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2020 ANNUAL REPORT
BIOLOGICAL MONITORING

for Range 48; BLM Area B Units B-2A, B-3 West, B-3 East, A Southern Containment Line, B, and C; Units 5A, 9, 23, and 28; Units 2 East and 3 East.

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ACRONYMS AND ABBREVIATIONS

AIC	Akaike Information Criterion
ANOVA	Analysis of Variance
Burleson	Burleson Consulting, Inc.
EcoSystems West	EcoSystems West Consulting Group, Inc.
ER	Evidence Ratio
ft	feet
GPS	Global Positioning System
HMP	Habitat Management Plan
HMP annuals	Annual Species of Concern
HMP shrub	Shrub Species of Concern
LER	Log_{10} Evidence Ratio
MEC	Munitions and Explosives of Concern
m	meter(s)
MRA	Munitions Response Area
NOAA NCDC	National Oceanic and Atmospheric Administration National Climatic Data Center
NPS	Naval Postgraduate School
NMDS	Non-metric Multidimensional Scaling
PERMANOVA	Permutation-Based Multivariate Analysis of Variance
PBO	Programmatic Biological Opinion
Protocol	Protocol for Conducting Vegetation Monitoring in Compliance with the Installation-Wide Multispecies Habitat Management Plan at Former Fort Ord
RAC	Rank Abundance Curve
Revised Protocol	Revisions of Protocol for Conducting Vegetation Monitoring for Compliance with the Installation-Wide Multispecies Habitat Management Plan, Former Fort Ord
Tetra Tech	Tetra Tech Inc.
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service

1 INTRODUCTION

The United States Army Corps of Engineers (USACE) contracted Burleson Consulting, Inc. (Burleson) to conduct biological monitoring at former Fort Ord, Monterey County, California (see Figures 1-1 and 1-2). Burleson subcontracted EcoSystems West Consulting Group (EcoSystems West) to support field monitoring and data review. Monitoring is centered on biological impacts associated with environmental cleanup activities for munitions and explosives of concern (MEC). Biological monitoring includes rare annual plant species density, annual grass density, invasive and rare species locations, and shrub transects.

This report presents results of biological monitoring conducted in Range 48 (Year 1 monitoring); BLM Area B Units B-2A, B-3 West, B-3 East, A Southern Containment Line, B, and C (Year 3 monitoring); Units 5A, 9, 23 North, 23, and 28 (Year 5 monitoring); and Units 2 East and 3 East (Year 8 monitoring). Monitoring was conducted during spring and summer of 2020 to satisfy requirements of the *Installation-wide Multispecies Habitat Management Plan for Former Fort Ord* (HMP) and the reinitiated *Programmatic Biological Opinion for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord* (PBO) issued by the United States Fish and Wildlife Service (USFWS) (USACE, 1997; USFWS, 2017). This annual monitoring report presents results of monitoring for annual species of special concern (HMP annuals), shrubs, exotic annual grasses, and invasive plants. Baseline monitoring is conducted prior to cleanup activities (such as vegetation clearance, MEC removal, and other related operations) to establish the presence, location, and abundance of protected species. Vegetation clearance is achieved by burning and/or masticating standing vegetation to allow access to the soil surface. Appendices included present species acronyms (Appendix A), HMP annuals grid monitoring maps (Appendix B), HMP shrub transect maps (Appendix C), annual grass density maps (Appendix D), invasive and rare species location maps (Appendix E), HMP shrub transect cover data (Appendix F), non-native species tables (Appendix G), and macroplots presence/absence maps (Appendix H).

After completion of cleanup activities, follow-up monitoring of protected species and habitat is conducted to determine whether the species and habitat recovery are meeting success criteria as established in the *Revisions of Protocol for Conducting Vegetation Monitoring for Compliance with the Installation-Wide Multispecies Habitat Management Plan, Former Fort Ord* (Revised Protocol) and the *Protocol for Conducting Vegetation Monitoring in Compliance with the Installation-Wide Multispecies Habitat Management Plan at Former Fort Ord* (Protocol) (Tetra Tech Inc. (Tetra Tech) and EcoSystems West, 2015b; Burleson, 2009a). As part of the development of the Revised Protocol, a series of three major shrub associations were identified based on the dominant species present in the Baseline surveys and their successional patterns described. These associations included: Association A – shaggy-barked manzanita (*Arctostaphylos tomentosa*) dominated with chamise (*Adenostoma fasciculatum*) sub-dominant; Association B – chamise dominated with shaggy-barked manzanita and sandmat manzanita (*Arctostaphylos pumila*) subdominant; Association C/D – sandmat manzanita dominated.

Densities of annual HMP plants have been monitored at 1, 3, 5, and 8 years after completion of vegetation clearance. Shrub communities have been monitored at 3, 5, 8, and 13 years after completion of vegetation clearance. With the issuance of the 2015 PBO, USFWS concurred with the Army's recommendation to reduce the duration of monitoring to a maximum of 5 years for HMP annuals and 8 years for shrub communities (USFWS, 2015). This change was based on an analysis of vegetation data collected from over 5,000 acres over a period of up to 10 years that indicated that recovery could be documented based on a reduced time period (Tetra Tech and EcoSystems West, 2015b).

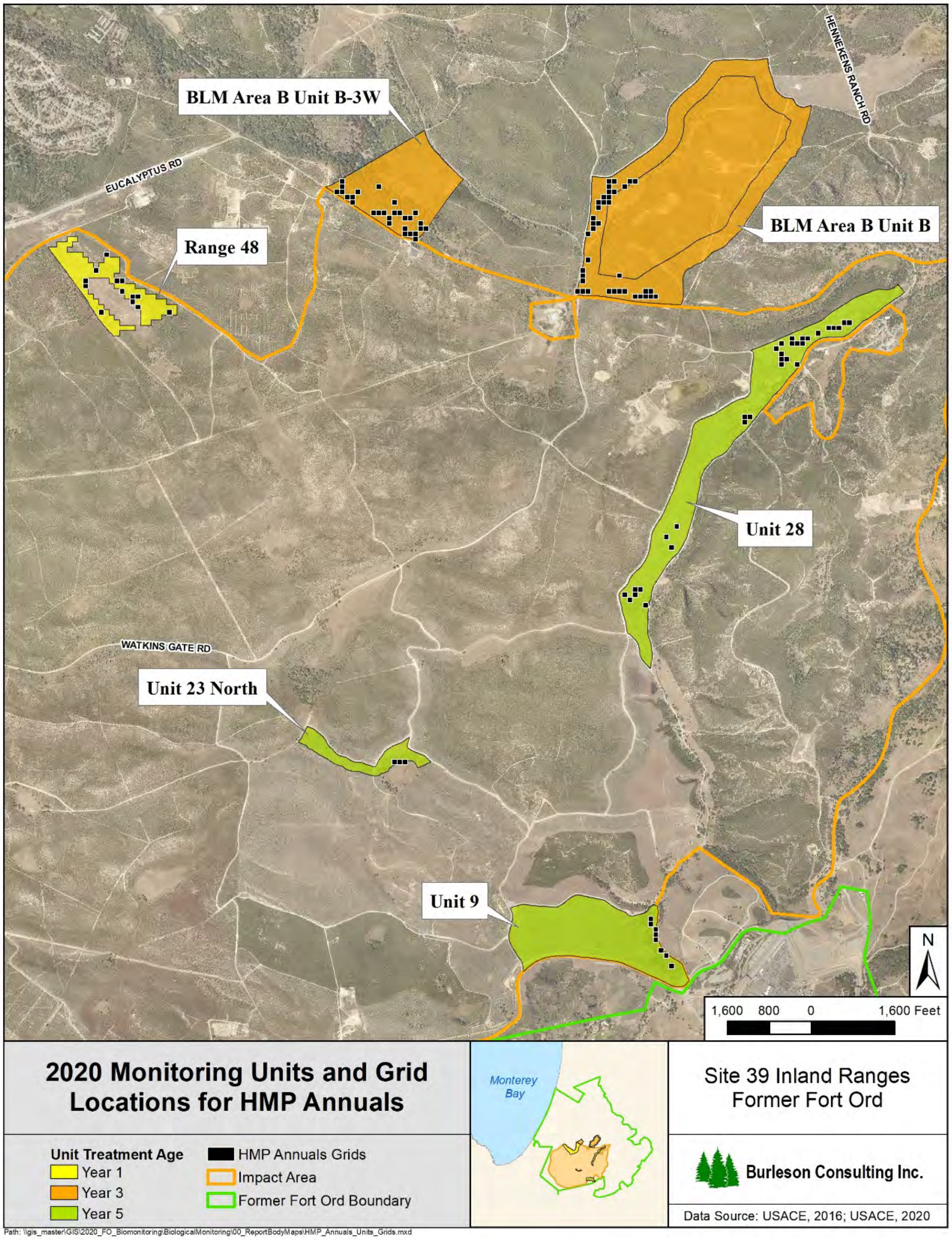

Figure 1-1. Map of Former Fort Ord, Monterey, CA, Showing Locations of Units and Grids Sampled for HMP Annual Species in 2020.

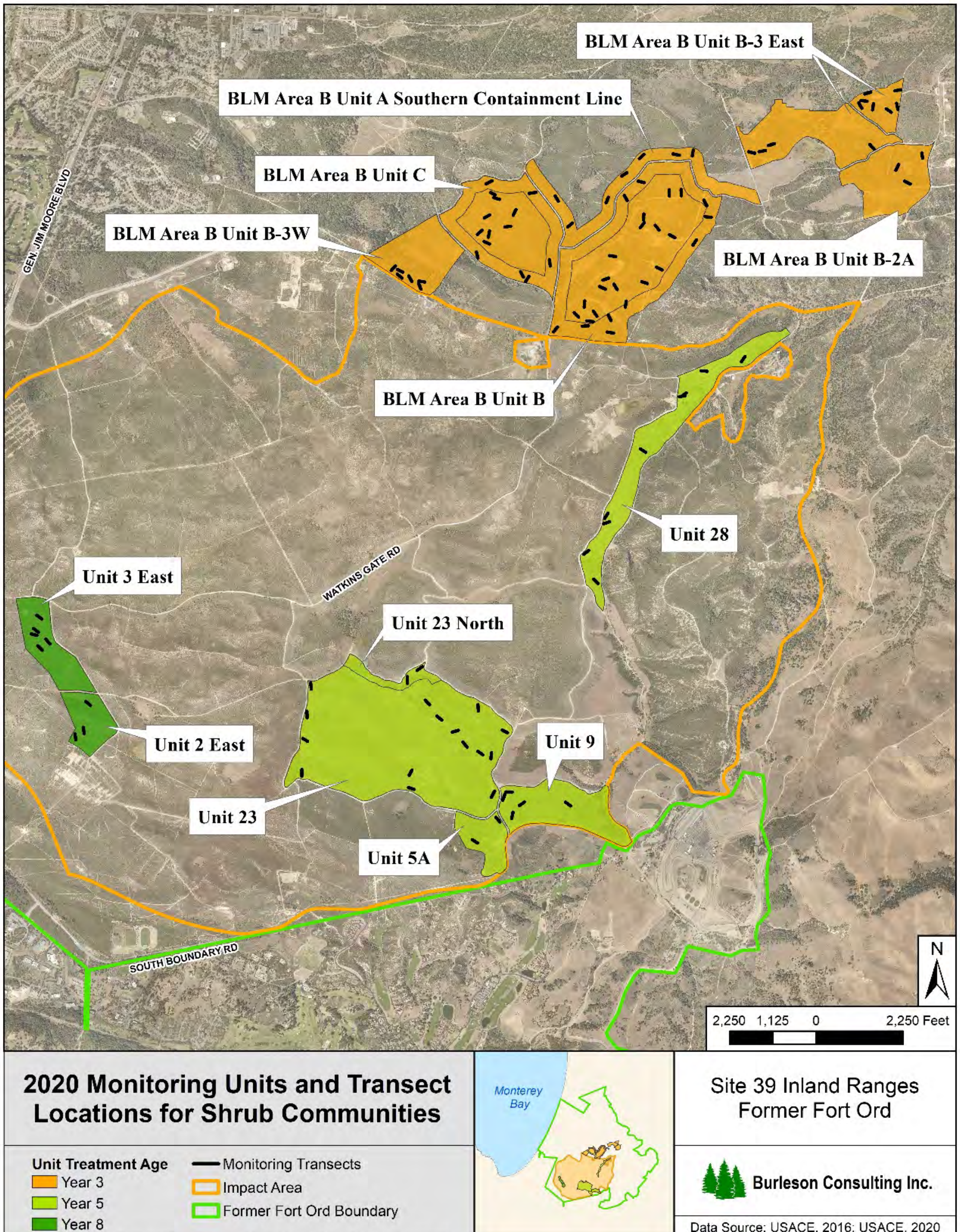

Figure 1-2. Map of Former Fort Ord, Monterey, CA, Showing Locations of Units and Transects Sampled for Shrub Community in 2020.

The terrain over most of the units consists of rolling hills with elevations ranging from 375 to 550 feet (ft). The vegetation type is primarily central maritime chaparral with patches of annual grasslands, vernal pools, meadows, and coast live oak (*Quercus agrifolia*) woodlands. Central maritime chaparral is protected under the HMP because of its restricted geographic range and association with significant numbers of rare, threatened, and endangered species. Central maritime chaparral is adapted to periodic fires that remove the dominant shrub species and create open space that can be colonized by annual plants. Van Dyke *et al.* (2001) suggested that prescribed burning, or mechanical disturbance with smoke treatment, may be necessary in central maritime chaparral management. This regime may support the establishment of a more diverse chaparral community by creating more openings for plants to colonize.

A significant mitigating factor affecting the response of vegetation at former Fort Ord has been the drought that spanned water-years 2012 to 2016. Though the drought was not without precedent, the Central Coast Region had some of the most severe conditions during the California drought (He *et al.*, 2017). This may have affected the response of burn units which were recovering during this period. One of the last three water-years was above normal (2018-2019), and the 2019-2020 water year was approximately normal. The region is no longer considered in drought (Figure 1-3) (NPS, 2020; NOAA NCDC, 2016).

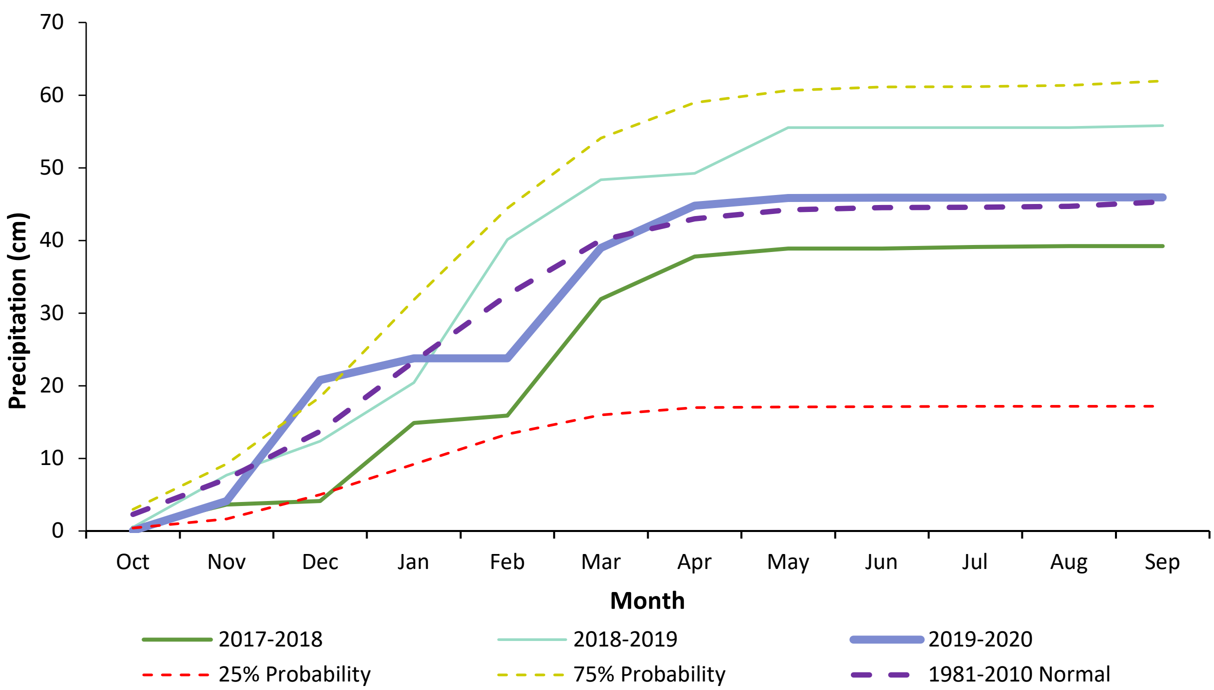

Figure 1-3. Cumulative Monthly Precipitation for the 2019-2020 Water Year Compared to the 30-Year Normal (mean 1981-2010), the previous two water-years, and the 25% and 75% Probabilities (NPS, 2020; NOAA NCDC 2016). Data were collected at the NWSFO Station located at the Monterey Regional Airport in 2017-2018 and October through March of 2018-2019. Beginning April 1, 2019, these data were collected at the replacement station titled *Monterey Peninsula Regional Airport*, which is located within 1 kilometer of the previous station.

1.1 Species Included in 2020 Habitat and Rare Species Monitoring

Plant species within central maritime chaparral habitat include a variety of shrub and herbaceous plants (see Appendix A). These include five shrub species and three annual herbaceous species that are special-status species and, as such, were the focus of the HMP (USACE, 1997). The focus shrub species (HMP shrubs) include:

- California Native Plant Society (CNPS) 1B.2 listed sandmat manzanita,

- CNPS 1B.2 listed Toro manzanita (*Arctostaphylos montereyensis*),
- CNPS 1B.2 listed Hooker's manzanita (*Arctostaphylos hookeri* ssp. *hookeri*),
- CNPS 4.2 listed Monterey ceanothus (*Ceanothus rigidus*),
- and CNPS 1B.1 listed Eastwood's goldenbush (*Ericameria fasciculata*).

The focus annual species (HMP annuals) include:

- state threatened, federally endangered, and CNPS 1B.2 listed sand gilia (*Gilia tenuiflora* ssp. *arenaria*),
- federally threatened and CNPS 1B.2 listed Monterey spineflower (*Chorizanthe pungens* var. *pungens*),
- state endangered and CNPS 1B.1 listed seaside bird's-beak (*Cordylanthus rigidus* ssp. *littoralis*).

Survey teams also report the locations of federally endangered and CNPS 1B.1 listed Yadons's piperia (*Piperia yadonii*) when encountered incidentally during monitoring efforts.

Some changes in species taxonomy were made to conform to current taxonomic treatments (Baldwin *et al.*, 2012). Specifically, the acronym for the Monterey ceanothus (*Ceanothus cuneatus* var. *rigidus*) was changed from CERI to CECUR in 2010 to reflect the sub-specific designation of this plant at that time. However, prior to the 2013 survey, the accepted species designation was changed back to *Ceanothus rigidus* (Baldwin *et al.*, 2012). Therefore, the code has been changed back to CERI to remain consistent with historical data.

1.2 Previous Surveys Conducted on the Sites

Previous surveys conducted at specific former Fort Ord Units monitored in 2020 are referenced in Table 1-1. Data from previous surveys for HMP annuals and shrub line transects were obtained from GIS shapefiles and associated metadata provided by the USACE and from results of previous surveys (HLA, 1999 and 2001; MACTEC, 2004; Tetra Tech and EcoSystems West, 2011 – 2015a; Burleson, 2016 – 2019b).

When appropriate and available, shrub transect data were transcribed from the electronic versions of previous monitoring reports. In addition to incorporating past line transect data into the database, adjustments were made to the "density" class field in the HMP vegetation monitoring data table to correspond to the density classes defined by Burleson (2009a) while maintaining the original data. If only count data were provided in previous reports or the database, then an entry was provided in the "density" class field. If the database contained only qualitative estimates of HMP densities (e.g., high, medium, low), then an appropriate density class was determined.

Four treatment classes were identified based on treatments applied:

- Masticated – Vegetation was cut in place;
- Masticate & Burn – Vegetation was cut and then burned in place, or was cut and inadvertently burned;
- Burn – Vegetation was burned in place without being cut first. This method most closely mimics a natural fire.

Table 1-1. Previous Monitoring Surveys at 2020 Study Units on Fort Ord.

Survey Year	Survey
1998	Harding Lawson Associates (1999) performed Baseline surveys in Unit B-2A (formerly called OE Site 48).
2000	Harding Lawson Associates (2001) performed Baseline surveys in Unit B (formerly called OE Site 9) and Range 48.
2003	MACTEC (2004) performed Baseline surveys in Unit 23 (formerly Range 30A).
2011	Tetra Tech and EcoSystems West (2012) performed Baseline surveys in Units 5A, 9, 23, and 28.
2012	Tetra Tech and EcoSystems West (2013) performed Baseline surveys in Units 02 East and 03 East.
2013	Tetra Tech and EcoSystems West (2014) performed Year 10 (Pre-treatment) surveys in Range 48.
2015	Burleson (2016) performed Baseline surveys in BLM Area B Unit B-3 West, B-3 East, B, C, the Containment Lines of BLM Area B Unit A, and Unit B-2A; and Year 3 annual plant density and shrub transect monitoring on Units 2 East and 3 East.
2016	Burleson (2017) performed Year 1 HMP annuals surveys in Units 9, 23 North, and 28.
2017	Burleson (2018) performed Year 5 shrub transect monitoring and annual grasses monitoring on Units 2 East and 3 East.
2018	Burleson (2019) performed Year 1 HMP annual surveys in Units B and B-3 West; Year 1 annual grasses monitoring in Units B, B-3-West, and the southern containment line of Unit A; and Year 3 shrub transect monitoring of Unis, 5A, 9, 23, and 28.

In addition, another treatment class was identified for grids and transects which could not be assigned to one of the three primary treatment classes:

- Mixed – A portion of the grid cell was masticated and a portion was burned. These grids are generally located on the border between two treatments.

Treatments were identified based on the activities reported in previous reports and using data from the "flora_fire_area" shapefile obtained from the USACE (USACE, 2020).

2 METHODS

This section describes the standard monitoring methods used during the 2020 vegetation monitoring program. Monitoring was completed based on methodology presented in the HMP, Protocol, and Revised Protocol (USACE, 1997; Burleson, 2009a; Tetra Tech and EcoSystems West, 2015b). Unit specific modifications to methods are identified in the introduction to each age class results.

2.1 Soils

The U.S. Department of Agriculture (USDA) mapped six soil types as occurring in units monitored in 2020, shown in Table 2-1 (USDA, 2020). Antioch very fine sandy loam, 2 to 9 percent slopes occur in the BLM Area B-3 East and B-2A Units and the BLM Area B Unit A Containment Line and Unit B. Arnold loamy sand, 9-15 percent slopes, occurs in Unit 28. Arnold-Santa Ynez complex is a large portion of the munitions remediation area (MRA) and occurs in Units 2 East, 3 East, 5A, 9, 23, and 23 North; BLM Area B-3 East, B-3 West, B-2A, Unit B, Unit C, and Unit A Containment Line; and Range 48. Baywood sand, 2-15 percent slopes, occurs in Unit 3 East and Range 48. Oceano loamy sand, 2 to 15 percent slopes occur in BLM Area B-3 West. Xerorthents, dissected, occurs in BLM Area B-2A and Units 9, 23, and 28.

Burleson identified at least two distinct types of soil during previous surveys in areas where the soil was mapped as Arnold-Santa Ynez complex. One type of this soil consists primarily of relatively coarse, loose sand, generally without gravel. The other soil type consists of harder-packed sand with finer material, and typically contains large numbers of small, reddish, rounded pebbles. The HMP annual species Monterey spineflower, sand gilia, and seaside bird's-beak occur almost exclusively on the former soil type. The soils mapped as Arnold-Santa Ynez complex in the MRA may be incorrectly mapped or reflect co-occurring soil types.

Table 2-1. Distribution of Soil Types in Former Fort Ord Biological Monitoring Areas of 2020 (USDA, 2020).

Soil Type	Description	Units Where Found
AeC, Antioch very fine sandy loam, 2 to 9 percent slopes	Very fine loam and sand; moderately well to somewhat poorly drained; derived on level to sloped alluvial fans and terraces	BLM Area B-3 East, BLM Area B-2A, BLM Area B Unit A Containment Line, BLM Area B Unit B
AkD, Arnold loamy sand, 9 to 15 percent slopes, MLRA 15	**Arnold**: Loamy fine sand; somewhat excessively drained; derived from residuum weathered from sandstone	28
Ar, Arnold-Santa Ynez complex	**Arnold**: Loamy fine sand; somewhat excessively drained; derived from residuum weathered from sandstone **Santa Ynez**: Fine sandy loam; moderately well drained; derived from residuum weathered from sandstone	2 East, 3 East, 5A, 9, 23, 23 North, 28, BLM Area B-3 East, BLM Area B-3 West, BLM Area B-2A, BLM Area B Unit C, BLM Area B Unit A Containment Line, BLM Area B Unit B, Range 48
BbC, Baywood sand, 2 to 15 percent slopes	Sand; somewhat excessively drained; derived from stabilized sandy aeolian sands	3 East, Range 48
OaD, Oceano loamy sand, 2 to 15 percent slopes	Loamy sand, sand; deep, excessively drained soils that formed in material weathered from sandy aeolian deposits	BLM Area B-3 West
Xd, Xerorthents, dissected	Loam, clay loam; well drained; derived from mixed unconsolidated alluvium	BLM Area B-2A, 9, 23, 28

2.2 HMP Annuals Grids Methods

2.2.1 Field Methods

Burleson conducted density monitoring for three HMP annual species (Monterey spineflower, sand gilia, and seaside bird's-beak) during the 2020 monitoring season. These surveys occurred in Range 48 and BLM Area B Units B-3W, B, 9, 23 North, and 28. Yadon's piperia was not monitored for density as individual plants are often widely scattered and difficult to locate. Instead, individuals were mapped using a Garmin 62s handheld Global Positioning System (GPS) receiver and occurrences were noted for comparison with future monitoring efforts and to inform the Army and BLM of these locations for possible avoidance during future remediation work. Piperia individuals were recorded to genus due to the difficulty of identifying to species when not flowering.

The predefined basewide 100×100-ft grids were used as sample grids for density monitoring. In the Baseline Units, a stratified random sample of 100×100-ft grids were selected for sampling, consisting of grids identified during meandering transect surveying as occupied by one or more herbaceous HMP species. The monitoring protocol indicates that 20 percent (%) of occupied grids or 38 total grids, whichever is greater, be selected for HMP annual density monitoring (Burleson, 2009a). Sampling was stratified by species to ensure adequate representation of Monterey spineflower, sand gilia, and seaside bird's-beak, and by containment area versus interior. The baseline grids were not marked in any way in the field. A resource grade Trimble® GeoXH GPS receiver with the grid boundaries loaded as a map layer was used to determine the boundaries of the sampled grids. Grid corners were temporarily marked in the field using pink flagging tape tied to the tallest point of vegetation to assist with navigation during HMP annual species monitoring.

Methods specified in the monitoring protocols were followed for all Units monitored in 2020 (Burleson, 2009a; Tetra Tech and EcoSystems West, 2015b). Follow-up monitoring for HMP annual species density is conducted at Baseline, 1, 3, and 5-year intervals following treatment and MEC clearance. For all 2020 HMP annuals density surveys, the surveyors conducted an initial reconnaissance of each 100×100-ft sample grid to determine which HMP annual species were present and how they were distributed within the grid. Entire grids were censused by counting all individuals of a given HMP annual species within the grid using a hand counter. The only exception to this is when more than 500 individuals of any species were recorded, surveyors stopped counting individuals since this is the maximum density class.

For each HMP annual species in a 100×100-ft sample grid, surveyors estimated the percent suitable habitat within the grid. In practice, “suitable habitat” was essentially treated as equivalent to “occupied habitat.” Percent suitable habitat was historically used to calculate the estimated number of individuals present within a 100×100-ft sample grid when a circular subsample plot was used. The 2020 monitoring effort was based on the more recent protocols which eliminated the need for circular plots (Tetra Tech and EcoSystems West, 2015b).

For each HMP annual species, the 100×100-ft sample grid was assigned to one of five density classes based on the number of individuals counted or subsampled to be present. The density classes are as follows when the entire 100×100-ft sample grid was sampled:

0 = 0 plants,
1 = 1 to 50 plants,
2 = 51 to 100 plants,
3 = 101 to 500 plants,
4 = >500 plants.

When only a portion of the grid was sampled, due to recent disturbance or interception by roads, the density classes were scaled proportionally to the percentage of the total grid sampled. In some cases, where it was evident that a given sample grid should be assigned to density class 4 (i.e., more than 500 plants), the survey team assigned the grid to this density class without attempting to count or estimate the numbers of plants. In some cases, grids were assigned to density class 4 after a partial census indicated that considerably more than 500 plants were present in a 100×100-ft sample grid. The general steps taken by field surveyors when monitoring HMP annual grids were the following:

- Located grid using Trimble® GeoXH GPS receiver.
- Marked the staked corners with flagging tape, or re-staked if necessary.
- Monitored each grid with two surveyors, started at opposite corners of the grid, and walked parallel lanes approximately 2-3 ft wide towards the center of the grid.
- Used hand counters, one for each HMP species, to count the number of individuals.
- Marked areas that had been counted to reduce double counting.
- Stopped counting a species once the entire grid was surveyed, or after 501 individuals were counted.
- Estimated percent occupied habitat.

- Recorded counts of individuals in each grid for Monterey spineflower, seaside bird's-beak, and sand gilia and the percent occupied on the field data sheet.

2.2.2 Statistical Methods

HMP annual grid density classes were calculated for Monterey spineflower, seaside bird's-beak, and sand gilia based on individual plant counts and grid area using ArcGIS (ESRI, 2020). Partial grid areas were established using a combination of hand digitization and physically walking the partial grid using a Trimble® GeoXH GPS receiver.

Density classes were also assessed by unit by plotting counts of each density class for each HMP annual species. These are visually displayed using bar plots, and trends between Baseline, intervening survey years, and the current monitoring year are evaluated.

When possible, the effects due to treatment type (burned, masticated, or mixed) were evaluated. Treatment types were allocated by examining shapefiles of the HMP annual monitoring grids against the FODIS shapefiles "flora_pres_burn_area" and "flora_fire_area" using ArcGIS (ESRI, 2020; USACE, 2020). Treatment types were allocated based on the following rules:

- Masticated – Greater than 90% of the grid was only masticated.
- Burned – Greater than 90% of the grid was only burned.
- Mixed – A portion of the grid was masticated and burned, and a portion was only burned or a portion was only masticated. Neither treatment was greater than 90%, but the sum was greater than 90%.
- Masticated and Burned – Greater than 90% of the grid was masticated and then subsequently burned.

Unit B was the only unit with a mixture of treatment types. Effects due to treatment were evaluated using histograms of grid counts by density class, density class maps, and professional field knowledge of Unit B. The histograms were grouped by *treatment* and *age*. The Unit B map was color-coded to distinguish density class as well as treatment types (Figure B-7). Statistical hypothesis tests were not conducted due to the confounding nature of the edaphic and community differences reported by Ecosystems West field biologists.

2.3 HMP Shrub Transects Methods

2.3.1 Field Methods

Burleson conducted shrub transect monitoring in maritime chaparral in BLM Area B Units B-2A, B-3 West, B-3 East, B, C; Units 5A, 9, 23 North, 23, 28, 2 East, and 3 East during the 2020 monitoring season. For previously sampled transects, including follow-up monitoring at 3, 5, and 8 years post-treatment, the surveyors used a resource grade Trimble® GeoXH GPS unit to locate the previously recorded start points of each transect sampled. One transect was allocated in the baseline year for approximately each 11 acres. Transects were allocated separately within the masticated primary Containment Lines or the interior of the units. This is done to evaluate effects due to treatment type when different treatments are employed between the Containment Lines and the interiors.

Locations for all newly established transects were randomly selected using 100×100-ft grids within the areas of maritime chaparral vegetation in each Baseline Unit. The number of grids derived for transects was approximately four times the number needed, to allow field crews to eliminate grids that were unsuitable (difficult terrain, crossing roads, etc.) once the field crew was on-site. These grids were randomly ranked. The field biologist determined field suitability of transect placement within each selected grid based on ability to physically sample the transect line. When a grid was deemed unsuitable, the subsequently ranked grid was used. The start point of each transect was located on or near one of the boundaries of the 100×100-ft grid. Exact transect placement was such that the vegetation along the transect represented the surrounding area and such that most of the transect crossed the selected grid.

Shrub transect sampling was conducted using the line intercept method along transects 50 meters (m) in length (Tetra Tech and EcoSystems West, 2015b; Burleson, 2009a). The general line intercept methodology included:

- Navigating to the transect start point using Trimble® GeoXH GPS receiver and following line shapefiles of transects from the FODIS database.
- Laying out a 50-m transect along the line, repeating direction from previous sampling year.
- Recording plants greater than or equal to 0.1 m contiguous cover directly beneath the transect.
- Identifying shrubs to species and recording start/end points on the transect. Bare ground was also recorded.
- Recording herbaceous cover collectively when its cover was less than 20% of the transect line, and all species present recorded without cover quantification for each.
    - Herbaceous cover only included individuals that appeared to be from this growing season. Herbaceous cover that appeared dead from the previous growing season was considered thatch and not quantified along the transect line.
    - When herbaceous cover was greater than 20%, quadrat sampling was conducted to describe the species composition and abundance (cover) of herbaceous vegetation at that location. These quadrats alternated from right to left on either side of the transect placed every 10 m (6 quadrats total).
- Recording transect direction, clarifying species codes for uncommon species, and noted areas of new mastication or fuel breaks that may have reduced the effective length of a transect since the baseline sampling year.
- When transects were less than 50 m, calculating cover values with the new transect length. The shortened transects were then analyzed as if they were 50 m. This was deemed appropriate since the differences in length occurred on few transects and was a small portion of the total transect length.

2.3.2 Statistical Methods

Burleson initially separated treatment units by the age of treatment at the point when 2020 shrub transect monitoring was conducted (e.g. 5-year-old vs 3-year-old). Within these groups, we conducted either one-way, two-way, or three-way permutational analysis of variance (PERMANOVA) testing to detect differences in community composition between Unit, Age, or Treatment (Anderson, 2001; McArdle and Anderson, 2001). Community composition is defined by the structural patterns of the community (e.g. abundance, richness, evenness, and diversity; Smith and Smith, 2001). Treatment age, Unit, and treatment type are grouping factors that will be referred to as *age*, *unit*, and *treatment*. Burleson conducted these tests using the *adonis* function in the vegan package in R Statistical Software (Oksanen, 2020; R Core Team, 2020). We used Bray-Curtis dissimilarity matrices to measure community composition, and partitioned between factors. The function *adonis* uses permutation testing to detect the potential influence of those partitions. Two-way PERMANOVA testing was the conducted on Units that contained more than one treatment to examine the influence of *treatment* on community composition. PERMANOVA testing is a robust alternative to other analyses (e.g. Kruskal-Wallis or ANOVA). While the test has the potential to increase the Type II error (false positive) rate compared to other tests, PERMANOVA reduces the need to conduct separate tests for each community structure parameter and eliminates the normality assumption required from ANOVA (some community structure data do not meet normality assumption).

Following Legendre and Legendre (1998), we conducted nonmetric multidimensional scaling (NMDS) ordinations. These allowed qualitative visualizations of the differences detected in PERMANOVA testing. NMDS is a reduced-space ordination method that begins with full dimensional space and attempts to represent groups in as few dimensions as possible while retaining the distance relationships between groups. Burleson grouped vegetation transect data by *treatment* or *age*. The matrices analyzed were *transect* by *species* and are sometimes longer in the *species* dimension than in the *transect* dimension. Differences between these grouping factors are illustrated by differing locations of ellipsoids that surround grouped transect points in ordination space. These analyses were conducted utilizing the *metaMDS* function in the vegan package, using Bray-Curtis dissimilarity distances (Oksanen, 2020).

Burleson calculated four community metrics and grouped them by *treatment* or *age* within Units to assess community structure. Community metrics calculated were total cover (%), Shannon-Wiener diversity index, species richness (# species), and species evenness index. Cover (%) is identified as:

c = vegetative cover

Species diversity was measured by the Shannon-Weiner *H'* metric (Pielou, 1974). This metric expresses diversity as a combination of the number of species present in the association and their relative abundance (or cover) in the sample. Diversity increases with both increasing number of species and increasing equitability of species abundance. For a given number of species, diversity is highest when all species are present in equal abundance. Diversity index is calculated as:

$$H' = -\sum_{i=1}^{S} p_i * \ln(p_i)$$

where,

p_i = proportion of the i^{th} species = $\frac{n_i}{N}$

Evenness is a measure of the equability of the relative contribution of species to the total cover in the association (Pielou, 1974). Evenness is the ratio of the observed diversity to the maximum diversity possible for a sample with the same number of species. Maximum evenness (value = 1) is achieved when all species are present in equal abundance in the sample. Evenness is calculated as:

$$J' = \frac{H'}{\ln(S)}$$

where,

S = species richness

These statistics were conducted using the functions *rowSums*, *diversity*, and *specnumber* in the *vegan* package (Oksanen, 2020).

One-way, two-way, or mixed-design ANOVA were conducted to detect differences of community metrics between *units* within age classes, and *treatment* groups within units when more than one treatment was applied to any unit. Bare ground cover and herbaceous cover were evaluated using the same methods as for community metrics. These methods were also utilized to evaluate HMP species cover differences between *treatment* types in the Year 8 units.

When conducting two- or three-way ANOVA tests, the *F*-statistic and *p*-value were used to assess potential differences. The *F*-statistic is defined as:

$$F = \frac{variation\ between\ sample\ means}{variation\ among\ individuals\ within\ the\ same\ sample}$$

The *F*-statistic can only be zero or positive in value and is only zero when all sample means are identical (Moore *et al.*, 2013). The *F*-statistic gets larger as the sample means move further apart. Large values provide evidence against the null hypothesis that the means are the same.

The *p*-value is a means to assess the strength of evidence against a claim (the null hypothesis) (Moore *et al.*, 2013). It follows the reasoning that an outcome that would rarely happen if a claim were true is good evidence against that claim. The *p*-value represents the probability of how infrequently an outcome like this would happen if the null hypothesis were true. Small *p*-values are evidence against the null hypothesis because they show that the observed result would be unlikely if the null were true.

In previous Former Fort Ord Biomonitoring Annual Reports statistical differences were considered significant when the *p*-value was less than a 0.05 significance level and when the *F*-statistic was considerably greater than one. For this year's report, less emphasis was placed on *p*-values in comparison to a significance level. This shift is based on a recent statement by the American Statistical Association (Wasserstein and Lazar, 2016) that discussed potential misinterpretation of the of a *p*-value and the "bright line" created between significant and not significant when compared against a predetermined significance level (Wasserstein and Lazar, 2016; Wasserstein et al, 2019). Instead, for this year's report while the *F*-statistic and *p*-value are reported, no significance level is identified and interpretation of the factors affecting recovery is based on an overall assessment of the data and descriptive statistics.

When two- or three-way ANOVAs were conducted, *F*-statistic and *p*-value were reported for interaction terms. Interaction terms may suggest if unique responses to particular treatment combinations (e.g. *Burned* transects at the *Age* level of Year 8 only) exist (Gotelli and Ellison, 2004).

When appropriate, Mauchly's test was utilized to test that the sphericity assumption was met. This tests for equal variance of the differences between all possible combinations of groups. When community metrics did not meet parametric assumptions of one-way ANOVA testing, either Greenhouse-Geisler sphericity corrections or nonparametric Kruskall-Wallis tests were used. In cases where community metrics did not meet parametric assumptions of two-way ANOVA testing, we made inference using the PERMANOVA results, as there is no nonparametric version of a two-way ANOVA. Descriptive statistics were used to examine differences in communities over time and between treatments.

Rank-abundance curves (RACs) were generated to illustrate the important community relationships and show species-level responses to differences in *treatment* or *age* (Molles, 2010). We plotted RACs with species rank on the x-axis and the log-10 proportional abundance on the y-axis, with species identified using their species code (see Appendix A for complete Fort Ord species code list). The distribution of the species in these units can characterize the species composition further than the community metrics such as the Shannon-Wiener diversity index or the species evenness index (Calow, 1999). We created rank abundance curves using the *rankabundance* function in the BiodiversityR package (Kindt, 2019).

2.4 Non-native Annual Grasses Methods

2.4.1 Field Methods

Non-native annual grasses were mapped within primary Containment Lines and in roadside fuel breaks adjacent to each unit monitored in 2020. Areas directly adjacent to the roads were mapped from the vehicle. Areas further than 25-50 ft from the vehicle, or where direct line-of-sight was impeded, were mapped on foot. All maps of annual grass polygons were initially hand-drawn on hard copies of ArcGIS derived aerial maps. The polygons were later digitized and the area occupied was calculated using ArcGIS software. Density classes for each polygon were visually estimated and recorded.

2.4.2 Reporting Methods

Non-native annual grasses are presented on maps derived in ArcGIS (ESRI, 2020). Additionally, the estimated area occupied by annual grasses was quantified for all areas where surveys occurred, and reported by density class. The density classes are as follows:

1 (low)	= 1-5%
2 (medium)	= 6-25%
3 (high)	= >25%

2.5 Invasive Species Methods

2.5.1 Field Methods

Invasive species were monitored along shrub transects and where encountered incidentally during meandering transects or when traversing the Units to reach sampling locations, HMP annuals density monitoring, and annual grass monitoring. Emphasis was placed on iceplant (*Carpobrotus edulis*), pampas grass (*Cortaderia jubata*), and French broom (*Genista monspessulana*). Iceplant locations were only recorded when the occurrence was larger than about 100 ft^2 or in areas clustered with smaller individuals that collectively indicated a recent and/or potentially problematic infestation. Locations were recorded using either a Garmin 62s GPS receiver or a Trimble® GeoXH GPS unit.

2.5.2 Reporting Methods

Invasive species are presented on maps developed in ArcGIS (ESRI, 2020). These surveys were not intended to be comprehensive. The intent is to document occurrences to support invasive species management through the Service Agreement with Bureau of Land Management.

3 YEAR 1 VEGETATION SURVEYS: RANGE 48

3.1 Introduction

Year 1 surveys were completed at Range 48 (Figure 3-1). The area was masticated in 2019 per as part of environmental cleanup operations involving MEC removal activities. Prior to mastication efforts in 2019, Range 48 vegetation was monitored over thirteen years (2000-2013) following a controlled burn in 2003. Baseline monitoring for Range 48 was conducted in 2000 following previous HMP Annual monitoring protocols (HLA, 2001). The baseline data from 2000 were documented by mapping patches of HMP Annual species instead of recording numbers of individuals by grid. For the 2020 HMP Annual density analyses, comparing 2020 data to baseline results (2000 surveys) was done from a qualitative standpoint. Results from 2013 HMP Annual grid surveys (Year 10 post-burn) will supplement baseline comparisons as the 2013 results were collected using the current protocol and the data represent pre-mastication conditions (Tetra Tech and Ecosystems West 2014). No shrub transects or annual grass monitoring was conducted during Year 1 surveys of Range 48.

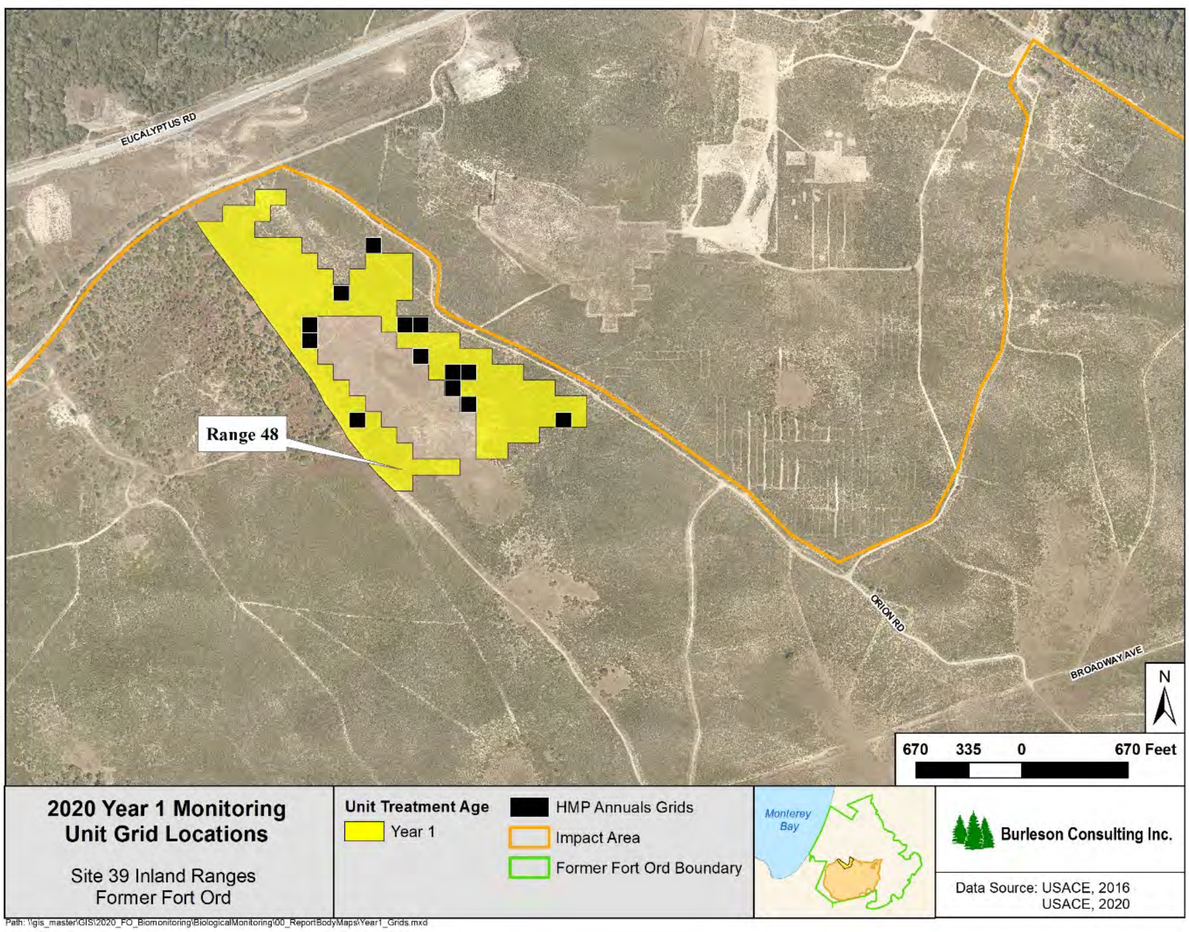

Figure 3-1. Year 1 HMP Annuals Grids Surveyed in 2020.

3.2 Range 48: Setting

Range 48 2020 monitoring is a subset of the 2013 monitoring and the 2008 and 2010 monitoring (Burleson 2008; Tetra Tech and EcoSystems West 2011). It encompasses approximately 30 acres of generally rolling terrain that was masticated in 2019. Range 48 is treated as the area west and northwest of the intersection of Orion Road and Broadway Avenue and south of Eucalyptus Road. Two major vegetation types predominate in the area: maritime chaparral, and areas dominated by grasses and herbs with only scattered shrubs.

Two soil types are mapped in Range 48 as described in Table 2-1 (USDA, 2020). Most of Range 48 consists of Arnold-Santa Ynez complex. Baywood sand, 2 to 15 percent slopes was mapped in the northwestern arm of Range 48. Characteristics of these soil types are presented in Table 2-1.

3.3 Range 48: Methods

In accordance with methods outlined in the Revised Protocol (Tetra Tech and EcoSystems West, 2015b) and Section 2 of this report, the 2020 Year 1 surveys in Range 48 consisted of the following components:

- Density monitoring for three HMP annual species: sand gilia, seaside bird's-beak, and Monterey spineflower. This survey effort was conducted across 13 grids to assess Year 1 densities of HMP annual species in the 30-acre masticated area.
- Mapping of invasive species including iceplant, pampas grass, and French broom, where encountered. This survey effort was conducted to assess increase or decrease of invasive populations over time after disturbance.

3.4 Range 48: Results and Discussion

Year 1 surveys included 13 HMP monitoring grids. Maps of HMP survey grids for Range 48 are provided in Appendix B (Appendix B, Figure B-1 through B-3).

3.4.1 Sand Gilia

Sand gilia was observed in Range 48 in Year 1 (2020). No sand gilia were mapped in or overlapping the Year 1 grids during the 2000 baseline survey. In 2013, sand gilia were observed in approximately half of the Year 1 grids. During Year 1 surveys sand gilia were observed in eleven grids for a frequency of occurrence of 85% (Figure 3-2).

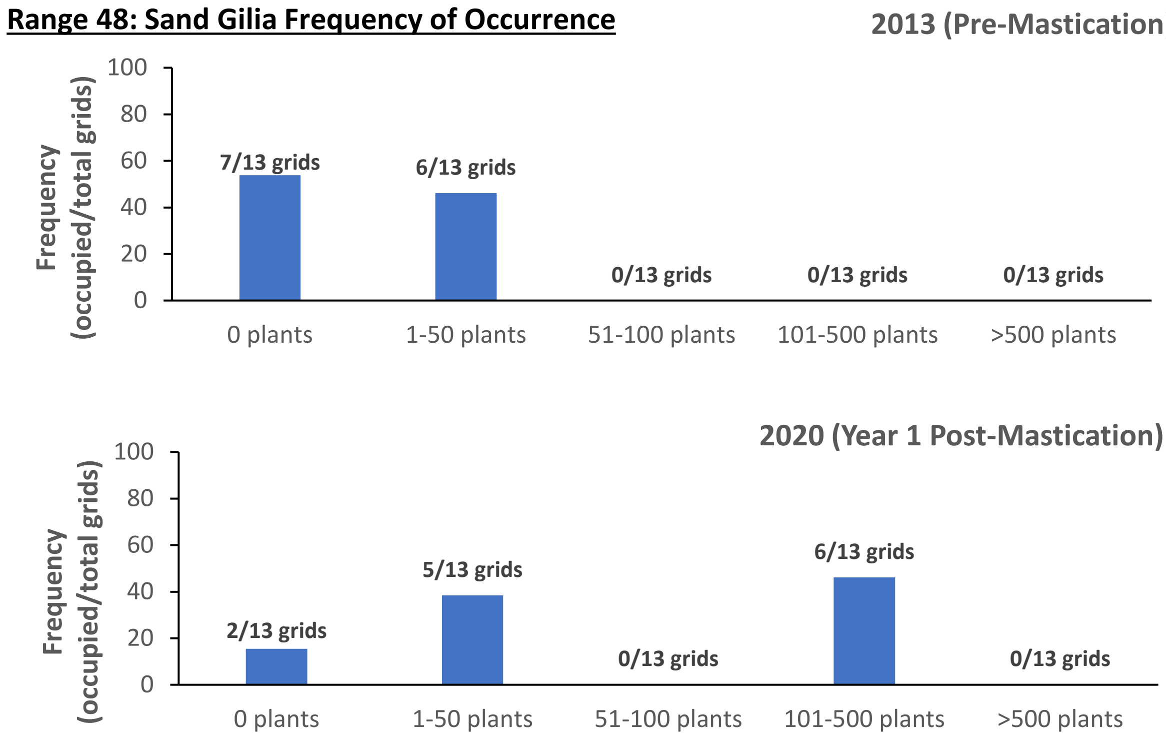

Figure 3-2. Range 48 Sand Gilia Occurrence in Surveyed Grids (n=13) for Pre-mastication (2013) and Year 1 (2020).

3.4.2 Seaside Bird's-Beak

Seaside bird's-beak was observed in Range 48 in Year 1 (2020). No seaside bird's-beak were mapped in or overlapping the Year 1 grids during the 2000 baseline survey. In 2013, sand gilia were observed in two of the Year 1 grids. During Year 1 surveys seaside bird's-beak were observed in one grid for a frequency of occurrence of 8% (Figure 3-3).

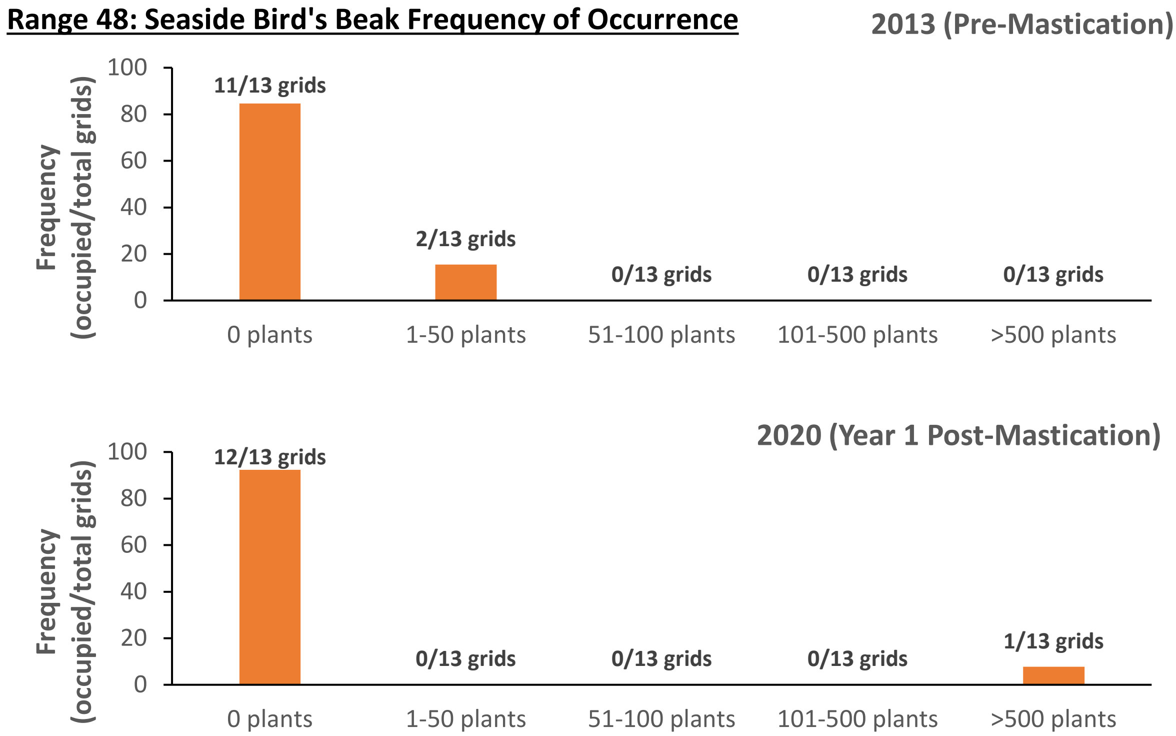

Figure 3-3. Range 48 Seaside Bird's Beak Occurrence in Surveyed Grids (*n*=13) for Pre-mastication (2013) and Year 1 (2020).

3.4.3 Monterey Spineflower

Monterey spineflower was observed in Range 48 in Baseline (2000) and Year 1 (2020). Comparing the Baseline map from the 2000 Annual Report (Plate 14; HLA, 2001) to the locations of the current Year 1 grids, two mapped patches (25 and 11 acres) of High-Density Monterey spineflower (501 – 5,000 individuals) in 2000 fully overlap six of the Year 1 grids. The rest of the grids either slightly overlapped these high-density areas or were completely outside these areas (i.e., low-density Monterey spineflower). In 2013, Monterey spineflower was observed in all but one of the Year 1 grids. During Year 1 surveys Monterey spineflower were observed in all grids (Figure 3-4).

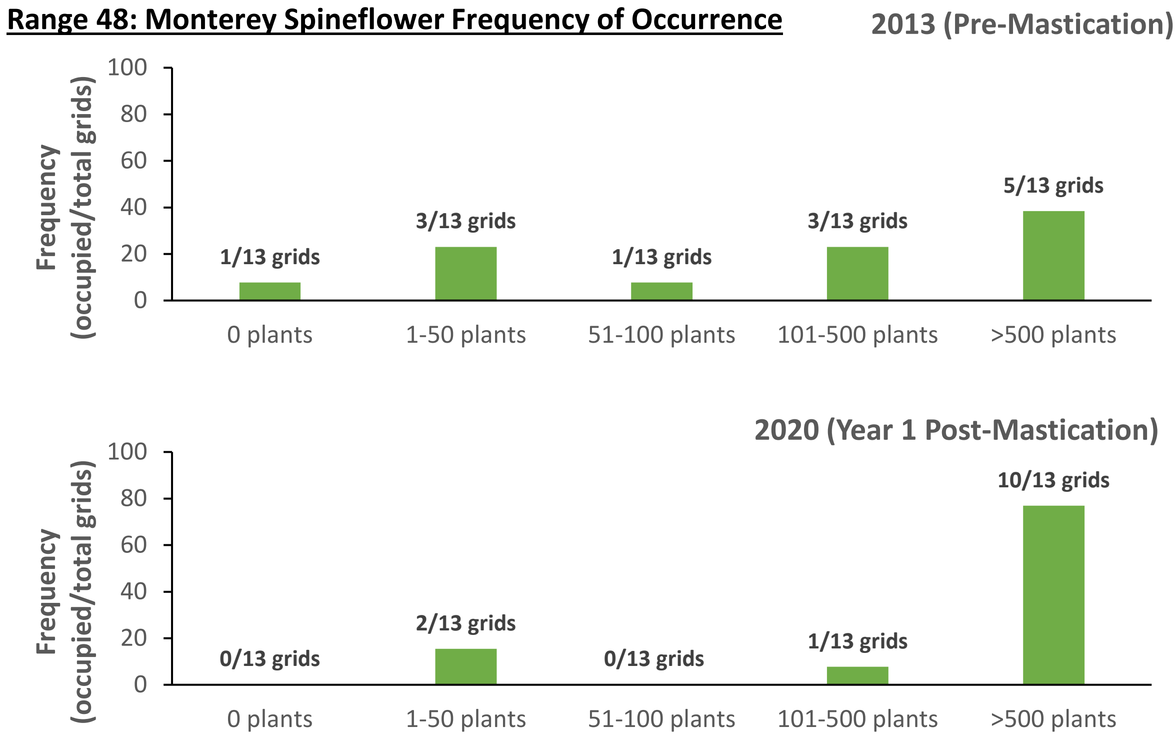

Figure 3-4. Range 48 Monterey Spineflower Occurrence in Surveyed Grids (*n*=13) for Pre-mastication (2013) and Year 1 (2020).

3.4.4 Yadon's Piperia

A single piperia plantwas observed within Range 48 during Year 1 monitoring (Appendix E, Figure E-1). It is not confirmed that this individual is Yadon's piperia as this plant was not in flower and therefore not identifiable to its specific taxon.

3.4.5 Effect of Treatment on HMP Density

The effect of treatment type on HMP annuals density could not be evaluated at Range 48 since this area was masticated only, with no prescribed burns.

3.4.6 Year 1 Invasive and Non-Native Species Monitoring

None of the target invasive species (iceplant, pampas grass, and French broom) were observed during Year 1 monitoring at Range 48.

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4 YEAR 3 VEGETATION SURVEYS: BLM AREA B UNITS B-2A, B-3 WEST, B-3 EAST, A SOUTHERN CONTAINMENT LINE, B, AND C

4.1 Introduction

Year 3 units included BLM Area B Units B-2A, B-3 West, B-3 East, A Southern Containment Line, B, and C (Figure 4-1). Units B-3 West, B-3 East, A Southern Containment line, and B and C Containment Lines were masticated in 2017. Prescribed burns were conducted at Units B and C after containment line mastication to facilitate environmental cleanup operations involving MEC removal. Subsequently, portions of Unit B and C containment lines were burned. Baseline monitoring for Year 3 Units was conducted in 2015, except for Unit B-2A (Baseline Year 1998) and two Unit B shrub transects (Baseline Year 1999). Year 3 monitoring included density monitoring for the HMP annual species sand gilia, seaside bird's-beak, and Monterey spineflower; transect surveys to sample shrub composition in the maritime chaparral; and annual grass monitoring within the planned primary containment lines surrounding these Units (Burleson, 2016).

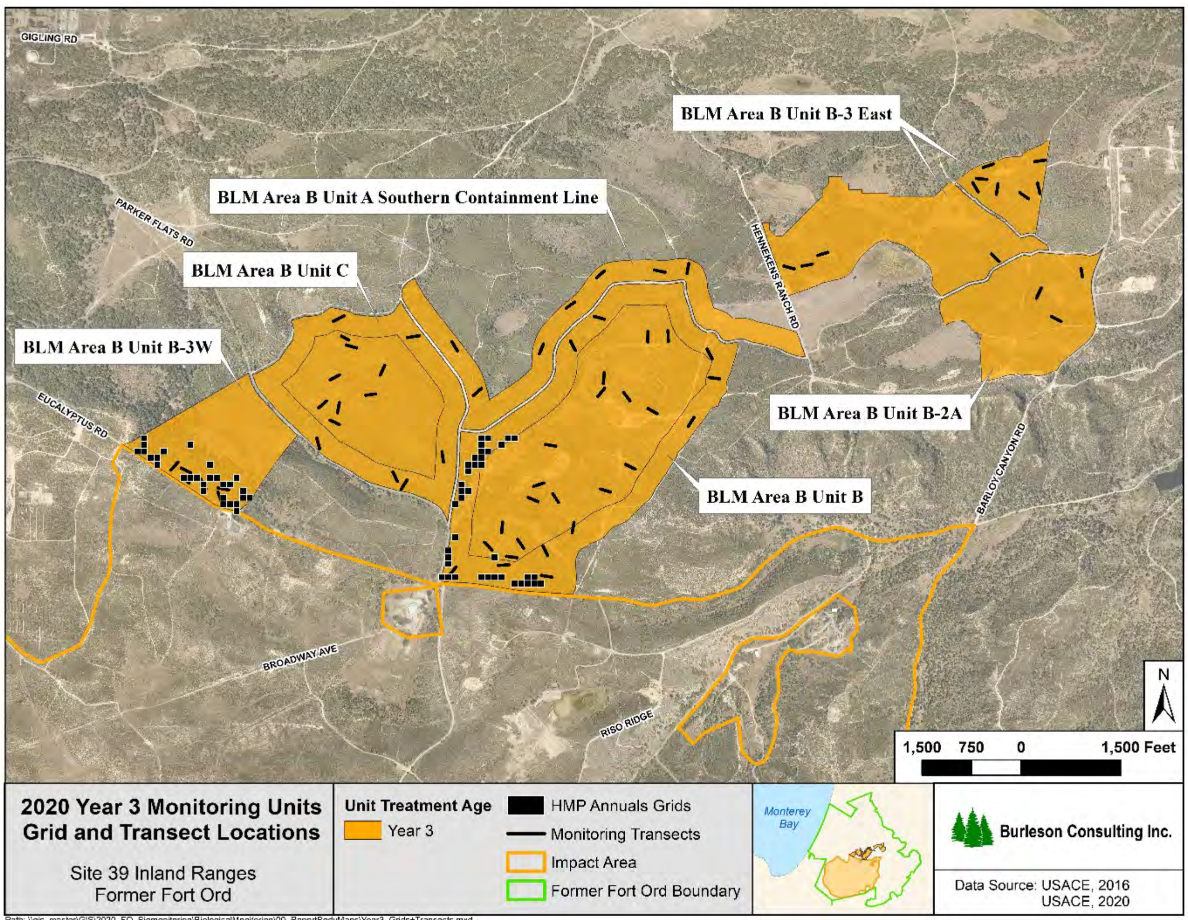

Figure 4-1. BLM Area B Units B-3 West, B-3 East, B-2A, A Southern Containment Line, B, and C HMP Annuals Grids and Shrub Transects Surveyed for Year 3 in 2020.

4.2 BLM Area B Units B-2A, B-3 West, B-3 East, A Southern Containment Line, B, and C: Setting

BLM Area B is a 1,646-acre area and is part of the publicly accessible lands on Fort Ord National Monument. This irregularly configured area is located immediately north and east of the Impact Area Units and is divided into eight subareas. BLM Area B is roughly bordered by Watkins Gate Road and Parker Flats Road to the west, Eucalyptus Road to the south, Barloy Canyon Road to the east, and Gigling Road to the north. Portions of this area are currently managed by the Bureau of Land Management (BLM) and contain numerous maintained trails and roads publicly accessible for biking and hiking, providing access to the interior portions of many of these areas. BLM Area B varies greatly in physiognomy, vegetation community composition, and topography.

Unit B-3 West is largely dominated by oak woodland and grassland with maritime chaparral limited primarily to the northern and southern boundaries. This unit is 64 acres in size. Chaparral habitat in the southern portion of this area is dominated primarily by sandmat manzanita and other lower growing shrubs, which may indicate an affinity to the sandy aeolian soils or reflect relatively recent disturbance.

Unit B-3 East is dissimilar from the majority of BLM Area B. The majority of this area is dominated by oak woodland and expansive native grasslands interspersed with vernal pools. Maritime chaparral is limited in this subarea to areas immediately east of Hennekens Ranch Road and Addington Road. A persistent vernal pool (Pool 60) located in the center of this subarea is known to support federally threatened California tiger salamanders.

Unit A is in the northernmost portion of BLM Area B and is bisected by several trails and roads. This area contains a diverse array of maritime chaparral, coast live oak woodland, blueblossom ceanothus-poison oak scrub, native grass prairie, and wet meadow habitats. The Unit A Containment Line was the only portion surveyed in 2020 and comprises 65 acres.

Unit B is dominated by a low-lying, hummocky valley comprised grassland and shallow vernal pools. This valley is bordered by a mosaic of maritime chaparral and coast live oak woodland to the west and a steep, somewhat eroded slope containing oak woodland, chaparral, and disturbed unvegetated, highly-eroded openings to the east. The Unit B Containment Line comprises 106 acres, and it was the only portion surveyed in 2018 because it contains all HMP annual grids within the unit.. This subarea contains many abandoned roads and trails that are deteriorated and unmaintained in a badlands appearance. This subarea also contains several vernal pools with populations of Contra Costa goldfields (*Lasthenia conjugens*), a federally endangered plant species.

Unit C contains rolling topography and has several prominent east to west trending ridges and low-lying valleys. The area comprises nearly ubiquitous, dense maritime chaparral dominated by shaggy bark manzanita and chamise with areas of locally dense Hooker's manzanita and Monterey ceanothus.

Unit B-2A contains mostly maritime chaparral with transitional oak woodland areas. The rolling terrain of the unit also contains erodible roads with underlying compacted soils. Small mesic areas are located in the interior of the unit.

The U.S. Department of Agriculture (USDA, 2020) maps three soil types as occurring in the Year 3 areas. Arnold-Santa Ynez complex is mapped as occurring in the majority of BLM Area B-3 West and Units A and B Containment Lines. Antioch fine sandy loam is located in portions of BLM Area B Units A and B

Containment Lines, while Oceano loamy sound is found in BLM Area B Units B-3 West and A Containment Lines. Characteristics of these soil types are presented in Table 2-1.

It is apparent in the field that at least two distinct types of soil occur in the Year 3 areas where the soil is mapped as Arnold-Santa Ynez complex. One type of this soil consists primarily of relatively coarse, loose sand, generally without gravel. The other soil type consists of finer, harder-packed sand with finer material, and typically contains large numbers of small, reddish, rounded pebbles. The HMP annual species Monterey spineflower, sand gilia, and seaside bird’s-beak occur almost exclusively on the former soil type. Soils supporting HMP herbaceous plants in BLM Area B are primarily situated along a north to south gradient along Watkins Gate Road.

4.3 BLM Area B Units B-2A, B-3 West, B-3 East, A Southern Containment Line, B, and C: Methods

In accordance with methods outlined in the Revised Protocol and Section 2 in this report, the 2020 Year 3 vegetation monitoring surveys in BLM Area B Units B-3 West, B-3 East, B, C, A Containment Line, and B-2A consisted of the following components:

- Density monitoring for three HMP annual species: sand gilia, seaside bird's-beak, and Monterey spineflower. This survey effort was conducted to evaluate how the density of these species responded to treatment within the monitored grids. Surveys occurred on April 13, 14, 15, 16, and 20, 2020.

- Macroplot surveys for three HMP annual species: sand gilia, seaside bird's-beak, and Monterey spineflower. This survey effort was conducted to assess changes in the distribution of HMP annual species in response to treatment and evaluate what factors influence those changes.

- Repeated sampling of transects that were monitored in 1998, 1999, and 2015 surveys (Burleson, 2016). This survey effort was conducted to assess shrub species composition of the sensitive maritime chaparral community after treatment. Surveys occurred on May 4, 5, 7, 11, 14, 21, and 27, and June 1, 2, 3, 4, 10, 11, 15, 16, and 17, 2020.

- Mapping of non-native annual grasses within the primary containment areas. This survey effort was conducted to assess expansion or contraction of these populations over time after disturbance.

- Mapping of invasive species including iceplant, pampas grass, and French broom, where encountered. This survey effort was conducted to support ongoing management.

4.4 BLM Area B Unit B-2A, B-3 West, B-3 East, A Southern Containment Line, B, and C: Results and Discussion

Burleson surveyed 66 HMP monitoring grids in the Year 3 Units in 2020, with 28 grids in BLM Area B Unit B-3 West ($n_{\text{masticated}}$=28) and 38 grids in the Containment Line of BLM Area B Unit B ($n_{\text{masticated}}$=15; $n_{\text{masticated\&burned}}$=6; n_{mixed}=17). Maps of survey grids for the sampled units are provided in Appendix B (Figures B-4 through B-9).

4.4.1 Sand Gilia

Sand gilia was observed in BLM Area Unit B in 2020 and the Baseline year, but not in BLM Area Unit B-3 West in either year (Figure 4-2; Appendix B, Figures B-4 and B-7). The frequency of occurrence in BLM Area B Unit B was 21% in 2015 (8 of 38 grids), 32% in 2018 (12 of 38 grids), and 32% in 2020 (12 of 38 grids).

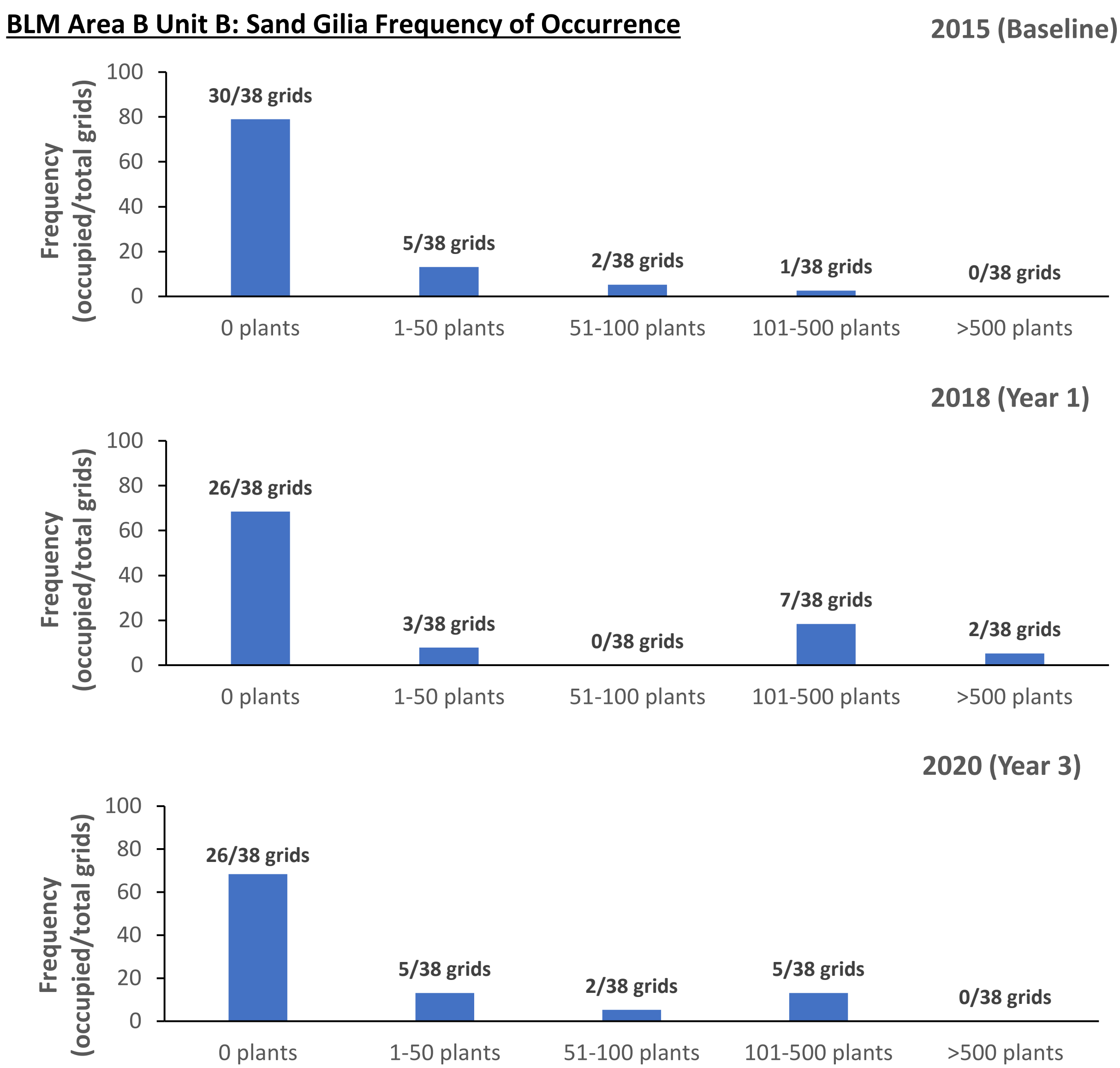

Figure 4-2. BLM Area B Unit B Containment Sand Gilia Occurrence in Surveyed Grids (*n*=38) for Baseline (2015), Year 1 (2018), and Year 3 (2020).

4.4.2 Seaside Bird's-Beak

Seaside bird's-beak was not present in BLM Area B Unit B or B-3 West in 2020. Seaside bird's-beak was present in BLM Area B Unit B in 2018, but not in BLM Area B Unit B-3 West (Figure 4-3; Appendix B, Figures B-5 and B-8). No grids contained seaside bird's beak in Baseline in any unit. The frequency of occurrence in monitored plots in BLM Area B Unit B was 0% in 2015 (0 of 38 grids), 3% in 2018 (1 of 38 grids), and 0% in 2020 (0 of 38 grids).

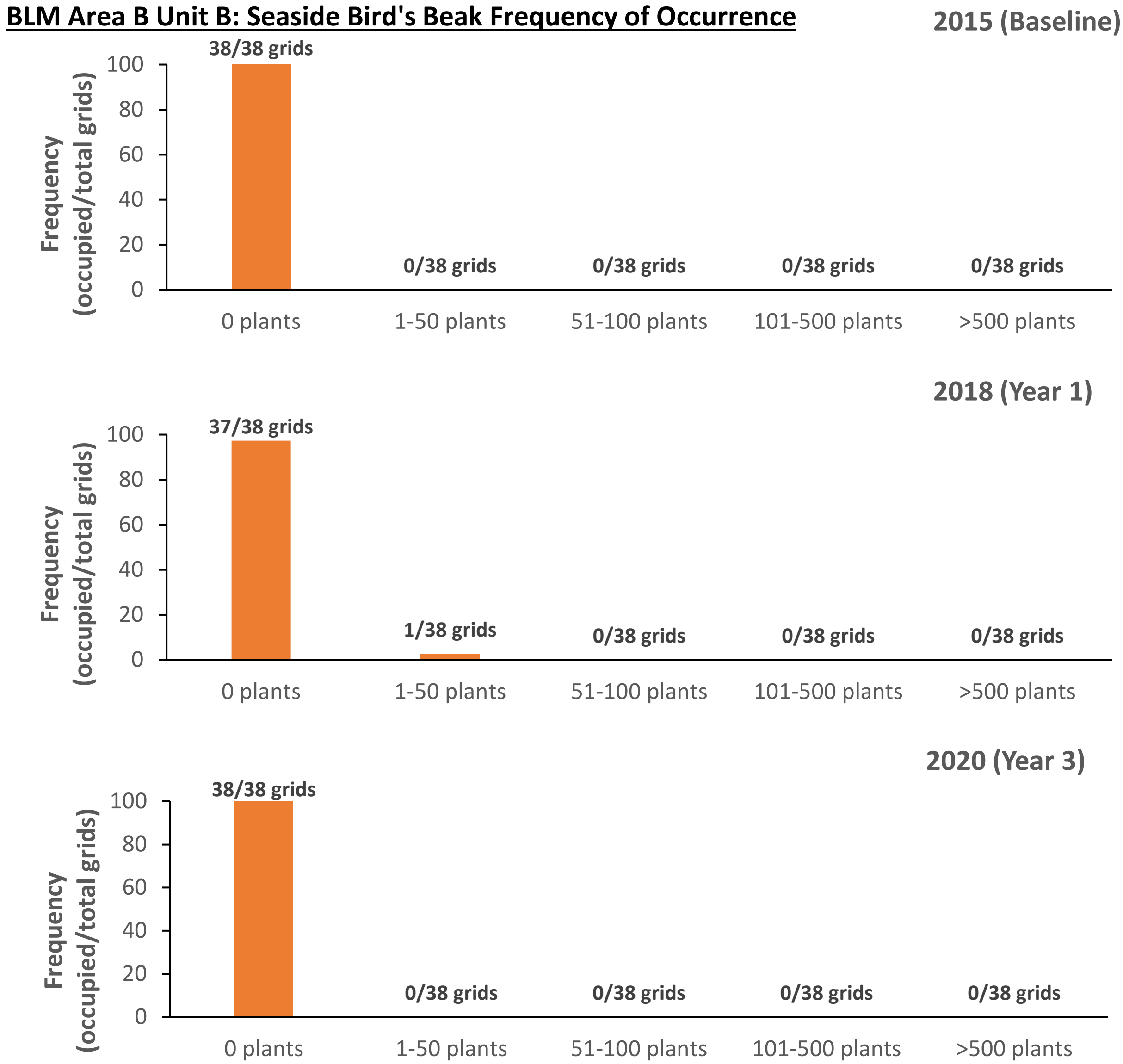

Figure 4-3. BLM Area B Unit B Containment Seaside Bird's Beak Occurrence in Surveyed Grids (*n*=38) for Baseline (2015), Year 1 (2018), and Year 3 (2020).

4.4.3 Monterey Spineflower

Monterey spineflower was present in all Year 3 units (Figures 4-4 through 4-5; Appendix B, Figures B-6 and B-9). The frequency of occurrence in BLM Area B-3 West was 100% in 2015 (28 of 28 grids), 89% in 2018 (25 of 28 grids), and 89% in 2020 (25 of 28 grids). The frequency of occurrence in BLM Area B Unit B was 100% in 2015 (38 of 38 grids), 89% in 2018 (34 of 38 grids), and 87% in 2020 (33 of 38 grids).

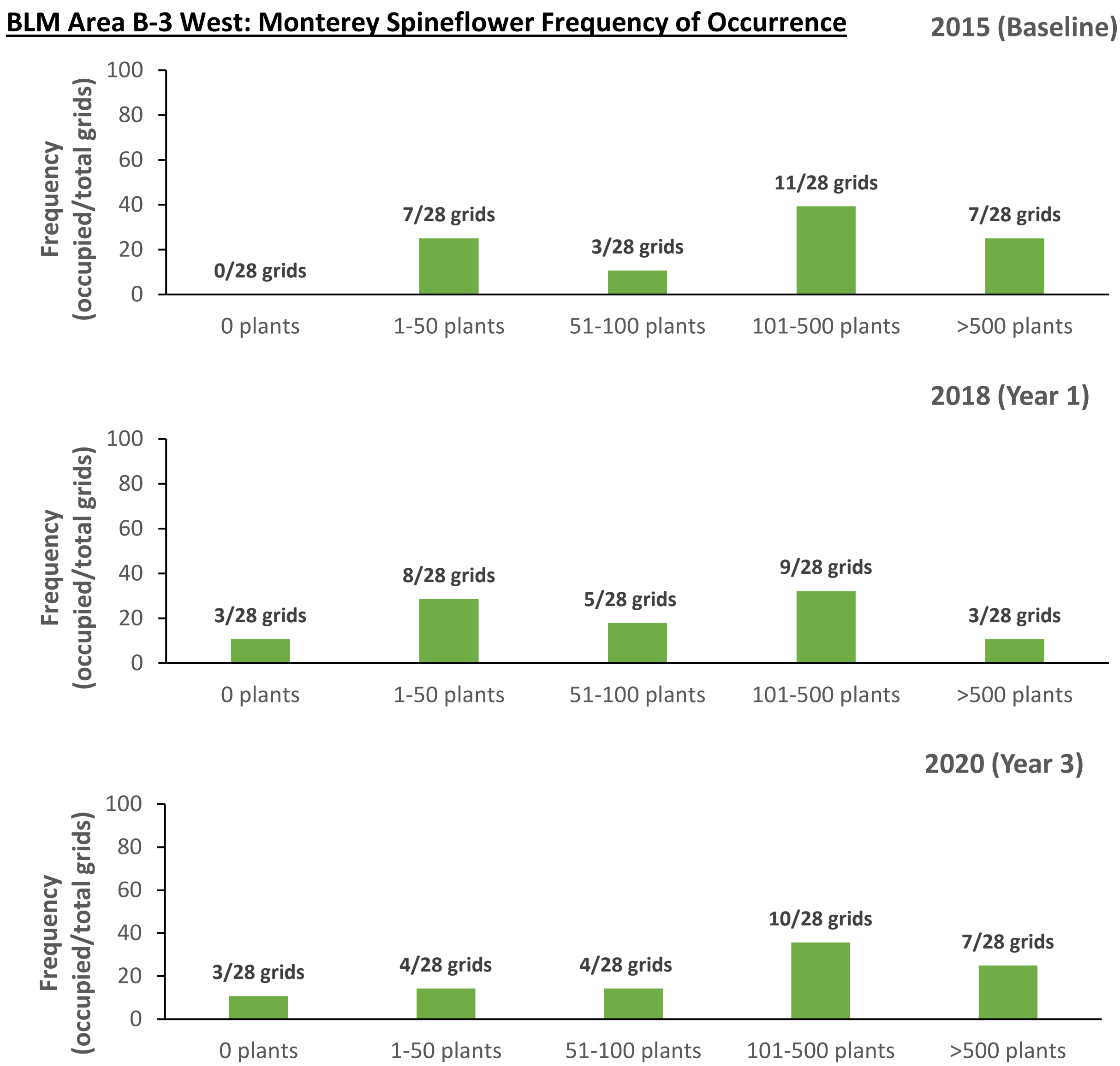

Figure 4-4. BLM Area B-3 West Monterey Spineflower Occurrence in Surveyed Grids (*n*=28) for Baseline (2015), Year 1 (2018), and Year 3 (2020).

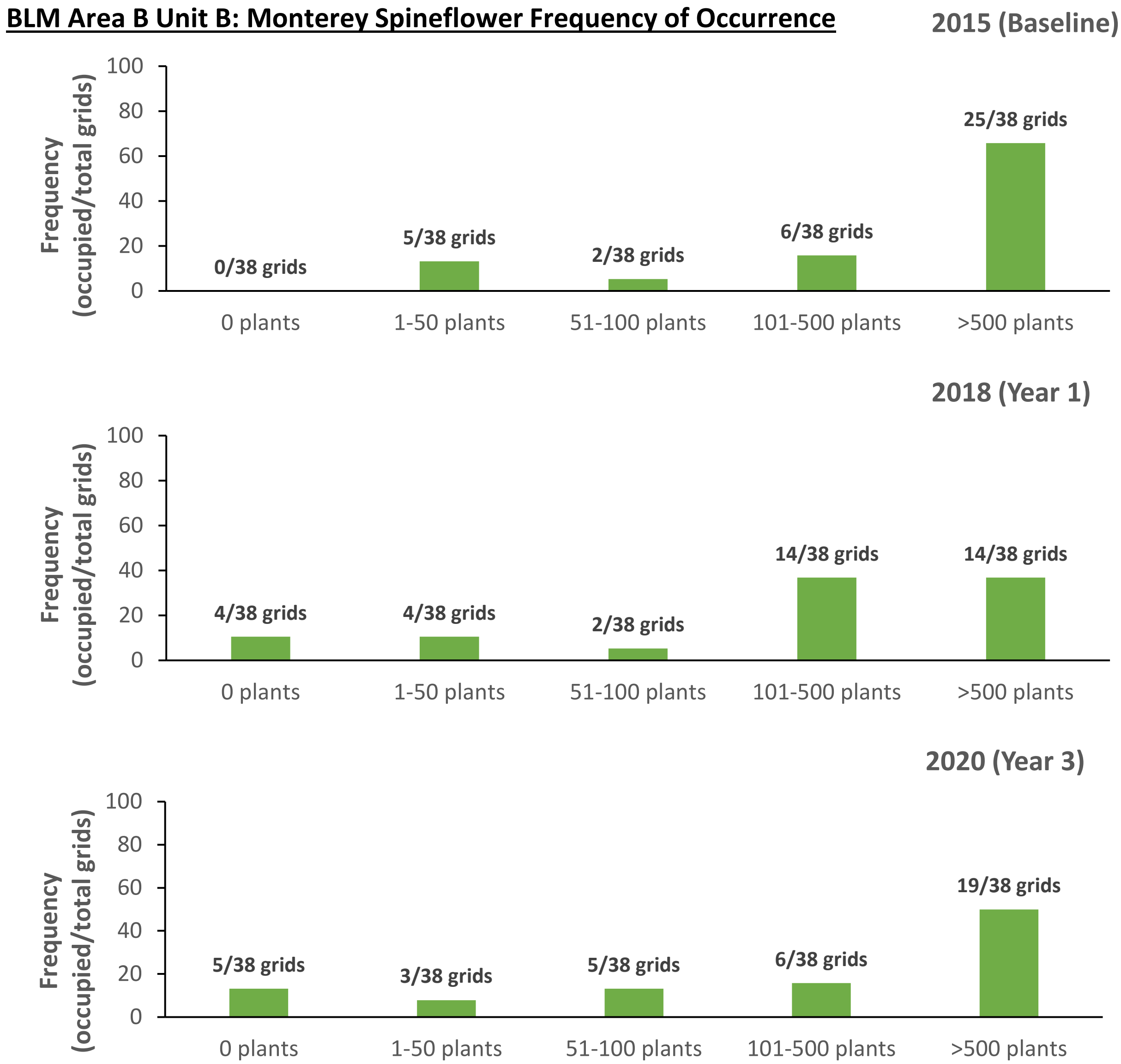

Figure 4-5. BLM Area B Unit B Monterey Spineflower Occurrence in Surveyed Grids (*n*=38) for Baseline (2015), Year 1 (2018), and Year 3 (2020).

4.4.4 Yadon's Piperia

Piperia was observed within BLM Area B Units B-3 West, A Southern Containment Line, and B during 2020 surveys (Appendix E, Figures E-2 through E-6). Piperia was not observed within Units B-2A, B-3 East, or C. In Unit B-3 West, seven single occurrences and one patch of greater than ten individuals of piperia were documented. All piperia found were located in the southwestern part of the unit. Within the Unit A Southern Containment Line, a single-plant occurrence was found along the southern edge of the containment line. Within Unit B, a single-plant occurrence was found along the southern-most portion of the containment line. Due to the timing of monitoring, these individuals were not in flower and could not be identified to their specific taxon.

4.4.5 Effect of Treatment on HMP Density

The effect of treatment type on HMP annuals density was evaluated in the BLM Area B Unit B. BLM Area B-3 West could not be evaluated for differential effects due to treatment since only mastication occurred in the area.

Since 2015, regional differences in sand gilia recruitment were observed at the southern and western extent of the unit (Appendix B, Figure B-7). In the western region, across all treatments, there was consistently no sand gilia recruitment, while the southern region treatment grids had sand gilia recruitment. Based on professional field observation and judgement, the variability of edaphic conditions and community composition within Unit B likely contributed to the differences in sand gilia recruitment, and the distribution of treatments between the western and southern regions confound any analyzable effect of treatment. As a result, there is limited validity of using PERMANOVA to analyze sand gilia response to treatment in Unit B. Figure 4-6 illustrates that even in pre-treatment baseline surveys, a greater percentage of the “Mixed” grids had sand gilia present (35%) than in either “Masticate” (6%) or “Masticate & Burn” (17%) grids.

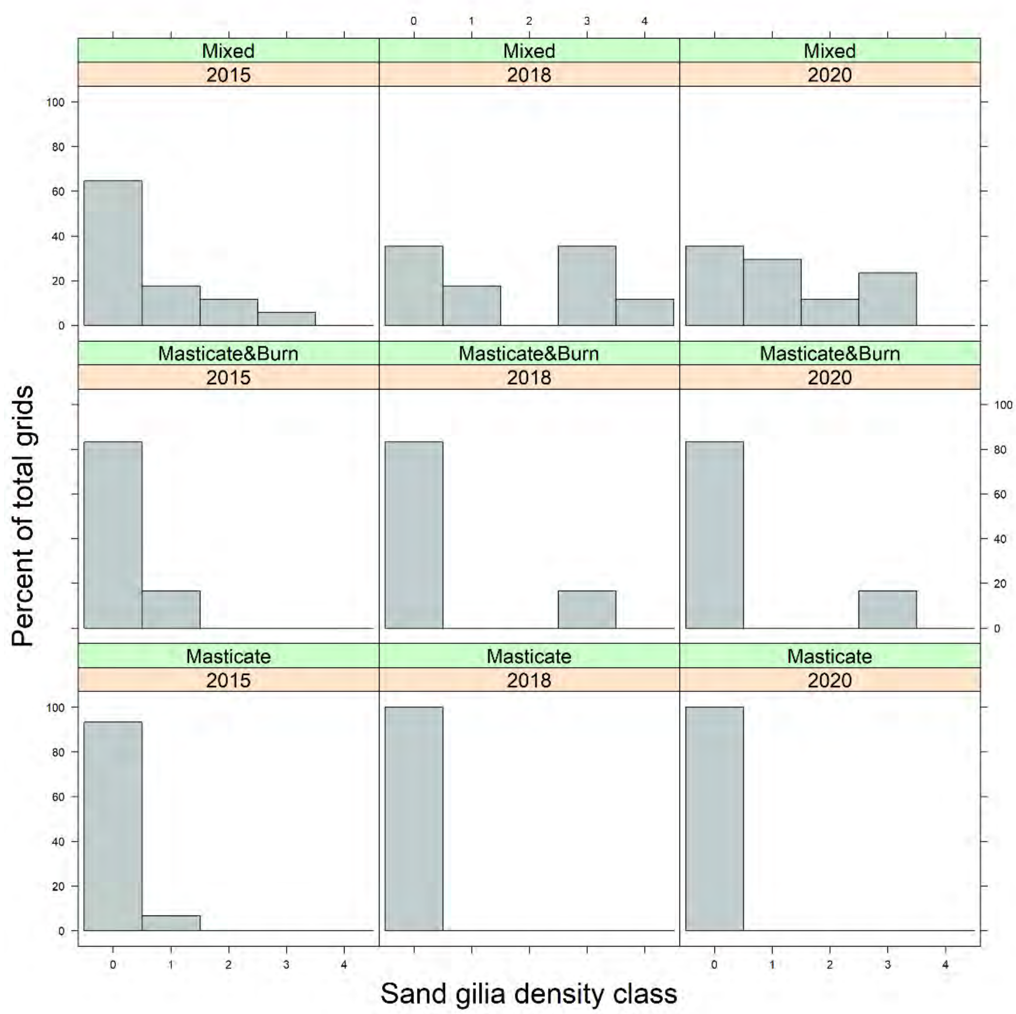

Figure 4-6. Percent of Total Grids for Sand Gilia Density Classes for All Treatment Types in Baseline (2015), Year 1 (2018), and Year 3 (2020) in BLM Area B Unit B. Masticate grids n=15 grids, Masticate&Burn grids n=6 grids, Mixed grids n=17 grids.

Monterey spineflower recruitment appears ubiquitous across the southern and western extent of Unit B (Appendix B, Figure B-9). A two-way PERMANOVA was conducted to evaluate the effect of treatment and age on the distribution of Monterey spineflower in the BLM Area B Unit B (Tables 4-1). Based on PERMANOVA results and examination of the density distribution by treatment over time, it is plausible that treatment and the survey year may influence differences observed in density distributions. The distributions across density classes for Monterey spineflower by treatment and age are shown in Figure 4-7. During Baseline surveys, Monterey spineflower was observed in all grids regardless of treatment, and through time, it maintained presence in the majority of grids. Mixed treatment grids maintained a relatively high density of Monterey spineflower across all years. After masticate and burn treatment, Monterey spineflower occupied four of six grids in Year 1 and Year 3. Almost all masticate treatment grids had high densities of Monterey spineflower during Baseline surveys which decreased after treatment; however, Monterey spineflower was observed in most grids post-mastication showing that the species is still present.

Seaside bird's beak recruitment is consistently low across the southern and western extent of Unit B (Appendix B, Figure B-8). No seaside bird's beak were observed during Year 3 surveys of BLM Area B Unit B grids. Additionally, seaside bird's beak has only occupied one grid (density class 1) over the course of Baseline, Year 1, and Year 3 surveys (Figure 4-8). As a result of minimal species observations, conducting a PERMANOVA was not necessary to illustrate that post-treatment survey results are very similar to baseline survey results.

Table 4-1. Two-way PERMANOVA results for Monterey spineflower in BLM Area B Unit B, based on Bray distance matrices.

Factor	***F***	***p***
Age	2.70	0.016
Treat	2.32	0.052
Treat*Age	2.30	0.011

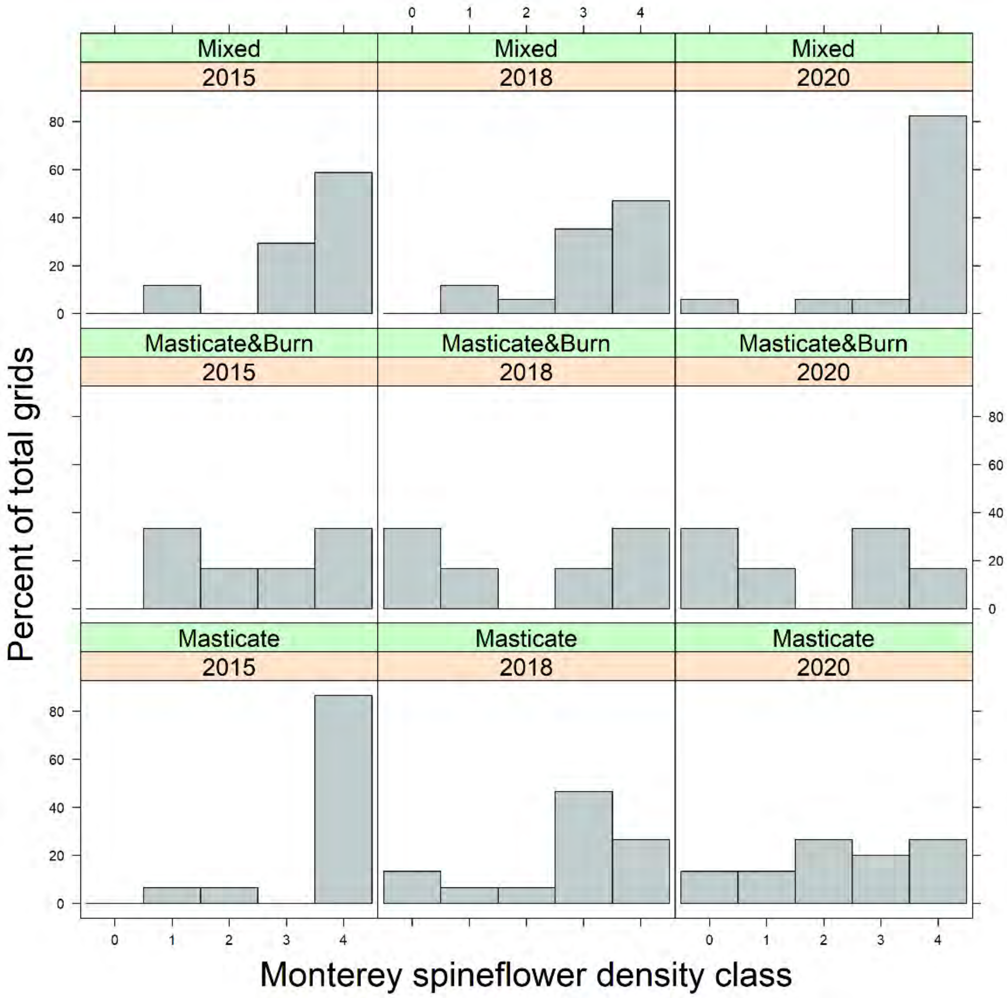

Figure 4-7. Percent of Total Grids for Monterey Spineflower Density Classes for All Treatment Types in Baseline (2015) and Year 3 (2020) in BLM Area B Unit B. Masticate grids n=15 grids, Masticate&Burn grids n=6 grids, Mixed grids n=17 grids.

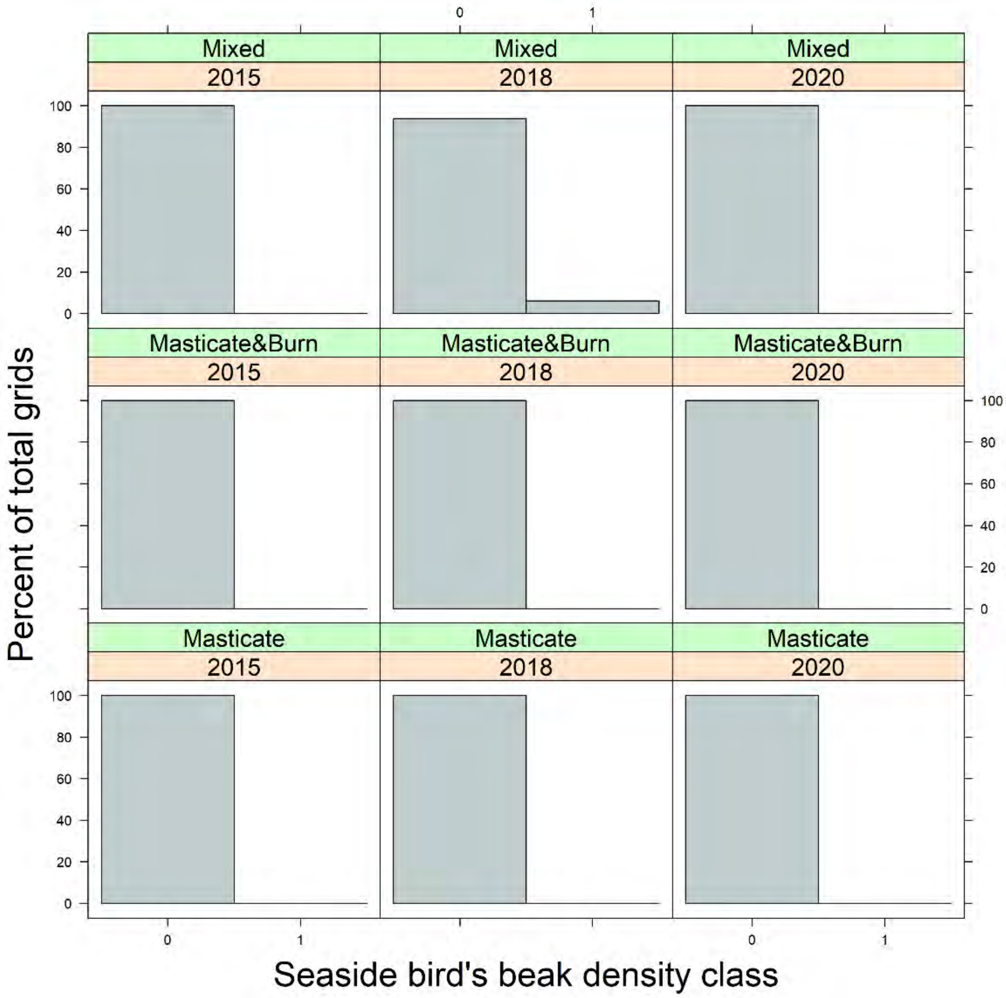

Figure 4-8. Percent of Total Grids for Seaside Bird's Beak Density Classes for All Treatment Types in Baseline (2015) and Year 3 (2020) in BLM Area B Unit B. Masticate grids n=15 grids, Masticate&Burn grids n=6 grids, Mixed grids n=17 grids.

4.4.6 Shrub Transect Monitoring

Shrub transects were sampled in BLM Area B Units B-3 West (*n*=6), B-3 East (*n*=11), A Southern Containment Line (*n*=7), B (*n*=26), C (*n*=14), and B-2A (*n*=3) in 2020 (Appendix C; Figures C-1 through C-6). Baseline transects were collected in 2015 for Units A Southern Containment Line, C, B-3 East, B-3 West, and B and in 1998 for Unit B-2A (Burleson, 2016; HLA, 1999). Additionally, two Baseline transects were collected in Unit B in 2000 (HLA, 2000). Data from Unit B-2A were evaluated separately from the other Year 3 units to reduce potential influence from differing Baseline data years.

The temporal patterns of broad-scale community response to mastication were generally congruent with past observations of the neighboring Units in the MRA (Tetra Tech and EcoSystems West, 2011 through 2015b; Burleson, 2016 through 2019b). Community structure parameters in all Year 3 units changed through time similarly in most cases.

Mixed-design ANOVAs were conducted to examine the effect of unit and age on mean percent cover, species richness, species evenness, and species diversity for Year 3 units except for Unit B-2A. Mean percent cover generally varied between units as did species evenness, species richness, and species diversity. These differences are illustrated in Figures 4-9 through 4-14 and are described in the text following Table 4-4. Age of the unit (Baseline vs. Year 3) appeared to influence total percent cover, species richness, and species diversity, where, generally, mean percent cover decreased from Baseline to Year 3, and species richness and species diversity generally increased. There was evidence that interactions between unit and age factors may contribute to differences seen between mean percent cover, species evenness, and species diversity (Table 4-2).

Mixed design ANOVAs were conducted on BLM Area B Units B and C to examine the effect of treatment on mean percent cover, species richness, species evenness, and species diversity. These two units were selected to assess treatment as these were the only Year 3 units with multiple treatments. Treatment appeared to influence differences in mean percent coverage in BLM Area B Unit C (Table 4-3). These differences are illustrated in Figure 4-13 where percent mean cover for burn transects and masticated transects increased after treatment while masticated and burned transects decreased. Treatment may also influence species evenness in BLM Area B Unit C as shown by a sharper decline in evenness after treatment in masticated and burned transects; however, during Year 3 surveys species evenness was relatively similar across all treatments (approximately 0.6) (Figure 4-13). Treatment did not appear to influence any community metrics in BLM Area B Unit B as all the transects reacted similarly over time regardless of treatment (Figure 4-12). It should be noted that BLM Area B Units B and C have unbalanced data by treatment types and the different sample sizes by treatment type may affect statistical results.

Table 4-2. Mixed-design ANOVA results for BLM Area B Units B-3 West, B-3 East, B, C, and A Containment Line.

Factor	Total Mean Cover		Species Richness		Species Evenness		Species Diversity	
	F	*P*	*F*	*p*	*F*	*p*	*F*	*p*
Unit	12.47	2.05e-07	1.209	0.317	3.796	0.008	3.692	0.010
Age	36.64	1.06e-07	105.4	9.44e-15	0.574	0.452	32.95	3.47e-07
Unit*Age	13.43	7.62e-08	1.839	0.133	2.959	0.027	4.283	0.004

Table 4-3. Mixed-design ANOVA results for BLM Area B Unit C. Eight transects received burn treatment, four transects received masticate and burn treatment, and two transects received masticate treatment.

Factor	Total Mean Cover		Species Richness		Species Evenness		Species Diversity	
	F	*P*	*F*	*p*	*F*	*p*	*F*	*p*
Treatment	4.614	0.035	1.600	0.246	4.53	0.003	1.603	0.245
Age	2.116	0.174	9.838	0.009	1.29	0.261	0.563	0.469
Treatment*Age	6.714	0.012	0.627	0.552	3.49	0.013	0.259	0.777

Table 4-4. Mixed-design ANOVA results for BLM Area B Unit B. Sixteen transects received burn treatment, seven transects received masticate and burn treatments, and three transected received mixed treatment.

Factor	Total Mean Cover		Species Richness		Species Evenness		Species Diversity	
	F	*P*	*F*	*p*	*F*	*p*	*F*	*p*
Treatment	0.500	0.690	0.397	0.677	0.061	0.941	0.126	0.882
Age	3.96	0.059	31.20	1.10e-05	7.269	0.013	24.32	5.52e-05
Treatment*Age	0.819	0.453	0.771	0.474	0.632	0.540	0.494	0.617

Year 3 units generally decreased in shrub cover between Baseline and 2020, three years after treatment (Figures 4-9 through 4-12 and 4-14; Table 4-2). Unit A Containment Line, B-3 West, B-3 East, and B-2A cover decreased from Baseline ($c_{A,\ Baseline}$ = 112%, $c_{B3W,\ Baseline}$ = 83.3%, $c_{B3E,\ Baseline}$ =115%, $c_{B2A,\ Baseline}$ = 92.9%) to Year 3 ($c_{A,\ Year3}$ =74.7%, $c_{B3W,\ Year\ 3}$ = 55.6%, $c_{B3E,\ Year\ 3}$ =72.1%, $c_{B2A,\ Year\ 3}$ =73.0%). Unit B cover on the burned transects decreased from 101% in Baseline years to 96.8%. Unit B cover decreased on the masticated and burned transects from 100.6% in Baseline years to 91.2%. Unit B cover decreased on the mixed transects (masticated and burned and masticated) from 99.1 % in Baseline years to 74.1%. Unit C shrub cover was potentially also influenced by treatment (Figure 4-13; Tables 4-3). Unit C cover on the burned transects increased from 110.3% in 2015 to 134.1%. Unit C cover on masticated transects decreased from 116.9% in 2015 to 93.4%. Unit C cover on masticated and burned transects increased from 104.5% in 2015 to 127%.

Year 3 units increased in species richness between Baseline and 2020, three years after treatment (Figures 4-9 through 4-11 and 4-14; Table 4-2). Unit A Containment Line, B-3 West, B-3 East, and B-2A species richness increased from Baseline ($S_{A,\ Baseline}$ = 6.14 species, $S_{B3W,\ Baseline}$ = 6.0 species, $S_{B3E,\ Baseline}$ =6.27 species, $S_{B2A,\ Baseline}$ = 6.0 species) to Year 3 ($S_{A,\ Year3}$ = 8.43 species, $S_{B3W,\ Year\ 3}$ = 11.17 species, $S_{B3E,\ Year\ 3}$ = 9.27 species, $S_{B2A,\ Year\ 3}$ = 8.0 species). Unit B and C species richness also increased regardless of treatment (Figures 4-12 and 4-13; Tables 4-3 and 4-4). Unit B richness for burned transects increased from 7.13 species in Baseline years to 10.56 species by 2020. Unit B richness for masticated and burned transects increased from 7.14 species in Baseline years to 9.43 species by 2020. Unit B richness for mixed transects (masticated and burned, and masticated) increased from 6 species in Baseline years to 10 species by 2020. Unit C richness for burned transects increased from 7.38 species in 2015 to 9.38 species by 2020. Unit C richness for masticated transects increased from 9 species in 2015 to 11 species by 2020. Unit C richness for masticated and burned transects increased from 6.5 species in 2015 to 10.25 species by 2020.

Year 3 units' species evenness remained relatively stable between Baseline and 2020 but variability of species evenness was observed between units (Figures 4-9 through 4-11 and 4-14; Table 4-2). Unit A Containment Line and Unit B-2A evenness decreased from Baseline ($J_{A,\ Baseline}$ = 0.55, $J_{B2A,\ Baseline}$ = 0.55) to Year 3 ($J_{A,\ Year\ 3}$ = 0.45, $J_{B2A,\ Year\ 3}$ = 0.52). Unit B-3 West and B-3 East evenness increased from Baseline ($J_{B3W,\ Baseline}$ = 0.67, $J_{B3E,\ Baseline}$ = 0.57) to Year 3 ($J_{B3W,\ Year\ 3}$ = 0.77, $J_{B3E,\ Year\ 3}$ = 0.61). Unit B evenness was similar between treatment and over time (Figure 4-12; Table 4-4). Unit B evenness for burned transects increased from 0.62 in Baseline years to 0.67 by 2020. Unit B evenness for masticated and burned transects increased from 0.60 in Baseline years to 0.71 by 2020. Unit B evenness for mixed transects (masticated and burned, and masticated) increased from 0.57 in Baseline years to 0.69 by 2020. Unit C evenness generally was more variable by treatment and by age (Figure 4-13; Table 4-3). Unit C evenness for burned transects increased from 0.57 in 2015 to 0.59 by 2020. Unit C evenness for masticated transects decreased from 0.65 in 2015 to 0.62 by 2020. Unit C evenness for masticated and burned transects decreased from 0.79 in 2015 to 0.63 by 2020.

Year 3 unit species diversity generally increased or remained stable between their Baseline and 2020, three years after mastication (Figures 4-9 through 4-11 and 4-14; Table 4-2). Unit A Containment Line diversity remained relatively stable from 0.98 in 2015 to 0.96 by 2020. Unit B-3 West, B-3 East, and B-2A diversity increased from Baseline ($H_{B3W,\ Baseline}$ = 1.15, $H_{B3E,\ Baseline}$ = 1.03, $H_{B2A,\ Baseline}$ = 0.96) to Year 3 ($H_{B3W,\ Year\ 3}$ = 1.9, $H_{B3E,\ Year\ 3}$ = 1.36, $H_{B2A,\ Year\ 3}$ = 1.07). Unit B and Unit C species diversities were generally similar between treatments within each unit (Figures 4-12 and 4-13; Tables 4-3 and4-4). Unit B diversity for burned transects increased from 1.21 in Baseline years to 1.56 by 2020. Unit B diversity for masticated and burned transects increased from 1.17 in Baseline years to 1.59 by 2020. Unit B diversity for mixed transects (masticated and burned, and masticated) increased from 1.0 in Baseline years to 1.58 by 2020. Unit C diversity for burned transects increased from 1.14 in 2015 to 1.33 by 2020. Unit C diversity for masticated transects increased from 1.43 in 2015 to 1.47 by 2020. Unit C diversity for masticated and burned transects increased from 1.42 in 2015 to 1.46 by 2020.

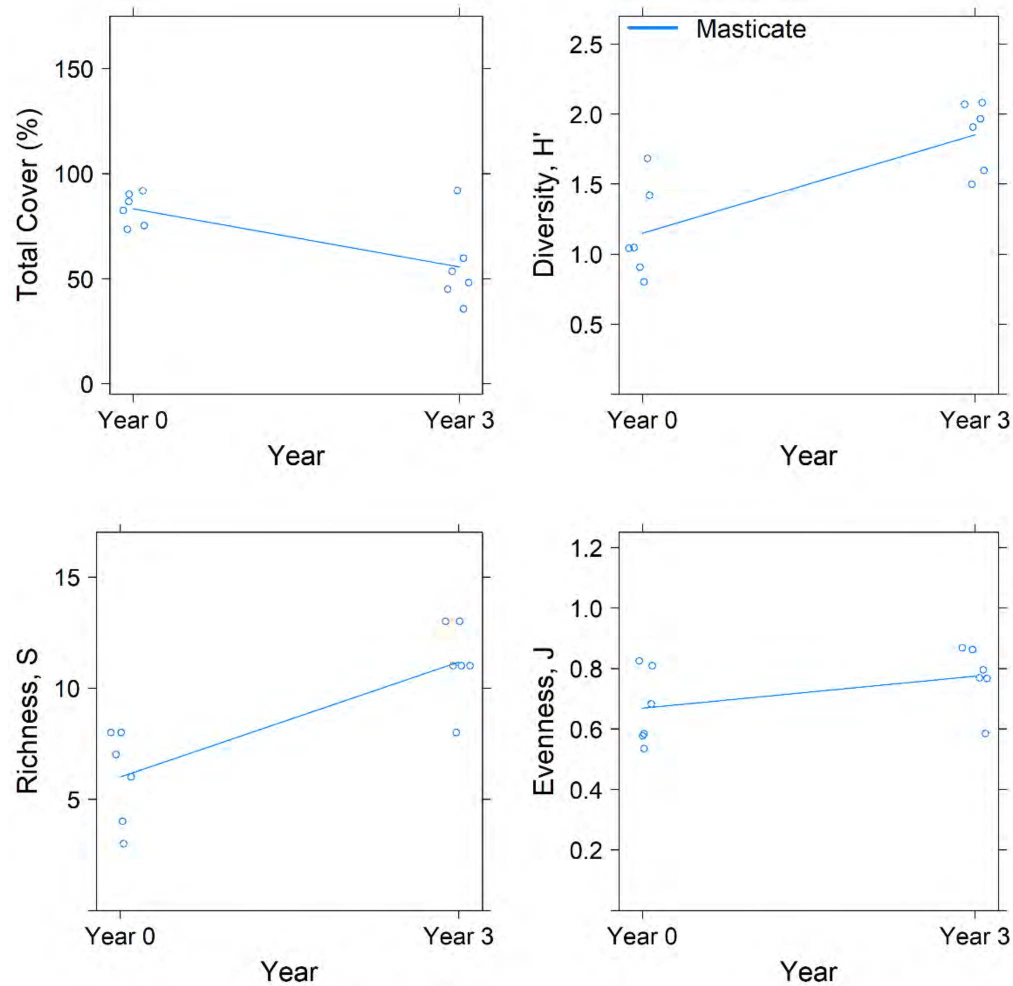

Figure 4-9. Unit B-3 West Community Structure from Baseline (2015) to Three Years After Mastication (2020). Six masticated transects were analyzed in Unit B-3 West.

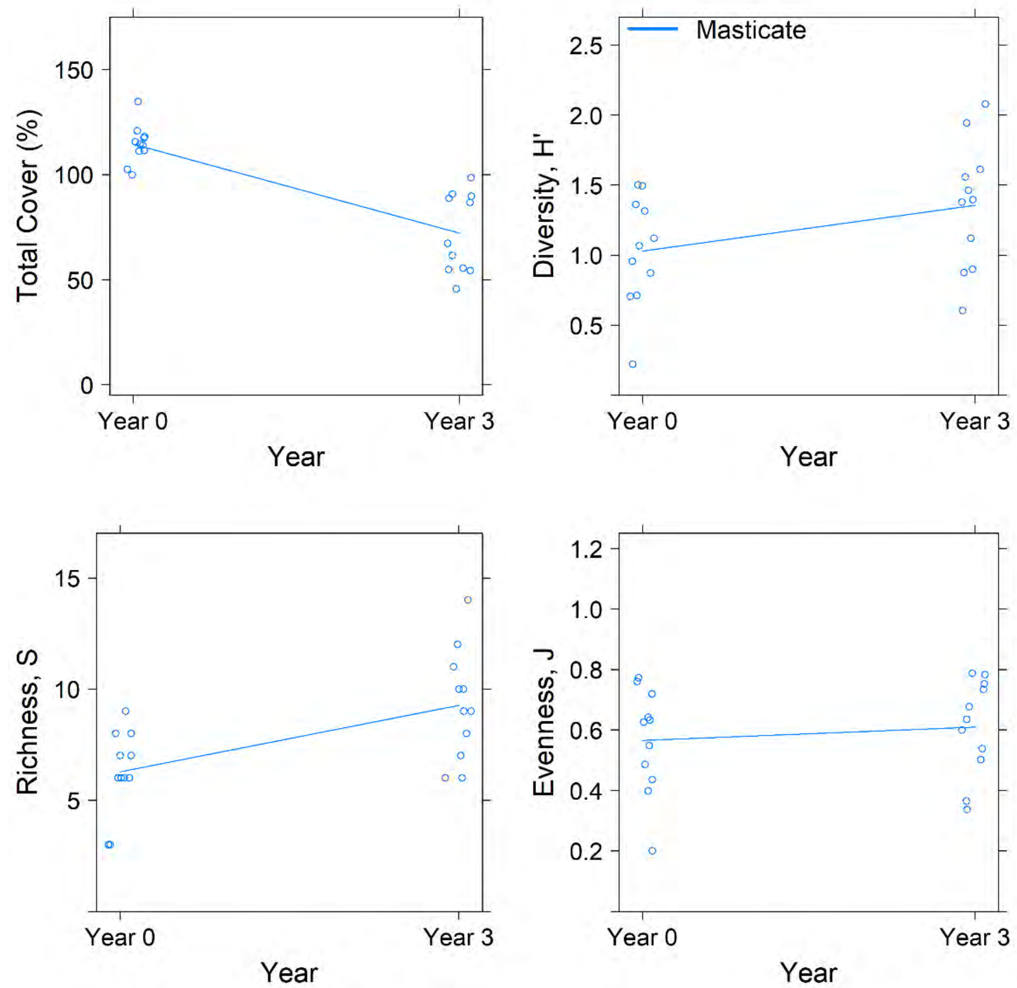

Figure 4-10. Unit B-3 East Community Structure from Baseline (2015) to Three Years After Mastication (2020). Eleven masticated transects were analyzed in Unit B-3 East.

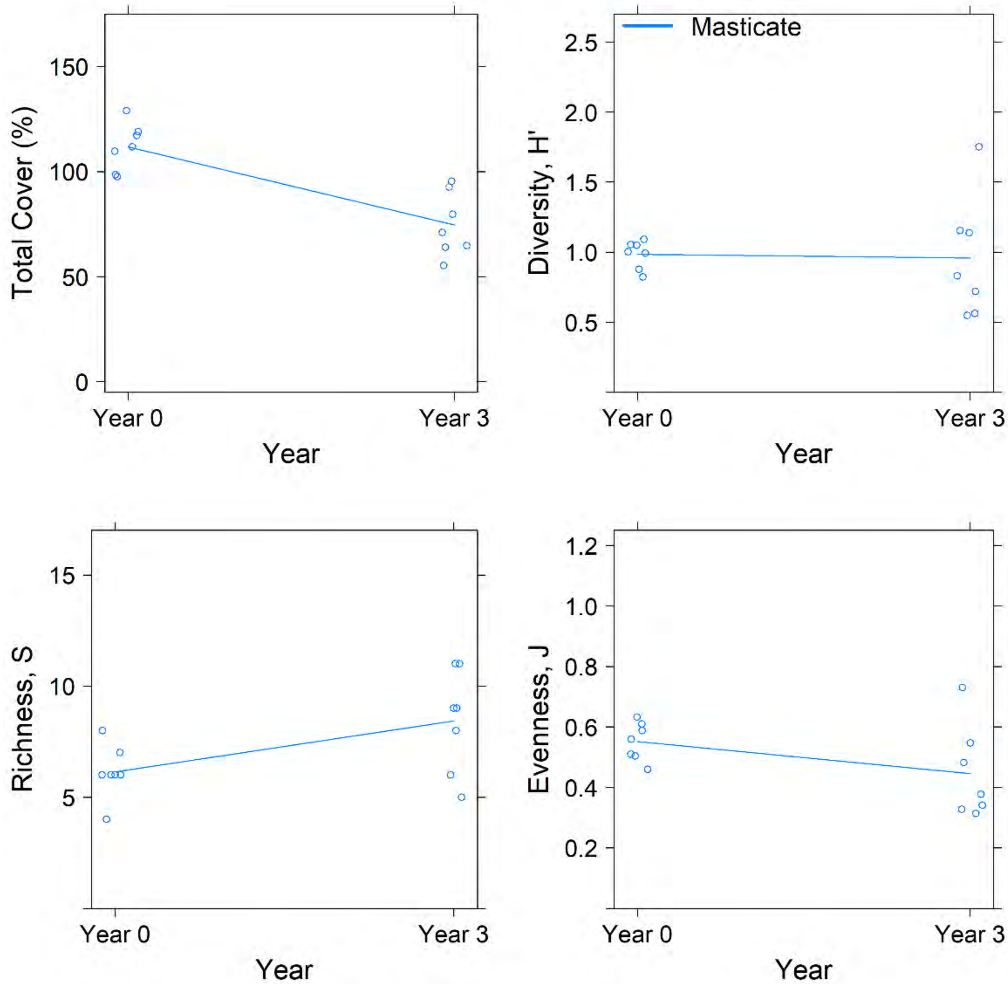

Figure 4-11. BLM Area B Unit A Containment Line Community Structure from Baseline (2015) to Three Years After Mastication (2020). Seven masticated transects were analyzed in BLM Area B Unit A Containment Line.

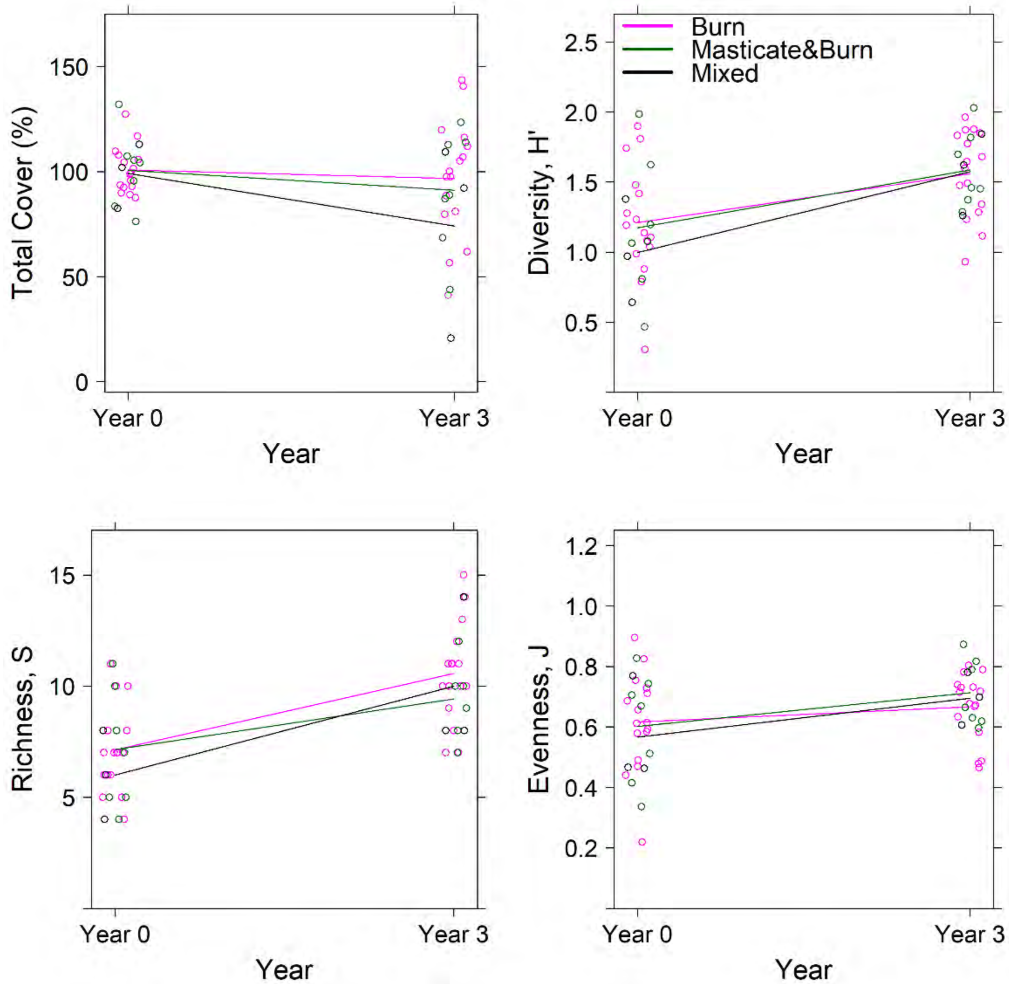

Figure 4-12. BLM Area B Unit B Community Structure from Baseline (2015 and 1999) to Three Years After Treatment (2020). Sixteen burned transects, seven masticated and burned transects, and three mixed (masticate and burn and masticate [2 transects]; masticate and burn and burn [1 transect]) transects were analyzed in BLM Area B Unit B.

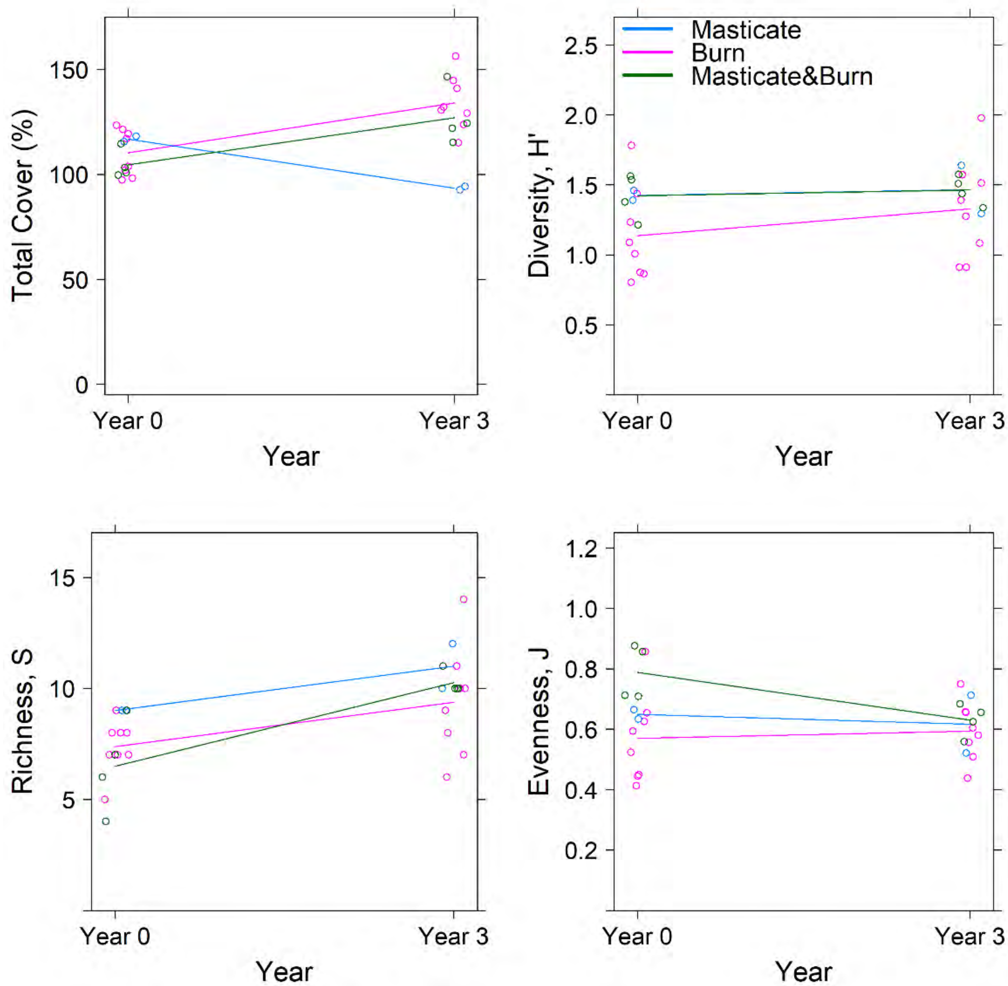

Figure 4-13. BLM Area B Unit C Community Structure from Baseline (2015) to Three Years After Treatment (2020). Eight burned transects, four masticated and burned transects, and two masticated transects were analyzed in BLM Area B Unit C.

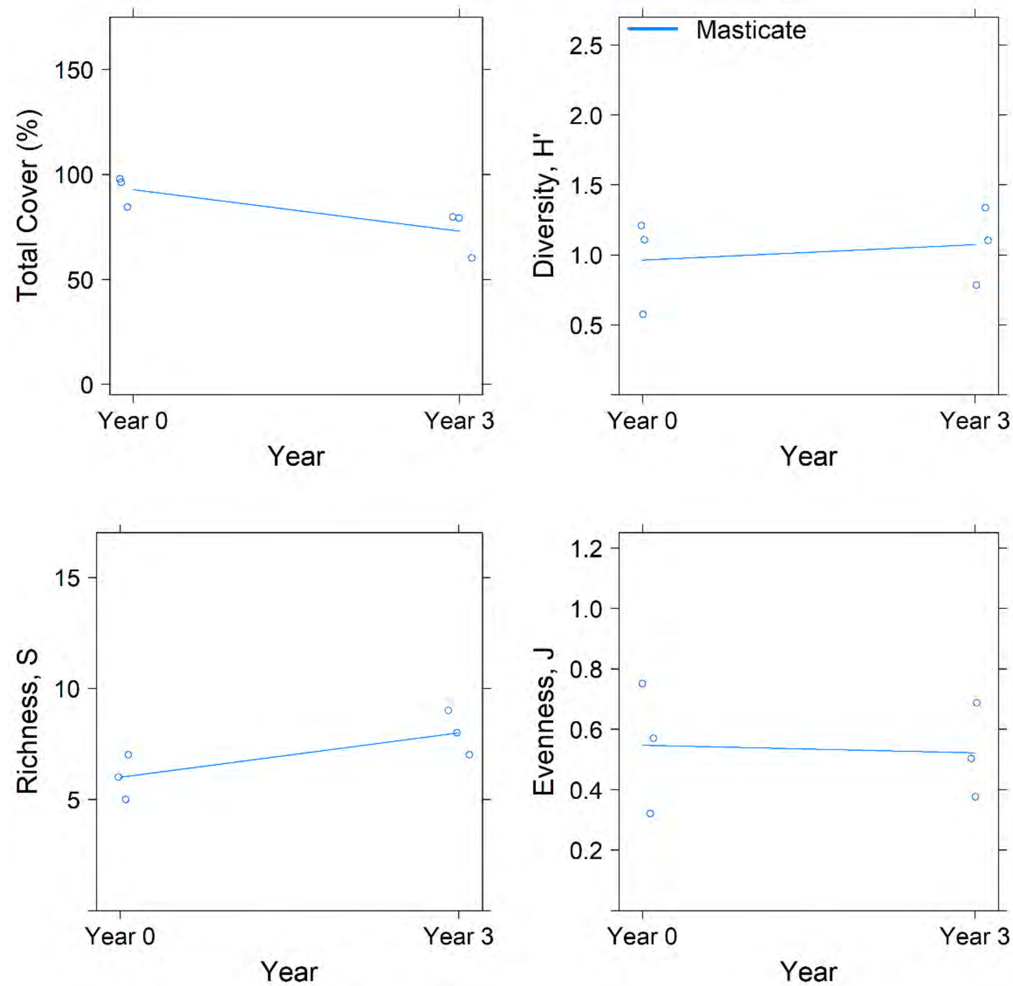

Figure 4-14. Unit B-2A Community Structure from Baseline (1998) to Three Years After mastication (2020). Three masticated transects were analyzed in Unit B-2A.

Bare ground and herbaceous cover generally increased through time for Year 3 units (Figures 4-15 through 4-20). Mixed-design ANOVAs were conducted to examine the effect of unit and age on mean percent bare ground and mean percent herbaceous cover. Percent bare ground herbaceous cover appeared to vary between units (Table 4-5). These differences are illustrated in Figures 4-15 through 4-20 and are described in the text following Table 4-7. Age of the unit (Baseline vs. Year 3) appeared to influence bare ground cover and herbaceous cover where bare ground and herbaceous cover increased after treatment. Additionally, there was evidence that interactions between unit and age factors may contribute to variation seen in bare ground coverage and herbaceous cover.

Mixed design ANOVAs were conducted on BLM Area B Units B and C to compare the effect of treatment through time on bare ground and herbaceous cover. Treatment did not appear to influence differences observed in bare ground coverage or herbaceous cover (Tables 4-6 and 4-7). Additionally, the changes in bare ground and herbaceous cover did not appear to be influenced by treatment in either BLM Area B Units B or C. All Unit B and Unit C transects generally reacted similarly over time regardless of treatment; however, Mixed treatment in Unit B had a slightly greater percent of bare ground in Year 3 than other treatments (Figures 4-18 and 4-19). In Unit C, there was evidence that interaction between treatment and age may affect bare ground and herbaceous cover response (Tables 4-6 and 4-7).

Table 4-5. Mixed-design ANOVA results for BLM Area B Units B-3 West, B-3 East, B, C, and A Containment Line bare ground and herbaceous cover.

Factor	Bare Ground		Herbaceous Cover	
	F	*p*	*F*	*p*
Unit	10.83	1.19e-6	7.52	5.75e-5
Age	52.39	1.07e-9	46.64	5.25e-9
Unit*Age	2.934	0.029	8.930	1.04e-5

Table 4-6. Mixed-design ANOVA results for BLM Area B Unit B bare ground and herbaceous cover.

Factor	Bare Ground		Herbaceous Cover	
	F	*p*	*F*	*p*
Treatment	2.196	0.134	0.260	0.773
Age	15.41	6.77e-4	11.21	0.003
Treatment*Age	1.799	0.188	0.045	0.956

Table 4-7. Mixed-design ANOVA results for BLM Area B Unit C bare ground and herbaceous cover.

Factor	Bare Ground		Herbaceous Cover	
	F	*p*	*F*	*p*
Treatment	2.216	0.155	2.863	0.100
Age	16.37	0.019	8.134	0.016
Treatment*Age	4.245	0.043	3.587	0.063

Year 3 units bare ground cover varied between units and through time from Baseline to 2020 (Figures 4-15 through 4-20; Table 4-5). Units B-3 West, B-3 East, A Containment Line, and B-2A all increased from 22%, 5%, 5%, and 9% in Baseline years to 36%, 19%, 30%, and 22% in 2020, respectively.

Treatment generally did not appear to influence bare ground coverage as bare ground varied similarly between treatments within Units B or C except for Year 3 Mixed treatment transects in Unit B. The Mixed treatment transects in Year 3 contained over double the bare ground percent cover of other Unit B treatments (Figures 4-18 and 4-19). In Unit B, bare ground on Burned transects increased from 12% in Baseline years to 20% in 2020. Bare ground on Masticated and Burned transects increased from 12% in Baseline years to 21% in 2020. Bare ground on Mixed Treatment transects increased from 12% in Baseline years to 44% in 2020. In Unit C, bare ground on Burned transects increased from 5% in Baseline years to 9% in 2020. Bare ground on Masticated and Burned transects increased from 10% in Baseline years to 12% in 2020. Bare ground on Masticated transects increased from 2% in Baseline years to 18% in 2020.

Year 3 units herbaceous cover varied between units and through time from Baseline to 2020 (Figures 4-15 through 4-20; Table 4-5). Units B-3 West, B-3 East, A Containment Line, and B-2A all increased from 0.4%, 0.3%, 0.3%, and 4% in Baseline years to 17%, 32%, 4%, and 21% in 2020, respectively.

Treatment generally did not appear to influence herbaceous cover as it varied similarly between treatments within Units B or C except for Year 3 Mixed treatment transects in Unit B. The Mixed treatment transects in Year 3 contained over double the bare ground percent cover of other Unit B treatments (Figures 4-18 and 4-19). In Unit B, herbaceous cover on Burned transects increased from 1% in Baseline years to 14% in 2020. Herbaceous cover on Unit B Masticated and Burned transects increased from 1% in Baseline years to 12% in 2020. Herbaceous cover on Unit B Mixed Treatment transects increased from 4% in Baseline years to 18% in 2020. In Unit C, herbaceous cover on Burned transects increased from 0.1% in Baseline years to 1% in 2020. Herbaceous cover on Unit C Masticated and Burned transects increased from 0.4% in Baseline years to 2% in 2020. Herbaceous cover on Unit C Masticated transects increased from 0% in Baseline years to 8% in 2020.

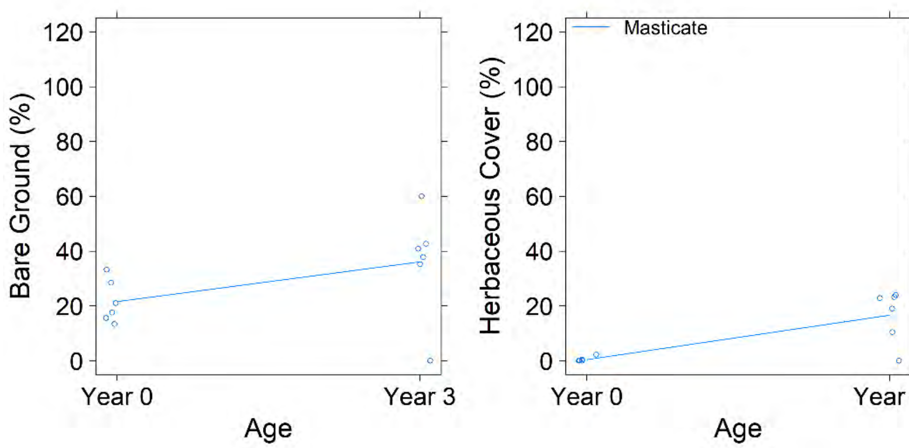

Figure 4-15. Unit B-3 West Bare Ground and Herbaceous Cover Between Baseline (2015) and Year 3 (2020). Six masticated transects were analyzed in Unit B-3 West.

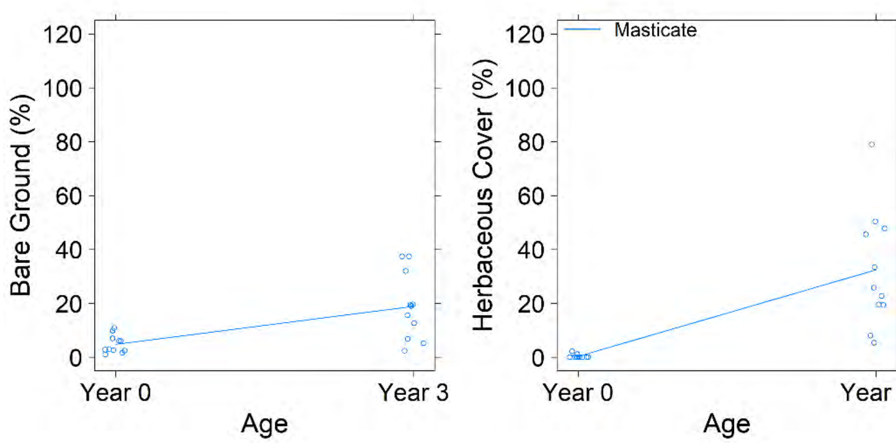

Figure 4-16. Unit B-3 East Bare Ground and Herbaceous Cover from Baseline (2015) and Year 3 (2020). Eleven masticated transects were analyzed in Unit B-3 East.

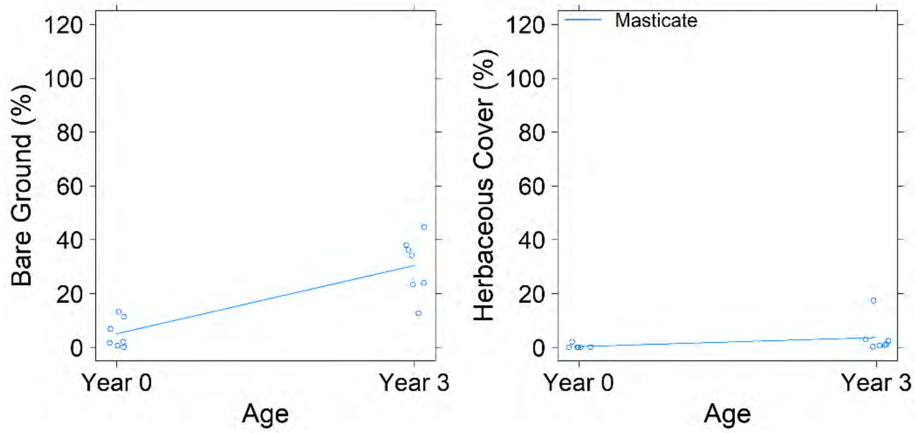

Figure 4-17. BLM Area B Unit A Bare Ground and Herbaceous Cover from Baseline (2015) and Year 3 (2020). Seven masticated transects were analyzed in Unit A.

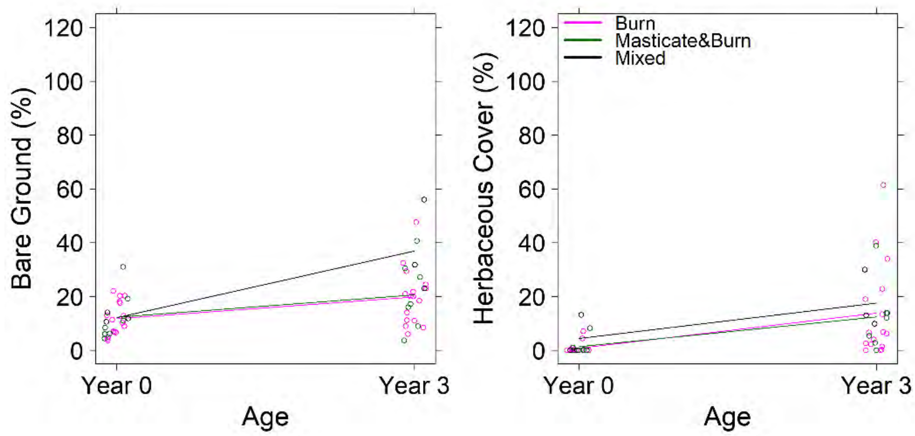

Figure 4-18. BLM Area B Unit B Bare Ground and Herbaceous Cover from Baseline (2015 & 1999) and Year 3 (2020). Sixteen burned transects, seven masticated and burned transects, and three mixed (masticated, and masticated and burned) transects were analyzed in Unit B.

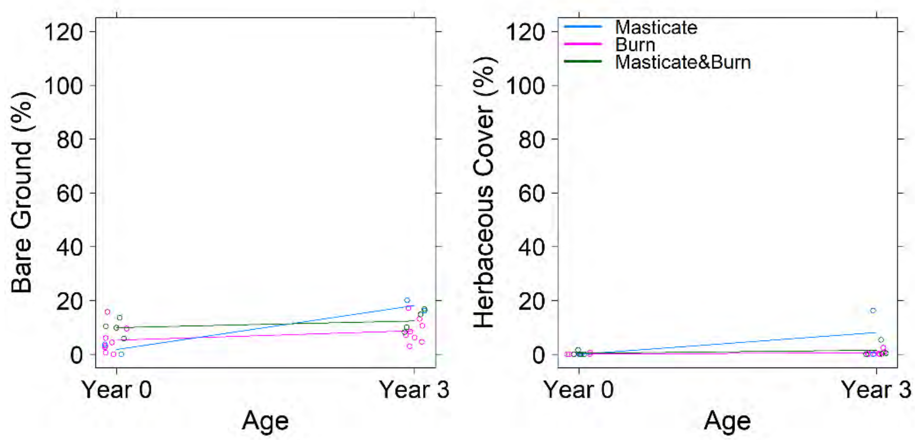

Figure 4-19. BLM Area B Unit C Bare Ground and Herbaceous Cover from Baseline (2015) and Year 3 (2020). Eight burned transects, four masticated and burned transects, and two masticated transects were analyzed in Unit C.

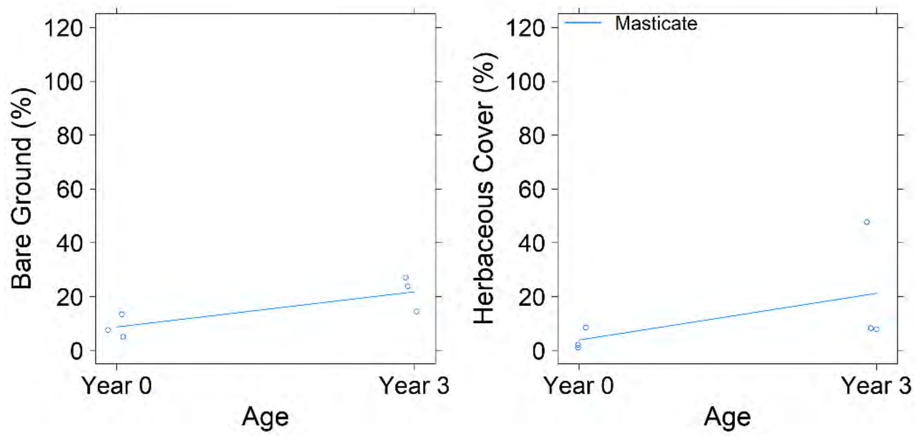

Figure 4-20. Unit B-2A Bare Ground and Herbaceous Cover from Baseline (1998) and Year 3 (2020). Three masticated were analyzed in Unit B-2A.

Burleson conducted PERMANOVA to examine differences in community composition among age treatments, and units (Table 4-8) These results suggest that overall community composition differences were influenced by unit and age (Baseline vs. Year 3), and there was evidence for interaction between units and age that affected community composition. This indicates that the types and abundances of species within each Unit were different and that composition varied through time. Rank abundance curves illustrate the species composition in each Unit through time (Figures 4-21 through 4-26). Additionally, there was evidence that interactions between unit and age factors and potentially between age and treatment factors may contribute to variation seen in community compositions.

PERMANOVAs were conducted to evaluate differences in community composition among treatments in Units B and C where more than one treatment was applied (Tables 4-9 and 4-10). Between treatments in Unit B, community composition generally varied similarly (Table 4-9, Figure 4-24). Between treatments in Unit C, community composition was more disparate (Table 4-10, Figure 4-25).

Table 4-8. Three-way PERMANOVA results for Units B-3 West, B-3 East, A, B, and C community compositions, based on Bray-Curtis distance matrices.

Factor	***F***	***p***
Age	45.70	0.0001
Unit	12.80	0.0001
Treat	1.916	0.0781
Unit*Age	5.465	0.0001
Unit*Treat	1.299	0.2334
Age*Treat	1.952	0.0759
Unit*Age*Treat	0.905	0.4802

Table 4-9. Two-way PERMANOVA results for Unit B community composition, based on Bray-Curtis distance matrices.

Factor	*F*	*p*
Age	25.52	0.0001
Treat	1.150	0.308
Age*Treat	1.010	0.377

Table 4-10. Two-way PERMANOVA results for Unit C community composition, based on Bray-Curtis distance matrices.

Factor	*F*	*p*
Age	31.16	0.0001
Treat	3.283	0.0420
Age*Treat	2.954	0.0525

Community composition differs between Year 3 units over time (Figures 4-21 through 4-26). BLM Area B Unit A transects were dominated by shaggy-barked manzanita during the Baseline Year (c_{UA} = 78%) which remained the dominant species during Year 3 survey (c_{UA} = 55%). Units B-3 East and B-2A were dominated by chamise during Baseline Year surveys (c_{UB3E} = 55%, c_{UB2A} = 36.9%). By Year 3 Unit B-3 East remained dominated by chamise (c_{UB3E} = 30%) and Unit B-2A was dominated by shaggy-barked manzanita (c_{UB2A} = 29.5%). During Baseline, Unit B-3 West was dominated by sandmat manzanita (c_{UB3W} = 40%); however, by Year 3 the dominant species was peak rush rose (*Crocanthemum scoparium*) (c_{UB3W} = 11%).

Community composition was generally similar among treatments in BLM Area B Unit B (Figure 4-24). During Baseline surveys, shaggy-barked manzaninta was the dominant species along burn (burn transects c_{UB} = 46%) and masticate and burn transects (masticate&burn transects c_{UB} = 56%); and while Hooker's manzanita was the dominant species along mixed transects (mixed transects c_{UB} = 27%), shaggy-barked manzanita covered on average 20 percent of the mixed treatment transects (third most dominate shrub species). Dwarf ceanothus (*Ceanothus dentatus*) became the most dominant species after treatment in year 3 along burn (burn transects c_{UB} = 35%) and masticate and burn transects (masticate&burn transects c_{UB} = 36%). On average deerweed was the most dominate species along Mixed treatment transects followed closely by peak-rush rose (mixed treatment ACGL c_{UB} = 24%; mixed treatment CRSC c_{UB} = 23%).

BLM Area B Unit C community compositions appeared different among treatment (Figure 4-25). During Baseline surveys, shaggy-barked manzanita was the dominant species across all treatments (burn transects c_{UC} = 70%, masticate&burn transects c_{UC} = 46%, masticated transects c_{UC} = 59%). Shaggy-barked manzanita remained the dominant species on the masticated transects in Year 3 (masticated transects c_{UC} = 47%); however, dwarf ceanothus was the dominant species among burned transects (burn transects c_{UC} = 69%) and peak rush rose was the dominant species among masticated and burned transects (masticate&burn transects c_{UC} = 43%).

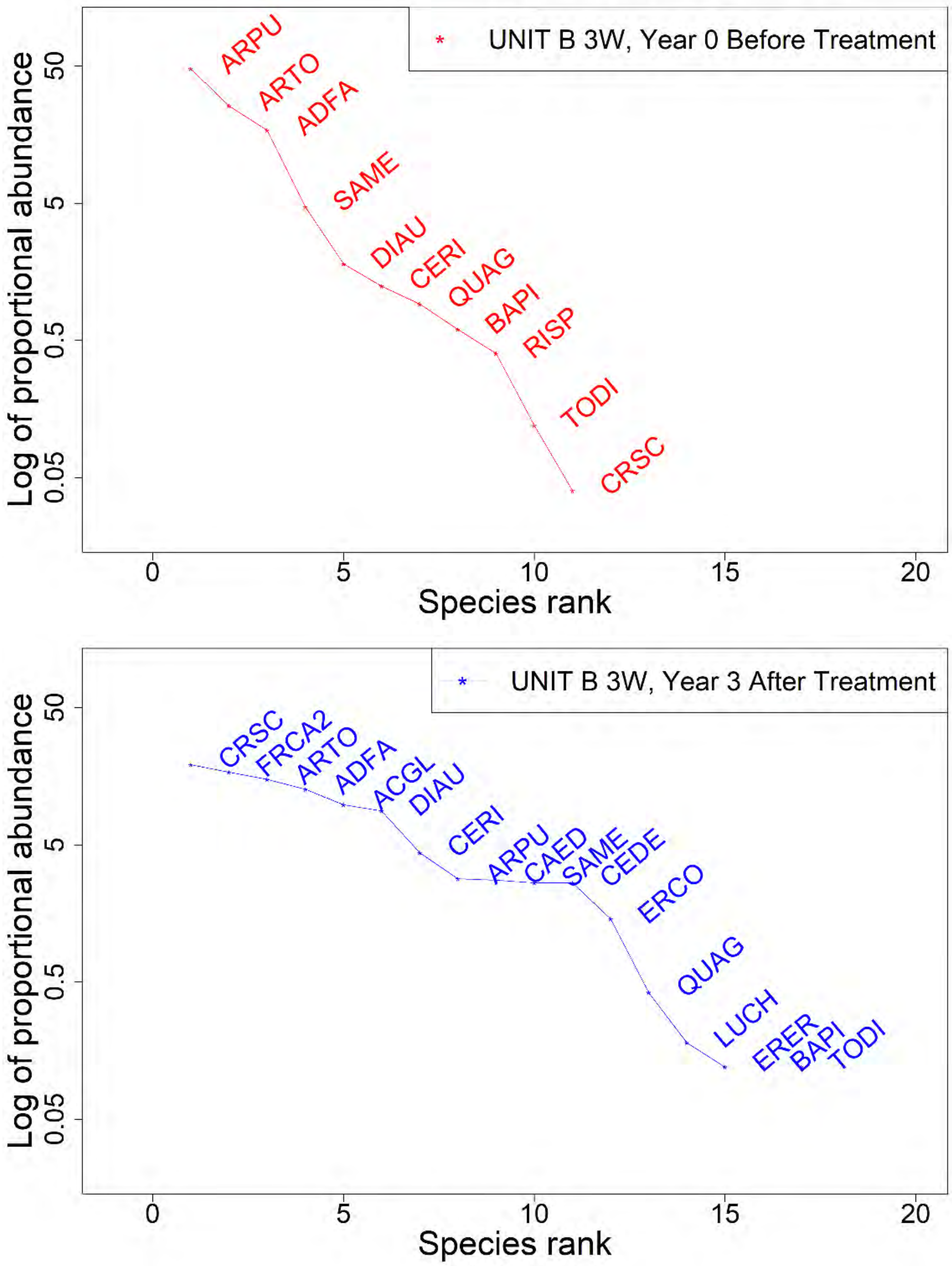

Figure 4-21. Unit B-3 West Rank Abundance Curves Between Pre-mastication (2015) and Year 3 (2020). New species present in Year 3 surveys include deerweed (*Acmispon glaber*), golden yarrow (*Eriophyllum confertiflorum*), mock heather (*Ericameria ericoides*), and silver beach lupine (*Lupinus chamissonis*). Species present in Baseline surveys, but absent in Year 3 was fuchsia-flowered gooseberry (*Ribes speciosum*). Six masticated transects were analyzed in Unit B-3 West. Note that the y-axis is log-10 scale.

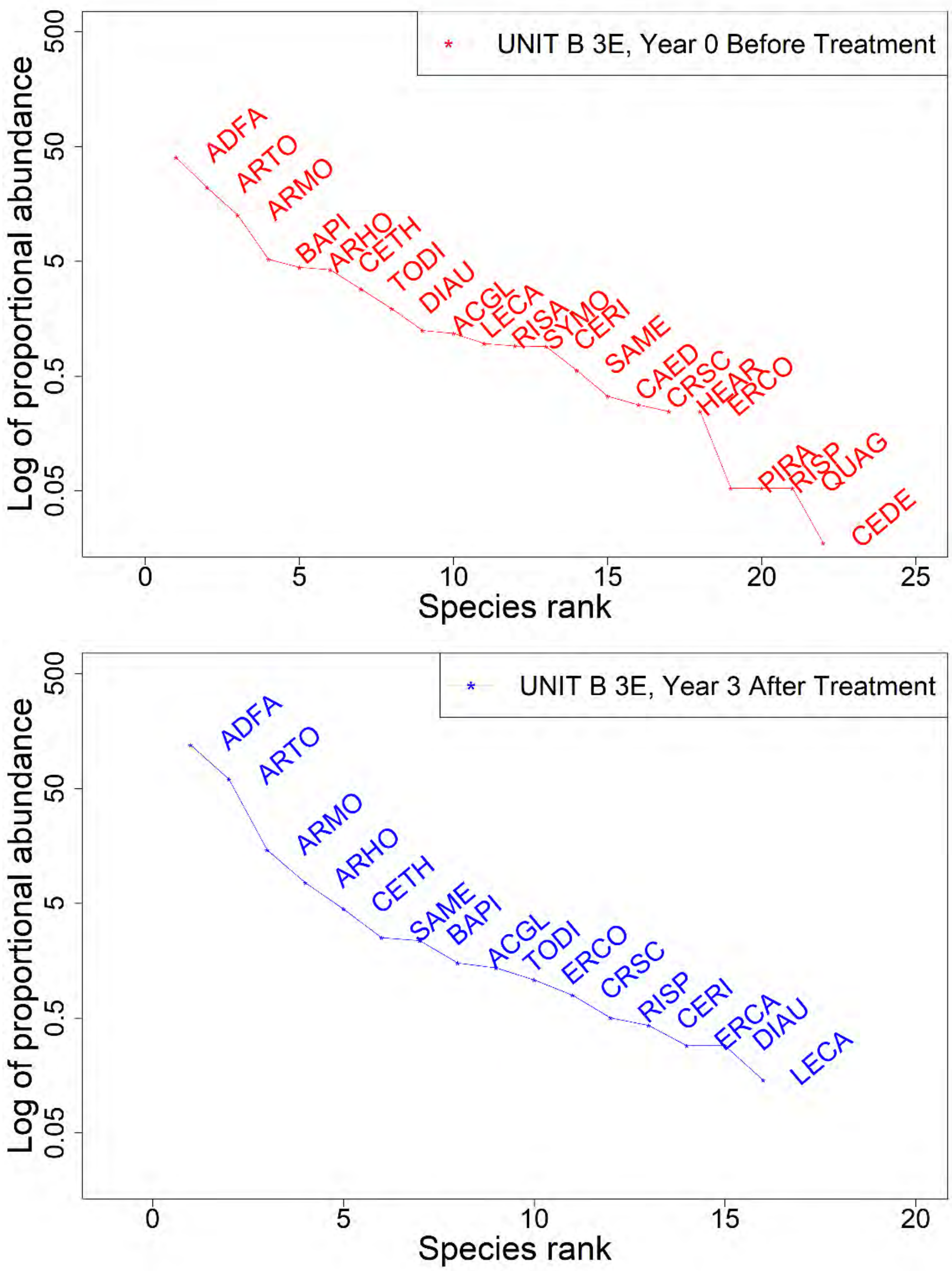

Figure 4-22. Unit B-3 East Rank Abundance Curves Between Pre-mastication (2015) and Year 3 (2020). New species present in Year 3 surveys include yerba santa (*Eriodictyon californicum*). Species present in Baseline surveys, but absent in Year 3 include iceplant, dwarf ceanothus, toyon, Monterey pine, coast live oak, red flowering currant, and creeping snowberry (*Symphoricarpos mollis*). Eleven masticated transects were analyzed in Unit B-3 East. Note that the y-axis is log-10 scale.

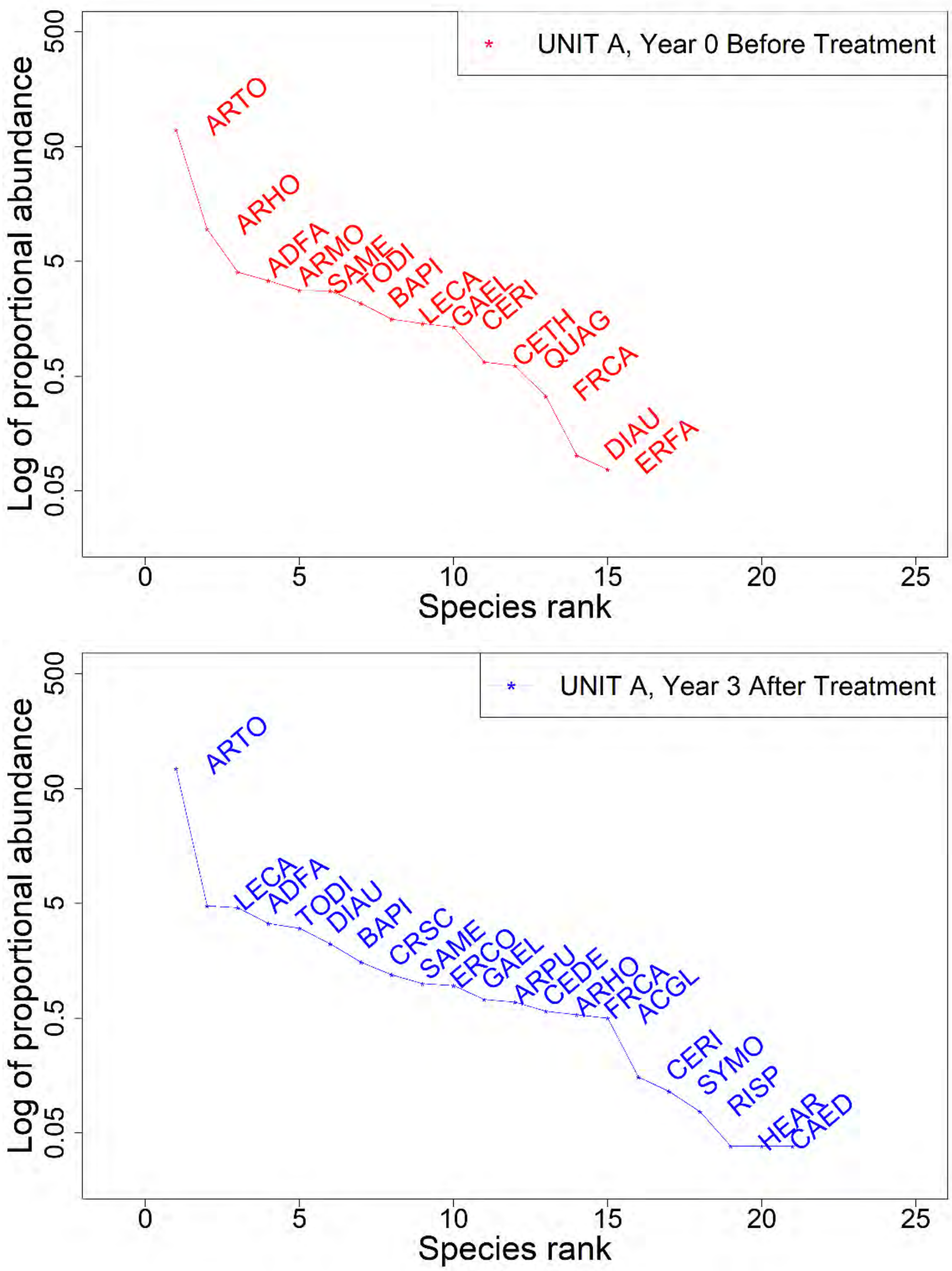

Figure 4-23. BLM Area B Unit A Rank Abundance Curves Between Pre-mastication (2015) and Year 3 (2020). New species present in Year 3 surveys include deerweed, sandmat manzanita, iceplant, dwarf ceanothus, peak rush rose, golden yarrow, toyon (*Heteromeles arbutifolia*), fuchsia-flowered gooseberry, and creeping snowberry. Species present in Baseline surveys, but absent in Year 3 include Toro manzanita, blue blossom (*Ceanothus thyrsiflorus*), and Eastwood's goldenbush. Seven masticated transects were analyzed in Unit A. Note that the y-axis is log-10 scale.

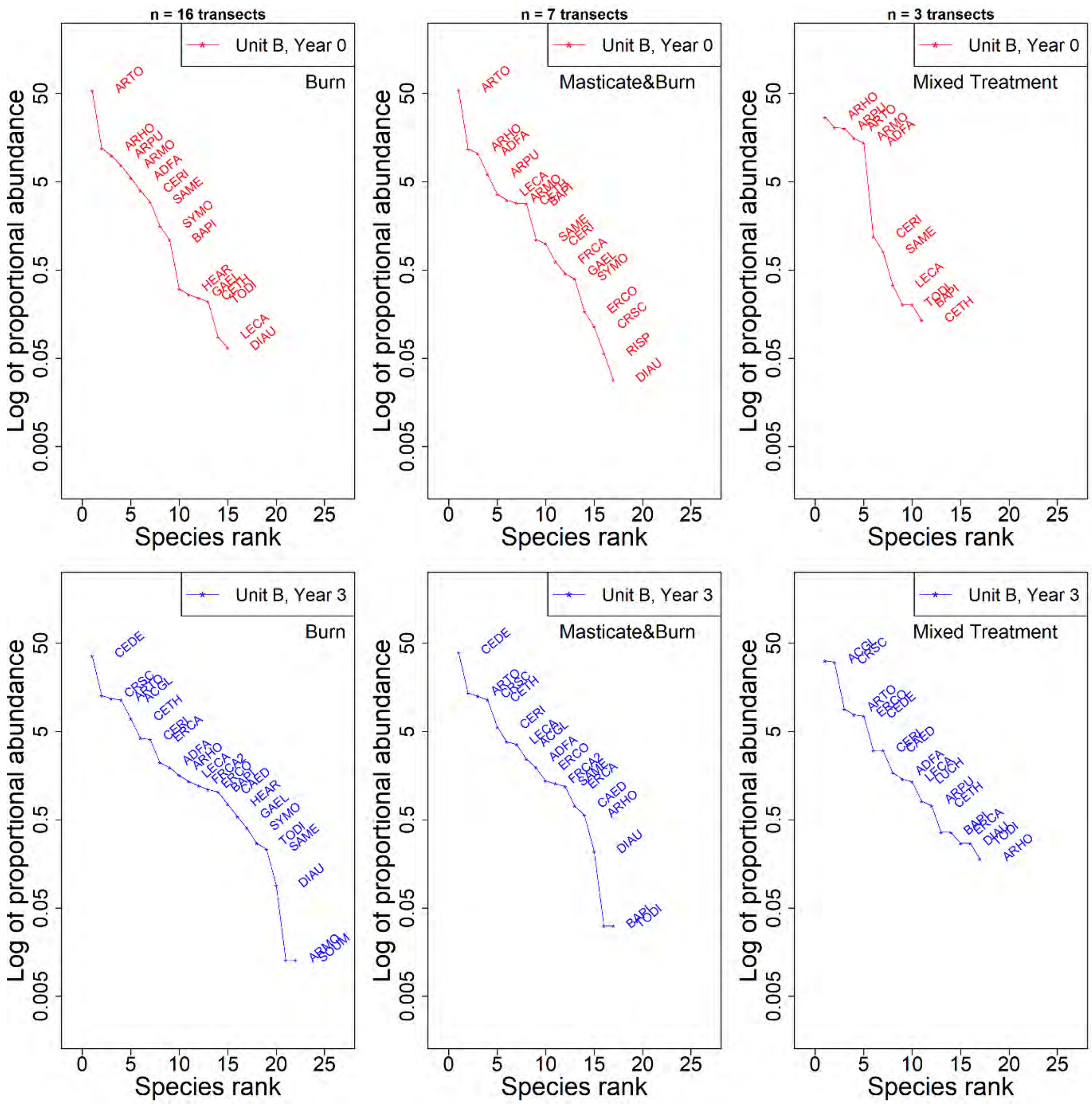

Figure 4-24. BLM Area B Unit B Rank Abundance Curves Between Pre-Treatment (2015 & 1999 [two transects]) and Year 3 (2020). The left column represents burned transects (n=16 transects). New species present in burned Year 3 surveys include peak rush-rose, deerweed, yerba santa, golden yarrow, iceplant, dwarf ceanothus, blue witch (*Solanum umbelliferum*), and California flannel bush (*Fremontodendron californicum*). Species present in Baseline surveys, but absent in burned Year 3 include sandmat manzanita. The middle column represents masticated and burned transects (n=7 transects). New species present in masticated and burned Year 3 surveys include dwarf ceanothus, deerweed, California flannel bush, yerba santa, iceplant, and poison oak (*Toxicodendron diversilobum*). Species present in Baseline surveys, but absent in masticated and burned Year 3 include sandmat manzanita, Monterey manzanita, California coffeeberry (*Frangula californica*), coast silk tassel (*Garrya elliptica*), and fuchsia-flowered gooseberry. The right column represents mixed treatment transects (n=3 transects). New species present in mixed treatment Year 3 surveys include deerweed, peak rush-rose, golden yarrow, dwarf ceanothus, iceplant, silver beach lupine, yerba santa, and sticky monkeyflower. Species present in Baseline surveys, but absent in mixed treatment Year 3 include Monterey manzanita and black sage (*Salvia mellifera*). Note that the y-axis is log-10 scale.

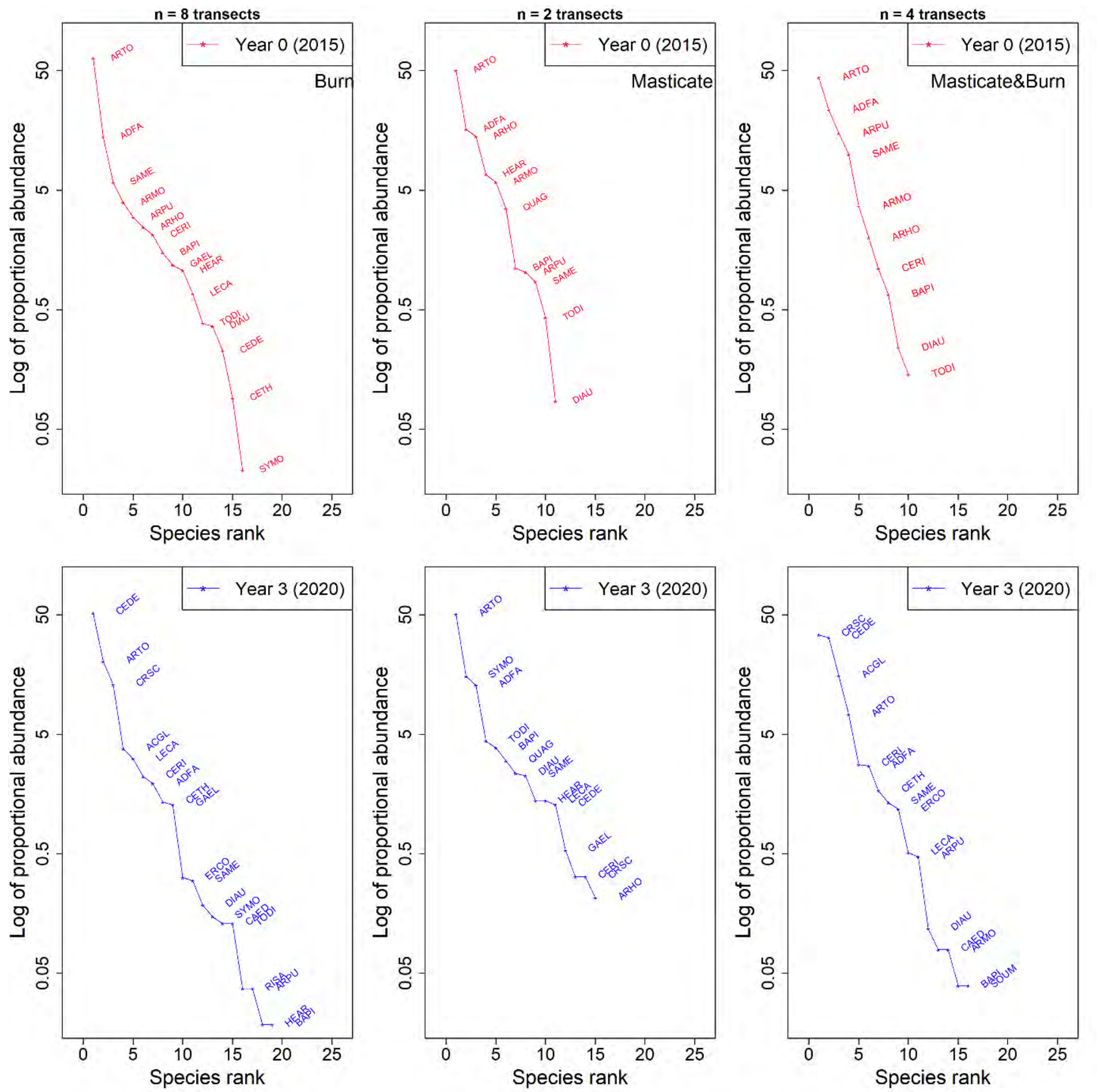

Figure 4-25. BLM Area B Unit C Rank Abundance Curves Between Pre-Treatment (2015) and Year 3 (2020). The left column represents burned transects (n=8 transects). New species present in burned Year 3 surveys include deerweed, iceplant, peak rush rose, golden yarrow, and red flowering currant (*Ribes sanguineum*). Species present in Baseline surveys, but absent in burned Year 3 include Hooker's manzanita and Toro manzanita. The middle column represents masticated transects (n= 2 transects). New species present in masticated Year 3 surveys include dwarf ceanothus, Monterey ceanothus, peak rush rose, coast silk tassel, pitcher sage (*Lepechinia calycina*), and creeping snowberry. Species present in Baseline surveys, but absent in masticated Year 3 include Toro manzanita and sandmat manzanita. The right column represents masticated and burned transects (n=4 transects). New species present in masticated and burned Year 3 surveys include deerweed, iceplant, dwarf ceanothus, blue blossom, peak rush rose, golden yarrow, pitcher sage, and blue witch. Species present in Baseline surveys, but absent in masticated and burned Year 3 include Hooker's manzanita, Monterey ceanothus, and poison oak. Note that the y-axis is log-10 scale.

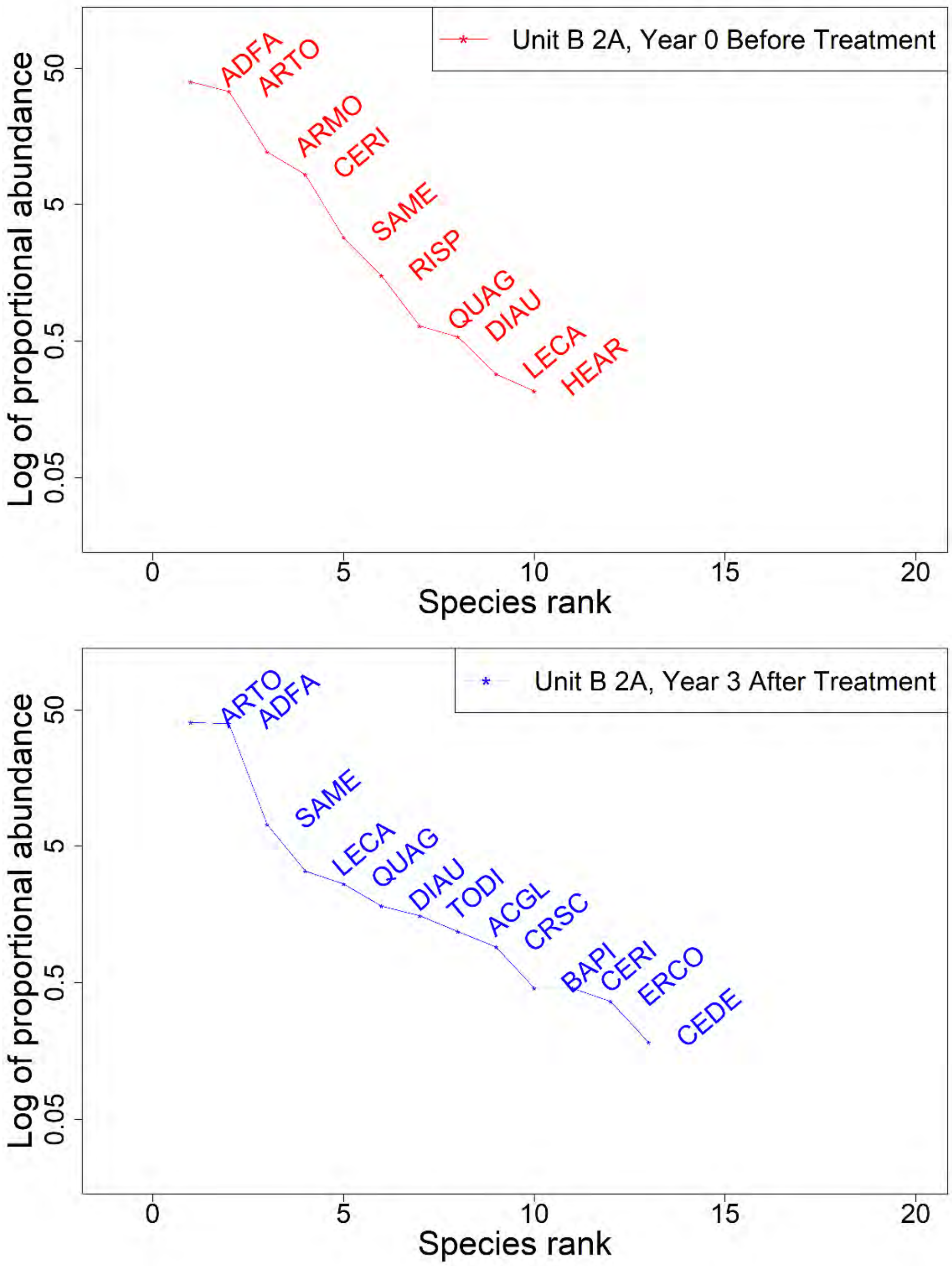

Figure 4-26. Unit B-2A Rank Abundance Curves Between Pre-Masticated (1998) and Year 3 (2020). New species present in Year 3 surveys include deerweed, coyote brush (*Baccharis pilularis*), dwarf ceanothus, peak rush rose, golden yarrow, and poison oak. Species present in Baseline surveys, but absent in Year 3 include Toro manzanita, toyon, and fuchsia-flowered gooseberry. Three transects were analyzed in Unit B-2A. Note that the y-axis is log-10 scale.

The HMP shrub species present in Year 3 units varied by unit and treatment, and their recovery tended to occur at a slower rate than dominant species (Figures 4-27 through 4-32). Unit B-3 West HMP species in Baseline were sandmat manzanita and Monterey ceanothus which were present in Year 3 surveys. Unit B-3 East HMP species in Baseline were Hooker's manzanita, Toro manzanita, and Monterey ceanothus which were present in Year 3 surveys. BLM Area B Unit A HMP species in Baseline were

Hooker's manzanita, Toro manzanita, Monterey ceanothus, and Eastwood's goldenbush. In Year 3, Toro manzanita and Eastwood's goldenbush were not observed in Unit A; sandmat manzanita was newly observed, and Hooker's manzanita and Monterey ceanothus were present. Unit B-2A HMP species in Baseline (1998) were Toro manzanita and Monterey ceanothus of which only Monterey ceanothus was observed in Year 3.

BLM Area B Unit B HMP species were not evaluated separately by treatment since composition did not differ by Treatment. Hooker's manzanita, Toro manzanita, sandmat manzanita, and Monterey ceanothus were present during Baseline surveys and were also present during Year 3 surveys.

BLM Area B Unit C HMP species were evaluated by treatment since composition varied by treatment. During Baseline surveys of the burned transects, Hooker's manzanita, Toro manzanita, sandmat manzanita, and Monterey ceanothus were present of which sandmat manzanita and Monterey ceanothus were also present in Year 3. Hooker's manzanita and Toro manzanita were not observed along burned transects during Year 3 surveys. During Baseline surveys of the masticated and burned transects, Hooker's manzanita, Toro manzanita, sandmat manzanita, and Monterey ceanothus were present of which only Toro manzanita and sandmat manzanita were present in Year 3. Hooker's manzanita and Monterey ceanothus were not observed on masticated and burned transects during Year 3 surveys. During Baseline surveys of the masticated transects, Hooker's manzanita, Toro manzanita, and sandmat manzanita were present of which only Hooker's manzanita was present in Year 3. Toro manzanita and sandmat manzanita were not observed on masticated transects during Year 3 surveys.

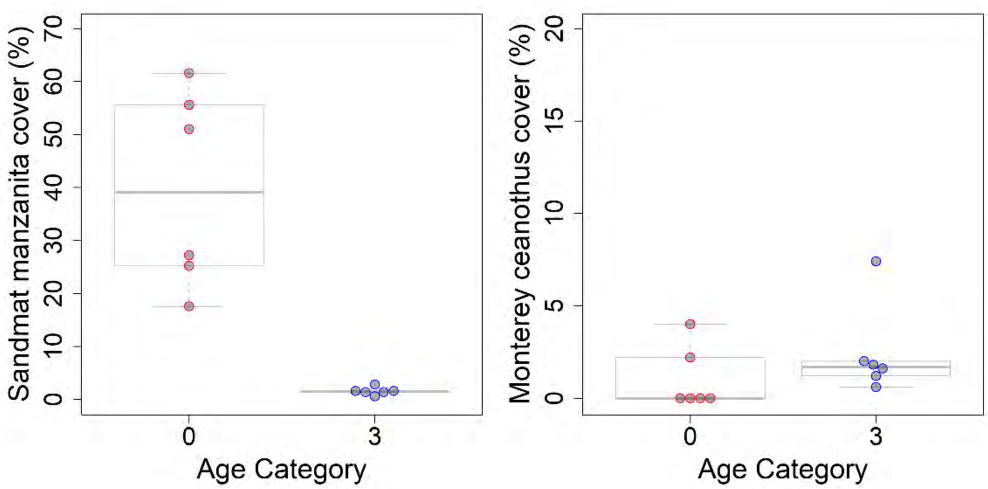

Figure 4-27. Unit B-3 West HMP Shrub Species Cover Between Baseline (2015) and Year 3 (2020). Scales Not Equivalent. The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Six masticated transects were analyzed in Unit B-3 West.

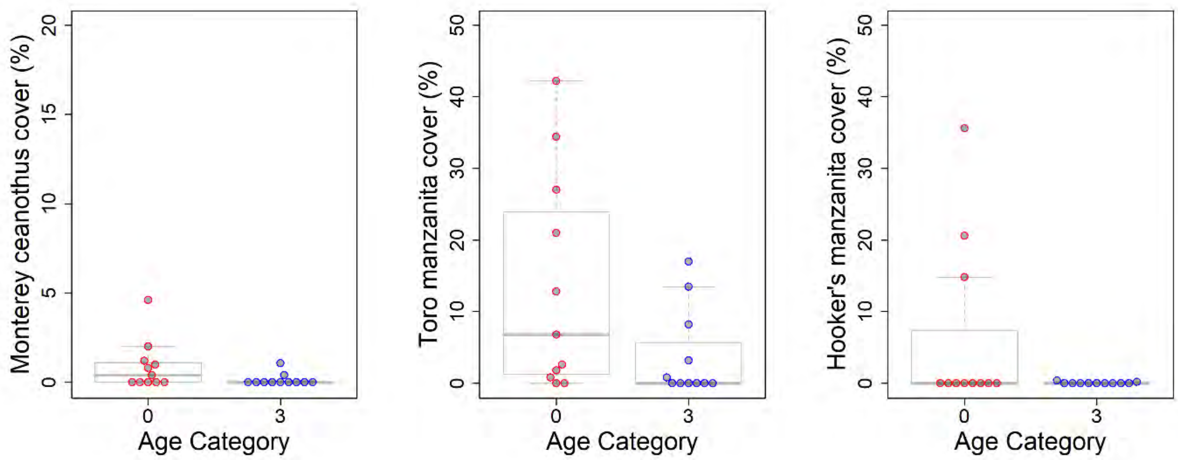

Figure 4-28. Unit B-3 East HMP Shrub Species Cover Between Baseline (2015) and Year 3 (2020). Scales Not Equivalent. The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Eleven masticated transects were analyzed in Unit B-3 East.

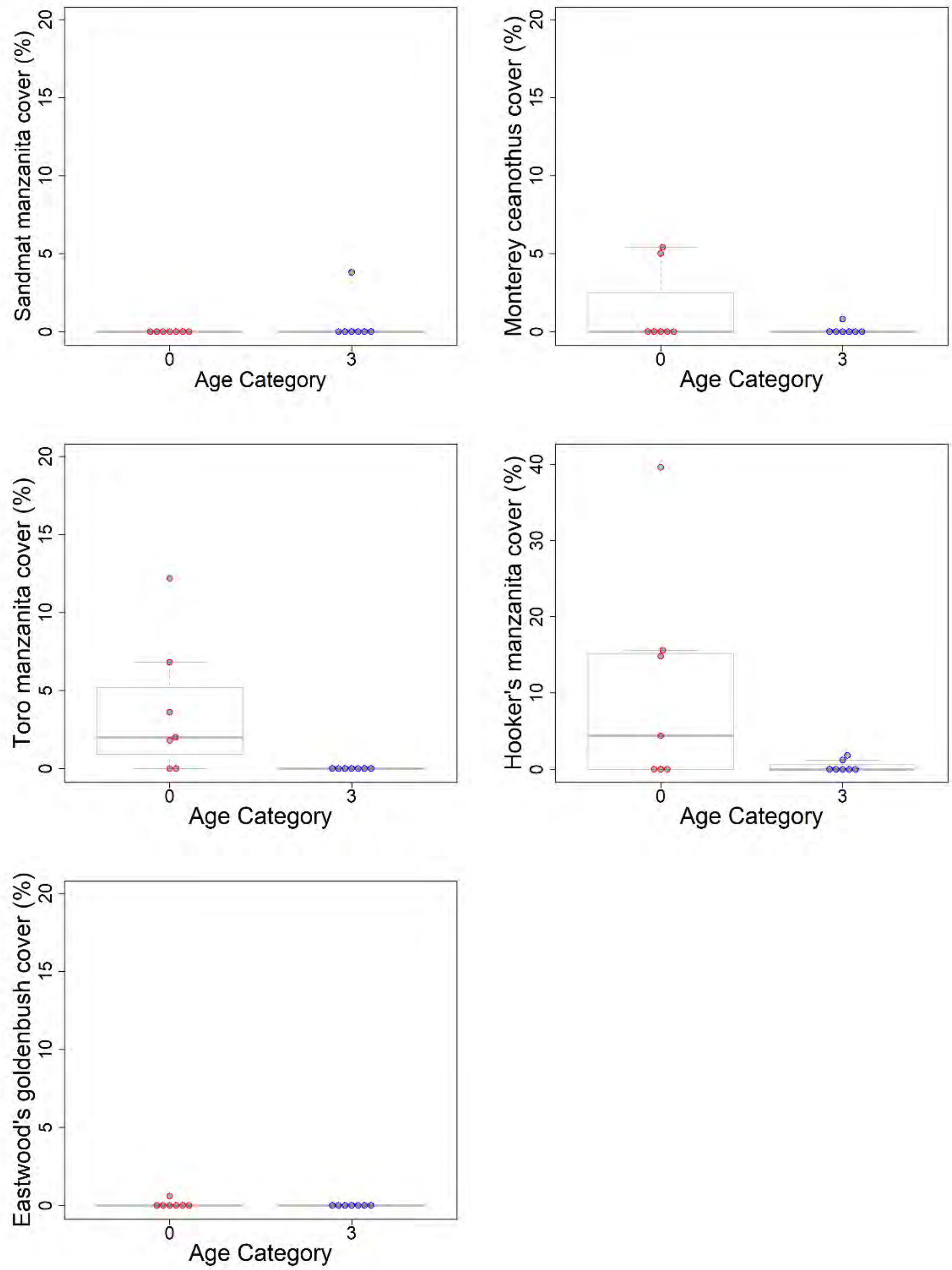

Figure 4-29. BLM Area B Unit A HMP Shrub Species Cover Between Baseline (2015) and Year 3 (2020). Scales Not Equivalent. The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Seven transects were analyzed in Unit A.

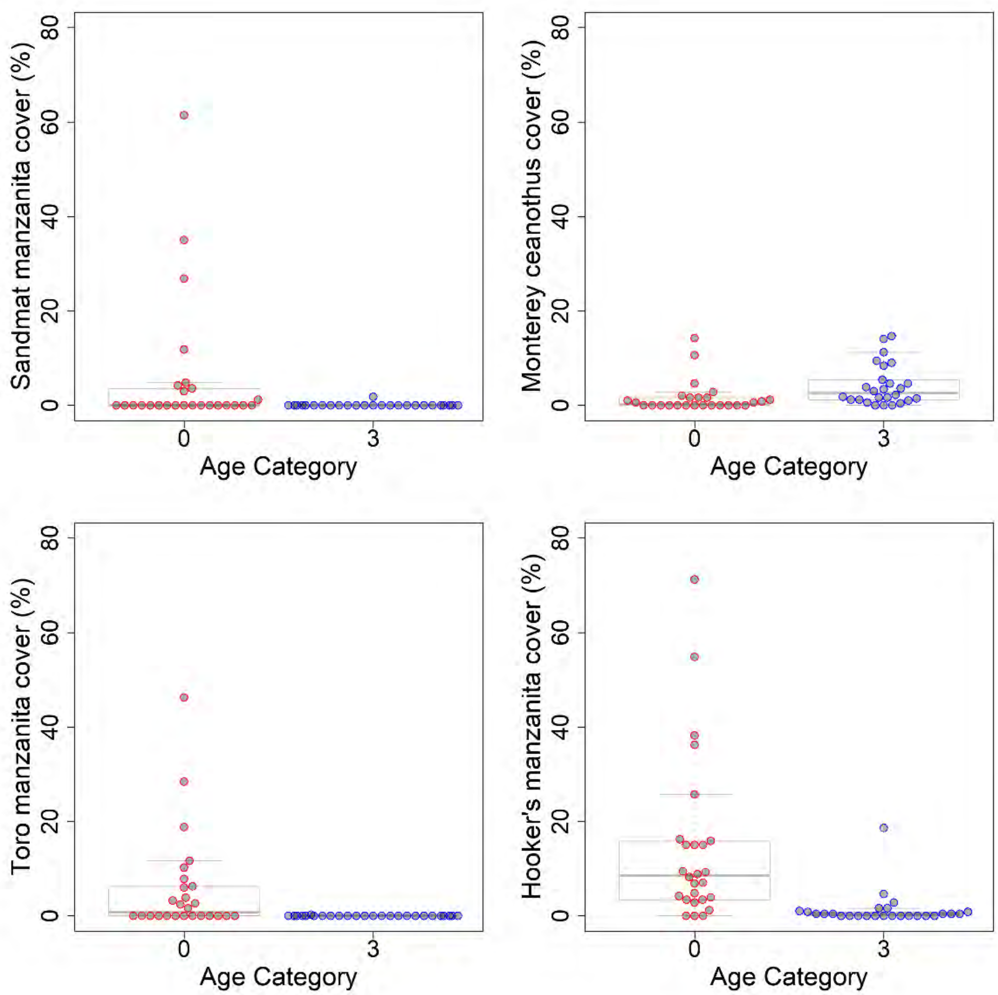

Figure 4-30. BLM Area B Unit B HMP Shrub Species Cover Between Baseline (2015 & 1999 [2 transects]) and Year 3 (2020). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Twenty-six transects were analyzed in Unit B.

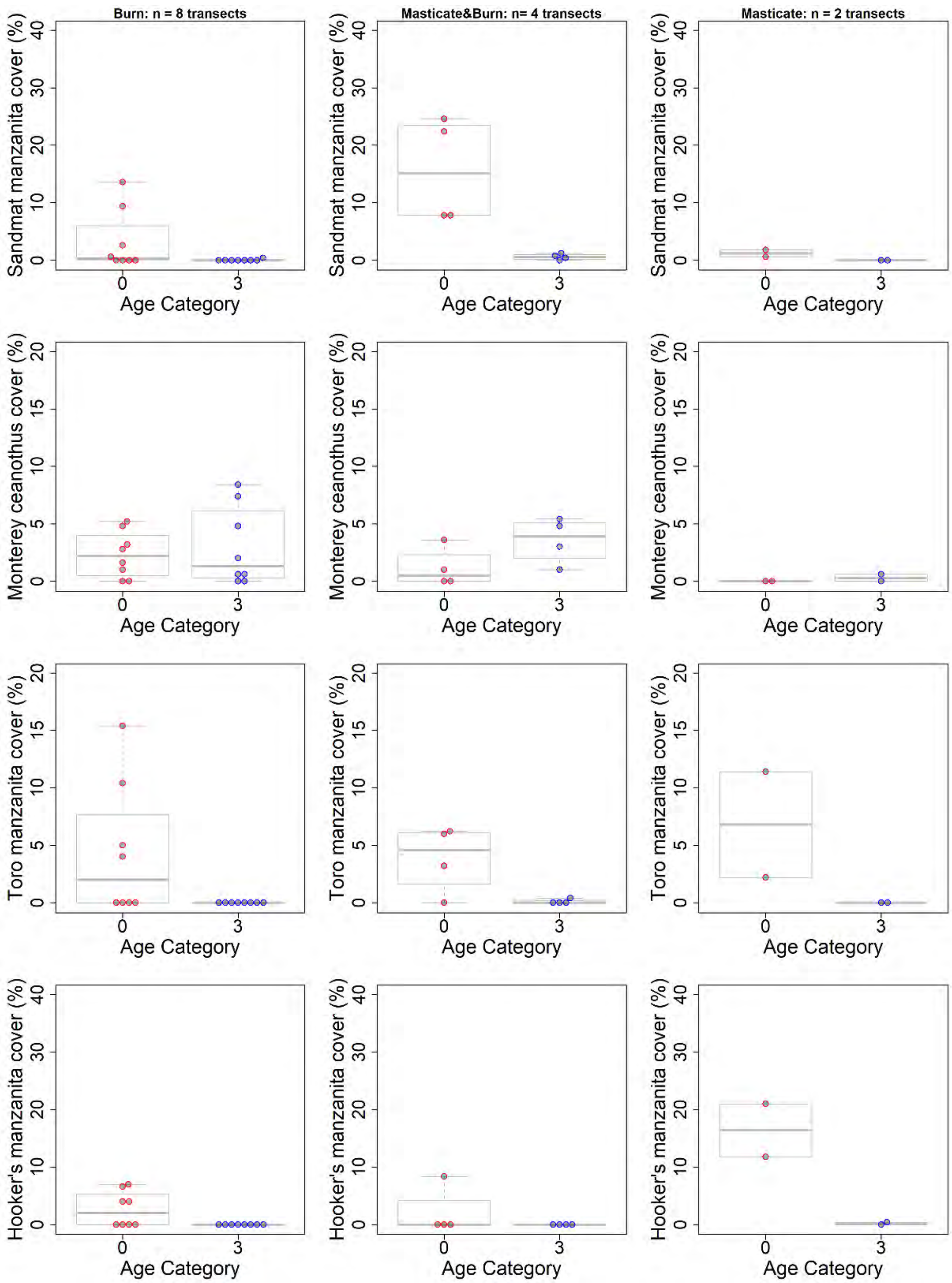

Figure 4-31. BLM Area B Unit C HMP Shrub Species Cover Between Baseline (2015) and Year 3 (2020). Scales Not Equivalent. The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. The left column represents burned transects (n = 8 transects). The middle column represents masticated and burned transects (n = 4 transects). The right column represents masticated transects (n = 2 transects).

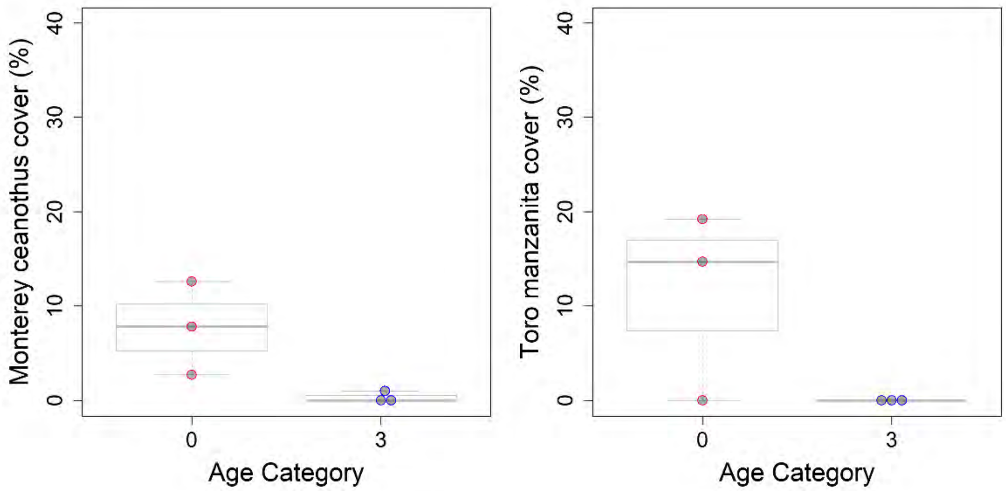

Figure 4-32. Unit B-2A HMP Shrub Species Cover Between Baseline (1998) and Year 3 (2020). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Three masticated transects were analyzed in Unit B-2A.

NMDS ordinations illustrate that the 2020 community compositions for Units B-3 West, B-3 East, and B-2A; and BLM Area B Unit A, Unit B, and Unit C have diverged from their respective Baseline compositions (Figures 4-33 through 4-37). Community composition is represented by the shape and location of ellipses in the ordination space, where ellipses with similar shape and location imply similar community composition.

In Unit B-2A, there was an insufficient number of transects by age to conduct an NMDS ordination and a plot is not provided. Paired samples Wilcoxon signed-rank tests were performed on Unit B-2A by age as an alternative to determine differences in community composition factors (total cover, species richness, species diversity, and evenness). Age did not appear to influence any community metric. Along transect 1, compared to Baseline (1998), total cover decreased from 96.3 % to 79.6%, diversity increased slightly from 1.21 to 1.34, species evenness decreased from 0.75 to 0.69, and species richness increased from 5 species to 7 species. Along transect 3, compared to Baseline (1998), total cover decreased from 97.8% to 79.2%, diversity increased from 0.57 to 0.78, species evenness increased slightly from 0.32 to 0.38, and species richness increased from 6 species to 8 species. Along transect 4, compared to Baseline (1998), total cover decreased from 84.5% to 60.2%, diversity decreased very slightly from 1.11 to 1.10, species evenness decreased from 0.57 to 0.50, and species richness increased from 7 species to 9 species.

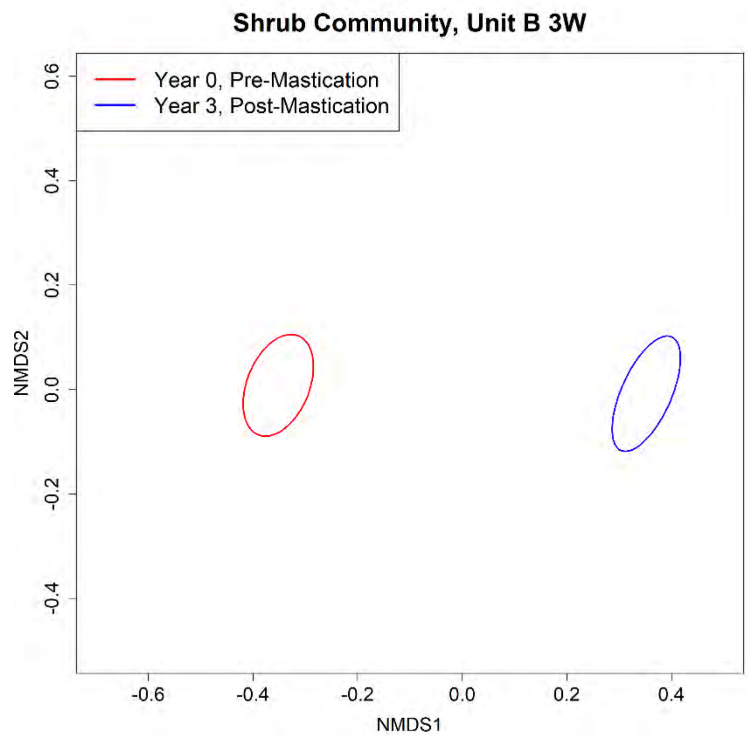

Figure 4-33. NMDS Ordination Plot Showing Unit B-3 West Community Composition Changes Between Baseline Surveys (2015) and Year 3 Surveys (2020). Six masticated transects were analyzed in Unit B-3 West.

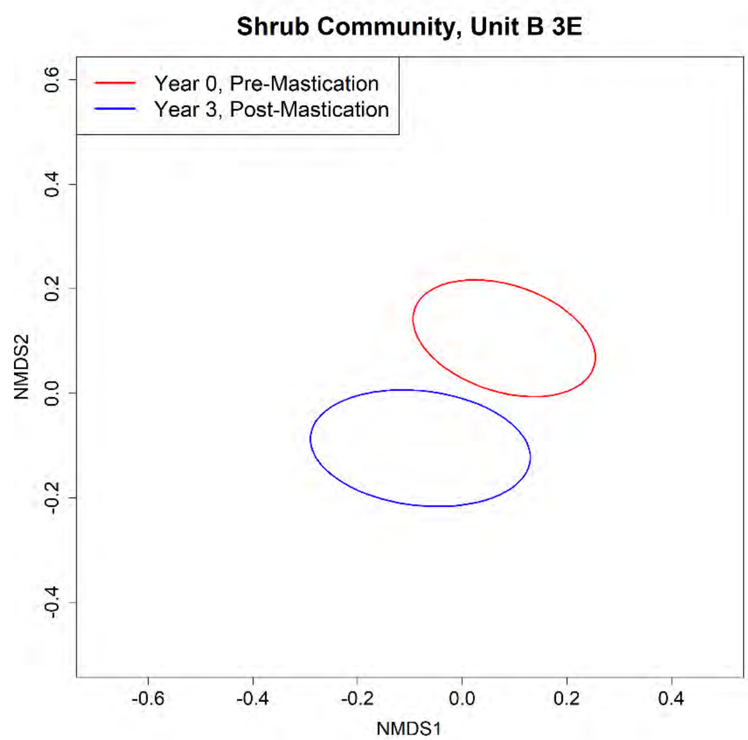

Figure 4-34. NMDS Ordination Plot Showing Unit B-3 East Community Composition Changes Between Pre-mastication Surveys (2015) and Year 3 Surveys (2020). Eleven masticated transects were analyzed in Unit B-3 East.

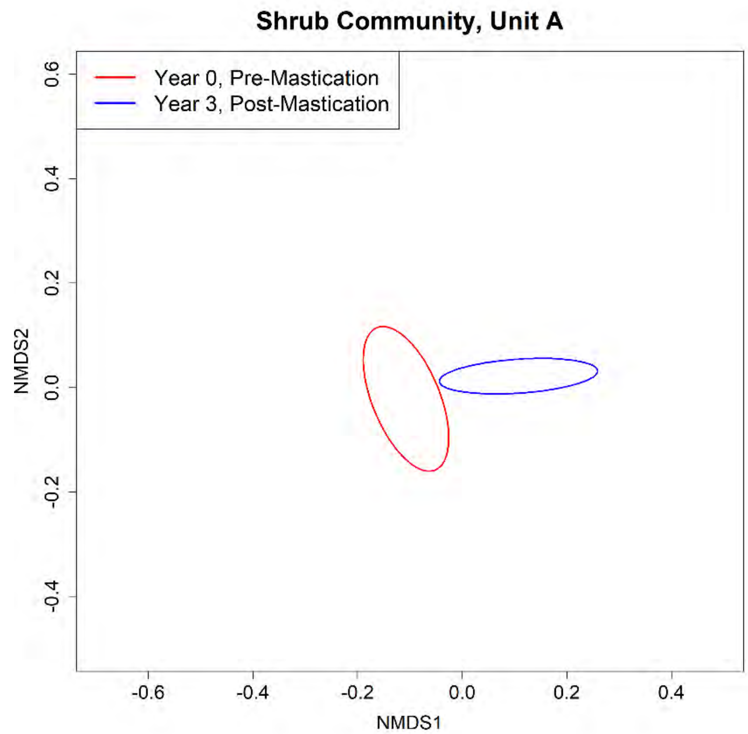

Figure 4-35. NMDS Ordination Plot Showing BLM Area B Unit A Community Composition Changes Between Pre-mastication Surveys (2015) and Year 3 Surveys (2020). Seven masticated transects were analyzed in Unit A.

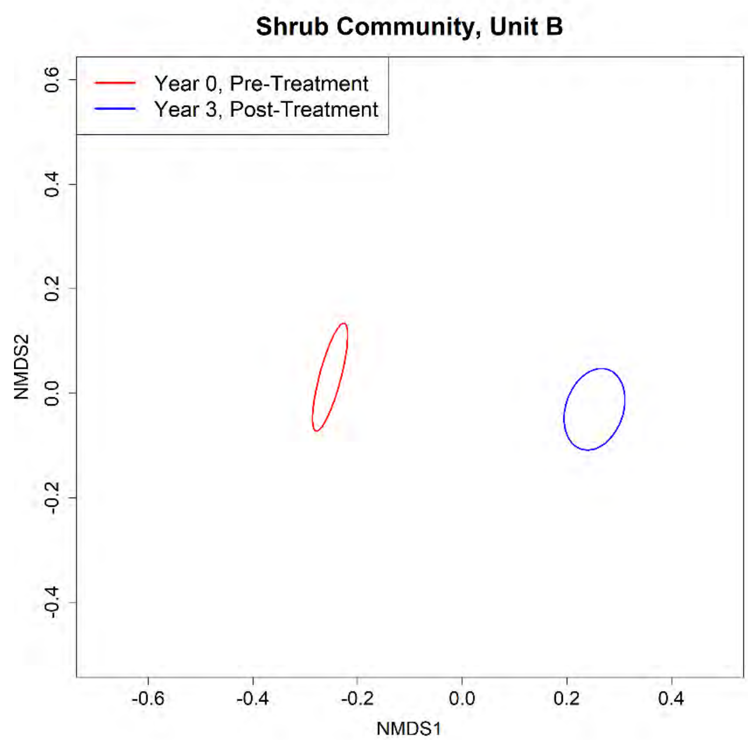

Figure 4-36. NMDS Ordination Plot Showing BLM Area B Unit B Community Composition Changes Between Pre-treatment Surveys (2015 and 1999 [2 transects]) and Year 3 Surveys (2020). Twenty-six transects were analyzed in Unit B.

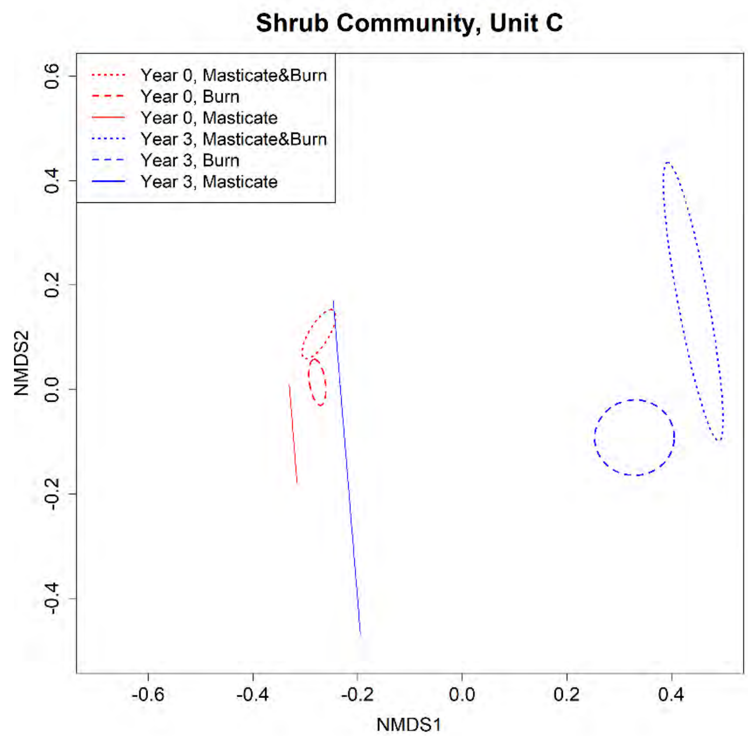

Figure 4-37. NMDS Ordination Plot Showing BLM Area B Unit C Community Composition Changes Between Pre-treatment Surveys (2015) and Year 3 Surveys (2020). Eight burned transects (dashed lines), four masticated and burned transects (dotted lines), and two masticated transects (solid lines) were analyzed in Unit C.

4.4.7 Annual Grass Monitoring

Non-native annual grasses were observed and mapped within the Containment Lines and roadside fuel breaks of BLM Area B Units B-3W, A Southern Containment Line, and B (Appendix D, Figures D-1 through D-3). Non-native annual grasses were not mapped in Units B-2A, B-3 East, or C. Estimated areas occupied by each density class in 2020 are summarized in Table 4-11. Annual grass cover increased between Baseline and Year 3 and density class 3 (>25% cover) had the largest areal extent in all surveyed areas. Density class 3 contained an area approximately 28.87 acres in Unit B-3W, 22.19 acres in the Unit A Southern Containment Line, and 54.57 acres in Unit B at the time of Year 3 monitoring.

Table 4-11. Estimated Area Occupied by Annual Grasses between Baseline (2015) and Year 3 (2020) in BLM Area Unit B-3 West, A Southern Containment Line, and B.

Cover Class	2015, Baseline (acres)	2018, Year 1 (acres)	2020, Year 3 (acres)
BLM Area B Unit B-3W			
1 (Low) = 1 – 5%	22.61	9.25	20.47
2 (Medium) = 6 – 25%	1.98	3.98	13.65
3 (High) = > 25%	2.24	14.61	28.87
Total Acreage	**26.83**	**27.84**	**62.99**
BLM Area B Unit A Southern Containment Line*			
1 (Low) = 1 – 5%	13.79	2.41	12.04
2 (Medium) = 6 – 25%	0.45	1.97	5.46
3 (High) = > 25%	0.51	13.14	22.19
Total Acreage	**14.75**	**17.52**	**39.69**
BLM Area B Unit B			

1 (Low) = 1 – 5%	3.56	14.61	29.86
2 (Medium) = 6 – 25%	7.31	15.64	13.19
3 (High) = > 25%	8.94	10.03	54.57
Total Acreage	**19.81**	**40.28**	**97.62**

*** Only the southern containment line of Unit A was monitored in 2020. 2015 and 2018 data were clipped to only include data for the southern containment line so that 2020 data could be compared to that of previous years.**

4.4.8 Invasive and Non-Native Species Monitoring

Of the target invasive species, pampas grass was observed in Units B-3 West, A Southern Containment Line, B, C, and B-2A. Iceplant was observed in Unit B-3 West, B-3 East, and Unit A Southern Containment Line. French broom was observed in Unit B-3 West.

Seven patches of iceplant, one patch of pampas grass, and one patch of French broom were observed in Unit B-3 West; small to medium patches of iceplant were ubiquitous in Unit B-3 East (which were not mapped); three patches of iceplant and four patches of pampas grass were observed within the Unit A Southern Containment Line; 14 patches of iceplant and four patches of pampas grass were observed in Unit B; one patch of iceplant and one patch of pampas grass were observed in Unit C; and one patch of pampas grass was observed in Unit B-2A (Appendix E, Figures E-2 through E-6). Additionally, minor occurrences of non-native herbaceous cover were observed during transect monitoring in all Year 3 units (Appendix G, Tables G-1 through G-4).

5 YEAR 5 VEGETATION SURVEYS: UNITS 5A, 9, 23, 23 NORTH, AND 28

5.1 Introduction

Year 5 units included the entirety of Units 5A, 9, 23, 23 North, and 28 (see Figure 5-1). These Units were masticated in 2015. Unit 23N was initially masticated in 2011 to support a planned prescribed burn of Units 11 and 12 and re-masticated during the larger effort to clear MEC from the remainder of Unit 23 to the south in 2015. Baseline monitoring for Units 5A, 9, and 28 was conducted in 2011 and included meandering transect surveys to map areas of occurrence of HMP herbaceous species; density monitoring for the HMP annual species sand gilia, seaside bird's-beak, and Monterey spineflower; transect surveys to sample shrub composition in the maritime chaparral; and annual grass monitoring (Tetra Tech and EcoSystems West, 2012). Baseline monitoring for HMP annual species sand gilia, seaside bird's-beak, and Monterey spineflower and for shrubs was conducted in Unit 23 in 2003, and additional Baseline HMP annual density monitoring in Unit 23N was conducted in 2011 (MACTEC, 2004; Tetra Tech and EcoSystems West, 2012).

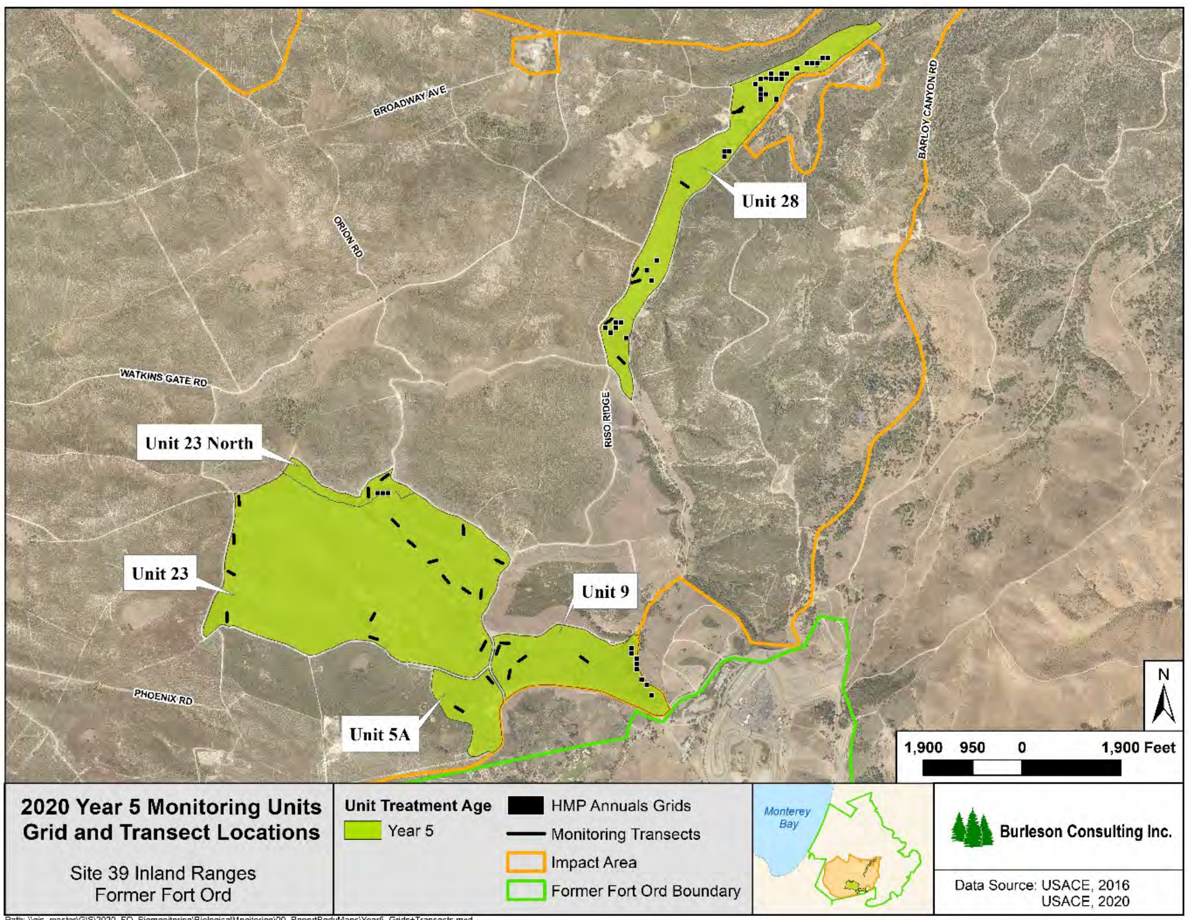

Figure 5-1. Units 5A, 9, 23, and 28 HMP Annuals Grids and HMP Shrub Transects Surveyed for Year 5 in 2020.

5.2 Units 5A, 9, 23, 23 North, and 28: Setting

Unit 5A encompasses an area of 33 acres (see Figure 5-1). The Unit is located south of Darwin Road and is bordered by South Boundary Road to the east and south. Unit 5A is contiguous with Unit 5 to the west. The terrain is mostly gently rolling to moderately steep. In pre-treatment condition, Unit 5A was dominated by mature maritime chaparral vegetation varying considerably in physiognomy and species composition. Most of the chaparral vegetation was very dense, particularly in the south and central portions of the Unit with limited clearings. The chaparral shrubs ranged in height from low (3-4 feet) to tall (12-15 feet), and shrub density ranged from relatively open, to essentially 100 percent areal cover. As in maritime chaparral throughout Fort Ord, shaggy-barked manzanita is the most characteristic dominant and is overwhelmingly dominant where the shrub cover is tall and dense. Other characteristic shrubs that are often dominant or co-dominant include chamise, black sage, Monterey ceanothus, and poison-oak.

Unit 9 encompasses an area of 77 acres (see Figure 5-1). This Unit is located at the south end of former Fort Ord. The terrain is mostly gently rolling to moderately steep. In pre-treatment condition, this Unit was vegetated primarily with mature maritime chaparral largely dominated by shaggy-barked manzanita. Other dominants sometimes include Hooker's manzanita, Toro manzanita, chamise, and black sage (*Salvia mellifera*). The far east end of Unit 9 is vegetated with coast live oak woodland, interspersed with smaller patches of maritime chaparral and intermediate habitat between the two.

Unit 23 and Unit 23 North encompass areas of 343 acres and 10 acres, respectively (see Figure 5-1). These Units are located near the southern end of former Fort Ord. The terrain is gently rolling to locally steep. In pre-treatment condition, these units were vegetated primarily with mature maritime chaparral largely dominated by shaggy-barked manzanita. Pond 54, a large vernal pool containing emergent vegetation and known to support federally threatened California tiger salamander (*Ambystoma californiense*), is in the northeastern corner of Unit 23, near the intersection of Nowhere Road and Orion Road.

Unit 28 encompasses an area of 105 acres (see Figure 5-1). This long narrow unit is delineated by a portion of Impossible Canyon as well as portions of the adjacent southeast-facing slopes of Riso Ridge and Tongue (Dallas) Ridge. The terrain is gently rolling to very steep. In pre-treatment condition, Unit 28 was vegetated primarily with mature maritime chaparral, but also included numerous areas of coast live oak woodland of various patch sizes. Toro manzanita is prevalent in this unit and was flagged to be omitted from fall 2015 mastication efforts. Localized erosion areas also occurred in this unit. Part of the northern end of this unit was burned in an accidental fire in 2003.

Collectively, these units have rolling to steep topography. Arnold-Santa Ynez complex soil type is mapped in Units 5A, 9, 23, 23 North, and 28 (USDA, 2020). Xerorthents dissected area was mapped in small portions on the eastern edges of Units 9 and 23. The distribution of soils in the Year 5 survey areas and characteristics of these soils are presented in Table 2-1.

5.3 Units 5A, 9, 23, 23 North, and 28: Methods

In accordance with methods outlined in the Revised Protocol (Tetra Tech and EcoSystems West, 2015b) and Section 2 of this report, the 2020 Year 5 follow-up monitoring in Units 5A, 9, 23, 23 North, and 28 consisted of the following activities:

- Density monitoring for three HMP annual species: sand gilia, seaside bird's-beak, and Monterey spineflower. This survey effort was conducted at Units 9, 23 North, and 28 to evaluate how the density of these species responded to treatment. Surveys occurred on April 22, 23, 27, 28, and 29, 2020.

- Macroplot surveys for three HMP annual species: sand gilia, seaside bird’s-beak, and Monterey spineflower. This survey effort was conducted at Units 9, 23 North, and 28 to assess changes in the distribution of HMP annual species in response to treatment and evaluate what factors influence those changes.

- Repeated sampling of transects that were monitored in 2003, 2011, and 2018 surveys (MACTEC, 2004; Tetra Tech and EcoSystems West, 2012; Burleson, 2019a). This survey effort was conducted to assess shrub species composition of the sensitive maritime chaparral community after treatment. Surveys occurred on May 12, 13, 18, 19, 20, 26, and 27, and June 9, 2020.

- Mapping of invasive species, including iceplant, pampas grass, and French broom, where encountered. This survey effort was conducted to support ongoing management.

5.4 Units 5A, 9, 23, 23 North, and 28: Results and Discussion

Burleson surveyed 43 HMP monitoring grids in the Year 5 Units, with 8 grids in Unit 9, 3 grids in Unit 23, and 31 grids in Unit 28. No HMP monitoring grids were surveyed in Unit 5A as no HMP annuals were found in baseline surveys in this Unit (Tetra Tech and EcoSystems West, 2012). Similarly, no HMP annual species were found in Unit 23 during 2003 surveys, thus only Unit 23N had follow up surveys of HMP annuals (MACTEC, 2004; Tetra Tech and EcoSystems West, 2012). Maps of survey grids for the sampled units are provided in Appendix B (Figures B-10 through B-18). All HMP grids in these units have been masticated.

5.4.1 Sand Gilia

Sand gilia was present in Unit 28, but not in Units 23N or 9 (Figure 5-2; Appendix B, B-10, B-13, and B-16). The frequency of occurrence in monitored plots in Unit 28 was 39% in 2011 (13 of 31 grids), 74% in 2016 (23 of 31 grids), 65% in 2018 (20 of 31 grids), and 58% in 2020 (18 of 31 grids).

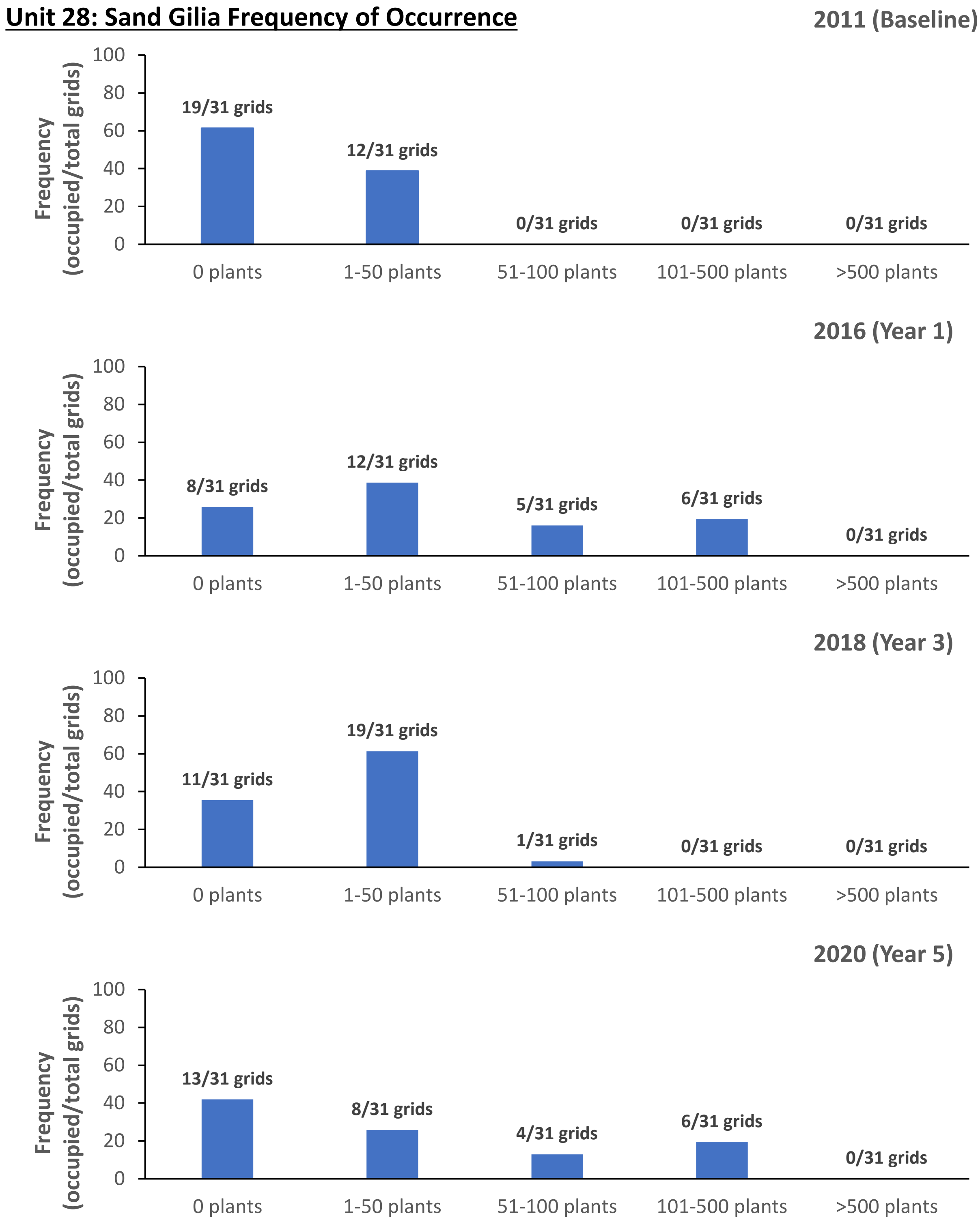

Figure 5-2. Unit 28 Sand Gilia Occurrence in Surveyed Grids (*n*=31) Between Baseline (2011) and Year 5 (2020).

5.4.2 Seaside Bird's-Beak

Seaside bird's-beak was not present in any Year 5 unit (Appendix B, Figures B-11, B-14 and B-17).

5.4.3 Monterey Spineflower

Monterey spineflower was present in all Year 5 units (Figures 5-3 through 5-5; Appendix B, Figures B-12, B-15, and B-18). The frequency of occurrence in monitored plots in Unit 9 was 100% in 2011 (8 of 8 grids), 87% in 2016 (7 of 8 grids), 62% in 2018 (5 of 8 grids), and 75% in 2020 (6 of 8 grids). The frequency of occurrence in monitored plots in Unit 23 was 100% in 2011 (3 of 3 grids), 100% in 2016 (3 of 3 grids), 100% in 2018 (3 of 3 grids), and 100% in 2020 (3 of 3 grids). The frequency of occurrence in monitored plots in Unit 28 was 100% in 2011 (31 of 31 grids), 100% in 2016 (31 of 31 grids), 87% in 2018 (27 of 31 grids), and 90% in 2020 (28 of 31 grids).

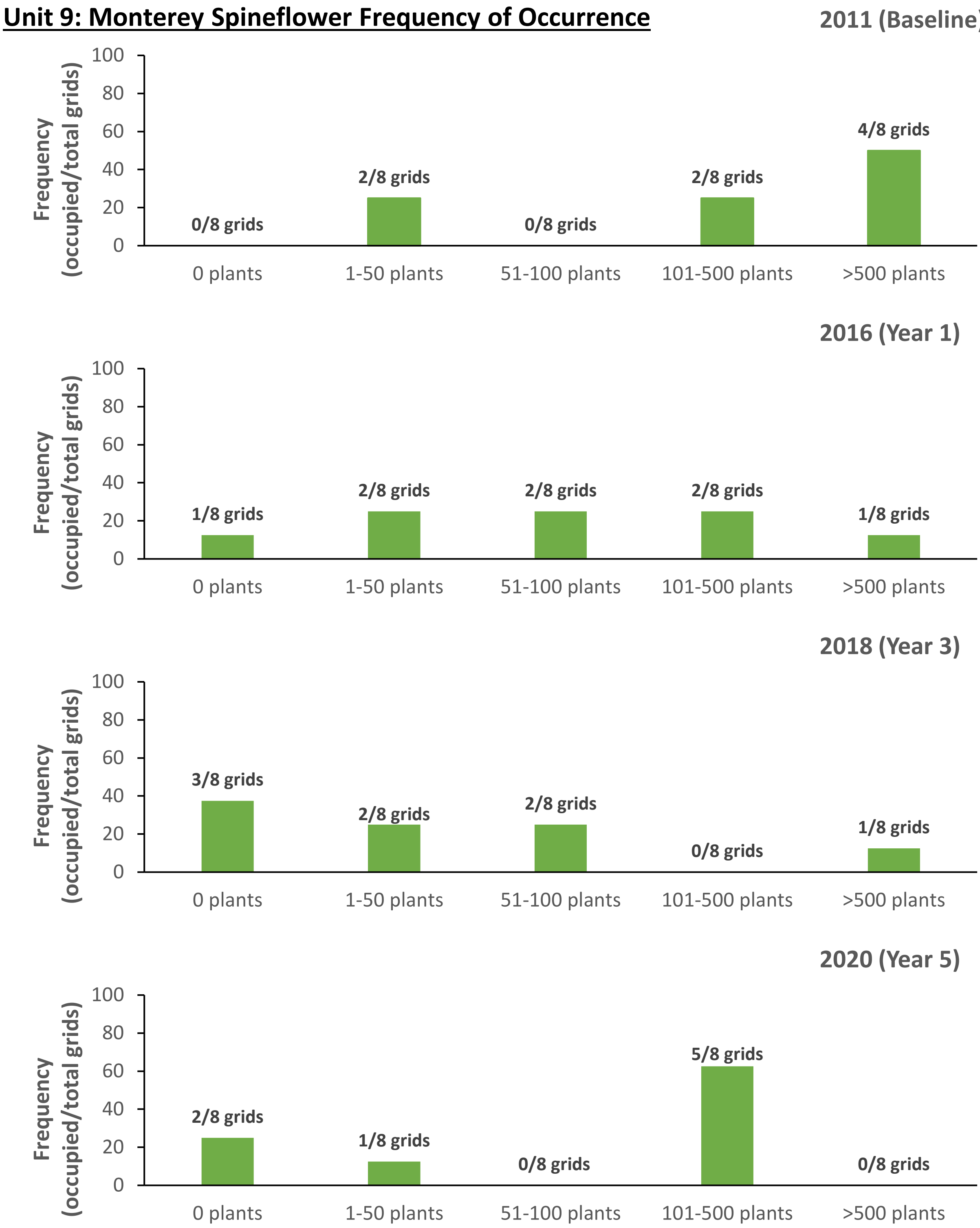

Figure 5-3. Unit 9 Monterey Spineflower Occurrence in Surveyed Grids (*n*=8) Between Baseline (2011) and Year 5 (2020).

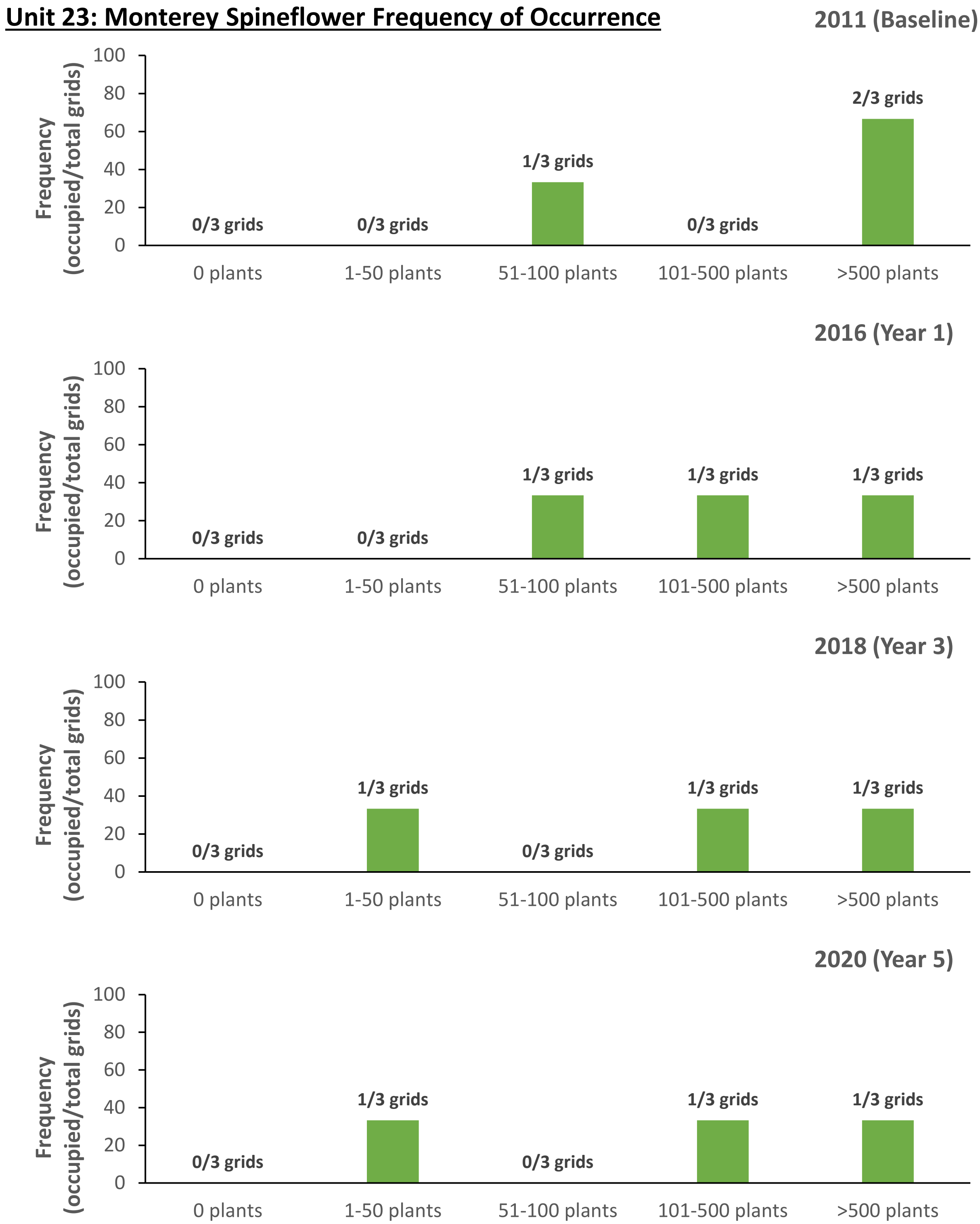

Figure 5-4. Unit 23 Monterey Spineflower Occurrence in Surveyed Grids (*n*=3) Between Baseline (2011) and Year 5 (2020).

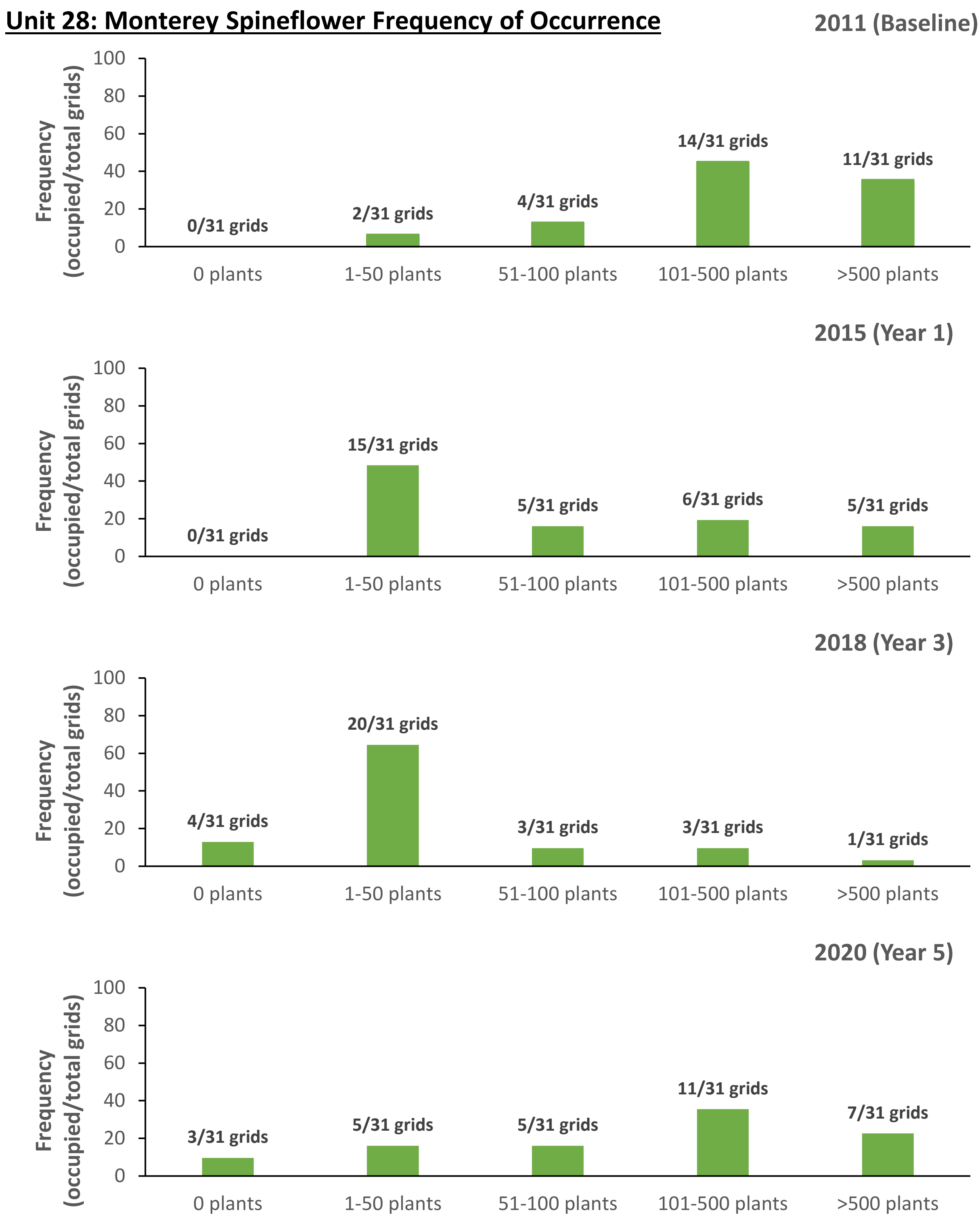

Figure 5-5. Unit 28 Monterey Spineflower Occurrence in Surveyed Grids (*n*=31) Between Baseline (2011) and Year 5 (2020).

5.4.4 Yadon's Piperia

A single occurrence of piperia of undetermined species was observed in the eastern portion of Unit 23 North and two individuals were observed in the northeastern portion of Unit 28 (Appendix E, Figures E-9 and E-10). No piperia were observed in Units 5A, 9, or 23.

5.4.5 Effect of Treatment on HMP Density

The effect of treatment type on HMP annuals density could not be evaluated in the Year 5 units since these areas were masticated only, with no prescribed burns.

5.4.6 Shrub Transect Monitoring

Shrub transects were sampled in Units 5A (n=2), 9 (n=5), 23 (n=16), and 28 (n=9) in 2020 (Appendix C; Figures C-7 through C-10). Baseline transects were collected in 2011 for Units 5A, 9, and 28, and in 2003 for Unit 23 (Tetra Tech and EcoSystems West, 2011; MACTEC, 2004).

The temporal patterns of broad scale community response to mastication were generally congruent with past observations of the neighboring Units in the MRA (Tetra Tech and EcoSystems West, 2011 through 2015b; Burleson, 2016 through 2019b). Community structure parameters in all Year 5 units changed through time similarly in most cases.

Mixed-design ANOVAs were conducted to examine the effect of unit and age on mean percent cover, species richness, species evenness, and species diversity for Year 5 units (Table 5-1). Unit did not appear to influence mean percent cover or species evenness; however, the location of a unit seems to have an effect on species richness and diversity (Figures 5-6 through 5-9). Mean percent cover, while varying by year, generally was similar between each unit within an age category. Species evenness generally did not vary widely between units or age categories. Species richness was different between units and varied by age category; however, richness either increased or remained static through time for each unit. Species diversity appeared to be influenced by the location of the unit as well and the age category.

Table 5-1. Mixed-design ANOVA results for Units 5A, 9, 23, and 28.

Factor	Total Mean Cover		Species Richness		Species Evenness		Species Diversity	
	F	*p*	*F*	*p*	*F*	*p*	*F*	*p*
Unit	1.789	0.159	4.533	5.99e-03	1.902	0.138	3.188	0.028
Age	75.23	1.36e-16	11.77	7.29e-05	0.241	0.721	7.027	0.002
Unit*Age	1.963	0.068	1.512	0.178	0.683	0.664	0.779	0.623

Year 5 units shrub cover varied over time between Baseline, Year 3 (2018), and Year 5 (2020) (Figures 5-6 through 5-9; Table 5-1). Percent mean cover decreased for all Year 5 units between Baseline ($c_{5A, Baseline}$ = 135.2%, $c_{9, Baseline}$ = 113.4%, $c_{23, Baseline}$ = 108.0%, $c_{28, Baseline}$ = 106.5%) and Year 3 ($c_{5A, Year 3}$ = 73.3%, $c_{9, Year 3}$ = 74.9%, $c_{23, Year 3}$ = 77.9%, $c_{28, Year 3}$ = 70.4%). Subsequently, all Year 5 units increased in cover between Year 3 and Year 5 ($c_{5A, Year 5}$ = 87.1%, $c_{9, Year 5}$ = 95.4%, $c_{23, Year 5}$ = 90.4%, $c_{28, Year 5}$ = 77.9%).

Year 5 units varied by unit and by age (Figures 5-6 through 5-9; Table 5-1). Unit 9, Unit 23, and Unit 28 richness increased from Baseline ($S_{9, Baseline}$ = 5.2 species, $S_{23, Baseline}$ = 7.06 species, $S_{28, Baseline}$ = 6.22 species) to Year 3 ($S_{9, Year 3}$ = 8.8 species, $S_{23, Year 3}$ = 10.1 species, $S_{28, Year 3}$ = 9.0 species). Richness continued to increase in Year 5 for Unit 23 and 28 ($S_{23, Year 5}$ = 10.4 species, $S_{28, Year 5}$ = 9.89 species). In Year 5, Unit 9 richness remained static from Year 3. Unit 5A richness relatively similar from Baseline to Year 3 and Year 5 ($S_{5A,\ Baseline}$ = 8.0 species, $S_{5A,\ Year\ 3}$ = 7.5 species, $S_{5A,\ Year\ 5}$ = 8.0 species).

Year 5 units generally did not vary much between Baseline, Year 3 (2018), and Year 5 (2020) surveys Figures 5-6 through 5-9; Table 5-1). Unit 5A and Unit 9 evenness decreased from Baseline ($J_{5A,\ Baseline}$ = 0.77, $J_{9,\ Baseline}$ = 0.56) to Year 3 ($J_{5A,\ Year\ 3}$ = 0.71, $J_{9,\ Year\ 3}$ = 0.54). In Year 5, Unit 5A evenness continued to decrease to 0.69 while Unit 9 evenness increased to 0.59. Unit 23 and Unit 28 evenness increased from Baseline ($J_{23,\ Baseline}$ = 0.67, $J_{28,\ Baseline}$ = 0.65) to Year 3 ($J_{23,\ Year\ 3}$ = 0.69, $J_{28,\ Year\ 3}$ = 0.71). In Year 5, Unit 23 evenness remained constant at 0.69 while Unit 28 evenness decreased to 0.66.

Species diversity between Year 5 units were generally different and appeared to respond differently ove time (Figures 5-6 through 5-9; Table 5-1). Unit 9, Unit 23, and Unit 28 diversity increased from Baseline ($H_{9,\ Baseline}$ = 0.91, $H_{23,\ Baseline}$ = 1.28, $H_{28,\ Baseline}$ = 1.16) to Year 3 ($H_{9,\ Year\ 3}$ = 1.17, $H_{23,\ Year\ 3}$ = 1.58, $H_{28,\ Year\ 3}$ = 1.51). Unit 9 and Unit 23 diversity continued to increase in Year 5 ($H_{9,\ Year\ 5}$ = 1.28, $H_{23,\ Year\ 5}$ = 1.60). Unit 28 diversity decreased slightly in Year 5 (1.5). Unit 5A diversity decreased from Baseline to Year 3 and remained static between Year 3 and Year 5 ($H_{5A,\ Baseline}$ = 1.55, $H_{5A,\ Year\ 3}$ = 1.43).

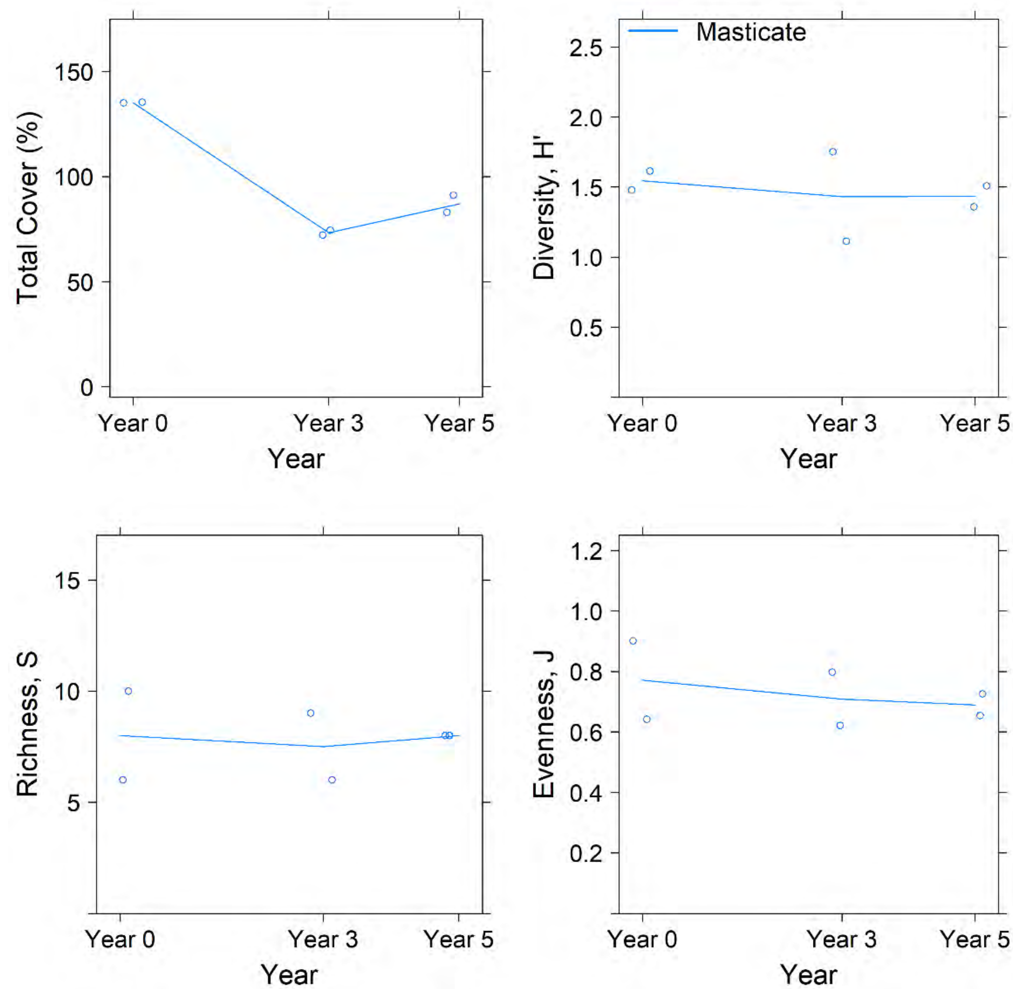

Figure 5-6. Unit 5A Community Structure from Baseline (2011) to Five Years After Mastication (2020). Two masticated transects were analyzed in Unit 5A.

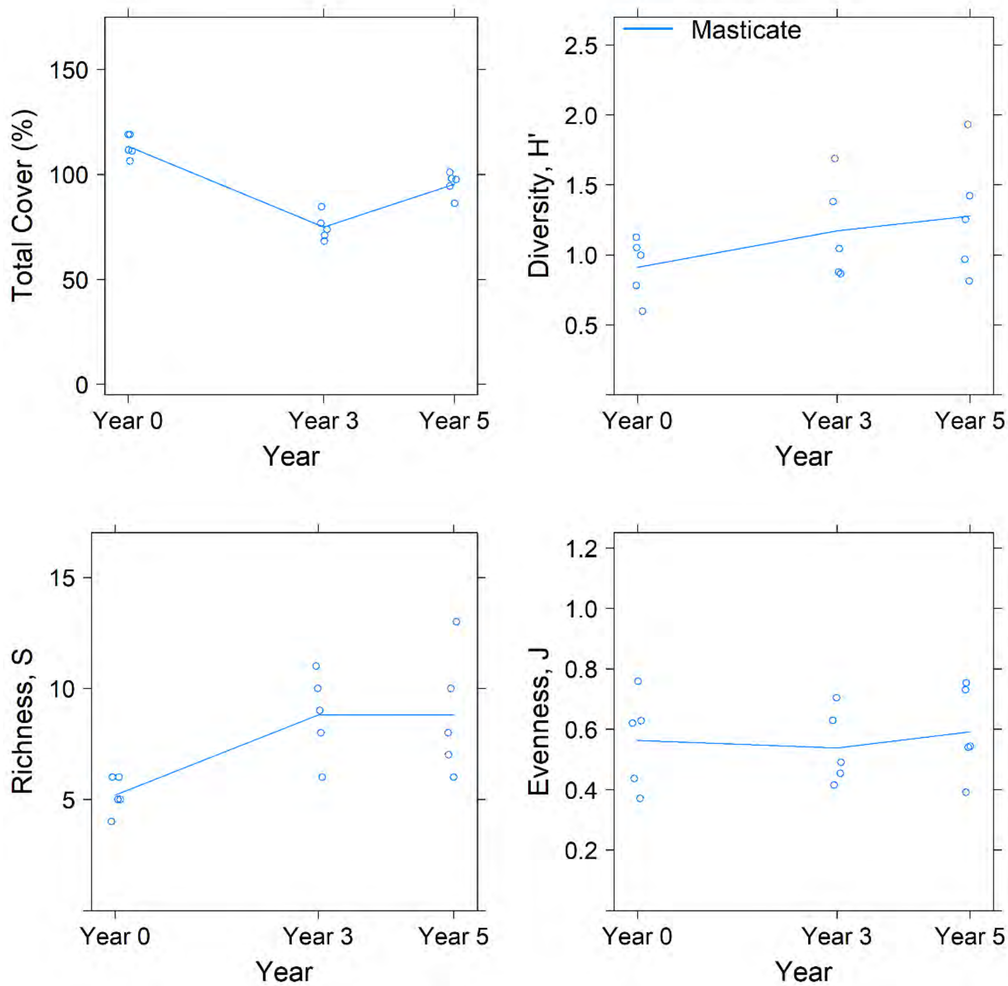

Figure 5-7. Unit 9 Community Structure from Baseline (2011) to Five Years After Mastication (2020). Five masticated transects were analyzed in Unit 9.

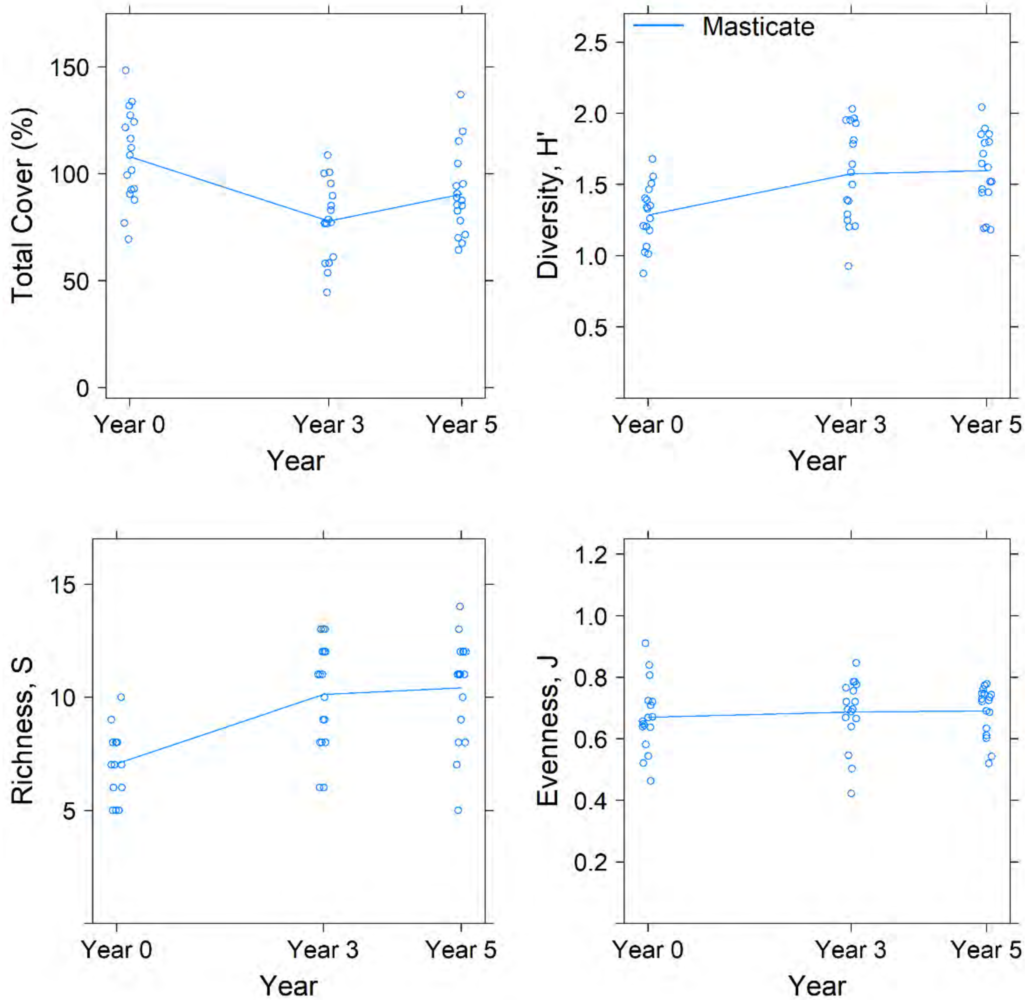

Figure 5-8. Unit 23 Community Structure from Baseline (2003) to Five Years After Mastication (2020). Sixteen masticated transects were analyzed in Unit 23.

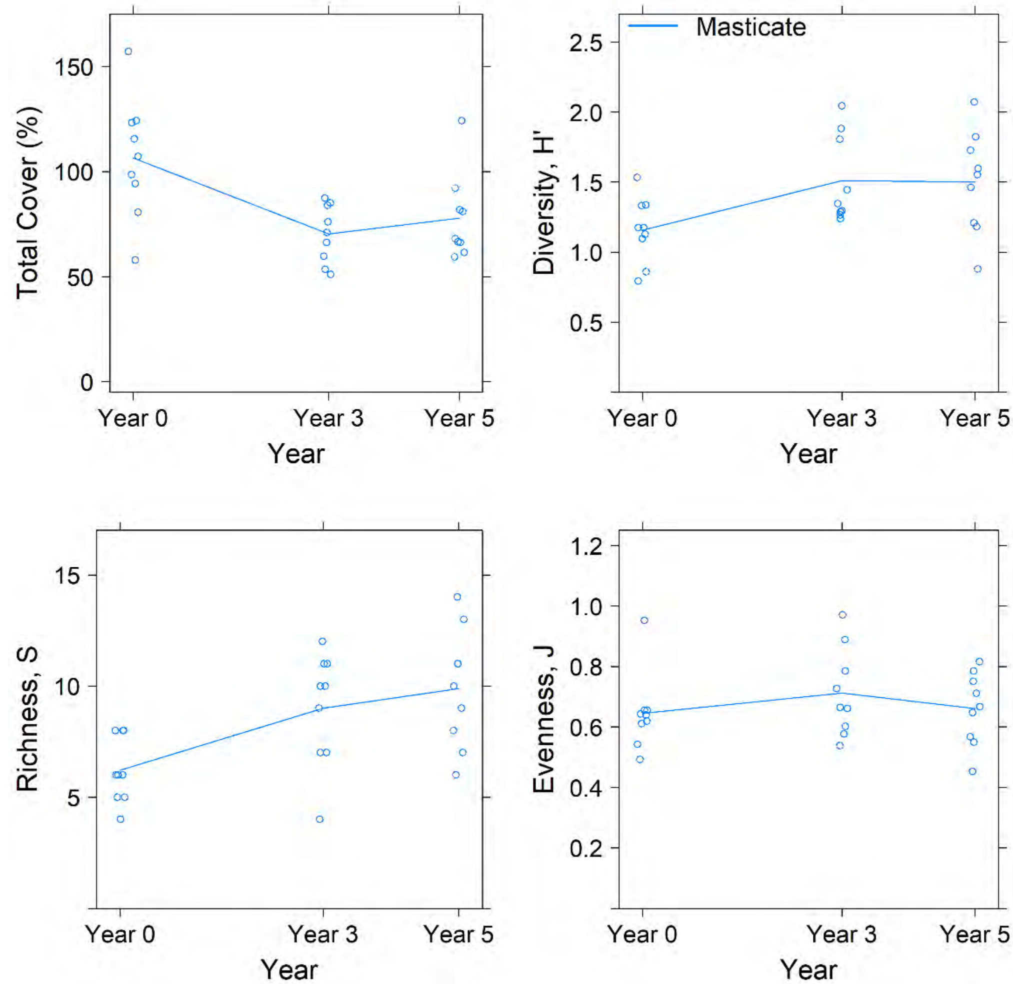

Figure 5-9. Unit 28 Community Structure from Baseline (2011) to Five Years After Mastication (2020). Nine masticated transects were analyzed in Unit 28.

The pattern by which bare ground and herbaceous cover changed over time was similar in all Year 5 units (Figure 5-10 through 5-13). Mixed-design ANOVAs were conducted to examine the effect of unit and age on mean percent bare ground and mean percent herbaceous cover (Table 5-2). Unit appeared to influence bare ground cover while it did not seem to affect herbaceous cover. Both bare ground and herbaceous cover varied by age, as shown by the increase of both metrics in from Baseline to Year 3 and generally a decrease or slight increase from Year 3 to Year 5 (Table 5-3). There was evidence that interactions between unit and age factors may contribute to differences seen between mean bare ground cover (Table 5-2).

Table 5-2. Mixed-design ANOVA results for Units 5A, 9, 23, and 28 bare ground and herbaceous cover.

Factor	**Bare Ground**		**Herbaceous Cover**	
	F	***p***	***F***	***p***
Unit	3.301	0.024	1.410	0.257
Age	44.29	1.53e-09	6.273	0.014
Unit*Age	2.155	0.069	1.106	0.374

All Year 5 units increased in bare ground cover between Baseline and Year 3 and decreased between Year 3 and Year 5 (Table 5-3). All Year 5 units increased in herbaceous cover between Baseline and Year 3 with Units 5A and 9 decreasing in herbaceous cover between Year 3 and Year 5 and Units 23 and 28 increasing between Year 3 and Year 5.

Table 5-3. Average percent coverage of bare ground and herbaceous cover for Units 5A, 9, 23, and 28 during baseline, Year 3, and Year 5 surveys.

Cover Type % (Year)	Unit 5A	Unit 9	Unit 23	Unit 28
Bare ground (Baseline)	1%	3%	15%	13%
Bare ground (Year 3)	37%	31%	28%	34%
Bare ground (Year 5)	24%	19%	21%	25%
Herbaceous (Baseline)	0%	0%	2%	4%
Herbaceous (Year 3)	4%	3%	13%	10%
Herbaceous (Year 5)	1%	1%	15%	14%

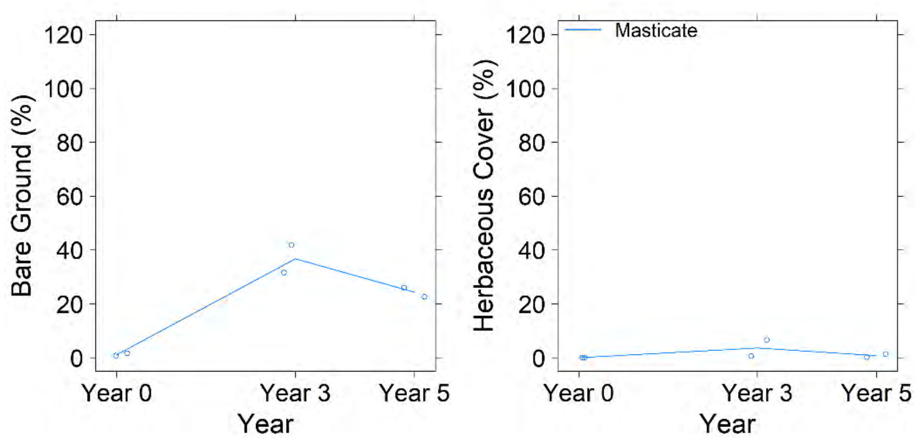

Figure 5-10. Unit 5A Bare Ground and Herbaceous Cover Between Baseline (2011), Year 3 (2018), and Year 5 (2020). Two masticated transects were analyzed in Unit 5A.

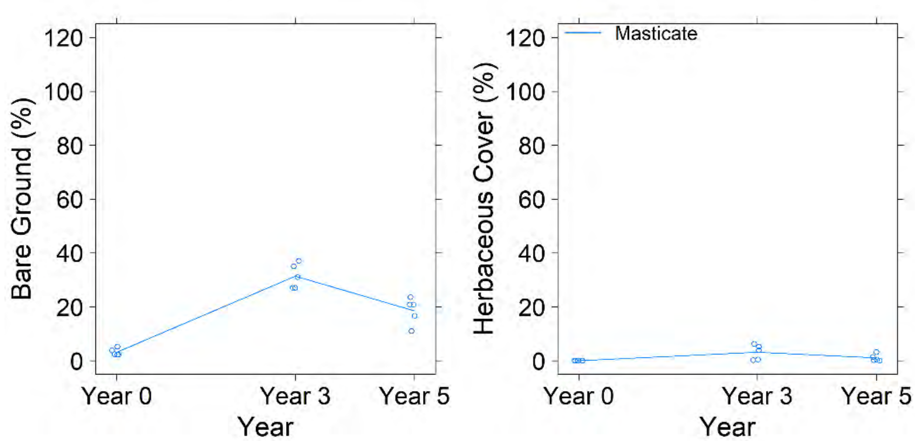

Figure 5-11. Unit 9 Bare Ground and Herbaceous Cover from Baseline (2011), Year 3 (2018), and Year 5 (2020). Five masticated transects were analyzed in Unit 9.

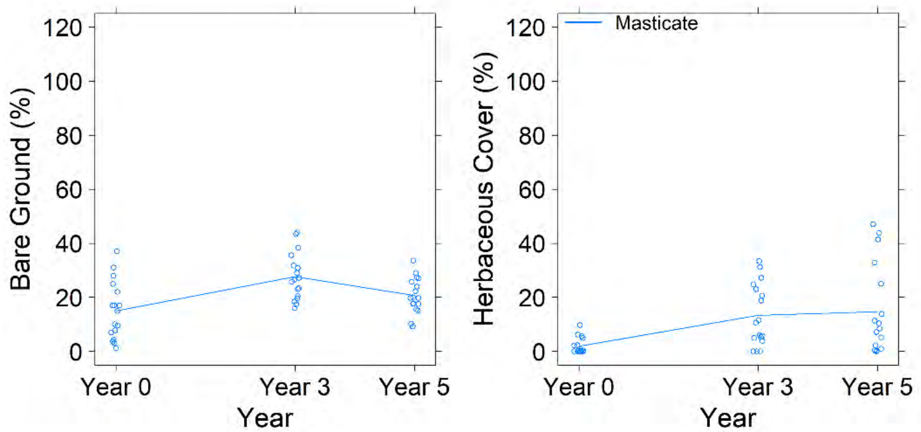

Figure 5-12. Unit 23 Bare Ground and Herbaceous Cover from Baseline (2003), Year 3 (2018), and Year 5 (2020). Sixteen masticated transects were analyzed in Unit 23.

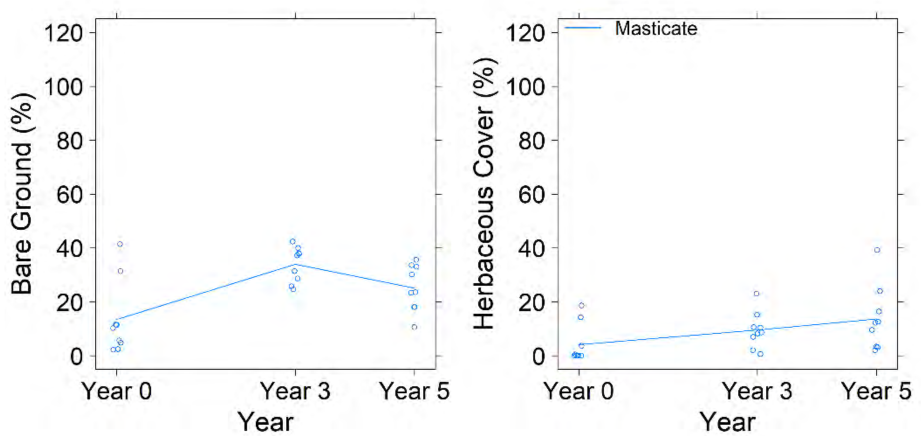

Figure 5-13. Unit 28 Bare Ground and Herbaceous Cover from Baseline (2011), Year 3 (2018), and Year 5 (2020). Nine masticated transects were analyzed in Unit 28.

While the community structure parameters were similar in some cases among Year 5 units, community composition differed between Units. Community composition also differed between years. Burleson conducted PERMANOVA to examine differences in community composition (Table 5-4). These results suggest that overall community composition was influenced by the unit and by age (Baseline, Year 3, or Year 5). This indicates that the types and abundance of species present within each unit were different, and they changed after treatment. Rank abundance curves illustrate the species composition in each Unit through time (Figures 5-14 through 5-17).

Table 5-4. Two-way PERMANOVA results for Units 5A, 9, 23, and 28 community compositions, based on Bray-Curtis distance matrices.

Factor	***F***	***p***
Age	9.59	0.001
Unit	5.90	0.001
Unit*Age	0.719	0.799

Year 5 units have different overall shrub vegetation compositions (Figures 5-14 through 5-17- proportional shrub ranking results). However, all Units were dominated by shaggy-barked manzanita during their Baseline year as shown by the average percent coverage of each unit's transects (c_{5A}=59%, c_{9}=78%, c_{23}=46%, and c_{28}=50%). By Year 3, Units 5A and 9 were still dominated by shaggy-barked manzanita (c_{5A}=35%, c_{9}=48%), Unit 23 was dominated by chamise (c_{23}=29%), and Unit 28 was co-dominated by shaggy-barked manzanita and chamise ($c_{28\ shaggy\text{-}barked\ manzanita}$=21%, $c_{28\ chamise}$=18%). By Year 5, Units 5A, 9, and 28 remained dominated by shaggy-barked manzanita (c_{5A}=43%, c_{9}=55%, c_{28}=27%) and Unit 23 remained dominated by chamise (c_{23}=32%).

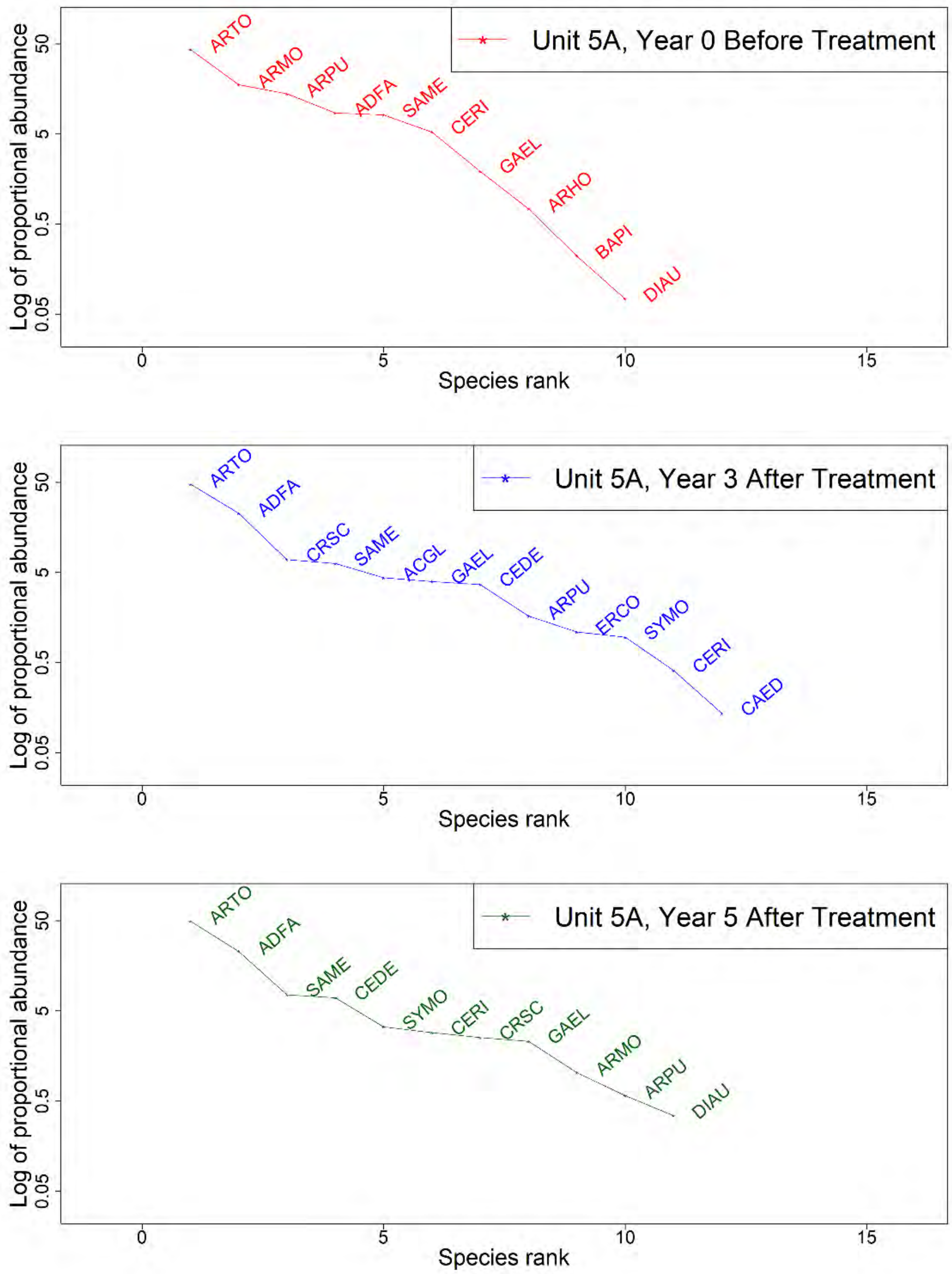

Figure 5-14. Unit 5A Rank Abundance Curves Between Baseline (2011), Year 3 (2018), and Year 5 (2020). New species present in Year 5 surveys compared to Baseline include dwarf ceanothus, peak rush rose, and creeping snowberry. Species present in Baseline surveys, but absent in Year 5 include Hooker's manzanita and coyote brush. Two masticated transects were analyzed in Unit 5A. Note that the y-axis is log-10 scale.

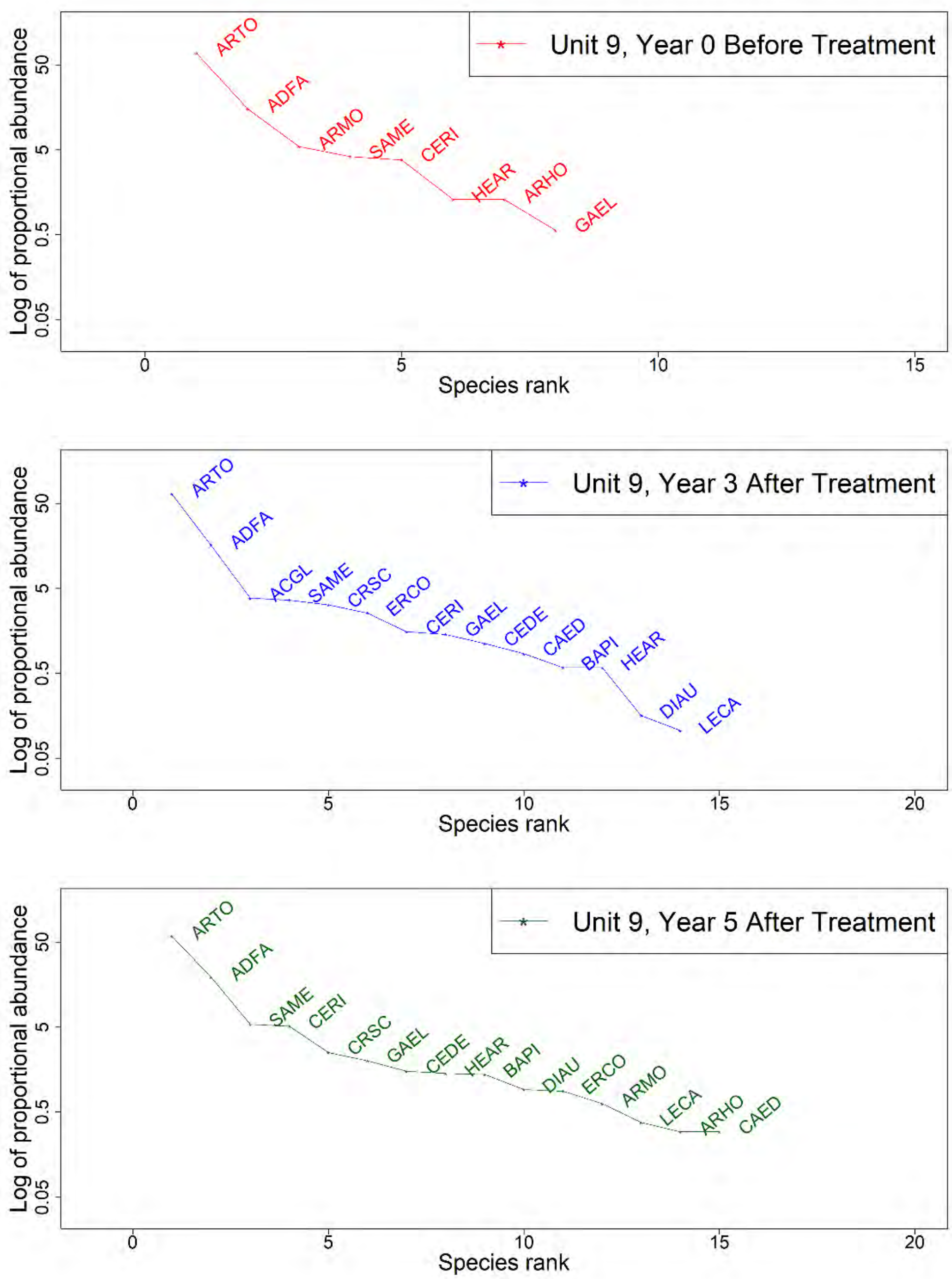

Figure 5-15. Unit 9 Rank Abundance Curves Between Baseline (2011), Year 3 (2018), and Year 5 (2020). New species present in Year 5 surveys compared to Baseline include coyote brush, iceplant, dwarf ceanothus, peak rush rose, sticky monkeyflower (*Diplacus aurantiacus*), golden yarrow, and pitcher sage. Species present in Baseline surveys, but absent in Year 5 include shaggy-barked manzanita. Five masticated transects were analyzed in Unit 9. Note that the y-axis is log-10 scale.

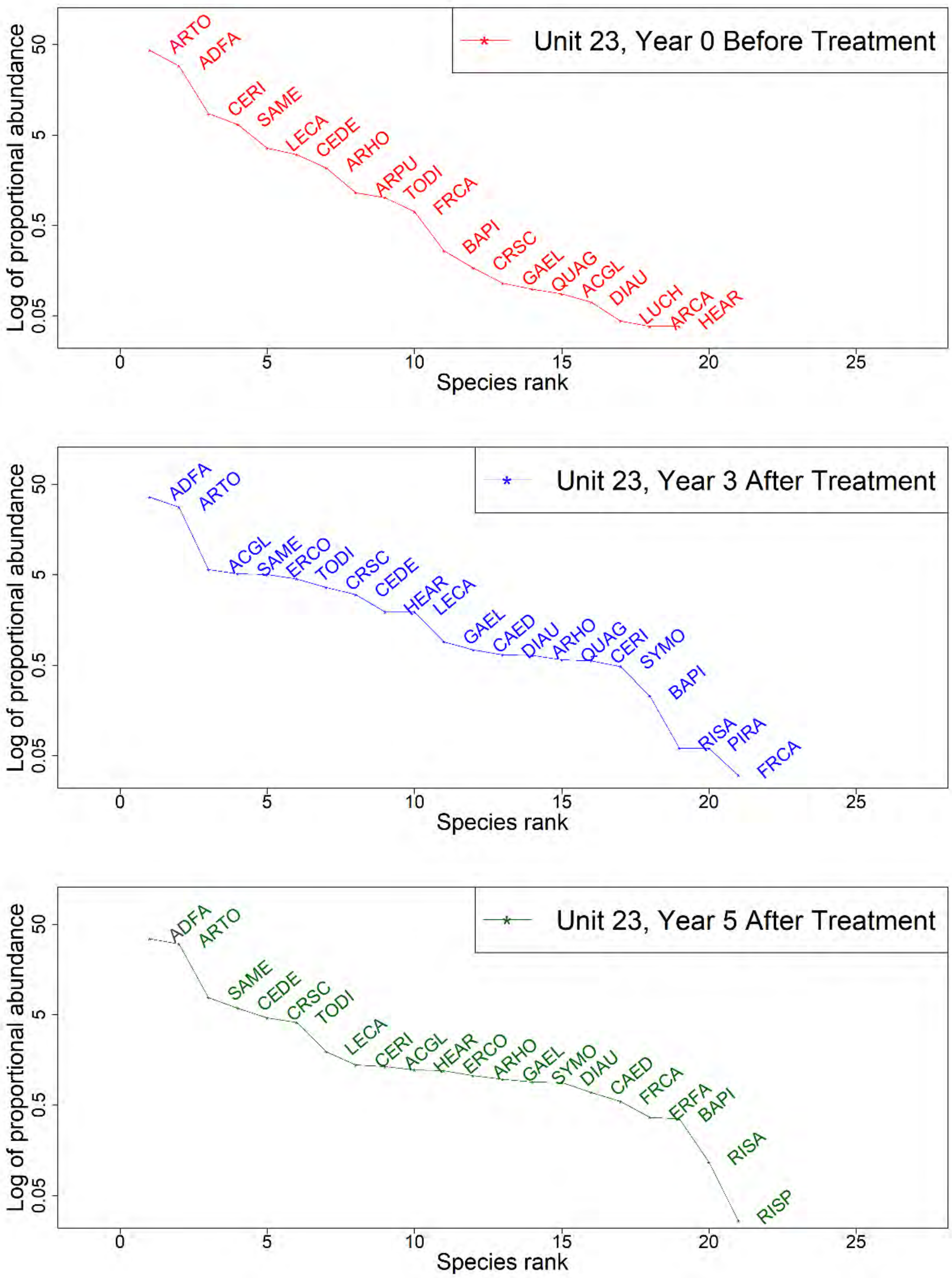

Figure 5-16. Unit 23 Rank Abundance Curves Between Baseline (2003), Year 3 (2018), and Year 5 (2020). New species present in Year 5 surveys compared to Baseline include iceplant, golden yarrow, creeping snowberry, Eastwood's goldenbush, red flowering currant, and fuchsia-flowered gooseberry. Species present in Baseline surveys, but absent in Year 5 include sandmat manzanita, silver beach lupine, and California sagebrush (*Artemisia californica*). Sixteen masticated transects were analyzed in Unit 23. Note that the y-axis is log-10 scale.

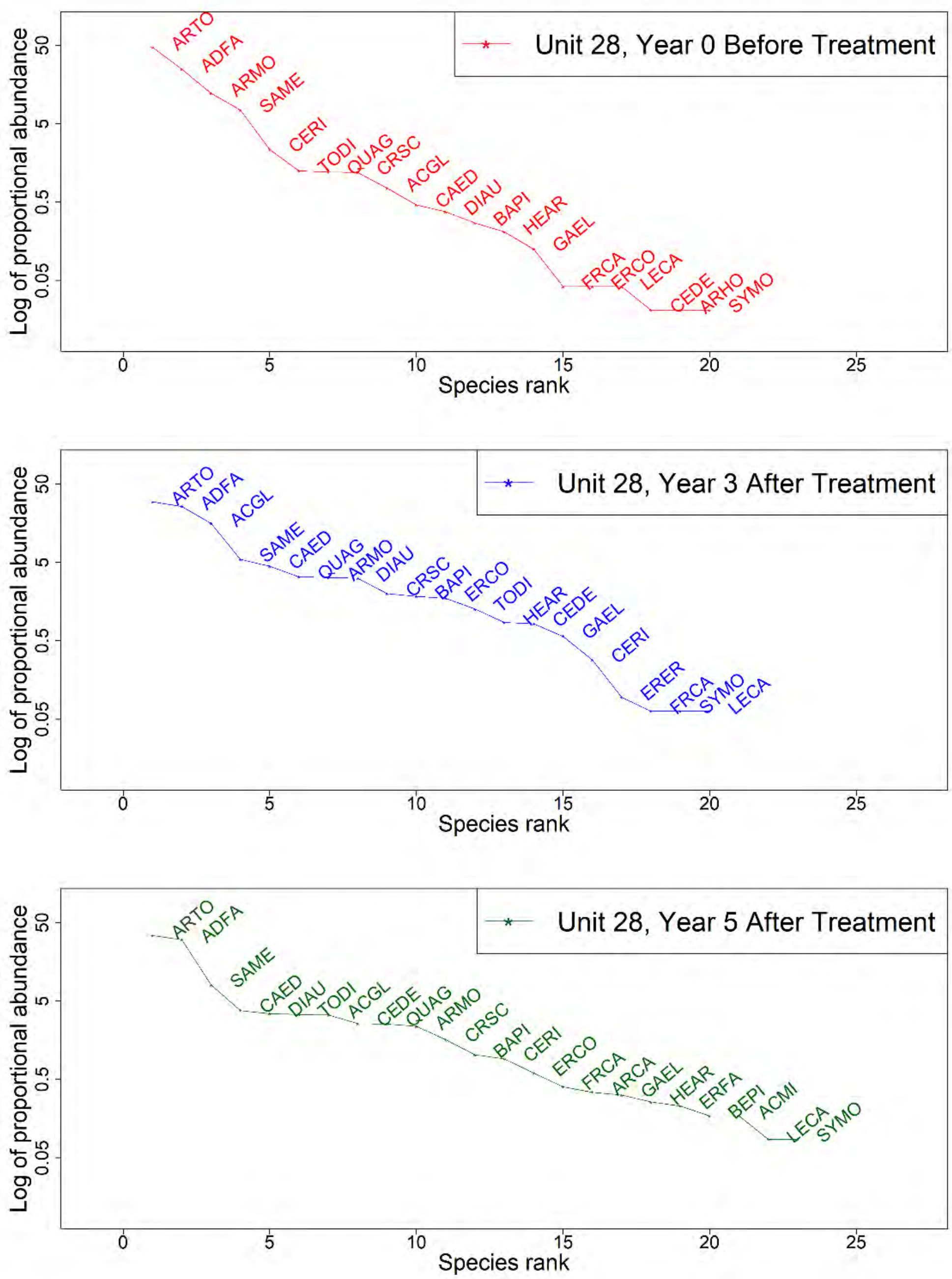

Figure 5-17. Unit 28 Rank Abundance Curves Between Baseline (2011), Year 3 (2018), and Year 5 (2020). New species present in Year 5 surveys compared to Baseline include common yarrow (*Achillea millefolium*), California sagebrush, California barberry (*Berberis pinnata*), and Eastwood's goldenbush. There were no species present in Baseline surveys that were absent in Year 5. Nine masticated transects were analyzed in Unit 28. Note that the y-axis is log-10 scale.

During Year 5 surveys, the HMP shrub species Monterey ceanothus was present in all Year 5 units. Sandmat manzanita and Toro manzanita were present in Unit 5A. Toro manzanita was also observed in Unit 9 and Unit 28. Hooker's manzanita was present in Units 9 and 23.

HMP shrub species have generally recovered at a slower rate than the dominant species in all Year 5 units (Figures 5-18 through 5-21). Monterey ceanothus is recovering in all Year 5 units. Sandmat manzanita is recovering in Units 5A and 28 but was not observed after mastication in Unit 23. Toro manzanita was present during Baseline surveys and was observed in Units 5A and 9 five years after mastication. This species was also present during Unit 28 Baseline survey and was observed during Year 3 and Year 5 surveys of Unit 28 and at a higher Year 5 cover than in Units 5A and 9. This may be due to saving some of mature Toro manzanitas in that unit from mastication. Hooker's manzanita was observed in all Year 5 units in Baseline; however, it was only present on Year 5 transects in Units 23 and 28.

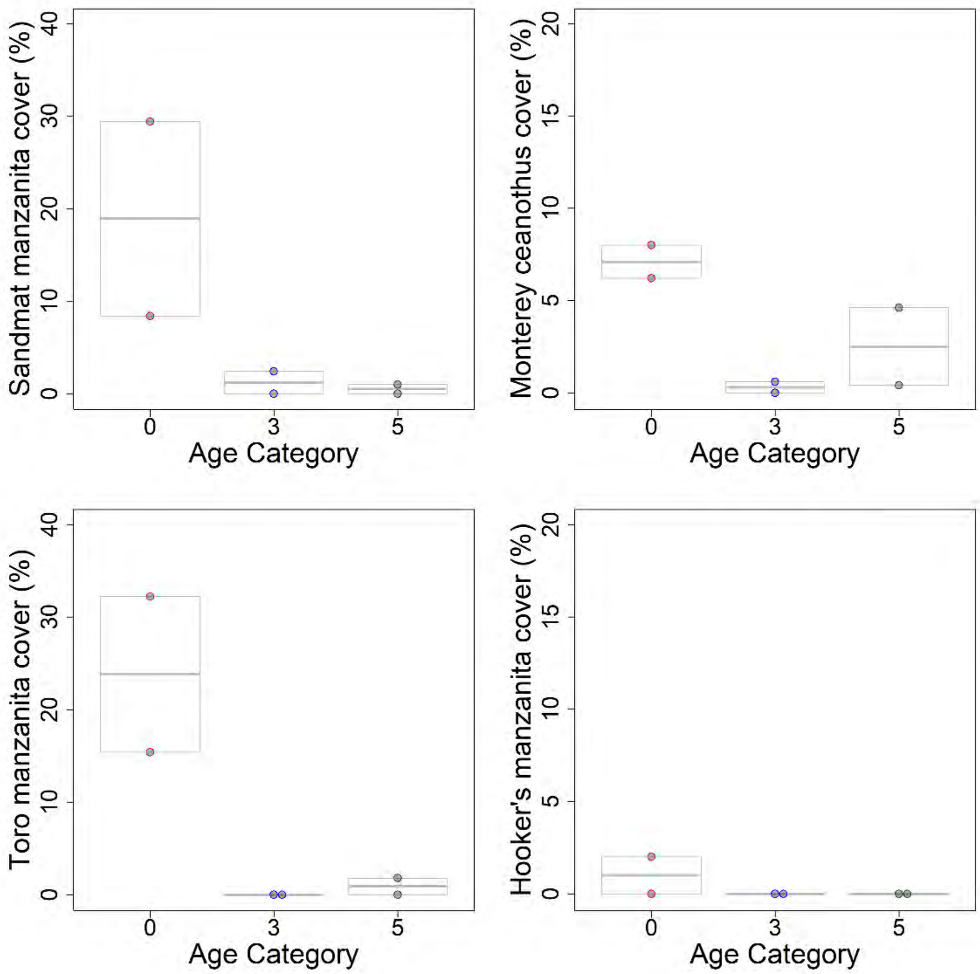

Figure 5-18. Unit 5A HMP Shrub Species Cover Between Baseline (2011), Year 3 (2018), and Year 5 (2020). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Two masticated transects were analyzed in Unit 5A. Scales Not Equivalent.

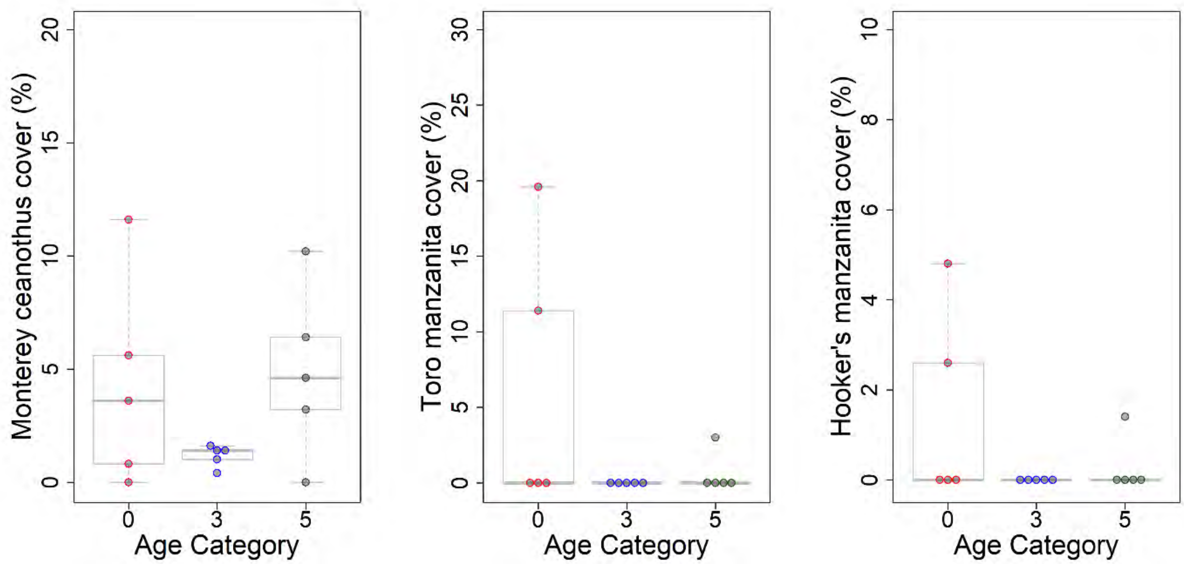

Figure 5-19. Unit 9 HMP Shrub Species Cover Between Baseline (2011), Year 3 (2018), and Year 5 (2020). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Five masticated transects were analyzed in Unit 9. Scales Not Equivalent.

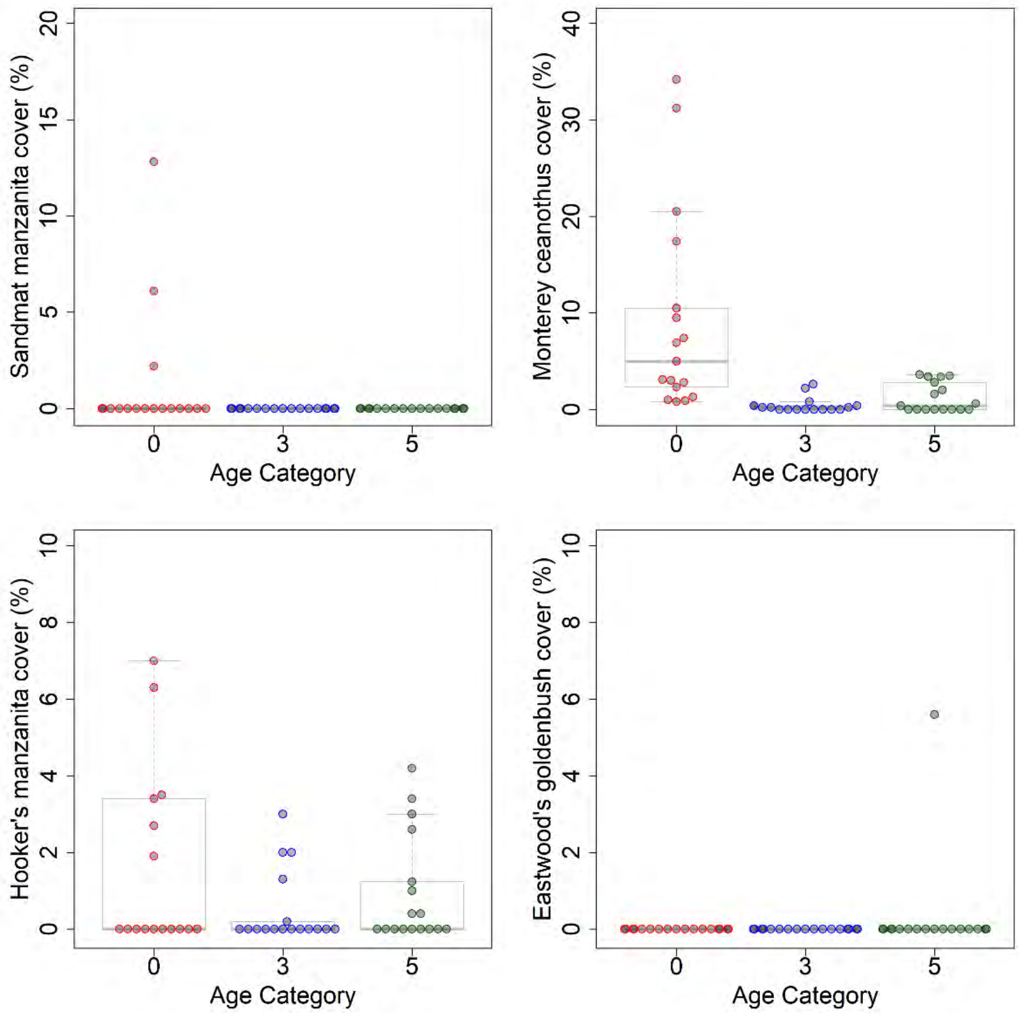

Figure 5-20. Unit 23 HMP Shrub Species Cover Between Baseline (2003), Year 3 (2018), and Year 5 (2020). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Seventeen masticated transects were analyzed in Unit 23. Scales Not Equivalent.

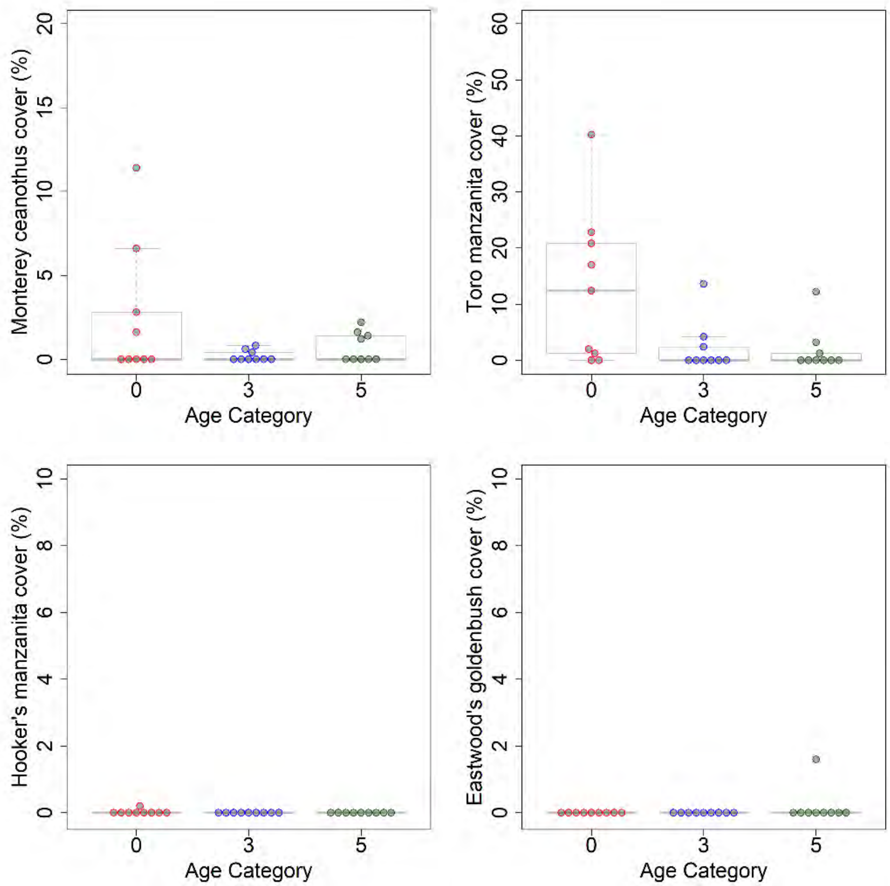

Figure 5-21. Unit 28 HMP Shrub Species Cover Between Baseline (2003), Year 3 (2018), and Year 5 (2020). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Nine masticated transects were analyzed in Unit 28.

NMDS ordinations for Year 5 units illustrate that community compositions by Year 5 were on trajectory towards Baseline composition (Figures 5-22 through 5-24). Community composition is represented by the shape and location of ellipses in the ordination space, where ellipses with similar shape and location imply similar community composition. In Year 3 after treatment, ellipses are typically in a different location on the ordination than the Baseline ellipses since species composition has shifted. By Year 5, the location of ellipses typically shifts back towards the Baseline ellipse location, implying that community composition is more similar to Baseline by Year 5 than in Year 3.

In Unit 5A, there were an insufficient number of transects by age (two transects for each age category) to conduct an NMDS ordination or a Wilcoxon signed-rank test and an ordination plot is not provided. To examine changes in community composition in Unit 5A, community statistics (total cover, diversity, species richness, and species evenness) for individual transects are evaluated over time. Along transect 5A-1 in Unit 5A, total cover decreased from 135% in Baseline (2011) to 74.4% in Year 3 (2018) before increasing to 83% in Year 5 (2020). Diversity decreased from 1.48 in Baseline (2011) to 1.11 in Year 3 (2018) and increased to 1.36 in Year 5 (2020). Species evenness remained relatively unchanged from Baseline through Year 5 (0.64, 0.62, 0.65; Baseline, Year 3, Year 5). Species richness decreased from 10 species in Baseline to 6 species in Year 3 before increasing to 8 species in Year 5.

In Unit 5A, along transect 5A-2, total cover decreased from 135.4% in Baseline (2011) to 72.2% in Year 3 (2018) before increasing to 91.2% in Year 5 (2020). Diversity increased from 1.62 in Baseline (2011) to 1.75 in Year 3 (2018) and decreased to 1.51 in Year 5 (2020). Species evenness decreased from 0.90 in Baseline to 0.73 in Year 5. Species richness increased from 6 species in Baseline to 9 species in Year 3 before decreasing to 8 species in Year 5.

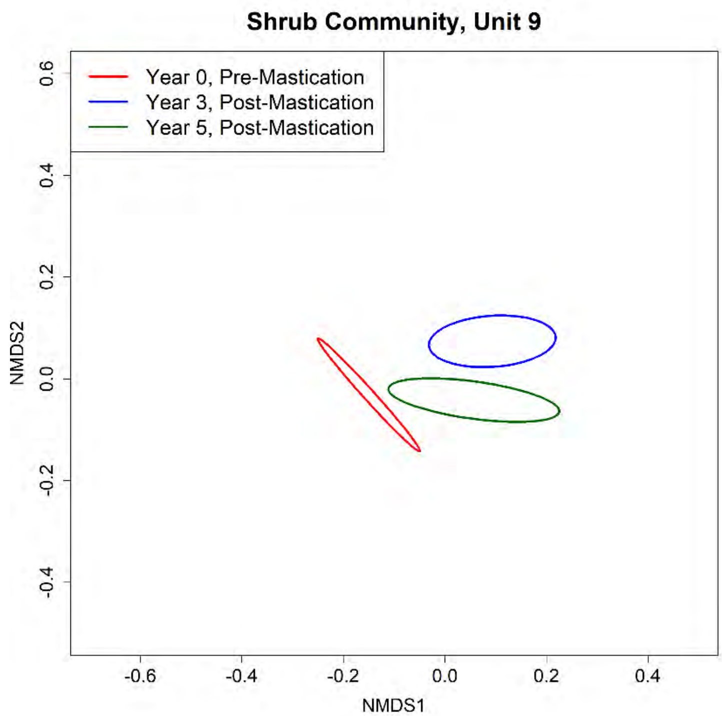

Figure 5-22. NMDS Ordination Plot Showing Unit 9 Community Composition Changes Between Pre-mastication Surveys (2011), Year 3 Surveys (2018), and Year 5 Surveys (2020). Five masticated transects were analyzed in Unit 9.

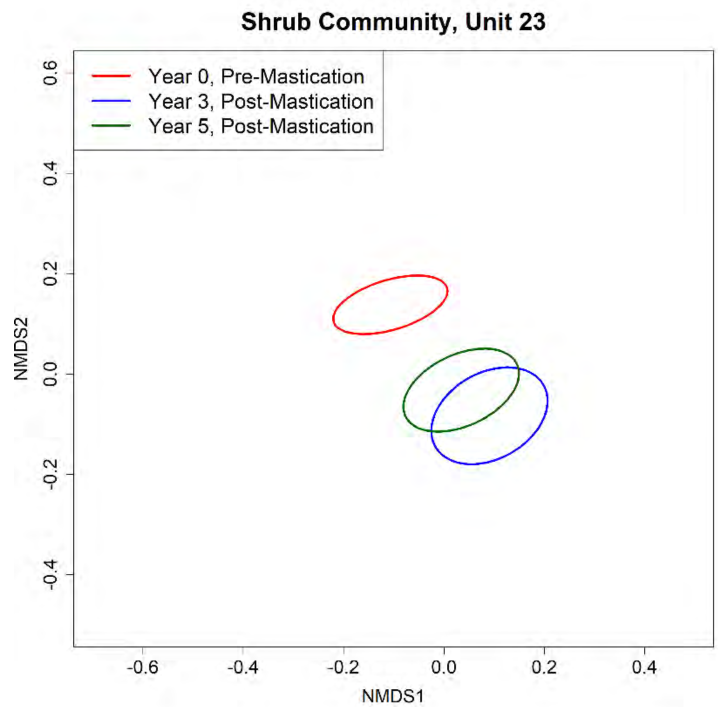

Figure 5-23. NMDS Ordination Plot Showing Unit 23 Community Composition Changes Between Pre-mastication Surveys (2003), Year 3 Surveys (2018), and Year 5 Surveys (2020). Sixteen masticated transects were analyzed in Unit 23.

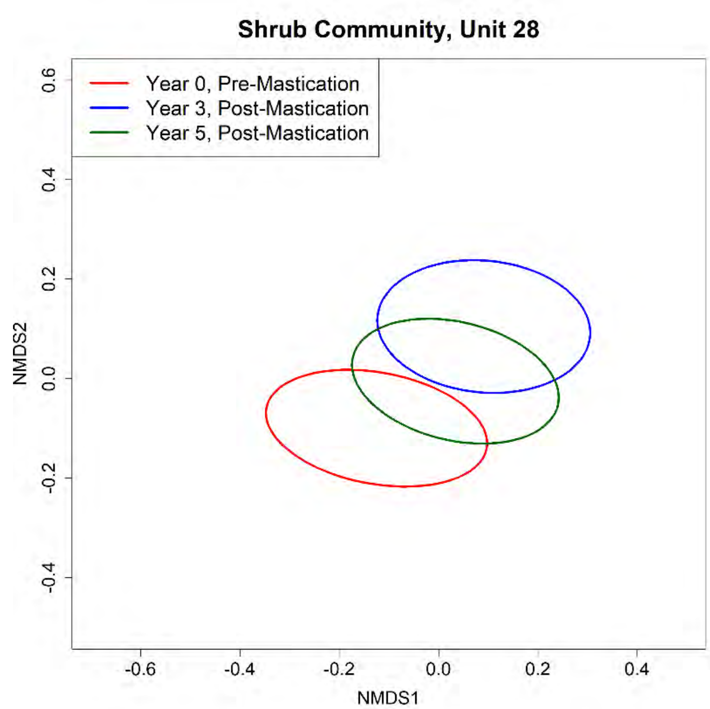

Figure 5-24. NMDS Ordination Plot Showing Unit 28 Community Composition Changes Between Pre-mastication Surveys (2011), Year 3 Surveys (2018), and Year 5 Surveys (2020). Nine masticated transects were analyzed in Unit 28.

5.4.7 Invasive and Non-Native Species Monitoring

Of the target invasive species, iceplant and pampas grass were observed in Units 5A and 28 while French broom was not observed. Only iceplant was observed in Units 9 and 23, and no invasive species were observed in Unit 23 North. One patch of iceplant intermingled with a patch of pampas grass was documented in Unit 5A; ten patches of iceplant and one patch of pampas grass were found in Unit 28; five patches of iceplant were observed in Unit 9; and two patches of iceplant were observed in Unit 23 (Appendix E, Figures E-7 through E-10). Additionally, minor occurrences of non-native herbaceous cover were observed during transect monitoring in all Year 5 units (Appendix G, Tables G-7 through G-11).

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6 YEAR 8 VEGETATION SURVEYS: UNITS 2 EAST AND 3 EAST

6.1 Introduction

Year 8 units included Units 2 East and 3 East (Figure 6-1). Units 2 East and 3 East were masticated as part of 2012-2013 preparations for the prescribed burns of the adjacent Units 7 and 10. Vegetation clearance in Units 2 East and 3 East included only mastication in areas of mature maritime chaparral, with no prescribed burning. In mastication areas, essentially all shrub cover was mowed to a height of approximately 6 inches. The units contain the easternmost portions of Units 2 and 3, the remainder of which were masticated in 2014 (Units 2 West and 3 West). Units 2 East and 3 East encompass 34 acres and 49 acres, respectively. Baseline monitoring was conducted in 2012, Year 3 monitoring in 2015, and Year 5 monitoring in 2017, while Year 1 monitoring did not occur in these units (Tetra Tech and EcoSystems West, 2013; Burleson, 2016; Burleson, 2018).

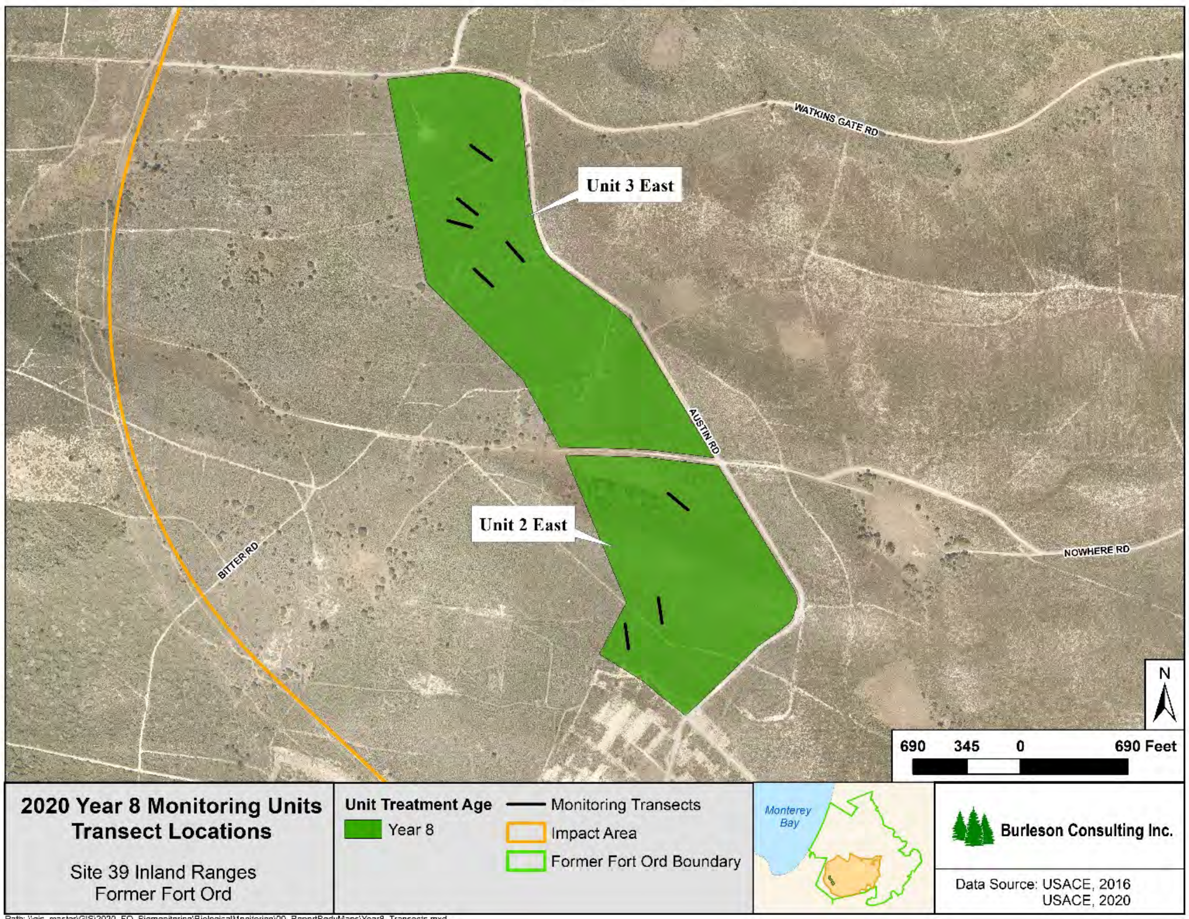

Figure 6-1. Map of Units 2 East and 3 East Shrub Transects. Containment Lines Can be Seen Outlined in Black Where the Annual Grass Surveys Occurred.

6.2 Units 2 East and 3 East: Setting

Units 2 East and 3 East are adjacent to each other and bordered by Austin Road to the east and Watkins Gate Road to the north. The topography is level to gently rolling. In pre-treatment condition, these two units were mostly vegetated with mature maritime chaparral similar to that in adjacent areas on former Fort Ord. This chaparral was mostly dense with few openings in Unit 3 East and more variable in physiognomy in Unit 2 East. In the south portion of Unit 3 East, chaparral occurred in a mosaic with patches of coast live oak woodland and a disturbed, sparsely vegetated area. Currently, a sizable stand of coast live oak woodland is located in the northern portion of the Unit 2 East on a steep, north facing slope. A dry, grassy meadow is situated along the border between the two units. Disturbed soil remediation areas were located in the northern portion of Unit 3 East and in the southernmost portion of Unit 2 East.

Arnold-Santa Ynez complex soil type is mapped in all of Unit 2 East and the southern portion of Unit 03 East. Baywood sand, 2 to 15 percent slopes, is mapped in the northern half of Unit 3 East (USDA, 2020). The distribution of soils in the Year 5 survey areas and characteristics of these soils are presented in Table 2-1.

6.3 Units 2 East and 3 East: Methods

In accordance with methods outlined in the Revised Protocol (Tetra Tech and EcoSystems West, 2015b) and Section 2 of this report, the 2020 Year 8 follow-up monitoring in Units 2 East and 3 East consisted of the following activities:

- Repeated sampling of transects that were sampled in 2012, 2015, and 2017 (Tetra Tech and EcoSystems West, 2013; Burleson, 2016; Burleson, 2018). This survey effort was conducted to assess shrub species composition of the sensitive maritime chaparral community after treatment. Surveys occurred on May 6 and 7, 2020.

- Mapping of invasive species, including iceplant, pampas grass, and French broom, where encountered. This survey effort was conducted to support ongoing management.

- Mapping of non-native annual grasses. This survey effort was conducted to assess expansion or contraction of these populations over time after disturbance.

6.4 Units 2 East and 3 East: Results and Discussion

A total of 8 shrub monitoring transects were sampled in Units 2 East and 3 East, with 3 in Unit 2 East and 5 in Unit 3 East.

6.4.1 Shrub Transect Monitoring

Shrub transects were sampled in Units 2 East (n=3) and 3 East (n=8) (Appendix C; Figures C-11 and C-12). The temporal patterns of broad scale community response to treatment in Year 8 units were generally congruent with past observations of neighboring units in the MRA (Tetra Tech and EcoSystems West, 2011 through 2015a; Burleson, 2016 through 2020). All transects were masticated with no prescribed burns.

Units 2 East and 3 East community structures and compositions are progressing towards their Baseline conditions. The effects of treatment could not be analyzed for Year 8 units because only one treatment was applied.

Mixed-design ANOVAs were conducted to examine the effect of unit and age on mean percent cover, species richness, species evenness, and species diversity for Year 8 units (Table 6-1). The changes observed in all metrics, aside from species evenness, appeared influenced by time, and Year 8 community metrics appeared to vary similarly by unit (Figures 6-2 and 6-3). These results suggest that the response of the Year 8 units to treatment was variable by age.

Table 6-1. Mixed-design ANOVA results for Units 2 East and 3 East.

Factor	Total Mean Cover		Species Richness		Species Evenness		Species Diversity	
	F	*p*	*F*	*p*	*F*	*p*	*F*	*p*
Unit	0.024	0.882	0.8254	0.399	0.709	0.432	0.157	0.705
Age	33.08	1.38e-07	9.889	4.47e-04	1.643	0.215	8.994	7.41e-04
Unit*Age	1.453	0.261	2.291	0.113	0.416	0.744	0.485	0.697

Units 2 East and 3 East decreased in shrub cover between Baseline ($c_{2E,\ Baseline}$ = 102.5%, $c_{3E,\ Baseline}$ = 107%) and Year 3 ($c_{2E,\ Year\ 3}$ = 57.1%, $c_{3E,\ Year\ 3}$ = 67.1%), with subsequent increases between Year 3 and Year 8 ($c_{2E,\ Year\ 8}$ = 98.6%, $c_{3E,\ Year\ 8}$ = 95.3%) (Figures 6-2 and 6-3).

Unit 2 East increased in species diversity between Baseline ($H_{2E,\ Baseline}$ = 1.11) and Year 3 ($H_{2E,\ Year\ 3}$ = 1.44) with subsequent slight decreases between Year 3 and Year 8 ($H_{2E,\ Year\ 8}$ =1.40) (Figures 6-2 through 6-4). Unit 3 East increased in species diversity between Baseline ($H_{3E,\ Baseline}$ = 0.96) and Year 5 ($H_{3E,\ Year\ 5}$ = 1.40) with a subsequent slight decrease between Year 5 and Year 8 ($H_{3E,\ Year\ 8}$ = 1.29) (Figures 6-2 and 6-3).

Units 2 East increased in species richness between Baseline ($S_{2E,\ Baseline}$ = 5.33 species) and Year 3 ($S_{2E,\ Year\ 3}$ = 8.0 species), with a subsequent decrease observed between Year 3 and Year 5 ($S_{2E,\ Year\ 5}$ = 6.67 species), and a slight increase in species richness between Year 5 and Year 8 ($S_{2E,\ Year\ 8}$ = 7.0 species). Unit 3 East steadily increased in species richness between Baseline ($S_{3E,\ Baseline}$ = 5.0 species) and Year 8 ($S_{3E,\ Year\ 8}$ = 8.8 species) (Figures 6-2 and 6-3).

Units 2 East and 3 East increased in species evenness between Baseline ($J_{2E,\ Baseline}$ =0.66, $J_{3E,\ Baseline}$ =0.59) and Year 5 ($J_{2E,\ Year\ 5}$ = 0.74, $J_{3E,\ Year\ 5}$ = 0.66) and decreased in species evenness between Year 5 and Year 8 ($J_{2E,\ Year\ 8}$ =0.73, $J_{3E,\ Year\ 8}$ =0.60) (Figures 6-2 and 6-3).

These results suggest that Year 8 units generally responded similarly through time.

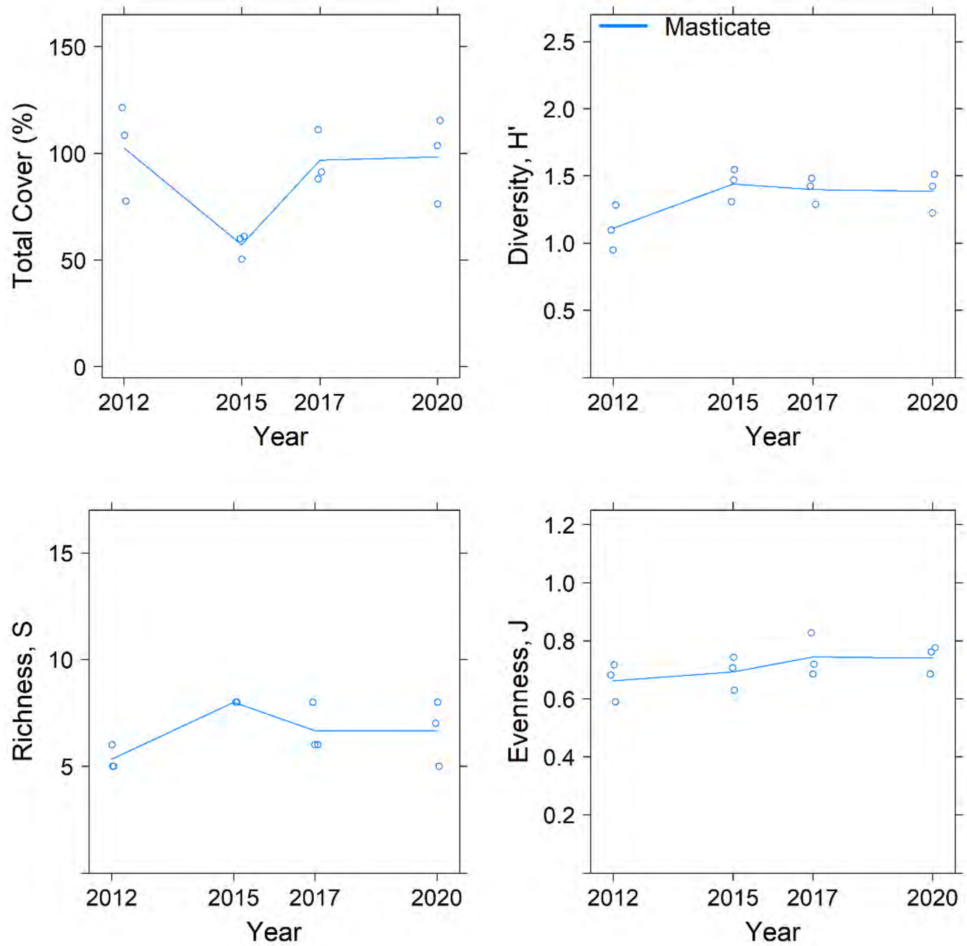

Figure 6-2. Unit 2 East Community Structure from Baseline (2012) to Eight Years After Mastication (2020). Three masticated transects were analyzed in Unit 2 East.

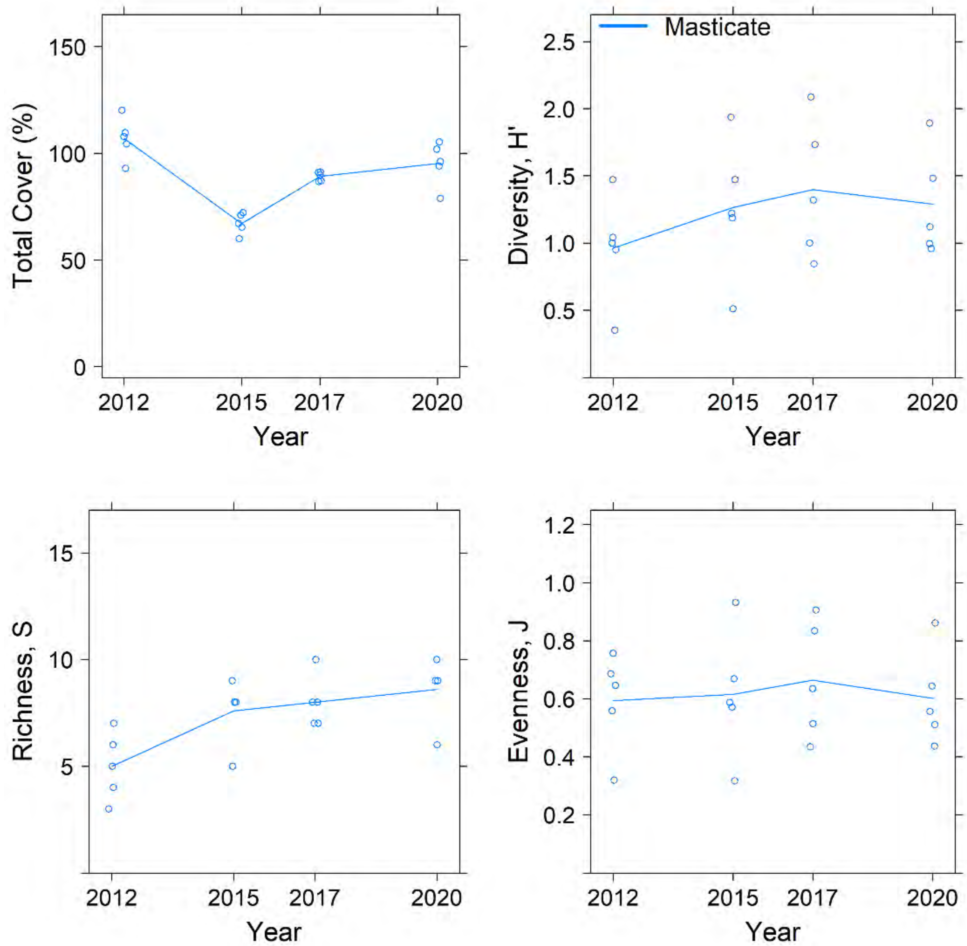

Figure 6-3. Unit 3 East Community Structure from Baseline (2012) to Eight Years After Mastication (2020). Five masticated transects were analyzed in Unit 3 East.

Mixed-design ANOVAs were conducted to compare the effect of unit and age on bare ground and herbaceous cover for Year 8 units (Table 6-2). Bare ground coverage varied similarly between the units, but differences were observed in the collective bare ground coverage over time (Figures 6-4 and 6-5). Generally, herbaceous coverage remained relatively small in each unit through time and neither unit nor age was considered to influence herbaceous coverage (Table 6-2 and Figures 6-4 and 6-5).

Table 6-2. Mixed-design ANOVA results for Units 2 East and 3 East bare ground and herbaceous cover.

Factor	Bare Ground		Herbaceous Cover	
	F	*P*	*F*	*p*
Unit	0.193	0.894	2.236	0.185
Age	26.40	8.24e-07	2.146	0.193
Unit*Age	1.066	0.388	2.114	0.196

Both Year 8 units increased in bare ground cover between Baseline and Year 3 and decreased between Year 3 and Year 5 (Figures 6-4 and 6-5; Table 6-3). Unit 3 East bare ground coverage continued to decrease between Year 5 and Year 8 transects, while Unit 2 East bare ground coverage increased very slightly. No herbaceous cover was observed along Year 8 transects during Baseline surveys. Unit 3 East herbaceous coverage never exceeded 1% in any survey years. In Unit 2 East, herbaceous coverage was observed in Year 3 and decreased in Year 5 and Year 8.

Table 6-3. Average percent coverage of bare ground and herbaceous cover for Units 2 East and 3 East during baseline, Year 3, Year 5, and Year 8 surveys.

Cover Type % (Year)	Unit 2 East	Unit 3 East
Bare ground % (Baseline)	13%	7%
Bare ground % (Year 3)	28%	40%
Bare ground % (Year 5)	19%	25%
Bare ground % (Year 8)	20%	21%
Herbaceous % (Baseline)	0%	0%
Herbaceous % (Year 3)	16%	0.3%
Herbaceous % (Year 5)	5%	0.2%
Herbaceous % (Year 8)	1%	0.4%

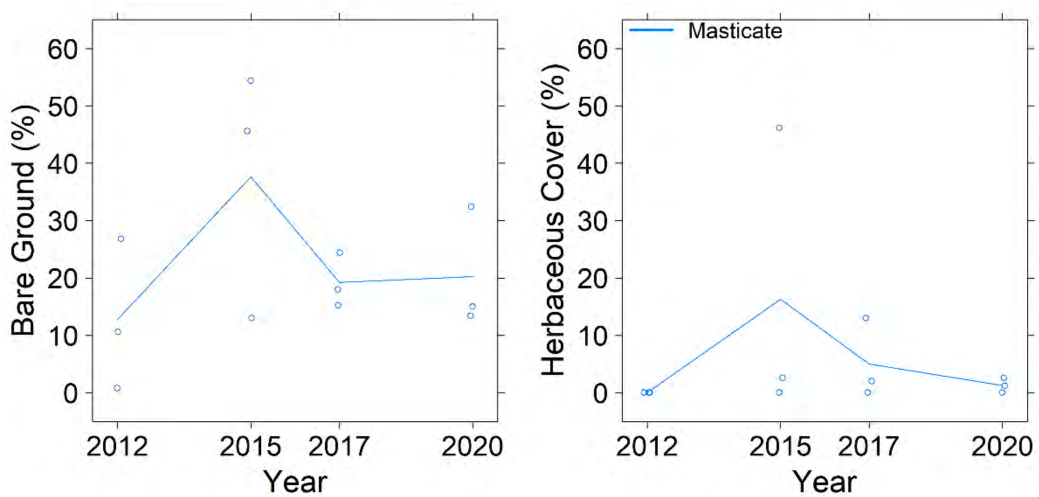

Figure 6-4. Unit 2 East Bare Ground and Herbaceous Cover from Baseline to Year 8 After Mastication. Three masticated transects were analyzed in Unit 2 East.

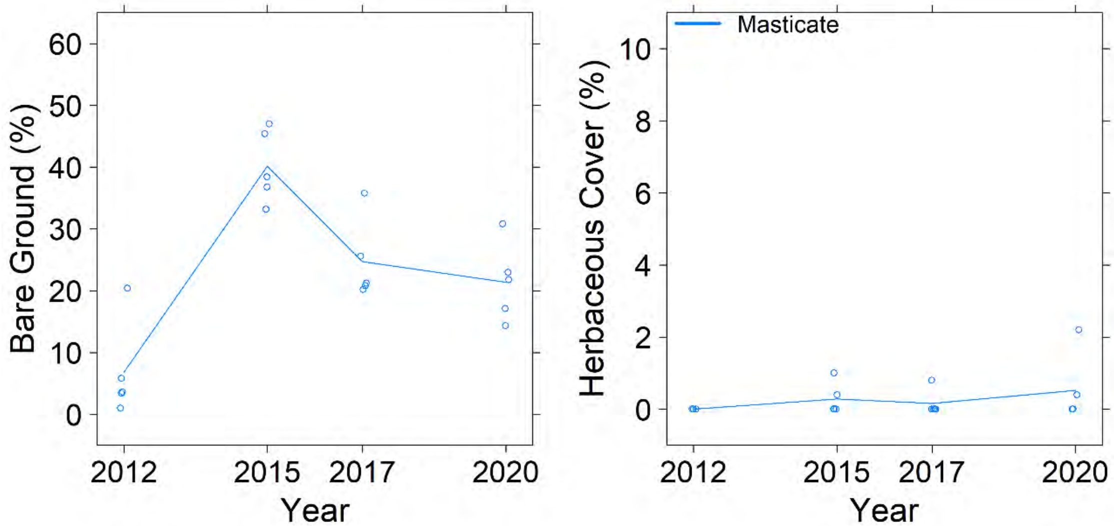

Figure 6-5. Unit 3 East Bare Ground and Herbaceous Cover from Baseline to Year 8 After Mastication. Five masticated transects were analyzed in Unit 3 East.

Burleson conducted PERMANOVA to examine differences in community composition among age and unit (Table 6-4). These results suggest that the unit may influence overall community composition; however, age of the unit did not appear to influence the community composition within the unit. This indicates that the types and abundances of species within each unit were different, and that composition generally did not vary through time. The community compositions for each unit are shown in Figures 6-6 and 6-7.

Table 6-4. Two-way PERMANOVA results for Year 8 Units community compositions, based on Bray-Curtis distance matrices.

Factor	*F*	*p*
Unit	5.693	0.001
Age	0.769	0.589
Age*Unit	0.398	0.857

Community composition differs between Year 8 units (Figures 6-28 through 6-33). Units 2 East and 3 East were dominated by chamise (c_{2E}=43%) and shaggy-barked manzanita (c_{3E}=63%), respectively. The dominant species along transects in Unit 2 East remained chamise throughout all surveyed years. The dominant species along transects in Units 3 East remained shaggy-barked manzanita throughout all surveyed years.

The HMP species present in both Year 8 units were sandmat manzanita and Monterey ceanothus, and their recovery tended to occur at a slower rate than the dominant species (Figures 6-8 and 6-9). Unit 2 East HMP species in Baseline contained Monterey ceanothus which was present by Year 5. In Year 8 sandmat manzanita was observed along surveyed transects. Unit 3 East HMP species in Baseline contained sandmat manzanita and Monterey ceanothus, and both species were observed along Year 3 transects. In Year 5 only sandmat manzanita was observed; however, by Year 8 both species were observed again in Unit 3 East.

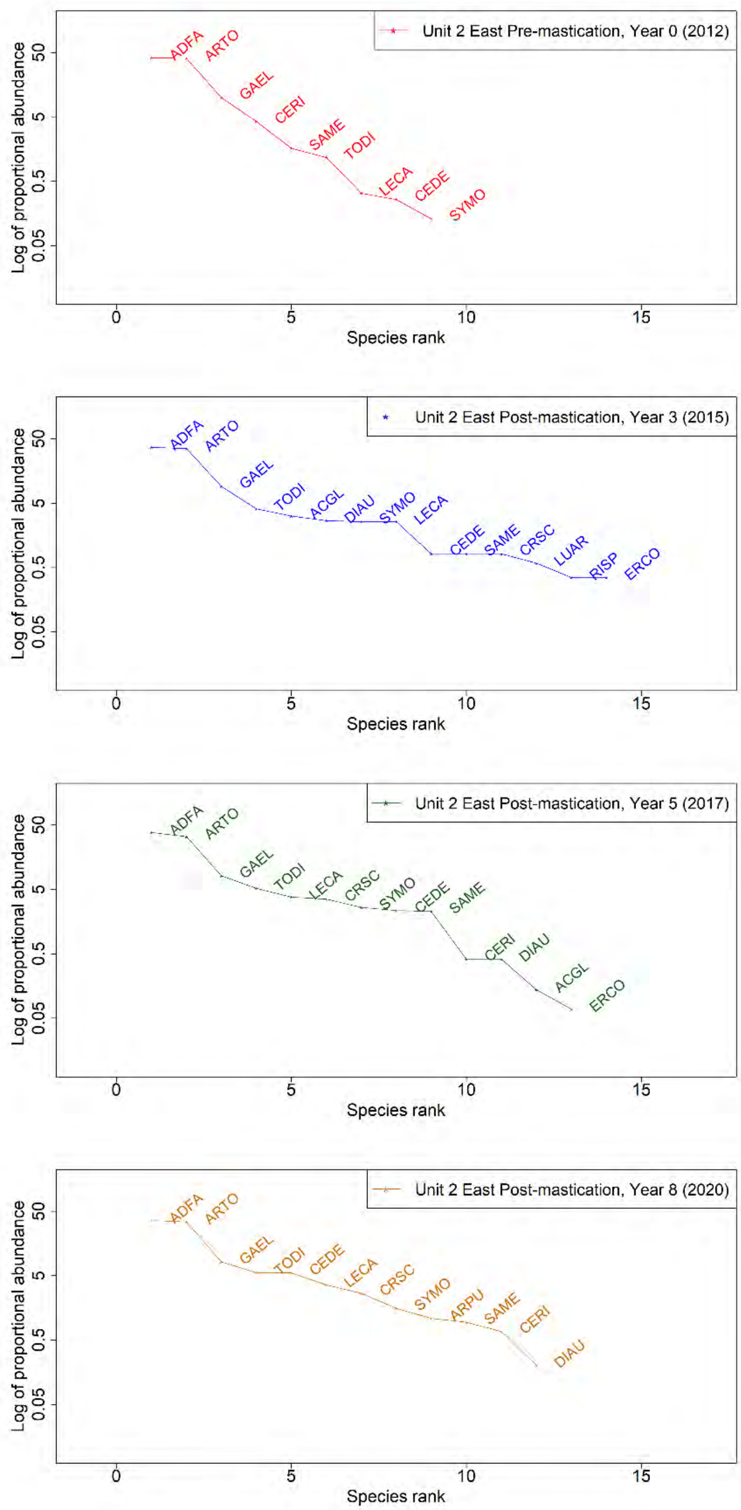

Figure 6-6. Unit 2 East Rank Abundance Curves Between Baseline (2012) and Year 8 (2020). New species present in Year 8 surveys compared to Baseline include sandmat manzanita, peak rush rose, and sticky monkeyflower. There were no species present in Baseline surveys that were absent in Year 8. Three masticated transects were analyzed in Unit 2 East. Note that the y-axis is log-10 scale.

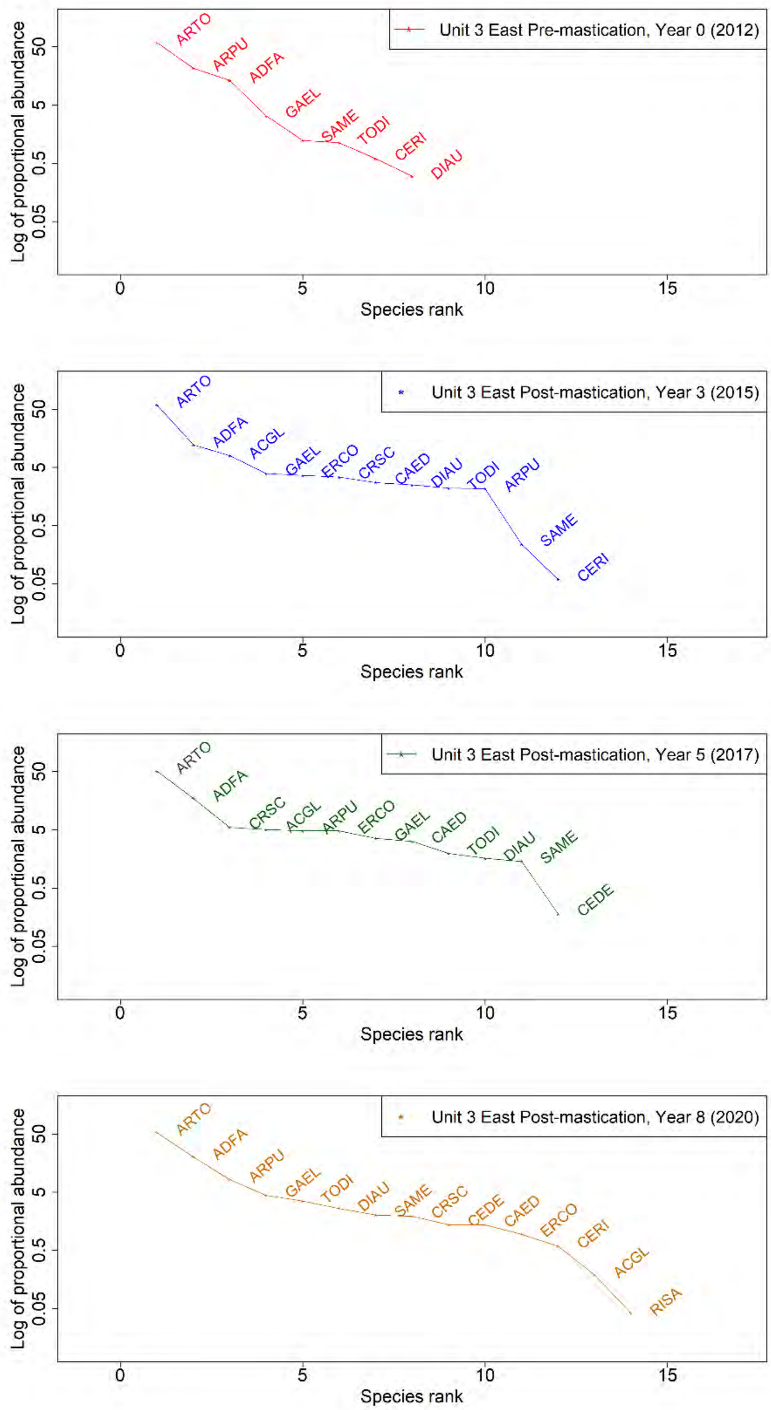

Figure 6-7. Unit 3 East Rank Abundance Curves Between Baseline (2012) and Year 8 (2020). New species present in Year 8 surveys compared to Baseline include deerweed, iceplant, dwarf ceanothus, peak rush rose, golden yarrow, and red flowering current. There were no species present in Baseline surveys that were absent in Year 8. Five masticated transects were analyzed in Unit 3 East. Note that the y-axis is log-10 scale.

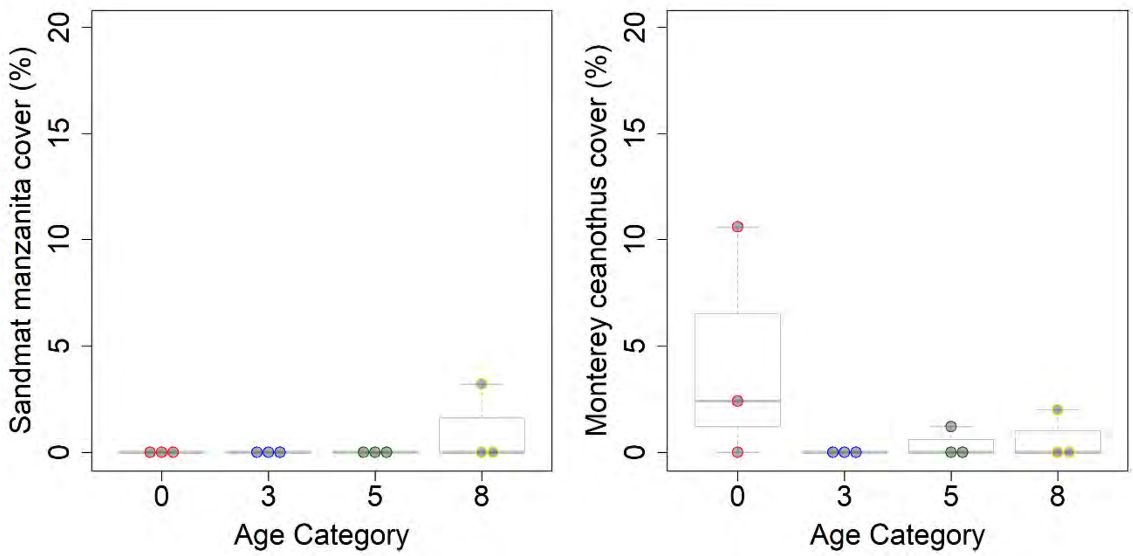

Figure 6-8. Unit 2 East HMP Shrub Species Cover Between Baseline (2012), Year 3 (2015), Year 5 (2017), and Year 8 (2020). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Three masticated transects were analyzed in Unit 1 East.

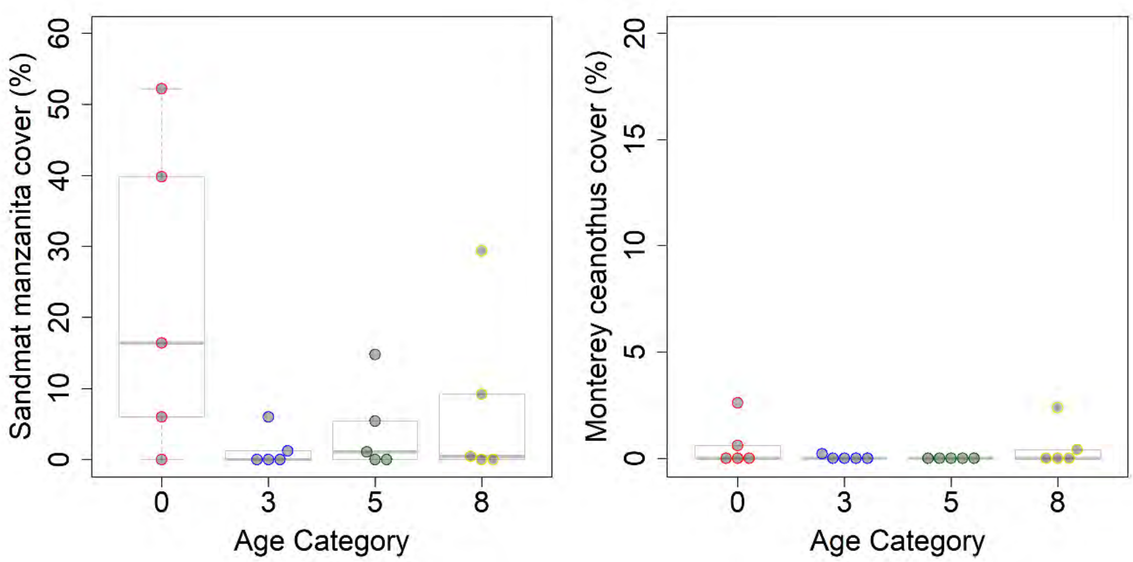

Figure 6-9. Unit 3 East HMP Shrub Species Cover Between Baseline (2012), Year 3 (2015), Year 5 (2017), and Year 8 (2020). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Five masticated transects were analyzed in Unit 3 East. Scales Not Equivalent.

NMDS ordinations for Year 8 units illustrate that the community compositions by Year 8 were on trajectory towards Baseline composition (Figure 6-10 and 6-11). Community composition is represented by the shape and location of ellipses in the ordination space, where ellipses with similar shape and location imply similar community composition. In Year 3 after treatment, ellipses are typically located in a different location on the ordination than the Baseline ellipses since composition has shifted. By Year 5 and Year 8, the location of ellipses typically shifts back towards the Baseline ellipse location, implying that community composition is more similar to Baseline by Year 8 than in Year 5 or Year 3.

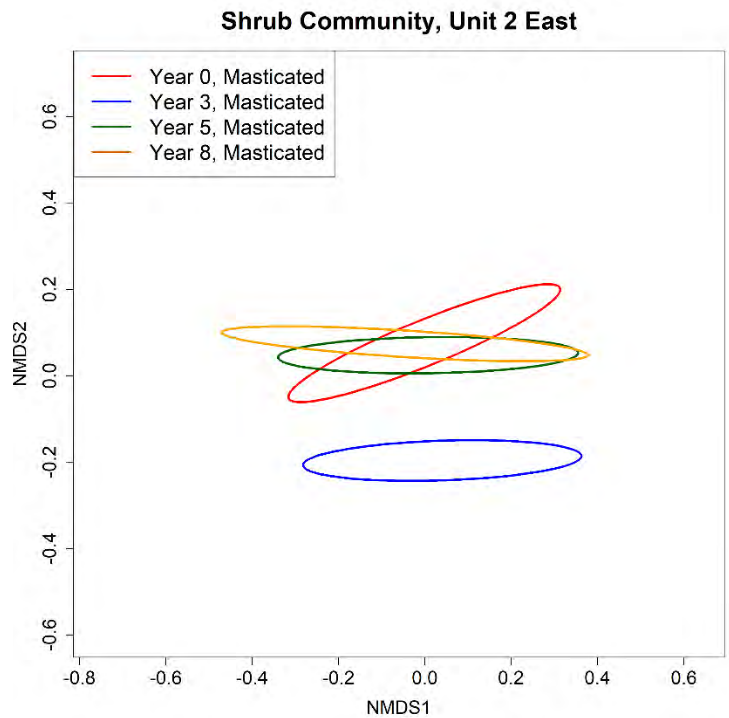

Figure 6-10. NMDS Ordination Plot Showing Unit 2 East Community Composition Changes Between Baseline and Year 8. Three masticated transects were analyzed in Unit 2 East.

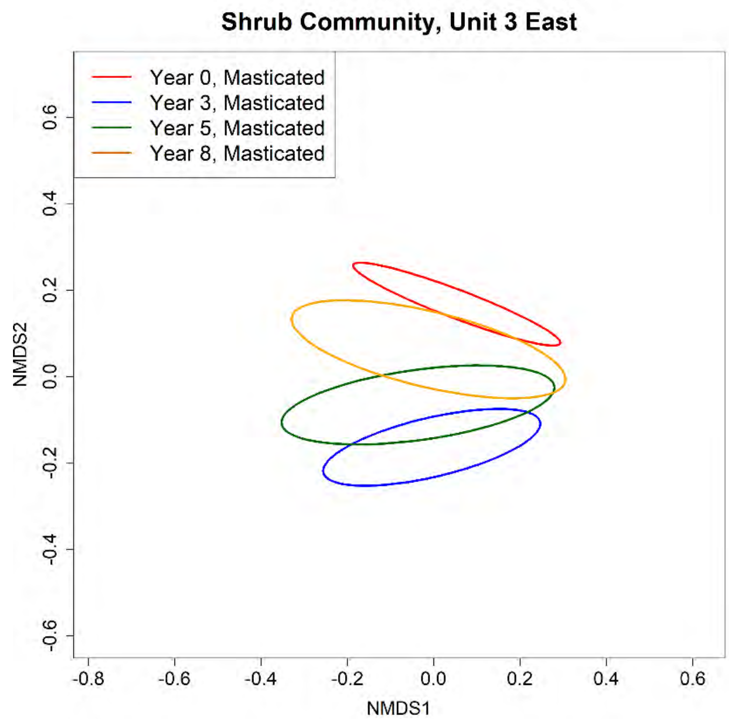

Figure 6-11. NMDS Ordination Plot Showing Unit 3 East Community Composition Changes Between Baseline and Year 8. Five masticated transects were analyzed in Unit 3 East.

6.4.2 Annual Grass Monitoring

Non-native annual grasses were observed and mapped within the Containment Lines and roadside fuel breaks of Units 2 East and 3 East (Appendix D, Figures D-4 and D-5). Estimated areas occupied by each density class for all monitoring years are summarized in Table 6-5. Units 2 East and 3 East were not monitored for annual grasses in Year 1. In Unit 2 East, annual grass cover increased between Baseline and Year 5 from 2.33 acres to 4.19 acres and decreased to 3.11 acres in Year 8. In all monitoring years, density class 3 (>25% cover) had the largest areal extent. Density class 3 contained 2.23 acres at the time of Year 8 monitoring. In Unit 3 East, annual grass cover increased from 1.80 acres in Baseline to 3.73 acres in Year 3 and decreased to 1.78 acres in Year 8. During baseline monitoring, density class 1 and density class 3 covered equal area (0.90 acres). Density class 1 (1% - 5% cover) had the largest areal extent during Year 3, Year 5, and Year 8. Density class 1 contained 0.91 acres at the time of Year 8 monitoring.

Table 6-5. Estimated Area Occupied by Annual Grasses between Baseline (2012) and Year 8 (2020) in Unit 2 East and Unit 3 East.

Cover Class	2012, Baseline (acres)	2013, Year 1 (acres)	2015, Year 3 (acres)	2017, Year 5 (acres)	2020, Year 8 (acres)
Unit 2 East					
1 (Low) = 1 – 5%	0.15	NS	0.50	0.91	0.73
2 (Medium) = 6 – 25%	0.07	NS	1.09	0.50	0.15
3 (High) = > 25%	2.11	NS	1.99	2.78	2.23
Total Acreage	**2.33**	-	**3.58**	**4.19**	**3.11**
Unit 3 East					
1 (Low) = 1 – 5%	0.90	NS	1.78	1.23	0.91
2 (Medium) = 6 – 25%	0.00	NS	0.48	0.22	0.45
3 (High) = > 25%	0.90	NS	1.47	0.43	0.42
Total Acreage	**1.80**	-	**3.73**	**1.88**	**1.78**

NS = Not surveyed

6.4.3 Invasive and Non-Native Species Monitoring

Of the target invasive species, only iceplant was observed in Year 8 units. In both Unit 2 East and Unit 3 East, small to medium patches of iceplant were ubiquitous. The extent of these iceplant patches made mapping with GPS infeasible, therefore data is not represented in map form for this report. No non-native herbaceous cover was observed during transect monitoring in either of the Year 8 units.

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7 MACROPLOT ANALYSES

7.1 Introduction

Macroplot surveys were first proposed in the *Revised Protocol for Conducting Vegetation Monitoring* and additional guidance provided in *Addendum to Revisions of Survey Protocol for HMP Annual Plants: Implementation of Macroplot Sampling at Former Fort Ord* (Tetra Tech and EcoSystems West, 2015b and 2016). Macroplot surveys were included as a requirement of the *Programmatic Biological Opinion for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord* (PBO) issued by the United States Fish and Wildlife Service (USFWS, 2017). The objective of macroplot sampling is to assess changes in the distribution of HMP annual species in response to treatment.

It was hypothesized that HMP annual species would expand outward from the quantitatively sampled grid at the center of a macroplot once mastication or fire had removed the shrub cover. This expansion in distribution could be detected by noting the presence or absence of the species in the surrounding grids within a macroplot.

Burleson analyzed macroplot survey data using two approaches. The first approach is referred to as the *macroplot-level analysis* and examines changes in distribution within macroplots between the Baseline year and 2020. This approach determines if the distributions of the HMP annual species change after treatment.

The second approach Burleson used is referred to as *single-season occupancy analysis* and examines three factors including age, treatment, or density of species in the macroplot grid, any of which may affect the distribution of HMP annual species. This analysis examines only 2020 macroplot survey results.

7.2 Methods

7.2.1 Macroplot Selection

Macroplots consisted of nine standard 100 x 100-ft sampling grids, arranged in a 3 by 3 square. An irregular rectangle arrangement was applied when a square was not feasible do its proximity to perimeter of a unit or other disturbance. The macroplots were centered on a grid that was sampled for HMP annual density. The presence or absence of each of the three HMP annual plants (sand gilia, seaside bird's beak, and Monterey spineflower) was determined in each of the grids within a macroplot.

Macroplots were selected based on the following rules:

- Macroplot center points were randomly chosen from the grids selected for quantitative density sampling for HMPs.
- Initial detection frequencies (number of grids out of 9 grids within the macroplot that were occupied) for all possible macroplots within a unit were estimated based on the results of the meandering transects. This provides the Baseline (Year 0) estimate of detection frequency.
- Macroplots were selected from potential macroplot locations that had a baseline detection frequency of 5/9 or less.

- Macroplots may not overlap.
- For macroplots established along boundaries (either unit or treatment), their position/shape was adjusted to ensure that it remained within the subject area.
- Macroplot size was maintained at nine grids.
- There was no stratification by treatment (i.e., masticated or masticated and burned) within a unit when selecting macroplots.
- There was no stratification by HMP annual species.

A total of 18 macroplot locations were surveyed in 2020 (see Table 7-1 and Figure 7-1). Year 3 and Year 5 macroplots were previously surveyed in 2018 (Burleson, 2019a). Maps showing macroplot survey locations are provided in Appendix H.

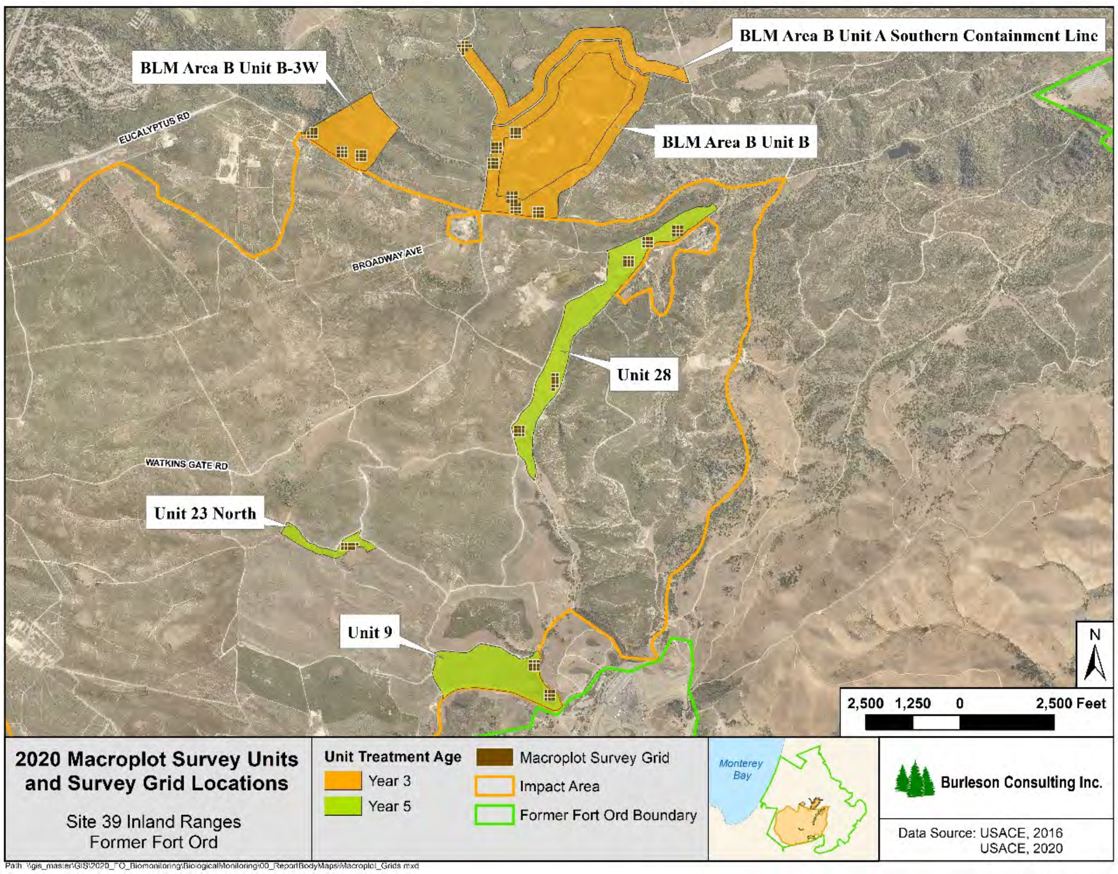

Figure 7-1. Map of Macroplots Surveyed in 2020

Table 7-1. Survey Years and Treatment Years for Each Macroplot.

MacroplotID	Unit	Age	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
C3D4F2	BLM Area B, Unit A	3					Y0		M	Y1		Y3
B3J5C6	BLM Area B, Unit B	3					Y0		M&B	Y1		Y3
B3J6B2	BLM Area B, Unit B	3					Y0		Mix	Y1		Y3
C3A4E0	BLM Area B, Unit B	3					Y0		M	Y1		Y3
C3A5I1	BLM Area B, Unit B	3					Y0		Mix	Y1		Y3
C3B5C6	BLM Area B, Unit B	3					Y0		M&B	Y1		Y3
B3J5F5	BLM Area B, Unit B	3					Y0		Mix	Y1		Y3
C2A0H0	BLM Area B-3 West	3					Y0		M	Y1		Y3
C2B0C2	BLM Area B-3 West	3					Y0		M	Y1		Y3
C3A1G5	BLM Area B-3 West	3					Y0		M	Y1		Y3
A3G6D5	9	5	Y0				M	Y1		Y3		Y5
A3H6B1	9	5	Y0				M	Y1		Y3		Y5
B3A1C2	23 North	5	Y0				M	Y1		Y3		Y5
B3D5D7	28	5	Y0				M	Y1		Y3		Y5
B3E6H6	28	5	Y0				M	Y1		Y3		Y5
B3H8I6	28	5	Y0				M	Y1		Y3		Y5
B3I9D1	28	5	Y0				M	Y1		Y3		Y5
B3I9G9	28	5	Y0				M	Y1		Y3		Y5

When possible, the effects of treatment type (masticated, masticated and burned, or mixed) were evaluated. Treatment types were allocated by examining shapefiles of the HMP annual monitoring grids against the FODIS shapefiles “flora_pres_burn_area” and “flora_fire_area” using ArcGIS (ESRI, 2020; USACE, 2020). Treatment types were allocated based on the following rules:

- Masticated – Greater than 90% of the macroplot was only masticated.
- Burned – Greater than 90% of the macroplot was only burned.
- Mixed – A portion of the macroplot was masticated and burned and a portion was only burned. Neither the masticated and burned or burned portions were greater than 90%.
- Masticated and Burned – Greater than 90% of the macroplot was masticated and then subsequently burned.

7.2.2 Statistical Approach

Changes in distribution of HMP annual species were characterized by changes in the number of individual grids in which the species were present within a macroplot. These changes were examined with the *macroplot-level analyses* and the *single-season occupancy analysis*.

7.2.2.1 Macroplot Level Analysis

The *macroplot-level analyses* were used to evaluate the changes in distribution of HMP annual species between Baseline and 2020. Data were summarized by calculating frequency of occurrence for different groups of macroplots based on age and treatment. Analysis of variance (ANOVA) was used to assess differences in frequency of occurrence between age and treatment. When ANOVA test assumptions were not met, permutational ANOVA (PERMANOVA) was used to assess differences between these groups. PERMANOVA was used on matrices of binary data, taking the form of *Macroplot* x *Replicate,* and using Jaccard distances (McCune *et al*., 2002; Choi *et al*., 2010). Replicates represent the individual grids within the macroplot, and the data within the matrix are binary presence/absence data, where 1 is present and 0 is absent. In some cases, the HMP species were not detected in all or many of the macroplot grids. This created a scenario referred to as zero-inflation for some combinations of species and age. In these cases, descriptive statistics were utilized to describe the observed data.

Baseline data were not collected for any macroplot. To rectify this data gap, Baseline data were estimated using Baseline meandering transects which occurred for all Units. During meandering transects the presence of all HMP annual individuals are documented and mapped. These locations were overlaid on top of the macroplot locations using ArcMap, and presence/absence derived (ESRI, 2020). From these presence/absence values, frequency of occurrence was determined, and binary matrices developed for use in the *macroplot-level analyses*.

7.2.2.2 Single-season Occupancy Analysis

Single-season occupancy analysis was used to determine what factors affect the detectability of HMP annuals in macroplots during the 2020 survey season. This analysis included fitting models to observed macroplot data, utilizing Akaike Information Criterion (AIC) model selection techniques and evidence ratio (ER) calculations to determine the best fitting model, and computing $\log_{10}$ evidence ratios (LER) to evaluate support for covariates affecting detection probability (MacKenzie *et al.* 2006; Akaike, 1974; Burnham and Anderson, 2002; Burnham *et al.*, 2011; Watson, 2014). This was conducted for Monterey spineflower, sand gilia, and seaside bird's beak separately, with one analysis per species.

Single-season occupancy analysis employs multivariate models to analyze two response variables:

1. Probability of occupancy – the probability of observing the HMP annual species in a macroplot. This value is equal to the proportion of macroplots occupied by the species.
2. Probability of detection – the probability of detecting an HMP annual species given that the macroplot is occupied. Each grid within the macroplot is treated as an independent observation of the presence of the species. Hence the number of grids supporting the HMP species is an indication of the detectability.

The first models examined were the null models. These models did not contain any covariates for either occupancy or detectability and were examined separately for each HMP annual species. The null models yielded an occupancy estimate (number of macroplots occupied divided by the total number of macroplots surveyed) and the probability of detection across all macroplots (the number of grids occupied divided by the total number of grids in macroplots that were occupied). These models provided information about the occupancy and probability of detection during the 2020 surveys. When qualitatively assessing occupancy and detectability rates from survey data, Burleson classified >0.75 as high, 0.25–0.75 as moderate, and <0.25 as low.

Burleson fit various models to estimate detectability using combinations of covariates including macroplot age (i.e., time since treatment) (Age), treatment type (Treatment), and density class in the central grid (Density). Models included single covariates as well as combinations of covariates. These models were subsequently evaluated using AIC model selection and evidence ratios (ERs) to determine which model best fit the observed data (Burnham and Anderson, 2002; Burnham *et al.*, 2011). Each covariate was evaluated using LERs to evaluate support for its effect on detectability (Watson, 2014). Following Kass and Raftery (1995), it was decided *a priori* to use the terms ‘equivocal’, ‘substantial’, ‘strong’, and ‘decisive’ to correspond approximately to LERs of less than 0.5, and greater than 0.5, 1, and 2 respectively.

Since the probability of detection represents the number of grids occupied by HMP species in an occupied macroplot, evaluating detectability provided information about the expansion of the species within a macroplot after treatment. Due to this, Burleson prioritized the probability of detection as the modeled response over the probability of occupancy.

Single-season occupancy analysis was conducted using the package *unmarked* in R statistical software (Fiske *et al.*, 2017; R Core Team, 2020). Initial analyses were also conducted in the PRESENCE software developed by the United States Geological Survey to validate results in R (Hines, 2006).

7.3 RESULTS

Eighteen macroplots were surveyed in 2020. Monterey spineflower was observed in 17 of the 18 macroplots, sand gilia observed in 7, and seaside bird’s beak observed in none (see Appendix H). Frequency of occurrence within macroplots where the HMP species were observed varied by species and macroplot.

The most influential factors affecting the detectability of Monterey spineflower were density of the central grid in Baseline, and treatment type. No specific factors appear to influence sand gilia detectability for the macroplots examined in 2020.

7.3.1 Macroplot Level Analysis

Macroplot level analyses were conducted for each age group and HMP annual species, resulting in six total analyses.

7.3.1.1 Monterey spineflower

Monterey spineflower frequency of occurrence within macroplots increased between baseline surveys and Year 1 surveys regardless of age class or treatment type. Between Year 1 and Year 3 all Year 3 Unit macroplots increased in Monterey spineflower frequency of occurrence regardless of treatment. Year 5 Unit macroplots, however, slightly decreased in Monterey spineflower frequency of occurrence between Year 1 and Year 3. Between Year 3 and Year 5, Monterey spineflower frequency of occurrence in Year 5 macroplots remained stable.

Two-way ANOVA suggested that macroplot frequency of occurrence of Monterey spineflower varied through time in the Year 3 macroplots (Table 7-2; Figure 7-2). The ANOVA results also suggested that the frequency of Monterey spineflower did not vary much between treatments; however, in Year 1 and Year 3 the average frequency of occurrence by treatment was more different than in Baseline (Figure 7-2). Frequency of occurrence for the species increased for all treatments between Baseline and Year 1 and between Year 1 and Year 3. Frequency of occurrence of the species in masticated macroplots increased between Baseline and Year 1 (+0.09) and increased between Year 1 and Year 3 (+0.2). Frequency of occurrence of the species in masticated and burned macroplots increased between Baseline and Year 1 (+0.39) and increased between Year 1 and Year 3 (+0.16). Frequency of occurrence of the species in mixed macroplots increased between Baseline and Year 1 (+0.15) and increased between Year 1 and Year 3 (+0.07). Year 3 macroplots are located in BLM Area B-3 West, BLM Area B Subarea B Containment Line, and BLM Area B Subarea A Containment Line.

Table 7-2. Two-way ANOVA results for Monterey spineflower frequency of occurrence in Year 3 macroplots.

Factor	*F*	*p*
Age	4.05	0.032
Treat	1.32	0.289
Treat*Age	0.40	0.809

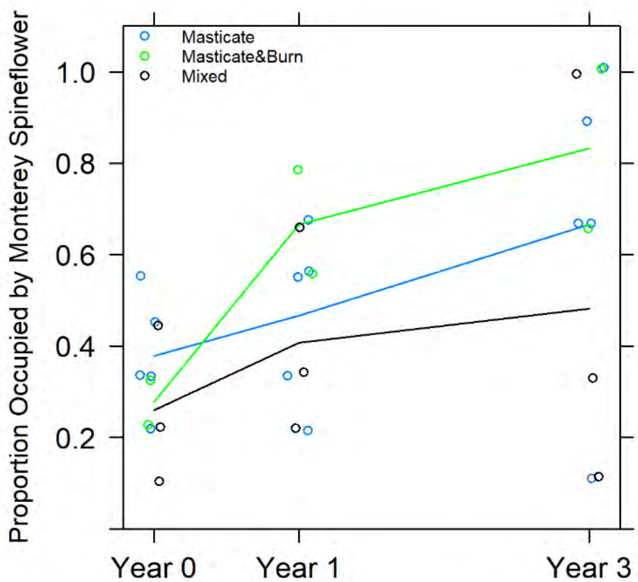

Figure 7-2. Monterey Spineflower Frequency of Occurrence in Year 3 Macroplots.

One-way ANOVA suggests that macroplot frequency of occurrence of Monterey spineflower generally did not vary through time in the Year 5 macroplots (Table 7-3; Figure 7-3). The frequency of occurrence of the species increased between Baseline and Year 1 (+0.11), decreased between Year 1 and Year 3 (-0.04), and remained the same between Year 3 and Year 5. Year 5 macroplots are located in Unit 9, Unit 23, and Unit 28.

Table 7-3. One-way ANOVA results for Monterey spineflower frequency of occurrence in Year 5 macroplots.

Factor	*F*	*p*
Age	0.21	0.89

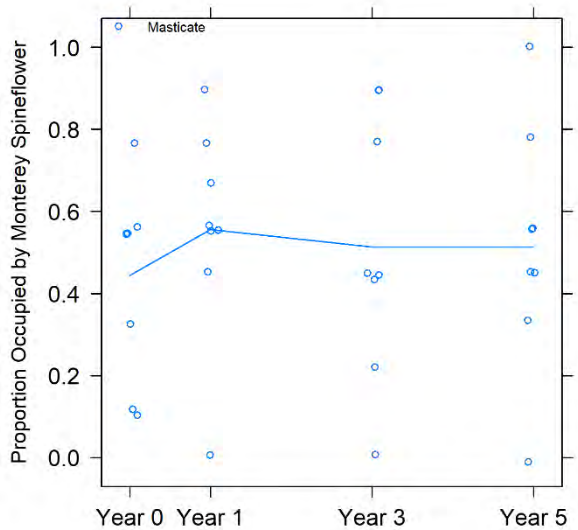

Figure 7-3. Monterey Spineflower Frequency of Occurrence in Year 5 Macroplots.

7.3.1.2 Sand Gilia

Sand gilia frequency of occurrence within macroplots increased the first survey year after treatment for all age classes and treatments except for masticated Year 3 macroplots where no sand gilia were observed in any year. Mixed treatment Year 3 macroplots increased in frequency of occurrence of sand gilia between Year 1 and Year 3. In masticated and burned macroplots (Year 3) and Year 5 macroplots, decreases were observed after the first post-treatment year in Year 3 and Year 5 Units.

Sand gilia was only observed in the Year 3 macroplots that had either been burned and masticated or that had received mixed treatment (Figure 7-4). Frequency of occurrence of the species in masticated and burned macroplots increased between Baseline and Year 1 (+0.39) and decreased between Year 1 and Year 3 (-0.17). Frequency of occurrence of the species in mixed macroplots increased between Baseline and Year 1 (+0.15) and increased between Year 1 and Year 3 (+0.11). Year 3 macroplots were in BLM Area B-3 West, BLM Area B Subarea B Containment Line, and BLM Area B Subarea A Containment Line. These sand gilia data did not meet assumptions to conduct ANOVA. PERMANOVA could not be conducted due to zero-inflation of the dataset.

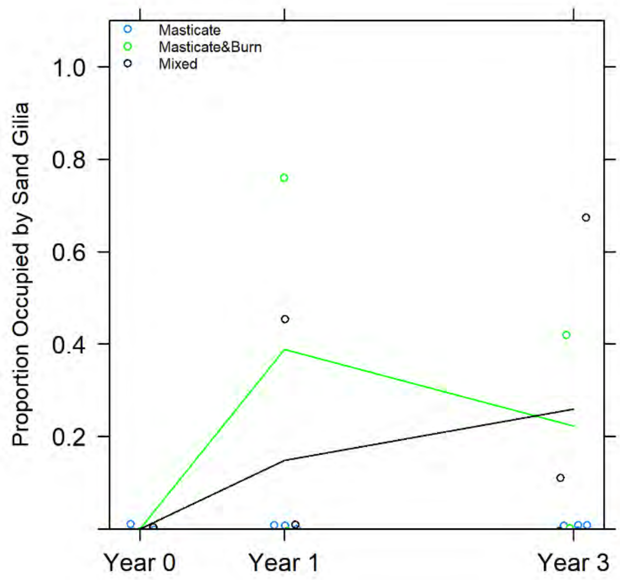

Figure 7-4. Sand Gilia Frequency of Occurrence in Year 3 Macroplots.

Macroplot frequency of occurrence of sand gilia varied through time in the Year 5 macroplots (Figure 7-5). Frequency of occurrence of the species increased between Baseline and Year 1 (+0.26), decreased between Year 1 and Year 3 (-0.13), and increased between Year 3 and Year 5 (+0.05). Year 5 macroplots are located in Unit 9, Unit 23, and Unit 28. These sand gilia data did not meet assumptions to conduct ANOVA. PERMANOVA could not be conducted due to zero-inflation of the dataset.

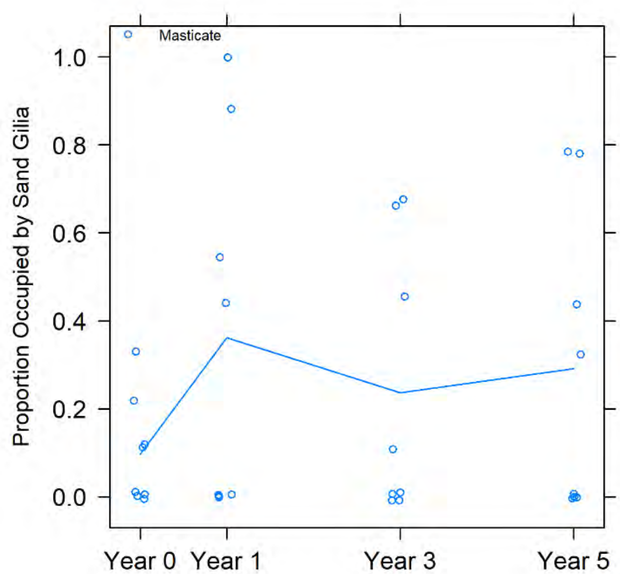

Figure 7-5. Sand Gilia Frequency of Occurrence in Year 5 Macroplots.

7.3.1.3 Seaside Bird's Beak

Seaside bird's beak frequency of occurrence within macroplots was zero for both age classes and all treatments during 2020. No individuals were observed in Year 3 macroplots in any survey year. During 2018 surveys of Year 5 macroplots, the species was observed in one macroplot grid (Figure 7-6). This occurrence was in macroplot B3A1C2 in Unit 23 North which had been masticated (Figure 7-1). None of the seaside bird's beak datasets met assumptions to conduct ANOVA. PERMANOVA could not be conducted due to zero-inflation of these datasets.

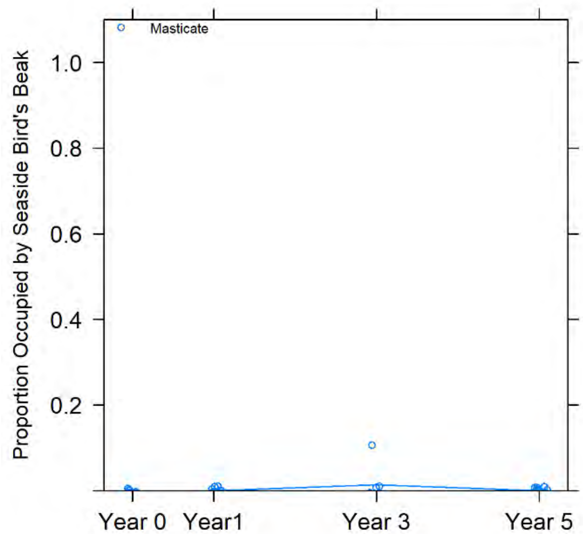

Figure 7-6. Seaside Bird's Beak Frequency of Occurrence in Year 5 Macroplots.

7.3.2 Occupancy Analysis

Single-season occupancy analyses were conducted for each HMP annual species, resulting in three total analyses.

7.3.2.1 Monterey Spineflower

Monterey spineflower occupancy of macroplots was high (0.945) and detection probability was moderate (0.621) during the 2020 surveys. These values were derived from the null model where both occupancy and detectability were held constant.

The best AIC model was model *dc8*, which included density, age, and treatment as covariates for detection probability of Monterey spineflower (Table 7-4). As evidenced by the top four models including density as a covariate and the LER indicating strong evidence for density, baseline grid density appeared to be the most important factor for occupancy detection assessed in this study. Generally, macroplots with denser central grids during baseline surveys yielded more detected occupied grids in 2020 than macroplots with less dense central grids. Treatment also appeared to influence detection frequency of Monterey spineflower in macroplot grids, though this covariate was only in the top two models and had substantial LER evidence (Tables 7-4 and 7-5). The evidence for age as a covariate was equivocal based on LER results (Table 7-5). Among the treatments masticated and burned macroplots generally yielded one more detected occupied grid than masticated only macroplots, and mixed treatment macroplots generally yielded slightly fewer detected occupied grids than masticated grids. The covariate design is not balanced across either treatments or density classes.

Table 7-4. AIC comparison of models representing various combinations of covariates on Monterey spineflower detection probability. The best models have the lowest ΔAIC$_C$, and AIC$_W$ is interpreted as the probability that the corresponding model is the best of the compared models.

Model Name	Covariates	AIC	AIC$_C$	ΔAIC$_C$	AIC$_W$	ER
dc8	Density + Age + Treatment	192	208	0.00	6.17e-01	1.00
dc6	Density + Treatment	200	211	2.86	1.48e-01	4.17
dc2	Density	206	211	3.22	1.23e-01	5.00
dc5	Density + Age	204	212	3.95	8.57e-02	7.20
nullchp	null	215	216	7.58	1.39e-02	44.35
dc4	Treatment	214	217	8.72	7.90e-03	78.07
dc3	Age	217	218	10.44	3.33e-03	185.31
dc7	Treatment + Age	216	221	12.62	1.12e-03	551.11

Table 7-5. Log$_{10}$ evidence ratio comparison assessing evidence in support for each covariate.

Monterey Spineflower Detection Probability Covariate	LER	Evidence
Age	0.383	Equivocal
Treatment	0.535	Substantial
Density	1.57	Strong

7.3.2.2 Sand Gilia

Sand gilia occupancy of macroplots was moderate (0.39) and detection probability was moderate (0.507) during the 2020 surveys. These values were derived from the null model where both occupancy and detectability were held constant.

The best performing model was model *dg4*, which included Treatment as a covariate for detection probability of sand gilia (Table 7-6). However, evidence ratios of all models compared against *dg4* suggested that differences between the top seven models (inclusive of the null model) were negligible. The comparison between the top models indicated that examined explanatory covariates did not support estimation of sand gilia detection probability. Two factors likely influenced the lack of support for any one model. The first being that only two out of eighteen macroplots contained sand gilia in central grids during baseline surveys and the second was that sand gilia were only observed in seven macroplots (three year 3 and four year 5) during 2020 surveys. The design was not balanced across either treatments or density classes.

The LER results also suggest no strong support for any one covariate. The LER results yielded equivocal evidence that density of the species in the central grid prior to treatment, time since treatment, and treatment type, affected sand gilia detection probability (Table 7-7).

Table 7-6. AIC comparison of models representing various combinations of covariates on sand gilia detection probability. The best models have the lowest ΔAIC_C, and AIC_W is interpreted as the probability that the corresponding model is the best of the compared models.

Model Name	Covariates	AIC	AIC_C	ΔAIC_C	AIC_W	ER
dg4	Treatment	113	116	0.00	0.2432	1.00
nullgit	null	115	116	0.297	0.2097	1.16
dg2	Density	115	117	1.086	0.1413	1.72
dg6	Density + Treatment	112	117	1.134	0.1380	1.76
dg3	Age	115	117	1.253	0.1300	1.87
dg5	Density + Age	115	118	2.503	0.0696	3.49
dg7	Treatment + Age	114	119	3.210	0.0489	4.98
dg8	Density + Treatment +Age	113	121	5.065	0.0193	12.59

Table 7-7. Log_{10} evidence ratio comparison assessing evidence in support for each covariate.

Sand Gilia Detection Probability Covariate	LER	Evidence
Age	-0.437	Equivocal
Treatment	-0.088	Equivocal
Density	-0.234	Equivocal

7.3.2.3 Seaside Bird's Beak

Since Seaside bird's beak was not observed during 2020 macroplot surveys, occupancy analyses could not be conducted for this species.

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8 CONCLUSIONS

8.1 HMP Annuals

Results of HMP annual species surveys on multiple units over varying amounts of time since treatment have shown that these species continue to persist following vegetation clearance activities. In 2020, comparison to Baseline was conducted for all age classes. Multiple treatments were used at Unit B grids (Year 3). However, treatment-related effects were not able to be assessed due to confounding factors such as regional edaphic and community conditions that also contributed to HMP response differences. Treatment-related effects were not assessed in other areas due to utilization of only one treatment.

In general, observed densities and frequency of occurrence of HMP annual species were consistent with historic baseline conditions. Sand gilia and Monterey spineflower seed set, abundance, and survival are highly complex (Fox *et al.*, 2006; Fox, 2007). Both species are generally correlated with rainfall; however, their survival mechanisms are different. Sand gilia is negatively affected by herbivory and its survival mechanism is a persistent seed bank. Monterey spineflower is not affected by herbivory and its survival mechanism is its ability to readily germinate under optimal conditions. Considering these life strategies, the densities of these species would be expected to fluctuate between years in response to rainfall, seed bank conditions, or herbivory.

Seaside bird's-beak densities are also variable (Watts *et al*., 2010). The cause for this variability is highly complex and can be the result of several factors including variable reproduction and germination rates, host availability, herbivory or seed predation, or competition from invasive species.

8.1.1 HMP Annuals Success Criteria

The Revised Protocol provided specific success criteria for re-establishment of HMP annual species following treatment (Tetra Tech and EcoSystems West, 2015b). Comparisons of survey data to these success criteria are provided in Table 8-1. The only criterion that could not be assessed was comparison of the percentage of bare ground relative to Baseline conditions for Range 48 because no shrub transect surveys were required in the Year 1 Unit. However, given that bare ground continues to be present in high percentages in Year 3 and later units, it is likely that sufficient bare ground was present in the Year 1 Unit to support HMP annual species.

Eighty-three percent of HMP annual success criteria were met for the 2020 survey year (Table 8-1). The criteria not met were Monterey spineflower in BLM Area B-3 West and BLM Area B Unit B Containment Line (Year 3); Monterey spineflower in Units 9 (Year 5); and seaside bird's beak in Range 48 (Year 1). Of the HMP success criteria not met, 75% were related to Monterey spineflower. Since Monterey spineflower vitality is strongly correlated with rainfall, it is possible that the historic California drought between 2012 and 2016 and the drier than average 2017-2018 water year affected densities of the species in these areas (Fox et al., 2006; Fox, 2007).

The HMP annual success criteria requires that frequency of occurrence is at least 90% of the Baseline frequency in any post-treatment year. The areas which did not meet this success criteria ranged between 53% and 89% of the respective Baseline frequency. Despite not meeting the criterion, seaside bird's beak and Monterey spineflower were persisting in these areas.

Range 48 contained one less seaside bird's beak-occupied grid in 2020 than in Baseline. Because only two grids were occupied during Baseline, the change of occupancy in one grid represents a substantial change in frequency. Previous surveys showed it is not uncommon to have a change of frequency of one grid (Burleson, 2019b). Such fluctuations can be expected to occur by chance, and they do not necessarily indicate a response to remediation activities.

Table 8-1. Evaluation of Success Criteria for HMP Annuals.

Year Class	Units	Criterion	Baseline	2020	Pass/Fail
Year 1	Range 48	Frequency of sand gilia > 90% of baseline frequency	$f_{Range\ 48}$ = 0.46	$f_{Range\ 48}$ = 0.85	Pass
		Frequency of seaside bird's-beak > 90% of baseline frequency	$f_{Range\ 48}$ = 0.15	$f_{Range\ 48}$ = 0.08	Fail
		Frequency of Monterey spineflower > 90% of baseline frequency	$f_{Range\ 48}$ = 0.93	$f_{Range\ 48}$ = 1.00	Pass
		Bare ground > Baseline condition	--	--	--
Year 3	Unit B-3 West, Unit B Containment Line	Frequency of sand gilia > 90% of baseline frequency	$f_{Unit\ B\text{-}3\ West}$ = 0.00 $f_{Unit\ B}$ = 0.21	$f_{Unit\ B\text{-}3\ West}$ = 0.00 $f_{Unit\ B}$ = 0.32	Pass Pass
		Frequency of seaside bird's-beak > 90% of baseline frequency	$f_{Unit\ B\text{-}3\ West}$ = 0.00 $f_{Unit\ B}$ = 0.00	$f_{Unit\ B\text{-}3\ West}$ = 0.00 $f_{Unit\ B}$ = 0.00	Pass Pass
		Frequency of Monterey spineflower > 90% of baseline frequency	$f_{Unit\ B\text{-}3\ West}$ = 1.00 $f_{Unit\ B}$ = 1.00	$f_{Unit\ B\text{-}3\ West}$ = 0.89 $f_{Unit\ B}$ = 0.87	Fail Fail
		Bare ground > Baseline condition	$c_{Unit\ B\text{-}3\ West}$ = 22% $c_{Unit\ B}$ = 12%	$c_{Unit\ B\text{-}3\ West}$ = 46% $c_{Unit\ B}$ = 22%	Pass Pass
Year 5	Unit 9, Unit 23, Unit 28	Frequency of sand gilia > 90% of baseline frequency	$f_{Unit\ 9}$ = 0.00 $f_{Unit\ 23}$ = 0.00 $f_{Unit\ 28}$ = 0.39	$f_{Unit\ 9}$ = 0.00 $f_{Unit\ 23}$ = 0.00 $f_{Unit\ 28}$ = 0.58	Pass Pass Pass
		Frequency of seaside bird's-beak > 90% of baseline frequency	$f_{Unit\ 9}$ = 0.00 $f_{Unit\ 23}$ = 0.00 $f_{Unit\ 28}$ = 0.00	$f_{Unit\ 9}$ = 0.00 $f_{Unit\ 23}$ = 0.00 $f_{Unit\ 28}$ = 0.00	Pass Pass Pass
		Frequency of Monterey spineflower > 90% of baseline frequency	$f_{Unit\ 9}$ = 1.00 $f_{Unit\ 23}$ = 1.00 $f_{Unit\ 28}$ = 1.00	$f_{Unit\ 9}$ = 0.75 $f_{Unit\ 23}$ = 1.00 $f_{Unit\ 28}$ = 0.90	Fail Pass Pass
		Bare ground > Baseline condition	$c_{Unit\ 9}$ = 3% $c_{Unit\ 23}$ = 24%* $c_{Unit\ 28}$ = 13%	$c_{Unit\ 9}$ = 19% $c_{Unit\ 23}$ = 31%* $c_{Unit\ 28}$ = 25%	Pass Pass Pass

* These values were derived from transects which are located in Unit 23N where HMP annuals were monitored and transects in the rest of Unit 23 were not included.

8.2 Macroplot Surveys

8.2.1 Macroplot Level Analyses

The *macroplot-level analyses* were used to evaluate the changes in the distribution of HMP annual species after treatment. Data were summarized by calculating frequency of occurrence for different groups of macroplots based on age and treatment. Seaside bird's beak was not observed in any of the eighteen macroplots in 2020 and could not be evaluated.

The distribution of Monterey spineflower and sand gilia generally increased following treatment with subsequent declines in frequency by Years 3 and 5 (Figures 7-2 through 7-4). This is consistent with the observations of the 2018 macroplot survey results (Burleson, 2019). However, since each year class had a different baseline survey year and consisted of different units, interpretation of temporal grid occupancy patterns across year classes should consider these differences.

8.2.2 Single-Season Occupancy Analyses

The *single-season occupancy analyses* were used to determine what factors affect the detectability of HMP annuals in macroplots during the 2020 survey season. Since the probability of detection represents the number of grids occupied by HMP species in an occupied macroplot, evaluating detectability provided information about the expansion of the species within a macroplot after treatment.

The Monterey spineflower AIC and LER results suggest that density was generally the more important covariate for detection where macroplots with higher Baseline densities of the central grid had more Monterey spineflower detection in surrounding macroplot grids in 2020. Treatment also appeared to affect occupancy detection. Generally masticated and burned macroplots had one more grid detected with the species in 2020 than macroplots that were masticated or mixed.

The sand gilia analyses suggest that the age of macroplot, the type of treatment, and the density of center macroplot during Baseline surveys were not considered to be more influential than one another or the null model when determining occupancy. Additionally, the analyses suggest that any one covariate had negligible influence on occupancy or probability of detection (Tables 7-6 and 7-7).

It should be noted that these occupancy analyses have unbalanced designs (e.g., masticated and burned macroplots are only Age 3, number of grids between treatments are not equal), and that interactions between covariates were not evaluated.

8.3 Shrub Community

Results of shrub community structure analyses reaffirm results of previous surveys. Years 5 and 8 showed a progressive change in community structure and composition, returning towards the Baseline assemblage in the ordination plots. This pattern has been observed in every monitoring year since 2010 and reflects predictable successional changes in the shrub community (Tetra Tech and EcoSystems West, 2011 – 2015a; Burleson, 2016 – 2019b).

Differential response to treatment was assessed in units where multiple treatments were applied. This occurred in Year 3 BLM Area B Units B and C. Different species and community metrics can be promoted by burning, while others can be promoted by mastication. Mastication generally yielded less average shrub cover in Unit C, and mastication and burn transects appeared to diminish species evenness in Unit C when compared to other treatments (Figure 4-13). Unit B Mixed treatment generally yielded more bare ground cover compared to Burn and Masticated and Burn treatments (Figure 4-16).

8.3.1 Shrub Community Success Criteria

The Revised Protocol identified success criteria for recovery of the shrub community in Years 3 and 5. All Year 3 and Year 5 criteria were achieved except the native sub-shrub criteria at four Year 3 units (Table 8-2). Bare ground cover was higher in Year 3 than Baseline and invasive plants were less than 10% cover for all Year 3 units. The community composition in Year 5 units showed a progression towards the

Baseline condition (Figures 5-22 through 5-24). The only recommendation is to closely watch Year 3 units in future monitoring years.

Table 8-2. Evaluation of Success Criteria for Shrub Communities in Year 3 and Year 5.

Year Class	Units	Criterion	Rationale	Pass/Fail
Year 3	B-3 West B-3 East A Southern Containment Line B C B-2A	Native sub-shrubs > 20% cover	$c_{Unit\ B\text{-}3\ West}$ = 16.9% $c_{Unit\ B\text{-}3\ East}$ = 7.1% $c_{Unit\ A}$ = 2.3% $c_{Unit\ B}$ = 25.6% $c_{Unit\ C}$ = 31.5% $c_{Unit\ B2A}$ = 1.8%	Fail Fail Fail Pass Pass Fail
		Bare ground > baseline conditions	Figures 4-15 through 4-20	Pass
		Invasive plants < 10% cover	$c_{Unit\ B\text{-}3\ West}$ = 1.5% $c_{Unit\ B\text{-}3\ East}$ = 0.35% $c_{Unit\ A}$ = 0.03% $c_{Unit\ B}$ = 1.1% $c_{Unit\ C}$ = 0.13% $c_{Unit\ B2A}$ = 0%	Pass
Year 5	5A 9 23 28	Observation of community recovery	Figure 5-22 through 5-24 and Unit 5A community transect trends over time	Pass

The native subshrub (peak rush-rose, deerweed, and golden yarrow) criterion was met for two out of six Year 3 units. Units B and C met the native sub-shrub criterion with these species comprising on average 25.6% and 31.5% cover, respectively. The cover of these species for the remaining Year 3 units were 16.9% (0.03%, Year 0), 7.1% (0.0%, Year 0), 2.3% (0.0%, Year 0), and 1.8% (0.0%, Year 0), on average, for Units B-3 West, B-3 East, A Southern Containment Line, and B-2A, respectively. Since the criterion requires 20% cover of these species, Units B and C were in compliance and Unit B-3 West was near compliance. The 20% criterion was derived from observations of previous surveys and generally aligns with the expected successional response to treatment; however, some variation of this response can be expected (Tetra Tech and EcoSystem West, 2015b).

Year 3 units that did not meet the 20% sub-shrub cover, Units B-3 West, B-3 East, A Southern Containment Line, and B-2A, yielded values similar to some previous Year 3 units and dissimilar to others despite similar baseline sub-shrub values. For example, values recorded in 2014 at the Year 3 Units 4 (7.7%, Year 3; 0.1%, Year 0), 11 (2.1%, Year 3; 0.1%, Year 0), and 12 (2.5%, Year 3; 1.0%, Year 0) were similar to 2020 Year 3 units (Tetra Tech and EcoSystems West, 2015a). Values recorded in 2012 at the Year 3 Units 14 (40%, Year 3; 0.2% Year 0) and 19 (36%, Year 3; 1.7%, Year 0) and in 2020 at Year 3 Units B (25.6%, Year 3; 0.3% Year 0) and C (31.5%, Year 3; 0%, Year 0) were dissimilar to noncompliant 2020 Year 3 units (Tetra Tech and EcoSystems West, 2013).

The dissimilar sub-shrub responses (Units 14 and 19 vs. Units 4, 5A, 9, 11, 12, 23, 28) occurred in units with different treatments. Units with low sub-shrub cover by Year 3 were masticated (Units B-3 East, A, and B-2A), while some areas with high sub-shrub cover by Year 3 were burned (Units 14, 19, B, C). Analysis of historical subshrub cover values indicated the presence of differences in subshrub cover between treatment types (Figure 8-1; *p*=2.00e-16; *F*=35.1). Other researchers have found differing results. Brennan and Keeley (2017) found no differences between sub-shrub cover response to mastication compared to burning in Southern California chaparral (typically chamise-dominated), however, they did not examine deerweed, peak rush-rose, or golden yarrow individually.

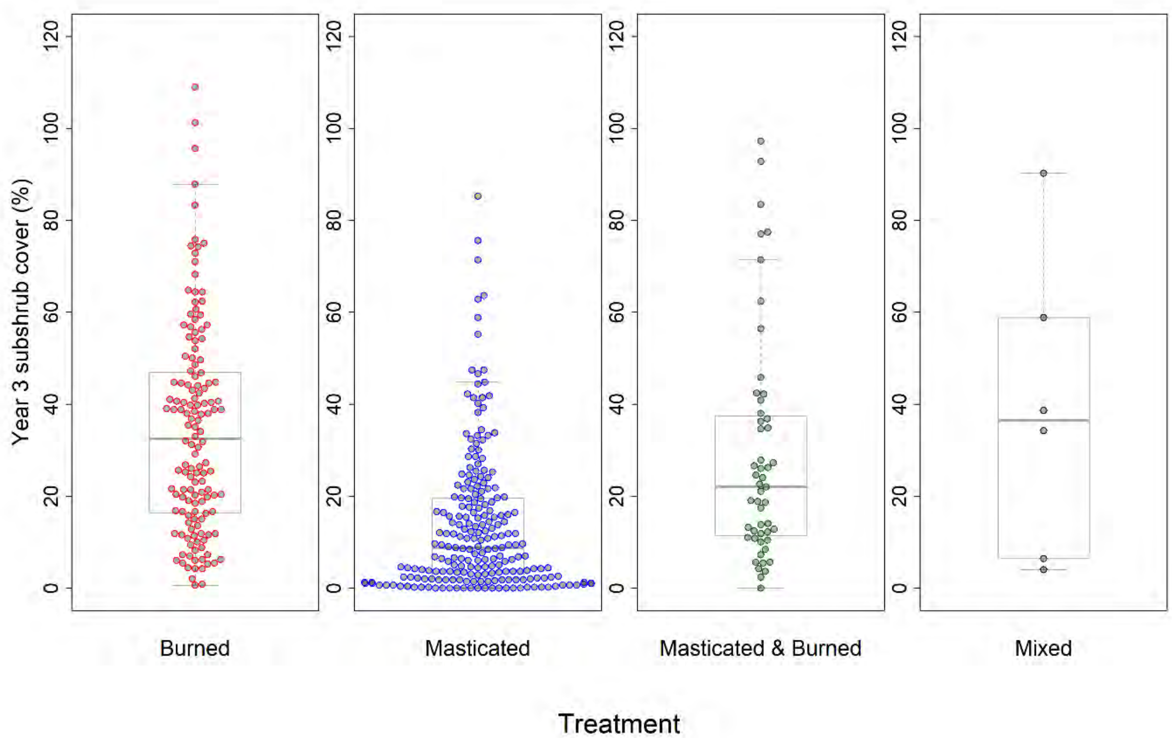

Figure 8-1. Subshrub Cover Values (Deerweed, Peak Rush-Rose, and Golden Yarrow) Partitioned by Treatment Type for all Year 3 Surveys Between 2011 and 2020. Each dot represents the percent subshrub cover for an individual Year 3 transect. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively.

As part of the Revised Protocol development, a series of three major shrub associations were identified based on dominant species present in the baseline survey. Recovery was predicted to differ among these associations (Tetra Tech and EcoSystems West, 2015b). Therefore, more detailed success criteria for each of the associations, as well as criteria for the amount of bare ground and cover of invasive species were developed for the Year 8 survey. These criteria are evaluated in Table 8-3.

All but two specified criteria were met in Year 8:

1) the shaggy-barked manzanita dominated Baseline transects in Unit 2 East were observed as having less than 70% of the Baseline frequency of Monterey ceanothus by Year 8 (0%),
2) the sandmat manzanita dominated (Shrub Association C/D) Baseline transects in Unit 3 East were observed as having less than 70% of the Baseline frequency of Monterey ceanothus by Year 8 (50%).

Monterey ceanothus Year 8 frequency was less than the required 70% of the Baseline frequency on the Unit 2 East Shrub Association A transect and Unit 3 East Shrub Association C/D transects. Because sample sizes were small (*n*=1 and *n*=2, respectively), the change of occupancy on one transect represents a substantial change in frequency. Despite the lack of Monterey ceanothus on these transects, it persisted on other transects within these units. For all Unit 2 East transect shrub associations the frequency on Monterey ceanothus on surveyed transects was 33% in 2020. For all Unit 3 East transect shrub associations the frequency on Monterey ceanothus on surveyed transects was 40% in 2020.

Despite these few criteria not being met, overall community compositions in the Year 8 units have continued to move towards their Baseline conditions (see Figures 6-10 and 6-11). Per the Revised Protocol, Year 8 is the final year required for monitoring, and given the overall positive response of vegetation to the mastication in Units 2 East and 3 East, they will be removed from the monitoring schedule.

Table 8-3. Evaluation of Success Criteria for Dominant Chaparral Shrub Associations on Fort Ord in Year 8 Units Monitored in 2020 (Units 2 East and 3 East).

Plant Association	Criterion	Unit	Baseline value	Year 8 value	P/F
A – ARTO dominated	Average cover of ARTO > 30% of baseline cover	2 East	51%	38.8%	Pass
		3 East	81%	69%	Pass
	Frequency of dwarf ceanothus > 70% baseline frequency	2 East	1.00	1.00	Pass
		3 East	0.00	0.00	Pass
	Frequency of Monterey ceanothus >70% baseline frequency	2 East	1.00	0.00	Fail
		3 East	0.00	0.33	Pass
B – ADFA dominated	Average cover of ADFA > 30% of baseline cover	2 East	55%	49%	Pass
		3 East	NA	NA	NA
	Frequency of dwarf ceanothus > 70% baseline frequency	2 East	0.00	0.00	Pass
		3 East	NA	NA	NA
	Frequency of Monterey ceanothus >70% baseline frequency	2 East	0.50	0.50	Pass
		3 East	NA	NA	NA
C/D – ARPU dominated	Frequency of ARPU > 70% of baseline frequency	2 East	NA	NA	NA
		3 East	1.00	1.00	Pass
	Frequency of dwarf ceanothus > 70% baseline frequency	2 East	NA	NA	NA
		3 East	0.00	0.50	Pass
	Frequency of Monterey ceanothus >70% baseline frequency	2 East	NA	NA	NA
		3 East	1.00	0.50	Fail
Bare Ground	Bare ground > 90% of baseline cover	2 East	13%	20%	Pass
		3 East	6.8%	21%	Pass
Invasive plants	Invasive plants <10% cover per transect	2 East	0.00%	0.00%	Pass
		3 East	0.00%	5% (max.)	Pass

8.4 Annual Grasses

Annual grasses were present along the edges of roads, masticated areas, other disturbed areas, and occasionally extended into the interior of the units monitored in 2020. High annual grass density was present in all cleared fuel break areas; however, it does not appear that colonization by annual grasses is a major concern along fuel breaks because annual grasses generally decrease with time as shrubs begin to colonize these areas post-treatment.

Response of annual grasses varied between age classes and units. The cover of annual grasses in all Year 3 units (BLM Area B Units B-3 West, A Southern Containment Line, and B) increased between Baseline and Year 3 by at least twofold. In Unit 2 East (Year 8), annual grass cover increased between Baseline and Year 5 and decreased between Year 5 and Year 8 to approximately three-quarters of an acre more than what was observed in Baseline. In Unit 3 East (Year 8), annual grass cover increased between Baseline and Year 3 and then decreased between Year 3 and Year 8 to approximately the same acreage as Baseline conditions. As shrubs continue to mature in these units, annual grass density is expected to continue to decrease.

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APPENDIX A

SPECIES ACRONYMS

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Table A-1. Species Acronyms, Former Fort Ord

Acronym	Scientific Name	Common Name	Life Form
ACGL	*Acmispon glaber (Lotus scoparius)*	deerweed	subshrub
ACHEO	*Acmispon heermannii* var. *orbicularis*	round-leaved Heermann's lotus	perennial herb
ACME	*Acacia melanoxylon*	blackwood acacia	tree
ACMI	*Achillea millefolium*	common yarrow	perennial herb
ACST	*Acmispon strigosus (Lotus strigosus)*	strigose lotus	annual herb
ADFA	*Adenostoma fasciculatum*	chamise	shrub
AGXX	*Agoseris* sp.		
AICA	*Aira caryophyllea*	silvery hair grass	annual grass
AMME	*Amsinckia menziesii*	Menzies' fiddleneck	annual herb
ARCA	*Artemisia californica*	California sagebrush	shrub
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	Hooker's manzanita	shrub
ARMO	*Arctostaphylos montereyensis*	Monterey manzanita	shrub
ARPU	*Arctostaphylos pumila*	sandmat manzanita	shrub
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	shaggy-barked manzanita	shrub
AVBA	*Avena barbata*	slender wild oat	annual or perennial grass
BAPI	*Baccharis pilularis*	coyote brush	shrub
BEPI	*Berberis pinnata*	California barberry	shrub
BRDI	*Bromus diandrus*	ripgut brome	annual grass
BRHO	*Bromus hordeaceus*	soft chess	annual grass
BRMA	*Briza maxima*	rattlesnake grass	annual grass
BRMAR	*Bromus madritensis* ssp. *rubens*	red brome	annual grass
BRMI	*Briza minor*	small quaking grass	annual grass
CAAF	*Castilleja affinis*	Indian paintbrush	perennial herb
CAAL	*Calochortus albus*	white globe lily	perennial herb
CABR	*Carex brevicaulis*	short-stemmed sedge	perennial grass
CACO	*Camissonia contorta*	contorted suncup	annual herb
CAED	*Carpobrotus edulis*	iceplant	perennial succulent herb
CAEX	*Castilleja exserta*	purple owl's-clover	annual herb
CAGL	*Carex globosa*	round fruit sedge	perennial herb
CAKO	*Calamagrostis koelerioides*	fire reedgrass	perennial grass
CAMI	*Camissoniopsis micrantha*	Spencer primrose	annual herb
CARA	*Cardionema ramosissimum*	sand mat	perennial herb
CARU	*Calamagrostis rubescens*	pinegrass	perennial grass
CASU	*Calystegia subacaulis*	hill morning glory	perennial herb
CAXX1	*Carex* sp.	sedge	perennial herb
CAXX2	*Castilleja* sp.		
CEDE	*Ceanothus dentatus*	dwarf ceanothus	shrub
CEME	*Centaurea melitensis*	tocalote	annual herb

Table A-1. Species Acronyms, Former Fort Ord

Acronym	Scientific Name	Common Name	Life Form
CERI	*Ceanothus rigidus (Ceanothus cuneatus* var. *rigidus)*	Monterey ceanothus	shrub
CETH	*Ceanothus thyrsiflorus*	blue blossom	shrub
CHDI	*Chorizanthe diffusa*	diffuse spineflower	annual herb
CHDO	*Chorizanthe douglasii*	Douglas' spineflower	annual herb
CHPO	*Chlorogalum pomeridianum*	wavyleaf soap plant	perennial herb
CHPUP	*Chorizanthe pungens* var. *pungens*	Monterey spineflower	HMP annual
CIBR	*Cirsium brevistylum*	clustered thistle	perennial herb
CIOC	*Cirsium occidentale*	cobwebby thistle	perennial herb
COFI	*Corethrogyne (Lessingia) filaginifolia*	common sandaster	perennial herb
COJU	*Cortaderia jubata*	jubata grass	large perennial grass
CORIL	*Cordylanthus rigidus* ssp. *littoralis*	seaside bird's beak	HMP annual
COXX	*Cortaderia* sp. *(C. jubata* or *C. selloana)*	pampas grass	large perennial grass
CRCA	*Croton californicus*	California croton	perennial herb
CRSC	*Crocanthemum (Helianthemum) scoparium*	peak rush-rose	subshrub
CRXX	*Cryptantha* sp.		annual herb
DAPU	*Daucus pusillus*	American wild carrot	annual herb
DECO	*Deinandra corymbosa*	coastal tarweed	annual herb
DIAU	*Diplacus aurantiacus*	sticky monkeyflower	shrub
DICA	*Dichelostemma capitatum*	blue dicks	perennial herb
DRGL	*Drymocallis (Potentilla) glandulosa*	sticky cinquefoil	perennial herb
ELGL	*Elymus glaucus*	blue wild rye	perennial grass
ERBI	*Erodium brachycarpum*	foothill filaree	annual herb
ERBO	*Erodium botrys*	long-beaked filaree	annual herb
ERCA20*	*Erigeron canadensis*	horseweed	annual herb
ERCA6*	*Eriodictyon californicum*	yerba santa	shrub
ERCI	*Erodium cicutarium*	red-stemmed filaree	annual herb
ERCO	*Eriophyllum confertiflorum*	golden yarrow	subshrub
ERER	*Ericameria ericoides*	mock heather	shrub
ERFA	*Ericameria fasciculata*	Eastwood’s goldenbush	shrub
ERNUA	*Eriogonum nudum* var. *auriculatum*	ear-shaped wild buckwheat	shrub
ERVI	*Eriastrum virgatum*	virgate eriastrum	annual herb
EURA	*Eurybia radulina*	roughleaf aster	perennial herb
FEBR	*Festuca (Vulpia) bromoides*	brome fescue	annual grass
FEMY	*Festuca (Vulpia) myuros*	rattail sixweeks grass	annual grass
FEOC	*Festuca (Vulpia) octoflora*	sixweeks grass	annual grass
FRAF	*Fritillaria affinis*	checker lily	perennial herb
FRCA	*Frangula (Rhamnus) californica*	California coffeeberry	shrub
GAAP	*Galium aparine*	goose grass	annual herb

Table A-1. Species Acronyms, Former Fort Ord

Acronym	Scientific Name	Common Name	Life Form
GACA	*Galium californicum*	California bedstraw	perennial herb
GAEL	*Garrya elliptica*	coast silk tassel	shrub
GAPH	*Gastridium phleoides*	nit grass	annual grass
GAPO	*Galium porrigens*	climbing bedstraw	vine
GAUS	*Gamochaeta ustulata*	purple cudweed	perennial herb
GEMO	*Genista monspessulana*	French broom	shrub
GITEA	*Gilia tenuiflora* ssp. *arenaria*	sand gilia	HMP annual
HEAR	*Heteromeles arbutifolia*	toyon	shrub
HEGR	*Heterotheca grandiflora*	telegraph weed	annual herb
HEXX	*Hemizonia* sp.		annual herb
HOCU	*Horkelia cuneata*	wedge-leaved horkelia	perennial herb
HYGL	*Hypochaeris glabra*	smooth cat's-ear	annual herb
HYRA	*Hypochaeris radicata*	rough cat's-ear	perennial herb
IRDO	*Iris douglasiana*	Douglas iris	perennial herb
JUPH	*Juncus phaeocephalus*	brown-headed rush	perennial grass
JUXX	*Juncus* sp.	rush	
KOMA	*Koeleria macrantha*	June grass	perennial herb
LAPL	*Layia platyglossa*	coastal tidytips	annual herb
LECA	*Lepechinia calycina*	pitcher sage	shrub
LEPE	*Lessingia pectinata* (var. *pectinata?)*	common lessingia	annual herb
LOGA	*Logfia (Filago) gallica*	daggerleaf cottonrose	annual herb
LOMA	*Lomatium* sp.		perennial herb
LOPA	*Lomatium parvifolium*	small-leaved lomatium	perennial herb
LUAL	*Lupinus albifrons* (var. *albifrons?)*	silver bush lupine	shrub
LUAR	*Lupinus arboreus*	yellow bush lupine	shrub
LUBI	*Lupinus bicolor*	miniature lupine	annual herb
LUCH	*Lupinus chamissonis*	silver beach lupine	shrub
LUCO	*Lupinus concinnus*	bajada lupine	annual herb
LUNA	*Lupinus nanus*	sky lupine	annual herb
LUTR	*Lupinus truncatus*	Nuttall's annual lupine	annual herb
LUXX	*Lupinus* sp.	lupine	
LYAR	*Lysimachia arvensis*	scarlet pimpernel	annual herb
MAEX	*Madia exigua*	small tarweed	annual herb
MAGR	*Madia gracilis*	gumweed (slender tarweed)	annual herb
MASA	*Madia sativa*	coast tarweed	annual herb
MICA	*Micropus californicus*	cotton top	annual herb
MOUN	*Monardella undulata*	curly-leaved monardella	annual herb
NAAT	*Navarretia atractyloides*	holly leaf navarretia	annual herb
NAHA	*Navarretia hamata*	hooked navarretia	annual herb
NAXX	*Navarretia* sp.		annual herb

Table A-1. Species Acronyms, Former Fort Ord

Acronym	Scientific Name	Common Name	Life Form
PEDE	*Pedicularis densiflora*	Indian warrior	perennial herb
PEDU	*Petrorhagia dubia*	hairypink	annual herb
PEMUM	*Pellaea mucronata* var. *mucronata*	bird's foot fern	fern
PETR	*Pentagramma triangularis* ssp. *triangularis*	gold back fern	fern
PHDI	*Phacelia distans*	common phacelia	annual herb
PHRA	*Phacelia ramosissima*	branching phacelia	perennial herb
PIRA	*Pinus radiata*	Monterey pine	tree
PIYA	*Piperia yadonii*	Yadon's piperia	perennial herb
PLCO	*Plantago coronopus*	cut-leaved plantain	annual herb
PLER	*Plantago erecta*	California plantain	annual herb
PLXX	*Plantago* sp.	plantain	
POCA	*Polygala californica*	California milkwort	perennial herb
POSE	*Poa secunda*	pine bluegrass	perennial grass
POUN	*Poa unilateralis*	San Francisco bluegrass	perennial grass
POXX	*Poa* sp.		
PSBE	*Pseudognaphalium beneolens*	fragrant everlasting	perennial herb
PSCA	*Pseudognaphalium californicum*	lady's tobacco	annual herb
PSRA	*Pseudognaphalium ramosissimum*	pink everlasting	biennial herb
PSST	*Pseudognaphalium stramineum*	cottonbatting plant	perennial herb
PSXX	*Pseudognaphalium* sp.		
PTAQP	*Pteridium aquilinum* var. *pubescens*	western bracken fern	fern
QUAG	*Quercus agrifolia*	coast live oak	tree
QUPAS	*Quercus parvula* var. *shrevei*	Shreve oak	tree
QUWIF	*Quercus wislizeni* var. *frutescens*	chaparral oak	tree
RISA	*Ribes sanguineum*	red flowering currant	shrub
RISP	*Ribes speciosum*	fuchsia-flowered gooseberry	shrub
ROCA	*Rosa californica*	California wild rose	shrub
ROGY	*Rosa gymnocarpa*	wood rose	shrub
RUAC	*Rumex acetosella*	sheep sorrel	perennial herb
RUUR	*Rubus ursinus*	California blackberry	woody vine
SABI	*Sanicula bipinnatifida*	purple sanicle	perennial herb
SALA	*Salix lasiolepsis*	arroyo willow	shrub
SAME	*Salvia mellifera*	black sage	shrub
SEGL	*Senecio glomeratus*	cutleaf burnweed	annual or perennial herb
SESY	*Senecio sylvaticus*	woodland ragwort	annual herb
SIBE	*Sisyrinchium bellum*	western blue-eyed grass	perennial herb
SIGA	*Silene gallica*	small flower catchfly	annual herb
SOAS	*Sonchus asper*	prickly sow thistle	annual herb
SOOL	*Sonchus oleraceus*	common sow thistle	annual herb
SOUM	*Solanum umbelliferum*	blue witch	shrub

Table A-1. Species Acronyms, Former Fort Ord

Acronym	Scientific Name	Common Name	Life Form
SOXX	*Solidago* sp.	goldenrod	perennial herb
STPU	*Stipa pulchra*	purple needle grass	perennial grass
STVI	*Stephanomeria virgata*	tall stephanomeria	annual herb
SYMO	*Symphoricarpos mollis*	creeping snowberry	subshrub
TODI	*Toxicodendron diversilobum*	poison oak	shrub
TOMI	*Toxicoscordion micranthum*	small flowered star lily	perennial herb
TRBI	*Trifolium bifidum*	notch leaf clover	annual herb
TRFR	*Trifolium fragiferum*	strawberry clover	perennial herb
TRIX	*Triteleia ixioides*	coast pretty face	perennial herb
TRMI	*Trifolium microcephalum*	small head clover	annual herb
TRVA	*Trifolium variegatum*	variegated clover	annual herb
URLI	*Uropappus lindleyi*	silver puffs	annual herb
VAOV	*Vaccinium ovatum*	huckleberry	shrub
ZEDA	*Zeltnera davyi*	Davy's centuary	annual herb
ZEMU	*Zeltnera muehlenbergii*	Muehlenberg's centaury	annual herb

*The numbered codes correspond with the species acronym codes on the USDA PLANTS Database (USDA NRCS, 2018).

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APPENDIX B

MAPS: HMP ANNUALS GRIDS

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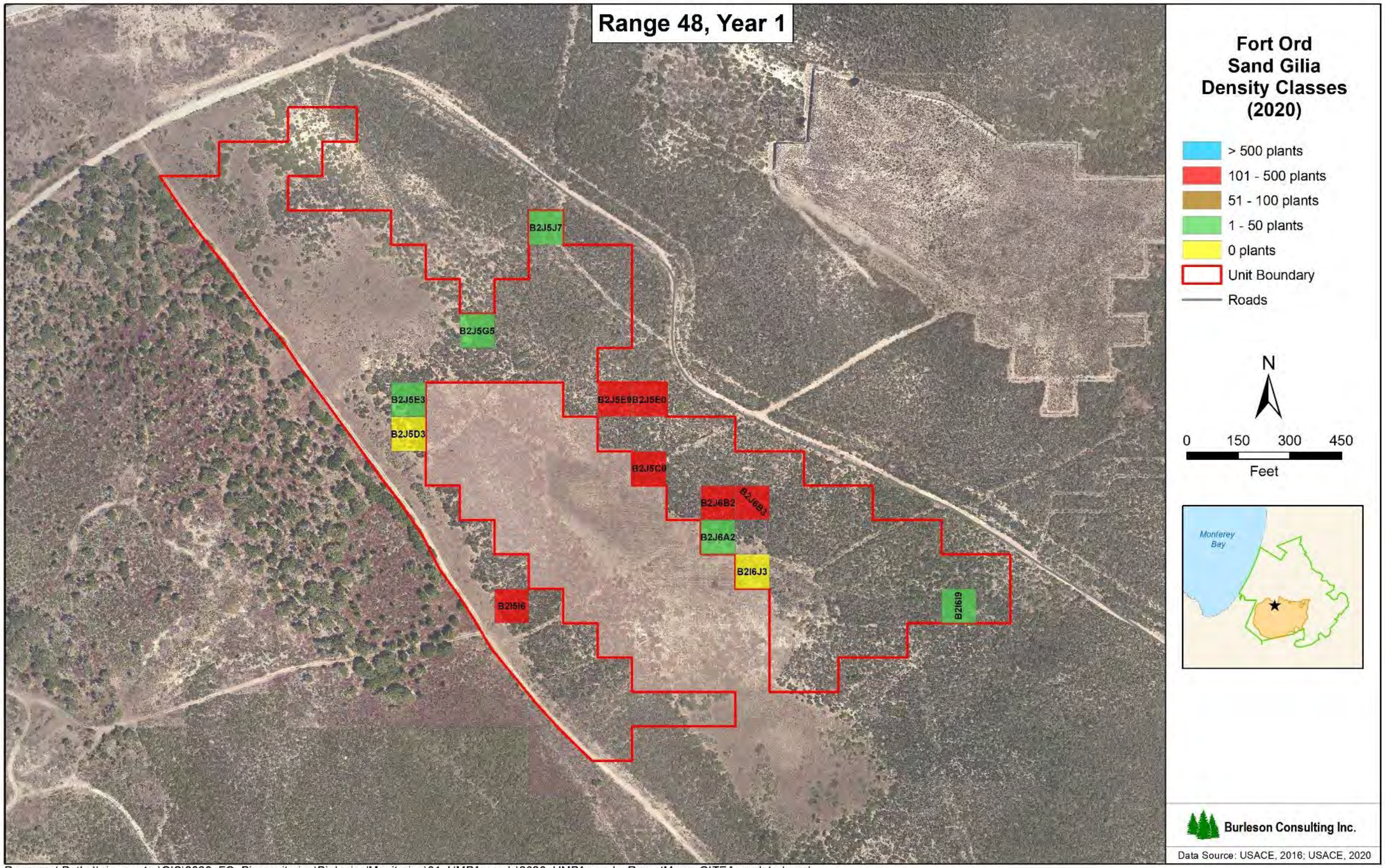

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Figure B-1. Map of Sand Gilia Density; Range 48 (Year 1)

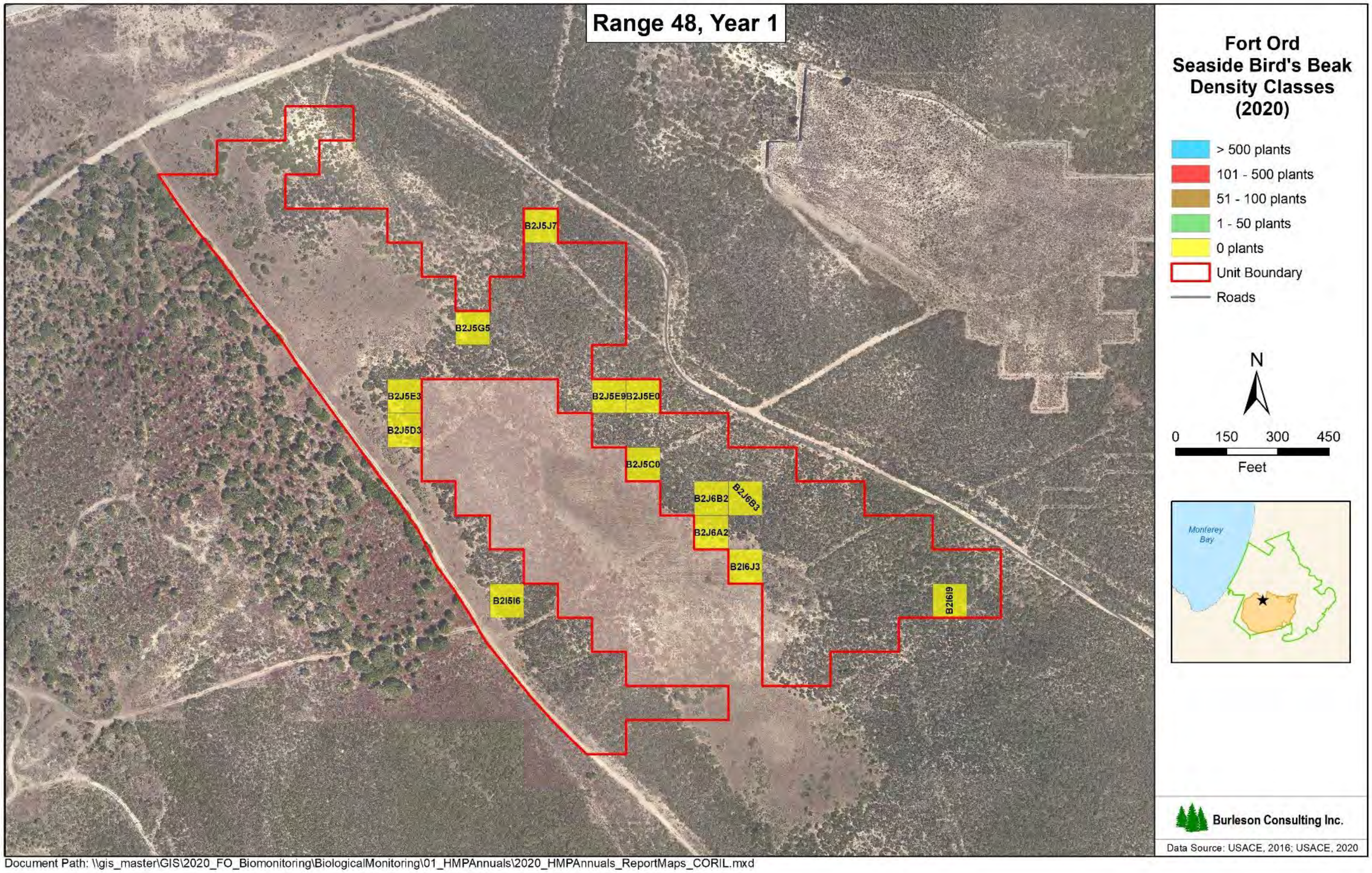

Figure B-2. Map of Seaside Bird's Beak Density; Range 48 (Year 1)

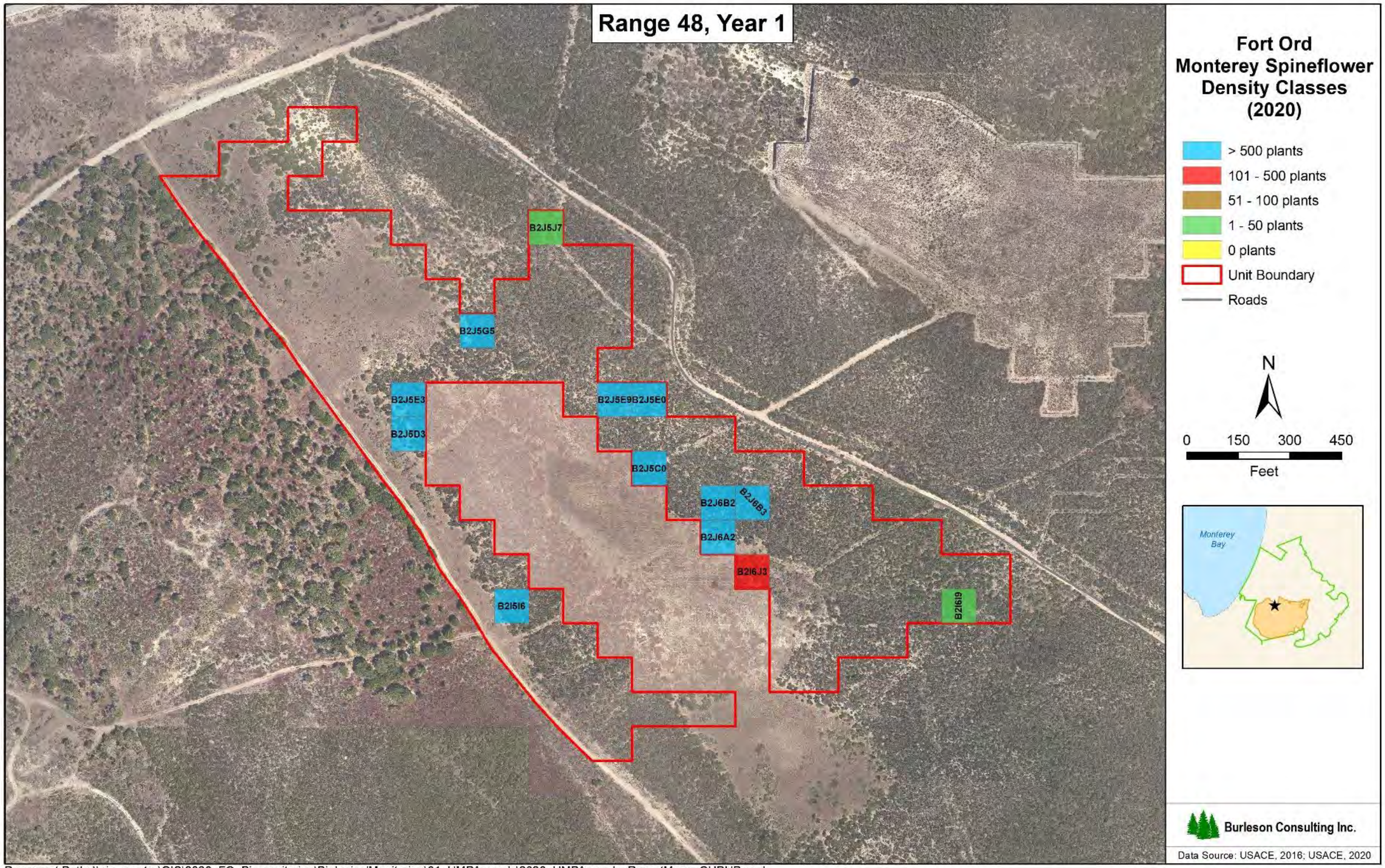

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Figure B-3. Map of Monterey spineflower Density; Range 48 (Year 1)

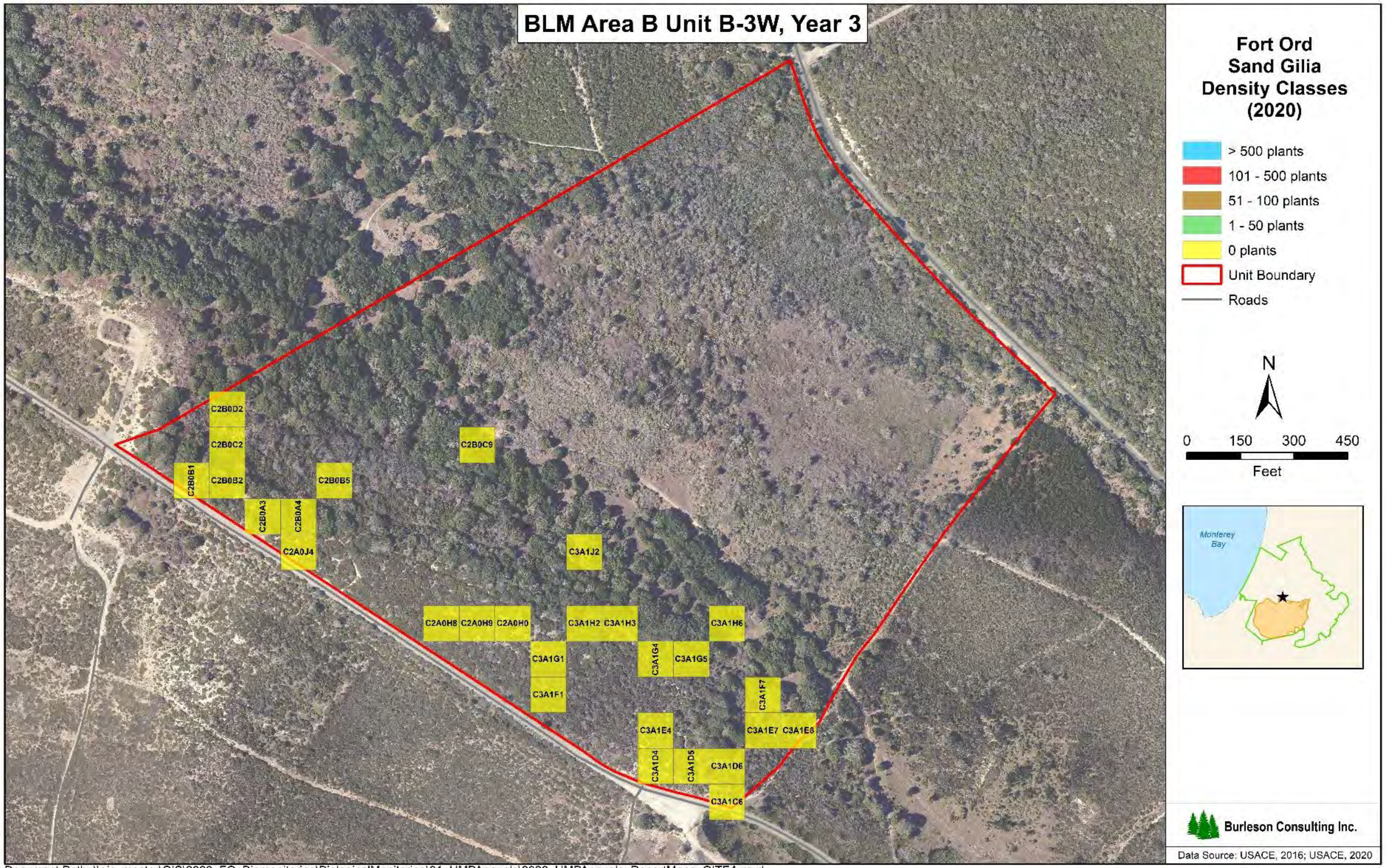

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Figure B-4. Map of Sand Gilia Density; BLM Area B Unit B 3 West (Year 3)

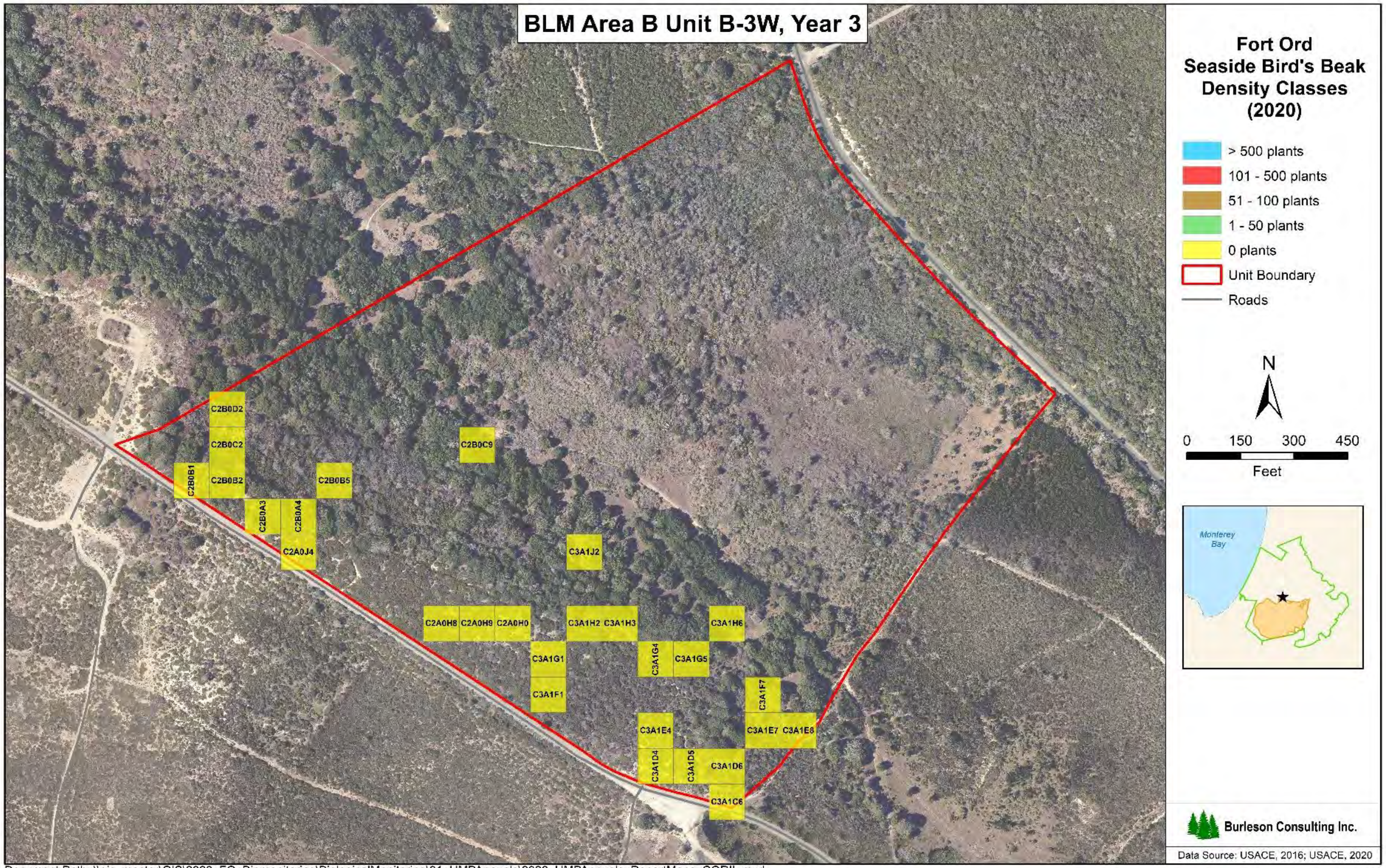

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Figure B-5. Map of Seaside Bird's Beak Density; BLM Area B Unit B 3 West (Year 3)

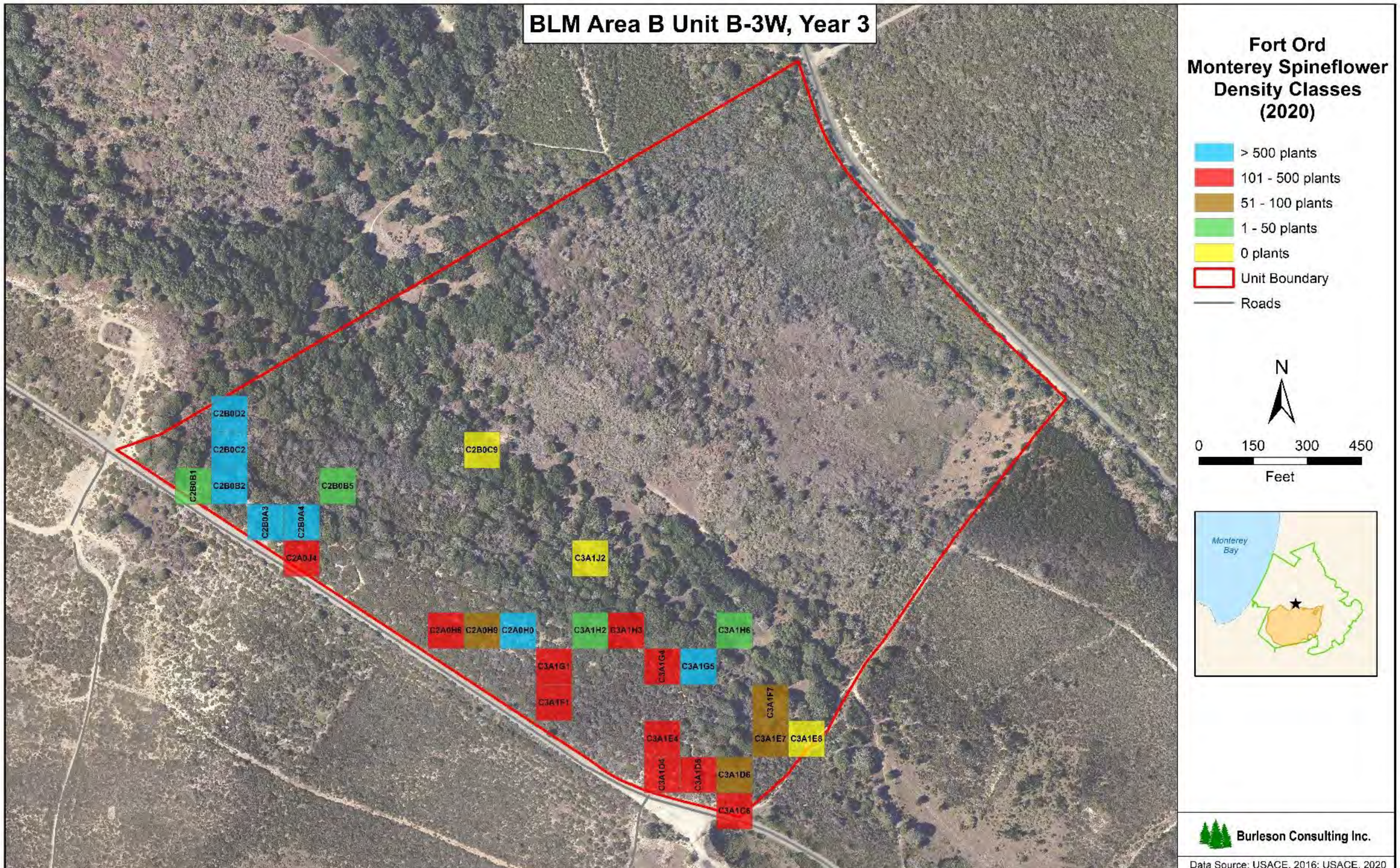

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Figure B-6. Map of Monterey Spineflower Density; BLM Area B Unit B 3 West (Year 3)

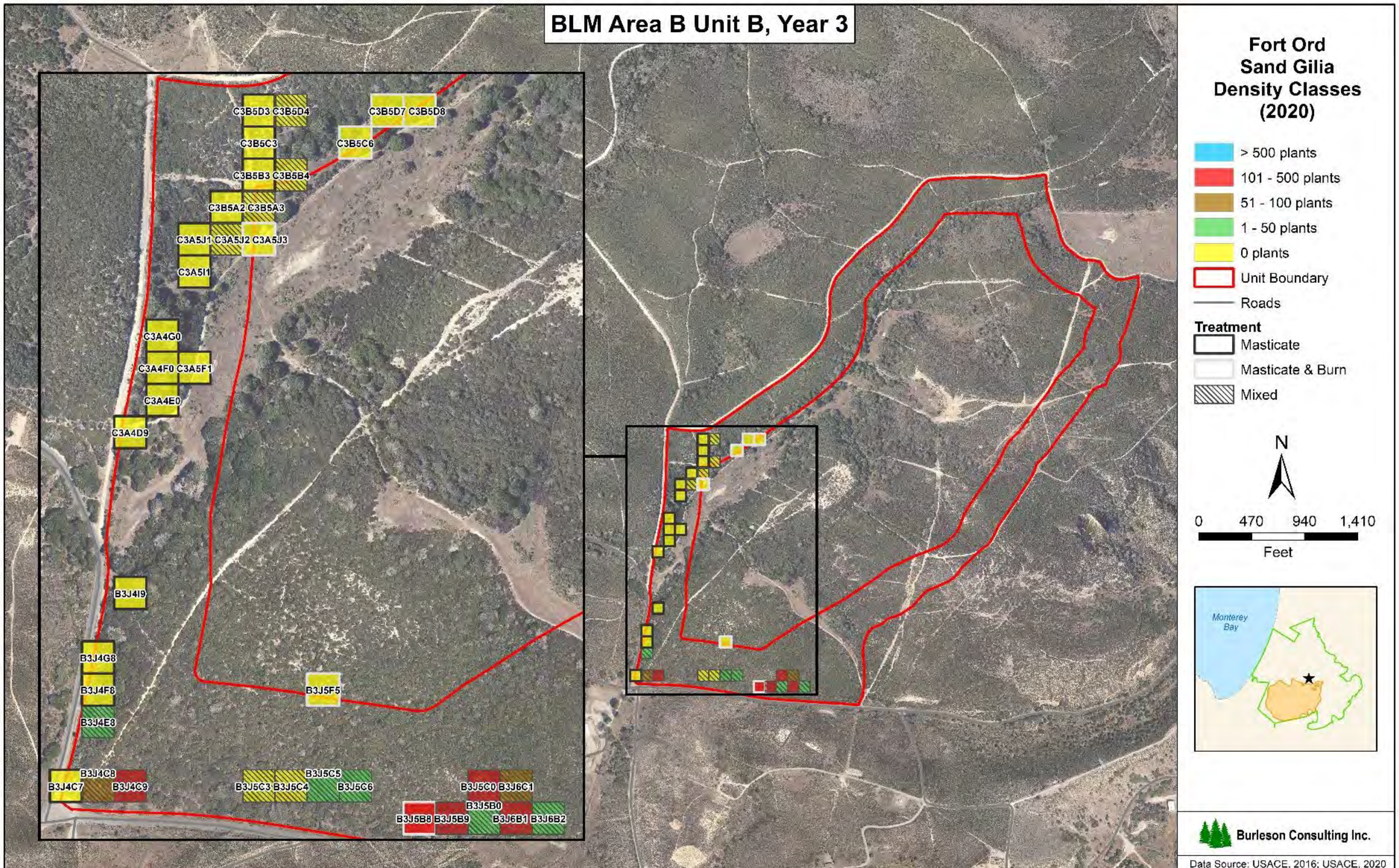

Figure B-7. Map of Sand Gilia Density; BLM Area B Unit B (Year 3)

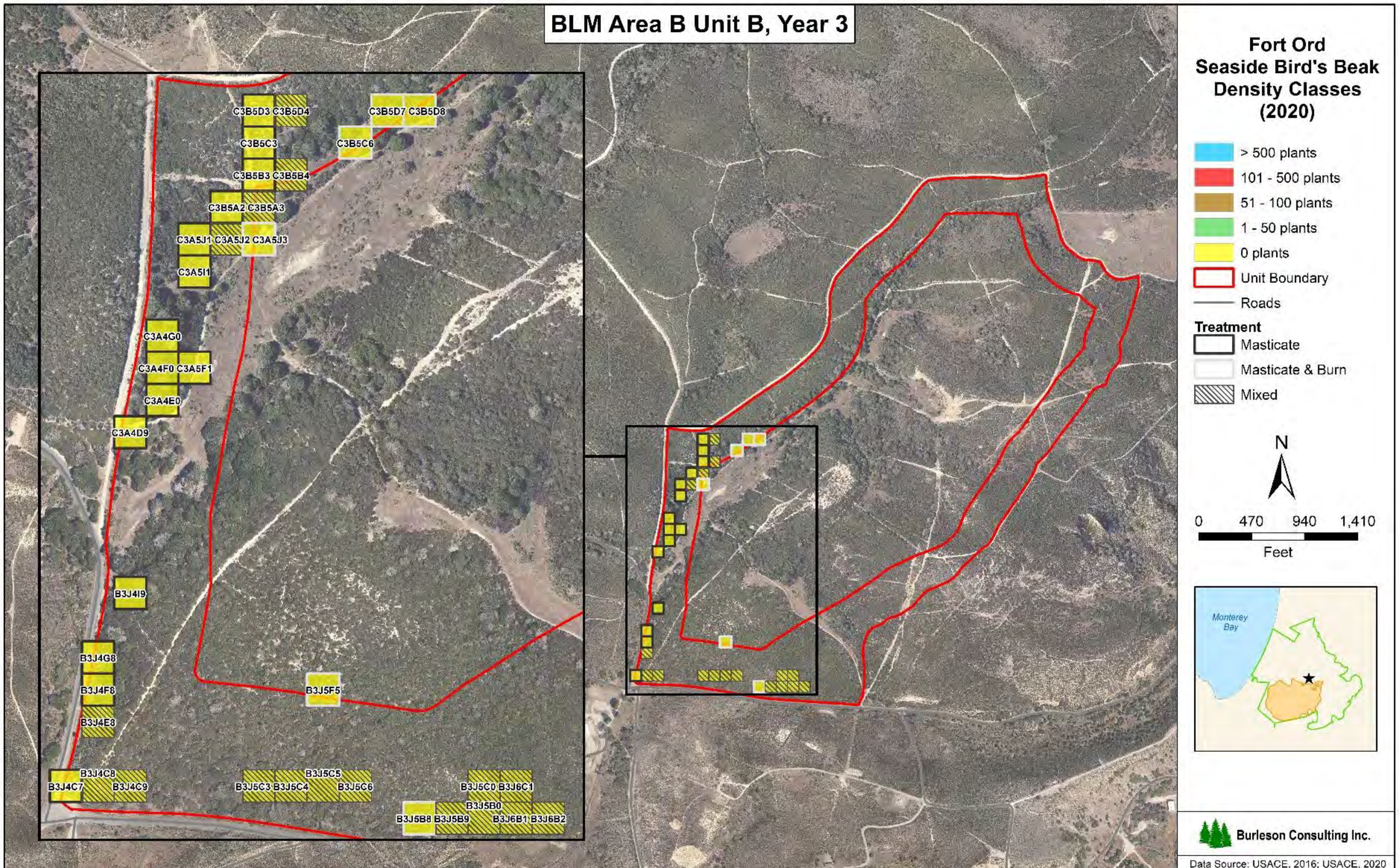

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Figure B-8. Map of Seaside Bird's Beak Density; BLM Area B Unit B (Year 3)

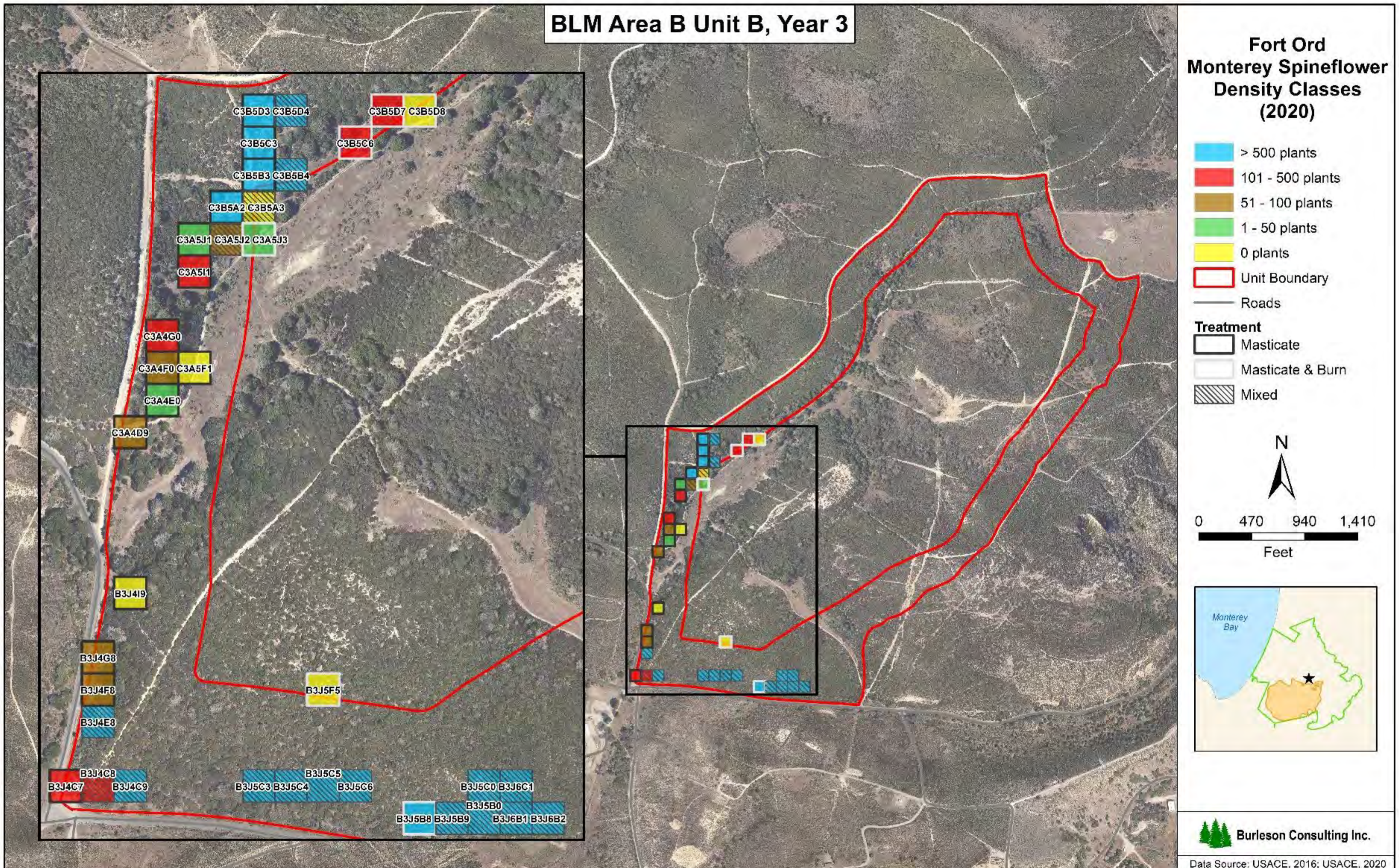

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Figure B-9. Map of Monterey Spineflower Density; BLM Area B Unit B (Year 3)

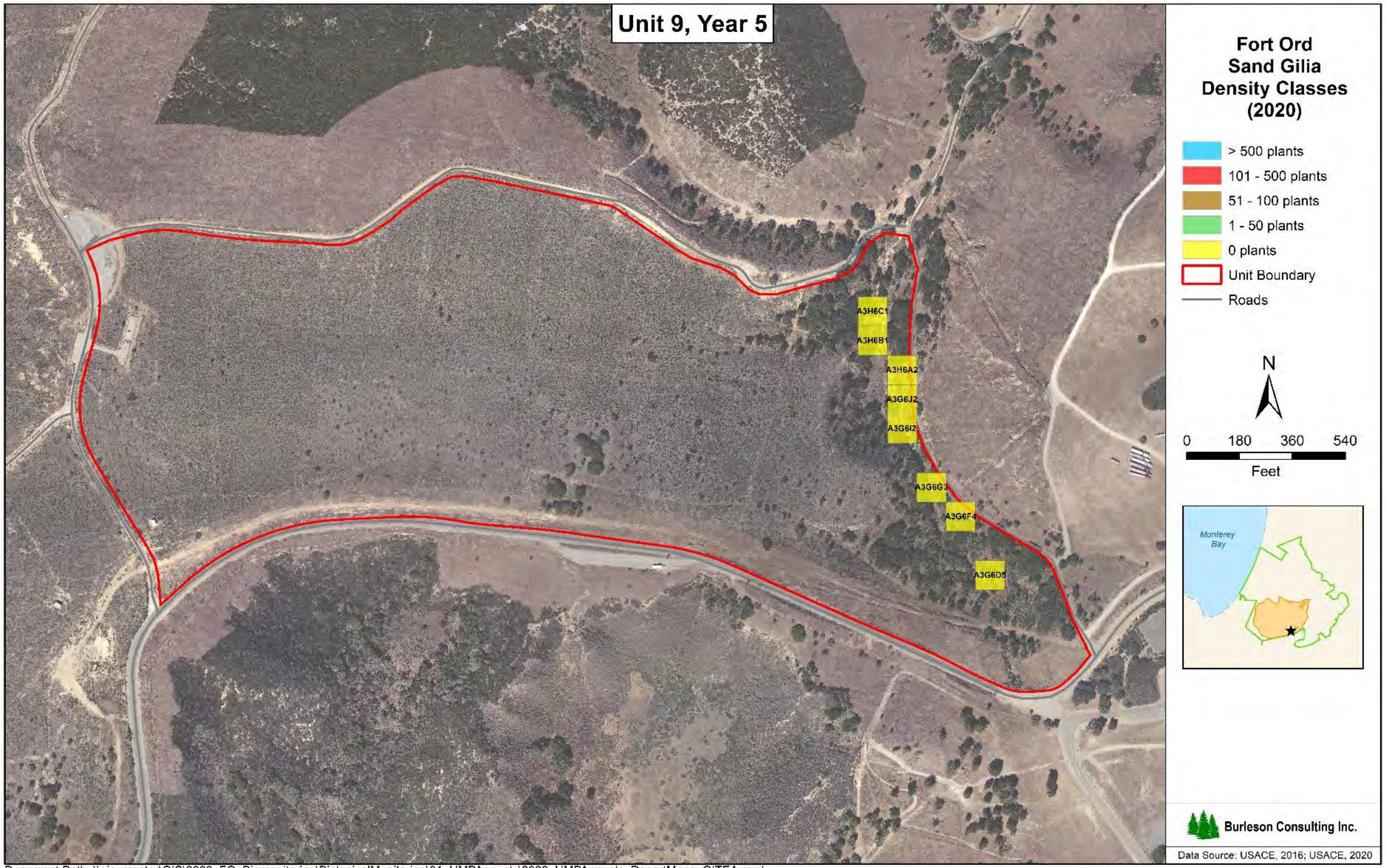

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Figure B-10. Map of Sand Gilia Density; Unit 9 (Year 5)

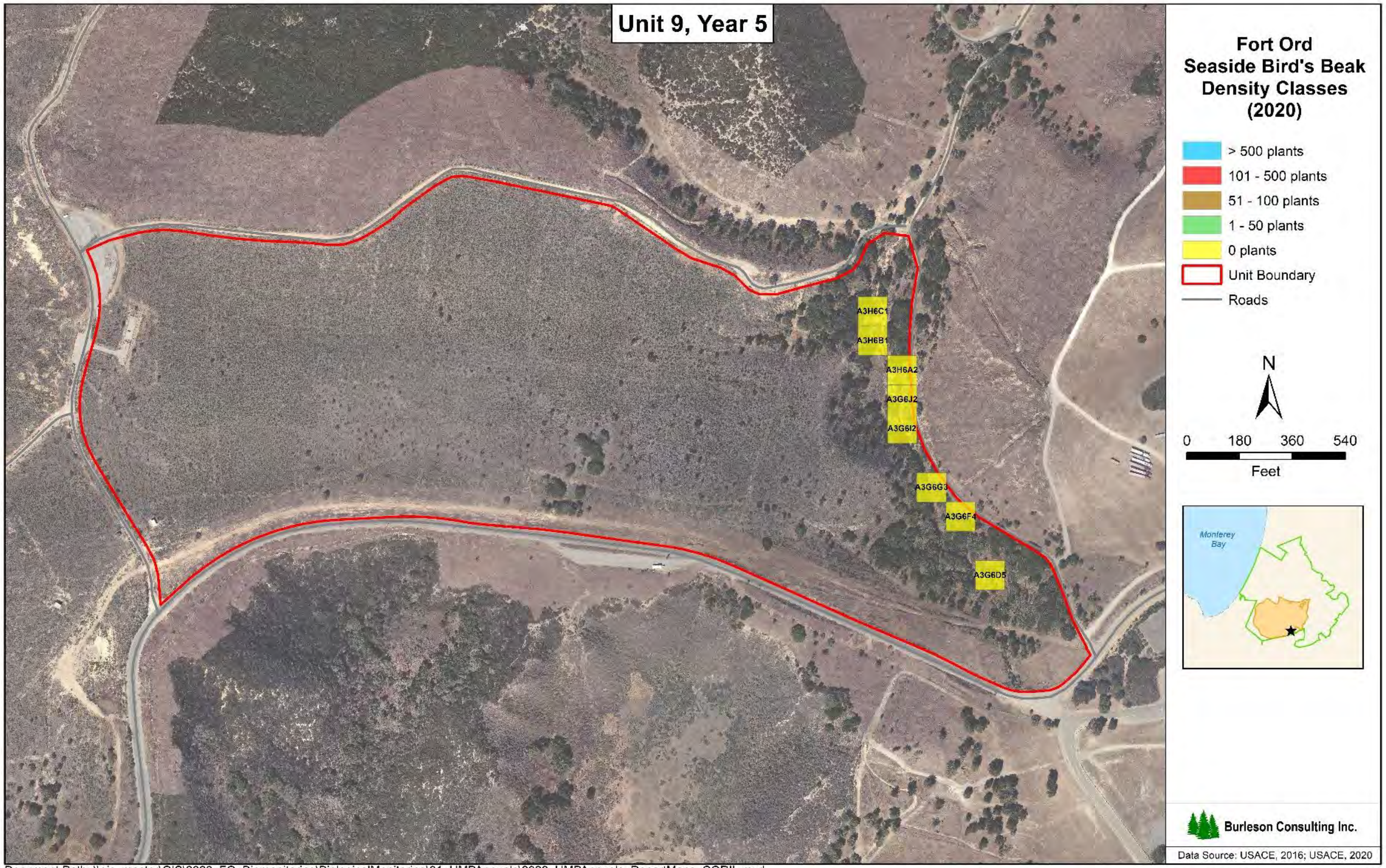

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Figure B-11. Map of Seaside Bird's Beak Density; Unit 9 (Year 5)

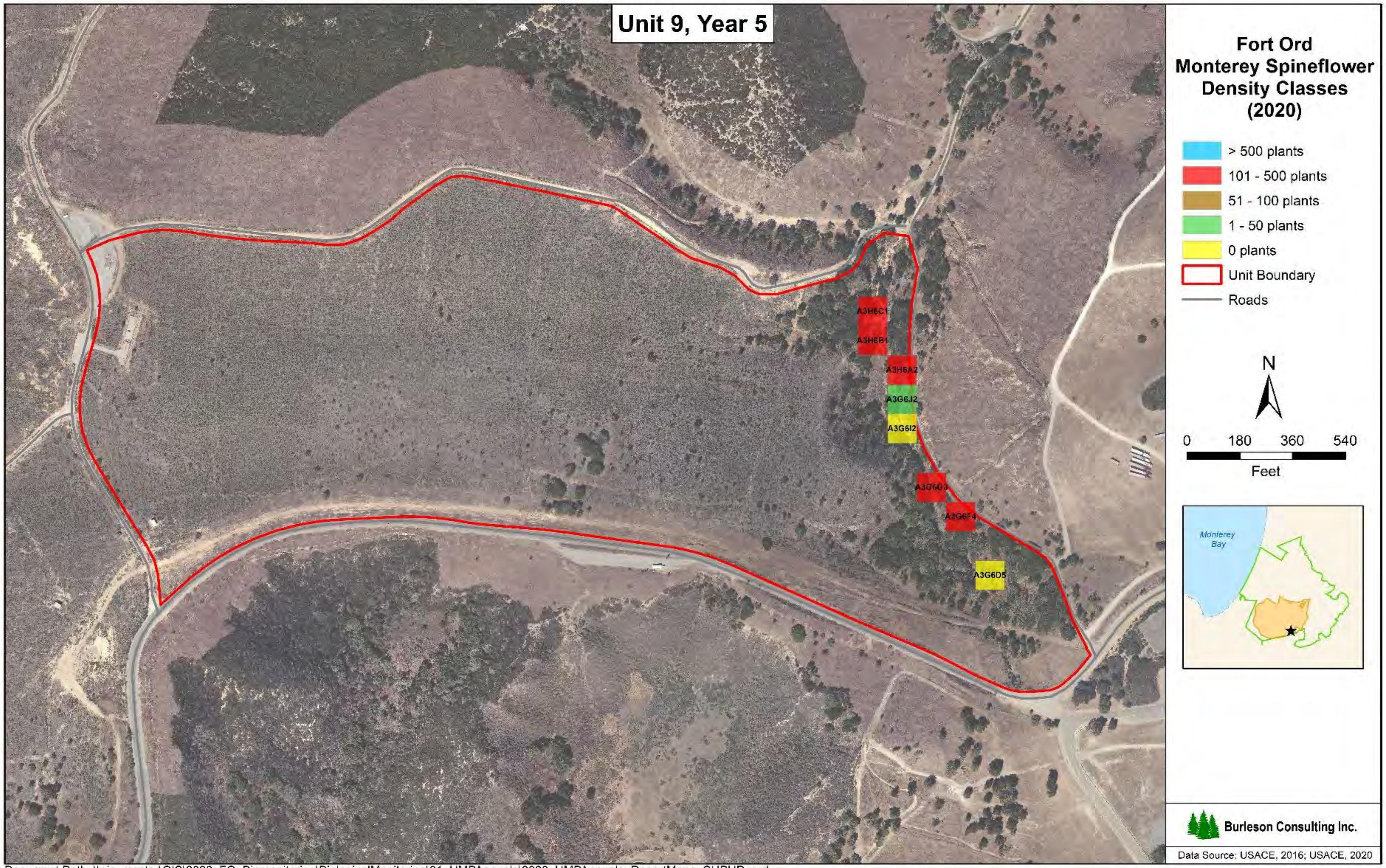

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Figure B-12. Map of Monterey Spineflower Density; Unit 9 (Year 5)

Figure B-13. Map of Sand Gilia Density; Unit 23 North (Year 5)

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Figure B-14. Map of Seaside Bird's Beak Density; Unit 23 North (Year 5)

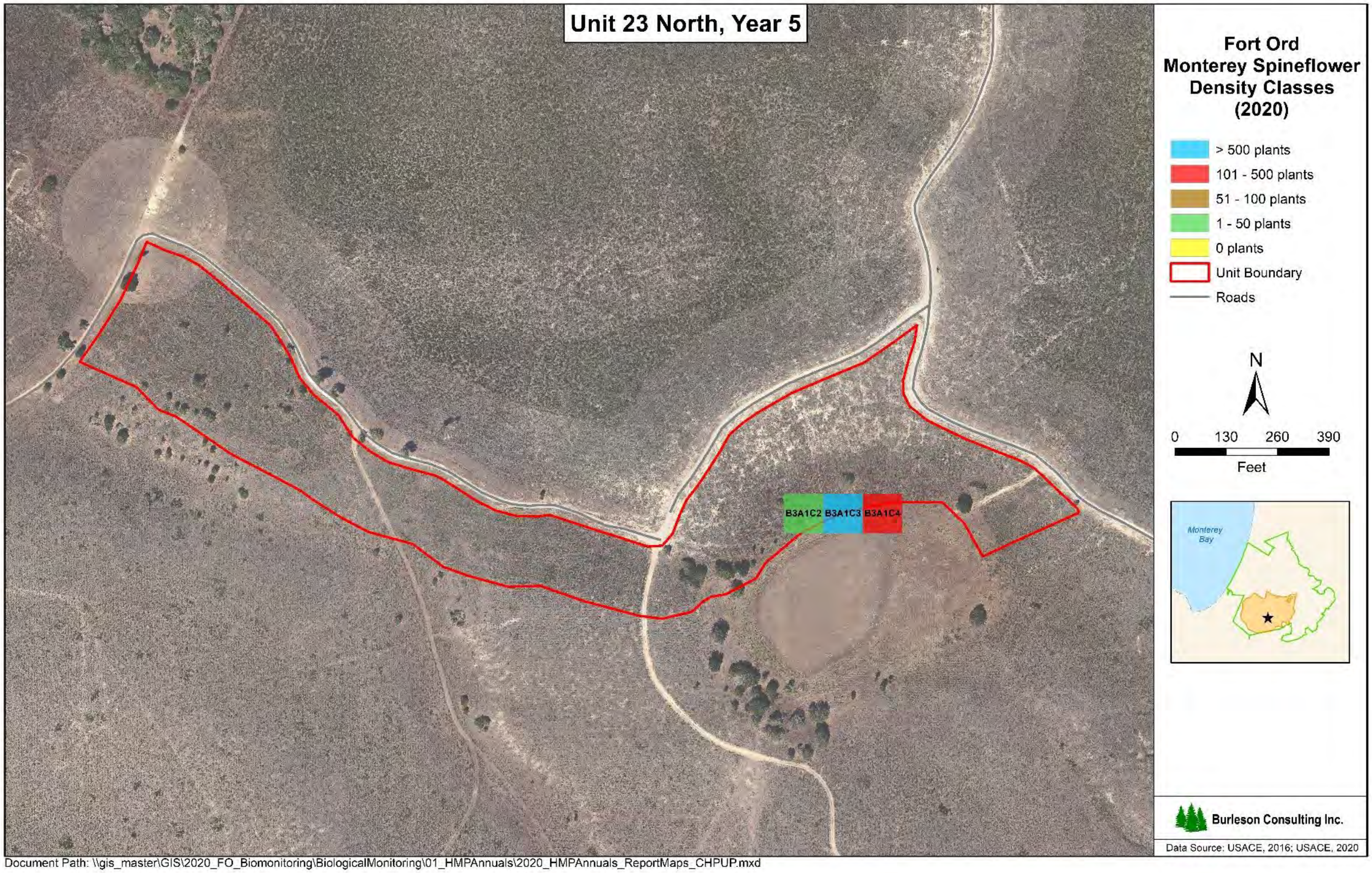

Figure B-15. Map of Monterey Spineflower Density; Unit 23 North (Year 5)

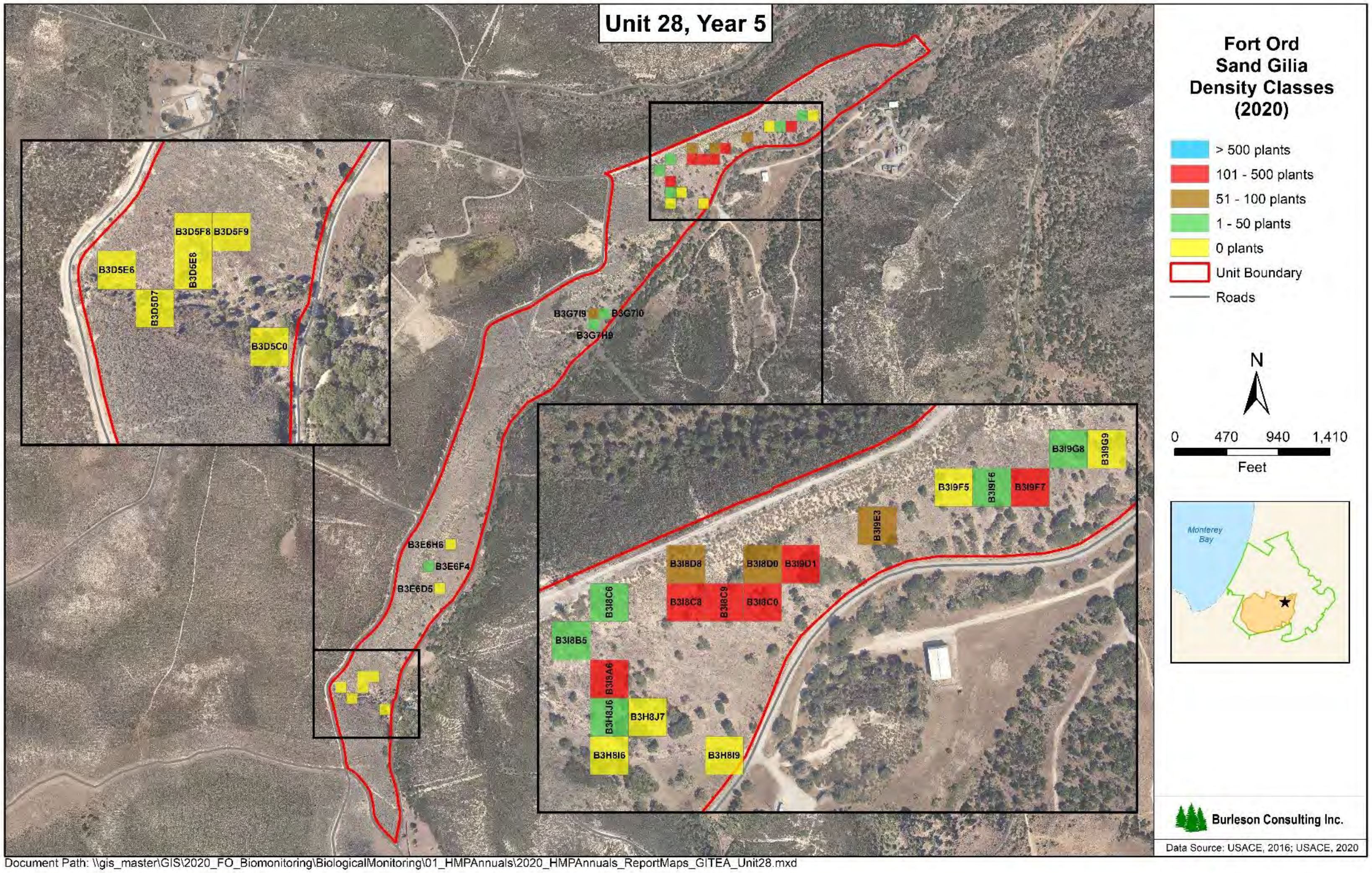

Figure B-16. Map of Sand Gilia Density; Unit 28 (Year 5)

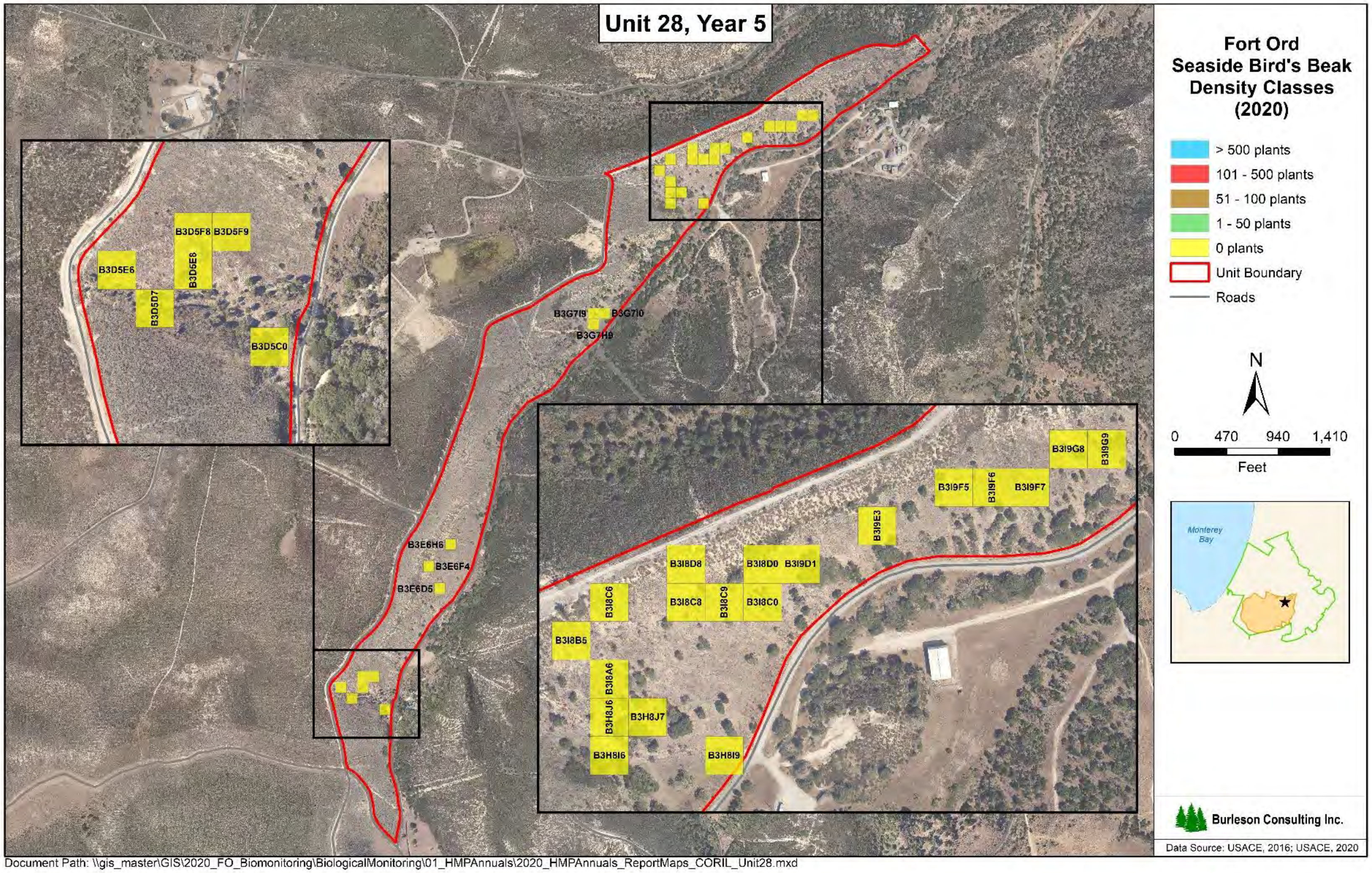

Figure B-17. Map of Seaside Bird's Beak Density; Unit 28 (Year 5)

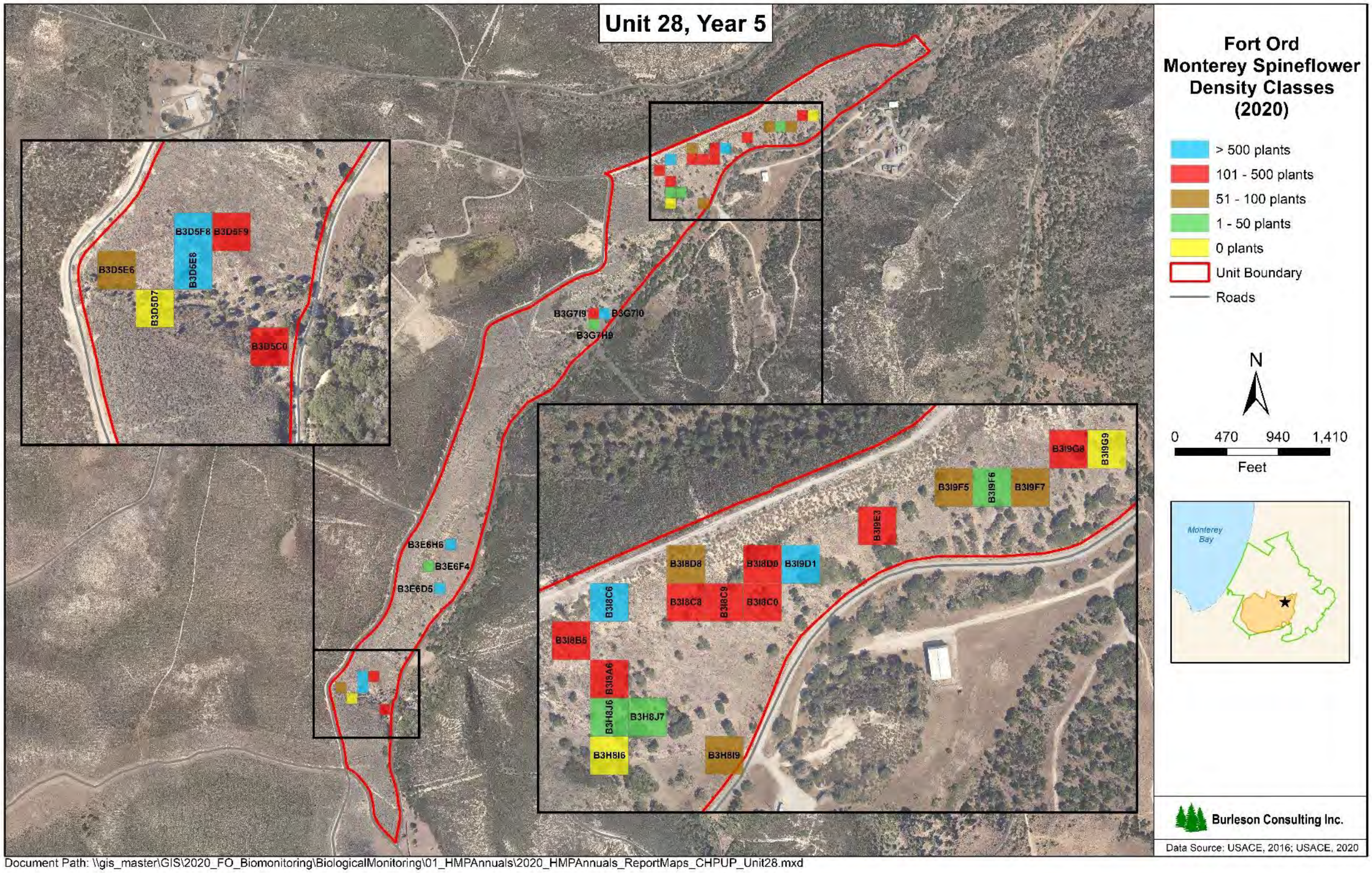

Figure B-18. Map of Monterey Spineflower Density; Unit 28 (Year 5)

APPENDIX C

MAPS: HMP SHRUB TRANSECTS

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Figure C-1. Map of Shrub Transects; BLM Area B Unit B 3 West (Year 3)

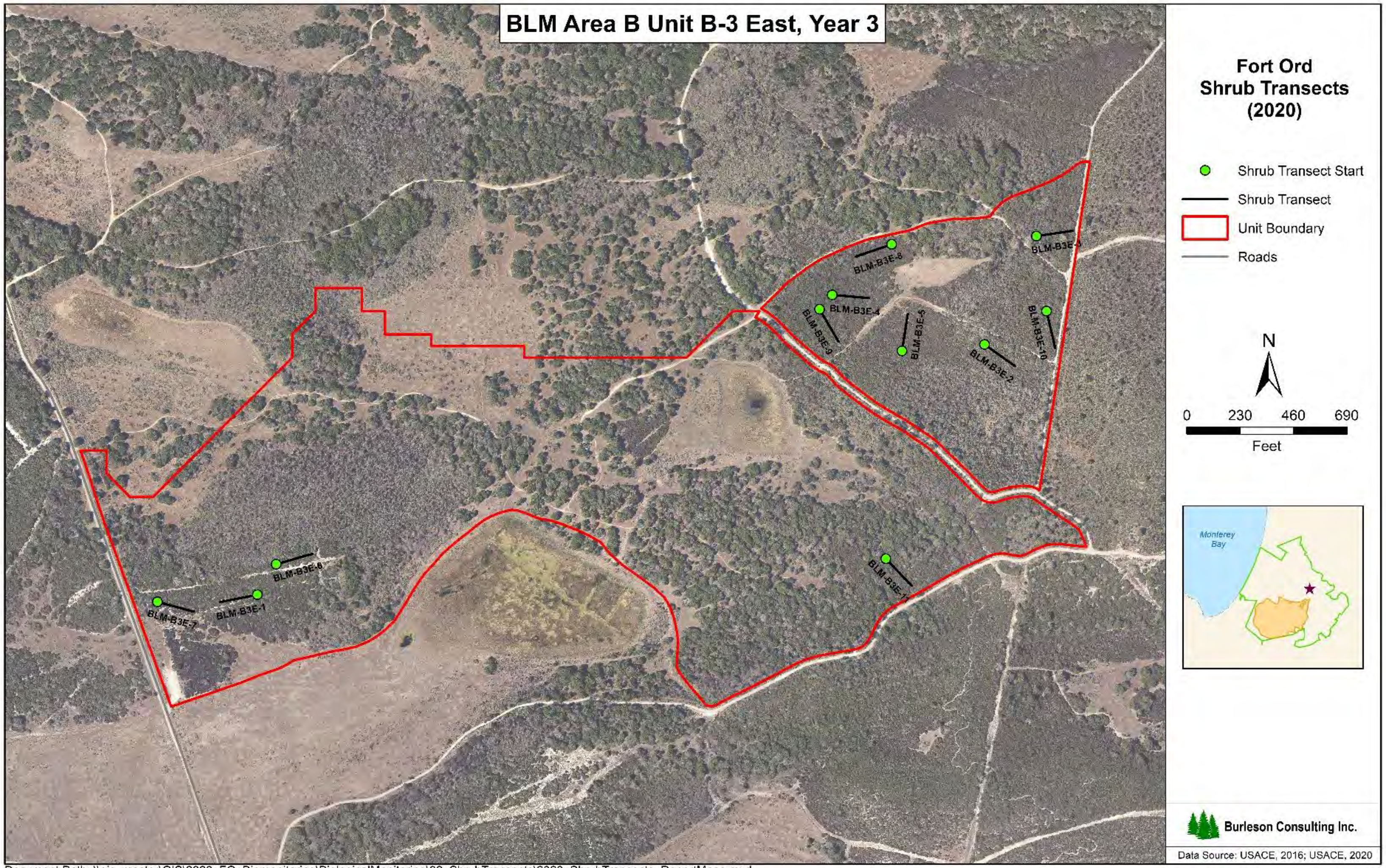

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Figure C-2. Map of Shrub Transects; BLM Area B Unit B 3 East (Year 3)

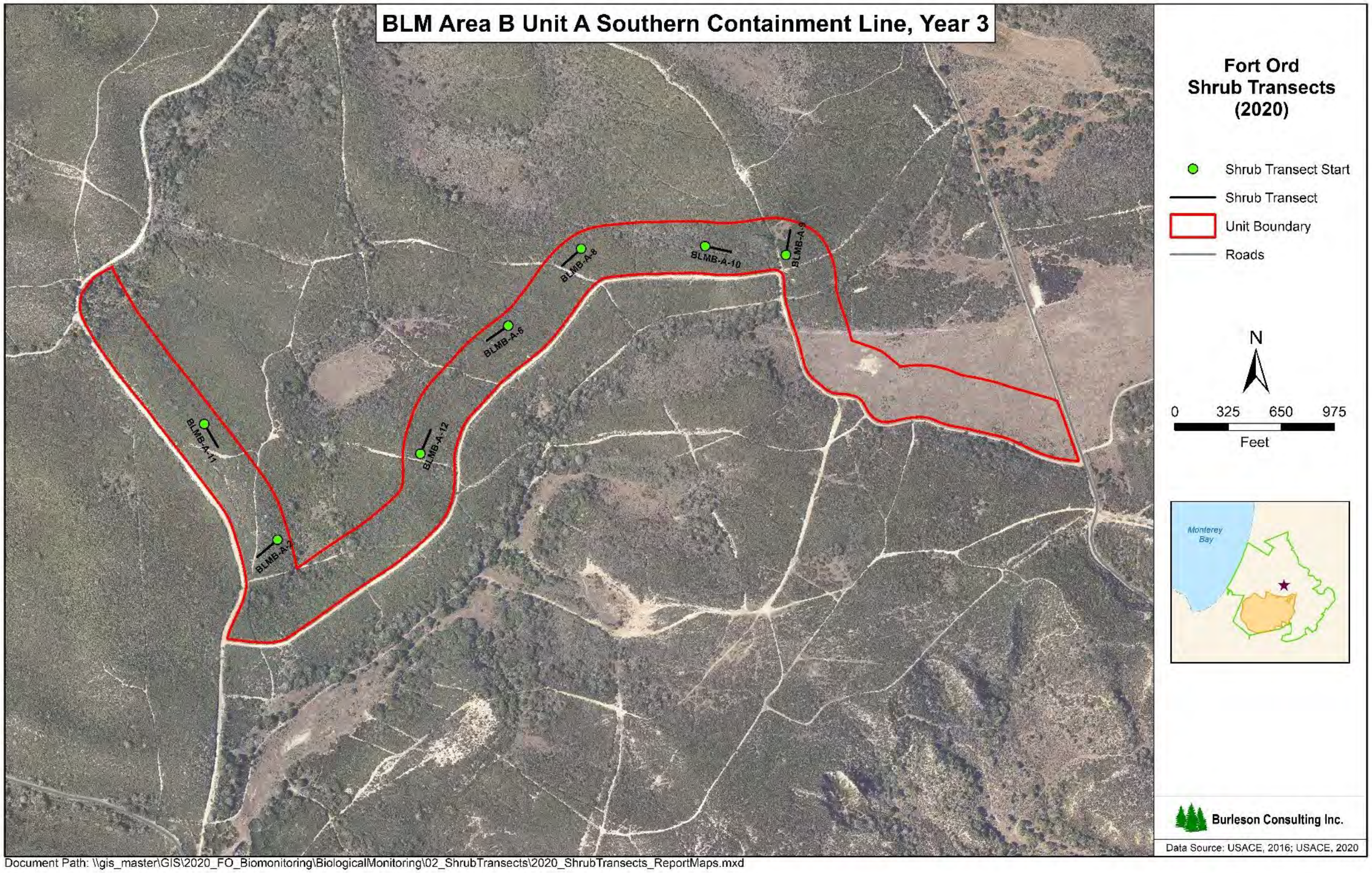

Figure C-3. Map of Shrub Transects; BLM Area B Unit A Southern Containment Line (Year 3)

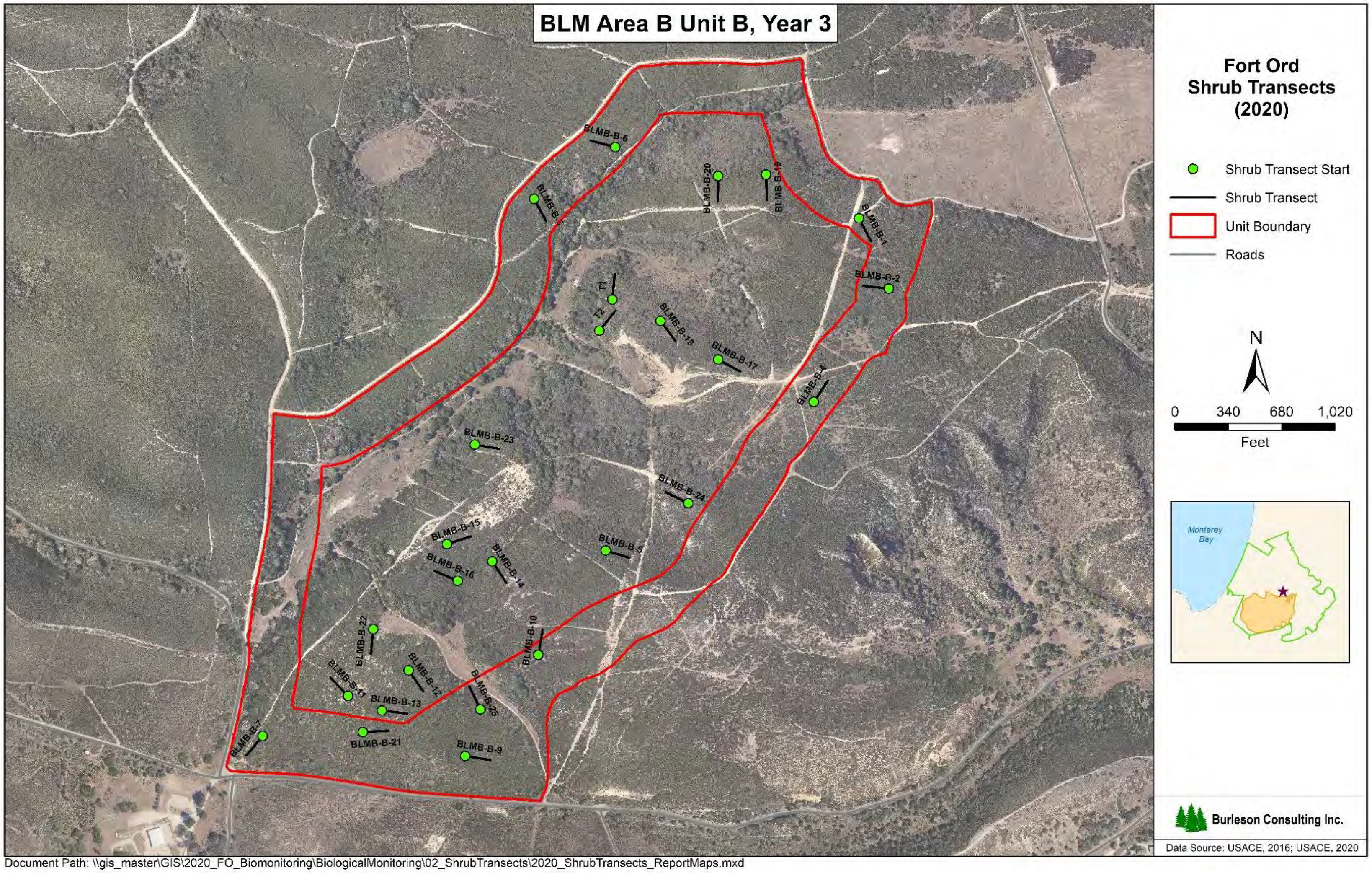

Figure C-4. Map of Shrub Transects; BLM Area B Unit B (Year 3)

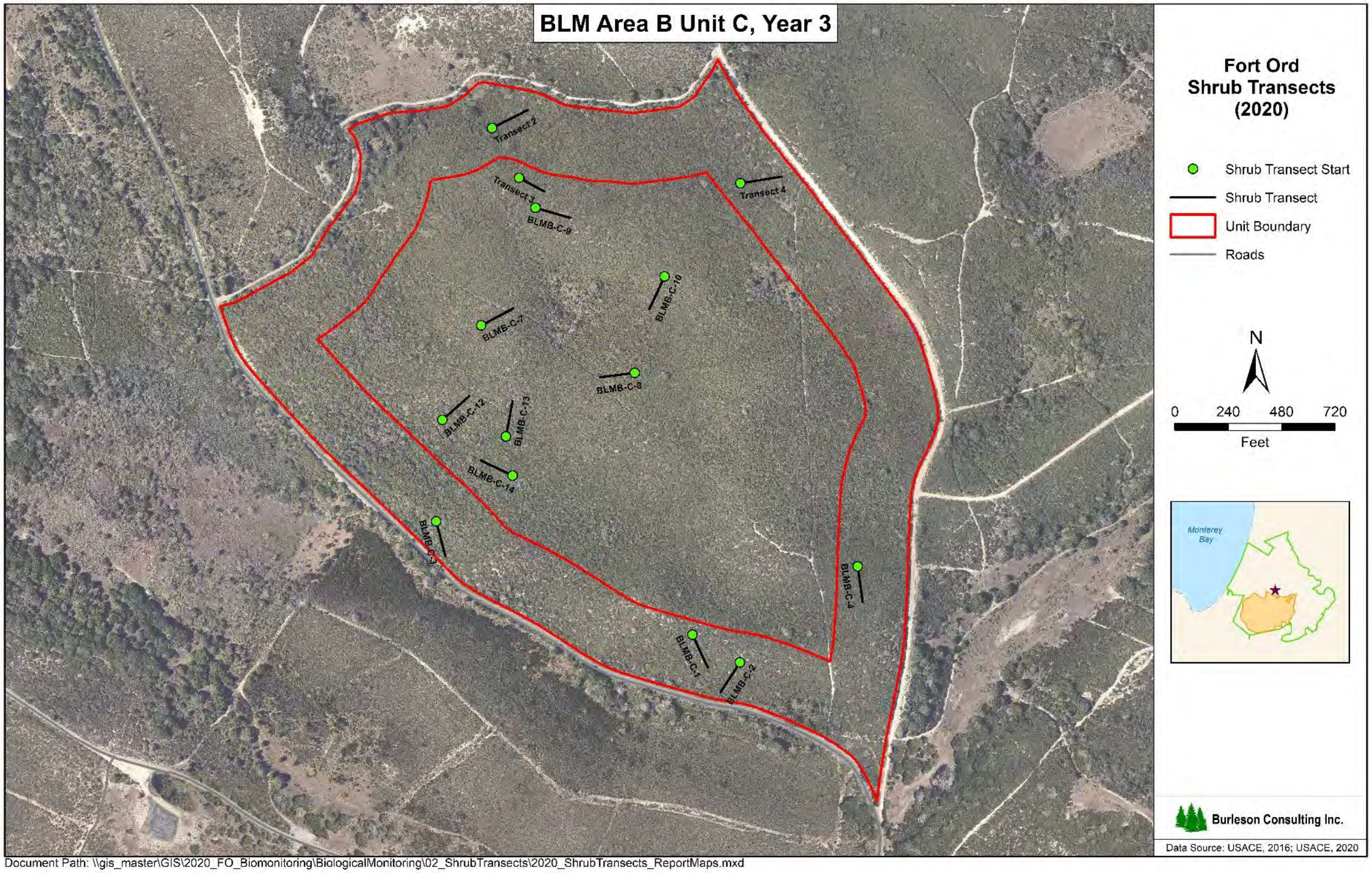

Figure C-5. Map of Shrub Transects; BLM Area B Unit C (Year 3)

Figure C-6. Map of Shrub Transects; BLM Area B Unit B-2A (Year 3)

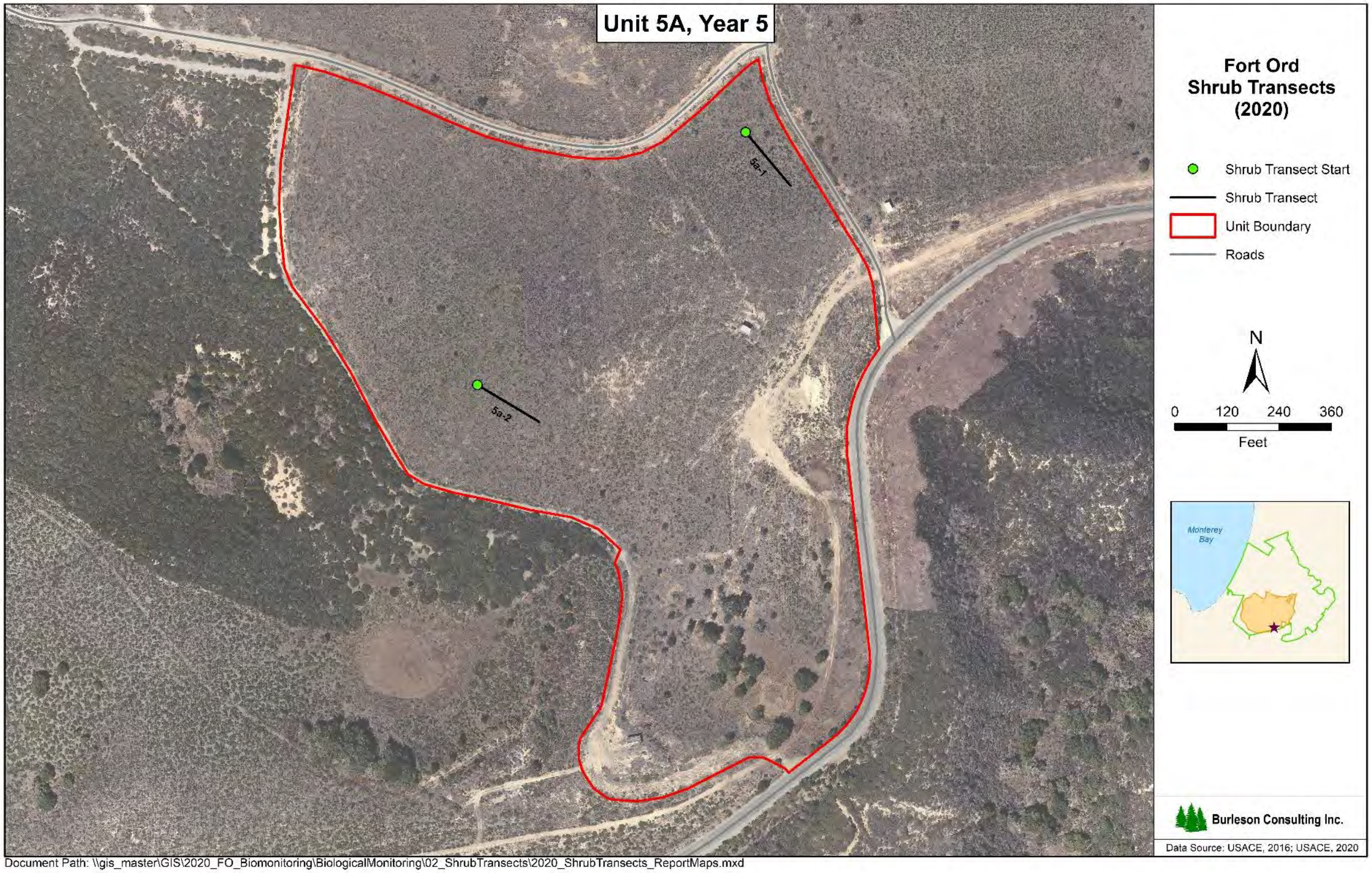

Figure C-7. Map of Shrub Transects; Unit 5A (Year 5)

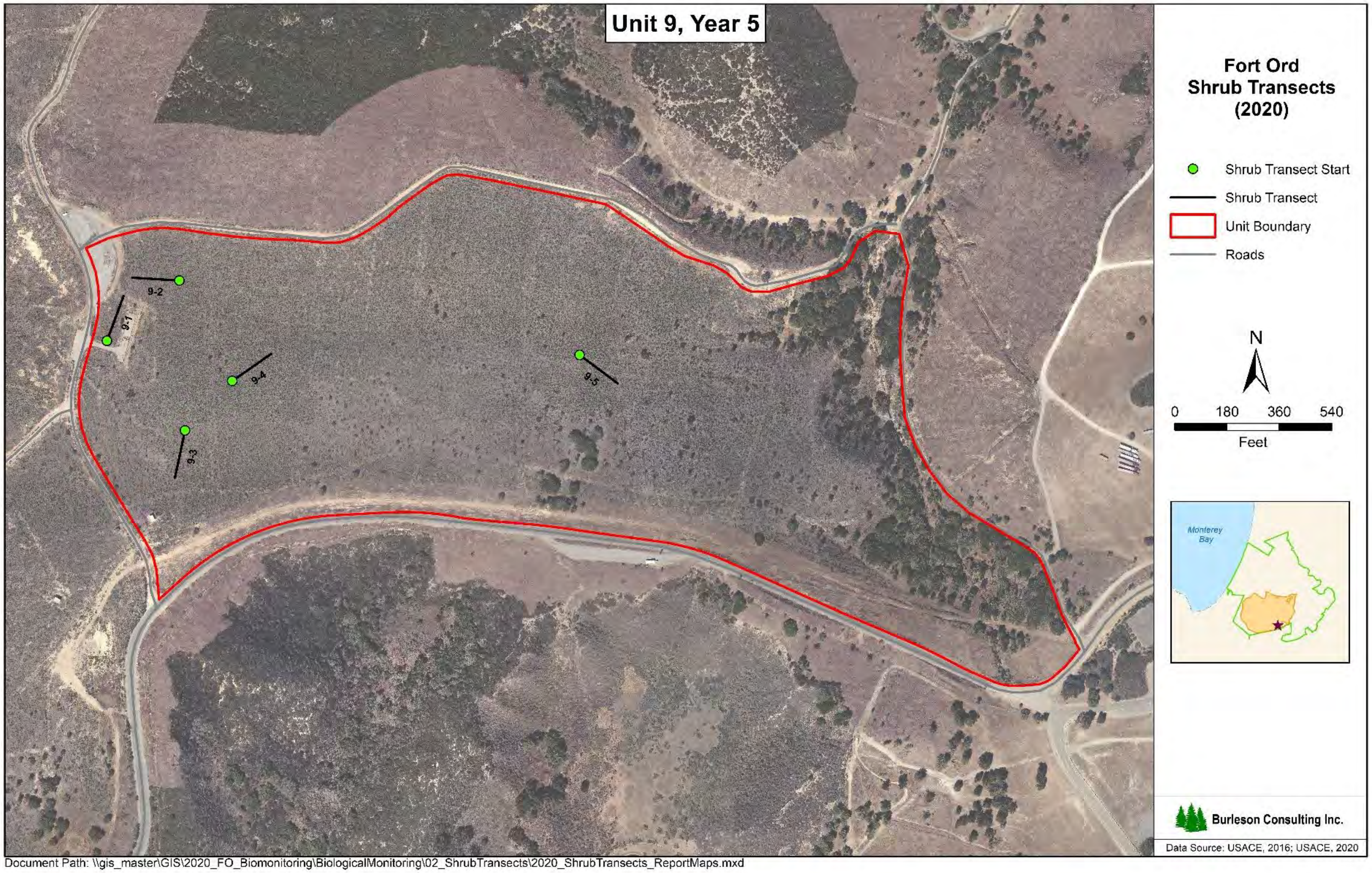

Figure C-8. Map of Shrub Transects; Unit 9 (Year 5)

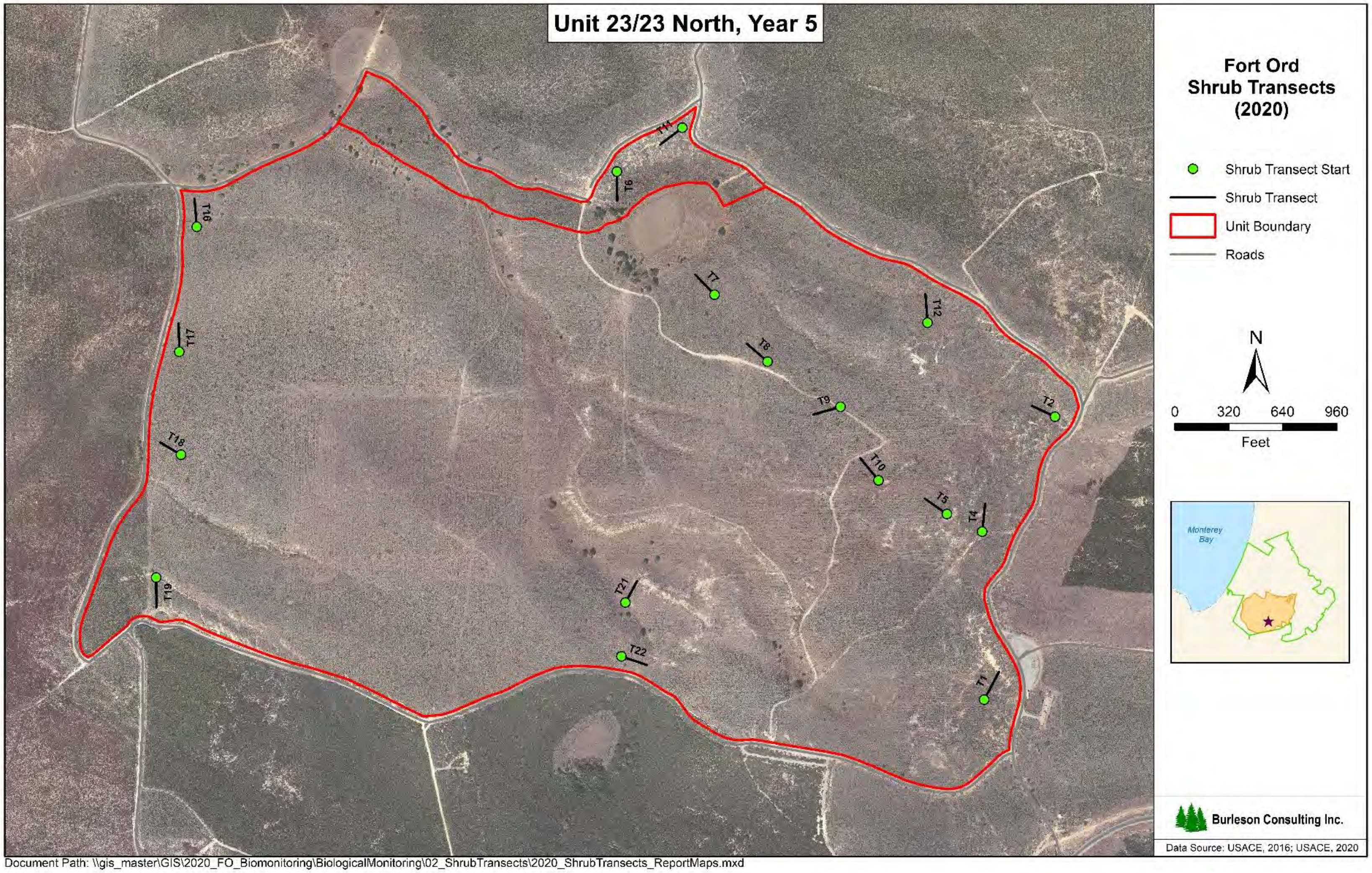

Figure C-9. Map of Shrub Transects; Unit 23 (Year 5)

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Figure C-10. Map of Shrub Transects; Unit 28 (Year 5)

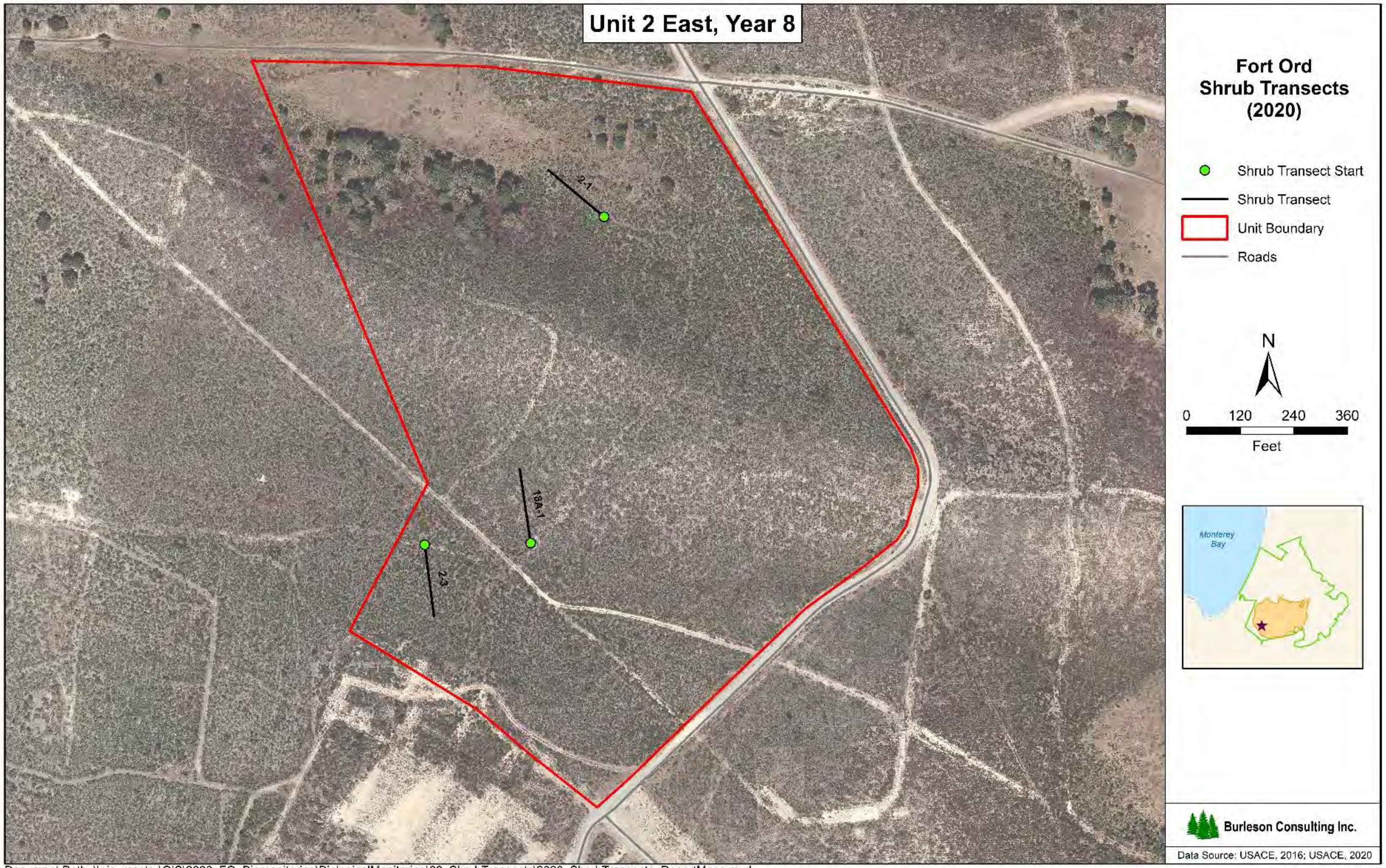

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Figure C-11. Map of Shrub Transects; Unit 2 East (Year 8)

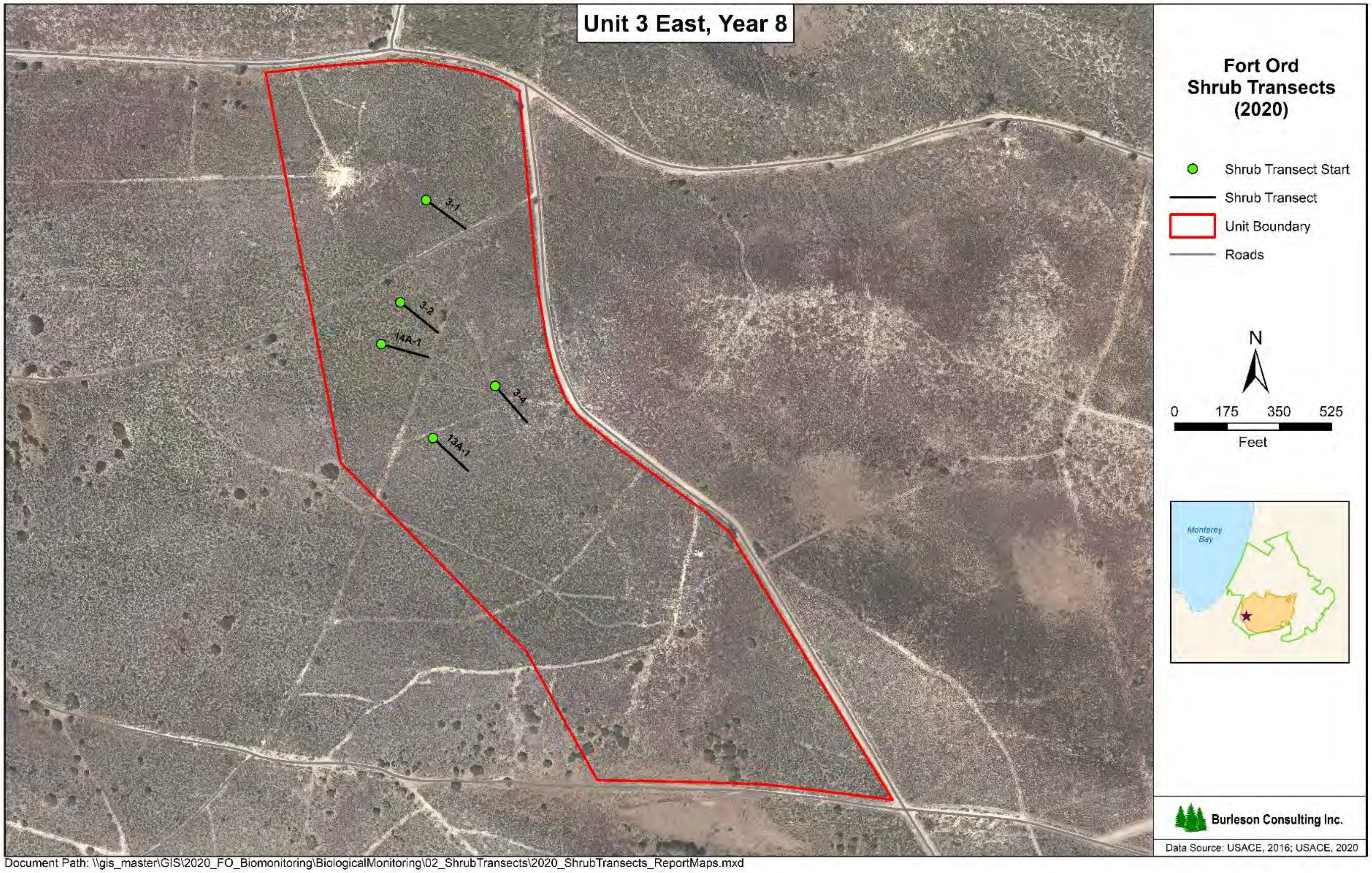

Figure C-12. Map of Shrub Transects; Unit 3 East (Year 8)

APPENDIX D

MAPS: ANNUAL GRASS DENSITY

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Figure D-1. Map of Annual Grass Density; BLM Area B Unit B 3 West (Year 3)

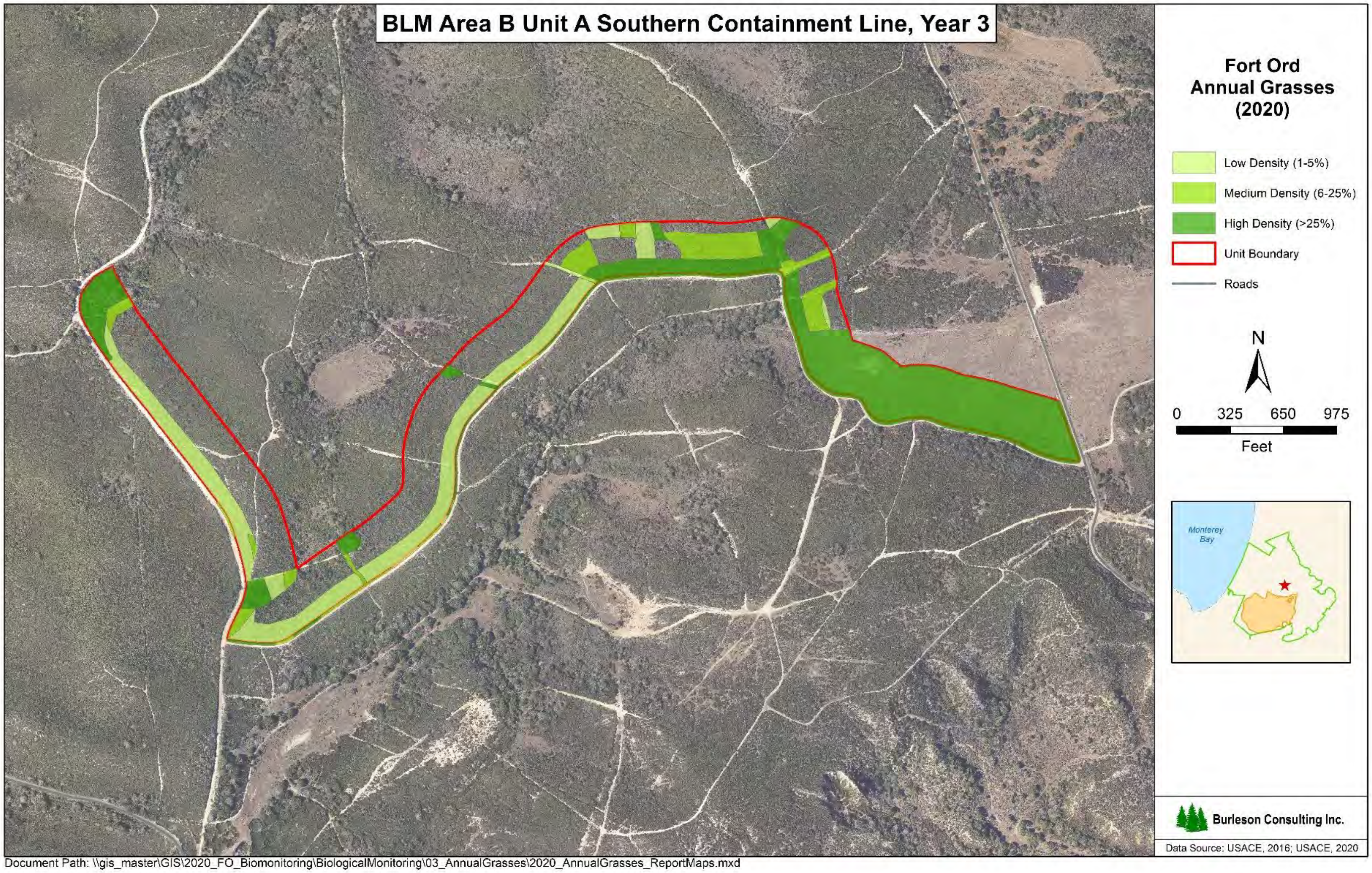

Figure D-2. Map of Annual Grass Density; BLM Area B Unit A Southern Containment Line (Year 3)

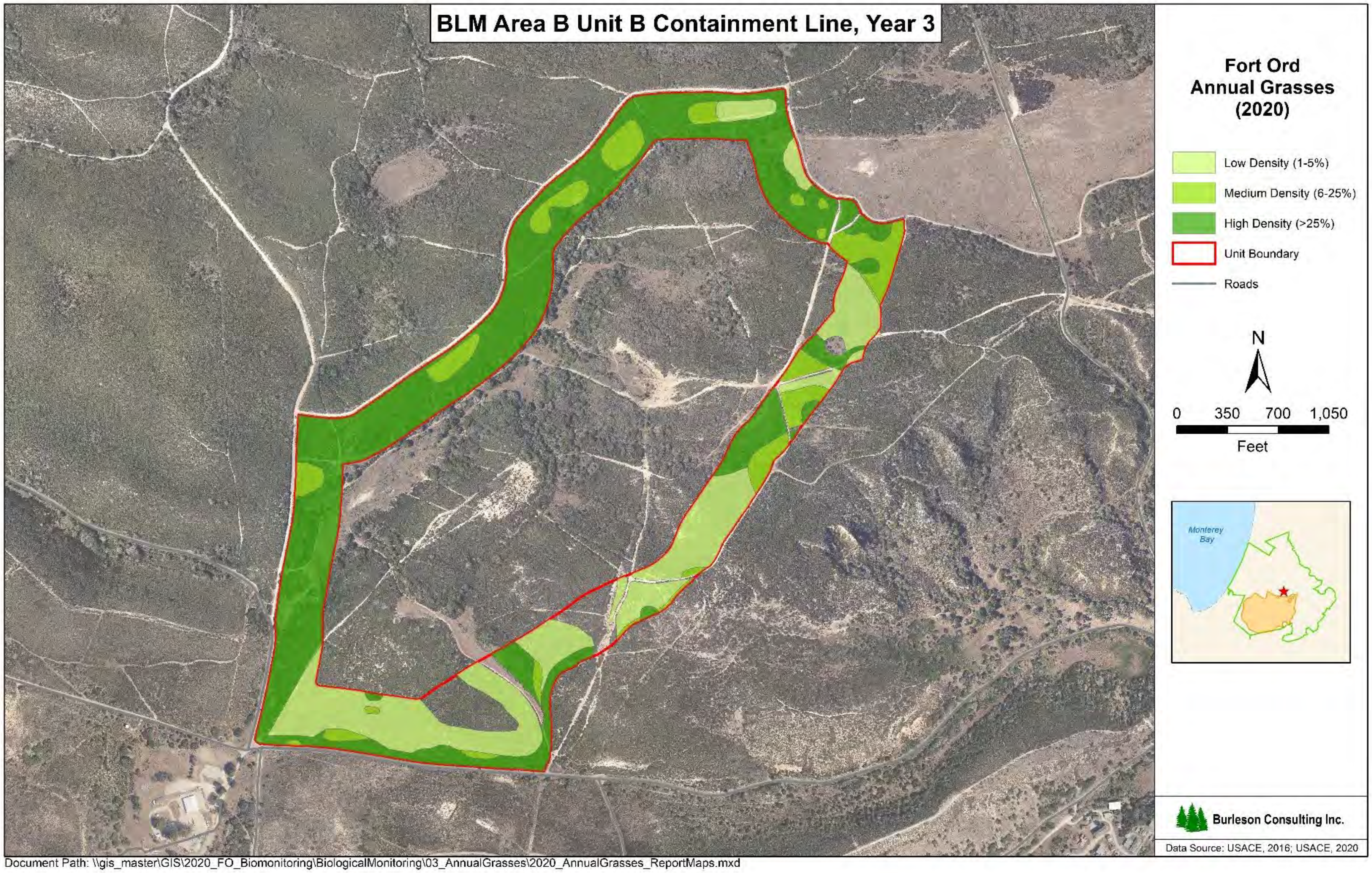

Figure D-3. Map of Annual Grass Density; BLM Area B Unit B (Year 3)

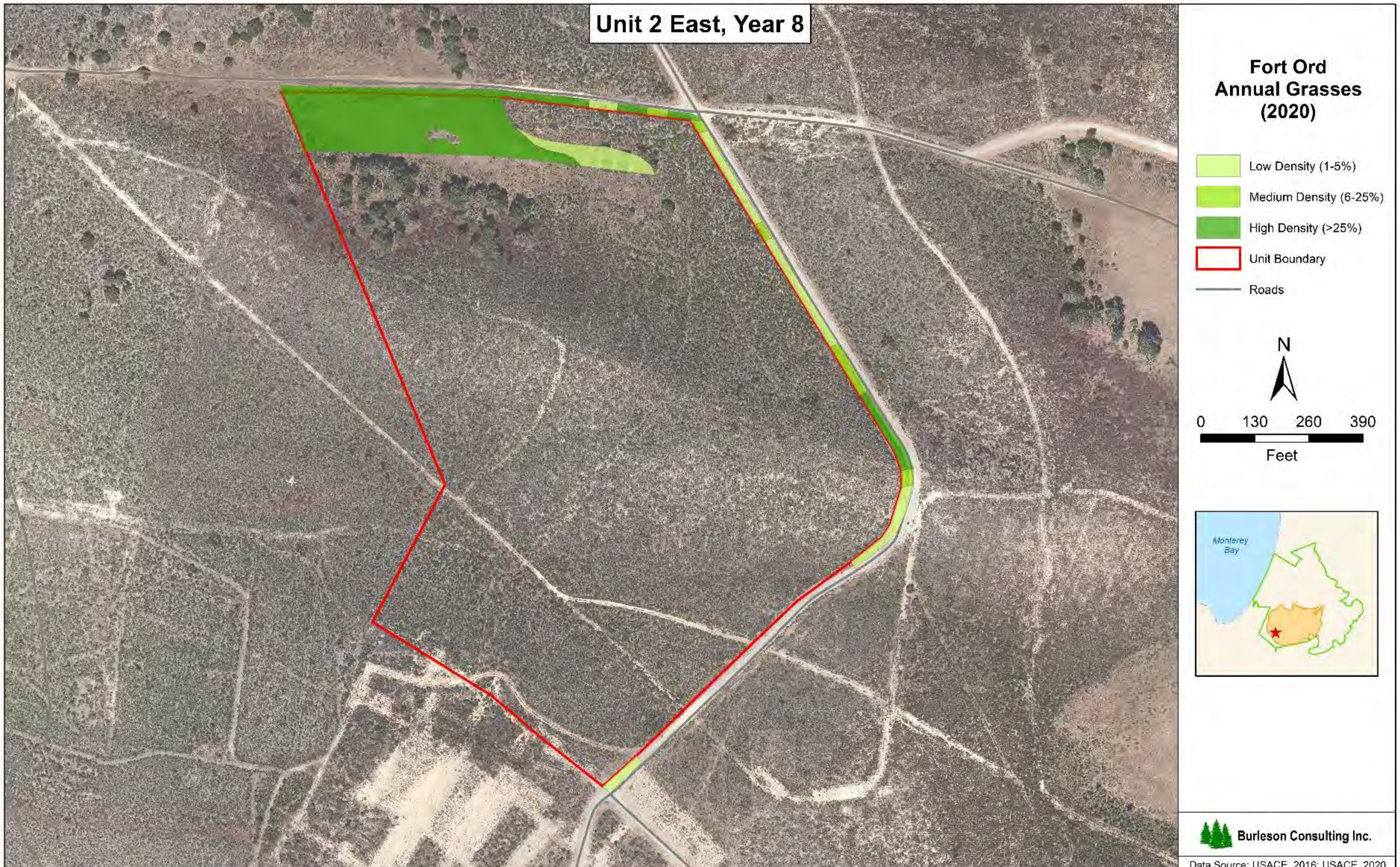

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Figure D-4. Map of Annual Grass Density; Unit 2 East (Year 8)

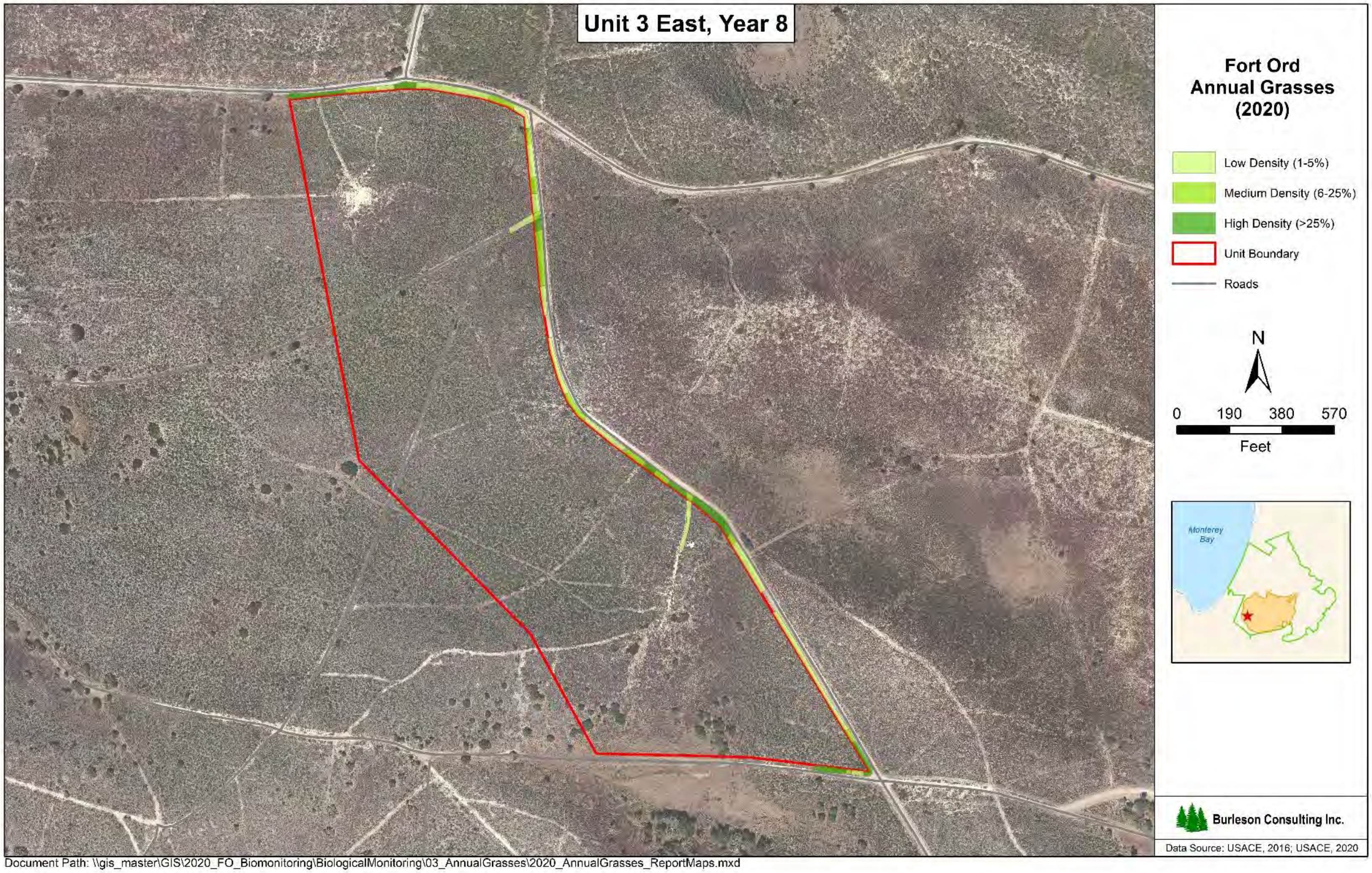

Figure D-5. Map of Annual Grass Density; Unit 3 East (Year 8)

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APPENDIX E

MAPS: INVASIVE AND RARE SPECIES

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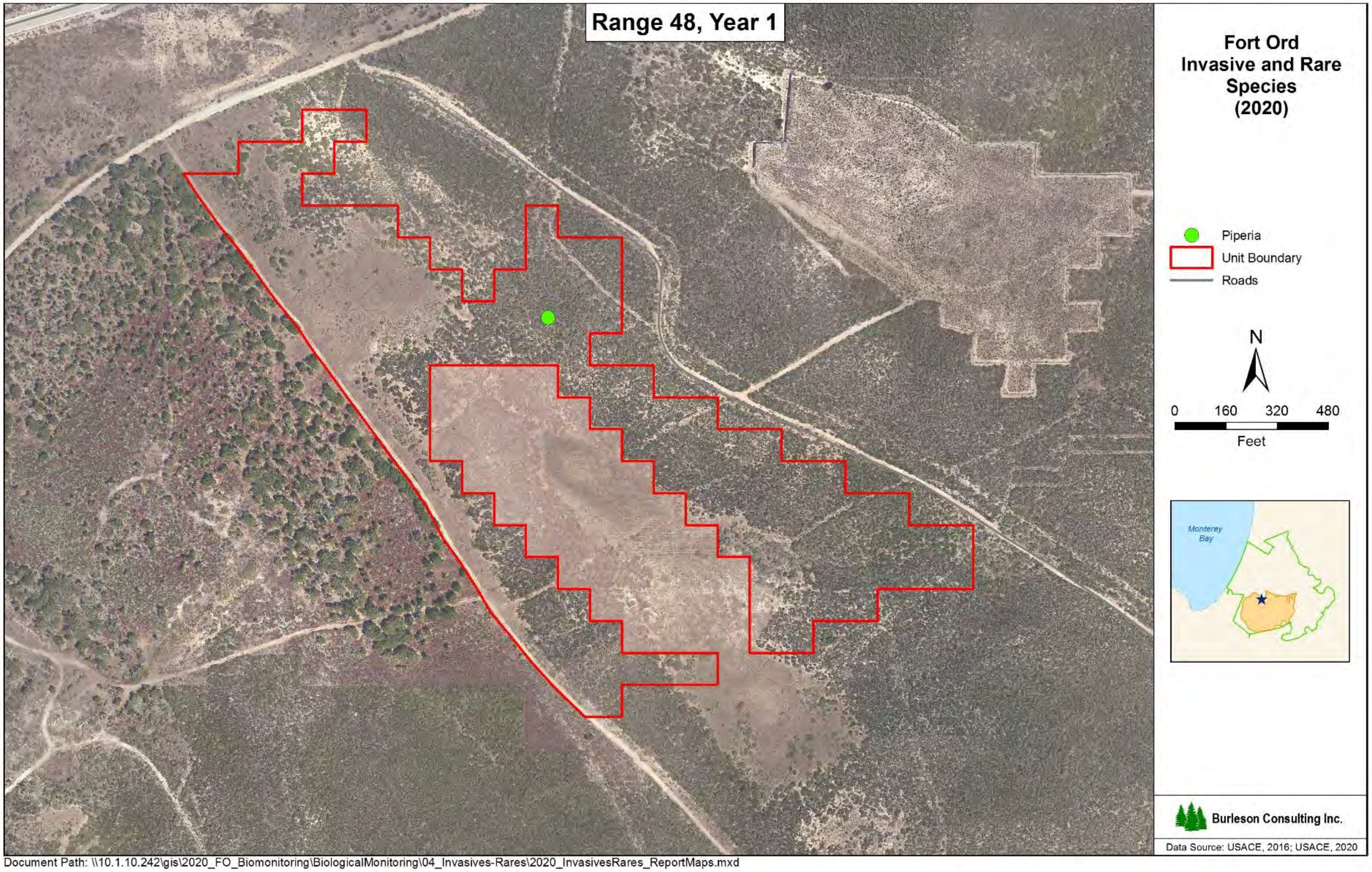

Figure E-1. Map of Invasive and Rare Species; Range 48 (Year 1)

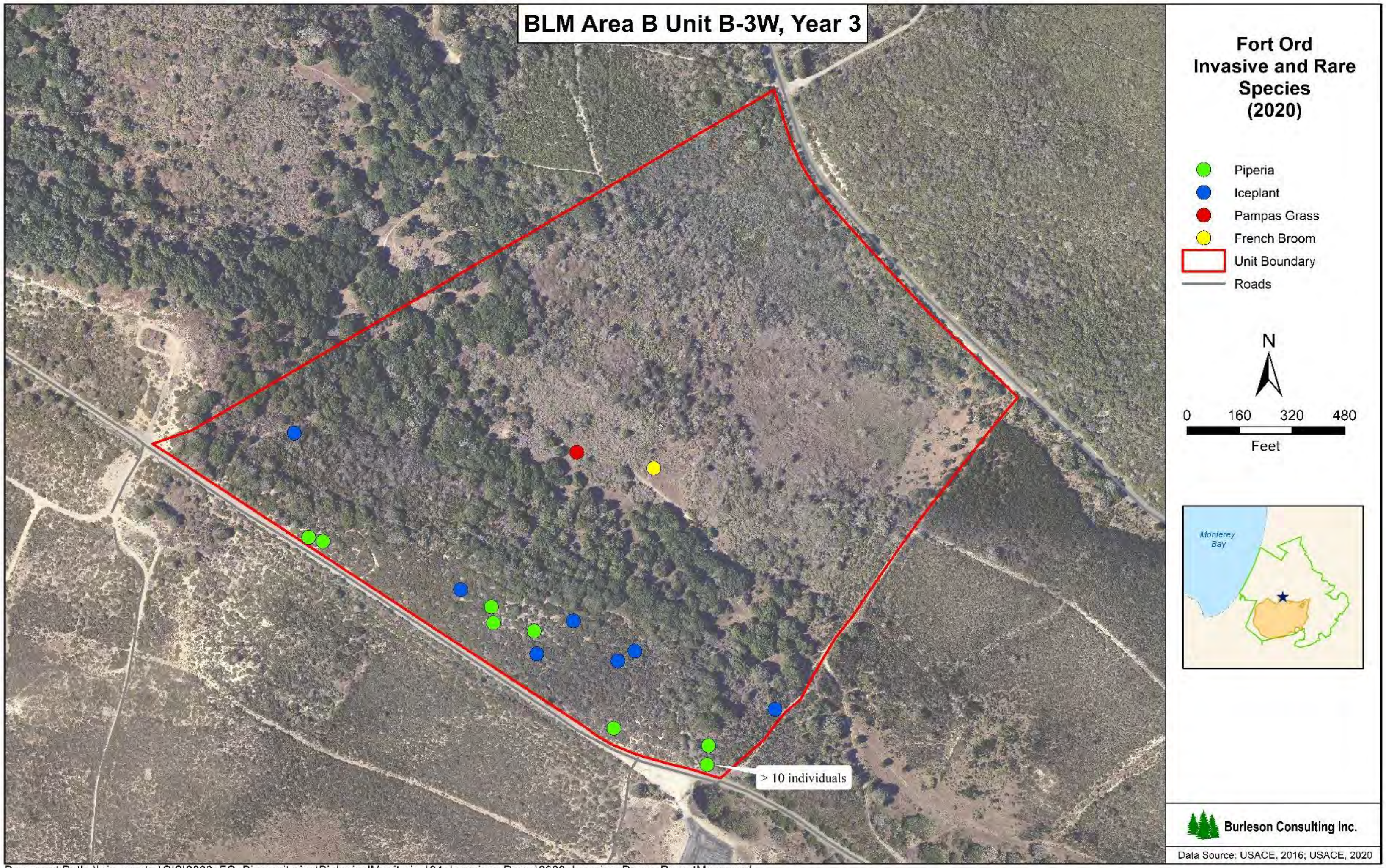

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Figure E-2. Map of Invasive and Rare Species; BLM Area B Unit B West (Year 3)

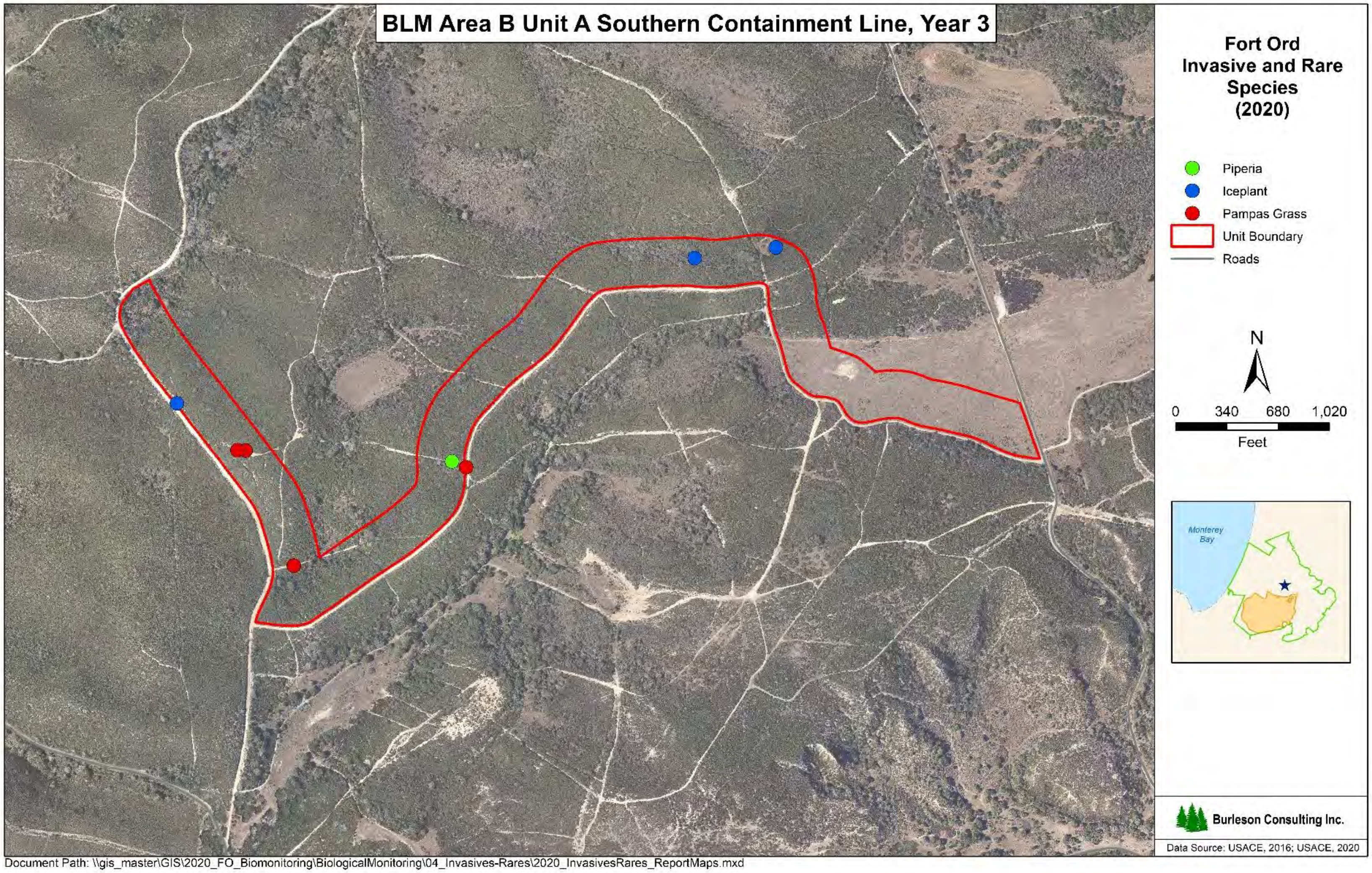

Figure E-3. Map of Invasive and Rare Species; BLM Area B Unit A Southern Containment Line (Year 3)

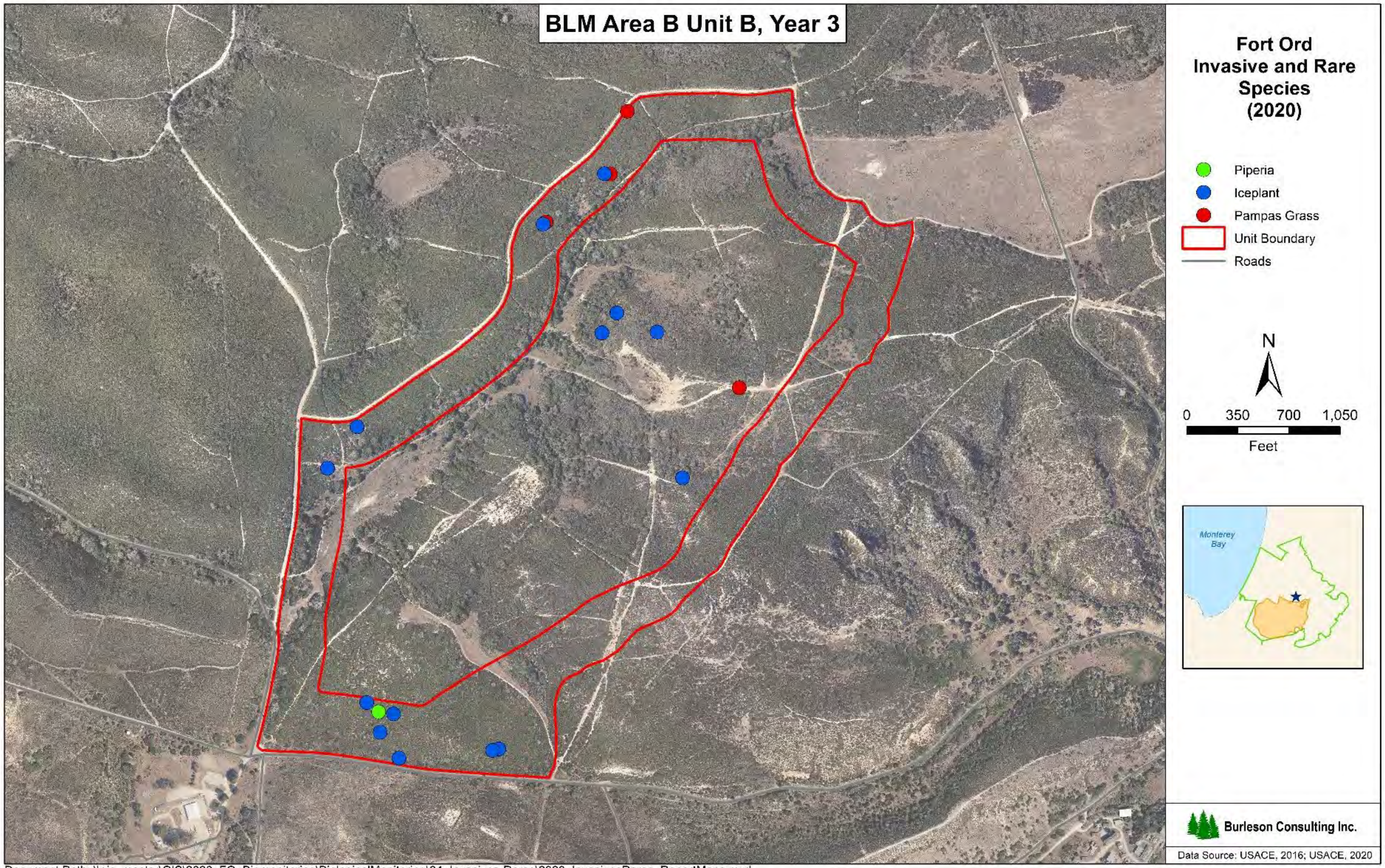

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Figure E-4. Map of Invasive and Rare Species; BLM Area B Unit B (Year 3)

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Figure E-5. Map of Invasive and Rare Species; BLM Area B Unit C (Year 3)

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Figure E-6. Map of Invasive and Rare Species; BLM Area B Unit B 2A (Year 3)

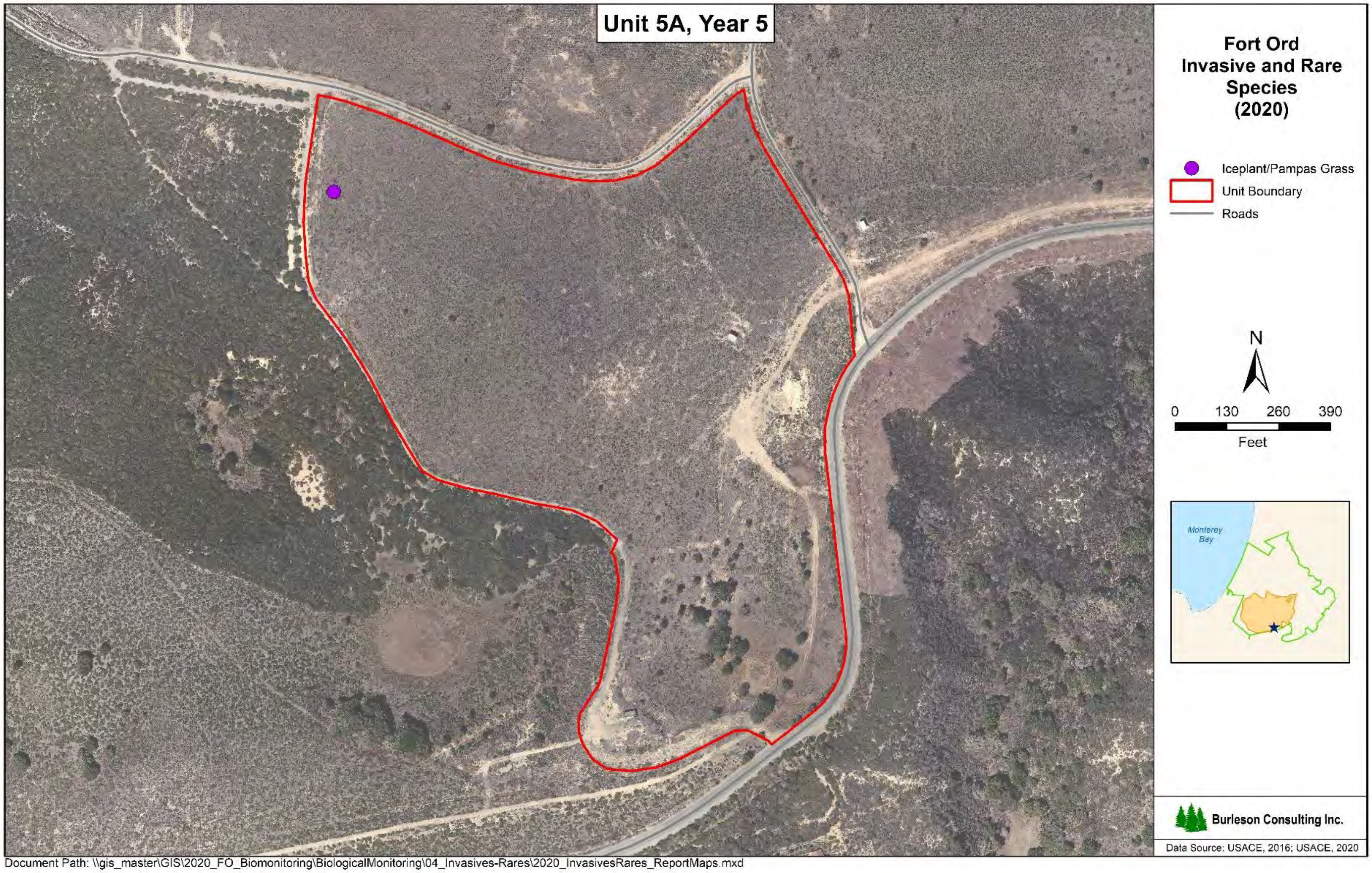

Figure E-7. Map of Invasive and Rare Species; Unit 5A (Year 5)

Figure E-8. Map of Invasive and Rare Species; Unit 9 (Year 5)

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Figure E-9. Map of Invasive and Rare Species; Unit 23 (Year 5)

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Figure E-10. Map of Invasive and Rare Species; Unit 28 (Year 5)

APPENDIX F

SHRUB TRANSECT COVER DATA

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Table F-1. Year 3 Shrub Transects, BLM Area B Unit B-3 West

		BLM Area B Unit B-3 West					
Code	**Species**	**BLM-B3W-1**	**BLM-B3W-2**	**BLM-B3W-3**	**BLM-B3W-4**	**BLM-B3W-5**	**BLM-B3W-6**
ACGL	*Acmispon glaber*	8.6	3.8	1.2	8.2	2.8	8
ADFA	*Adenostoma fasciculata*	5.2	2.2	8	3.6	13.8	9.6
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	1.4	1.6	1.6	2.8	1.4	0.6
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	3	5.4	14.6	10.8	3.2	13
BAPI	*Baccharis pilularis*	0.4	-	-	-	-	-
CAED	*Carpobrotus edulis*	1.6	1.8	-	0.6	4.8	0.4
CEDE	*Ceanothus dentatus*	-	-	4.4	4	0.2	0.2
CERI	*Ceanothus rigidus*	1.6	1.8	1.2	7.4	2	0.6
CETH	*Ceanothus thrysifloris var. griseus*	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	5.8	11.4	13.8	15.6	9	8.4
DIAU	*Diplacus aurantiacus*	4	3.8	-	3.6	9.4	8.6
ERCA	*Eriodictyon californicum*	0.4	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	3.2	0.4	0.2	0.8	0.2	-
ERER	*Ericameria ericoides*	-	-	-	-	0.4	-
FRCA	*Frangula californica*	-	-	-	-	-	-
FRCA2	*Fremontodendron californicum*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-	-
LECA	*Lepechinia calycina*	-	-	-	-	-	-
LUCH	*Lupinus chamissonis*	-	-	-	-	0.6	-
PIRA	*Pinus radiata*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	0.8	-	-	-	0.6
RISA	*Ribes sanguineum*	-	-	-	-	-	-
RISP	*Ribes speciosum*	-	-	-	-	-	-
SAME	*Salvia mellifera*	0.4	2.6	-	2.2	0.2	3.4
SOUM	*Solanum umbelliferum*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	0.4	-	-	-	-	-
BG	Bare Ground	56.4	60	40.8	37.8	42.6	35.2
HERB	Herbaceous Vegetation	16.2	10.4	22.8	19	24	23.2

Table F-2. Year 3 Shrub Transects, BLM Area B Unit B-3 East

		BLM Area B Unit B-3 East					
Code	**Species**	**BLM-B3E-1**	**BLM-B3E-10**	**BLM-B3E-11**	**BLM-B3E-2**	**BLM-B3E-3**	**BLM-B3E-4**
ACGL	*Acmispon glaber*	4.2	-	10.4	-	-	3.8
ADFA	*Adenostoma fasciculata*	15.8	18.8	14.2	38.3	18.2	43.4
ARHO	*Arctostaphylos hookeri ssp. hookeri*	0.4	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	17.0	-	-	13.5	3.2	0.8
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	18.0	42.6	19.8	5.8	14.8	4.8
BAPI	*Baccharis pilularis*	0.2	7.0	1.4	27.2	3.2	0.8
CAED	*Carpobrotus edulis*	-	-	3.6	-	-	0.2
CEDE	*Ceanothus dentatus*	-	-	0.2	-	-	-
CERI	*Ceanothus rigidus*	-	0.4	-	1.1	-	-
CETH	*Ceanothus thrysifloris var. griseus*	-	1.2	-	-	2.0	-
CRSC	*Crocanthemum scoparium*	2.2	0.2	0.4	0.6	1.8	-
DIAU	*Diplacus aurantiacus*	0.6	3.4	14.7	0.6	2.2	0.2
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	3.0	2.0	-	-	0.2	0.6
ERER	*Ericameria ericoides*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
FRCA2	*Fremontodendron californicum*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	2.2	-
LECA	*Lepechinia calycina*	-	10.8	2.6	-	-	-
LUCH	*Lupinus chamissonis*	-	-	-	-	-	-
PIRA	*Pinus radiata*	-	-	-	0.6	-	-
QUAG	*Quercus agrifolia*	-	-	0.6	-	-	-
RISA	*Ribes sanguineum*	-	3.2	1.4	0.9	4.0	0.2
RISP	*Ribes speciosum*	-	-	0.2	-	-	-
SAME	*Salvia mellifera*	-	-	-	-	-	0.4
SOUM	*Solanum umbelliferum*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	4.2	-	2.2	-
TODI	*Toxicodendron diversilobum*	-	-	13.0	-	0.8	0.2
BG	Bare Ground	37.4	15.6	2.4	12.6	32.0	19.6
HERB	Herbaceous Vegetation	19.4	8.0	47.8	22.7	25.8	45.6

Table F-2. Year 3 Shrub Transects, BLM Area B Unit B-3 East (cont'd)

		BLM Area B Unit B-3 East				
Code	**Species**	**BLM-B3E-5**	**BLM-B3E-6**	**BLM-B3E-7**	**BLM-B3E-8**	**BLM-B3E-9**
ACGL	*Acmispon glaber*	-	-	-	21.4	17.6
ADFA	*Adenostoma fasciculata*	37.0	9.0	40.8	61.4	27.6
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	0.2	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	8.2	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	-	37.8	4.8	3.6	33.8
BAPI	*Baccharis pilularis*	7.2	-	1.2	0.2	-
CAED	*Carpobrotus edulis*	-	-	-	-	-
CEDE	*Ceanothus dentatus*	-	-	-	-	-
CERI	*Ceanothus rigidus*	-	-	-	-	-
CETH	*Ceanothus thrysifloris var. griseus*	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	0.2	0.8	-	0.2	-
DIAU	*Diplacus aurantiacus*	0.2	0.2	-	0.8	5.0
ERCA	*Eriodictyon californicum*	-	4.4	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	1.0	4.4	-	3.4
ERER	*Ericameria ericoides*	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-
FRCA2	*Fremontodendron californicum*	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-
LECA	*Lepechinia calycina*	-	3.6	-	2.8	2.8
LUCH	*Lupinus chamissonis*	-	0.0	-	-	-
PIRA	*Pinus radiata*	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-
RISA	*Ribes sanguineum*	0.8	-	0.4	-	0.4
RISP	*Ribes speciosum*	-	-	-	-	-
SAME	*Salvia mellifera*	-	10.0	-	-	-
SOUM	*Solanum umbelliferum*	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	0.2	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	0.2	2.6	-	-
BG	Bare Ground	19.4	37.4	5.2	6.8	19.0
HERB	Herbaceous Vegetation	50.4	5.4	79.0	33.4	19.6

Table F-3. Year 3 Shrub Transects, BLM Area B Unit A

		BLM Area B Unit A					
Code	**Species**	**BLMB_A-10**	**BLMB_A-11**	**BLMB_A-12**	**BLMB_A-2**	**BLMB_A-6**	**BLMB_A-8**
ACGL	*Acmispon glaber*	-	0.2	-	2.4	-	-
ADFA	*Adenostoma fasciculata*	-	2.4	1.6	11	3.8	1.8
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	-	-	-	1.2	1.8
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	3.8	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	79.4	61.6	46	34	55.6	45.8
BAPI	*Baccharis pilularis*	4	1.6	1.6	-	2.4	0.2
CAED	*Carpobrotus edulis*	-	0.2	-	-	-	-
CEDE	*Ceanothus dentatus*	-	2.2	-	0.2	-	0.2
CERI	*Ceanothus rigidus*	-	-	-	0.8	-	-
CETH	*Ceanothus thrysifloris var. griseus*	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	-	1.6	1.4	3.2	0.6	-
DIAU	*Diplacus aurantiacus*	1	0.8	3.8	4.2	0.4	4.2
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	-	-	5.2	-	-
ERER	*Ericameria ericoides*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	2.8	-	-
FRCA2	*Fremontodendron californicum*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	4.6	-	-	0.4
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-	0.2
LECA	*Lepechinia calycina*	-	20.4	3.6	-	-	-
LUCH	*Lupinus chamissonis*	-	-	-	-	-	-
PIRA	*Pinus radiata*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
RISP	*Ribes speciosum*	0.4	-	-	-	-	-
SAME	*Salvia mellifera*	-	-	2.2	3.4	-	0.6
SOUM	*Solanum umbelliferum*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	0.6	-	-	-	-
TODI	*Toxicodendron diversilobum*	7.8	3.8	-	-	-	-
BG	Bare Ground	12.6	23.4	36.2	34.2	38	44.6
HERB	Herbaceous Vegetation	0.8	0.6	0.2	2.0	3	1.2

Table F-3. Year 3 Shrub Transects, BLM Area B Unit A (cont'd)

		BLM Area B Unit A
Code	**Species**	**BLMB_A-9**
ACGL	*Acmispon glaber*	-
ADFA	*Adenostoma fasciculata*	3.2
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-
ARMO	*Arctostaphylos montereyensis*	-
ARPU	*Arctostaphylos pumila*	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	64.2
BAPI	*Baccharis pilularis*	1.8
CAED	*Carpobrotus edulis*	-
CEDE	*Ceanothus dentatus*	1
CERI	*Ceanothus rigidus*	-
CETH	*Ceanothus thrysifloris var. griseus*	-
CRSC	*Crocanthemum scoparium*	1.2
DIAU	*Diplacus aurantiacus*	1.4
ERCA	*Eriodictyon californicum*	-
ERCO	*Eriophyllum confertiflorum*	-
ERER	*Ericameria ericoides*	-
FRCA	*Frangula californica*	-
FRCA2	*Fremontodendron californicum*	-
GAEL	*Garrya elliptica*	-
HEAR	*Heteromeles arbutifolia*	-
LECA	*Lepechinia calycina*	0.8
LUCH	*Lupinus chamissonis*	-
PIRA	*Pinus radiata*	-
QUAG	*Quercus agrifolia*	0.2
RISA	*Ribes sanguineum*	-
RISP	*Ribes speciosum*	-
SAME	*Salvia mellifera*	-
SOUM	*Solanum umbelliferum*	-
SYMO	*Symphoricarpos mollis*	-
TODI	*Toxicodendron diversilobum*	5.8
BG	Bare Ground	24
HERB	Herbaceous Vegetation	17.4

Table F-4. Year 3 Shrub Transects, BLM Area B Unit B

		BLM Area B Unit B					
Code	**Species**	**BLMB_B-1**	**BLMB_B-10**	**BLMB_B-11**	**BLMB_B-12**	**BLMB_B-13**	**BLMB_B-14**
ACGL	*Acmispon glaber*	6.8	62.2	9.2	8.8	4.4	35
ADFA	*Adenostoma fasciculata*	3.6	-	-	-	0.2	3.8
ARHO	*Arctostaphylos hookeri ssp. hookeri*	0.4	-	2.8	-	-	1
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	6.8	4.6	16	37.4	25.8	7.4
BAPI	*Baccharis pilularis*	0.8	-	9	-	-	-
CAED	*Carpobrotus edulis*	0.2	6.6	0.8	0.6	0.2	1.8
CEDE	*Ceanothus dentatus*	12.8	3.8	60.8	69.8	65	6
CERI	*Ceanothus rigidus*	3	3.8	1.8	0.6	9.4	3.6
CETH	*Ceanothus thrysifloris var. griseus*	1.6	-	-	0.4	-	-
CRSC	*Crocanthemum scoparium*	40	27.2	10.6	23	11.8	13.6
DIAU	*Diplacus aurantiacus*	0.2	0.4	-	-	-	0.2
ERCA	*Eriodictyon californicum*	0.8	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	12	0.8	-	-	0.4	1
ERER	*Ericameria ericoides*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
FRCA2	*Fremontodendron californicum*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	1	-	2.4	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-	6.2
LECA	*Lepechinia calycina*	3.2	-	-	-	-	-
LUCH	*Lupinus chamissonis*	-	-	-	-	-	-
PIRA	*Pinus radiata*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
RISP	*Ribes speciosum*	-	-	-	-	-	-
SAME	*Salvia mellifera*	-	-	-	-	-	-
SOUM	*Solanum umbelliferum*	-	-	-	-	0.2	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	-	-	-	-
BG	Bare Ground	23	31.8	11.2	9	14	20
HERB	Herbaceous Vegetation	13	9.8	2.6	-	6.8	19

Table F-4. Year 3 Shrub Transects, BLM Area B Unit B (cont'd)

		BLM Area B Unit B					
Code	**Species**	**BLMB_B-15**	**BLMB_B-16**	**BLMB_B-17**	**BLMB_B-18**	**BLMB_B-19**	**BLMB_B-2**
ACGL	*Acmispon glaber*	15.2	-	3.4	6.4	3.2	-
ADFA	*Adenostoma fasciculata*	1	5.8	1.6	-	1	1.8
ARHO	*Arctostaphylos hookeri ssp. hookeri*	0.4	18.6	4.6	-	-	1.6
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	14.84	-	6	-	14.4	13.2
BAPI	*Baccharis pilularis*	-	1.6	0.2	1.4	0.2	-
CAED	*Carpobrotus edulis*	2.2	2.2	-	-	-	-
CEDE	*Ceanothus dentatus*	19.4	10.2	1.4	1.2	83	17.8
CERI	*Ceanothus rigidus*	4.6	11.2	4.6	-	1	0.4
CETH	*Ceanothus thrysifloris var. griseus*	-	0.4	29.4	38.4	3.8	33.6
CRSC	*Crocanthemum scoparium*	42.8	0.6	11	5.4	4	12.8
DIAU	*Diplacus aurantiacus*	-	-	-	0.2	-	0.6
ERCA	*Eriodictyon californicum*	-	-	18	28.2	-	3.2
ERCO	*Eriophyllum confertiflorum*	1.4	-	0.6	-	-	6.2
ERER	*Ericameria ericoides*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
FRCA2	*Fremontodendron californicum*	-	-	7.8	9.8	-	8.8
GAEL	*Garrya elliptica*	-	-	-	-	1	-
HEAR	*Heteromeles arbutifolia*	-	3.2	-	-	2.2	-
LECA	*Lepechinia calycina*	-	-	-	8.8	2.4	12.8
LUCH	*Lupinus chamissonis*	-	-	-	-	-	-
PIRA	*Pinus radiata*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
RISP	*Ribes speciosum*	-	-	-	-	-	-
SAME	*Salvia mellifera*	3.2	-	-	-	-	-
SOUM	*Solanum umbelliferum*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	2.8	-	0.4	-	-
BG	Bare Ground	21.8	6	32.4	20	8.4	16
HERB	Herbaceous Vegetation	0.2	61.4	-	22.8	1.4	12

Table F-4. Year 3 Shrub Transects, BLM Area B Unit B (cont'd)

		BLM Area B Unit B					
Code	**Species**	**BLMB_B-20**	**BLMB_B-21**	**BLMB_B-22**	**BLMB_B-23**	**BLMB_B-24**	**BLMB_B-25**
ACGL	*Acmispon glaber*	6.6	15	13.6	3.2	20	1.2
ADFA	*Adenostoma fasciculata*	0.8	2.4	3.6	0.2	8	9.8
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	-	-	-	-	0.4
ARMO	*Arctostaphylos montereyensis*	-	-	0.2	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	6.6	11	25.6	7	18	9.8
BAPI	*Baccharis pilularis*	-	-	0.4	-	-	-
CAED	*Carpobrotus edulis*	0.2	4.4	1.4	-	0.2	-
CEDE	*Ceanothus dentatus*	65.6	5.8	62.2	38.4	29.4	64.6
CERI	*Ceanothus rigidus*	1.6	1.6	14.6	1.2	5.4	1.4
CETH	*Ceanothus thrysifloris var. griseus*	1.2	-	0.2	8.6	1	20.6
CRSC	*Crocanthemum scoparium*	9.4	3.6	2.4	16	17.4	4.2
DIAU	*Diplacus aurantiacus*	0.4	-	-	0.2	-	-
ERCA	*Eriodictyon californicum*	1.2	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	0.8	-	3	1.2	6.8	0.2
ERER	*Ericameria ericoides*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
FRCA2	*Fremontodendron californicum*	0.8	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	3.4	0.6	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-	-
LECA	*Lepechinia calycina*	2.2	-	6	4.4	0.2	1.8
LUCH	*Lupinus chamissonis*	-	-	-	-	-	-
PIRA	*Pinus radiata*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
RISP	*Ribes speciosum*	-	-	-	-	-	-
SAME	*Salvia mellifera*	-	-	-	-	0.4	-
SOUM	*Solanum umbelliferum*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	6.2	-	-	-
TODI	*Toxicodendron diversilobum*	0.2	-	0.8	-	-	-
BG	Bare Ground	23	30.4	11	24.4	18.4	3.6
HERB	Herbaceous Vegetation	2.2	38.8	6.2	34	6.6	13.8

Table F-4. Year 3 Shrub Transects, BLM Area B Unit B (cont'd)

		BLM Area B Unit B					
Code	**Species**	**BLMB_B-3**	**BLMB_B-4**	**BLMB_B-5**	**BLMB_B-6**	**BLMB_B-7**	**BLMB_B-9**
ACGL	*Acmispon glaber*	-	-	-	-	1.4	6.6
ADFA	*Adenostoma fasciculata*	0.2	-	-	-	0.2	1.4
ARHO	*Arctostaphylos hookeri ssp. hookeri*	0.8	0.4	1.6	0.4	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	1.8	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	9.4	-	2.2	4	8.6	40
BAPI	*Baccharis pilularis*	-	0.2	-	-	-	-
CAED	*Carpobrotus edulis*	-	-	-	-	-	0.2
CEDE	*Ceanothus dentatus*	46.2	26.4	44.6	39.8	-	51.4
CERI	*Ceanothus rigidus*	14	9	2.2	8.4	-	1.2
CETH	*Ceanothus thrysifloris var. griseus*	3.4	14.2	0.2	0.8	-	-
CRSC	*Crocanthemum scoparium*	12.2	20.4	10.4	12	0.6	15.4
DIAU	*Diplacus aurantiacus*	-	0.8	-	-	-	-
ERCA	*Eriodictyon californicum*	-	4.4	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	5.6	-	0.4	4.4	-
ERER	*Ericameria ericoides*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
FRCA2	*Fremontodendron californicum*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-	-
LECA	*Lepechinia calycina*	0.8	5.6	0.6	-	-	3.4
LUCH	*Lupinus chamissonis*	-	-	-	-	3	-
PIRA	*Pinus radiata*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
RISP	*Ribes speciosum*	-	-	-	-	-	-
SAME	*Salvia mellifera*	1.6	-	-	2.8	-	3.8
SOUM	*Solanum umbelliferum*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	0.2	-	-	-	0.6	-
BG	Bare Ground	27.2	17.2	47.6	40.6	56	9
HERB	Herbaceous Vegetation	5.4	13.8	4	2.8	30	-

Table F-4. Year 3 Shrub Transects, BLM Area B Unit B (cont'd)

		BLM Area B Unit B	
Code	**Species**	**T1**	**T2**
ACGL	*Acmispon glaber*	16	31.4
ADFA	*Adenostoma fasciculata*	2.4	6
ARHO	*Arctostaphylos hookeri ssp. hookeri*	0.8	0.4
ARMO	*Arctostaphylos montereyensis*	-	-
ARPU	*Arctostaphylos pumila*	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	0.6	0.8
BAPI	*Baccharis pilularis*	-	4.2
CAED	*Carpobrotus edulis*	1	5.4
CEDE	*Ceanothus dentatus*	-	0.2
CERI	*Ceanothus rigidus*	3.4	-
CETH	*Ceanothus thrysifloris var. griseus*	-	24.2
CRSC	*Crocanthemum scoparium*	14.8	5
DIAU	*Diplacus aurantiacus*	-	0.4
ERCA	*Eriodictyon californicum*	-	15.6
ERCO	*Eriophyllum confertiflorum*	2.2	1.4
ERER	*Ericameria ericoides*	-	-
FRCA	*Frangula californica*	-	-
FRCA2	*Fremontodendron californicum*	-	2.6
GAEL	*Garrya elliptica*	-	-
HEAR	*Heteromeles arbutifolia*	-	-
LECA	*Lepechinia calycina*	-	-
LUCH	*Lupinus chamissonis*	-	-
PIRA	*Pinus radiata*	-	-
QUAG	*Quercus agrifolia*	-	-
RISA	*Ribes sanguineum*	-	-
RISP	*Ribes speciosum*	-	-
SAME	*Salvia mellifera*	-	-
SOUM	*Solanum umbelliferum*	-	-
SYMO	*Symphoricarpos mollis*	-	-
TODI	*Toxicodendron diversilobum*	-	-
BG	Bare Ground	29.4	21
HERB	Herbaceous Vegetation	40.2	13.4

Table F-5. Year 3 Shrub Transects, BLM Area B Unit C

		BLM Area B Unit C					
Code	**Species**	**BLMB_C-1**	**BLMB_C-10**	**BLMB_C-12**	**BLMB_C-13**	**BLMB_C-14**	**BLMB_C-2**
ACGL	*Acmispon glaber*	29	-	23.6	6.4	2.4	38.8
ADFA	*Adenostoma fasciculata*	7.2	0.4	1	1.6	7.2	3.2
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	0.8	-	-	0.4	-	1.2
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	8.4	32	36.6	25.6	39.2	5.8
BAPI	*Baccharis pilularis*	-	-	-	-	0.2	-
CAED	*Carpobrotus edulis*	0.4	-	1	-	0.2	-
CEDE	*Ceanothus dentatus*	10.8	88.4	54.8	58.8	45.2	21.6
CERI	*Ceanothus rigidus*	1	0.6	0.6	7.4	8.4	4.8
CETH	*Ceanothus thrysifloris var. griseus*	-	-	-	0.8	13.8	-
CRSC	*Crocanthemum scoparium*	61.8	5.2	19.4	16.6	9.4	44.6
DIAU	*Diplacus aurantiacus*	-	-	-	-	1	0.2
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	2	-	-	-	-	-
ERER	*Ericameria ericoides*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
FRCA2	*Fremontodendron californicum*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	2	2.8	9	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-	-
LECA	*Lepechinia calycina*	-	2.8	1.2	3	18.4	-
LUCH	*Lupinus chamissonis*	-	-	-	-	-	-
PIRA	*Pinus radiata*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	0.4	-
RISP	*Ribes speciosum*	-	-	-	-	-	-
SAME	*Salvia mellifera*	0.6	0.8	0.8	0.4	-	4
SOUM	*Solanum umbelliferum*	-	-	-	-	-	0.2
SYMO	*Symphoricarpos mollis*	-	-	-	-	1.6	-
TODI	*Toxicodendron diversilobum*	-	0.4	-	-	-	-
BG	Bare Ground	14.8	4.6	8.4	17.2	7.2	16.8
HERB	Herbaceous Vegetation	0.4	-	0.2	0.8	0.4	-

Table F-5. Year 3 Shrub Transects, BLM Area B Unit C (cont'd)

		BLM Area B Unit C					
Code	**Species**	**BLMB_C-3**	**BLMB_C-4**	**BLMB_C-7**	**BLMB_C-8**	**BLMB_C-9**	**Transect 2**
ACGL	*Acmispon glaber*	-	10.8	1.8	-	1	-
ADFA	*Adenostoma fasciculata*	1.2	2.2	2.2	-	4.4	9.8
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	0.4	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	0.4	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	9.8	13.2	28	15.4	19.4	33.8
BAPI	*Baccharis pilularis*	0.2	-	-	-	-	1.6
CAED	*Carpobrotus edulis*	-	-	-	-	-	-
CEDE	*Ceanothus dentatus*	64.8	66.4	79.6	83.2	56	0.8
CERI	*Ceanothus rigidus*	3	5.4	2	-	4.8	-
CETH	*Ceanothus thrysifloris var. griseus*	8.6	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	24.6	41.6	26.4	10.8	41	-
DIAU	*Diplacus aurantiacus*	-	0.4	-	-	1	3.2
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	4	2.4	0.6	0.4	-
ERER	*Ericameria ericoides*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
FRCA2	*Fremontodendron californicum*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	-	-	-	1
HEAR	*Heteromeles arbutifolia*	-	-	-	-	0.2	-
LECA	*Lepechinia calycina*	1.4	1.2	2.2	4	-	0.2
LUCH	*Lupinus chamissonis*	-	-	-	-	-	-
PIRA	*Pinus radiata*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	5.6
RISA	*Ribes sanguineum*	-	-	-	-	-	-
RISP	*Ribes speciosum*	-	-	-	-	-	-
SAME	*Salvia mellifera*	0.8	1.4	0.2	-	1	-
SOUM	*Solanum umbelliferum*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	28.6
TODI	*Toxicodendron diversilobum*	-	-	-	1	-	8
BG	Bare Ground	8.2	10	6.2	10.6	13.2	20
HERB	Herbaceous Vegetation	5.4	0.2	0.2	2.4	0.6	16.2

Table F-5. Year 3 Shrub Transects, BLM Area B Unit C (cont'd)

Code	Species	BLM Area B Unit C	
		Transect 3	Transect 4
ACGL	*Acmispon glaber*	5.4	-
ADFA	*Adenostoma fasciculata*	4	14.2
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	0.4
ARMO	*Arctostaphylos montereyensis*	-	-
ARPU	*Arctostaphylos pumila*	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	22.4	60.6
BAPI	*Baccharis pilularis*	-	5.6
CAED	*Carpobrotus edulis*	0.2	-
CEDE	*Ceanothus dentatus*	87.6	1.6
CERI	*Ceanothus rigidus*	-	0.6
CETH	*Ceanothus thrysifloris var. griseus*	-	-
CRSC	*Crocanthemum scoparium*	10.8	0.6
DIAU	*Diplacus aurantiacus*	-	1.2
ERCA	*Eriodictyon californicum*	-	-
ERCO	*Eriophyllum confertiflorum*	-	-
ERER	*Ericameria ericoides*	-	-
FRCA	*Frangula californica*	-	-
FRCA2	*Fremontodendron californicum*	-	-
GAEL	*Garrya elliptica*	-	-
HEAR	*Heteromeles arbutifolia*	-	2.6
LECA	*Lepechinia calycina*	1.8	2.4
LUCH	*Lupinus chamissonis*	-	-
PIRA	*Pinus radiata*	-	-
QUAG	*Quercus agrifolia*	-	-
RISA	*Ribes sanguineum*	-	-
RISP	*Ribes speciosum*	-	-
SAME	*Salvia mellifera*	-	4.2
SOUM	*Solanum umbelliferum*	-	-
SYMO	*Symphoricarpos mollis*	-	-
TODI	*Toxicodendron diversilobum*	-	0.2
BG	Bare Ground	3	16.2
HERB	Herbaceous Vegetation	-	-

Table F-6. Year 3 Shrub Transects, Unit B-2A

		Unit B-2A		
Code	**Species**	**Transect 1**	**Transect 3**	**Transect 4**
ACGL	*Acmispon glaber*	2.6	-	-
ADFA	*Adenostoma fasciculata*	42	5.4	39.2
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	12.2	63.4	12.8
BAPI	*Baccharis pilularis*	-	0.2	0.8
CAED	*Carpobrotus edulis*	-	-	-
CEDE	*Ceanothus dentatus*	-	0.4	-
CERI	*Ceanothus rigidus*	-	-	1
CETH	*Ceanothus thrysifloris var. griseus*	-	-	-
CRSC	*Crocanthemum scoparium*	1	0.6	0.4
DIAU	*Diplacus aurantiacus*	-	3	1
ERCA	*Eriodictyon californicum*	-	-	-
ERCO	*Eriophyllum confertiflorum*	0.6	-	0.2
ERER	*Ericameria ericoides*	-	-	-
FRCA	*Frangula californica*	-	-	-
FRCA2	*Fremontodendron californicum*	-	-	-
GAEL	*Garrya elliptica*	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-
LECA	*Lepechinia calycina*	-	5.8	1.4
LUCH	*Lupinus chamissonis*	-	-	-
PIRA	*Pinus radiata*	-	-	-
QUAG	*Quercus agrifolia*	5.8	-	-
RISA	*Ribes sanguineum*	-	-	-
RISP	*Ribes speciosum*	-	-	-
SAME	*Salvia mellifera*	15.4	0.4	-
SOUM	*Solanum umbelliferum*	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	3.4
BG	Bare Ground	23.8	27	14.4
HERB	Herbaceous Vegetation	8.2	7.5	47.6

Table F-7. Year 5 Shrub Transects, Unit 5A

		Unit 5A	
Code	**Species**	**5A-1**	**5A-2**
ACGL	*Acmispon glaber*	-	-
ACMI	*Achillea millefolium*	-	-
ADFA	*Adenostoma fasciculata*	18.8	21
ARCA	*Artemisia californica*	-	-
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	-
ARMO	*Arctostaphylos montereyensis*	1.8	-
ARPU	*Arctostaphylos pumila*	-	1
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	44.4	42
BAPI	*Baccharis pilularis*	-	-
BEPI	*Berberis pinnata*	-	-
CAED	*Carpobrotus edulis*	-	-
CEDE	*Ceanothus dentatus*	-	12.2
CERI	*Ceanothus rigidus*	0.4	4.6
CRSC	*Crocanthemum scoparium*	0.6	3.8
DIAU	*Diplacus aurantiacus*	-	0.6
ERCO	*Eriophyllum confertiflorum*	-	-
ERFA	*Ericameria fasciculata*	-	-
FRCA	*Frangula (Rhamnus) californica*	-	-
GAEL	*Garrya elliptica*	4	-
HEAR	*Heteromeles arbutifolia*	-	-
LECA	*Lepechinia calycina*	-	-
QUAG	*Quercus agrifolia*	-	-
RISA	*Ribes sanguineum*	-	-
RISP	*Ribes speciosum*	-	-
SAME	*Salvia mellifera*	7.2	6
SYMO	*Symphoricarpos mollis*	5.8	-
TODI	*Toxicodendron diversilobum*	-	-
BG	Bare Ground	26	22.6
HERB	Herbaceous Vegetation	1.4	0.2

Table F-8. Year 5 Shrub Transects, Unit 9

		Unit 9				
Code	**Species**	**9-1**	**9-2**	**9-3**	**9-4**	**9-5**
ACGL	*Acmispon glaber*	-	-	-	-	-
ACMI	*Achillea millefolium*	-	-	-	-	-
ADFA	*Adenostoma fasciculata*	17	20.2	9	18.2	27.4
ARCA	*Artemisia californica*	-	-	-	-	-
ARHO	*Arctostaphylos hookeri ssp. hookeri*	1.4	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	3
ARPU	*Arctostaphylos pumila*	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	40.8	40.2	65.2	72.4	58.4
BAPI	*Baccharis pilularis*	2.8	-	3.6	0.2	-
BEPI	*Berberis pinnata*	-	-	-	-	-
CAED	*Carpobrotus edulis*	1.4	-	-	-	-
CEDE	*Ceanothus dentatus*	3.4	3.2	-	0.6	-
CERI	*Ceanothus rigidus*	10.2	3.2	6.4	-	4.6
CRSC	*Crocanthemum scoparium*	7.4	1.6	2.2	0.2	0.6
DIAU	*Diplacus aurantiacus*	0.6	2.4	1.4	-	-
ERCO	*Eriophyllum confertiflorum*	3.4	-	0.4	-	0.4
ERFA	*Ericameria fasciculata*	-	-	-	-	-
FRCA	*Frangula (Rhamnus) californica*	-	-	-	-	-
GAEL	*Garrya elliptica*	8.4	-	1.2	-	-
HEAR	*Heteromeles arbutifolia*	2.6	-	-	4.2	-
LECA	*Lepechinia calycina*	-	-	0.8	1	-
QUAG	*Quercus agrifolia*	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-
RISP	*Ribes speciosum*	-	-	-	-	-
SAME	*Salvia mellifera*	1.6	15.4	7.8	0.8	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	-	-	-
BG	Bare Ground	23.6	20.8	16.6	11	20.8
HERB	Herbaceous Vegetation	3.2	1.4	-	0.2	0.4

Table F-9. Year 5 Shrub Transects, Unit 23

		Unit 23							
Code	**Species**	**T1**	**T10**	**T12**	**T16**	**T17**	**T18**	**T19**	**T2**
ACGL	*Acmispon glaber*	-	0.4	0.6	-	-	-	-	10.2
ACMI	*Achillea millefolium*	-	-	-	-	-	-	-	-
ADFA	*Adenostoma fasciculata*	40.8	26.2	17.2	31.6	47.0	53.2	13.8	34.7
ARCA	*Artemisia californica*	-	-	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri ssp. hookeri*	3.4	2.6	3.0	-	1.0	0.4	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	16.4	17.6	21.4	32.2	20.6	26.0	45.6	24.0
BAPI	*Baccharis pilularis*	0.2	0.8	0.2	-	1.2	-	0.2	0.8
BEPI	*Berberis pinnata*	-	-	-	-	-	-	-	-
CAED	*Carpobrotus edulis*	-	0.6	-	-	-	-	-	-
CEDE	*Ceanothus dentatus*	-	-	5.2	13.2	3.6	-	5.4	1.4
CERI	*Ceanothus rigidus*	1.6	-	-	3.4	2.8	3.6	-	3.4
CRSC	*Crocanthemum scoparium*	2.2	8.4	13.6	4.8	1.4	-	2.2	5.2
DIAU	*Diplacus aurantiacus*	-	3.8	1.4	0.2	-	1.2	1.6	1.0
ERCO	*Eriophyllum confertiflorum*	1.8	3.2	0.2	-	0.2	-	-	1.6
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-	-	-
FRCA	*Frangula (Rhamnus) californica*	-	-	-	-	-	-	-	-
GAEL	*Garrya elliptica*	2.0	-	0.8	1.8	1.8	-	6.2	-
HEAR	*Heteromeles arbutifolia*	7.6	-	4.2	-	-	-	2.6	-
LECA	*Lepechinia calycina*	0.8	2.4	-	-	-	8.0	3.4	2.8
QUAG	*Quercus agrifolia*	-	-	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-	-	-
RISP	*Ribes speciosum*	-	-	-	-	-	-	-	-
SAME	*Salvia mellifera*	1.2	4.0	0.4	17.6	6.8	19.6	6.6	2.2
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	1.4	1.8	-	1.2	7.8	1.2	5.2
BG	Bare Ground	17.8	17.6	19.8	20.0	27.0	15.6	24.0	17.6
HERB	Herbaceous Vegetation	43.8	41.4	32.8	0.2	0.4	-	0.4	25.0

Table F-9. Year 5 Shrub Transects, Unit 23 (cont'd)

		Unit 23								
Code	**Species**	**T21**	**T4**	**T5**	**T7**	**T8**	**T9**	**T22**	**T11**	**T6**
ACGL	*Acmispon glaber*	-	2.4	-	3.0	0.4	-	-	2.0	1.4
ACMI	*Achillea millefolium*	-	-	-	-	-	-	-	-	-
ADFA	*Adenostoma fasciculata*	25.2	50.0	15.8	26.2	18.6	51.5	23.4	23.6	29.6
ARCA	*Artemisia californica*	-	-	-	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	4.2	0.4	-	-	1.2	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	24.4	2.6	30.4	54.6	56.2	17.9	23.6	27.0	23.6
BAPI	*Baccharis pilularis*	0.8	0.2	-	0.6	-	0.4	-	-	-
BEPI	*Berberis pinnata*	-	-	-	-	-	-	-	-	-
CAED	*Carpobrotus edulis*	7.2	-	-	-	-	-	2.8	-	-
CEDE	*Ceanothus dentatus*	15.6	-	17.6	1.8	4.2	12.9	9.6	-	-
CERI	*Ceanothus rigidus*	0.4	2.0	-	-	-	3.5	0.6	-	-
CRSC	*Crocanthemum scoparium*	2.2	8.6	4.8	0.2	1.2	0.8	9.4	2.6	2.8
DIAU	*Diplacus aurantiacus*	3.8	-	0.2	-	-	-	0.4	-	-
ERCO	*Eriophyllum confertiflorum*	0.6	6.2	2.0	0.6	0.6	1.0	0.4	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-	-	5.6	-
FRCA	*Frangula (Rhamnus) californica*	-	-	-	-	-	-	8.4	-	-
GAEL	*Garrya elliptica*	-	2.2	-	-	-	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	1.4	-	-	1.8	-	1.2	-
LECA	*Lepechinia calycina*	3.2	0.4	4.8	0.4	0.6	2.3	0.8	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-	-	-	-
RISA	*Ribes sanguineum*	1.8	-	-	-	-	-	-	-	-
RISP	*Ribes speciosum*	0.4	-	-	-	-	-	-	-	-
SAME	*Salvia mellifera*	21.4	-	1.6	3.2	2.2	15.8	3.8	5.4	6.8
SYMO	*Symphoricarpos mollis*	-	3.8	6.4	3.6	-	-	-	0.0	-
TODI	*Toxicodendron diversilobum*	30.0	-	-	-	6.6	6.0	1.8	-	-
BG	Bare Ground	10.2	9.2	25.8	19.8	22.2	15.2	27.4	29.0	33.6
HERB	Herbaceous Vegetation	7.2	47.0	8.4	11.4	1.0	2.3	5.2	13.8	10.4

Table F-10. Year 5 Shrub Transects, Unit 28

		Unit 28								
Code	**Species**	**28-1**	**28-2**	**28-3**	**28-4**	**28-5**	**28-6**	**28-7**	**28-8**	**36-1**
ACGL	*Acmispon glaber*	1.2	5.2	9.6	0.4	-	2.6	2.6	0.8	0.8
ACMI	*Achillea millefolium*	-	-	-	-	-	-	1.2	-	-
ADFA	*Adenostoma fasciculata*	27.6	40.4	20.2	7.6	16.2	35.8	38	7.4	19.2
ARCA	*Artemisia californica*	-	-	-	-	-	-	-	-	2.4
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	-	-	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	3.2	-	-	1.2	-	-	12.2	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	43.4	18.4	-	50.8	31.4	47.4	2.2	27.6	18
BAPI	*Baccharis pilularis*	2.2	-	-	-	1.2	0.8	-	3	-
BEPI	*Berberis pinnata*	-	-	1.2	-	-	-	-	-	-
CAED	*Carpobrotus edulis*	-	2	13	-	11.2	-	-	0.2	-
CEDE	*Ceanothus dentatus*	1	2	-	1	-	6.2	-	2.6	5.2
CERI	*Ceanothus rigidus*	1.6	-	-	-	-	2.2	-	1.4	1.2
CRSC	*Crocanthemum scoparium*	2.6	0.2	0.6	0.8	0.4	0.6	0.8	2.4	2.8
DIAU	*Diplacus aurantiacus*	-	5.2	-	-	11.8	6.8	-	0.4	-
ERCO	*Eriophyllum confertiflorum*	2	0.4	-	-	-	0.2	0.4	-	1.2
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-	-	-	1.6
FRCA	*Frangula (Rhamnus) californica*	-	-	-	-	-	-	-	-	2.8
GAEL	*Garrya elliptica*	-	-	-	-	-	-	-	0.8	1.4
HEAR	*Heteromeles arbutifolia*	-	-	-	-	1.8	-	-	-	-
LECA	*Lepechinia calycina*	0.2	0.4	-	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-	3	8.8	6
RISA	*Ribes sanguineum*	-	-	-	-	-	-	-	-	-
RISP	*Ribes speciosum*	-	-	-	-	-	-	-	-	-
SAME	*Salvia mellifera*	-	3.6	16.8	3	16.8	1.2	11.2	0.4	3
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-	-	-	0.6
TODI	*Toxicodendron diversilobum*	-	-	-	3	0.2	20.4	-	-	-
BG	Bare Ground	23.6	18	30.2	33.6	23.4	10.6	18	35.6	33
HERB	Herbaceous Vegetation	3.4	24	12.6	3.2	2	9.6	39.2	12.2	16.4

Table F-11. Year 8 Shrub Transects, Unit 2 East

		Unit 2 East		
Code	**Species**	**18A-1**	**2-1**	**2-3**
ACGL	*Acmispon glaber*	-	-	-
ADFA	*Adenostoma fasciculata*	7.4	55.2	43
ARPU	*Arctostaphylos pumila*	3.2	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	38.8	25.2	37.2
CAED	*Eriophyllum confertiflorum*	-	-	-
CEDE	*Ceanothus dentatus*	16.2	-	-
CERI	*Ceanothus rigidus*	-	-	2
CRSC	*Crocanthemum scoparium*	7.8	-	-
DIAU	*Diplacus aurantiacus*	0.6	-	-
ERCO	*Eriophyllum confertiflorum*	-	-	-
GAEL	*Garrya elliptica*	-	14.2	10
LECA	*Lepechinia calycina*	0.6	-	10
RISA	*Ribes sanguineum*	-	-	-
SAME	*Salvia mellifera*	1.6	-	1.2
SYMO	*Symphoricarpos mollis*	-	4.6	-
TODI	*Toxicodendron diversilobum*	-	4.4	12
BG	Bare Ground	32.4	13.4	15
HERB	Herbaceous Vegetation	1.2	2.6	-

Table F-12. Year 8 Shrub Transects, Unit 3 East

		Unit 3 East				
Code	**Species**	**13A-1**	**14A-1**	**3-1**	**3-2**	**3-4**
ACGL	*Acmispon glaber*	0.2	-	0.6	-	-
ADFA	*Adenostoma fasciculata*	28.2	19.9	19.3	12.2	16.4
ARPU	*Arctostaphylos pumila*	9.2	-	0.4	-	29.4
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	30.2	69.4	67.1	70.4	13.6
CAED	*Eriophyllum confertiflorum*	0.6	0.4	0.4	5.0	-
CEDE	*Ceanothus dentatus*	-	-	-	-	6.6
CERI	*Ceanothus rigidus*	0.4	-	2.4	-	-
CRSC	*Crocanthemum scoparium*	3.6	0.9	-	0.5	4.2
DIAU	*Diplacus aurantiacus*	3.2	2.7	-	1.4	5.2
ERCO	*Eriophyllum confertiflorum*	2.8	-	-	0.5	1.2
GAEL	*Garrya elliptica*	-	12.1	1.3	7.6	-
LECA	*Lepechinia calycina*	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	0.2	-	-
SAME	*Salvia mellifera*	0.4	-	4.3	1.6	3.4
SYMO	*Symphoricarpos mollis*	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	-	2.8	14.0
BG	Bare Ground	30.8	14.3	17.1	22.9	21.8
HERB	Herbaceous Vegetation	0.4	-	-	-	2.2

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APPENDIX G

NON-NATIVE SPECIES

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Table G-1. Non-Native Species Observed During Line Intercept Transect Monitoring in BLM Area B Unit B-3 East

Non-Native Herbaceous Species Name	Common Name	Species Code
Aira caryophyllea	silver hair grass	AICA
Avena barbata	slender wild oat	AVBA
Briza maxima	rattlesnake grass	BRMA
Briza minor	small quaking grass	BRMI
Carduus pycnocephalus	Italian thistle	CAPY
Festuca (Vulpia) myuros	rattail sixweeks grass	FEMY
Gastridium phleoides	nit grass	GAPH
Hypochaeris glabra	smooth cat's ear	HYGL
Lysimachia arvensis	scarlet pimpernel	LYAR
Senecio sylvaticus	woodland groundsel	SESY
Sonchus asper	prickly sow thistle	SOAS
Trifolium angustifolium	narrow-leaved clover	TRAN

Table G-2. Non-Native Species Observed During Line Intercept Transect Monitoring in BLM Area B Unit B-3 West

Non-Native Herbaceous Species Name	Common Name	Species Code
Aira caryophyllea	silver hair grass	AICA
Bromus diandrus	ripgut grass	BRDI
Bromus madritensis ssp. rubens	foxtail chess	BRMAR
Festuca (Vulpia) myuros	rattail sixweeks grass	FEMY
Festuca perennis	Italian rye grass	FEPE
Hypochaeris glabra	smooth cat's ear	HYGL
Logfia gallica	daggerleaf cottonrose	LOGA
Rumex acetosella	sheep sorrel	RUAC
Senecio sylvaticus	woodland groundsel	SESY

Table G-3. Non-Native Species Observed During Line Intercept Transect Monitoring in BLM Area B Unit A

Non-Native Herbaceous Species Name	Common Name	Species Code
Briza minor	small quaking grass	BRMI

Table G-4. Non-Native Species Observed During Line Intercept Transect Monitoring in BLM Area B Unit B

Non-Native Herbaceous Species Name	Common Name	Species Code
Aira caryophyllea	silver hair grass	AICA
Avena barbata	slender wild oat	AVBA
Briza minor	small quaking grass	BRMI
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Erodium cicutarium	red-stemmed filaree	ERCI
Festuca (Vulpia) bromoides	brome fescue	FEBR
Festuca (Vulpia) myuros	rattail sixweeks grass	FEMY
Gastridium phleoides	nit grass	GAPH
Hypochaeris glabra	smooth cat's ear	HYGL
Hypochaeris radicata	rough cat's ear	HYRA
Logfia gallica	daggerleaf cottonrose	LOGA
Lysimachia arvensis	scarlet pimpernel	LYAR
Petrorhagia dubia	hairypink	PEDU
Plantago coronopus	cut-leaved plantain	PLCO
Polypogon monspeliensis	rabbitsfoot grass	POMO
Rumex acetosella	sheep sorrel	RUAC
Senecio sylvaticus	woodland groundsel	SESY

Table G-5. Non-Native Species Observed During Line Intercept Transect Monitoring in BLM Area B Unit C

Non-Native Herbaceous Species Name	Common Name	Species Code
Aira caryophyllea	silver hair grass	AICA
Festuca (Vulpia) myuros	rattail sixweeks grass	FEMY
Hypochaeris glabra	smooth cat's ear	HYGL
Senecio sylvaticus	woodland groundsel	SESY

Table G-6. Non-Native Species Observed During Line Intercept Transect Monitoring in Unit B-2A

Non-Native Herbaceous Species Name	Common Name	Species Code
Aira caryophyllea	silver hair grass	AICA
Avena barbata	slender wild oat	AVBA
Bromus diandrus	ripgut grass	BRDI
Festuca (Vulpia) myuros	rattail sixweeks grass	FEMY
Hypochaeris glabra	smooth cat's ear	HYGL
Senecio sylvaticus	woodland groundsel	SESY

Table G-7. Non-Native Species Observed During Line Intercept Transect Monitoring in Unit 5A

Non-Native Herbaceous Species Name	Common Name	Species Code
Hypochaeris radicata	rough cat's ear	HYRA

Table G-8. Non-Native Species Observed During Line Intercept Transect Monitoring in Unit 9

Non-Native Herbaceous Species Name	Common Name	Species Code
Hypochaeris radicata	rough cat's ear	HYRA

Table G-9. Non-Native Species Observed During Line Intercept Transect Monitoring in Unit 23

Non-Native Herbaceous Species Name	Common Name	Species Code
Aira caryophyllea	silver hair grass	AICA
Avena barbata	slender wild oat	AVBA
Bromus diandrus	ripgut grass	BRDI
Bromus madritensis ssp. rubens	foxtail chess	BRMAR
Festuca (Vulpia) bromoides	brome fescue	FEBR
Hypochaeris glabra	smooth cat's ear	HYGL
Hypochaeris radicata	rough cat's ear	HYRA
Logfia gallica	daggerleaf cottonrose	LOGA
Senecio sylvaticus	woodland groundsel	SESY

Table G-10. Non-Native Species Observed During Line Intercept Transect Monitoring in Unit 23 North

Non-Native Herbaceous Species Name	Common Name	Species Code
Aira caryophyllea	silver hair grass	AICA
Festuca (Vulpia) bromoides	brome fescue	FEBR
Hypochaeris glabra	smooth cat's ear	HYGL

Table G-11. Non-Native Species Observed During Line Intercept Transect Monitoring in Unit 28

Non-Native Herbaceous Species Name	Common Name	Species Code
Aira caryophyllea	silver hair grass	AICA
Avena barbata	slender wild oat	AVBA
Bromus diandrus	ripgut grass	BRDI
Festuca (Vulpia) bromoides	brome fescue	FEBR
Festuca (Vulpia) myuros	rattail sixweeks grass	FEMY
Hypochaeris glabra	smooth cat's ear	HYGL
Senecio sylvaticus	woodland groundsel	SESY
Trifolium hirtum	rose clover	TRHI

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APPENDIX H

MAPS: MACROPLOTS PRESENCE/ABSENCE

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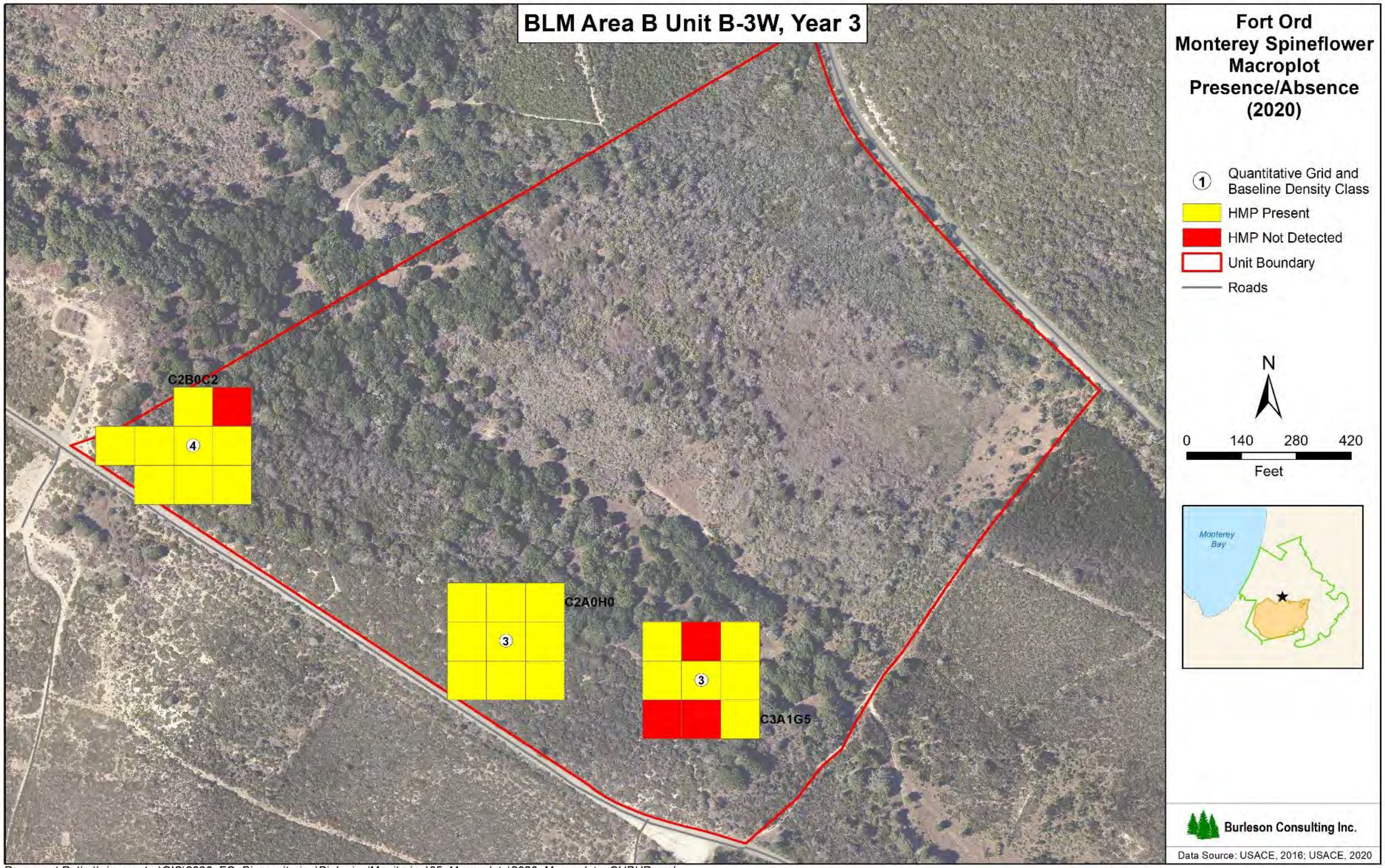

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Figure H-1. Map of Monterey Spineflower Macroplot Presence/Absence, BLM Area B-3 West (Year 3)

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Figure H-2. Map of Sand Gilia Macroplot Presence/Absence, BLM Area B-3 West (Year 3)

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Figure H-3. Map of Seaside Bird's Beak Macroplot Presence/Absence, BLM Area B-3 West (Year 3)

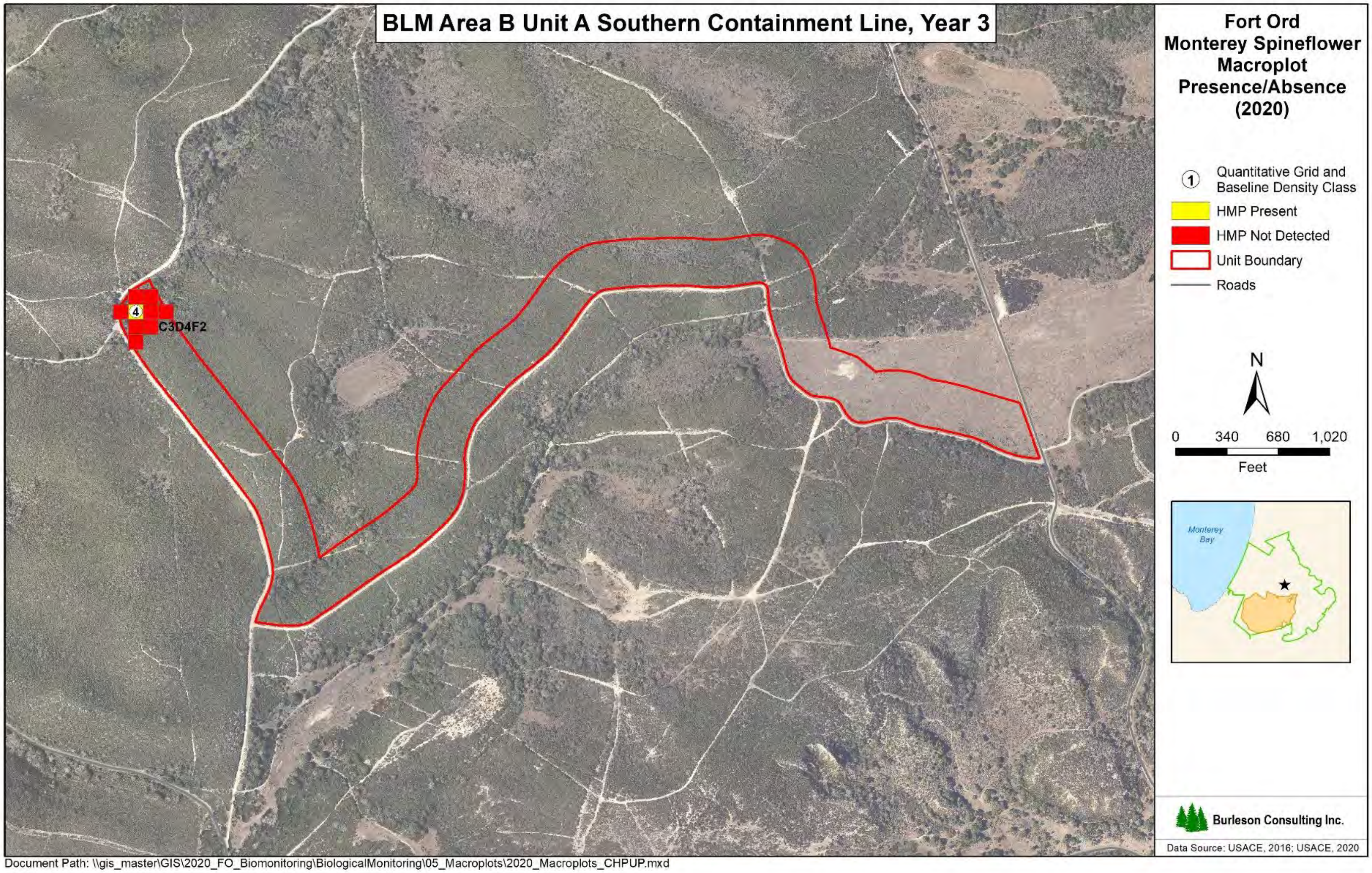

Figure H-4. Map of Monterey Spineflower Macroplot Presence/Absence, BLM Area B Unit A Containment Line (Year 3)

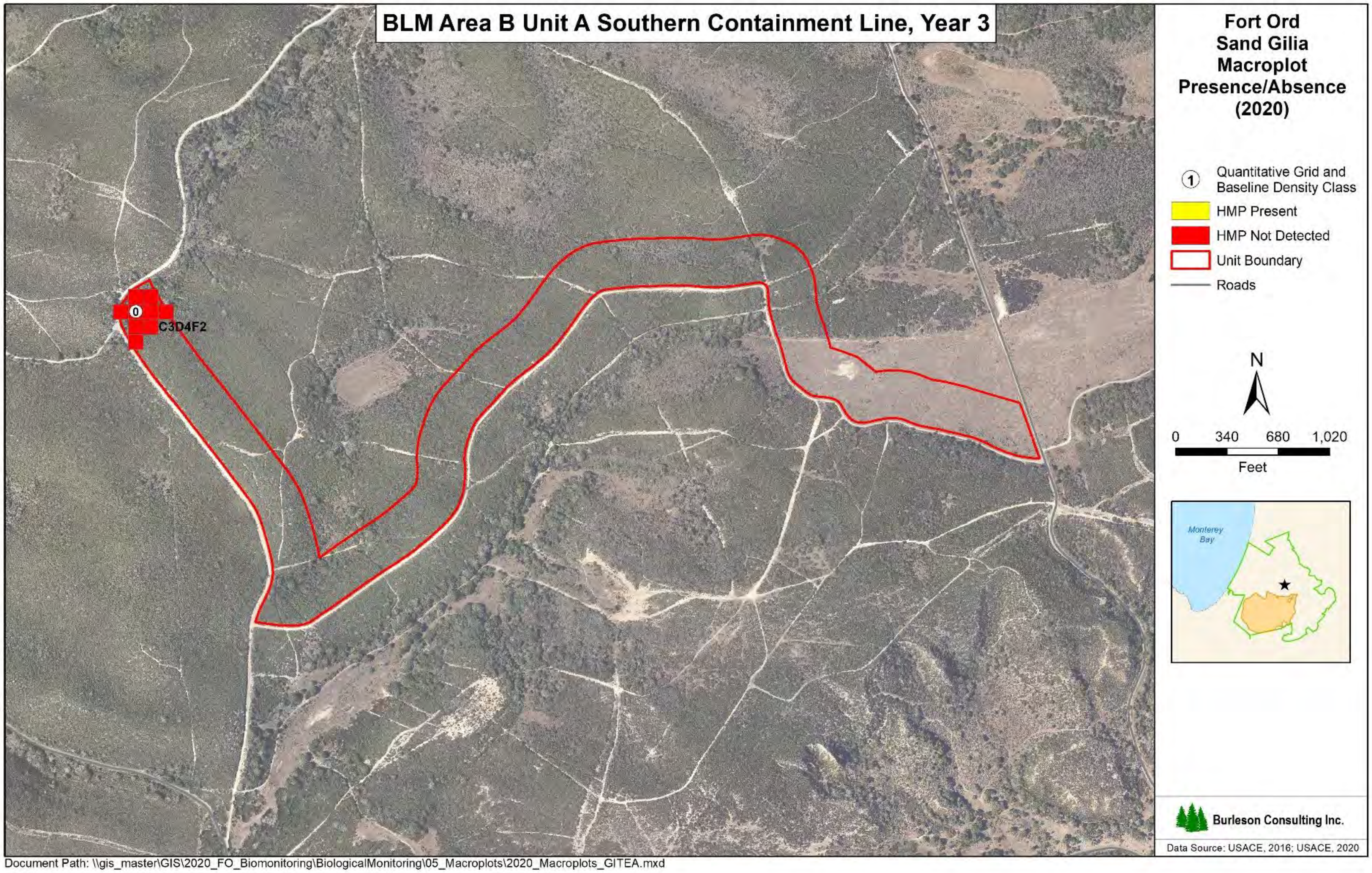

Figure H-5. Map of Sand Gilia Macroplot Presence/Absence, BLM Area B Unit A Containment Line (Year 3)

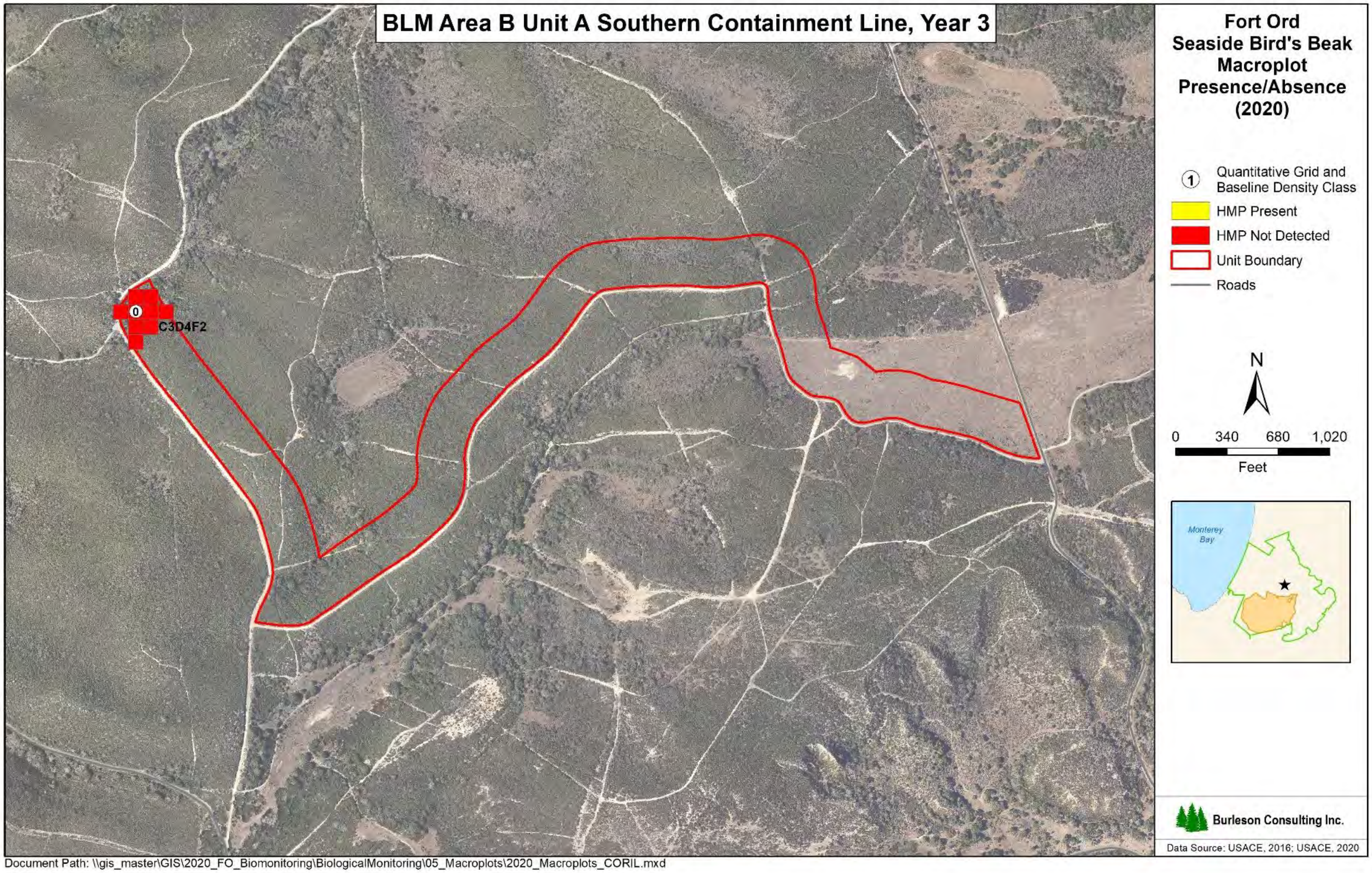

Figure H-6. Map of Seaside Bird's Beak Macroplot Presence/Absence, BLM Area B Unit A Containment Line (Year 3)

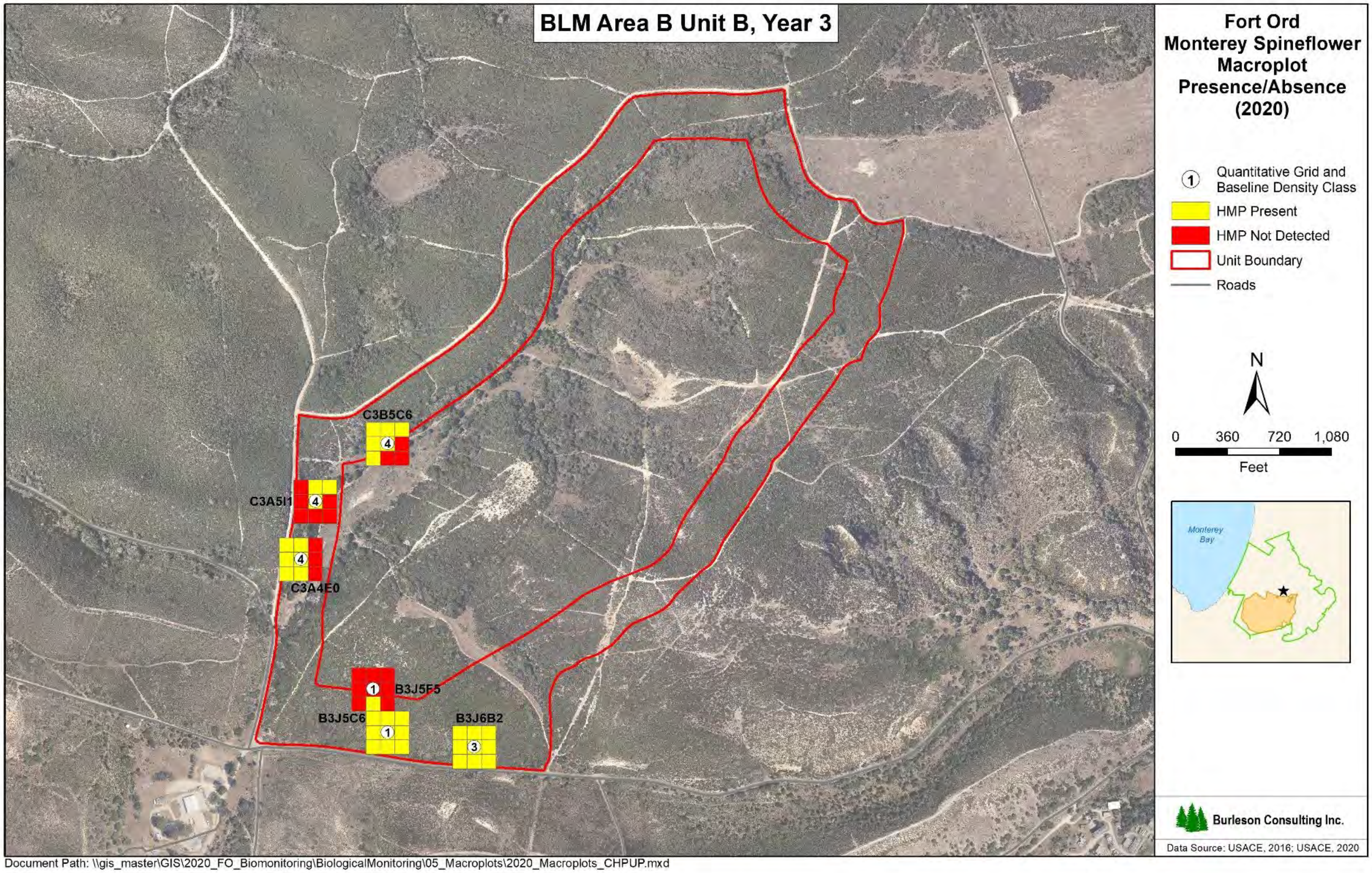

Figure H-7. Map of Monterey Spineflower Macroplot Presence/Absence, BLM Area B Unit B Containment Line (Year 3)

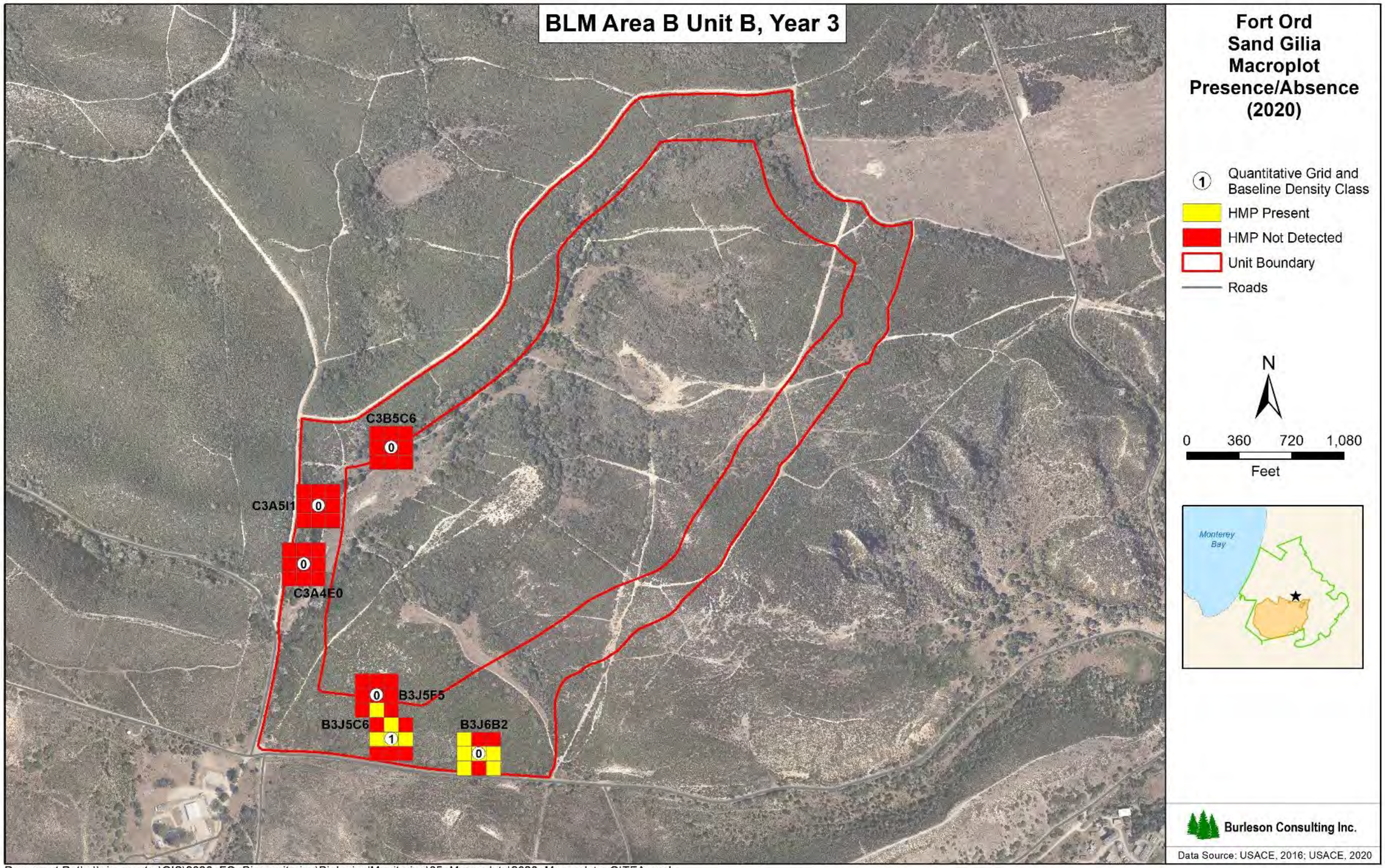

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Figure H-8. Map of Sand Gilia Macroplot Presence/Absence, BLM Area B Unit B Containment Line (Year 3)

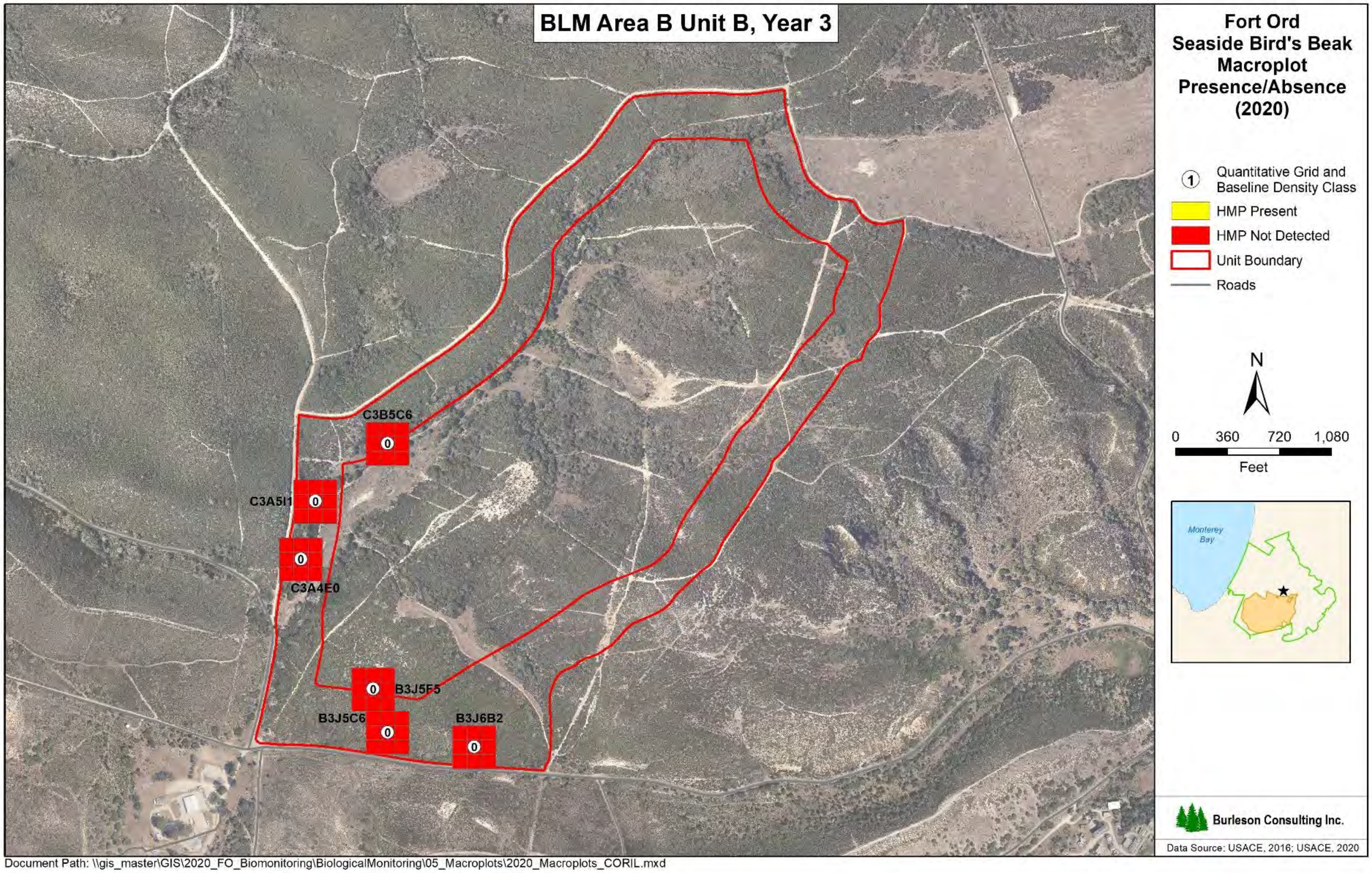

Figure H-9. Map of Seaside Bird's Beak Macroplot Presence/Absence, BLM Area B Unit B Containment Line (Year 3)

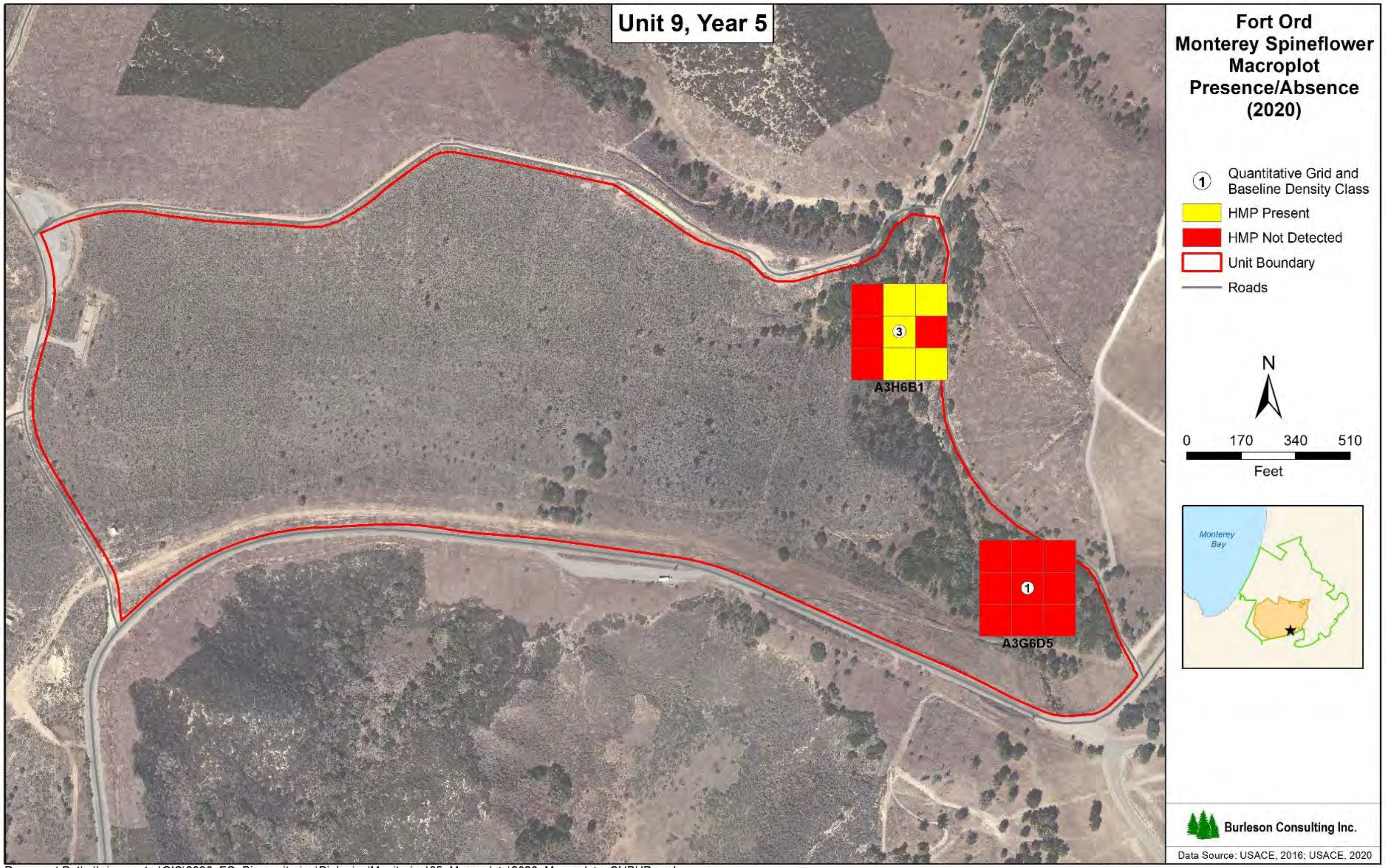

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Figure H-10. Map of Monterey Spineflower Macroplot Presence/Absence, Unit 9 (Year 5)

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Figure H-11. Map of Sand Gilia Macroplot Presence/Absence, Unit 9 (Year 5)

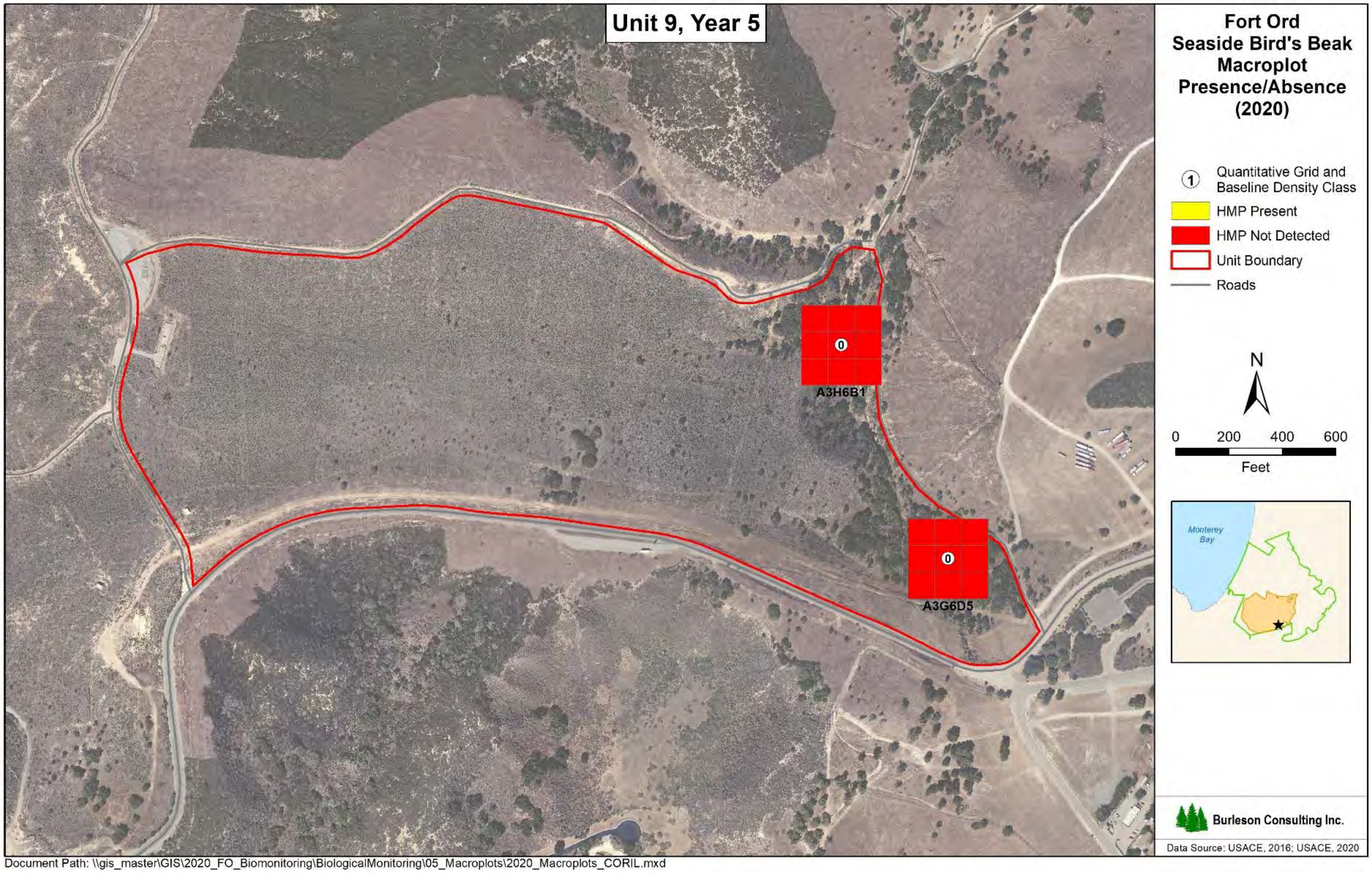

Figure H-12. Map of Seaside Bird's Beak Macroplot Presence/Absence, Unit 9 (Year 5)

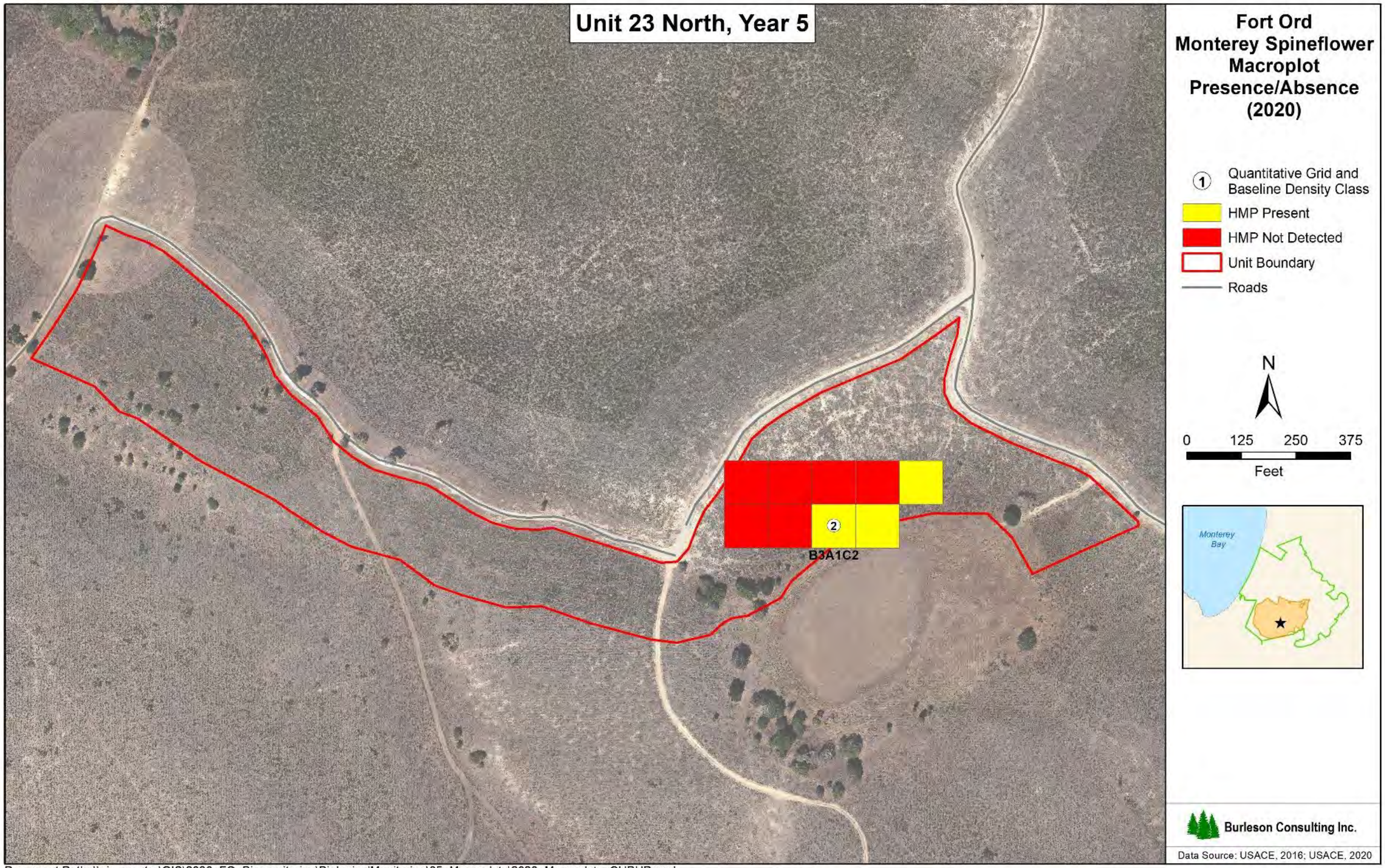

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Figure H-13. Map of Monterey Spineflower Macroplot Presence/Absence, Unit 23 North (Year 5)

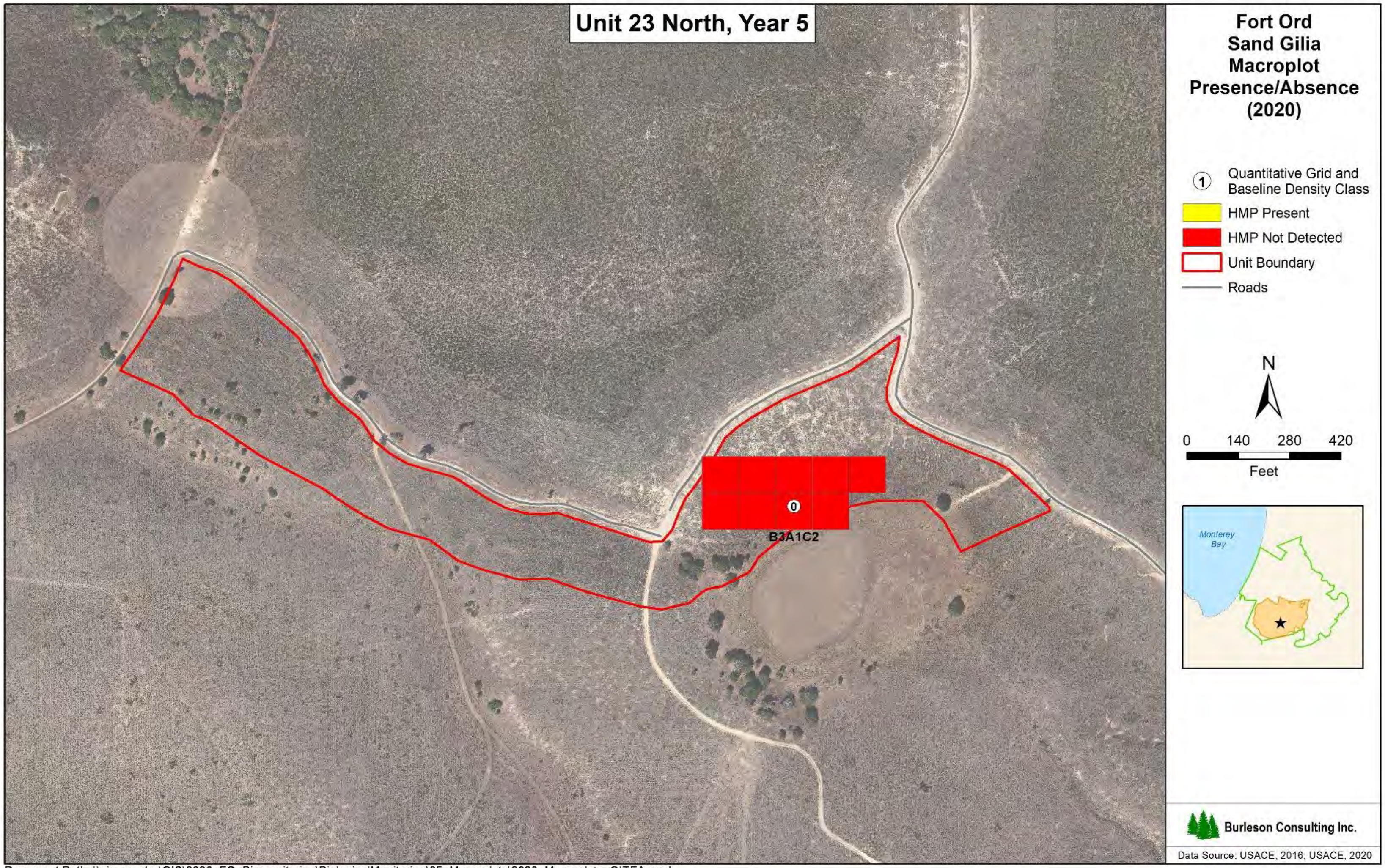

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Figure H-14. Map of Sand Gilia Macroplot Presence/Absence, Unit 23 North (Year 5)

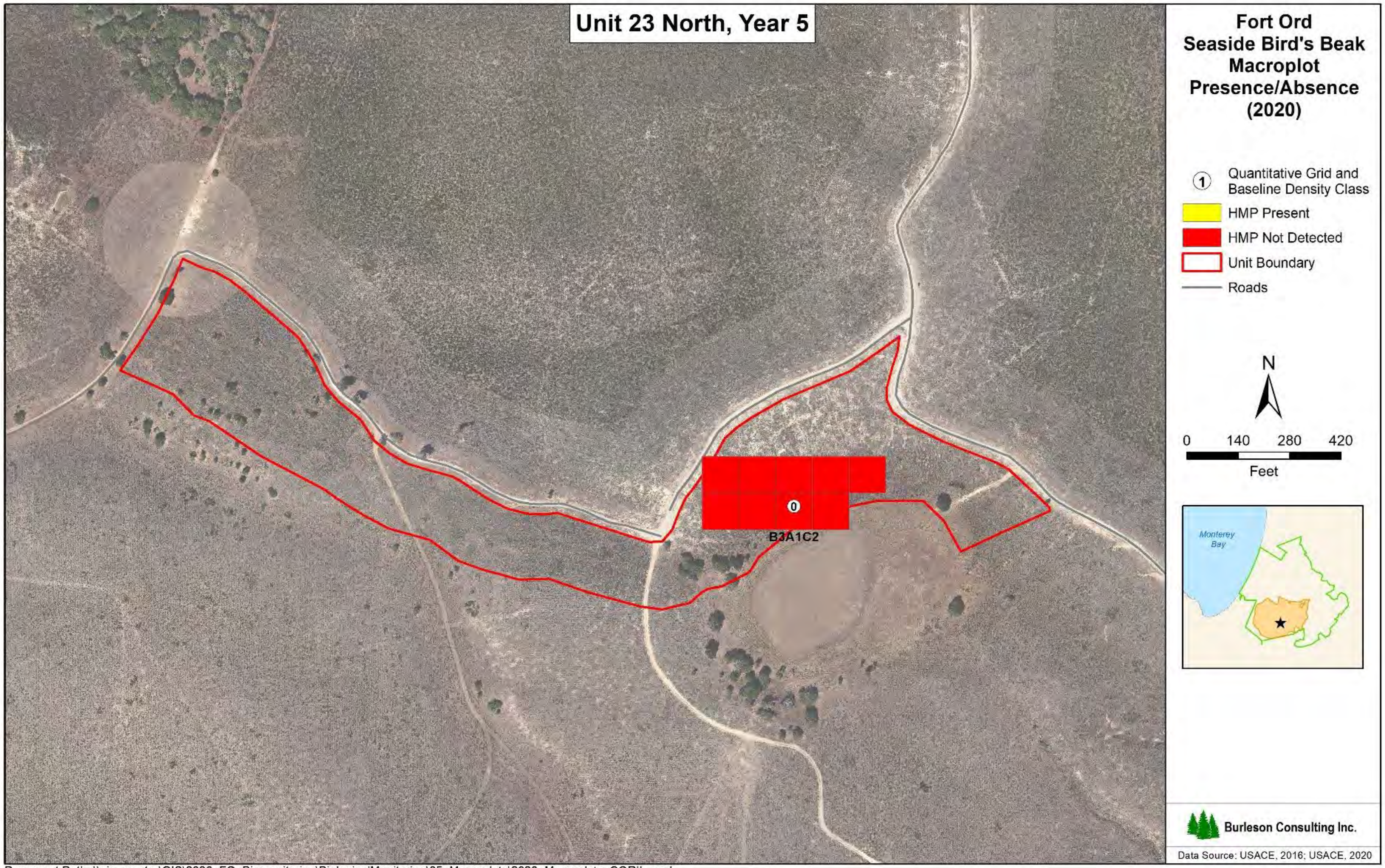

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Figure H-15. Map of Seaside Bird's Beak Macroplot Presence/Absence, Unit 23 North (Year 5)

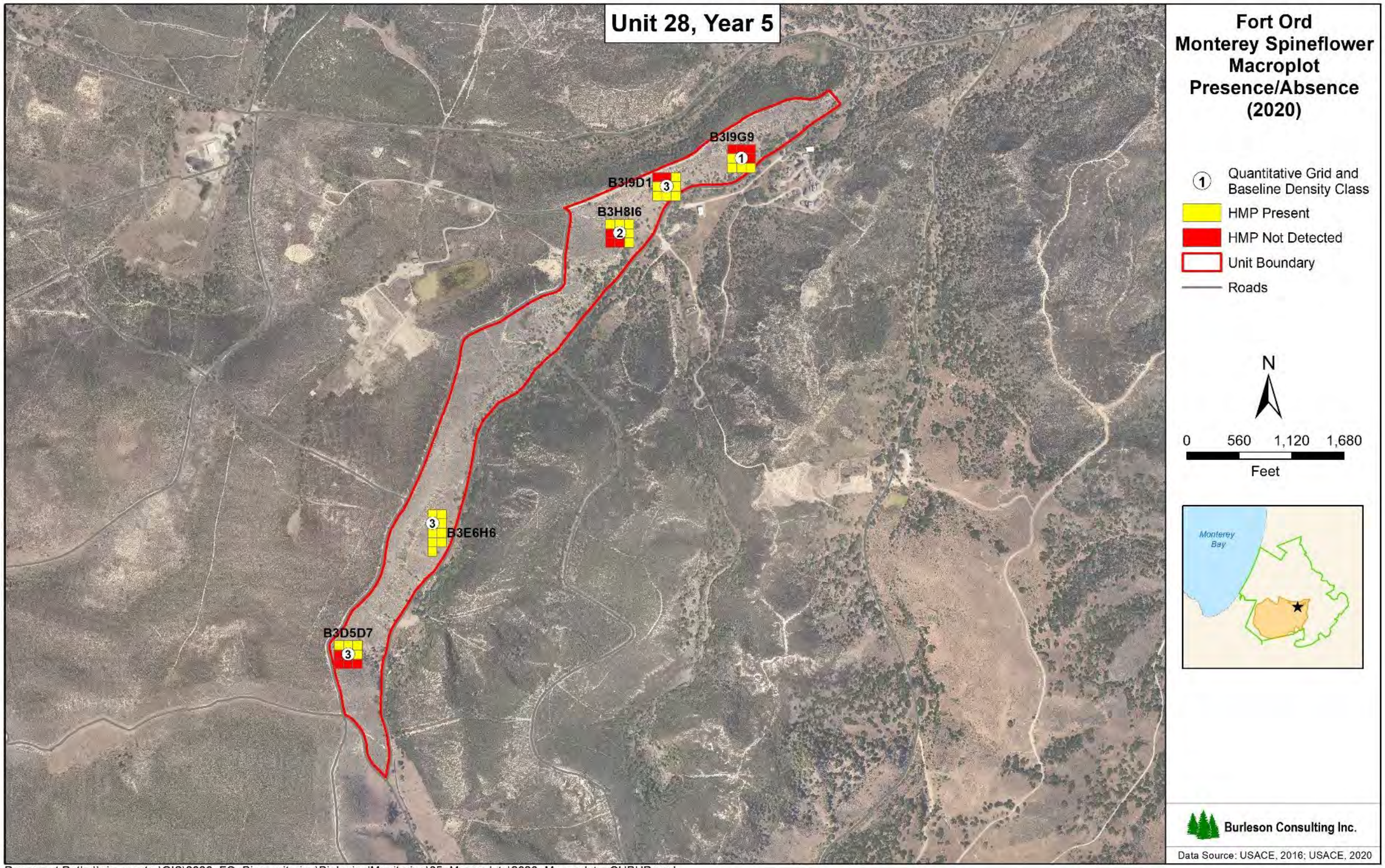

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Figure H-16. Map of Monterey Spineflower Macroplot Presence/Absence, Unit 28 (Year 5)

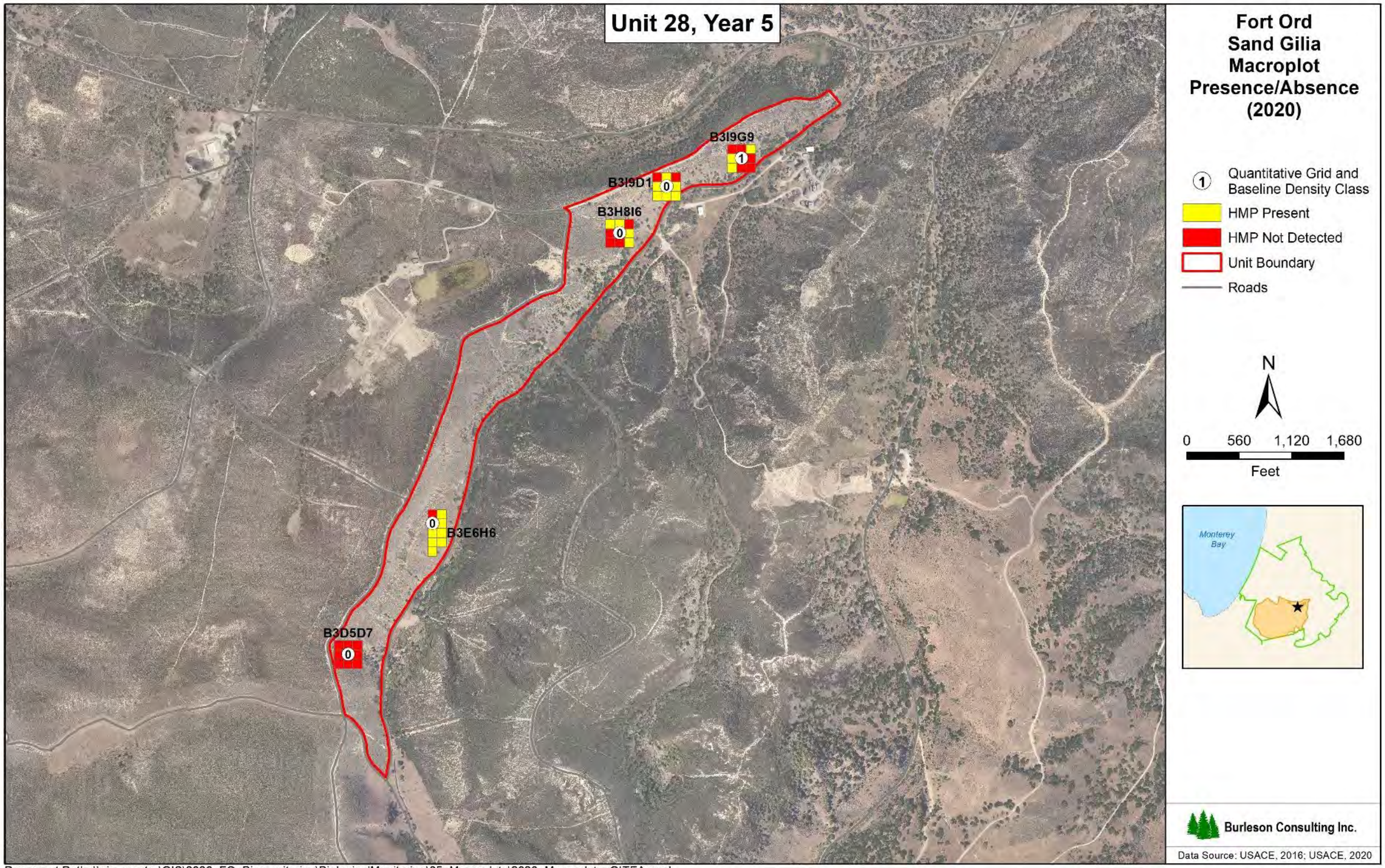

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Figure H-17. Map of Sand Gilia Macroplot Presence/Absence, Unit 28 (Year 5)

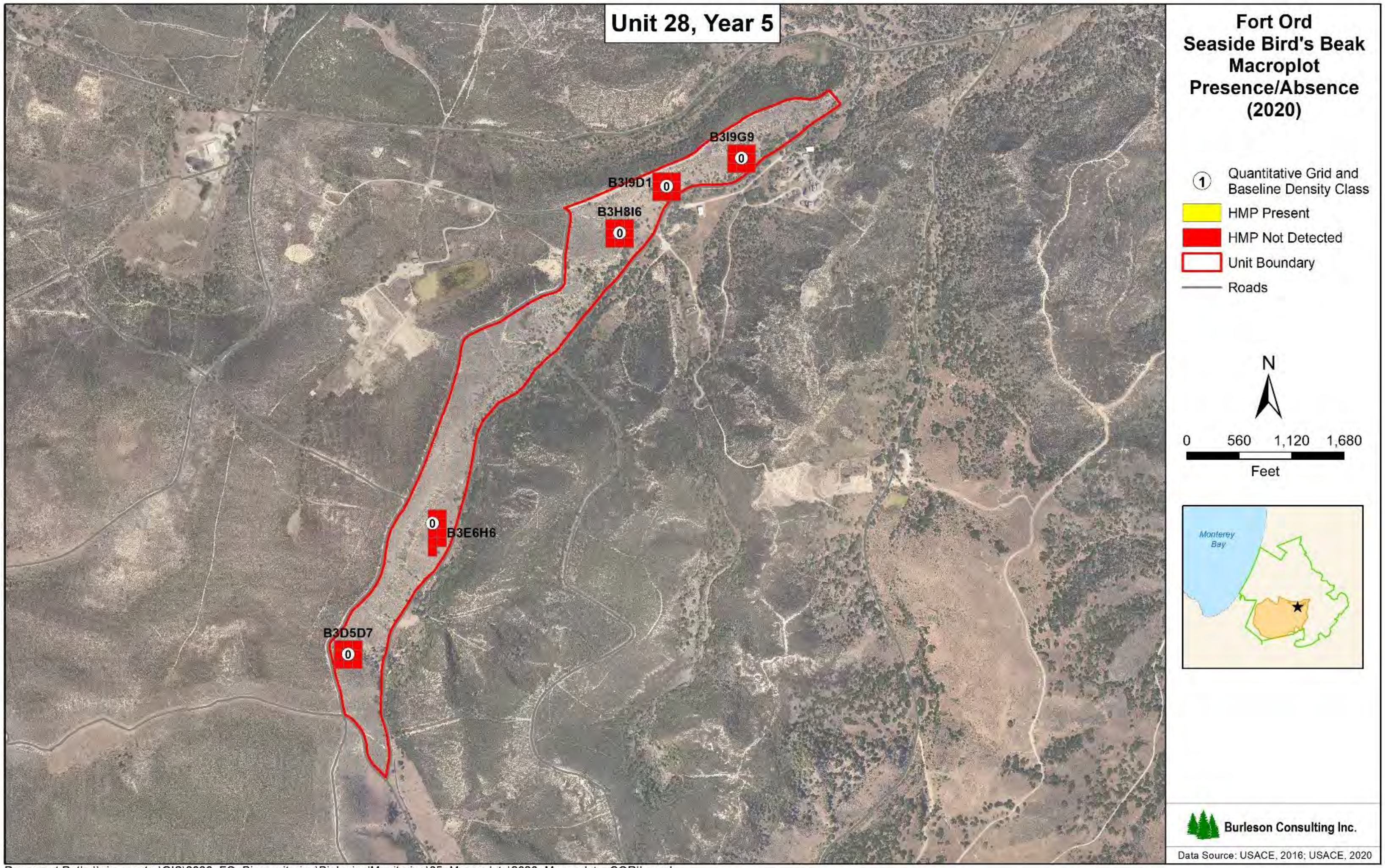

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Figure H-18. Map of Seaside Bird's Beak Macroplot Presence/Absence, Unit 28 (Year 5)