BW-2922
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2021 ANNUAL REPORT
BIOLOGICAL MONITORING

for Units 25, 31, BLM Area B Subunit A Containment Lines; Unit 25 and Units 13, 20, 31 Containment Lines; and Units 6, 7, 10, 1 East, Military Operations Urban Terrain Buffer, and Watkins Gate Burn Area

CONTRACT NO. W91238-18-D-0007

TASK ORDER W9123821F0034

FORMER FORT ORD

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July 2022

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ACRONYMS AND ABBREVIATIONS

ANOVA	Analysis of Variance
BLM	Bureau of Land Management
Burleson	Burleson Consulting, Inc.
EcoSystems West	EcoSystems West Consulting Group, Inc.
ft	feet
GPS	Global Positioning System
HMP	Habitat Management Plan
HMP annuals	Annual Species of Concern
HMP shrub	Shrub Species of Concern
MEC	Munitions and Explosives of Concern
m	meter(s)
MOUT	Military Operations Urban Terrain
MRA	Munitions Response Area
NOAA	National Oceanic and Atmospheric Administration
NCEI	National Centers for Environmental Information
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
WGBA	Watkins Gate Burn Area

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1 INTRODUCTION

The United States Army Corps of Engineers (USACE) contracted Burleson Consulting, Inc., A Terracon Company (Burleson) to conduct biological monitoring at former Fort Ord, Monterey County, California (see Figures 1-1 and 1-2). 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 (a) the Containment Lines of Units 25, 31, and the Bureau of Land Management (BLM) Area B Subunit A Containment Line (Year 3 monitoring); (b) Units 13, 25, and the Containment Line of Unit 20 (Year 5 monitoring); and (c) Units 6, 7, 10, 1 East, Military Operations Urban Terrain (MOUT) Buffer, and Watkins Gate Burn Area (WGBA) (Year 8 monitoring). Monitoring was conducted during spring and summer of 2021 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, non-native 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), and non-native species tables (Appendix G).

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 recovery could be documented over a reduced time period (Tetra Tech and EcoSystems West, 2015b).

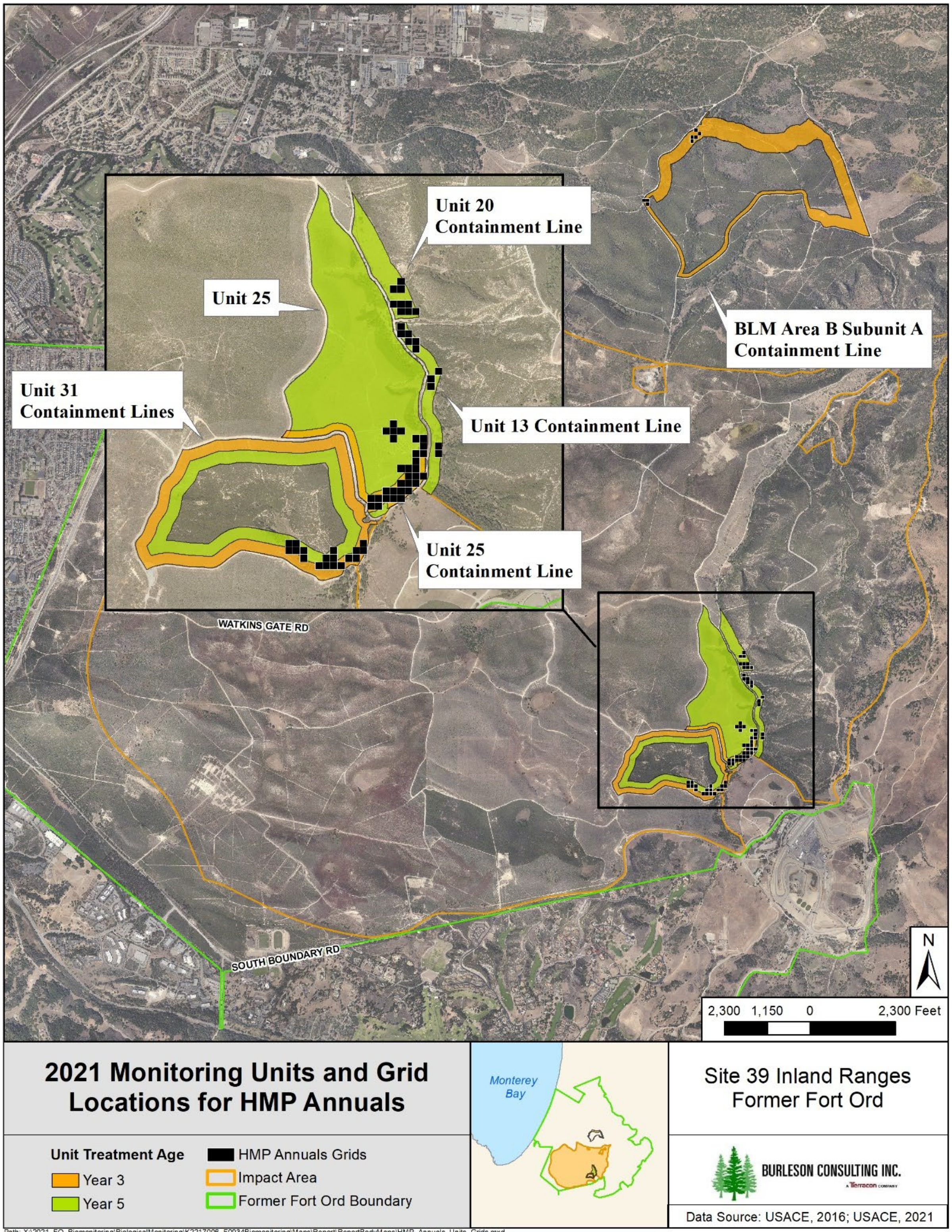

Figure 1-1. Map of Former Fort Ord, Monterey, CA, Showing Locations of Units and Grids Sampled for HMP Annual Species in 2021.

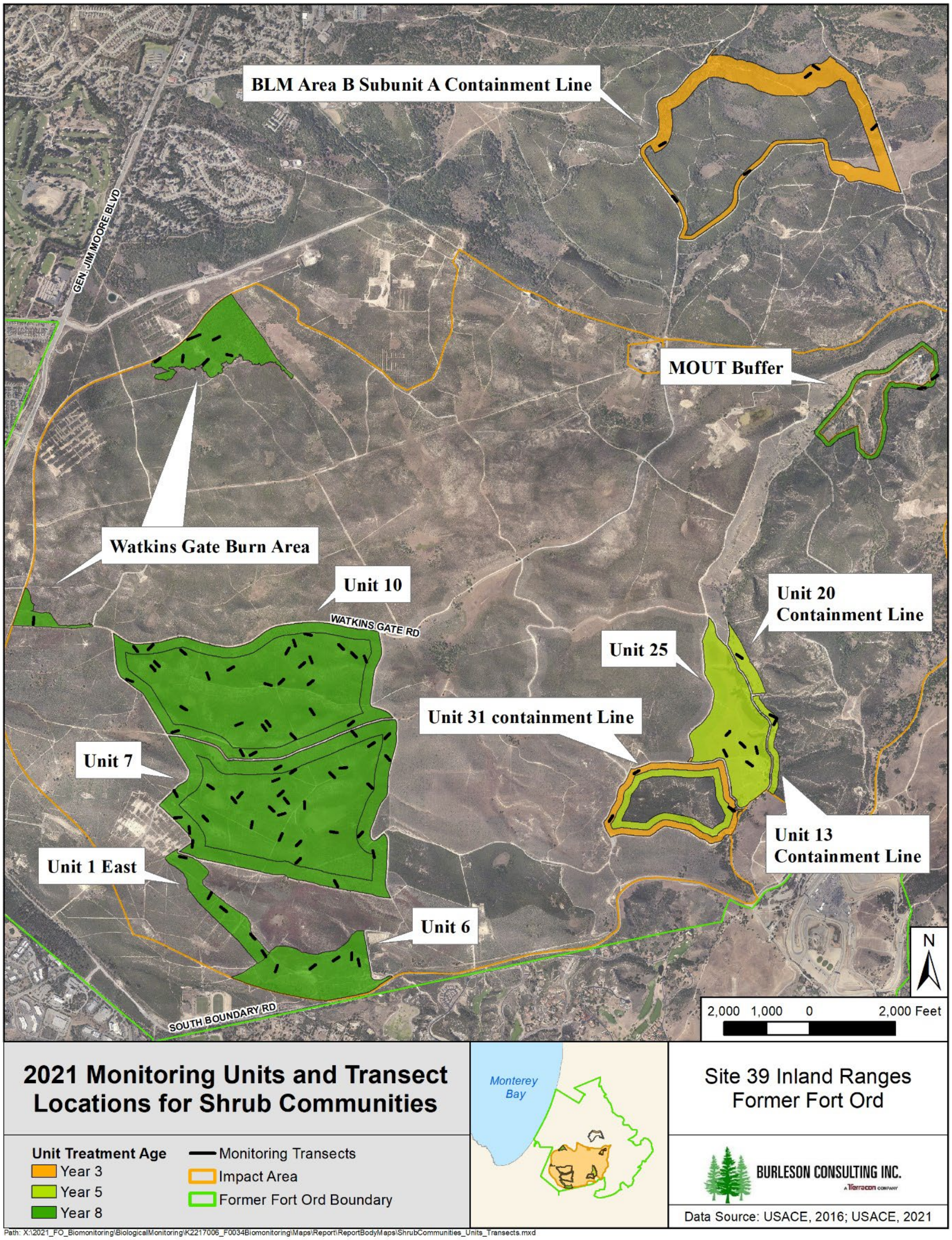

Figure 1-2. Map of Former Fort Ord, Monterey, CA, Showing Locations of Units and Transects Sampled for Shrub Community in 2021.

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.

Drought is a substantial factor affecting vegetation composition at former Fort Ord (Burleson, 2021). The 2019-2020 water-year had cumulative precipitation similar to the 30-year normal; however, 2020-2021 was a drought year and was well below-normal (Figure 1-3; NPS, 2021; NCEI, 2021). The low water-year likely impacted HMP annual density in 2021 and may have affected recovery of shrub community composition particularly in Year 3 Units, where certain species may not have had sufficient time to become re-established post-treatment before drought conditions occurred.

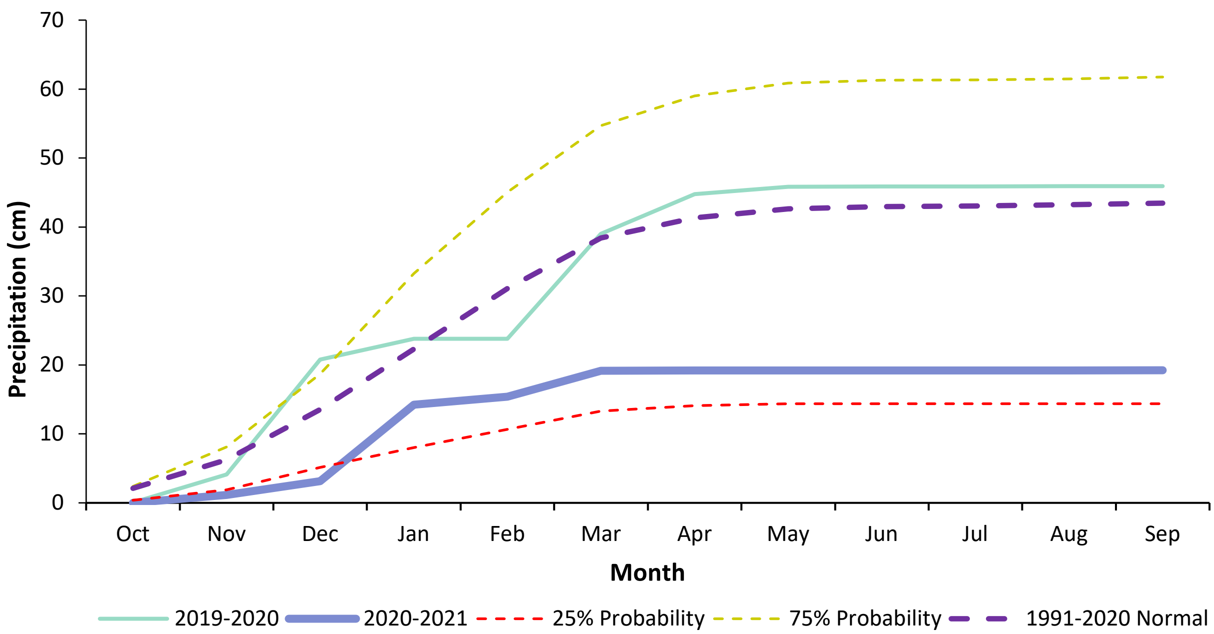

Figure 1-3. Cumulative Monthly Precipitation for the 2020-2021 Water-Year Compared to the 30-Year Normal (mean 1991-2020), the previous water-year, and the 25% and 75% Probabilities (NPS, 2021; NEIC 2021; NOAA, 2021). Data were collected at the NWSFO Station located at the Monterey Regional Airport in 2018-2019 and October through March of 2019-2020. Beginning April 1, 2020, 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 2021 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 four shrub species and three annual herbaceous species that are special-status species and, as such, were the focus of the HMP (USACE, 1997). Shrub species of interest (HMP shrubs) include:

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

Annual species of interest (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 2021 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 – 2021).

When appropriate and available, shrub transect data were transcribed from the electronic versions of previous monitoring reports. In addition to incorporating past 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.

Three 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, followed where needed by subsequent cutting of high stands of brush stem. This method most closely mimics a natural fire.

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, 2021).

Table 1-1. Previous Monitoring Surveys at 2021 Study Units on Fort Ord.

Survey Year	Survey
1997	Harding Lawson Associates (1997) performed Baseline surveys in Units 1 East (formerly called the Multirange Area).
2007	Shaw (2008) performed Baseline surveys in Unit 1 East.
2011	Tetra Tech and EcoSystems West (2012) performed Baseline surveys in MOUT Buffer and WGBA.
2012	Tetra Tech and EcoSystems West (2013) performed Baseline surveys in Units 6 and 10.
2013	Tetra Tech and EcoSystems West (2014) performed Baseline surveys in Unit 7.
2014	Tetra Tech and EcoSystems West (2015a) performed baseline surveys on Unit 25 and 31 Containment Lines; and Year 1 surveys in Units 6, 7, 10, MOUT Buffer, and WGBA.
2015	Burleson (2016) performed Baseline surveys in Units 13, 20, and BLM Area B Subunit A Containment Lines.
2016	Burleson (2017) performed Year 3 surveys on Units 1 East, 6, 7, 10, MOUT Buffer, and WGBA.
2017	Burleson (2018) performed Year 1 surveys in Unit 25; shrub transect monitoring and annual grasses monitoring on Unit 25, and Units 13, 20, and 31 Containment Lines.
2018	Burleson (2019a) performed Year 1 surveys of the three western grids in BLM Area B Subunit A Containment Line; and Year 5 shrub transect monitoring of Units 6, 7, 10, 1 East, MOUT Buffer, and WGBA.
2019	Burleson (2019b) performed Year 1 shrub transect monitoring and HMP annual surveys in Units 25 and 31 Containment Lines; Year 3 shrub transect monitoring of Unit 25 and Units 13, 20, and 31 Containment Lines.

2 METHODS

This section describes the standard monitoring methods used during the 2021 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 section.

2.1 Soils

The U.S. Department of Agriculture (USDA) mapped eight soil types occurring in Units monitored in 2021, shown in Table 2-1 (USDA, 2021). Antioch very fine sandy loam, 2 to 9 percent slopes and Oceano loamy sand, 2 to 15 percent slopes occur in the BLM Area B Subunit A Containment Line. Aquic Xerofluvents and Arnold loamy sand, 15-50 percent slopes, occur only in MOUT Buffer. Arnold loamy sand, 9-15 percent slopes, occurs only in Unit 20 Containment Line. Arnold-Santa Ynez complex is a large portion of the munitions remediation area (MRA) and occurs in BLM Area B Subunit A Containment Line; Units 1 East, 6, 7, 10, 20 Containment Line, 25, 31, and MOUT Buffer. Baywood sand, 2-15 percent slopes, occurs only in Units 10 and WGBA. Xerorthents, dissected, occurs in Units 13, 20 Containment Line, 25, 31, and MOUT Buffer.

Burleson identified at least two distinct types of soil during previous surveys in areas where the soil was mapped as Arnold-Santa Ynez complex (Units 25 and 31). The first soil type consists primarily of relatively coarse, loose sand, generally without gravel. The other 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 2021 (USDA, 2021).

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 Subunit A Containment Line
Af, Aquic Xerofluvents	Texture variable; somewhat poorly drained; derived from alluvium derived from sedimentary rock	MOUT Buffer
AkD, Arnold loamy sand, 9 to 15 percent slopes, MLRA 15	**Arnold**: Loamy fine sand; somewhat excessively drained; derived from residuum weathered from sandstone	20 Containment Line
AkF, Arnold loamy sand, 15 to 50 percent slopes, MLRA 15	Loamy fine sand; somewhat excessively drained; derived from residuum weathered from sandstone.	MOUT Buffer
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	BLM Area B Subunit A Containment Line, Units 1 East, 6, 7, 10, 20 Containment Line, 25, 31, MOUT Buffer, and WGBA
BbC, Baywood sand, 2 to 15 percent slopes	Sand; somewhat excessively drained; derived from stabilized sandy aeolian sands	10, WGBA
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 Subunit A Containment Line
Xd, Xerorthents, dissected	Loam, clay loam; well drained; derived from mixed unconsolidated alluvium	13, 20 Containment Line, 25, 31, and MOUT Buffer

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 2021 monitoring season. These surveys occurred in Unit 25 and in the Containment Lines of Units 13, 20, 25, 31, and BLM Area B Subunit A Containment Line. 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; the Army and BLM were informed 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 in flower.

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 2021 (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 2021 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 is when more than 500 individuals of any species were present, 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 2021 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, 2021). 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.

Effects of treatment type (burned, masticated, mixed, or masticated and burned) were not evaluated in 2021 due to HMP annual surveys being conducted only in areas where one treatment type was applied.

2.3 HMP Shrub Transects Methods

2.3.1 Field Methods

Burleson conducted shrub transect monitoring in maritime chaparral in Units 6, 7, 10, 25, 1 East, MOUT Buffer, and WGBA and the containment lines of Units 13, 20, 25, 31, and BLM Area B Subunit A during the 2021 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 was done to evaluate effects due to treatment type when different treatments are employed between the Containment Lines and the Unit 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 vegetation along the transect represented the surrounding area and 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 2021 shrub transect monitoring was conducted (e.g. 5-year-old vs 3-year-old). Within these groups, Burleson 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 type (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* respectively. Burleson conducted these tests using the *adonis* function in the vegan package in R Statistical Software (Oksanen, 2020; R Core Team, 2021). Burleson 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 then conducted on Units that contained more than one treatment type to examine the influence of *treatment* in addition to *age* 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), Burleson 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; R Core Team, 2021).

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 (number of species present), and species evenness index. Total cover is sometimes greater than 100 percent due to overlapping growth of some species (e.g., a coast live oak tree growing within a sandmat manzanita individual). 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 ith 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 ANOVAs 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.

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, inference was made 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 important community relationships and show species-level responses to differences in *treatment* or *age* (Molles, 2010). RACs were plotted 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). Rank-abundance curves were created using the *rankabundance* function in the BiodiversityR package (Kindt, 2019; R Core Team, 2021).

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 2021. 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, 2021). 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*), jubata 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, 2021). These surveys were not intended to be comprehensive. The intent is to document occurrences to support invasive species management through the Service Agreement with BLM.

3 YEAR 3 VEGETATION SURVEYS: UNITS 25, 31, AND BLM AREA B SUBUNIT A CONTAINMENT LINES

3.1 Introduction

Year 3 Units included the Containment Lines of Units 25, 31, and BLM Area B Subunit A (Figure 3-1). The Containment Lines of Units 25 and 31 were masticated in 2016 and partially re-masticated in 2018 as part of environmental cleanup operations involving preparations for prescribed burns and MEC removal. The BLM Area B Subunit A Containment Line was masticated in 2017 and partially re-masticated in 2018 in preparation for a prescribed burn.

Baseline surveys occurred in 2014 for the Containment Lines of Units 25 and 31 and in 2015 for the BLM Area B Subunit A Containment Line (Tetra Tech and EcoSystems West, 2015a; Burleson, 2016). These surveys included meandering transects 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; transects to sample shrub composition in the maritime chaparral (for Units 31 and BLM Area B Subunit A Containment Lines); and annual grass monitoring.

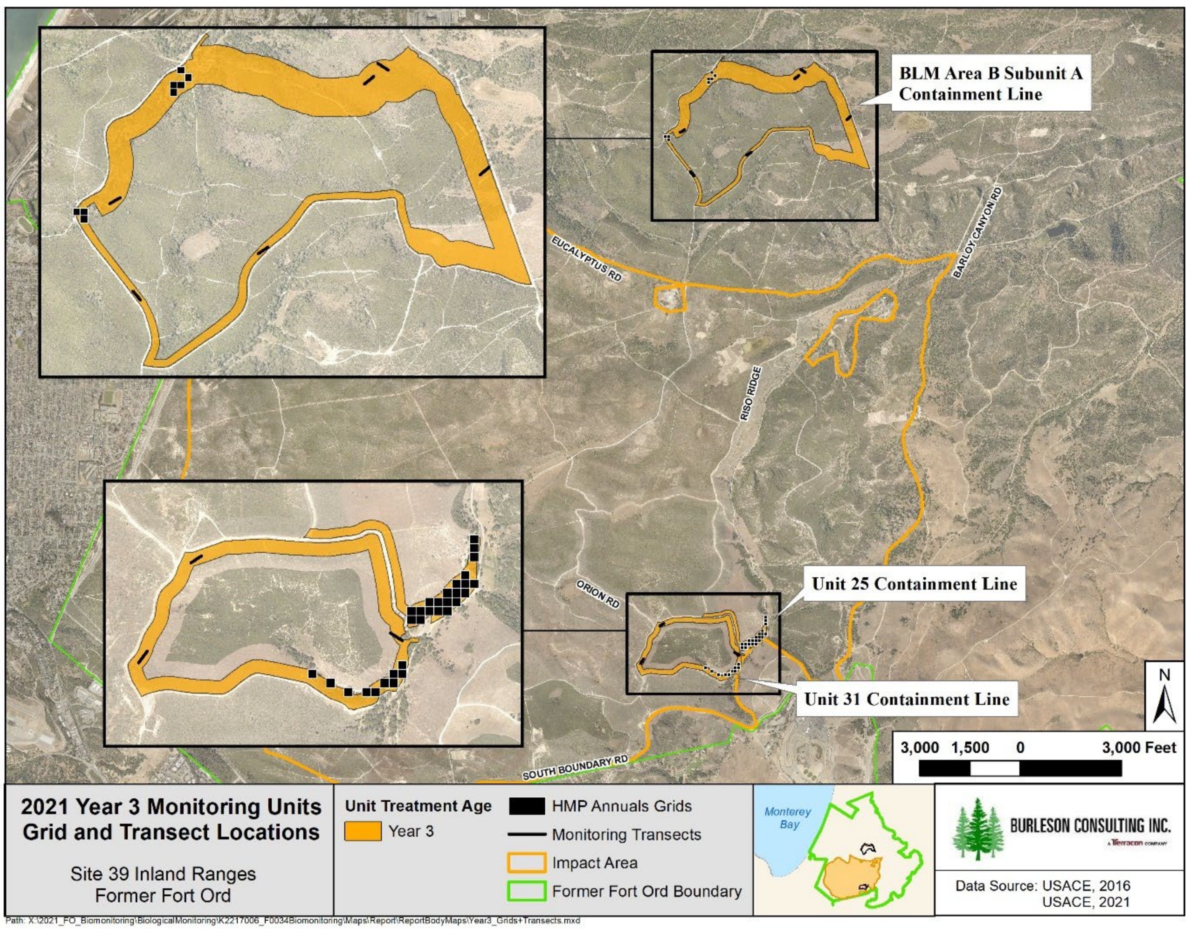

Figure 3-1. Units 25, 31, and BLM Area B Subunit A Containment Lines HMP Annuals Grids and Shrub Transects Surveyed for Year 3 in 2021.

3.2 Units 25, 31, and BLM Area B Subunit A Containment Lines: Setting

Subunit 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 BLM Area B Subunit A Containment Line comprises 106 acres. The southern portion of the Containment Line along Watkins Gate Road and West Machine Gun Flats Road encompassing the western group of three survey grids was initially masticated in 2017 and re-masticated in 2018 when the entire Containment Line was masticated. The portion of the Containment Line encompassing the northern five survey grids was only masticated in 2018. Western grids were surveyed in 2019 as Year 1 post-second mastication and were resurveyed in 2021 as Year 3 post-second mastication (Group 1 grids). The northern five survey grids were surveyed in 2019 as Year 1 post-mastication and were resurveyed in 2021 as Year 3 post-mastication (Group 2 grids).

Unit 25 encompasses an area of 95 acres. This Unit was initially slated for a prescribed burn, but due to significant risk of an escaped wildfire (difficult terrain and proximity to residential areas) the Army decided to masticate the entire Unit in 2016. This action was coordinated with USFWS which affirmed that it was within the allowed activities described in the PBO (USFWS, 2019). A portion of the Unit was subsequently re-masticated in 2018 to create a containment line for a prescribed burn of Unit 31. Due to the re-mastication, a portion of the grids were evaluated as Year 1 post-mastication, and a portion of the grids were evaluated as Year 3 post-second mastication in 2019. These grids were surveyed again in 2021 as Year 3 post-second mastication and Year 5 post-mastication. The post-second mastication area of Unit 25 comprises 10 acres, located east of Riso Ridge Road and west of Impossible Canyon Road in the southeast portion of former Fort Ord. Unit 25 has gently rolling topography in the western portion, with a steep, east-facing slope dominated by coast live oak woodland in the eastern portion bordering Impossible Canyon Road. Abandoned roads with varying amounts of vegetative overgrowth cross the Unit along ridgelines providing some degree of unobstructed access to the interior portions of the Unit. Prior to mastication, Unit 25 was dominated by mature maritime chaparral vegetation of the shaggy-barked manzanita association. Non-meadow annual grassland and disturbed areas occur in the southeast portion of the Unit along Impossible Canyon Road. Relatively open chaparral is most extensive on south and east facing slopes in areas that appeared more recently disturbed.

The Unit 31 Containment Line was masticated in 2016 and a portion was re-masticated in 2018 in preparation for prescribed burns. Due to the re-mastication, a portion of the grids were evaluated in 2019 as Year 1 post-second mastication (29 acres), and a portion of the grids were evaluated as Year 3 post-mastication (27 acres; see Section 4). These two portions were surveyed again in 2021 as Year 3 and Year 5, respectively. The remaining 47 acres are within the interior of the Unit and are planned for a prescribed burn without mastication. The Unit is located east of Riso Ridge Road and west of Impossible Canyon Road in the southeast portion of the area of former Fort Ord. Unit 31 is dominated by mature maritime chaparral of the shaggy-barked manzanita association, coast live oak woodland, and disturbed non-native grassland. The Unit is situated as a southeast facing bowl sloping down to a narrow valley that was evidenced to have been heavily used for infantry training when the base was active. The relatively flat valley is bordered by dense coast live oak woodland on a steep north facing slope immediately to the south and comprised of patchy non-native grassland with sparse to locally dense coyote brush (*Baccharis pilularis*).

3.3 Units 25, 31, and BLM Area B Subunit A Containment Lines: Methods

In accordance with methods outlined in the Revised Protocol and Section 2 in this report, the 2021 Year 3 vegetation monitoring surveys in Units 25, 31, and BLM Area B Subunit A Containment Lines comprised 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 19, 20, 21, 22, 26, 27, 28, and May 6, 2021.

- Repeated sampling of transects that were monitored in 2014 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 June 1, 2, 3, and 4; and July 7 and 8, 2021.

- 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, jubata grass, and French broom, where encountered. This survey effort was conducted to support ongoing management.

3.4 Units 25, 31, and BLM Area B Subunit A Containment Lines: Results and Discussion

Burleson surveyed 39 HMP monitoring grids in the Year 3 Units in 2021. Eight grids were surveyed in BLM Area B Subunit A; five of these grids were surveyed post-first mastication (Group 2 grids) and three were surveyed post-second mastication (Group 1 grids). Twenty-one grids were surveyed in the Containment Line of Unit 25 (post-second mastication) and 10 grids were surveyed in the Containment Line of Unit 31. Maps of survey grids for the sampled Units are provided in Appendix B (Figures B-1 through B-9).

3.4.1 Sand Gilia

Sand gilia was observed in 2021 in the Containment Line of Unit 31. Sand gilia was not observed in BLM Area B Subunit A Containment Line in any survey year and this species was present in the Unit 25 Containment Line only in 2019 (Figures 3-2 through 3-5; Appendix B, Figures B-1, B-4, and B-7). Sand gilia was observed in Unit 25 Containment Line in Year 1 (2019), and in Unit 31 Containment Line in Year 1 and Year 3 surveys. Sand gilia was found at a frequency of occurrence of 10% (2 of 21 grids) in Unit 25 Containment Line during Year 1 (2019) surveys, post-second mastication. Frequency of occurrence in Unit 31 Containment Line was 0% (0 of 10 grids) in 2014, 40% (4 of 10 grids) in 2017 post-mastication, 30% (3 of 10 grids) in 2019 post-second mastication, and 20% (2 of 10 grids) in 2021 post-second mastication.

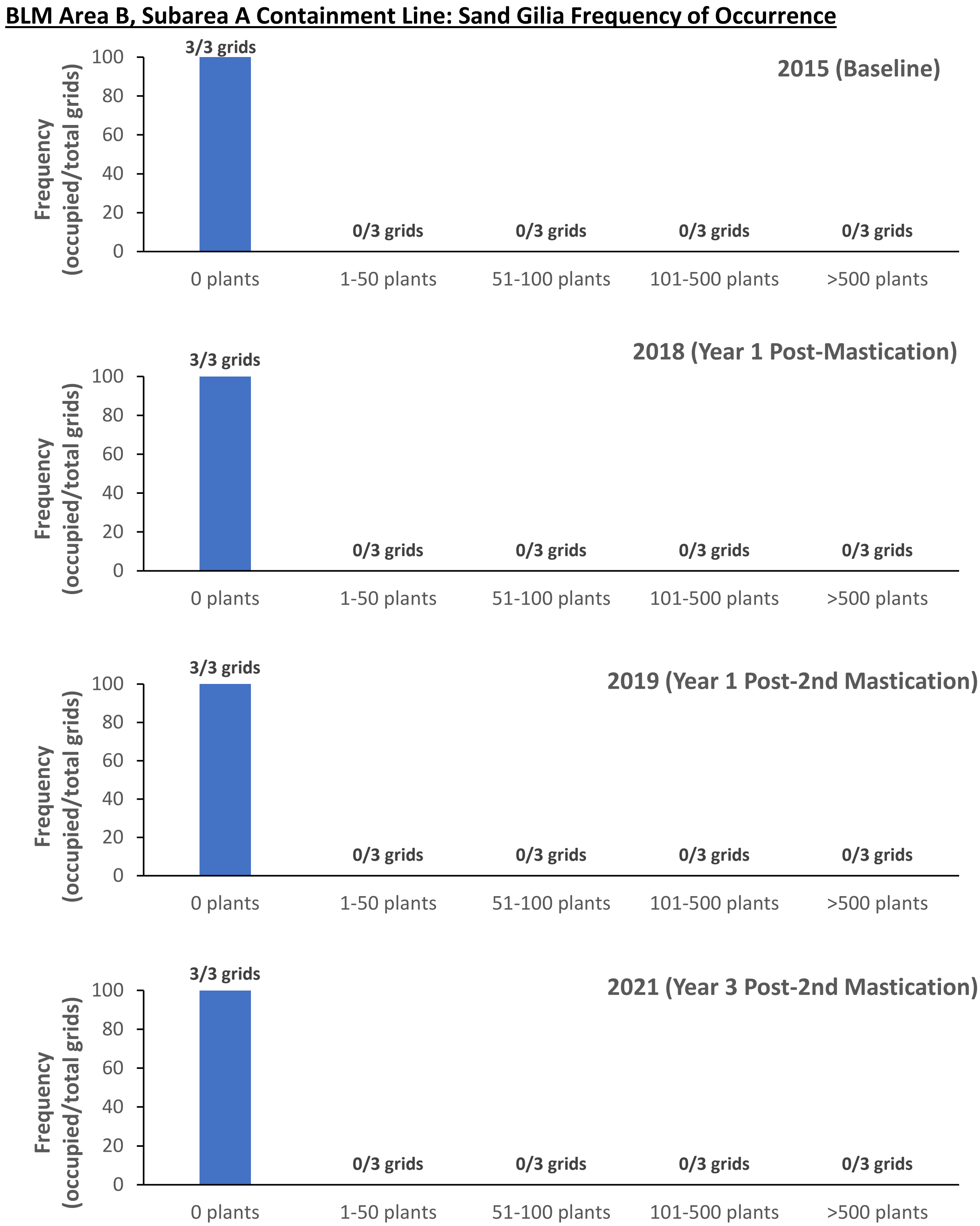

Figure 3-2. Unit BLM Area B Subunit A Containment Line sand gilia occurrence in surveyed Group 1 Grids (n=3) for Baseline (2015), Year 1 Post-Mastication (2018), Year 1 Post-Second Mastication (2019), and Year 3 (2021).

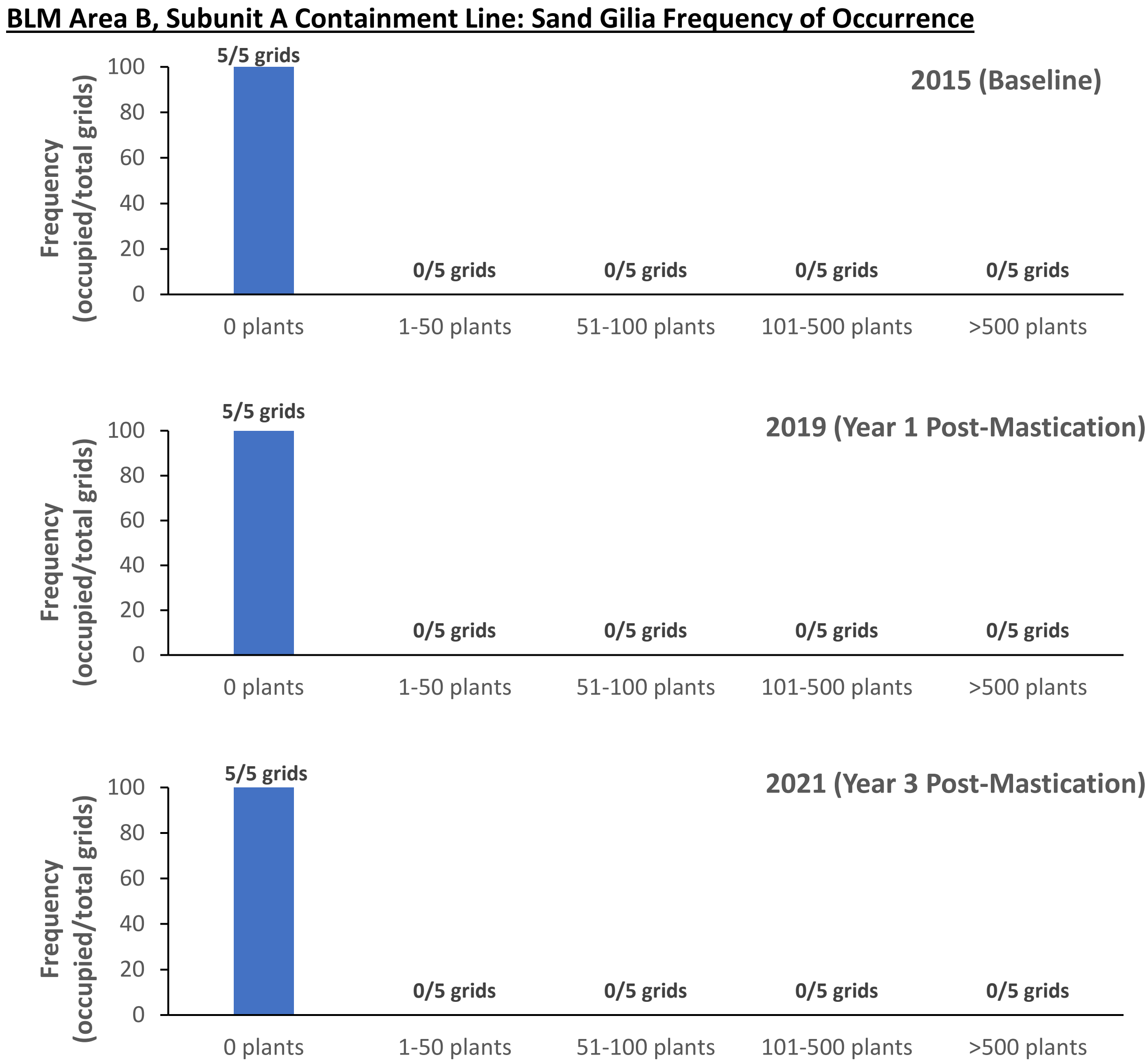

Figure 3-3. Unit BLM Area B Subunit A Containment Line sand gilia occurrence in surveyed Group 2 Grids (n=5) for Baseline (2015), Year 1 Post-Mastication (2018), Year 1 Post-Second Mastication (2019), and Year 3 (2021).

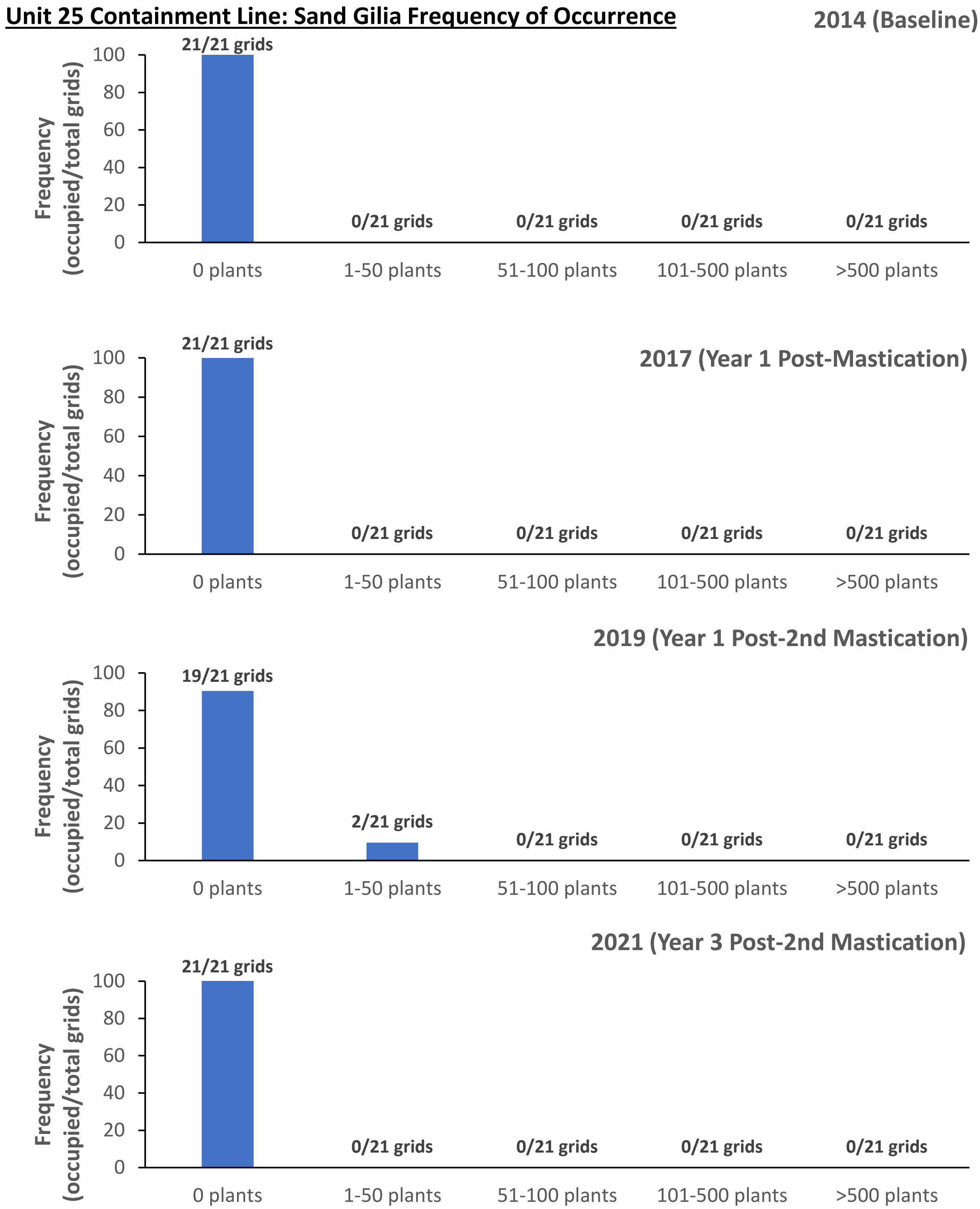

Figure 3-4. Unit 25 Containment Line sand gilia occurrence in surveyed grids (n=21) for Baseline (2014), Year 1 Post-Mastication (2017), Year 1 Post-Second Mastication (2019), and Year 3 (2021).

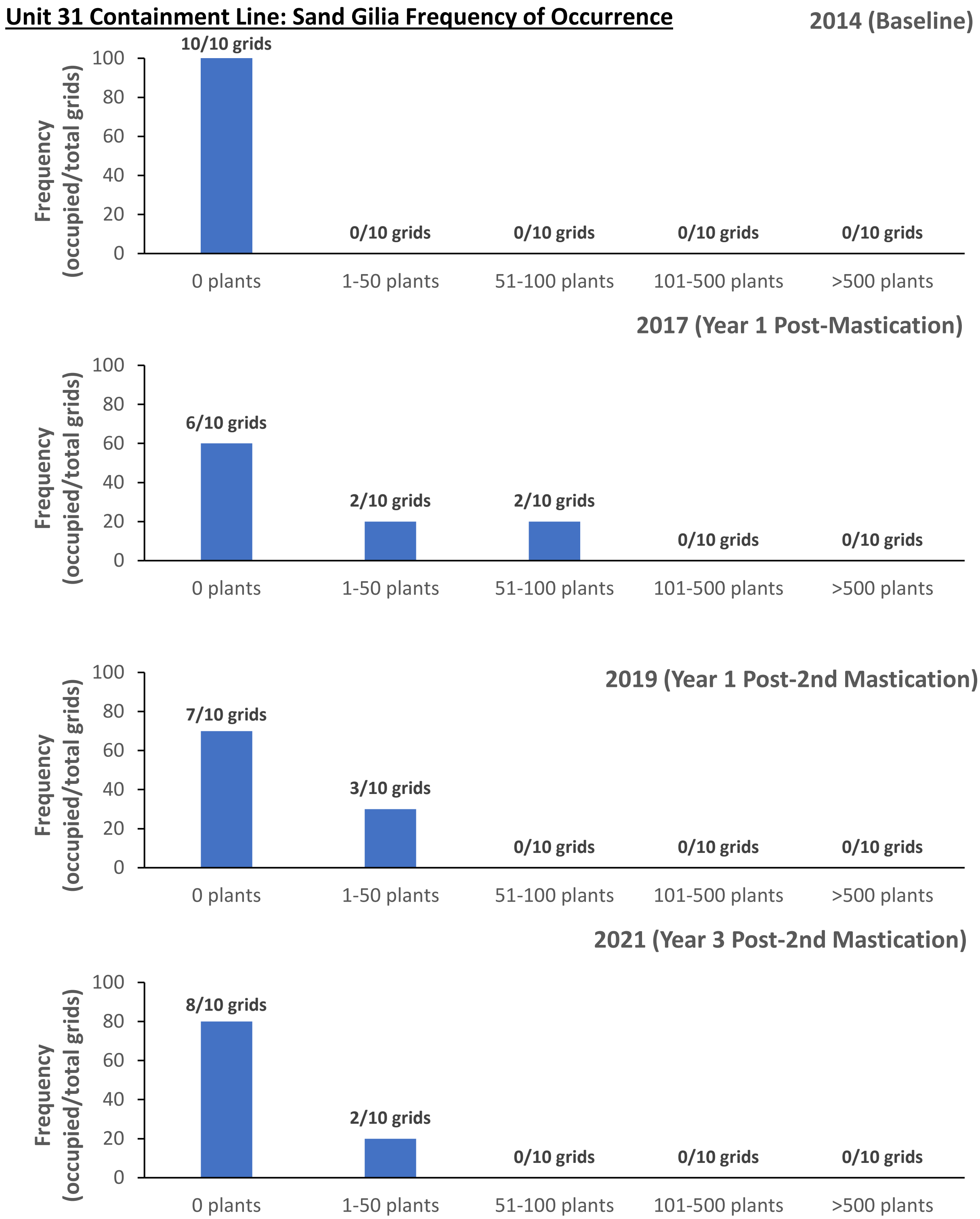

Figure 3-5. Unit 31 Containment Line sand gilia occurrence in surveyed grids (n=10) for Baseline (2014), Year 1 Post-Mastication (2017), Year 1 Post-Second Mastication (2019), and Year 3 Post-Second Mastication (2021).

3.4.2 Seaside Bird's Beak

Seaside bird's beak was not observed in any of the Year 3 Units in 2021; however, this species was found in Unit 25 Containment Line with a frequency of occurrence of 5% (1 of 21 grids) during Year 1 Post-Mastication (2017) and Year 1 Post-Second Mastication (2019) surveys (Figures 3-6 through 3-9; Appendix B, Figures B-2, B-5, and B-8).

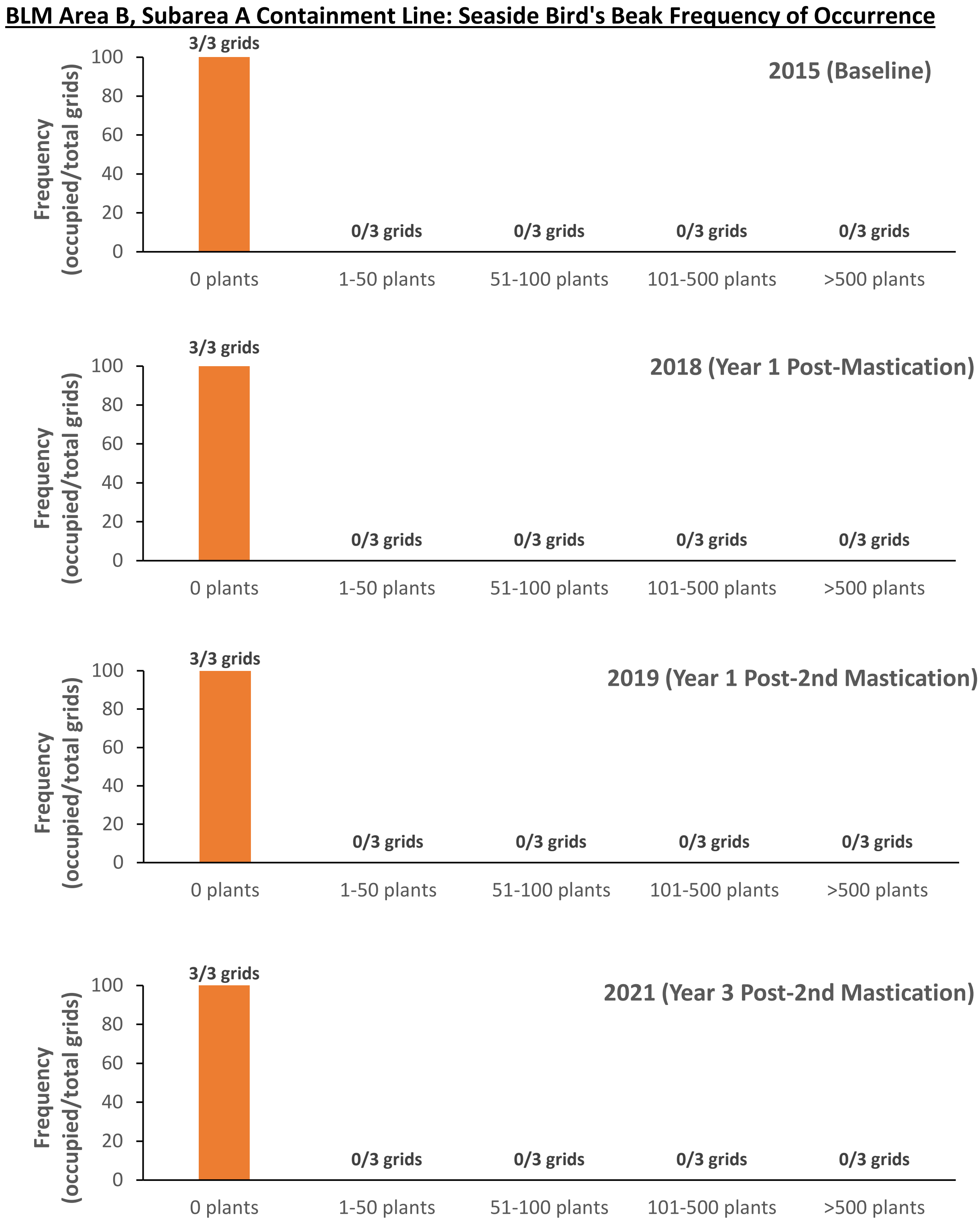

Figure 3-6. Unit BLM Area B Subunit A Containment Line seaside bird's beak occurrence in surveyed Group 1 Grids (n=3) for Baseline (2015), Year 1 Post-Mastication (2018), Year 1 Post-Second Mastication (2019), and Year 3 (2021).

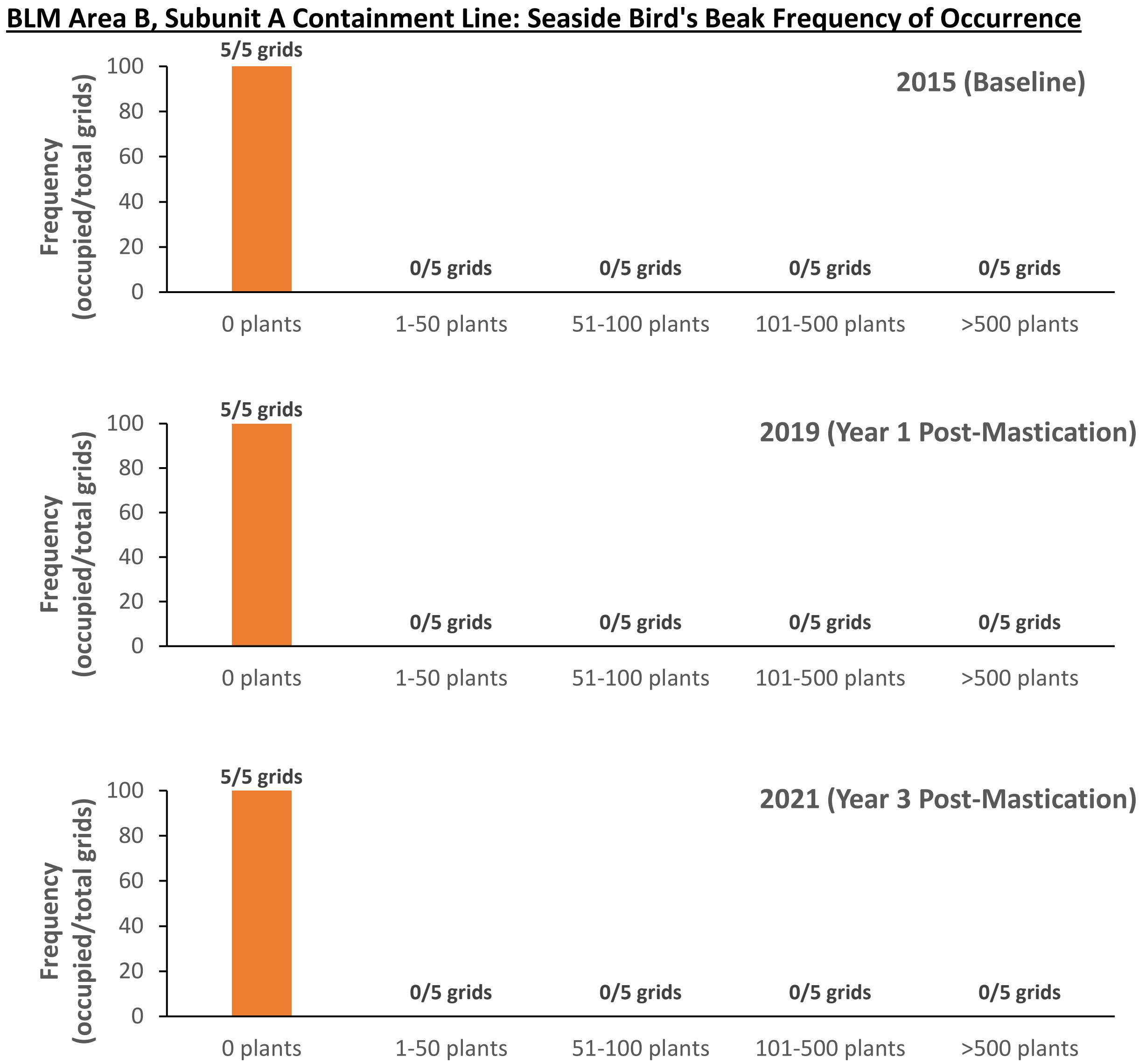

Figure 3-7. Unit BLM Area B Subunit A Containment Line seaside bird's beak occurrence in surveyed Group 2 Grids (n=5) for Baseline (2015), Year 1 Post-Mastication (2018), Year 1 Post-Second Mastication (2019), and Year 3 (2021).

Figure 3-8. Unit 25 Containment Line seaside bird's beak occurrence in surveyed grids (n=21) for Baseline (2014), Year 1 Post-Mastication (2017), Year 1 Post-Second Mastication (2019), and Year 3 (2021).

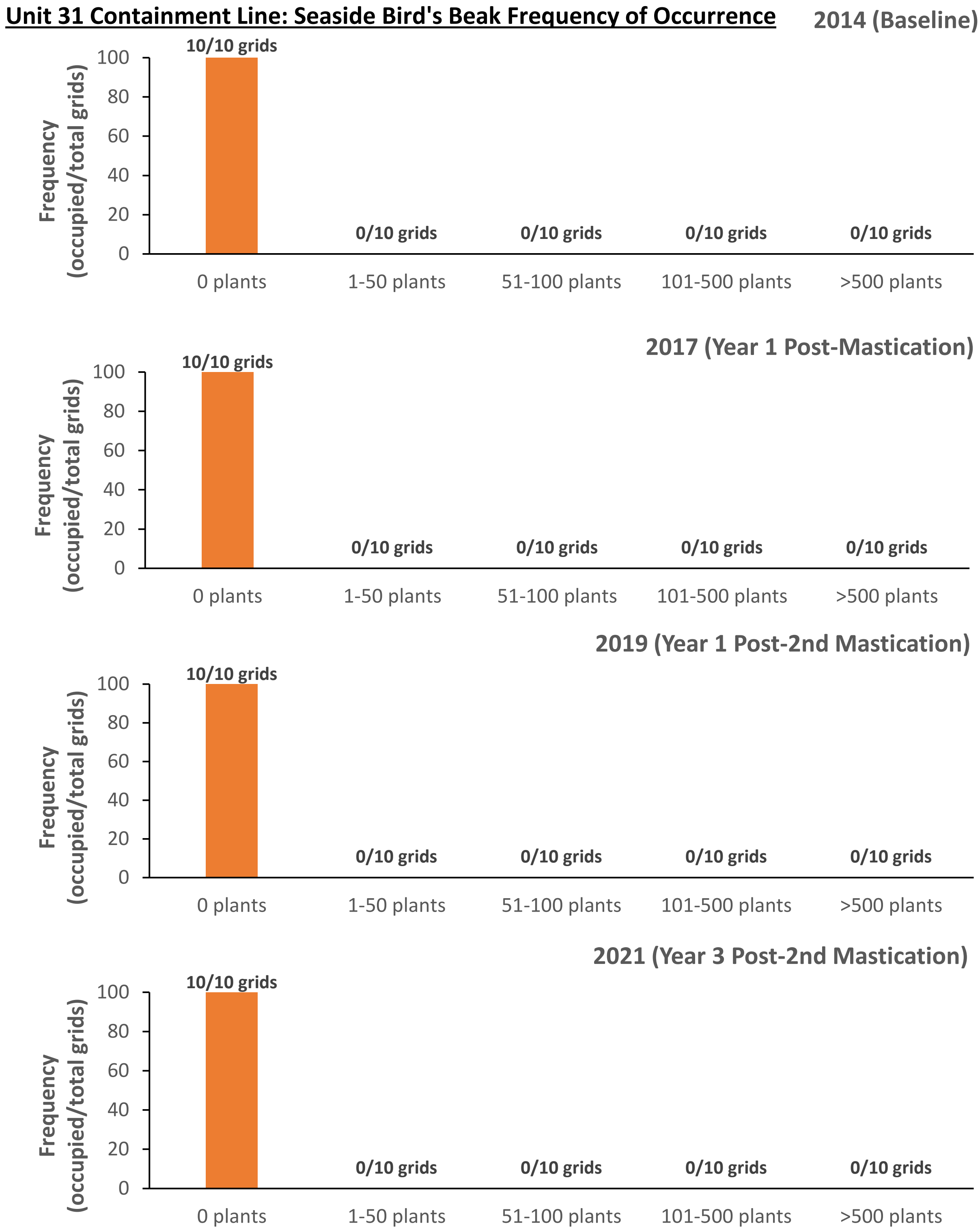

Figure 3-9. Unit 31 Containment Line seaside bird's beak occurrence in surveyed grids (n=10) for Baseline (2014), Year 1 Post-Mastication (2017), Year 1 Post-Second Mastication (2019), and Year 3 (2021).

3.4.3 Monterey Spineflower

Monterey spineflower was present in all Year 3 Units (Figures 3-10 through 3-13; Appendix B, Figures B-3, B-6, and B-9). The frequency of occurrence in BLM Area B Subunit A Containment Line was 100% in 2015 for both Group 1 (3 of 3 grids) and Group 2 (5 of 5 grids). In Group 1 grids, frequency of occurrence was 67% in 2018 (post-mastication) and in 2019 (post-second mastication), and 33% in 2021. In Group 2 grids, frequency of occurrence was 100% in 2019 and 80% in 2021. Frequency of occurrence of Monterey spineflower in Unit 25 Containment Line was 100% in Baseline, 95% in 2017 (post-mastication), 86% in 2019 (post-second mastication), and 90% in 2021. Frequency of occurrence of Monterey spineflower in Unit 31 Containment Line was also 100% in Baseline and did not change until 2021, when frequency of occurrence was 90%.

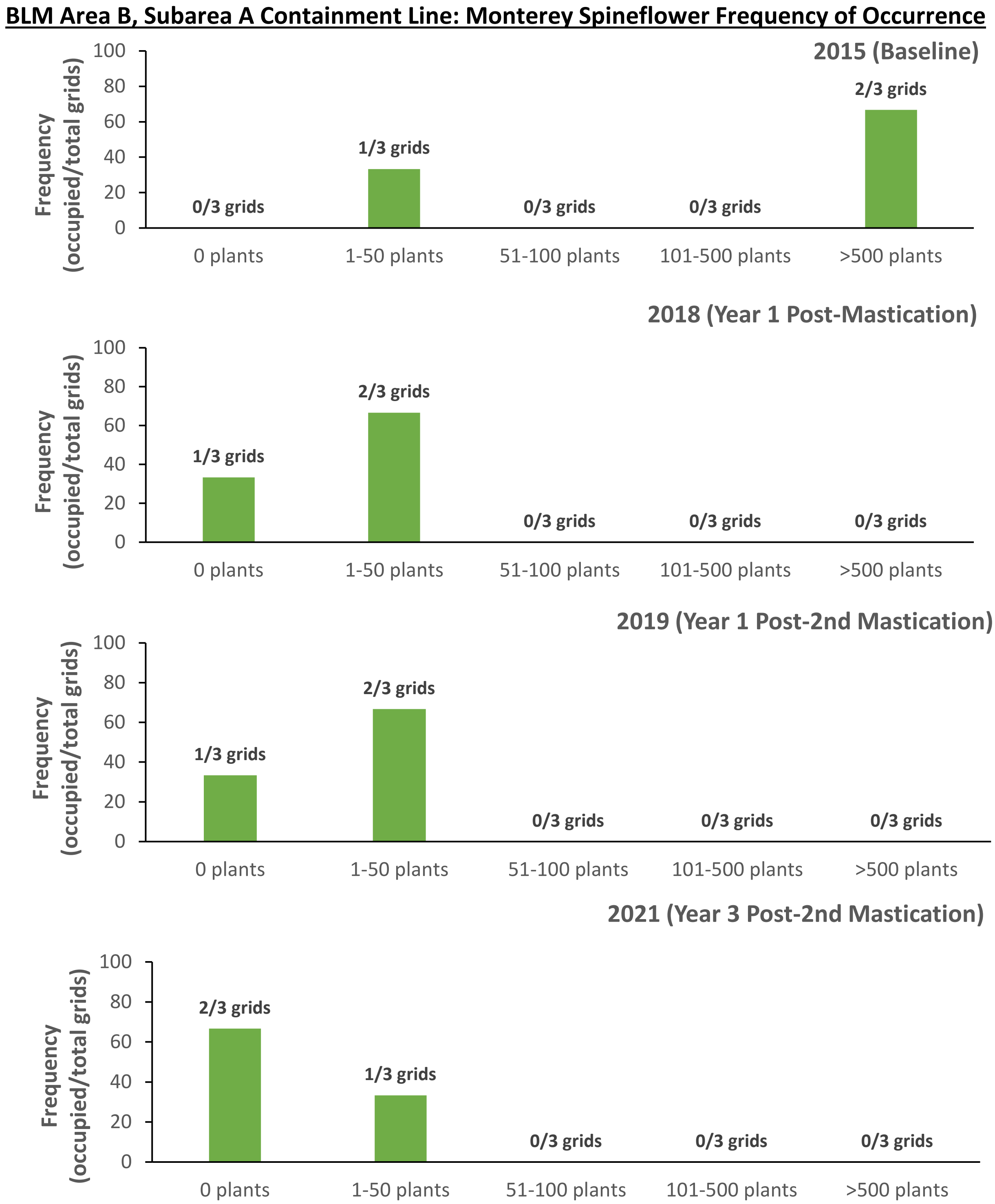

Figure 3-10. BLM Area B Subunit A Containment Line Monterey spineflower occurrence in Group 1 Grids (n=3) for Baseline (2015), Year 1 Post-Mastication (2018), Year 1 Post-Second Mastication (2019), and Year 3 (2021).

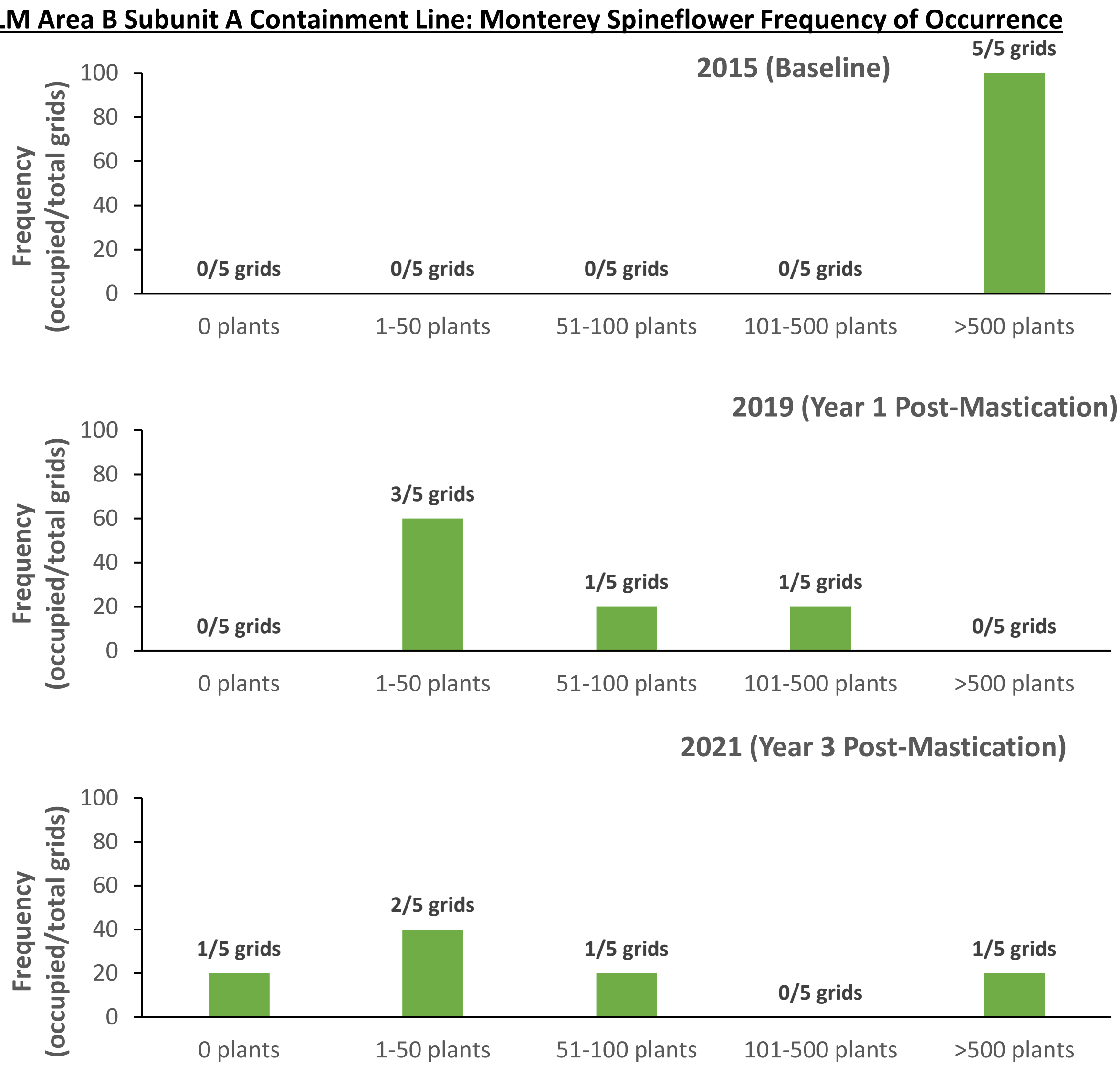

Figure 3-11. BLM Area B Subunit A Containment Line Monterey spineflower occurrence in Group 2 Grids (n=5) for Baseline (2015), Year 1 Post-Mastication (2019), and Year 3 (2021).

Figure 3-12. Unit 25 Containment Line Monterey spineflower occurrence in surveyed grids (n=21) for Baseline (2015), Year 1 Post-Mastication (2017), Year 1 Post-Second Mastication (2019), and Year 3 (2021).

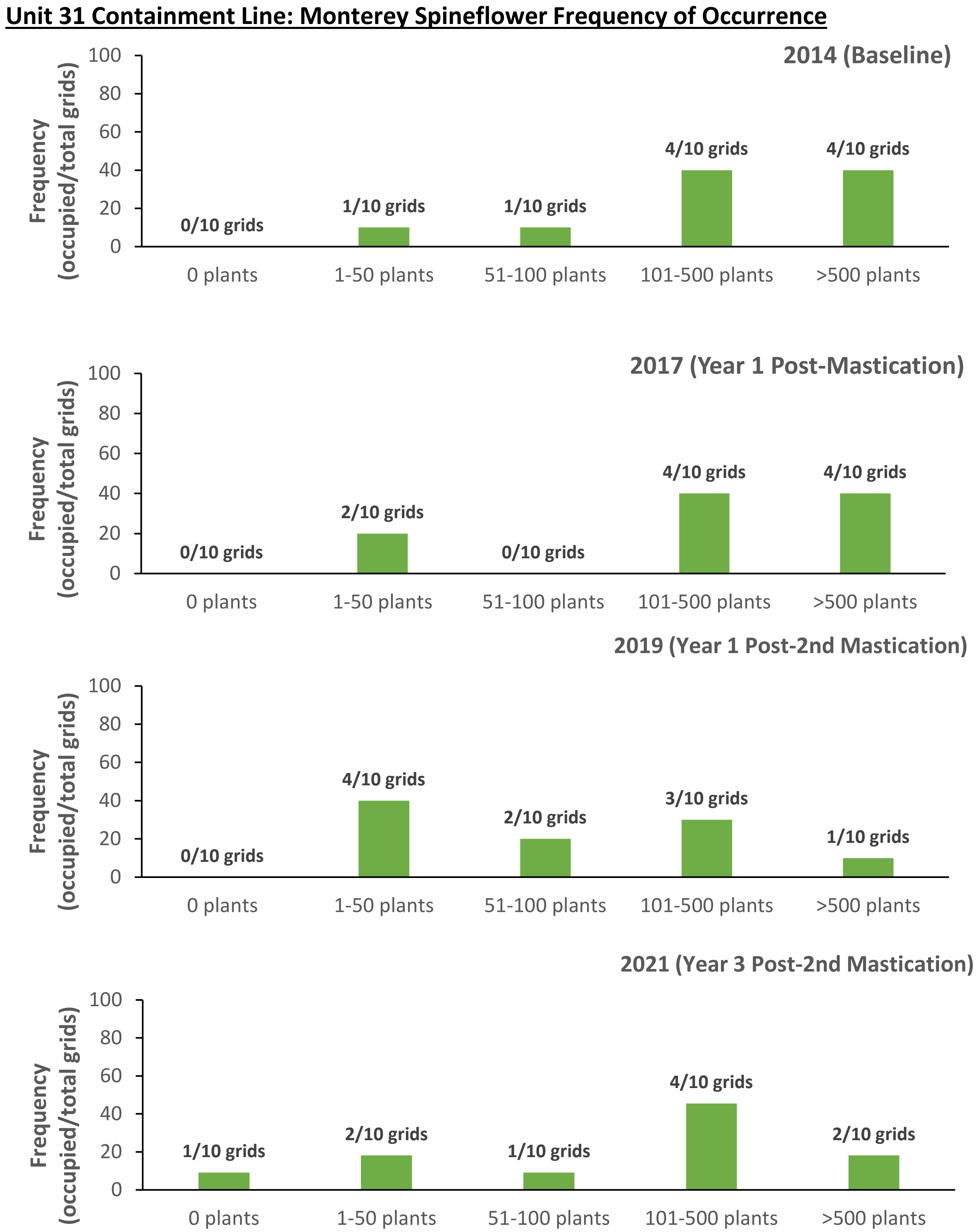

Figure 3-13. Unit 31 Containment Line Monterey spineflower occurrence in surveyed grids (n=10) for Baseline (2014), Year 1 Post-Mastication (2017), Year 1 Post-Second Mastication (2019), and Year 3 (2021).

3.4.4 Yadon's Piperia

Piperia was observed within BLM Area B Subunit A Containment Line during 2021 surveys (Appendix E, Figure E-1). Two piperia individuals were located in the northwestern area of BLM Area B Subunit A Containment Line and one was observed in the westernmost area of the Unit. Due to the timing of monitoring, these individuals were not in flower and could not be identified to their specific taxon. Piperia was not observed within Unit 31 Containment Line.

3.4.5 Effect of Treatment on HMP Density

The effect of treatment type on HMP annuals density was not evaluated in Year 3 Units since only mastication occurred in these areas, with no prescribed burns.

3.4.6 Shrub Transect Monitoring

Shrub transects were sampled in BLM Area B Subunit A Containment Line (n = 6) and Unit 31 Containment Line (n = 3) in 2021 (Appendix C; Figures C-1 and C-2). Baseline transects were collected in 2015 for BLM Area B Subunit A Containment Line and in 2014 for Unit 31 Containment Line (Burleson, 2016).

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, 2016-2021). Community structure parameters in all Year 3 Units changed similarly through time.

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. Unit appeared to influence species evenness and diversity but there was no evidence that Unit affected mean percent cover or species richness. Age of the Unit (Baseline vs. Year 3) appeared to influence all community structure parameters. There was no evidence that interactions between Unit and age factors contribute to differences seen in community structure (Table 3-1).

Table 3-1. Mixed-design ANOVA results for BLM Area B Subunit A and Unit 31 Containment Lines.

Factor	Total Mean Cover		Species Richness		Species Evenness		Species Diversity	
	F	*P*	*F*	*P*	*F*	*P*	*F*	*P*
Unit	0.008	0.933	0.156	0.705	5.625	0.049	9.852	0.016
Age	53.468	1.61E-04	44.333	2.88E-04	23.078	0.002	8.271	0.024
Unit*Age	0.110	0.750	3.07	0.123	0.099	0.763	0.018	0.896

Shrub cover generally decreased between Baseline and 2021 surveys, three years after treatment (Figures 3-14 and 3-15). Mean percent cover in BLM Area B Subunit A and Unit 31 Containment Lines decreased between Baseline and Year 3 by approximately 38% and 41%, respectively.

Both species richness and diversity tended to increase between Baseline and Year 3 surveys (Figures 3-14 and 3-15). Species richness increased between Baseline and Year 3 in both BLM Area B Subarea A and Unit 31 Containment Lines. Likewise, species diversity increased for both Units ($H_{BLMB\_A,Year\ 0}$ = 0.877, $H_{BLMB\_A,\ Year\ 3}$ = 1.34; $H_{U31,Year\ 0}$ = 1.197 $H_{U31,\ Year\ 3}$ = 1.602).

Species evenness slightly increased between Baseline and Year 3 in both Year 3 Units (Figures 3-14 and 3-15). BLM Area B Subunit A evenness increased slightly from Baseline ($J_{BLMB\_A,\ Year\ 0}$ = 0.496, $J_{BLMB\_A,\ Year\ 3}$ = 0.587) and evenness slightly increased at Unit 31 Containment Line ($J_{U31,\ Year\ 0}$ = 0.619, $J_{U31,\ Year\ 3}$ = 0.719).

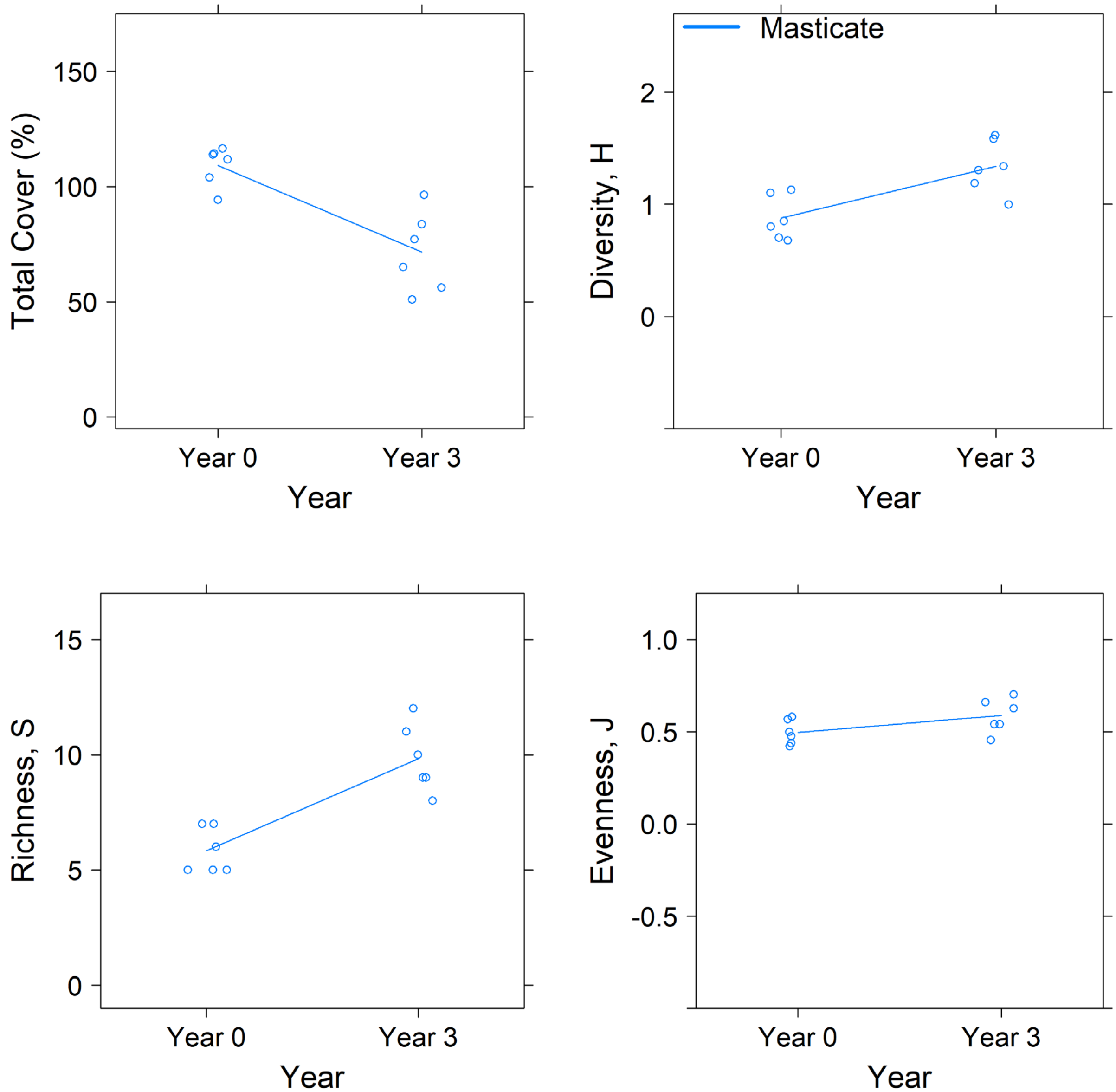

Figure 3-14. BLM Area B Subunit A Containment Line community structure from baseline (2015) to three years after mastication (2021). Six masticated transects were analyzed in BLM Area B Subunit A Containment Line.

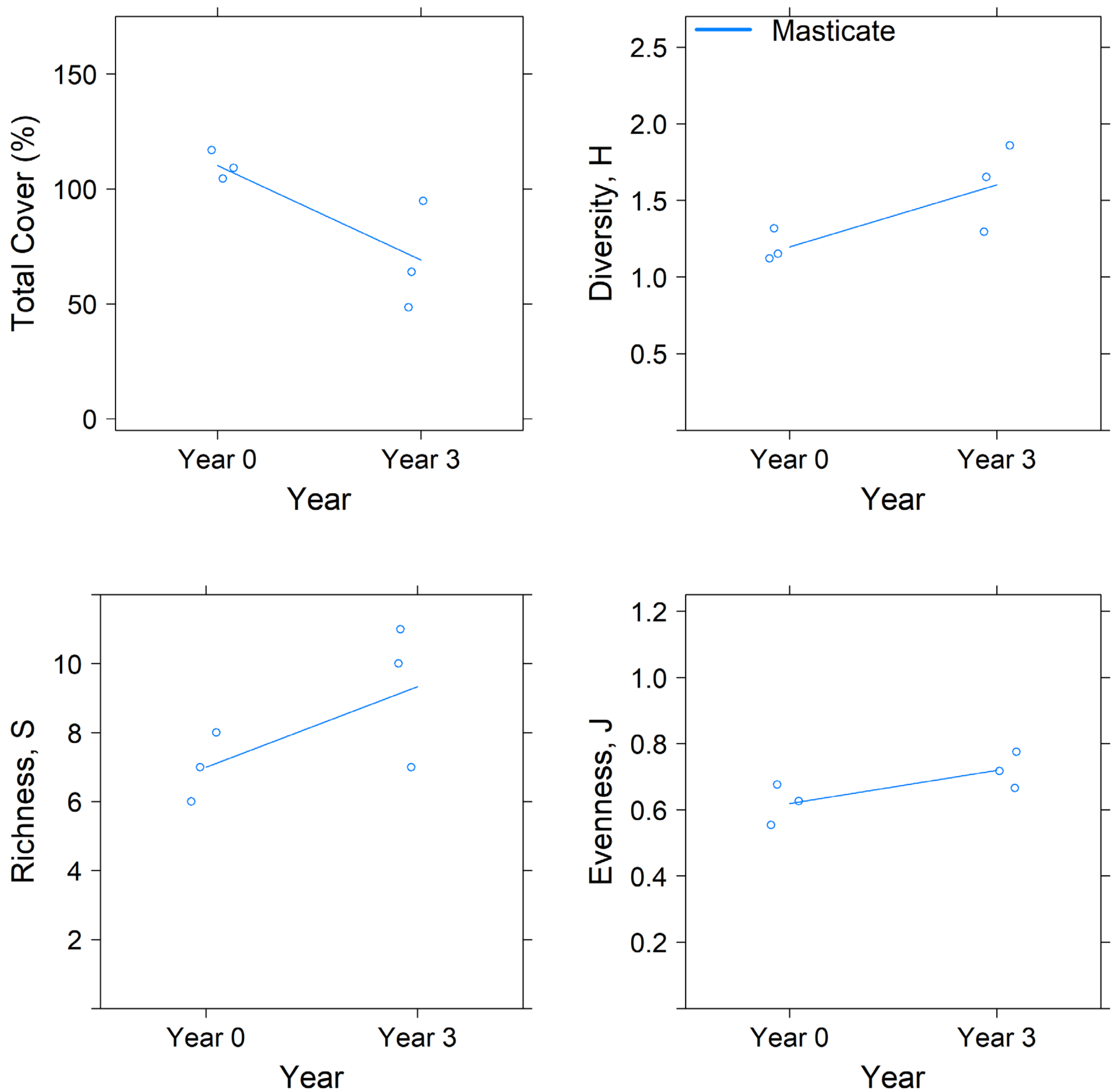

Figure 3-15. Unit 31 Containment Line community structure from Baseline (2014) to three years after mastication (2021). Three masticated transects were analyzed in Unit 31 Containment Line.

Bare ground and herbaceous cover generally increased over time for Year 3 Units (Figures 3-16 and 3-17). There was no evidence that Unit affected bare ground or herbaceous cover nor that an interaction between Unit and age may contribute to the observed variation in bare ground cover and herbaceous cover. There was statistical evidence that age of the Unit (Baseline vs. Year 3) influenced bare ground and herbaceous cover (Table 3-2).

Table 3-2. Mixed-design ANOVA results for BLM Area B Subunit A and Unit 31 Containment Lines bare ground and herbaceous cover.

Factor	Bare Ground		Herbaceous Cover	
	F	*P*	*F*	*P*
Unit	0.162	0.699	0.002	0.967
Age	54.735	1.50E-04	39.856	3.99E-04
Unit*Age	0.191	0.676	0.044	0.841

Both Year 3 Units exhibited more substantial increases in mean bare ground cover than in mean herbaceous cover between Baseline and 2021 (Figures 3-16 and 3-17). Bare ground cover in BLM Area B Subunit A Containment Line and Unit 31 Containment Line increased between Baseline and Year 3 surveys by approximately 24% and 21%, respectively. Mean percent herbaceous cover increased similarly between Year 3 units. Herbaceous cover in BLM Area B Subunit A Containment Line increased by approximately 13% and herbaceous cover in Unit 31 Containment Line increased by 14%.

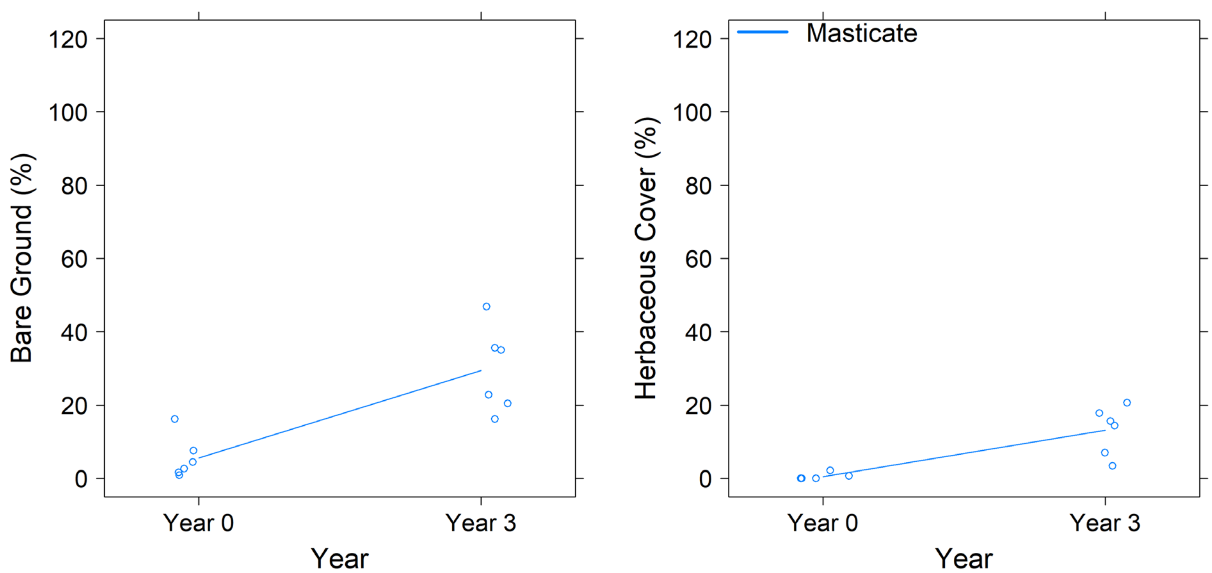

Figure 3-16. BLM Area B Subunit A Containment Line bare ground and herbaceous cover between Baseline (2015) and Year 3 (2021). Six masticated transects were analyzed in BLM Area B Subarea A Containment Line.

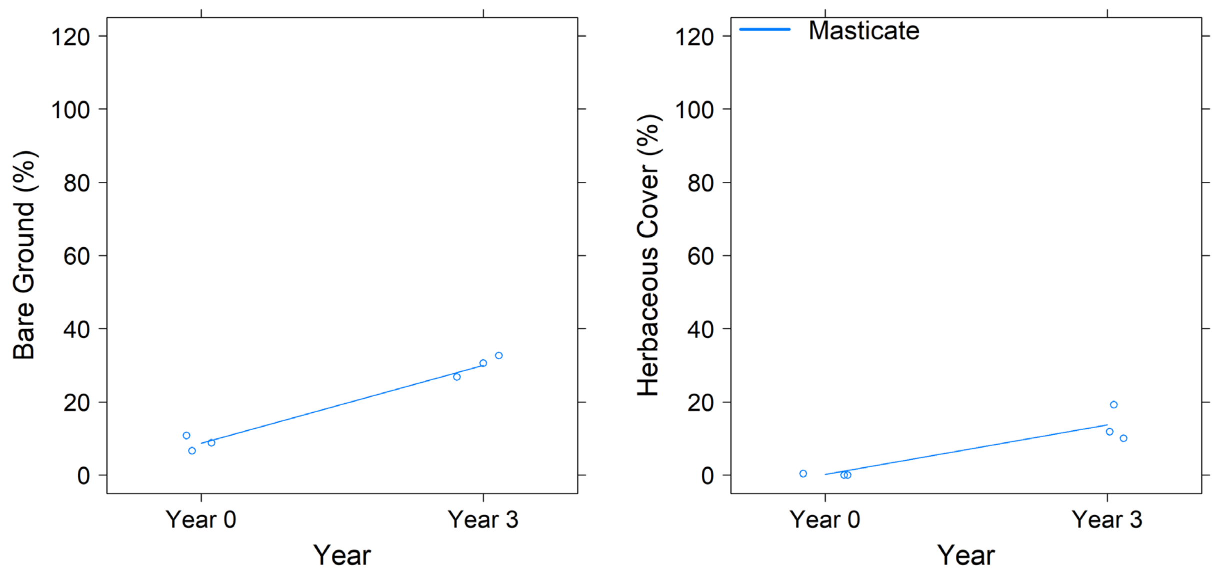

Figure 3-17. Unit 31 Containment Line bare ground and herbaceous cover between Baseline (2014) and Year 3 (2021). Three masticated transects were analyzed in Unit 31 Containment Line.

Results of a PERMANOVA used to examine differences in community composition among age and Units suggest that overall variation in community composition was influenced by both Unit and age. There was no evidence that an interaction between Unit and age affected community composition (Table 3-3). This indicates that the types and abundances of species within each Unit were different and that community composition was different between Baseline and post-mastication. Rank-abundance curves illustrate species richness and evenness in each Unit between Baseline and Year 3 surveys (Figures 3-18 and 3-19).

Table 3-3. Two-way PERMANOVA results for BLM Area B Subunit A and Unit 31 Containment Lines community compositions, based on Bray-Curtis distance matrices.

Factor	*F*	*p*
Age	7.838	0.0003
Unit	3.216	0.018
Age*Unit	0.928	0.438

Community composition differed between Year 3 Units over time. Shaggy-barked manzanita was the dominant species in BLM Area B Subunit A both in Baseline and Year 3 surveys ($C_{BLMB\_A,\ Year\ 0}$ = 70%, $C_{BLMB\_A,\ Year\ 3}$ = 61%). Shaggy-barked manzanita and chamise were co-dominant in Unit 31 Containment Line; shaggy-barked manzanita cover was 54% in Baseline and 43% in Year 3, while chamise cover was 28% in Baseline and 24% in Year 3. Species richness increased between Baseline and 2021 in both Units. Additional species observed in BLM Area B Subunit A Containment Line in 2021 were peak rush-rose, golden yarrow, deerweed, pitcher sage, coast silk tassel, coast live oak, common snowberry, California yerba santa, dwarf ceanothus, red flowering currant, and an unknown species. Additional species observed in Unit 31 Containment Line in 2021 were deerweed, peak rush-rose, golden yarrow, tree lupine, common snowberry, and toyon (Figures 3-18 and 3-19).

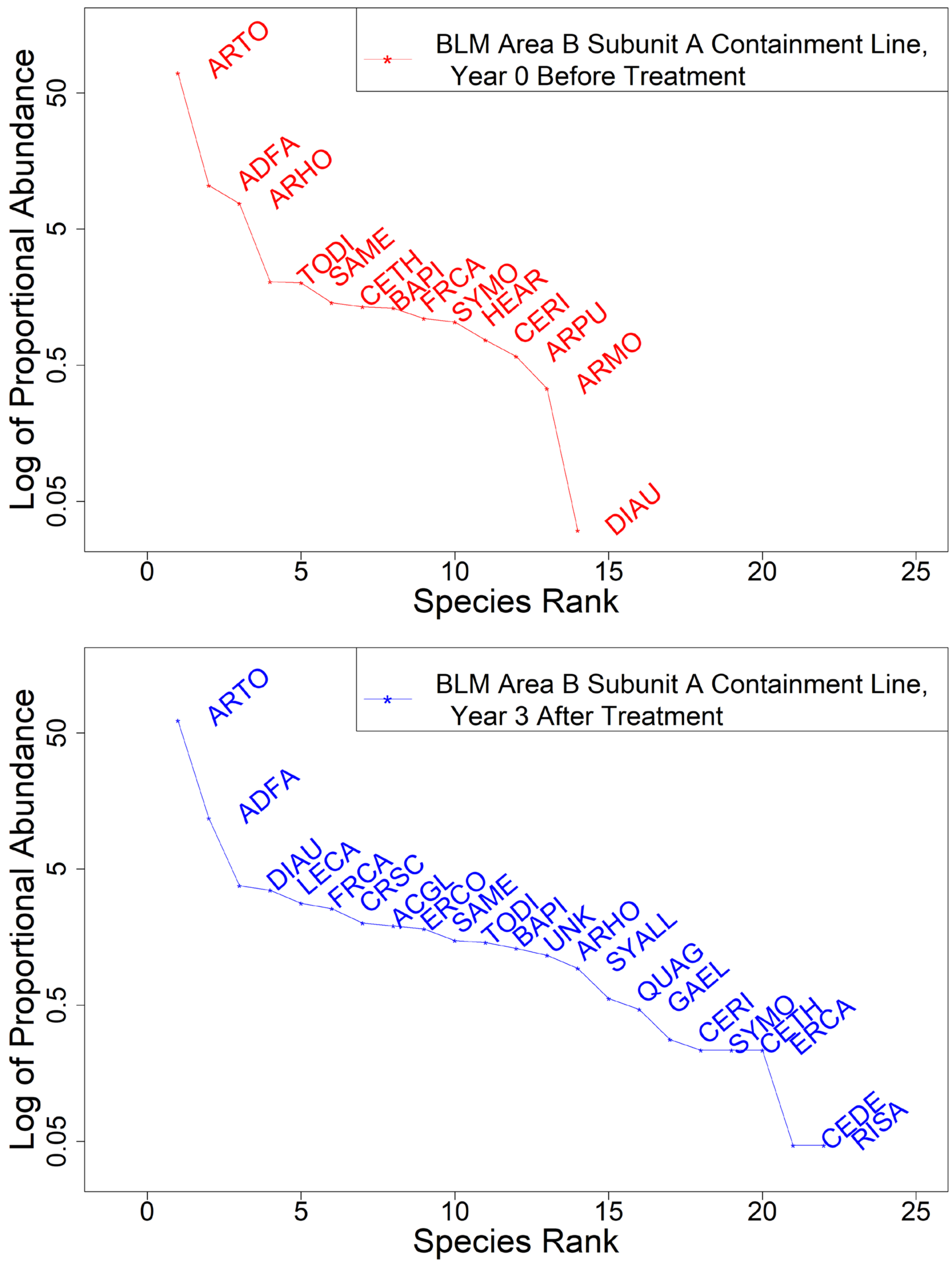

Figure 3-18. BLM Area B Subunit A Containment Line rank-abundance curves between Baseline (2015) and Year 3 (2021). New species observed in Year 3 surveys include peak rush-rose (*Crocanthemum scoparium*), golden yarrow (*Eriophyllum confertiflorum*), deerweed (*Acmispon glaber*), pitcher sage (*Lepechinia calycina*), coast silk tassel (*Garrya elliptica*), coast live oak (*Quercus agrifolia*), common snowberry (*Symphoricarpos albus*), California yerba santa (*Eriodictyon californicum*), dwarf ceanothus (*Ceanothus dentatus*), red flowering currant (*Ribes sanguineum*) and unknown. Species present in Baseline surveys, but absent in Year 3 were toyon (*Heteromeles arbutifolia*), Toro manzanita (*Arctostaphylos montereyensis*), and sandmat manzanita (*Arctostaphylos pumila*). Six masticated transects were analyzed in BLM Area B Subunit A Containment Line. Y-axis is log_{10} scale.

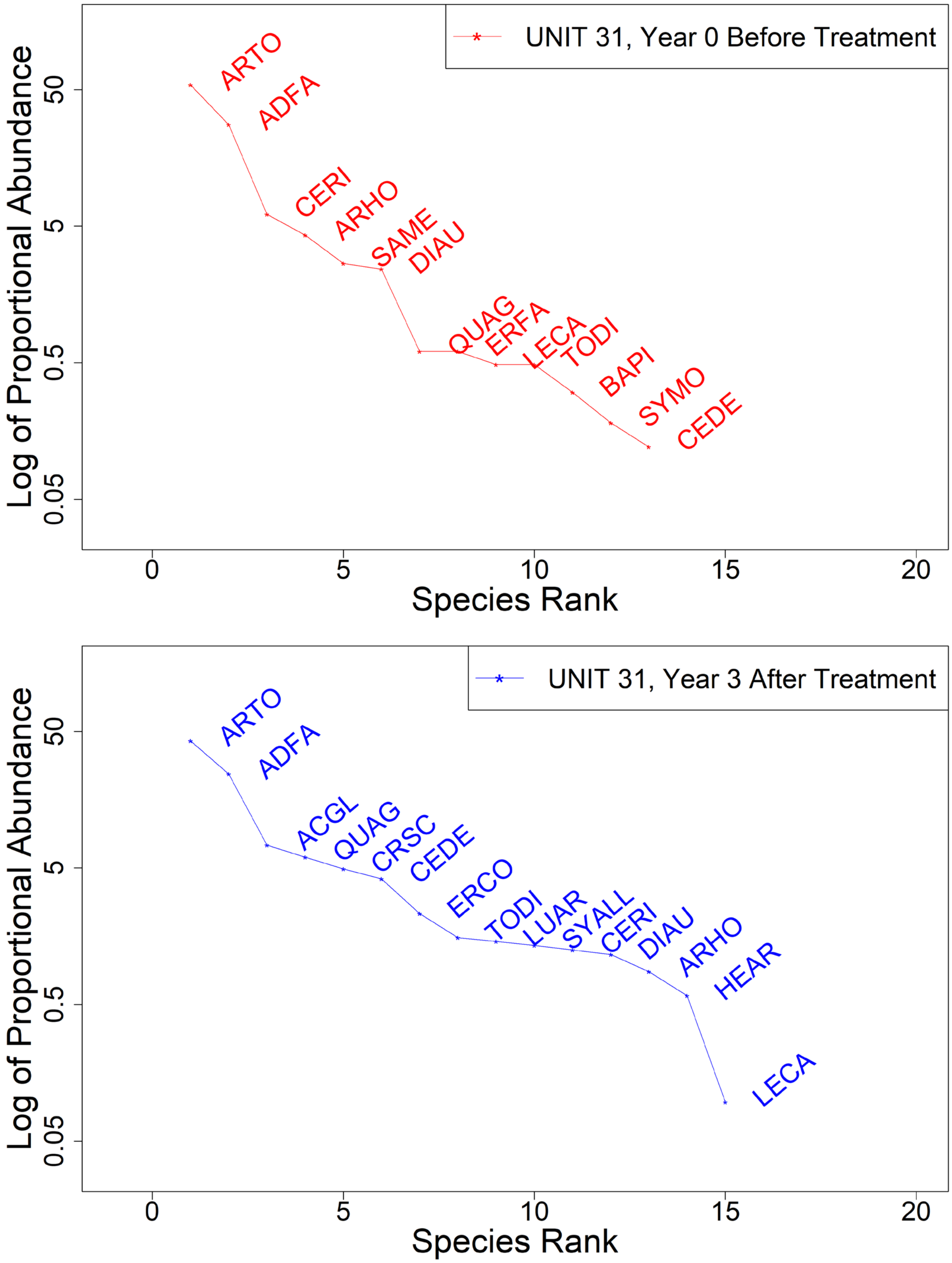

Figure 3-19. Unit 31 Containment Line rank abundance curves between Baseline (2014) and Year 3 (2021). New species present in Year 3 surveys include deerweed (*Acmispon glaber*), peak rush-rose (*Crocanthemum scoparium*), golden yarrow (*Eriophyllum confertiflorum*), tree lupine (*Lupinus arboreus*), common snowberry (*Symphoricarpos albus*), and toyon (*Heteromeles arbutifolia*). Species present in Baseline surveys, but absent in Year 3 included black sage (*Salvia mellifera*), Eastwood's goldenbush (*Ericameria fasciculata*), coyote brush (*Baccharis pilularis*), and creeping snowberry (*Symphoricarpos mollis*). Three masticated transects were analyzed in Unit 31 Containment Line. Y-axis is $\log_{10}$ scale.

HMP shrub species varied between Units and no HMP shrub species that were present in Baseline fully recovered three years after mastication in either of the Year 3 Units. HMP shrub species observed in BLM Area B Subunit A Containment Line in Baseline were sandmat manzanita, Monterey ceanothus, Toro manzanita, and Hooker's manzanita. Sandmat manzanita and Toro manzanita were not observed in 2021 after mastication occurred whereas Monterey ceanothus and Hooker's manzanita were still present in 2021 but had decreased from Baseline cover. Monterey ceanothus, Hooker's manzanita, and Eastwood's goldenbush were present in Unit 31 Containment Line during Baseline surveys. Mean percent cover of Monterey ceanothus decreased from approximately 7% to 0.9% between Baseline and 2021, while Hooker's manzanita mean percent cover decreased from approximately 5% to 0.6% between Baseline and 2021. Eastwood's goldenbush was observed in Unit 31 Containment Line during Baseline surveys but was not observed in Year 3 surveys (Figures 3-20 and 3-21).

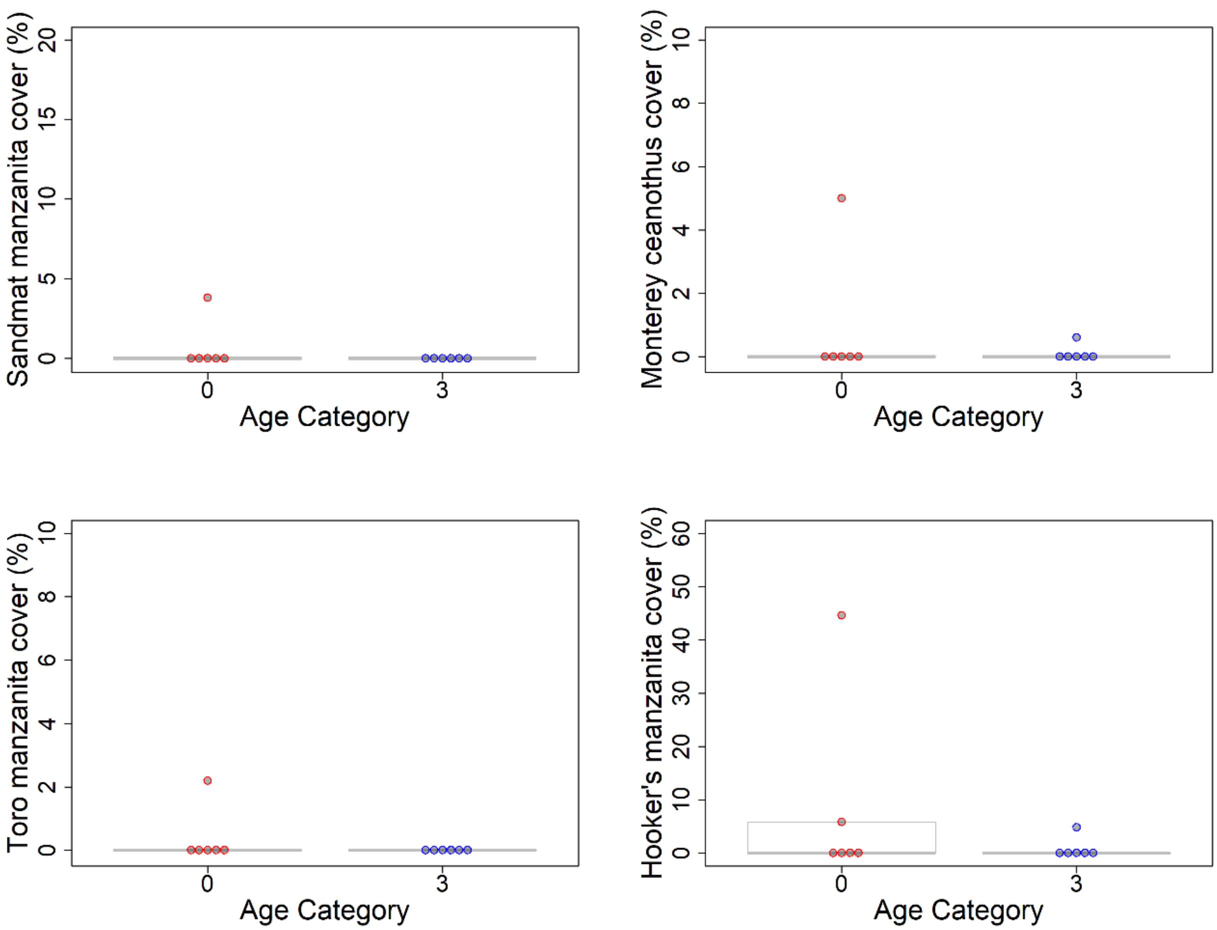

Figure 3-20. BLM Area B Subunit A Containment Line HMP shrub species cover between baseline (2015) and Year 3 (2021). Scales not equivalent. The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median and the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartiles, respectively. Six masticated transects were analyzed in BLM Area B Subarea A.

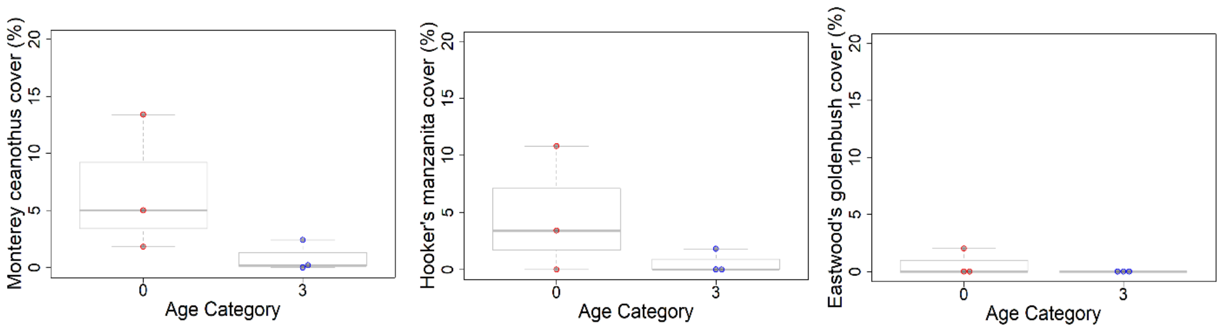

Figure 3-21. Unit 31 Containment Line HMP shrub species cover between Baseline (2014) and Year 3 (2021). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median and the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartiles, respectively. Three transects were analyzed in Unit 31 Containment Line.

NMDS ordinations illustrate that the 2021 community compositions for BLM Area B Subunit A and Unit 31 Containment Lines have diverged from their respective Baseline compositions (Figures 3-22 and 3-23). 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. Shrub community composition appeared to be more similar in BLM Area B Subunit A Containment Line between Baseline and 2021 than in Unit 31 Containment Line, as indicated by the closer proximity of ellipses in the Subunit A ordination.

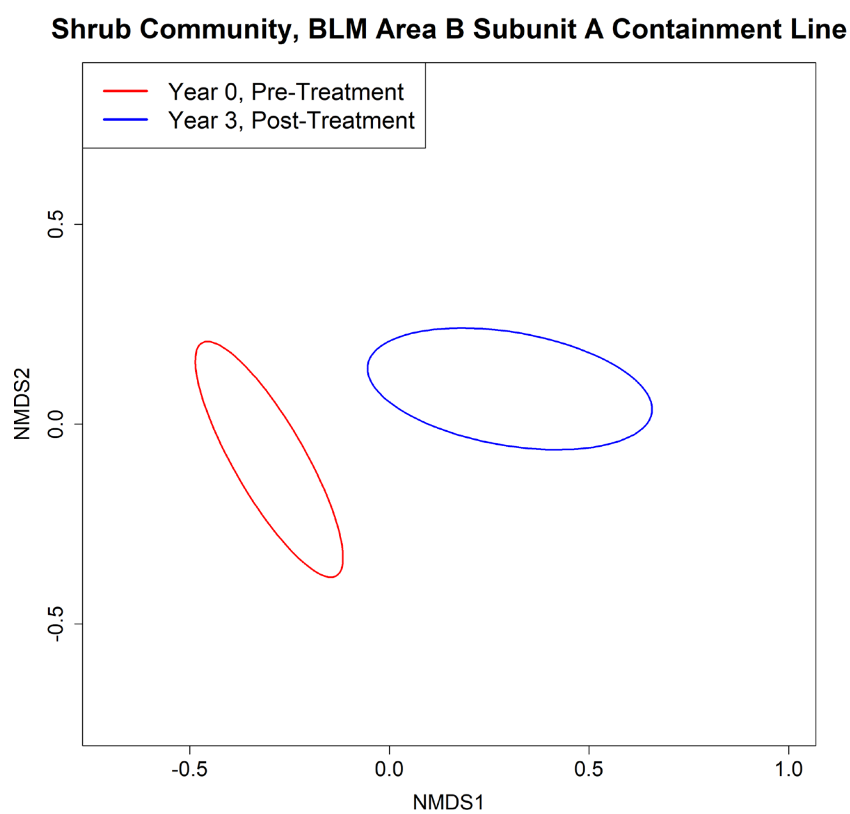

Figure 3-22. NMDS Ordination Plot BLM Area B Subunit A Containment Line community composition changes between Baseline (2015) and Year 3 (2021) surveys. Six masticated transects were analyzed in BLM Area B Subunit A Containment Line.

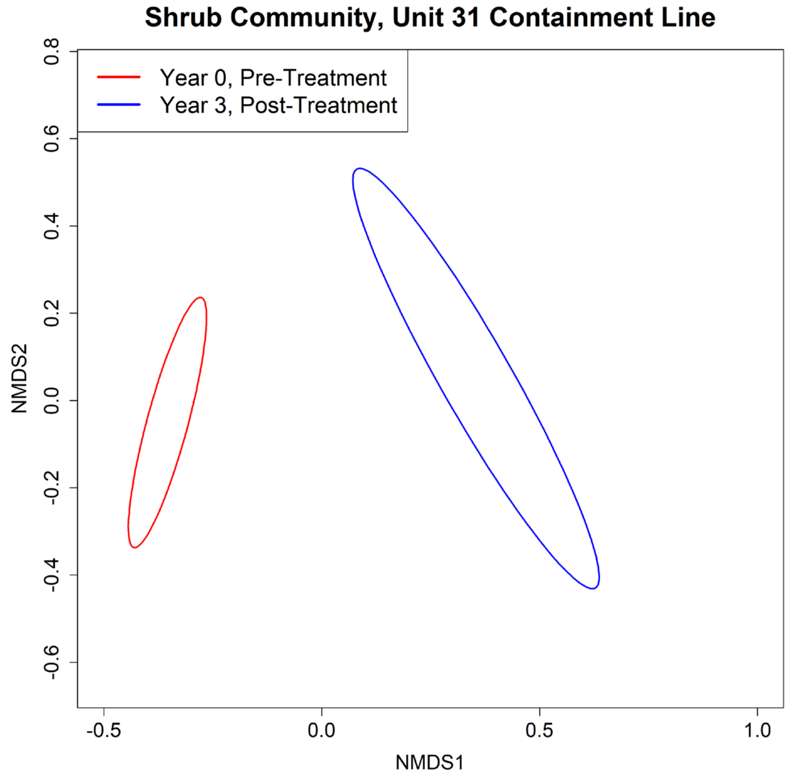

Figure 3-23. NMDS Ordination Plot Showing Unit 31 Containment Line community composition changes between Baseline (2014) and Year 3 (2021) surveys. Three masticated transects were analyzed in Unit 31 Containment Line.

3.4.7 Annual Grass Monitoring

Non-native annual grassland cover was surveyed and mapped for BLM Area B Subunit A, Unit 31, and Unit 25 Containment Lines in 2021. Non-native annual grass cover increased between Baseline and Year 3 surveys in all Year 3 Units (Appendix D, Figures D-1 through D-3). Estimated areas occupied by each density class in 2021 are summarized in Table 3-4. 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 41.19 acres in the BLM Area B Subunit A Containment Line, 15.22 acres in the Unit 31 Containment Line, and 6.32 acres in the Unit 25 Containment Line at the time of Year 3 monitoring (Table 3-4).

Table 3-4. Estimated area occupied by annual grasses in BLM Area B Subunit A and Unit 31 Containment Lines between Baseline (2015 and 2014, respectively) and Year 3 (2021).

Cover Class	Baseline (acres)	Year 1 (acres)	Year 3 (acres)
BLM Area B Unit A Containment Line			
1 (Low) = 1 - 5%	22.12	3.38	23.73
2 (Medium) = 6-25%	4.76	2.35	31.83
3 (High) = >25%	17.05	19.73	41.19
Total Acreage	**43.93**	**25.46**	**96.75**
Unit 31 Containment Line			
1 (Low) = 1 - 5%	1.68	4.06	5.74
2 (Medium) = 6-25%	1.38	10.65	6.55
3 (High) = >25%	1.42	13.91	15.22
Total Acreage	**4.48**	**28.62**	**27.51**
Unit 25 Containment Line			
1 (Low) = 1 - 5%	0.63	2.41	2.70
2 (Medium) = 6-25%	0.50	0.38	0.46
3 (High) = >25%	3.80	6.41	6.32
Total Acreage	**4.93**	**9.20**	**9.48**

3.4.8 Invasive and Non-Native Species Monitoring

Of the target invasive species, only jubata grass was observed in BLM Area B Subunit A Containment Line (Appendix E, Figure E-1). No target invasive species were observed in the Containment Lines of Units 25 or 31 in 2021. Minor occurrences of non-native herbaceous cover were observed during transect monitoring in BLM Area B Subunit A Containment Line and Unit 31 Containment Line but not in the Containment Line of Unit 25 (Appendix G, Tables G-1 and G-2).

4 YEAR 5 VEGETATION SURVEYS: UNIT 25 AND UNITS 13, 20, AND 31 CONTAINMENT LINES

4.1 Introduction

Year 5 Units included Unit 25 and the Containment Lines of Units 13, 20, and 31 (Figure 4-1). These Units were masticated in 2016 as part of environmental cleanup operations involving preparations for prescribed burns and MEC removal. The Containment Lines of Units 25 and 31 were partially re-masticated in 2018 (see Section 3.0). Baseline surveys occurred in 2014 for Units 25 and 31, and 2015 for the Containment Lines of Units 13 and 20 (Tetra Tech and EcoSystems West, 2015a; Burleson, 2016). These surveys included meandering transects 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; transects to sample shrub composition in the maritime chaparral (Unit 25 and Units 13 and 20 Containment Lines); and annual grass monitoring. Year 1 surveys occurred in 2017 and Year 3 surveys occurred in 2019 for all Year 5 Units. Both Year 1 and Year 3 surveys included density surveys for the HMP annual species sand gilia, seaside bird's-beak, and Monterey spineflower and annual grass surveys (Burleson, 2019a).

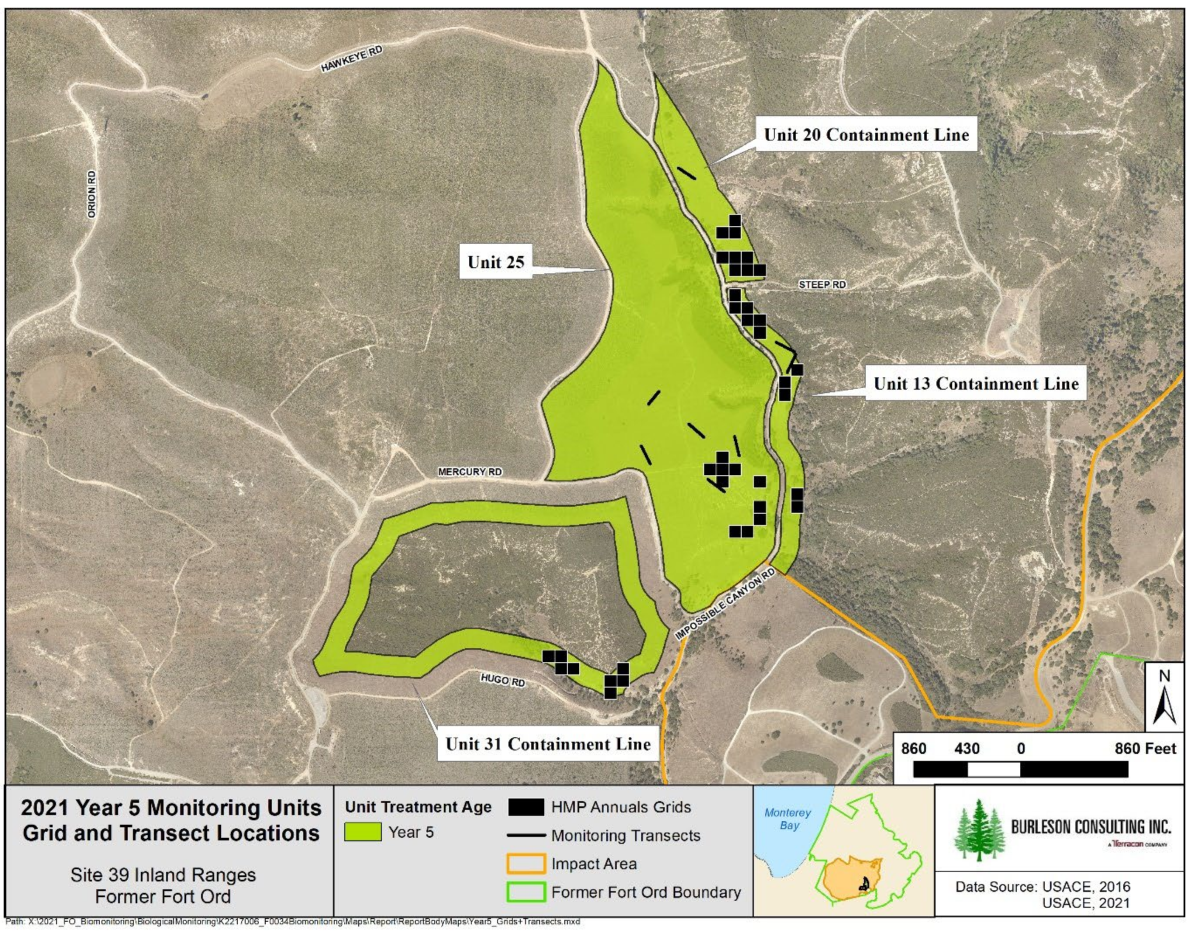

Figure 4-1. Unit 25 and Units 13, 20, and 31 Containment Lines HMP Annuals Grids and HMP Shrub Transects Surveyed for Year 5 in 2021.

4.2 Unit 25 and Units 13, 20, and 31 Containment Lines: Setting

Unit 25 encompasses an area of 95 acres. This Unit was initially slated for a prescribed burn, but due to significant risk of an escaped wildfire (difficult terrain and proximity to residential areas), the Army decided to masticate the entire Unit. This action was coordinated with USFWS which affirmed that it was within the allowed activities described in the PBO (USFWS, 2019). The Unit is located east of Riso Ridge Road and west of Impossible Canyon Road in the southeast portion of former Fort Ord. Unit 25 has gently rolling topography in the western portion, with a steep, east-facing slope dominated by coast live oak woodland in the eastern portion bordering Impossible Canyon Road. Abandoned roads with varying amounts of vegetative overgrowth cross the Unit along ridgelines providing some degree of unobstructed access to the interior portions of the Unit. Prior to mastication, Unit 25 was dominated by mature maritime chaparral vegetation. Non-meadow annual grassland and disturbed areas occur in the southeast portion of the Unit along Impossible Canyon Road. Relatively open chaparral is most extensive on south and east facing slopes in areas that appeared more recently disturbed.

The Containment Lines of Units 13 and 20 encompass 9 acres and 10 acres, respectively. These areas will serve as the primary containment (mastication only) areas for prescribed burns planned for Unit 31 immediately to the west. The Units are bordered to the west by Impossible Canyon Road and situated in the southeast portion of the former Fort Ord Impact Area and immediately northwest of the Laguna Seca Raceway. Unit 13 is dominated by mature maritime chaparral to the north and coast live oak woodland and disturbed non-native grassland to the south. The Unit is situated along the lower half of a steep west facing slope forming Impossible Canyon. A sizable vernal pool (Pond 16) containing emergent vegetation and known to support federally threatened California tiger salamander (*Ambystoma californiense*) is located in the western portion of Unit 13 and is surrounded by annual grassland and coyote brush scrub. Unit 20 is contiguous with Unit 13 to the south and is more heavily dominated by maritime chaparral. There are scattered areas of oak woodland in the southernmost and northernmost section and a large area of past disturbance with non-native fill material in the south-central portion of the Unit. Several old north-south trending roads bisect the Unit providing some degree of unobstructed access to the interior portions of the Unit.

The Unit 31 Containment Line was masticated in 2016 and a portion was re-masticated in 2018 in preparation for prescribed burns (see Section 3). The Unit is located east of Riso Ridge Road and west of Impossible Canyon Road in the southeast portion of the area of former Fort Ord. Unit 31 is dominated by mature maritime chaparral, coast live oak woodland, and disturbed non-native grassland. The Unit is situated as a southeast facing bowl sloping down to a narrow valley that was evidenced to have been heavily used for infantry training when the base was active. The relatively flat valley is bordered by dense coast live oak woodland on a steep north facing slope immediately to the south and comprises patchy non-native grassland with sparse to locally dense coyote brush (*Baccharis pilularis*).

4.3 Unit 25 and Units 13, 20, and 31 Containment Lines: Methods

In accordance with methods outlined in the Revised Protocol (Tetra Tech and EcoSystems West, 2015b) and Section 2 of this report, the 2021 Year 5 follow-up monitoring in Unit 25 and Units 13, 20, and 31 Containment Lines 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 Unit 25 and Units 13 and 20 Containment Lines to evaluate how the density of these species responded to treatment. Surveys occurred on April 19, 20, 21, 22, 26, 27, 28, and May 6, 2021.

- 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. Surveys occurred on June 17, 18, and 19, 2021.

- Repeated sampling of transects that were monitored in 2014, 2015, and 2019 surveys (Tetra Tech and EcoSystems West, 2015a; Burleson, 2016; Burleson, 2019b). This survey effort was conducted to assess shrub species composition of the sensitive maritime chaparral community after treatment. Surveys occurred on July 7, 8, and 12, 2021.

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

4.4 Unit 25 and Units 13, 20, and 25 Containment Lines: Results and Discussion

Burleson surveyed 38 HMP monitoring grids in the Year 5 Units, with 10 grids in Unit 25, 11 grids in Unit 13 Containment Line, 9 grids in Unit 20 Containment Line, and 8 grids in Unit 31 Containment Line. Maps of survey grids for the sampled Units are provided in Appendix B (Figures B-7 through B-15). All HMP grids in these Units were masticated.

4.4.1 Sand Gilia

Sand gilia was present in the Containment Lines of Units 13 and 31 in 2021 (Figures 4-2 through 4-5). Sand gilia was most prevalent in Units 13 and 31 Containment Lines and was only present in Unit 25 and Unit 20 Containment Line at relatively low densities in Year 3 and Year 1, respectively (Figures 4-2 through 4-5; Appendix B, B-10, B-13, B-16, and B-19). Sand gilia was present in Unit 13 Containment Line with a total frequency of occurrence of 36% (4 of 11 grids) in 2015, 45% (5 of 11 grids) in 2017, 36% (4 of 11 grids) in 2019, and 27% (3 of 11 grids) in 2021. In Unit 31 Containment Line no sand gilia was present in 2014. Total frequency of occurrence was 88% (7 of 8 grids) in 2017, remained at 88% in 2019, and was 62% (5 of 8 grids) in 2021.

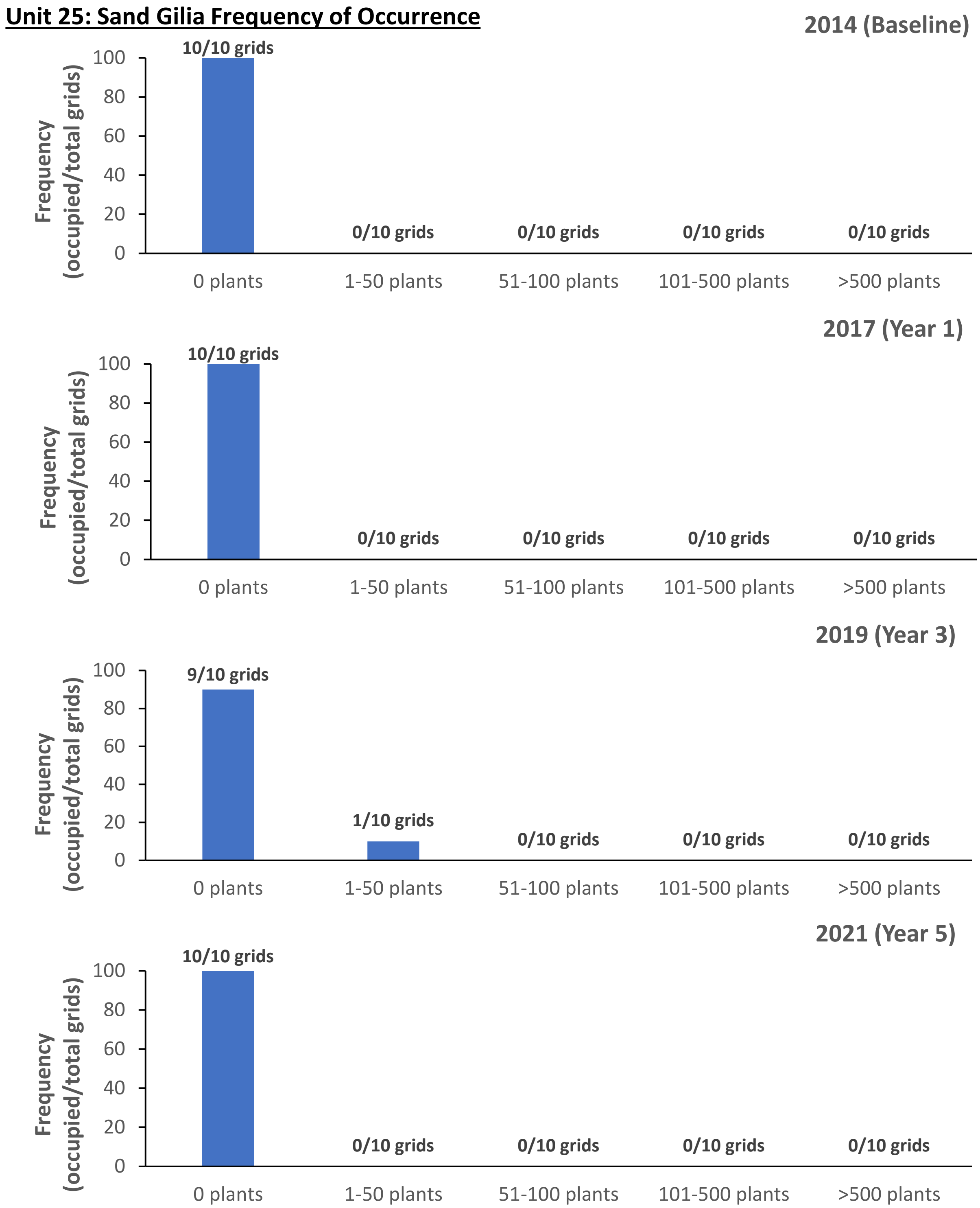

Figure 4-2. Unit 25 sand gilia occurrence in surveyed grids (n=10) between Baseline (2014) and Year 5 (2021).

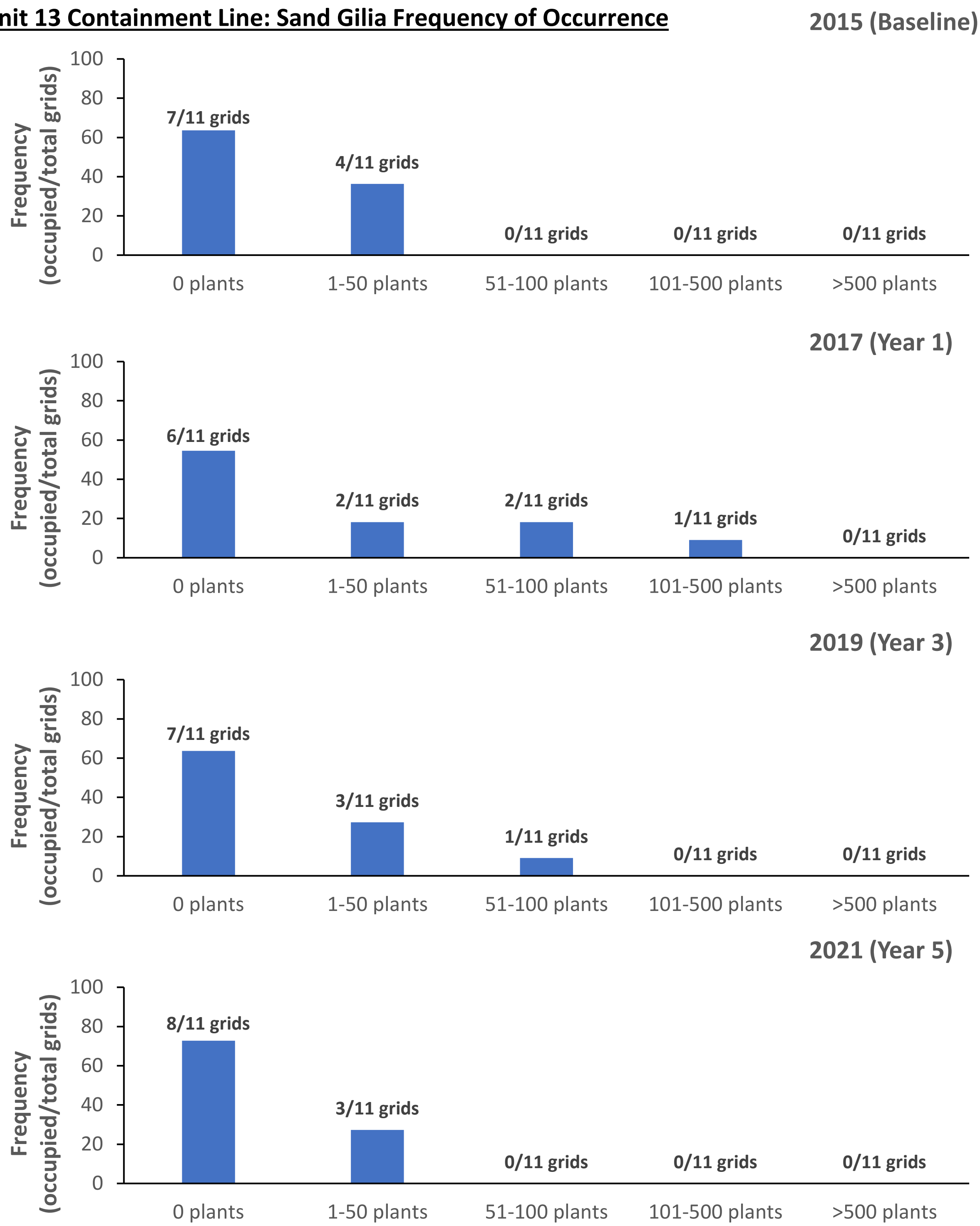

Figure 4-3. Unit 13 Containment Line sand gilia occurrence in surveyed grids (n=11) between Baseline (2015) and Year 5 (2021).

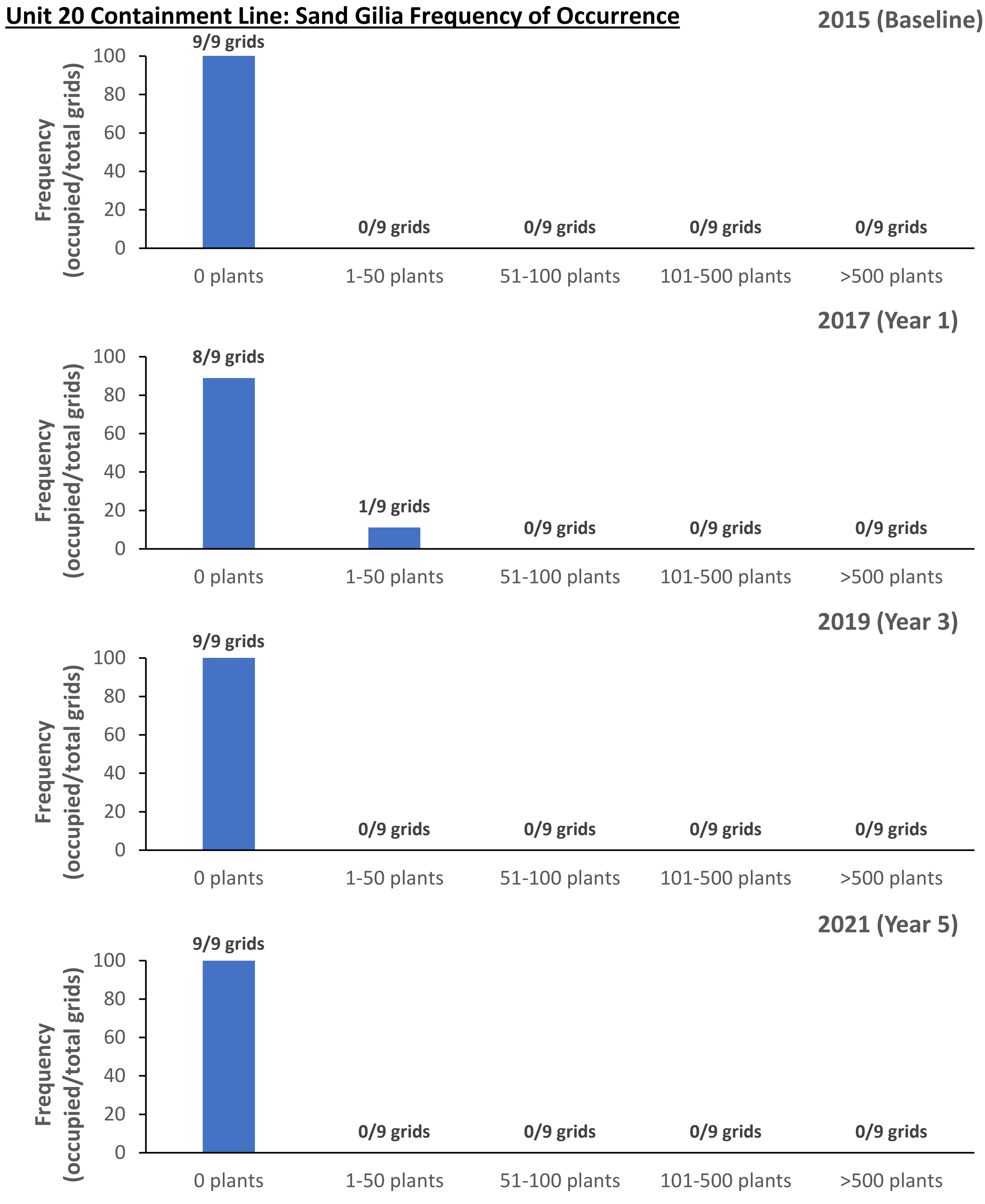

Figure 4-4. Unit 20 Containment Line sand gilia occurrence in surveyed grids (n=9) between Baseline (2015) and Year 5 (2021).

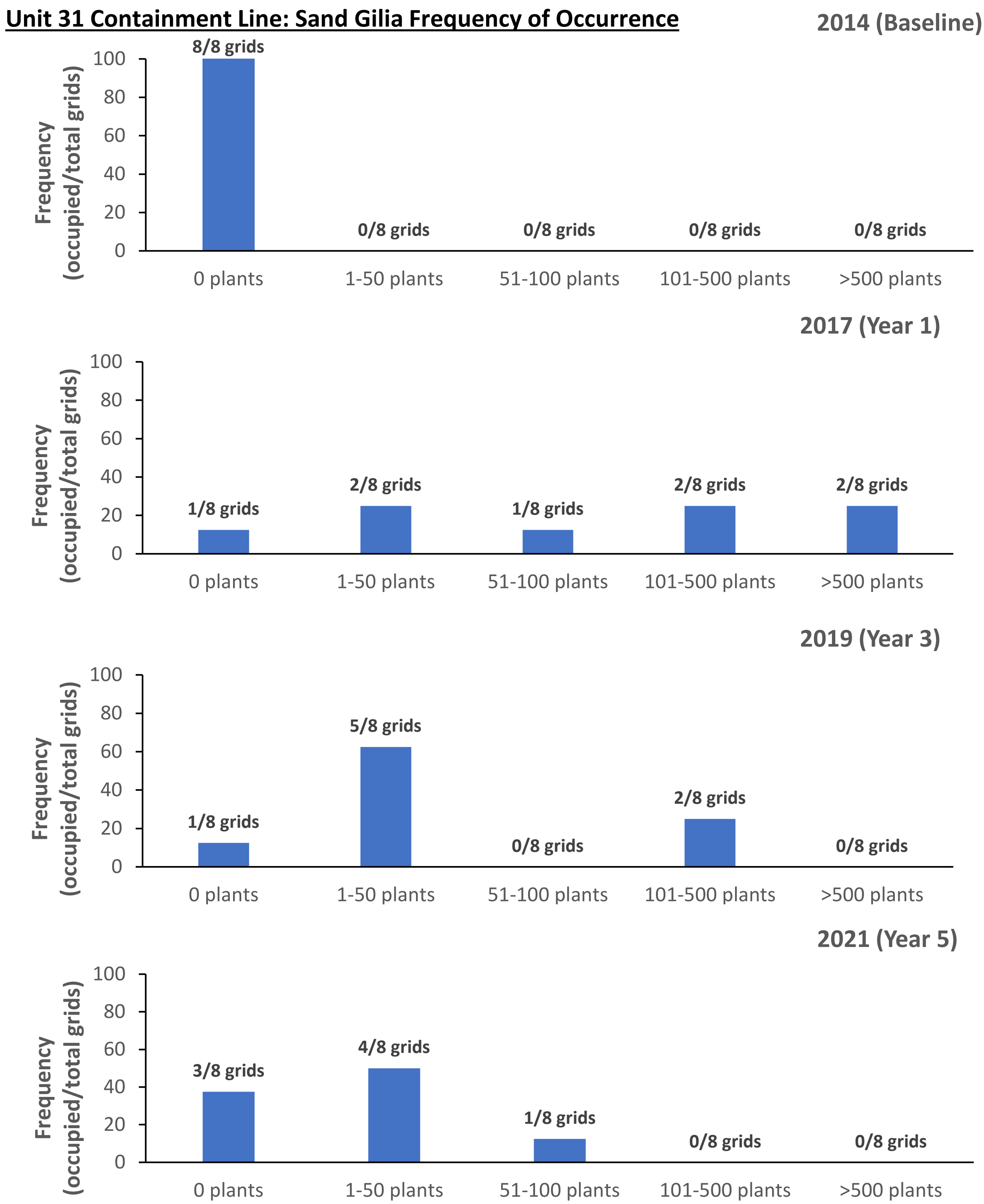

Figure 4-5. Unit 31 Containment Line sand gilia occurrence in surveyed grids (n=8) between Baseline (2014) and Year 5 (2021).

4.4.2 Seaside Bird's Beak

Seaside bird's beak was observed only in Unit 25 in 2021 (Figures 4-6 through 4-9; Appendix B, B-11, B-14, B-17, and B-20). Total frequency of occurrence in this Unit was 20% (2 of 10 grids) in both 2019 and 2021. Seaside bird's beak has not been observed in Units 13, 20 or 31 Containment Lines in Baseline or any follow-up survey year.

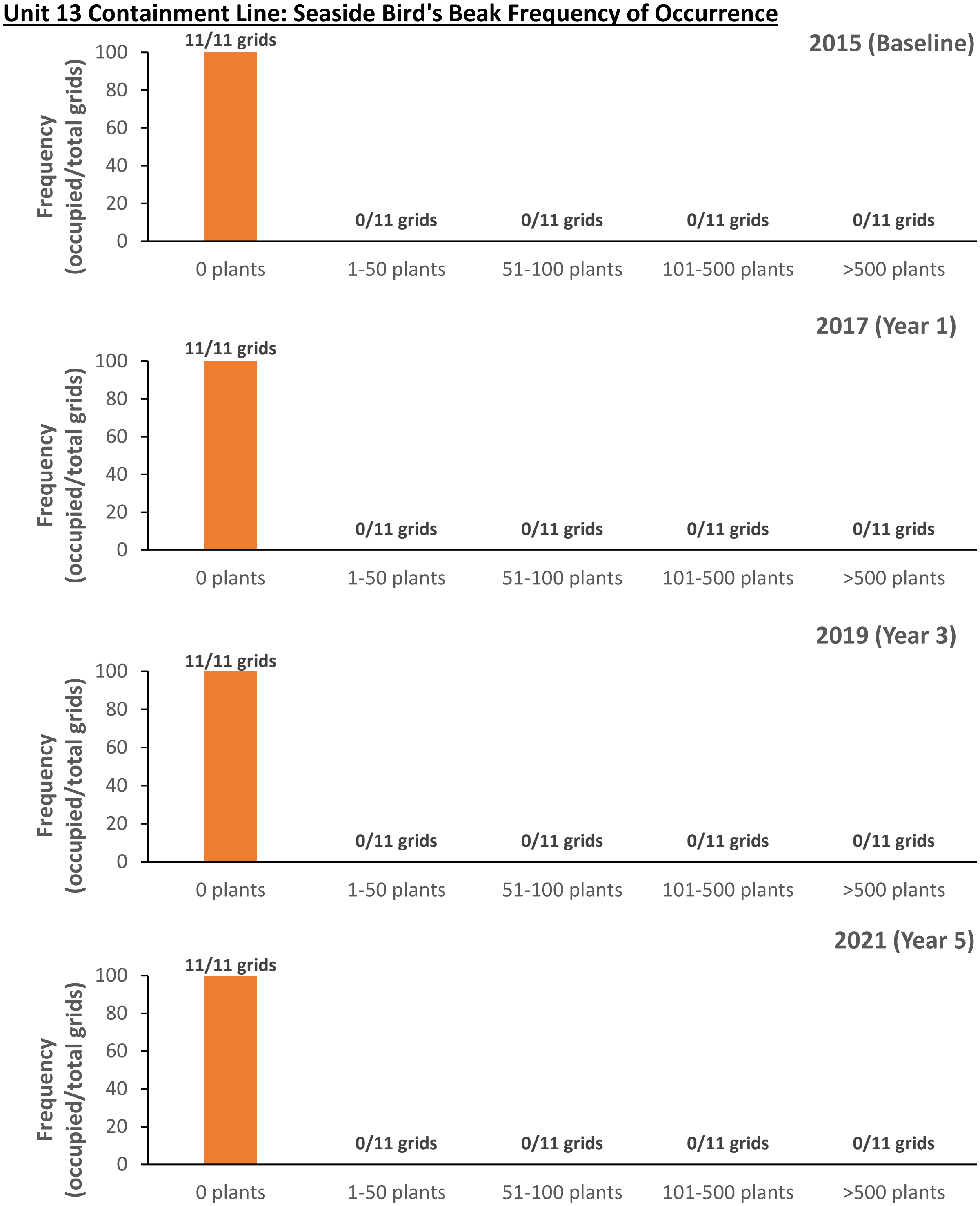

Figure 4-6. Unit 13 Containment Line seaside bird's beak occurrence in surveyed grids (n=11) between Baseline (2015) and Year 5 (2021).

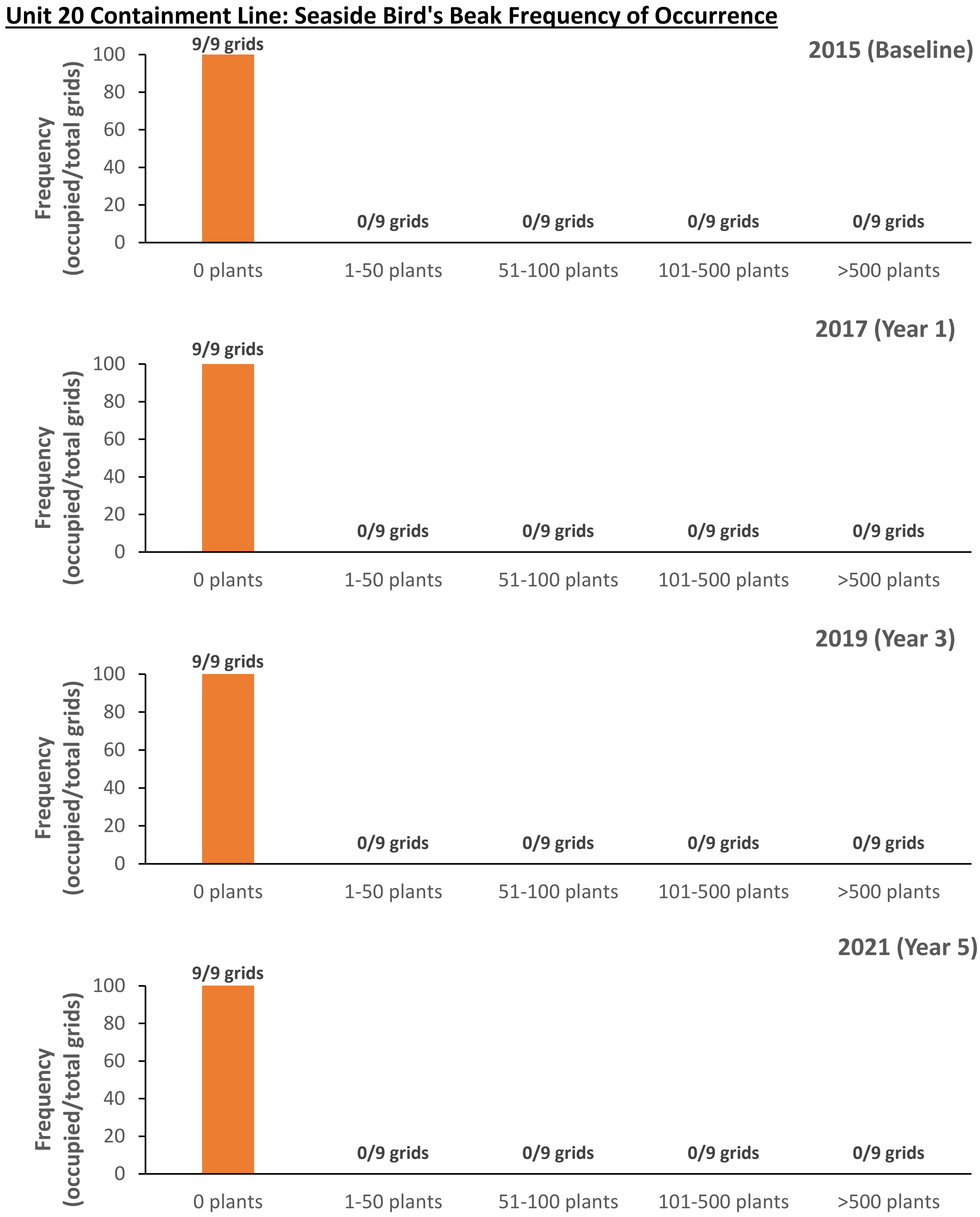

Figure 4-7. Unit 20 Containment Line seaside bird's beak occurrence in surveyed grids (n=9) between Baseline (2015) and Year 5 (2021).

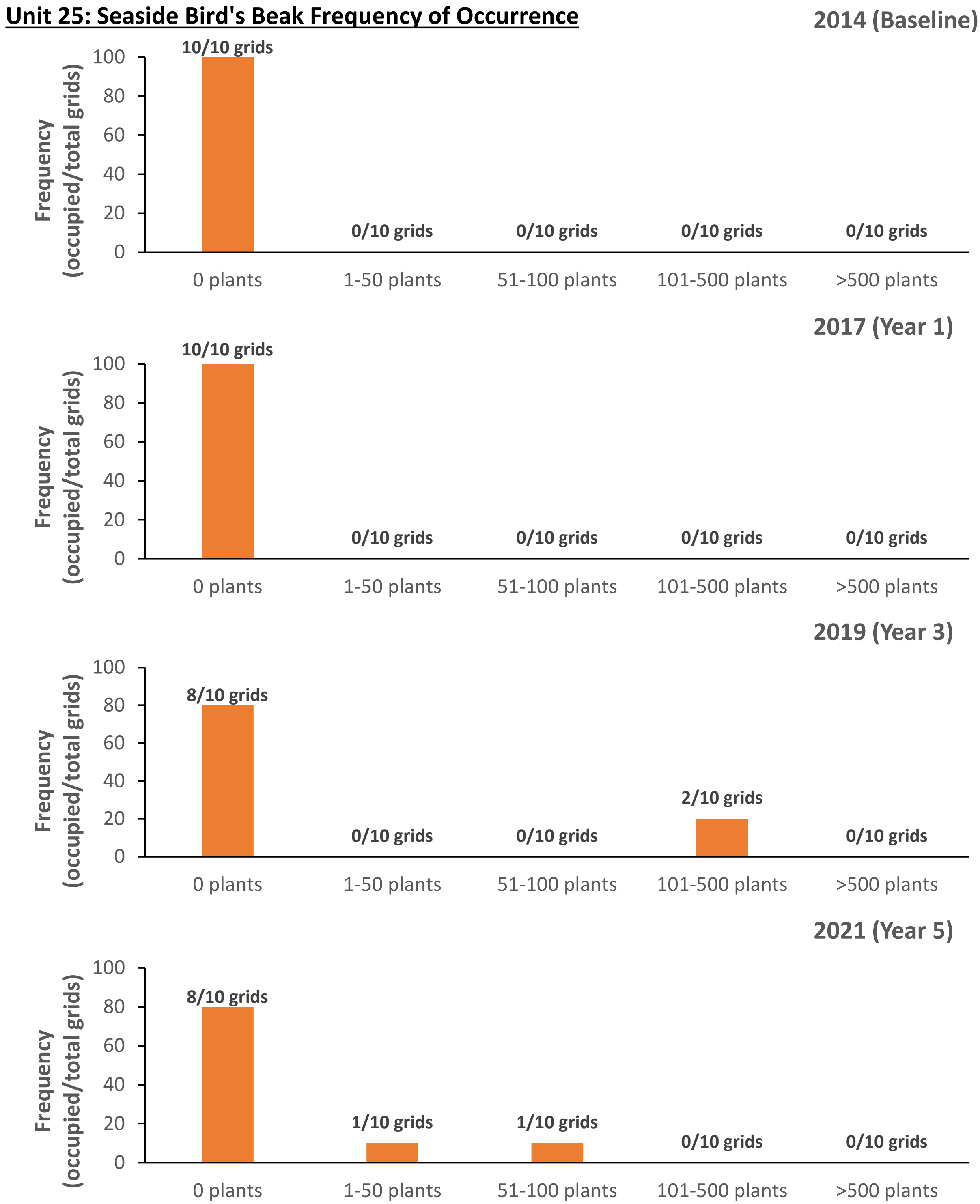

Figure 4-8. Unit 25 Containment Line seaside bird's beak occurrence in surveyed grids (n=10) between Baseline (2014) and Year 5 (2021).

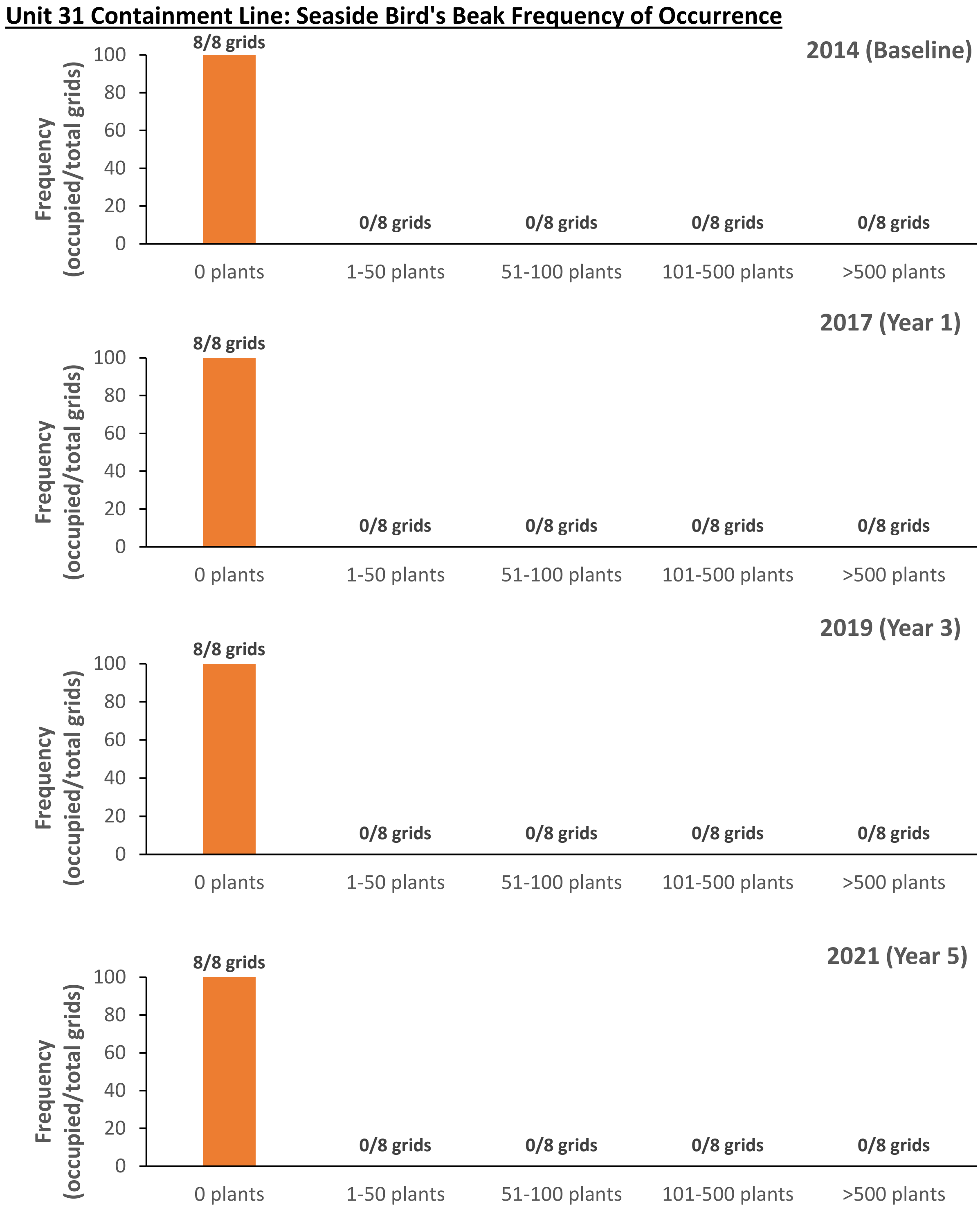

Figure 4-9. Unit 31 Containment Line seaside bird's beak occurrence in surveyed grids (n=8) between Baseline (2014) and Year 5 (2021).

4.4.3 Monterey Spineflower

Monterey spineflower was relatively abundant in all Year 5 Units in 2021 (Figures 4-10 through 4-13; Appendix B, Figures B-12, B-15, B-18, and B-21). Total frequency of occurrence in monitored plots in Unit 25 was 100% (10 of 10 grids) in 2014, 2017, and 2019 but decreased to 80% (8 of 10 grids) in 2021. Total frequency of occurrence of Monterey spineflower in Unit 13 Containment Line was 100% (11 of 11 grids) in all survey years (2015, 2017, 2019, and 2021). Likewise, in Unit 31 Containment Line, Monterey spineflower frequency of occurrence was 100% (8 of 8 grids) in all survey years (2014, 2017, 2019, and 2021). Monterey spineflower total frequency of occurrence in Unit 20 Containment Line was 100% (9 of 9 grids) in 2015 and 2017, then decreased to 89% (8 of 9 grids) in 2019 and decreased again to 67% (6 of 9 grids) in 2021.

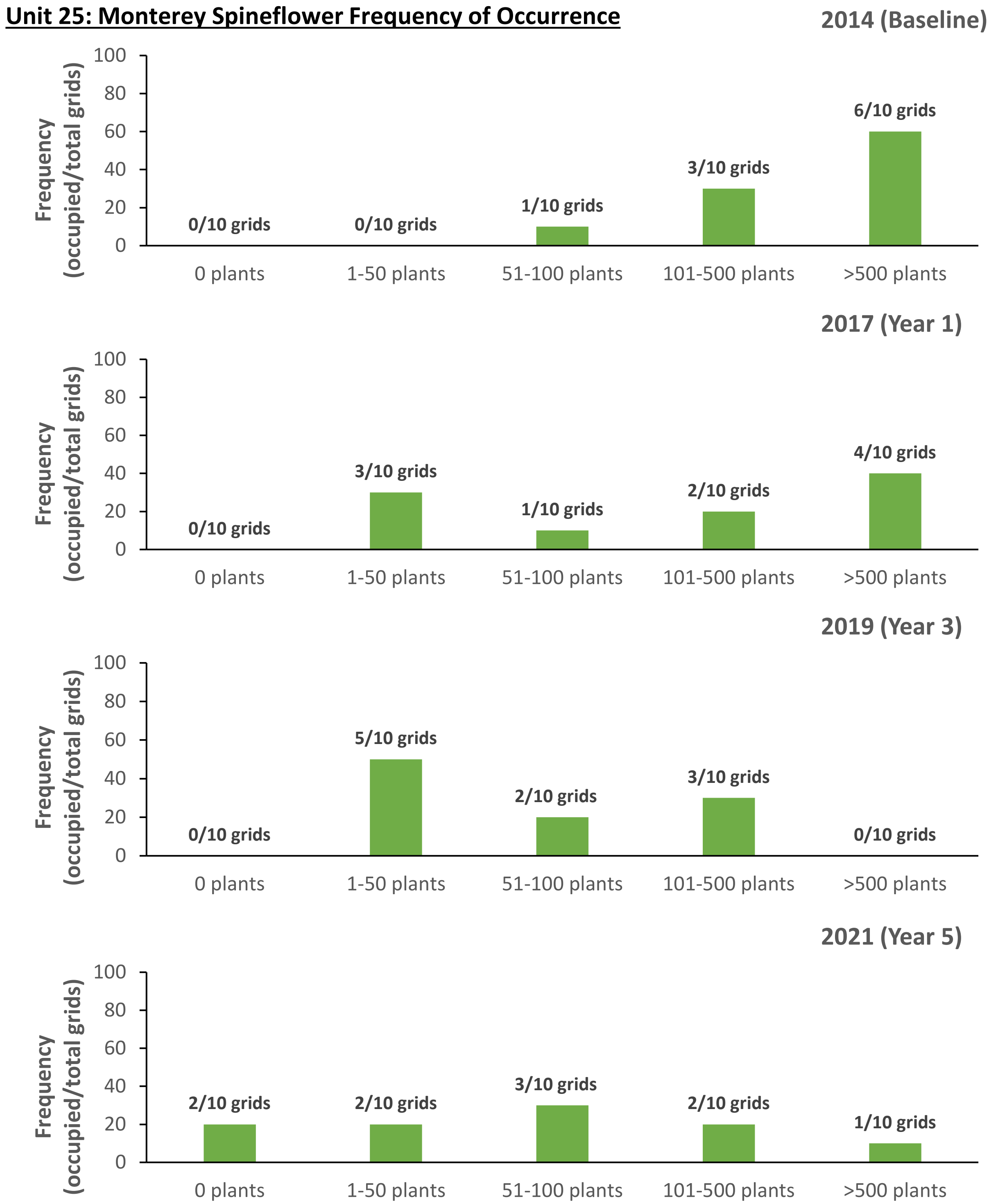

Figure 4-10. Unit 25 Monterey spineflower occurrence in surveyed grids (n=10) between Baseline (2014) and Year 5 (2021).

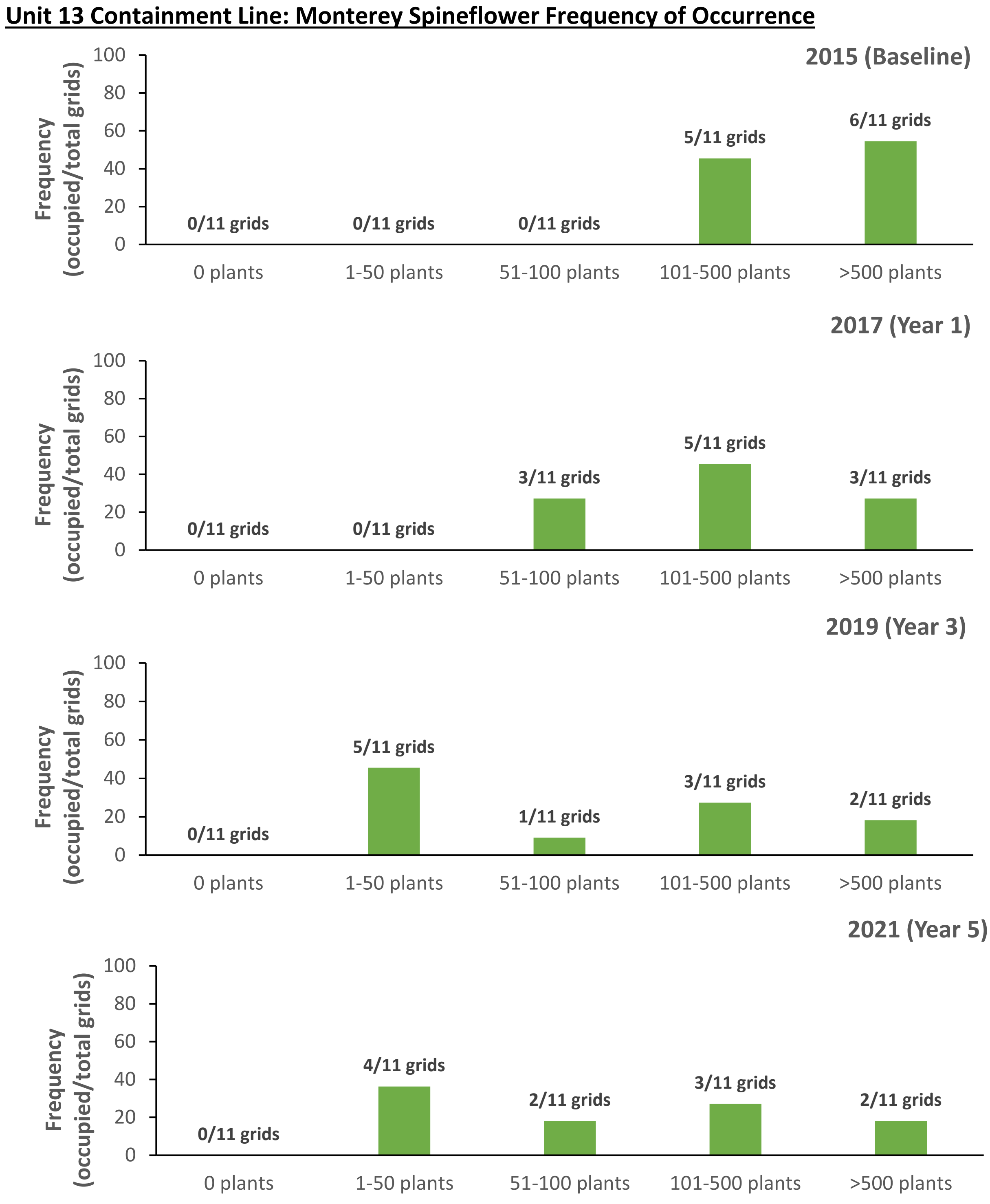

Figure 4-11. Unit 13 Containment Line Monterey spineflower occurrence in surveyed grids (n=11) between Baseline (2015) and Year 5 (2021).

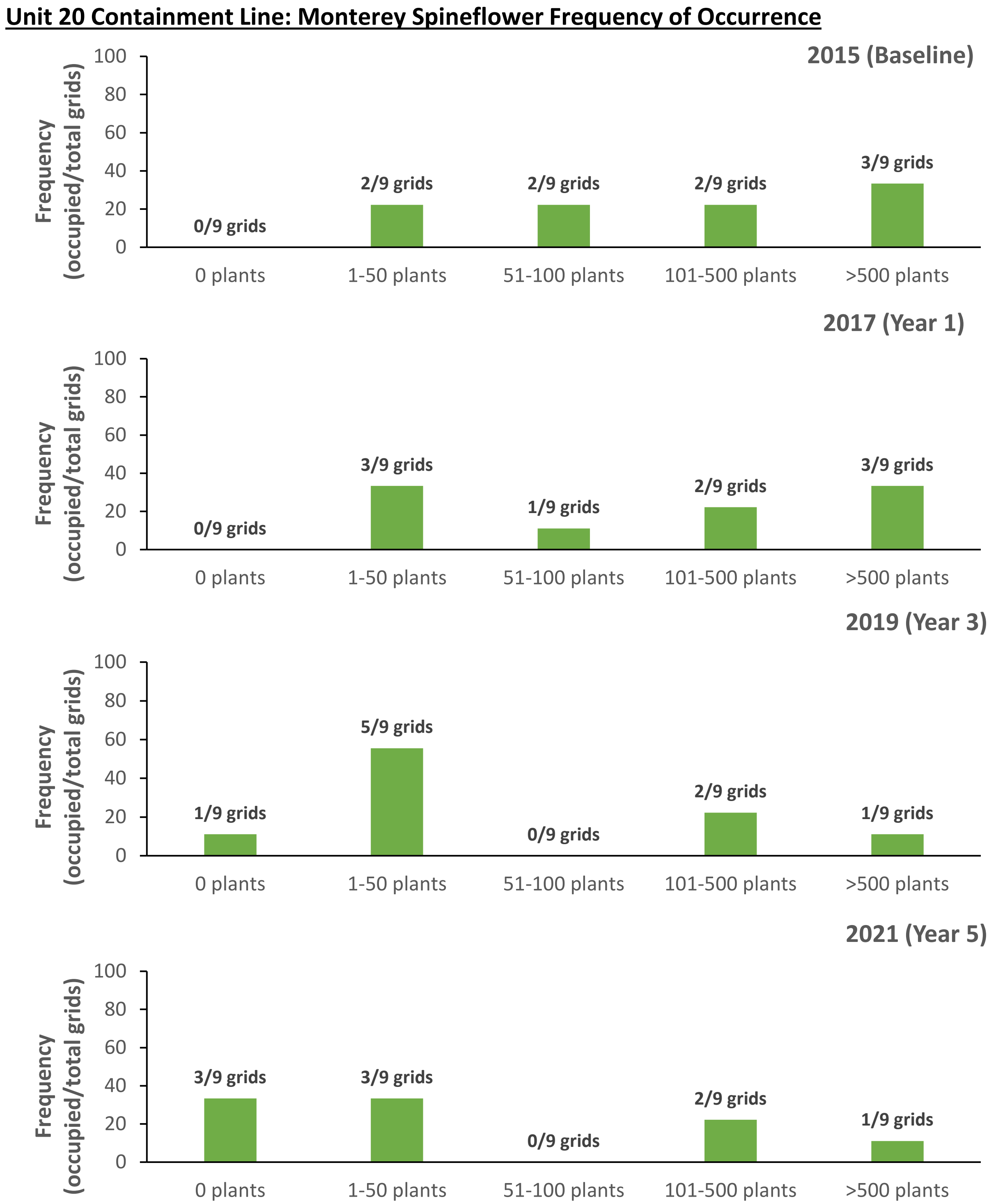

Figure 4-12. Unit 20 Containment Line Monterey spineflower occurrence in surveyed grids (n=9) between Baseline (2015) and Year 5 (2021).

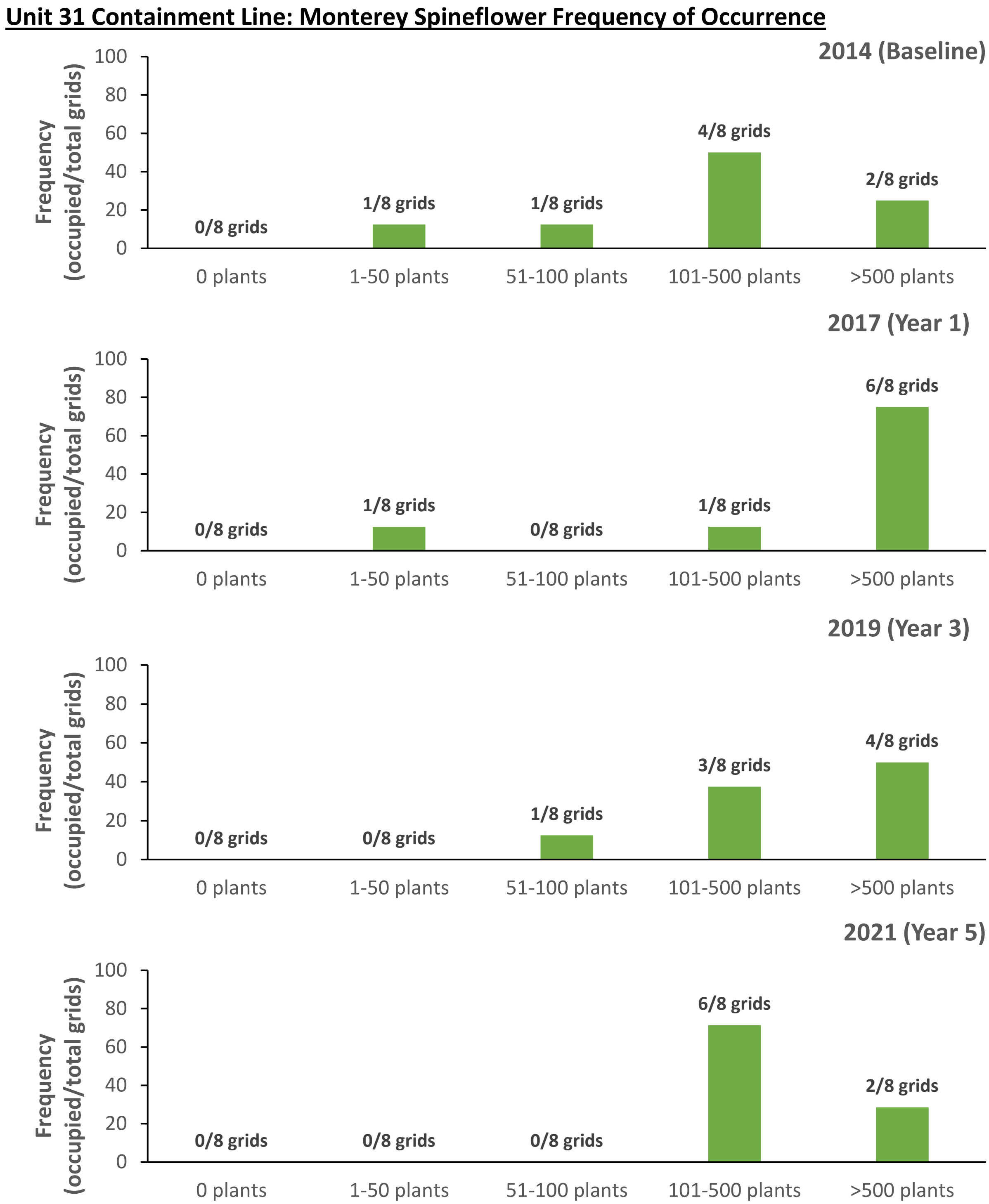

Figure 4-13. Unit 31 Containment Line Monterey spineflower occurrence in surveyed grids (n=8) between Baseline (2014) and Year 5 (2021).

4.4.4 Yadon's Piperia

A single occurrence of piperia was observed in the southeastern area of Unit 20 Containment Line (Appendix E, Figure E-2). No piperia individuals were observed in Unit 25 or the Containment Lines of Units 13 and 31 during 2021 surveys.

4.4.5 Effect of Treatment on HMP Density

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

4.4.6 Shrub Transect Monitoring

Shrub transects were sampled in Unit 25 (n = 5) and Units 13 (n = 2) and 20 (n = 1) Containment Lines in 2021 (Appendix C; Figures C-3 through C-5). Baseline transects were collected in 2014 for Unit 25 and in 2015 for Units 13 and 20 Containment Lines (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 2021). Community structure parameters in all Year 5 Units changed similarly through time.

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. Age appeared to influence mean percent cover, species richness and species evenness, but not species diversity. There was no evidence that Unit affected community composition, nor was there evidence of an interaction between Unit and age affecting community composition (Table 4-1).

Table 4-1. Mixed-design ANOVA results for Unit 25 and Units 13 and 20 Containment Lines.

Factor	Total Mean Cover		Species Richness		Species Evenness		Species Diversity	
	F	P	F	P	F	P	F	P
Unit	0.423	0.676	5.200	0.060	0.042	0.959	0.172	0.846
Age	17.271	6.00E-04	25.525	1.18E-04	5.704	0.022	0.398	0.682
Unit*Age	0.259	0.898	0.139	0.964	0.066	0.991	0.197	0.934

The general pattern of variation in community structure over time was consistent between Year 5 Units (Figures 4-14 and 4-16). Shrub cover decreased between Baseline and Year 3 but began recovering between Year 3 and Year 5 surveys in all Year 5 Units ($C_{U13,\ Year\ 0}$ = 109%, $C_{U13,\ Year\ 3}$ = 79%, $C_{U13,\ Year\ 5}$ = 83%; $C_{U20,\ Year\ 0}$ = 108%, $C_{U20,\ Year\ 3}$ = 66%, $C_{U20,\ Year\ 5}$ = 76%; $C_{U25,\ Year\ 0}$ = 106%, $C_{U25,\ Year\ 3}$ = 65%, $C_{U25,\ Year\ 5}$ = 69%). Species diversity and richness increased between Baseline and Year 3 and continued to increase at a lower rate or remained stable between Year 3 and Year 5 surveys in Unit 13 ($H_{U13,\ Year\ 0}$ = 0.98, $H_{U13,\ Year\ 3}$ = 1.3, $H_{U13,\ Year\ 5}$ = 1.4; $S_{U13,\ Year\ 0}$ = 4 species, $S_{U13,\ Year\ 3}$ = 8 species, $S_{U13,\ Year\ 5}$ = 8 species), Unit 20 ($H_{U20,\ Year\ 0}$ = 0.96, $H_{U20,\ Year\ 3}$ = 1.4, $H_{U20,\ Year\ 5}$ = 1.4; $S_{U20,\ Year\ 0}$ = 6 species, $S_{U20,\ Year\ 3}$ = 10 species, $S_{U20,\ Year\ 5}$ = 10 species), and Unit 25 ($H_{U25,\ Year\ 0}$ = 0.92, $H_{U25,\ Year\ 3}$ = 1.4, $H_{U25,\ Year\ 5}$ = 1.4; $S_{U25,\ Year\ 0}$ = 5 species, $S_{U25,\ Year\ 3}$ = 8 species, $S_{U25,\ Year\ 5}$ = 9 species). Species evenness generally stayed stable between years for all Year 5 Units ($J_{U13,\ Year\ 0}$ = 0.65, $J_{U13,\ Year\ 3}$ = 0.64, $J_{U13,\ Year\ 5}$ = 0.65; $J_{U20,\ Year\ 0}$ = 0.54, $J_{U20,\ Year\ 3}$ = 0.62, $J_{U20,\ Year\ 5}$ = 0.62; $J_{U25,\ Year\ 0}$ = 0.58, $J_{U25,\ Year\ 3}$ = 0.64, $J_{U25,\ Year\ 5}$ = 0.62).

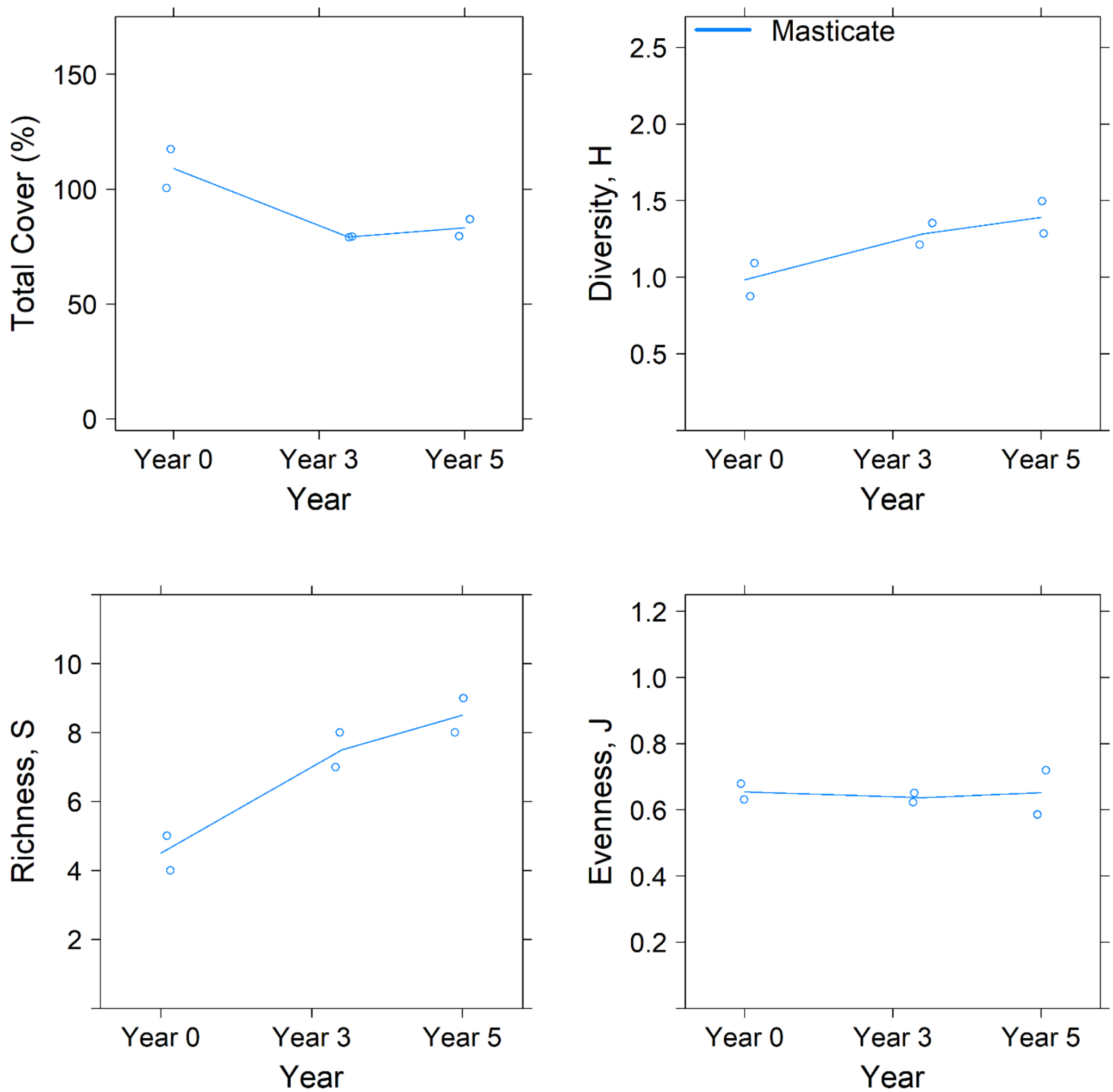

Figure 4-14. Unit 13 Containment Line community structure from Baseline (2015) to five years after mastication (2021). Two masticated transects were analyzed in Unit 13 Containment Line.

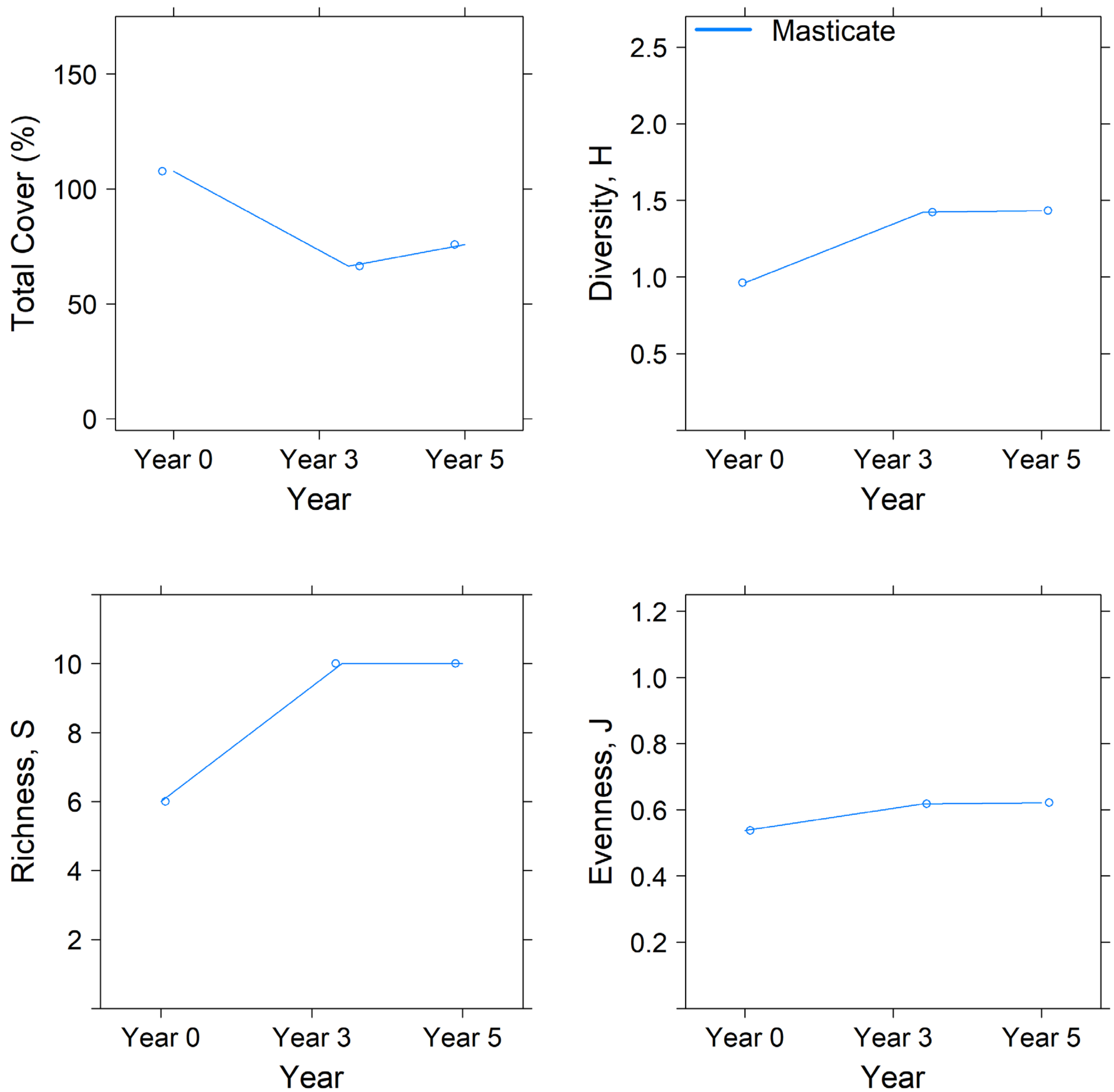

Figure 4-15. Unit 20 Containment Line community structure from Baseline (2015) to five years after mastication (2021). One masticated transect was analyzed in Unit 20 Containment Line.

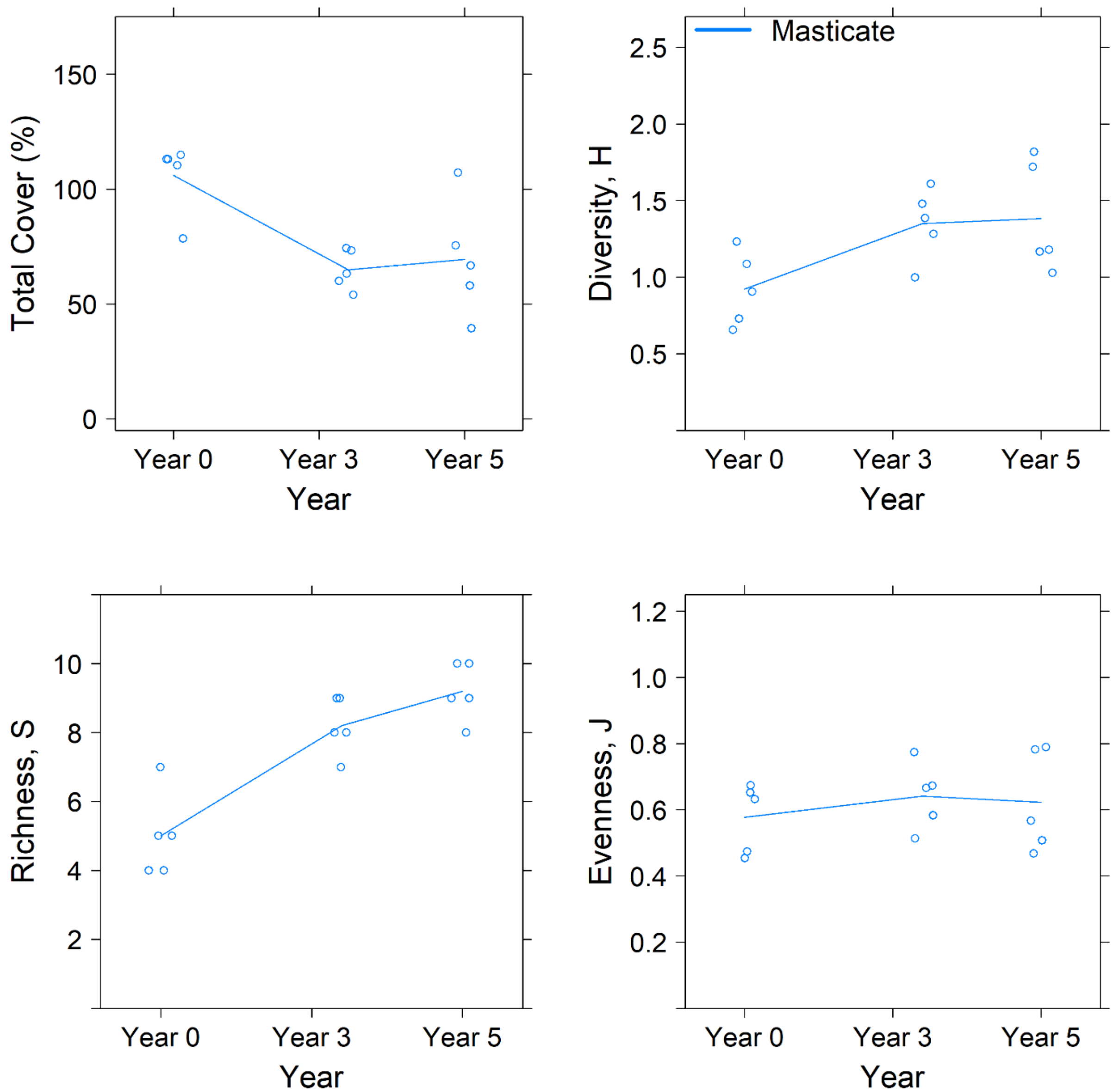

Figure 4-16. Unit 25 community structure from Baseline (2014) to five years after mastication (2021). Five masticated transects were analyzed in Unit 25.

Results of mixed-design ANOVAs used to examine the effect of Unit and age on bare ground and herbaceous cover, provide evidence that age influenced mean percent bare ground and herbaceous cover. There was no evidence suggesting that either Unit or an interaction between Unit and age influenced bare ground or herbaceous cover (Table 4-2).

All Year 5 Units increased in bare ground and herbaceous cover between Baseline and Year 3. Bare ground cover in Unit 13 increased by 14% between Baseline and Year 3 surveys and decreased from 25% to 22% between Year 3 and Year 5. Likewise, herbaceous cover in Unit 13 increased by 8% between Baseline and Year 3 and decreased by approximately 4% between Year 3 and Year 5. Bare ground cover in Unit 25 increased by 22% between Baseline and Year 3, then increased by 6% between Years 3 and 5.

Herbaceous cover in Unit 25 increased by approximately 13% between Baseline and Year 3 and decreased from 13% to only 4% cover between Year 3 and Year 5. Bare ground cover in Unit 20 increased by 3% between Baseline and Year 3 and increased by 12% between Year 3 and Year 5. Herbaceous cover in Unit 20 increased from 1% to 27% cover between Baseline and Year 3 and decreased between Year 3 and Year 5 by 12% (Table 4-3; Figures 4-17 through 4-19).

Table 4-2. Mixed-design ANOVA results for Unit 25 and Units 13 and 20 Containment Lines bare ground and herbaceous cover.

Factor	Bare Ground		Herbaceous Cover	
	F	*P*	*F*	*P*
Unit	0.557	0.605	2.297	0.196
Age	4.936	0.032	15.230	9.22E-04
Unit*Age	0.913	0.493	1.468	0.283

Table 4-3. Average percent coverage of bare ground and herbaceous cover for Unit 25 and Units 13 and 20 Containment Lines during Baseline, Year 3, and Year 5 surveys.

Cover Type (Year)	Unit 13	Unit 20	Unit 25
Bare ground (Baseline)	11%	16%	9%
Bare ground (Year 3)	25%	19%	31%
Bare ground (Year 5)	22%	31%	37%
Herbaceous (Baseline)	0.3%	1%	0.3%
Herbaceous (Year 3)	8%	27%	13%
Herbaceous (Year 5)	4%	15%	4%

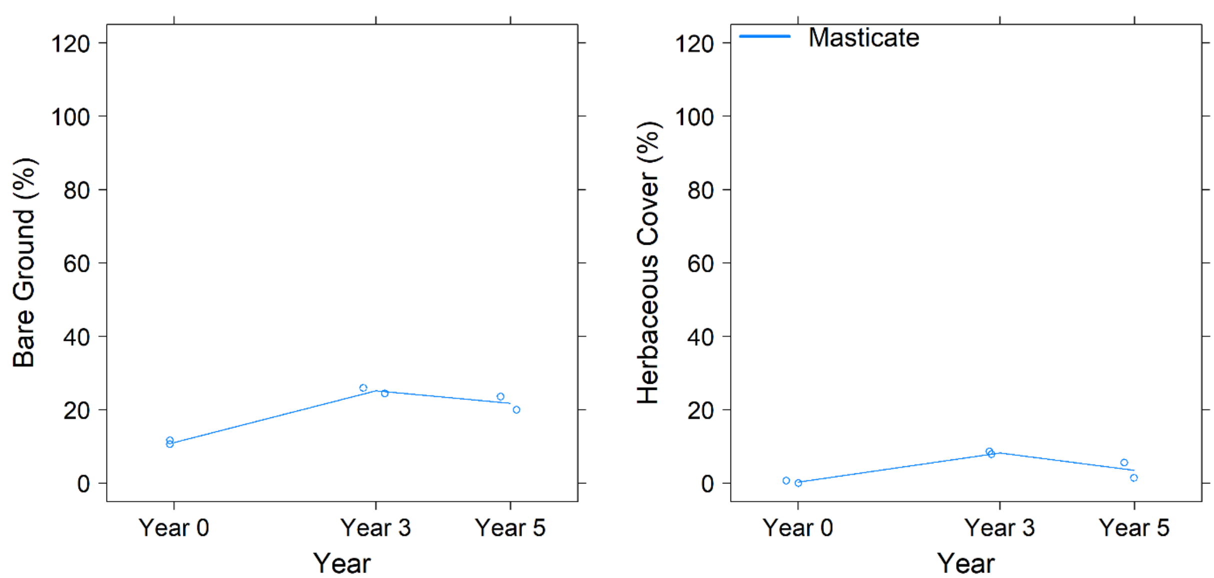

Figure 4-17. Unit 13 Containment Line bare ground and herbaceous cover between Baseline (2015), Year 3 (2019), and Year 5 (2021). Two masticated transects were analyzed in Unit 13 Containment Line.

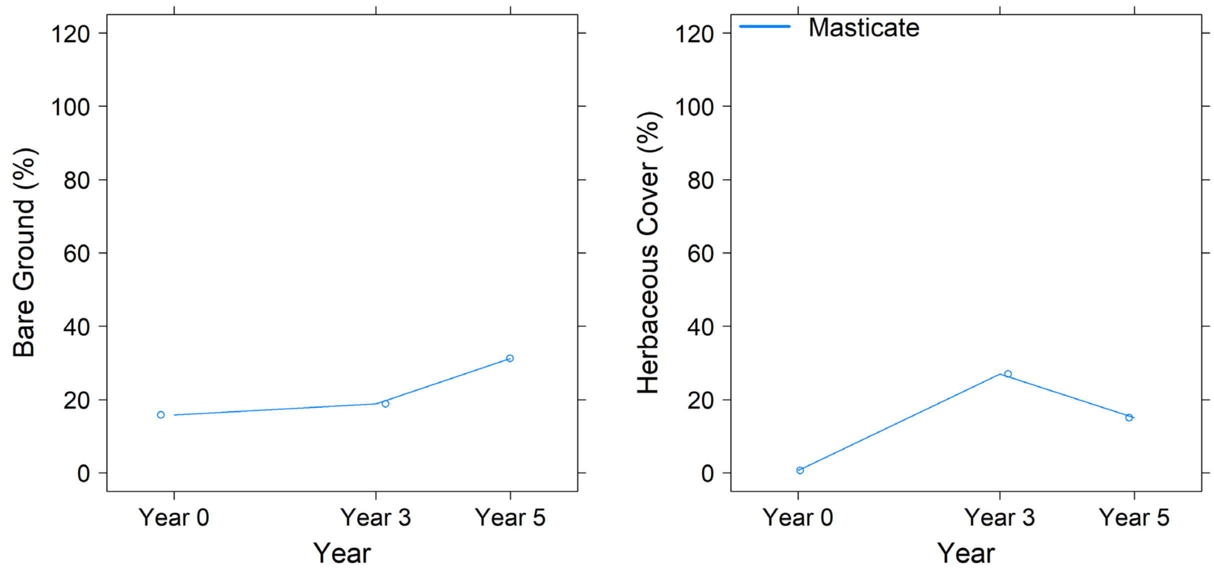

Figure 4-18. Unit 20 Containment Line bare ground and herbaceous cover between Baseline (2015), Year 3 (2019), and Year 5 (2021). One masticated transect was analyzed in Unit 20 Containment Line.

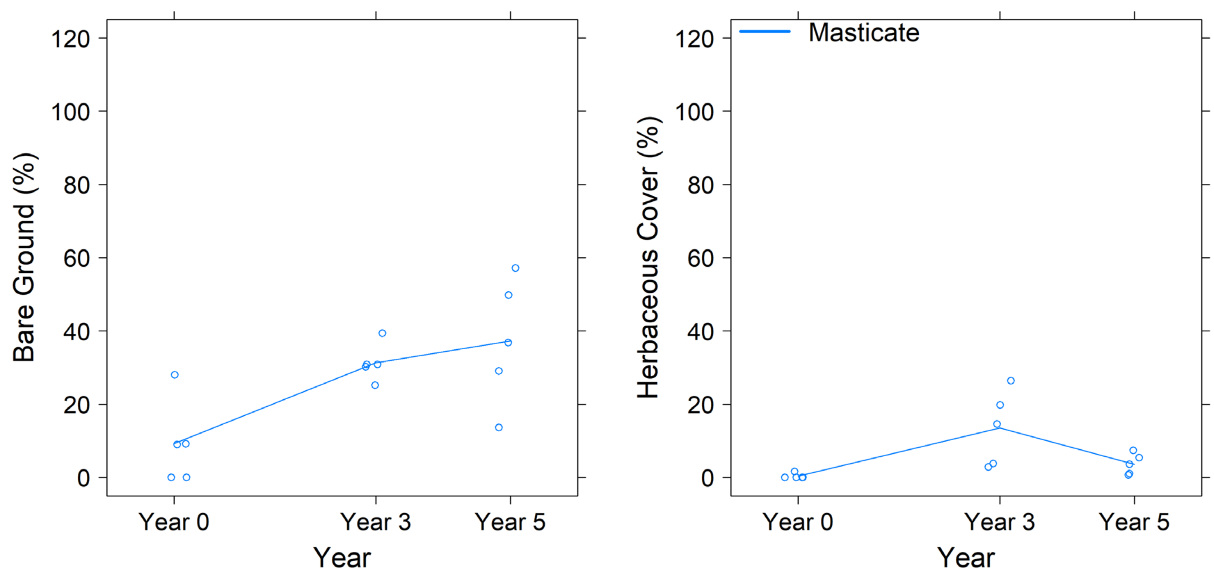

Figure 4-19. Unit 25 bare ground and herbaceous cover from Baseline (2014), Year 3 (2019), and Year 5 (2021). Five masticated transects were analyzed in Unit 25.

Results of a two-way PERMANOVA provide evidence that community composition was affected by age (Baseline, Year 3, or Year 5) and by Unit. There was no evidence that an interaction between age and Unit influenced community composition. These results suggest the types and abundances of species differed depending on the age group and Unit they were in, where Unit may have a greater influence than age on Year 5 Units (Table 4-4). Rank-abundance curves illustrate the species composition in each Unit through time (Figures 4-20 and 4-21).

Table 4-4. Two-way PERMANOVA results for Unit 25 and Units 13 and 20 Containment Lines community compositions, based on Bray-Curtis distance matrices.

Factor	*F*	*P*
Age	2.857	0.011
Unit	3.956	0.002
Age*Unit	0.433	0.970

Community composition differed between Year 5 Units over time. Shaggy-barked manzanita and chamise were co-dominant in Unit 25 and Unit 13 Containment Line in all survey years; however, chamise became slightly more dominant than shaggy-barked manzanita after treatment in Unit 13 ($C_{U13,\ Year\ 0}$ = 47% ARTO and 43% ADFA; $C_{U13,\ Year\ 3}$ = 37% ARTO and 44% ADFA; $C_{U13,\ Year\ 5}$ = 32% ARTO and 43% ADFA). Unit 20 Containment Line was dominated by chamise in all survey years but chamise cover decreased between Baseline and Year 3 and remained below Baseline cover in Year 5 ($C_{U20,\ Year\ 0}$ = 77%, $C_{U20,\ Year\ 3}$ = 36%, $C_{U20,\ Year\ 5}$ = 40%). Species richness continually increased since Baseline in both Unit 13 and Unit 25. Additional species observed in Unit 13 during Year 5 surveys that were not observed in Baseline included dwarf ceanothus, coast live oak, peak rush-rose, toyon, deerweed, California oatgrass, sticky monkeyflower, and golden yarrow. Additional species observed in Unit 25 were peak rush-rose, dwarf ceanothus, California sagebrush, golden yarrow, iceplant, coast live oak, and Eastwood's goldenbush (Figures 4-20 and 4-21). The sample size in Unit 20 Containment Line was too low (n = 1) to conduct rank-abundance analysis or create a boxplot of HMP shrub data and figures are not provided for this Unit; however, the total cover of HMP shrub species was analyzed for Unit 20 Containment Line and is discussed below, in conjunction with analysis of mean HMP shrub cover for Unit 25 and Unit 13 Containment Line.

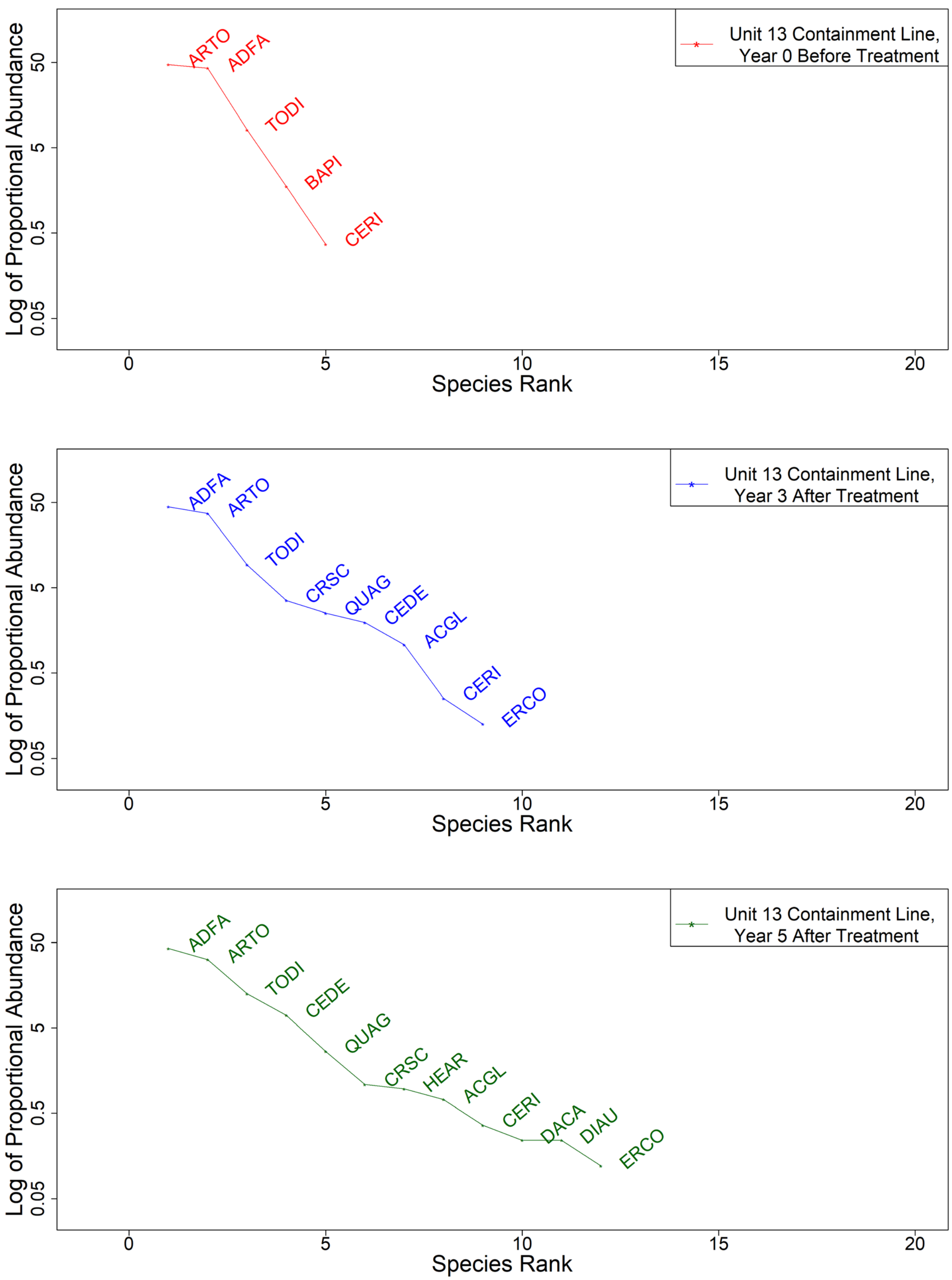

Figure 4-20. Unit 13 Containment Line rank-abundance curves between Baseline (2015), Year 3 (2019), and Year 5 (2021). New species present in Year 5 surveys compared to Baseline include dwarf ceanothus, coast live oak, peak rush-rose, toyon, deerweed, California oatgrass (*Danthonia californica*), sticky monkeyflower, and golden yarrow. Species present in Baseline surveys, but absent in Year 5 include coyote brush. Two masticated transects were analyzed in Unit 13. Y-axis is $\log_{10}$ scale.

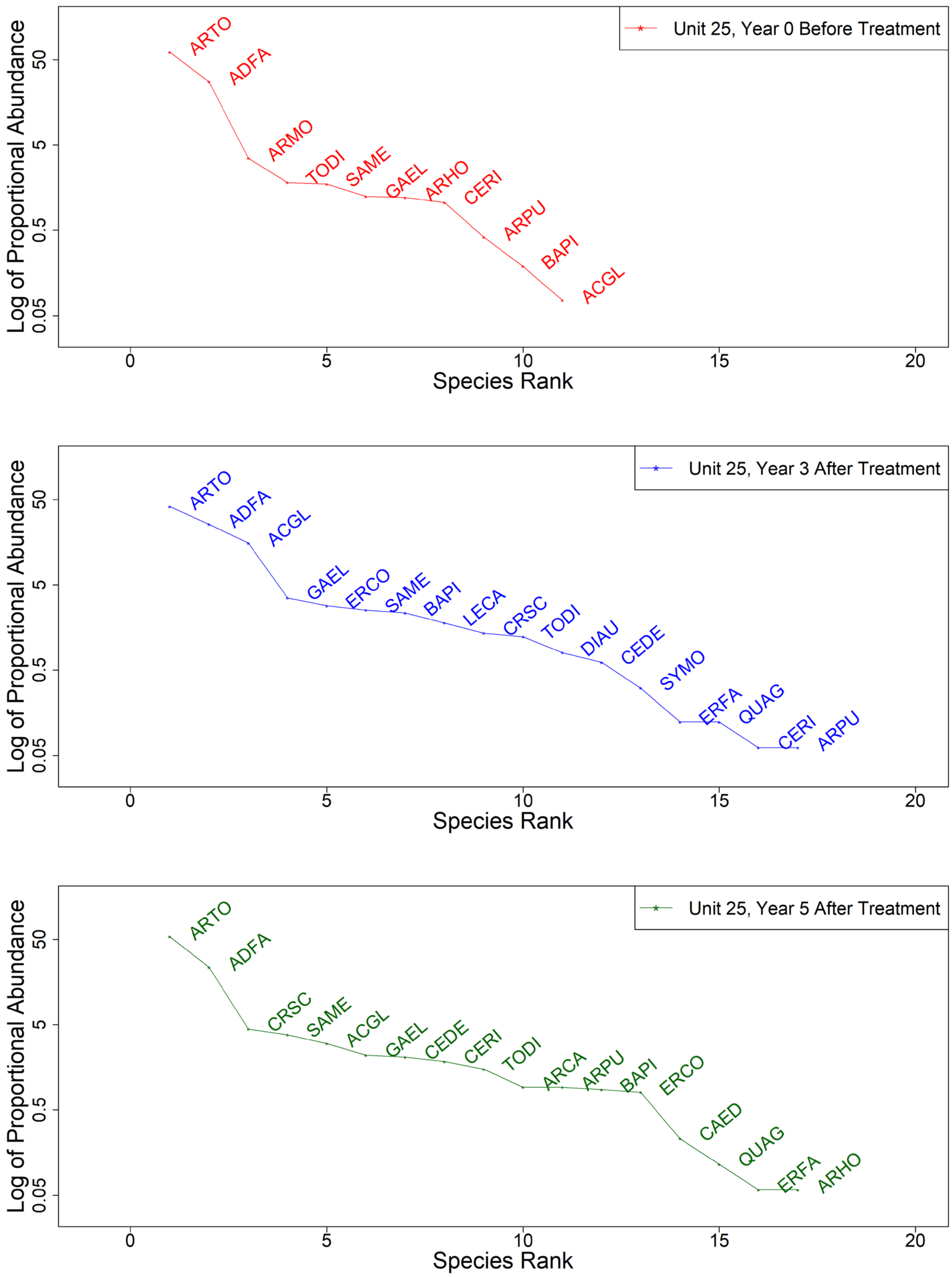

Figure 4-21. Unit 25 rank-abundance curves between Baseline (2014), Year 3 (2019), and Year 5 (2021). New species present in Year 5 surveys compared to Baseline include peak rush-rose, dwarf ceanothus, California sagebrush, golden yarrow, iceplant (*Carpobrotus edulis*), coast live oak, and Eastwood's goldenbush. Species present in Baseline surveys, but absent in Year 5 include Toro manzanita. Five masticated transects were analyzed in Unit 25. Y-axis is $\log_{10}$ scale.

HMP shrub species observations were highly variable between Units but did not generally vary much between age groups (Figures 4-22 and 4-23). The only HMP shrub species observed in Unit 13 Containment Line was Monterey ceanothus. Mean percent cover of Monterey ceanothus in Unit 13 Containment Line remained relatively stable over time (between 0.3% and 0.4% cover). Monterey ceanothus was also the only HMP shrub species present in Unit 20 Containment Line. Total cover of this species in Unit 20 Containment Line was 6.6% in Baseline, 1.6% in Year 3, and 5.4% in Year 5. All HMP shrub species were observed in Unit 25 in Baseline. Sandmat manzanita was observed in all survey years in Unit 25; mean cover of this species was lowest in Year 3 ($C_{U25, Y3}$ = 0.04%) but showed an overall increase between Baseline ($C_{U25, Y0}$ = 0.44%) and Year 5 ($C_{U25, Y5}$ = 0.64%). Similarly, Monterey ceanothus cover dropped slightly between Baseline and Year 3 but had recovered approximately back to Baseline by Year 5 ($C_{U25, Y0}$ = 1.12%; $C_{U25, Y5}$ = 1.28%). This suggests Monterey ceanothus and sandmat manzanita may be more resilient to mastication than other HMP species. Toro manzanita was observed in Unit 25 in Baseline surveys but was not observed in Year 3 or Year 5 surveys. Hooker's manzanita had a mean cover of 1.28% in Baseline and was absent in Year 3. By Year 5, Hooker's manzanita was observed at very low abundance ($C_{U25, Y5}$ = 0.04%) in this Unit. In contrast, Eastwood's goldenbush was not observed in Unit 25 in Baseline but was observed at very low abundance in Year 3 ($C_{U25, Y3}$ = 0.08%) and Year 5 ($C_{U25, Y5}$ = 0.04%).

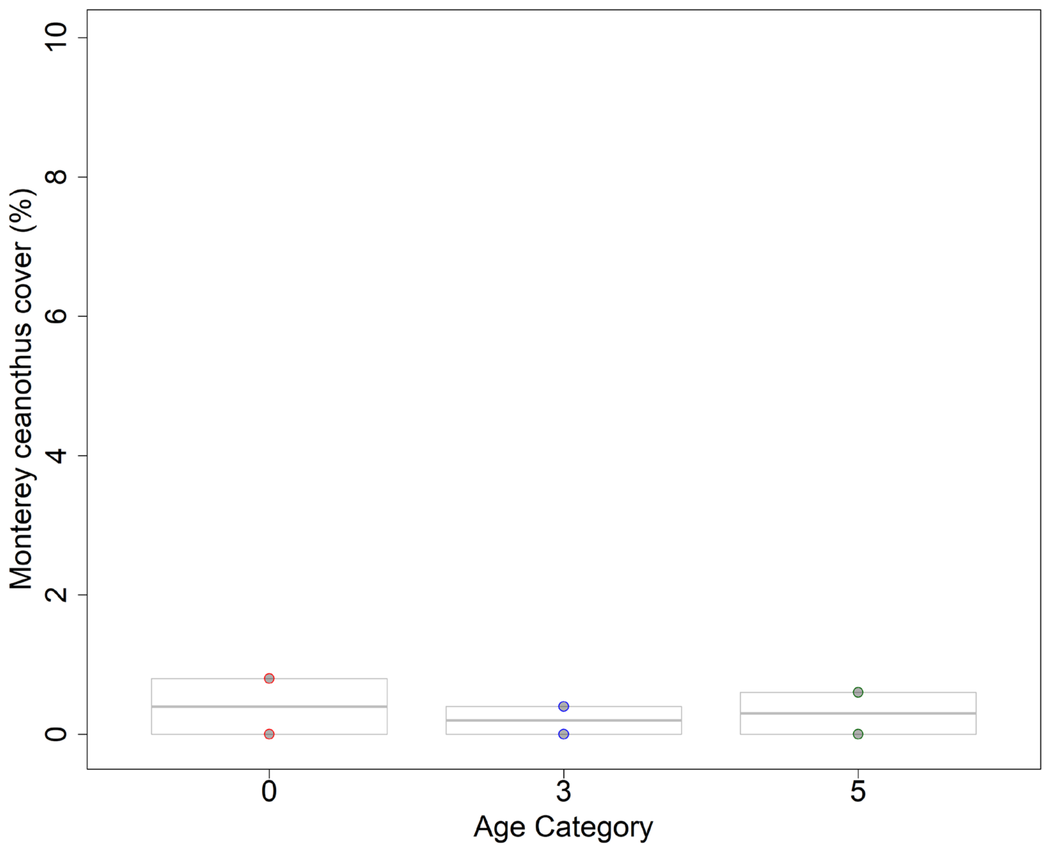

Figure 4-22. Unit 13 Containment Line HMP shrub species cover between Baseline (2015), Year 3 (2019), and Year 5 (2021). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Two masticated transects were analyzed in Unit 13 Containment Line.

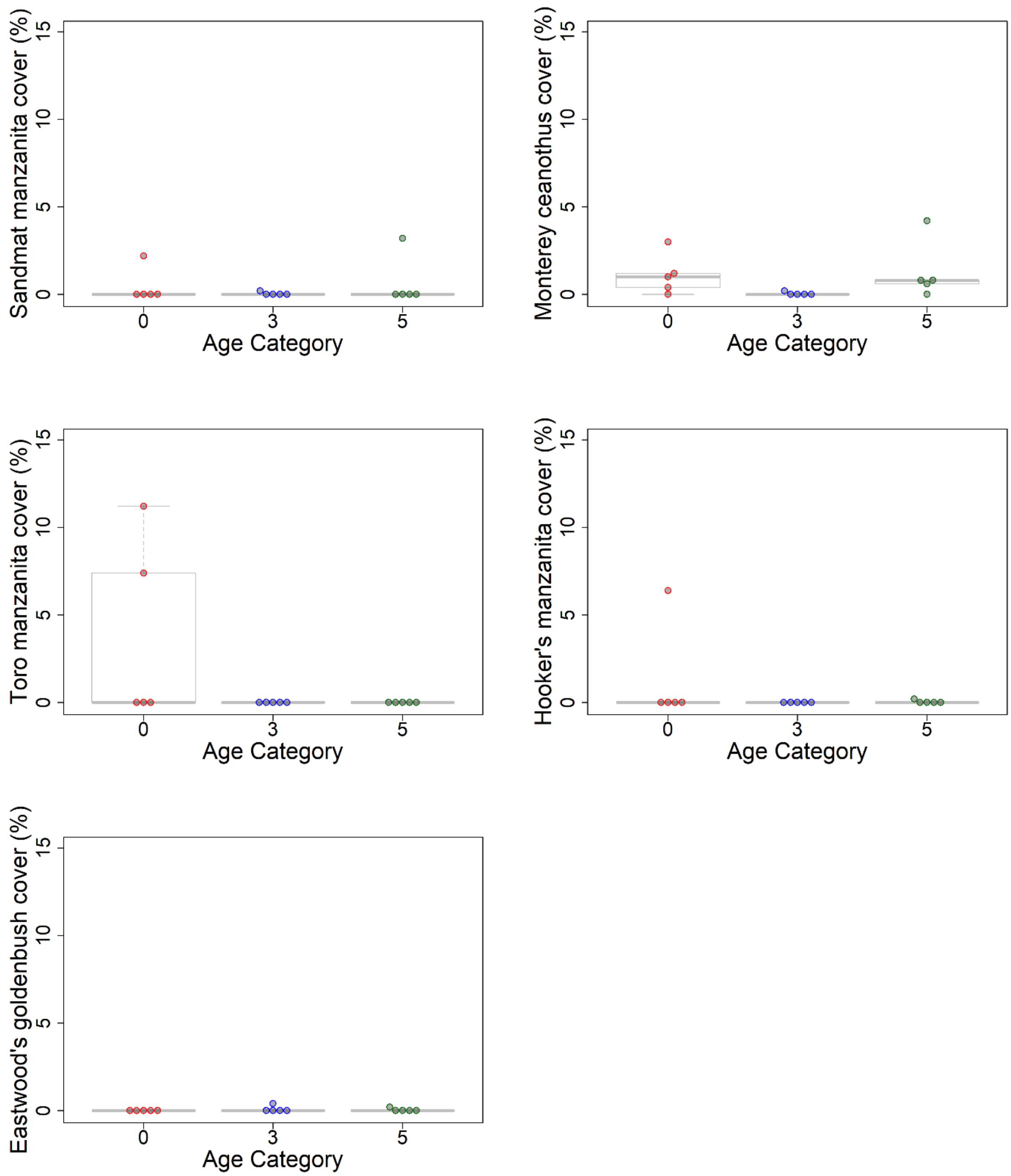

Figure 4-23. Unit 25 HMP shrub species cover between Baseline (2014), Year 3 (2019), and Year 5 (2021). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartiles, respectively. Five masticated transects were analyzed in Unit 25.

The results of NMDS ordination for Year 5 Units combined illustrates a trajectory of community composition toward Baseline composition (Figure 4-24). 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 post-treatment, species composition shifted from Baseline. By Year 5, the location of ellipses began to shift toward the Baseline ellipse location, implying that community composition is more similar to Baseline in Year 5 than in Year 3.

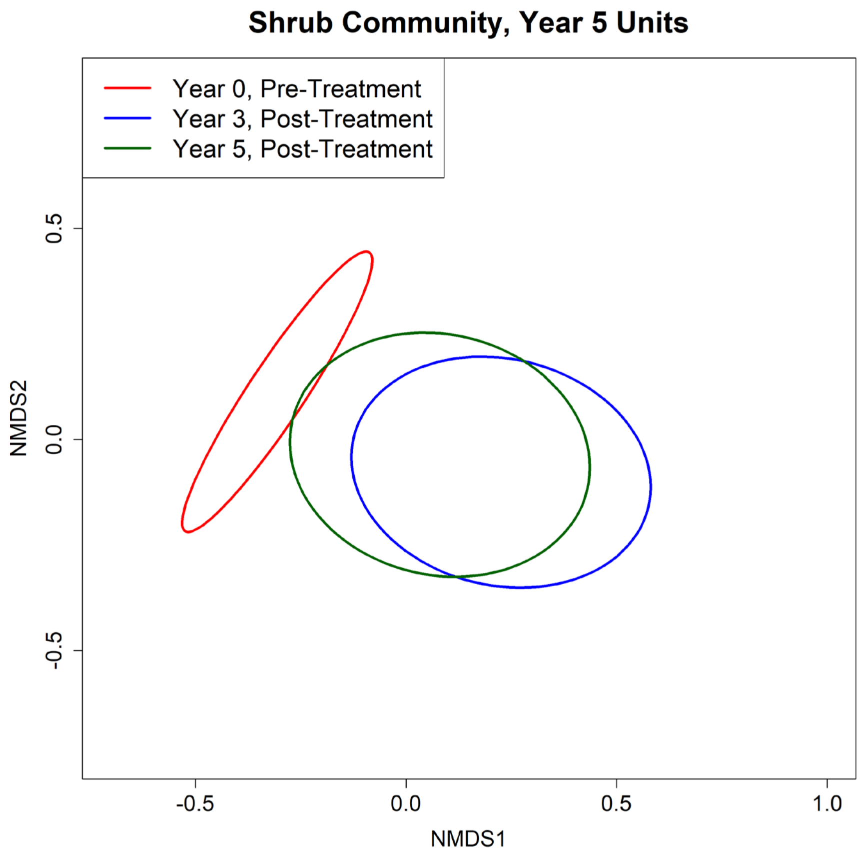

Figure 4-24. NMDS ordination plot showing Year 5 Units community composition changes between Baseline (2014 and 2015), Year 3 (2019), and Year 5 (2021). Eight masticated transects were analyzed in Year 5 Units.

4.4.7 Annual Grass Monitoring

Non-native annual grassland cover was surveyed and mapped for Unit 25 and the Containment Lines of Units 13, 20, and 31 in 2021. Non-native annual grass cover increased between Baseline and Year 3 surveys in all Year 5 Units (Appendix D, Figures D-4 through D-7). Estimated areas occupied by each density class in 2021 are summarized in Table 4-5. Annual grass cover increased between Baseline and Year 3 and tended to decrease between Year 3 and Year 5. In Year 5, density class 3 (>25% cover) had the largest areal extent in the Unit 13 Containment Line, whereas density class 1 (1 – 5% cover) had the largest areal extent in the Containment Lines of Units 20 and 31 and in Unit 25 (Table 4-5).

Table 4-5. Estimated area occupied by annual grasses in Unit 25 and Units 13, 20, and 31 Containment Lines between Baseline (2014 and 2015) and Year 5 (2021).

Cover Class	Baseline (acres)	Year 1 (acres)	Year 3 (acres)	Year 5 (acres)
Unit 13 Containment Line				
1 (Low) = 1 - 5%	0.06	1.24	2.09	2.56
2 (Medium) = 6-25%	1.44	1.38	2.06	2.36
3 (High) = >25%	4.43	0.53	4.17	3.76
Total Acreage	**5.93**	**3.15**	**8.32**	**8.67**
Unit 20 Containment Line				
1 (Low) = 1 - 5%	0.05	2.85	4.91	8.55
2 (Medium) = 6-25%	0.27	4.95	2.63	1.51
3 (High) = >25%	0.58	2.41	2.92	0.31
Total Acreage	**0.90**	**10.21**	**10.46**	**10.36**
Unit 25				
1 (Low) = 1 - 5%	0.22	20.06	22.90	20.89
2 (Medium) = 6-25%	1.62	3.86	12.14	6.10
3 (High) = >25%	3.52	6.43	7.74	9.71
Total Acreage	**5.36**	**30.35**	**42.78**	**36.70**
Unit 31 Containment Line				
1 (Low) = 1 - 5%	0.13	5.59	5.42	5.99
2 (Medium) = 6-25%	0.04	1.74	7.84	3.13
3 (High) = >25%	0.00	0.80	5.41	4.10
Total Acreage	**0.17**	**8.13**	**18.67**	**13.22**

4.4.8 Invasive and Non-Native Species Monitoring

Of the target invasive species, iceplant, jubata grass, and French broom were observed in Unit 25 (Appendix E, Figure E-3). No target invasive species were observed in Units 13 or 20 Containment Lines. Iceplant was observed along shrub monitoring transects in Unit 25 but was not mapped elsewhere in Year 5 Units. Minor occurrences of non-native herbaceous cover were observed during transect monitoring in Unit 25 and the Containment Lines of Units 20 and 31 but not in Unit 13 Containment Line (Appendix G, Tables G-3 and G-4).

5 YEAR 8 VEGETATION SURVEYS: UNITS 6, 7, 10, 1 EAST, MOUT BUFFER, AND WGBA

5.1 Introduction

Year 8 Units included Units 6, 7, 10, 1 East, MOUT Buffer, and WGBA (Figure 5-1). Units 6, 1 East, MOUT Buffer, WGBA, and the Containment Lines of Unit 7 were masticated in 2013 (Burleson, 2017). The Containment Lines of Unit 10 were masticated in 2012. Prescribed burns were conducted in the interiors of Units 7 and 10 in the Fall of 2013. Unit 1 East and part of Unit 6 were masticated in 2013, with concurrence from USFWS, to create a containment line for prescribed burns in Units 7 and 10 (USFWS, 2013; Burleson, 2019a).

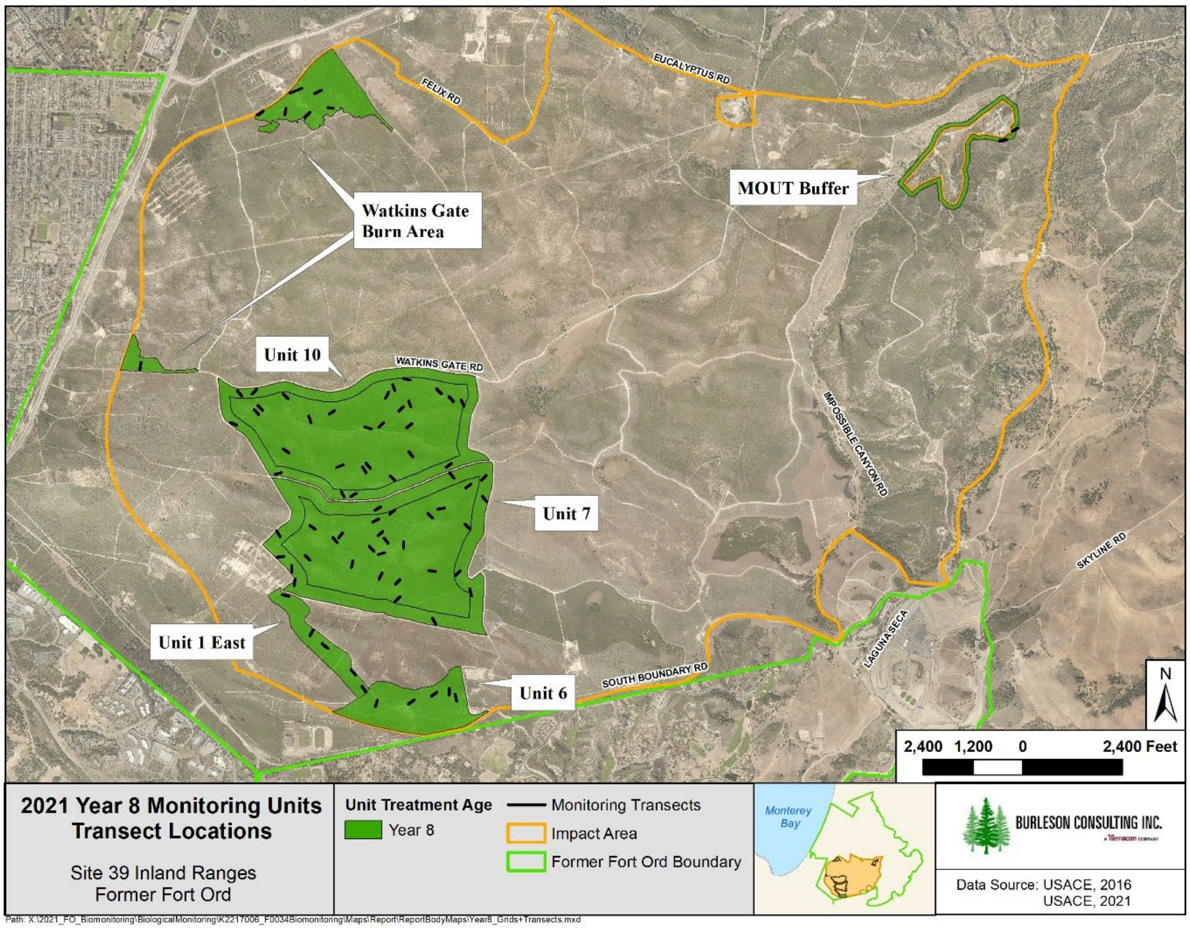

Figure 5-1. Map of Units 6, 7, 10, 1 East, MOUT Buffer, and WGBA Shrub Transects. Containment Lines Can be Seen Outlined in Black Where the Annual Grass Surveys Occurred.

Baseline data for herbaceous HMP plants were not gathered for Unit 1 East following methods outlined in the Vegetation Monitoring Protocol (Burleson, 2009a). Rather, Baseline monitoring was conducted in this Unit by Harding Lawson Associates in 1997 and included shrub transect sampling and broad-scale mapping of HMP annuals not associated with survey grids. No HMP annuals were identified in Unit 1 East during Baseline surveys.

Baseline monitoring was conducted in spring and early summer of 2011 for Unit 6, MOUT Buffer and WGBA, in 2012 for Unit 10, and in 2013 for Unit 7 (Tetra Tech and EcoSystems West, 2012, 2013 and 2014). Baseline monitoring 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 in Unit 6, MOUT Buffer, and the primary containment areas around the perimeters of Units 7 and 10.

In all Units except for Units 1 East and 6, where no HMP annual species were observed during Baseline surveys, Year 1 follow-up monitoring was conducted in the spring and early summer of 2013. This was due to the need to assess recovery of the three HMP annual species in these Units during the first season after burning, as well as to assess the status of non-native annual grasses in the primary containment areas. Year 3, 5, and 8 follow-up monitoring, including HMP annual density (in Year 3 and Year 5 Units), shrub transect, and annual grass monitoring, was conducted in these Units in 2016, 2018, and 2021 respectively.

5.2 Units 6, 7, 10, 1 East, MOUT Buffer, and WGBA: Setting

Unit 6 encompasses an area of 72 acres and is located at the south-central end of the former Fort Ord with the base boundary forming part of the southern boundary of the Unit (see Figure 5-1). The topography consists of portions of two parallel east-west-trending ridges along the northern and southern periphery of the Unit, with a broad lower-lying area – the upper headwaters of a west-draining canyon – in the central portion. In Baseline condition, the vegetation of Unit 6 consisted of a mosaic of mature maritime chaparral and extensive disturbed areas with large clumps of invasive, non-native perennial pampas grass, and limited areas of coast live oak woodland in the southern third of the Unit. Mature maritime chaparral occupied much of the eastern half of the Unit and to a lesser extent in the extreme western portion. Shaggy-barked manzanita was the principal dominant in this chaparral. Other dominants included chamise and black sage (Tetra Tech and EcoSystems West, 2014). Much of Unit 6, especially the central and south-central portions, has a history of extensive heavy disturbance. Small arms range HA 27A is located in this area and is in the process of being restored. Vegetation of disturbed areas in Baseline condition ranged from areas dominated by non-native annual grass and herb species, to a sizable sparsely vegetated bare area near the center of the Unit. A large area in the south-central portion of the Unit was heavily infested with large clumps of the invasive, non-native perennial pampas grass. The density of pampas grass in the area has been considerably reduced in recent years through weed eradication efforts. The northwestern portion of the Unit was vegetated with maritime chaparral that had been subject to considerable past disturbance, consisting of clumps of chaparral shrubs interspersed with open areas vegetated with mostly non-native grasses and herbs.

Unit 7 encompasses an area of 347 acres, of which 124 acres are within the 316-ft primary containment mastication area (see Figure 6-1). The remaining 216 acres are in the interior of the Unit, located in the west-central portion of the impact area, where prescribed burning was conducted. The Unit is located south of Nowhere Road and north of Phoenix Road in the southwest portion of former Fort Ord. In general, Unit 7 slopes down from east to west with several prominent north-south trending ridges. Abandoned roads with varying amounts of vegetative overgrowth follow these ridgelines providing some degree of unobstructed access to the interior portions of the Unit.

Under Baseline conditions, Unit 7 was almost entirely vegetated with mature maritime chaparral varying considerably in physiognomy and species composition, except for a few meadow grasslands in lowland basins throughout the Unit (Tetra Tech and EcoSystems West, 2014). Relatively open chaparral was most extensive in the southeast along ridgelines and south-facing slopes in areas that appeared to be more recently disturbed, during active use of the range by the military. As in maritime chaparral throughout Fort Ord, shaggy-barked manzanita was the most characteristic dominant. Other characteristic shrubs that were often dominant or co-dominant included chamise, black sage, sandmat manzanita, Monterey ceanothus, and poison-oak (*Toxicodendron diversilobum*). Three sizable areas of meadow grassland habitat, dominated by native and non-native grasses and forbs, occur in the Unit. The largest meadow, located in the east-central portion of Unit 7, is dominated primarily by a mix of upland and wetland herbaceous vegetation. In years of average to above average rainfall, standing water typically forms a contiguous seasonal pond (referred to as Pond 71) lasting into spring which was present during the 2016 monitoring due to slightly above average seasonal rainfall (Burleson, 2019a). Although numerous individual coast live oak trees are scattered throughout the Unit and small stands occur surrounding the meadow margins, well developed coast live oak woodland does not occur elsewhere in this Unit. Disturbed areas are limited in this Unit, and mostly occur along old roads and fuel breaks. However, a large lead remediation area encroaches on the southwest corner of Unit 7 near the intersection of Austin Road and Phoenix Road. This area, referred to as HA 26, is currently undergoing habitat restoration activities.

Unit 10 encompasses a total area of 320 acres, of which approximately 87 acres are within the 239-ft primary containment mastication area and the remaining 233 acres are in the interior of the Unit where prescribed burning was conducted. The Unit is located south of Watkins Gate Road in the west-central portion of the Impact Area (see Figure 5-1). The Unit is dominated by a prominent ridge (presumably a fossil dune ridge) running east-west across the center of the Unit. Elsewhere in the Unit the terrain is gently rolling.

In Baseline condition, Unit 10 was almost entirely vegetated with mature maritime chaparral varying considerably in physiognomy and species composition (Tetra Tech and EcoSystems West, 2013). The chaparral shrubs ranged in height from low (3-4 ft) to tall (12-15 ft), and shrub density ranged from relatively open, with numerous openings of various sizes, to essentially 100% areal cover. Relatively open chaparral was most extensive on the upper parts of the main ridge, where chaparral with this physiognomy was continuous almost all the way across the Unit. Like Unit 7, shaggy-barked manzanita is the most characteristic dominant where vegetation is tall and dense. Other shrubs such as chamise, black sage, sandmat manzanita, Monterey ceanothus, and poison-oak are dominant or co-dominant elsewhere in the Unit. Two sizable areas of meadow habitat, dominated by native and non-native grasses and herbs, occur in the southwestern portion of the Unit. One stand of coast live oak woodland occurs in the north-central portion of the Unit. Although numerous individual coast live oak trees are scattered throughout the remainder of the Unit, and small stands occur in the southwestern portion of the Unit, well developed coast live oak woodland does not occur elsewhere in this Unit. Disturbed areas are of limited extent in this Unit, and mostly occur along old roads and fuel breaks.

Unit 1 East encompasses 33 acres and is situated in the southwest portion of the Fort Ord Impact Area (see Figure 5-1). In pre-treatment condition, this Unit consisted of structurally heterogeneous maritime chaparral reflecting varying levels of disturbance from past military staging activities. No wetlands or oak woodland is located within this Unit, but maritime chaparral begins to transition to coastal scrub and disturbed grassland. Dense infestations of pampas grass and iceplant were present towards the south and west portions of the Unit in Baseline.

MOUT Buffer encompasses an area of approximately 20 acres (see Figure 5-1). This area consists of a 100-ft wide buffer encircling the periphery of the MOUT area containing the Impossible City training facility in and east of Impossible Canyon. The terrain within the MOUT Buffer Area ranges from nearly level to steep. In Baseline conditions, the area was vegetated with a mosaic of mature maritime chaparral, non-meadow grassland, and coast live oak woodland, with some localized areas of heavy disturbance. A portion of this area was burned in an accidental fire in 2003.

WGBA encompasses 73 acres, divided into two non-contiguous portions (see Figure 5-1; Tetra Tech and EcoSystems West, 2012). The larger northern portion is in the northeast corner of the WGBA, west of the north end of Evolution Road; the smaller southern portion is in the southwest corner of the WGBA, north of Watkins Gate Road. The terrain is level to gently rolling, with mostly low local relief. In Baseline condition, the northern area was vegetated primarily with mature maritime chaparral in its western portion, with smaller areas of coast live oak woodland interspersed. The eastern portion was vegetated primarily with dense coast live oak woodland, interspersed with areas of maritime chaparral of varying sizes. Sizable disturbed areas occur in the westernmost area of the northern portion; some areas of maritime chaparral in the eastern portion were also subject to soil remediation activities that removed or reduced the coast live oak canopy. The southern area was vegetated in Baseline condition almost entirely with mature maritime chaparral with numerous openings, except for a small seasonal wetland adjacent to Blueline Road.

5.3 Units 6, 7, 10, 1 East, MOUT Buffer, and WGBA: Methods

In accordance with methods outlined in the Revised Protocol (Tetra Tech and EcoSystems West, 2015b) and Section 2 of this report, the 2021 Year 8 follow-up monitoring in Units 6, 7, 10, 1 East, MOUT Buffer, and WGBA consisted of the following activities:

- Repeated sampling of transects that were sampled in 1997, 2011, 2012, 2013, 2016, and 2018 (Tetra Tech and EcoSystems West, 2013; Burleson, 2019a; Burleson, 2019b). This survey effort was conducted to assess shrub species composition of the sensitive maritime chaparral community after treatment. Surveys occurred on June 3, 4, 7, 8, 9, 10, 15, 16, 22, 23, 29, and 30; July 1 and 6; and August 5 and 20, 2021.
- Mapping of invasive species, including iceplant, jubata 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.

5.4 Units 6, 7, 10, 1 East, MOUT Buffer, and WGBA: Results and Discussion

A total of 79 shrub monitoring transects were sampled in Year 8 Units in summer of 2021.

5.4.1 Shrub Transect Monitoring

Shrub transects were sampled in Units 6 (n=5), 7 (n=31), 10 (n=29), 1 East (n=5), MOUT Buffer (n=2), and WGBA (n=7) (Appendix C; Figures C-6 through C-11). In Unit 6, four of the five transects have been consistently monitored between Baseline and Year 8; transect 28B-1 was not surveyed in Baseline or Year 3 and is therefore not included in analyses. 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, 2016-2021).

Community structure and composition of Year 8 Units are progressing toward their respective Baseline conditions. The effects of treatment were analyzed for Units 7 and 10, where various treatments were used.

Mixed-design ANOVAs could not be conducted to examine the effects of Unit and age on mean percent cover, species richness, species evenness, species diversity, or bare ground and herbaceous cover for Year 8 Units due to failure to meet parametric assumptions of this test. Likewise, mixed-design ANOVAs could not be conducted to assess effects of age and treatment on community composition metrics in Units 7 and 10 due to failure to meet parametric assumptions. Instead, results from PERMANOVAs conducted for Year 8 Units were used to make inferences about the effects of Unit, age, and treatment on community composition, and qualitative inferences were made to assess the effects of these factors on bare ground and herbaceous cover.

Specific aspects of community structure were variable between Units, ages, and treatments; however, overall patterns of community structure changes through time were generally similar between Units (Figures 5-2 through 5-7). Generally, shrub cover decreased between Baseline and Year 5 and increased back toward Baseline between Year 5 and Year 8. Species diversity and richness tended to be higher in Year 8 than in Baseline, and species evenness generally remained stable throughout all years.

Shrub cover generally decreased between Baseline and five years after treatment but recovered to or near Baseline by Year 8. In Units 6, 1 East, MOUT, and WGBA shrub cover decreased between Baseline ($C_{U6,Y0}$ = 94%, $C_{U1E,Y0}$ = 114%, $C_{MOUT,Y0}$ = 91%, $C_{WGBA,Y0}$ = 94%) and Year 5 ($C_{U6,Y5}$ = 73%, $C_{U1E,Y5}$ = 93%, $C_{MOUT,Y5}$ = 73%, $C_{WGBA,Y5}$ = 76%) then increased between Year 5 and Year 8 ($C_{U6,Y8}$ = 88%, $C_{U1E,Y8}$ = 105%, $C_{MOUT,Y8}$ = 105% $C_{WGBA,Y8}$ = 88%). In Units 7 and 10, shrub cover in masticated areas was more variable between years than in areas where other treatment types were applied. Masticated areas in Unit 7 decreased between Baseline and Year 3 by 25%, recovered to the Baseline value in Year 5, and exceeded Baseline by 29% in Year 8 ($C_{U7,\ Year\ 0\ masticate}$ = 77%, $C_{U7,\ Year\ 3\ masticate}$ = 52%, $C_{U7,\ Year\ 5\ masticate}$ = 78%, $C_{U7,\ Year\ 8\ masticate}$ = 106%). Cover along burned transects and along masticated and burned transects in Unit 7 stayed relatively stable between Baseline and Year 8 (between 100% and 114%). On transects exposed to mixed treatment, cover decreased by approximately 22% between Baseline ($C_{U7,\ Year\ 0\ mixed}$ = 128%) and Year 3 ($C_{U7,\ Year\ 3\ mixed}$ = 107%,) and continued exhibiting a downward trend in Year 8 ($C_{U7,\ Year\ 8\ mixed}$ = 81%). In Unit 10, shrub cover increased between Year 5 and Year 8 by 32% along masticated transects and decreased between Year 5 and Year 8 by 7% along burned transects. Shrub cover along transects that were both masticated and burned steadily decreased from Baseline to Year 8 by a total of 20%.

Species diversity tended to be higher in Year 8 than in Baseline and did not appear to vary much between treatment types. Species diversity in Units 6, MOUT, and WGBA increased between Baseline ($H_{U6,Y0}$ = 0.98, $H_{MOUT,Y0}$ = 1.62, $H_{WGBA,Y0}$ = 1.01) and Year 8 ($H_{U6,Y8}$ = 1.34, $H_{MOUT,Y8}$ = 1.66 $H_{WGBA,Y8}$ = 1.42). Diversity in Units 7 and 10 was also higher in Year 8 than in Baseline, regardless of treatment type. Diversity in Unit 7 along masticated transects was 0.95 in Baseline and 1.60 in Year 8; along burned transects was 1.06 in Baseline and 1.48 in Year 8; along masticated and burned transects was 1.01 in Baseline and 1.68 in Year 8; and along mixed transects was 1.20 in Baseline and 1.51 in Year 8. Diversity in Unit 10 along masticated transects was 1.06 in Baseline and 1.80 in Year 8; along burned transects was 1.19 in Baseline and 1.68 in Year 8; and along masticated and burned transects was 1.36 in Baseline and 1.77 in Year 8. Unit 1 East was the only Unit where diversity decreased from Baseline ($H_{U1E,Y0}$ = 1.54) to Year 8 ($H_{U1E,Y8}$ = 1.48).

Species richness also tended to be higher in Year 8 than in Baseline. Richness in Units 6, MOUT, and WGBA increased between Baseline ($S_{U6,Y0}$ = 6 species, $S_{MOUT,Y0}$ = 10 species, $S_{WGBA,Y0}$ = 6 species) and Year 8 ($S_{U6,Y8}$ = 7 species, $S_{MOUT,Y8}$ = 12 species, $S_{WGBA,Y8}$ = 8 species). Richness in Units 7 and 10 was higher in Year 8 than in Baseline, regardless of treatment type; additionally, masticated transects had higher richness than transects exposed to other treatment types in Unit 10. Richness in Unit 7 along masticated transects was 4 species in Baseline and 10 species in Year 8; along burned transects was 6 species in Baseline and 7 species in Year 8; along masticated and burned transects was 5 species in Baseline and 9 species in Year 8; and along mixed transects was 5 species in Baseline and 8 species in Year 8. Richness in Unit 10 along masticated transects was 8 species in Baseline and 12 species in Year 8; along burned transects was 6 species in Baseline and 9 species in Year 8; and along masticated and burned transects was 5 species in Baseline and 9 species in Year 8. In Unit 1 East, richness was the same in Baseline and Year 8 (8 species).

Species evenness remained relatively stable over time in all Year 8 Units and appeared to vary between treatment types. Evenness in Units 6 and WGBA increased between Baseline ($J_{U6,Y0}$ = 0.59, $J_{WGBA,Y0}$ = 0.59) and Year 8 ($J_{U6,Y8}$ = 0.66, $J_{WGBA,Y8}$ = 0.68). Evenness in Unit 7 along masticated transects was 0.64 in Baseline, 0.70 in Year 3, 0.64 in Year 5, and 0.70 in Year 8; along burned transects was 0.64 in Baseline, 0.75 in Year 3, 0.74 in Year 5, and 0.74 in Year 8; along masticated and burned transects was 0.63 in Baseline, 0.68 in Year 3, 0.72 in Year 5, and 0.77 in Year 8; and along mixed transects was 0.74 in Baseline, 0.79 in Year 3, 0.78 in Year 5, and 0.75 in Year 8. Evenness in Unit 10 along masticated transects was 0.52 in Baseline, 0.74 in Year 3, 0.68 in Year 5, and 0.72 in Year 8; along burned transects was 0.65 in Baseline, 0.76 in Year 3, 0.78 in Year 5, and 0.78 in Year 8; and along masticated and burned transects was 0.81 in Baseline, 0.81 in Year 3, 0.83 in Year 5, and 0.82 in Year 8. Evenness decreased slightly in Units 1 East and MOUT Buffer from Baseline ($J_{U1E,Y0}$ = 0.72, $J_{MOUT,Y0}$ = 0.72) to Year 8 ($J_{U1E,Y8}$ = 0.70, $J_{MOUT,Y8}$ = 0.66).

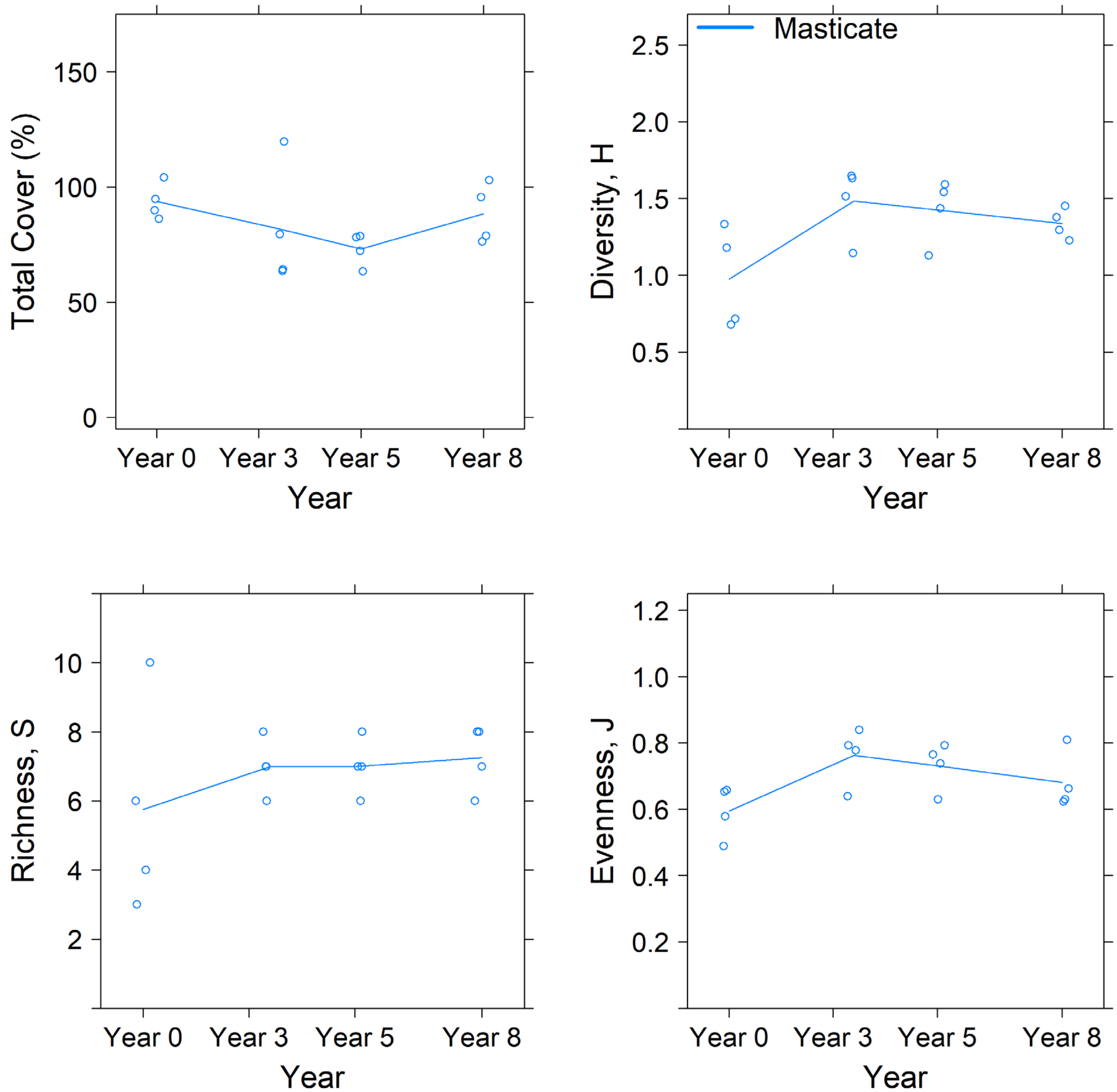

Figure 5-2. Unit 6 community structure from Baseline (2012) to eight years after mastication (2021). Four masticated transects were analyzed in Unit 6.

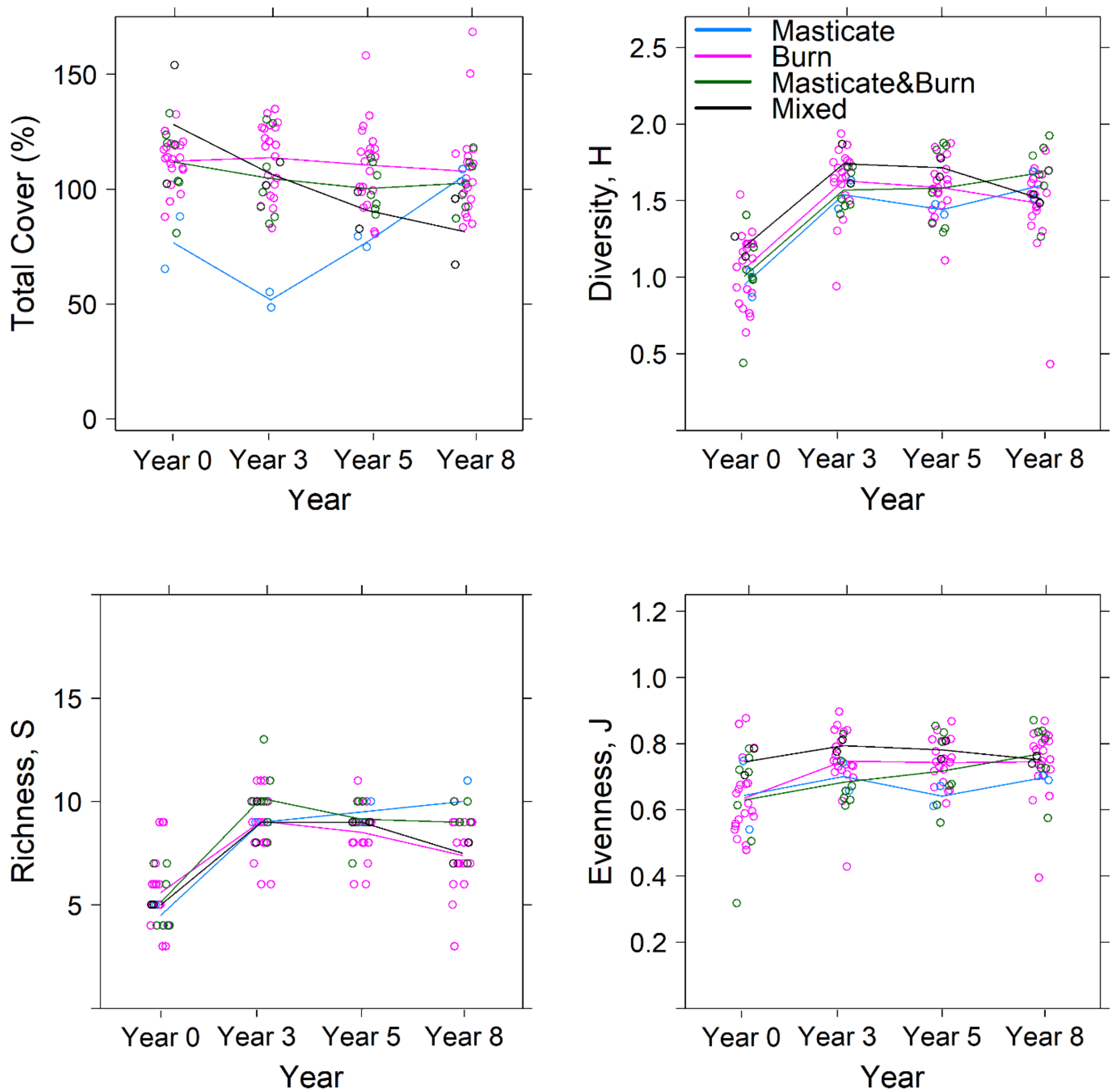

Figure 5-3. Unit 7 community structure from Baseline (2013) to eight years after mastication (2021). Two masticated, 20 burned, seven masticated and burned, and two mixed transects were analyzed in Unit 7.

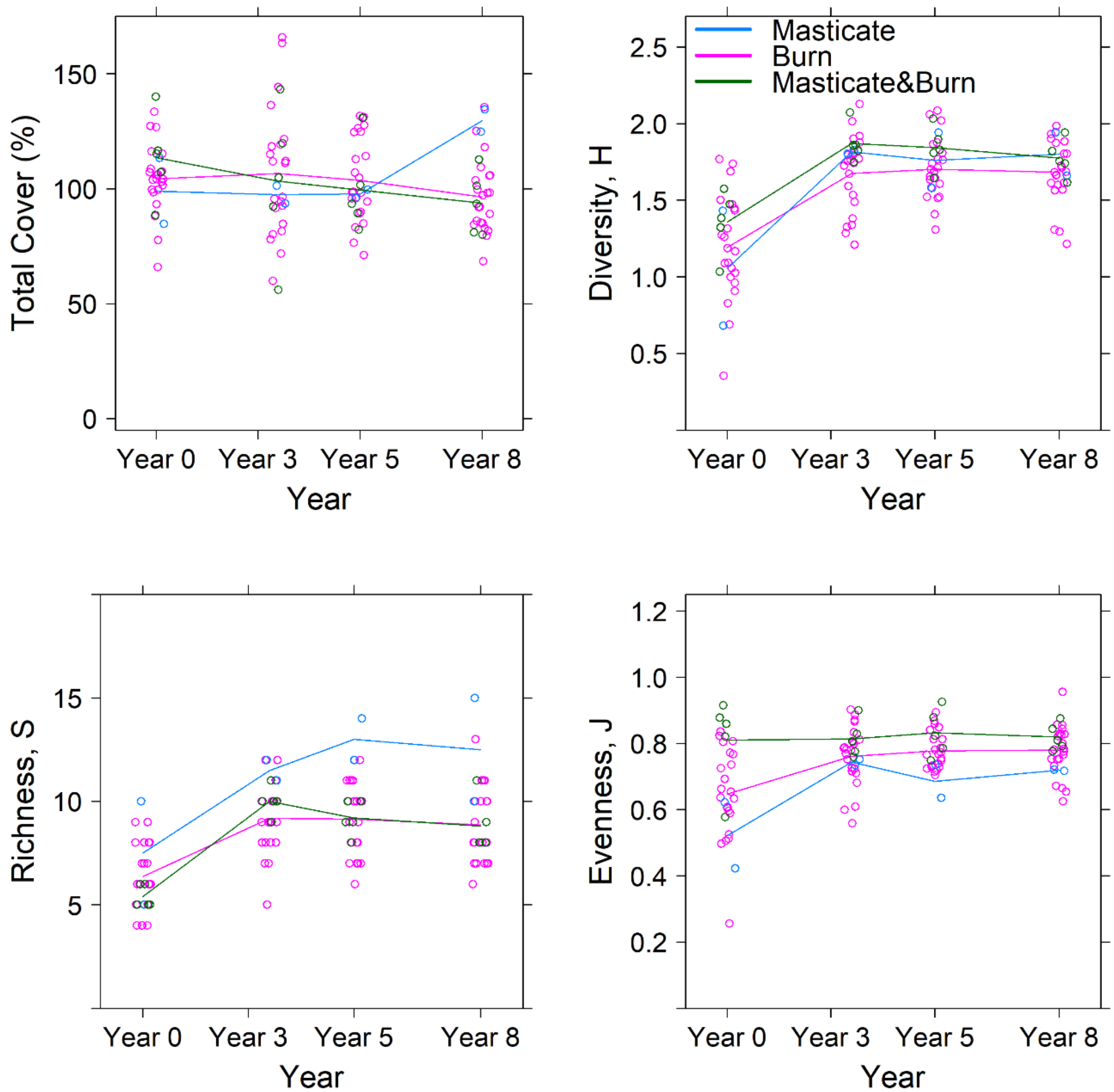

Figure 5-4. Unit 10 community structure from Baseline (2012) to eight years after mastication (2021). Two masticated, 22 burned, and five masticated and burned transects were analyzed in Unit 10.

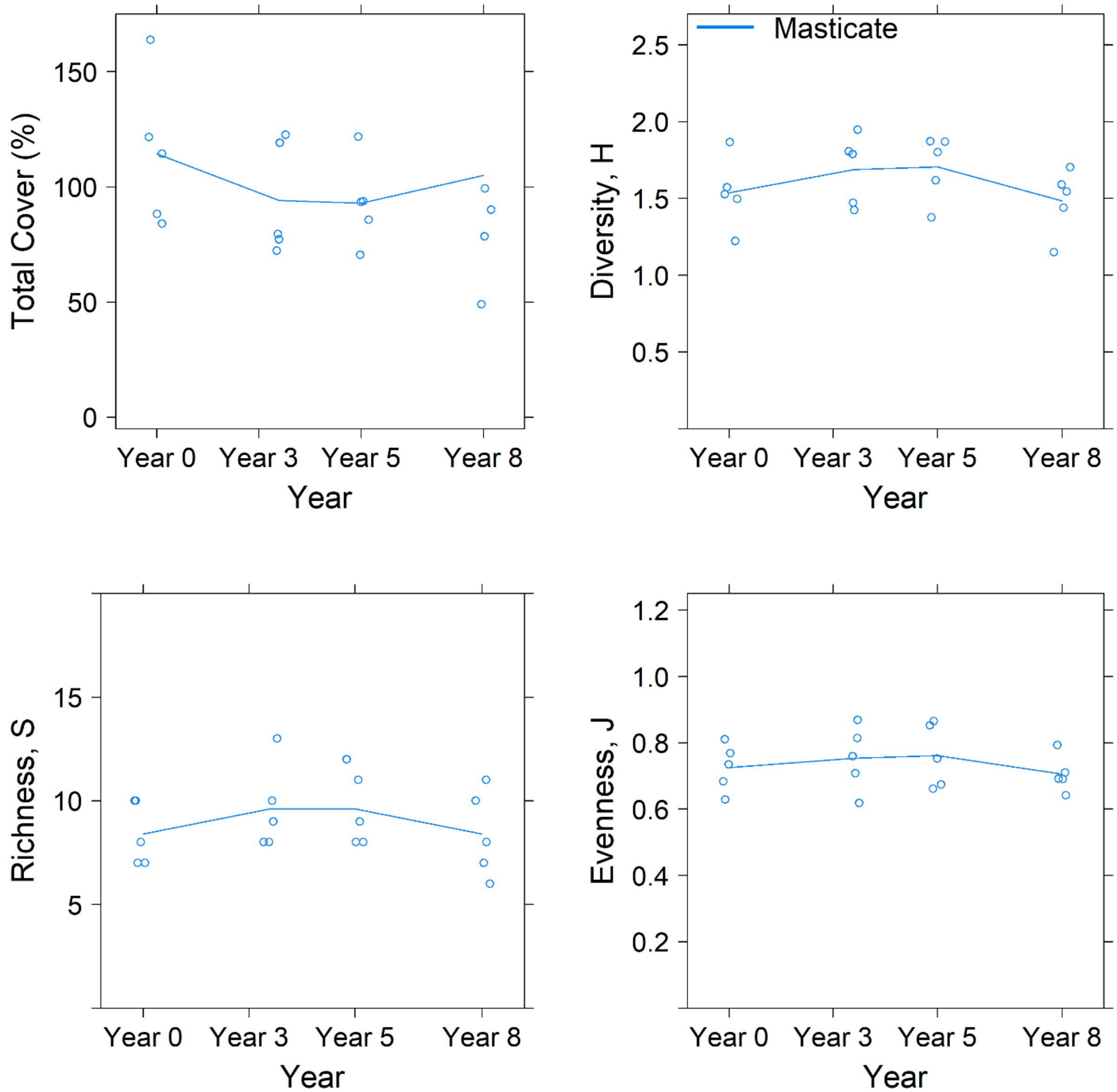

Figure 5-5. Unit 1 East community structure from Baseline (1997) to eight years after mastication (2021). Five masticated transects were analyzed in Unit 1 East.

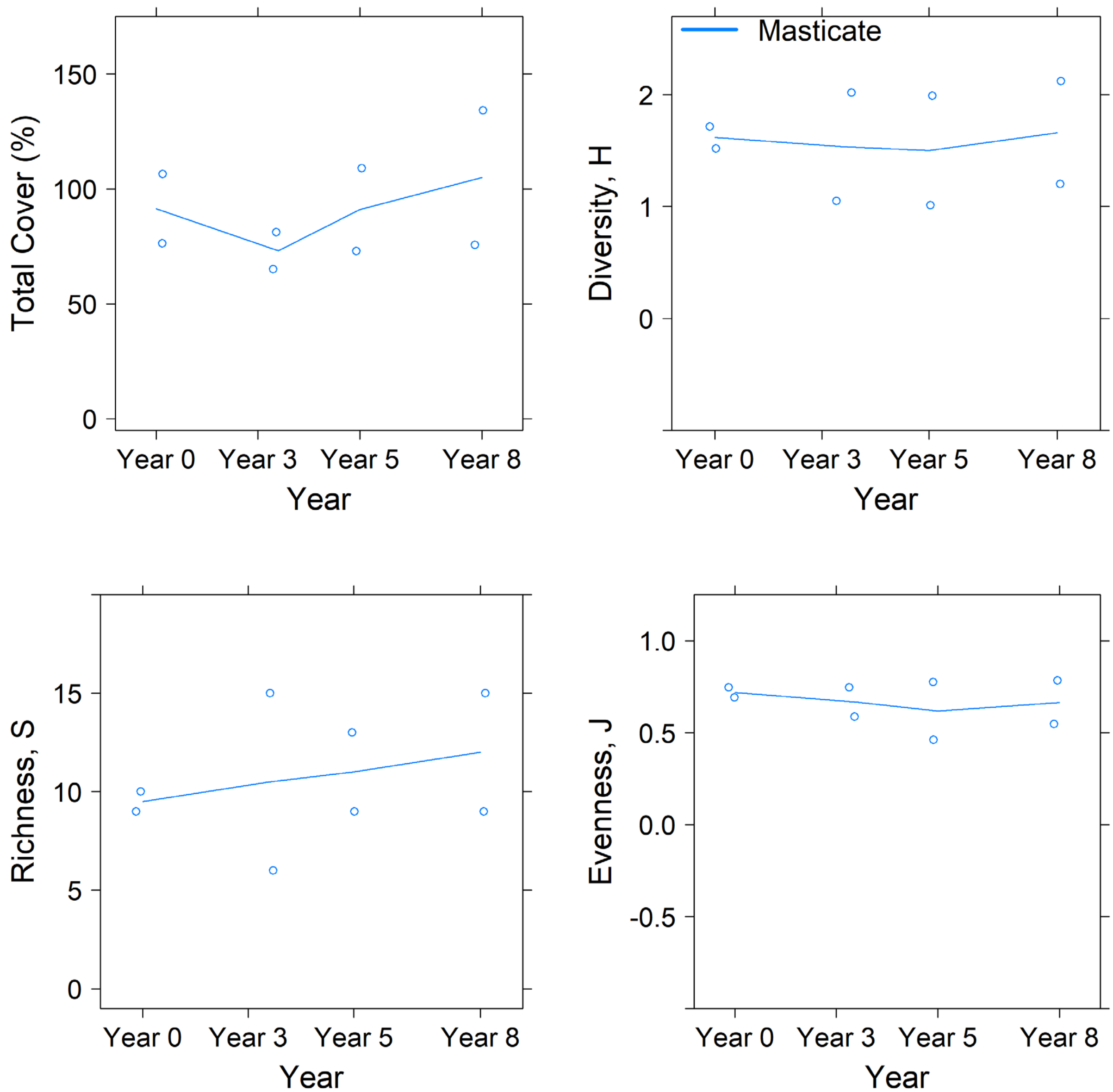

Figure 5-6. MOUT Buffer community structure from Baseline (2011) to eight years after mastication (2021). Two masticated transects were analyzed in MOUT Buffer.

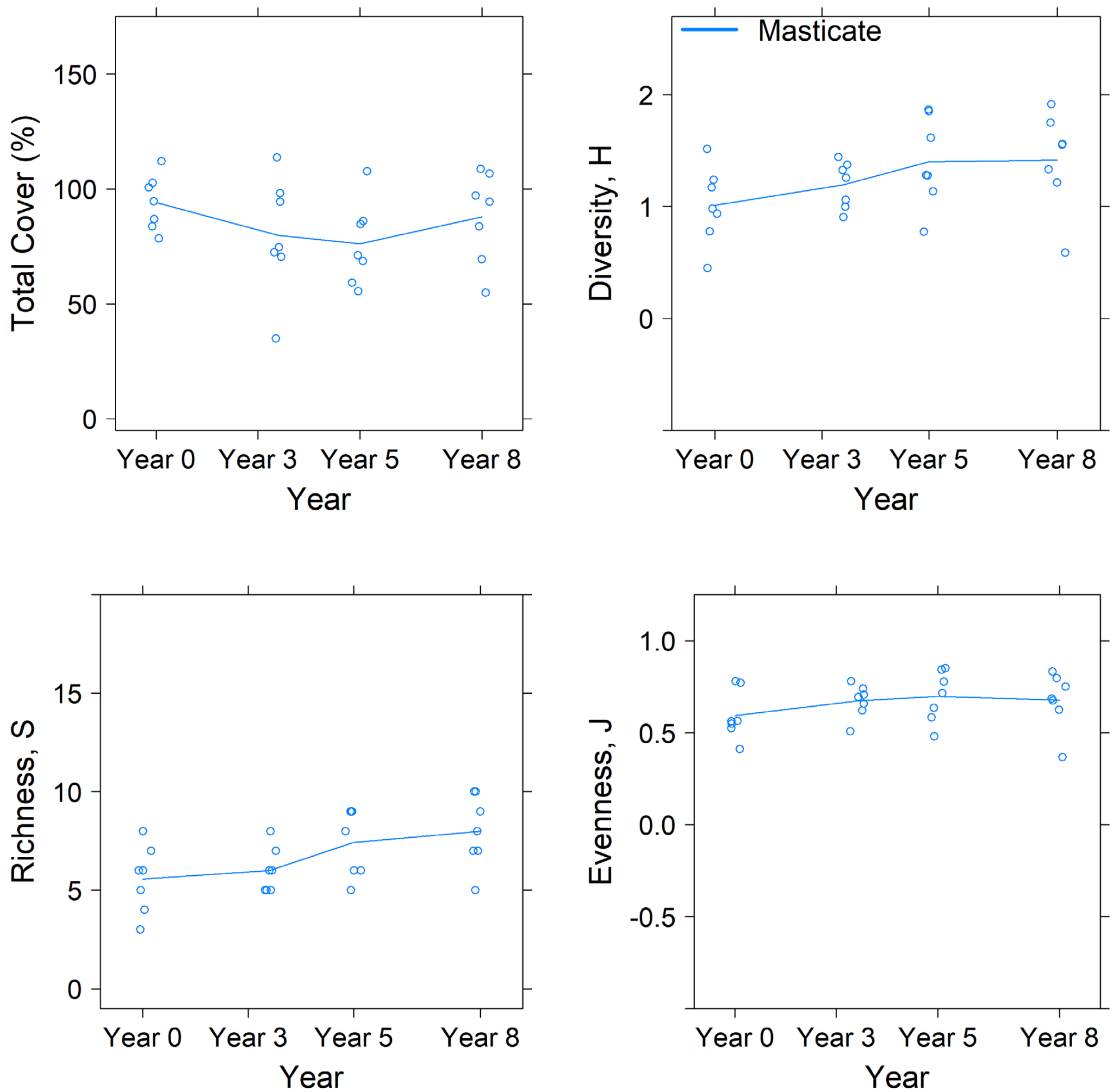

Figure 5-7. WGBA community structure from Baseline (2011) to eight years after mastication (2021). Seven masticated transects were analyzed in WGBA.

Trends in bare ground cover over time were similar between Units where only mastication occurred; however, bare ground cover varied between some treatment types (Figures 5-8 through 5-13). Generally, herbaceous coverage remained low in each Unit through time, with the exception of MOUT Buffer.

Bare ground cover increased between Baseline and Year 3 and remained stable or decreased between Year 3 and Year 5 in all Units (Table 5-1; Figures 5-8 through 5-13). Treatment type appeared to affect bare ground cover in Unit 7, where bare ground cover in masticated transects decreased between Years 3 and 8 at a much higher rate than transects exposed to other treatment types. Bare ground cover was substantially higher along masticated transects in Baseline than in all other treatment types ($C_{U7,Y0\ masticate}$

= 33%, $C_{U7,Y0\ burn}$ = 9%, $C_{U7,Y0\ M\&B}$ = 8%, $C_{U7,Y0\ mixed}$ = 5%); however, shrub cover along masticated transects in Year 8 exceeded Baseline by 30% and species richness increased most between Baseline and Year 8 along masticated transects (Figure 5-3). Therefore, the sharp decrease in bare ground cover along masticated transects may be due to more substantial increases in shrub cover and species richness along masticated transects compared to transects exposed to other treatments (Table 5-1; Figures 5-8 through 5-13).

Herbaceous cover increased between Baseline and Year 3 for all Units. Maximum herbaceous cover for Units 6, 7, 10, 1 East, and WGBA in all years was only 7%. In contrast, herbaceous cover in MOUT Buffer reached a maximum of 33% cover in Year 3 (from 5% in Baseline) before decreasing to 19% in Year 8. Herbaceous cover was also noticeably greater in masticated areas compared to areas subjected to other treatment types between Baseline and Year 5 (Table 5-1; Figures 5-8 through 5-13).

Table 5-1. Average percent coverage of bare ground and herbaceous cover for Units 6, 7, 10, 1 East, MOUT Buffer, and WGBA during Baseline, Year 3, Year 5, and Year 8 surveys.

Cover Type (Year)	Unit 6	Unit 7	Unit 10	Unit 1 East	MOUT Buffer	WGBA
Bare ground (Baseline)	18%	10%	10%	10%	16%	16%
Bare ground (Year 3)	31%	22%	22%	27%	20%	30%
Bare ground (Year 5)	33%	20%	20%	24%	19%	35%
Bare ground (Year 8)	32%	21%	21%	31%	25%	24%
Herbaceous (Baseline)	0.5%	0%	0%	1%	5%	1%
Herbaceous (Year 3)	1%	2%	2%	7%	33%	5%
Herbaceous (Year 5)	4%	0.3%	0.3%	2%	20%	3%
Herbaceous (Year 8)	2%	0.2%	0.2%	2%	19%	3%

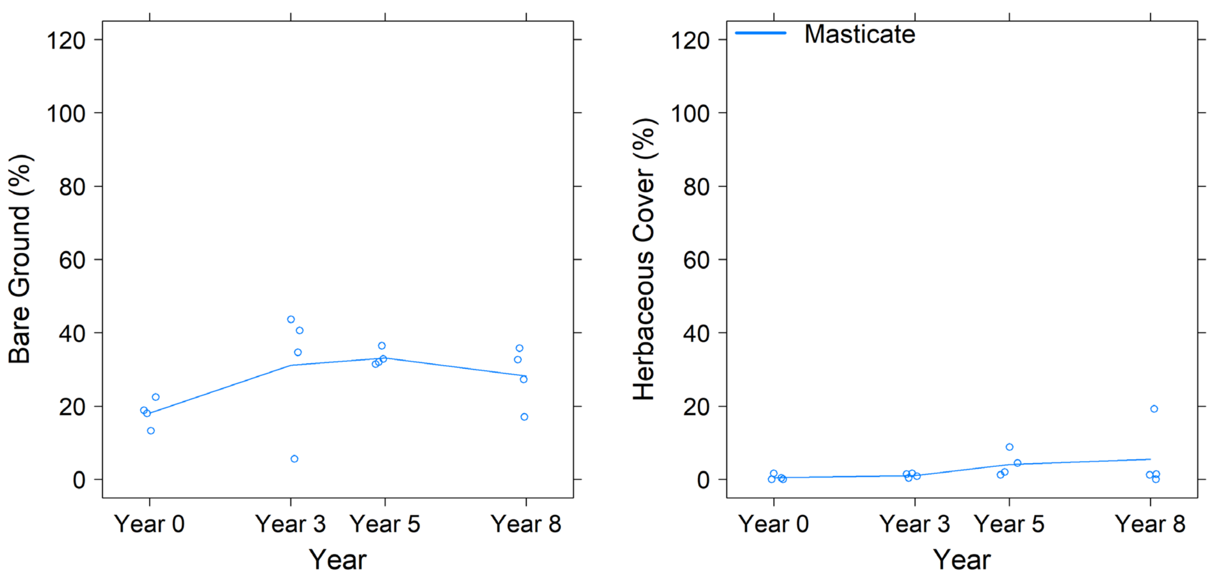

Figure 5-8. Unit 6 bare ground and herbaceous cover from Baseline to Year 8 after treatment. Four masticated transects were analyzed in Unit 6.

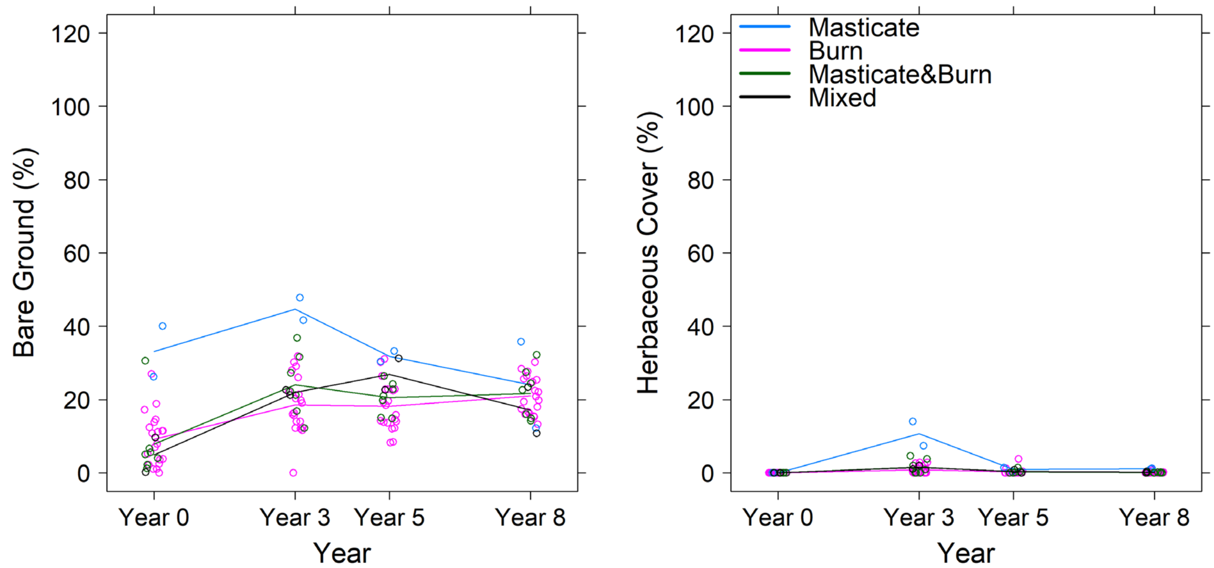

Figure 5-9. Unit 7 bare ground and herbaceous cover from Baseline to Year 8 after treatment. Two masticated transects, 20 burned transects, seven masticated and burned transects, and two mixed transects were analyzed in Unit 7.

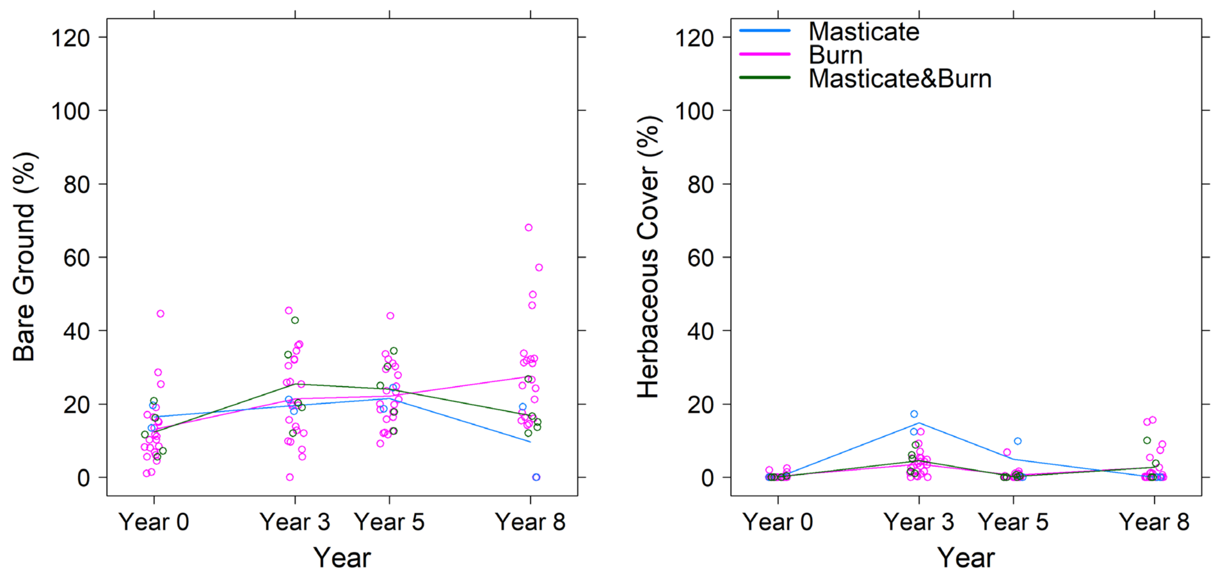

Figure 5-10. Unit 10 bare ground and herbaceous cover from Baseline to Year 8 after treatment. Two masticated transects, 22 burned transects, and five masticated and burned transects were analyzed in Unit 10.

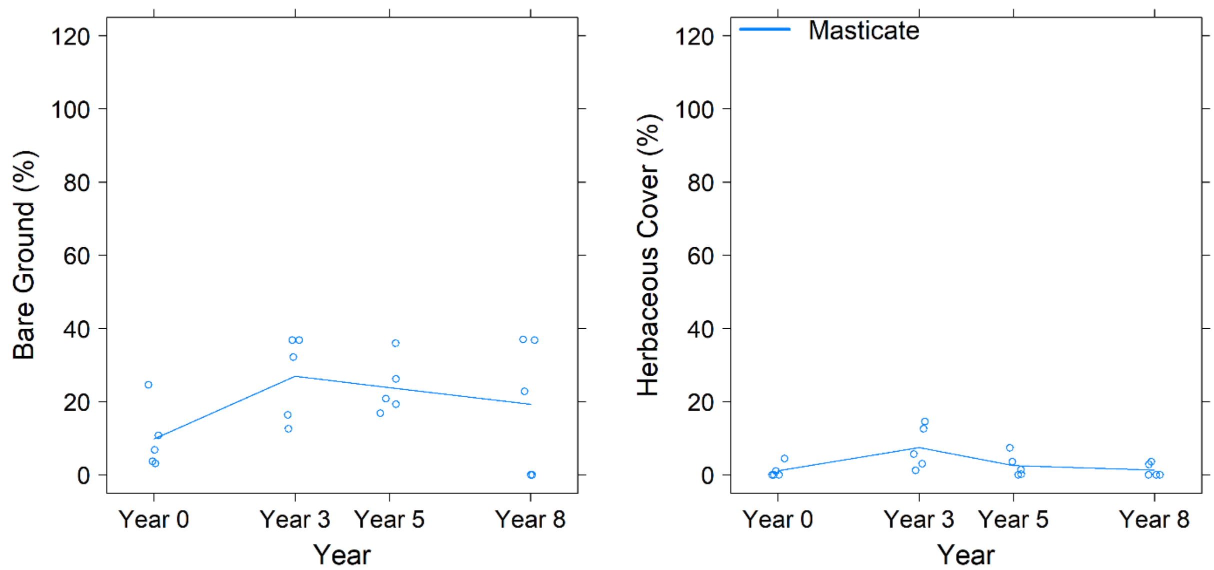

Figure 5-11. Unit 1 East bare ground and herbaceous cover from Baseline to Year 8 after treatment. Five masticated transects were analyzed in Unit 1 East.

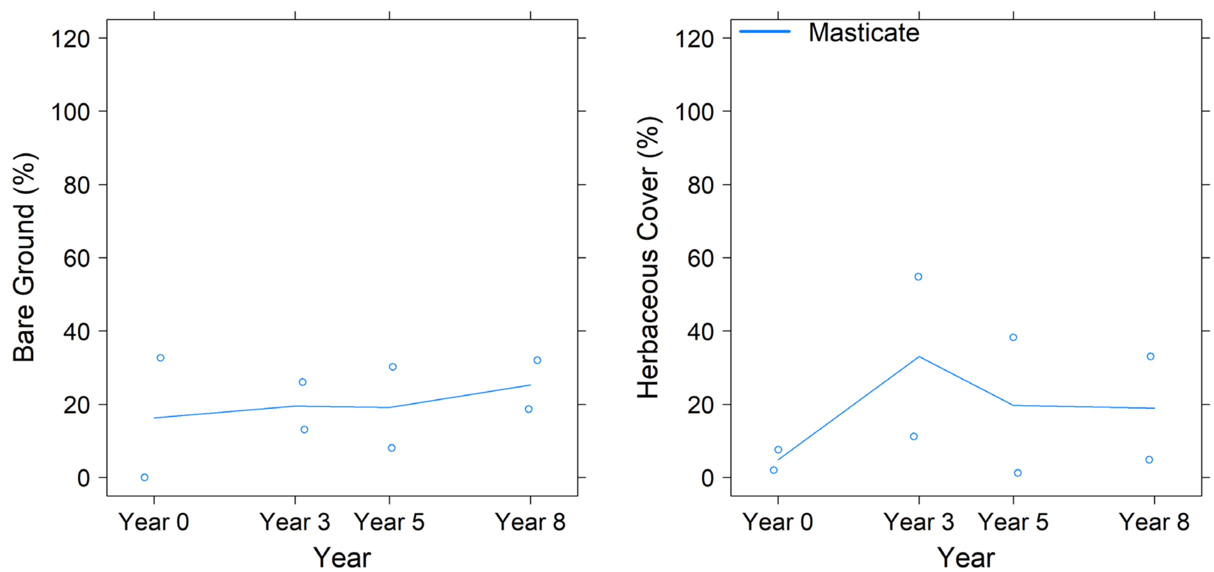

Figure 5-12. MOUT Buffer bare ground and herbaceous cover from Baseline to Year 8 after treatment. Two masticated transects were analyzed in MOUT Buffer.

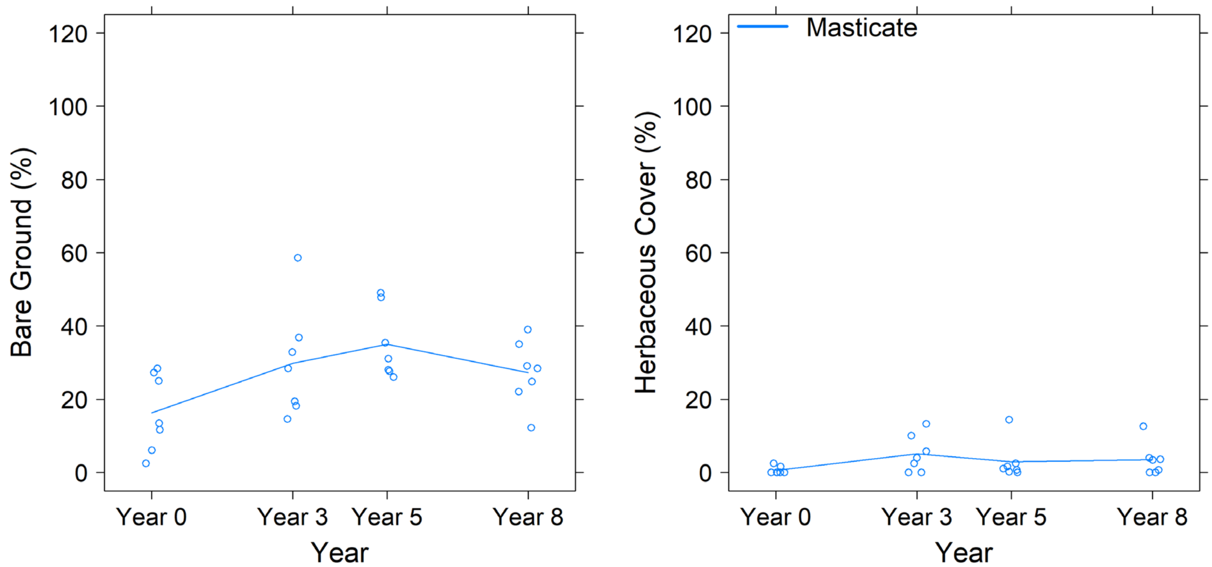

Figure 5-13. WGBA bare ground and herbaceous cover from Baseline to Year 8 after treatment. Seven masticated transects were analyzed in WGBA.

Burleson conducted PERMANOVAs to examine differences in community composition among age, Unit, and treatment. PERMANOVA results for all Year 8 Units combined suggest that age, Unit, and treatment may all influence community composition; however, there was evidence a relationship exists between age and Unit and between Unit and treatment. Community composition may vary through time, but these results also indicate that the inherent relationships between age and Unit, and Unit and treatment may mask the true effects of these factors separately on community composition (Table 5-2). PERMANOVAs conducted for Units 7 and 10 separately suggest that age and treatment influence community composition and there was no evidence of a relationship between age and treatment in either Unit (Tables 5-3 and 5-4). This suggests that when Unit is not considered a factor, age and treatment have real effects on community composition that are not overshadowed by an underlying relationship between Unit and treatment. Additionally, these results provide evidence of inherent differences in community composition between Units.

Table 5-2. Three-way PERMANOVA results for Year 8 Units combined community compositions, based on Bray-Curtis distance matrices.

Factor	*F*	*P*
Age	49.4	0.0001
Unit	12.997	0.0001
Treatment	6.504	0.0001
Age*Unit	1.573	0.001
Age*Treatment	1.055	0.366
Unit*Treatment	6.612	0.0001
Age*Unit*Treatment	0.366	1.000

Table 5-3. Two-way PERMANOVA results for Unit 7 community compositions, based on Bray-Curtis distance matrices.

Factor	*F*	*p*
Age	15.293	0.0001
Treatment	2.921	0.001
Age*Treatment	0.816	0.632

Table 5-4. Two-way PERMANOVA results for Unit 10 community compositions, based on Bray-Curtis distance matrices.

Factor	*F*	*p*
Age	13.497	0.0001
Treatment	7.423	0.0001
Age*Treatment	0.284	0.9875

Community composition was generally similar between Units; however, species dominance appeared to differ slightly between Year 8 Units, particularly in response to treatment (Figures 5-14 through 5-20). Units were generally dominated by shaggy-barked manzanita in all years or were co-dominated by shaggy-barked manzanita and chamise; however, when burning occurred in a Unit, dominant species typically shifted between shaggy-barked manzanita, deerweed, and dwarf ceanothus (Figures 5-15 through 5-17).

Unit 6 was dominated by shaggy-barked manzanita in all years except Year 3, when deerweed temporarily became the most dominant species (C = 27%). Species richness decreased between Baseline and Year 8, with 13 species in Baseline, 10 species in Year 3, 11 species in Year 5, and 12 species in Year 8. Sydney golden wattle, golden yarrow, poison oak, Eastwood's goldenbush, and deerweed were observed in Year 8 but were not observed in Baseline (Figure 5-14).

Unit 7 was generally co-dominated by shaggy-barked manzanita and chamise along masticated transects and transects exposed to mixed treatment. Along burned transects and masticated and burned transects, shaggy-barked manzanita and chamise were strongly co-dominant in Baseline. Three years after burn treatment, deerweed and dwarf ceanothus became the co-dominant species. In Year 8, dwarf ceanothus and shaggy-barked manzanita became co-dominant along all transects except those exposed to mixed treatment. Species richness tended to increase over time, regardless of treatment type (Figures 5-15 and 5-16).

In Unit 10, shaggy-barked manzanita was the dominant species in Baseline surveys for all treatments. In Year 3 post burning, deerweed temporarily became the dominant species, with dwarf ceanothus and shaggy-barked manzanita becoming co-dominant in Years 5 and 8. In masticated areas between Years 3 and 8, poison oak became co-dominant with shaggy-barked manzanita. In areas that were masticated and burned, dwarf ceanothus became dominant in Years 3 and 5 but by Year 8 the three most abundant species were black sage, Monterey ceanothus, and shaggy-barked manzanita. Species present in Baseline but not present in Year 8 were Hooker's manzanita (along burned transects and masticated and burned transects), pitcher sage (along masticated transects), and poison oak (along masticated and burned transects). No additional species were present in Year 8 along burned transects. Additional species present in Year 8 that were not present in Baseline along masticated transects were peak rush-rose, dwarf ceanothus, golden yarrow, and deerweed; and along masticated and burned transects were dwarf ceanothus, toyon, peak rush-rose, iceplant, coast silk tassel, golden yarrow, sticky monkeyflower, and deerweed (Figure 5-17).

Unit 1 East was dominated by shaggy-barked manzanita in all years except Year 3, when deerweed temporarily became the most abundant species (*C* = 32%). Species richness decreased from 21 species in Baseline to 15 species in Year 8 and no additional species were observed in Year 8 (Figure 5-18).

MOUT Buffer was co-dominated by shaggy-barked manzanita and chamise in all years. Species richness increased from 14 species in Baseline to 19 species in Year 8. Additional species present in Year 8 that were not observed in Baseline were coast live oak, common snowberry, deerweed, golden yarrow, tree lupine, and California wildrose (Figure 5-19).

WGBA was dominated by shaggy-barked manzanita in all years except Year 3, which was dominated by deerweed. Species richness was lowest in Year 3 with 11 shrub species observed; however, richness increased back to Baseline richness in Year 5 (*S* = 13 species) and increased to 14 species in Year 8. Monterey ceanothus was the only species present in Year 8 that was not present in Baseline (Figure 5-20).

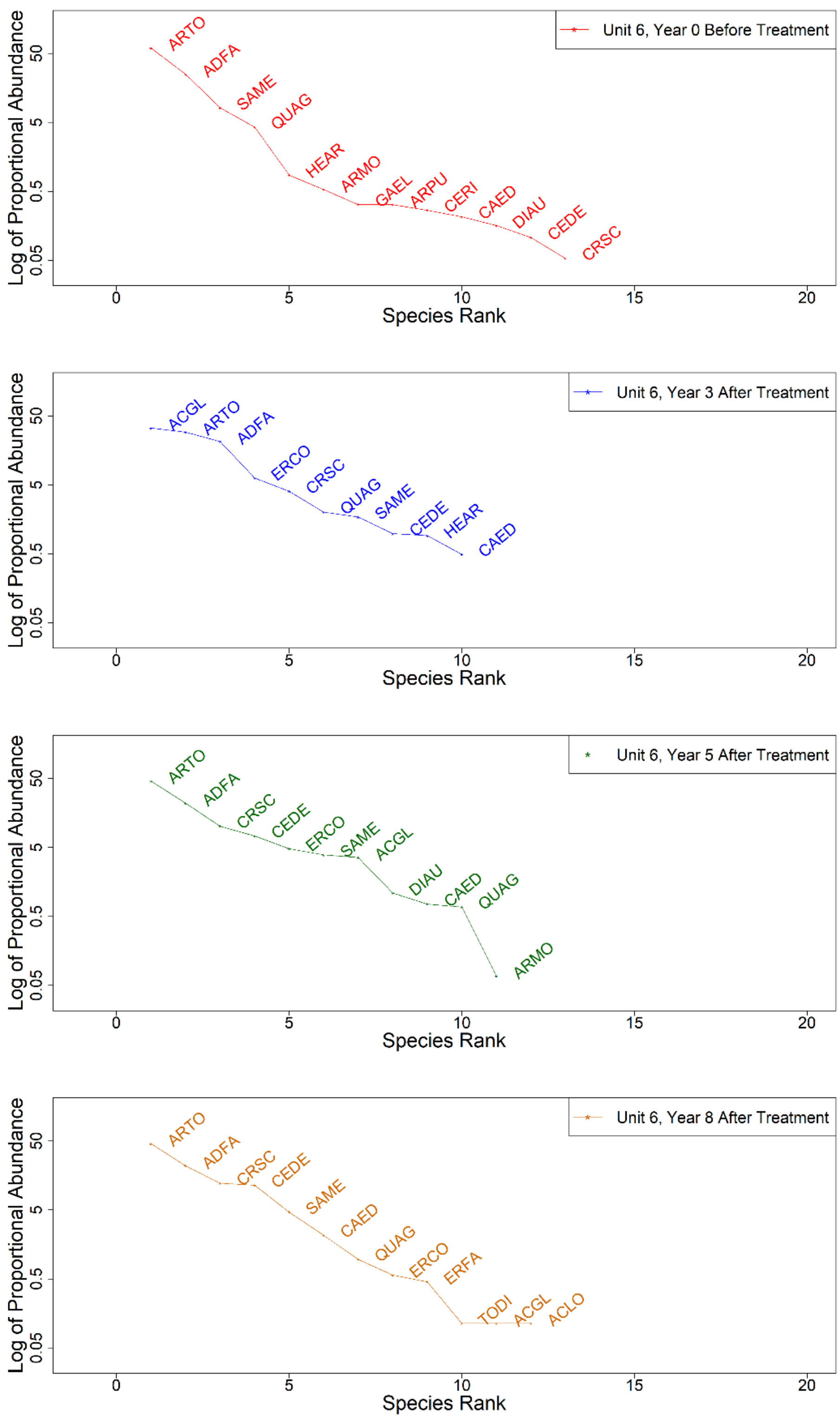

Figure 5-14. Unit 6 rank-abundance curves between Baseline (2012) and Year 8 (2021). New species present in Year 8 surveys compared to Baseline include Sydney golden wattle (*Acacia longifolia*), golden yarrow, poison oak, Eastwood's goldenbush, and deerweed. Species present in Baseline that were not present in Year 8 included Monterey ceanothus, toyon, Toro manzanita, sandmat manzanita, coast silk tassel, and sticky monkeyflower. Y-axis is log_{10} scale.

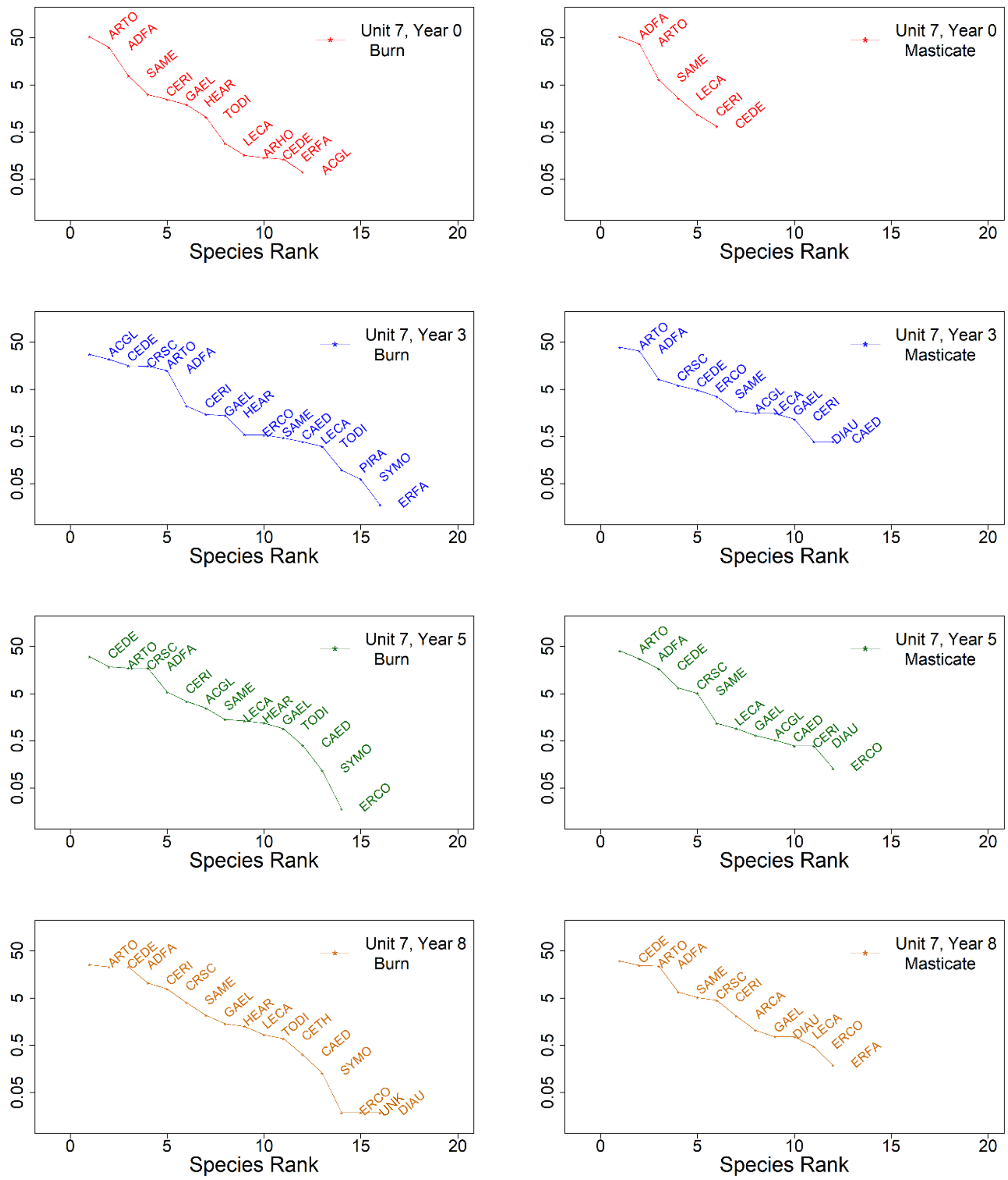

Figure 5-15. Unit 7 burned and masticated transects rank-abundance curves between Baseline (2013) and Year 8 (2021). New species present in Year 8 surveys of burned areas compared to Baseline included peak rush-rose, iceplant, blueblossom ceanothus (*Ceanothus thyrsiflorus*), creeping snowberry, golden yarrow, sticky monkeyflower, and unknown. Species present in Baseline that were absent in Year 8 in burned areas were Hooker's manzanita, Eastwood's goldenbush, and deerweed. New species present in Year 8 masticated areas that were not present in Baseline were peak rush-rose, California sagebrush, coast silk tassel, sticky monkeyflower, golden yarrow, and Eastwood's goldenbush. There were no species that were present in masticated areas during Baseline surveys but absent in Year 8. Twenty burned and two masticated transects were analyzed in Unit 7. Y-axis is log_{10} scale.

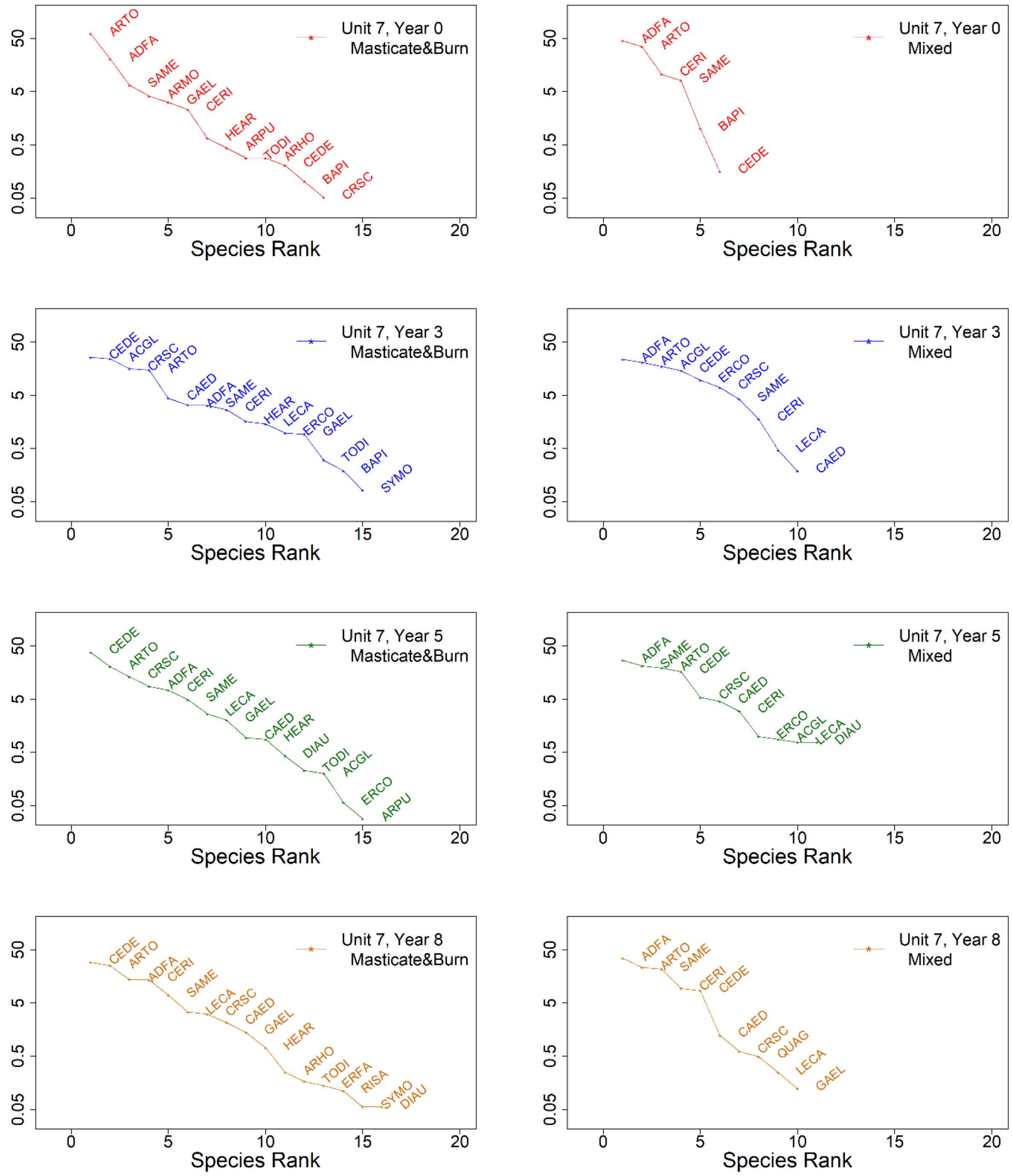

Figure 5-16. Unit 7 masticated and burned and mixed transects rank-abundance curves between Baseline (2013) and Year 8 (2021). New species present in masticated and burned areas in Year 8 surveys compared to Baseline include pitcher sage, iceplant, Eastwood's goldenbush, red flowering currant, creeping snowberry, and sticky monkeyflower. Species present in Baseline but absent in Year 8 in masticated and burned areas were Toro manzanita, sandmat manzanita, and coyote brush. Coyote brush was the only species present in mixed areas in Baseline but absent in Year 8. Species present in Year 8 surveys but absent in Baseline in mixed areas were iceplant, peak rush-rose, coast live oak, pitcher sage, and coast silk tassel. Seven masticated and burned transects and two mixed transects were analyzed in Unit 7. Y-axis is $\log_{10}$ scale.

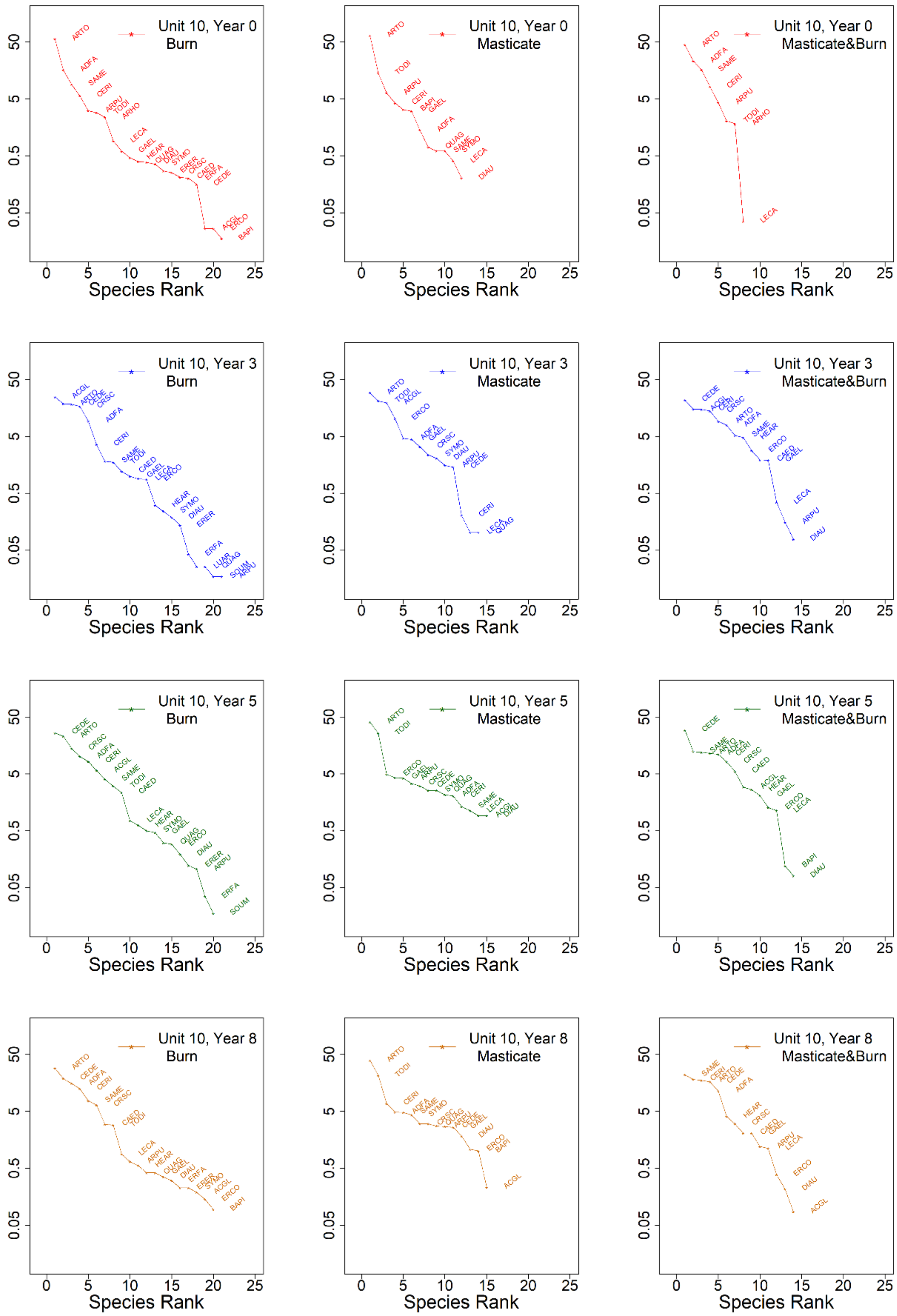

Figure 5-17. Unit 10 burned, masticated, and masticated and burned areas rank-abundance curves between Baseline (2012) and Year 8 (2021). The left, middle, and right columns represent burned transects (n=22), masticated transects (n=2), and masticated and burned transects (n=5), respectively. See report body text for species composition details. Y-axis is log_{10} scale.

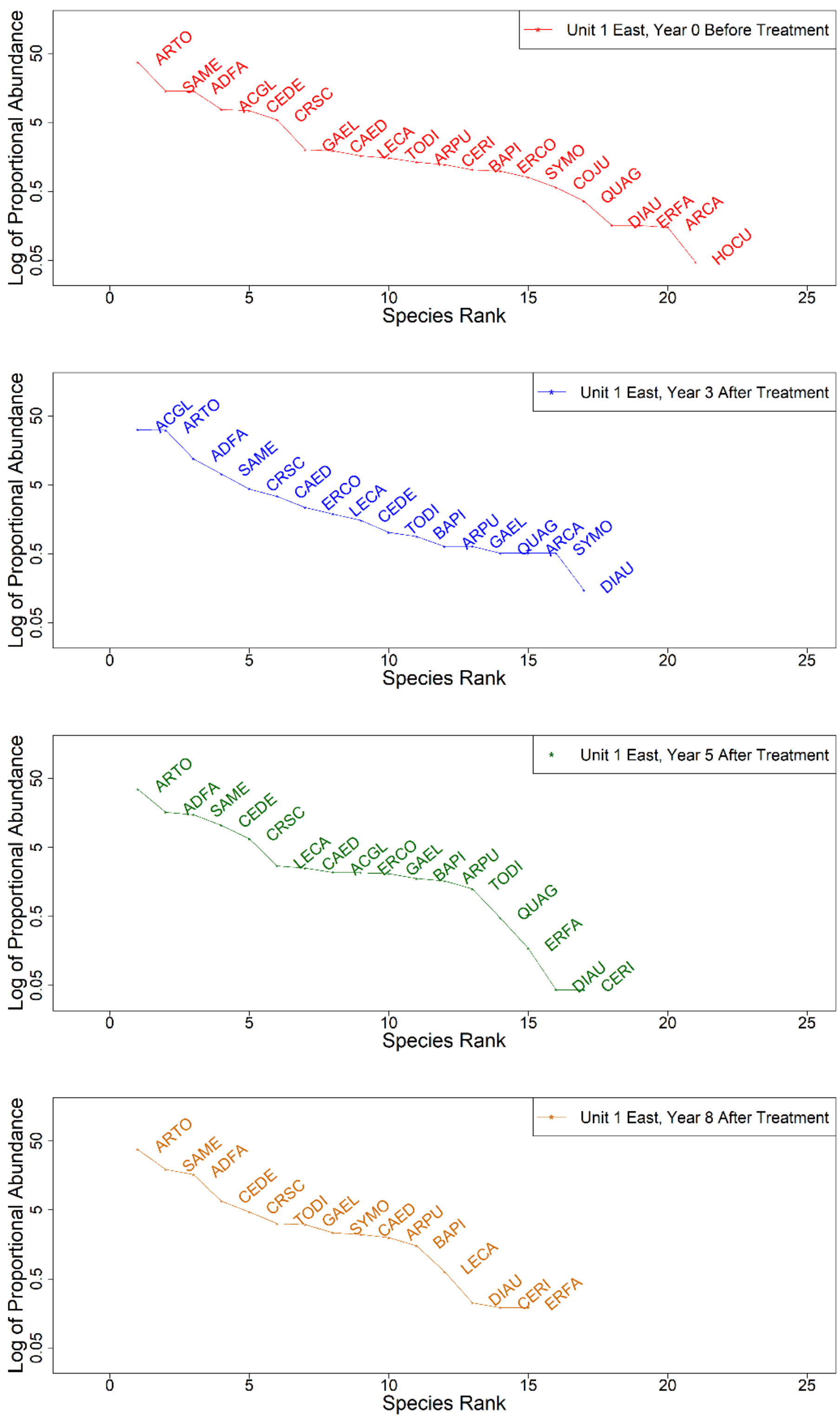

Figure 5-18. Unit 1 East rank-abundance curves between Baseline (1997) and Year 8 (2021). No new species were present in Year 8 surveys compared to Baseline. Species present in Baseline surveys but absent in Year 8 included deerweed, golden yarrow, jubata grass (*Cortaderia jubata*), coast live oak, California sagebrush, and wedgeleaf horkelia (*Horkelia cuneata*). Five masticated transects were analyzed in Unit 1 East. Y-axis is log_{10} scale.

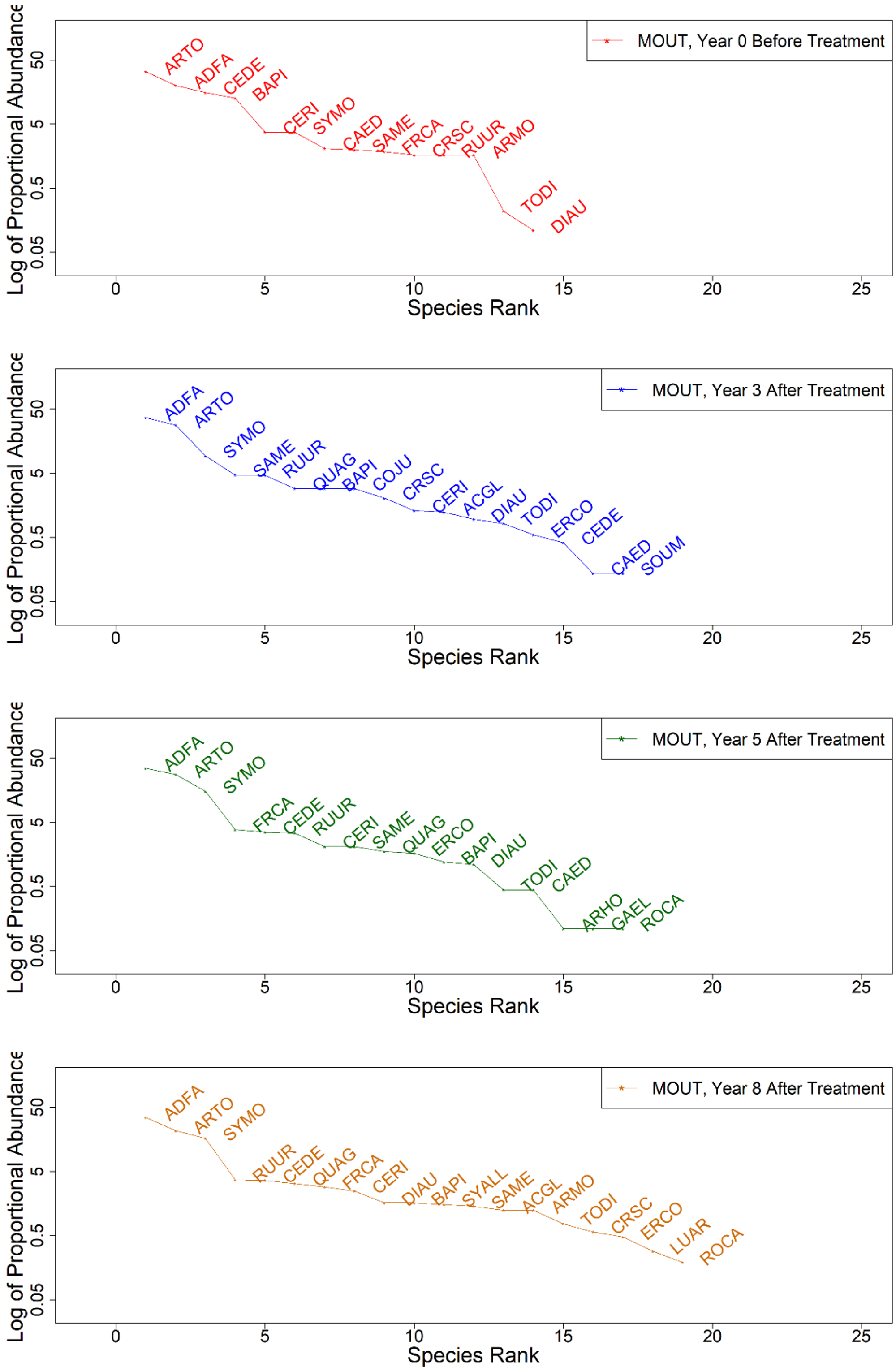

Figure 5-19. MOUT Buffer rank-abundance curves between Baseline (2011) and Year 8 (2021). New species present in Year 8 surveys that were absent in Baseline included coast live oak, common snowberry, deerweed, golden yarrow, tree lupine, and California wildrose (*Rosa californica*). The only species present in Baseline surveys but absent in Year 8 was iceplant. Two masticated transects were analyzed in MOUT Buffer. Y-axis is log_{10} scale.

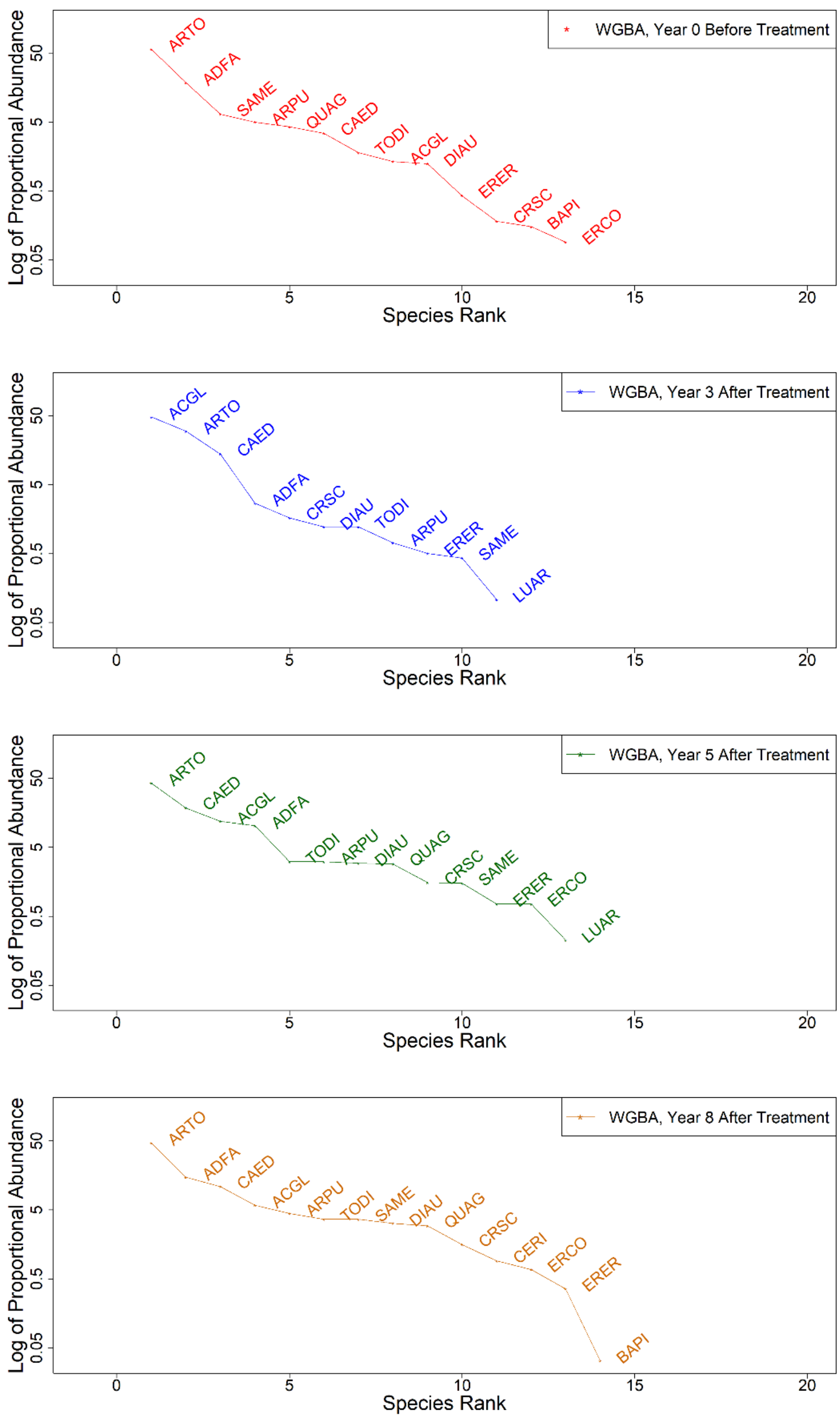

Figure 5-20. WGBA rank-abundance curves between Baseline (2011) and Year 8 (2021). Monterey ceanothus was the only species present in Year 8 that was not present in Baseline. No species were present in Baseline surveys but absent in Year 8. Two masticated transects were analyzed in MOUT Buffer. Y-axis is log_{10} scale.

Presence and recovery of HMP shrub species varied between Units and treatment types (Figures 5-21 through 5-27). Sandmat manzanita was found in Baseline in Units 6, 1 East, WGBA, masticated and burned transects of Unit 7, and all transects in Unit 10. Sandmat manzanita was not observed in Units 6 or 7 eight years after treatment; however, this species persisted after treatment in Units 10, 1 East, and WGBA. Additionally, sandmat manzanita cover was higher in Year 8 than in Baseline in Unit 1 East and WGBA. Monterey ceanothus was the most prevalent HMP shrub species in Year 8 Units. This species was present in Baseline of all Units except WGBA and in all treatments. Monterey ceanothus was not present eight years after treatment in Unit 6 but recovered to or exceeded Baseline values by Year 8 in Units 7, 10, 1 East, MOUT Buffer, and WGBA. Hooker's manzanita was only present in Units 7, 10, and MOUT Buffer. In Unit 7, this species was observed along burned transects and masticated and burned transects in Baseline; Hooker's manzanita was not present post-treatment along burned transects but was found along masticated and burned transects in Year 8. In Unit 10, this species was observed along burned transects in Baseline and was no longer present post-treatment. Toro manzanita was observed in Baseline of Units 6 and MOUT Buffer. This species persisted in Year 8 in MOUT Buffer but was absent in Year 8 in Unit 6. Eastwood's goldenbush was observed in low abundance in Baseline of Units 7 (burned transects only), 10 (burned transects only) and 1 East. This species persisted in Year 8 for Units 10 and 1 East but was absent along burned transects in Unit 7 by Year 8. Additionally, Eastwood's goldenbush was newly present in Year 8 along masticated and burned transects in Unit 7.

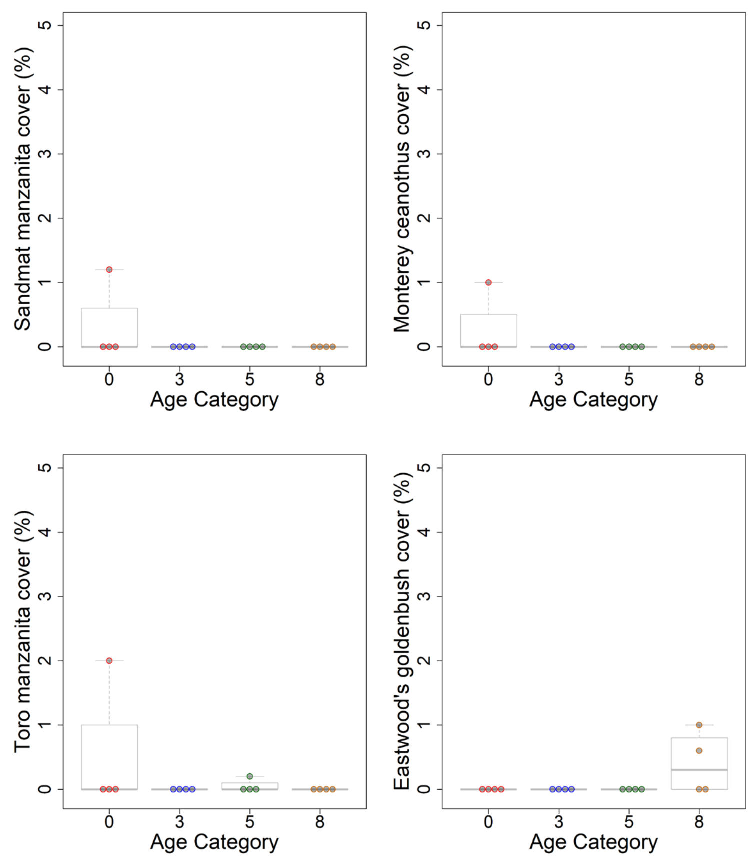

Figure 5-21. Unit 6 HMP shrub species cover between Baseline (2012), Year 3 (2016), Year 5 (2018), and Year 8 (2021). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Four masticated transects were analyzed in Unit 6.

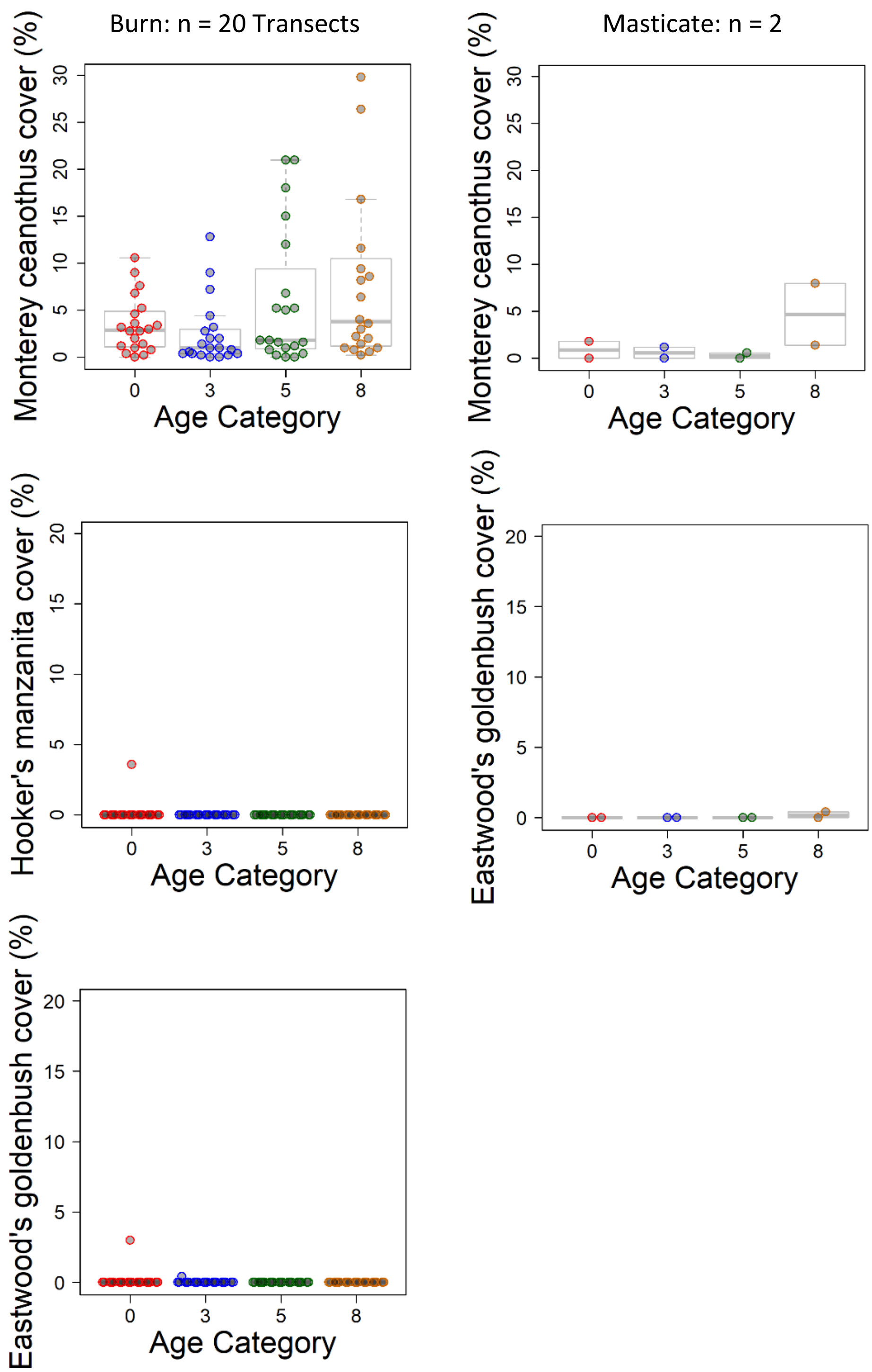

Figure 5-22. Unit 7 HMP shrub species cover along burned transects and masticated transects between Baseline (2013), Year 3 (2016), Year 5 (2018), and Year 8 (2021). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Twenty burned and two masticated transects were analyzed in Unit 7. Y-axes not equivalent in all plots.

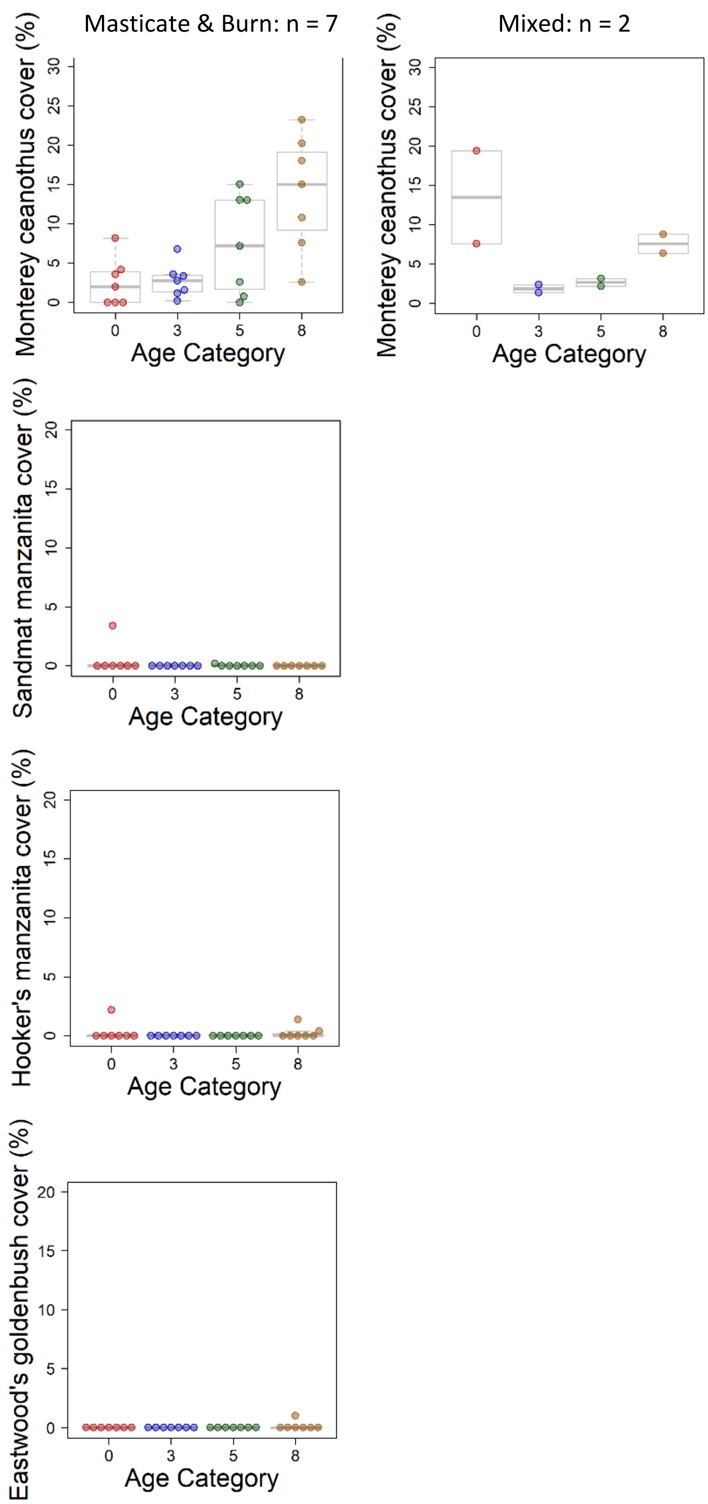

Figure 5-23. Unit 7 HMP shrub species cover along masticated and burned transects and mixed transects between Baseline (2013), Year 3 (2016), Year 5 (2018), and Year 8 (2021). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey 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 burned and two mixed transects were analyzed in Unit 7. Y-axes not equivalent in all plots.

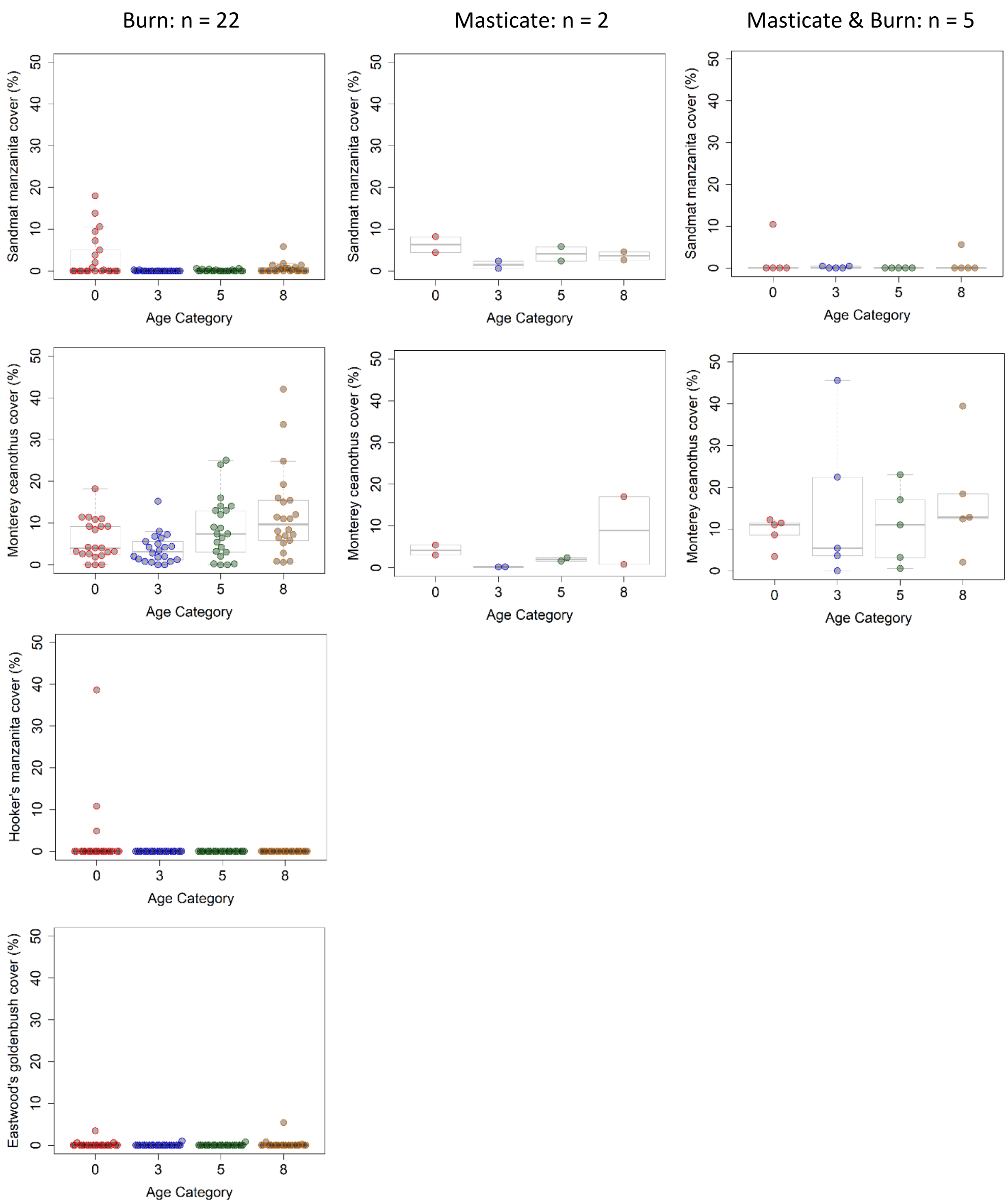

Figure 5-24. Unit 10 HMP shrub species cover along burned transects, masticated transects, and masticated and burned transects between Baseline (2012), Year 3 (2016), Year 5 (2018), and Year 8 (2021). The colored dots represent the percent cover of the respective species for each transect within an age 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-two burned transects, two masticated transects, and five masticated and burned transects were analyzed in Unit 10. Y-axes not equivalent in all plots.

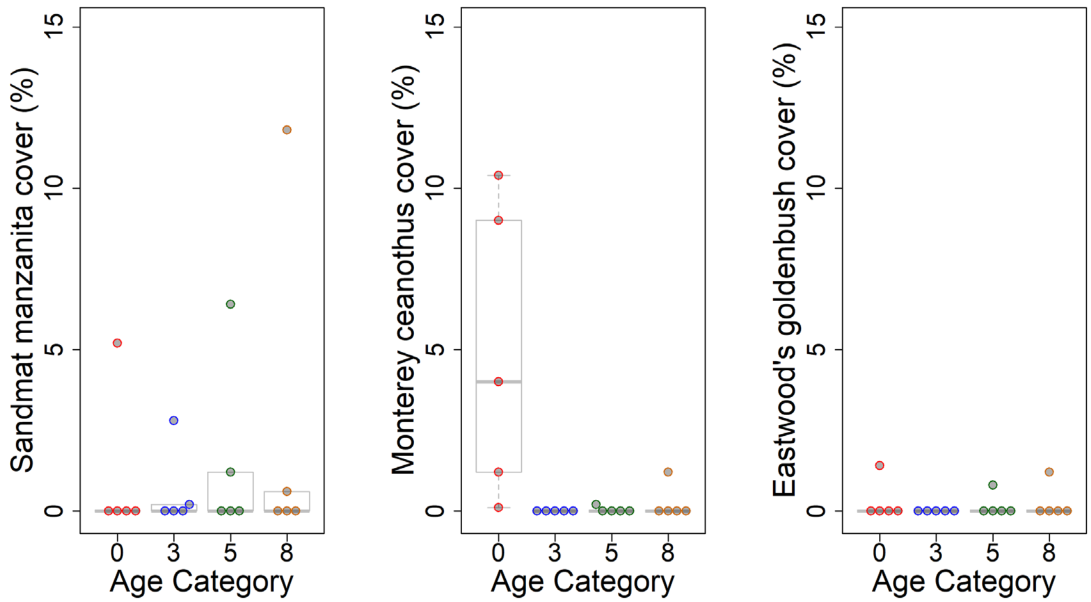

Figure 5-25. Unit 1 East HMP shrub species cover between Baseline (1997), Year 3 (2016), Year 5 (2018), and Year 8 (2021). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Five masticated transects were analyzed in Unit 1 East.

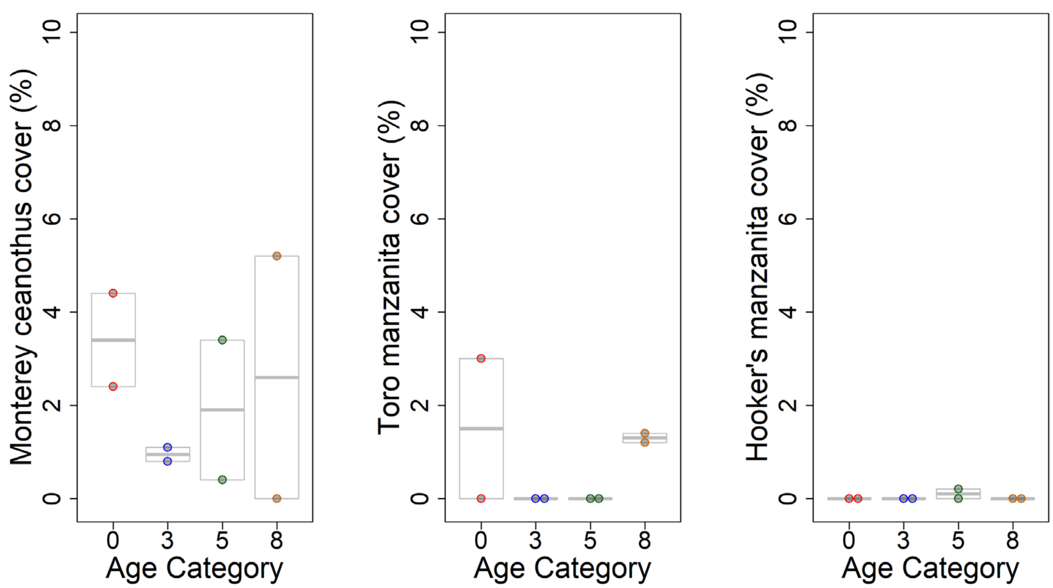

Figure 5-26. MOUT Buffer HMP shrub species cover between Baseline (2011), Year 3 (2016), Year 5 (2018), and Year 8 (2021). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Two masticated transects were analyzed in MOUT Buffer.

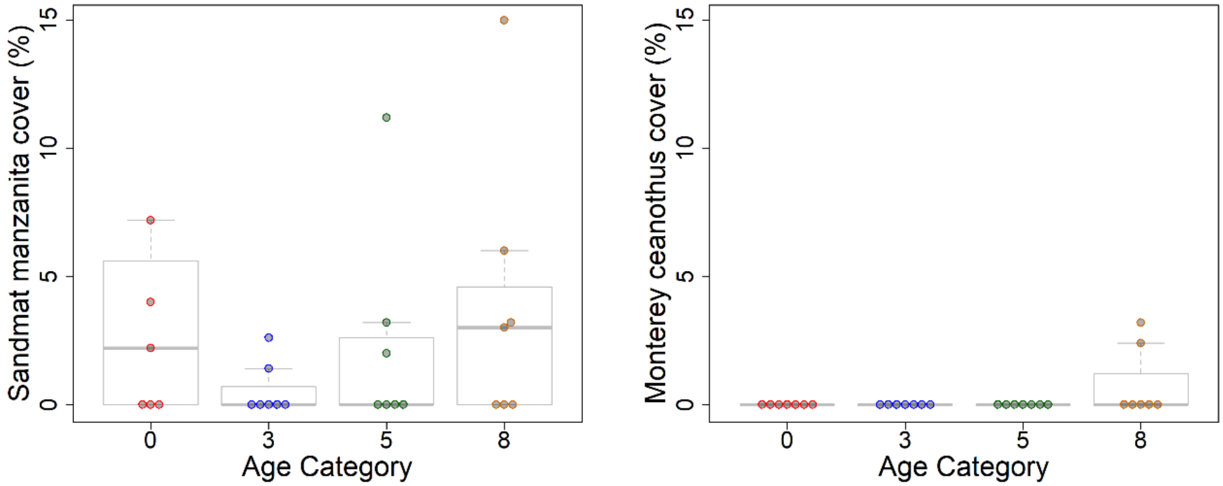

Figure 5-27. WGBA HMP shrub species cover between Baseline (2011), Year 3 (2016), Year 5 (2018), and Year 8 (2021). The colored dots represent the percent cover of the respective species for each transect within an age category. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Seven masticated transects were analyzed in WGBA.

NMDS ordinations for Year 8 Units illustrate that the community compositions by Year 8 were on trajectory toward Baseline compositions (Figure 5-28 through 5-32). 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 plot than the Baseline ellipses, indicating a substantial shift in community composition shortly after treatment. By Year 5 and Year 8, the location of ellipses typically shifts back towards the Baseline ellipse location with the Year 8 ellipse nearer to Baseline than Years 3 or 5, implying that community composition is more similar to Baseline in Year 8 than in Year 5 or Year 3. There was an insufficient number of transects in MOUT Buffer (n =2) to run ordination on this Unit, yielding results of infinity when attempting to conduct ordination, and a plot is not provided for this Unit. However, based on the results of analyses assessing changes in total cover, species diversity, richness, and evenness (see Figure 5-6), MOUT Buffer appears to be following the same pattern of returning to Baseline conditions that is typical of Year 8 Units.

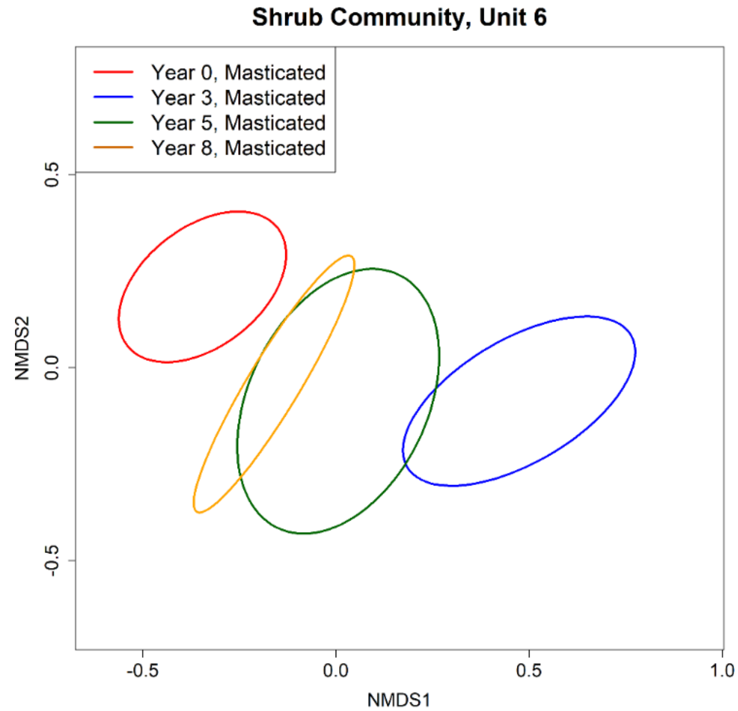

Figure 5-28. NMDS ordination plot showing Unit 6 community composition changes between Baseline and Year 8. Six masticated transects were analyzed in Unit 6.

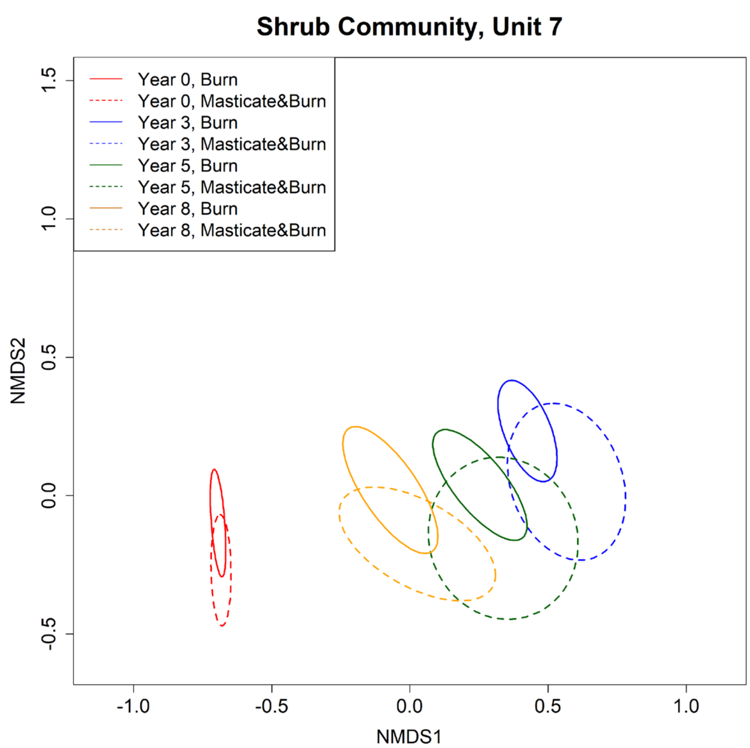

Figure 5-29. NMDS ordination plot showing Unit 7 community composition changes between Baseline and Year 8. The sample sizes of masticated transects and mixed transects were too low (n=2) to include in NMDS ordination. Twenty burned transects and seven masticated and burned transects were analyzed in Unit 7.

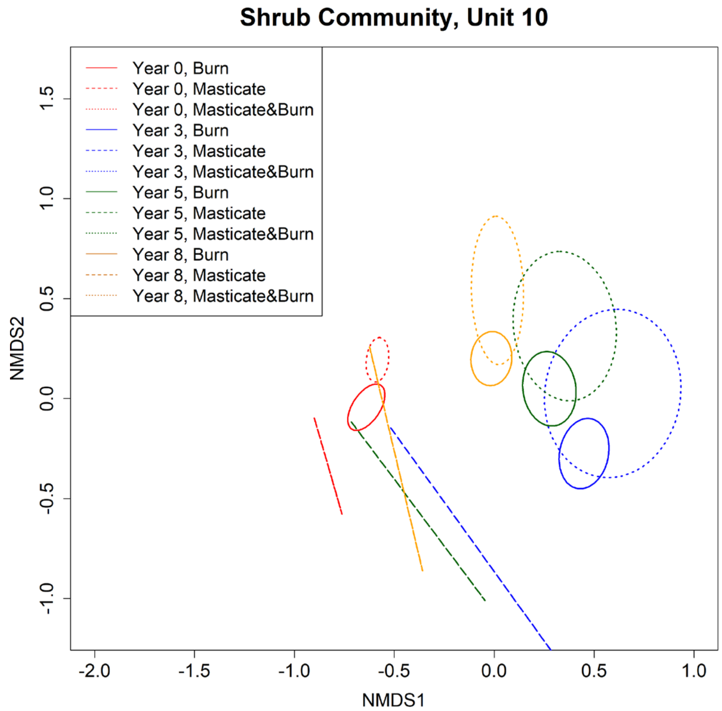

Figure 5-30. NMDS ordination plot showing Unit 10 community composition changes between Baseline and Year 8. Twenty-two burned transects, two masticated transects, and five masticated and burned transects were analyzed in Unit 10.

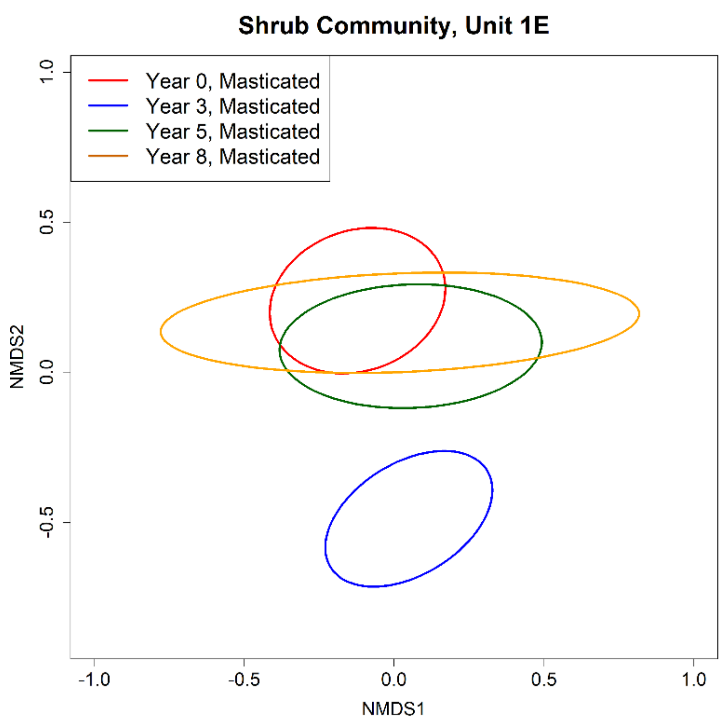

Figure 5-31. NMDS ordination plot showing Unit 1 East community composition changes between Baseline and Year 8. Five masticated transects were analyzed in Unit 1 East.

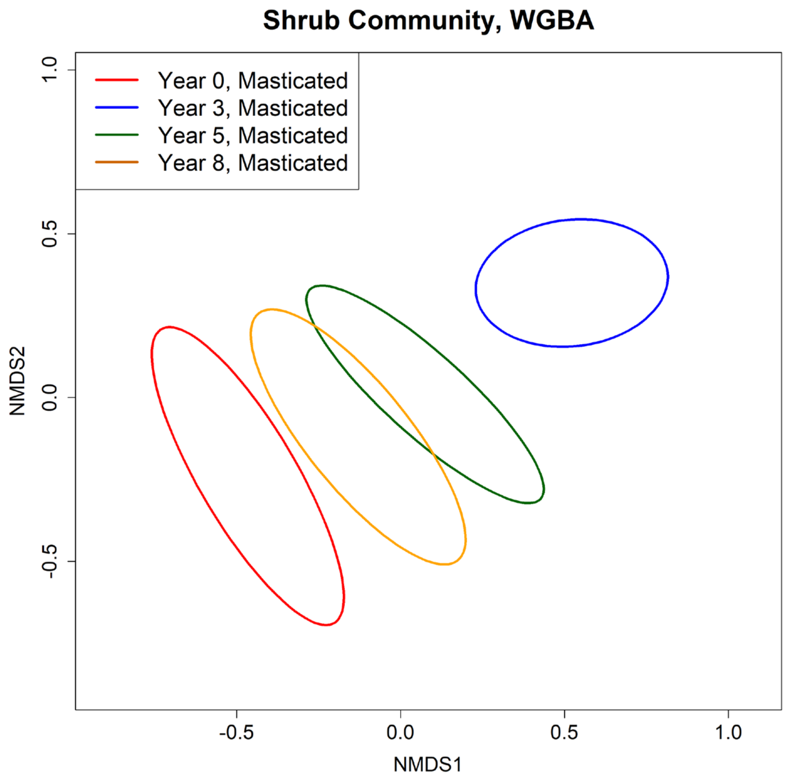

Figure 5-32. NMDS ordination plot showing WGBA community composition changes between Baseline and Year 8. Seven masticated transects were analyzed in WGBA.

5.4.2 Annual Grass Monitoring

Non-native annual grasses were observed and mapped within Unit 6 and MOUT Buffer, and in the Containment Lines of Units 7 and 10 (Appendix D, Figures D-8 and D-10). Estimated areas occupied by each density class for all monitoring years are summarized in Table 5-5. Unit 6 was not monitored for annual grasses in Year 3. Annual grass cover increased between Baseline and Year 3 in all Units. Additionally, annual grass cover was higher in Year 8 than in Baseline in all Units except Unit 7 ($C_{U7, Y0}$ = 9.43 acres, $C_{U7, Y8}$ = 6.92 acres). In Units 6, 7, and MOUT Buffer, most of the acreage comprising annual grassland was of high density (> 25% cover) whereas medium density (6-25% cover) contributed the most acreage to Unit 10 annual grassland (Table 5-5).

Table 5-5. Estimated area occupied by annual grasses between Baseline and Year 8 in Units 6, 7, 10, and MOUT Buffer.

Cover Class	Baseline (acres)	Year 1 (acres)	Year 3 (acres)	Year 5 (acres)	Year 8 (acres)
Unit 6					
1 (Low) = 15%	5.08	9.82	NS	0.24	1.34
2 (Medium) = 6-25%	2.29	13.51	NS	2.80	4.94
3 (High) = >25%	2.81	16.27	NS	12.05	7.15
Total Acreage	**10.18**	**39.60**	**-**	**15.09**	**13.43**
Unit 7					
1 (Low) = 1-5%	2.34	3.95	4.54	3.07	1.81
2 (Medium) = 6-25%	2.44	1.97	3.58	1.47	1.66
3 (High) = >25%	4.65	4.77	8.69	6.96	3.45
Total Acreage	**9.43**	**10.69**	**16.81**	**11.50**	**6.92**
Unit 10					
1 (Low) = 1-5%	0.55	39.50	45.24	3.59	1.98
2 (Medium) = 6-25%	0.41	10.50	8.00	3.90	6.39
3 (High) = >25%	1.01	8.97	9.79	2.47	1.23
Total Acreage	**1.97**	**58.97**	**63.03**	**9.96**	**9.60**
Military Operations, Urban Terrain Buffer					
1 (Low) = 1-5%	3.43	5.76	4.89	3.86	4.76
2 (Medium) = 6-25%	3.10	5.04	3.93	4.97	5.45
3 (High) = >25%	7.65	8.62	10.25	7.37	9.21
Total Acreage	**14.18**	**19.42**	**19.07**	**16.20**	**19.42**

NS = Not surveyed

5.4.3 Invasive and Non-Native Species Monitoring

Of the target invasive species, only iceplant was observed in Year 8 Units. This species was not mapped throughout Year 8 Units but was observed along shrub transects in Units 6, 7, and 1 East. Additionally, Sydney golden wattle (*Acacia longifolia*) was observed in Unit 6 during shrub transect monitoring. Non-native herbaceous species were observed at low abundance during transect monitoring in Year 8 Units (Appendix G, Tables G-5 through G-8).

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6 CONCLUSIONS

6.1 HMP Annuals

Results of HMP annual species surveys on multiple Units over varying amounts of time since treatment have shown that these species generally continue to persist following vegetation clearance activities. In 2021, comparison to Baseline was conducted for all age classes. Treatment-related effects were not assessed in any of the Units surveyed in 2021 due to utilization of only one treatment (mastication).

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.

6.1.1 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 6-1.

Eighty-two percent of HMP annual success criteria were met for the 2021 survey year (Table 6-1). The criteria not met were Monterey spineflower in BLM Area B Subunit A Containment Line Groups 1 and 2 (Year 3), Unit 25 (Year 5), and Unit 20 Containment Line (Year 5); and bare ground cover in Unit 20 Containment Line. Since Monterey spineflower vitality is strongly correlated with rainfall, it is possible that the drier than average 2020-2021 water-year affected densities of the species in these areas (Fox et al., 2006; Fox, 2007).

The HMP annual success criterion requires that frequency of occurrence be at least 90% of the Baseline frequency in any post-treatment year. The areas which did not meet this success criterion ranged between 67% and 80% of the respective Baseline frequency. Despite not meeting the criterion, sand gilia and Monterey spineflower were persisting in these areas, post-treatment.

The bare ground success criterion requires bare ground cover to be greater than Baseline values. Unit 20 Containment Line did not meet this criterion; however, 2021 bare ground cover in this Unit was only 4.2% lower than Baseline.

Table 6-1. Evaluation of Success Criteria for HMP Annuals.

Year Class	Units	Criterion	Baseline	2021	Pass/Fail
Year 3	Unit 25 Containment Line, Unit 31 Containment Line, BLM Area B Subunit A Containment Line	Frequency of sand gilia > 90% of baseline frequency	$f_{\text{Unit 25 Contain}} = 0.00$ $f_{\text{Unit 31 Contain}} = 0.00$ $f_{\text{Subarea A, Group 1}} = 0.00$ $f_{\text{Subarea A, Group 2}} = 0.00$	$f_{\text{Unit 25 Contain}} = 0.00$ $f_{\text{Unit 31 Contain}} = 0.20$ $f_{\text{Subarea A, Group 1}} = 0.00$ $f_{\text{Subarea A, Group 2}} = 0.00$	Pass Pass Pass Pass
		Frequency of seaside bird's-beak > 90% of baseline frequency	$f_{\text{Unit 25 Contain}} = 0.00$ $f_{\text{Unit 31 Contain}} = 0.00$ $f_{\text{Subarea A, Group 1}} = 0.00$ $f_{\text{Subarea A, Group 2}} = 0.00$	$f_{\text{Unit 25 Contain}} = 0.00$ $f_{\text{Unit 31 Contain}} = 0.00$ $f_{\text{Subarea A, Group 1}} = 0.00$ $f_{\text{Subarea A, Group 2}} = 0.00$	Pass Pass Pass Pass
		Frequency of Monterey spineflower > 90% of baseline frequency	$f_{\text{Unit 25 Contain}} = 1.00$ $f_{\text{Unit 31 Contain}} = 1.00$ $f_{\text{Subarea A, Group 1}} = 1.00$ $f_{\text{Subarea A, Group 2}} = 1.00$	$f_{\text{Unit 25 Contain}} = 0.90$ $f_{\text{Unit 31 Contain}} = 0.90$ $f_{\text{Subarea A, Group 1}} = 0.33$ $f_{\text{Subarea A, Group 2}} = 0.80$	Pass Pass Fail Fail
		Bare ground > Baseline condition	Figures 3-16 and 3-17		Pass
Year 5	Unit 25, Unit 13, 20, and 31 Containment Lines	Frequency of sand gilia > 90% of baseline frequency	$f_{\text{Unit 25}} = 0.00$ $f_{\text{Unit 13 Contain}} = 0.36$ $f_{\text{Unit 20 Contain}} = 0.00$ $f_{\text{Unit 31 Contain}} = 0.00$	$f_{\text{Unit 25}} = 0.00$ $f_{\text{Unit 13 Contain}} = 0.45$ $f_{\text{Unit 20 Contain}} = 0.00$ $f_{\text{Unit 31 Contain}} = 0.62$	Pass Pass Pass Pass
		Frequency of seaside bird's-beak > 90% of baseline frequency	$f_{\text{Unit 25}} = 0.00$ $f_{\text{Unit 13 Contain}} = 0.00$ $f_{\text{Unit 20 Contain}} = 0.00$ $f_{\text{Unit 31 Contain}} = 0.00$	$f_{\text{Unit 25}} = 0.20$ $f_{\text{Unit 13 Contain}} = 0.00$ $f_{\text{Unit 20 Contain}} = 0.00$ $f_{\text{Unit 31 Contain}} = 0.00$	Pass Pass Pass Pass
		Frequency of Monterey spineflower > 90% of baseline frequency	$f_{\text{Unit 25}} = 1.00$ $f_{\text{Unit 13 Contain}} = 1.00$ $f_{\text{Unit 20 Contain}} = 1.00$ $f_{\text{Unit 31 Contain}} = 1.00$	$f_{\text{Unit 25}} = 0.80$ $f_{\text{Unit 13 Contain}} = 1.00$ $f_{\text{Unit 20 Contain}} = 0.67$ $f_{\text{Unit 31 Contain}} = 1.00$	Fail Pass Fail Pass
		Bare ground > Baseline condition	$c_{\text{Unit 25}} = 9.24\%$ $c_{\text{Unit 13 Contain}} = 11.1\%$ $c_{\text{Unit 20 Contain}} = 23.6\%$	$c_{\text{Unit 25}} = 27.56\%$ $c_{\text{Unit 13 Contain}} = 21.76\%$ $c_{\text{Unit 20 Contain}} = 19.4\%$	Pass Pass Fail

6.2 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 – 2021).

Differential response to treatment was assessed in Units where multiple treatments were applied. This occurred in Year 8 Units 7 and 10. Different species and community metrics can be promoted by burning, while others can be promoted by mastication. Deerweed and peak rush-rose tended to benefit from burn treatment in the short-term, becoming dominant species between Year 3 and Year 5 after burn treatment and in masticated and burned areas in both Units 7 and 10. Dwarf ceanothus appeared to benefit from burn treatment in the long-term, becoming the dominant or a co-dominant species by Year 8 along burned and masticated transects and burned transects in Units 7 and 10 (Figures 5-15 through 5-17). Additionally, mastication in Unit 7 generally yielded less shrub cover than other treatments between Year 3 and Year 5 but resulted in the greatest increase in shrub cover and species richness between Baseline and Year 8 compared to other treatment types. In contrast, mixed treatment tended to cause a continual decrease in average cover in this Unit (Figure 5-3). In Unit 10, masticated transects generally yielded higher richness than other treatment types and showed substantially greater average shrub cover in Year 8 than burned or masticated and burned transects. (Figure 5-4). This suggests mastication may be more effective than treatments that include burning at producing long-term increases in shrub cover and species richness.

6.2.1 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 in Year 3 Units (Table 6-2). Bare ground cover was higher in Year 3 than in Baseline and invasive plants were less than 10% cover for all Year 3 Units. Community composition in Year 5 Units showed a progression toward the Baseline condition (Figures 4-24). The only recommendation is to closely monitor Year 3 Units in future years.

Table 6-2. Evaluation of Success Criteria for Shrub Communities in Year 3 and Year 5.

Year Class	Units	Criterion	Rationale	Pass/Fail
Year 3	BLM Area B Subunit A Containment Line, Unit 31 Containment Line	Native sub-shrubs > 20% cover	$C_{BLM\ Area\ B\ Subunit\ A\ Contain}$ = 4.57% $C_{Unit\ 31\ Contain}$ = 10.07%	Fail Fail
		Bare ground > baseline conditions	Figures 3-11 and 3-12	Pass
		Invasive plants < 10% cover	$C_{BLM\ Area\ B\ Subunit\ A\ Contain}$ = 0.00% $C_{Unit\ 31\ Contain}$ = 0.00%	Pass Pass
Year 5	Unit 13 Containment Line, Unit 20 Containment Line, Unit 25	Observation of community recovery	Figure 4-24	Pass

The native subshrub (peak rush-rose, deerweed, and golden yarrow) criterion was not met for Year 3 Units. The cover of these species in Units BLM Area B Subunit A and Unit 31 Containment Lines were on average 4.75% in Year 3 (0.03% in Year 0) and 10.07% in Year 3 (0.0% in Year 0), respectively. Since the criterion requires 20% cover of these species, neither Unit 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 EcoSystems West, 2015b).

While subshrub cover in 2021 Year 3 Units was too low to comply with established criteria, these values were similar to those in Year 3 masticated Units in previous years. Additionally, subshrub cover tends to be higher in Units exposed to burn treatment or a combination of mastication and burning (Figure 6-1). It is therefore not surprising that 2021 Year 3 Units, which received only mastication treatment, exhibit similarly low subshrub cover as other Year 3 Units observed in previous years.

Dissimilar subshrub responses to those observed in 2021 occurred in Units with different treatments. Units that were masticated tended to have low subshrub cover by Year 3, while areas that were burned or masticated and burned had relatively high subshrub cover by Year 3. Analysis of all Year 3 subshrub cover values indicates differences in subshrub cover between treatment types (Figure 6-1; one-way ANOVA, p=2.00^{-16}, F=37.4). Other researchers have found different 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.

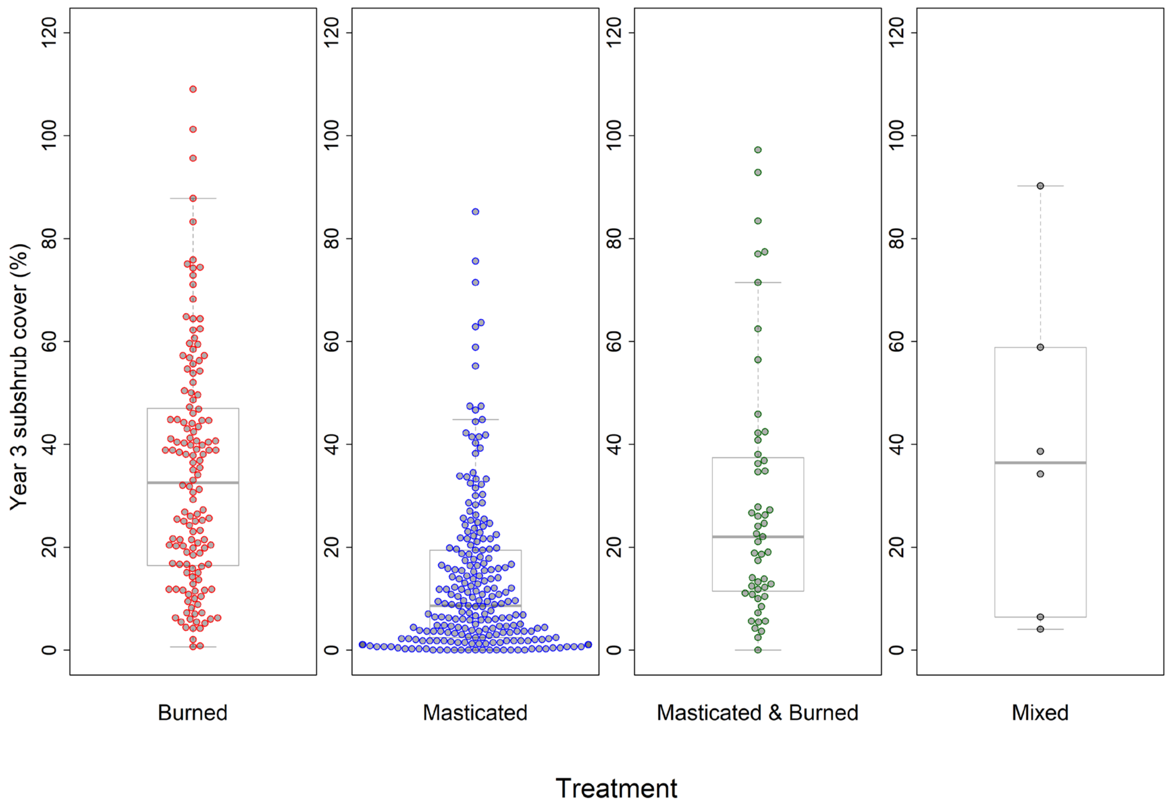

Figure 6-1. Subshrub Cover Values (Deerweed, Peak Rush-Rose, and Golden Yarrow) Partitioned by Treatment Type for all Year 3 Surveys Between 2011 and 2020. Each dot represents the percent subshrub cover for an individual Year 3 transect. The thick grey line in the box represents the median, the top and bottom edges of the central box represent the upper (3rd) and lower (1st) quartile, respectively. Note that all Year 3 transects in 2021 were masticated, so burned, masticated & burned, and mixed values are equivalent to those reported in 2020.

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 6-3.

All but six specified criteria were met in Year 8:

1) the shaggy-barked manzanita dominated Baseline transects in Unit 6 were observed as having less than 70% of the Baseline frequency of Monterey ceanothus by Year 8 (0%),
2) the shaggy-barked manzanita dominated Baseline transects in Unit 1 East were observed as having less than 70% of the Baseline frequency of Monterey ceanothus by Year 8 (20%),
3) the shaggy-barked manzanita dominated Baseline transects in MOUT Buffer were observed as having less than 70% of Baseline frequency of Monterey ceanothus by Year 8 (50%),
4) the maximum invasive plant cover along Unit 10 transects was greater than 10% cover (15.2%),
5) the maximum invasive plant cover along Unit 1 East transects was greater than 10% cover (13.8%),
6) the maximum invasive plant cover along WGBA transects was greater than 10% cover (33.2%),

Monterey ceanothus cover in MOUT Buffer in Year 8 was less than the required 70% of the Baseline frequency; however, because the sample size was small in this Unit (n=2), the change of occupancy on one transect represents a substantial change in percent cover.

Despite the relatively low frequencies of Monterey ceanothus on certain transects, these species persisted and even benefitted after treatment on other transects within these Units. Additionally, overall community compositions in the Year 8 Units have continued to move towards their respective Baseline conditions (see Figures 5-28 through 5-32). 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 6, 7, 10, 1 East, MOUT Buffer, and WGBA, they will be removed from the monitoring schedule.

Table 6-3. Evaluation of Success Criteria for dominant chaparral shrub associations on Fort Ord in Year 8 Units monitored in 2021 (Units 6, 7, 10, 1 East, MOUT Buffer, and WGBA).

Plant Association	Criterion	Unit	Baseline value	Year 8 value	P/F
A – ARTO dominated	Average cover of ARTO > 30% of baseline cover	6	61.6%	42.6%	Pass
		7	66.3%	31.1%	Pass
		10	59.8%	28.2%	Pass
		1 East	50.6%	47.1%	Pass
		MOUT	30.2%	22.8%	Pass
		WGBA	60.7%	44.8%	Pass
	Frequency of dwarf ceanothus > 70% baseline frequency	6	0.33	1.00	Pass
		7	0.30	1.00	Pass
		10	0.15	0.89	Pass
		1 East	0.60	1.00	Pass
		MOUT	0.50	0.50	Pass
		WGBA	0.00	0.00	Pass
	Frequency of Monterey ceanothus >70% baseline frequency	6	0.33	0.00	Fail
		7	0.83	1.00	Pass
		10	0.89	1.00	Pass
		1 East	1.00	0.20	Fail
		MOUT	1.00	0.50	Fail
		WGBA	0.00	0.33	Pass
B – ADFA dominated	Average cover of ADFA > 30% of baseline cover	6	44.4%	29.8%	Pass
		7	61.6%	41.2%	Pass
		10	45.3%	41.2%	Pass
		1 East	NA	NA	NA
		MOUT	NA	NA	NA
		WGBA	43.4%	36.4%	Pass
	Frequency of dwarf ceanothus > 70% baseline frequency	6	0.00	0.00	Pass
		7	0.25	0.75	Pass
		10	0.50	1.00	Pass
		1 East	NA	NA	NA
		MOUT	NA	NA	NA
		WGBA	0.00	0.00	Pass
	Frequency of Monterey ceanothus >70% baseline frequency	6	0.00	0.00	Pass
		7	0.88	1.00	Pass
		10	1.00	1.00	Pass
		1 East	NA	NA	NA
		MOUT	NA	NA	NA
		WGBA	0.00	0.00	Pass
C/D – ARPU dominated	Frequency of ARPU > 70% of baseline frequency	6	NA	NA	NA
		7	NA	NA	NA
		10	NA	NA	NA
		1 East	NA	NA	NA
		MOUT	NA	NA	NA
		WGBA	NA	NA	NA
	Frequency of dwarf ceanothus > 70% baseline frequency	6	NA	NA	NA
		7	NA	NA	NA
		10	NA	NA	NA
		1 East	NA	NA	NA

Table 6-3. Evaluation of Success Criteria for dominant chaparral shrub associations on Fort Ord in Year 8 Units monitored in 2021 (Units 6, 7, 10, 1 East, MOUT Buffer, and WGBA).

Plant Association	Criterion	Unit	Baseline value	Year 8 value	P/F
		MOUT	NA	NA	NA
		WGBA	NA	NA	NA
	Frequency of Monterey ceanothus >70% baseline frequency	6	NA	NA	NA
		7	NA	NA	NA
		10	NA	NA	NA
		1 East	NA	NA	NA
		MOUT	NA	NA	NA
		WGBA	NA	NA	NA
Bare Ground	Bare ground > 90% of baseline cover	6	18.10%	32.30%	Pass
		7	10.12%	21.12%	Pass
		10	13.17%	23.48%	Pass
		1 East	9.80%	31.24%	Pass
		MOUT	16.30%	25.30%	Pass
		WGBA	16.29%	24.54%	Pass
Invasive plants	Invasive plants <10% cover per transect	6	0.80%	7.60% (max.)	Pass
		7	0.00%	6.80% (max.)	Pass
		10	4.80%	15.2% (max.)	Fail
		1 East	6.3% (max.)	13.8%	Fail
		MOUT	3.60% (max.)	0.00%	Pass
		WGBA	20.0% (max.)	33.2% (max.)	Fail

6.3 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 2021 (Appendix D). 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 (Table 5-5).

Response of annual grasses varied between age classes and Units. Annual grass cover in all Year 3 Units (BLM Area B Subunit A Containment Line, Unit 25 Containment Line, and Unit 31 Containment Line) increased between Baseline and Year 3 by at least twofold. Annual grass cover increased in all Year 5 Units (Unit 25 and Units 13, 20, and 31 Containment Lines) but to a lesser degree than Year 3 Units. Unit 7 was the only Year 8 Unit with a decrease in annual grass cover between Baseline and Year 8; however, increases in annual grass cover in the other Year 8 Units (Units 6, 10, and MOUT Buffer) was much lower than in Year 3 and Year 5 Units (Tables 3-4, 4-5, and 5-5). 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
ACLO	*Acacia longifolia*	Sydney golden wattle	tree
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

Table A-1. Species acronyms, Former Fort Ord.

Acronym	Scientific Name	Common Name	Life Form
CEME	*Centaurea melitensis*	tocalote	annual herb
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
DACA	*Danthonia californica*	California oatgrass	Perennial grass
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

Table A-1. Species acronyms, Former Fort Ord.

Acronym	Scientific Name	Common Name	Life Form
FRCA	*Frangula (Rhamnus) californica*	California coffeeberry	shrub
GAAP	*Galium aparine*	goose grass	annual herb
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

Table A-1. Species acronyms, Former Fort Ord.

Acronym	Scientific Name	Common Name	Life Form
NAHA	*Navarretia hamata*	hooked navarretia	annual herb
NAXX	*Navarretia* sp.		annual herb
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

Table A-1. Species acronyms, Former Fort Ord.

Acronym	Scientific Name	Common Name	Life Form
SOOL	*Sonchus oleraceus*	common sow thistle	annual herb
SOUM	*Solanum umbelliferum*	blue witch	shrub
SOXX	*Solidago* sp.	goldenrod	perennial herb
STPU	*Stipa pulchra*	purple needle grass	perennial grass
STVI	*Stephanomeria virgata*	tall stephanomeria	annual herb
SYALL	*Symphoricarpos albus* var. *laevigatus*	common snowberry	subshrub
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

*Numbered codes correspond with the species acronym codes on the USDA PLANTS Database (USDA NRCS, 2021).

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APPENDIX B

MAPS: HMP ANNUALS GRIDS

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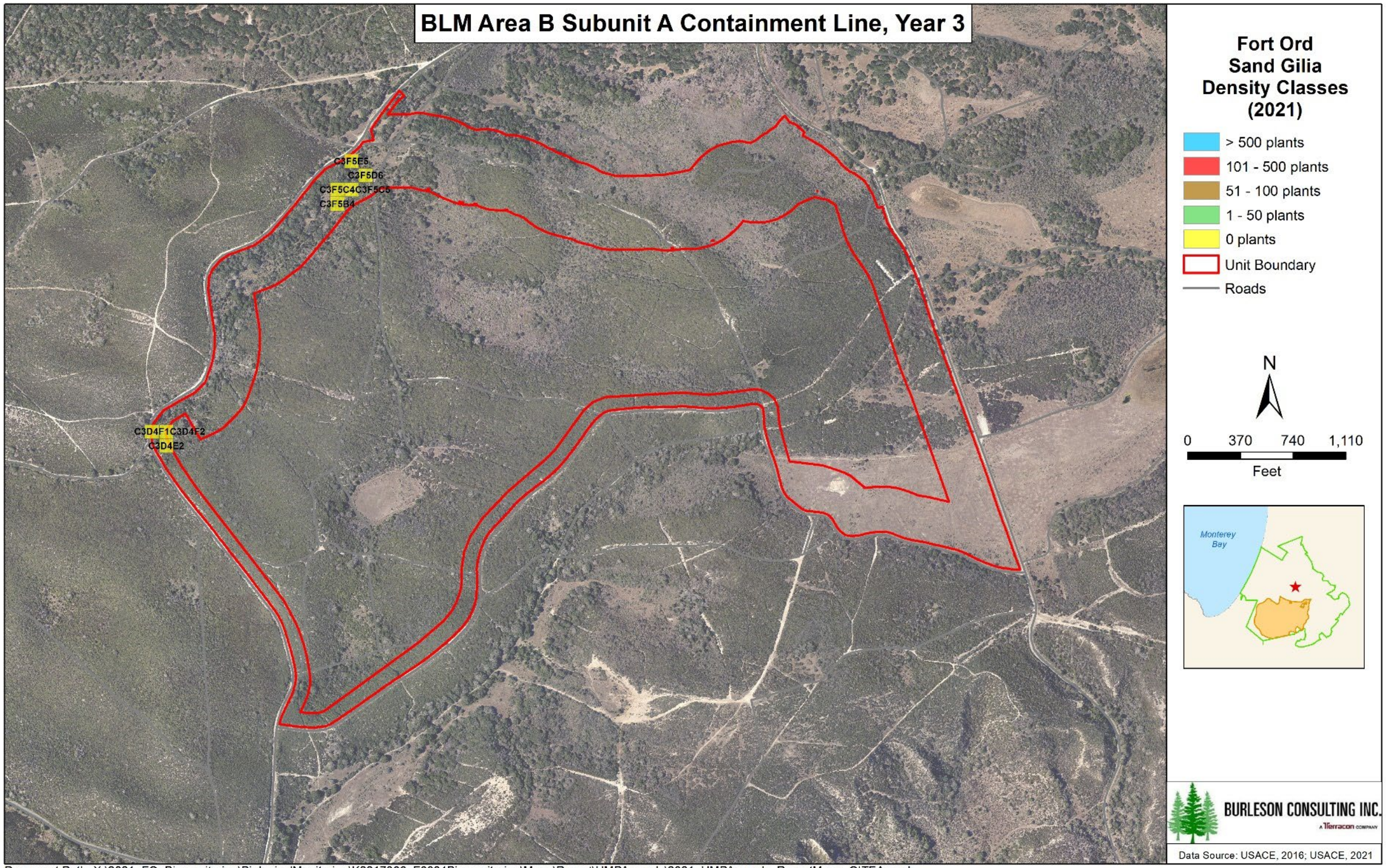

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Figure B-1. Map of Sand Gilia Density; BLM Area B Subunit A Containment Line (Year 3).

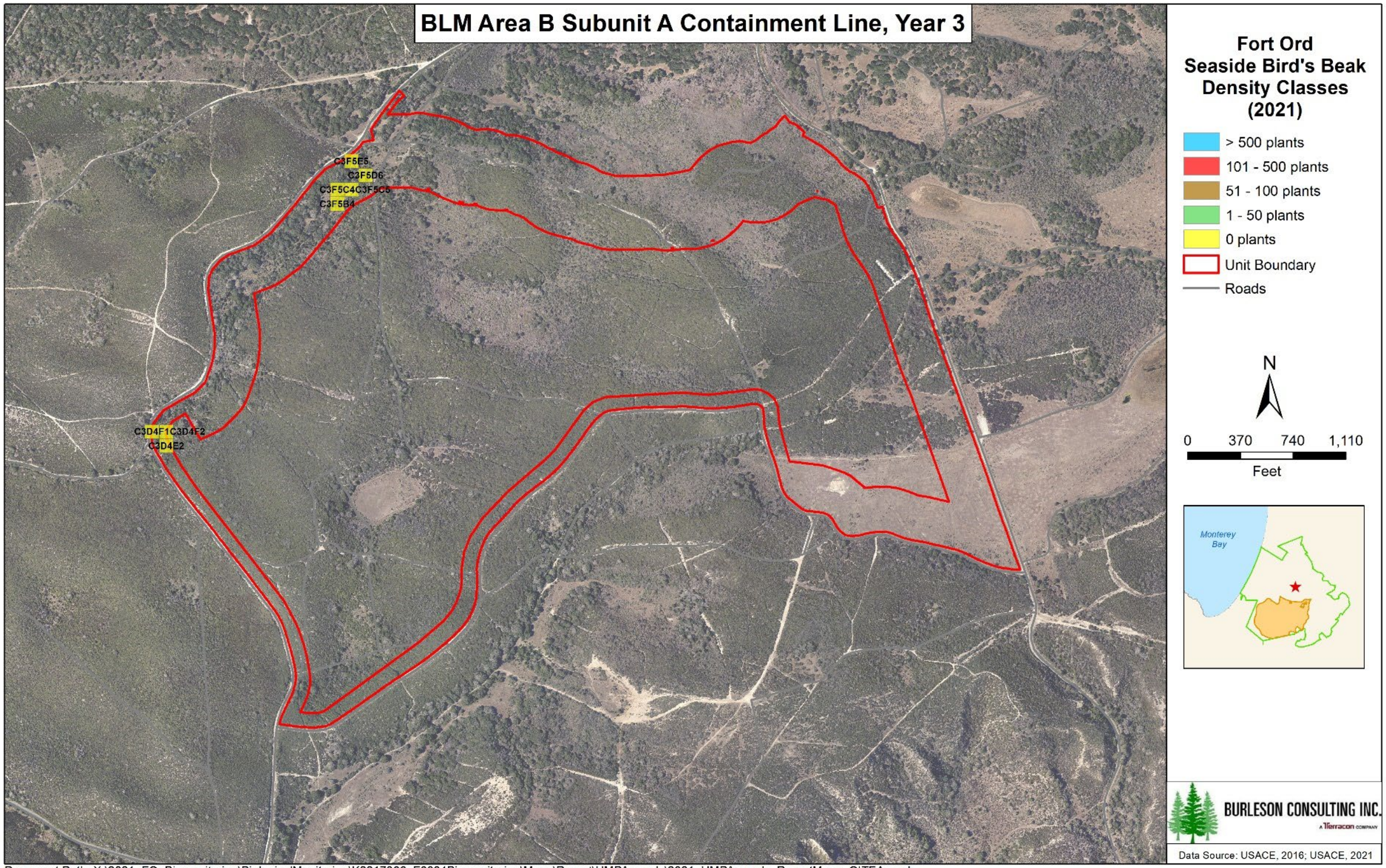

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Figure B-2. Map of Seaside Bird's Beak Density; BLM Area B Subunit A Containment Line (Year 3).

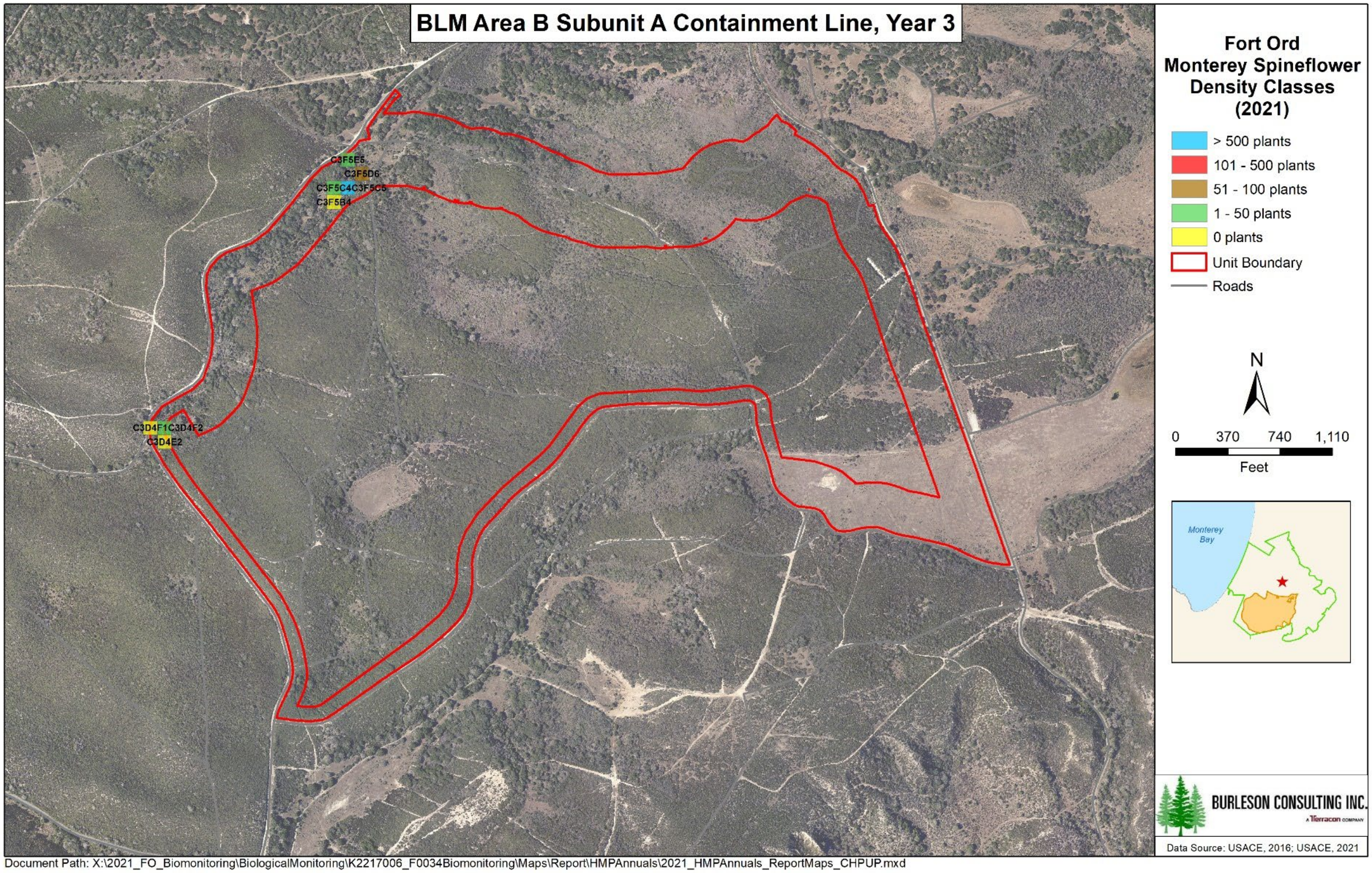

Figure B-3. Map of Monterey Spineflower Density; BLM Area B Subunit A Containment Line (Year 3).

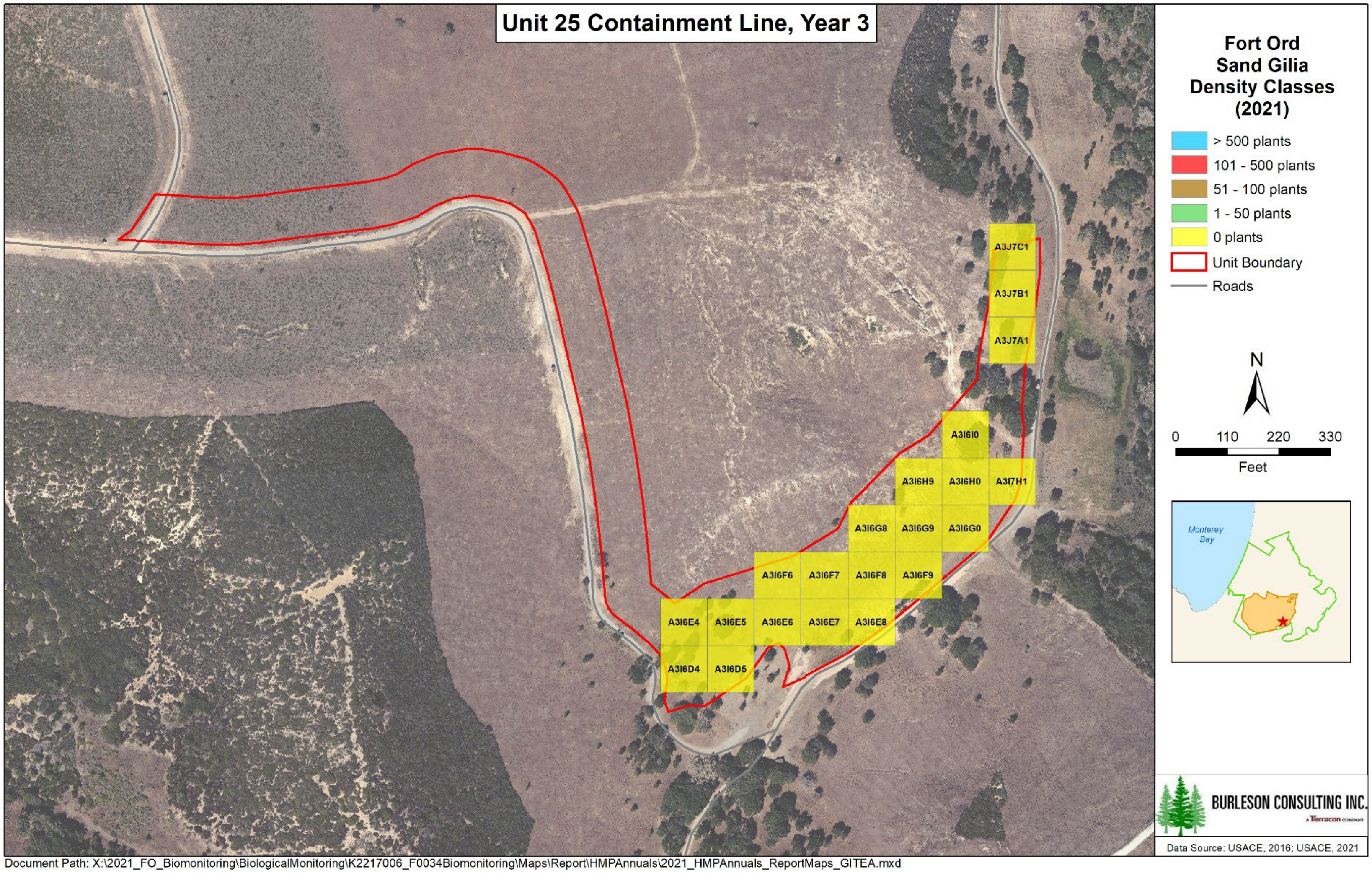

Figure B-4. Map of Sand Gilia Density; Unit 25 Containment Line (Year 3).

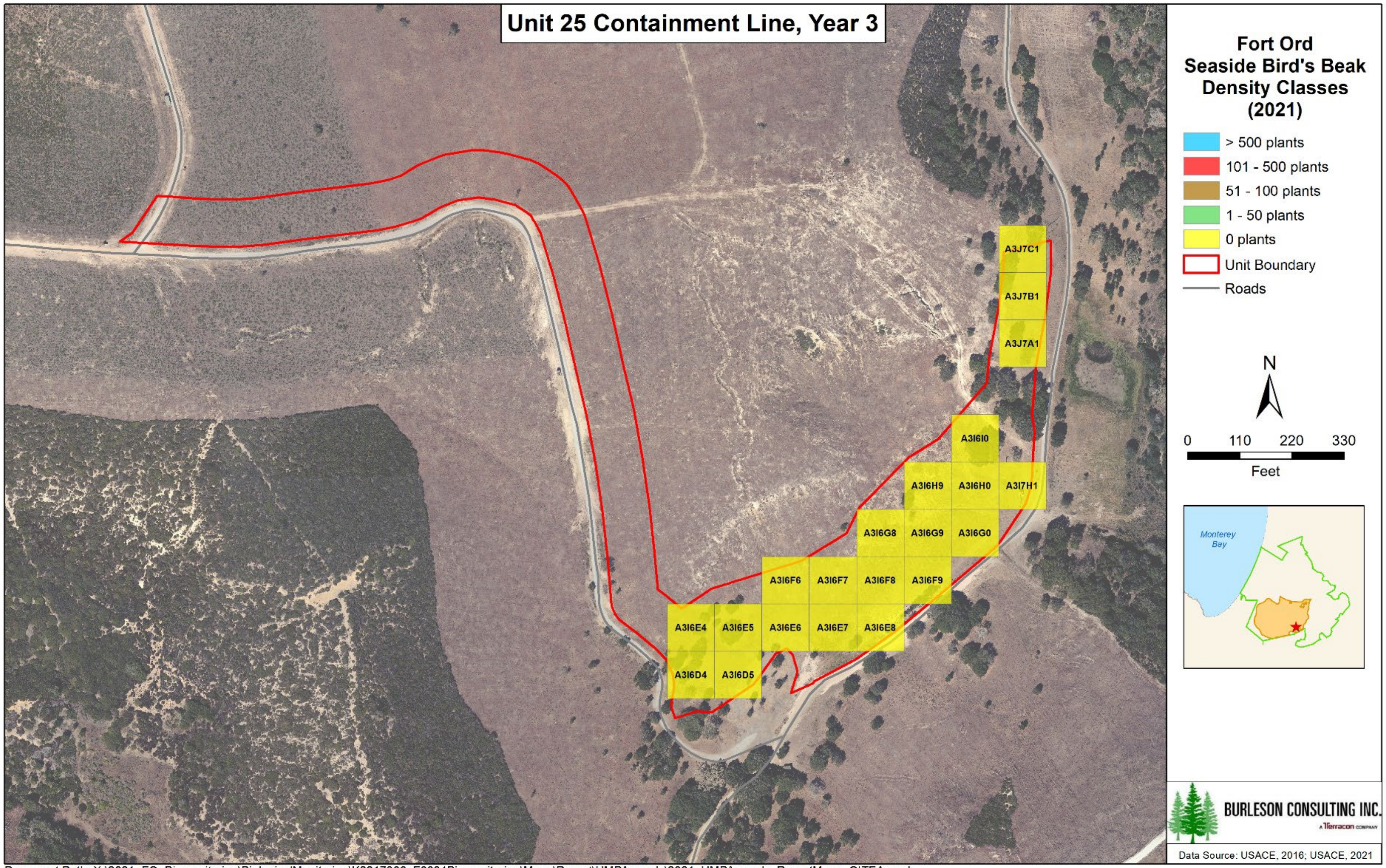

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Figure B-5. Map of Seaside Bird's Beak Density; Unit 25 Containment Line (Year 3).

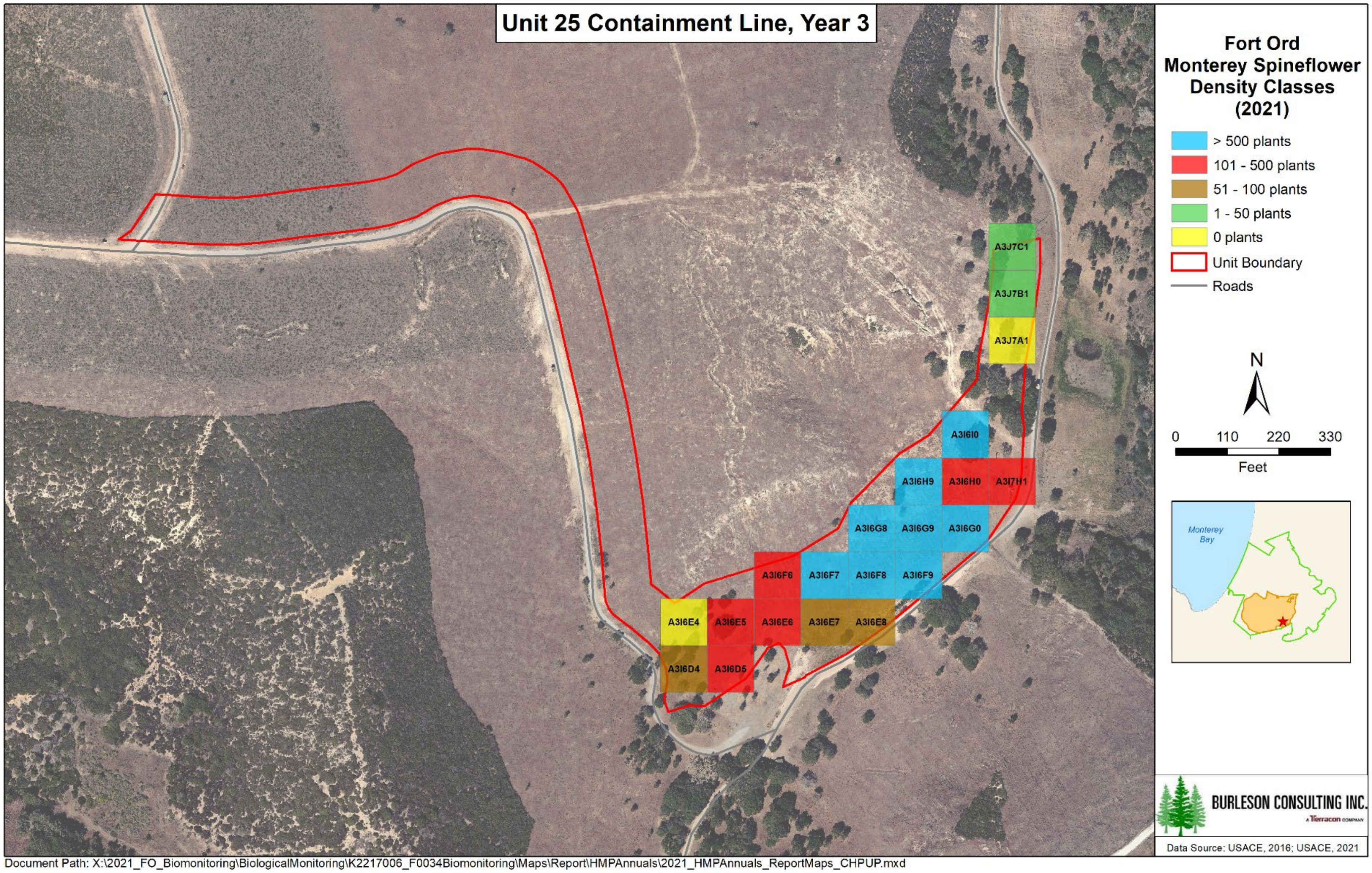

Figure B-6. Map of Monterey Spineflower Density; Unit 25 Containment Line (Year 3).

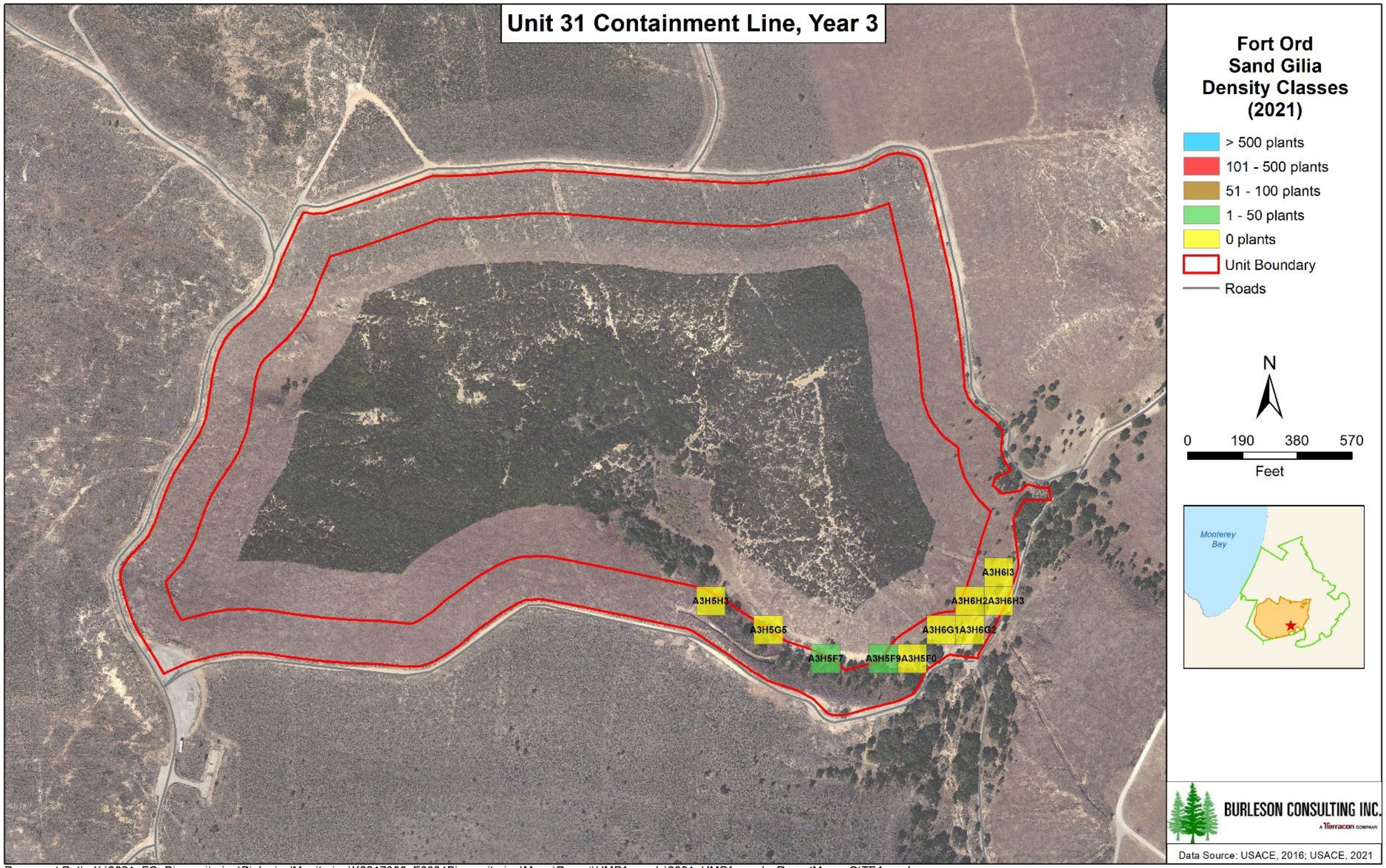

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Figure B-7. Map of Sand Gilia Density; Unit 31 Containment Line (Year 3).

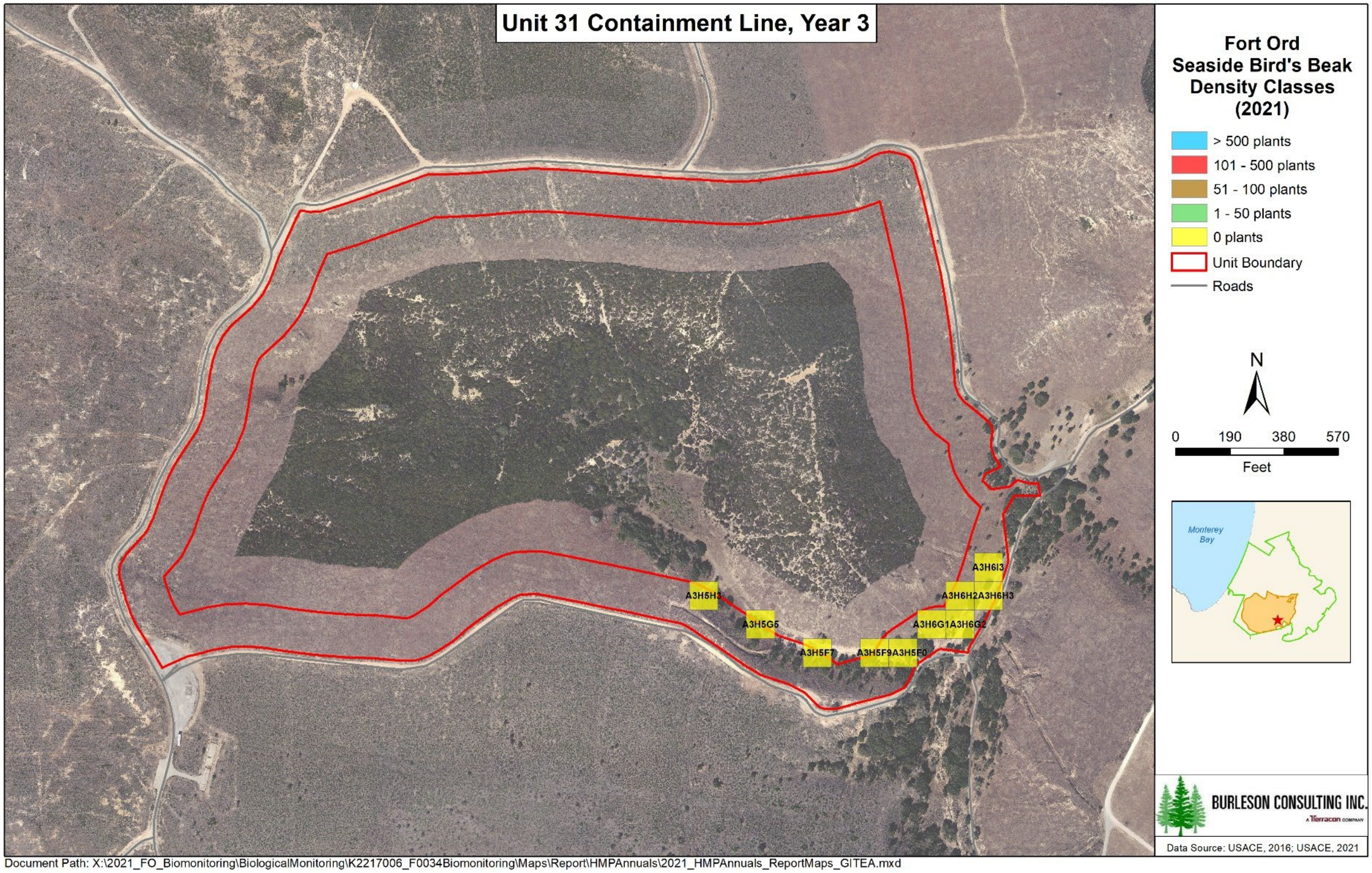

Figure B-8. Map of Seaside Bird's Beak Density; Unit 31 Containment Line (Year 3).

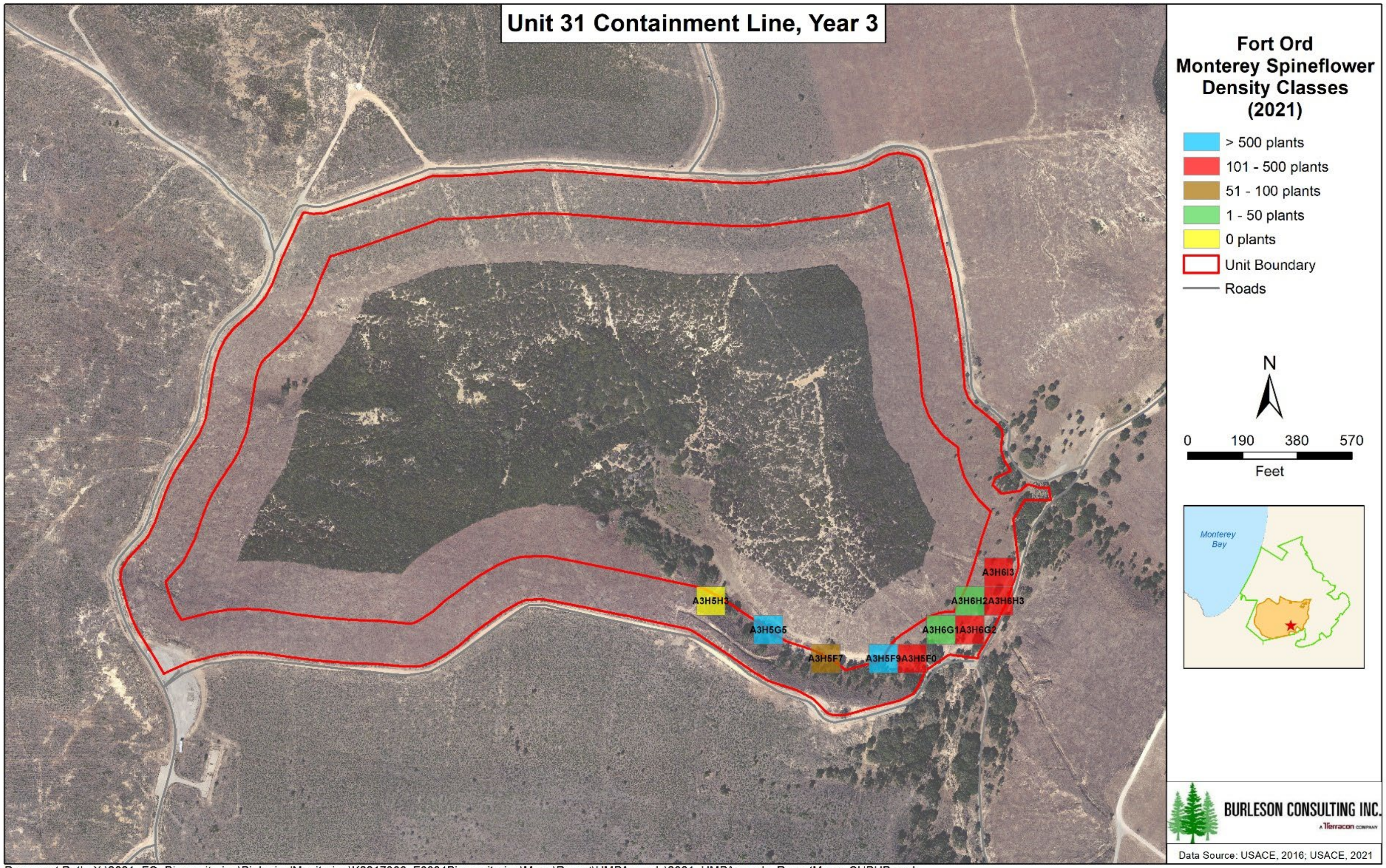

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Figure B-9. Map of Monterey Spineflower Density; Unit 31 Containment Line (Year 3).

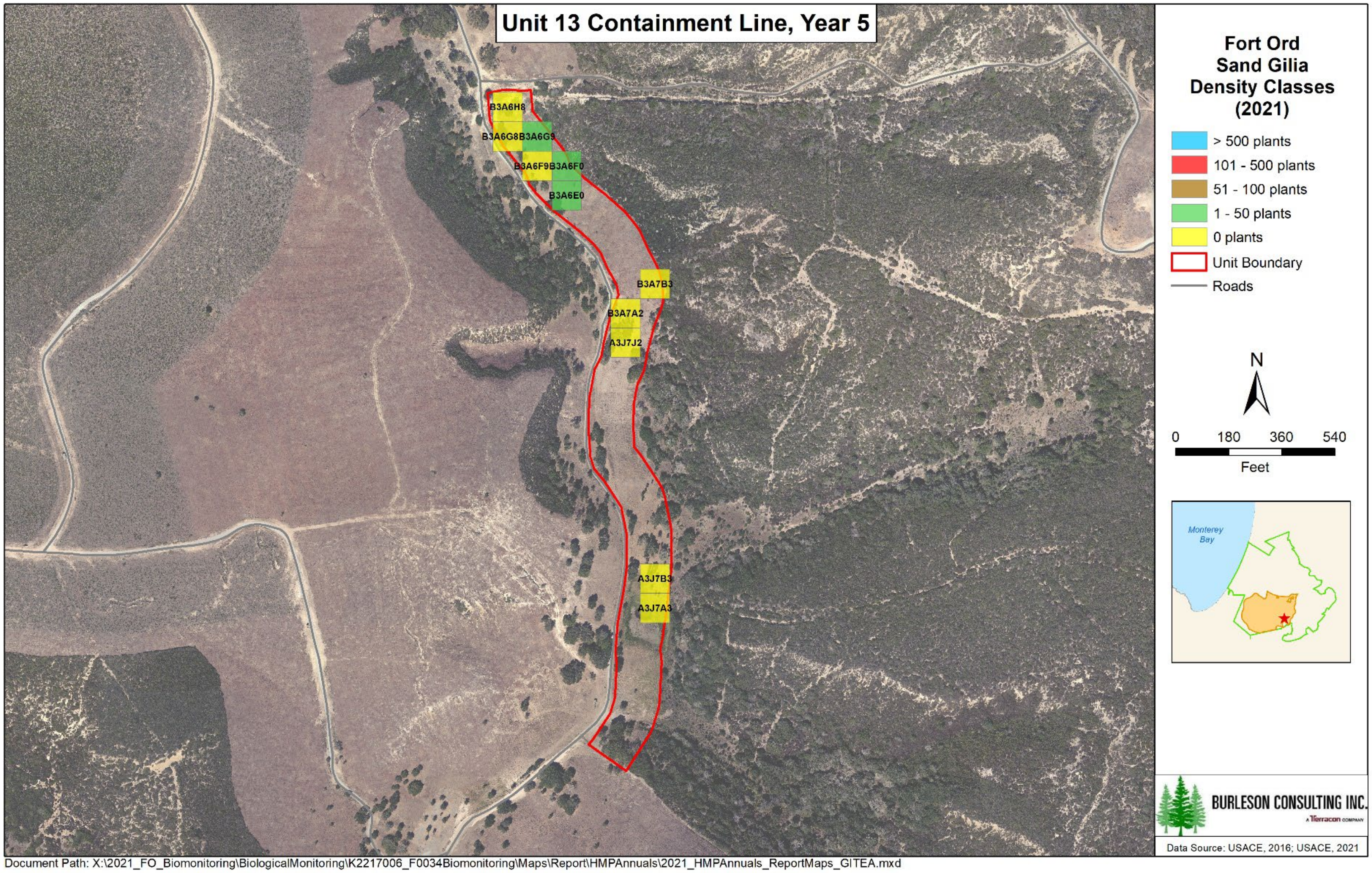

Figure B-10. Map of Sand Gilia Density; Unit 13 Containment Line (Year 5).

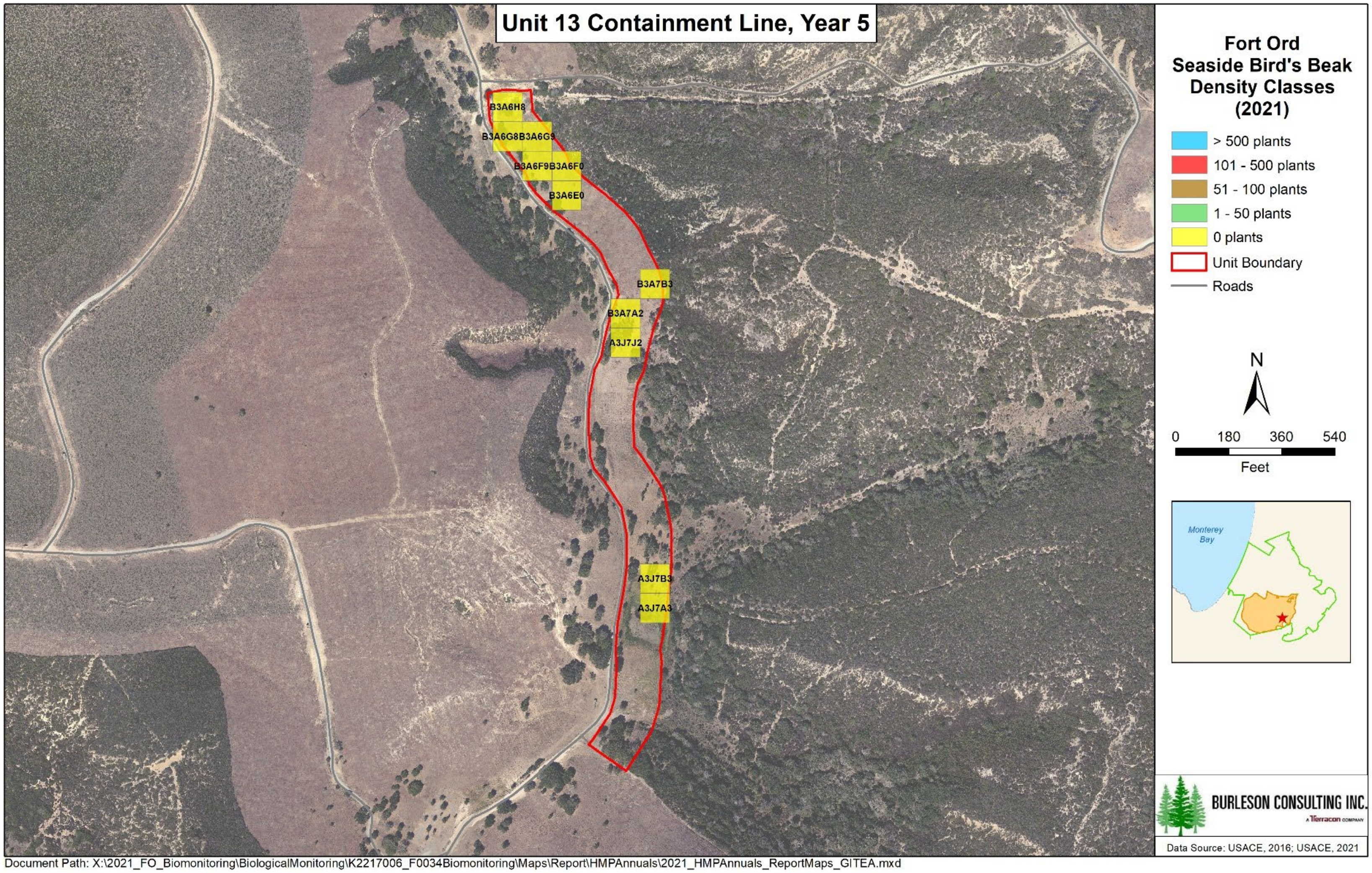

Figure B-11. Map of Seaside Bird's Beak Density; Unit 13 Containment Line (Year 5).

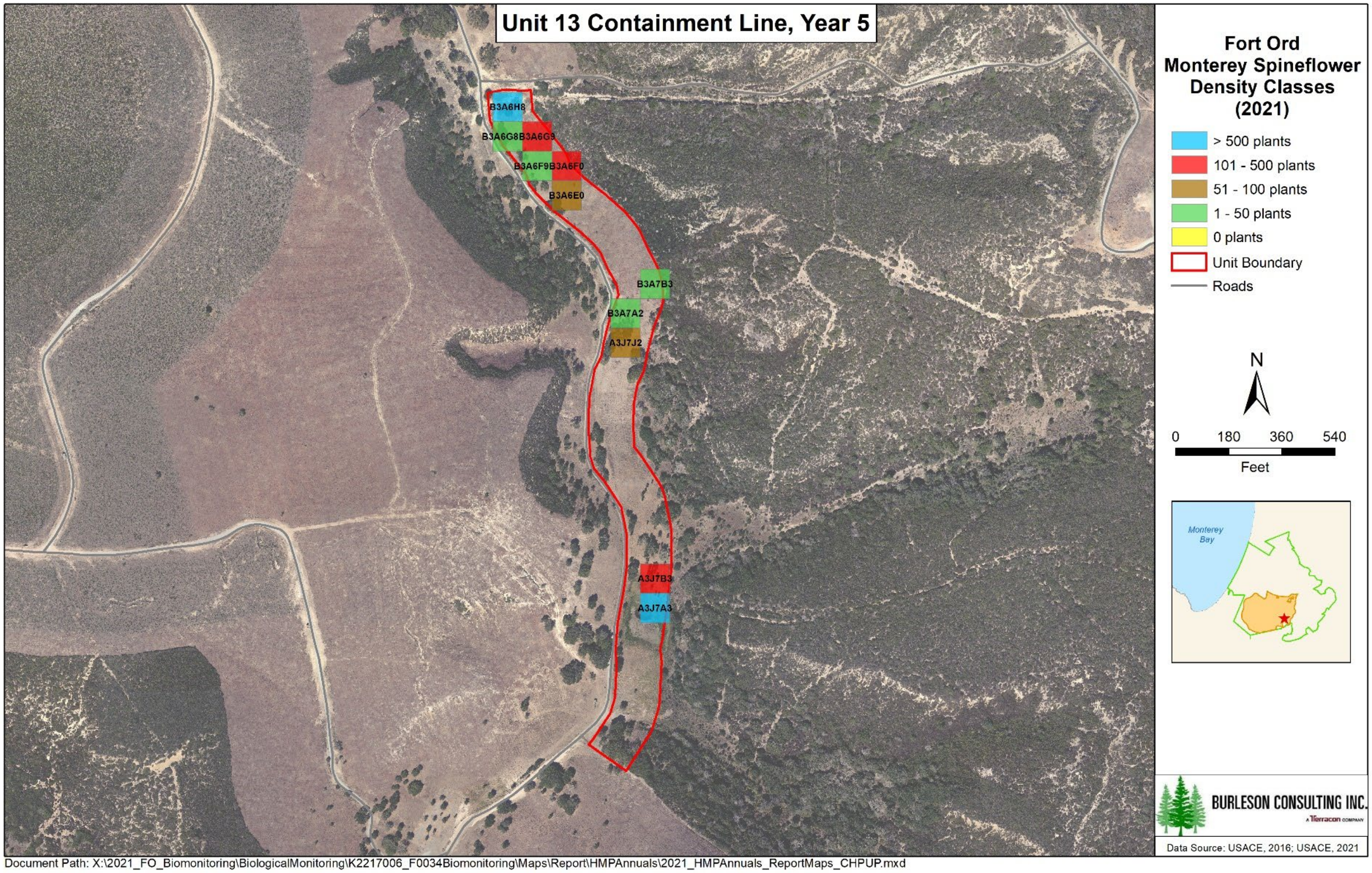

Figure B-12. Map of Monterey Spineflower Density; Unit 13 Containment Line (Year 5).

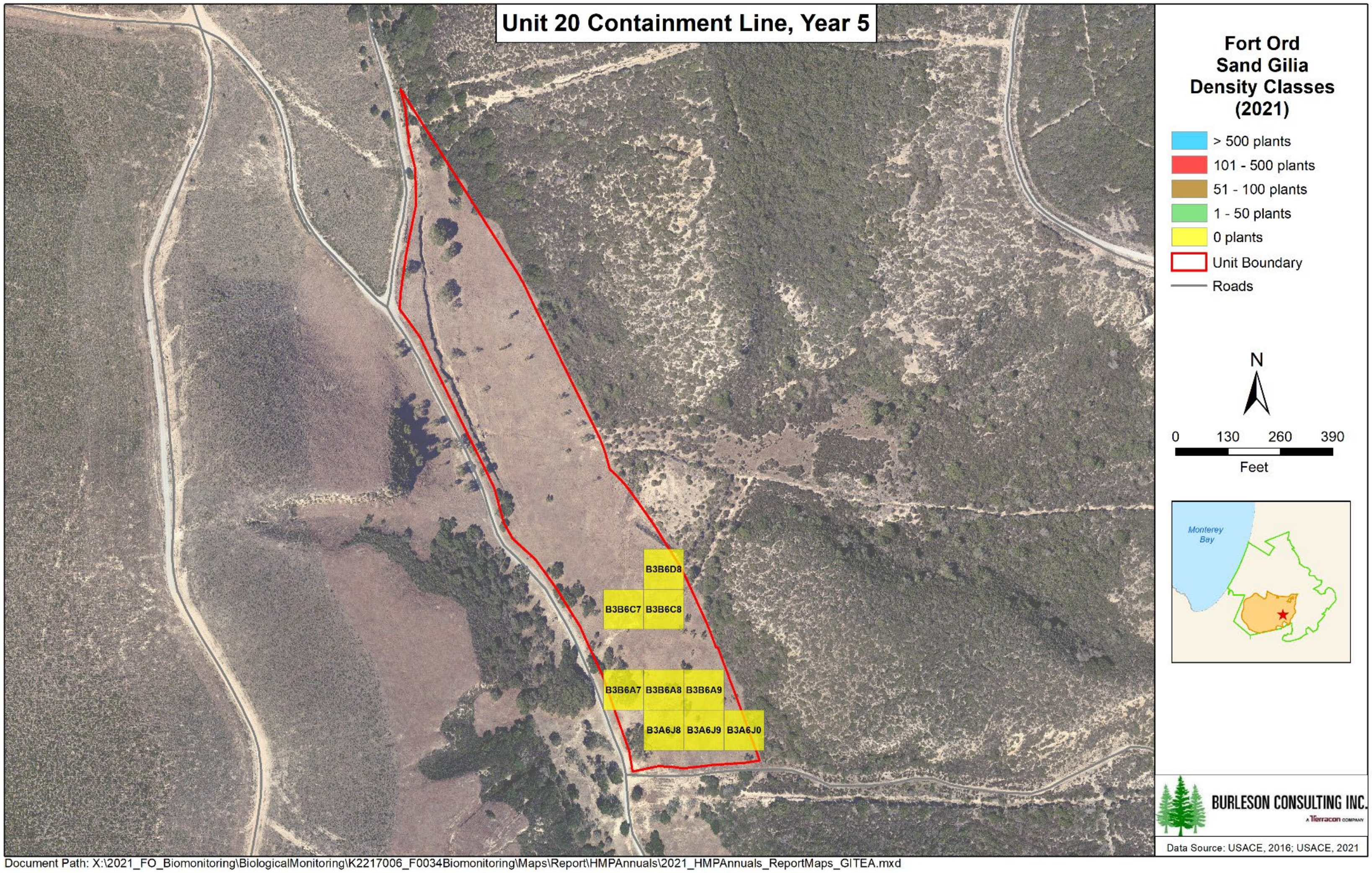

Figure B-13. Map of Sand Gilia Density; Unit 20 Containment Line (Year 5).

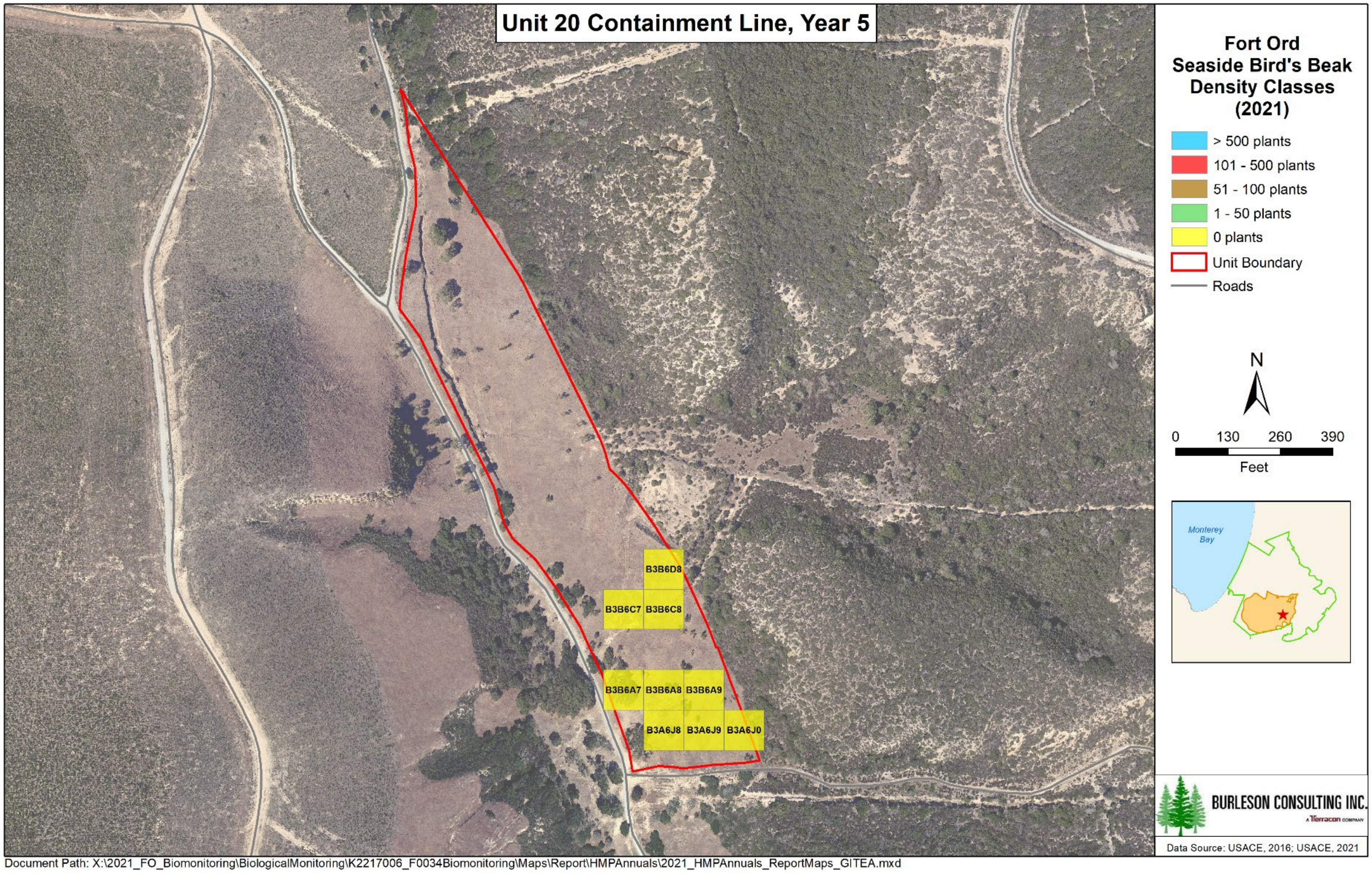

Figure B-14. Map of Seaside Bird's Beak Density; Unit 20 Containment Line (Year 5).

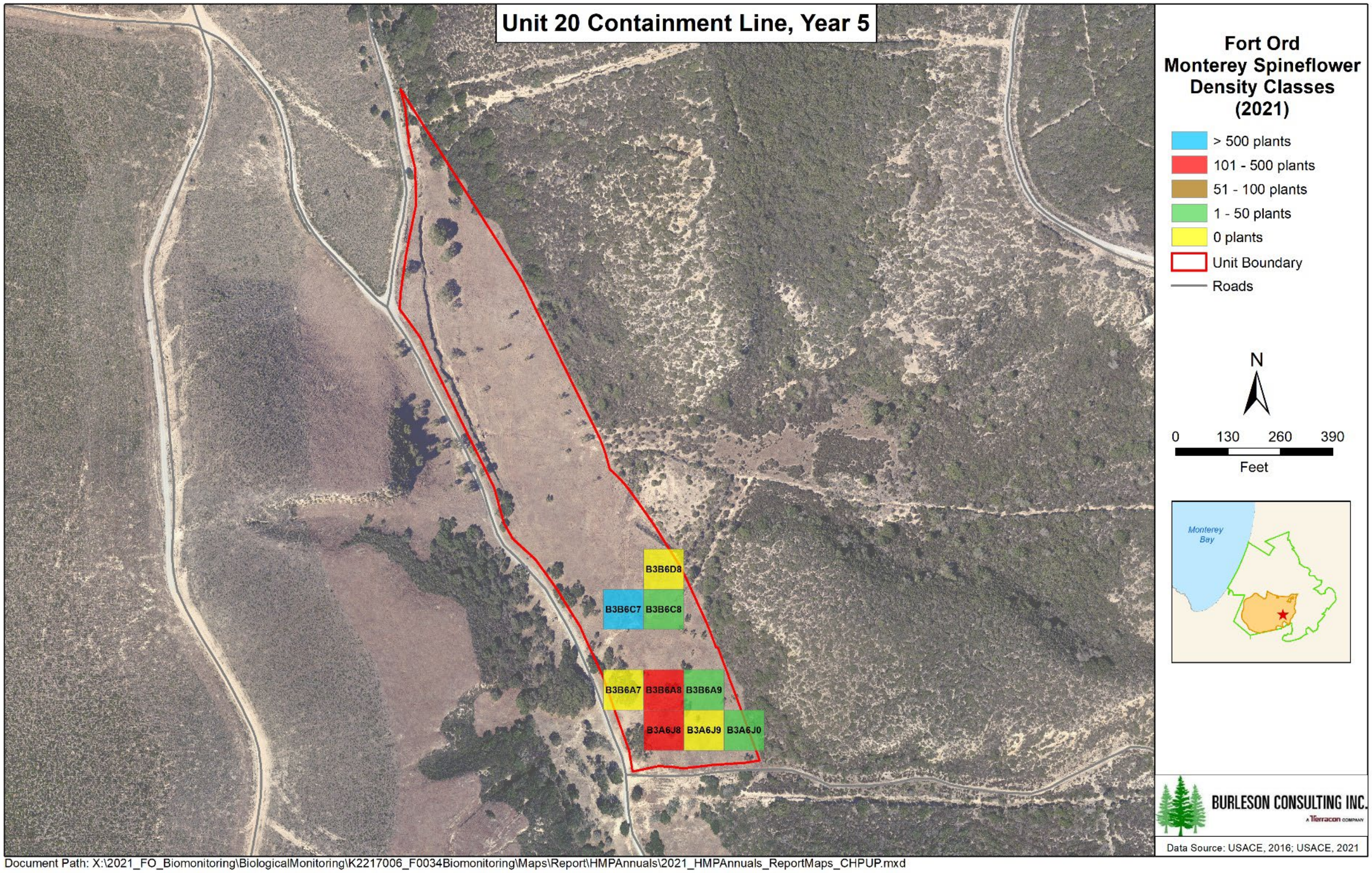

Figure B-15. Map of Monterey Spineflower Density; Unit 20 Containment Line (Year 5).

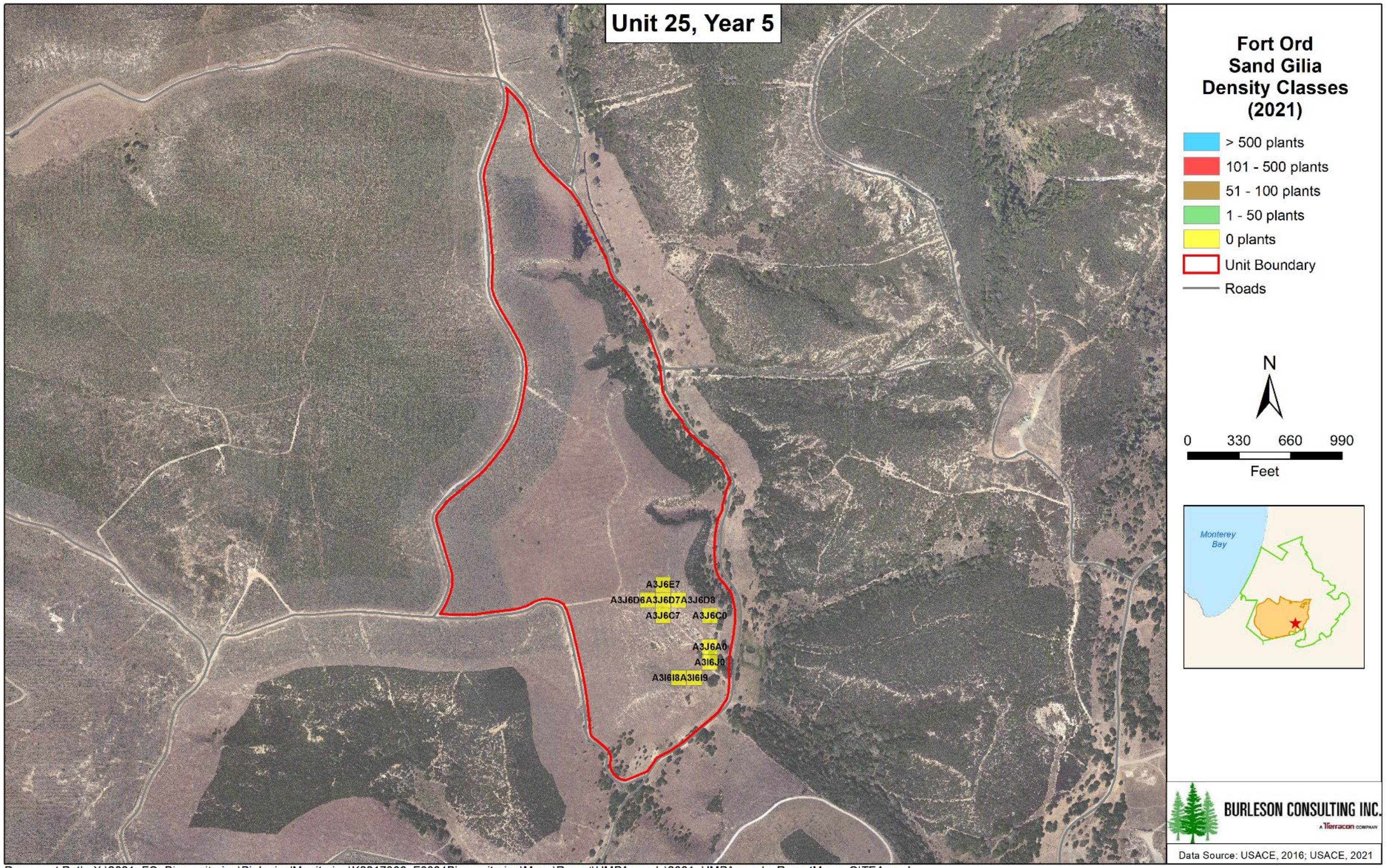

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Figure B-16. Map of Sand Gilia Density; Unit 25 (Year 5).

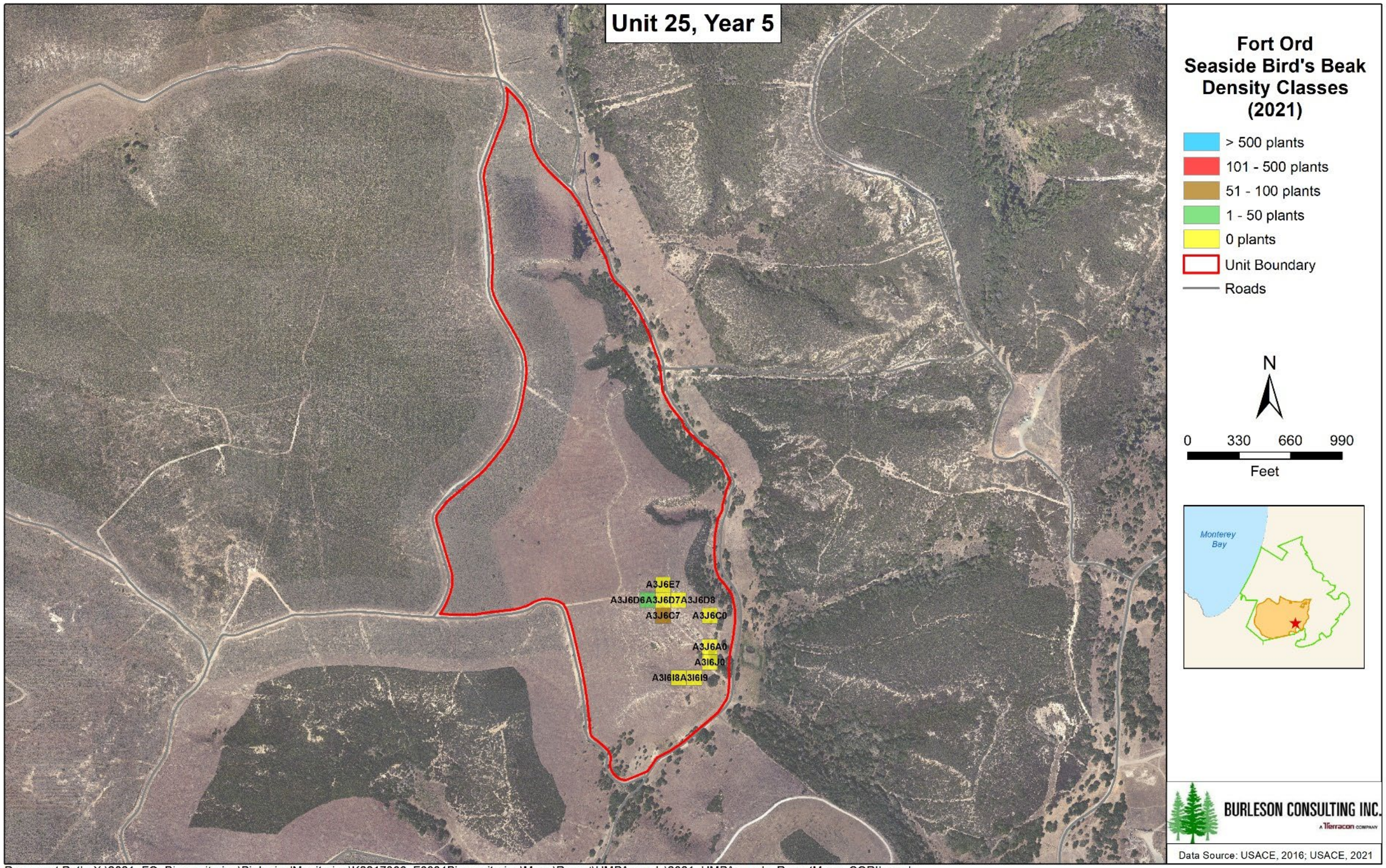

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Figure B-17. Map of Seaside Bird's Beak Density; Unit 25 (Year 5).

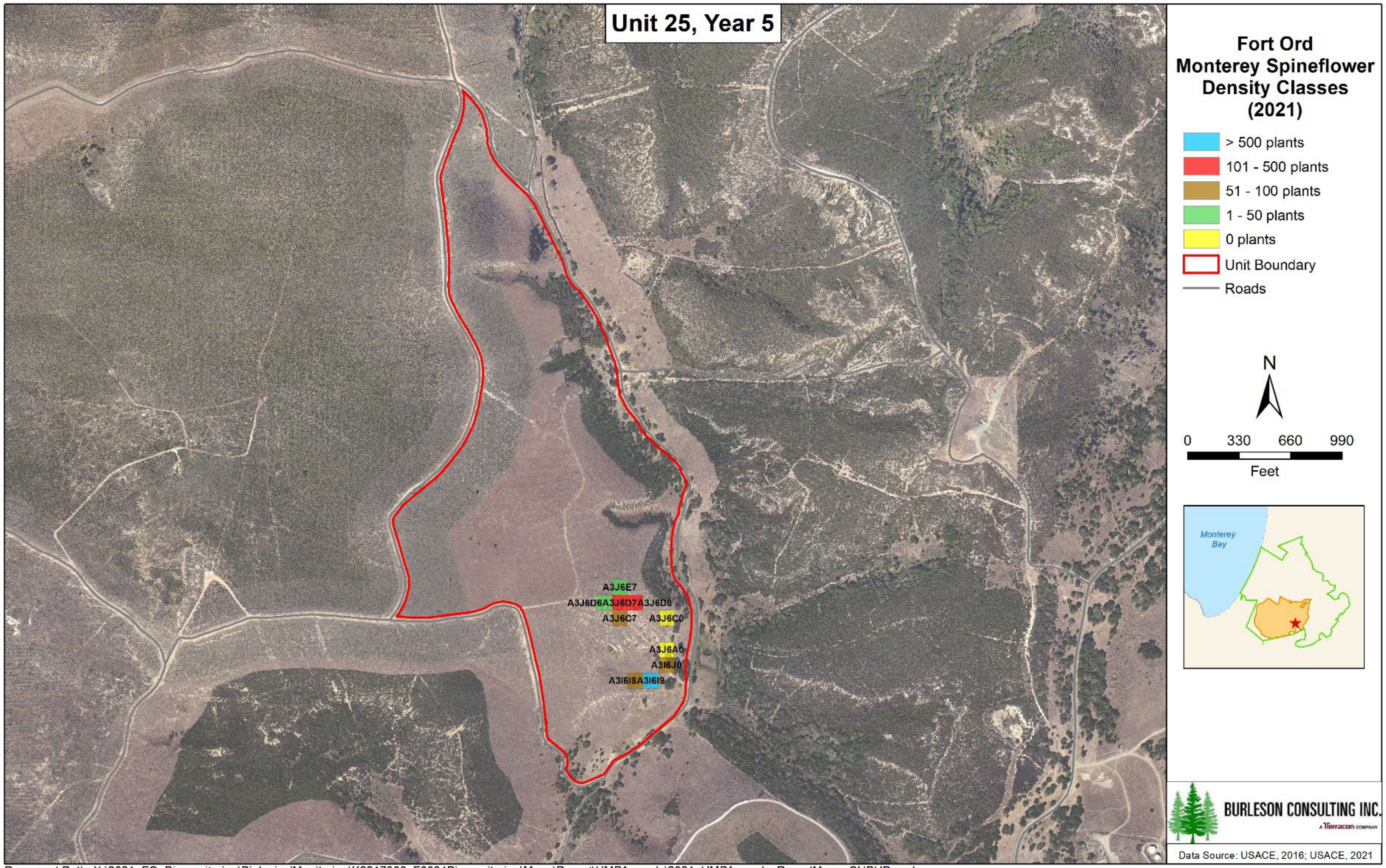

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Figure B-18. Map of Monterey Spineflower Density; Unit 25 (Year 5).

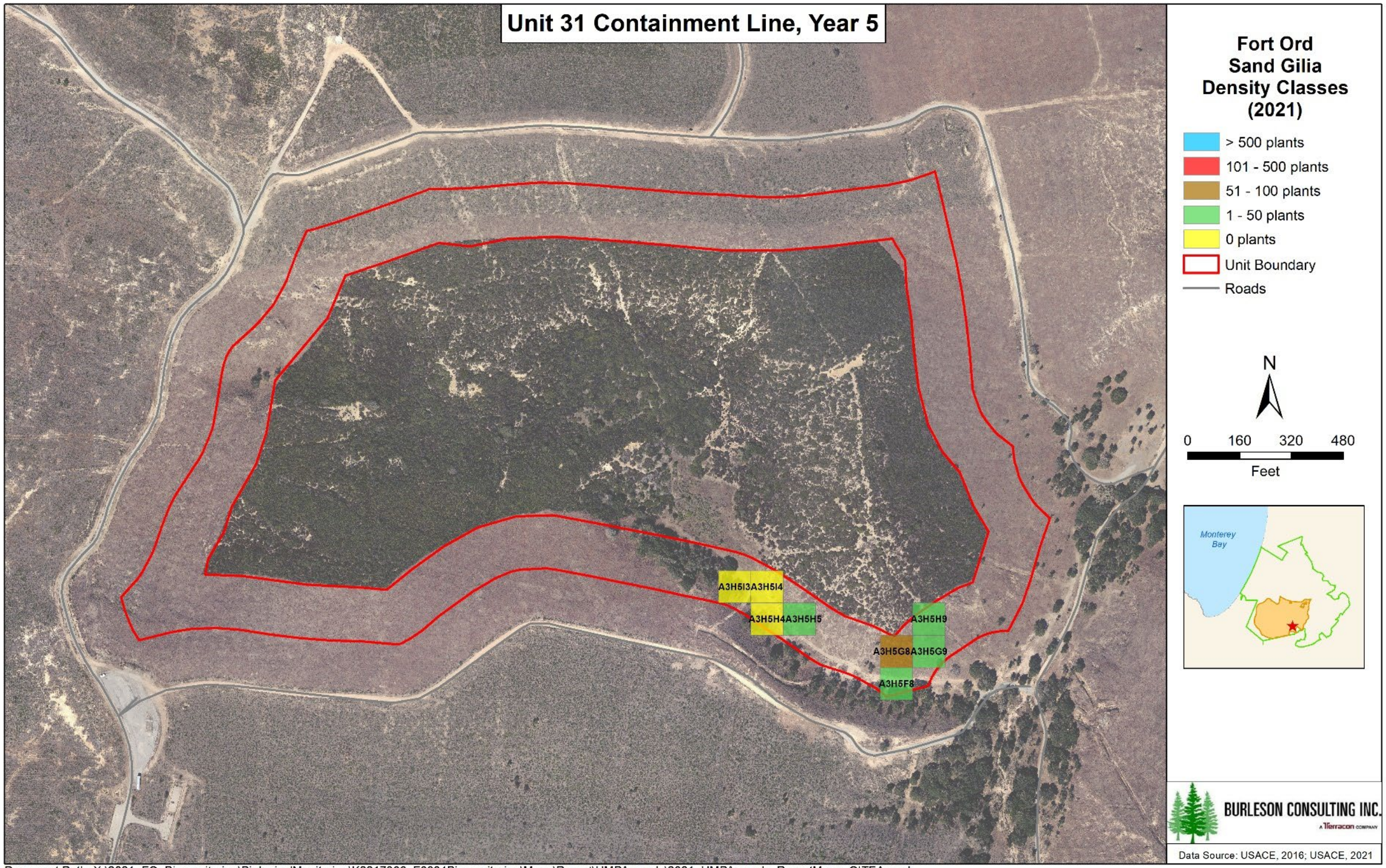

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Figure B-19. Map of Sand Gilia Density; Unit 31 Containment Line (Year 5).

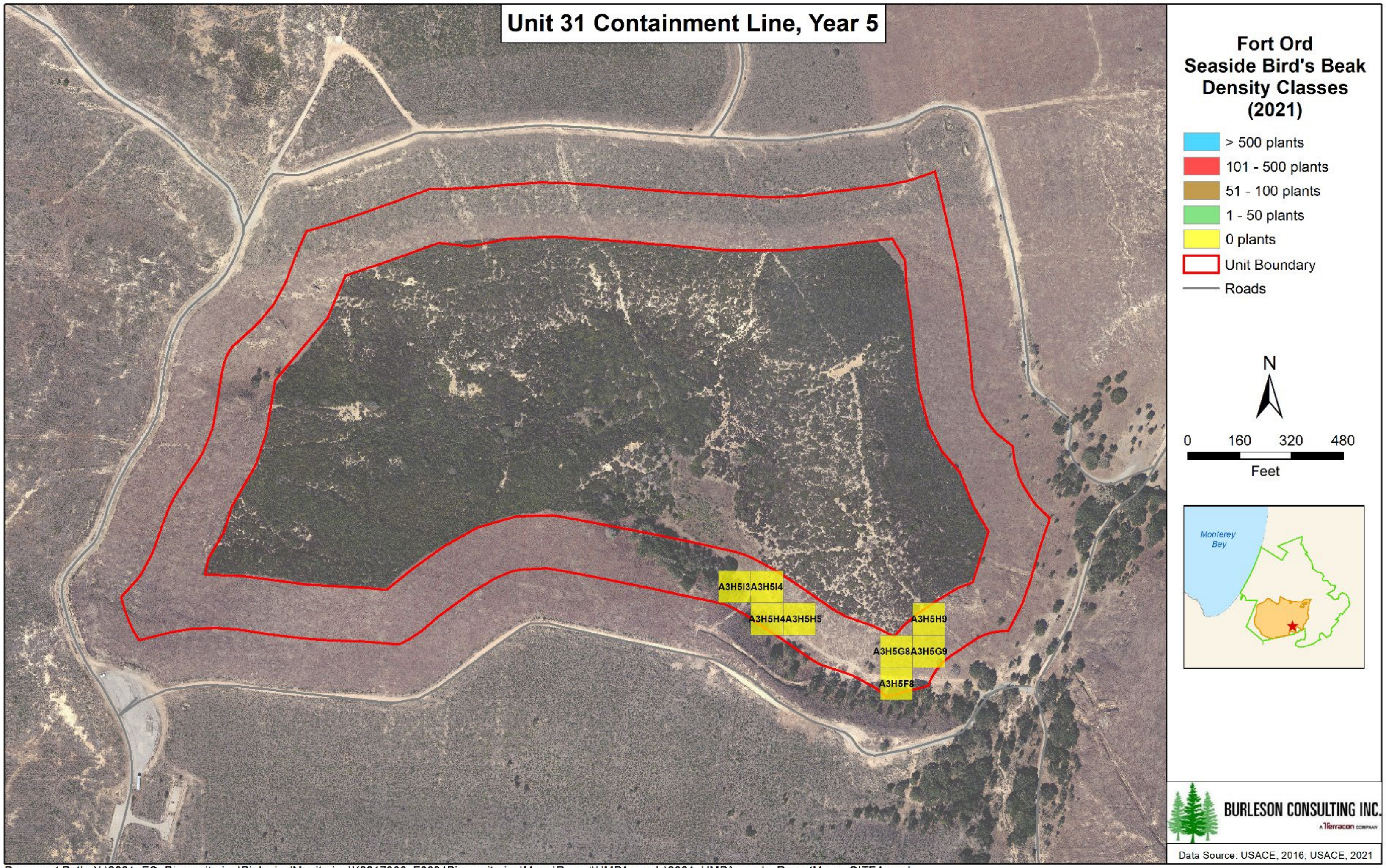

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Figure B-20. Map of Seaside Bird's Beak Density; Unit 31 Containment Line (Year 5).

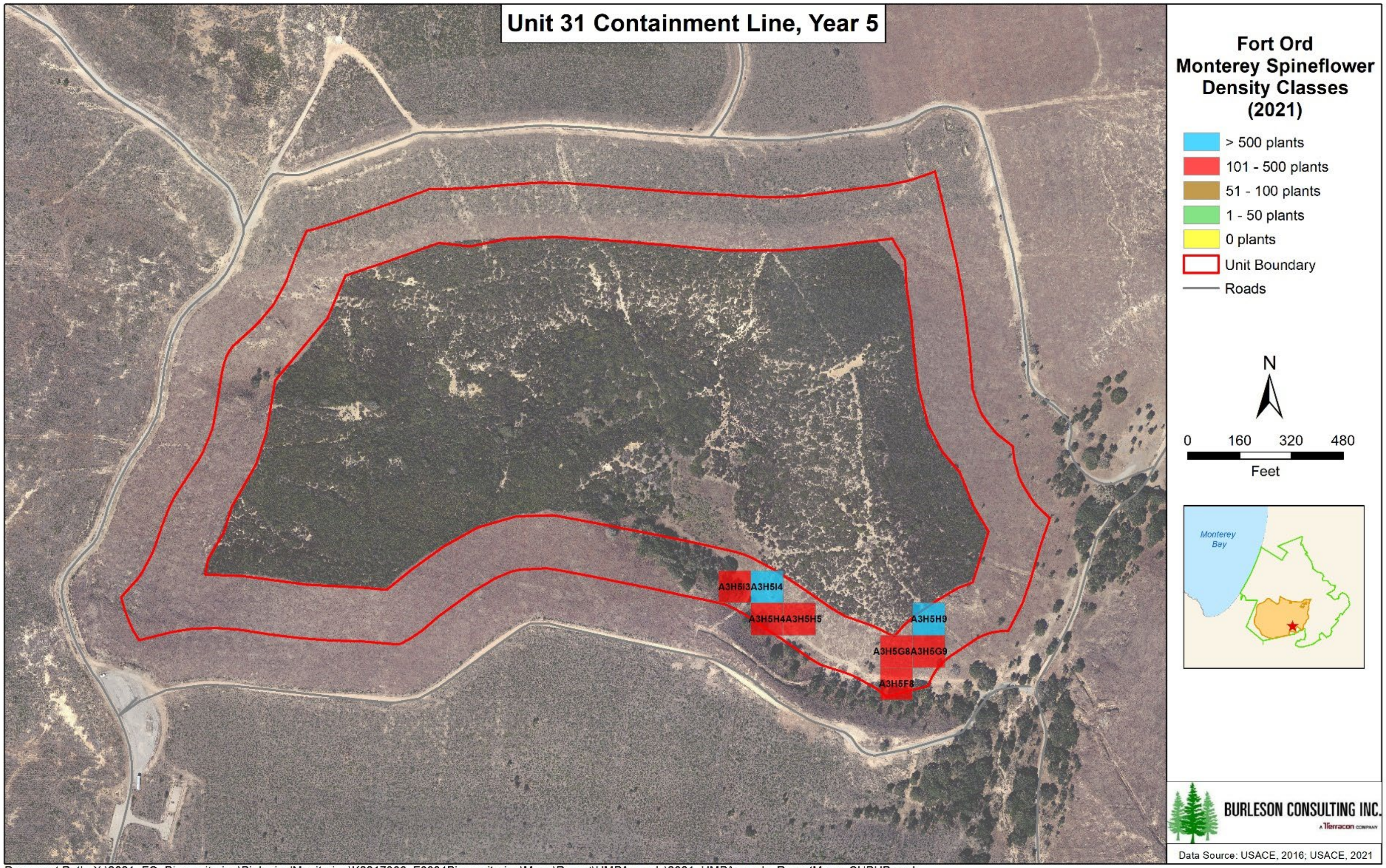

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Figure B-21. Map of Monterey Spineflower Density; Unit 31 Containment Line (Year 5).

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APPENDIX C

MAPS: HMP SHRUB TRANSECTS

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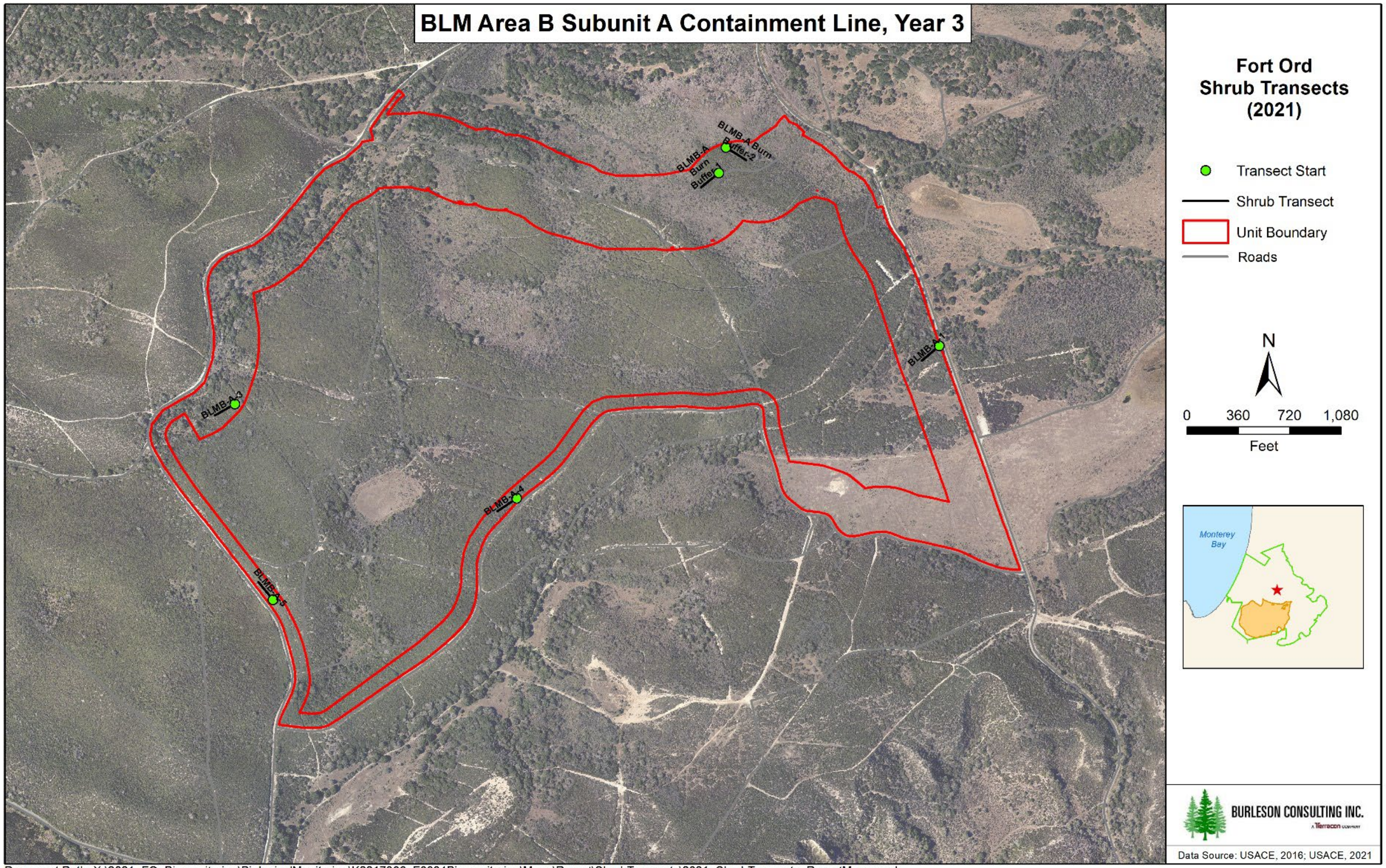

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Figure C-1. Map of Shrub Transects; BLM Area B Subunit A Containment Line (Year 3).

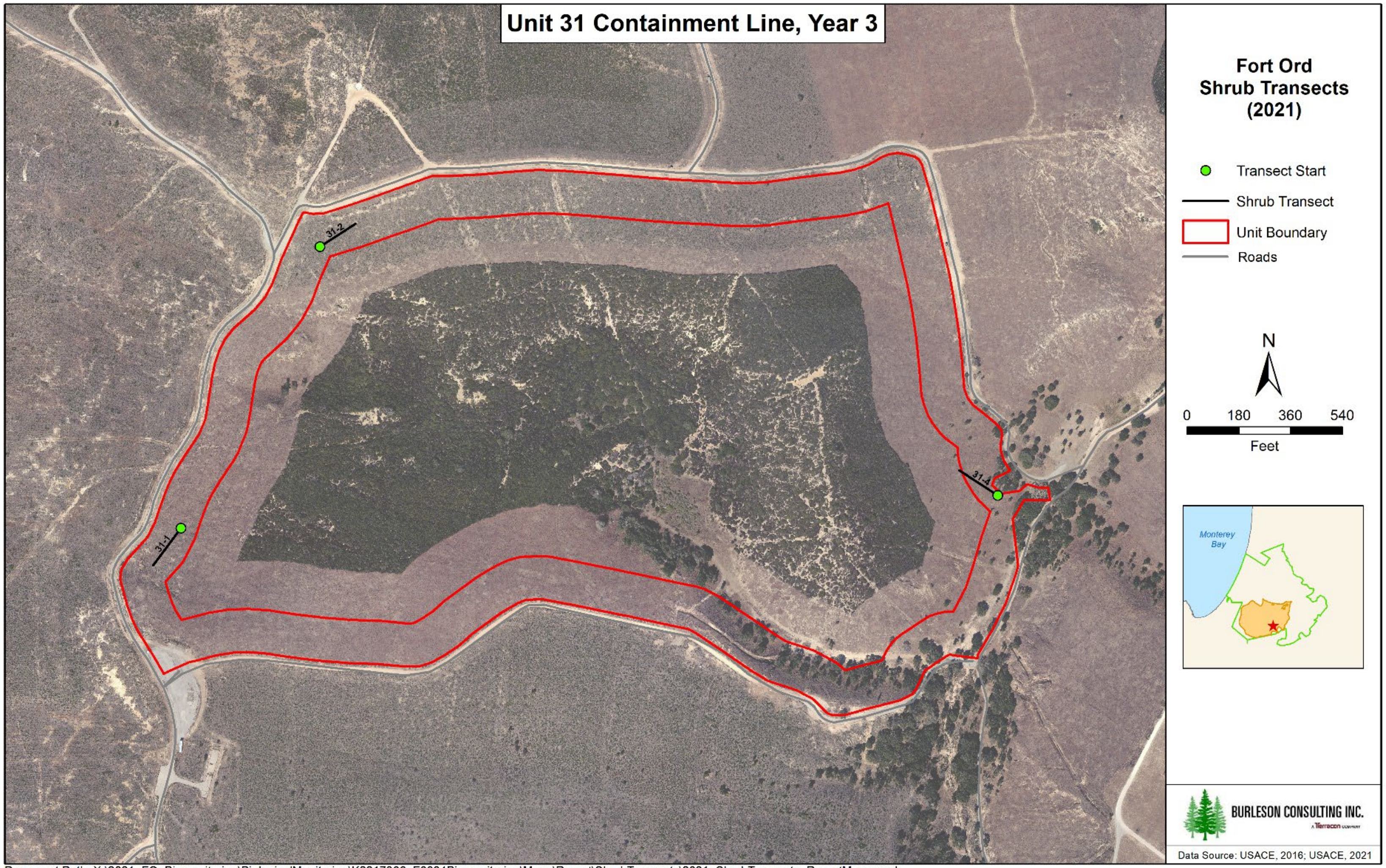

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Figure C-2. Map of Shrub Transects; Unit 31 Containment Line (Year 3).

Figure C-3. Map of Shrub Transects; Unit 13 Containment Line (Year 5).

Figure C-4. Map of Shrub Transects; Unit 20 Containment Line (Year 5).

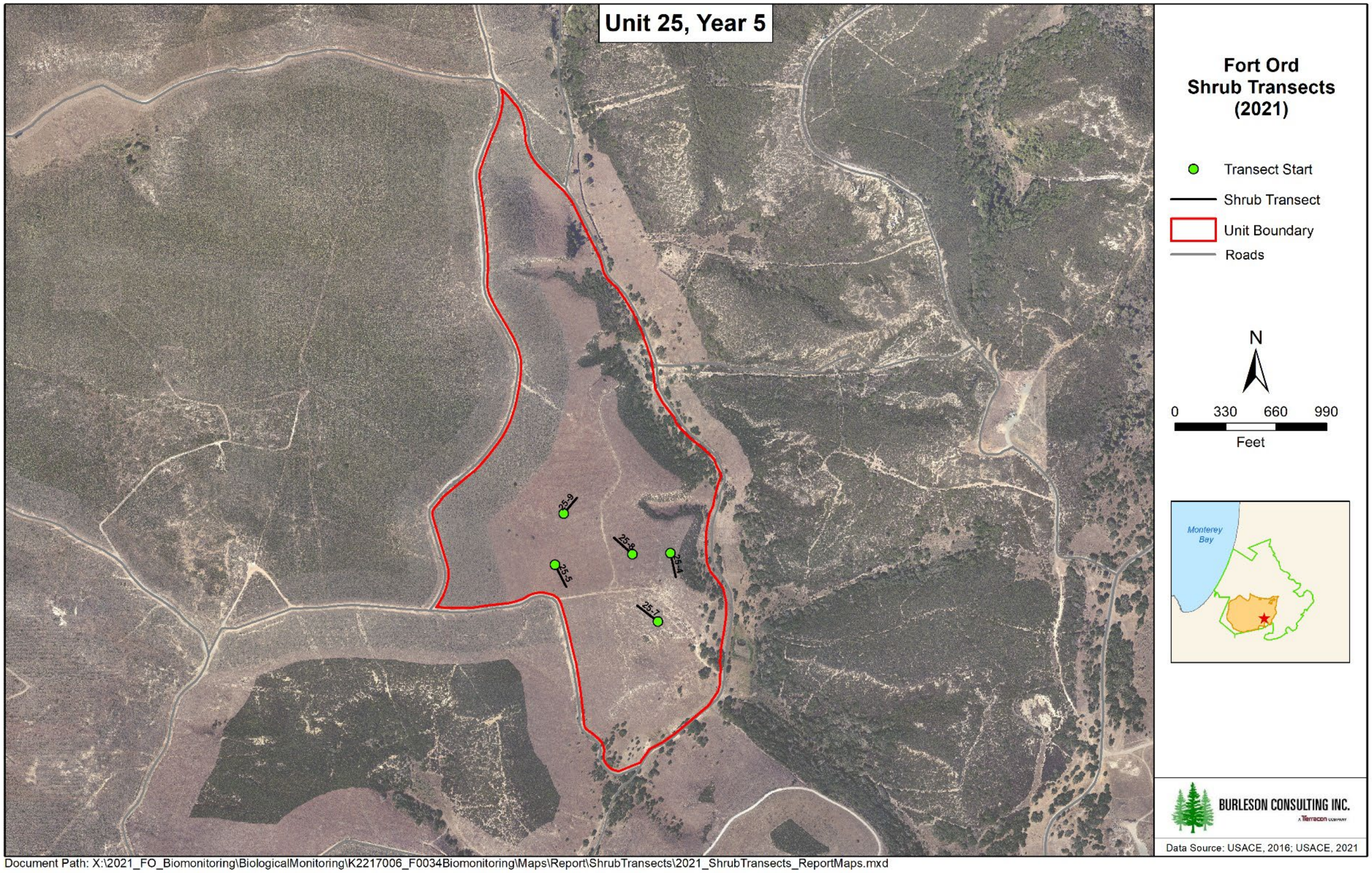

Figure C-5. Map of Shrub Transects; Unit 25 (Year 5).

Figure C-6. Map of Shrub Transects; Unit 6 (Year 8).

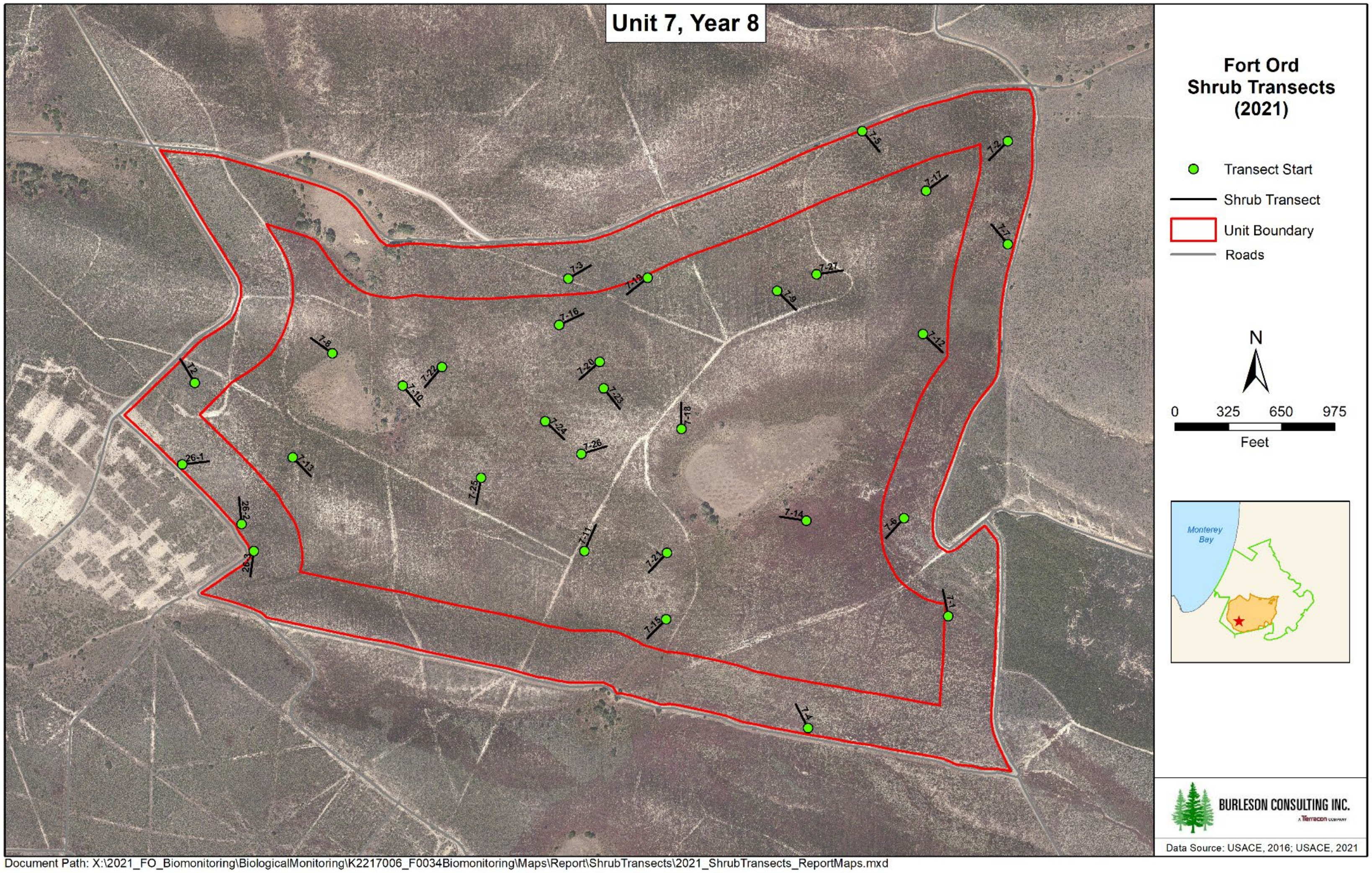

Figure C-7. Map of Shrub Transects; Unit 7 (Year 8).

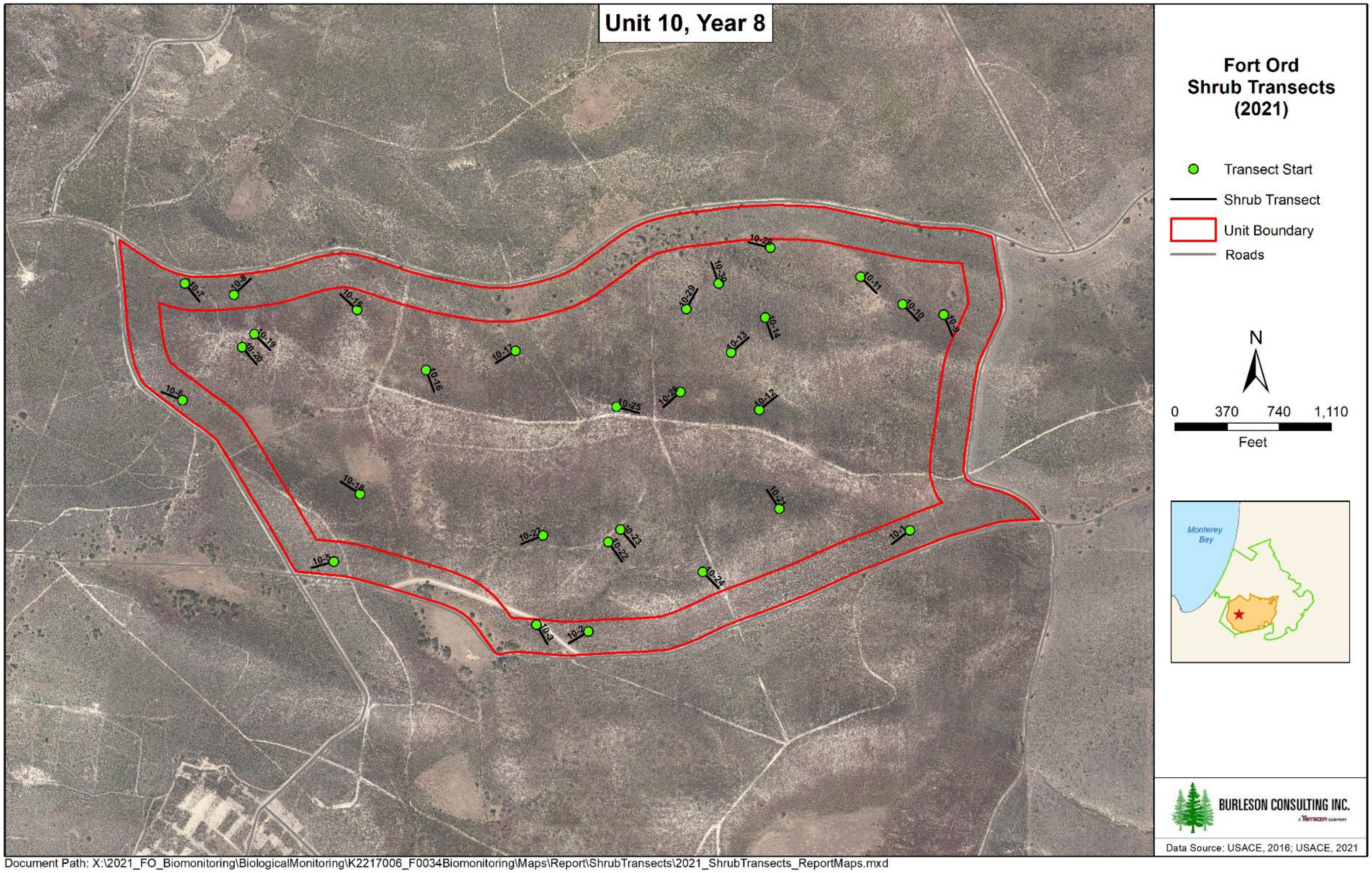

Figure C-8. Map of Shrub Transects; Unit 10 (Year 8).

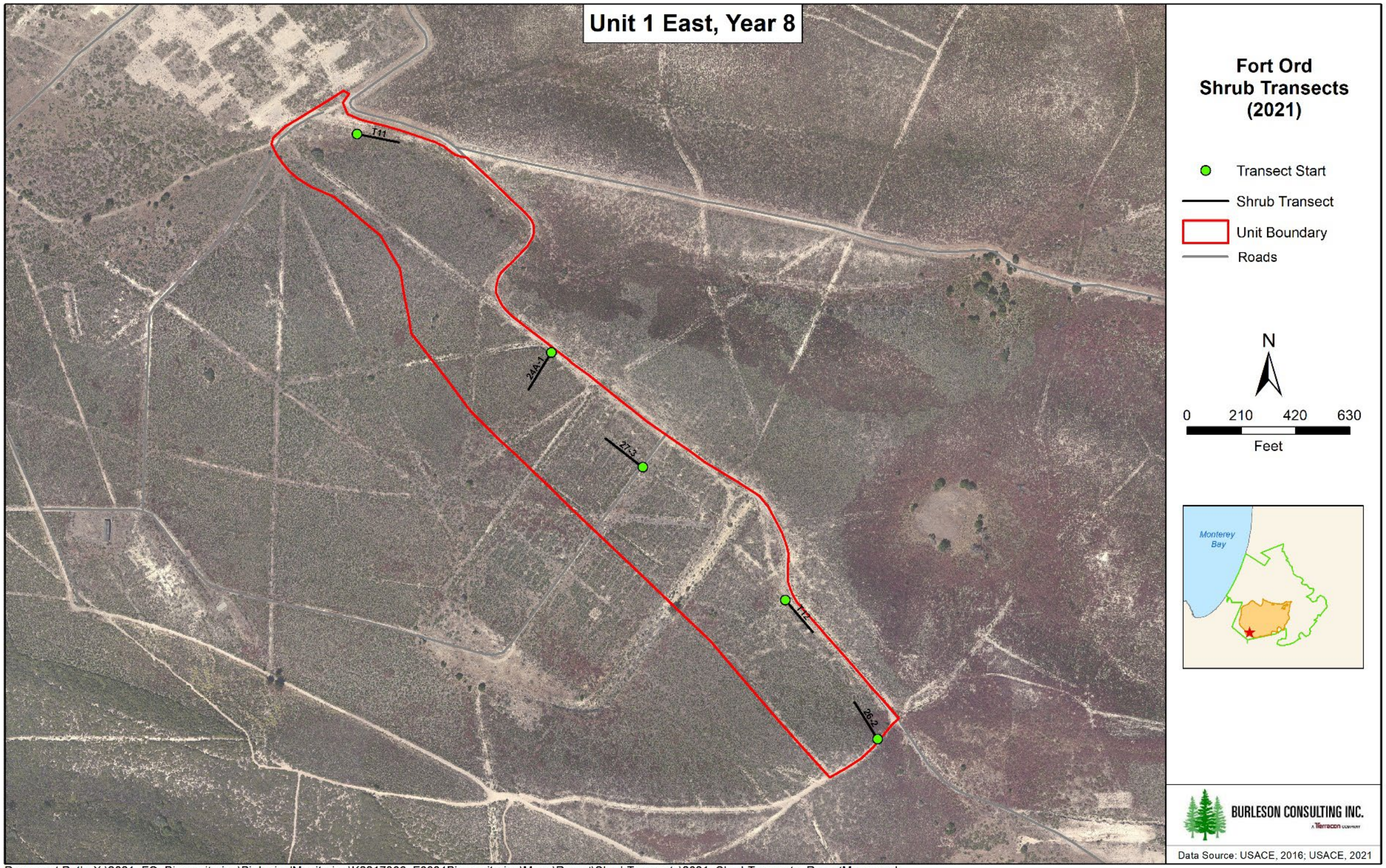

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Figure C-9. Map of Shrub Transects; Unit 1 East (Year 8).

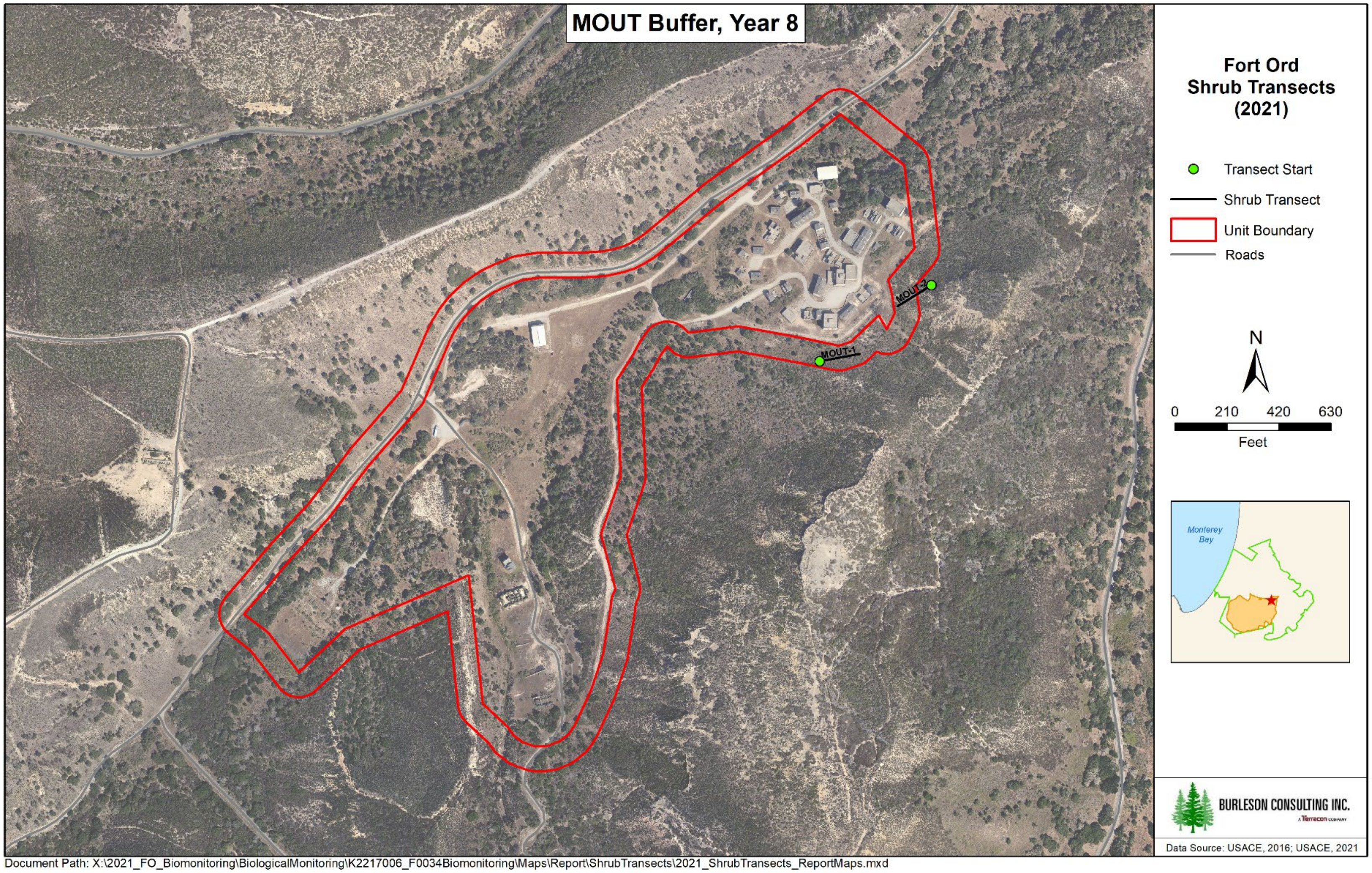

Figure C-10. Map of Shrub Transects; MOUT Buffer (Year 8).

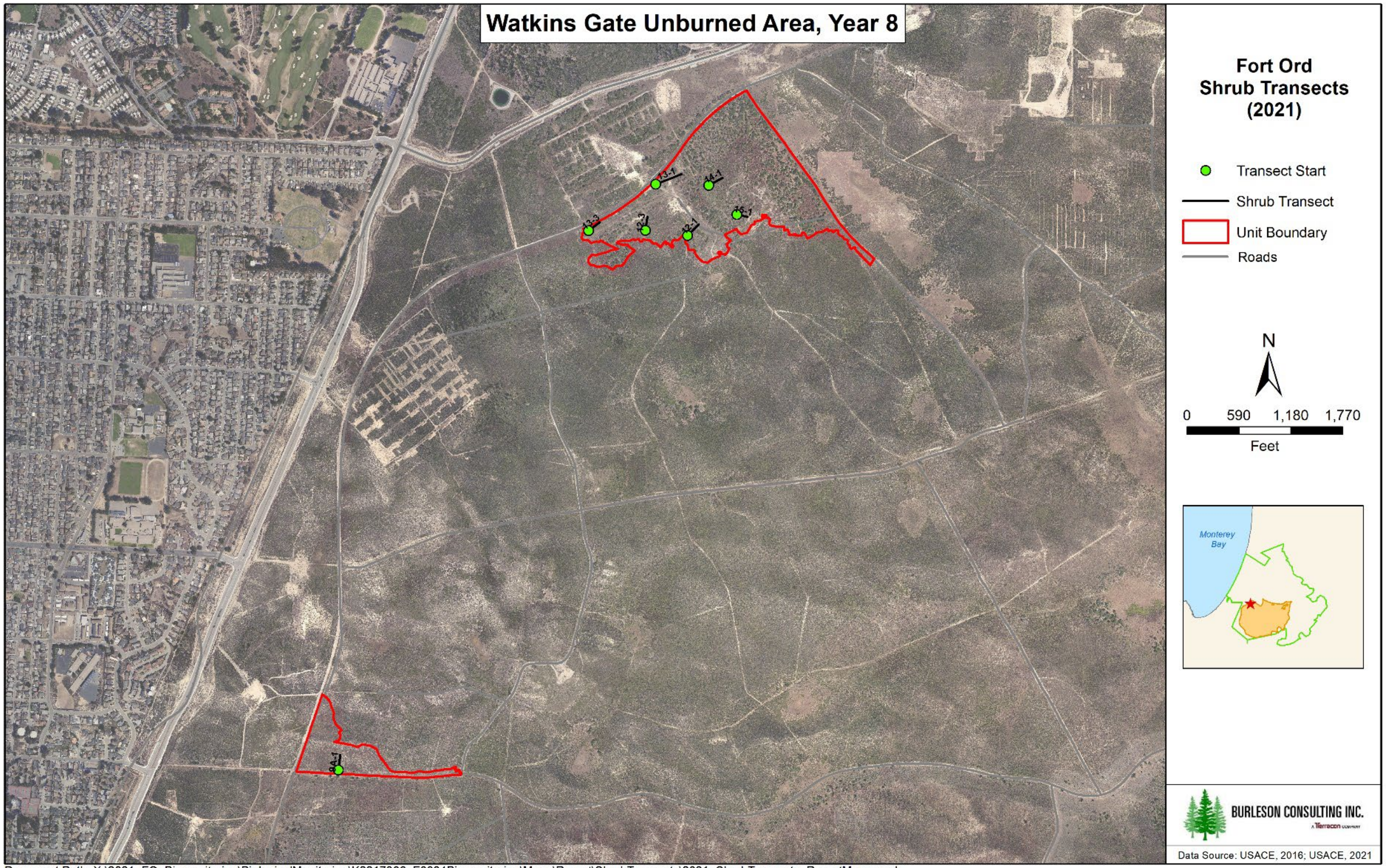

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Figure C-11. Map of Shrub Transects; WGBA (Year 8).

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APPENDIX D

MAPS: ANNUAL GRASS DENSITY

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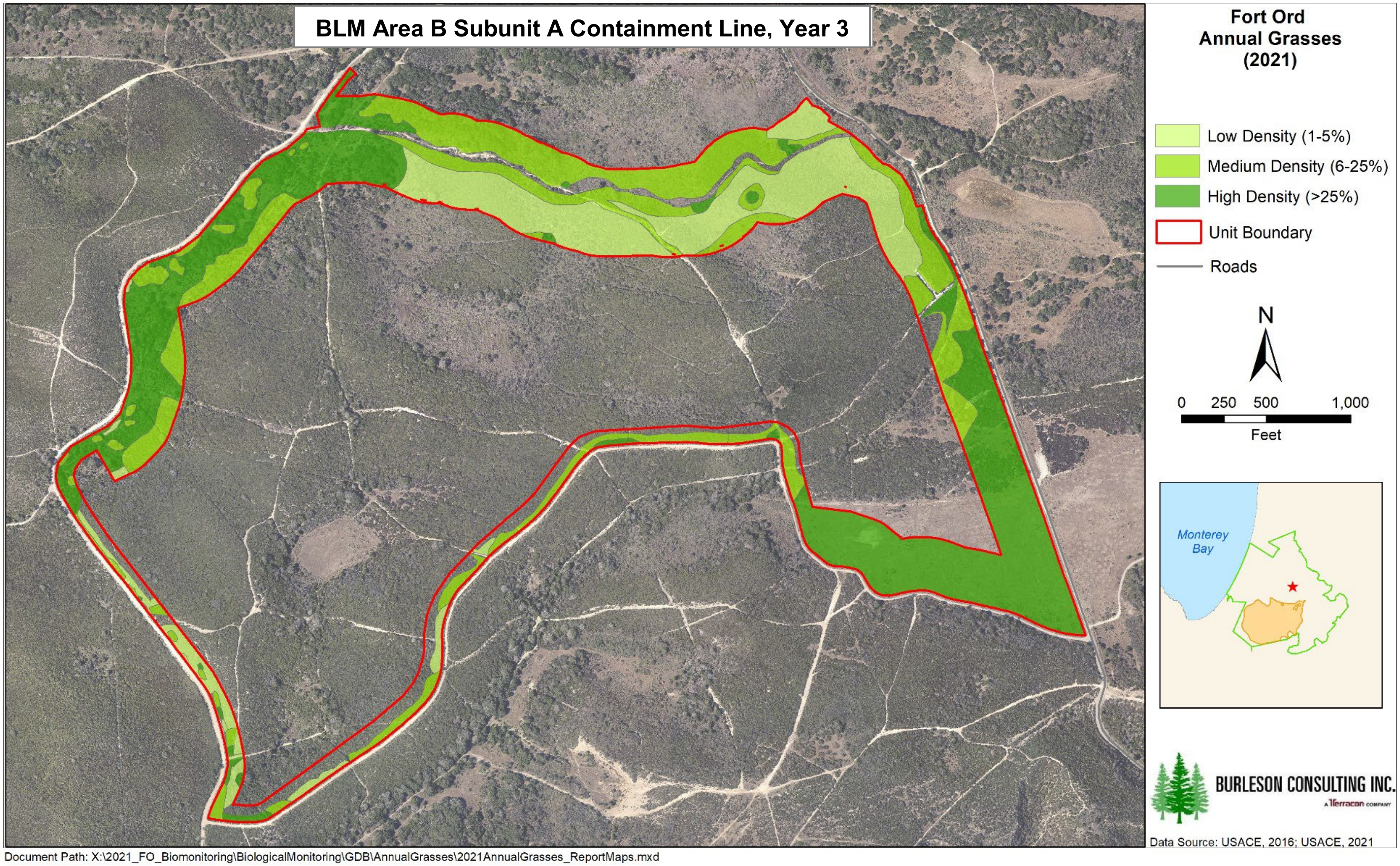

Figure D-1. Map of Annual Grass Density; BLM Area B Subunit A (Year 3).

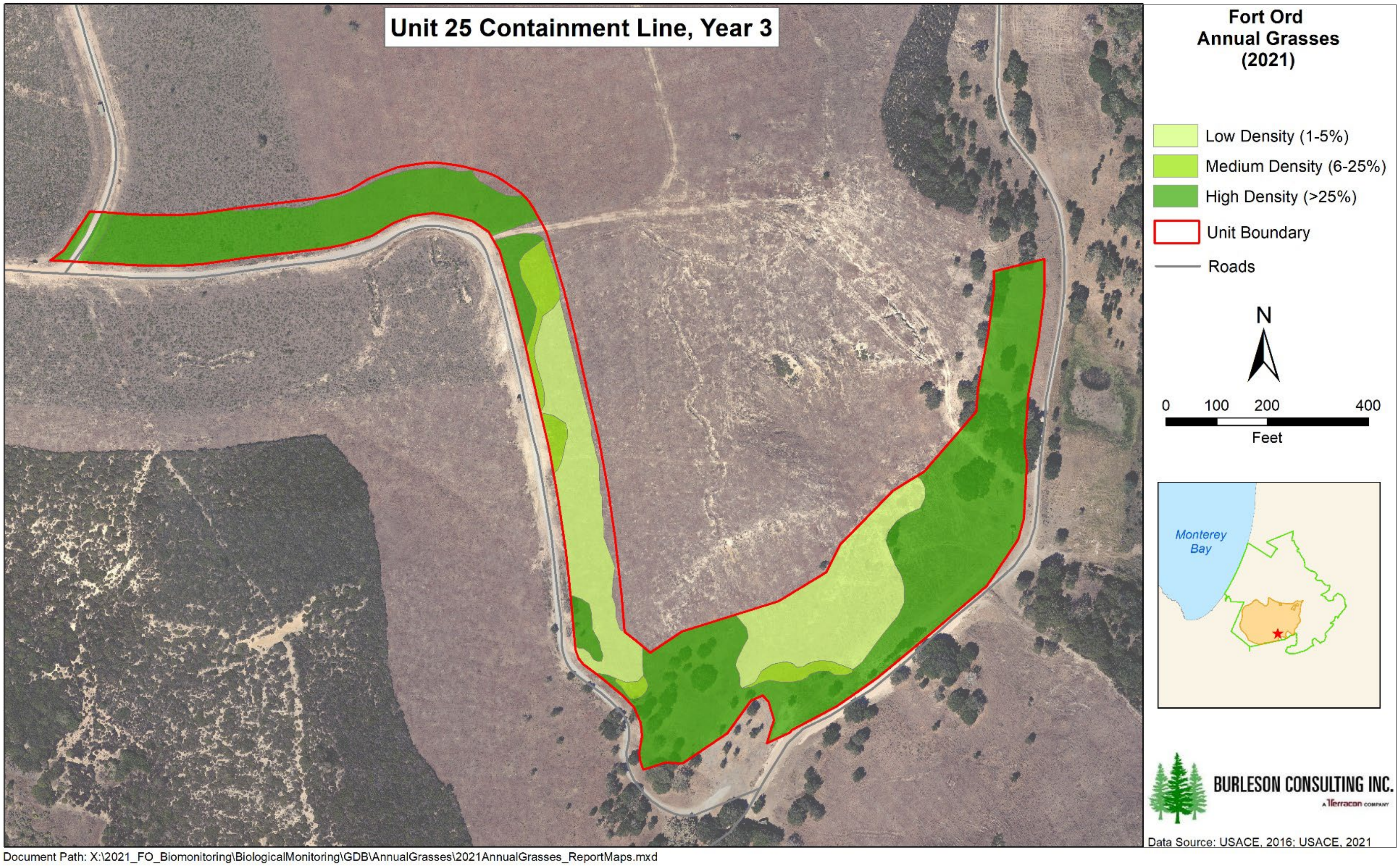

Figure D-2. Map of Annual Grass Density; Unit 25 Containment Line (Year 3).

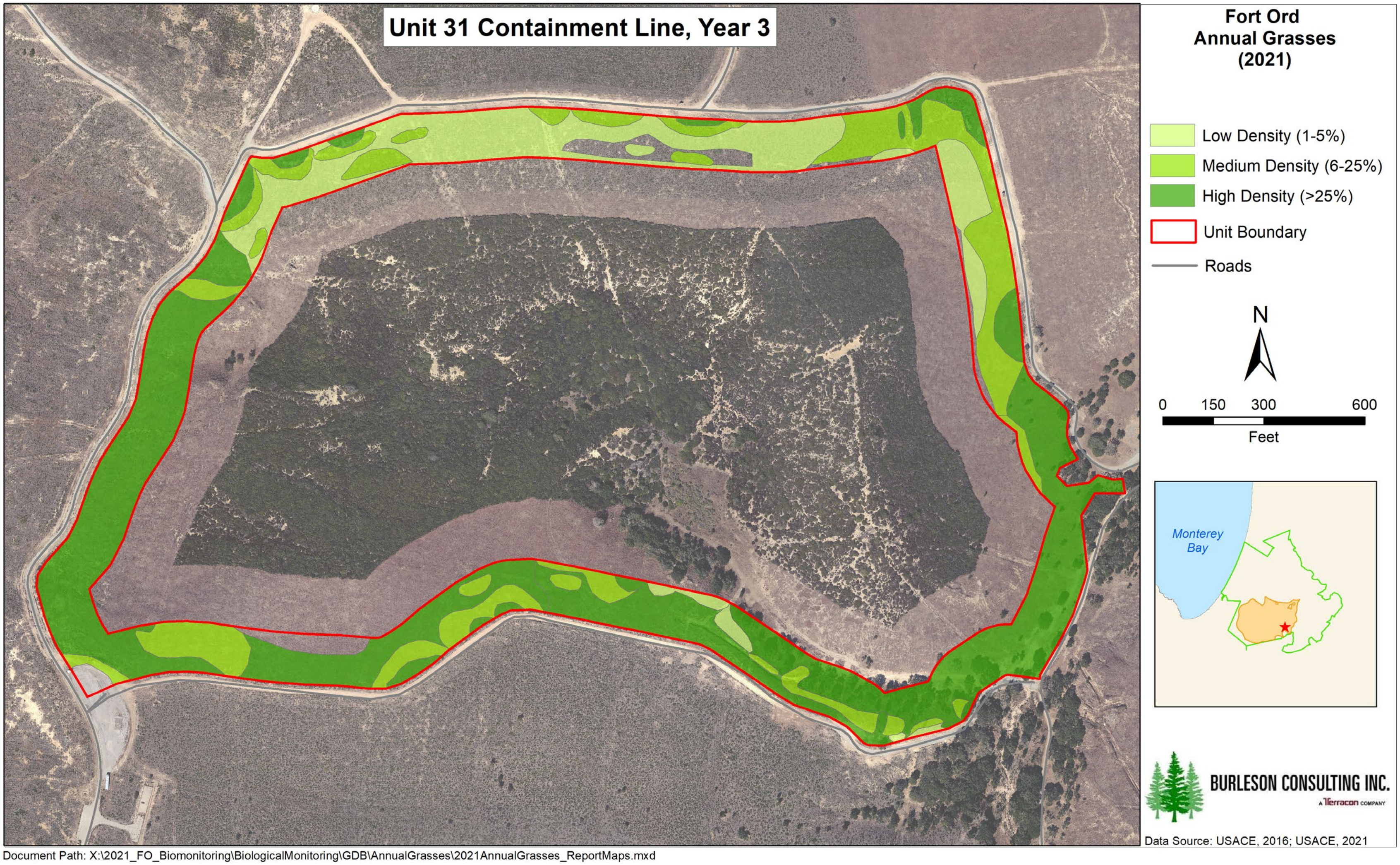

Figure D-3. Map of Annual Grass Density; Unit 31 Containment Line (Year 3).

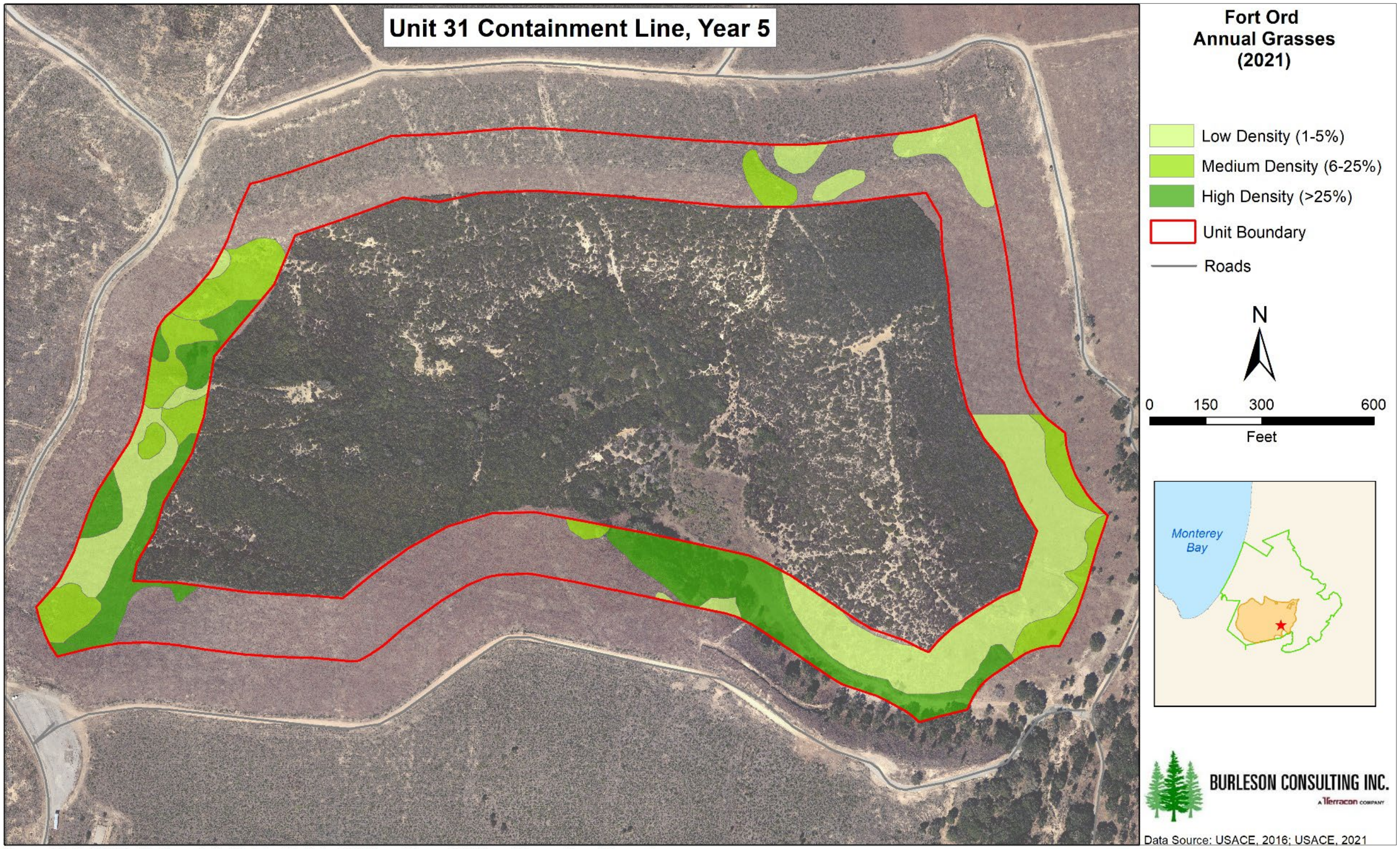

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Figure D-4. Map of Annual Grass Density; Unit 31 Containment Line (Year 5).

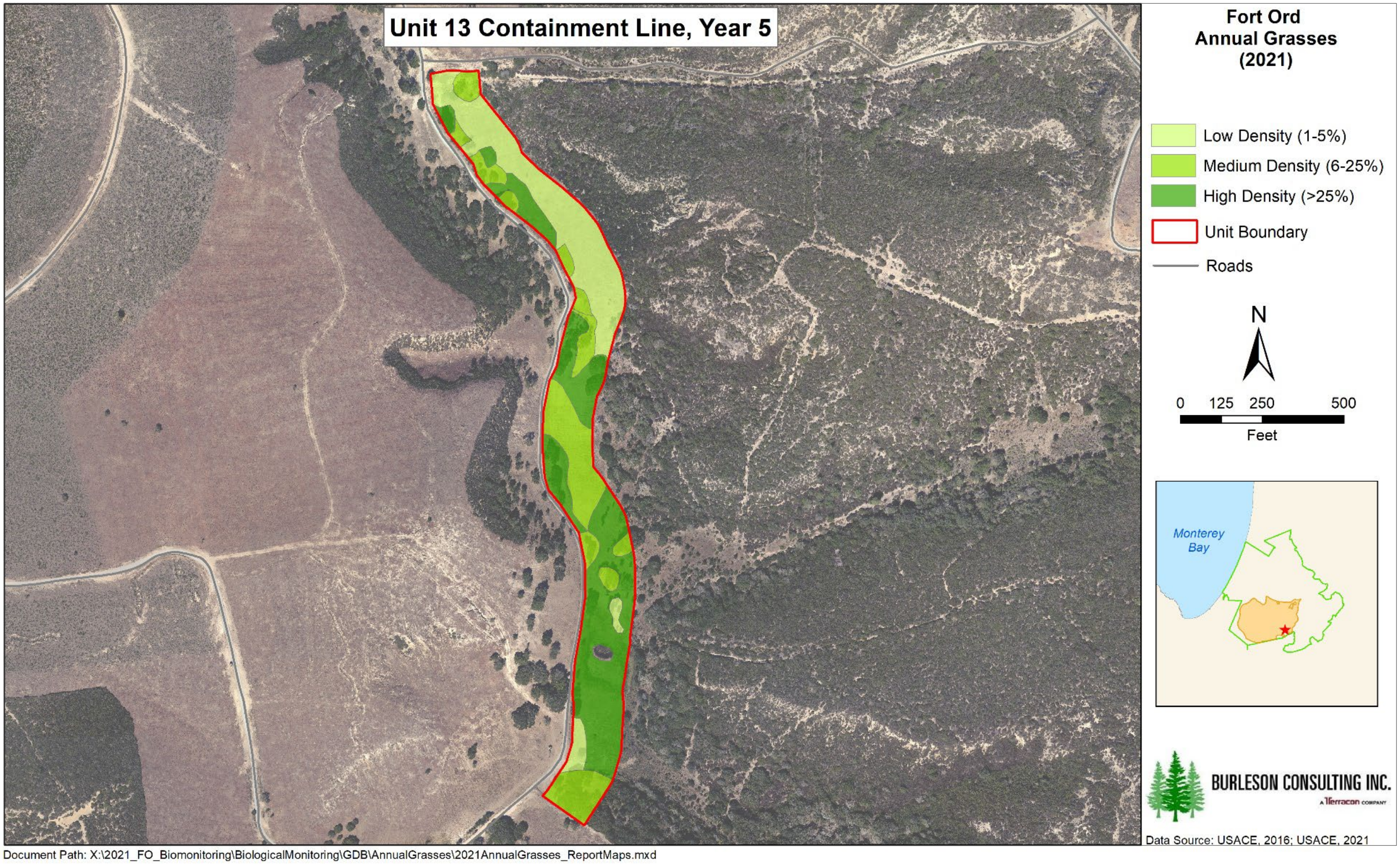

Figure D-5. Map of Annual Grass Density; Unit 13 Containment Line (Year 5).

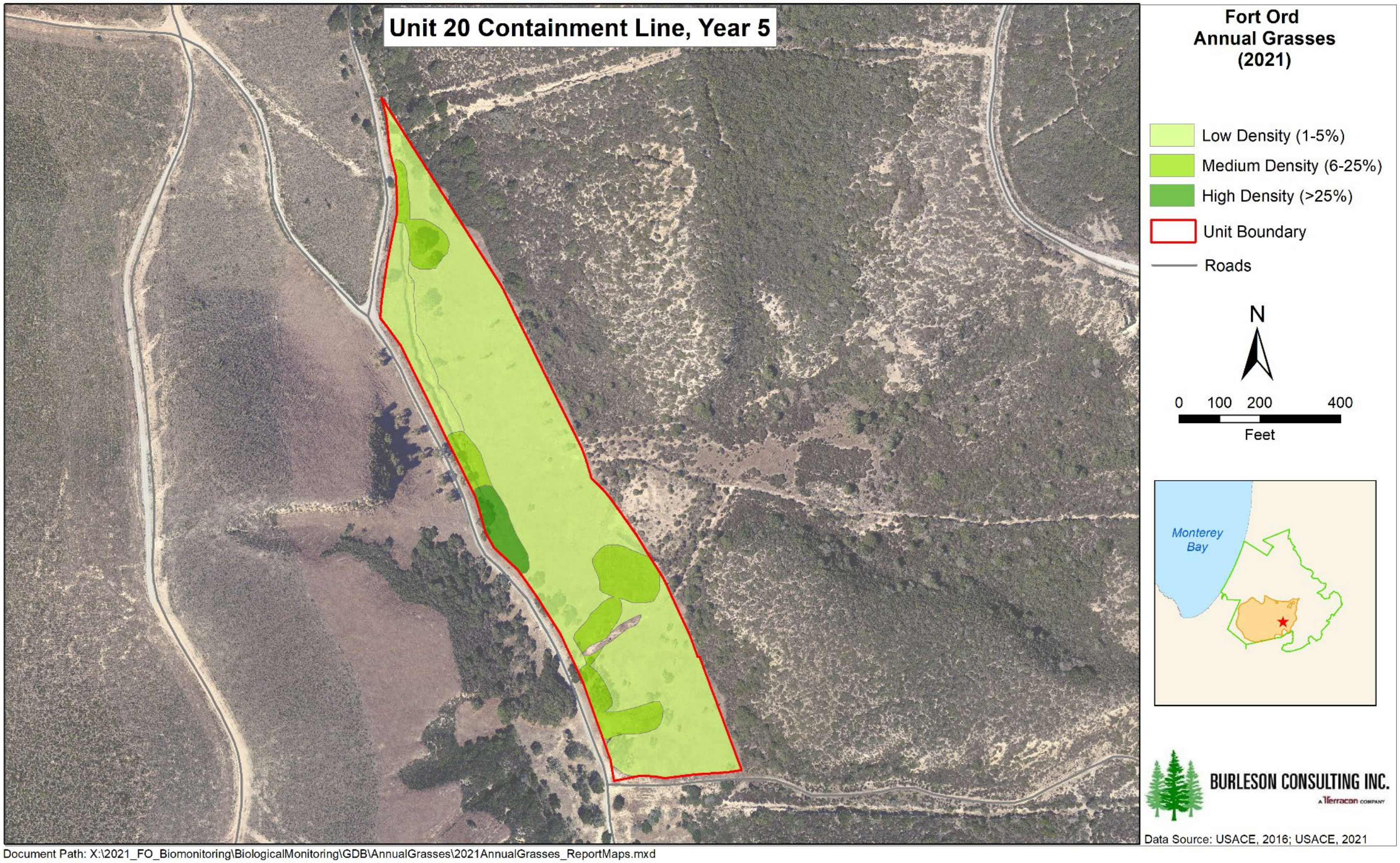

Figure D-6. Map of Annual Grass Density; Unit 20 Containment Line (Year 5).

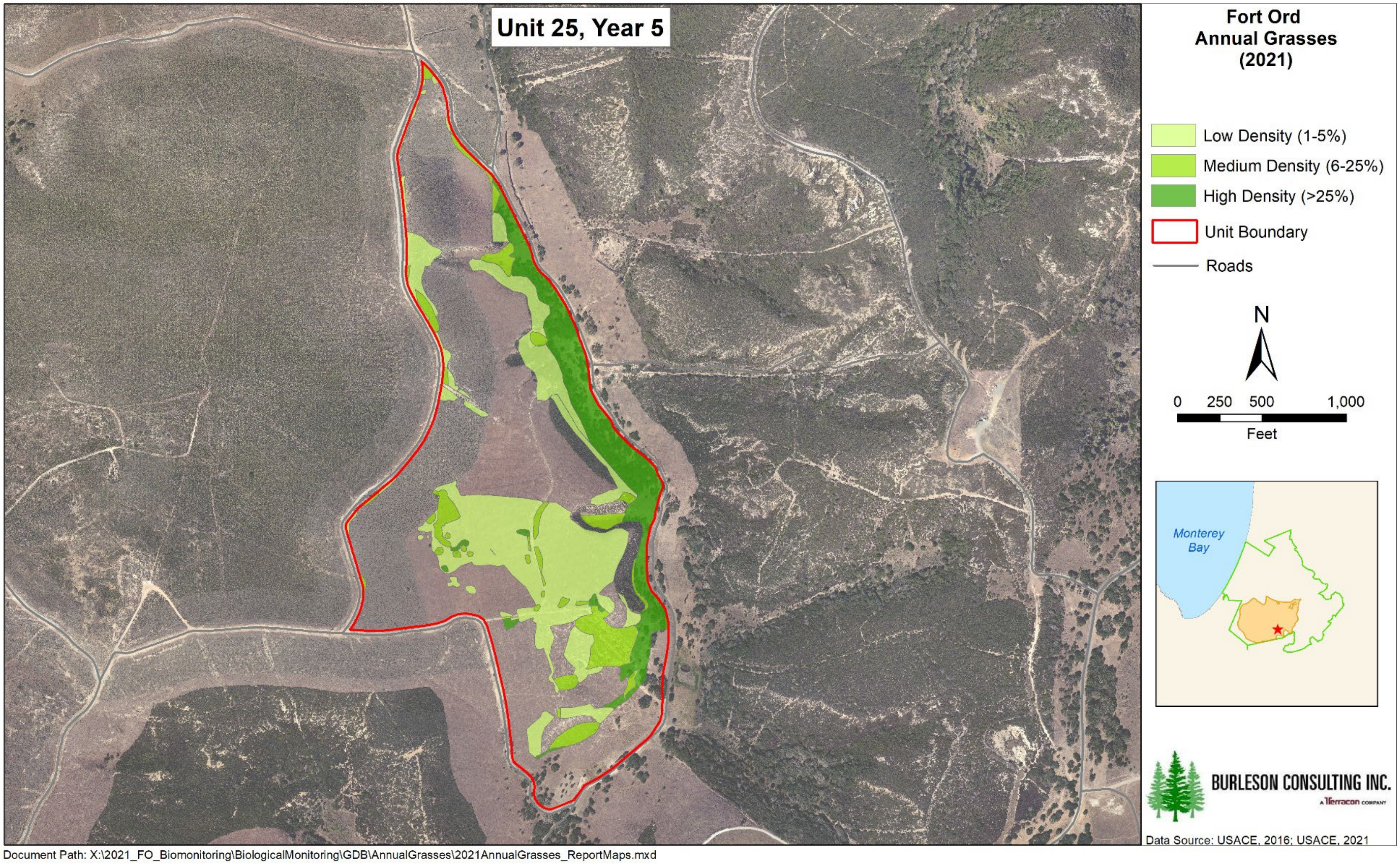

Figure D-7. Map of Annual Grass Density; Unit 25 (Year 5).

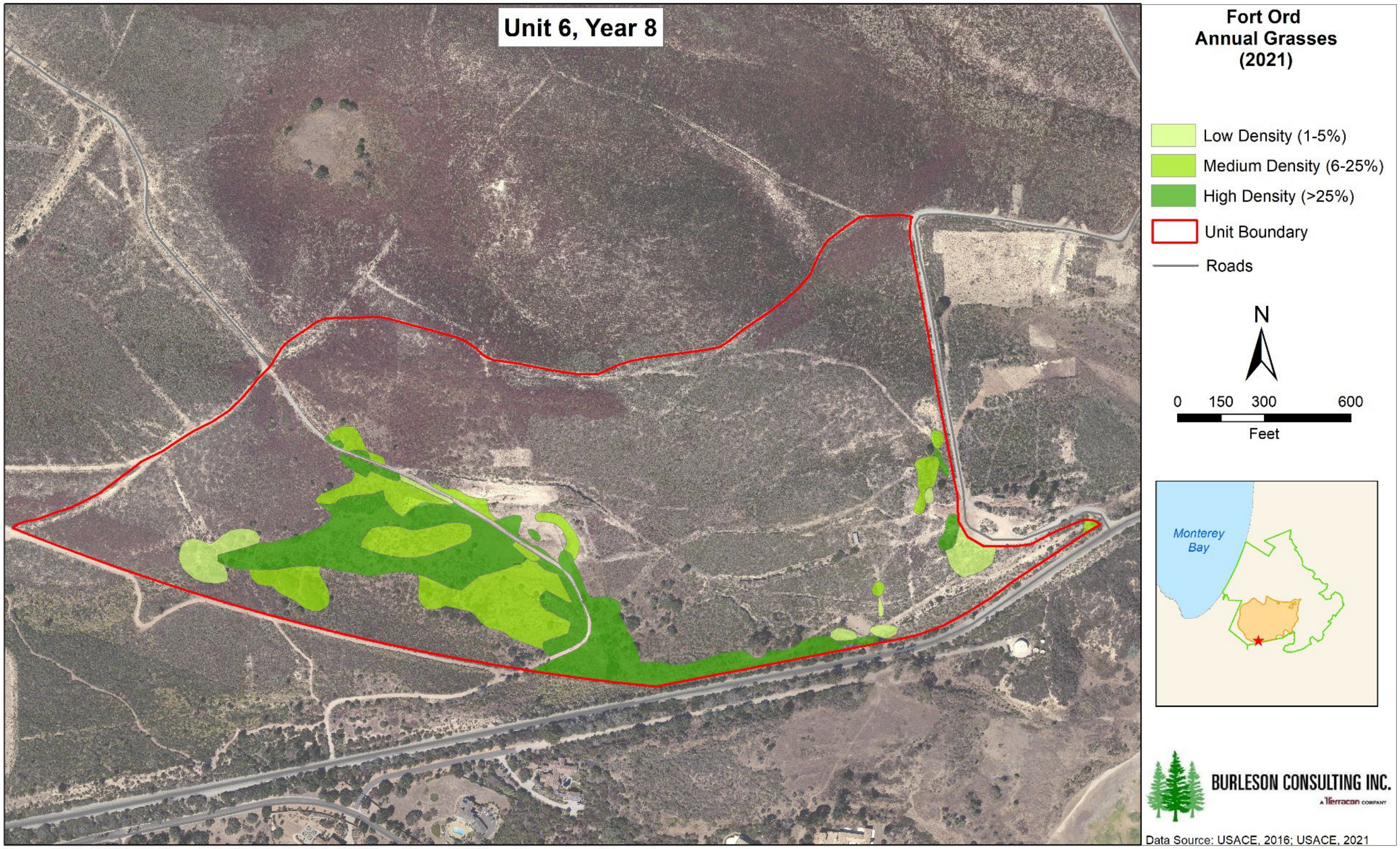

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Figure D-8. Map of Annual Grass Density; Unit 6 (Year 8).

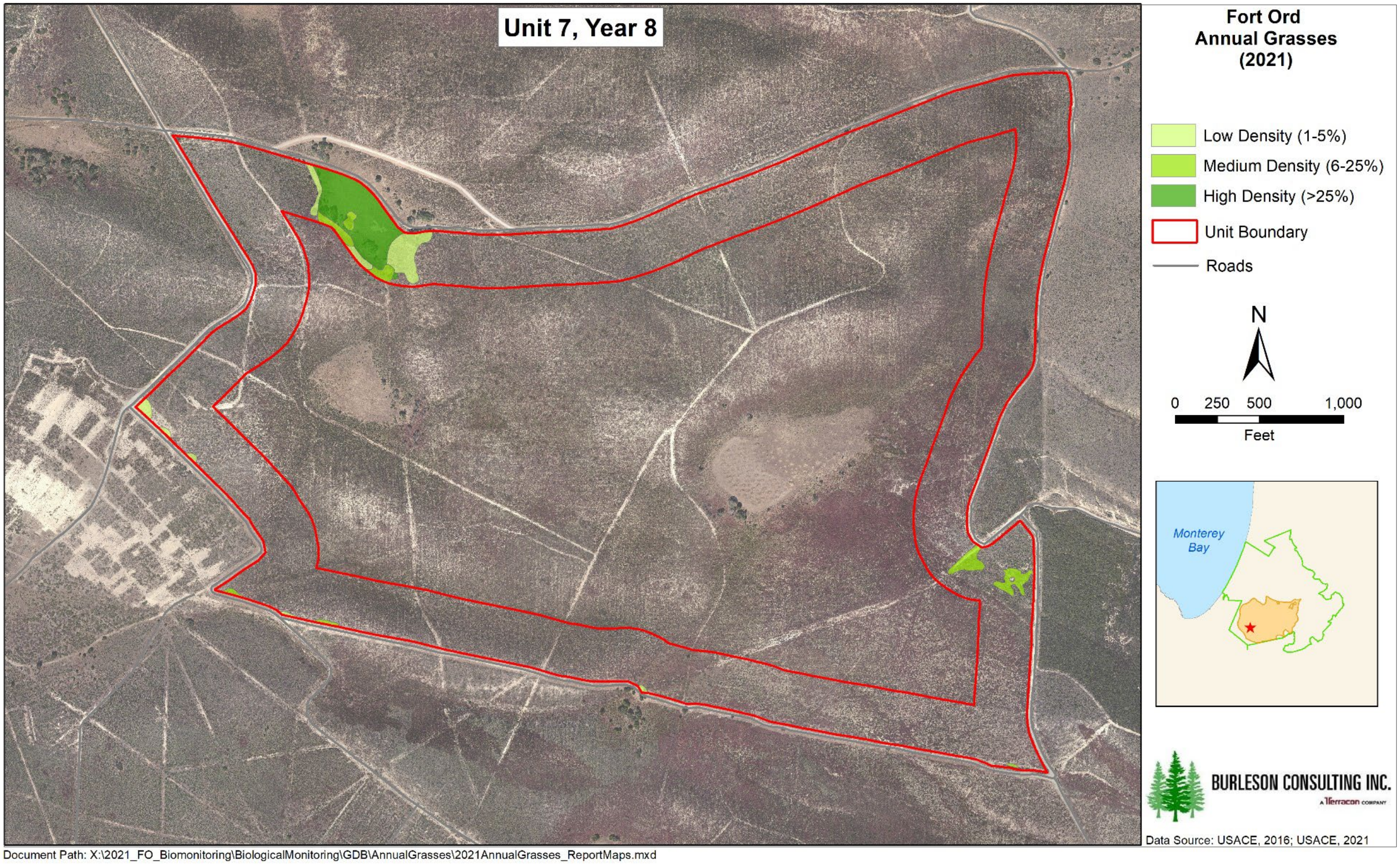

Figure D-9. Map of Annual Grass Density; Unit 7 (Year 8).

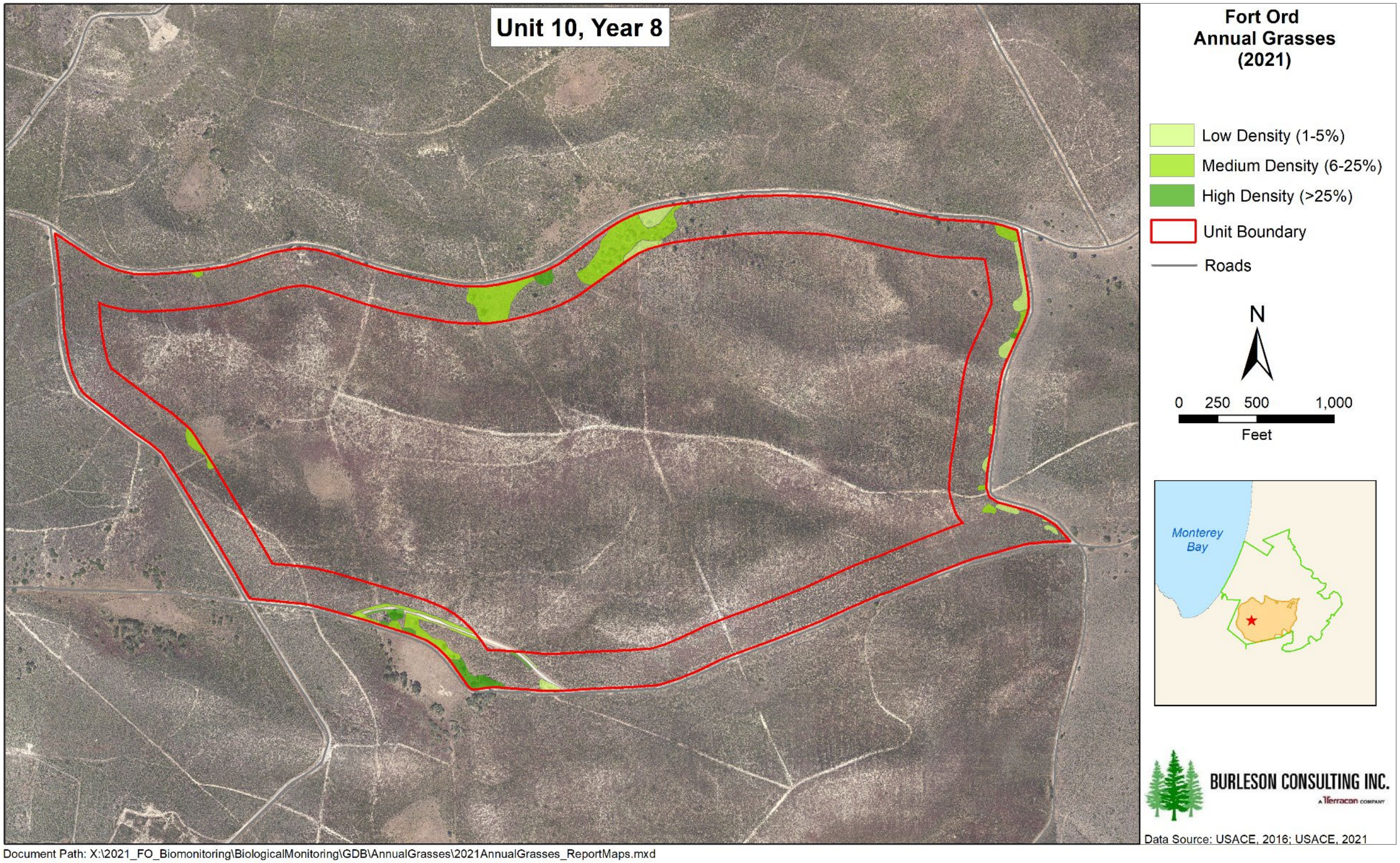

Figure D-10. Map of Annual Grass Density; Unit 10 (Year 8).

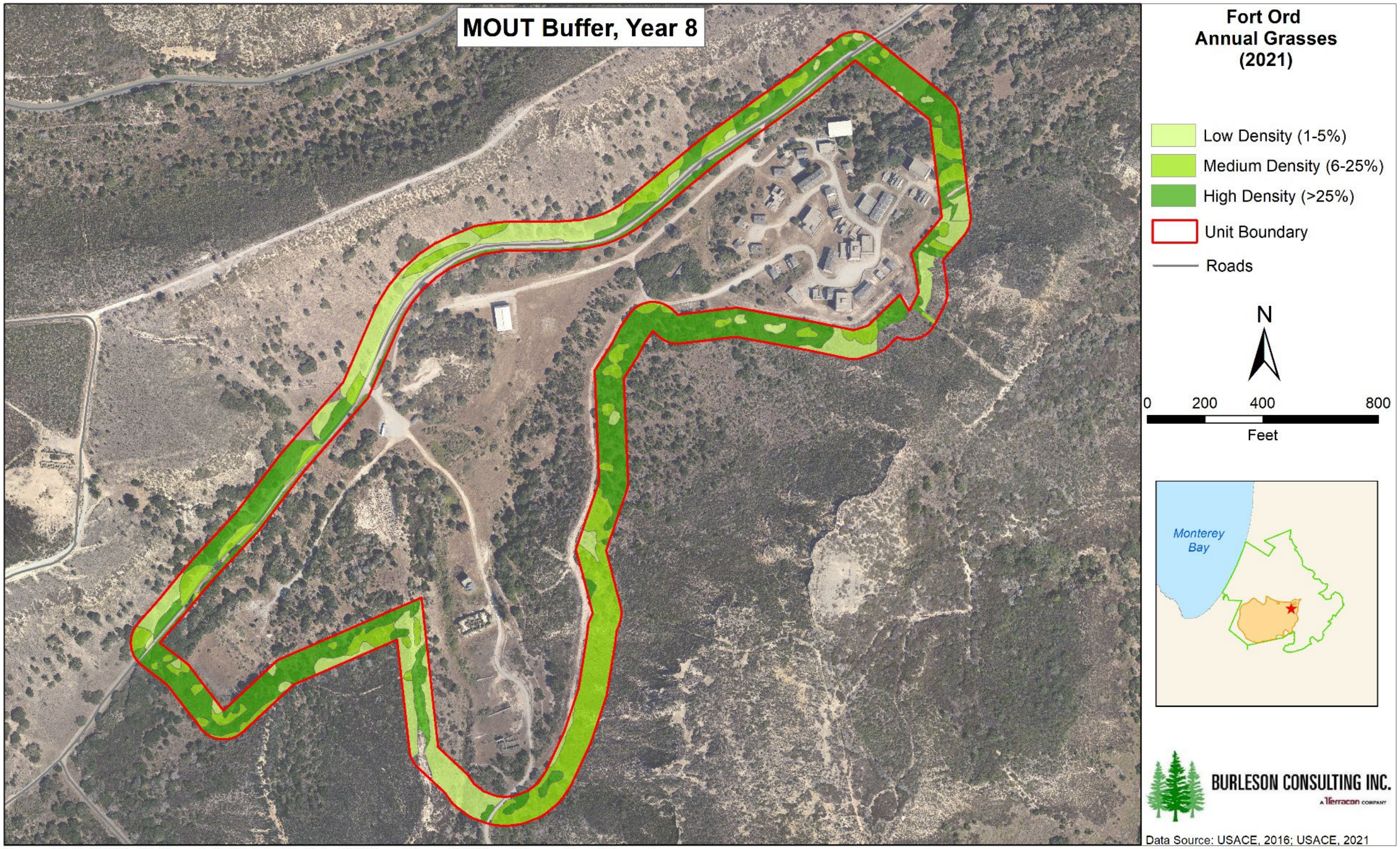

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Figure D-11. Map of Annual Grass Density; MOUT Buffer (Year 8).

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APPENDIX E

MAPS: INVASIVE AND RARE SPECIES

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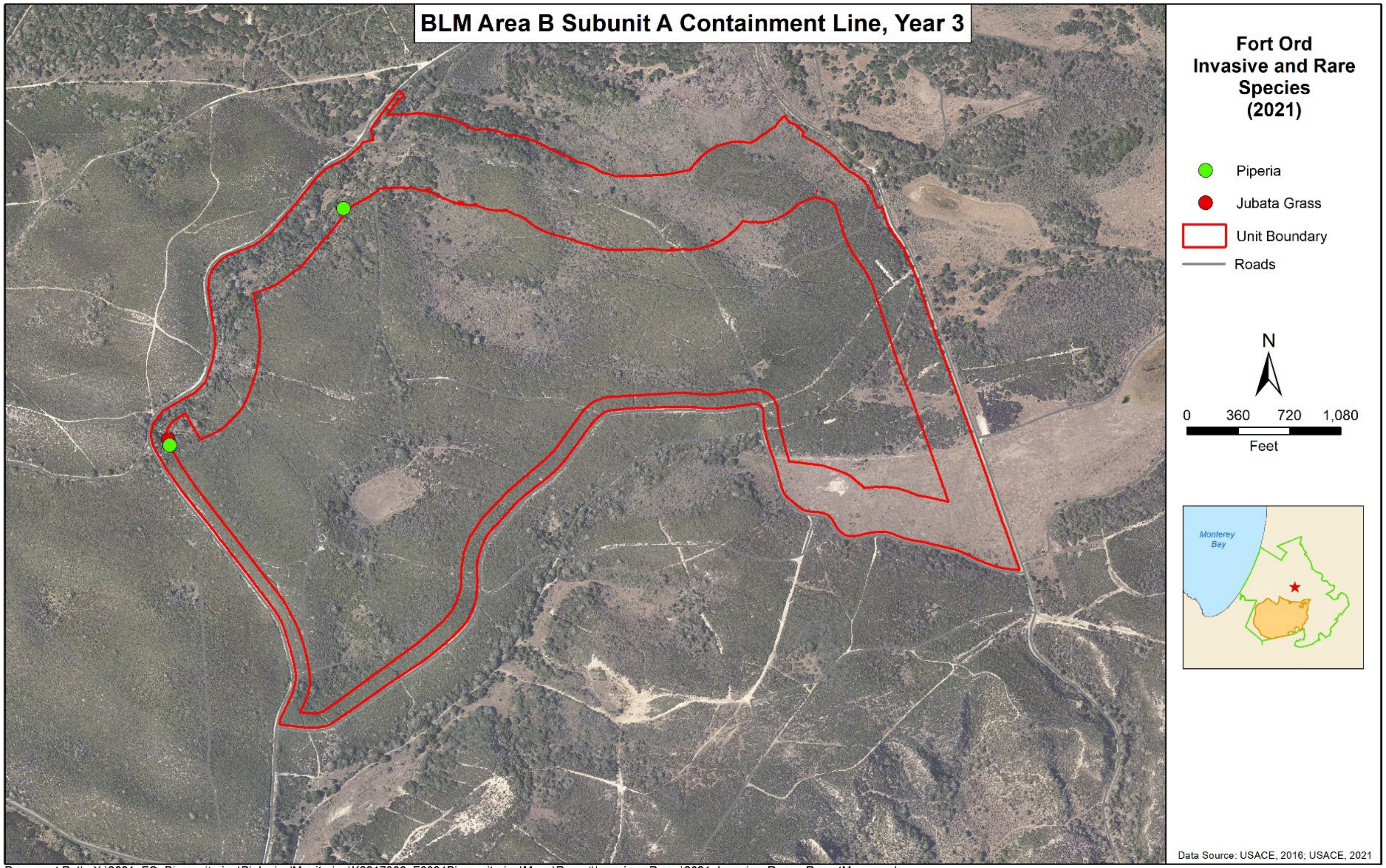

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Figure E-1. Map of Invasive and Rare Species; BLM Area B Subunit A Containment Line (Year 3).

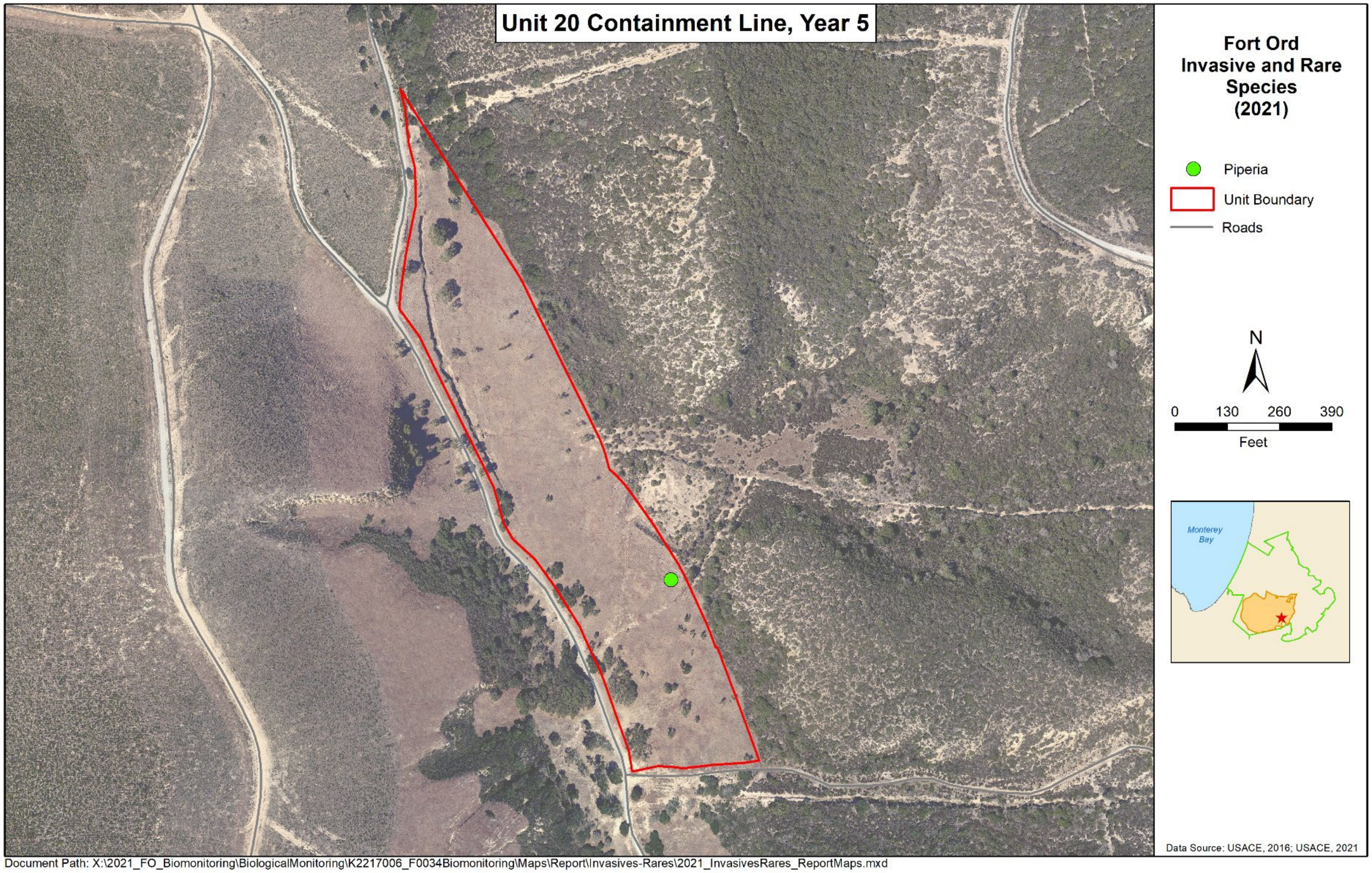

Figure E-2. Map of Invasive and Rare Species; Unit 20 Containment Line (Year 5).

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Figure E-3. Map of Invasive and Rare Species; Unit 25 (Year 5).

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APPENDIX F

SHRUB TRANSECT COVER DATA

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Table F-1. Year 3 shrub transects, BLM Area B Subunit A Containment Line.

Code	Species	BLM Area B Subunit A Containment Line					
		BLMB_A-1	BLMB_A-3	BLMB_A-4	BLMB_A-5	BLMB_A Burn Buffer-1	BLMB_A Burn Buffer-2
ACGL	*Acmispon glaber*	-	2.0	-	0.8	3.4	2.4
ACLO	*Acacia longifolia*	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	5.0	2.0	3.8	2.6	14.4	22.8
ARCA	*Artemisia californica*	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	0.2	-	4.8	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	30.6	73.4	26.6	38.8	48.4	46.0
BAPI	*Baccharis pilularis*	-	1.8	1.6	-	0.2	2.6
CAED	*Carpobrotus edulis*	-	-	-	-	-	-
CEDE	*Ceanothus dentatus*	-	-	0.2	-	-	-
CERI	*Ceanothus rigidus*	0.6	-	-	0.6	-	-
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	0.6	0.4
CRSC	*Crocanthemum scoparium*	0.4	1.0	3.6	4.2	0.4	1.4
DACA	*Danthonia californica*	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	6.6	-	2.6	3.8	-	3.2
ERCA	*Eriodictyon californicum*	-	-	-	-	1.0	-
ERCO	*Eriophyllum confertiflorum*	-	1.8	-	2.2	2.0	2.2
ERER	*Ericameria ericoides*	-	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	12.0	-	-
GAEL	*Garrya elliptica*	-	-	2.0	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-	-
LECA	*Lepechinia calycina*	3.6	2.6	-	-	6.8	2.0
LUAR	*Lupinus arboreus*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	2.0	-	0.2	-	-	0.2
RISA	*Ribes sanguineum*	-	-	-	-	-	0.2
ROCA	*Rosa californica*	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-
SAME	*Salvia mellifera*	-	7.6	-	-	-	0.2
SYALL	*Symphoricarpos albus* var. *laevigatus*	4.0	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	1.0	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	2.2	4.2	-	-	-	-
UNK	Unknown	-	-	5.6	-	-	-
BG	Bare Ground	35.6	16.2	46.8	35.0	20.4	22.8
HERB	Herbaceous Vegetation	20.6	7.0	15.6	3.4	14.4	17.8

Table F-2. Year 3 shrub transects, Unit 31 Containment Line.

		Unit 31		
Code	**Species**	**31-1**	**31-2**	**31-4**
ACGL	*Acmispon glaber*	5.4	3.4	6.4
ACLO	*Acacia longifolia*	-	-	-
ADFA	*Adenostoma fasciculatum*	11.2	19.4	19.8
ARCA	*Artemisia californica*	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	1.8	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	21.2	30.6	36.4
BAPI	*Baccharis pilularis*	-	-	-
CAED	*Carpobrotus edulis*	-	-	-
CEDE	*Ceanothus dentatus*	0.2	3.2	5.2
CERI	*Ceanothus rigidus*	-	0.2	2.4
CETH	*Ceanothus thyrsiflorus*	-	-	-
CRSC	*Crocanthemum scoparium*	2.4	6.8	1.0
DACA	*Danthonia californica*	-	-	-
DIAU	*Diplacus aurantiacus*	2.4	-	-
ERCA	*Eriodictyon californicum*	-	-	-
ERCO	*Eriophyllum confertiflorum*	2.4	0.2	2.2
ERER	*Ericameria ericoides*	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-
FRCA	*Frangula californica*	-	-	-
GAEL	*Garrya elliptica*	-	-	-
HEAR	*Heteromeles arbutifolia*	1.2	-	-
LECA	*Lepechinia calycina*	0.2	-	-
LUAR	*Lupinus arboreus*	-	-	3.0
QUAG	*Quercus agrifolia*	-	-	12.4
RISA	*Ribes sanguineum*	-	-	-
ROCA	*Rosa californica*	-	-	-
RUUR	*Rubus ursinus*	-	-	-
SAME	*Salvia mellifera*	-	-	-
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	2.8
SYMO	*Symphoricarpos mollis*	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	3.2
UNK	Unknown	-	-	-
BG	Bare Ground	30.6	32.6	26.8
HERB	Herbaceous Vegetation	11.8	19.2	10.0

Table F-3. Year 5 shrub transects, Unit 13 Containment Line.

Code	Species	Unit 13 Containment Line	
		13-1	13-2
ACGL	*Acmispon glaber*	1.2	-
ACLO	*Acacia longifolia*	-	-
ADFA	*Adenostoma fasciculatum*	36.4	34.4
ARCA	*Artemisia californica*	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-
ARMO	*Arctostaphylos montereyensis*	-	-
ARPU	*Arctostaphylos pumila*	-	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	29.6	22.8
BAPI	*Baccharis pilularis*	-	-
CAED	*Carpobrotus edulis*	-	-
CEDE	*Ceanothus dentatus*	2.8	8.8
CERI	*Ceanothus rigidus*	-	0.6
CETH	*Ceanothus thyrsiflorus*	-	-
CRSC	*Crocanthemum scoparium*	1.2	0.6
DACA	*Danthonia californica*	0.4	-
DIAU	*Diplacus aurantiacus*	-	0.4
ERCA	*Eriodictyon californicum*	-	-
ERCO	*Eriophyllum confertiflorum*	0.2	-
ERER	*Ericameria ericoides*	-	-
ERFA	*Ericameria fasciculata*	-	-
FRCA	*Frangula californica*	-	-
GAEL	*Garrya elliptica*	-	-
HEAR	*Heteromeles arbutifolia*	1.6	-
LECA	*Lepechinia calycina*	-	-
LUAR	*Lupinus arboreus*	-	-
QUAG	*Quercus agrifolia*	-	4.4
RISA	*Ribes sanguineum*	-	-
ROCA	*Rosa californica*	-	-
RUUR	*Rubus ursinus*	-	-
SAME	*Salvia mellifera*	-	-
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-
SYMO	*Symphoricarpos mollis*	-	-
TODI	*Toxicodendron diversilobum*	6.0	14.8
UNK	Unknown	-	-
BG	Bare Ground	20.0	23.5
HERB	Herbaceous Vegetation	5.6	1.4

Table F-4. Year 5 shrub transects, Unit 20 Containment Line.

		Unit 20 Containment Line
Code	**Species**	**20-1**
ACGL	*Acmispon glaber*	0.4
ACLO	*Acacia longifolia*	-
ADFA	*Adenostoma fasciculatum*	40.0
ARCA	*Artemisia californica*	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-
ARMO	*Arctostaphylos montereyensis*	-
ARPU	*Arctostaphylos pumila*	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	18.4
BAPI	*Baccharis pilularis*	2.2
CAED	*Carpobrotus edulis*	-
CEDE	*Ceanothus dentatus*	1.4
CERI	*Ceanothus rigidus*	5.4
CETH	*Ceanothus thyrsiflorus*	-
CRSC	*Crocanthemum scoparium*	0.8
DACA	*Danthonia californica*	-
DIAU	*Diplacus aurantiacus*	-
ERCA	*Eriodictyon californicum*	-
ERCO	*Eriophyllum confertiflorum*	-
ERER	*Ericameria ericoides*	-
ERFA	*Ericameria fasciculata*	-
FRCA	*Frangula californica*	-
GAEL	*Garrya elliptica*	-
HEAR	*Heteromeles arbutifolia*	-
LECA	*Lepechinia calycina*	-
LUAR	*Lupinus arboreus*	-
QUAG	*Quercus agrifolia*	-
RISA	*Ribes sanguineum*	-
ROCA	*Rosa californica*	-
RUUR	*Rubus ursinus*	-
SAME	*Salvia mellifera*	3.6
SYALL	*Symphoricarpos albus* var. *laevigatus*	0.6
SYMO	*Symphoricarpos mollis*	-
TODI	*Toxicodendron diversilobum*	3.0
UNK	Unknown	-
BG	Bare Ground	31.2
HERB	Herbaceous Vegetation	15.0

Table F-5. Year 5 shrub transects, Unit 25.

Code	Species	Unit 25				
		25-4	25-5	25-7	25-8	25-9
ACGL	*Acmispon glaber*	3.4	-	6.8	0.2	-
ACLO	*Acacia longifolia*	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	13.0	34.4	12.8	7.6	13.6
ARCA	*Artemisia californica*	-	3.2	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	0.2	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	3.2	-	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	21.4	63.4	9.2	45.2	47.0
BAPI	*Baccharis pilularis*	-	-	-	0.2	2.8
CAED	*Carpobrotus edulis*	0.8	-	-	-	-
CEDE	*Ceanothus dentatus*	3.2	0.6	-	3.4	-
CERI	*Ceanothus rigidus*	0.6	0.8	-	4.2	0.8
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	6	0.6	4.8	3.8	0.2
DACA	*Danthonia californica*	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	-	-	-	-	-
ERCA	*Eriodictyon californicum*	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	0.8	0.8	0.4	0.2	0.6
ERER	*Ericameria ericoides*	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	0.2	-	-
FRCA	*Frangula californica*	-	-	-	-	-
GAEL	*Garrya elliptica*	-	3.2	-	1.8	2.6
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-
LECA	*Lepechinia calycina*	-	-	-	-	-
LUAR	*Lupinus arboreus*	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	0.4	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-
SAME	*Salvia mellifera*	3.6	-	1.6	0.2	7.8
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	5.2	-	-	-	-
UNK	Unknown	-	-	-	-	-
BG	Bare Ground	49.8	13.6	57.2	36.8	29.0
HERB	Herbaceous Vegetation	5.4	1.0	7.4	3.6	0.6

Table F-6. Year 8 shrub transects, Unit 6.

Code	Species	Unit 6			
		6-2	27B-1	28-2	6-3
ACGL	*Acmispon glaber*	-	0.4	-	-
ACLO	*Acacia longifolia*	-	-	-	0.4
ADFA	*Adenostoma fasciculatum*	12.0	29.8	8.2	27.0
ARCA	*Artemisia californica*	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	38.4	33.2	52.2	37.2
BAPI	*Baccharis pilularis*	-	-	-	-
CAED	*Carpobrotus edulis*	-	7.6	-	-
CEDE	*Ceanothus dentatus*	20.0	-	16.6	3.6
CERI	*Ceanothus rigidus*	-	-	-	-
CETH	*Ceanothus thyrsiflorus*	-	-	-	-
CRSC	*Crocanthemum scoparium*	27.62	0.4	10.6	4.6
DACA	*Danthonia californica*	-	-	-	-
DIAU	*Diplacus aurantiacus*	-	-	-	-
ERCA	*Eriodictyon californicum*	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	0.4	-	1.2	0.4
ERER	*Ericameria ericoides*	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	1.0	0.6
FRCA	*Frangula californica*	-	-	-	-
GAEL	*Garrya elliptica*	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-
LECA	*Lepechinia calycina*	-	-	-	-
LUAR	*Lupinus arboreus*	-	-	-	-
QUAG	*Quercus agrifolia*	-	3.4	-	-
RISA	*Ribes sanguineum*	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-
SAME	*Salvia mellifera*	4.6	1.4	5.4	5.0
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	0.4	-
UNK	Unknown	-	-	-	-
BG	Bare Ground	53.0	24.2	22.8	29.2
HERB	Herbaceous Vegetation	1.8	1.0	2.8	1.8

Table F-7. Year 8 shrub transects, Unit 7 (Transects 7-1 through 7-6).

		Unit 7					
Code	**Species**	**7-1**	**7-2**	**7-3**	**7-4**	**7-5**	**7-6**
ACGL	*Acmispon glaber*	-	-	-	-	-	-
ACLO	*Acacia longifolia*	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	26.6	32.2	4.8	13.6	14.6	16.8
ARCA	*Artemisia californica*	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	0.4	-	-	-	-	1.4
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	31.0	31.2	30.8	33.4	22.8	19.0
BAPI	*Baccharis pilularis*	-	-	-	-	-	-
CAED	*Carpobrotus edulis*	0.4	-	-	3.6	0.6	2.6
CEDE	*Ceanothus dentatus*	2.8	12.2	61.4	21.0	17.0	36.4
CERI	*Ceanothus rigidus*	20.2	6.4	7.6	23.2	18.0	15.0
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	-	-	-	1	-	18.2
DACA	*Danthonia californica*	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	0.4	-	-	-	-	-
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	-	-	-	-	-
ERER	*Ericameria ericoides*	-	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	0.8	0.2	3.4	-	5.8	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	5.2	-
LECA	*Lepechinia calycina*	6.2	0.4	1.8	6.0	5.6	1.2
LUAR	*Lupinus arboreus*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	0.8	-	-
ROCA	*Rosa californica*	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-
SAME	*Salvia mellifera*	13.2	13.2	0.95	7.2	2	7.4
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	0.4	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	0.6	-	0.6	-
UNK	Unknown	-	-	-	-	-	-
BG	Bare Ground	24.4	23.4	14.2	16.0	27.4	14.8
HERB	Herbaceous Vegetation	-	0.4	-	-	-	0.2

Table F-7. Year 8 shrub transects, Unit 7 Cont'd (Transects 7-7 through 7-12).

		Unit 7					
Code	**Species**	**7-7**	**7-8**	**7-9**	**7-10**	**7-11**	**7-12**
ACGL	*Acmispon glaber*	-	-	-	-	-	-
ACLO	*Acacia longifolia*	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	24.2	39.0	13.4	20.4	11.0	71.4
ARCA	*Artemisia californica*	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	3.6	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	6.6	15.0	80.0	21.4	46.0	0.4
BAPI	*Baccharis pilularis*	-	-	-	-	-	-
CAED	*Carpobrotus edulis*	2.0	-	-	0.2	-	-
CEDE	*Ceanothus dentatus*	1.6	20.2	1.0	26.8	46.8	-
CERI	*Ceanothus rigidus*	8.8	86.0	1.0	0.6	3.0	11.6
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	1	8.2	-	28.4	0.6	-
DACA	*Danthonia californica*	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	-	-	-	-	-	-
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	-	-	-	-	-
ERER	*Ericameria ericoides*	-	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	4.6	-	1.4	-
HEAR	*Heteromeles arbutifolia*	-	-	4.4	-	-	-
LECA	*Lepechinia calycina*	-	-	1.0	-	-	-
LUAR	*Lupinus arboreus*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	0.8	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-
SAME	*Salvia mellifera*	22.0	-	-	4.8	8.2	-
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	9.2	-	-	-
UNK	Unknown	-	-	-	-	0.4	-
BG	Bare Ground	10.8	26.4	2.4	22.4	18.0	24.8
HERB	Herbaceous Vegetation	-	0.6	-	1.0	-	-

Table F-7. Year 8 shrub transects, Unit 7 Cont'd (Transects 7-13 through 7-18).

		Unit 7					
Code	**Species**	**7-13**	**7-14**	**7-15**	**7-16**	**7-17**	**7-18**
ACGL	*Acmispon glaber*	-	-	-	-	-	-
ACLO	*Acacia longifolia*	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	28.2	56.4	38.6	16.6	7.6	43.8
ARCA	*Artemisia californica*	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	41.0	14.2	15.8	34.8	28.4	7.0
BAPI	*Baccharis pilularis*	-	-	-	-	-	-
CAED	*Carpobrotus edulis*	-	-	1.4	-	3.0	-
CEDE	*Ceanothus dentatus*	37.8	-	1.8	36.4	52.6	4.4
CERI	*Ceanothus rigidus*	26.4	3.6	16.8	2.2	4.0	9.4
CETH	*Ceanothus thyrsiflorus*	-	14.8	-	-	-	-
CRSC	*Crocanthemum scoparium*	8.0	-	-	15.0	12.8	24.2
DACA	*Danthonia californica*	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	-	-	-	-	-	-
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	-	-	-	0.2	-
ERER	*Ericameria ericoides*	-	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	0.6	-	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	3.0	-	-
LECA	*Lepechinia calycina*	1.8	8.6	-	-	0.4	-
LUAR	*Lupinus arboreus*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-
SAME	*Salvia mellifera*	1.6	2.4	10.4	6.2	8.4	6.8
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	0.4	-	-	-	-
TODI	*Toxicodendron diversilobum*	4.8	9.2	-	-	-	-
UNK	Unknown	-	-	-	-	-	-
BG	Bare Ground	15.2	22.0	28.4	20.8	16.0	15.4
HERB	Herbaceous Vegetation	-	-	-	0.2	-	0.2

Table F-7. Year 8 shrub transects, Unit 7 Cont'd (Transects 7-19 through 7-24).

		Unit 7					
Code	**Species**	**7-19**	**7-20**	**7-21**	**7-22**	**7-23**	**7-24**
ACGL	*Acmispon glaber*	-	-	-	-	-	-
ACLO	*Acacia longifolia*	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	14.2	23.4	3.2	36.0	8.2	16.8
ARCA	*Artemisia californica*	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	20.4	19.8	59.2	23.4	35.2	32.6
BAPI	*Baccharis pilularis*	-	-	-	-	-	-
CAED	*Carpobrotus edulis*	-	-	1.4	0.8	-	-
CEDE	*Ceanothus dentatus*	2.6	24.2	34.4	13.6	28.6	37.6
CERI	*Ceanothus rigidus*	29.8	2.0	1.0	8.6	0.2	1.4
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	-	-	14.4	2.2	13.8	8.2
DACA	*Danthonia californica*	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	0.4	-	-	-	-	-
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	-	-	-	-	-
ERER	*Ericameria ericoides*	-	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	19.6	5.6	-	3.2	7.0	-
HEAR	*Heteromeles arbutifolia*	10.8	4.4	-	-	7.0	-
LECA	*Lepechinia calycina*	5.0	-	-	-	2.0	0.2
LUAR	*Lupinus arboreus*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-
SAME	*Salvia mellifera*	-	9.8	1.8	10.2	0.2	3.8
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	1.8	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	-	-	0.8	-
UNK	Unknown	-	-	-	-	-	-
BG	Bare Ground	19.4	27.6	16.6	25.4	17.4	19.8
HERB	Herbaceous Vegetation	-	-	-	-	-	-

Table F-7. Year 8 shrub transects, Unit 7 Cont'd (Transects 7-25 through T2).

		Unit 7						
Code	**Species**	**7-25**	**7-26**	**7-27**	**26-1**	**26-2**	**26-3**	**T2**
ACGL	*Acmispon glaber*	-	-	-	-	-	-	-
ACLO	*Acacia longifolia*	-	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	16.0	9.8	17.2	24.0	7.6	15.0	25.8
ARCA	*Artemisia californica*	-	-	-	-	-	-	4.4
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	-	-	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	32.8	34.4	30.4	11.4	23.4	19.8	40.6
BAPI	*Baccharis pilularis*	-	-	-	-	-	-	-
CAED	*Carpobrotus edulis*	-	-	-	-	6.8	1.4	-
CEDE	*Ceanothus dentatus*	20.6	35.0	26.0	47.0	43.0	27.0	17.4
CERI	*Ceanothus rigidus*	8.2	1.0	6.4	8.0	2.6	10.8	1.4
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	4.4	26.8	1.0	9.4	3.0	-	1.4
DACA	*Danthonia californica*	-	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	-	-	-	1.0	-	-	0.6
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	0.2	-	-	-	-	1.0
ERER	*Ericameria ericoides*	-	-	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	0.4	1.0	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-	-
GAEL	*Garrya elliptica*	2.2	-	-	-	-	-	2.2
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-	-	-
LECA	*Lepechinia calycina*	0.2	-	6.0	0.8	0.6	3.0	0.8
LUAR	*Lupinus arboreus*	-	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-	-
SAME	*Salvia mellifera*	2.0	4.4	5.4	1.2	9.4	10.2	13.0
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	1.2	-	-	-	-	-	-
UNK	Unknown	-	-	-	-	-	-	-
BG	Bare Ground	30.2	16.2	25.6	35.8	22.6	32.2	12.2
HERB	Herbaceous Vegetation	-	-	-	1.2	0.2	-	1.0

Table F-8. Year 8 Shrub Transects, Unit 10 (Transects 10-1 through 10-7).

		Unit 10					
Code	**Species**	**10-1**	**10-2**	**10-3**	**10-5**	**10-6**	**10-7**
ACGL	*Acmispon glaber*	-	-	-	-	0.4	-
ACLO	*Acacia longifolia*	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	5.0	12.6	16.2	5.6	14.0	8.0
ARCA	*Artemisia californica*	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	5.6	4.6
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	14.8	21.0	2.6	28.2	15.0	60.8
BAPI	*Baccharis pilularis*	-	-	-	-	-	-
CAED	*Carpobrotus edulis*	1.8	0.2	-	0.4	7.2	-
CEDE	*Ceanothus dentatus*	21.8	13.4	19.2	21.6	1.0	-
CERI	*Ceanothus rigidus*	39.4	12.4	12.8	2.0	18.4	17.0
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	0.4	-	-	11.6	2.0	6.2
DACA	*Danthonia californica*	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	-	-	-	-	1.0	1.2
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	-	-	1.0	0.8	0.4
ERER	*Ericameria ericoides*	-	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	3.6	0.2	5.8	-	-	2.4
HEAR	*Heteromeles arbutifolia*	-	9.0	10.0	-	-	-
LECA	*Lepechinia calycina*	5.2	-	-	-	-	-
LUAR	*Lupinus arboreus*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-
SAME	*Salvia mellifera*	20.6	24.6	31.8	9.6	15.6	11.6
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	-	-	-	12.6
UNK	Unknown	-	-	-	-	-	-
BG	Bare Ground	13.6	25.8	21.2	30.0	35.4	12.0
HERB	Herbaceous Vegetation	-	-	-	0.6	0.8	-

Table F-8. Year 8 Shrub Transects, Unit 10 Cont'd (Transects 10-8 through 10-13).

		Unit 10					
Code	**Species**	**10-8**	**10-9**	**10-10**	**10-11**	**10-12**	**10-13**
ACGL	*Acmispon glaber*	0.6	-	-	-	-	1.0
ACLO	*Acacia longifolia*	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	4.6	20.4	14.4	10.2	14.2	20.6
ARCA	*Artemisia californica*	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	2.6	-	-	0.2	0.6	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	41.4	14.4	43.8	25.8	30.6	28.2
BAPI	*Baccharis pilularis*	2.6	-	-	-	-	-
CAED	*Carpobrotus edulis*	-	1.2	2.6	0.2	-	2.6
CEDE	*Ceanothus dentatus*	7.0	15.8	3.0	11.6	16.0	15.8
CERI	*Ceanothus rigidus*	0.8	33.6	42.0	5.2	11.0	12.0
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	1.6	0.2	-	19.8	0.4	13.0
DACA	*Danthonia californica*	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	3.6	-	-	-	-	0.8
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	2.4	-	-	0.2	-	-
ERER	*Ericameria ericoides*	-	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-	0.2
FRCA	*Frangula californica*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	4.4	-	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	3.8	-	-
LECA	*Lepechinia calycina*	-	-	-	-	1	-
LUAR	*Lupinus arboreus*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	7.8	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-
SAME	*Salvia mellifera*	0.8	26.78	3.4	8.2	9.0	1.0
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	11.2	-	0.2	-	-	-
TODI	*Toxicodendron diversilobum*	43.0	-	-	-	-	4.4
UNK	Unknown	-	-	-	-	-	-
BG	Bare Ground	15.0	19.2	14.6	31.8	32.4	22.6
HERB	Herbaceous Vegetation	3.8	-	-	0.6	-	0.2

Table F-8. Year 8 Shrub Transects, Unit 10 Cont'd (Transects 10-14 through 10-19).

		Unit 10					
Code	**Species**	**10-14**	**10-15**	**10-16**	**10-17**	**10-18**	**10-19**
ACGL	*Acmispon glaber*	-	-	-	-	-	0.6
ACLO	*Acacia longifolia*	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	10.2	10.6	22.2	13.2	60.2	23.0
ARCA	*Artemisia californica*	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	-	0.4	-
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	36.6	20.2	15.8	13.8	15.8	11.6
BAPI	*Baccharis pilularis*	-	-	-	-	-	-
CAED	*Carpobrotus edulis*	15.2	3.2	2.4	1.0	2.0	7.8
CEDE	*Ceanothus dentatus*	39.2	21.0	19.2	4.6	9.4	-
CERI	*Ceanothus rigidus*	24.8	15.0	15.4	19.2	8.0	0.6
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	0.6	9.4	1	2.4	-	22.4
DACA	*Danthonia californica*	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	-	-	-	-	-	1.8
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	-	0.2	-	-	0.2
ERER	*Ericameria ericoides*	-	-	-	4.6	-	0.2
ERFA	*Ericameria fasciculata*	-	0.8	-	-	-	5.4
FRCA	*Frangula californica*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-	-
LECA	*Lepechinia calycina*	-	-	13.4	-	-	-
LUAR	*Lupinus arboreus*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	3.6	-	-	5.2
RISA	*Ribes sanguineum*	-	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-
SAME	*Salvia mellifera*	-	3.0	12.6	1.6	-	-
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	0.2	2.0	2.4	-
TODI	*Toxicodendron diversilobum*	8.8	2.8	-	6.0	-	5.0
UNK	Unknown	-	-	-	-	-	-
BG	Bare Ground	14.2	32.8	22.2	11.2	19.4	25.8
HERB	Herbaceous Vegetation	-	0.8	0.2	0.4	1.6	8.6

Table F-8. Year 8 Shrub Transects, Unit 10 Cont'd (Transects 10-20 through 10-25).

		Unit 10					
Code	**Species**	**10-20**	**10-21**	**10-22**	**10-23**	**10-24**	**10-25**
ACGL	*Acmispon glaber*	1.4	-	0.4	-	-	-
ACLO	*Acacia longifolia*	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	9.0	13.8	24.0	17.6	6.2	6.2
ARCA	*Artemisia californica*	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	0.8	-	-	-	1.8	0.6
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	46.4	24.6	22.4	18.8	23.8	46.6
BAPI	*Baccharis pilularis*	1.8	-	-	-	-	-
CAED	*Carpobrotus edulis*	4.2	-	-	-	-	6.6
CEDE	*Ceanothus dentatus*	-	37.6	27.0	23.6	31.4	21.6
CERI	*Ceanothus rigidus*	0.8	7.0	6.4	8.4	2.8	0.8
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	24.0	2.2	4.4	16.6	4.4	6.2
DACA	*Danthonia californica*	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	-	-	-	-	-	4.4
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	2.2	-	-	-	0.2	-
ERER	*Ericameria ericoides*	-	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	0.2	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	0.4	-	-	-	1.4
LECA	*Lepechinia calycina*	-	4.6	-	-	-	-
LUAR	*Lupinus arboreus*	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-
SAME	*Salvia mellifera*	5.0	15.4	7.4	7.0	11.0	5.0
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	1.4	-	-	-	-	25.6
UNK	Unknown	-	-	-	-	-	-
BG	Bare Ground	17.0	19.4	25.0	26.6	31.0	23.8
HERB	Herbaceous Vegetation	1.2	-	-	-	1.2	1.2

Table F-8. Year 8 Shrub Transects, Unit 10 Cont'd (Transects 10-26 through 10-30).

		Unit 10				
Code	Species	10-26	10-27	10-28	10-29	10-30
ACGL	*Acmispon glaber*	-	-	-	-	0.6
ACLO	*Acacia longifolia*	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	1.8	13.4	8.4	-	8.0
ARCA	*Artemisia californica*	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	0.8	-	5.8	1.4	1.4
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	30.2	26.4	36.0	43.6	34.6
BAPI	*Baccharis pilularis*	0.2	-	-	-	-
CAED	*Carpobrotus edulis*	6.4	-	-	4.6	2.6
CEDE	*Ceanothus dentatus*	9.6	38.8	20.0	24.2	7.8
CERI	*Ceanothus rigidus*	11.0	5.8	11.4	7.2	16.0
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	1.6	-	1.8	-	6.2
DACA	*Danthonia californica*	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	0.4	-	-	-	-
ERCA	*Eriodictyon californicum*	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	-	-	-	-
ERER	*Ericameria ericoides*	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-
GAEL	*Garrya elliptica*	-	0.8	-	-	7.8
HEAR	*Heteromeles arbutifolia*	-	6.2	-	-	-
LECA	*Lepechinia calycina*	-	-	-	-	-
LUAR	*Lupinus arboreus*	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-
SAME	*Salvia mellifera*	17.4	12.2	2.6	0.4	13.0
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	3.0	3.6	-
UNK	Unknown	-	-	-	-	-
BG	Bare Ground	37.0	22.0	27.8	27.2	24.8
HERB	Herbaceous Vegetation	-	-	3.0	-	0.6

Table F-9. Year 8 Shrub Transects, Unit 1 East.

		Unit 1 East				
Code	Species	24A-1	26-2	27-3	T11	T12
ACGL	*Acmispon glaber*	-	-	-	-	-
ACLO	*Acacia longifolia*	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	9.4	42.8	16.6	29.0	4.4
ARCA	*Artemisia californica*	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	-	-	-	0.6	11.8
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	50.2	99.2	44.2	35.6	6.2
BAPI	*Baccharis pilularis*	-	-	0.6	8.8	-
CAED	*Carpobrotus edulis*	-	13.8	-	-	-
CEDE	*Ceanothus dentatus*	10.4	4.8	14.4	10.6	1.8
CERI	*Ceanothus rigidus*	-	1.2	-	-	-
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	1.6	1.6	2.2	2.6	21.2
DACA	*Danthonia californica*	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	-	-	1.4	-	-
ERCA	*Eriodictyon californicum*	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	-	-	-	-
ERER	*Ericameria ericoides*	-	-	-	-	-
ERFA	*Ericameria fasciculata*	-	-	-	-	1.2
FRCA	*Frangula californica*	-	-	-	-	-
GAEL	*Garrya elliptica*	-	11.6	-	7.6	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-
LECA	*Lepechinia calycina*	1.8	-	1.2	1	-
LUAR	*Lupinus arboreus*	-	-	-	-	-
QUAG	*Quercus agrifolia*	-	-	-	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-
SAME	*Salvia mellifera*	5	9.6	9.42	94.6	2.4
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	2	-	12.6	-
TODI	*Toxicodendron diversilobum*	-	14.4	-	5.4	-
UNK	Unknown	-	-	-	-	-
BG	Bare Ground	22.6	38.0	28.4	13.6	53.6
HERB	Herbaceous Vegetation	0.6	0.8	2.6	1.4	5.8

Table F-10. Year 8 Shrub Transects, MOUT Buffer.

Code	Species	MOUT Buffer	
		MOUT-1	MOUT-2
ACGL	*Acmispon glaber*	-	2.6
ACLO	*Acacia longifolia*	-	-
ADFA	*Adenostoma fasciculata*	28.6	44.6
ARCA	*Artemesia californica*	-	-
ARHO	*Arctostaphylos hookeri ssp. hookeri*	-	-
ARMO	*Arctostaphylos montereyensis*	1.4	1.2
ARPU	*Arctostaphylos pumila*	-	-
ARTO	*Arctostaphylos tomentosa ssp. tomentosa*	25.4	20.2
BAPI	*Baccharis pilularis*	3.4	-
CAED	*Carpobrotus edulis*	-	-
CEDE	*Ceanothus dentatus*	7.6	-
CERI	*Ceanothus rigidus*	5.2	-
CETH	*Ceanothus thyrsiflorus*	-	-
CRSC	*Crocanthemum scoparium*	-	1.2
DACA	*Danthonia californica*	-	-
DIAU	*Diplacus aurantiacus*	2.2	1.2
ERCA	*Eriodictyon californicum*	-	-
ERCO	*Eriophyllum confertiflorum*	-	1
ERER	*Ericameria ericoides*	-	-
ERFA	*Ericameria fasciculata*	-	-
FRCA	*Frangula californica*	6.0	-
GAEL	*Garrya elliptica*	-	-
HEAR	*Heteromeles arbutifolia*	-	-
LECA	*Lepechinia calycina*	-	-
LUAR	*Lupinus arboreus*	0.6	-
QUAG	*Quercus agrifolia*	6.2	0.6
RISA	*Ribes sanguineum*	-	-
ROCA	*Rosa californica*	0.4	-
RUUR	*Rubus ursinus*	7.8	-
SAME	*Salvia mellifera*	-	3.0
SYALL	*Symphoricarpos albus* var. *laevigatus*	3.2	-
SYMO	*Symphoricarpos mollis*	34.6	-
TODI	*Toxicodendron diversilobum*	1.6	-
UNK	Unknown	-	-
BG	Bare Ground	18.6	32.0
HERB	Herbaceous Vegetation	33.0	4.8

Table F-11. Year 8 Shrub Transects, WGBA.

		WGBA						
Code	**Species**	**12-1**	**13-1**	**13-3**	**14-1**	**15-1**	**12-3**	**9A-1**
ACGL	*Acmispon glaber*	11.0	2.4	4.0	5.4	2.4	6.4	4.4
ACLO	*Acacia longifolia*	-	-	-	-	-	-	-
ADFA	*Adenostoma fasciculatum*	20.4	-	27.4	-	-	7.2	36.4
ARCA	*Artemisia californica*	-	-	-	-	-	-	-
ARHO	*Arctostaphylos hookeri* ssp. *hookeri*	-	-	-	-	-	-	-
ARMO	*Arctostaphylos montereyensis*	-	-	-	-	-	-	-
ARPU	*Arctostaphylos pumila*	3.2	-	-	-	6.0	3.0	15.0
ARTO	*Arctostaphylos tomentosa* ssp. *tomentosa*	22.2	33.0	31.0	80.6	63.8	38.2	20.0
BAPI	*Baccharis pilularis*	-	-	-	0.2	-	-	-
CAED	*Carpobrotus edulis*	3.4	6.8	33.2	10.4	2.8	5.6	4.6
CEDE	*Ceanothus dentatus*	-	-	-	-	-	-	-
CERI	*Ceanothus rigidus*	3.2	-	-	-	-	2.4	-
CETH	*Ceanothus thyrsiflorus*	-	-	-	-	-	-	-
CRSC	*Crocanthemum scoparium*	1.8	4.2	-	-	0.6	0.8	2.2
DACA	*Danthonia californica*	-	-	-	-	-	-	-
DIAU	*Diplacus aurantiacus*	14.0	-	1.0	-	-	-	4.6
ERCA	*Eriodictyon californicum*	-	-	-	-	-	-	-
ERCO	*Eriophyllum confertiflorum*	-	1.4	-	-	-	1.2	1.6
ERER	*Ericameria ericoides*	-	2.0	-	-	-	0.2	-
ERFA	*Ericameria fasciculata*	-	-	-	-	-	-	-
FRCA	*Frangula californica*	-	-	-	-	-	-	-
GAEL	*Garrya elliptica*	-	-	-	-	-	-	-
HEAR	*Heteromeles arbutifolia*	-	-	-	-	-	-	-
LECA	*Lepechinia calycina*	-	-	-	-	-	-	-
LUAR	*Lupinus arboreus*	-	-	-	-	-	-	-
QUAG	*Quercus agrifolia*	2.4	-	6.4	-	9.2	-	-
RISA	*Ribes sanguineum*	-	-	-	-	-	-	-
ROCA	*Rosa californica*	-	-	-	-	-	-	-
RUUR	*Rubus ursinus*	-	-	-	-	-	-	-
SAME	*Salvia mellifera*	2.0	5.0	5.4	-	-	4.4	5.6
SYALL	*Symphoricarpos albus* var. *laevigatus*	-	-	-	-	-	-	-
SYMO	*Symphoricarpos mollis*	-	-	-	-	-	-	-
TODI	*Toxicodendron diversilobum*	-	-	0.2	0.4	21.8	-	-
UNK	Unknown	-	-	-	-	-	-	-
BG	Bare Ground	29.0	39.0	12.2	16.4	17.6	35.8	21.8
HERB	Herbaceous Vegetation	4.0	12.6	3.6	1.0	-	1.4	0.6

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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 Subunit A Containment Line.

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
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Festuca (Vulpia) myuros	rattail sixweeks grass	FEMY
Gastridium phleoides	nit grass	GAPH
Hypochaeris glabra	smooth cat's ear	HYGL
Senecio glomeratus	cutleaf burnweed	SEGL
Trifolium angustifolium	narrow-leaved clover	TRAN

Table G-2. Non-native species observed during line intercept transect monitoring in Unit 31 Containment Line.

Non-Native Herbaceous Species Name	Common Name	Species Code
Aira caryophylla	silver hair grass	AICA
Avena barbata	slender wild oat	AVBA
Bromus diandrus	Ripgut brome	BRDI
Bromus hordeaceus	soft chess	BRHO
Festuca (Vulpia) myuros	rattail sixweeks grass	FEMY
Hypochaeris glabra	smooth cat's ear	HYGL
Hypochaeris radicata	rough cat's ear	HYRA
Plantago coronopus	cut leaf plantain	PLCO
Rumex acetocella	sheep's sorrel	RUAC

Table G-3. Non-native species observed during line intercept transect monitoring in Unit 20 Containment Line.

Non-Native Herbaceous Species Name	Common Name	Species Code
Briza maxima	rattlesnake grass	BRMA
Briza minor	small quaking grass	BRMI
Festuca (*Vulpia*) *bromoides*	brome fescue	FEBR
Festuca (*Vulpia*) *myuros*	rattail sixweeks grass	FEMY

Table G-4. Non-native species observed during line intercept transect monitoring in Unit 25.

Non-Native Herbaceous Species Name	Common Name	Species Code
Aira caryophyllea	silver hair grass	AICA
Senecio glomeratus	cutleaf burnweed	SEGL

Table G-5. Non-native species observed during line intercept transect monitoring in WGBA.

Non-Native Herbaceous Species Name	Common Name	Species Code
Avena barbata	slender wild oat	AVBA
Bromus diandrus	ripgut brome	BRDI
Bromus madritensis ssp. *rubescens*	red brome	BRMAR
Briza minor	small quaking grass	BRMI
Erigeron bonariensis	flax-leaved horseweed	ERBO
Festuca (*Vulpia*) *myuros*	rattail sixweeks grass	FEMY
Polycarbon tetraphyllum	four leaved all seed	POTET
Rumex acetocella	sheep's sorrel	RUAC