Appendix E

Poinsettia Fire Post-Fire Habitat Recovery

Final Report

2015-2019

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POINSETTIA FIRE POST-FIRE MONITORING RESULTS 2015-2019

Prepared for
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February 2020

ESA

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POINSETTIA FIRE POST-FIRE MONITORING RESULTS 2015-2019

Background

The May 2014 Poinsettia Fire burned approximately 295 acres within the City of Carlsbad's HMP Preserve, the majority of which was chaparral habitat (**Figure 1**). The City of Carlsbad (City) led an effort to develop and implement post-fire monitoring studies to document habitat recovery. In conjunction with Preserve Managers, the City developed the *Carlsbad HMP Post-Fire Monitoring Protocol* (Protocol; City of Carlsbad, 2014). Information derived from monitoring efforts following this protocol was aimed to assist City staff to determine if specific management actions are needed to help the habitat recover. Studies were focused on the following habitats: chamise chaparral (CC), southern maritime chaparral (SMC), coastal sage scrub (CSS), oak woodland (OW) and vernal pool (VP).

Although vegetation communities in Carlsbad can burn naturally, most fires are anthropogenic, and occur at a much higher frequency that those that occur naturally. Frequent fires can lead to an alteration of species composition, often with nonnative plant species opportunistically invading a recently burned area. The alternation of native to nonnative plants can lead to a decrease in the native assemblage of animals as well. Natural recovery, especially with the added uncertainty of the effects of climate change (i.e., longer periods of drought, increased temperatures, decreased coastal fog cover, etc.), can thus be compromised and overall habitat deterioration can be the result. This post-fire study, performed over a 5-year period throughout the natural burned habitats, will allow the City and its land managers to assess habitat recovery and determine if the habitat is on a self-sustaining trajectory of recovery, or if values are being compromised and recovery is not occurring.

Methods

The objective of these monitoring activities is to ascertain the trajectory of recovery of each vegetation community, and compare it to known post-fire plant response expectations. The results of these studies are thus to provide site specific management guidance to the City and its land managers. Each method described below is a standard vegetation community assessment protocol which provides the data needed monitor and follow post-fire recovery.

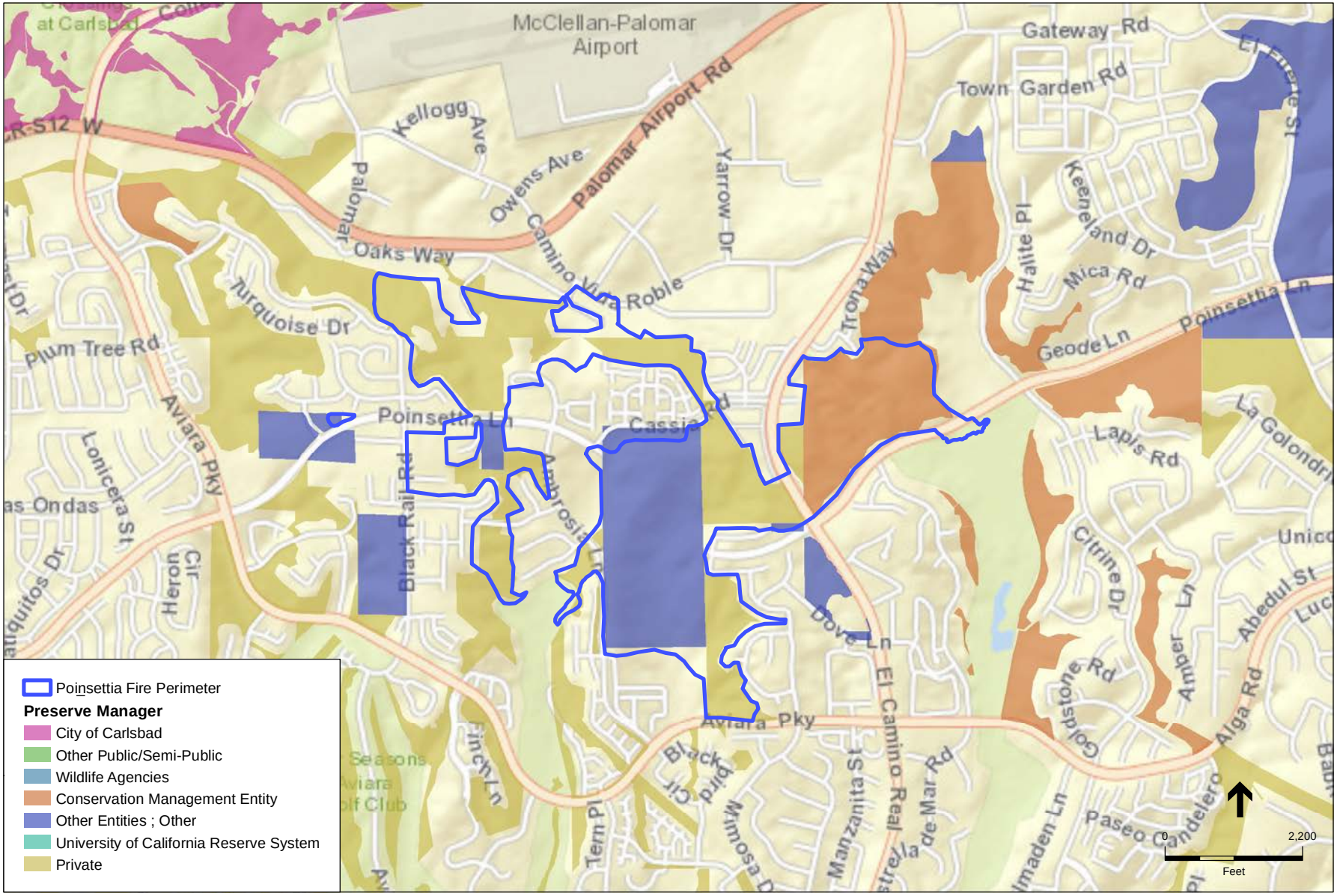

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Figure 1 Poinsettia Fire Burn Area

Chamise chaparral, southern maritime chaparral and coastal sage scrub. The Protocol is a simple methodology consisting of a series of plots, each having a 30-meter transect, a 2-meter by 30-meter belt transect, summary evaluations and photographs. Data collected in belt transects are primarily used to complement the point-intercept transect data, as the latter may under-represent the presence of rarer or smaller species. In addition, the data collected on shrubs species, such as seedling or re-sprouts, provide an indication of burn severity. Nine separate locations were monitored using this methodology: Rancho La Costa Greens, Aviara Premier, Manzanita Partners, Poinsettia Heights, Poinsettia Place, Palomar Business Center, Viadana and Morning Ridge.

Within these locations, 22 study plots were established in 2015, of which 15 were within in SMC, 4 were within CC and 3 were within CSS. Monitoring activities occurred between March and May, 2015 to 2019. All plots were monitored in each year, except in 2017, when all but one CSS plot was monitored.

In 2019, three unburned SMC reference plots were added at La Costa Greens and City Ventures, and one unburned CSS reference plot was added at Emerald Point to provide data comparison to unburned areas. Data from the city-wide CSS monitoring program is also used in this report to provide comparison to unburned CSS in the City. Reference plots were chosen based on close proximity to the burned areas, but were just outside of the burn limits.

Oak woodland. Oak tree (*Quercus agrifolia* and *Q. engelmannii*) assessments included choosing a sampling of oaks trees to monitor at two locations with oaks woodlands in the burn area, Manzanita Partners and La Costa Greens. ESA monitored 20 coast live oak (*Quercus agrifolia*) trees on the Manzanita Partners Preserve over the five-year period; CNLM monitored 54 trees (47 coast live oak and 7 Engelmann oak (*Quercus Engelmannii*) at La Costa Greens over the same period. In year one, the location of these trees were recorded using a Global Position System (GPS) to allow for year-over-year comparisons. Quantitative data such as tree height estimates and diameter-at-breast-height (DBH) measurements were taken in year 1 to establish baseline information. Qualitative data (such as dead/living and sprouting type (base or crown)), as well as general comments and notes about tree condition were taken in years 1 through 5. It was determined that quantitative data was not necessary after year one because height and trunk growth were shown to be nominal. Photographs proved to be the best method to monitor and compare year-to-year recovery. Photographs were taken each year at both locations, except 2016 at La Costa Greens.

Vernal Pool. Vernal pool assessments included quadrats along a center line transect in which percent cover of each species is estimated. A species list was also developed. Photographs and general observations are also recorded. Three vernal pools at Manzanita Partners Preserve were monitored between 2016 and 2018 by Dudek.

Results

Chamise Chaparral and Southern Maritime Chaparral

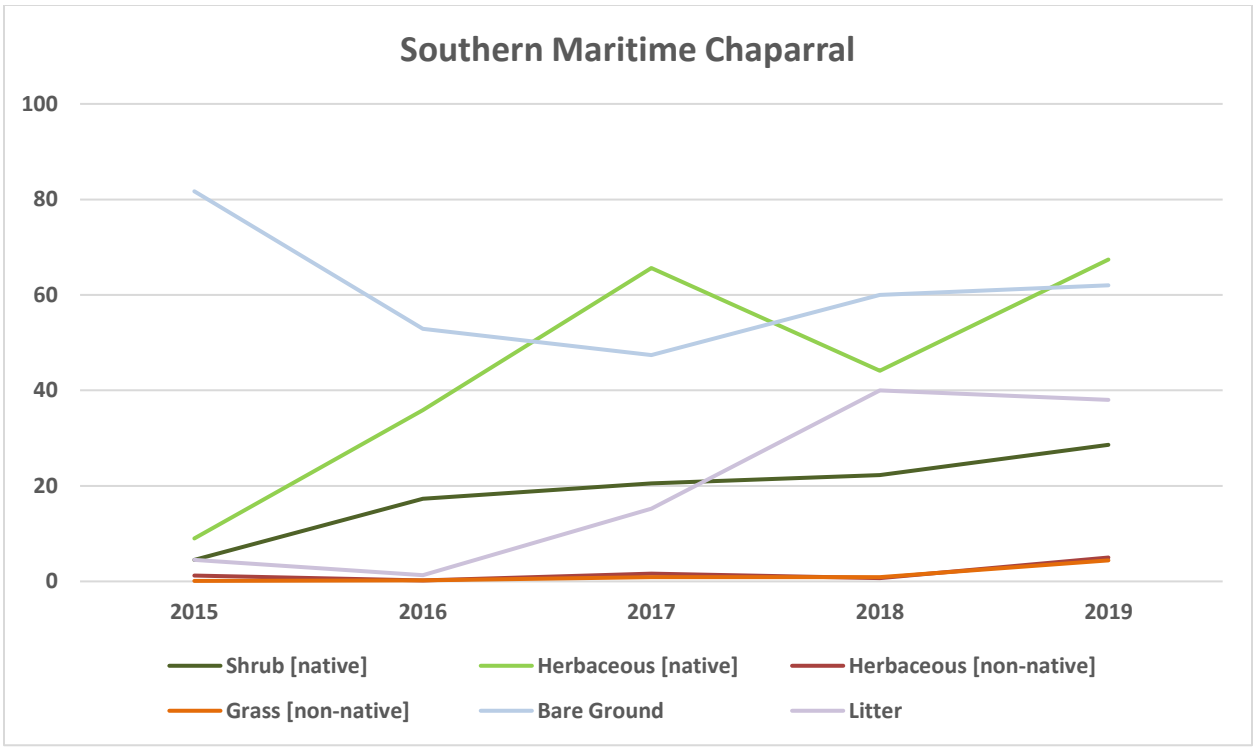
Overall chaparral (SMC and CC) recovery is currently following a course towards healthy recovery with native shrub and herbaceous cover increasing each year (**Figures 2** and **3** and **Appendix A**). Native shrub cover in CC increased from approximately 14 percent to approximately 40 percent over five years. Over the same time period, SMC shrub cover increased from approximately 4.5 percent to approximately 30 percent. Native herbaceous cover in CC increased from approximately 14 percent to approximately 120 percent during the five-year time period. Native herbaceous cover in SMC increased from approximately 9.0 in 2015 to approximately 70 percent in 2019. The increase in herbaceous cover is mostly attributed to deerweed (*Acmispon glaber*), which has been one of the dominant species over the last few years. This species is a "fire-follower," a common inhabitant after a fire, adding nitrogen to the soil as expected after fire, so this is a positive response and observation. Nonnative herbaceous and nonnative grass cover is roughly less than 4 percent for both habitat types (see Figures 2 and 3), which shows that the habitat appears to be recovering well and not significantly threatened by invasive plants, which commonly increase after a fire.

The unburned SMC reference plots showed bare ground and litter cover at roughly 15 percent and 85 percent, respectively. Native shrub and herbaceous cover for the SMC reference plots were 97 percent and 10 percent, respectively. Nonnative plant cover for the SMC was 0.0 percent or trace (see Figure 2).

Coastal Sage Scrub

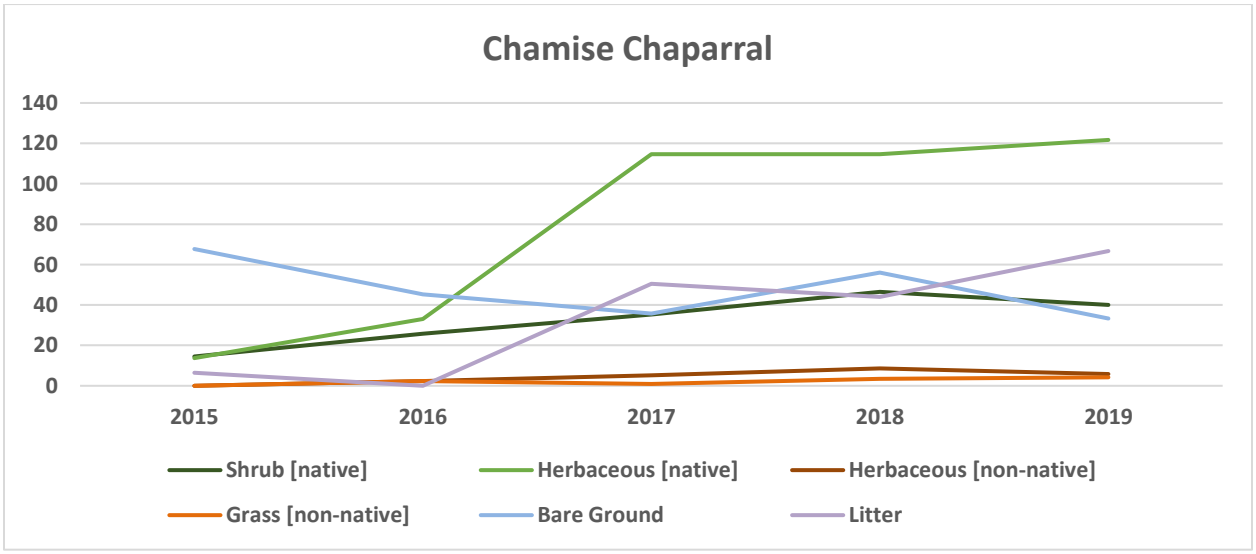
Native shrub cover has increased from approximately 7.5 percent to approximately 40 percent between 2015 and 2019, respectively (**Figure 4** and Appendix A). Native herbaceous cover has increased from approximately 15 percent to approximately 120 percent between 2015 and 2019, respectively, and is also mostly represented by deerweed. Nonnative herbaceous cover has trended around approximately 20 percent and nonnative grass was relatively low until 2019, at approximately 25 percent cover.

The unburned CSS reference plots showed percent cover for native shrubs, herbaceous, and grass for 2019 at 64.1 percent, 32.5 percent and 8.1 percent, respectively. Reference transect percent cover for nonnative herbaceous and grass for 2019 was 4.4 percent and 10.5 percent, respectively. Reference transect cover for bare ground and litter for 2019 was 25 percent and 75 percent, respectively.



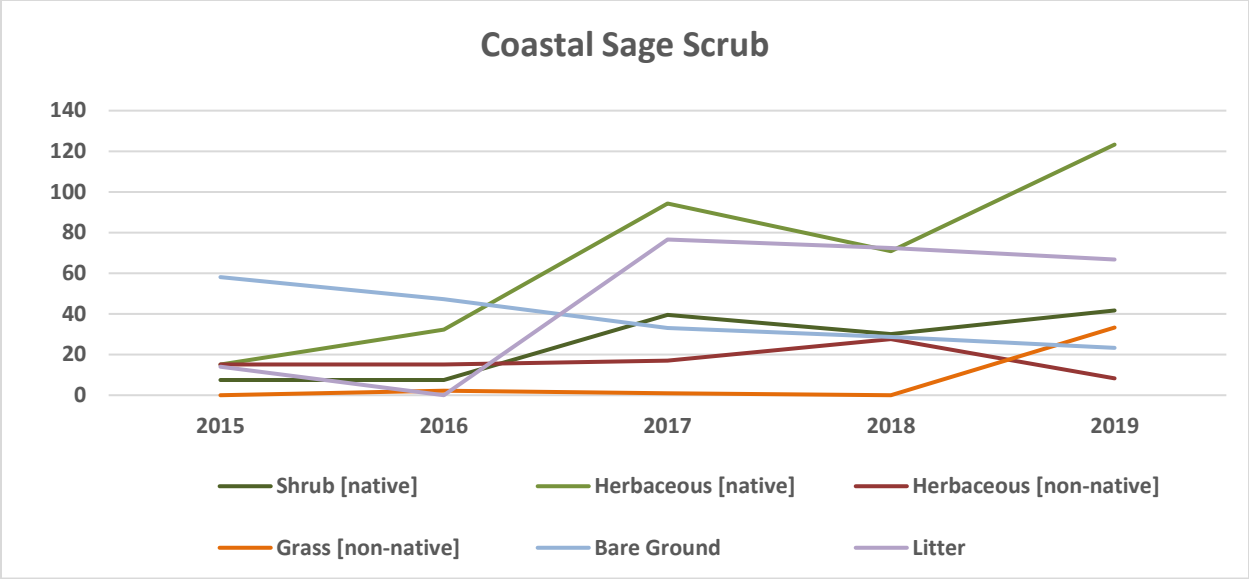
NOTE: Deerweed is included in herbaceous cover; Reference data: Shrub, herbaceous, nonnative plants, bare ground and litter cover=97%, 10%, 0.0%, 15% and 85%, respectively)

Figure 2
Trend in Functional Group Percent Cover within Southern Maritime Chaparral



NOTE: Deerweed is included in herbaceous cover

Figure 3
Trend in Functional Group Percent Cover in Chamise Chaparral



NOTE: Deerweed (Acmispon glaber) is included in herbaceous cover; Reference data: Shrub, herbaceous, grass, nonnative herbaceous and grass, bare ground and litter cover=64.1%, 32.5%, 8.1%, 4.4%, 10.5%, 25% and 75%, respectively)

Figure 4
Trend in Functional Group Percent Cover within Coastal Sage Scrub

Belt Transects

Across all monitoring years (2015–2019), the total number of native shrub species recorded within CC and SMC was 12 and 24, respectively. The total number of native herbaceous species recorded within CC and SMC was 30 and 50, respectively. The total number of nonnative herbaceous species within CC and SMC was 10 and 24, respectively. The total number of native shrubs and herbaceous species recorded within the CSS was 15 and 25, respectively. The total number of nonnative herbaceous species within the CSS was 11. This data shows that most of the plant species expected to occur in each habitat type have been observed.

Oak Woodland

ESA monitored 24 coast live oak trees on the Manzanita Partners Preserve and adjacent open space. However, four of these trees were cut down and removed in 2017 for the Poinsettia Lane extension project. The remaining 20 trees will be discussed in the results. Of the 20 trees, 18 of the burned trees showed some post-fire re-growth at the trunk and/or along the base in 2015, the first year of monitoring. In 2016 the number of dead trees increased from 2 to 3. In 2017, the number of dead trees grew to eight, no additional die-off occurred in 2018. In 2019, the final year of monitoring, 7 trees were recorded as dead—a tree that was previously recorded as dead had live sprouts along the base—and 13 trees were recorded as alive. Of the 13 trees that were alive, 7 trees were assessed as demonstrating exceptional growth (as compared to Year 1), 4 trees were assessed as demonstrating moderate growth, and 2 trees were assessed as demonstrating minimal growth (**Appendix B**). Seedlings were not surveyed as the vegetation within the drainage was very dense. Seedlings were expected to be low in number due to competition from

the dense vegetation currently surrounding the oaks; however, seedlings were incidentally noted surrounding the base of two oak trees.

CNLM monitored coast live oak and Engelmann oak trees at Rancho La Costa Greens. Forty-seven coast live oak and seven Engelmann oak trees were monitored. Forty-four coast live oak trees were alive and three were dead by 2019. Five Engelmann oak trees were alive and two were dead by 2019. In 2019, five new Engelmann oak trees, presumably seedlings, were found, as well as 10 Engelmann oak/coast live oak hybrids. Most tree canopies are expanding in these species, however inconsistently between individuals (i.e. some doing better than others).

Vernal Pool

A total of 13 plants species were observed in 2018 compared to 24 observed in 2017 and 12 observed in 2016 (Table 4). Vernal pool vegetative cover is relatively even amongst functional groups. Dominant species observed in 2018, the last year monitored, included broad leaf filaree (*Erodium botrys*) (19 percent cover), annual hairgrass (*Deschampsia danthonioide*) (40 percent) and woolly marbles (*Psilocarphus brevissimus*) (8.0 percent) and slender woolly heads (*P. tennellus*) (5.4 percent) being the most dominant species observed.

Discussion and Recommendation

The CC, SMC and CSS vegetation communities have been recovering mostly as expected after the Poinsettia Fire of 2014 (see Appendix A for transect photo monitoring) and appear to be headed for the self-sustaining trajectory that is desired. Higher than average rainfall in 2017 and 2019 has been very beneficial, with most shrub species showing good vigor, and the herbaceous cover increasing and showing post-fire type species diversity. The post-fire native and nonnative assemblage is mostly in-line with what is expected, as is the cover and density of plant species.

Although nonnative plant species were observed, the cover and density is also in-line with what is expected and tolerated, and is mostly not considered a threat that would alter the recovery and long-term species composition within each community. In some cases, it is clear that management activities, such as veldt grass (*Ehrharta calycina*) removal at La Costa Greens, have been beneficial, as this species was rarely observed in the sampling plots. However, it should be noted that drainage areas tend to have a higher cover of nonnative plant species, and in the future, post-fire monitoring efforts should include these areas for study.

It will still take many more years for the SMC and CC communities to attain the over 90 percent cover of native shrubs that typifies these communities, and as shown by the data collected in the reference transects in the SMC community (see Figure 2). The low cover of nonnative species should allow for this projection to be met. Native shrub cover in the CSS community will likely take fewer years to recover than the chaparral communities, and is already trending in that direction as compared to the reference transects located across the City. Native herbaceous cover in the CSS community is already robust, and will likely decrease as native shrub species become more dominant. Nonnative herbaceous and grass species may be an issue in CSS, and have

higher percent cover than the reference transects; however, these functional groups may also decrease as native shrub cover increases and out-competes these species.

CSS and CC recovery at each preserve location is threatened by various species depending on location. At the Poinsettia Heights and Palomar Business Center preserves, there has been an increase in acacia trees (*Acacia* spp.), and these individuals should be promptly removed, as they increase in cover rapidly and expand easily via seed production. If not addressed, the primary threats to the upland areas at La Costa Greens are veldt grass, black mustard (*Brassica nigra*), nonnative ice plant (*Mesembryanthemum crystallinum*). These species are actively monitored, treated and/or removed by CNLM on an annual basis, so they are currently under control.

In the riparian areas of La Costa Greens, and potentially other preserve areas, species such as tree tobacco (*Nicotiana glauca*), pampas (*Cortaderia selloana*), poison hemlock (*Conium maculatum*) and eucalyptus (*Eucalyptus* spp.) could become dense if not properly maintained. These species are also actively monitored, treated and/or removed by CNLM on an annual basis, so they are currently under control.

Generally, the Manzanita Partners oak woodland is on the trajectory towards recovery, with native plants such as bush mallow (*Malacothamnus fasciculatus*), laurel sumac (*Malosma laurina*), poison oak (*Toxicodendron diversilobum*), and black sage (*Salvia mellifera*) repopulating the area. However, with roughly only 65 percent of the original oak trees surviving, the 2014 fire has demonstrated a long-term detrimental impact on this oak woodland habitat. In addition, invasive non-native plants such as pampas grass and black mustard are also present in this habitat. If left untreated, invasive plants can out-compete native plants, especially within vulnerable habitats, such as those that have been burned. This area should be managed for invasive plants to ensure the habitat continues to recover. Many of the oak trees that were evaluated during this study are located on a newly established preserve that is undergoing upland habitat enhancement in association with the Poinsettia Lane Extension and Poinsettia 61 Residential Development projects. Once these activities are completed (in approximately five years), the area will be placed under long-term management by San Diego Habitat Conservancy. It is expected that long-term monitoring will continue into the future, as this activity is included in the long-term management plan.

Coast live oak trees at CNLM's Rancho La Costa-Greens property have not fully recovered, but are healthy with continued regrowth from the initial fire; low mortality was observed since the 2015 survey. Engelmann oak response varied, with larger trees dying, but smaller trees resprouting and several new individuals, possibly from seedlings, observed in 2019.

Last year vernal pools were dominated by nonnative plant species. This year, average percent cover across functional groups was lower and roughly equivalent, and key indicator species were noted.

At this time, further detailed monitoring of CSS, SMC and CC is not needed; however, qualitative assessments should be considered, such as occasional visual shrub and herbaceous assessments. This would allow for any potential issues, such as an increase in a particular nonnative plant species, to be noted and quickly managed.

General oak tree assessments should continue, as this species has not necessarily recovered as expected. Many oak trees have died in the Manzanita Partners area and any severe drought period would likely affect these species negatively. Conversely, the status of Engelmann oaks, with many new individuals found in 2019, is encouraging, and this species should also be assessed again soon. If it is determined that the surviving oaks are not re-seeding, the land managers should consider planting acorns or small oaks in the burn area oak woodlands.

References

City of Carlsbad, 2014. Carlsbad HMP Post-Fire Monitoring Protocol. City of Carlsbad, Center for Natural Lands Management and ESA & Associates. September 11, 2014.

Tierra Data, Inc., 2005. *Blossom Valley Habitat Conservation Area Post-fire Monitoring and Management Strategy*.

Appendix A
Post-Fire Transect Photo Monitoring

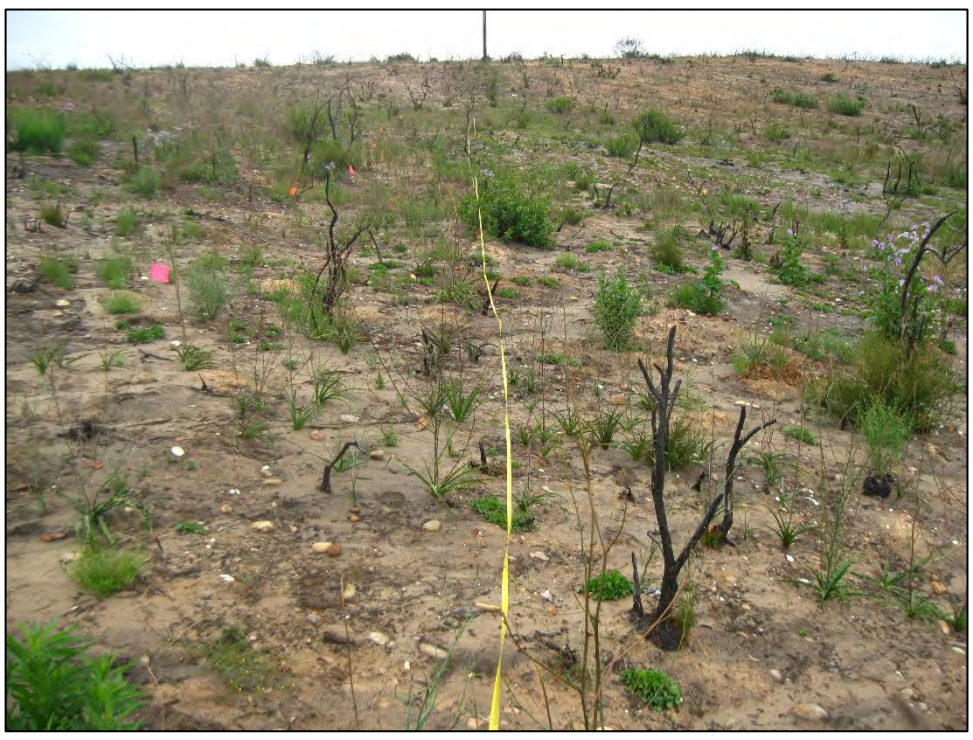
Reference Transects 2019

La Costa Greens Southern Maritime Chaparral Reference Transects (above)

Emerald Point Coastal Sage Scrub Reference Transect

City Ventures Southern Maritime Chaparral Reference Transect

AVI-SMC-1, Aviara HOA, southern maritime chaparral



2015

2016

2017

2018

2019

AVI-SMC-2, Aviara HOA, southern maritime chaparral

2015

2016

2017

2018

2019

AVI-SMC-3, Aviara HOA, southern maritime chaparral

2015

2016

2017

2018

2019

MNZ-CSS-1, Manzanita Partners, coastal sage scrub

2015

2016

2017

2018

2019

MNZ-CSS-2, Manzanita Partners, coastal sage scrub

2015

2016

2017

2018

2019

MNZ-SMC-1, Manzanita Partners, southern maritime chaparral

2015

2016

2017

2018

2019

MNZ-SMC-2, Manzanita Partners, southern maritime chaparral

2015

2016

2017

2018

2019

Morning Ridge (origin), southern mixed chaparral

2015

2016

2017

2018

2019

Morning Ridge (end), southern mixed chaparral

2015

2016

2017

2018

2019

PH-SMC-1, Poinsettia Heights, southern maritime chaparral

2015

2016

2017

2018

2019

PH-SMC-2, Poinsettia Heights, southern maritime chaparral

2015

2016

2017

2018

2019

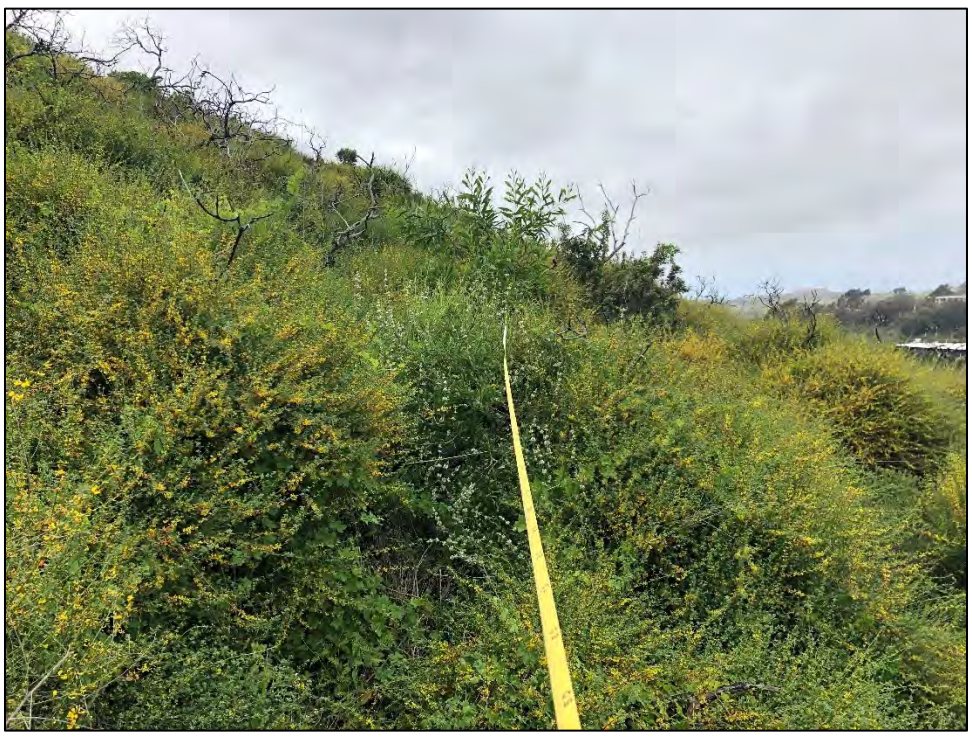
POBC-CHP-1, Palomar Oaks Business Center, chaparral

2015

2016

2017

2018



2019

POBC-CHP-2, Palomar Oaks Business Center, chaparral

2015

2016

2017

2018

2019

POBC-CHP-3, Palomar Oaks Business Center, chaparral

2015

2016

2017

2018

2019

POBC-CHP-4, Palomar Oaks Business Center, chaparral

2015

2016

2017

2018

2019

PP-SMC-A, Poinsettia Place, southern maritime chaparral

2015

2016

2017

2018

2019 (below)

PP-SMC-B, Poinsettia Place, southern maritime chaparral

2015

2016

2017

2018

2019 (below)

RLC-SMC-1, Rancho La Costa Greens, southern maritime chaparral

2015

2016

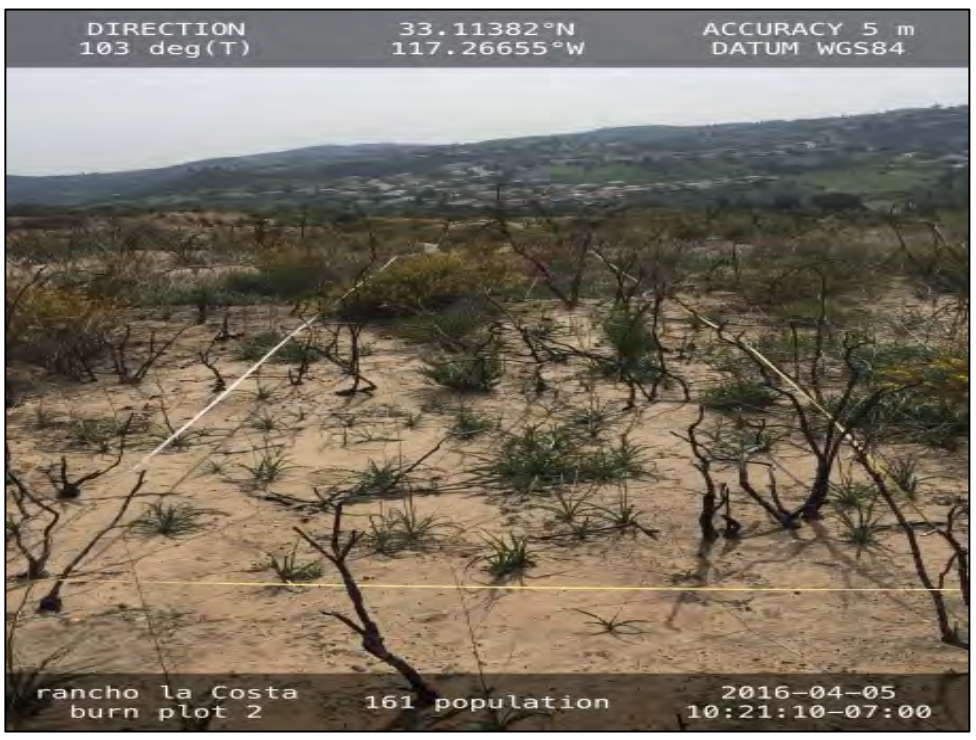
2017

2018

2019

RLC-SMC-2, Rancho La Costa Greens, southern maritime chaparral

2015



2016

2017

2018

2019

RLC-SMC-3, Rancho La Costa Greens, southern maritime chaparral

2015

2016

2017

2018

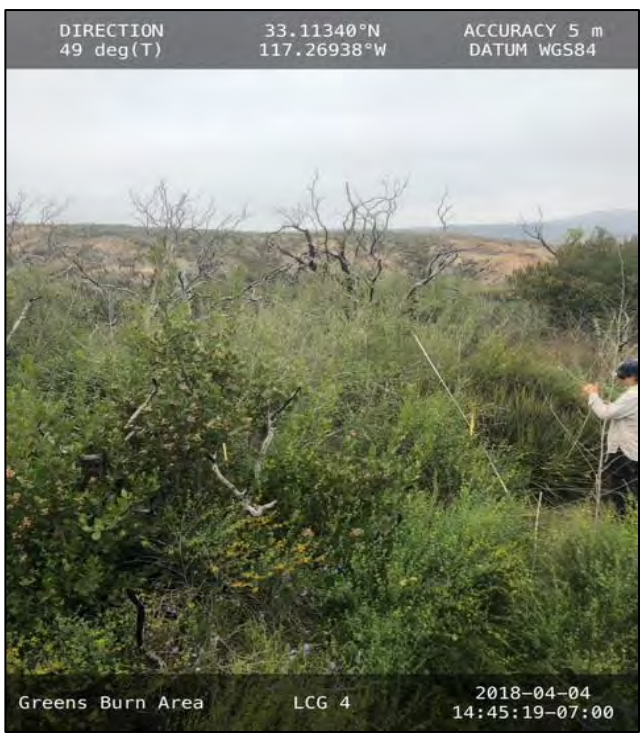
2019

RLC-SMC-4, Rancho La Costa Greens, southern maritime chaparral

2015

2016

2017



2018

2019

RLC-SMC-5, Rancho La Costa Greens, southern maritime chaparral

2015

2016

2017

2018

2019

VIA-SMC-1, Viadana, southern maritime chaparral

2015

2016

2017

2018

2019

Attachment B

Post-Fire Oak

Photo Monitoring

Oak 1

2015

2016

2017

2018

2019

Oak 2

2015

2016

2017

2018

2019

Oak 3

2015

2016

2017

No photo; tree fell

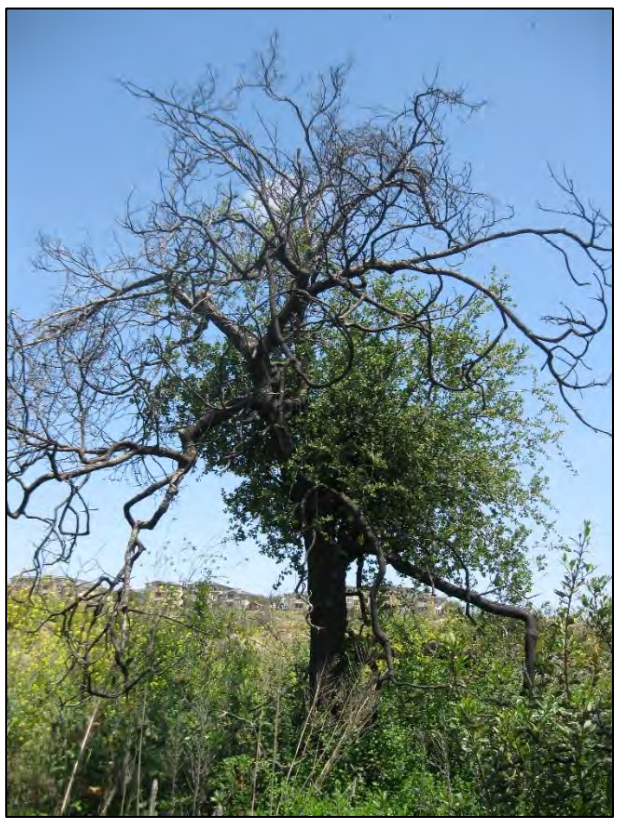
2018

No photo; tree fell

2019

Oak 4

2015



2016

2017

2018

2019

Oak 5

2015

2016

2017

2018

2019

Oak 6

2015

2016

2017

No photo; tree fell

2018

2019

Oak 7

2015

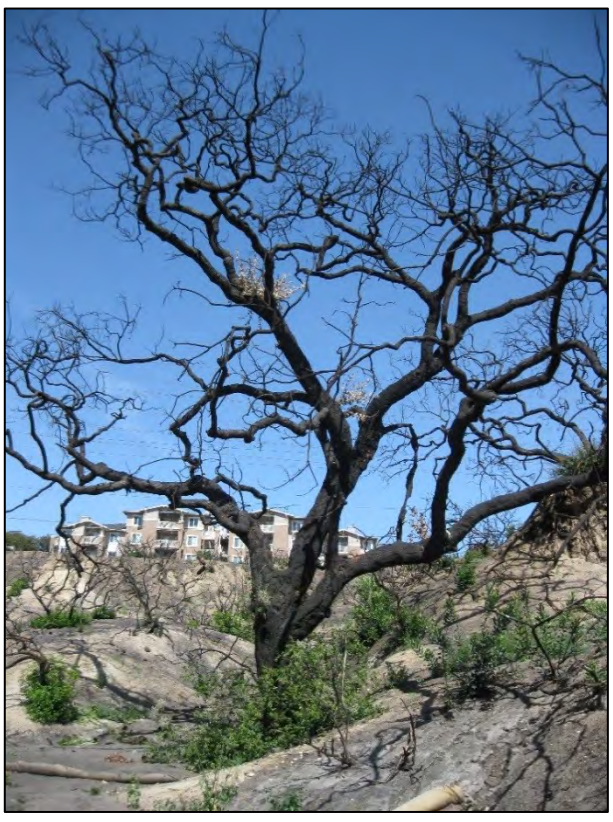
2016

2017

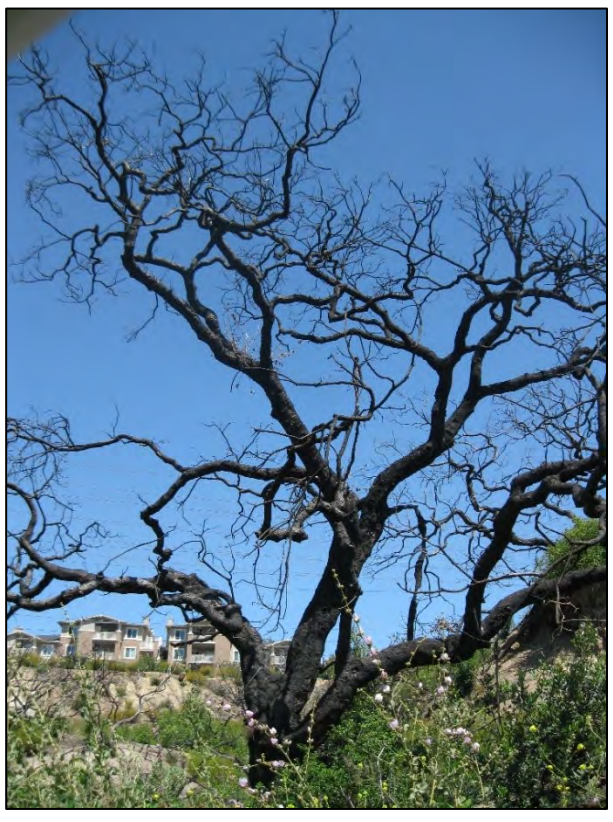
2018

2019

Oak 8

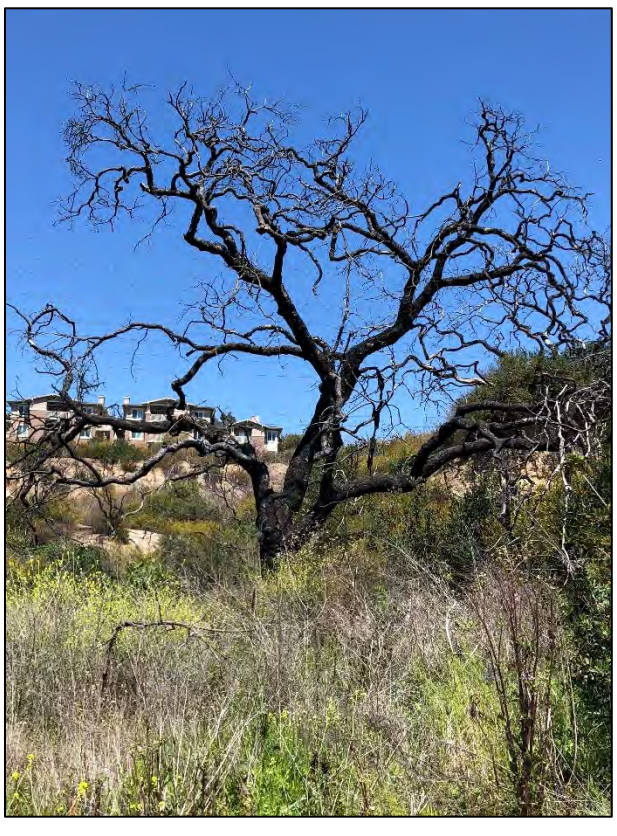


2015



2016

2017



2018

2019

Oak 9

2015

2016

2017

2018

2019

Oak 10

2015

2016

2017

2018

2019

Oak 11

2015

2016

2017

2018

2019

Oak 12

2015

2016

2017

2018

2019

Oak 13

2015

2016

2017

2018

2019

Oak 14

No photo

2015

No photo

2016

2017

2018

No photo; tree dead

2019

Oak 15

2015

2016

2017

No photo; tree dead

2018, 2019

Oak 16

2015

2016

2017

No photo; tree fell over

2018, 2019

Oak 17

2015

2016

2017

2018

No photo; tree fell over

2019

Oak 18

2015

2016

2017

2018

2019

Oak 19

2015

2016

2017

2018

2019

Oak 20

2015

2016

2017

2018

2019

Oak 21

2015

2016

2017

No photo; tree fell over.

2018, 2019

Oak 22

2015

2016

2017

2018

Tree cut down in anticipation of building project/restoration

Oak 23

2015

2016

2017

2018

Tree cut down in anticipation of building project/restoration

Oak 24

2015

2016

2017

2018

Tree cut down in anticipation of building project/restoration