LAKE CACHUMA OAK TREE RESTORATION PROGRAM

2016 ANNUAL REPORT
with
Fiscal Year 2016-2017 Financials and Water Usage

Lake Cachuma Park Entrance – Frisbee Golf Course

Prepared for: Cachuma Operation and Maintenance Board

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Executive Summary

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 annual survey (COMB, 2017). To date, 4,290 oak trees have been planted and 3,590 are alive which is a survival rate of 81.5%. The number of mitigation trees still to be planted is **1,131** trees. The cost of the program during Fiscal Year 2016-2017 was $101,227 with a total cost of the program since it started in 2005 of $1,378,277. Water usage for irrigation over the year was 0.92 acre-feet.

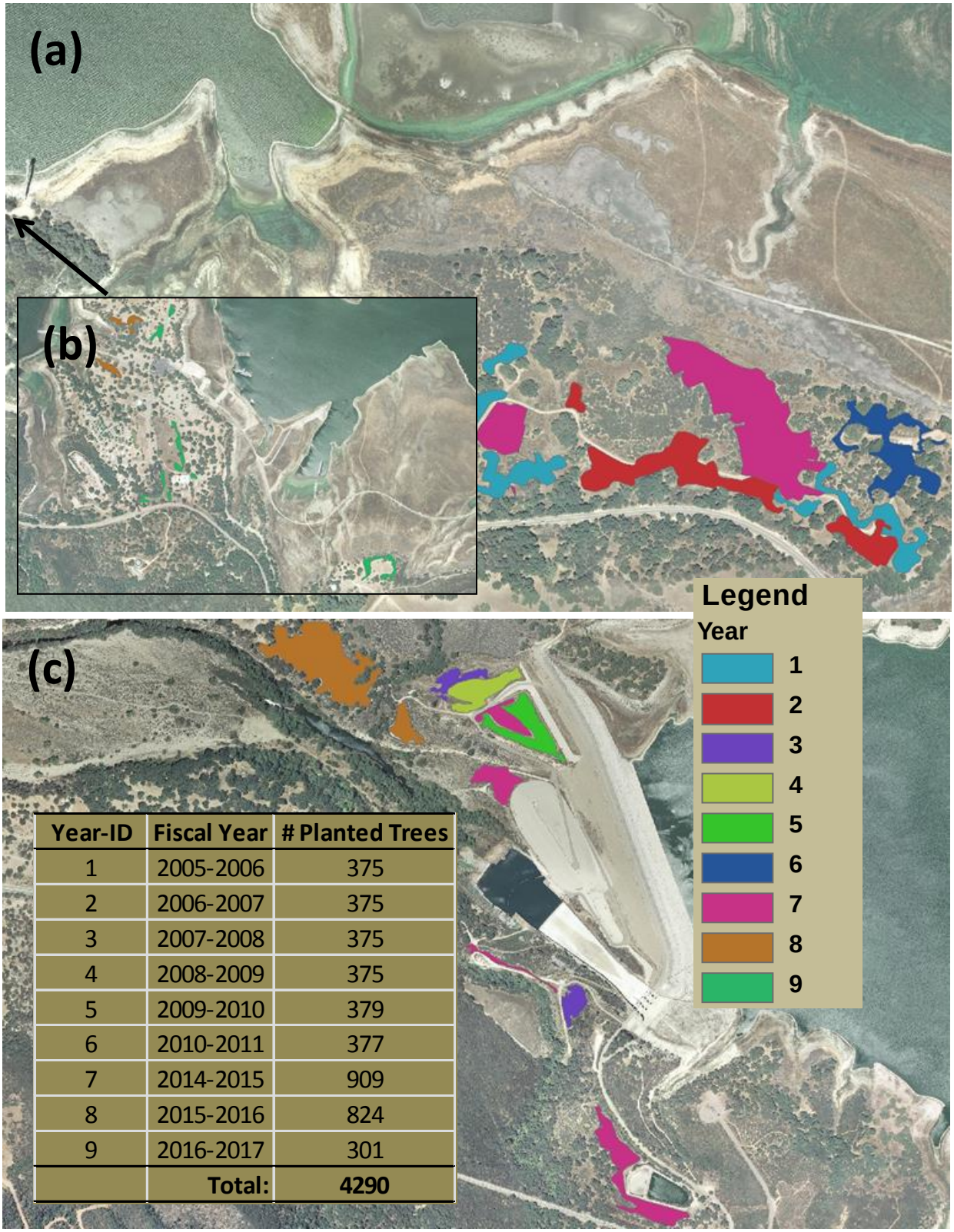
Introduction/Background

This Annual Report presents the results of the 2016 oak tree inventory and Fiscal Year 2016/2017 (FY16/17) 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 301 oak trees planted in FY16/17. These trees are referred to as the Year 9 trees and were planted in several locations within Lake Cachuma County Park. The inventory and results of that planting effort in regards to meeting the mitigation requirement will be presented in next year's annual report although the financials and maintenance effort are included in this report.

Results

The 2016 inventory (or survey) of the oak trees planted through the Lake Cachuma Oak Tree Restoration Program was completed in May 2017. 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 8 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), and Year 8 (2015-2016) in four different locations around Lake Cachuma (Figure 1). Year 9 (2016-2017) trees are newly planted (Figure 2) and will be included in the 2017 inventory next year. 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. Methods for reducing the survey time are being 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
	Total:	**4290**

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

Figure 2: Year 9 oak trees were all planted within the County Park, specifically at Mohawk, Yurts, Parade Grounds, and the Park Entrance.

The following figures and tables are the results of the survey in 2016 with 2015 results included for comparison; overall success rates in 2015 and 2016 (Figures 3 and 4) and success by planting year in 2015 and 2016 (Figures 5-12). The overall success rate went from 85.7% in 2015 to 81.5% in 2016; the decrease is due to the fifth straight year of drought, the vast number of trees planted, and that some of those trees were thought to be self-sustained that were not. 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 4,722 trees would need to be planted to meet our mitigation requirements in 2025. To date, there are 3,289 planted alive trees plus 301 Year 9 trees suggesting that **1,131** trees still need to be planted.

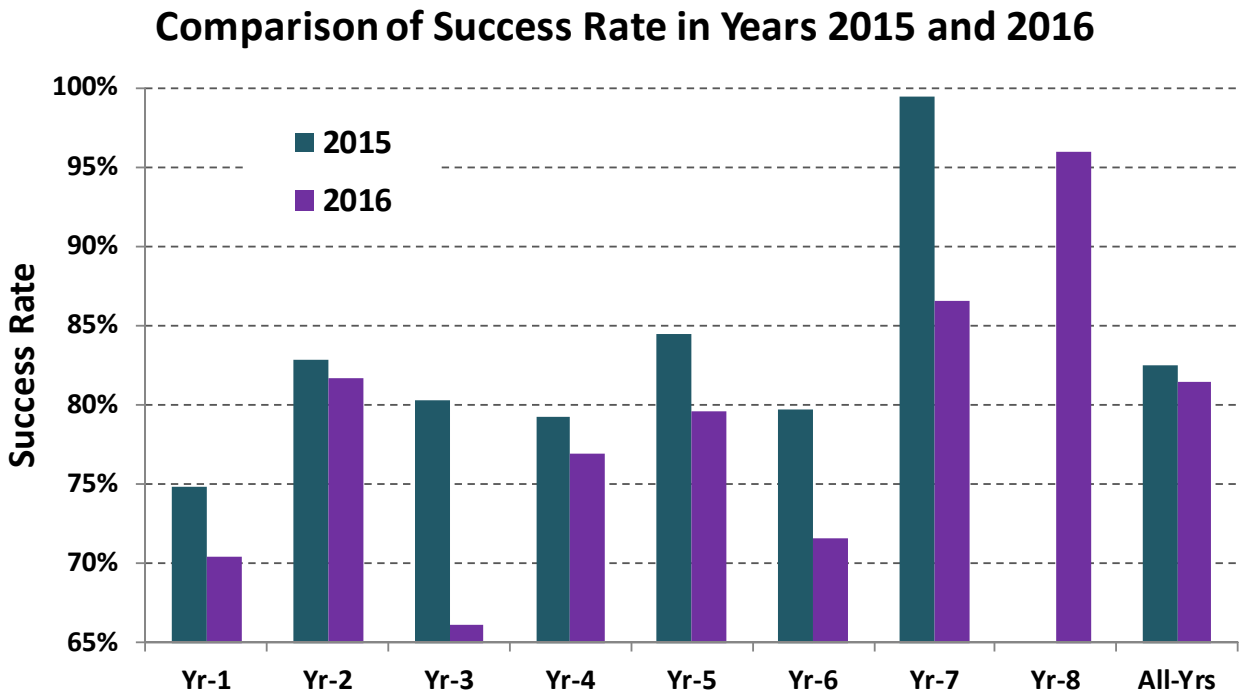
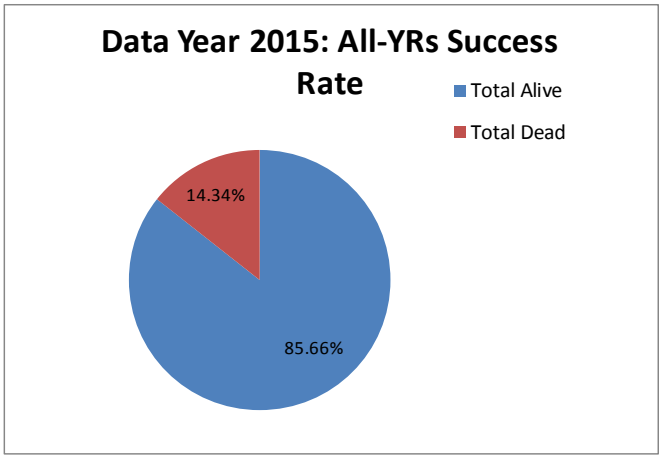
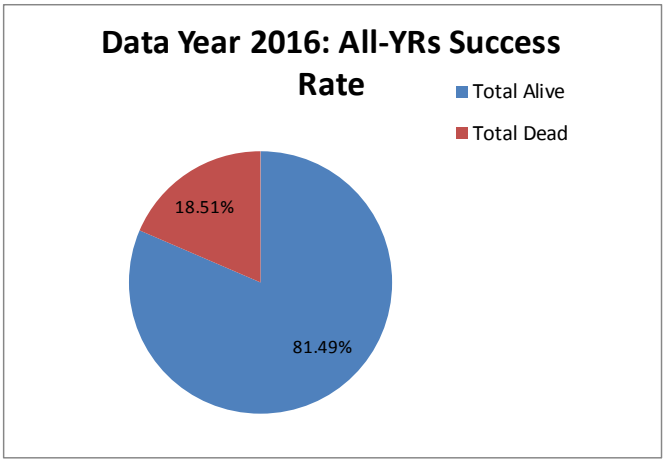


Figure 3: Success rate comparison from 2015 to 2016 for each and all tree years (Yr); not including Year 9 trees.

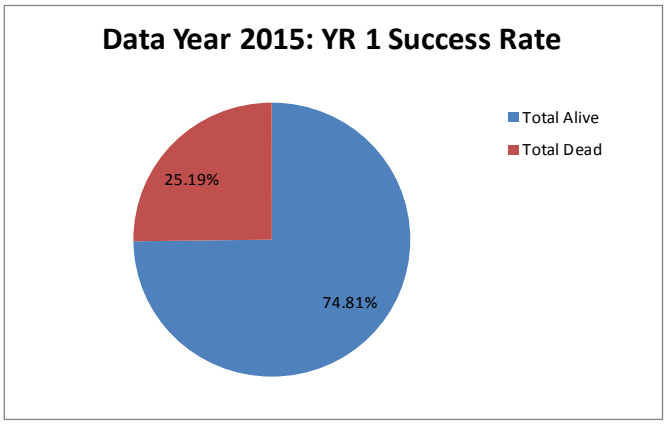


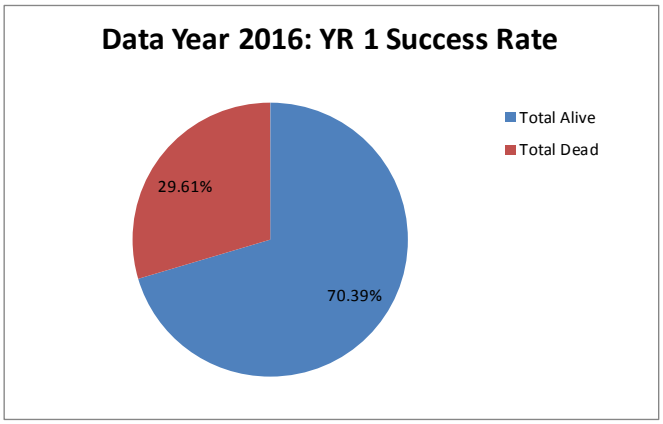


All Years - Total Observed in 2015				Percent of Total
Total Coast Live Oak (alive)	2396	Total Alive	2759	85.66%
Total Valley Oak (alive)	363	Total Dead	462	14.34%
Ratio Coast/Valley	6.6	Total	3221	100.00%

All Years - Total Observed in 2016				Percent of Total
Total Coast Live Oak (alive)	2894	Total Alive	3289	81.49%
Total Valley Oak (alive)	394	Total Dead	747	18.51%
Ratio Coast/Valley	7.3	Total	4036	100.00%

Figure 4: 2015 and 2016 status of oak trees from all years (Years 1 through 8) planted; not including Year 9 trees.

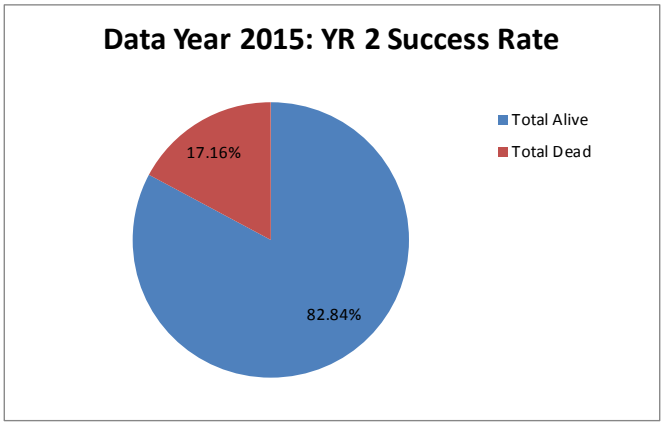


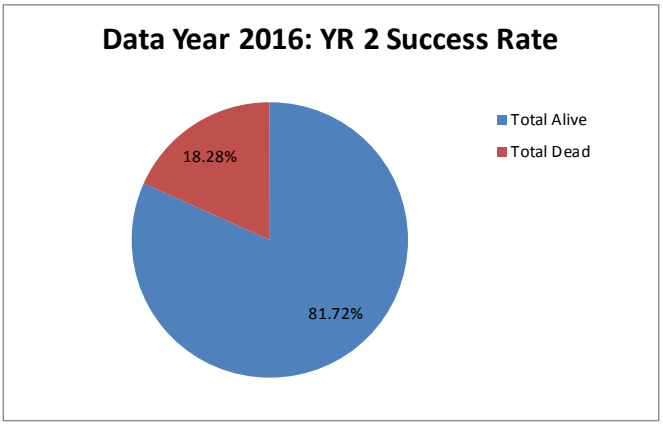


Year 1 - Total Observed in 2015				Percent of Total
Total Coast Live Oak (alive)	264	Total Alive	288	74.81%
Total Valley Oak (alive)	24	Total Dead	97	25.19%
Ratio Coast/Valley	11.0	Total	385	100.00%

Year 1 - Total Observed in 2016				Percent of Total
Total Coast Live Oak (alive)	250	Total Alive	271	70.39%
Total Valley Oak (alive)	21	Total Dead	114	29.61%
Ratio Coast/Valley	11.9	Total	385	100.00%

Figure 5: Status comparison of Year (YR) 1 trees from 2015 to 2016.

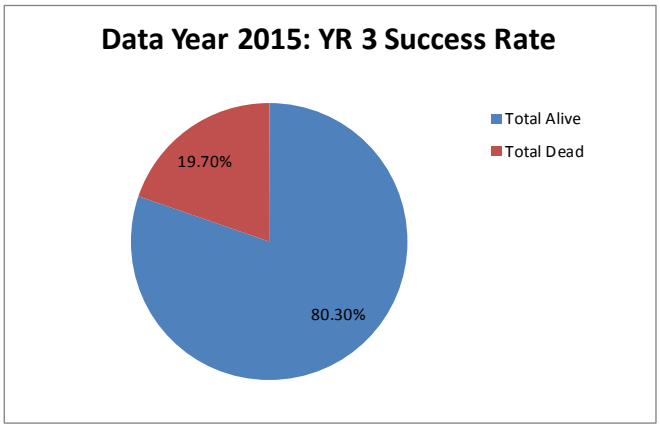


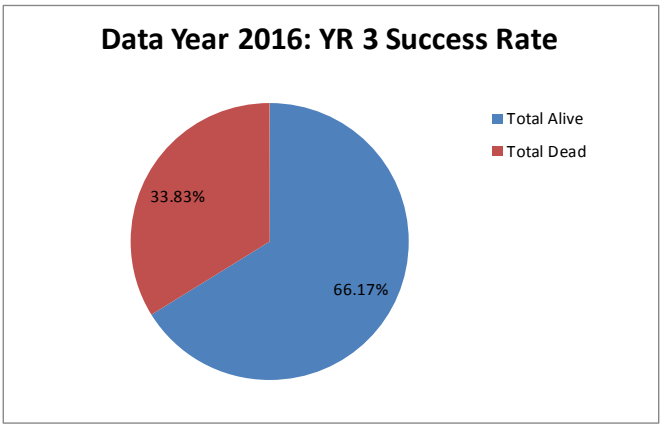


Year 2 - Total Observed in 2015				Percent of Total
Total Coast Live Oak (alive)	285	Total Alive	309	82.84%
Total Valley Oak (alive)	24	Total Dead	64	17.16%
Ratio Coast/Valley	11.9	Total	373	100.00%

Year 2 - Total Observed in 2016				Percent of Total
Total Coast Live Oak (alive)	278	Total Alive	304	81.72%
Total Valley Oak (alive)	26	Total Dead	68	18.28%
Ratio Coast/Valley	10.7	Total	372	100.00%

Figure 6: Status comparison of Year 2 trees from 2015 to 2016.

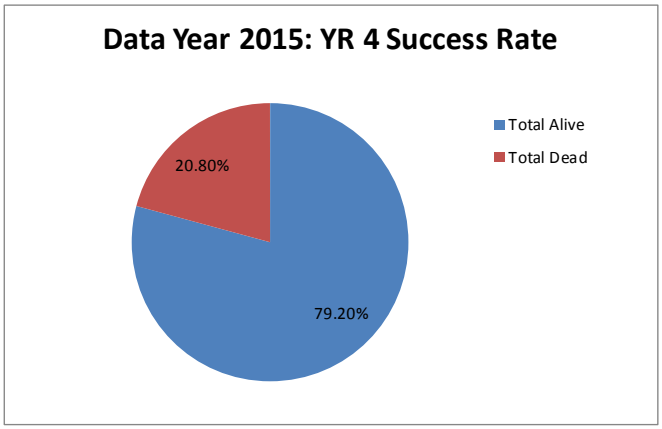


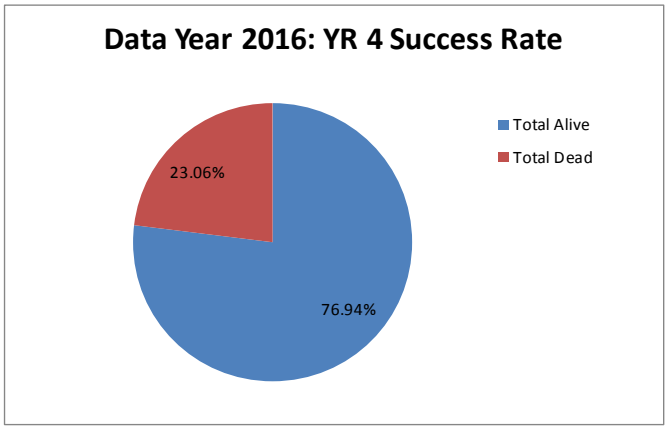


Year 3 - Total Observed in 2015				Percent of Total
Total Coast Live Oak (alive)	295	Total Alive	322	80.30%
Total Valley Oak (alive)	27	Total Dead	79	19.70%
Ratio Coast/Valley	10.9	Total	401	100.00%

Year 3 - Total Observed in 2016				Percent of Total
Total Coast Live Oak (alive)	239	Total Alive	264	66.17%
Total Valley Oak (alive)	24	Total Dead	135	33.83%
Ratio Coast/Valley	10.0	Total	399	100.00%

Figure 7: Status comparison of Year 3 trees from 2015 to 2016.

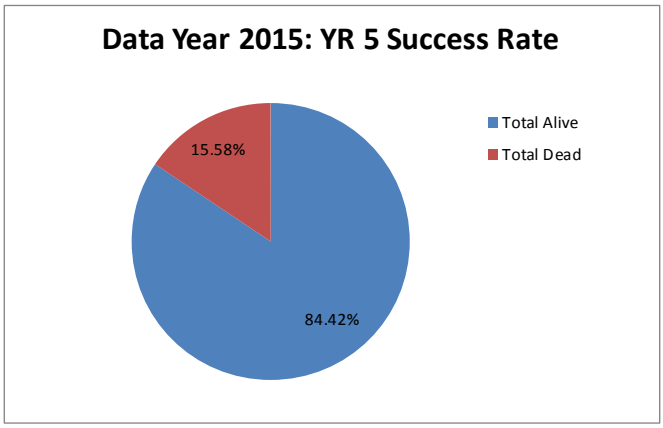


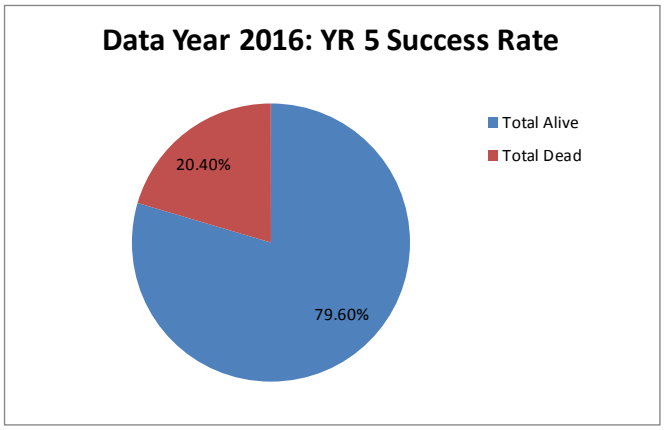


Year 4 - Total Observed in 2015				Percent of Total
Total Coast Live Oak (alive)	270	Total Alive	297	79.20%
Total Valley Oak (alive)	27	Total Dead	78	20.80%
Ratio Coast/Valley	10.0	Total	375	100.00%

Year 4 - Total Observed in 2016				Percent of Total
Total Coast Live Oak (alive)	261	Total Alive	287	76.94%
Total Valley Oak (alive)	26	Total Dead	86	23.06%
Ratio Coast/Valley	10.0	Total	373	100.00%

Figure 8: Status comparison of Year 4 trees from 2015 to 2016.

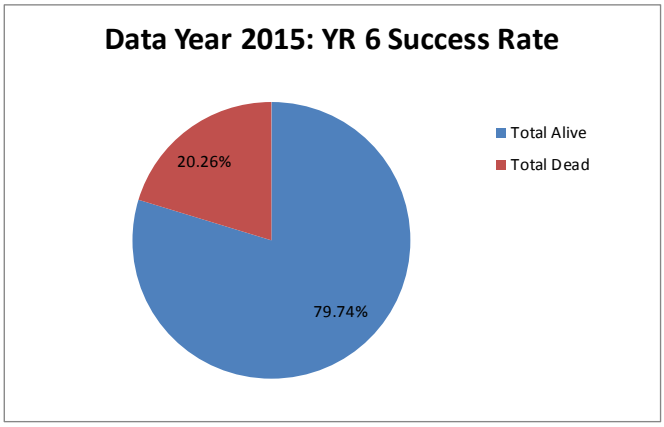


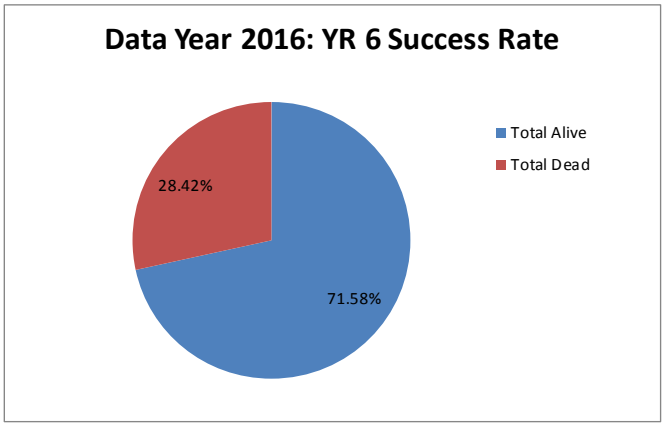


Year 5 - Total Observed in 2015				Percent of Total
Total Coast Live Oak (alive)	285	Total Alive	336	84.42%
Total Valley Oak (alive)	51	Total Dead	62	15.58%
Ratio Coast/Valley	5.6	Total	398	100.00%

Year 5 - Total Observed in 2016				Percent of Total
Total Coast Live Oak (alive)	266	Total Alive	316	79.60%
Total Valley Oak (alive)	50	Total Dead	81	20.40%
Ratio Coast/Valley	5.3	Total	397	100.00%

Figure 9: Status comparison of Year 5 trees from 2015 to 2016.

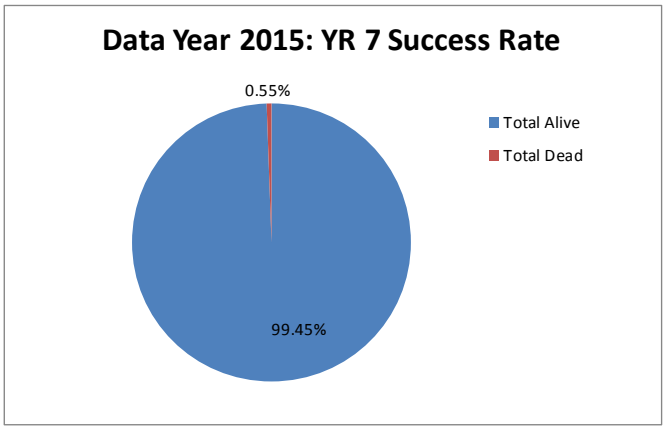


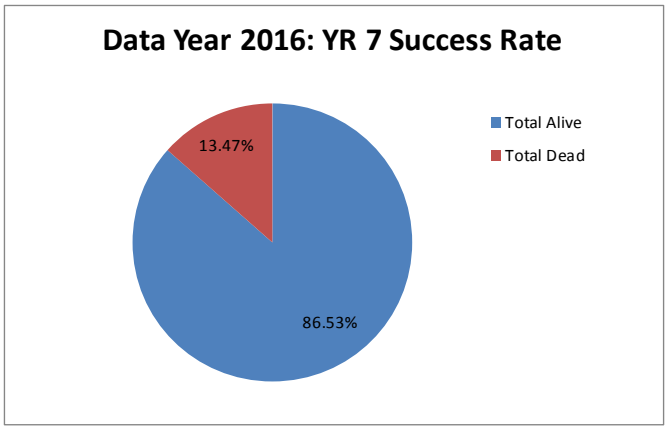


Year 6 - Total Observed in 2015				Percent of Total
Total Coast Live Oak (alive)	265	Total Alive	303	79.74%
Total Valley Oak (alive)	38	Total Dead	77	20.26%
Ratio Coast/Valley	7.0	Total	380	100.00%

Year 6 - Total Observed in 2016				Percent of Total
Total Coast Live Oak (alive)	237	Total Alive	272	71.58%
Total Valley Oak (alive)	35	Total Dead	108	28.42%
Ratio Coast/Valley	6.8	Total	380	100.00%

Figure 10: Status comparison of Year 6 trees from 2015 to 2016.

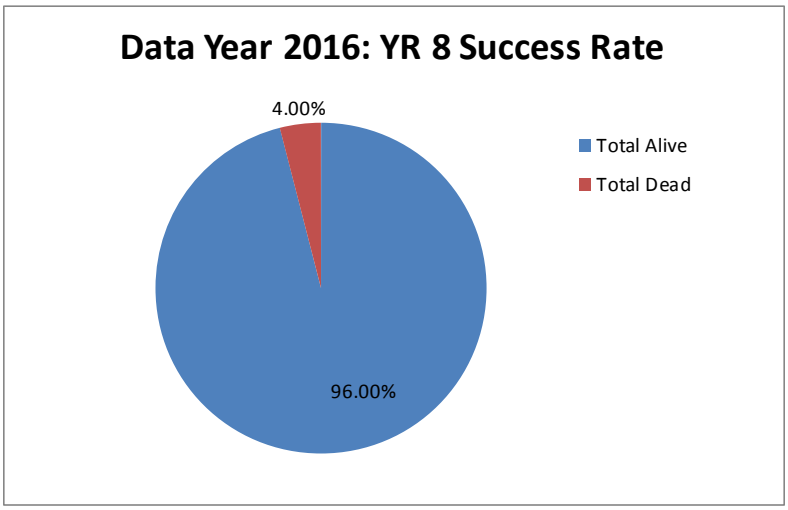




Year 7 - Total Observed in 2015				Percent of Total
Total Coast Live Oak (alive)	732	Total Alive	904	99.45%
Total Valley Oak (alive)	172	Total Dead	5	0.55%
Ratio Coast/Valley	4.3	Total	909	100.00%

Year 7 - Total Observed in 2016				Percent of Total
Total Coast Live Oak (alive)	636	Total Alive	784	86.53%
Total Valley Oak (alive)	148	Total Dead	122	13.47%
Ratio Coast/Valley	4.3	Total	906	100.00%

Figure 11: Status comparison of Year 7 trees from 2015 to 2016.



Year 8 - Total Observed in 2016				Percent of Total
Total Coast Live Oak (alive)	727	Total Alive	791	96.00%
Total Valley Oak (alive)	64	Total Dead	33	4.00%
Ratio Coast/Valley	11.4	Total	824	100.00%

Figure 12: Status of Year 8 trees to 2015.

Maintenance

Maintenance of all planted oak trees in FY16/17 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 FY16/17 is provided in Table 2. Information presented in Tables 1 and 2 does include Year 9 trees.

Table 1: Cachuma Oak Tree Restoration Program completed maintenance in FY16/17.

	July 2016	Aug 2016	Sept 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017*	Feb 2017*	March 2017*	April 2017**	May 2017**	June 2017
Year 9 Oaks								New Trees	New Trees	New Trees	Irrigated	Irrigated
(2016-2017)								Gopher Baskets	Gopher Baskets	Gopher Baskets	Weeded	Weeded
								Fert/Comp	Fert/Comp	Fert/Comp		
								Deer Cages	Deer Cages	Deer Cages		
								Mulch/Irrigated	Mulch/Irrigated	Mulch/Irrigated		
Year 8 Oaks	Irrigated	Irrigated	Irrigated	Irrigated	Irrigated	Mulched		Weeded		Weeded	Irrigated	Irrigated
(2015-2016)	Weeded	Weeded	Weeded	Weeded	Weeded						Weeded	Weeded
Year 7 Oaks	Irrigated	Irrigated	Irrigated	Irrigated	Irrigated					Weeded		Irrigated
(2014-2015)	Weeded	Weeded	Weeded	Weeded	Weeded					Mulched		Weeded
	Mulched											
Year 6 Oaks												Irrigated
(2010-2011)												Weeded
Year 5 Oaks		Irrigated				Cage maint.						Irrigated
(2009-2010)		Weeded										Weeded
Year 4 Oaks						Cage maint.						
(2008-2009)												
Year 3 Oaks					Irrigated	Cage maint.						
(2007-2008)												
Year 2 Oaks												
(2006-2007)												
Year 1 Oaks	Irrigated											
(2005-2006)												

* Annual Oak Tree Inventory

** April-May work included Year 9 oak tree inventory

Table 2: Cachuma Oak Tree Restoration Program water usage from Lake Cachuma for irrigation during FY16/17.

	Gallons	Acre-feet
July	16,200	0.05
August	50,875	0.156
September	37,150	0.103
October	21,400	0.066
November	22,300	0.068
April	4,275	0.013
May	68,075	0.209
June	83,950	0.258
Total	**304,225**	**0.92**

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 and fuel expenses over the period. 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 9 planting effort.

Table 3: Total program costs by Fiscal Year including planting 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	300	$101,227
			Total:	**4289**	**$1,378,277**

Table 4: Labor costs for the Lake Cachuma Oak Tree Program during FY16/17.

	Total
COMB Staff (hours):	
Seasonal Biologist Aide A	142
Seasonal Biologist Aide B	390.01
Seasonal Biologist Aide C	61.75
Seasonal Biologist Aide D	765.63
Seasonal Biologist Aide E	463.75
Water Service Worker III	10
Water Service Worker I	64
Water Service Worker I	64
Water Service Worker III	66
Biologist Assistant	1073.88
Project Biologist A	44.13
Project Biologist B	82.5
Senior Resource Scientist	102
Total Staff Hours:	3329.65
Cost - Labor plus burden	$82,126.90
Consultant Service Hours (Ken Knight):	13
Consultant Cost	$1,300.00
Total Personnel /Consultant Cost	**$83,426.90**

Table 5: Total expenses (labor, materials and supplies) for the Lake Cachuma Oak Tree Program during FY16/17.

	Total
Materials and Supplies:	
Oak trees	$5,412.42
Tree stakes	$2,042.15
Tree tags	$134.73
Mulch	$390.60
Compost	$344.80
Fertilizer	$281.24
Gopher baskets	$5,547.35
Protective deer caging/netting	$1,231.07
Hand tools	$243.19
Rebar	
Hoses	$315.70
Cable ties	
PPE	$52.78
Lake Cachuma boat rental	
Backhoe mobilization	$770.00
California Conservation Corps	
Vehicle Fuel Cost	$924.08
Equipment Fuel Cost	$110.27
Arborist Services	
Total Materials and Supplies	**$17,800.37**
TOTAL EXPENSES (labor, materials + supplies)	**$101,227.27**

The total cost of the Lake Cachuma Oak Tree Restoration Program in FY16/17 was $101,227 of which $31,380 of that amount was the cost of planting the Year 9 oak trees. There were 301 oak trees planted in FY16/17. 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 (4290 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.
- Scaling back on 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.
- Planting less trees than the previous year that allowed the Fisheries Division crew to conduct all the planting and not utilize the assistance of the California Conservation Core.

- 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.
- Reduced equipment (generator/pumps) gas consumption from more efficient irrigation hosing and better delivery technique for extracting water from Lake Cachuma.

Summary and Program Improvements

There are 3,590 (3,289 from Years 1-8 and 301 from Year 9) alive oak trees attributed to the mitigation effort of the Program. The survival rate to date is 81.5% (Years 1-8 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 **1,131** trees.

Challenges for the Program, specifically tree survival, are five years of an extraordinary drought, inadequate initial planting during the first 6 years (compromised gopher wire baskets, trees planted too low, deer cages removed too soon, etc.), and a limited staff to take care of an extensive number of trees. Some planting areas have better soil and topography than others, for example the Year 4 planting area has shallow soils with southern exposed whereas the Year 7 planting area is just the opposite.

Lessons learned by the COMB staff from 5 years of conducting this Program have been put into practice, specifically:

- Mulch all trees once a year.
- Maintain deer cages for all trees below deer browsing level.
- Clear the dirt away from the tree base.
- Expose gopher wire baskets at the surface to prohibit gopher travel over the top of the cage.
- 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 (Figure 13).
- Plant well established trees from the nursery as they seem to have a better success rate.
- Structurally pruned planted trees grow larger and taller faster than unpruned trees thus becoming more likely to survive and be self-sustaining.
- Continue to use Grow-Tubes as they appear to be quite successful (Figure 14).

Figure 13: New Year 9 tree planting at the Santa Barbara County Park showing (a) backhoe digging larger holes, and (b) tree planted above grade.

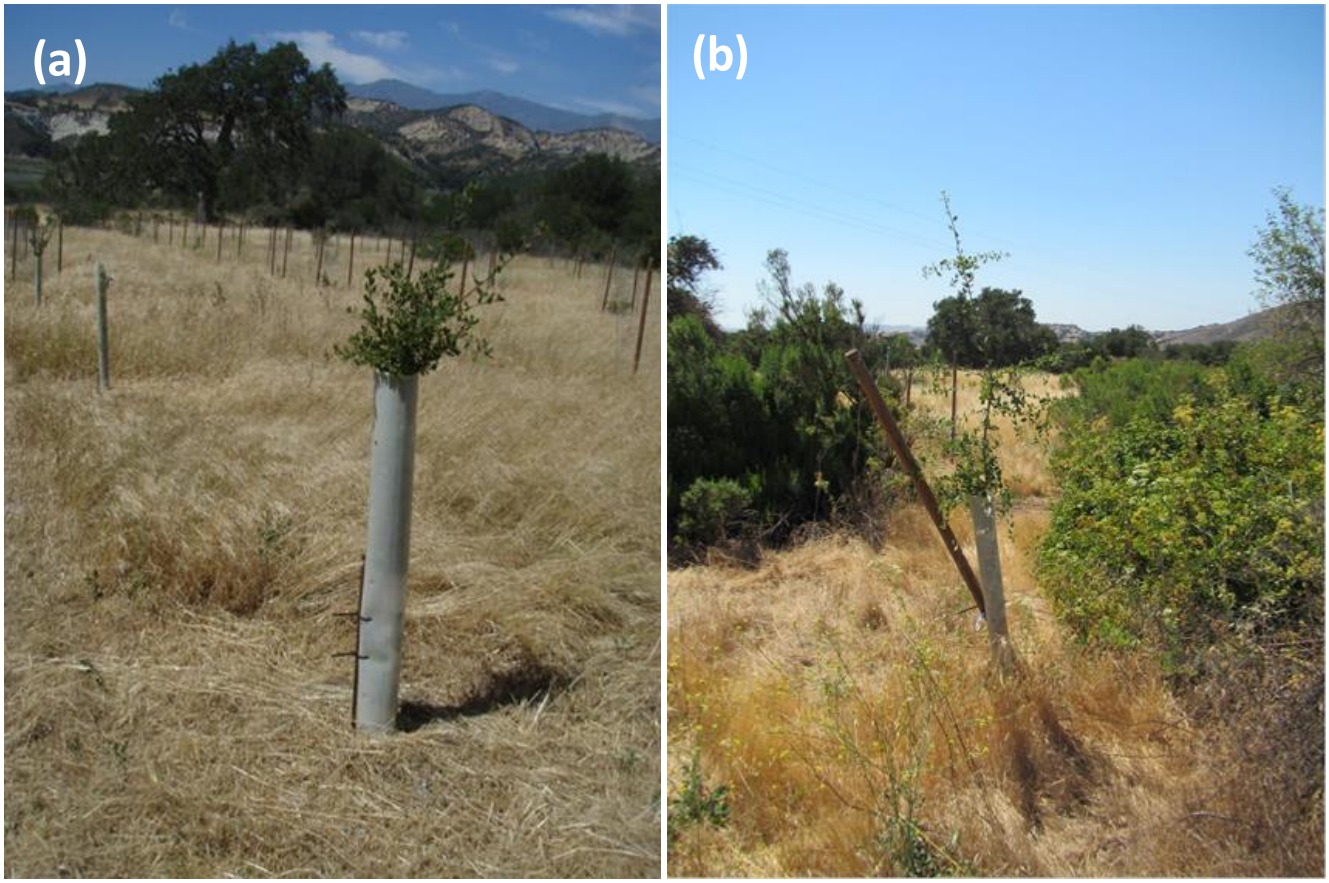


Figure 14: Examples of trees planted within 4 foot tall grow tubes at (a) Storke Flat and (b) Wastewater planting areas.

References:

COMB, 2016. 2014 Annual Report of the Lake Cachuma Oak Tree Restoration Program. Cachuma Operation and Maintenance Board (COMB).

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