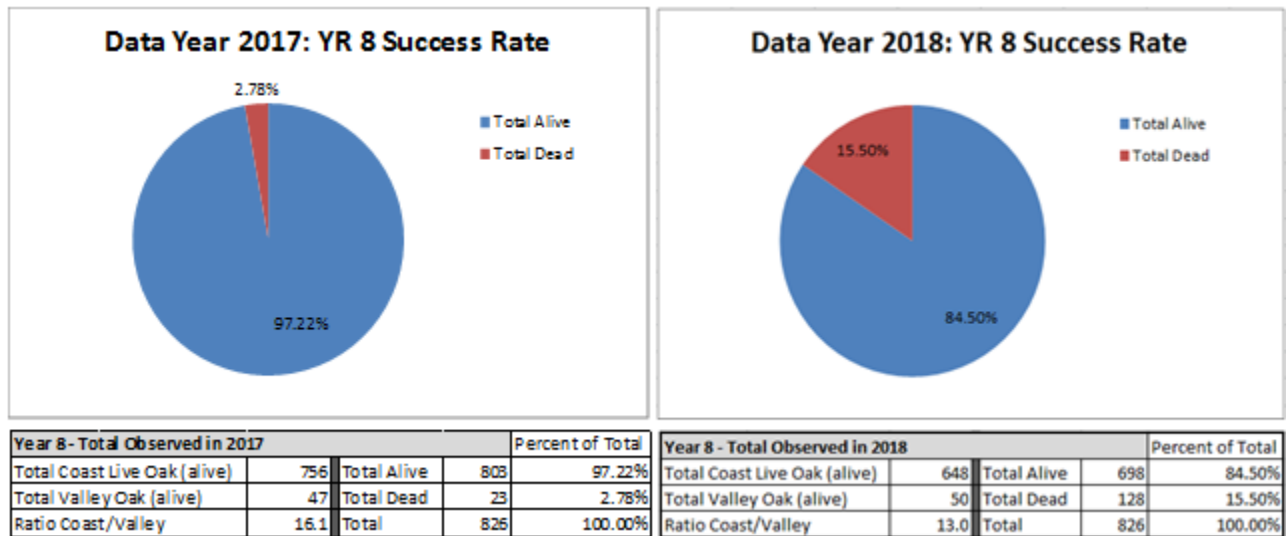


Figure 12: Status comparison of Year 8 trees from 2017 to 2018.

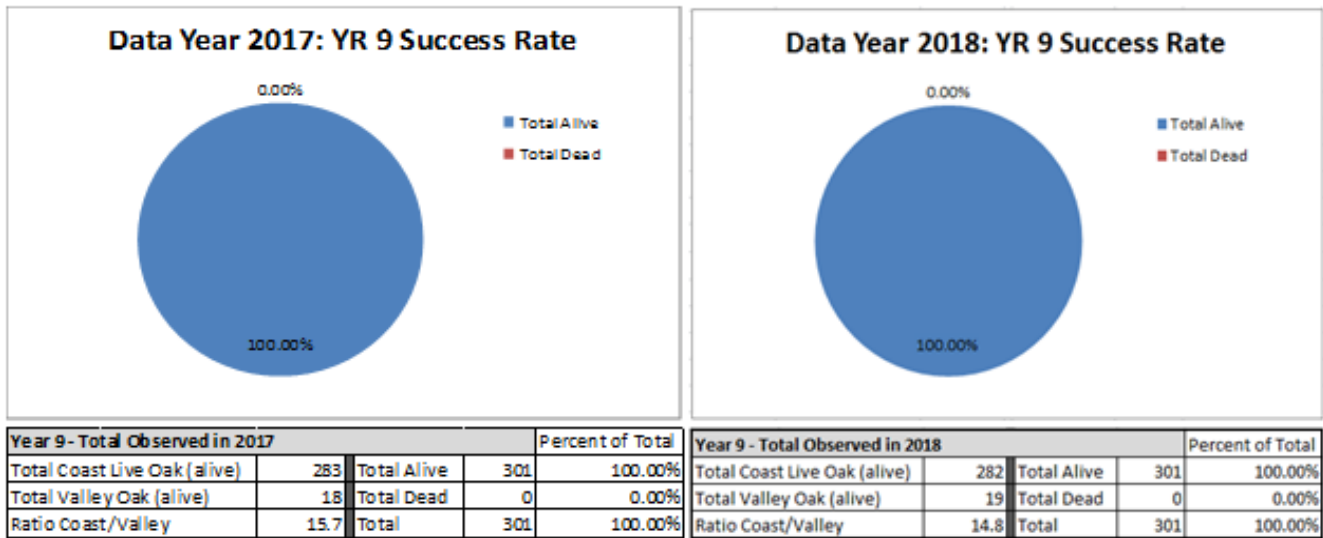


Figure 13: Status comparison of Year 9 trees from 2017 to 2018

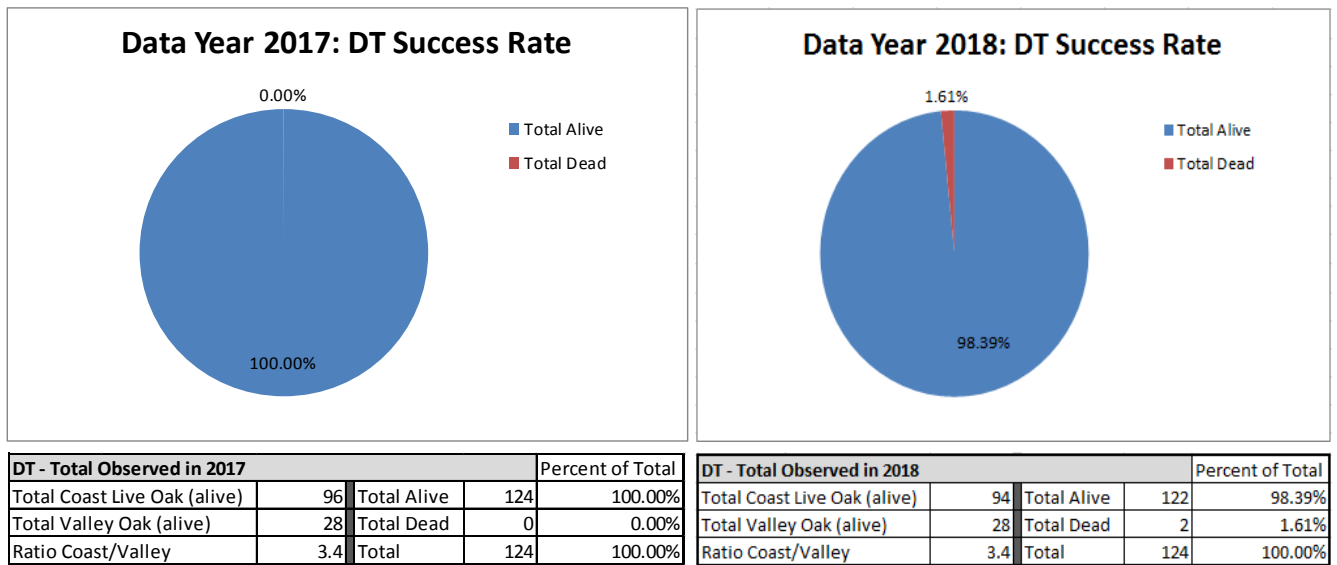


Figure 14: Status comparison of Dam Tender trees from 2017 to 2018.

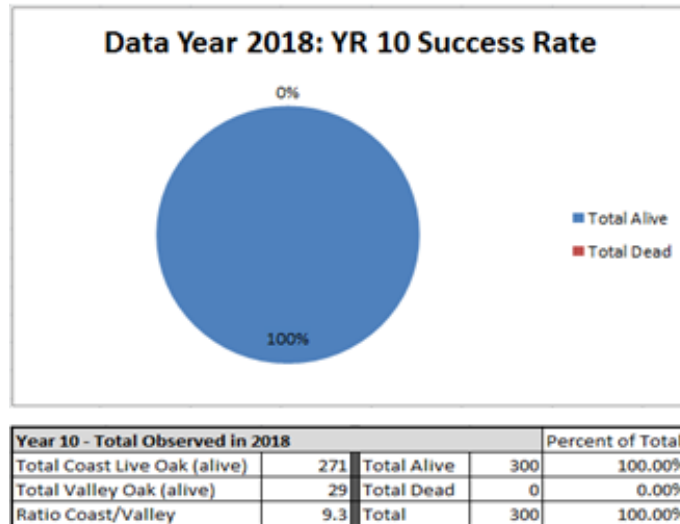


Figure 15: Year 10 trees planted in 2018

Maintenance

Maintenance of all planted oak trees in FY18/19 included irrigating, weeding, mulching, and deer cage maintenance is presented in Table 1. The total amount of water used from Lake Cachuma to irrigate oak trees from all years in FY18/19 was 1.41 acre-feet which was slightly higher than last year at 1.31 acre-feet due to more trees in the program and the continued effect of a recent long-term drought (Table 2). Information presented in Tables 1 and 2 does include Year 10.

Table 1: Cachuma Oak Tree Restoration Program completed maintenance in FY18/19.

	July 2018	Aug 2018	Sept 2018	Oct 2018	Nov 2018	Dec 2018 ²	Jan 2019 ²	Feb 2019 ²	Mar 2019 ³	April 2019	May 2019	June 2019
Year 10 Oaks (2018-2019)						Planted	Planted			Irrigated Weeded		Irrigated Weeded
Year 9 Oaks (2016-2017)	Irrigated Weeded		Irrigated Weeded	Irrigated Weeded						Weeded Deer Cages	Irrigated Weeded	Irrigated Weeded
Year 8 Oaks (2015-2016)	Irrigated Weeded	Irrigated Weeded	Irrigated Weeded	Irrigated Weeded	Irrigated Weeded					Weeded Deer Cages	Irrigated Weeded	Irrigated Weeded
Year 7 Oaks (2014-2015)	Irrigated Weeded	Irrigated Weeded Deer Cages		Irrigated Weeded	Irrigated Weeded			Irrigated			Irrigated Weeded	Irrigated Weeded
Year 6 Oaks (2010-2011)	Irrigated ¹											
Year 5 Oaks (2009-2010)	Irrigated ¹											
Year 4 Oaks (2008-2009)	Irrigated ¹			Deer Cages	Deer Cages						Deer Cages	
Year 3 Oaks (2007-2008)	Irrigated ¹			Deer Cages	Deer Cages						Deer Cages	
Year 2 Oaks (2006-2007)	Irrigated ¹											
Year 1 Oaks (2005-2006)	Irrigated ¹											

¹ Stressed trees irrigated.
² Oak tree inventory (Year 1-9).
³ Oak tree inventory (Year 10).

Table 2: Cachuma Oak Tree Restoration Program water usage from Lake Cachuma for irrigation during FY18/19.

	Gallons	Acre-feet
July	85,175	0.261
August	61,700	0.189
September	55,650	0.171
October	68,350	0.210
November	68,300	0.203
December	4,000	0.012
January	2,000	0.006
February	36,875	0.106
April	21,500	0.066
May	20,350	0.062
June	40,475	0.124
Total:	464,375	1.41

Financials

Annual expenses by Fiscal Year since the beginning of the Lake Cachuma Oak Tree Restoration Program in FY05/06 are presented in Table 3. The totals include COMB staff (plus burden) and consulting arborist hours, material, supplies, fuel expenses, GPS mapping, conducting the annual inventory, replanting trees over the period, and reporting. The breakout for those costs is presented by labor (Table 4) and the total cost (labor, materials, and supplies) in Table 5. The financials do include the Year 10 planting and mapping efforts.

Table 3: Total program costs by Fiscal Year including planting, maintenance, mapping, conducting the annual inventory, and reporting by year (Year-ID) and number of trees planted during those years.

# of Years	Fiscal Year	Operator	Year-ID	# Planted Trees	Cost
1	2005-2006	Fournier	1	375	\$116,731
2	2006-2007	Fournier	2	375	\$117,620
3	2007-2008	Fournier	3	375	\$138,786
4	2008-2009	Fournier	4	375	\$137,872
5	2009-2010	Fournier	5	379	\$136,900
6	2010-2011	Fournier	6	377	\$137,878
7	2011-2012	Fournier	-	-	\$79,439
8	2012-2013	COMB	-	-	\$101,431
9	2013-2014	COMB	-	-	\$48,097
10	2014-2015	COMB	7	909	\$134,054
11	2015-2016	COMB	8	824	\$128,241
12	2016-2017	COMB	9	301	\$101,227
13	2017-2018	COMB	DT	124	\$128,752
14	2018-2019	COMB	10	300	\$120,573
			Total:	4714	\$1,627,602

Table 4: Labor costs for the Lake Cachuma Oak Tree Program during FY18/19.

	Total
COMB Staff (hours):	
Seasonal Biologist Aide A	340.5
Seasonal Biologist Aide B	725.75
Seasonal Biologist Aide C	72
Seasonal Biologist Aide D	322
System Analyst Assistant	134.5
Water Service Worker I	48
Water Service Worker III	6
Water Service Worker III	42
Biologist Assistant	1138.75
Project Biologist A	157
Project Biologist B	121.5
Senior Resource Scientist	84
Total Staff Hours:	3192
Cost - Labor plus burden	\$98,667.21
Consultant Service Hours (Ken Knight):	1.9
Consultant Cost	\$219.63
Total Personnel /Consultant Cost	\$98,886.84

Table 5: Total expenses (labor, materials and supplies) for the Lake Cachuma Oak Tree Program during FY18/19.

	Total
Materials and Supplies:	
Oak trees	\$4,913.40
Tree stakes	\$1,241.31
Tree tags	\$103.18
Mulch	\$637.78
Compost	\$377.13
Fertilizer	\$213.11
Gopher baskets	\$2,726.54
Protective deer caging/netting	\$4,169.25
Hand tools	\$34.03
Hoses	\$342.00
PPE	\$162.91
Roadbase	\$575.41
Backhoe mobilization	\$875.00
Vehicle Fuel Cost	\$2,526.84
Equipment Fuel Cost (incl. diesel H2O truck)	\$2,787.77
Total Materials and Supplies	\$21,685.66
TOTAL EXPENSES (labor, materials + supplies)	\$120,572.50

The total cost of the Lake Cachuma Oak Tree Restoration Program in FY18/19 was \$120,573 which includes any replanting and mapping costs of the Year 10 trees. Again, the total reflects personnel cost (labor plus burden), materials, supplies, expenses (vehicle and equipment fuel), and consultant fees. For comparison, during the first six years of the project annual consultant costs were approximately \$136,000 to plant approximately 375 and maintain the previously planted trees. In FY16/17, COMB staff planted 301 trees and maintained all previously planted trees (4,290 trees) at a cost of \$101,227. The ability to keep costs down is attributed to multiple factors, which include but are not limited to:

- Relying on the COMB Fisheries Division seasonal staff to conduct the bulk of field activities.
- Minimizing the amount of full-time staff being used.
- Reduced equipment needs as the bulk of purchases occurred during the fiscal year when COMB took over the project.
- Reduced consultant hours due to staff gaining more tree care experience.
- Reduced vehicle gas consumption as some of the seasonal staff live in the Santa Ynez Valley and use their own vehicles to travel to oak tree locations.
- A wet year that reduced the number of days staff had to water the trees.
- Reduced equipment (generator/pumps) gas consumption from more efficient irrigation hosing and better delivery technique for extracting water from Lake Cachuma.

Summary and Recommendations for Program Improvements

There are 3,741 (including Year 10 trees) alive oak trees attributed to the mitigation effort of the Program. The survival rate to date is 78.48% (Years 1-10 and DT trees) which would be considered very respectful in any open range oak tree planting effort in a similar climate. The number of mitigation trees still to be planted is **980** trees. It is recommended to continue planting next year 300-500 more mitigation trees depending on the projection for a normal to wet year.

Challenges for the Program, specifically tree survival, are six of eight years of an extraordinary drought (WY2012-WY2019, except WY2017 and WY2019), inadequate initial planting methodology during the first six years (compromised gopher wire baskets, trees planted too low, deer cages removed too soon, auger hole planting, etc.), and a limited staff to take care of an extensive number of trees. Some planting areas have better soils and topography than others, for example the Year 3 planting area has shallow soils with southern exposure whereas the Year 7 planting area is just the opposite.

Lessons learned by the COMB staff from seven years of conducting this Program have been put into practice and are recommended for future work, specifically:

- Systematically mulching all trees once a year, particularly newly planted trees (Figure 16).
- Maintain deer cages for all trees below deer browsing level (approximately 6 feet).
- Clear the dirt away from the tree base.
- Expose gopher wire baskets at the surface wherever possible to prohibit gopher travel over the top of the wire basket.
- Plant new trees in professional gopher wire baskets using backhoe dug holes (no auger holes that limit the spread of tree roots); plant the trees slightly above grade to accommodate subsidence; and use sturdy wire deer cages instead of netting or chicken wire.
- Plant well established trees from the nursery (at least a foot tall) instead of acorns as they have a better success rate.
- Structurally pruned planted trees grow larger, taller and faster than unpruned trees thus becoming more likely to survive and be self-sustaining.
- Carefully mow and/or weed-whack around trees for weed control and to facilitate access for all maintenance tasks (Figure 17).
- Continue to use Grow-Tubes as they appear to be quite successful particularly in areas with poor soils and where surface rodent impacts are noticed, such as near brushy natural vegetation found along the margins of planting areas.
- Wrap the bottom of deer cages with fine mesh shade cloth to prohibit surface rodents from accessing planted trees in areas near the margins of planting areas.
- Gather acorns from the local area in August for Valley Oaks and September for Coast Live Oaks to be germinated and grown at a nursery for future plantings (Figure 18).



Figure 16: Tree mulching of Year 7 trees.



Figure 17: Area maintenance by (a) brush mowing and (b) weed whacking around trees to (c) facilitate access.



Figure 18: Local Coast Live Oak and Valley Oak acorns gathered in the field.

References:

COMB, 2016. 2015 Lakeshore Survey Report. Cachuma Operation and Maintenance Board (COMB).

COMB, 2017a. 2015 Annual Report of the Lake Cachuma Oak Tree Restoration Program. Cachuma Operation and Maintenance Board (COMB).

COMB, 2017b. 2016 Annual Report for the Lake Cachuma Oak Tree Restoration Program. Cachuma Operation and Maintenance Board.