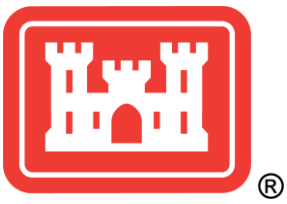
2017 ANNUAL REPORT
FORMER FORT ORD SITE 39 HABITAT RESTORATION
CONTRACT NO. W91238-14-D-0010-0005

FORMER FORT ORD



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April 2018

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Woman-Owned Small Business
Environmental Services

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APPENDICES

Appendix A - Seed and Plant Tables
Appendix B - Restoration Activities
Appendix C - Photo Log
Appendix D - Photo Points
Appendix E - Photo Points Time Lapse Series for HAs in Year 5

ACRONYMS AND ABBREVIATIONS

Army	US Department of the Army
BRAC	Base Realignment and Closure Division
Burleson	Burleson Consulting Inc.
BMP	Best Management Practice
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CTS	California Tiger Salamander
HA	Historic Area
HMP	Habitat Management Plan
HRP	Habitat Restoration Plan
lb	pound
Site 39	Site 39 Inland Ranges
SSRP	Site Specific Restoration Plan
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
UXO	Unexploded Ordnance

SPECIES LIST AND CODES

Scientific Name	Common Name	Code	Category
Achillea milefolium	common yarrow	ACMI	NP
Acmispon americanus var. *americanus*	Spanish clover	ACAMA	NF
Acmispon glaber	deerweed	ACGL	NP
Acmispon heermannii	Heermann's lotus	ACHE	NP
Acmispon parviflorus	hill lotus	ACPA	NF
Acmispon strigosus	Bishop's lotus	ACST	NF
Adenostoma fasciculatum	chamise	ADFA	NP
Agoseris apargioides	coast dandelion	AGAP	NP
Agoseris grandiflora	large-flowered agoseris	AGGR	NP
Agoseris heterophylla var. *cryptopleura*	California annual agoseris	AGHEC	NF
Agoseris sp.		AG	
Aira caryophyllea	silver hair grass	AICA	NNF
Amsinckia intermedia	common fiddleneck	AMIN	NF

Scientific Name	Common Name	Code	Category
Arbutus menziesii	Pacific madrone	ARME	NP
Arctostaphylos hookeri[1]	Hooker's manzanita	ARHO	NP
Arctostaphylos montereyensis	Toro manzanita	ARMO	NP
Arctostaphylos pumila[1]	sandmat manzanita	ARPU	NP
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO	NP
Artemisia californica	California sagebrush	ARCA	NP
Artemisia douglasiana	mugwort	ARDO	NP
Artemisia pycnocephala	coastal sagewort	ARPY	NP
Atriplex semibaccata	Australian saltbush	ATSE	NNP
Avena barbata	slender wild oat	AVBA	NNF
Baccharis pilularis	coyote brush	BAPI	NP
Briza maxima	rattlesnake grass	BRMA	NNF
Briza minor	small quaking grass	BRMI	NNF
Bromus carinatus	California brome	BRCA	NF
Bromus diandrus	ripgut brome	BRDI	NNF
Bromus hordeaceus	softchess	BRHO	NNF
Bromus madritensis ssp. *rubens*	red brome	BRMAR	NNF
Calandrinia menziesii	red maids	CAME	NF
Calochortus albus	white globe lily	CAAL	NP
Camissonia contorta	contorted primrose	CACO	NF
Camissoniopsis cheiranthifolia	beach evening primrose	CACH	NP
Camissoniopsis micrantha	small primrose	CAMI	NF
Cardionema ramosissimum	sand mat	CARA	NP
Carduus pycnocephalus	Italian thistle	CAPY	NNF
Carex barbarae	Santa Barbara sedge	CABA	NP
Carex brevicaulis	short stem sedge	CABR	NP
Carex globosa	round-fruited sedge	CAGL	NP
Carex sp.	sedge	CA	
Carpobrotus edulis	ice plant	CAED	NNP
Castilleja affinis	coast paint-brush	CAAF	NP
Castilleja attenuata	narrow leaved owl's clover	CAAT	NF
Castilleja densiflora	owl's clover	CADE	NF
Castilleja exserta ssp. *exserta*	purple owl's-clover	CAEX	NF
Ceanothus dentatus	dwarf ceanothus	CEDE	NP
Ceanothus rigidus[1]	Monterey ceanothus	CERI	NP
Ceanothus thrysiflorus var. *griseus*	Carmel ceanothus	CETHG	NP
Centaurea melitensis	tocalote	CEME	NNF
Cerastium glomeratum	sticky mouse-ear chickweed	CEGL	NNF
Chlorogalum pomeridianum	wavyleaf soap plant	CHPO	NP
Chorizanthe diffusa	diffuse spineflower	CHDI	NF
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP	NF
Cirsium occidentale	cobwebby thistle	CIOC	NP

Scientific Name	Common Name	Code	Category
Cirsium occidentale var. *candidisssimum*	snowy thistle	CIOCC	NP
Cirsium sp.	thistle	CI	
Clarkia lewisii	Lewis' clarkia	CLLE	NF
Clarkia sp.		CL	
Claytonia perfoliata	miner's lettuce	CLPE	NF
Clinopodium douglasii	yerba buena	CLDO	NP
Conicosia pugioniformis	narrowleaf iceplant	COPU	NNP
Cordylanthus rigidus ssp. *littoralis*[1]	seaside bird's-beak	CORIL	NF
Corethrogyne filaginifolia	common sandaster	COFI	NP
Cortaderia jubata	pampas grass	COJU	NNP
Crassula aquatica	water pygmy-weed	CRAQ	NF
Crassula connata	pygmy-weed	CRCO	NF
Crassula tillaea	moss pygmy-weed	CRTI	NNF
Crocanthemum scoparium	peak rush-rose	CRSC	NP
Croton californicus	California croton	CRCA	NP
Cryptantha clevelandii	Cleveland's cryptantha	CRCL	NF
Cryptantha micromeres	minute-flowered cryptantha	CRMI	NF
Cryptantha sp.		CR	
Cyperus eragrostis	tall cyperus	CYER	NP
Danthonia californica	California oat grass	DACA	NP
Deinandra corymbosa	coastal tarweed	DECO	NF
Delphinium hutchinsoniae	Hutchinson's larkspur	DEHU	NP
Dichelostemma capitatum	blue dicks	DICA	NP
Diplacus aurantiacus	sticky monkey flower	DIAU	NP
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW	NP
Elymus glaucus	blue wild-rye	ELGL	NP
Eriastrum virgatum	virgate eriastrum	ERVI	NF
Ericameria ericoides	mock heather	ERER	NP
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA	NP
Erigeron canadensis	horseweed	ERCA	NF
Eriophyllum confertiflorum	golden yarrow	ERCO	NP
Erodium botrys	long-beaked filaree	ERBO	NNF
Erodium cicutarium	red-stemmed filareee	ERCI	NNF
Eschscholzia californica	California poppy	ESCA	NF
Festuca bromoides	brome fescue	FEBR	NNF
Festuca myuros	rattail sixweeks grass	FEMY	NNF
Festuca perennis	Italian rye grass	FEPE	NNF
Frangula californica	California coffeeberry	FRCA	NP
Galium andrewsii	phlox-leaved bedstraw	GAAN	NP
Galium angustifolium	narrowly leaved bedstraw	GAAN	NP
Galium californicum	California bedstraw	GACA	NP
Gallium nuttalli	climbing bedstraw	GANU	NP

Scientific Name	Common Name	Code	Category
Gamochaeta ustulata	purple cudweed	GAUS	NP
Garrya elliptica	coast silk tassel	GAEL	NP
Genista monspessulana	French broom	GEMO	NNP
Geranium dissectum	cut-leaved geranium	GEDI	NNF
Gilia tenuiflora ssp. *arenaria*[1]	sand gilia	GITEA	NF
Githopsis specularoides	common bluecup	GISP	NF
Heteromeles arbutifolia	toyon	HEAR	NP
Heterotheca grandiflora	telegraph weed	HEGR	NF
Hordeum sp.	common barley	HO	NP
Horkelia cuneata	wedge-leaved horkelia	HOCU	NP
Hypochaeris glabra	smooth cat's-ear	HYGL	NNF
Hypochaeris radicata	rough cat's-ear	HYRA	NNP
Isocoma menziesii var. *vernioides*	coastal isocome	ISMEV	NP
Juncus bufonius	toad rush	JUBU	NF
Juncus occidentalis	western rush	JUOC	NP
Juncus patens	spreading rush	JUPA	NP
Juncus phaeocephalus	brown-headed rush	JUPH	NP
Juncus sp.		JU	
Lasthenia gracilis	common goldfields	LAGR	NF
Layia platyglossa	tidy-tips	LAPL	NF
Lepechinia calycina	pitcher sage	LECA	NP
Lessingia pectinata	common lessingia	LEPE	NF
Logfia filaginoides	California cottonrose	LOFI	NF
Logfia gallica	daggerleaf cottonrose	LOGA	NNF
Lomatium parvifolium	coastal biscuitroot	LOPA	NP
Lupinus albifrons	silver bush lupine	LUAL	NP
Lupinus arboreus	yellow bush lupine	LUAR	NP
Lupinus bicolor	miniature lupine	LUBI	NF
Lupinus chamissonis	silver beach lupine	LUCH	NP
Lupinus concinnus	bajada lupine	LUCO	NF
Lupinus nanus	sky lupine	LUNA	NF
Lupinus truncatus	Nuttall's annual lupine	LUTR	NF
Lysimachia arvensis	scarlet pimpernel	LYAR	NNF
Madia exigua	little tarweed	MAEX	NF
Madia gracilis	gumweed (slender tarweed)	MAGR	NF
Madia sativa	coast tarweed	MASA	NF
Marah fabacea	wild cucumber	MAFA	NP
Medicago polymorpha	California burclover	MEPO	NNF
Melica torreyana	Torrey's melic	METO	NP
Melilotus indicus	sourclover	MEIN	NNF
*Monardella sinuatas*sp. *nigrescens*	curly-leaved monardellla	MOSIN	NF
Navarretia hamata	hooked navarretia	NAHA	NF

Scientific Name	Common Name	Code	Category
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHAP	NF
Navarretia sp.		NA	NF
Navarretia squarrosa	skunkweed	NASQ	NF
Nuttallanthus texanus	blue toadflax	NUTE	NF
Orobanche californica ssp. *californica*	broomrape	ORCAC	NP
Petrorhagia dubia	hairypink	PEDU	NNF
Petrorhagia prolifera	pink grass	PEPR	NNF
Phalaris sp.	canary grass	PH	
Pinus radiata	Monterey pine	PIRA	NP
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH	NF
Plagiobothrys sp.	popcorn flower	PL	
Plantago coronopus	cut-leaved plantain	PLCO	NNF
Plantago erecta	California plantain	PLER	NF
Plantago lanceolata	English plantain	PLLA	NNF
Platystemon californicus	cream cups	PLCA	NF
Polycarpon tetraphyllum var. *tetraphyllum*	four-leaved allseed	POTET	NNF
Polygala californica	California milkwort	POCA	NP
Polypogon monspeliensis	rabbitfoot grass	POMO	NNF
Pseudognaphalium beneolens	fragrant everlasting	PSBE	NP
Pseudognaphalium californicum	California everlasting	PSCA	NP
Pseudognaphalium luteoalbum	weedy cudweed	PSLU	NNF
Pseudognaphalium ramosissimum	pink everlasting	PSRA	NP
Pseudognaphalium stramineum	cotton-batting plant	PSST	NP
Psilocarphus tenellus	slender woolly-marbles	PSTE	NF
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP	NP
Quercus agrifolia	coast live oak	QUAG	NP
Ranunculus californicus var. *californicus*	common buttercup	RACAC	NP
Rubus ursinus	California blackberry	RUUR	NP
Rumex acetosella	sheep sorrel	RUAC	NNP
Rumex crassus	willow-leaved dock	RUCR	NP
Salix lasiolepis	arroyo willow	SALA	NP
Salix sp.	willow	SA	
Salvia mellifera	black sage	SAME	NP
Sanicula crassicaulis	Pacific sanicle	SACR	NP
Sanicula laciniata	coast sanicle	SALA	NP
Schismus barbatus	old han schismus	SCBA	NNF
Senecio glomeratus	cutleaf burnweed	SEGL	NNF
Silene gallica	small-flower catchfly	SIGA	NNF
Sisyrinchium bellum	western blue-eyed grass	SIBE	NP
Solanum umbelliferum	blue witch	SOUM	NP
Solidago velutina ssp. *californica*	California goldenrod	SOVEC	NP
Sonchus asper	prickly sow thistle	SOAS	NNF

Scientific Name	Common Name	Code	Category
Sonchus oleraceus	common sow thistle	SOOL	NNF
Spergularia rubra	red sand-spurrey	SPRU	NNF
Spergularia villosa	hairy sand-spurrey	SPVI	NNP
Stachys ajugoides	bugle hedge-nettle	STAJ	NP
Stachys bullata	wood mint	STBU	NP
Stipa cernua	nodding needle grass	STCE	NP
Stipa pulchra	purple needle grass	STPU	NP
Stylocline gnaphaloides	everlasting neststraw	STGN	NF
Symphoricarpos albus var. *laevigatus*	common snowberry	SYALL	NP
Taraxia ovata	sun cup	TAOV	NP
Thysanocarpus laciniatus	narrow leaved fringe pod	THLA	NF
Toxicodendron diversilobum	poison oak	TODI	NP
Trifolium albopurpureum	rancheria clover	TRAL	NF
Trifolium angustifolium	narrow-leaved clover	TRAN	NNF
Trifolium campestre	hop clover	TRCA	NNF
Trifolium dubium	little hop clover	TRDU	NNF
Trifolium gracilentum	pinpoint clover	TRGR	NF
Trifolium hirtum	rose clover	TRHI	NNF
Trifolium macraei	Macrae's clover	TRMA	NF
Trifolium microcephalum	small-head clover	TRMI	NF
Trifolium willdenovii	tomcat clover	TRWI	NF
Triphysaria pusilla	dwarf owl's clover	TRPU	NF
Uropappus lindleyi	silver puffs	URLI	NF
Vicia americana ssp. *americana*	American vetch	VIAMA	NP
Vicia hassei	slender vetch	VIHA	NF
Vicia sativa	spring vetch	VISA	NNF
Vicia sativa ssp. *nigra*	narrow-leaved vetch	VISAN	NNF
Zeltnera davyi	Davy's centaury	ZEDA	NF

[1]HMP species

NP = Native Perennial (Shrubs and Perennial Herbs/Forbs)

NF = Native Forb (Annual Herbs/Forbs)

NNP = Non-Native Perennial

NNF = Non-Native Forb

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1. INTRODUCTION

Burleson Consulting Inc. (Burleson) was issued ID/IQ Contract Number W91238-14-D-0010 by the US Army Corps of Engineers (USACE) to continue habitat restoration at Site 39 Remedial Action Areas at former Fort Ord, Monterey, California. This annual report summarizes all restoration activities completed during the 2017 calendar year as well as a progress summary for each HA and recommendations.

1.1 Purpose

Former military ranges are currently undergoing soil remediation and subsequent habitat restoration in areas that range in size from 0.05 to 14 acres and are scattered around the perimeter of the Site 39 Inland Ranges area (Site 39) of former Fort Ord. Approximately 60 acres of soil remediation area needs restoration at Historic Areas (HA) 18, 19, 22, 23, 26, 27, 27A, 28, 29, 33, 34, 36, 37, 38, 39/40, 43, 44, 48, and Austin Road Stockpile. Burleson's objective is to provide seed/plant material collection, propagation, planting, and minor erosion control repairs necessary to restore the area to the requirements of the Site 39 Habitat Restoration Plan (HRP) (Shaw, 2009b). The restoration area contains primarily rare central maritime chaparral habitat with smaller inclusions of coastal sage scrub, oak woodland, grassland, and vernal pool habitats.

Previously, Burleson developed Site Specific Restoration Plans (SSRP) for HAs 18, 19, 22, 23, 26, 27, 27A, 28, 29, 33, 34, 36, 37, 38, 39/40, 43, 44, 48, and Austin Road Stockpile which provide detailed information (site conditions, baseline vegetation, targets, and collection/propagation requirements) for each HA (Burleson, 2013). In 2010, Burleson prepared the Plant Material, Collection, Storage, and Propagation Protocols for Site Restoration at Site 39 (Burleson, 2010). These documents provide the necessary information and guidance to conduct restoration activities at Site 39. This annual report provides the details involved with the execution of habitat restoration on Site 39 for the year 2017 as well as a progress summary for each HA and recommendations.

Work performed during 2017 consisted of:

- Storage of previously collected plant material
- Propagation of the collected plant material
- Restoration activities at HAs 26, 28, 34, 37, 38 and 44
- Erosion control repairs at HAs 34 and 37
- Monitoring of all restoration sites to evaluate vegetative establishment

1.2 General Site Conditions

Site 39 is dominated by maritime chaparral; a regionally rare, fire-dependent plant community found within the coastal fog zone on sandy to rocky soils. Chaparral habitats are dominated by drought-deciduous or evergreen sclerophyllous shrubs. This unique species-rich plant community changes in species composition from the western edges of the Site 39, which are frequently foggy and cool, to the eastern edges which are less foggy, warmer, and drier.

1.3 Site 39 Restoration Progress

SSRPs have been developed for 18 HAs and one stockpile area requiring habitat restoration for 61.71 acres. The 19 SSRPs have prescribed passive restoration (seeding) for all 61.71 acres and active

restoration (planting) to 29.84 acres. Active restoration requires installation of approximately 52,000 plants. Figure 1-1 presents the current status of restoration sites within Site 39.

Both active and passive restoration activities began in 2011 and are ongoing. By the end of the 2017 calendar year, approximately 52 acres had been seeded (passive restoration) and about 34,000 plants had been installed (active restoration). Thirteen of the 19 restoration sites have received their full SSRP restoration prescription and are currently in a monitoring phase. Four of the sites have received some level of restoration and two sites have not received any restoration to date.

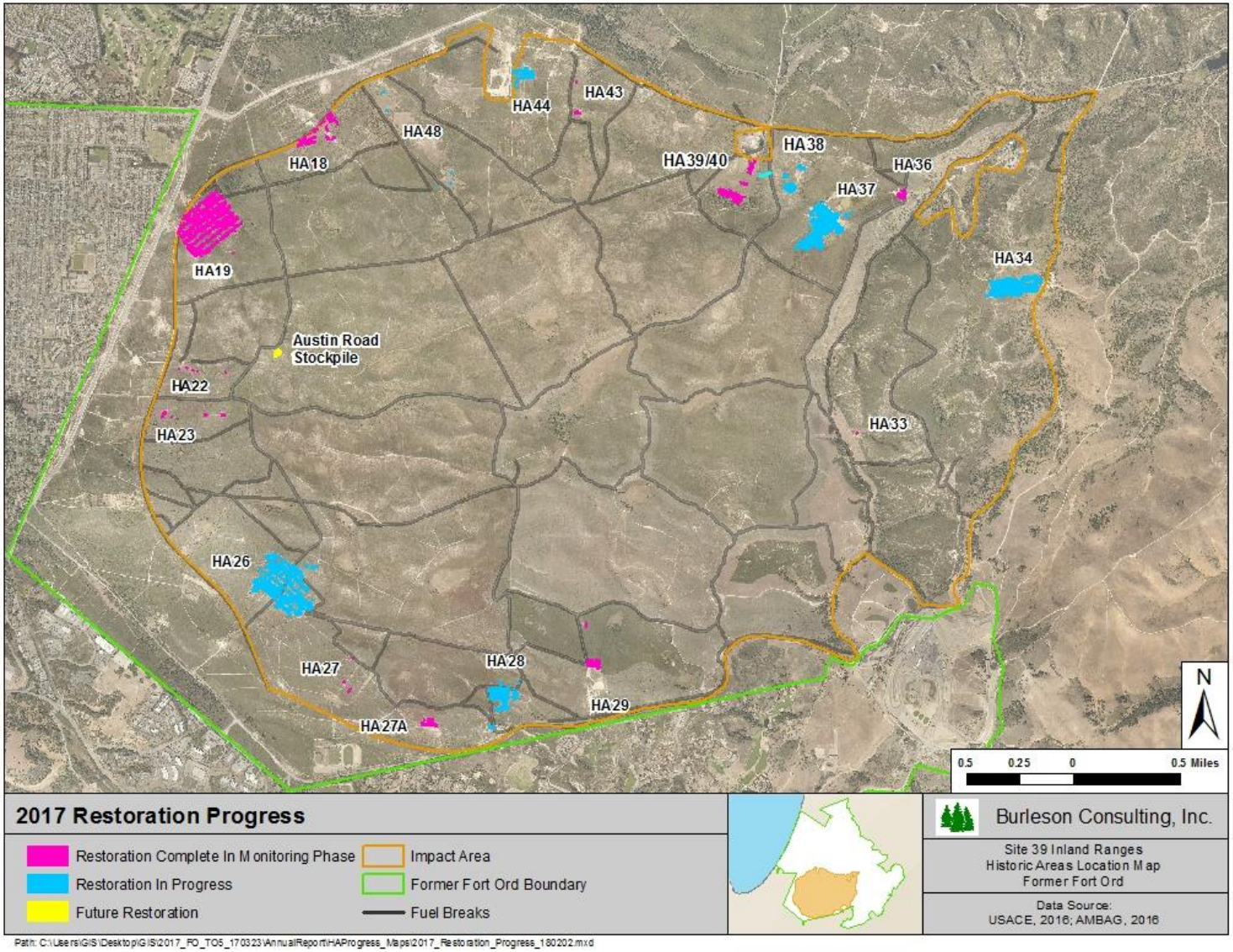

Figure 1-1. Restoration Progress Map

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2. RESTORATION PROTOCOLS AND SITE-SPECIFIC RESTORATION PLANS

Burleson developed the Site 39 Plant Material Collection, Storage, and Propagation Protocols and SSRPs for each HA that detail quantities and types of plant material to be collected for former Fort Ord (Burleson, 2010; Burleson, 2013). The protocols contain detailed information on specific salvage and propagation techniques to be followed by field crews. Additionally, Hedgerow Farms and S&S Seed supported Burleson with seed production as discussed in Section 3.1.

In accordance with the protocol, field crews collected Habitat Management Plan (HMP) species within a 1-kilometer radius centered on each HA (Burleson, 2010). Common species were collected within a 10-mile radius of each HA. Collected seeds were processed manually to remove residual hull, stems, leaves, and chaff, as much as possible. Seed weight totals were entered into the plant inventory database after seed processing was complete.

Collected plant material was stored at Burleson's native plant nursery in Carmel Valley in cool, dry locations until ready to be processed. Labeling and tracking of all plant material followed the storage protocol (Burleson, 2010). Burleson's biologists maintain the spreadsheet database so that plant and seed inventories are readily available. The database contains the following information:

- Scientific name and common name
- Container size (if applicable)
- Quantity (in nursery)
- Quantity (delivered)
- Seed/cutting origin
- Client
- Batch name and date sown
- Experimental treatments used during propagation (when applicable)

Burleson staff entered GPS data, collection quantities, and species of plants salvaged into the plant inventory database to track each species collected.

2.1 Burleson Carmel Valley Native Plant Nursery

Burleson continues to work closely with the California Department of Food and Agriculture (CDFA) and Monterey County Agricultural Commission to improve and implement recommended Best Management Practices (BMP) for plant pathogens at the native plant nursery. The BMPs that have been implemented include foot baths at critical access points, limited access points, mandatory use of new plant containers, sanitation of tools and off-site cuttings, designated areas for soil storage, raised plant platforms, cautionary distance of plants to one another, caging all seedling trays for rodent protection, as well as quarantine and treatment of questionable plants. In 2017, Burleson's nursery did not have any concerns about pathogen outbreaks.

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3. SEED COLLECTION

In 2017, 3.91 acres worth of seed was collected for HAs 26, 28, 37, 38 and 44 (see Table A-1, Appendix A). An acre-worth of seed is defined as the amount of seed, as prescribed by each SSRP, to restore 1 acre at a specific restoration site. All common and HMP species were collected in accordance with the protocol. All seed collection target goals were met for 2017.

3.1 Seed Production

In addition to on-site seed collection, Burleson contracts with Hedgerow Farms and S&S Seed to grow former Fort Ord-specific seed for four species. All four production seed species were successful in 2017. Seed production species and quantities produced in 2017 are listed below.

- blue wild-rye (*Elymus glaucus*): 200.00 lb
- purple needle grass (*Stipa pulchra*): 73.20 lb
- deerweed (*Acmispon glaber*): 19.30 lb
- common yarrow (*Achillea millefolium*): 71.80 lb

Seed test results for all four species are presented in Table A-2, Appendix A. Blue wild-rye, purple needle grass, and common yarrow seed production plots will be continued in 2018.

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4. PLANT PROPAGATION

All 2017 plant propagation activities occurred at Burleson's native plant nursery in Carmel Valley. Propagation activities were conducted in accordance with the Plant Material, Collection, Storage, and Propagation Protocols for Site Restoration at Site 39 for 15 different common and HMP species used in active restoration (Burleson, 2010). Total 2017 plant quantity targets, requiring 7,713 plants for HAs 26, 28, and 44 were achieved. However, some individual species targets were not achieved, while other species were in surplus of their target. Where suitable and approved by the USACE, these surplus plants were used to replace the missed targets. See Table A-3 in Appendix A, for final plant inventories for HAs 26, 28, and 44.

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5. RESTORATION ACTIVITIES

The objective of restoration activities is to return the impacted area to a natural landscape that conforms to the adjacent habitat communities in accordance with each SSRP. Restoration activities completed in 2017 included passive restoration at HAs 26, 28, 34, 37, 38, and 44, and active restoration at HAs 34 and 37.

5.1 Passive Restoration

Table 5-1 summarizes 2017 passive restoration activities. Generally, passive restoration activities occur annually between October and February, partially within two different calendar years. This report focuses on the 2017 calendar year and reports restoration activities in that timeframe. In early 2017, Burleson performed passive restoration at HAs 34 and 37. In late 2017, Burleson performed passive restoration at HAs 26, 28, 34, 37, 38, and 44. Appendix B provides detailed seed quantities, lists of the species applied, and locations of seed application for each restoration site. The following sections provide a description of passive restoration activities at each HA.

Table 5-1. 2017 Summary of Passive Restoration Activities per HA

HA	Passive Restoration Activities
26	Broadcast 2.27 acres-worth[1] of SSRP seed mix, enhanced with production seed.
28	Broadcast 0.21 acre-worth of Monterey spineflower (*Chorizanthe pungens* var. *pungens*).
34	Broadcast sterile barley (*Hordeum* sp.) over 0.1 acre of erosion control work in early 2017. Broadcast 0.1 acre-worth of erosion control seed mix and 0.25 acre-worth of production seed mix over 0.1 acre of erosion control work in late 2017.
37	Broadcast sterile barley over 0.25 acre of erosion control work in early 2017. Broadcast 1.0 acre-worth[1] of SSRP seed mix (enhanced with production seed), 0.24 acre-worth of erosion control seed mix, and 0.35 acre-worth of production seed mix in late 2017.
38	Broadcast 0.18 acre of each Monterey spineflower[2] and sand gilia[2] (*Gilia tenuiflora* ssp. *arenaria*).
44	Broadcast 0.25 acre-worth[1] of SSRP seed mix, enhanced with production seed.

[1]Acres-worth of seed = amount of seed prescribed to restore 1 acre of area in accordance with the SSRP
[2]HMP species

5.1.1 HA 26 Passive Restoration Activities

In November 2017, Burleson selectively applied 2.27 acres worth of SSRP seed mix, enhanced with the production seed mix, over 2.29 acres at HA 26 (see Appendix B Figure B-1, Table B-1,). The seeding areas were broken up into two locations; a 2.0-acre area in the northern active restoration polygon and a 0.29-acre area in the lower active restoration polygon. Prior to seeding, Kemron partially mulched both areas as part of erosion control efforts. Only grasses were applied to these mulched areas. In non-mulched areas seed was spread evenly, raked in, and covered with fresh straw. This site has not been cleared to depth and an unexploded ordnance (UXO) escort was utilized to support seeding.

5.1.2 HA 28 Passive Restoration Activities

In November 2017, Burleson applied 0.03 lb (13.6 g) of Monterey spineflower in three existing HMP plots totaling 0.21 acre at HA 28 (see Appendix B Figure B-2, Table B-2,). Seed was spread evenly across each plot and raked in.

5.1.3 HA 34 Passive Restoration Activities

In February 2017, Burleson applied sterile barley seed to 0.1 acre during minor erosion control repairs at HA 34 (see Appendix B Figure B-3, Tables B-3 and B-4). Seed was applied behind straw wattles for stabilization and covered with fresh straw.

In November 2017, Burleson applied 0.1 acre-worth of erosion control seed and 0.25 acre-worth of production seed to support erosion control repairs at HA 34. Seed was applied behind wattles and in collapsed rills for stabilization and covered with fresh straw.

5.1.4 HA 37 Passive Restoration Activities

In February 2017, Burleson applied sterile barley seed to 0.25 acre during straw wattle installation at the site (see Appendix B Figure B-4, Table B-5). Seed was applied behind straw wattles for stabilization and covered with fresh straw.

In October 2017, Burleson applied 0.24 acre-worth of erosion control seed and 0.35 acre-worth of production seed over approximately 0.75 acre to support minor erosion control repairs at HA 37 (see Appendix B Figure B-4, Table B-6). Seed was applied behind straw wattles and in collapsed rills for stabilization and covered with fresh straw.

In November 2017, Burleson applied 1.0 acre-worth of SSRP seed, enhanced with production seed, to 1.0 acre of area at HA 37 (see Appendix B Figure B-4, Table B-7). The seed was spread generally evenly throughout the area, raked in and covered with fresh straw. Part of this area has not been cleared to depth and a UXO escort was utilized to support seeding.

5.1.5 HA 38 Passive Restoration Activities

In November 2017, Burleson applied 0.0075 lb (3.4 g) of sand gilia and 0.015 lb (6.8 g) of Monterey spineflower in four new plots totaling 0.18 acre at HA 38 (see Appendix B Figure B-5, Tables B-8 and B-9). These plots were created along the outer edge of the active polygon. Sand gilia and Monterey spineflower seed were applied concurrently and raked into the soil.

5.1.6 HA 44 Passive Restoration Activities

In November 2017, Burleson applied 0.25 acre-worth of SSRP seed mix over 0.25 acre at HA 44 (see Appendix B Figure B-6, Table B-10). HA 44 is broken up into six restoration polygons; five received passive restoration and the sixth will receive both active and passive restoration. Seed was applied evenly throughout the five passive restoration polygons, raked in and covered with fresh straw.

5.2 Active Restoration

Table 5-2 summarizes 2017 active restoration activities at each site. Burleson installed a total of 8,799 plants at HAs 34 and 37 in early 2017. Tables B-11 and B-16 in Appendix B provide detailed information on species and quantities planted at HAs 34 and 37. Occasionally, when high-value shrubs are available, these surplus plants are swapped with early successional species. For example, swapping common yarrow with surplus manzanitas. Surplus HMP shrubs were substituted for early successional species at HAs 34 and 37. In addition, Burleson provided 100 surplus plants to the Army for a team building planting day. These plants were installed at HA 36.

Table 5-2. 2017 Summary of Active Restoration Activities per Historic Area

HA	Active Restoration Activities
34	Installed 4,836 plants (2.18 acres in six distinct areas)
37	Installed 3,963 plants (1.7 acres in two distinct areas)

5.2.1 HA 34 Active Restoration Activities

In January and February 2017, Burleson installed 4,836 plants over 2.18 acres in six distinct areas. Planting areas are listed as Areas 1 through 6 (see Appendix B Figure B-4, Tables B-6 and B-7). Areas 1 through 5 have been partially planted in previous years. Area 6 was not previously planted. Plants were selectively installed to avoid vulnerablilites due to potential erosion. This planting effort fulfilled the SSRP planting targets for Areas 1 through 6.

5.2.2 HA 37 Active Restoration Activities

In January, February, and March 2017, Burleson installed 3,963 plants in two different planting areas covering 1.7 acres at HA 37 (see Appendix B Figure B-6, Tables B-12, and B-13). Planting areas are identified as A and B. Neither of these areas were planted in previous years. Planting at Area A occurred within areas that had previously had erosion control effort including mulch and coir fabric. Plants were installed evenly throughout the area. In Area B, the number of manzanitas species was reduced by approximately 50-75% due to unsuitably wet conditions. The manzanitas were replaced with species that were more tolerant to standing water. The full prescription of manzanitas was installed in Area A where soils are well drained. This planting effort fulfilled the SSRP planting targets for these areas.

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6. MONITORING

Burleson conducted photo point documentation, HMP annual density surveys, species richness surveys, vegetative cover, and plant survivorship monitoring surveys at relevant HAs in 2017. Monitoring activities were guided by the HRP and Vegetation Sampling Protocol (Shaw, 2009b; Burleson, 2009). Table 6-1 provides a breakdown of monitoring activities conducted in 2017. The following sections provide detailed descriptions of monitoring activities. Expanded 2017 monitoring results are presented in Section 8 on a site-by-site basis.

Table 6-1. 2017 Summary of Monitoring Activities by HA

HA	Photo Point	HMP Annual Density	Species Richness	Vegetative Cover	Plant Survivorship
18	●	●	●	●	
19	●	●	●	●	
22	●	●	●	●	
23	●	●	●	●	
26	●	●	●	●	
27	●		●	●	
27A	●		●	●	
28	●	●	●	●	●
29	●		●	●	
33	●	●	●	●	
34	●		●	●	●
36	●		●	●	
37	●	●	●	●	●
38	●	●	●	●	●
39/40	●	●	●	●	
43	●	●	●	●	
44	●	●	●	●	
48	●	●	●	●	
Austin Rd. Stockpile	●	●	●		

Vegetative monitoring data were compared to the success criteria associated with each objective outlined in the SSRPs (Burleson, 2013). The data used for comparison to the success criteria include species richness, vegetative cover, and HMP annual density. The success criteria are summarized in Table 6-2.

Table 6-2. Success Criteria

Success Criterion	Category	Data Used for Comparison
Objective 1 – No. 1	Species richness	Meandering transects survey and 10-ft on either side of each transect
Objective 1 – No. 2	Native vegetation cover	Line-intercept transect survey percent cover data
Objective 2 – No. 3	Non-native target weed cover	Line-intercept transect survey percent cover data
Objective 3 – No. 4	HMP shrub cover	Line-intercept transect survey percent cover data
Objective 3 – No. 4	HMP shrub cover by species	Line-intercept transect survey percent cover data
Objective 3 – No. 4	HMP annual density	HMP annual plot density surveys and meandering transect surveys mapping discrete patches of HMP annuals outside of restoration plots

HMP annual species cover was not compared to the success criterion of objective 3 as described in the SSRPs. Prior to 2017, the success criterion for monitoring of HMP annuals required greater than or equal to 1% transect cover for Monterey spineflower, sand gilia, and/or seaside bird's beak (*Cordylanthus rigidus* ssp. *littoralis*) when applicable. However, transect sampling is not the most suitable method to quantify HMP annual species cover. Transects are designed to capture shrub and perennial plants greater than 0.1 meter of transect length. Patches of HMP annuals are often less than 0.1 meter across and have variable peak bloom time, which can result in underrepresentation. In August 2017, USFWS approved the abandonment of transect percent cover as a measure of HMP annual species cover and the associated success criterion (USFWS, 2017). USFWS agreed with recommendations made in the 2016 Habitat Restoration Annual Report that the estimation of density classes, mapped area occupied, and percent of bare ground represent more appropriate criteria of restoration success for these taxa.

6.1.1 Photo Points and Photo Documentation

Multiple permanent photo points have been established at each restoration site to document progress. Photos are taken annually from every photo point and more frequently at select photo points. Additionally, photo documentation of restoration activities occurs throughout the year. See Appendix C for a photo log of activities during 2017, Appendix D for select photo point comparisons for all sites, and Appendix E for photos illustrating progress, growth, and improvement at HAs in year 5 of monitoring in 2017.

6.1.2 HMP Annual Density Surveys at Restoration Plots and Across the Historic Area

Plot density surveys for HMP annuals, Monterey spineflower, sand gilia, and seaside bird's beak are performed at restoration sites in years 1, 2, 3, 4, 5, and 8 during peak bloom for each species according to the HRP guidelines (Shaw, 2009b). HMP annual density is obtained by counting every individual within a restoration plot and calculating the number of plants per 100 square feet. Density classes were derived from the HRP and are presented below.

Density Class	Plants Counted per 100 Square Feet
Not Present	0
Low	1-50
Medium	51-100
High	101-500
Very High	>500

Discrete patches of HMP annuals within the restoration site but outside of the HMP annual restoration plots are captured and mapped during meandering transect surveys using GPS. These patches are assigned a density class or an actual population number if it is easy to do so. If the HMP annual occupied area is larger than 1 acre in size, density may be obtained by sub-sampling the population with circle plot surveys as described in the 2009 protocol (Burleson, 2009). Circle plot data is analyzed in ArcMap using the interpolation tool to develop HMP annual density models.

HMP annual densities for plots and across the HA are compared to previous years. For the discrete patches, the density and the area occupied are taken into consideration. The combination of plots and discrete patches are considered when the results are compared to the applicable success criteria outlined in the SSRPs.

6.1.3 Plant Survivorship Monitoring

Annual plant survivorship surveys are completed for a minimum of three years after plants have been installed. A random sample of at least 10% of each shrub species are permanently tagged and monitored annually. Survivorship monitoring events occur in the fall at the end of the dry season when plant mortality rates are highest. During monitoring visits, all tagged plants are counted as alive or dead to calculate survivorship percentages. All plants being monitored are evergreens and should have live leaves year-round. Plants that exhibit live leaves are recorded as alive. If plants have no leaves or if leaves appear dead, then the plants are recorded as dead. Plant survivorship classifications are presented below.

Plant Survivorship	Percent Alive
High	80-100%
Moderate	50-79%
Low	≤49%

6.1.4 Vegetative Cover

Vegetative cover is monitored in years 1, 2, 3, 4, 5, 8, and 13 following restoration. In the first few years of monitoring, sites are visually assessed for cover. Beginning in 2016, cover of shrubs, annuals, perennials, grass, thatch, and bare ground were measured using line-intercept transect surveys, as described in the 2009 protocol (Burleson, 2009). At a rate of one transect per acre, 50-meter transects are placed randomly in portions of the site where similar restoration activities took place. When applicable, transects are stratified by year, and consideration is given to topography and features of the area (for example, avoidance of roads or berms if no restoration activities occurred there). For HAs that are less than 1 acre, transects are placed diagonally through each plot. The corners of each plot are numbered 1-4 and the start point is determined using a random number generator. Quadrat sampling along transects is completed when annual herbaceous cover under the transect line is 10% or greater.

Vegetative cover results are used to compare to the success criteria outlined in each SSRP. For 50-meter transects, the vegetative cover was calculated by summing the distance along the transect line for each species and dividing by 50. Percent cover for all transects were then averaged to get the site average for total cover by species, native shrubs and perennials and other categories (Shaw, 2009b). However, at sites with transect less than 50 meters, the total cover was calculated differently to account for varying transect lengths. To get the site average, the distance along all transect lines for each species were summed collectively and dividing by the total length of the transects on site. For each HA, the native vegetation cover, non-native vegetation cover, HMP shrub cover total, and HMP shrub cover by species, are evaluated against the quantitative objectives. When applicable, the results are also compared to previous years. An additional analysis was completed this year for a comparison of vegetation cover. Each HAs top five dominant species per year from line-intercept transects results were shown with comparison graphs. It should be noted that some HAs had additional transects in 2017 that were not surveyed in 2016.

6.1.5 Species Richness

Species richness surveys were completed at all restoration sites in 2017. Species richness is assessed by utilizing the available data at each restoration site, which may include meandering transects and 50-meter line-intercept transects, or both. Meandering transects are conducted throughout the restoration sites in years 1, 2, 3, 4, 5, 8, and 13 to compile a species list and map discrete areas of HMP annuals outside of restoration plots. Species richness was analyzed by comparing the number of native shrubs and perennials, native annuals and herbaceous species, and non-native species to the number recorded in previous years. Additional analysis included a comparison of species richness to the success criterion which dictates no net loss of SSRP species. This is measured by the presence or absence of SSRP species at the HA.

7. EROSION CONTROL

In early 2017, Burleson completed the 2016/2017 wet season erosion control repair at HAs 34 and 37. In late 2017, Burleson completed dry season erosion control repair at HAs 34 and 37 which initiated the 2017/2018 erosion control work. Photographs C-45 through C-56 in Appendix C document erosion control field activities.

At HA 34, the following work was performed in 2017:

- January 2017
    - Installed 75 linear feet of straw rolls
    - Applied barley and straw behind wattles for stabilization over ~0.1 acre
- November 2017
    - Repaired approximately 250 linear feet of rill erosion ranging from 6”-12” deep
    - Installed 1,025 linear feet of straw rolls
    - Broadcast erosion control seed mix and production seed mix on ~0.1 acre
    - Applied mulch to selected areas

At HA 37, the following work was performed in 2017:

- February 2017
    - Collapsed 230 linear feet of rills
    - Installed 625 linear feet of straw rolls
    - Applied barley and straw for stabilization over ~0.25 acre
- October 2017
    - Collapsing approximately 450 linear feet of rill erosion ranging from 6”-12” deep
    - Installed 2,175 linear feet of straw rolls
    - Broadcast erosion control seed mix and production seed mix over ~0.76 acre
    - Applied mulch to selected areas
    - Installed 6,000 ft^2 of coir fabric

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8. RESTORATION SUMMARY AND MONITORING RESULTS BY HA

In order to understand the progress of restoration, as well as to discuss the future efforts for each HA, it was important to compare the current status of each HA to its specific success criteria. Section 8 is an overview of the restoration effort through 2017, monitoring results and comparison to previous years, comparison to the SSRP baseline transects, and discussion of recommendations for each HA.

8.1 HA 18

HA 18 was used by the U.S Department of the Army (Army) as a long-distance small-arms firing range. The range consisted of seven target lanes about 165 feet apart. Soil remediation was completed in 2010 and resulted in 2,750 cubic yards of lead-contaminated soil being excavated from 1.4 acres (Shaw, 2008). HA 18 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 18 is relatively flat with a northwest and west aspect. The adjacent lands are high quality habitat areas which contain substantial amounts of intact native vegetation that will promote natural recruitment at the restoration areas.

HA 18 is located on the northwestern portion of Site 39, occurring within the sand hill formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

The prescription for passive restoration at HA 18 consisted of hand broadcast of a non-irrigated seed mix and annual weed management. HA 18 is relatively flat with little potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 18 occurred in 2012 and monitoring began in 2013. The HA has been monitored for seven years by photo documentation and site visits, five years for HMP annual density in plots, two years for HMP annual density across the HA, two years of species richness, and two years for vegetative cover (see Table 8-1). Figure 8-1 shows the passive restoration area, photo documentation locations, and transect monitoring locations. Success criteria for HA 18 are summarized in Table 8-2.

Table 8-1. Historic Summary of Restoration and Monitoring Activities at HA 18

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2011	2012	2013	2014	2015	2016	2017	2020	2025
Restoration: Passive	●	●							
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
HMP Annual Density across HA						●	●	●	
Species Richness						●	●	●	●
Vegetative Cover						●	●	●	●

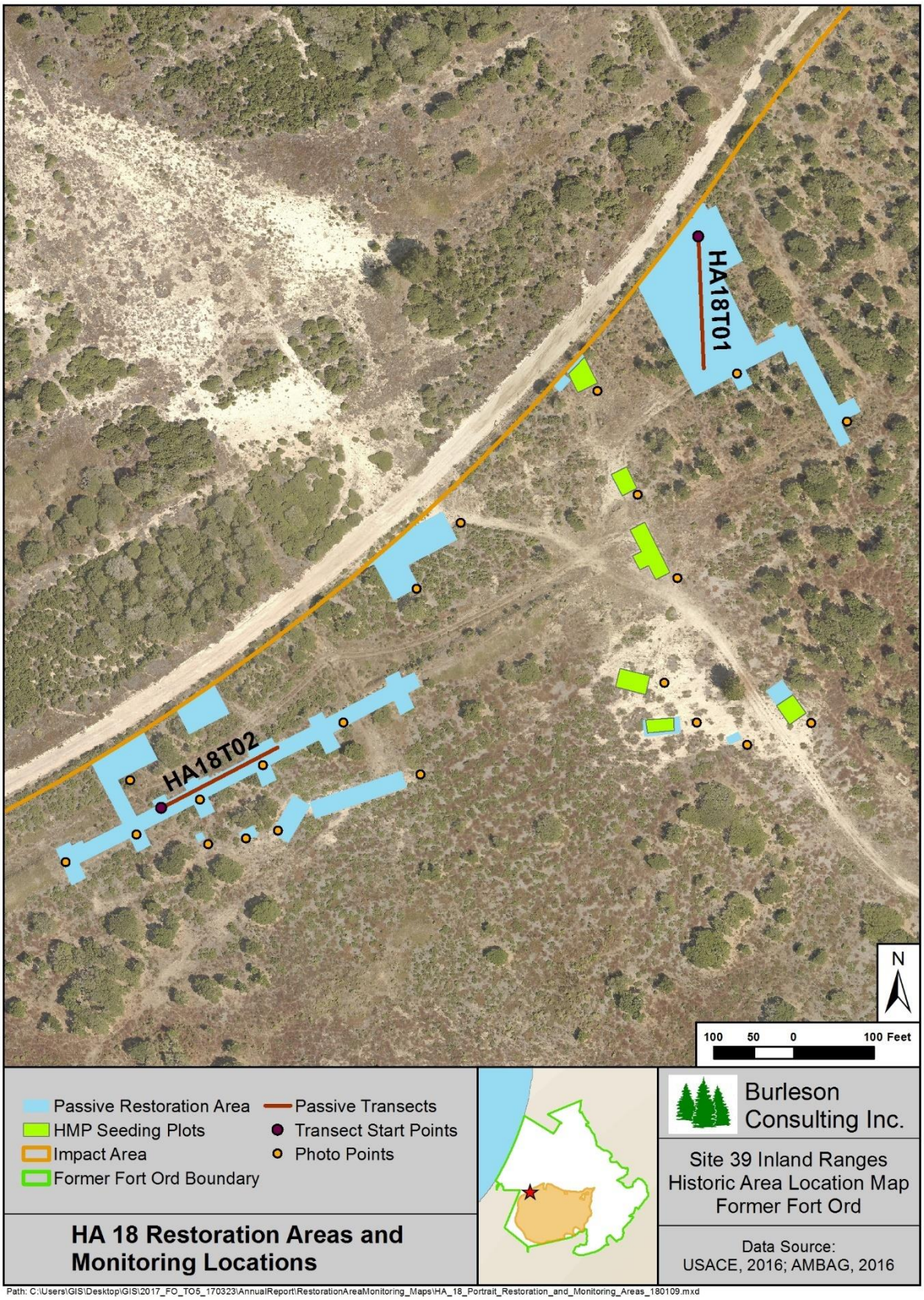


Figure 8-1. HA 18 Restoration Areas and Monitoring Locations Map

Table 8-2. Success Criteria and Acceptable Limits for Restoration of HA 18

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			shaggy-bark manzanita
			California sage brush
			coyote brush
			Monterey ceanothus[2]
			dwarf ceanothus
			mock heather
			Eastwood's goldenbush[2]
			golden yarrow
			peak rush-rose
			deerweed
			sticky monkeyflower
			coast live oak
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data did not indicate non-native target weed species. No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 2
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Monterey ceanothus percent cover, as an average of transect data, must be equal to or greater than 4

Table 8-2. Success Criteria and Acceptable Limits for Restoration of HA 18

			Sandmat manzanita percent cover, as an average of transect data, must be present however, less than 1 percent is acceptable
			Eastwood gold fleece percent cover, as an average of transect data, must be present however, less than 1 percent is acceptable
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.1.1 Restoration Activities

Burleson performed passive restoration at HA 18 for two years with two different applications of seed. No active restoration activities were prescribed at HA 18. Seed was broadcast in January and December of 2012, representing two seeding seasons. No additional passive restoration activities occurred at HA 18 in 2017. The total amount of seed broadcast on the site is 51.192 lb compared to the 50.220 lb prescribed in the SSRP. Table 8-3 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. Species code names are presented in Table 8-4. Burleson performed passive restoration for the HMP annual species Monterey spineflower. Six plots were chosen in the HA based on having suitable habitat for Monterey spineflower and adjacent extant populations.

Table 8-3. Summary of Passive Restoration Activities from 2012-2017 for HA 18

Species	Pounds of Seed Broadcast			
	SSRP Target	2012 (Jan)	2012 (Dec)	Total by Species
ACGL	2.80	1.00	1.44	2.44
ADFA	1.40	0.50	0.77	1.27
ARPU[1]	1.40	1.10	1.00	2.10
ARTO	2.80	1.00	1.45	2.45
ARCA	1.40	0.50	0.73	1.23
BAPI	0.20	0.50	0.11	0.61
CERI[1]	1.40	0.50	0.78	1.28
CHPUP[1]	0.02	0.40	0.047	0.447
CRSC	1.40	0.50	0.77	1.27
DIAU	0.10	0.30	0.39	0.69
ELGL	12.60	0.00	12.65	12.65
ERER	0.40	0.20	0.23	0.43
ERFA[1]	0.10	0.072	0.07	0.142

Table 8-3. Summary of Passive Restoration Activities from 2012-2017 for HA 18

Species	Pounds of Seed Broadcast			
	SSRP Target	2012 (Jan)	2012 (Dec)	Total by Species
ERCO	0.40	0.20	0.24	0.44
Hordeum sp.	12.60	0.00	12.70	12.70
HOCU	2.80	1.00	1.16	2.16
SAME	1.40	0.60	0.82	1.42
STCE	7.00	0.30	7.16	7.46
TOTAL	**50.22**	**8.672**	**42.52**	**51.192**

[1]HMP species

8.1.2 Monitoring Results

8.1.2.1 HMP Annual Density

Six Monterey spineflower plots were surveyed for year 5 density at HA 18 in 2017. The plots are numbered 1-6 on Figure 8-2 and are primarily located in the eastern part of the site. Monterey spineflower density was low at plot 1. Plots 4, 5, and 6 had a medium density and Plots 2 and 3 had a high density. Figure 8-3 presents all the Monterey spineflower restoration plot densities for HA 18.

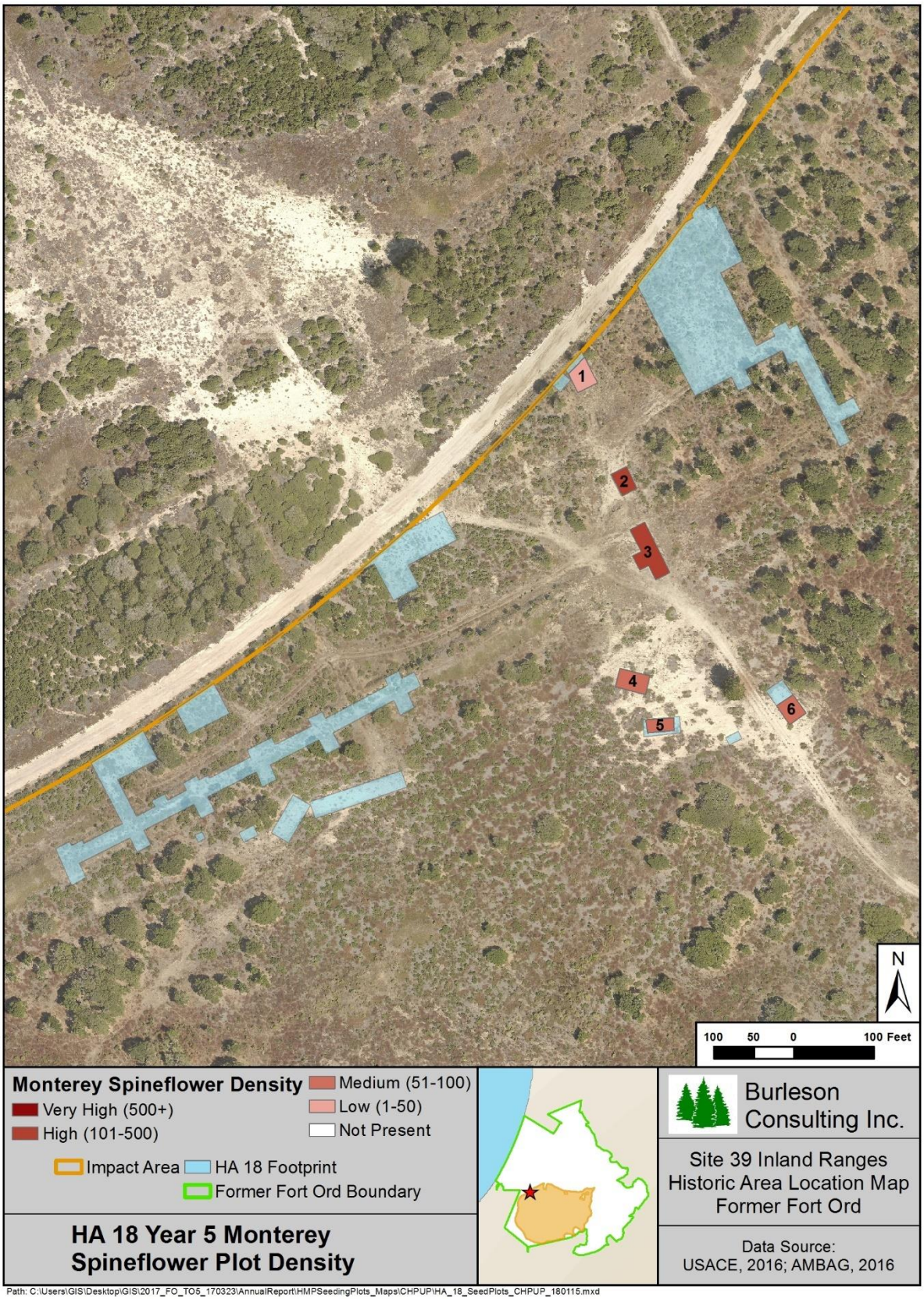


Figure 8-2. HA 18 Year 5 Monterey Spineflower Plot Density Map

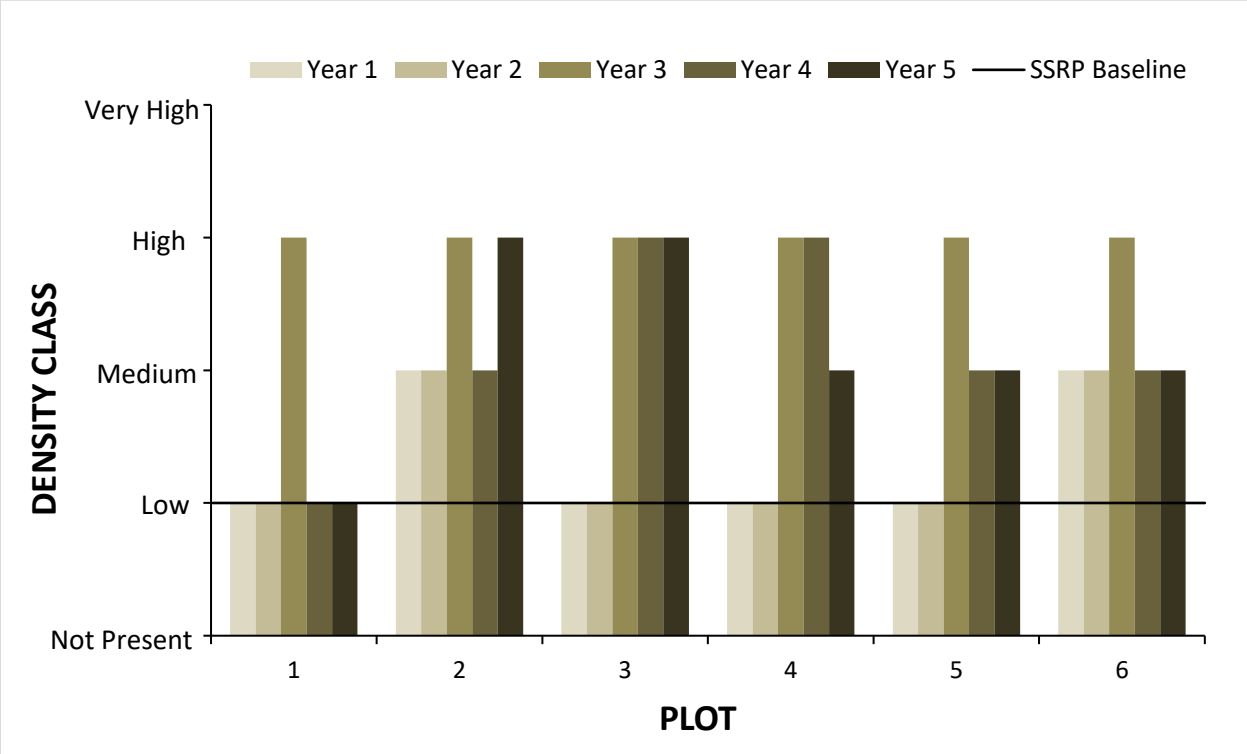


Figure 8-3. HA 18 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline Density Class for Years 1-5 at Restoration Plots 1-6

HMP annual density monitoring included mapping discrete patches of HMP annuals within the restoration area but outside of the HMP annual restoration plots. This survey was completed for Monterey spineflower. Seventeen discrete patches of Monterey spineflower were mapped and individual plants were counted within each patch (see Figure 8-4). The densities ranged from low to high. The total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.14 acre. The density class range slightly decreased from low to very high in 2016 to low to high in 2017, while the total acreage increased from 0.11 acre in 2016 to 0.14 acre.

Figure 8-4. HA 18 Monterey Spineflower Meandering Transect Density Map

8.1.2.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.1.2.3 Species Richness

Seventy-six species were observed at HA 18. Of those, 34 were native shrubs or perennials, 22 were native annual herbaceous species, 17 were non-native species, and three were not catergorized as they were only identified to genus (see Table 8-4). Species richness increased by eight species since 2016. Native shrub and perennial species increased by two, native herbaceous species increased by four, and non-native species decreased by two.

Table 8-4. Species Observed at HA 18, 2017

Scientific Name	Common Name	Code
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Agoseris sp.		AG
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Bromus carinatus	California brome	BRCA
Bromus diandrus	ripgut brome	BRDI
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Cardionema ramosissimum	sand mat	CARA
Carex sp.		CA
Carpobrotus edulis	ice plant	CAED
Castilleja attenuata	narrow-leaved owl's clover	CAAT
Castilleja exserta	purple owl's-clover	CADE
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens ssp. *pungens*[1]	Monterey spineflower	CHPUP
Claytonia perfoliata	miner's lettuce	CLPE
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	pampas grass	COJU
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Cryptantha clevelandii	Cleveland's cryptantha	CRCL
Cryptantha micromeres	minute-flowered cryptantha	CRMI
Dichelostemma capitatum	blue dicks	DICA
Diplacus aurantiacus	sticky monkeyflower	DIAU
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW
Elymus glaucus	blue wild-rye	ELGL
Eriastrum virgatum	virgate eriastrum	ERVI
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO

Table 8-4. Species Observed at HA 18, 2017

Scientific Name	Common Name	Code
Erodium cicutarium	red-stemmed filareee	ERCI
Eschscholzia californica	California poppy	ESCA
Festuca myuros	rattail sixweeks grass	FEMY
Galium angustifolium	narrowly leaved bedstraw	GAAN
Gamochaeta ustulata	purple cudweed	GAUS
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Juncus sp.		JU
Lessingia pectinata	common lessingia	LEPE
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus concinnus	bajada lupine	LUCO
Lupinus nanus	sky lupine	LUNA
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Marah fabacea	wild cucumber	MAFA
Navarretia hamata	hooked navarretia	NAHA
Nuttallanthus texanus	blue toadflax	NUTE
Petrorhagia dubia	hairy pink	PEDU
Plagiobothrys sp.	popcorn flower	PL
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Pseudognaphalium stramineum	cotton-batting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Sanicula crassicaulis	Pacific sanicle	SACR
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Solanum umbelliferum	blue witch	SOUM
Stachys bullata	wood mint	STBU
Stipa cernua	nodding needlegrass	STCE
Stipa pulchra	purple needlegrass	STPU
Toxicodendron diversilobum	poison oak	TODI
Trifolium campestre	hop clover	TRCA
Trifolium gracilentum	pinpoint clover	TRGR
Trifolium microcephalum	small-head clover	TRMI
Vicia hassei	slender vetch	VIHA

[1]HMP species

8.1.2.4 Vegetative Cover

Burleson completed two 50-meter line-intercept transects at HA 18. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 53.34%. The mean vegetative cover by native shrubs and perennials was slightly higher in 2016 than in 2017 by only 0.12%. Two transects were surveyed in 2016. Table 8-5 presents the vegetation cover summary and Table 8-6 presents

vegetation cover by species. Figure 8-5 presents the percent cover of the dominant species at HA 18 in 2016 and 2017.

Table 8-5. Transect Survey Summary for HA 18

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA18T01	51.90	50.84	0.00	1.06	98.68	1.32
HA18T02	56.60	55.84	0.00	0.76	82.60	13.32
SITE AVERAGE	**54.25**	**53.34**	**0.00**	**0.91**	**90.64**	**7.32**

Table 8-6. Transect Survey Results for HA 18 by Species

Transect	ACGL (%)	ARPU[1] (%)	ARTO (%)	BAPI (%)	CARA (%)	CAED (%)	CAEX (%)	CRSC (%)	DIAU (%)	ELGL (%)	ERFA[1] (%)	ERCO (%)	HOCU (%)	LUAR (%)	PLCO (%)	TODI (%)	TH (%)	BG (%)
HA18T01	24.06	0.28	6.22	2.56	0.32	0.84	0.20	0.00	0.28	0.48	0.26	0.32	0.38	3.44	0.22	12.04	98.68	1.32
HA18T02	44.80	0.84	5.02	0.00	0.00	0.76	0.00	4.42	0.26	0.00	0.00	0.50	0.00	0.00	0.00	0.00	82.60	13.32
SITE AVERAGE	**34.43**	**0.56**	**5.62**	**1.28**	**0.16**	**0.80**	**0.10**	**2.21**	**0.27**	**0.24**	**0.13**	**0.41**	**0.19**	**1.72**	**0.11**	**6.02**	**90.64**	**7.32**

[1]HMP species

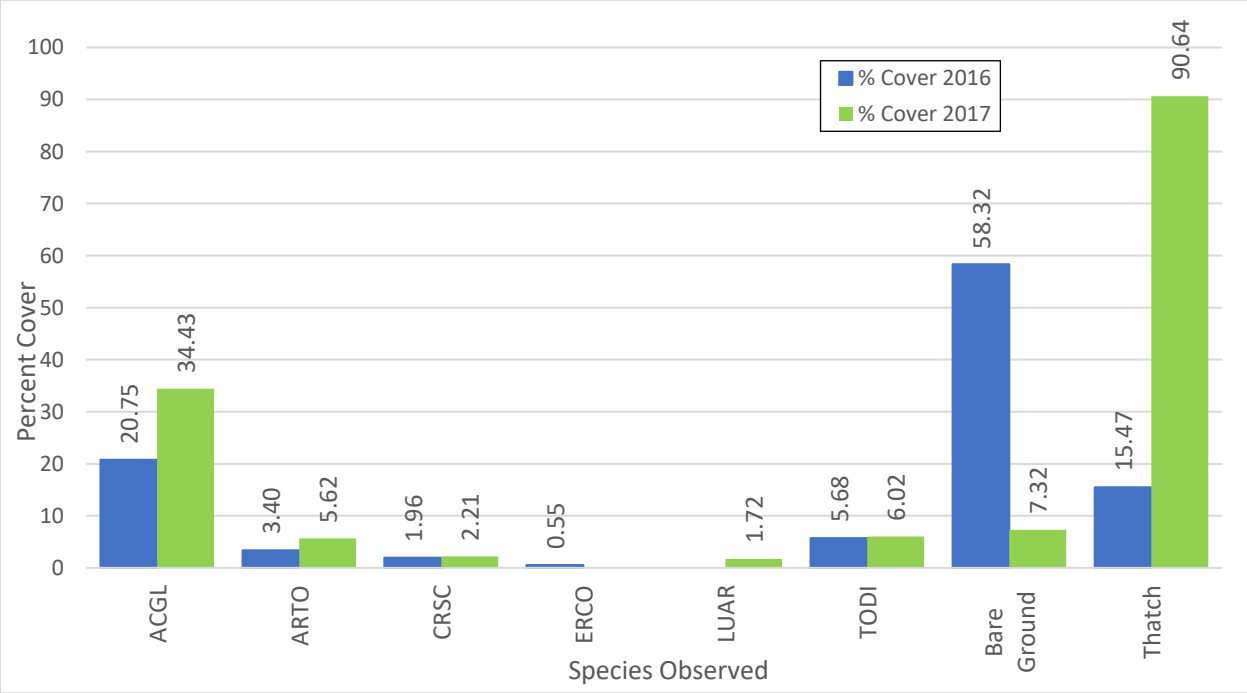


Figure 8-5. Percent Cover of Dominant Species at HA 18 in 2016 and 2017. Species codes and names are provided in Table 8-4.

8.1.3 Discussion

8.1.3.1 HMP Annual Density

Monterey spineflower density is within the acceptable limits for HMP annual density at HA 18. The SSRP baseline density class for Monterey spineflower was low. The Monterey spineflower restoration plot results show that by year 5, for all plots, densities met or exceeded the success criterion under objective 3. In addition, Monterey spineflower was present outside of the restoration plots. Discrete patches, with densities that either met or exceeded the success criterion, covered 0.14 acre of HA 18.

8.1.3.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.1.3.3 Species Richness

Shaggy-barked manzanita (*Arctostaphylos tomentosa*), California sagebrush (*Artemisia californica*), coyote brush (*Baccharis pilularis*), Monterey ceanothus (*Ceanothus rigidus*), dwarf ceanothus (*Ceanothus dentatus*), mock heather (*Ericameria ericoides*), Eastwood's goldenbush (*Ericameria fasciculata*), golden yarrow (*Eriophyllum confertiflorum*), peak rush-rose (*Crocanthemum scoparium*), deerweed, sticky monkeyflower (*Diplacus aurantiacus*), coast live oak (*Quercus agrifolia),* and black sage (*Salvia mellifera)* were present. Chamise (*Adenostoma fasciculatum*) was not present. HA 18 included 34 native shrubs and perennial species; however, it did not meet success criterion for objective 1 because chamise was not present.

8.1.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1, the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes 18 native shrub, perennial, and annual species presented in Table 2 of the HA 18 SSRP (Burleson, 2013). Currently the HA includes 45.34% vegetative cover from those species; therefore, this success criterion was met. In 2016, the vegetative cover was 27.64%. Cover has increased by 17.7% (see Figure 8-6).

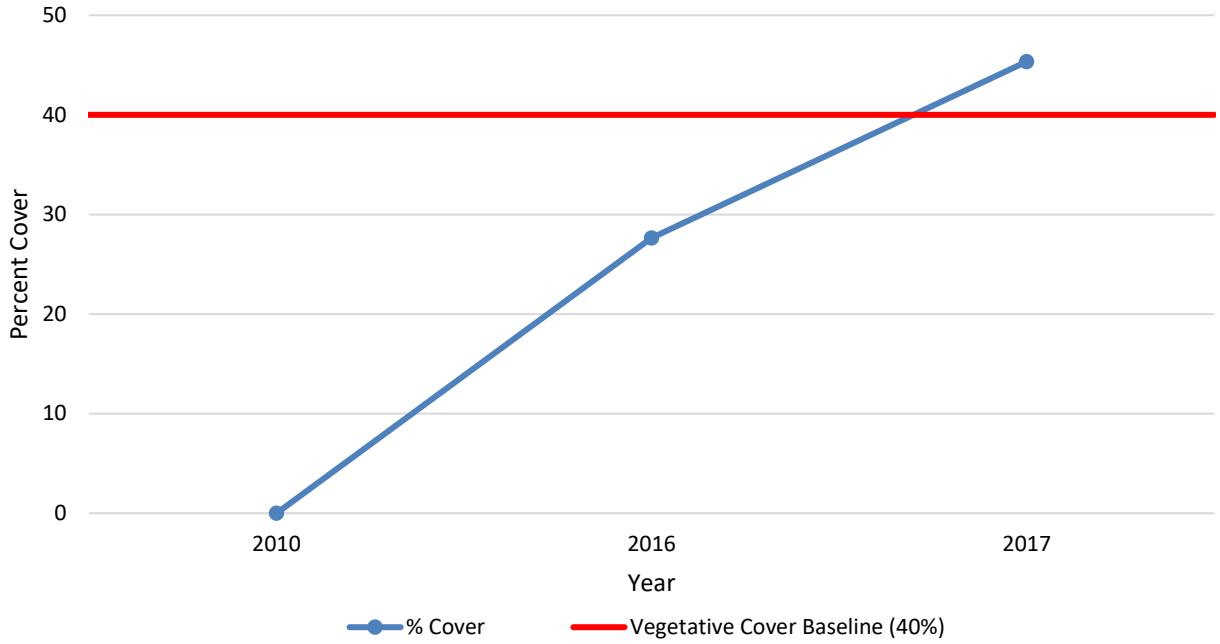


Figure 8-6. Native Vegetative Cover Compared to the Success Criterion at HA 18

Objective 2 considers the percent cover of non-native target weeds. The transect surveys contained iceplant (*Carpobrotus edulis*); however, the vegetative cover for non-native species was 0.80% which is less than the 5% acceptable limit. There was an increase of 0.61% from 2016. Despite the slight increase, this success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class met or exceeded the baseline cover class of 2. Cover class 2 is from 1-5% of absolute cover. The HMP shrub species at HA 18 are providing an absolute cover of 0.69%. This is an increase from 0.12% in 2016. However, HA 18 has not yet met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 18, this means a vegetative cover average of at least 4% cover for Monterey ceanothus (*Ceanothus rigidus*), and sandmat manzanita (*Arctostaphylos pumila*) and Eastwood's goldenbush (*Ericameria fasciculata*) must be present. The average vegetative cover for Monterey ceanothus was 0.00%, for sandmat manzanita 0.56%, and for Eastwood's goldenbush 0.13% (see Figure 8-7). Both sandmat manzanita and Eastwood's goldenbush increased in cover from 2016 to 2017. In 2017, two of the three species, sandmat manzanita and Eastwood's goldenbush, met the criterion. The success criterion was not met because Monterey ceanothus was not present but there has been measured improvement.

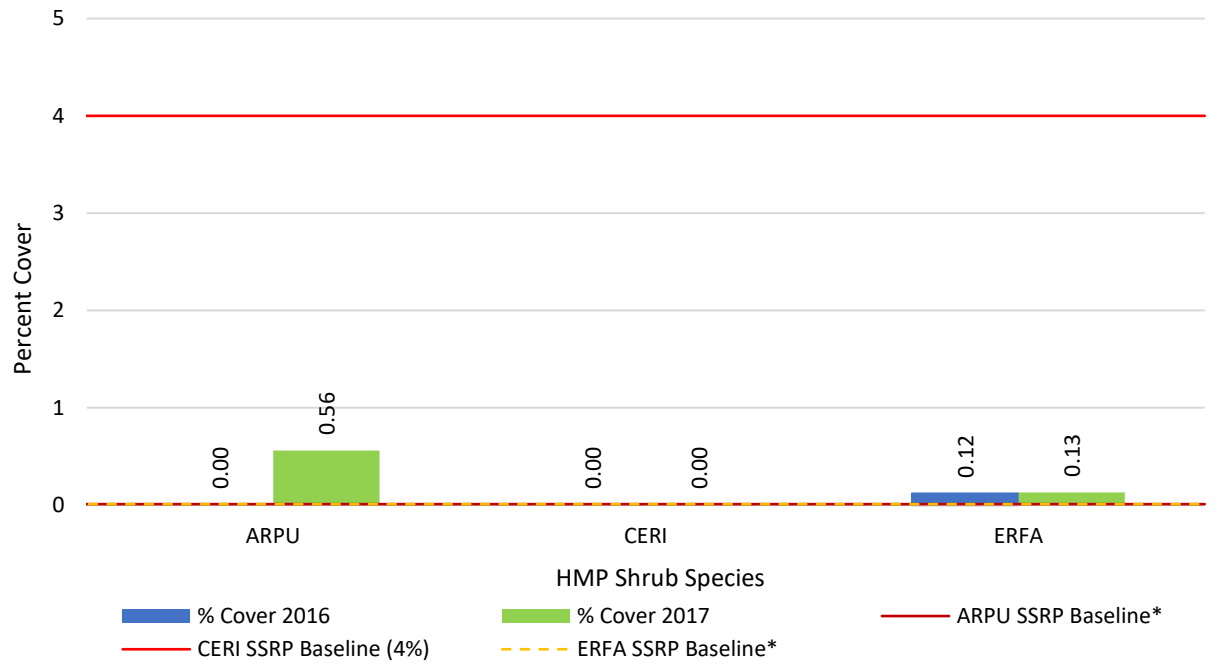


Figure 8-7. HMP Shrub Species Comparison to Success Criteria at HA 18

8.1.3.5 Recommendations

HA 18 was in year 5 of monitoring in 2017 and had responded well to previous restoration efforts. The restored area met three of its six success criteria by 2017, one more than had been achieved by 2016. The Army recommends planting Monterey ceanothus to support HMP shrub cover. Monterey ceanothus was present but cover too low to meet the HMP shrub cover criterion. Chamise was not present on site and is necessary to achieve the species richness criterion. It will be planted in 2018/2019 season per recommendations in the 2016 Annual Habitat Restoration Report (Burleson, 2017). Overall, HA 18 still needs time to respond to the restoration effort and continued monitoring to evaluate areas that may need additional effort. A qualitative overview is documented by the reference photo points (see Appendix D, page D-1 and Appendix E, page E-1). The photos illustrate the progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover line-intercept transects in monitoring year 8, 2020.

Table 8-7 summarizes the current status of HA 18 including which success criteria have been met as well as recommendation to move towards meeting all success criteria.

Table 8-7. Status and Recommendations for Achieving Success Criteria at HA 18

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant chamise (scheduled 2018)
Objective 1 – No. 2	Native vegetation cover	Yes	None
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant Monterey ceanothus
Objective 3 – No. 4	HMP shrub cover by species	No	Plant Monterey ceanothus
Objective 3 – No. 4	HMP annual density	Yes	None

8.2 HA 19

HA 19 was used by the Army as a small-arm firing range. Soil remediation was completed in 2010 and resulted in the excavation of 23,000 cubic yards of lead-contaminated soil from approximately 14 acres (Shaw, 2008). HA 19 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 19 is relatively flat with a western aspect. The adjacent lands are high quality habitat areas which contain substantial amounts of intact native vegetation that will promote natural recruitment at the restoration areas.

HA 19 is located on the western portion of Site 39, occurring within the sand hill formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. The vegetative habitat at HA 19 prior to remediation was predominantly very high quality maritime chaparral. The HA 19 SSRP includes a detailed list of the typical vegetation identified at the HA.

According to the SSRP, the restoration procedure for HA 19 included both passive and active restoration. The main focus of restoration was to broadcast non-irrigated seed mix. However, for the active restoration efforts, container-grown plants were installed. Areas within HA 19 which were less than 1.0 acre, or larger than 1.0 acre but less than 100 feet wide, were restored passively using broadcast seed only. Areas larger than 1.0 acre and greater than 100 feet across received active restoration in addition to the passive restoration efforts.

Restoration activities at HA 19 began in 2012 and were completed in 2016. Monitoring at HA 19 began in 2013. It has been monitored for six years by photo documentation and site visits, four years for HMP annual density in plots, two years for HMP annual density across the HA, two years for species richness, two years for vegetative cover, and four years for plant survivorship (see Table 8-8). Figure 8-8 shows the HA footprint, passive restoration area, active restoration area, and transect monitoring locations. The success criteria for HA 19 are summarized in the Table 8-9.

Table 8-8. Historic Summary of Restoration and Monitoring Activities at HA 19

Activity	Monitoring Years							
		1	2	3	4	5	8	13
	2013	2014	2015	2016	2017	2018	2021	2026
Restoration: Active and Passive	●	●	●	●				
Photo Points and Site Visit	●	●	●	●	●	●	●	●
Monterey Spineflower Plots		●		●	●	●		
Sand Gilia Plots		●	●	●	●	●		
HMP Annual Density across HA				●	●	●		
Species Richness				●	●	●	●	●
Vegetative Cover				●	●	●	●	●
Plant Survivorship	●	●	●	●				

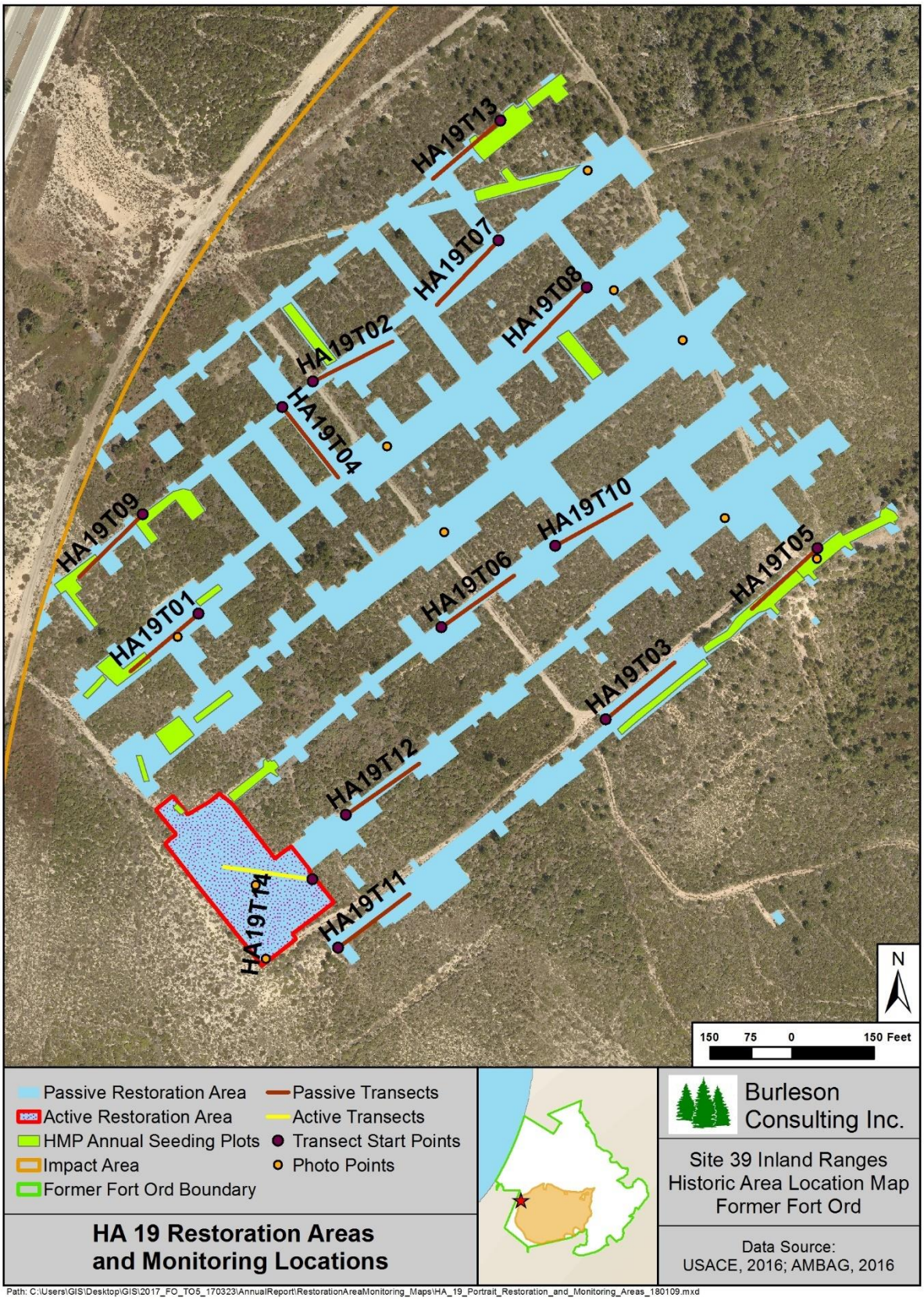


Figure 8-8. HA 19 Restoration Areas and Monitoring Locations Map

Table 8-9. Success Criteria and Acceptable Limits for Restoration of HA 19

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			sandmat manzanita[2]
			shaggy-barked manzanita
			California sagebrush
			coyote brush
			Monterey ceanothus[2]
			mock heather
			Eastwood's goldenbush[2]
			golden yarrow
			pitcher sage
			deerweed
			sticky monkeyflower
			coast live oak
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40% for native species listed as part of the plant palette in Table 2.
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data did not indicate non-native target weed species. No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 16.
			Monterey ceanothus percent cover, as an average of transect data, must be present however, less than 1 percent is acceptable.
			Eastwood's goldenbush percent cover, as an average of transect data, must be

Table 8-9. Success Criteria and Acceptable Limits for Restoration of HA 19

			present however, less than 1 percent is acceptable.
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.2.1 Restoration Activities

Burleson performed passive restoration at HA 19 for three years with four different applications of seed. Seed was broadcast twice in 2013, once in 2015, and once in 2016. No additional passive restoration activities occurred at HA 19 in 2017. The total amount of seed broadcast on the site was 393.9 lb compared to 517 lb prescribed in the SSRP. Table 8-10 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. Burleson performed passive restoration for the HMP annual species sand gilia and Monterey spineflower. Nine plots were chosen in the HA based on having suitable habitat for the HMP annuals and adjacent extant populations.

Table 8-10. Summary of Passive Restoration Activities from 2013-2017 for HA 19

Species	Pounds of Seed Broadcast					
	SSRP Target	2013 (Jan)	2013 (Nov)	2015	2016	Total by Species
ACMI	14.00	3.50	5.00	0.00	8.00	16.50
ACGL	28.00	7.00	10.00	0.00	16.00	33.00
ADFA	14.00	3.50	0.00	0.00	4.00	7.50
ARPU[1]	14.00	3.90	5.00	0.00	0.00	8.90
ARTO	28.00	7.00	0.00	0.00	0.00	7.00
ARCA	14.00	3.50	5.00	0.00	4.00	12.50
BAPI	2.10	0.53	1.00	0.00	4.00	5.53
CEDE	-	-	-	-	4.00	4.00
CERI[1]	14.00	3.70	5.00	0.00	4.00	12.70
CHPUP[1]	0.20	0.22	0.00	0.00	0.00	0.22
CRSC	14.00	3.50	5.00	0.00	4.00	12.50
DIAU	1.40	2.10	3.00	0.00	0.40	5.50
ELGL	126.00	31.70	45.00	0.00	36.00	112.70
ERER	3.50	0.88	0.50	0.00	0.00	1.38
ERFA[1]	1.40	0.37	1.50	0.00	0.40	2.27
ERCO	4.20	1.10	1.50	0.00	5.20	7.80
GITEA[1]	0.20	0.00	0.00	0.20	0.00	0.20
Hordeum sp.	126.00	31.70	45.00	0.00	0.00	76.70
HOCU	28.00	7.00	10.00	0.00	16.00	33.00

Table 8-10. Summary of Passive Restoration Activities from 2013-2017 for HA 19

Species	Pounds of Seed Broadcast					
	SSRP Target	2013 (Jan)	2013 (Nov)	2015	2016	Total by Species
LUAR	-	-	-	-	3.00	3.00
LUNA	-	-	-	-	1.00	1.00
SAME	14.00	3.50	5.00	0.00	4.00	12.50
STCE	70.00	17.50	0.00	0.00	0.00	17.50
TOTAL	**517.00**	**132.20**	**147.50**	**0.20**	**114.00**	**393.90**

[1]HMP species

Active restoration was completed in 2014. Plants were installed in 2013 and 2014. The total number of plants installed at HA 19 was 2,930 compared to 2,462 prescribed in the SSRP. Table 8-11 shows the number of plants installed at HA 19.

Table 8-11. Summary of Active Restoration from 2013-2017 for HA 19

Species	Number of Individual Plants			
	SSRP Target	2013	2014	Total by Species
ACMI	75	117	0	117
ACGL	250	250	0	250
ADFA	100	37	63	100
ARPU[1]	80	255	0	255
ARTO	150	24	126	150
ARCA	52	68	0	68
BAPI	150	150	0	150
CERI[1]	50	66	53	119
CRSC	250	250	5	255
DIAU	250	262	0	262
ELGL	55	138	0	138
ERER	50	33	25	58
ERFA[1]	50	97	0	97
ERCO	200	186	14	200
HOCU	250	9	241	250
LUAL	0	0	9	9
SAME	250	227	25	252
STCE	200	200	0	200
TOTAL	**2,462**	**2,369**	**561**	**2,930**

[1]HMP species

8.2.2 Monitoring Results

8.2.2.1 HMP Annual Density

Monterey spineflower and sand gilia restoration plots were monitored for density. Monitoring at HA 19 was completed for year 4 for Monterey spineflower and year 3 for sand gilia in 2017.

Nine Monterey spineflower plots were surveyed for year 4 density at HA 19 in 2017. The plots are numbered 1-9 on Figure 8-9 and located throughout HA 19. Monterey spineflower density was low at Plot 4, high at Plots 1, 2, and 3, and very high at Plots 5, 6, 7, 8, and 9. Figure 8-10 presents all the Monterey spineflower restoration plot densities for HA 19.

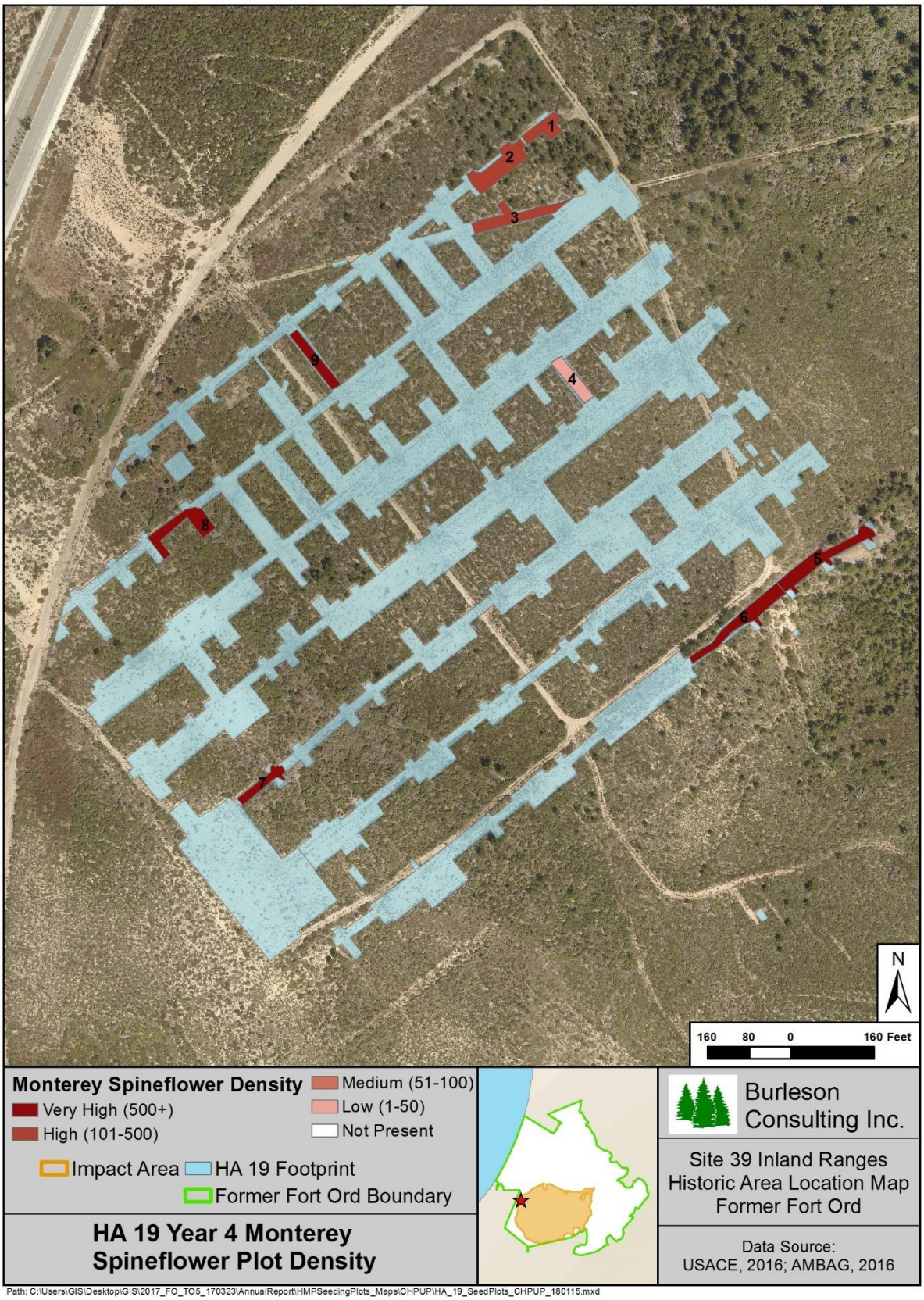


Figure 8-9. HA 19 Year 4 Monterey Spineflower Plot Density

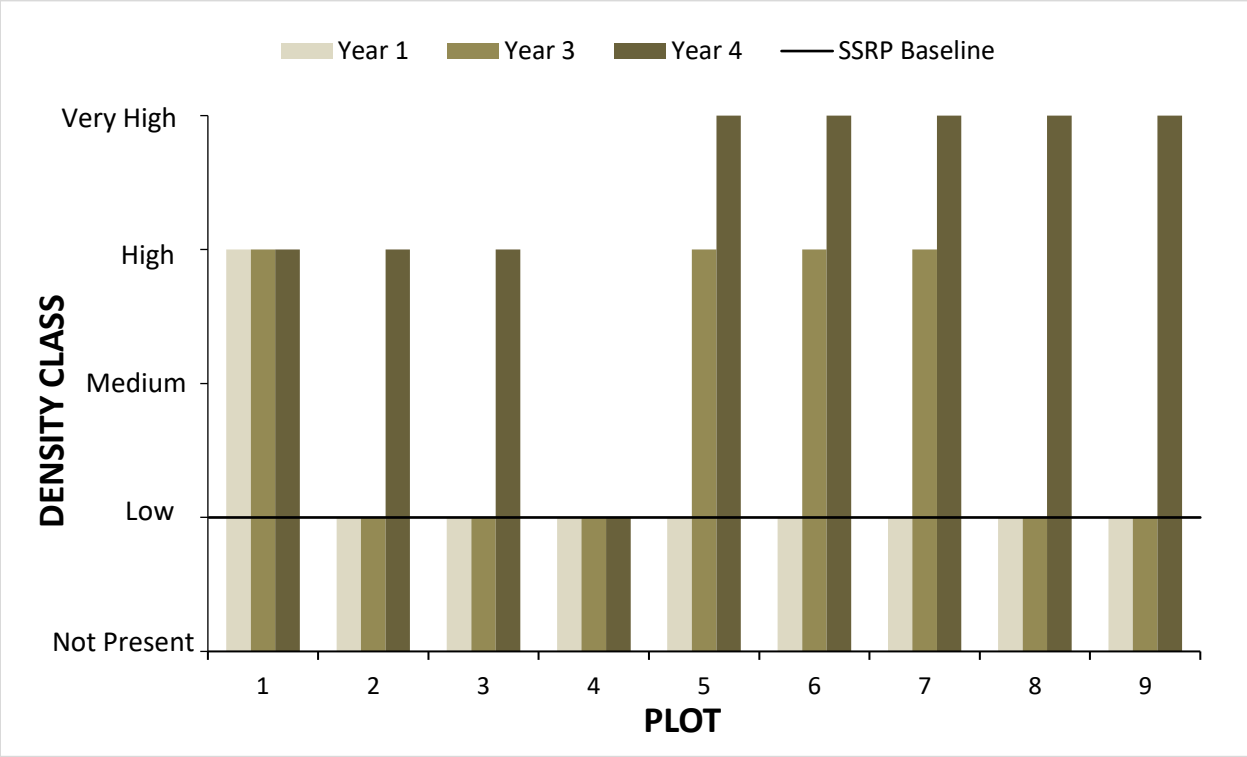


Figure 8-10. HA 19 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline Density Class for Years 1, 3, and 4 at Restoration Plots 1-9. Year 2 Data Were Not Collected.

Nine sand gilia plots were surveyed for year 3 density at HA 19 in 2017. The plots are numbered 1-9 on Figure 8-11 and are primarily located on the southwestern part of the site. Sand gilia densities were low at Plots 1, 3, 4, 5, 6, 7, 8, and 9 and medium at Plot 2. Figure 8-12 presents all the sand gilia restoration plot densities for HA 19.

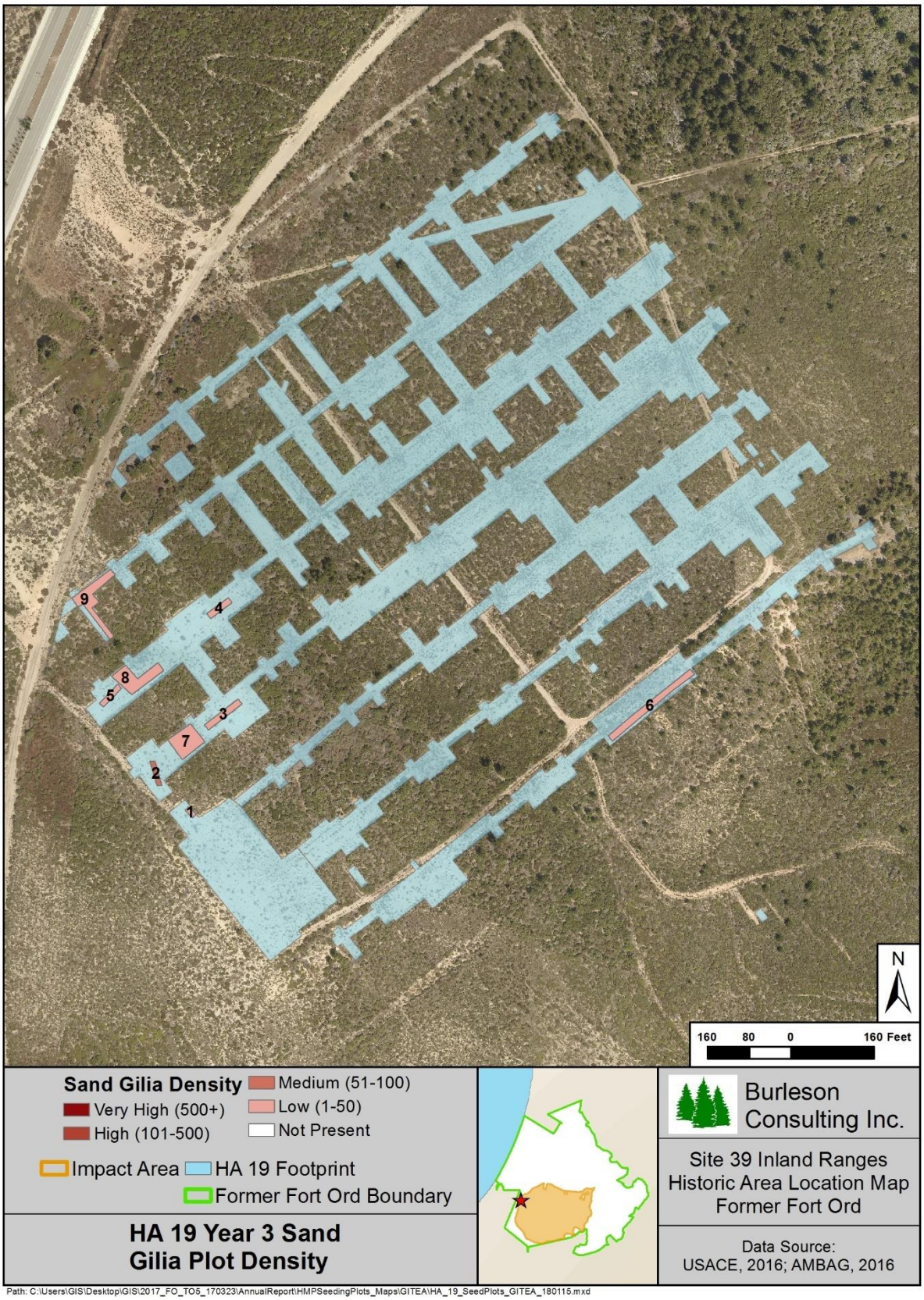


Figure 8-11. HA 19 Year 3 Sand Gilia Plot Density Map

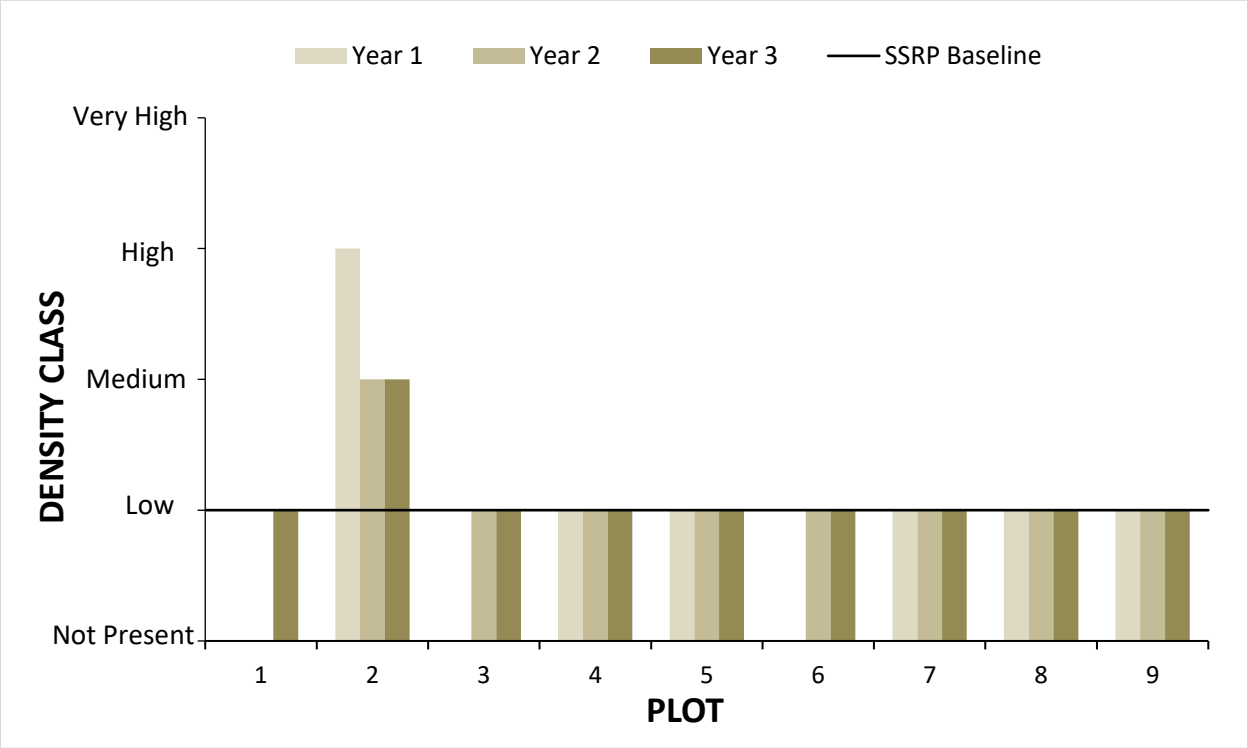


Figure 8-12. HA 19 Comparison of Sand Gilia Density Classes to the SSRP Baseline Density Class for Years 1, 2, and 3 at Restoration Plots 1-9

HMP annual density monitoring includes mapping discrete patches of HMP annuals within the restoration site but outside of the HMP annual restoration plots. This survey was completed for sand gilia and Monterey spineflower. Thirteen discrete patches of sand gilia were mapped and individuals counted within each patch (see Figure 8-13). The densities ranged from low to medium. The total acreage of sand gilia patches with a density at or above the SSRP baseline density class of low was 0.23 acre. Both the density class range and total acreage increased. In 2016, no sand gilia were found outside the restoration plots.

The Monterey spineflower population was very dense and patches were indistinguishable throughout HA 19. Therefore, Burleson biologists used the circle plot method to evaluate density across the site. The circle plot data were used in ArcMap to create a Monterey spineflower plant density interpolation model using the interpolation tool, spline with barriers. Figure 8-14 presents results of the circle plot data and density interpolation model for Monterey spineflower.

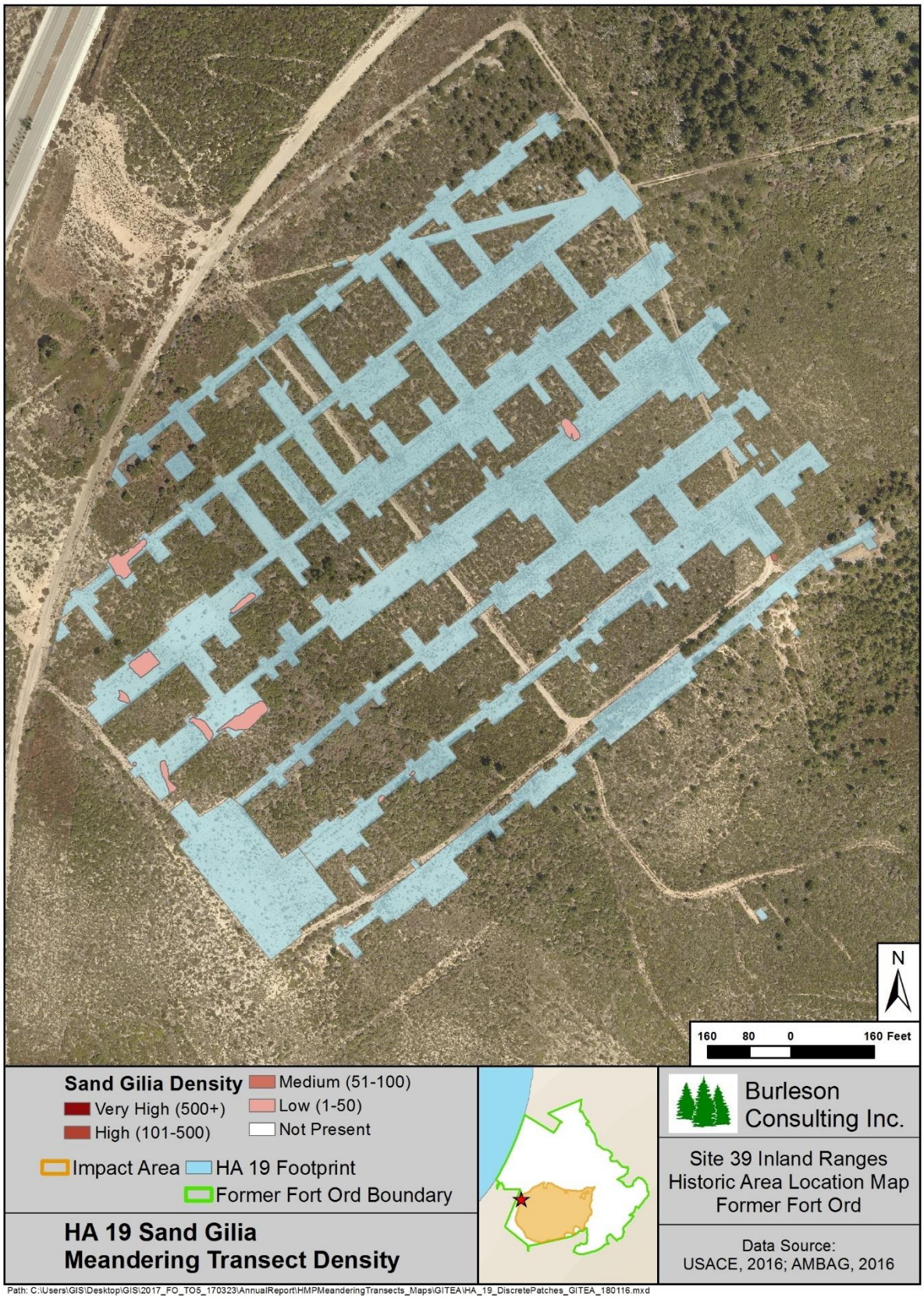


Figure 8-13. HA 19 Sand Gilia Meandering Transect Density Map

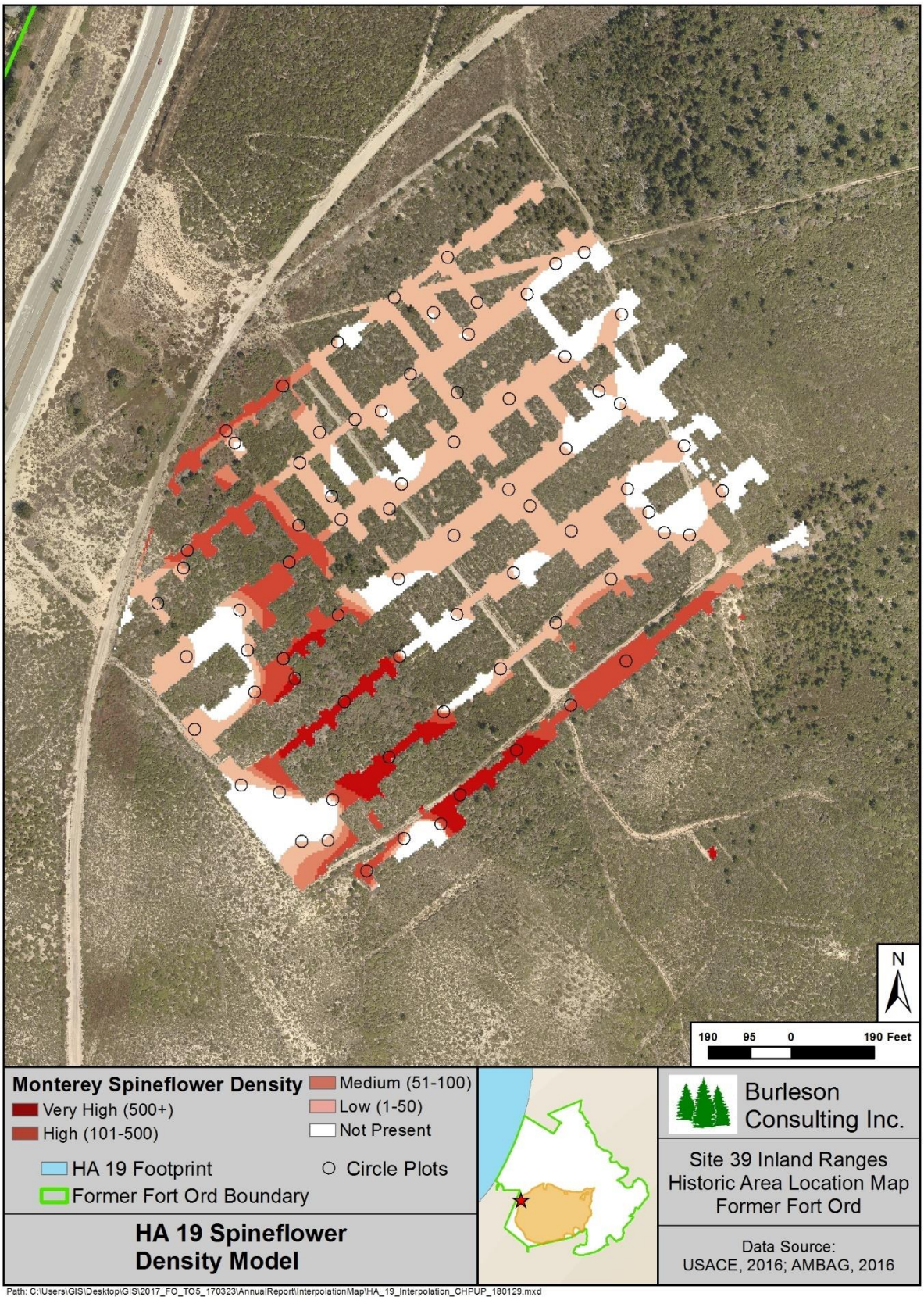


Figure 8-14. HA 19 Monterey Spineflower Density Model Map

8.2.2.2 Plant Survivorship

Plant survivorship monitoring was completed at HA 19 for plants installed in 2013 and 2014. A total of nine shrub species and 207 individual plants were monitored for survivorship. By year three monitoring, 60% of the 2013 plants were alive and 20% of the 2014 plants were alive. Survivorship monitoring is complete for both plantings. Table 8-12 and Table 8-13 present results by species.

Table 8-12. Plant Survivorship Monitoring Summary and Results for 2013 Planting at HA 19

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2013)	Year Two (2014)	Year Three (2015)
			Alive (%)	Alive (%)	Alive (%)
ADFA	37	32	47	63	63
ARCA	68	20	10	15	35
ARPU[1]	255	30	60	77	80
ARTO	24	10	30	80	70
BAPI	150	20	35	50	65
CERI[1]	66	30	23	20	27
ERER	33	20	75	70	70
ERFA[1]	97	20	70	90	95
SAME	227	20	55	45	35
TOTAL	**957**	**202**	**45***	**57***	**60***

*average
[1]HMP species

Table 8-13. Plant Survivorship Monitoring Summary and Results for 2014 Planting at HA 19

Species	Planted	Monitored	Year One (2014)	Year Two (2015)	Year Three (2016)
			Alive (%)	Alive (%)	Alive (%)
ADFA	63	5	40	20	20
TOTAL	**63**	**5**	**40***	**20***	**20***

*average

8.2.2.3 Species Richness

Seventy-nine species were observed at HA 19. Of those, 35 were native shrubs or perennials, 23 were native annual herbaceous species, 20 were non-native species, and one was not catergorized as it was only identified to genus (see Table 8-14). Species richness increased by nineteen species since 2016. However, native shrub and perennial species decreased by five, native herbaceous species increased by 13, and non-native species increased by ten.

Table 8-14. Species Observed at HA 19, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Bromus diandrus	ripgut brome	BRDI
Bromus hordaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Calandrinia menziesii	red maids	CAME
Camissoniopsis micrantha	small primrose	CAMI
Cardionema ramosissimum	sand mat	CARA
Carex sp.		CA
Carpobrotus edulis	Ice plant	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Cirsium occidentale	cobwebby thistle	CIOC
Claytonia perfoliata	miner's lettuce	CLPE
Clinopodium douglasii	yerba buena	CLDO
Conicosia pugioniformis	narrowleaf iceplant	COPU
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	pampas grass	COJU
Crassula aquatica	water pygmy-weed	CRAQ
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Cryptantha clevelandii	Cleveland's cryptantha	CRCL
Cryptantha micromeres	minute-flowered cryptantha	CRMI
Dichelostemma capitatum	blue dicks	DICA
Diplacus aurantiacus	sticky monkeyflower	DIAU
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW
Elymus glaucus	blue wild-rye	ELGL
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filareee	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Frangula californica	California coffeeberry	FRCA
Gamochaeta ustulata	purple cudweed	GAUS
Gilia tenuiflora ssp. *arenaria*[1]	Monterey gilia	GITEA
Heterotheca grandiflora	telegraph weed	HEGR

Table 8-14. Species Observed at HA 19, 2017

Scientific Name	Common Name	Code
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Layia platyglossa	tidy-tips	LAPL
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus albifrons var. *albifrons*	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus nanus	sky lupine	LUNA
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia sativa	coast tarweed	MASA
Marah fabacea	wild cucumber	MAFA
Navarretia hamata	hooked navarretia	NAHA
Nuttallanthus texanus	blue toadflax	NUTE
Pinus radiata	Monterey pine	PIRA
Plantago erecta	California plantain	PLER
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium californicum	California cudweed	PSCA
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium stramineum	cotton-batting plant	PSST
Psilocarphus tenellus	slender woolly-marbles	PSTE
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Schismus barbatus	old han schismus	SCBA
Silene gallica	small-flower catchfly	SIGA
Sonchus asper	prickly sow thistle	SOAS
Stipa pulchra	purple needle grass	STPU
Toxicodendron diversilobum	poison oak	TODI

[1] HMP species

8.2.2.4 Vegetative Cover

Burleson completed 14 50-meter line-intercept transects at HA 19. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 34.42%. The mean vegetative cover by native shrubs and perennials was greater in 2017 than 2016 by 0.76%. Table 8-15 presents a summary of vegetation cover and Table 8-16 presents vegetation cover by species. Figure 8-15 presents the percent cover of the dominant species at HA 19 in 2016 and 2017.

Table 8-15. Transect Survey Summary for HA 19

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA19T01	21.74	21.74	0.00	0.00	35.06	56.12
HA19T02	35.06	35.06	0.00	0.00	54.72	34.88
HA19T03	53.36	51.90	1.46	0.00	64.26	19.72
HA19T04	28.74	28.74	0.00	0.00	37.58	47.14
HA19T05	27.84	25.74	2.10	0.00	31.46	54.48
HA19T06	53.86	53.86	0.00	0.00	58.44	31.56
HA19T07	27.20	25.26	1.94	0.00	37.10	55.26
HA19T08	40.14	40.14	0.00	0.00	56.18	35.88
HA19T09	55.84	55.84	0.00	0.00	60.68	35.92
HA19T10	25.08	25.08	0.00	0.00	52.08	44.08
HA19T11	44.06	42.10	1.96	0.00	54.94	42.74
HA19T12	35.34	35.34	0.00	0.00	81.80	15.24
HA19T13	17.22	17.22	0.00	0.00	23.66	67.06
HA19T14	23.88	23.88	0.00	0.00	40.64	49.60
SITE AVERAGE	**34.95**	**34.42**	**0.53**	**0.00**	**49.19**	**42.12**

Table 8-16. Transect Survey Results for HA 19 by Species

Transect	ACMI (%)	ACGL (%)	ADFA (%)	ARCA (%)	ARPU[1] (%)	ARTO (%)	BAPI (%)	CA sp. (%)	CEDE (%)	CERI[1] (%)	CHPUP[1] (%)	COFI (%)	CRSC (%)	DIAU (%)	ERFA[1] (%)	ERCO (%)	HOCU (%)	LUAL (%)	PSBE (%)	SAME (%)	TODI (%)	TH (%)	BG (%)
HA19T01	0.00	4.04	0.00	0.00	6.18	1.36	0.00	0.00	0.00	0.00	0.00	0.00	3.28	1.64	0.00	0.00	0.52	0.00	0.00	0.00	4.72	35.06	56.12
HA19T02	0.96	9.44	0.00	1.40	6.32	3.72	1.24	0.00	0.00	0.00	0.00	0.00	6.96	0.00	0.00	0.80	0.00	0.00	0.00	4.22	0.00	54.72	34.88
HA19T03	0.00	7.00	0.00	0.00	4.60	2.48	0.30	0.00	3.12	0.00	0.00	1.46	27.38	0.00	0.00	1.34	0.96	2.64	0.00	2.08	0.00	64.26	19.72
HA19T04	0.00	2.18	0.00	0.00	11.92	5.24	0.22	0.00	3.08	0.00	0.00	0.00	3.50	0.00	0.00	2.02	0.58	0.00	0.00	0.00	0.00	37.58	47.14
HA19T05	0.00	10.30	0.00	0.00	3.26	0.00	0.00	0.00	0.00	0.36	0.00	2.10	10.06	0.00	0.00	1.18	0.00	0.00	0.00	0.58	0.00	31.46	54.48
HA19T06	0.00	3.86	0.26	0.00	11.06	2.02	0.00	0.00	3.20	0.00	0.00	0.00	33.26	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	58.44	31.56
HA19T07	0.00	1.78	0.00	0.00	7.32	0.96	0.00	0.00	0.46	0.30	0.00	1.94	12.48	0.00	0.00	1.48	0.20	0.00	0.28	0.00	0.00	37.10	55.26
HA19T08	0.00	0.60	0.00	0.00	8.68	1.58	0.00	0.00	3.38	0.00	0.00	0.00	24.58	0.00	0.00	1.32	0.00	0.00	0.00	0.00	0.00	56.18	35.88
HA19T09	0.00	13.60	0.98	0.00	15.32	1.86	0.00	0.00	0.00	0.00	0.00	0.00	22.90	0.00	0.00	0.68	0.00	0.50	0.00	0.00	0.00	60.68	35.92
HA19T10	0.00	4.02	0.00	0.00	4.44	0.68	0.28	0.00	4.20	0.00	0.00	0.00	8.28	0.00	0.00	1.66	0.52	0.00	0.00	1.00	0.00	52.08	44.08
HA19T11	0.00	8.22	0.00	0.00	2.74	1.88	0.00	0.00	0.00	0.00	1.96	0.00	8.20	0.00	0.00	0.40	0.00	2.74	0.00	17.92	0.00	54.94	42.74
HA19T12	0.38	23.46	0.00	0.00	6.64	1.16	0.00	0.00	0.00	0.00	0.00	0.00	2.82	0.00	0.00	0.36	0.28	0.00	0.00	0.00	0.24	81.80	15.24
HA19T13	0.00	1.10	0.00	0.00	1.24	0.66	0.00	0.00	0.00	0.00	0.00	0.00	11.22	0.00	2.18	0.82	0.00	0.00	0.00	0.00	0.00	23.66	67.06
HA19T14	0.00	1.46	0.00	0.00	9.20	0.24	0.38	0.40	0.00	0.00	0.00	0.00	6.50	0.00	0.00	0.68	0.00	5.02	0.00	0.00	0.00	40.64	49.60
SITE AVERAGE	0.10	6.50	0.09	0.10	7.07	1.70	0.17	0.03	1.25	0.05	0.14	0.39	12.96	0.12	0.16	0.91	0.23	0.78	0.02	1.84	0.35	49.19	42.12

[1]HMP species

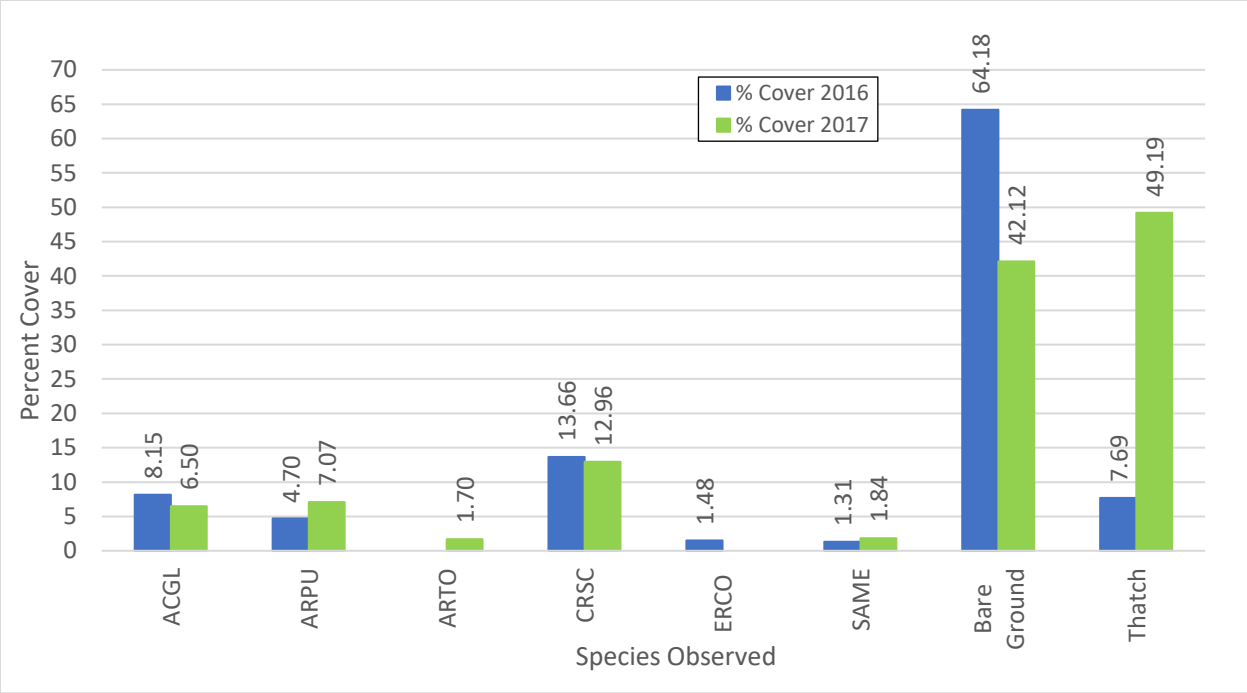


Figure 8-15. Percent Cover of Dominant Species at HA 19 in 2016 and 2017. Species codes and names are provided in Table 8-14.

8.2.3 Discussion

8.2.3.1 HMP Annual Density

Monterey spineflower density was within the acceptable limits for HMP annual density at HA 19. The SSRP baseline density class for Monterey spineflower was low. The Monterey spineflower restoration plots show that by year 4, all plots have met or exceeded the success criterion. It should be noted that Monterey spineflower was not monitored in year 2 due to conflicting instructions between the SSRP and the Protocol for Conducting Vegetation Monitoring. A clarification was made that the HMP annual plots should be monitored for density according to the SSRP. However, this clarification did not occur until after the peak bloom for Monterey spineflower. In addition, the Monterey spineflower population outside of the restoration plots has responded very well. The circle plot data results indicated areas of Monterey spineflower densities ranging from not present to very high. The density model that interpolates the circle plot data indicates that more than 10% of the overall area of HA 19 is being utilized by Monterey spineflower (see Figure 8-14). Overall, the HA is meeting the success criterion across the site for Monterey spineflower density.

Sand gilia density is within the acceptable limits for HMP annual density at HA 19. The SSRP baseline density class for sand gilia was low. The sand gilia restoration plot results show that by year 3 all plots densities met or exceeded the success criterion. In addition, sand gilia was present outside of the restoration plots. Discrete patches, with densities that either met or exceeded the success criterion, covered 0.23 acre of HA 19.

8.2.3.2 Plant Survivorship

Plant survivorship results indicate that 60% of plants installed in 2013 were still alive after three years of monitoring. However, for plants installed in 2014, only 20% were alive. The 2014 planting was an

additional effort to meet the planting target for chamise. The percentage of total monitored chamise plantings still alive by 2016 was 58% (combining both planting events).

Plant survivorship increased from 46% in year 1, to 54% in year 2, and to 58% in year 3. The increase in survivorship was attributed to some plants being recorded as dead in year 1 but then recorded as alive in years 2 and 3 because they showed new growth.

The three plant species that had low survivorship (California sagebrush, Monterey ceanothus, and black sage) appear to be more sensitive to high winds than the other species. It should be noted that Monterey ceanothus had low survivorship at multiple sites. Wind erosion was evident with signs of wind scour and deposition of sand, making it difficult for plants to get established at HA 19. If future plantings occur, it is recommended that wind breaks be installed to protect the plants from high winds and wind erosion.

8.2.3.3 Species Richness

Chamise, sandmat manzanita, shaggy-barked manzanita, California sagebrush, Monterey ceanothus, mock heather, Eastwood's goldenbush, golden yarrow, deerweed, sticky monkeyflower, coast live oak, and black sage were present. Pitcher sage (*Lepechinia calycina*) was not present. HA 19 included 35 native shrub and perennial species; however, it did not meet the success criterion for objective 1 because pitcher sage was not present.

8.2.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes twenty shrub and perennial species presented in Table 2 of the HA 19 SSRP (Burleson, 2013). Currently, these species comprise 32.13% cover of the HA. This success criterion is on an excellent trajectory but is not yet met. In 2016 the vegetative cover was 31.46%. Cover has increased by 0.67% (see Figure 8-16).

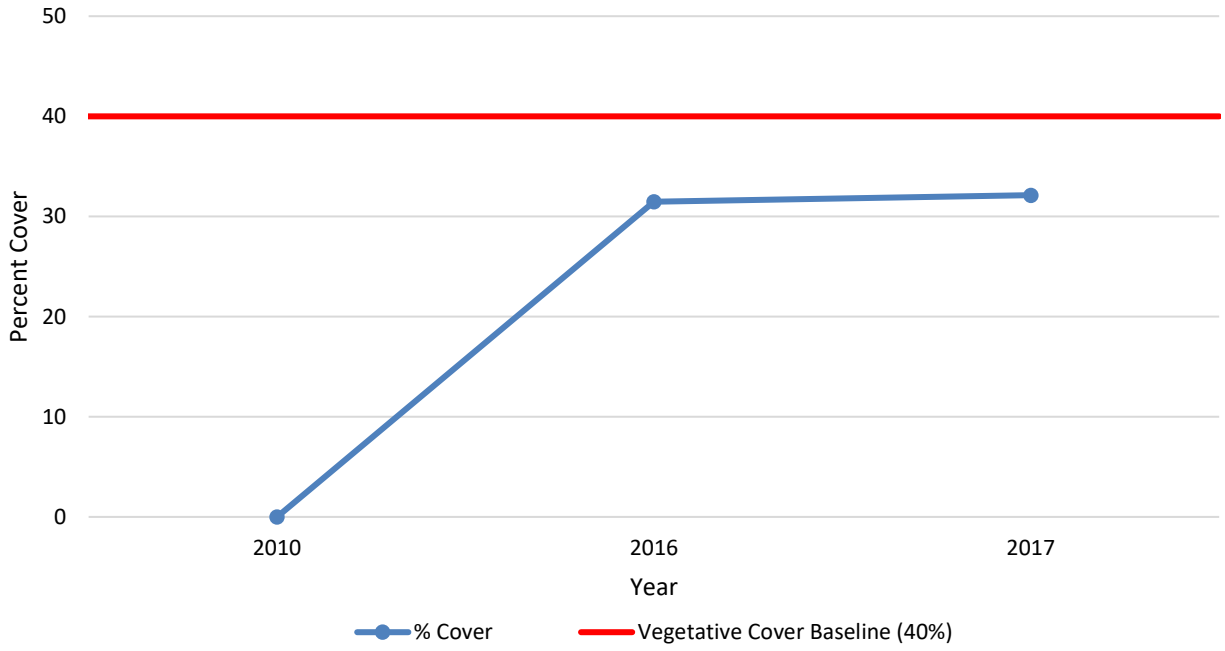


Figure 8-16. Native Vegetative Cover Compared to the Success Criterion at HA 19

Objective 2 considers the percent cover of non-native target weeds. No target weeds were encountered during the transect surveys, resulting in 0.00% vegetative cover. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class met or exceeded the baseline cover class of 3. Cover class 3 is from 6-25% of absolute cover. The HMP shrub species at HA 19 are providing an absolute cover of 7.27%; therefore, the HA met this success criterion. This is an increase by 2.47% from 2016 when the HA did not meet the success criterion. The second success criterion is no net loss of HMP shrubs. For HA 19 this means a vegetative cover average of at least 16% cover for sandmat manzanita (*Arctostaphylos pumila*) and presence of Monterey ceanothus (*Ceanothus rigidus*) and Eastwood's goldenbush (*Ericameria fasciculata*). The average vegetative cover for sandmat manzanita was 7.07%, for Monterey ceanothus 0.05%, and for Eastwood's goldenbush 0.16% (see Figure 8-17). All three species increased in cover from 2016 to 2017. In 2017, two of the three species, Monterey ceanothus and Eastwood's goldenbush, met the acceptable limit. The success criterion was not met because sandmat manzanita has not yet reached 16% cover but there has been measured improvement.

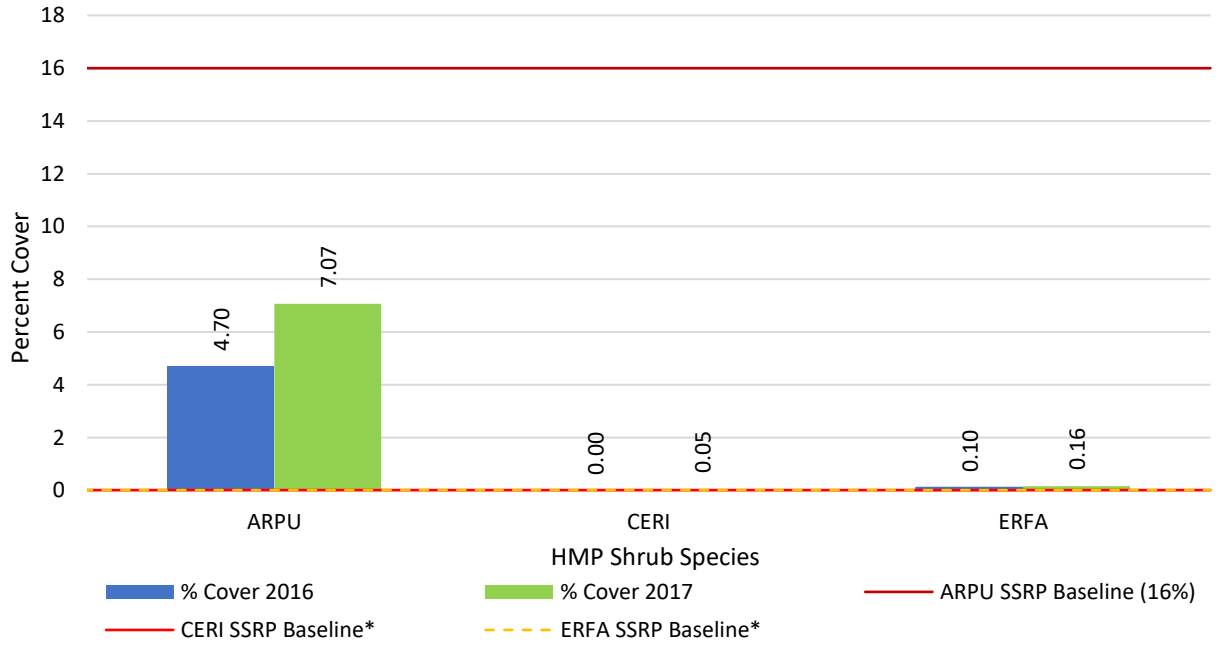


Figure 8-17. HMP Shrub Species Comparison to Success Criteria at HA 19

8.2.3.5 Recommendations

HA 19 was in year 4 of monitoring in 2017 and had responded well to the previous restoration efforts. The restored area met four of the six success criteria by 2017, two more than had been achieved by 2016. The Army recommends two actions to support HA 19 in achieving all success criteria in future years: 1) conducting the fifth year of monitoring prior to finalizing the SSRP seed broadcast prescription, and 2) closing the access road. A fifth year of monitoring at HA 19 will elucidate whether natural recruitment has supported restoration efforts enough to negate the need for more seed broadcast, despite being below the SSRP target. Since this is a possibility, the Army recommends delaying seed broadcast until monitoring results clarify that need. Overall, HA 19 requires more time to respond to the restoration effort and continued monitoring to evaluate areas that may need additional effort. A

qualitative overview is documented by the reference photo points (see Appendix D). The photos illustrate progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover line-intercept transects in year 5.

Table 8-17 summarizes the current status of HA 19 including which success criteria have been met as well as our recommendation to move towards meeting success criteria.

Table 8-17. Status and Recommendations for Achieving the Success Criteria at HA 19

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant pitcher sage (scheduled 2018)
Objective 1 – No. 2	Native vegetation cover	Yes	None
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	Yes	None
Objective 3 – No. 4	HMP shrub cover by species	No	Wait to see how the HA responds
Objective 3 – No. 4	HMP annual density	Yes	None

8.3 HA 22

HA 22 was used by the Army as a long-distance small-arms firing range with targets and no berm. Soil remediation was completed in 2010 and resulted in 100 cubic yards of lead-contaminated soil being excavated from 0.05 acre (Shaw, 2008). HA 22 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 22 is relatively flat with a northwest and west aspect. The adjacent lands are not developed and contain substantial amounts of intact native vegetation that will promote natural recruitment at the restoration areas.

HA 22 is located in the western portion of Site 39, occurring within sand hill formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

Passive restoration was prescribed at HA 22, and consisted of hand-broadcast non-irrigated seed and annual weed management activities. HA 22 is relatively flat with little potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 22 occurred in 2011 and 2012. Monitoring at HA 22 began in 2012. It has been monitored for seven years by photo documentation and site visits, five years for HMP annual density in plots, two years for HMP annual density across the HA, two years for species richness, and two years for vegetative cover (see Table 8-18). Figure 8-18 shows the historic area footprint, passive restoration area and transect monitoring locations. Success criteria for HA 22 are summarized in Table 8-19.

Table 8-18. Historic Summary of Restoration and Monitoring Activities at HA 22

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2011	2012	2013	2014	2015	2016	2017	2020	2025
Restoration: Passive	●	●							
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
HMP Annual Density across HA						●	●	●	
Species Richness						●	●	●	●
Vegetative Cover							●	●	●

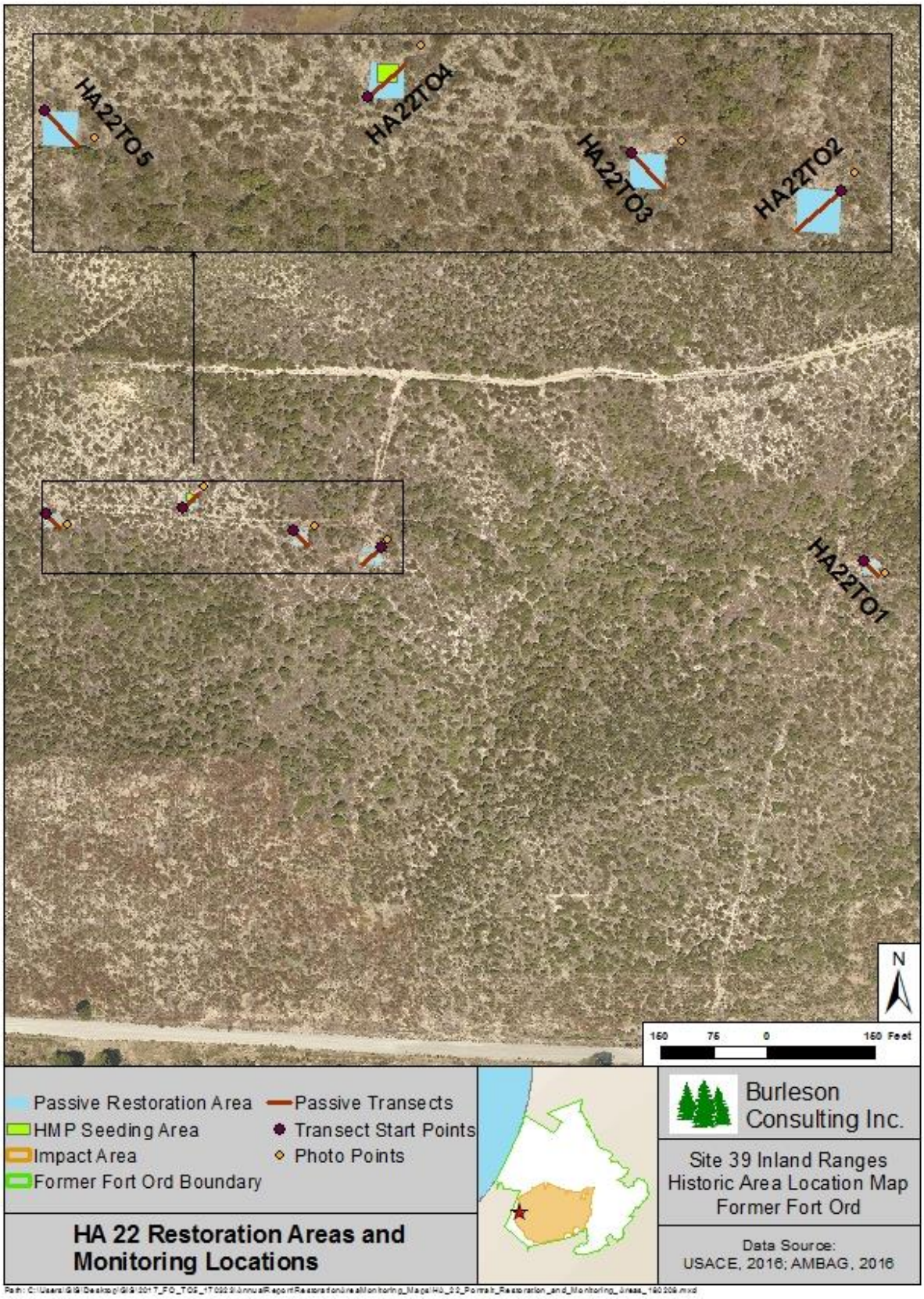


Figure 8-18. HA 22 Restoration Areas and Monitoring Locations Map

Table 8-19. Success Criteria and Acceptable Limits for Restoration of HA 22

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			shaggy-bark manzanita
			sandmat manzanita[2]
			Coyote brush
			Monterey ceanothus[2]
			dwarf ceanothus
			Monterey spineflower[2]
			mock heather
			Eastwood's goldenbush[2]
			golden yarrow
			peak rush-rose
			deerweed
			sticky monkeyflower
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or lessthan 5 percent [whichever is lower]	Baseline data did not indicate non-native target weed species. No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 20.

Table 8-19. Success Criteria and Acceptable Limits for Restoration of HA 22

			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 4.
			Eastwood's goldenbush percent cover, as an average of transect data, must be equal or greater than 1.
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.3.1 Restoration Activities

Burleson performed passive restoration at HA 22 for two years with seed broadcast in 2011 and 2012. No additional restoration activities occurred at HA 22 in 2017. The total amount of seed broadcast on the site is 1.219 lb compared to the 1.243 lb prescribed in the SSRP. No active restoration activities have been completed for HA 22. Table 8-20 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. Burleson performed passive restoration for the HMP annual species Monterey spineflower. The plot was chosen in the HA based on having suitable habitat for Monterey spineflower and adjacent extant populations.

Table 8-20. Summary of Passive Restoration Activities from 2011-2017 for HA 22

Species	Pounds of Seed Broadcast			
	SSRP Target	2011	2012	Total by Species
ACGL	0.100	0.051	0.059	0.110
ACMI	0.050	0.026	0.032	0.058
ADFA	0.050	0.028	0.032	0.060
ARPU[1]	0.050	0.027	0.04	0.067
ARTO	0.100	0.052	0.062	0.114
BAPI	0.008	0.000	0.006	0.006
CERI[1]	0.050	0.028	0.028	0.056
CHPUP[1]	0.001	0.011	0.005	0.016
CRCA	0.050	0.026	0.032	0.058
CRSC	0.050	0.028	0.029	0.057
DIAU	0.005	0.016	0.025	0.041
ERCO	0.015	0.011	0.012	0.023
ERER	0.013	0.009	0.014	0.023
ERFA[1]	0.001	0.000	0.002	0.002

Table 8-20. Summary of Passive Restoration Activities from 2011-2017 for HA 22

Species	Pounds of Seed Broadcast			
	SSRP Target	2011	2012	Total by Species
HOCU	0.100	0.051	0.058	0.109
Hordeum sp.	0.450	0.000	0.239	0.239
SAME	0.050	0.037	0.032	0.069
STCE	0.100	0.051	0.06	0.111
TOTAL	**1.243**	**0.452**	**0.767**	**1.219**

[1]HMP species

8.3.2 Monitoring Results

8.3.2.1 HMP Annual Density

One Monterey spineflower plot was surveyed for year 5 density at HA 22 in 2017. The plot is numbered 1 on Figure 8-19 and is located in the central part of the site. Monterey spineflower density was high at Plot 1. Figure 8-20 presents Monterey spineflower restoration plot densities for HA 22.

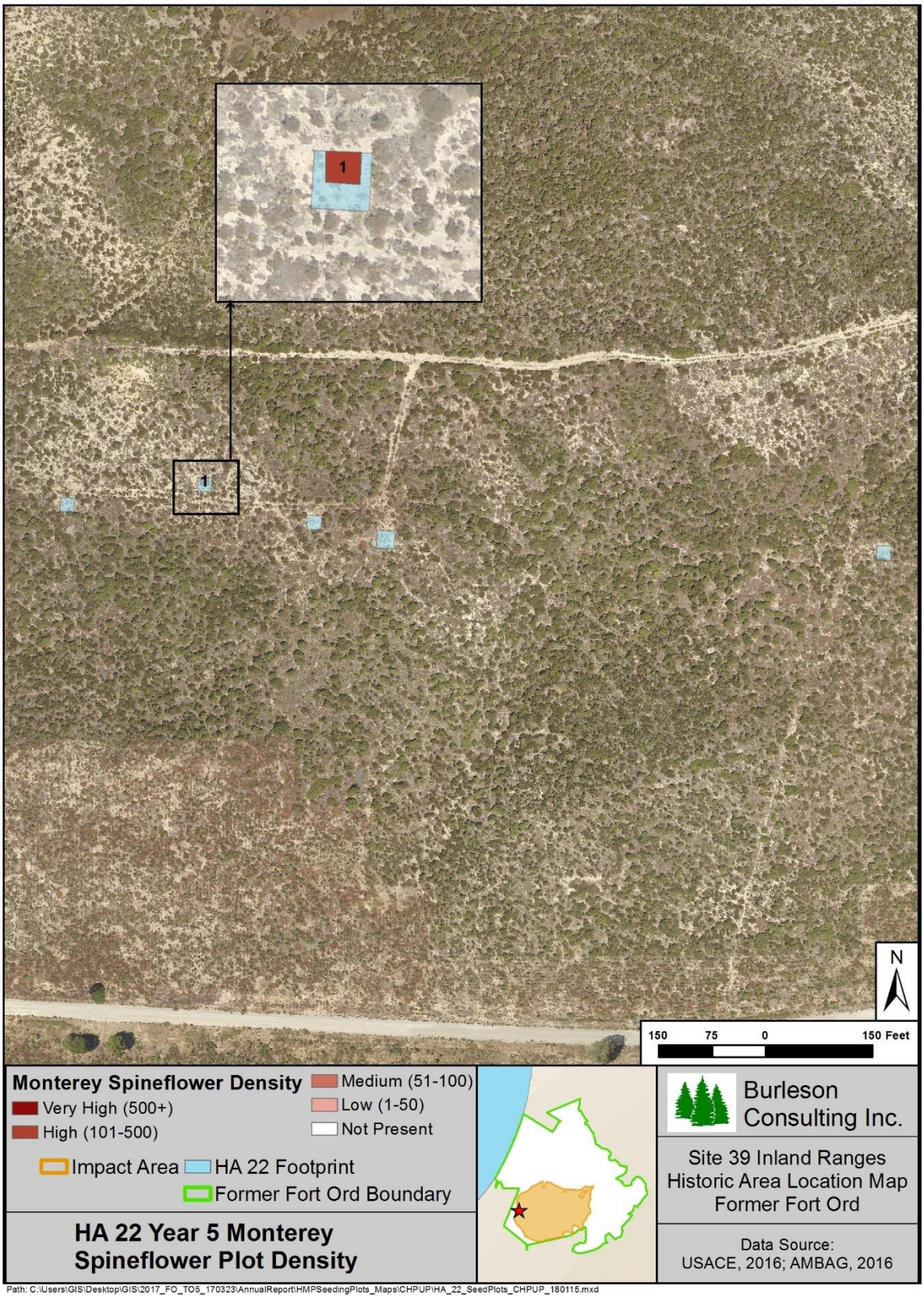


Figure 8-19. HA 22 Year 5 Monterey Spineflower Plot Density Map

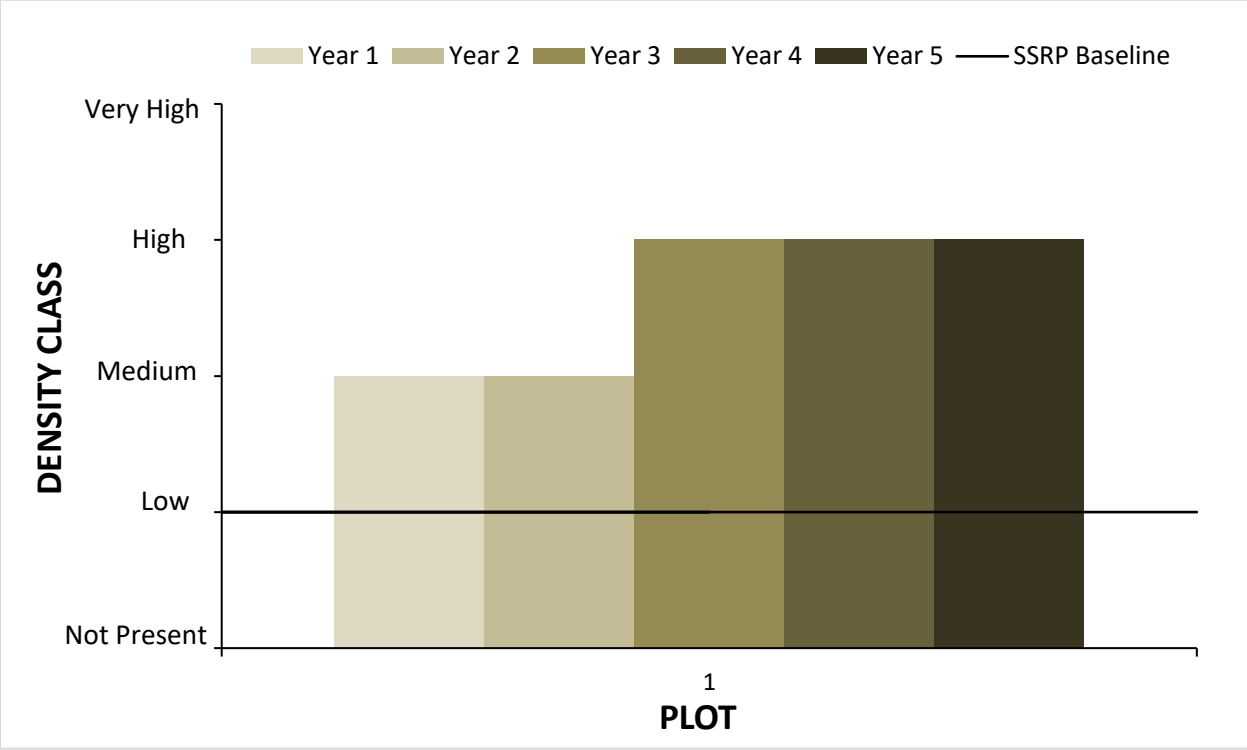


Figure 8-20. HA 22 Comparison of Monterey Spineflower Plot Density Classes to the SSRP Baseline Density Class for Years 1-5 at Restoration Plot 1

HMP annual density monitoring included mapping discrete patches of HMP annuals within the restoration area but outside of the HMP annual restoration plots. This survey was completed for Monterey spineflower and sand gilia. Five discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 8-21). The densities ranged from high to very high. The total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.06 acre. Both the density class and the acreage increased from 2016 to 2017.

Two discrete patches of sand gilia were mapped and individuals counted within each patch (see Figure 8-22). The densities were low. The total acreage of sand gilia patches with a density at the SSRP baseline density class of low was 0.01 acre. The total acreage increased from 0.004 acre in 2016.

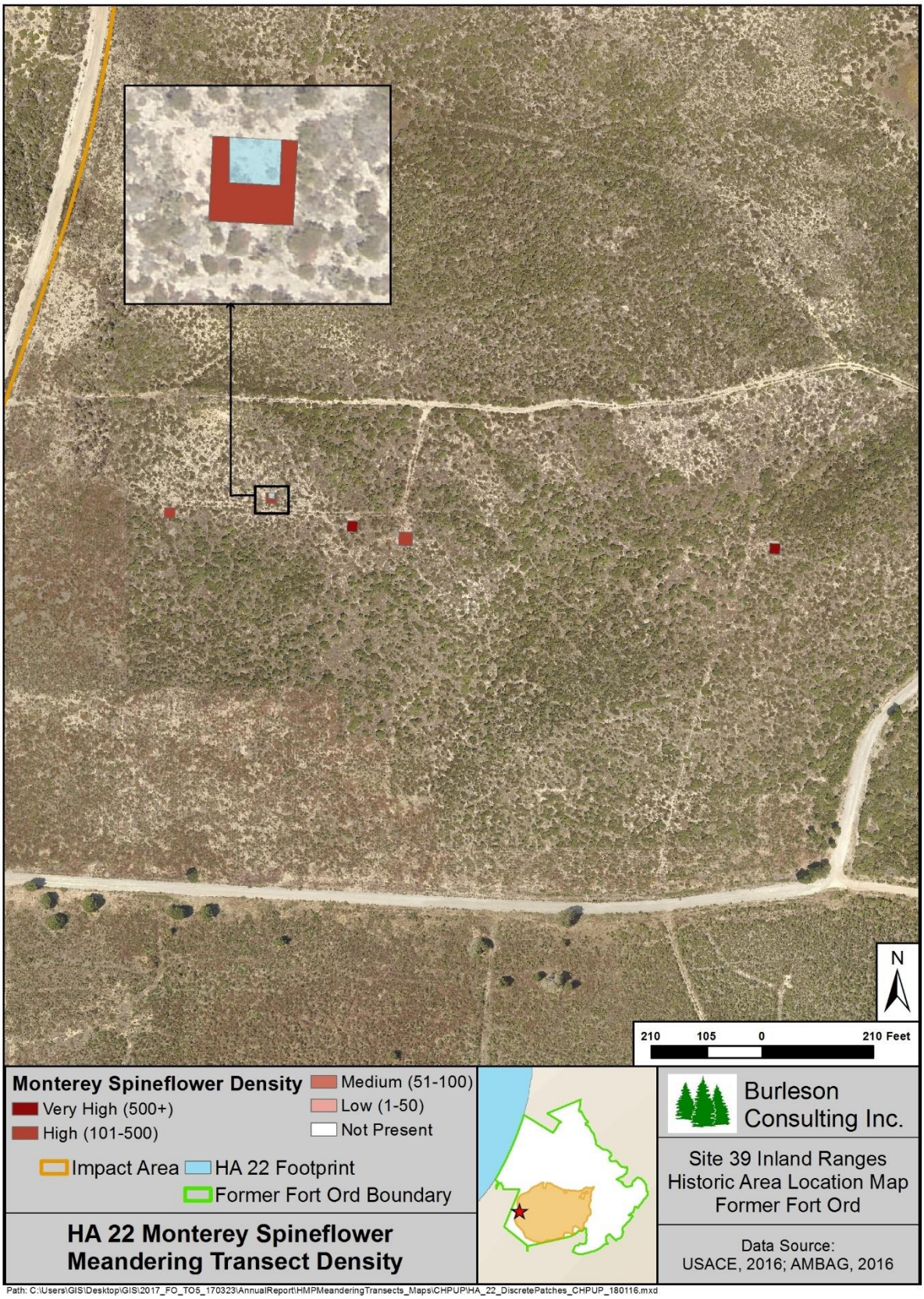


Figure 8-21. HA 22 Monterey Spineflower Meandering Transect Density Map

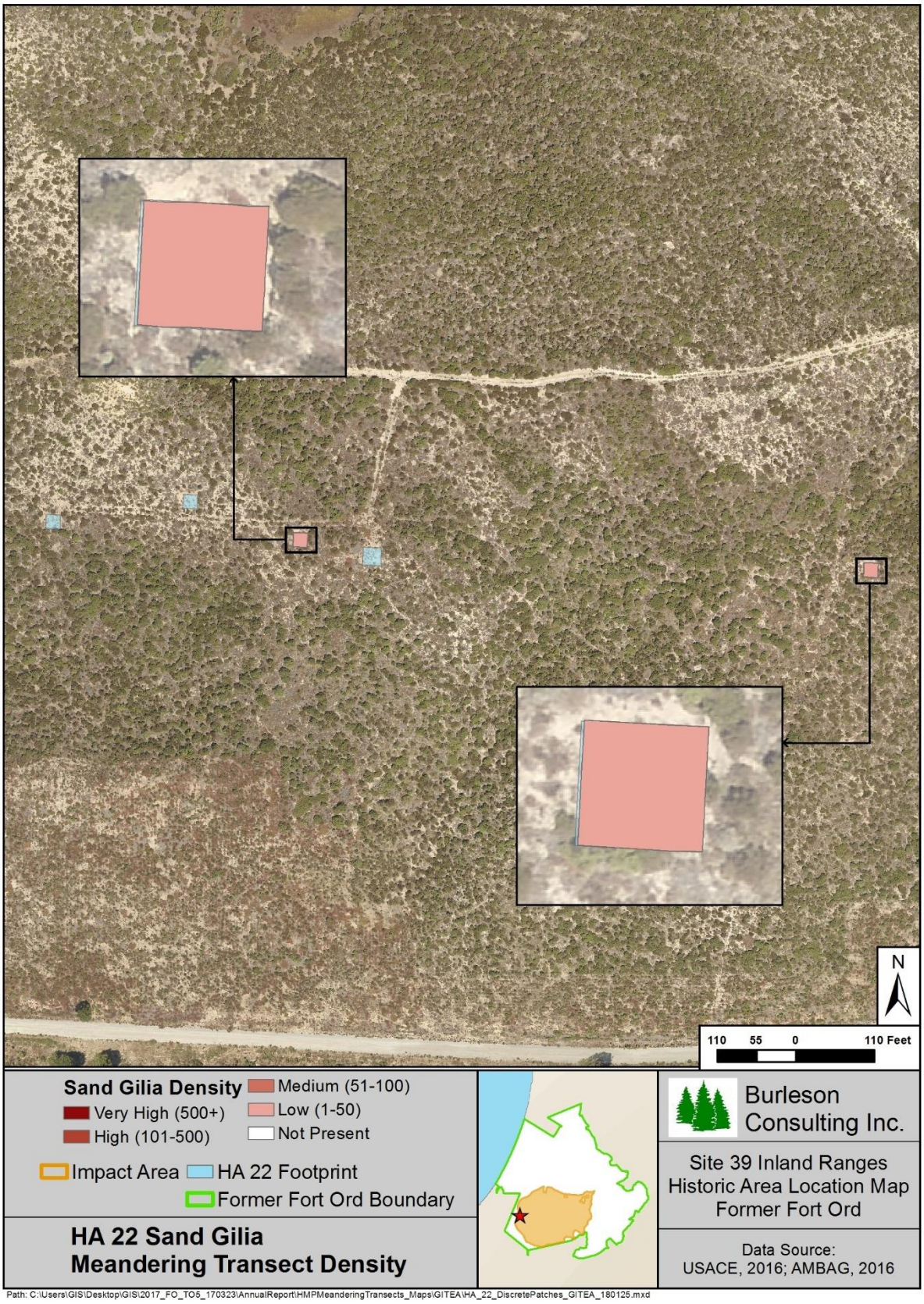


Figure 8-22. HA 22 Sand Gilia Meandering Transect Density Map

8.3.2.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.3.2.3 Species Richness

Thirty-five species were observed at HA 22 as shown on Table 8-21. Of those, 15 were native shrubs or perennials, 12 were native annual herbaceous species, and eight were non-native species (see Table 8-21). Species richness increased by 26 species since 2016. Native shrub and perennial species increased by eleven, native herbaceous species increased by eight, and non-native species increased by seven.

Table 8-21. Species Observed at HA 22, 2017

Scientific Name	Common Name	Code
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Artemisia pycnocephala	coastal sagewort	ARPY
Bromus diandrus	ripgut grass	BRDI
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Camissoniopsis micrantha	small primrose	CAMI
Cardionema ramosissimum	sand mat	CARA
Carpobrotus edulis	ice plant	CAED
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Corethrogyne filaginifolia	common sandaster	COFI
Crassula connata	pygmy-weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Croton californicus	California croton	CRCA
Cryptantha clevelandii	Cleveland's cryptantha	CRCL
Diplacus aurantiacus	sticky monkeyflower	DIAU
Eriastrum virgatum	virgate eriastrum	ERVI
Ericameria ericoides	mock heather	ERER
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium cicutarium	red-stemmed filareee	ERCI
Gilia tenuiflora ssp. *arenaria*[1]	Monterey gilia	GITEA
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus concinnus	bajada lupine	LUCO
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia sativa	coast tarweed	MASA
Navarretia hamata	hooked navarretia	NAHA
Nuttallanthus texanus	blue toadflax	NUTE
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Schismus barbatus	old han schismus	SCBA
Toxicodendron diversilobum	poison oak	TODI

[1]HMP species

8.3.2.4 Vegetative Cover

Burleson completed five line-intercept transects ranging from seven to 11 meters in length at HA 22. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 43.0%. The mean vegetative cover by native shrubs and perennials was substantially greater in 2017 than 2016 by 37.7%. However, only three quadrats rather than transects were completed in 2016. Table 8-22 presents the vegetation cover summary and Table 8-23 presents the vegetation cover by species. Figure 8-23 presents the percent cover of the dominant species at HA 22 in 2017.

Table 8-22. Transect Survey Summary for HA 22

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA22T01	18.00	18.00	0.00	0.00	56.13	40.25
HA22T02	57.82	57.82	0.00	0.00	80.09	14.73
HA22T03	64.29	64.29	0.00	0.00	55.00	26.43
HA22T04	35.44	33.11	2.33	0.00	18.11	52.89
HA22T05	40.13	40.13	0.00	0.00	38.75	43.13
SITE AVERAGE*	**43.49**	**43.00**	**0.49**	**0.00**	**50.88**	**34.65**

*Transect lengths are not equal. Site averages are weighted to reflect differing lengths.

Table 8-23. Transect Survey Results for HA 22 by Species

Transect	ACGL (%)	ARPU (%)	CHPUP (%)	CRCA (%)	DIAU (%)	ERER (%)	HOCU (%)	TH (%)	BG (%)
HA22T01	18.00	0.00	0.00	0.00	0.00	0.00	0.00	56.13	40.25
HA22T02	53.73	0.00	0.00	0.00	0.00	4.09	0.00	80.09	14.73
HA22T03	54.86	0.00	0.00	9.43	0.00	0.00	0.00	55.00	26.43
HA22T04	29.00	0.00	2.33	0.00	0.00	4.11	0.00	18.11	52.89
HA22T05	23.38	6.25	0.00	0.00	2.25	6.50	1.75	38.75	43.13
SITE AVERAGE	**36.44**	**1.16**	**0.49**	**1.53**	**0.42**	**3.12**	**0.33**	**50.88**	**34.65**

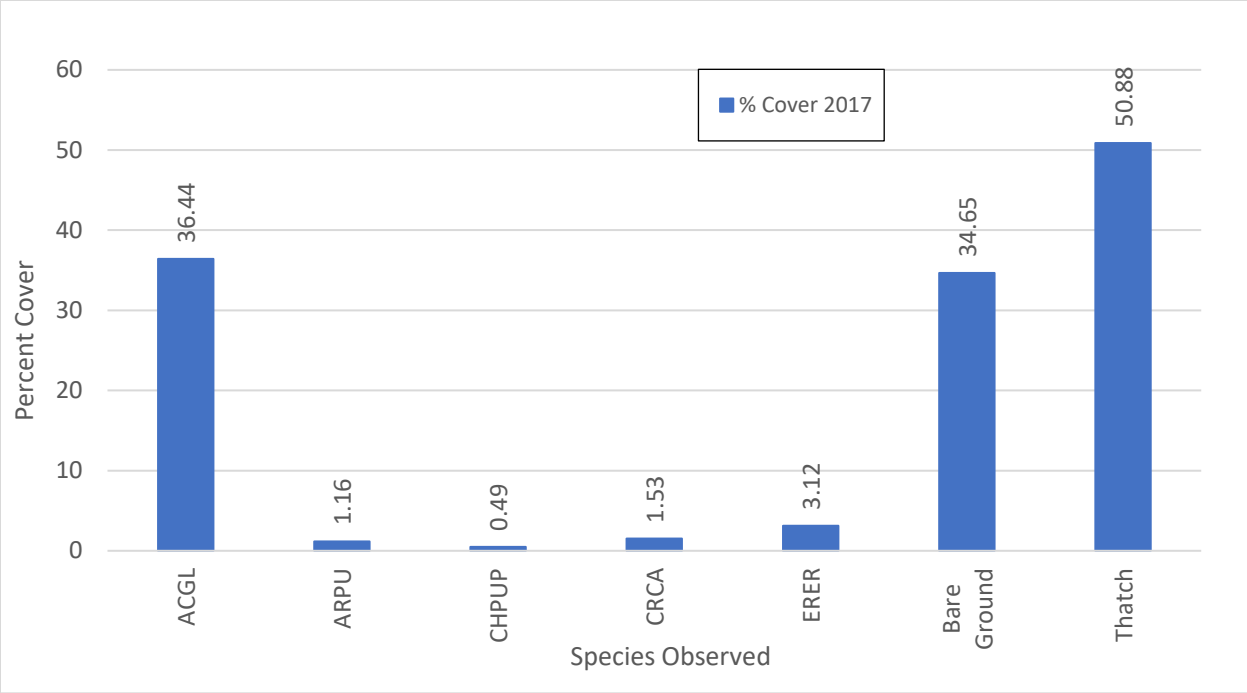


Figure 8-23. Percent Cover of Dominant Species at HA 22 in 2017. Species codes and names are provided in Table 8-21.

8.3.3 Discussion

8.3.3.1 HMP Annual Density

Monterey spineflower density is within the acceptable limits for HMP annual density at HA 22. The SSRP baseline density class for Monterey spineflower was low. The Monterey spineflower restoration plot results show that by year 5 the density exceeded the success criterion under objective 3. In addition, Monterey spineflower and sand gilia were present outside the restoration plots. Discrete patches of Monterey spineflower, with densities that exceeded the success criterion, covered 0.06 acre of HA 22. Discrete patches of sand gilia, with densities that met the success criterion, covered 0.01 acre of HA 22.

8.3.3.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.3.3.3 Species Richness

Chamise, peak rush-rose, deerweed, sandmat manzanita, shaggy-barked manzanita, mock heather, golden yarrow, and sticky monkeyflower were present. However, coyote brush, Monterey ceanothus, dwarf ceanothus, Eastwood's goldenbush, and black sage were not present. HA 22 included 15 native shrub and perennial species; however, HA 22 did not meet the success criterion for objective 1.

8.3.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes eighteen shrub and perennial species presented in Table 2 of the HA 22 SSRP (Burleson, 2013). Currently, these species comprise 43.49% cover of the HA (see Figure 8-24). This success criterion was met. In 2016, quadrats were completed to provide a preliminary idea of vegetative

cover with a limited amount of effort; however, multiple objectives outlined in the SSRP specifically require transect data. The 2016 quadrat data were not compared to the success criteria.

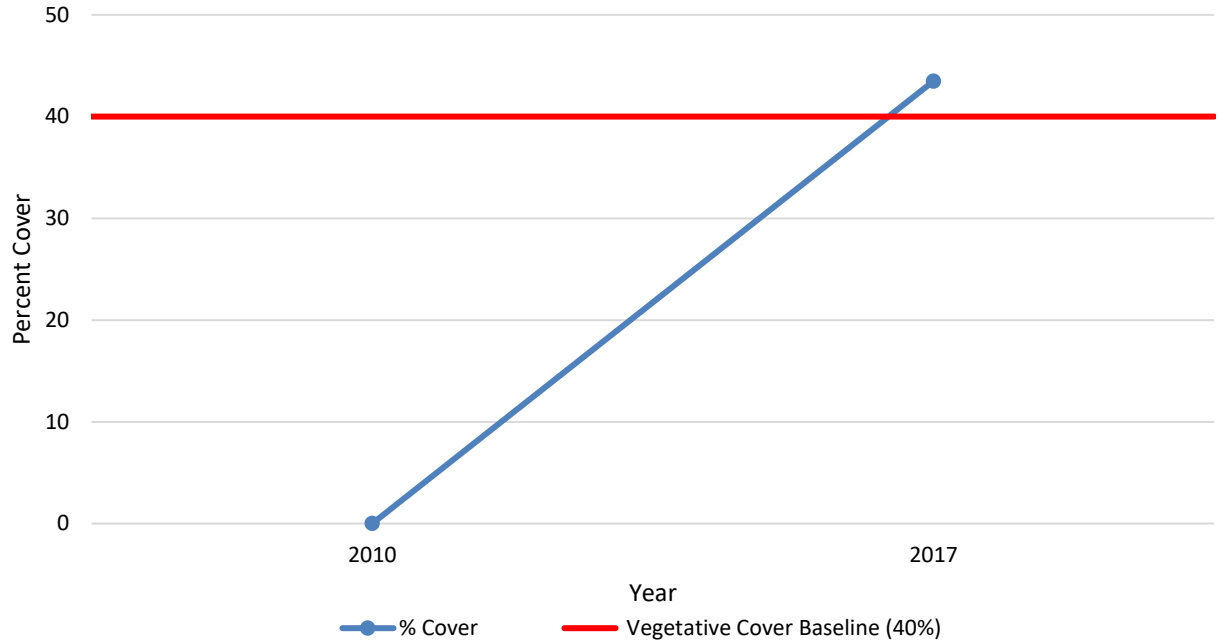


Figure 8-24. Native Vegetative Cover Compared to the Success Criterion at HA 22

Objective 2 considers the percent cover of non-native target weeds. In 2017, no target weeds were encountered during the transect surveys, resulting in 0.00% vegetative cover. The success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class met or exceeded the baseline cover class of 3. Cover class 3 is from 6-25% of absolute cover. The HMP shrub species at HA 22 are providing an absolute cover of 1.16%; therefore, the HA has not met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 22 this means a vegetative cover average of at least 20% cover for sandmat manzanita (*Arctostaphylos pumila*), 4% Monterey ceanothus (*Ceanothus rigidus*), and 1% Eastwood's goldenbush (*Ericameria fasciculata*). The average vegetative cover for sandmat manzanita was 1.16%, for Monterey ceanothus 0.00%, and for Eastwood's goldenbush 0.00% (see Figure 8-25). In 2017, none of the species met the acceptable limit. Therefore, the success criterion was not met.

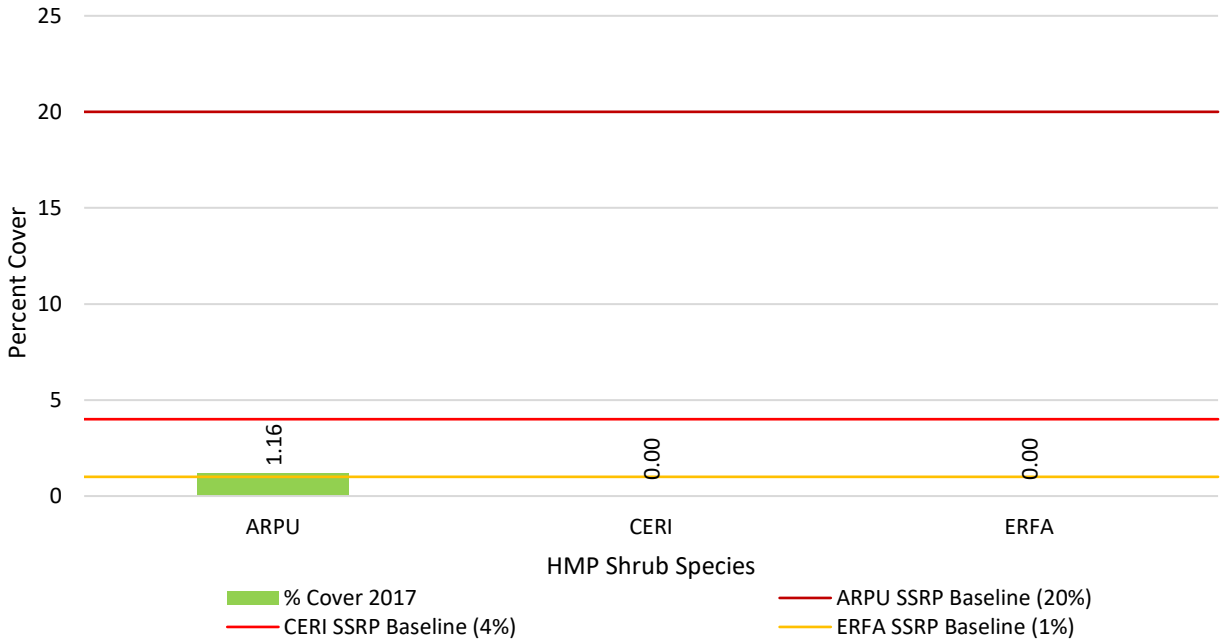


Figure 8-25. HMP Shrub Species Comparison to Success Criteria at HA 22

8.3.3.5 Recommendations

HA 22 was in year 5 of monitoring in 2017 and had responded well to previous restoration efforts. This site has met three of the six success criteria by 2017. Per recommendations in the 2016 Annual Habitat Restoration Report, sandmat manzanita, shaggy-barked manzanita, coyote brush, Monterey ceanothus, dwarf ceanothus, mock heather, Eastwood's goldenbush, golden yarrow, sticky monkeyflower, and black sage will be planted in the 2018/2019 season to support the species richness and HMP shrub cover criteria (Burleson, 2017). Overall, HA 22 requires more time to respond to the restoration effort and continued monitoring to evaluate areas that may need additional effort. A qualitative overview is documented by the reference photo points (see Appendix D, page D-3 and Appendix E, page E-2). The photos illustrate the progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, HMP annual density surveys, and species richness meandering transects in monitoring year 8, 2020.

Table 8-24 summarizes the current status of HA 22 including which success criteria have been met as well as our recommendation to move towards meeting all success criteria.

Table 8-24. Status and Recommendations for Achieving the Success Criteria at HA 22

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant sandmat manzanita, shaggy-barked manzanita, coyote brush, Monterey ceanothus, dwarf ceanothus, mock heather, Eastwood's goldenbush, golden yarrow, sticky monkeyflower and black sage (scheduled 2018)
Objective 1 – No. 2	Native vegetation cover	Yes	None
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush (scheduled 2018)
Objective 3 – No. 4	HMP shrub cover by species	No	Plant sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush (scheduled 2018)
Objective 3 – No. 4	HMP annual density	Yes	None

8.4 HA 23

HA 23 was used by the Army as a small-arms firing range. Soil remediation was completed in 2010 and resulted in 450 cubic yards of lead-contaminated soil being excavated from 0.3 acre (Shaw, 2008). HA 23 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 23 is relatively flat with a west aspect. The adjacent lands are not developed and contain substantial amounts of intact native vegetation that will promote natural recruitment at the restoration areas.

HA 23 is located on the western portion of Site 39, occurring within sand hill formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

The prescription for passive restoration at HA 23 consisted of hand broadcast non-irrigated seed and annual weed management activities. HA 23 is relatively flat with little potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 23 was completed in 2012 and monitoring began in 2013. The HA has been monitored for seven years by photo documentation and site visits, four years for HMP annual density in plots, two years for HMP annual density across the HA, two years for species richness, and two years for vegetative cover (see Table 8-25). Figure 8-26 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 23 are summarized in Table 8-26.

Table 8-25. Historic Summary of Restoration and Monitoring Activities at HA 23

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2011	2012	2013	2014	2015	2016	2017	2020	2025
Restoration: Passive	●	●							
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
HMP Annual Density across HA						●	●	●	
Species Richness						●	●	●	●
Vegetative Cover							●	●	●

*Monterey spineflower were not monitored in year 1 in 2013 because of UXO presence and mastication activities

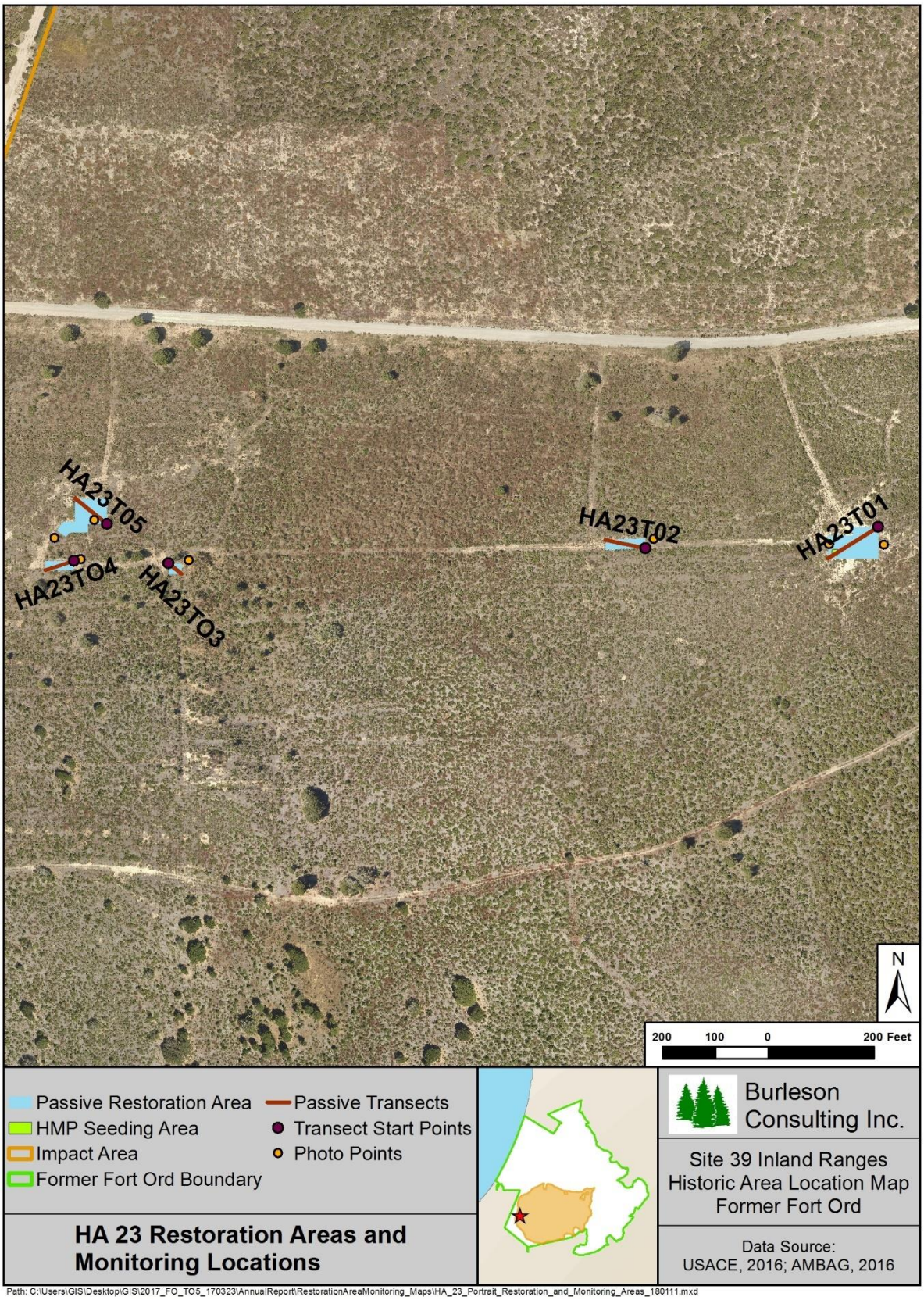


Figure 8-26. HA 23 Restoration Areas and Monitoring Locations Map

Table 8-26. Success Criteria and Acceptable Limits for Restoration of HA 23

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			shaggy-bark manzanita
			sandmat manzanita[2]
			coyote brush
			Monterey ceanothus[2]
			dwarf ceanothus
			Monterey spineflower[2]
			mock heather
			Eastwood's goldenbush[2]
			golden yarrow
			peak rush-rose
			deerweed
			sticky monkeyflower
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data did not indicate non-native target weed species. No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 20.
			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 4.

Table 8-26. Success Criteria and Acceptable Limits for Restoration of HA 23

			Eastwood's goldenbush percent cover, as an average of transect data, must be equal or greater than 1.
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.4.1 Restoration Activities

Burleson performed passive restoration at HA 23 for two years with seed broadcast in 2011 and 2012. No additional restoration activities occurred at HA 23 in 2017. The total amount of seed broadcast on the site was 5.953 lb compared to 5.7845 lb prescribed in the SSRP. Table 8-27 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. Burleson performed passive restoration for the HMP annual species Monterey spineflower. One plot was chosen in the HA based on its suitable habitat for Monterey spineflower and adjacent extant populations.

Table 8-27. Summary of Passive Restoration Activities from 2011-2017 for HA 23

Species	Pounds of Seed Broadcast			
	SSRP Target	2011	2012	Total by Species
ARTO	0.60	0.30	0.326	0.626
BAPI	0.05	0.00	0.028	0.028
CERI[1]	0.30	0.088	0.248	0.336
CHPUP[1]	0.005	0.022	0.003	0.025
CRCA	0.08	0.20	0.158	0.358
CRSC	0.30	0.20	0.168	0.368
DIAU	0.03	0.088	0.105	0.193
ERCO	0.09	0.49	0.058	0.548
ERER	0.08	0.42	0.044	0.464
ERFA[1]	0.05	0.028	0.026	0.054
HOCU	0.60	0.30	0.306	0.606
Hordeum sp.	2.70	0.00	1.370	1.370
SAME	0.30	0.20	0.162	0.362
STCE	0.60	0.30	0.315	0.615
TOTAL	**5.785**	**2.636**	**3.317**	**5.953**

[1]HMP species

8.4.2 Monitoring Results

8.4.2.1 HMP Annual Density

One Monterey spineflower plot was surveyed for year 5 density at HA 23 in 2017. The plot is numbered 1 on Figure 8-27 and is located in the eastern polygon on the site. Monterey spineflower density was low. Figure 8-28 presents Monterey spineflower restoration plot densities for HA 23. Monterey spineflower was not monitored in year 1 in 2013 due to UXO activity and associated restrictions for accessibility. The density class decreased in year 5 from medium in 2016 to low in 2017.

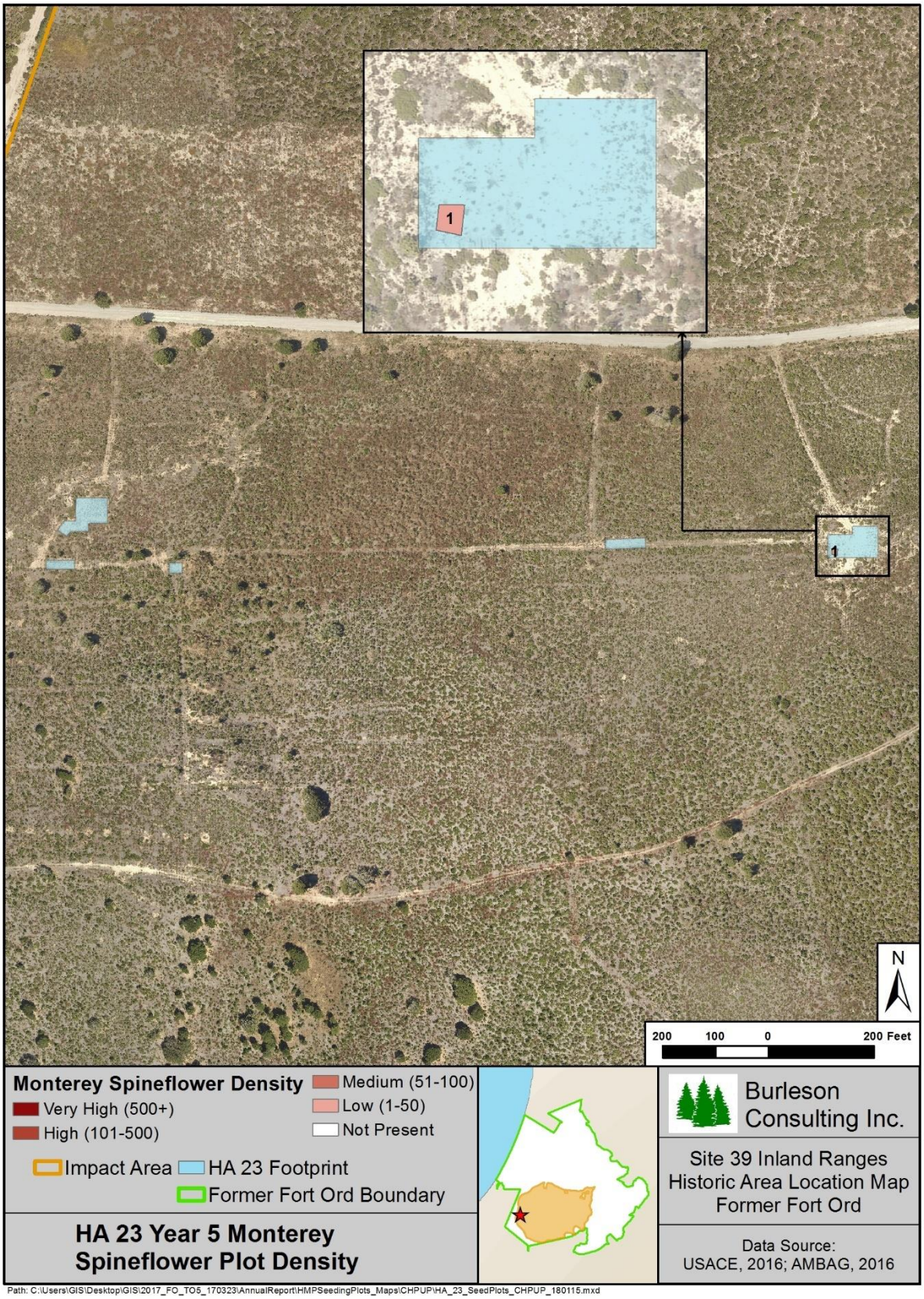


Figure 8-27. HA 23 Year 5 Monterey Spineflower Plot Density Map

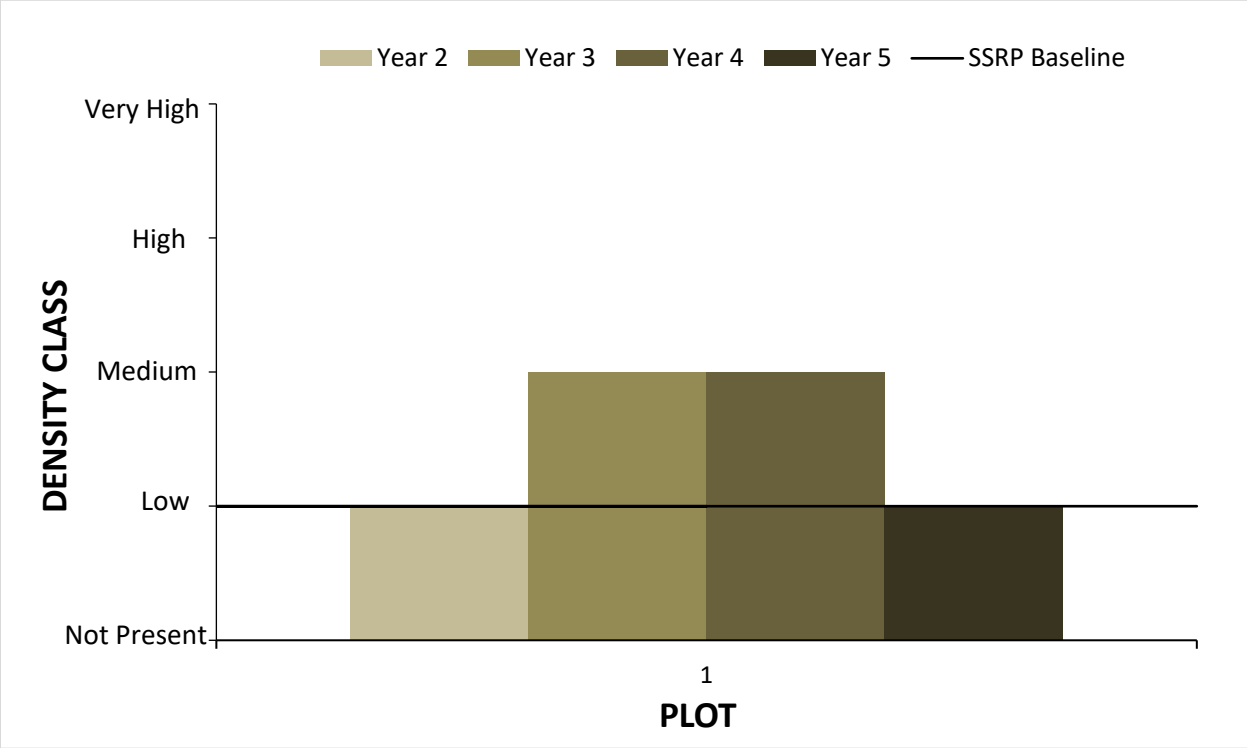


Figure 8-28. HA 23 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline Density Class for Years 1-4 at Restoration Plot 1. Year 1 data were not collected due to UXO.

HMP annual density monitoring included mapping discrete patches of HMP annuals within the restoration area but outside of the HMP annual restoration plots. This survey was completed for Monterey spineflower, seaside bird's beak, and sand gilia. Six discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 8-29). The densities ranged from low to high. The total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.15 acres. Both the density classes and total acreage increased from 2016. The two discrete patches in 2016 had a total acreage of 0.02 acre.

One discrete patch of sand gilia was mapped and individuals counted within the patch (see Figure 8-30). The density was low. The total acreage of sand gilia patches at the SSRP baseline density class of low was 0.01 acre. The total acreage decreased slightly from 2016 when the acreage was 0.02 acre.

One discrete patch of seaside bird's beak was mapped and individuals counted within each patch (see Figure 8-31). The density was low. The total acreage of seaside bird's beak patches at the SSRP baseline density class of low was 0.08 acre. The total acreage increased from 0.03 acre in 2016.

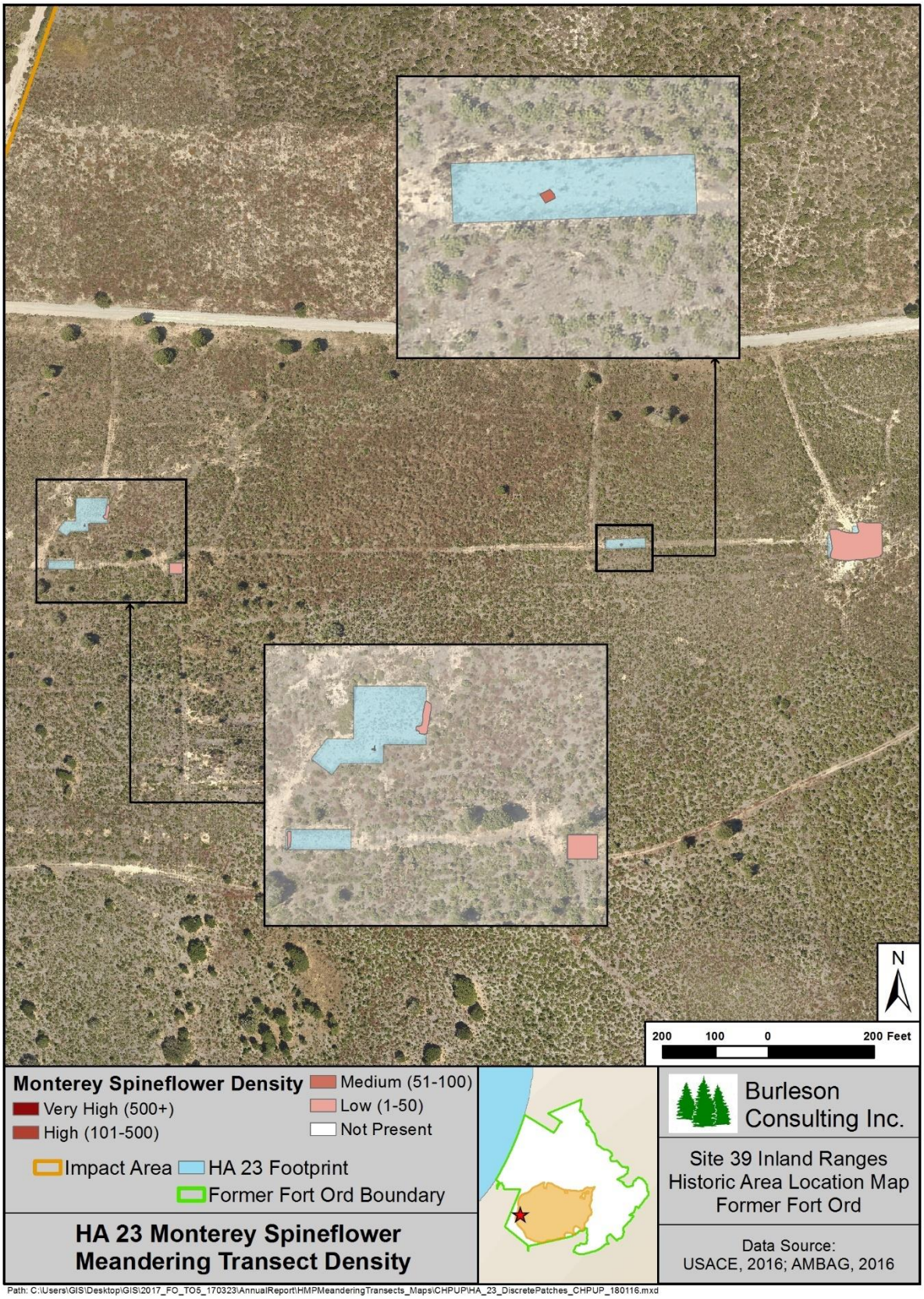


Figure 8-29. HA 23 Monterey Spineflower Meandering Transect Density Map

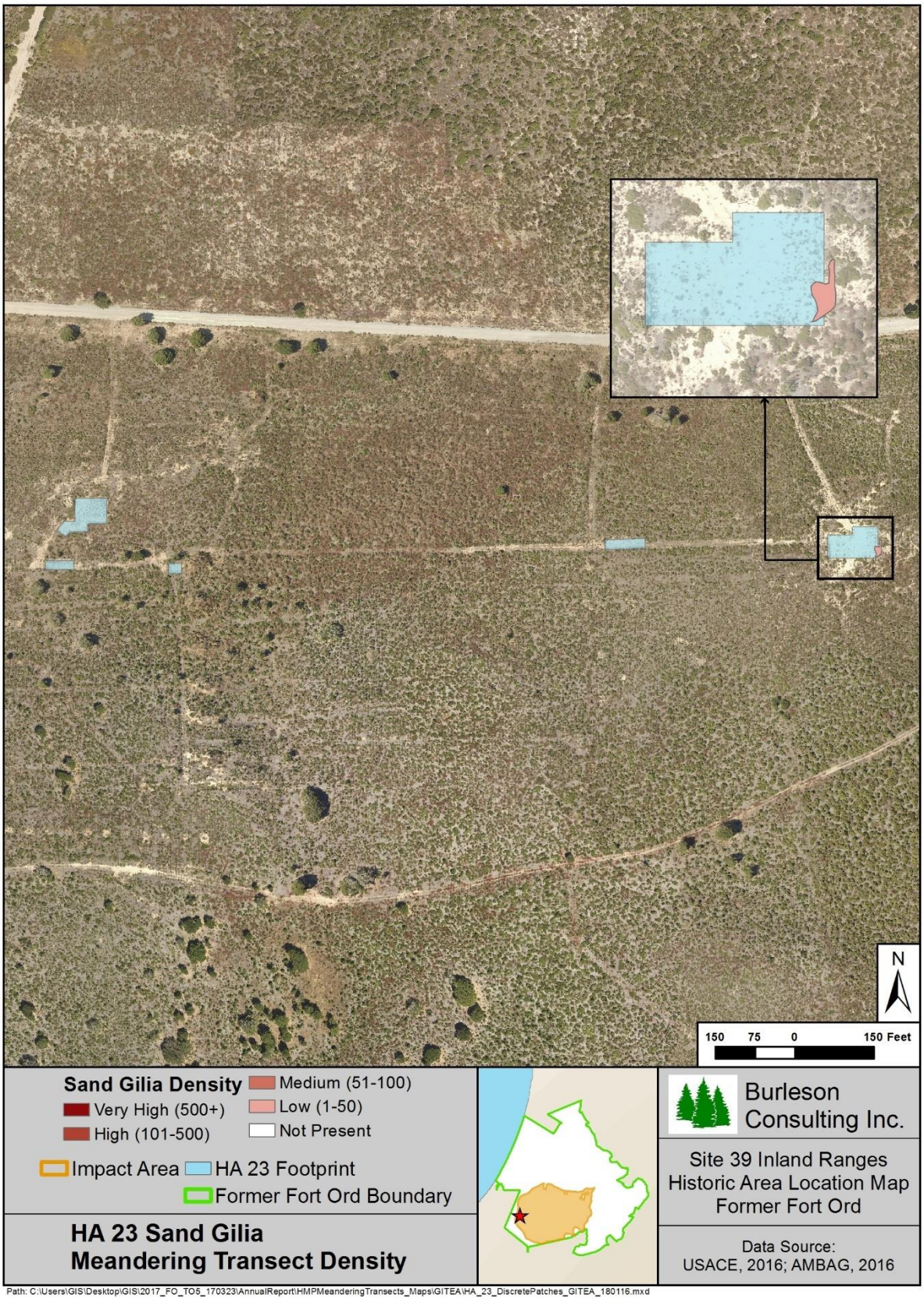


Figure 8-30. HA 23 Sand Gilia Meandering Transect Density Map

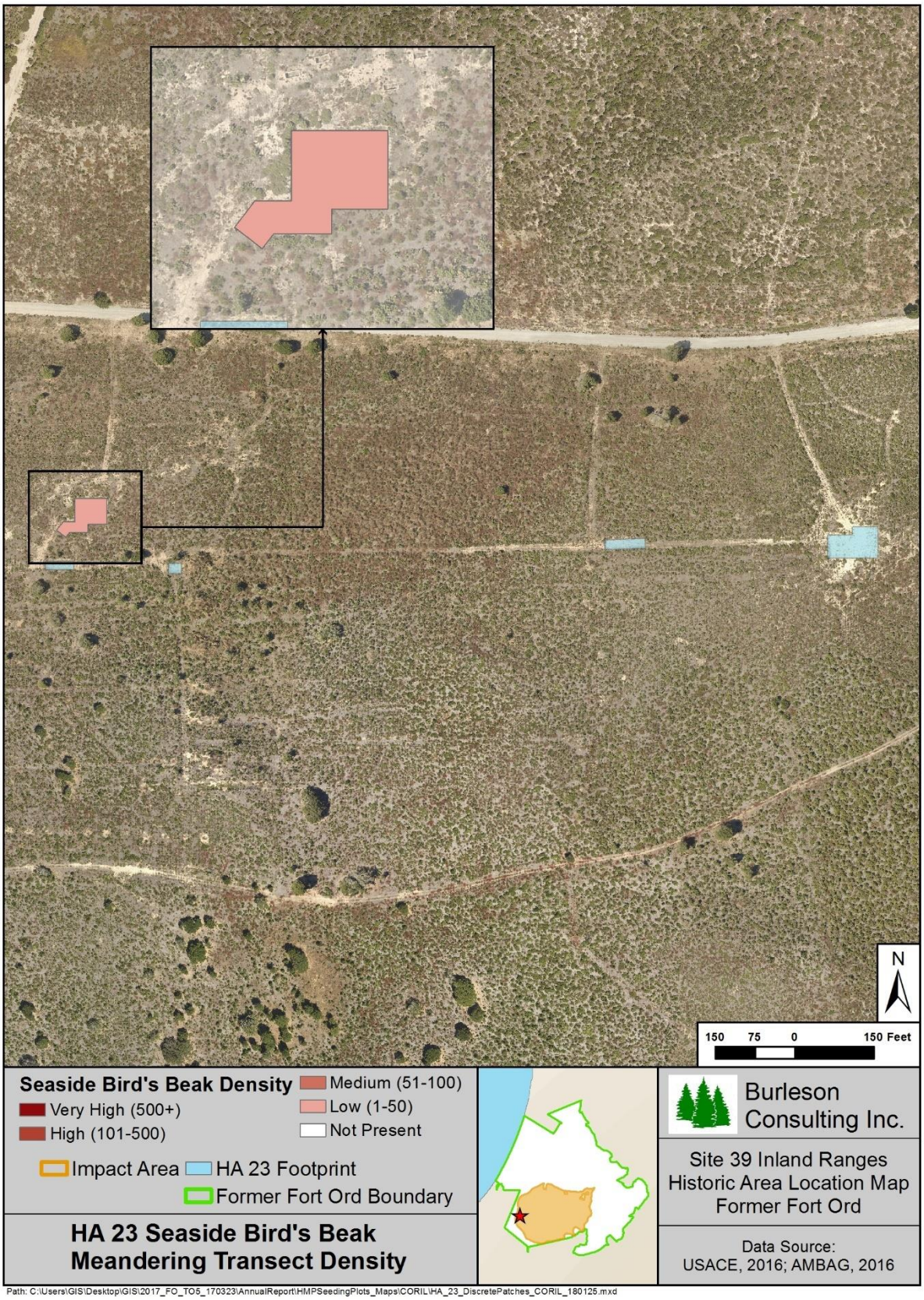


Figure 8-31. HA 23 Seaside Bird's Beak Meandering Transect Density Map

8.4.2.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.4.2.3 Species Richness

Fifty-seven species were observed at HA 23. Of those, 26 were native shrubs or perennials, 15 were native annual herbaceous species, and 16 were non-native species (see Table 8-28). Species richness increased by 35 species since 2016. Native shrub and perennial species increased by 13, native herbaceous species increased by eight, and non-native species increased by 14.

Table 8-28. Species Observed on HA 23, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Agoseris grandiflora	large-flowered agoseris	AGGR
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Baccharis pilularis	coyote brush	BAPI
Bromus diandrus	ripgut brome	BRDI
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Cardionema ramosissimum	sandmat	CARA
Carex glabosa	round fruit sedge	CAGL
Carpobrotus edulis	ice plant	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Cordylanthus rigidus ssp. *littoralis*[1]	seaside bird's-beak	CORIL
Corethrogyne filaginifolia	common sandaster	COFI
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Croton californicus	California croton	CRCA
Cryptantha clevelandii	Cleveland's cryptantha	CRCL
Deinandra corymbosa	coastal tarweed	DECO
Diplacus aurantiacus	sticky monkeyflower	DIAU
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata[1]	Eastwood’s goldenbush	ERFA
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium cicutarium	red-stemmed filareee	ERCI
Festuca bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Gilia tenuiflora ssp. *arenaria*[1]	Monterey gilia	GITEA
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat’s-ear	HYGL

Table 8-28. Species Observed on HA 23, 2017

Scientific Name	Common Name	Code
Logfia gallica	daggerleaf cottonrose	LOGA
Lomatium parvifolium	coastal biscuitroot	LOPA
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia sativa	coast tarweed	MASA
Navarretia hamata	hooked navarretia	NAHA
Plantago erecta	California plantain	PLER
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium stramineum	cotton-batting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Salvia mellifera	black sage	SAME
Schismus barbatus	old han schismus	SCBA
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchly	SIGA
Sonchus asper	prickly sow thistle	SOAS
Stipa cernua	nodding needle grass	STCE
Toxicodendron diversilobum	poison oak	TODI
Trifolium hirtum	rose clover	TRHI

[1]HMP species

8.4.2.4 Vegetative Cover

Burleson completed five line-intercept transects ranging from eight to 32 meters in length at HA 23. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 23.94%. The mean vegetative cover by native shrubs and perennials was slightly greater in 2017 than 2016 by 1.94%. However, fifteen quadrats rather than transects were completed in 2016. Table 8-29 presents the vegetation cover summary and Table 8-30 presents the vegetation cover by species. Figure 8-32 presents the percent cover of the dominant species at HA 23 in 2017.

Table 8-29. Transect Survey Summary for HA 23

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA23T01	15.25	14.94	0.31	0.00	8.62	80.19
HA23T02	18.82	18.82	0.00	0.00	27.23	61.95
HA23T03	29.88	29.88	0.00	0.00	51.63	36.00
HA23T04	34.20	34.20	0.00	0.00	43.13	40.27
HA23T05	37.33	33.43	3.90	0.00	7.24	59.29
SITE AVERAGE*	24.88	23.94	0.94	0.00	21.30	61.90

*Transect lengths are not equal. Site averages are weighted to reflect different lengths.

Table 8-30. Transect Survey Results for HA 23 by Species

Transect	ACGL (%)	ACST (%)	ADFA (%)	ARPU[1] (%)	CAGL (%)	CEDE (%)	CERI (%)	CORIL[1] (%)	COFI (%)	CRCA (%)	CRSC (%)	DIAU (%)	ERCO (%)	HOCU (%)	TODI (%)	TH (%)	BG (%)
HA23T01	2.22	0.00	0.00	1.09	0.00	0.00	1.28	0.00	0.31	0.78	8.00	0.00	1.56	0.00	0.00	8.62	80.19
HA23T02	7.68	0.00	0.00	2.55	0.45	1.18	0.00	0.00	0.00	1.82	0.00	1.55	2.68	0.91	0.00	27.23	61.95
HA23T03	26.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.88	0.00	51.63	36.00
HA23T04	3.47	0.00	0.00	15.40	0.00	0.00	0.00	0.00	0.00	0.00	11.33	0.00	0.87	0.00	3.13	43.13	40.27
HA23T05	1.52	0.81	0.95	17.52	0.00	0.00	0.00	1.52	1.57	0.00	10.48	2.48	0.48	0.00	0.00	7.24	59.29
SITE AVERAGE	5.49	0.17	0.20	7.04	0.10	0.27	0.42	0.33	0.44	0.66	6.59	0.88	1.35	0.36	0.48	21.30	61.90

[1]HMP species

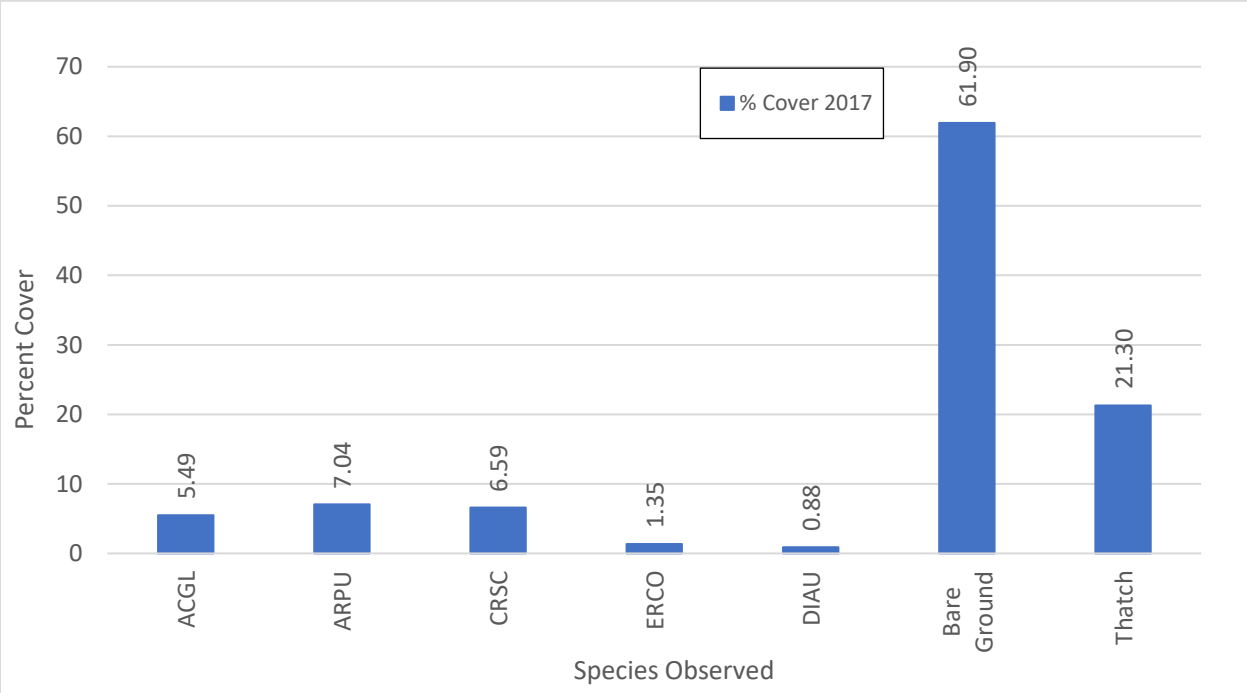


Figure 8-32. Percent Cover of Dominant Species at HA 23 in 2017. Species codes and names are provided in Table 8-28.

8.4.3 Discussion

8.4.3.1 HMP Annual Density

Monterey spineflower density is within the acceptable limits for HMP annual density at HA 23. The SSRP baseline density class for Monterey spineflower was low. The Monterey spineflower restoration plot results show that by year 5, the density within the plot had met the success criterion under objective 3. In addition, Monterey spineflower was present outside the restoration plot. Discrete patches, with density that met the success criterion, covered 0.15 acres of HA 23.

Although not part of the success criterion, sand gilia and seaside bird's beak were both present at HA 23. Both species had discrete patches of low density.

8.4.3.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.4.3.3 Species Richness

Chamise, sandmat manzanita, shaggy-barked manzanita, Monterey spineflower, mock heather, Eastwood's goldenbush, peak rush-rose, deerweed, sticky monkeyflower, coyote brush, Monterey ceanothus, dwarf ceanothus, golden yarrow, and black sage were present. HA 23 included 26 native shrub and perennial species, and HA 23 has met the success criterion for objective 1. In contrast, in 2016, HA 23 did not meet the success criterion for objective 1 because coyote brush, Monterey ceanothus, dwarf ceanothus, and golden yarrow were not present.

8.4.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes eighteen shrub and perennial species presented in Table 2 of the HA 23 SSRP (Burleson, 2013). Currently, these species comprise 22.99% cover of the HA (see Figure 8-33). This success criterion was not met. In 2016, quadrats were completed to provide a preliminary idea of vegetative cover with a limited amount of effort; however, multiple objectives outlined in the SSRP specifically require transect data. The 2016 quadrat data were not compared to the success criteria.

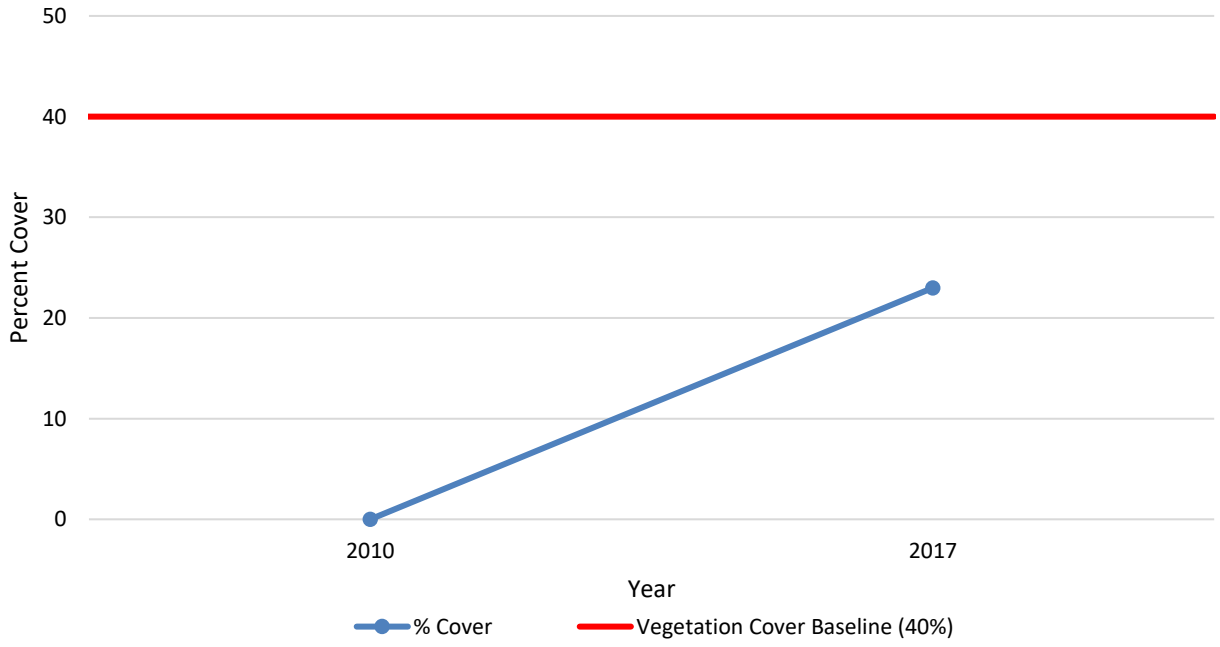


Figure 8-33. Native Vegetative Cover Compared to the Success Criterion at HA 23

Objective 2 considers the percent cover of non-native target weeds. In 2017, no target weeds were encountered during the transect surveys, resulting in 0.00% vegetative cover. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class met or exceeded the baseline cover class of 3. Cover class 3 is from 6-25% of absolute cover. The HMP shrub species at HA 23 are providing an absolute cover of 7.46%; therefore, the HA has met

this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 23 this means a vegetative cover average of at least 20% cover for sandmat manzanita (*Arctostaphylos pumila*), 4% Monterey ceanothus (*Ceanothus rigidus),* and 1% Eastwood's goldenbush (*Ericameria fasciculata*). The average vegetative cover for sandmat manzanita was 7.04%, for Monterey ceanothus 0.42%, and for Eastwood's goldenbush 0.00% (see Figure 8-34). In 2017, none of the species met the acceptable limit. Therefore, the success criterion was not met.

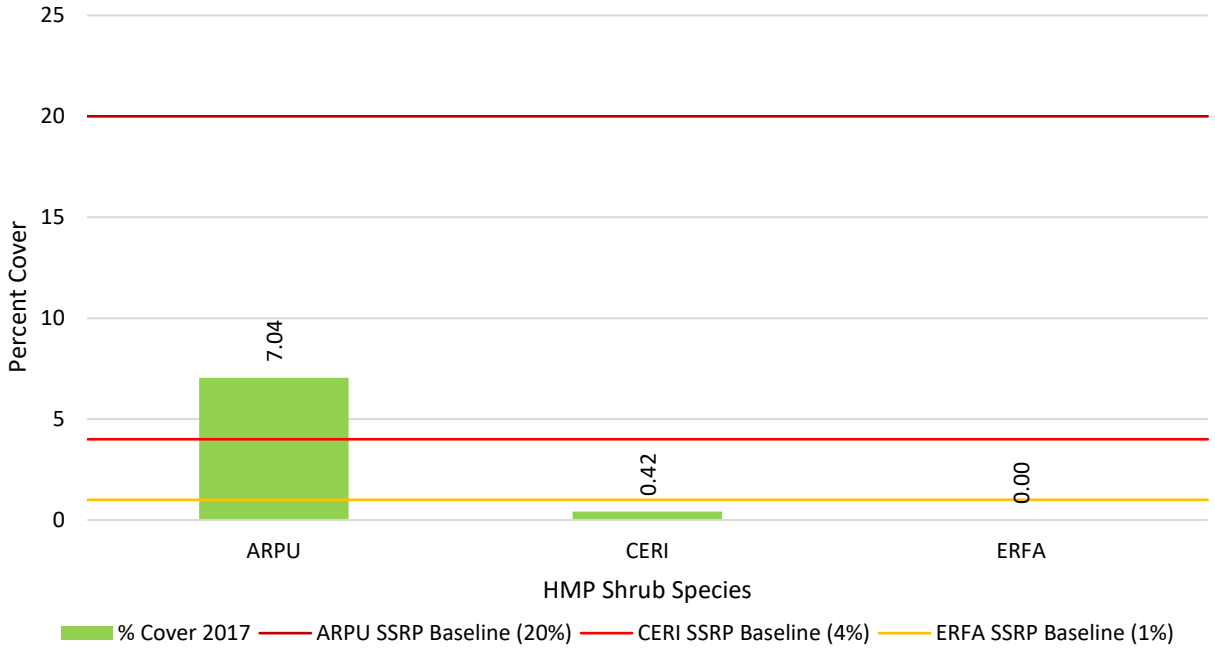


Figure 8-34. HMP Shrub Species Comparison to Success Criteria at HA 23

8.4.3.5 Recommendations

HA 23 was in year 5 of monitoring in 2017 and has responded well to previous restoration efforts. The restoration area has met four of the six success criteria by 2017. No corrective measures are recommended at this time but rather wait to see how the site responds on its own. Future focus should be given to Eastwood's goldenbush since it was the only SSRP-prescribed HMP shrub species not observed on transects. However, since the species was observed during meandering transects, over time it might expand its cover within HA 23. Overall, HA 23 needs time to respond to the restoration effort and continued monitoring to evaluate areas that may require additional effort. A qualitative overview is documented by the reference photo points (see Appendix D, page D-4 and Appendix E, page E-3). The photos illustrate the progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover line-intercept transects in year 8.

Table 8-31 summarizes the current status of HA 23 including which success criteria have been met as well as our recommendation to move towards meeting all success criteria.

Table 8-31. Status and Recommendations for Achieving the Success Criteria at HA 23

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Wait to see how the HA responds
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	Yes	None
Objective 3 – No. 4	HMP shrub cover by species	No	Wait to see how the HA responds
Objective 3 – No. 4	HMP annual density	Yes	None

8.5 HA 26

HA 26 was used by the Army as an intermittent machine gun range and dry fire movement course and later as a squad automatic weapon range. An estimated total of 22,400 cubic yards of soil was excavated over approximately 14 acres. Much of the site was dominated by invasive species. The excavation removed many areas of invasive species and may aid in the revegetation effort for this range (Mactec, 2008). HA 26 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 26 is relatively flat with a northeast aspect and contains low to medium quality habitat.

HA 26 is located on the western portion of Site 39, within the sand hill formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

Passive and active restoration activities were prescribed for HA 26. The prescription for passive restoration at HA 26 consisted of hand broadcast non-irrigated seed and annual weed management activities. The prescription for active restoration at HA 26 included transplanting native or greenhouse-grown individuals. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration and monitoring at HA 26 began in 2016. The HA has been monitored for four years by photo documentation and site visits, two years for HMP annual density in plots, two years for HMP annual density across the HA, two years for species richness, and one year for vegetative cover (see Table 8-32). Figure 8-35 shows the HA footprint, passive restoration area, and future active restoration area. Success criteria for HA 26 are summarized in Table 8-33.

Table 8-32. Historic Summary of Restoration and Monitoring Activities at HA 26

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2014	2015	2016	2017	2018	2019	2020	2023	2028
Restoration: Active, Passive, and Irrigation			●	●	●	●			
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
HMP Annual Density across HA			●	●	●	●	●	●	
Species Richness			●	●	●	●	●	●	●
Vegetative Cover				●	●	●	●	●	●
Plant Survivorship					●	●	●		

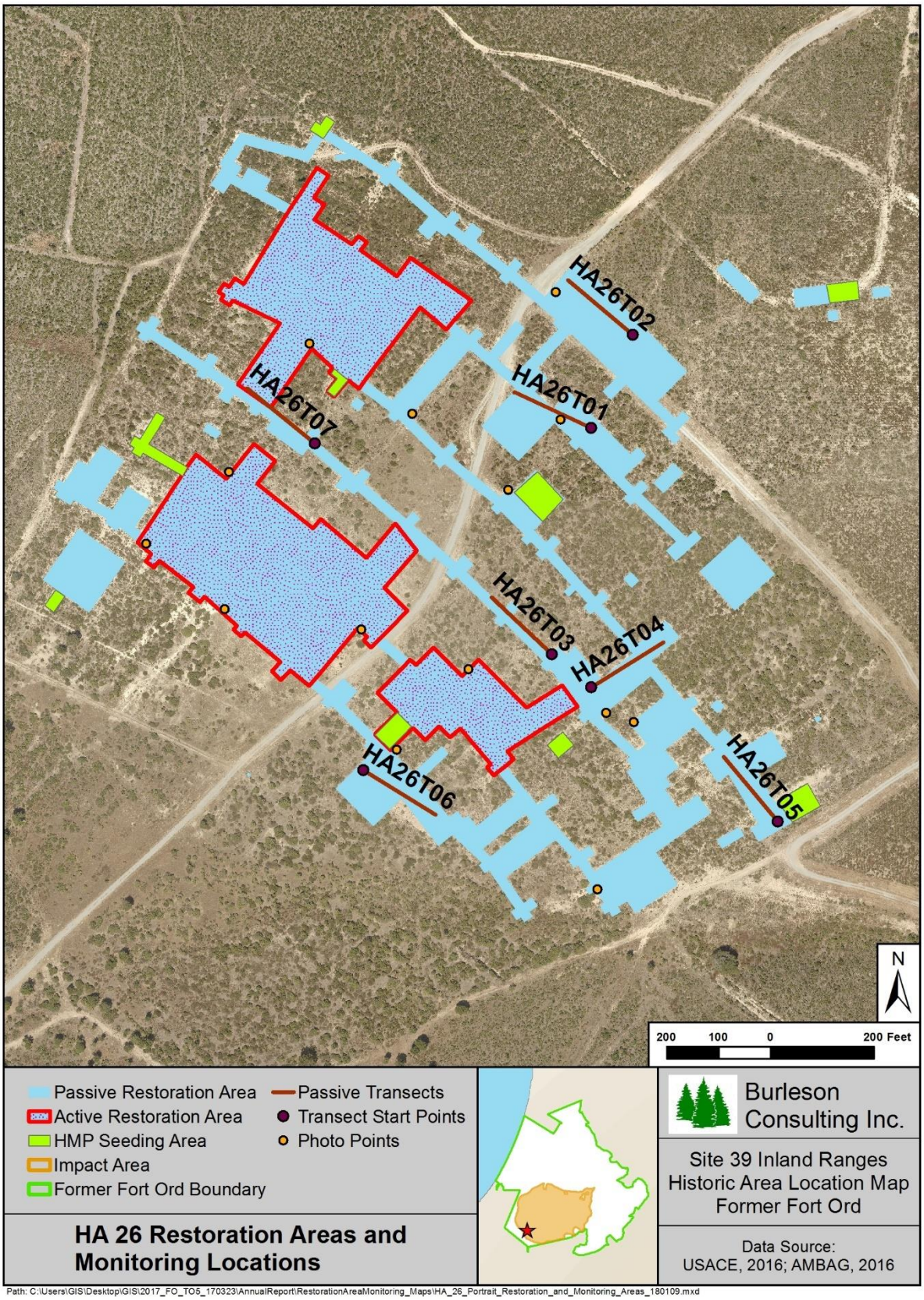


Figure 8-35. HA 26 Restoration Areas and Monitoring Locations Map

Table 8-33. Success Criteria and Acceptable Limits for Restoration of HA 26

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			sandmat manzanita[2]
			shaggy-bark manzanita
			Monterey ceanothus[2]
			Eastwood's goldenbush[2]
			sticky monkeyflower
			black sage
2	Percent cover of native species	Percent cover equals 20 percent for native species[3]	For the restoration area, percent cover monitoring data must meet or exceed 20 percent for native species listed as part of the plant palette in Table 2[3]
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data did indicate presence of non-native target weed species *Cortaderia jubata* (pampas grass). No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 2.
			Monterey ceanothus percent cover, as an average of transect data, must be present however, less than 1 percent is acceptable
			Eastwood's gold fleece percent cover, as an average of transect data, must be present however, less than 1 percent is acceptable
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low

Table 8-33. Success Criteria and Acceptable Limits for Restoration of HA 26

Notes:	[1]Objectives presented in HRP (Shaw, 2009b)
	[2]HMP Species
	[3]20 percent cover of native species is the revised success criteria due to the degraded conditions of the site prior to remediation - low quality habitat. However, the same restoration methods will be used and results will likely be similar to all restored areas.

8.5.1 Restoration Activities

Burleson performed passive restoration at HA 26 with two applications of seed, one each in 2016 and 2017. The total amount of seed broadcast on the site was 265.81 lb compared to the 303.10 lb prescribed in the SSRP. Active restoration activities were initiated in December 2017 and will be reported in the 2018 annual report. Table 8-34 summarizes the amount of seed applied in comparison to the SSRP target. Burleson performed passive restoration for the HMP annual species Monterey spineflower. Nine plots were chosen in the HA based on having suitable habitat for Monterey spineflower and adjacent extant populations.

Table 8-34. Summary of Passive Restoration Activities in 2016-2017 for HA 26

Species	Pounds of Seed Broadcast			
	SSRP Target	2016	2017	Total by Species
ACMI	14.00	5.24	18.08	23.32
ACGL	28.00	10.48	10.17	20.65
BAPI	2.10	1.05	0.45	1.5
CERI[1]	14.00	5.24	2.27	7.51
CHPUP[1]	2.10	0.85	-	0.85
CRSC	10.50	4.20	1.81	6.01
DIAU	7.00	2.62	1.13	3.75
ELGL	42.00	15.72	81.36	97.08
ERFA[1]	1.40	0.52	0.23	0.75
ERCO	14.00	5.24	2.27	7.51
Hordeum sp.	126.00	47.20	22.65	69.85
HOCU	28.00	10.48	9.04	19.52
SAME	14.00	5.24	2.27	7.51
TOTAL	**303.10**	**114.08**	**151.73**	**265.81**

[1]HMP species

8.5.2 Monitoring Results

8.5.2.1 HMP Annual Density

Nine Monterey spineflower plots were surveyed for year 2 density at HA 26 in 2017. The plots are numbered 1-9 on Figure 8-36 and are located throughout the site. All nine plots had a low density. Figure 8-37 summarizes all the Monterey spineflower restoration plot densities for HA 26.

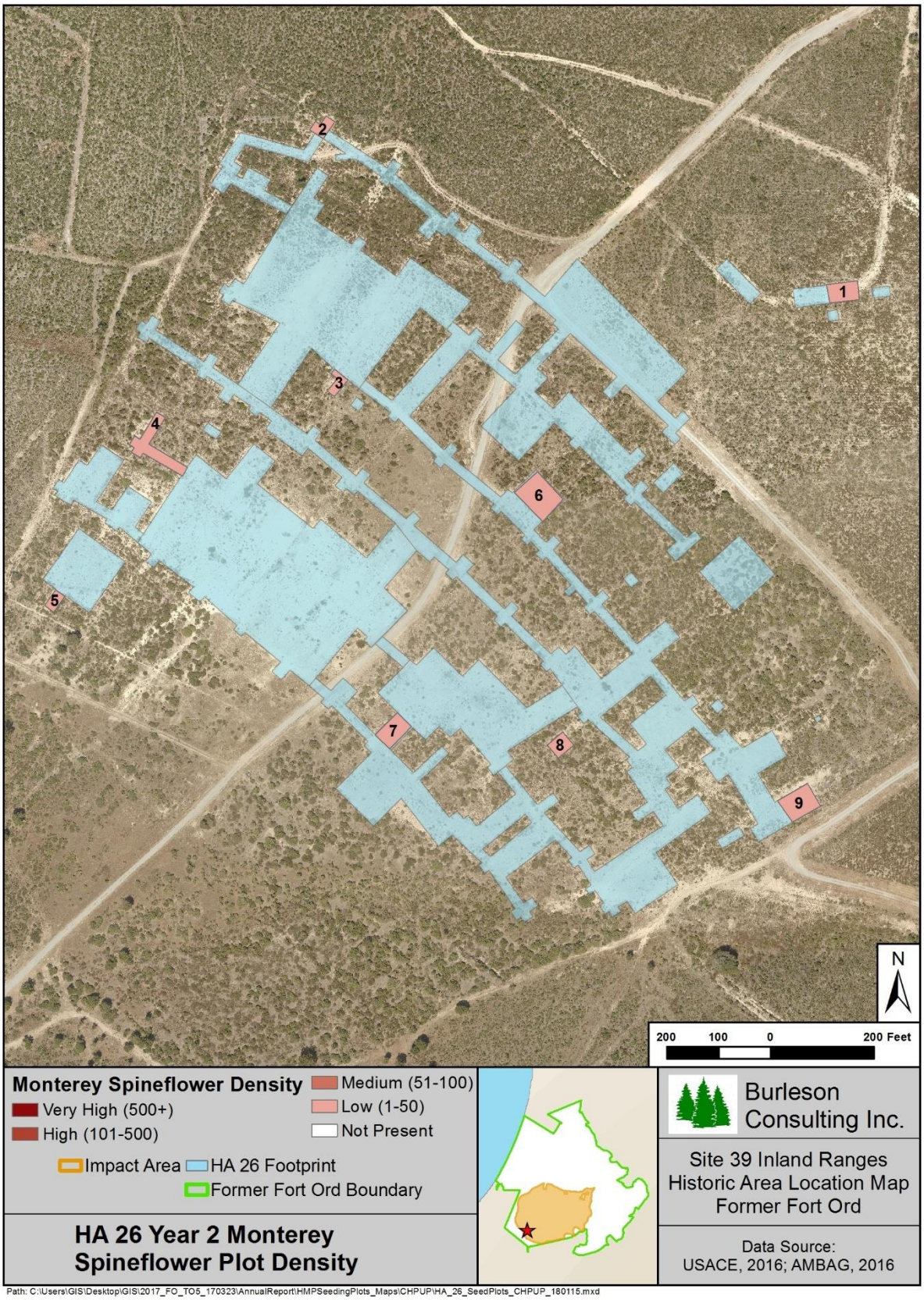


Figure 8-36. HA 26 Year 2 Monterey Spineflower Plot Density Map

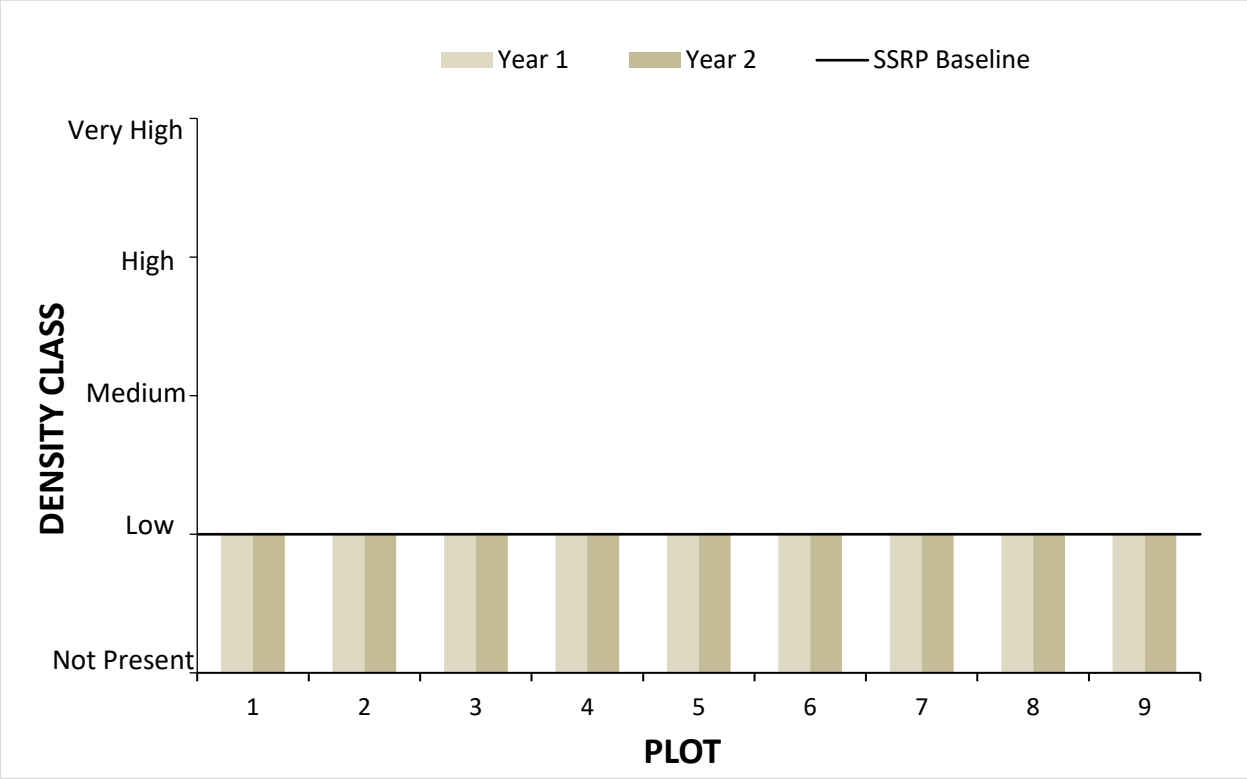


Figure 8-37. HA 26 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline Density Class for Years 1 and 2 at Restoration Plots 1-9

HMP annual density monitoring included mapping discrete patches of HMP annuals within the restoration area but outside of the HMP annual restoration plots. This survey was completed for Monterey spineflower. One individual Monterey spineflower was mapped (see Figure 8-38).

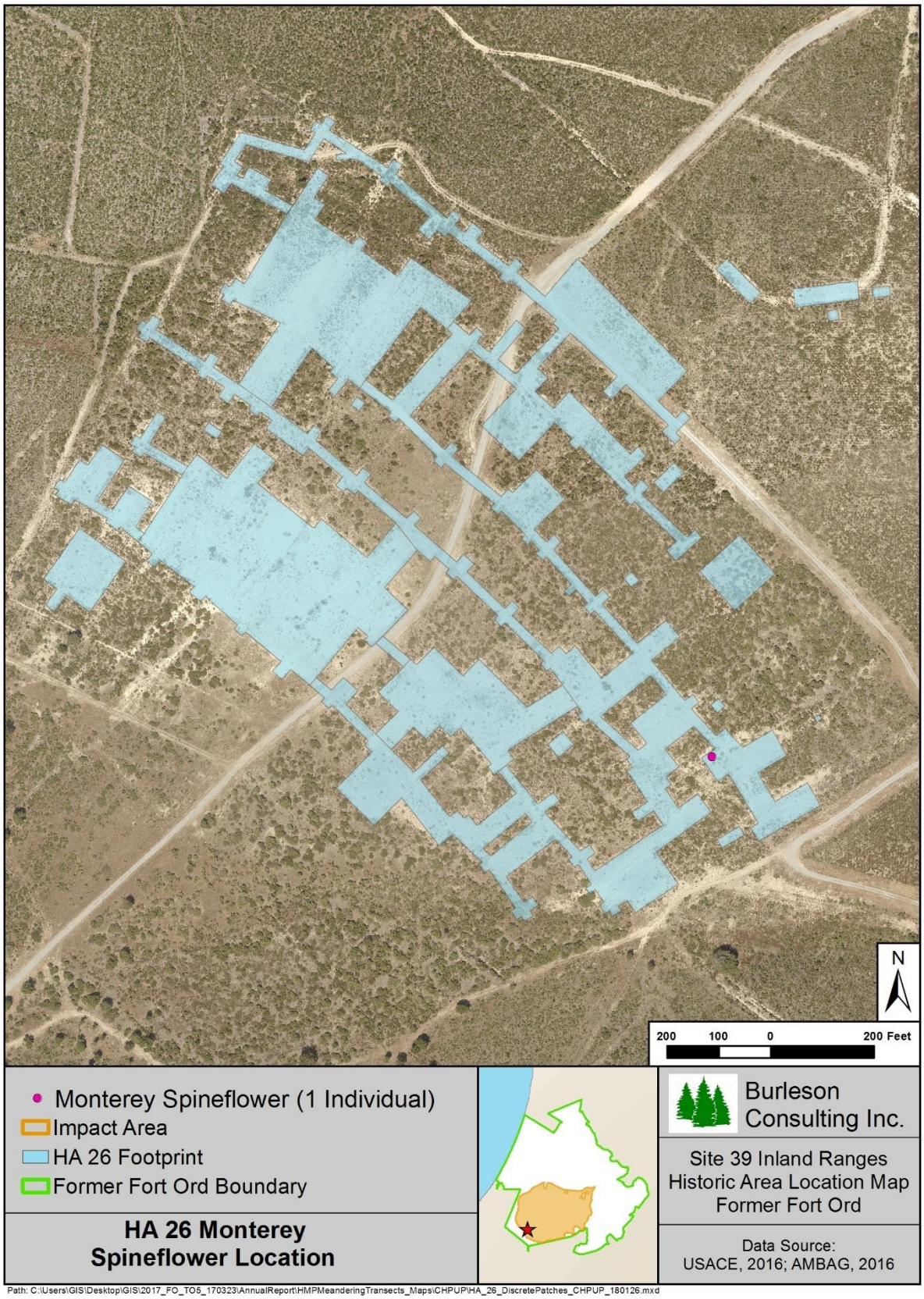


Figure 8-38. HA 26 Monterey Spineflower Meandering Transect Density Map

8.5.2.2 Plant Survivorship

No active restoration has been completed; therefore, no survivorship data were collected.

8.5.2.3 Species Richness

Seventy species were observed at HA 26. Of those, 30 were native shrubs or perennials, 17 were native annual herbaceous species, 22 were non-native species, and one was not catergorized as it was only identified to genus (see Table 8-35). Species richness increased by nine species since 2016. Native shrub and perennial species increased by two, native herbaceous species increased by two, and non-native species increased by four.

Table 8-35. Species Observed on HA 26, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon heermannii	Heermann's lotus	ACHE
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos montereyensis[1]	Monterey manzanita	ARMO
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake weed	BRMA
Briza minor	little quaking grass	BRMI
Bromus hordaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Calochortus albus	white globe lily	CAAL
Camissoniopsis cheiranthifolia	beach evening primrose	CACH
Carex sp.		CA
Carpobrotus edulis	ice plant	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Ceanothus thrysiflorus var. *griseus*	Carmel ceanothus	CETHG
Chlorogalum pomeridianum	soap plant	CHPO
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Cirsium sp.		CI
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	pampas grass	COJU
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Dichelostemma capitatum	blue dicks	DICA
Diplacus aurantiacus	sticky monkeyflower	DIAU
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filareee	ERCI

Table 8-35. Species Observed on HA 26, 2017

Scientific Name	Common Name	Code
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Githopsis specularoides	common bluecup	GISP
Heteromeles arbutifolia	toyon	HEAR
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	hairy cat's-ear	HYRA
Lepechinia calycina	pitcher sage	LECA
Lessingia pectinata	common lessingia	LEPE
Logfia gallica	daggerleaf cottonrose	LOGA
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus concinnus	bajada lupine	LUCO
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia exigua	little tarweed	MAEX
Madia gracilis	slender tarweed	MAGR
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHAP
Petrorhagia prolifera	pink grass	PEPR
Pinus radiata	Monterey pine	PIRA
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Polygala californica	California milkwort	POCA
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Silene gallica	small-flower catchfly	SIGA
Sonchus asper	prickly sow thistle	SOAS
Stylocline gnaphaloides	everlasting nest straw	STGN
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium hirtum	rose clover	TRHI
Zeltnera davyi	Davy's centaury	ZEDA

[1]HMP species

8.5.2.4 Vegetative Cover

Burleson completed seven 50-meter line-intercept transects at HA 26 in passive restoration areas. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 20.71%. 2017 is the first year that vegetative cover surveys have been completed at HA 26. Table 8-36 presents a summary of vegetation cover and Table 8-37 presents vegetation cover by species. Figure 8-39Figure 8-32 presents the percent cover of the dominant species at HA 26 in 2017.

Table 8-36. Transect Survey Summary for HA 26

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA26T01	31.06	30.42	0.00	0.64	59.36	39.24
HA26T02	39.88	42.66	0.00	1.18	73.84	23.70
HA26T03	11.24	8.86	0.00	2.38	80.14	16.96
HA26T04	7.98	7.78	0.00	0.20	62.66	36.58
HA26T05	13.12	13.12	0.00	0.00	67.56	30.72
HA26T06	23.50	18.26	0.00	5.24	80.96	17.80
HA26T07	24.28	23.90	0.00	0.38	49.44	48.48
SITE AVERAGE	21.58	20.71	0.00	1.43	67.71	30.50

Table 8-37. Transect Survey Results for HA 26 by Species

Transect	ACGL (%)	ADFA (%)	ARTO (%)	BAPI (%)	CA sp. (%)	CEDE (%)	CERI (%)	COJU (%)	CRSC (%)	HOCU (%)	HYRA (%)	LECA (%)	SAME (%)	TODI (%)	TH (%)	BG (%)
HA26T01	0.00	0.00	1.26	0.00	0.00	18.96	0.00	0.00	6.58	3.62	0.64	0.00	0.00	0.00	59.36	39.24
HA26T02	0.00	1.36	3.34	0.80	0.90	14.10	0.00	0.32	9.34	3.62	0.86	1.18	3.66	0.40	73.84	23.70
HA26T03	0.00	0.00	1.94	0.00	0.48	2.30	0.00	0.00	3.40	0.74	2.38	0.00	0.00	0.00	80.14	16.96
HA26T04	0.00	0.00	1.90	0.00	0.00	4.28	0.00	0.00	1.18	0.42	0.20	0.00	0.00	0.00	62.66	36.58
HA26T05	1.92	0.00	0.00	0.00	0.00	7.92	0.00	0.00	2.94	0.34	0.00	0.00	0.00	0.00	67.56	30.72
HA26T06	1.92	0.00	0.48	0.00	0.00	10.28	0.56	0.00	4.30	0.00	5.24	0.00	0.00	0.72	80.96	17.80
HA26T07	0.00	0.00	1.72	0.00	0.00	17.62	0.00	0.00	4.56	0.00	0.38	0.00	0.00	0.00	49.44	48.48
SITE AVERAGE	0.55	0.19	1.52	0.11	0.20	10.78	0.08	0.05	4.61	1.25	1.39	0.17	0.52	0.16	67.71	30.50

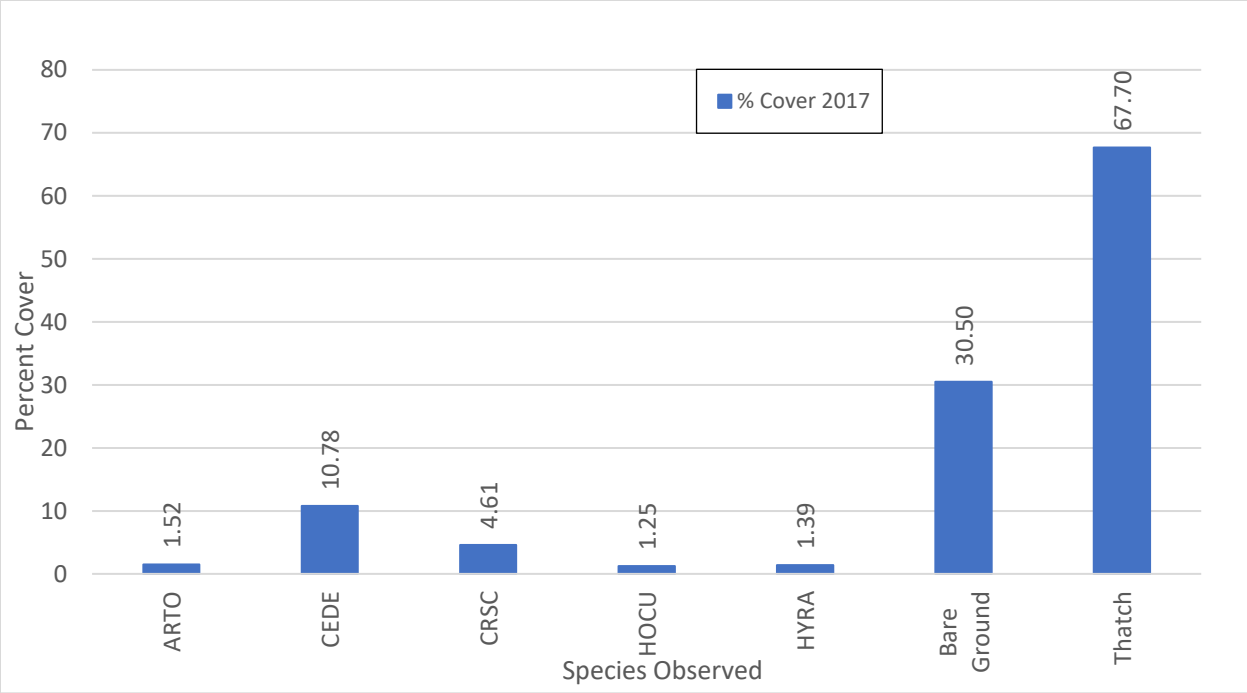


Figure 8-39. Percent Cover of Dominant Species at HA 26 in 2017. Species codes and names are provided in Table 8-35.

8.5.3 Discussion

8.5.3.1 HMP Annual Density

Monterey spineflower density was within the acceptable limits for HMP annual density at HA 26. The SSRP baseline density class for Monterey spineflower was low. All the Monterey spineflower restoration plots have met the success criterion. In addition, one Monterey spineflower was observed outside of the restoration plots.

8.5.3.2 Plant Survivorship

No active restoration occurred, therefore, no survivorship data were collected.

8.5.3.3 Species Richness

Chamise, sandmat manzanita, shaggy-barked manzanita, Monterey ceanothus, Eastwood's goldenbush, sticky monkeyflower, and black sage were all present. HA 26 included 30 native shrub and perennial species and 17 native annual herbaceous species, and HA 26 met the success criterion for objective 1.

8.5.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 20% for native species listed as part of the plant palette. This list includes sixteen shrub and perennial species presented in Table 2 of the HA 26 SSRP (Burleson, 2013). Currently, these species comprise 8.84% cover of the HA (see Figure 8-40). This success criterion was not met.

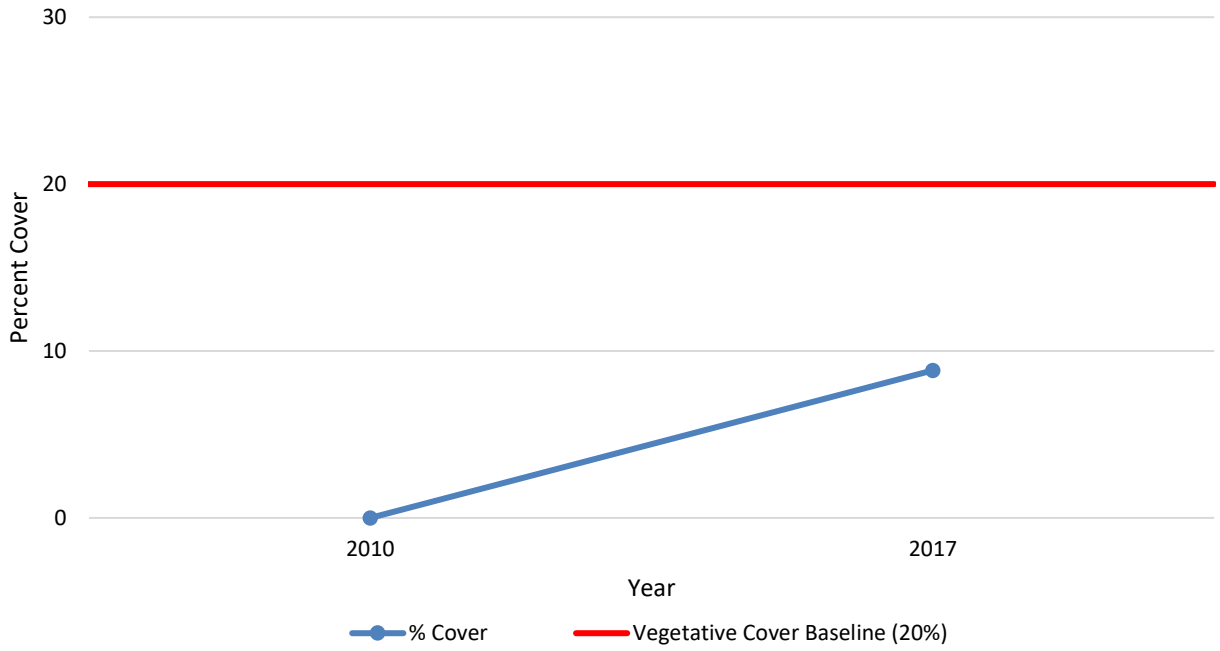


Figure 8-40. Native Vegetative Cover Compared to the Success Criterion at HA 26

Objective 2 considers the percent cover of non-native target weeds. In 2017, the transect surveys contained pampas grass (*Cortaderia jubata*); but, the vegetative cover for non-native species was 0.05%, which is less than the 5% acceptable limit. Pampas grass and iceplant were also observed at HA 26 in 2016, but no vegetative cover surveys were completed in 2016. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class met or exceeded the baseline cover class of 3. Cover class 3 is from 6-25% of absolute cover. The HMP shrub species at HA 26 are providing an absolute cover of 0.08%; therefore, the HA did not meet this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 26 this means a vegetative cover average of at least 2% cover for sandmat manzanita (*Arctostaphylos pumila*) and presence of Monterey ceanothus (*Ceanothus rigidus)* and Eastwood's goldenbush (*Ericameria fasciculata*). The average vegetative cover for sandmat manzanita was 0.00%, for Monterey ceanothus 0.08%, and for Eastwood's goldenbush 0.00% (see Figure 8-41). In 2017, only one of the three species, Monterey ceanothus, met the acceptable limit. Therefore, the success criterion was not met.

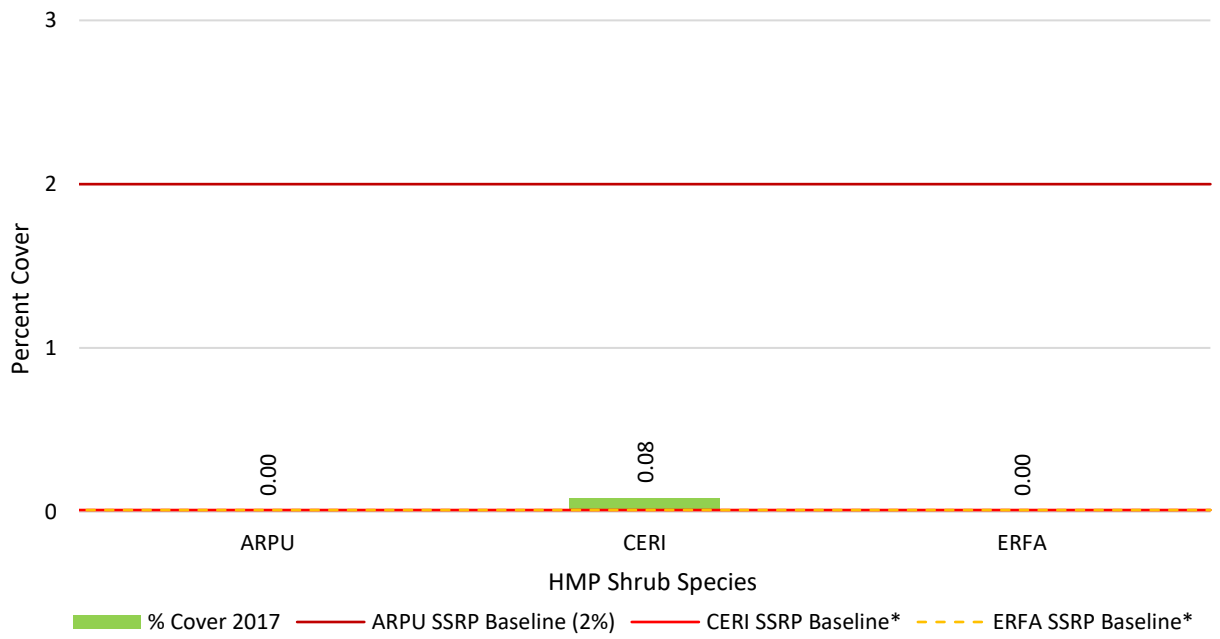


Figure 8-41. HMP Shrub Species Comparison to Success Criteria at HA 26

8.5.3.5 Recommendations

HA 26 was in year two of monitoring in 2017. The site received its full SSRP restoration prescription for passive areas in 2017 but had not yet received its full restoration prescription for active areas. HA 26 met three of its six success criteria by 2017. No corrective measures are recommended at this point in time since restoration activities are not complete. Monitoring HA 26 response at the end of restoration will guide future corrective measures. Overall, HA 26 needs time and the full prescription of active restoration to respond to the restoration effort and continued monitoring to evaluate areas that may require additional effort. A qualitative overview is documented by the reference photo points (see Appendix D, page D-5). The photos illustrate the progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, HMP annual density surveys, and species richness meandering transects in year 3.

Table 8-38 summarizes the current status of HA 26 including which success criteria have been met as well as our recommendation to move towards meeting success criteria.

Table 8-38. Status and Recommendations for Achieving the Success Criteria at HA 26

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Wait to see how the HA responds
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Wait to see how the HA responds
Objective 3 – No. 4	HMP shrub cover by species	No	Wait to see how the HA responds
Objective 3 – No. 4	HMP annual density	Yes	None

8.6 HA 27

HA 27 was used by the Army as a small-arms firing range. Soil remediation was completed in 2010 and resulted in 100 cubic yards of lead-contaminated soil being excavated from 0.06 acre (Shaw, 2008). HA 27 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 27 sits on exposed bedrock with surface water runoff in its western portion. The adjacent lands are not developed and contain substantial amounts of intact native vegetation that will promote natural recruitment at the restoration areas.

HA 27 is located on the southern portion of Site 39, occurring within Aromas formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

The prescription for passive restoration at HA 27 consisted of hand-broadcast non-irrigated seed and annual weed management activities. HA 27 is relatively flat. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 27 occurred in 2011 and 2012 and monitoring began in 2013. HA 27 has been monitored for seven years by photo documentation and site visits, two years for species richness, and two years for vegetative cover (see Table 8-39). Figure 8-42 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 27 are summarized in Table 8-40.

Table 8-39. Historic Summary of Restoration and Monitoring Activities at HA 27

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2011	2012	2013	2014	2015	2016	2017	2020	2025
Restoration: Passive	●	●							
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Species Richness						●	●	●	●
Vegetative Cover							●	●	●

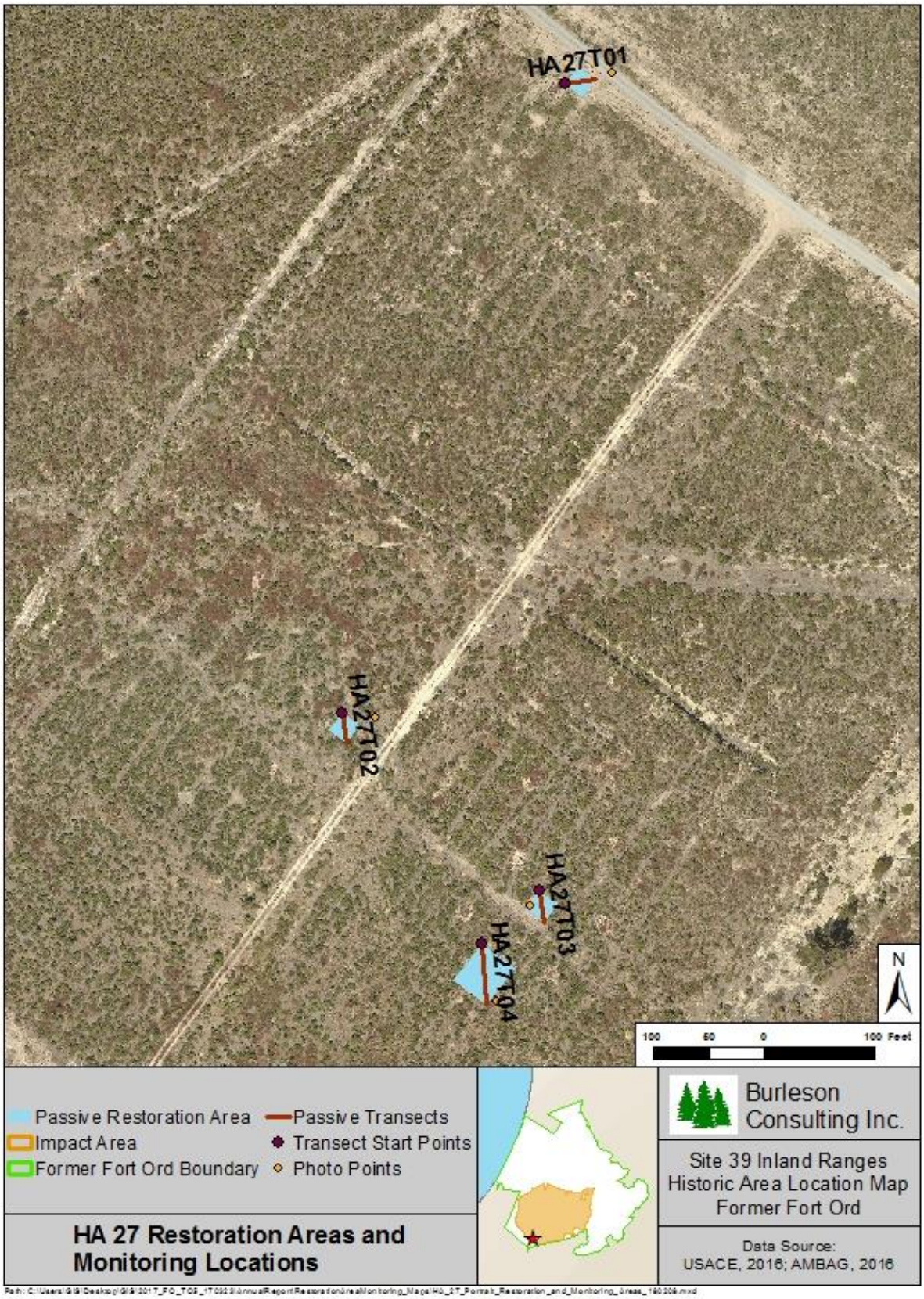


Figure 8-42. HA 27 Restoration Areas and Monitoring Locations Map

Table 8-40. Success Criteria and Acceptable Limits for Restoration of HA 27

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			Monterey manzanita[2]
			shaggy-bark manzanita
			sandmat manzanita[2]
			coyote brush
			Monterey ceanothus[2]
			golden yarrow
			peak rush-rose
			wedge-leaved horkelia
			deerweed
			sticky monkeyflower
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data indicated the non-native target weed species jubata grass at 50 percent cover. Therefore, the non-native target weed may be present at less than or equal to 5 percent.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 4

Table 8-40. Success Criteria and Acceptable Limits for Restoration of HA 27

		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 25.
			Monterey manzanita percent cover, as an average of transect data, must be equal or greater than 2.
			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 1.
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Not applicable
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.6.1 Restoration Activities

Burleson performed passive restoration at HA 27 for two years in 2011 and 2012. No additional restoration activities occurred at HA 27 in 2017. The total amount of seed broadcast on the site was 1.046 lb compared to the 1.270 lb prescribed in the SSRP. No active restoration activities have been conducted at HA 27. Table 8-41 summarizes the amount of seed applied by year and species, in comparison to the SSRP target.

Table 8-41. Summary of Passive Restoration Activities from 2011-2017 for HA 27

Species	Pounds of Seed Broadcast			
	SSRP Target	2011	2012	Total by Species
ACGL	0.120	0.062	0.060	0.122
ARMO[1]	0.060	0.032	0.043	0.075
ARPU[1]	0.120	0.063	0.067	0.130
ARTO	0.120	0.062	0.067	0.129
BAPI	0.010	0.000	0.005	0.005
CERI[1]	0.060	0.000	0.063	0.063
CRSC	0.060	0.033	0.033	0.066
HOCU	0.120	0.062	0.060	0.122
Hordeum sp.	0.540	0.000	0.268	0.268
SAME	0.060	0.035	0.031	0.066
TOTAL	**1.270**	**0.349**	**0.697**	**1.046**

[1]HMP species

8.6.2 Monitoring Results

8.6.2.1 HMP Annual Density

The baseline data from the SSRP indicated no HMP annual species at HA 27. Therefore, no HMP annuals need to be present at this restoration site.

8.6.2.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.6.2.3 Species Richness

Forty-one species were observed at HA 27. Of those, 18 were native shrubs or perennials, 11 were native annual herbaceous species, 11 were non-native species, and one was not catergorized as it was only identified to genus (see Table 8-42). Species richness increased by sixteen species since 2016. Native shrub and perennial species increased by two, native herbaceous species increased by seven, and non-native species increased by six.

Table 8-42. Species Observed on HA 27, 2017

Scientific Name	Common Name	Code
Acmispon glaber	deerweed	ACGL
Acmispon heermannii	Heermann's lotus	ACHE
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Arctostaphylos montereyensis[1]	Monterey manzanita	ARMO
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Baccharis pilularis	coyote brush	BAPI
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME
Chorizanthe diffusa	diffuse spineflower	CHDI
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	pampas grass	COJU
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Diplacus aurantiacus	sticky monkeyflower	DIAU
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Heterotheca grandiflora	telegraphweed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat’s-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Lepechinia calycina	pitcher sage	LECA
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia sativa	coast tarweed	MASA
Navarretia hamata	hooked navarretia	NAHA
Pinus radiata	Monterey pine	PIRA

Table 8-42. Species Observed on HA 27, 2017

Scientific Name	Common Name	Code
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Phalaris sp.	canary grass	PH
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Schismus barbatus	old han schismus	SCBA
Stylocline gnaphaloides	everlasting neststraw	STGN
Zeltnera davyi	Davy's centaury	ZEDA

[1] HMP species

8.6.2.4 Vegetative Cover

Burleson completed four line-intercept transects ranging from eight to 17 meters in length at HA 27. Survey results indicated that the mean vegetative cover by native shrubs and perennials was 34.45%. The mean vegetative cover by native shrubs and perennials was greater in 2017 than 2016 by about 6.15%. However, three quadrats rather than transects were completed in 2016, thus the difference in data comparison between those years does not directly relate to the change in vegetation on site. Table 8-43 summarizes vegetation cover and Table 8-44 presents vegetation cover results by species. Figure 8-43 presents the percent cover of the dominant species at HA 27 in 2017.

Table 8-43. Transect Survey Summary for HA 27

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA27T01	31.22	34.67	3.22	3.33	38.11	47.44
HA27T02	36.13	36.13	0.00	0.00	92.63	7.38
HA27T03	15.25	11.88	0.00	3.37	72.63	25.63
HA27T04	52.76	49.47	0.00	3.29	67.0	9.53
SITE AVERAGE*	**37.83**	**34.45**	**0.69**	**2.69**	**66.76**	**20.31**

*Transect lengths are not equal. Site averages are weighted to reflect different lengths.

Table 8-44. Transect Survey Results for HA 27 by Species

Transect	ACGL (%)	ARTO (%)	BAPI (%)	CEDE (%)	COFI (%)	COJU (%)	CRSC (%)	HOCU (%)	HYRA (%)	LECA (%)	TH (%)	BG (%)
HA27T01	11.44	0.00	0.00	1.44	1.22	0.00	9.44	4.33	3.33	0.00	38.11	47.44
HA27T02	9.37	0.00	0.00	0.00	0.00	0.00	23.75	3.00	0.00	0.00	92.63	7.38
HA27T03	0.00	1.88	0.00	0.00	0.00	0.00	8.63	1.38	3.37	0.00	72.63	25.63
HA27T04	9.12	29.71	0.65	0.00	0.00	2.47	1.24	4.12	0.82	4.65	67.00	9.53
SITE AVERAGE	**7.93**	**12.38**	**0.26**	**0.31**	**0.26**	**1.00**	**8.69**	**3.43**	**1.69**	**1.88**	**66.76**	**20.31**

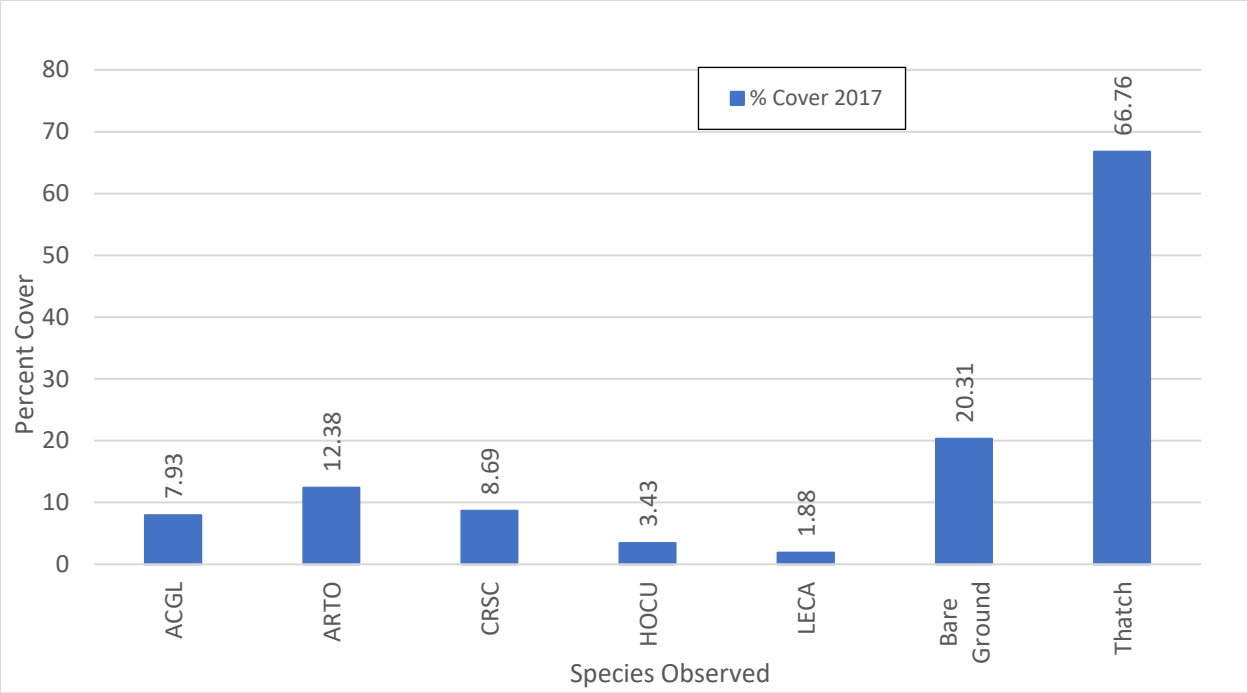


Figure 8-43. Percent Cover of Dominant Species at HA 27 in 2017. Species codes and names are provided in Table 8-42.

8.6.3 Discussion

8.6.3.1 HMP Annual Density

The baseline data from the SSRP indicated no HMP annual species at HA 27. Therefore, no HMP annuals need to be present at this restoration site.

8.6.3.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.6.3.3 Species Richness

Monterey manzanita (*Arctostaphylos montereyensis*), shaggy-barked manzanita, sandmat manzanita, coyote brush, Monterey ceanothus, peak rush-rose, sticky monkeyflower, wedge-leaved horkelia (*Horkelia cuneata*), deerweed, and black sage were present. Golden yarrow was not present. HA 27 included 18 native shrub and perennial species; however, it did not meet success criterion for objective 1 because golden yarrow was not present. Similarly, in 2016 HA 27 did not meet the success criterion for objective 1 because Monterey manzanita, golden yarrow, and sticky monkeyflower were not present.

8.6.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1, the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes 10 native shrub, perennial, and annual species presented in Table 2 of the HA 27 SSRP (Burleson, 2013). Currently the HA includes 32.69% vegetative cover from those species; therefore, this success criterion was not met (see Figure 8-44). In 2016, quadrats were completed to provide a preliminary idea of vegetative cover with a limited amount of effort; however, multiple objectives outlined in the SSRP specifically require transect data. The 2016 quadrat data were not compared to the success criteria.

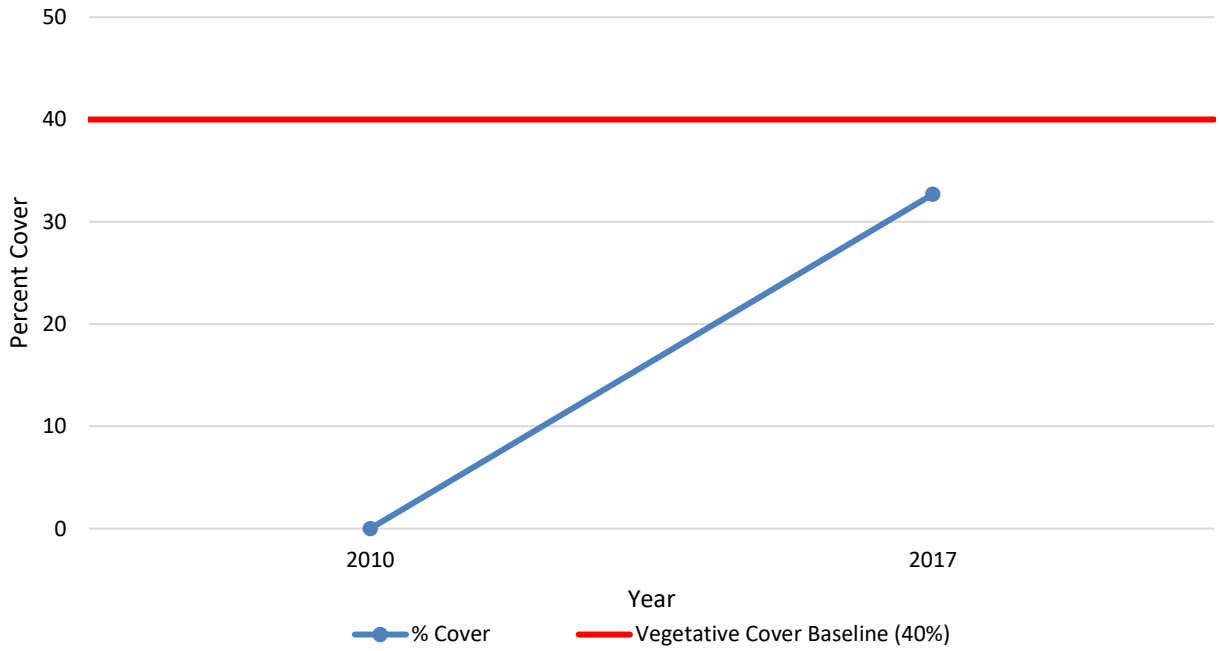


Figure 8-44. Native Vegetative Cover Compared to the Success Criterion at HA 27

Objective 2 considers the percent cover of non-native target weeds. In 2017, the transect surveys contained jubata grass (*Cortaderia jubata*); however, the vegetative cover for non-native species was 1.00%, which is less than the 5% acceptable limit. In 2016, jubata grass was observed in HA 27 but was not included in the quadrat data. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class met or exceeded the baseline cover class of 4. Cover class 4 is from 26-50% of absolute cover. The HMP shrub species at HA 27 are providing an absolute cover of 0.00%. HA 27 has not yet met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 27, this means a vegetative cover average of at least 4% cover for sandmat manzanita (*Arctostaphylos pumila*), at least 2% cover for Monterey manzanita (*Arctostaphylos montereyensis*), and at least 1% cover for Monterey ceanothus (*Ceanothus rigidus*). The average vegetative cover for sandmat manzanita was 0.00%, for Monterey manzanita 0.00%, and for Monterey ceanothus 0.00% (see Figure 8-45). None of the three species met the success criterion but all are present in the HA. The success criterion was not met.

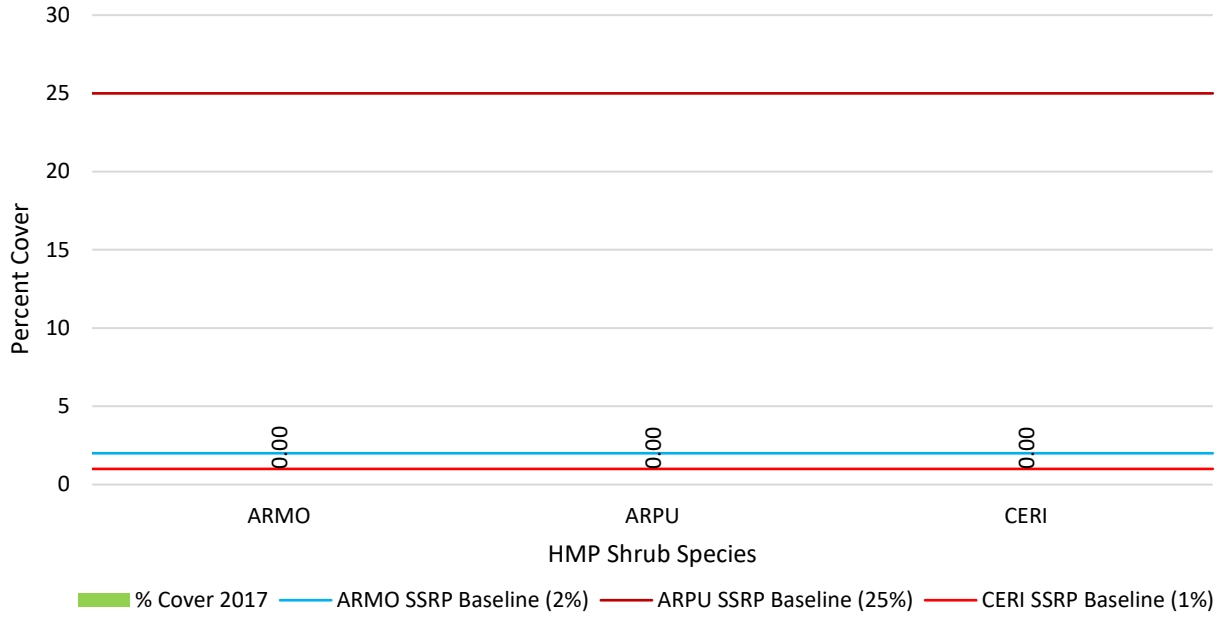


Figure 8-45. HMP Shrub Species Comparison to Success Criteria at HA 27

8.6.3.5 Recommendations

HA 27 was in year 5 of monitoring in 2017 and had generally responded marginally well to previous restoration efforts. The restoration area met one of its six success criteria by 2017. Per recommendations in the 2016 Annual Habitat Restoration Report, Monterey manzanita, golden yarrow, and sticky monkey flower will be planted in 2018/2019 season to support the species richness and HMP shrub cover criteria (Burleson, 2017). The abatement of jubata grass will be ongoing through a service agreement with BLM. Additionally, the Army will plant sandmat manzanita and Monterey ceanothus to further support the HMP shrub cover success criteria. Neither sandmat manzanita nor Monterey ceanothus are likely to meet criteria without corrective measures. Overall, HA 27 needs time to further respond to the restoration effort. A qualitative overview is documented by the reference photo points (see Appendix D, page D-6 and Appendix E, page E-4). The photos illustrate the positive change in the HA, where increased cover can be observed.

The site will continue to be monitored by photo documentation, species richness meandering transects, and vegetative cover line-intercept transects in montoring year 8, 2020.

Table 8-45 summarizes the current status of HA 27 including which success criteria have been met as well as recommendations to move towards meeting success criteria.

Table 8-45. Status and Recommendations for Achieving the Success Criteria at HA 27

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant Monterey manzanita, golden yarrow, and sticky monkey flower (scheduled 2018)
Objective 1 – No. 2	Native vegetation cover	No	Plant native species (scheduled 2018)
Objective 2 – No. 3	Non-native target weed cover	Yes	Weed abatement for jubata grass
Objective 3 – No. 4	HMP shrub cover	No	Plant sandmat manzanita and Monterey ceanothus
Objective 3 – No. 4	HMP shrub cover by species	No	Plant sandmat manzanita and Monterey ceanothus
Objective 3 – No. 4	HMP annual density	NA	NA

8.7 HA 27A

HA 27A was used by the Army as a small-arms firing range. Soil remediation was completed in 2010 and resulted in 1,100 cubic yards of lead-contaminated soil being excavated from 0.6 acre (Shaw, 2008). HA 27A rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 27A is relatively flat with a west aspect. The adjacent lands are not developed and contain substantial amounts of intact native vegetation that will promote natural recruitment at the restoration areas.

HA 27A is made up of three distinct polygons that are located on the southern portion of Site 39, occurring within Aromas formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In the southern most polygon, the surface layer is fine sand (USDA Forest Service, 2007).

The prescription for passive restoration at HA 27A consisted of hand broadcast non-irrigated seed and annual weed management activities. The southern polygon at HA 27A has a lack of top soil, exposed hardpan sandstone, and ongoing erosion issues. This area is a transitional vegetative zone between chaparral and grassland.

Restoration at HA 27A occurred in 2011, 2012, twice in 2016 (erosion control), and monitoring began in 2013. HA 27A has been monitored for seven years by photo documentation and site visits and two years for species richness and vegetative cover (see Table 8-46). Figure 8-46 shows the HA footprint, passive restoration area, and transect locations. Success criteria for HA 27A are summarized in Table 8-47.

Table 8-46. Historic Summary of Restoration and Monitoring Activities at HA 27A

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2011	2012	2013	2014	2015	2016	2017	2020	2025
Restoration: Passive and Erosion Control	●	●				●			
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Species Richness						●	●	●	●
Vegetative Cover						●	●	●	●

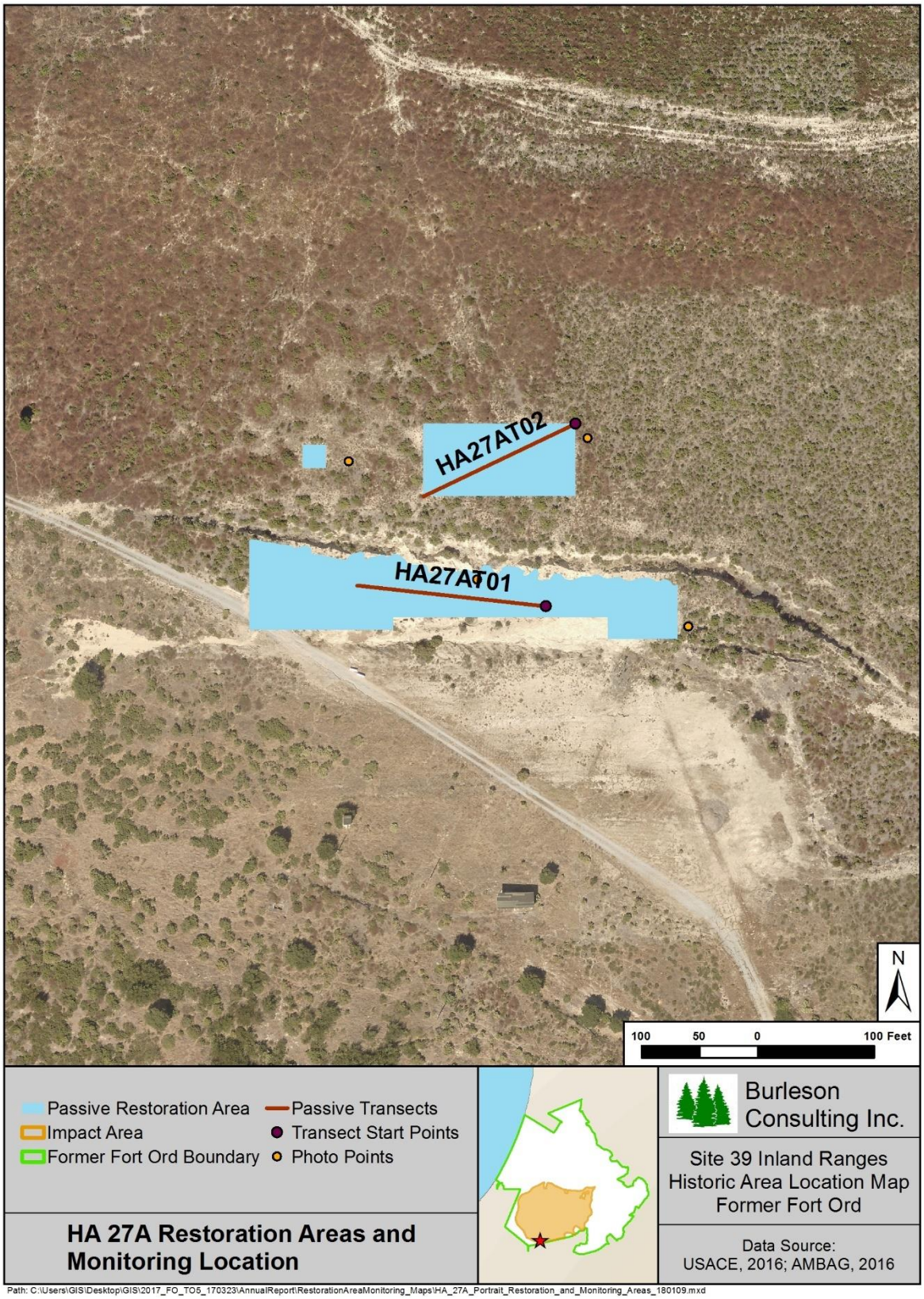


Figure 8-46. HA 27A Restoration Areas and Monitoring Location Map

Table 8-47. Success Criteria and Acceptable Limits for Restoration of HA 27A

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			Monterey manzanita[2]
			shaggy-bark manzanita
			sandmat manzanita[2]
			coyote brush
			Monterey ceanothus[2]
			golden yarrow
			peak rush-rose
			wedge-leaved horkelia
			deerweed
			sticky monkeyflower
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data indicated the non-native target weed species jubata grass at 10 percent cover. Therefore, the non-native target weed may be present at less than or equal to 5 percent.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 4
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 25.

Table 8-47. Success Criteria and Acceptable Limits for Restoration of HA 27A

			Monterey manzanita percent cover, as an average of transect data, must be equal or greater than 2.
			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 1.
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Not applicable
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.7.1 Restoration Activities

Burleson performed passive restoration at HA 27A with four applications of seed broadcast, once in 2011, once in 2012, and twice in 2016 (erosion control). No additional restoration activities occurred at HA 27A in 2017. The total amount of seed broadcast on the site was 21.906 lb compared to 13.530 lb prescribed in the SSRP. No active restoration activities have occurred at HA 27A. Table 8-48 summarizes the amount of seed applied by year and species, in comparison to the SSRP target.

Table 8-48. Summary of Passive Restoration Activities from 2011-2017 for HA 27A

Species	Pounds of Seed Broadcast				
	SSRP Target	2011	2012	2016	Total by Species
ACGL	1.200	0.600	0.608	0.800	2.008
ACMI	-	-	-	0.400	0.400
ADFA	0.600	0.300	0.308	0.000	0.608
ARMO[1]	1.200	0.600	0.611	0.000	1.211
ARPU[1]	0.600	0.300	0.308	0.000	0.608
ARTO	1.200	0.600	0.612	0.000	1.212
BAPI	0.090	0.000	0.046	0.000	0.046
CERI[1]	0.600	0.000	0.314	0.000	0.314
CRSC	0.600	0.300	0.303	0.000	0.603
DIAU	0.060	0.200	0.183	0.000	0.383
ELGL	-	-	-	3.800	3.800
ERCO	0.180	0.093	0.093	0.000	0.186
HOCU	1.200	0.600	0.600	0.800	2.000
Hordeum sp.	5.400	0.000	5.421	2.000	7.421
SAME	0.600	0.300	0.306	0.000	0.606
STPU	-	-	-	0.500	0.500
TOTAL	**13.530**	**3.893**	**9.713**	**8.300**	**21.906**

8.7.2 Monitoring Results

8.7.2.1 HMP Annual Density

The baseline data from the SSRP indicated no HMP annual species at HA 27A. Therefore, no HMP annuals need to be present at this restoration site.

8.7.2.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.7.2.3 Species Richness

Fifty-four species were observed at HA 27A. Of those, 23 were native shrubs or perennials, eight were native annual herbaceous species, 20 were non-native species, and three were not catergorized as they were only identified to genus (see Table 8-49). Species richness has increased by 13 species since 2016. Native shrub and perennial species decreased by one, native herbaceous species increased by one, and non-native species increased by eight. With the exception of ice plant, a perennial herb, the eight additional non-native species observed in 2017 are non-native annual grasses or herbs which likely took advantage of the increased precipitation in 2017.

Table 8-49. Species Observed on HA 27A, 2017

Scientific Name	Common Name	Code
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arbutus menziesii	Pacific madrone	ARME
Arctostaphylos montereyensis[1]	Monterey manzanita	ARMO
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake weed	BRMA
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Carex barbarae	Santa Barbara sedge	CABA
Carex sp.		CA
Carpobrotus edulis	iceplant	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Cortaderia jubata	pampas grass	COJU
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Dichelostemma capitatum	blue dicks	DICA
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wild-rye	ELGL
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filareee	ERCI
Festuca myuros	rattail sixweeks grass	FEMY

Table 8-49. Species Observed on HA 27A, 2017

Scientific Name	Common Name	Code
Gamochaeta ustulata	purple cudweed	GAUS
Heterotheca grandiflora	telegraph weed	HEGR
Hordeum sp.	common barley	HO
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Juncus bufonius	toad rush	JUBU
Juncus phaeocephalus	brown-headed rush	JUPH
Logfia gallica	daggerleaf cottonrose	LOGA
Lysimachia arvensis	scarlet pimpernel	LYAR
Marah fabacea	wild cucumber	MAFA
Navarretia hamata	hooked navarretia	NAHA
Pinus radiata	Monterey pine	PIRA
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Polypogon monspeliensis	rabbitfoot grass	POMO
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Salix sp.	willow	SA
Salvia mellifera	black sage	SAME
Schismus barbatus	old han schismus	SCBA
Silene gallica	small-flower catchfly	SIGA
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium dubium	little hop clover	TRDU

[1] HMP species

8.7.2.4 Vegetative Cover

Burleson completed one 50-meter and one 44-meter line-intercept transects at HA 27A. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 23.99%. The mean vegetative cover by native shrubs and perennials was substantially greater in 2017 than 2016 by 21.01%. However, only one transect was completed in 2016. Table 8-50 summarizes the vegetation cover and Table 8-51 presents vegetation cover by species. Figure 8-47 presents the percent cover of the dominant species at HA 27A in 2016 and 2017.

Table 8-50. Transect Survey Summary for HA 27A

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA27AT01	5.54	4.64	0.00	0.90	63.60	37.08
HA27AT02	45.25	45.98	0.00	0.00	90.16	9.32
SITE AVERAGE*	**24.13**	**23.99**	**0.00**	**0.48**	**76.03**	**24.09**

*Transect lengths are not equal. Site averages are weighted to reflect different lengths.

Table 8-51. Transect Survey Results for HA27A by Species

Transect	ACGL (%)	ADFA (%)	ARPU[1] (%)	ARTO[1] (%)	CA sp. (%)	CRSC (%)	ERCO (%)	HYRA (%)	PLCO (%)	POMO (%)	SAME (%)	TH (%)	BG (%)
HA27AT01	3.14	0.00	0.00	0.00	0.00	1.50	0.00	0.40	0.28	0.22	0.00	63.60	37.08
HA27AT02	13.25	0.36	1.32	8.23	0.66	20.64	0.141	0.00	0.00	0.00	0.39	90.16	9.32
SITE AVERAGE	**7.87**	**0.17**	**0.62**	**3.85**	**0.31**	**10.46**	**0.19**	**0.21**	**0.15**	**0.12**	**0.18**	**76.03**	**24.09**

[1]HMP species

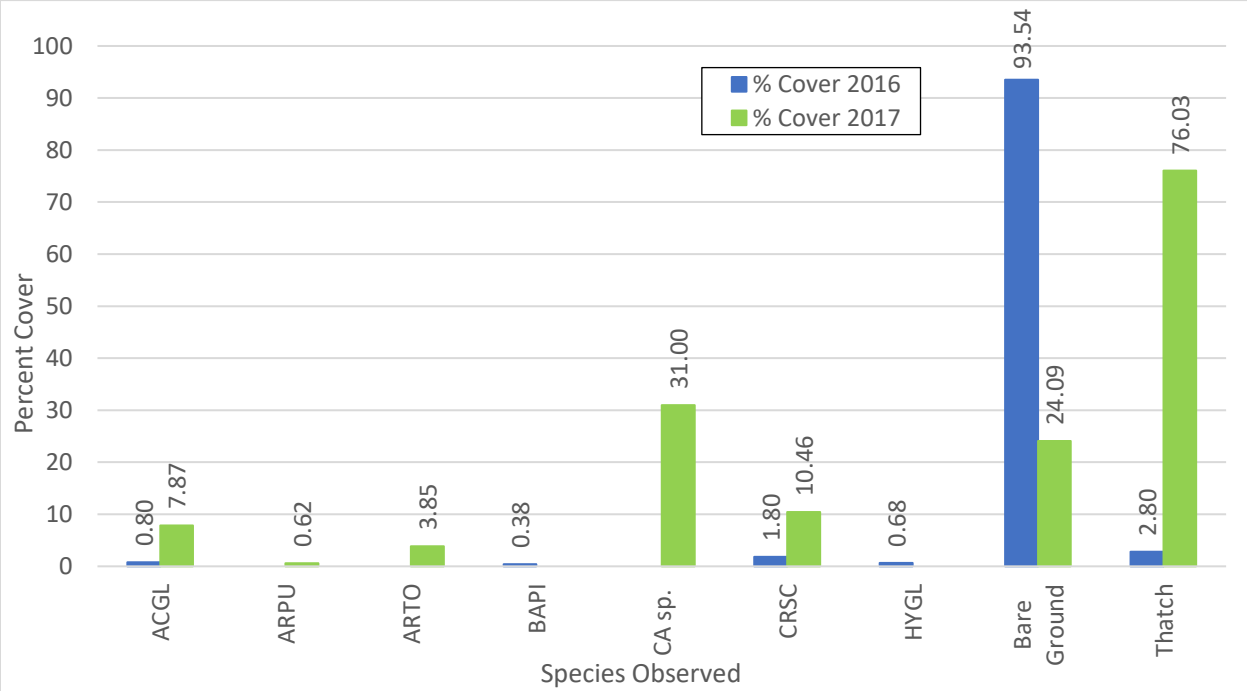


Figure 8-47. Percent Cover of Dominant Species at HA 27A in 2016 and 2017. Species codes and names are provided in Table 8-49. Only one transect was monitored in 2016 and two transects in 2017.

8.7.3 Discussion

8.7.3.1 HMP Annual Density

The baseline data from the SSRP indicated no HMP annual species at HA 27A. Therefore, no HMP annuals need to be present at this restoration site.

8.7.3.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.7.3.3 Species Richness

Chamise, Monterey manzanita, sandmat manzanita, shaggy-barked manzanita, coyote brush, Monterey ceanothus, golden yarrow, peak rush-rose, wedge-leaved horkelia, deerweed, sticky monkeyflower, and black sage were present. HA 27A included 23 native shrub and perennial species. HA 27A met the success criterion for objective 1.

8.7.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes thirteen shrub and perennial species presented in Table 2 of the HA 27A SSRP (Burleson, 2013). Currently the HA includes 23.34% vegetative cover; therefore, the success criterion was not met (see Figure 8-48).

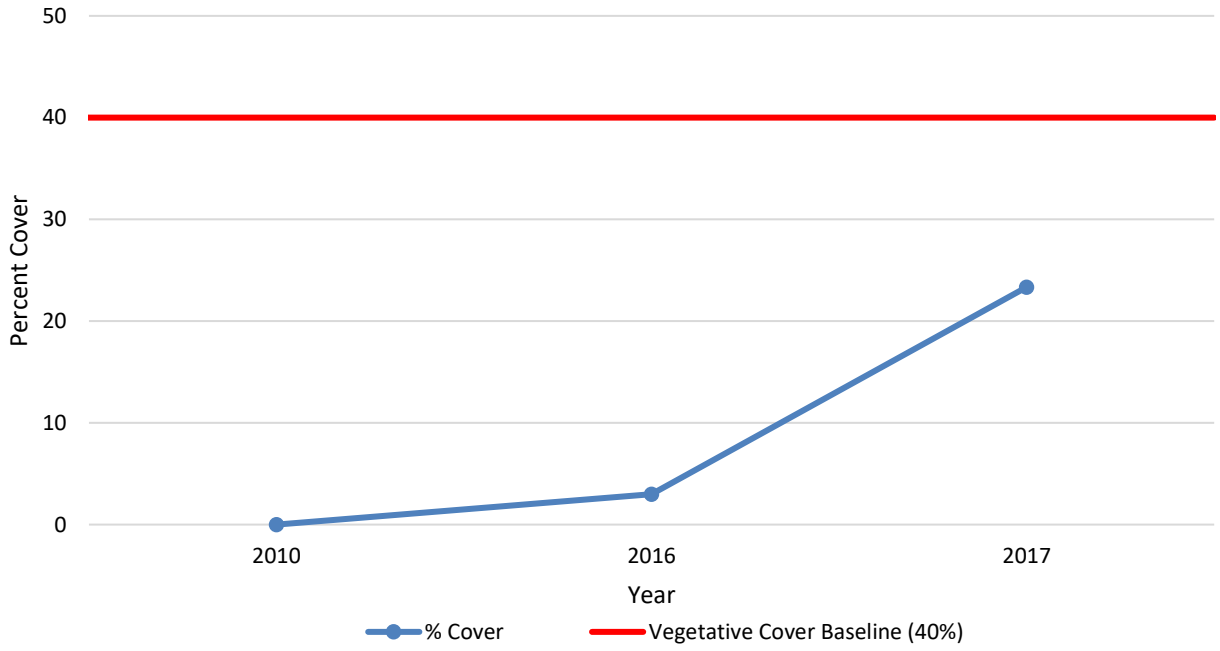


Figure 8-48. Native Vegetative Cover Compared to the Success Criterion at HA 27A. Only one transect was monitored in 2016 and two transects in 2017.

Objective 2 considers the percent cover of non-native target weeds. In 2017, the transect surveys did not encounter any target weeds. The vegetative cover for non-native species was 0.00%. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class has met or exceeded the baseline cover class of 4. Cover class 4 is from 26-50% of absolute cover. The HMP shrub species at HA 27A are providing an absolute cover of 0.62%, therefore the HA has not yet met this success criterion. This has been a slight increase from 0.00% in 2016. The second success criterion is no net loss of HMP shrubs. For HA 27A this means a vegetative cover average of at least 25% cover for sandmat manzanita (*Arctostaphylos pumila*), 2% or greater for Monterey manzanita (*Arctostaphylos montereyensis*), and 1% or greater for Monterey ceanothus (*Ceanothus rigidus*). The average vegetative cover for sandmat manzanita was 0.62%, for Monterey manzanita 0.00%, and for Monterey ceanothus 0.00% (see Figure 8-49). Only sandmat manzanita increased in cover from 2016 to 2017. In 2017, none of the species met the success criterion, but they were present on site. This success criterion was not met.

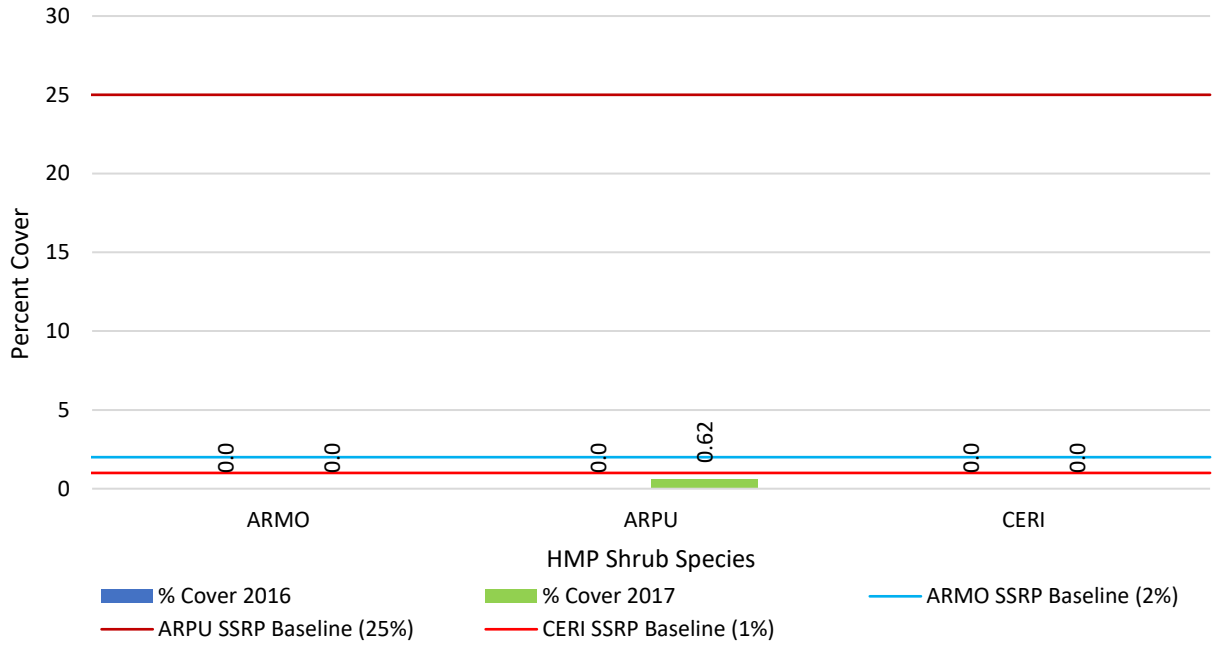


Figure 8-49. HMP Shrub Species Comparison to Success Criteria at HA 27A

8.7.3.5 Recommendations

HA 27A was in year 5 of monitoring in 2017 and had only begun to respond moderately well to restoration efforts. The restoration site met two of the five success criteria by 2017. The Army recommends three actions to support HA 27A in achieving success criteria in future years: 1) continue erosion control efforts, including the use of mulch; 2) plant sandmat manzanita, Monterey manzanita, and Monterey ceanothus to support HMP shrub criteria; and 3) manage the site in two distinct areas and reevaluate the success criteria for the southern polygon. The site is unlikely to meet the native vegetation and HMP shrub cover criteria without these corrective measures. Erosion control is necessary to control the movement of water and support the bolstering of denuded areas for future planting. Of the three distinct polygons, the southern polygon is heavily disturbed, has a lack of top soil, exposed hardpan sandstone, and ongoing erosion issues. This area is a transitional vegetative zone that may require a different plant palette and new success criteria. The Army proposes that the success criteria listed in table 8-47 shall only be applied to the two northern polygons which are fully within maritime chaparral habitat. The southern polygon will receive treatment for erosion control, and additional seeding with pioneer species. The southern polygon will be monitored according to the protocol, and invasive species will be treated. A qualitative objective for the southern polygon will be that at the end of 13th year of monitoring it will resemble an early successional stage of maritime chaparral. A qualitative overview is documented by the reference photo points (see Appendix D, page D-7 and Appendix E, page E-5). The photos illustrate some progress, but the site still has little cover.

The site will continue to be monitored by photo documentation, species richness meandering transects, and vegetative cover line-intercept transects in monitoring year 8, 2020.

Table 8-52 summarizes the current status of HA 27A including which success criteria have been met as well as our recommendation to move towards meeting success criteria.

Table 8-52. Status and Recommendations for Achieving the Success Criteria at HA 27A

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Continue erosion control effort. Plant sandmat manzanita, Monterey manzanita, and Monterey ceanothus. Reevaluate the success criteria
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant sandmat manzanita, Monterey manzanita, and Monterey ceanothus. Reevaluate the success criteria
Objective 3 – No. 4	HMP shrub cover by species	No	Plant sandmat manzanita, Monterey manzanita, and Monterey ceanothus. Reevaluate the success criteria
Objective 3 – No. 4	HMP annual density	NA	NA

8.8 HA 28

HA 28 was used by the Army as a range for automatic rifles. Soil was excavated over 4.3 acres. A pond partially extends into HA 28 and California tiger salamander (*Ambystoma californiense,* CTS) have been documented within this feature. This vernal pool is comprised by Ponds 30A, 30B, and 30C. These ponds provide habitat for CTS and other aquatic species. HA 28 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 28 is relatively flat and is surrounded by medium to very high-quality habitat.

HA 28 is located on the southern portion of Site 39, within the sand hill formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

Passive and active restoration activities were prescribed for HA 28. The prescription for passive restoration at HA 28 consisted of hand broadcast non-irrigated seed and annual weed management activities. The prescription for active restoration at HA 28 included installing native nursery-grown plants. HA 28 is moderately sloped and flat with some potential for erosion.

Restoration activities and monitoring at HA 28 began in 2013. The HA has been monitored for five years by photo documentation and site visits, three years for HMP annual density in plots, two years for HMP annual density across the HA, two years for vegetative cover, and three years for plant survivorship (see

Table 8-53). Figure 8-50 shows the HA footprint, passive restoration area, active restoration area, and transect monitoring locations. Success criteria for HA 28 are summarized in Table 8-54.

Table 8-53. Historic Summary of Restoration and Monitoring Activities at HA 28

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2013	2014	2015	2016	2017	2018	2019	2022	2027
Restoration: Active, Passive, and Erosion Control	●	●	●	●	●		●		
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
HMP Annual Density across HA				●	●	●	●	●	
Species Richness				●	●	●	●	●	●
Vegetative Cover				●	●	●	●	●	●
Plant Survivorship			●	●	●	●	●*		

*Plant survivorship monitoring will also be completed in 2020. However, it does not fit within the established monitoring years.

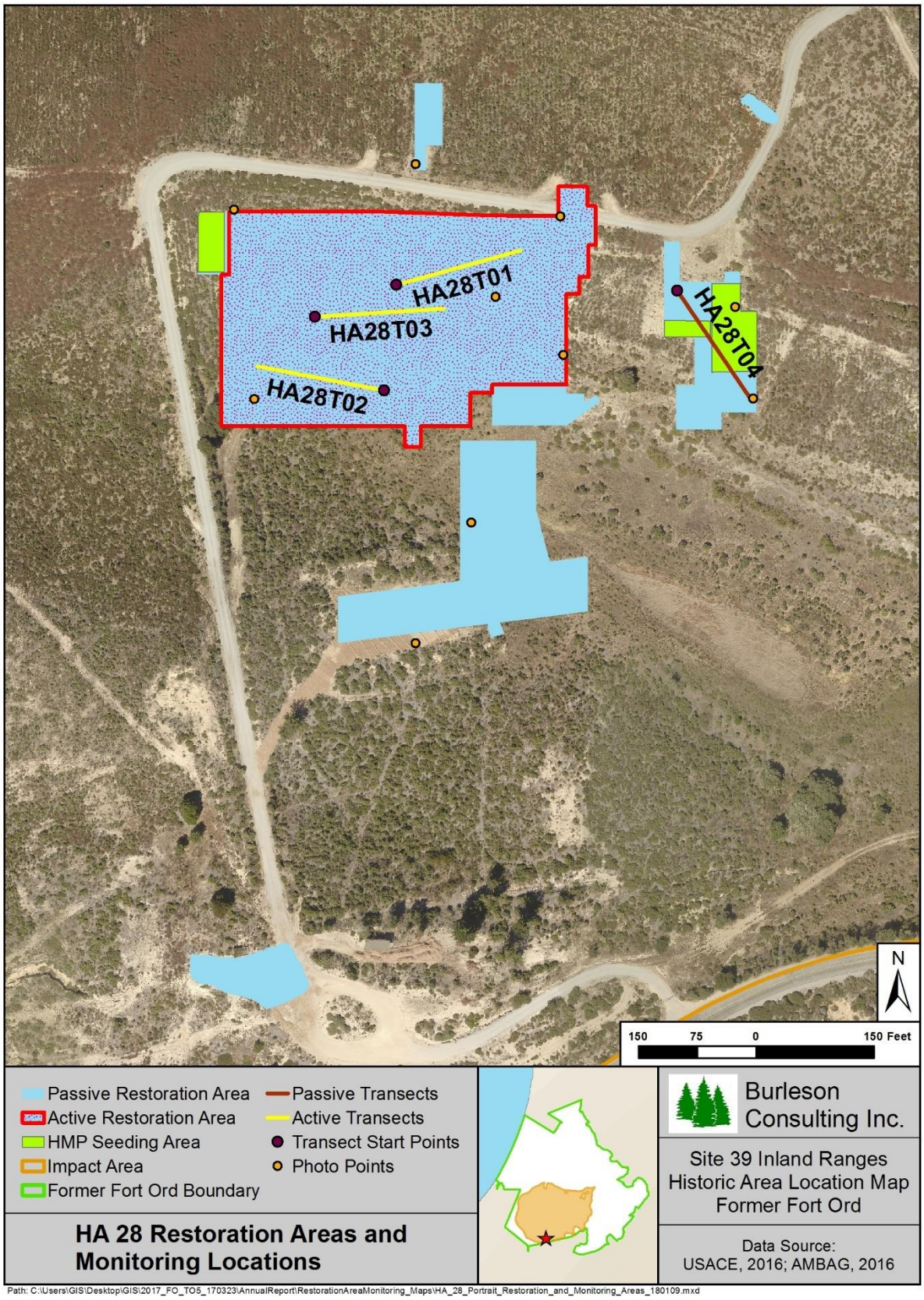


Figure 8-50. HA 28 Restoration Areas and Monitoring Locations Map

Table 8-54. Success Criteria and Acceptable Limits for Restoration of HA 28

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			Monterey manzanita[2]
			sandmat manzanita[2]
			shaggy-bark manzanita
			Monterey ceanothus[2]
			horkelia
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data indicated presence of non-native target weed species *Cortaderia jubata* (pampas grass). No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 35.
			Monterey ceanothus percent cover, as an average of transect data, must be present however, less than 1 percent is acceptable
			Monterey manzanita percent cover, as an average of transect data, must be present however, less than 2 percent is acceptable

Table 8-54. Success Criteria and Acceptable Limits for Restoration of HA 28

	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.8.1 Restoration Activities

Burleson performed passive restoration at HA 28 for five years in 2013, 2014, 2015, 2016, and 2017. The total amount of seed broadcast on the site was 263.30 lb compared to 115.80 lb prescribed in the SSRP. Table 8-55 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. Burleson performed passive restoration for the HMP annual species Monterey spineflower in 2014 and 2017. Three plots were chosen in the HA based on having suitable habitat for Monterey spineflower and adjacent extant populations.

Table 8-55. Summary of Passive Restoration Activities from 2013-2017 for HA 28

Species	Pounds of Seed Broadcast						
	SSRP Target	2013	2014	2015	2016	2017	Total by Species
ACMI	3.400	4.400	0.000	3.140	0.000	0.000	7.54
ACGL	6.800	8.500	0.000	3.720	0.000	0.000	12.22
BAPI	0.500	1.000	0.000	0.070	0.000	0.000	1.07
CERI[1]	1.700	1.700	0.000	0.360	0.000	0.000	2.06
CHPUP[1]	0.100	0.000	0.028	0.000	0.000	0.032	0.06
CRSC	2.600	3.500	0.000	0.290	0.000	0.000	3.79
DIAU	0.500	3.600	0.000	0.180	0.000	0.000	3.78
ELGL	13.600	33.600	0.000	15.700	1.200	0.000	50.50
ERCO	4.300	5.300	0.000	0.360	0.000	0.000	5.66
ERER	-	3.100	0.000	0.000	0.000	0.000	3.10
ERFA[1]	0.700	0.700	0.000	0.040	0.000	0.000	0.74
Hordeum sp.	68.000	118.000	0.000	36.400	0.800	0.000	155.20
HOCU	6.800	8.800	0.000	0.720	0.000	0.000	9.52
SAME	6.800	7.700	0.000	0.360	0.000	0.000	8.06
TOTAL	**115.800**	**199.900**	**0.028**	**61.340**	**2.000**	**0.032**	**263.30**

[1]HMP species

Active restoration was conducted in 2015. The total number of plants installed at HA 28 was 3,435 compared to 4,382 prescribed in the SSRP. Additional active restoration is planned for 2018. Table 8-56 summarizes the plants installed during active restoration.

Table 8-56. Summary of Active Restoration Activities from 2015-2017 for HA 28

Species	Number of Individual Plants		
	SSRP Target	2015 (Jan)	Total by Species
ACGL	237	237	237
ADFA	473	473	473
ARHO[1]	237	237	237
ARMO[1]	237	237	237
ARPU[1]	947	-	-
ARTO	592	592	592
BAPI	237	237	237
CERI[1]	237	375	375
CRSC	237	237	237
ERCO	237	175	175
ERFA[1]	237	161	161
HOCU	237	237	237
SAME	237	237	237
TOTAL	**4,382**	**3,435**	**3,435**

[1]HMP species

8.8.2 Monitoring Results

8.8.2.1 HMP Annual Density

Three Monterey spineflower plots were surveyed for year 3 density at HA 28 in 2017. The plots are numbered 1-3 on Figure 8-51 and are located throughout HA 28. Monterey spineflower was low density in all three plots. Figure 8-52 represents Monterey spineflower restoration plot densities for HA 28.

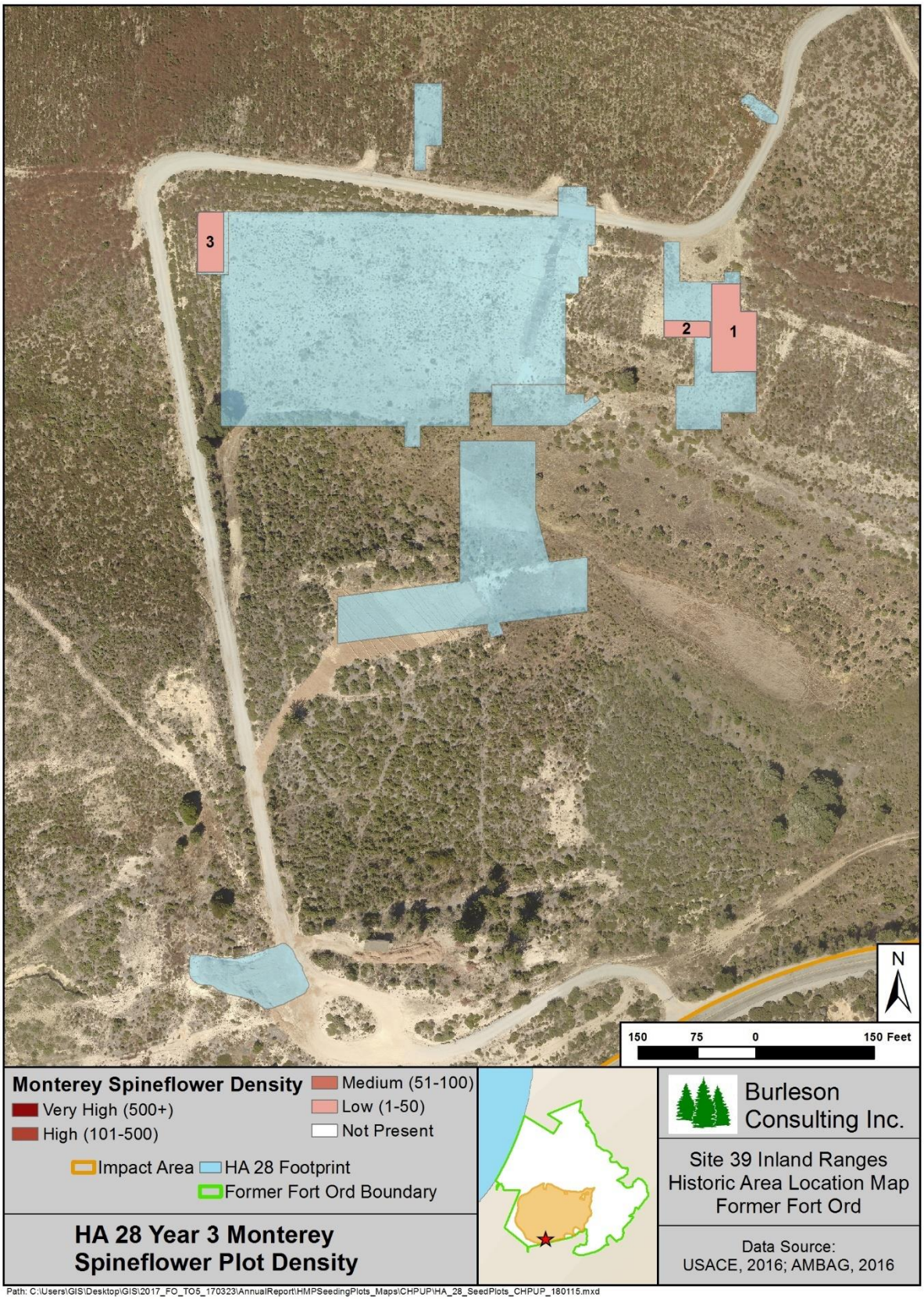


Figure 8-51. HA 28 Year 3 Monterey Spineflower Plot Density Map

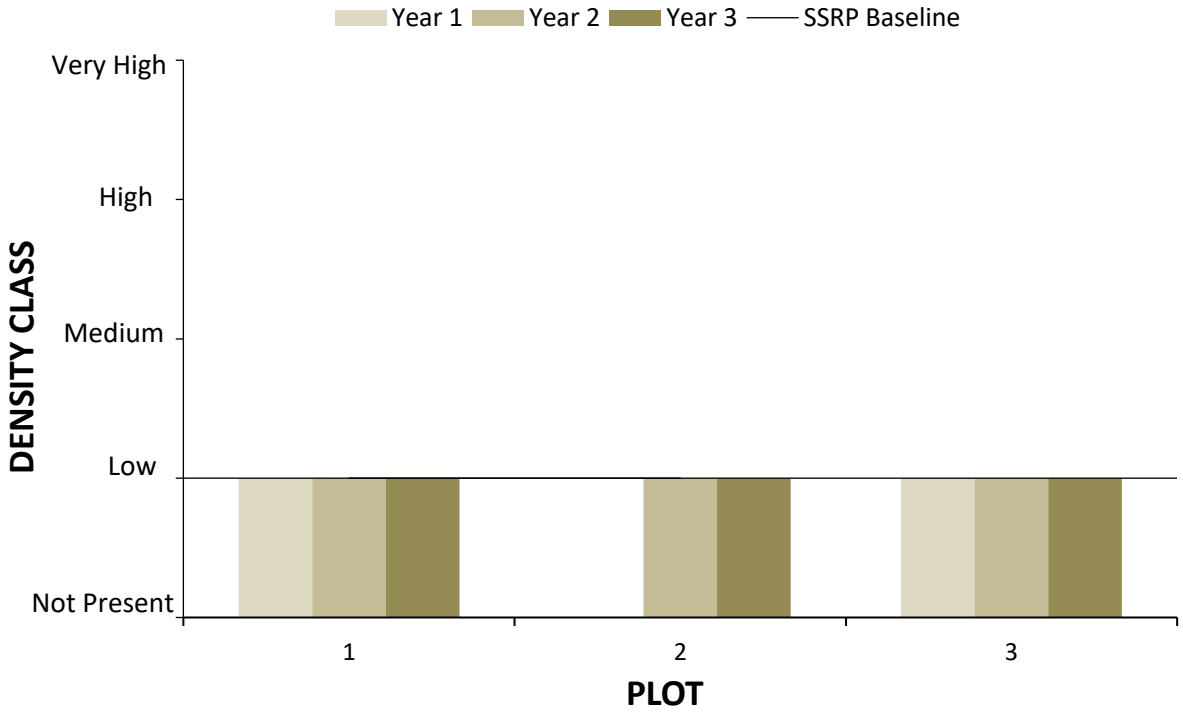


Figure 8-52. HA 28 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline Density Class for Years 1-3 at Restoration Plots 1-3

HMP annual density monitoring includes mapping discrete patches of HMP forbs within the restoration site but outside of the HMP annual restoration plots. This survey was completed for Monterey spineflower; they were not observed outside of the restoration plots at HA 28.

8.8.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 28. A total of eight shrub species and 243 individual plants were monitored for survivorship. By year 3 of monitoring for 2015 planting, 79% of the plants were alive. Survivorship for the 2015 planting increased from 77% to 79%. The increase in survivorship between years 2 and 3 was attributed to some plants being recorded as dead in year 2 but then recorded as alive in year 3 because they showed new growth. Table 8-57 presents results by species.

Table 8-57. Plant Survivorship Monitoring Summary and Results for 2015 Planting at HA 28

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2015)	Year Two (2016)	Year Three (2017)
			Alive (%)	Alive (%)	Alive (%)
ADFA	473	47	100	96	96
ARHO[1]	237	24	88	88	92
ARMO[1]	237	24	83	83	83
ARTO	592	60	87	82	83
BAPI	237	24	71	46	33
CERI[1]	375	24	71	58	50
ERFA[1]	161	16	88	75	69
SAME	237	24	96	88	96
TOTAL	**2,549**	**243**	**85***	**77***	**79***

* average

[1]HMP species

8.8.2.3 Species Richness

Sixty-two species were observed at HA 28. Of those, 30 were native shrubs or perennials, 16 were native annual herbaceous species, and 16 were non-native species (see Table 8-58). Species richness increased by 16 species since 2016. Native shrub and perennial species increased by four, native herbaceous species increased by eight, and non-native species increased by four.

Table 8-58. Species Observed on HA 28, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon heermannii	Heermann's lotus	ACHE
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos hookeri[1]	Hooker's manzanita	ARHO
Arctostaphylos montereyensis[1]	Monterey manzanita	ARMO
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Artemisia pycnocephala	coastal sagewort	ARPY
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Calochortus albus	white globe lily	CAAL
Carpobrotus edulis	ilce plant	CAED
Carex barbarae	Santa Barbara sedge	CABA
Castilleja densiflora	owl's clover	CADE
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME

Table 8-58. Species Observed on HA 28, 2017

Scientific Name	Common Name	Code
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Cordylanthus rigidus ssp. *littoralis*[1]	seaside bird's-beak	CORIL
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	pampas grass	COJU
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Deinandra corymbosa	coastal tarweed	DECO
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wild-rye	ELGL
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filaree	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Genista monspessulana	French broom	GEMO
Heterotheca grandiflora	telegraphweed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Lepechinia calycina	pitcher sage	LECA
Lessingia pectinata	common lessingia	LEPE
Logfia gallica	daggerleaf cottonrose	LOGA
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus bicolor	miniature lupine	LUBI
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia sativa	coast tarweed	MASA
Navarretia hamata	hooked navarretia	NAHA
Plantago erecta	California plantain	PLER
Polycarpon tetraphyllum var. *tetraphyllum*	four-leaved allseed	POTET
Polygala californica	California milkwort	POCA
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium stramineum	cotton-batting plant	PSST
Salvia mellifera	black sage	SAME
Schismus barbatus	old han schismus	SCBA
Silene gallica	small-flower catchfly	SIGA
Toxicodendron diversilobum	poison oak	TODI

[1]HMP species

8.8.2.4 Vegetative Cover

Burleson completed four 50-meter line-intercept transects at HA 28. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 21.06%. The mean vegetative cover was greater in 2016 than in 2017 by 3.02%. This may be attributed to a normal fluctuation in plant dominance from year to year. Additionally, the decrease from 2016 to 2017 was mostly due to the decrease in cover contributed by deerweed and sandmat manzanita. Although deerweed and sandmat manzanita are generally large plants that contribute a substantial amount of cover across all HA sites, it is possible that the location of the transect tape may have shifted slightly from 2016 to 2017 and captured different plants as a result. An increase in cover was observed for shaggy-barked manzanita, dwarf ceanothus, Monterey ceanothus, sticky monkeyflower, wedge-leaved horkelia, and black sage. Table 8-59 summarizes vegetation cover and Table 8-60 presents the vegetation cover by species. Figure 8-53 presents the percent cover of the dominant species at HA 28 in 2016 and 2017.

Table 8-59. Transect Survey Summary for HA 28

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA28T01	34.66	34.66	0.00	0.00	39.3	36.68
HA28T02	17.92	17.08	0.00	0.84	56.62	36.02
HA28T03	20.10	19.08	0.28	0.74	86.24	10.08
HA28T04	23.46	13.4	8.88	1.18	65.4	30.3
SITE AVERAGE	**24.04**	**21.06**	**2.29**	**0.69**	**61.89**	**28.27**

Table 8-60. Transect Survey Results for HA 28 by Species

Transect	ACGL (%)	ADFA (%)	ARHO[1] (%)	ARMO (%)	ARPU[1] (%)	ARTO (%)	CEDE (%)	CERI[1] (%)	CRSC (%)
HA28T01	14.84	0.94	0.00	0.00	7.86	0.46	0.00	0.00	5.08
HA28T02	1.68	0.00	0.00	0.00	1.16	0.00	0.00	0.00	12.80
HA28T03	3.38	0.66	0.86	0.62	0.00	2.72	4.90	3.04	1.90
HA28T04	6.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.32
SITE AVERAGE	**6.55**	**0.40**	**0.22**	**0.16**	**2.25**	**0.79**	**1.23**	**0.76**	**6.28**

Table 8-60 (continued). Transect Survey Results for HA 28 by Species

Transect	DIAU (%)	ERCO (%)	HEGR (%)	HOCU (%)	HYRA (%)	LEPE (%)	SAME (%)	TH (%)	BG (%)
HA28T01	1.10	0.00	0.00	0.78	0.00	0.00	3.60	39.3	36.68
HA28T02	0.00	0.00	0.00	1.44	0.84	0.00	0.00	56.62	36.02
HA28T03	0.00	0.00	0.28	0.74	0.74	0.00	0.00	86.24	10.08
HA28T04	0.00	1.24	0.32	0.52	1.18	8.56	0.00	65.4	30.3
SITE AVERAGE	**0.28**	**0.31**	**0.15**	**0.87**	**0.69**	**2.14**	**0.90**	**61.89**	**28.27**

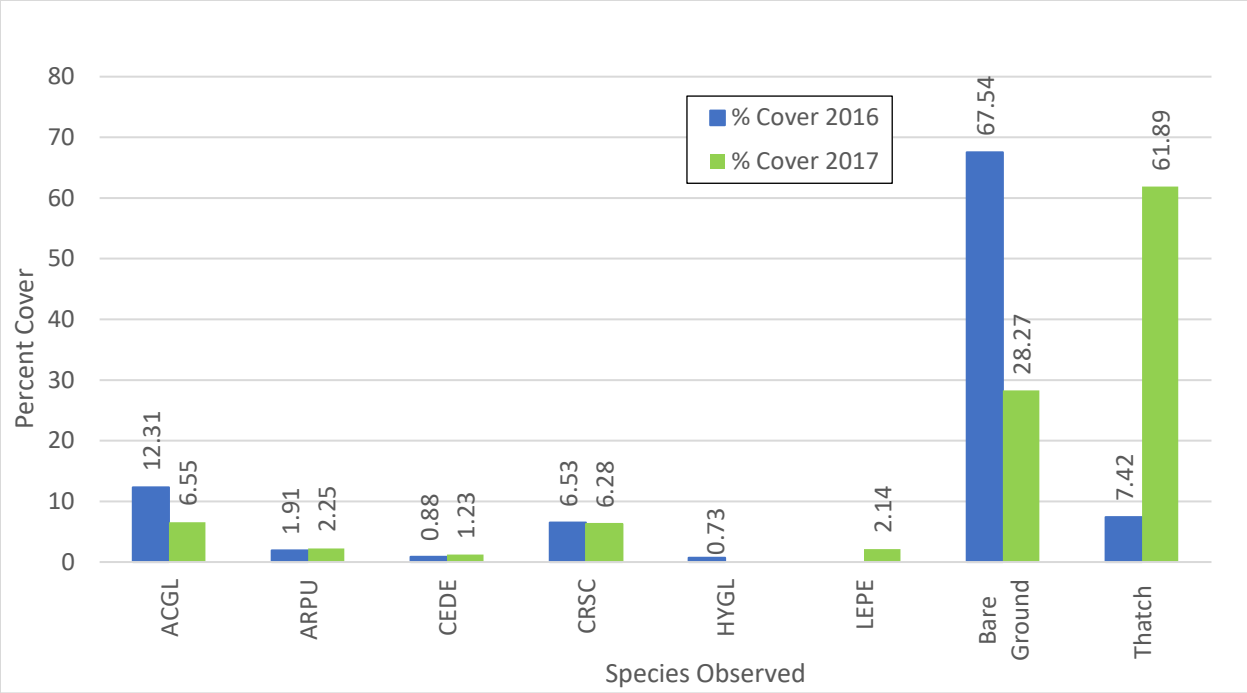


Figure 8-53. Percent Cover of Dominant Species at HA 28 in 2016 and 2017. Species codes and names are provided in Table 8-58.

8.8.3 Discussion

8.8.3.1 HMP Annual Density

Monterey spineflower density is within the acceptable limits for HMP annual density at HA 28. The SSRP baseline density class for Monterey spineflower was low. Monterey spineflower restoration plot results show that by year 3, for all plots, the density met the success criterion under objective 3. Monterey spineflower was not present outside of the restoration plots. However, seeding was completed in 2015 and it is likely that the site needs more time for Monterey spineflower to spread outside of the seeded restoration plots.

8.8.3.2 Plant Survivorship

Eight shrub species were monitored at HA 28 for year 3 plant survivorship in 2017. Plant survivorship results show that 79% of the plants installed in 2015 are still alive after three years of monitoring. Survivorship increased from 77% in 2016. Survivorship of Hooker's manzanita, Monterey manzanita, and black sage increased from 2016 to 2017. The increase in survivorship between years was attributed to some plants being recorded as dead in year 2 but then recorded as alive in year 3 because they showed new growth. All species are doing well at HA 28. In 2017, plant survivorship monitoring at HA 28 was completed for the minimum of three years after plant installation.

8.8.3.3 Species Richness

Chamise, Monterey manzanita, sandmat manzanita, shaggy-bark manzanita, Monterey ceanothus, wedge-leaved horkelia, and black sage were present. HA 28 included 30 native shrub and perennial species. HA 28 met the success criterion for objective 1.

8.8.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes eighteen shrub and perennial species presented in Table 2 of the HA 28 SSRP (Burleson, 2013). Currently the HA includes 19.77% vegetative cover; therefore, this criterion was not met. The vegetative cover was higher in 2016 by 3.6% (see Figure 8-54).

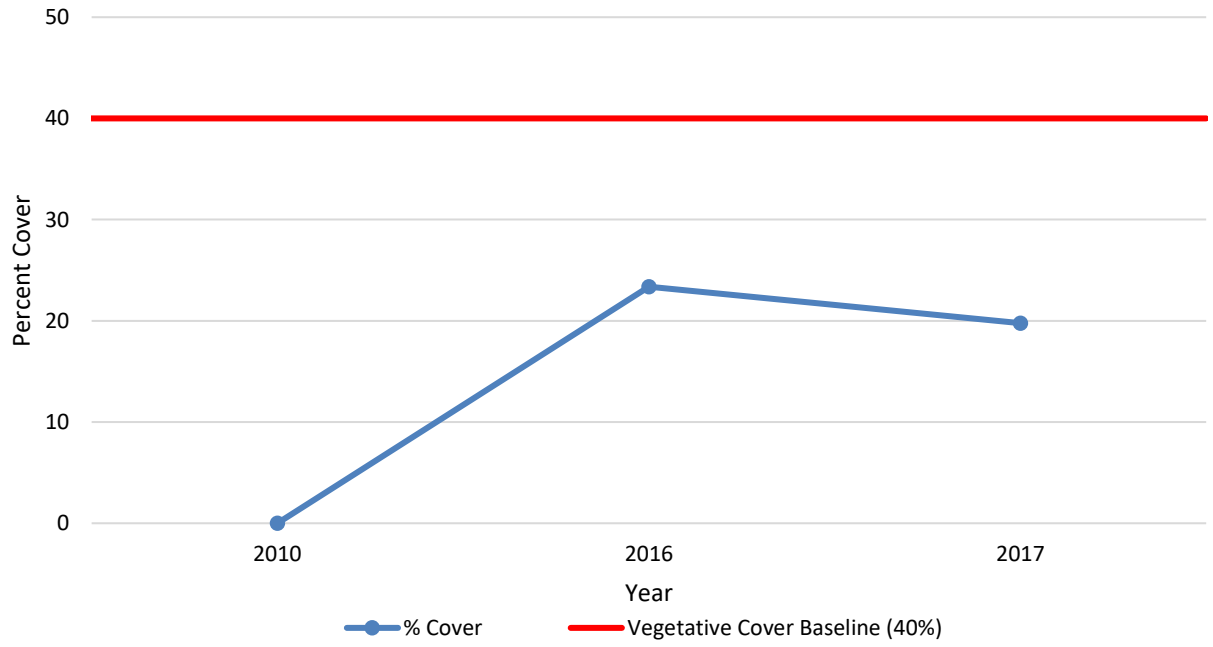


Figure 8-54. Native Vegetative Cover Compared to the Success Criterion at HA 28

Objective 2 considers the percent cover of non-native target weeds. In 2017, target weeds were not observed during the transect surveys. The vegetative cover for non-native species was 0.00%. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class was met or exceeded the baseline cover class of 3. Cover class 3 is from 6-25% of absolute cover. The HMP shrub species at HA 28 are providing an absolute cover of 3.17%, therefore the HA has not yet met this success criterion. However, this is an increase from 2.73% in 2016. The second success criterion is no net loss of HMP shrubs. For HA 28 this means a vegetative cover average of at least 35% cover for sandmat manzanita (*Arctostaphylos pumila*) and presence of Monterey ceanothus (*Ceanothus rigidus*) and Monterey manzanita (*Arctostaphylos montereyensis*). The average vegetative cover for sandmat manzanita was 2.25%, for Monterey ceanothus 0.76%, and for Monterey manzanita 0.16% (see Figure 8-55). Sandmat manzanita, Monterey ceanothus, and Monterey manzanita increased in cover from 2016 to 2017. In 2017, two of the three species, Monterey ceanothus and Monterey manzanita, met the success criterion. Therefore, the success criterion was not met although there has been measured improvement.

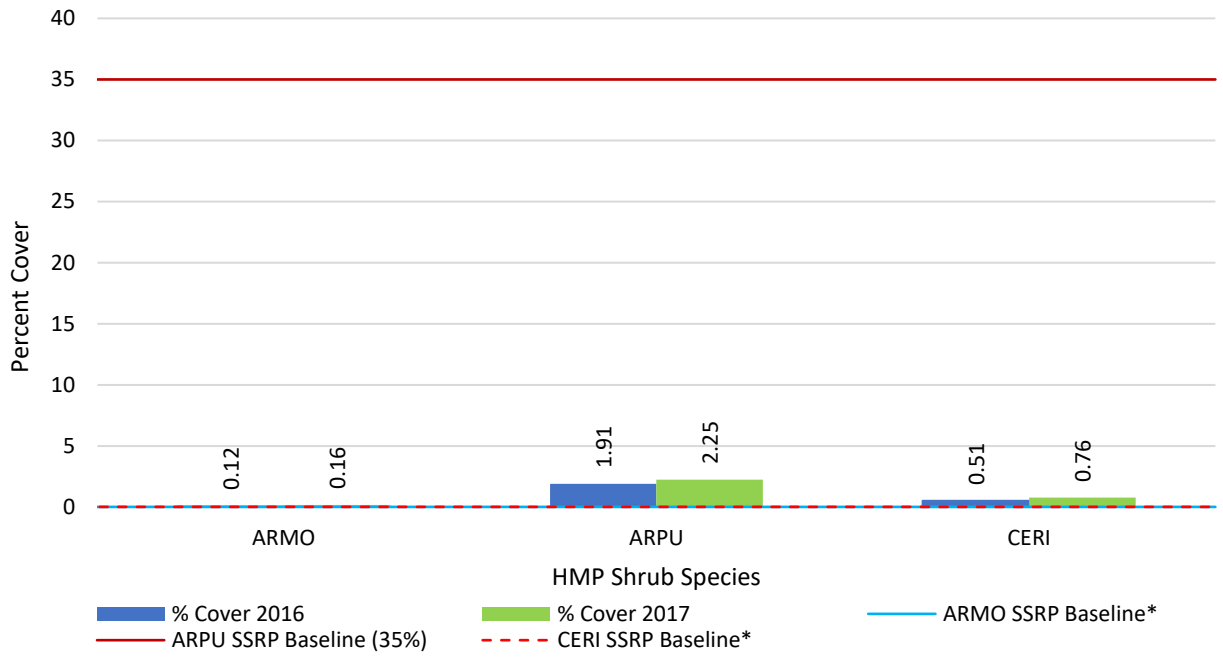


Figure 8-55. HMP Shrub Species Comparison to Success Criteria at HA 28

8.8.3.5 Recommendations

HA 28 was in year 3 of monitoring in 2017 and responded moderately well to the previous restoration efforts. The site has met three of the six success criteria. No corrective measures are recommended at this time at HA 28. Since the site is scheduled to receive 948 SSRP-prescribed sandmat manzanitas during the 2017/2018 planting season, it may respond favorably which could preclude the need for corrective measures prior to year 5. Overall, HA 28 needs time to respond to the restoration effort, and continued monitoring. A qualitative overview is documented by the reference photo points (see Appendix D, page D-8). The photos illustrate the progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover line-intercept transects in year 4.

Table 8-61 summarizes the current status of HA 28 including which success criteria have been met and which have not as well as our recommendation to move towards meeting all of the success criteria at HA 28.

Table 8-61. Status and Recommendations for Achieving the Success Criteria at HA 28

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Wait to see how the HA responds
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant sandmat manzanita (scheduled 2018)
Objective 3 – No. 4	HMP shrub cover by species	No	Plant sandmat manzanita (scheduled 2018)
Objective 3 – No. 4	HMP annual density	Yes	None

8.9 HA 29

HA 29 was used by the Army as a small-arms firing range. Soil remediation was completed in 2010 and resulted in 1,700 cubic yards of soil being excavated from 1.0 acre (Shaw, 2008). HA 29 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 29 varies in elevation with a west aspect. The adjacent lands are not developed and contain substantial amounts of intact native vegetation that will promote natural recruitment at the restoration areas. The area of HA 29 was heavily disturbed and covered with pampas grass prior to soil remediation. Approximately half of HA 29 has compacted soil.

HA 29 is located on the southern portion of Site 39, occurring within Aromas formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

Both passive and active restoration areas were designated for HA 29. The main focus of restoration was to broadcast non-irrigated seed. However, for the active restoration efforts, container-grown plants, cuttings, and burls were to be planted. The potential for erosion at HA 29 exists along the slopes surrounding the excavated areas. Areas within HA 29 which are less than 1.0 acre or are larger than 1.0 acre but less than 100 feet wide, were restored passively, using broadcast seed only. Areas larger than 1.0 acre and greater than 100 feet across received active restoration in addition to the passive restoration efforts.

Restoration at HA 29 began in 2012 and was completed in 2013. However, in 2016 additional seed was broadcast on the site. Monitoring at HA 29 began in 2013. It has been monitored for seven years by photo documentation and site visits, two years for vegetative cover, and three years for plant survivorship (see Table 8-62). Figure 8-56 shows the HA footprint, passive restoration area, active restoration area, and transect monitoring locations. Success criteria for HA 29 are summarized in Table 8-63.

Table 8-62. Historic Summary of Restoration and Monitoring Activities at HA 29

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2011	2012	2013	2014	2015	2016	2017	2020	2025
Restoration: Active, Passive, Erosion Control, and Corrective Measures	●	●	●						
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Species Richness						●	●	●	●
Vegetative Cover						●	●	●	●
Plant Survivorship			●	●	●				

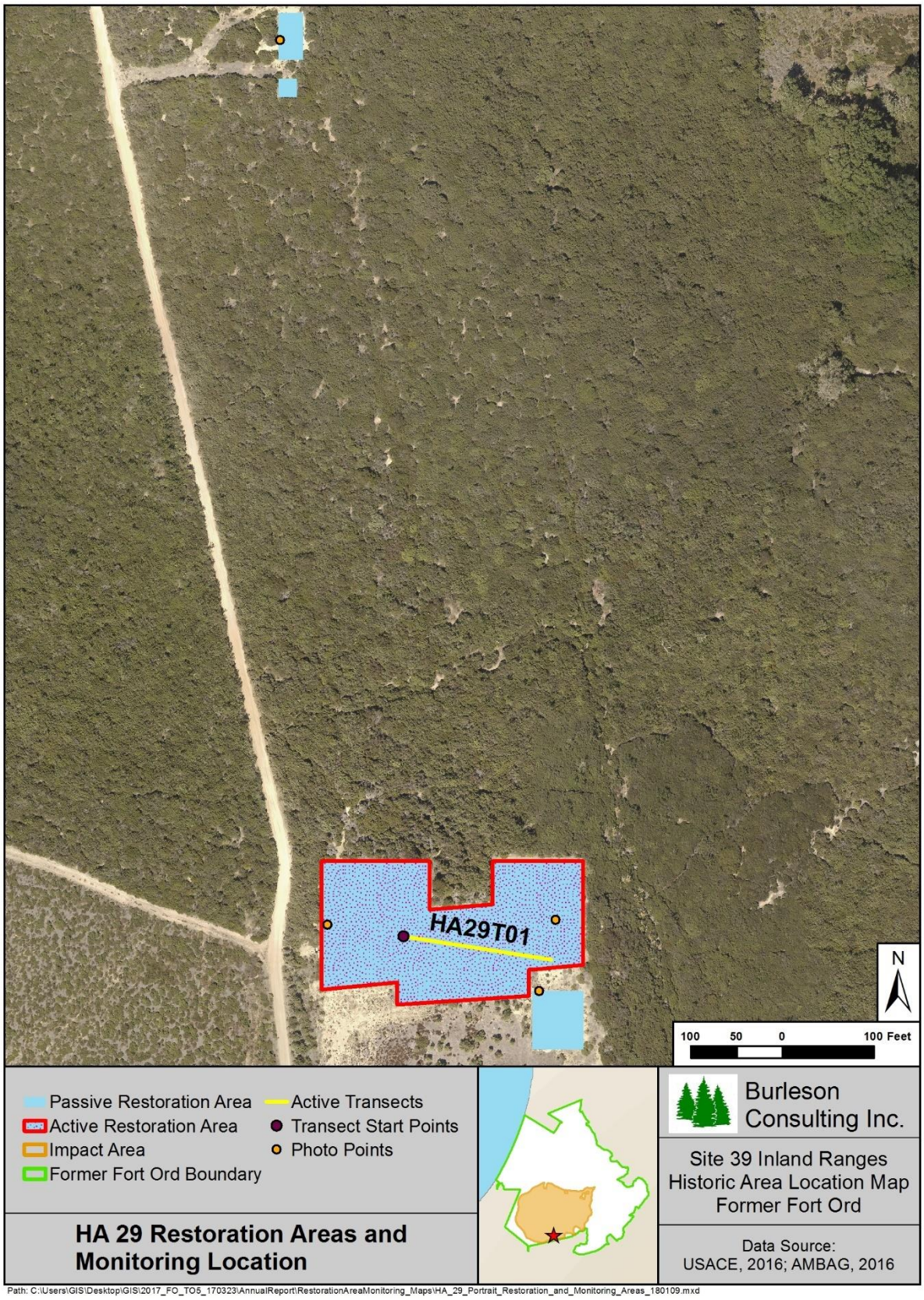


Figure 8-56. HA 29 Restoration Areas and Monitoring Locations Map

Table 8-63. Success Criteria and Acceptable Limits for Restoration of HA 29

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			Hooker's manzanita[2]
			Monterey manzanita[2]
			shaggy-bark manzanita
			sandmat manzanita[2]
			coyote brush
			Monterey ceanothus[2]
			Eastwood's goldenbush[2]
			golden yarrow
			toyon
			peak rush-rose
			wedge-leaved horkelia
			deerweed
			sticky monkeyflower
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data indicated that jubata grass was present at 11%. Therefore, no more than 5% non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 4
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Hooker's manzanita percent cover, as an average of transect data, must be equal or greater than 2

Table 8-63. Success Criteria and Acceptable Limits for Restoration of HA 29

			Monterey manzanita percent cover, as an average of transect data, must be equal or greater than 7
			Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 27
			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 1
			Eastwood gold fleece percent cover, as an average of transect data, must be equal or greater than 2
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Not applicable
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.9.1 Restoration Activities

Burleson performed passive restoration at HA 29 for three years in February 2012, December 2012, and 2016. No additional passive restoration activities occurred at HA 29 in 2017. The total amount of seed broadcast on the site was 32.090 lb compared to the 24.650 lb prescribed in the SSRP. Table 8-64 summarizes the amount of seed applied by year and species, in comparison to the SSRP target.

Table 8-64. Summary of Passive Restoration Activities from 2012-2017 for HA 29

Species	Pounds of Seed Broadcast				
	SSRP Target	2012 (Feb)	2012 (Dec)	2016	Total by Species
ACMI	-	-	-	0.800	0.800
ACGL	2.000	1.000	1.025	1.600	3.625
ADFA	1.000	0.500	0.505	0.000	1.005
ARHO[1]	2.000	1.000	1.019	0.000	2.019
ARMO[1]	2.000	1.000	1.011	0.000	2.011
ARPU[1]	1.000	0.500	0.520	0.000	1.020
ARTO	2.000	1.000	1.010	0.000	2.010
BAPI	0.150	0.000	0.083	0.000	0.083
CERI[1]	1.000	0.000	1.035	0.000	1.035
CRSC	1.000	0.500	0.515	0.000	1.015
DIAU	0.100	0.300	0.316	0.000	0.616
ELGL	-	-	-	1.600	1.600

Table 8-64. Summary of Passive Restoration Activities from 2012-2017 for HA 29

Species	Pounds of Seed Broadcast				
	SSRP Target	2012 (Feb)	2012 (Dec)	2016	Total by Species
ERCO	0.300	0.200	0.160	0.000	0.360
ERFA[1]	0.100	0.058	0.059	0.000	0.117
Hordeum sp.	9.000	0.000	9.030	0.000	9.030
HOCU	2.000	1.000	1.021	1.600	3.621
SAME	1.000	0.600	0.523	0.000	1.123
STPU	-	-	-	1.000	1.000
TOTAL	**24.650**	**7.658**	**17.832**	**6.600**	**32.090**

[1]HMP species

Active restoration was completed in 2012 and 2013. The total number of plants installed at HA 29 was 1,636 compared to 1,374 prescribed in the SSRP. Table 8-65 summarizes the plants installed at HA 29.

Table 8-65. Summary of Active Restoration Activities for HA 29

Species	Number of Individual Plants			
	SSRP Target	2012	2013	Total by Species
ACGL	189	225	-	225
ADFA	101	-	120	120
ARHO[1]	4	-	5	5
ARMO[1]	13	-	15	15
ARPU[1]	17	-	20	20
ARTO	21	-	25	25
BAPI	76	91	-	91
CERI[1]	4	-	5	5
CRSC	189	225	-	225
DIAU	189	225	-	225
ERCO	189	225	-	225
ERFA[1]	4	-	5	5
HOCU	189	225	-	225
SAME	189	225	-	225
TOTAL	**1,374**	**1,441**	**195**	**1,636**

[1]HMP species

8.9.2 Monitoring Results

8.9.2.1 HMP Annual Density

The baseline data from the SSRP indicated no HMP annual species at HA 29. Therefore, no HMP annuals need to be present at this restoration site.

8.9.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 29. A total of nine shrub species and 160 individual plants were monitored for survivorship. By year three, 87% of the 2013 plants were alive. Survivorship monitoring is complete. See Table 8-66 for results by species.

Table 8-66. Survivorship Monitoring Results for HA 29

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2013)	Year Two (2014)	Year Three (2015)
			Alive (%)	Alive (%)	Alive (%)
ADFA	120	45	67	89	91
ARHO[1]	5	5	100	100	100
ARMO[1]	15	15	100	100	87
ARPU[1]	20	20	95	95	85
ARTO	25	25	88	88	84
BAPI	91	20	85	70	75
CERI[1]	5	5	60	80	80
ERFA[1]	5	5	100	100	100
SAME	225	20	100	95	90
TOTAL	**511**	**160**	**88***	**91***	**87***

*average
[1]HMP species

8.9.2.3 Species Richness

Fifty-three species were observed at HA 29. Of those, 27 were native shrubs or perennials, seven were native annual herbaceous species, and 19 were non-native species (see Table 8-67). Species richness was also 53 species in 2016. However, native herbaceous species decreased by one, and non-native species increased by one.

Table 8-67. Species Observed on HA 29, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon heermannii	Heermann's lotus	ACHE
Adenostoma fasciculatum	chamise	ADFA
Agoseris grandiflora	large-flowered agoseris	AGGR
Aira caryophyllea	silver hair grass	AICA
Arbutus menziesii	Pacific madrone	ARME
Arctostaphylos hookeri[1]	Hooker's manzanita	ARHO
Arctostaphylos montereyensis[1]	Monterey manzanita	ARMO
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake weed	BRMA
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Carpobrotus edulis	ice plant	CAED

Table 8-67. Species Observed on HA 29, 2017

Scientific Name	Common Name	Code
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Cortaderia jubata	pampas grass	COJU
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wild-rye	ELGL
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filareee	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Heterotheca grandiflora	telegraphweed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ears	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Juncus bufonius	toad rush	JUBU
Lepechinia calycina	pitcher sage	LECA
Logfia gallica	daggerleaf cotton rose	LOGA
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia gracilis	gumweed (slender tarweed)	MAGR
Madia sativa	coast tarweed	MASA
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHAP
Pinus radiata	Monterey pine	PIRA
Plantago coronopus	cut-leaved plantain	PLCO
Polypogon monspeliensis	rabbitfoot grass	POMO
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium stramineum	cotton-batting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Salvia mellifera	black sage	SAME
Silene gallica	small-flower catchfly	SIGA
Sonchus asper	prickly sow thistle	SOAS
Toxicodendron diversilobum	poison oak	TODI
Trifolium hirtum	rose clover	TRHI

[1]HMP species

8.9.2.4 Vegetative Cover

Burleson completed one 50-meter line-intercept transect at HA 29. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 14.30%. The mean vegetative cover by native shrubs and perennials was greater in 2016 than in 2017 by 4.74%. This may be attributed to a normal fluctuation in plant dominance from year to year. Additionally, the decrease from 2016 to 2017 was mostly due to the decrease in cover contributed by deerweed, dwarf ceanothus, and black sage. Although deerweed, dwarf ceanothus, and black sage are generally large plants that contribute a

substantial amount of cover across all HA sites, it is possible that the location of the transect tape may have shifted slightly from 2016 to 2017 and captured different plants as a result. An increase in cover was observed for sandmat manzanita, peak rush-rose, sticky monkeyflower, and wedge-leaved horkelia.Table 8-68 summarizes the vegetation cover and Table 8-69 presents vegetation cover by species. Figure 8-57 presents the percent cover of the dominant species at HA 28 in 2016 and 2017.

Table 8-68. Transect Survey Summary for HA 29

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA29T01	15.60	14.30	0.00	1.30	59.06	35.84
SITE AVERAGE	**15.60**	**14.30**	**0.00**	**1.30**	**59.06**	**35.84**

Table 8-69. Transect Survey Results for HA 29 by Species

Transect	ACGL (%)	ADFA (%)	ARPU[1] (%)	BAPI (%)	CEDE (%)	COJU (%)	CRSC (%)	DIAU (%)	ERCO (%)	HOCU (%)	HYRA (%)	SAME (%)	TH (%)	BG (%)
HA29T01	2.04	0.42	3.14	0.20	1.98	0.70	1.72	0.68	0.20	1.44	0.60	2.48	59.06	35.84
SITE AVERAGE	**2.04**	**0.42**	**3.14**	**0.20**	**1.98**	**0.70**	**1.72**	**0.68**	**0.20**	**1.44**	**0.60**	**2.48**	**59.06**	**35.84**

[1]HMP species

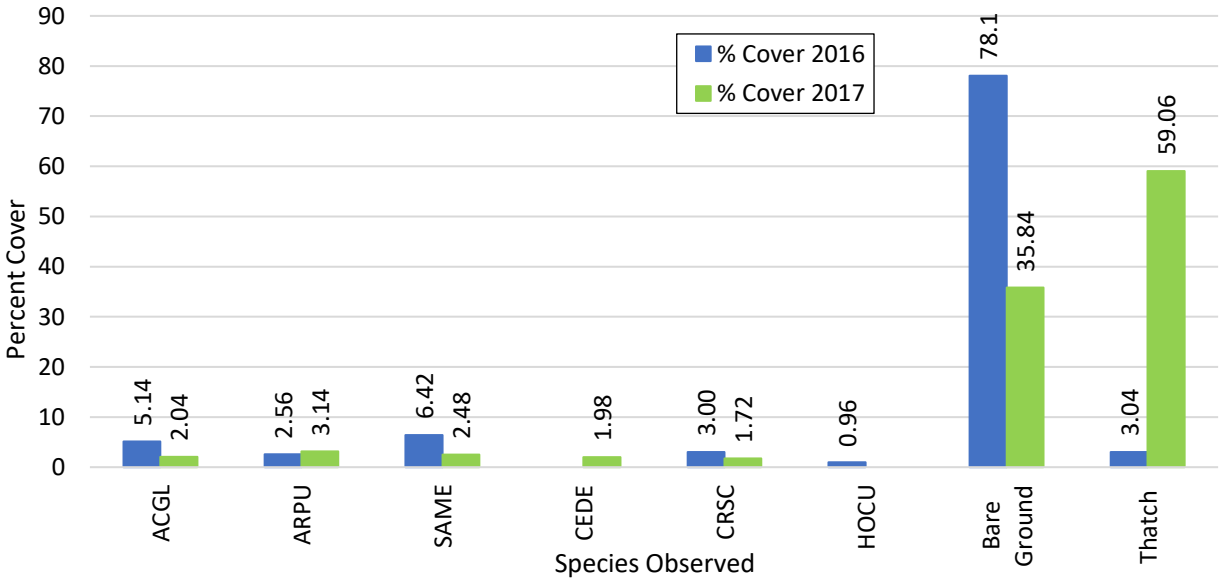


Figure 8-57. Percent Cover of Dominant Species at HA 29 in 2016 and 2017. Species codes and names are provided in Table 8-67.

8.9.3 Discussion

8.9.3.1 HMP Annual Density

The baseline data from the SSRP indicated no HMP annual species at HA 29. Therefore, no HMP annuals need to be present at this restoration site.

8.9.3.2 Plant Survivorship

Plant survivorship results show that 87% of the plants installed in 2013 were still alive after three years of monitoring. Survivorship increased from 84% in year 1 to 89% in year 2. The increase in survivorship between years 1 and 2 was attributed to some plants being recorded as dead in year 1 but then recorded as alive in year 2 because they showed new growth. Due to natural plant mortality over time, year 3 survivorship results slightly decreased from year 2. Overall, survivorship at HA 29 is high.

8.9.3.3 Species Richness

Chamise, Hooker's manzanita, Monterey manzanita, sandmat manzanita, shaggy-barked manzanita, coyote brush, Monterey ceanothus, Eastwood's goldenbush, golden yarrow, peak rush-rose, wedge-leaved horkelia, deerweed, sticky monkeyflower, and black sage were present. Toyon was not present. HA 29 included 27 native shrub and perennial species; however, it did not meet the success criterion for objective 1 because toyon was not present.

8.9.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1, the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes fourteen shrub and perennial species presented in Table 2 of the HA 29 SSRP (Burleson, 2013). Currently the HA includes 12.32% cover and this success criterion was not met. The vegetative cover was greater in 2016 by 3.56% (see Figure 8-58).

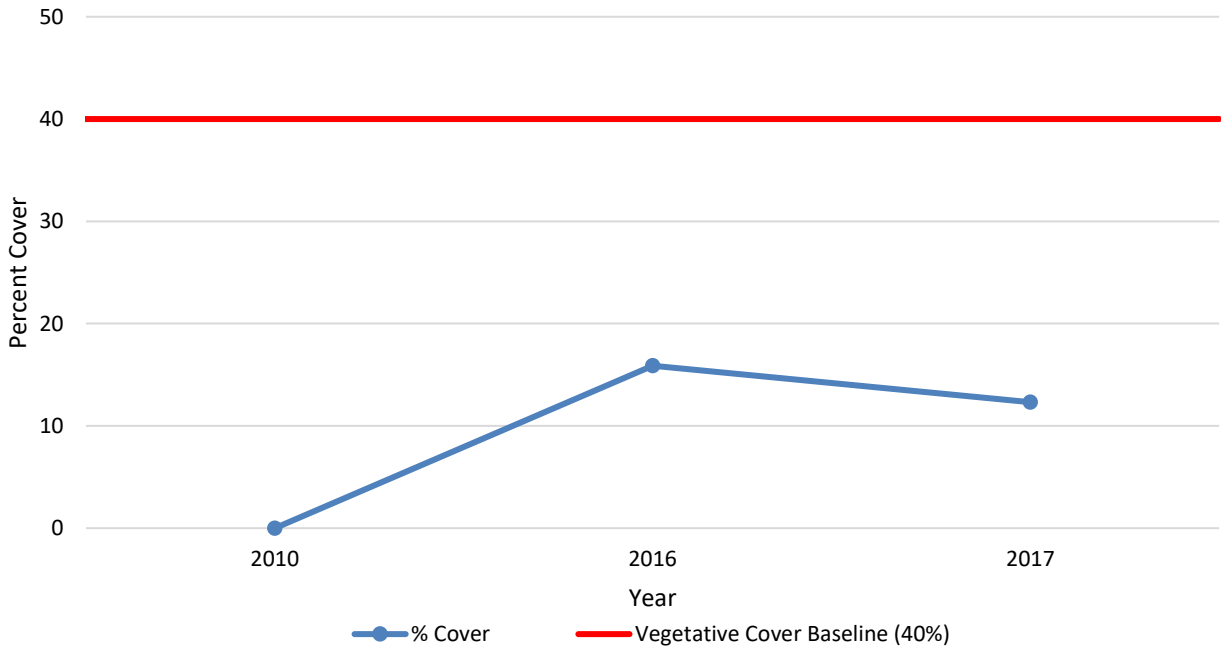


Figure 8-58. Native Vegetative Cover Compared to the Success Criterion at HA 29

Objective 2 considers the percent cover of non-native target weeds. In 2017, iceplant (*Carpobrotus edulis*) and jubata grass (*Cortaderia jubata*) were observed during the transect surveys. The vegetative cover for non-native species was 0.70%, which is less than the 5% acceptable limit. Although there was an increase of 0.70% since 2016, this success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class was met or exceeded the baseline cover class of 4. Cover class 4 is from 26-50% of absolute cover. The HMP shrub species at HA 29 are providing an absolute cover of 3.14%. This is an increase from 2.56% in 2016, however, the HA has not yet met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 29 this means a vegetative cover average of at least 2% for Hooker's manzanita (*Arctostaphylos hookeri*), 7% for Monterey manzanita (*Arctostaphylos montereyensis*), 27% for sandmat manzanita (*Arctostaphylos pumila*), 1% for Monterey ceanothus (*Ceanothus rigidus*), and 2% for Eastwood's goldenbush (*Ericameria fasciculata*). The average vegetative cover for Hooker's manzanita was 0.00%, Monterey manzanita 0.00%, sandmat manzanita 3.14%, Monterey ceanothus 0.00% and Eastwood's goldenbush 0.00% (see Figure 8-59). Only sandmat manzanita increased slightly in cover from 2016 to 2017. The success criterion was not met.

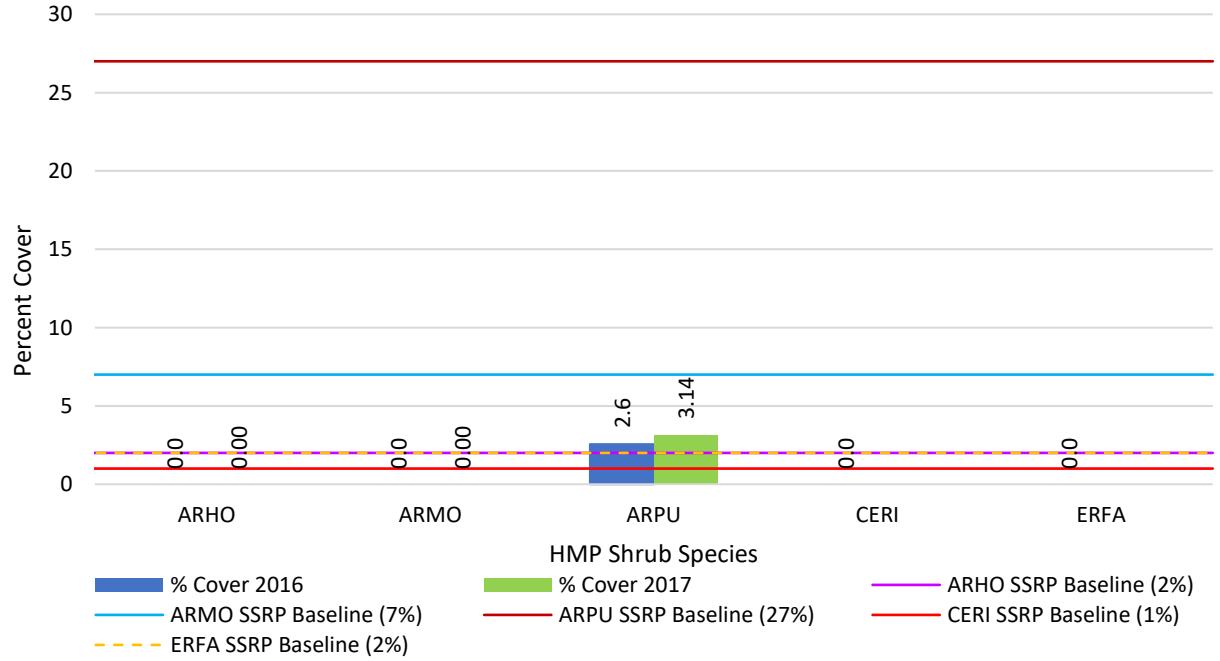


Figure 8-59. HMP Shrub Species Comparison to Success Criteria at HA 29

8.9.3.5 Recommendations

HA 29 was in year 5 of monitoring in 2017 and had responded slow to previous restoration efforts. The site met one of five success criteria by the 2017 monitoring season. Per recommendations in the 2016 Annual Habitat Restoration Report, toyon will be planted in 2018/2019 season to support the species richness and HMP shrub cover criteria (Burleson, 2017). The abatement of jubata grass will be ongoing through a service agreement with BLM. Additionally, the Army will 1) apply slow release fertilizer and mycorrhizae at the base of plants to promote faster plant growth; 2) plant Hooker's manzanita, Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush to support HMP shrub cover success criteria; 3) establish a new vegetation transect to expand inferential capacity for informing corrective measures; and 4) apply mulch. Mulch will help trap moisture and aid in releasing nutrients to the soil. Slow release fertilizer and mycorrhizae should be used since the planted

individuals at HA 29 appear to be growing much more slowly than at other HAs. While all HMP shrub species were present, their frequency and cover were low, requiring the use of more plants. A new transect is necessary since the current transect does not accurately represent site conditions, and data derived from this new transect will allow more accurate assessment of the need for corrective measures. Overall, HA 29 needs corrective measures as well as time to respond to the restoration effort and continued monitoring to evaluate areas that may need additional effort. A qualitative overview is documented by the reference photo points (see Appendix D, page D-9 and Appendix E, page E-6). The photos illustrate the progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, species richness meandering transects, and vegetative cover line-intercept transects in monitoring year 8, 2020.

Table 8-70 summarizes the current status of HA 29 including which success criteria have been met as well as our recommendation to move towards meeting success criteria.

Table 8-70. Status and Recommendations for Achieving the Success Criteria at HA 29

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant toyon (scheduled 2018)
Objective 1 – No. 2	Native vegetation cover	No	Fertilizer and mycorrhizae application. Plant Hooker's manzanita, Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush. Add additional transect.
Objective 2 – No. 3	Non-native target weed cover	Yes	Weed abatement for jubata grass
Objective 3 – No. 4	HMP shrub cover	No	Fertilizer and mycorrhizae application. Plant Hooker's manzanita, Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush. Add additional transect.
Objective 3 – No. 4	HMP shrub cover by species	No	Fertilizer and mycorrhizae application. Plant Hooker's manzanita, Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush. Add additional transect.
Objective 3 – No. 4	HMP annual density	NA	NA

8.10 HA 33

HA 33 was used by the Army as a demolitions range. Soil remediation was completed in 2010 and resulted in 20 cubic yards of soil being excavated from 0.01 acre (Shaw, 2008). HA 33 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 33 is relatively flat with a southwest and west aspect. The adjacent lands are heavily dominated by ice-plant and other non-native species, and disturbed central maritime chaparral.

HA 33 is located on the eastern portion of Site 39, occurring within Aromas formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

The prescription for passive restoration at HA 33 consisted of hand broadcast non-irrigated seed and annual weed management activities. HA 33 is relatively flat with little potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 33 occurred in 2011 and 2012 and monitoring began in 2011. The HA has been monitored for seven years by photo documentation and site visits, five years for HMP annual density in plots, and two years for species richness and vegetative cover (see Table 8-71). Figure 8-60 shows the HA footprint, passive restoration area, and transect survey location. Success criteria for HA 33 are summarized in Table 8-72.

Table 8-71. Historic Summary of Restoration and Monitoring Activities at HA 33

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2011	2012	2013	2014	2015	2016	2017	2020	2025
Restoration: Active, Passive, Erosion Control, and Corrective Measures	●	●							
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
HMP Annual Density across HA						●	●	●	
Species Richness						●	●	●	●
Vegetative Cover							●	●	●

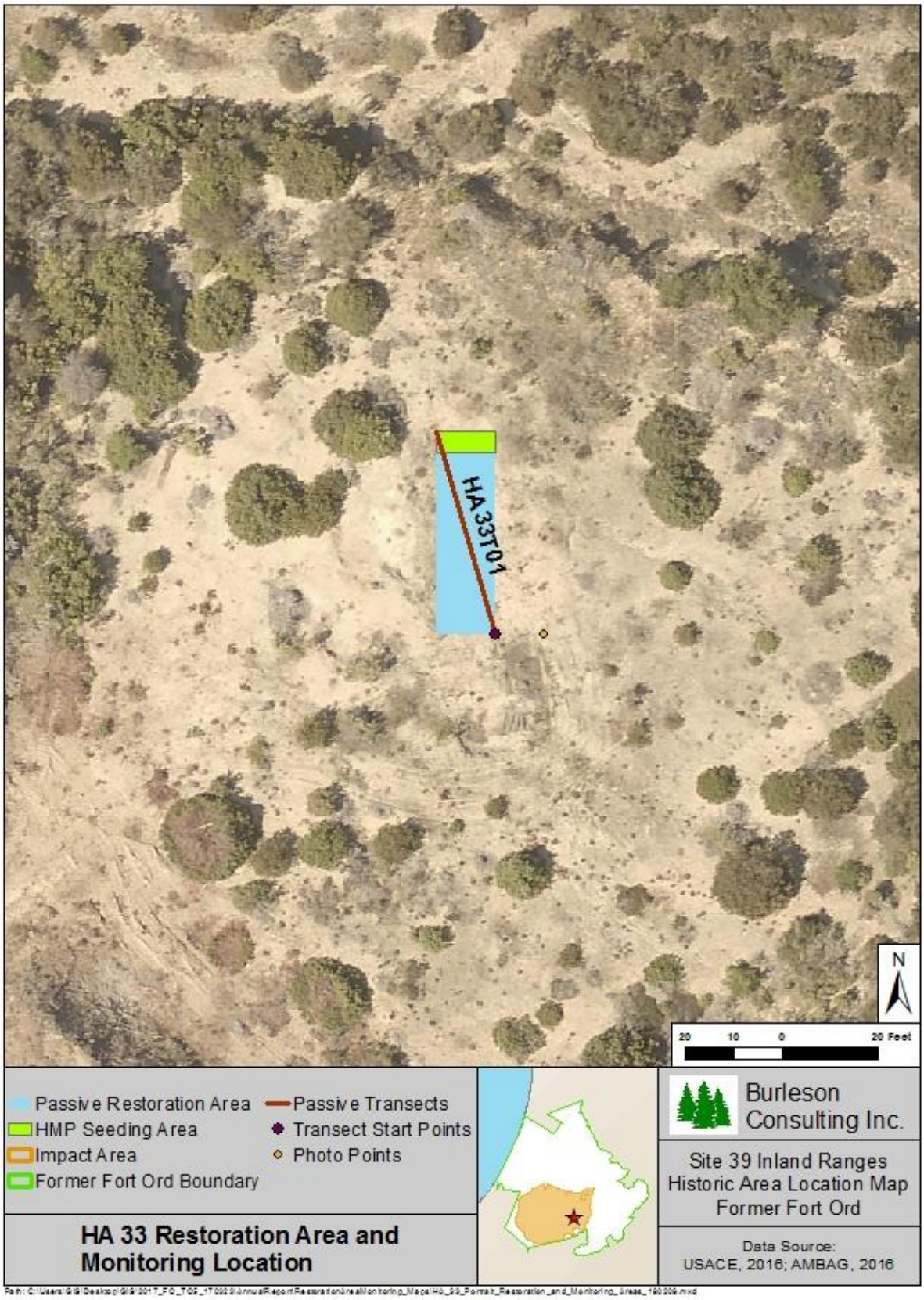


Figure 8-60. HA 33 Restoration Areas and Monitoring Locations Map

Table 8-72. Success Criteria and Acceptable Limits for Restoration of HA 33

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			common yarrow
			Monterey manzanita[2]
			shaggy-bark manzanita
			coyote brush
			Monterey ceanothus[2]
			dwarf ceanothus
			golden yarrow
			toyon
			peak rush-rose
			wedge-leaved horkelia
			deerweed
			sticky monkeyflower
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline surveys indicated that ice plant was present at HA-33 but was not available in transect data[3]. Therefore, no more than 5% non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 4
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Monterey manzanita percent cover, as an average of transect data, must be equal or greater than 30
			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 5

Table 8-72. Success Criteria and Acceptable Limits for Restoration of HA 33

	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		
	[3]Source: Shaw 2009a		

8.10.1 Restoration Activities

Burleson performed passive restoration at HA 33 for two years in 2011 and 2012. No additional restoration activities occurred at HA 33 in 2017. The total amount of seed broadcast on the site was 0.317 lb compared to 0.238 lb prescribed in the SSRP. Table 8-73 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. No active restoration activities have been conducted at HA 33. Burleson performed passive restoration for the HMP annual species Monterey spineflower. One plot was chosen in the HA based on its suitable habitat for Monterey spineflower and adjacent extant populations.

Table 8-73. Summary of Passive Restoration Activities from 2011-2017 for HA 33

Species	Pounds of Seed Broadcast			
	SSRP Target	2011	2012	Total by Species
ACMI	0.0100	0.0070	0.0070	0.0140
ACGL	0.0200	0.0110	0.0110	0.0220
ADFA	0.0100	0.0070	0.0110	0.0180
ARMO[1]	0.0200	0.0120	0.0110	0.0230
ARPU[1]	-	0.0070	0.0070	0.0140
BAPI	0.0015	0.0000	0.0010	0.0010
CERI[1]	0.0100	0.0100	0.0060	0.0160
CHPUP[1]	0.0002	0.0110	0.0010	0.0120
CRCA	0.0100	0.0070	0.0070	0.0140
CRSC	0.0100	0.0070	0.0070	0.0140
DIAU	0.0010	0.0030	0.0110	0.0140
ERCO	0.0030	0.0030	0.0020	0.0050
ERER	0.0025	0.0030	0.0020	0.0050
Hordeum sp.	0.0900	0.0000	0.0900	0.0900
HOCU	0.0200	0.0110	0.0110	0.0220
SAME	0.0100	0.0000	0.0110	0.0110
STCE	0.0200	0.0110	0.0110	0.0220
TOTAL	**0.2380**	**0.1100**	**0.2070**	**0.3170**

[1]HMP species

8.10.2 Monitoring Results

8.10.2.1 HMP Annual Density

One Monterey spineflower restoration plot was monitored for year 5 density at HA 33 in 2017. The plot is numbered 1 on Figure 8-61 and located in the northern part of the site. Monterey spineflower was low density at Plot 1. Figure 8-62 represents Monterey spineflower restoration plot densities for HA 33. The density class decreased in year 5 from medium in 2016 to low in 2017.

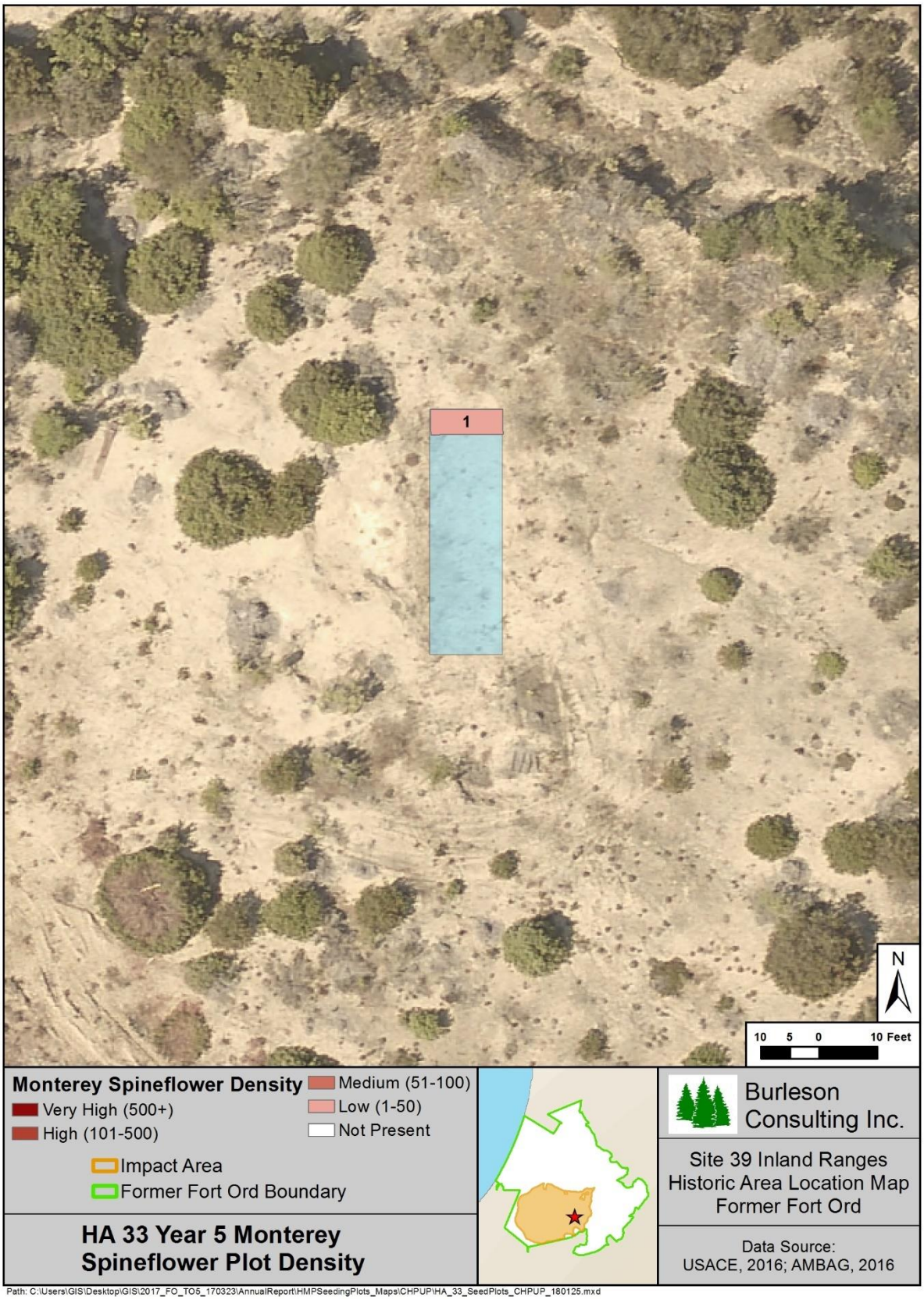


Figure 8-61. HA 33 Year 5 Monterey Spineflower Plot Density Map

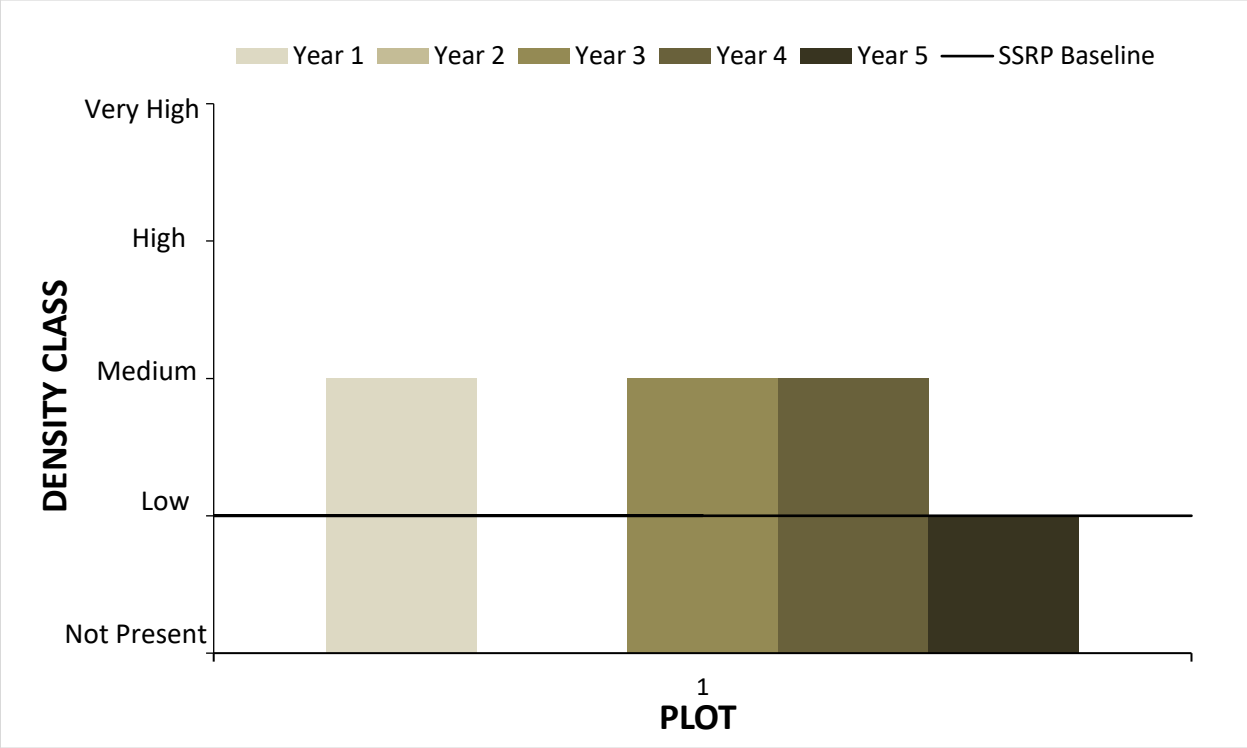


Figure 8-62. HA 33 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline Density Class for Years 1-5 at Restoration Plot 1

HMP annual density monitoring included mapping discrete patches of HMP annuals within the restoration area but outside of the HMP annual restoration plots. None of the three HMP annual species was observed outside of the plots.

8.10.2.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.10.2.3 Species Richness

Thirty-three species were observed at HA 33. Of those, 18 were native shrubs or perennials, five were native annual herbaceous species**,** nine were non-native species, and one was not catergorized as it was only identified to genus (see Table 8-74). Species richness increased by eleven species since 2016. Native shrub and perennial species increased by seven, native herbaceous species increased by one, and non-native species increased by two.

Table 8-74. Species Observed on HA 33, 2017

Scientific Name	Common Names	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos hookeri[1]	Hooker's manzanita	ARHO
Arctostaphylos montereyensis[1]	Monterey manzanita	ARMO

Table 8-74. Species Observed on HA 33, 2017

Scientific Name	Common Names	Code
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Bromus madritensis ssp. rubens	red brome	BRMAR
Cardionema ramosissimum	sand mat	CARA
Carex barbarae	Santa Barbara sedge	CABA
Carex sp.		CA
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Cortaderia jubata	pampas grass	COJU
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Croton californicus	California croton	CRCA
Cyperus eragrostis	tall cyperus	CYER
Elymus glaucus	blue wild-rye	ELGL
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Juncus bufonius	toad rush	JUBU
Logfia gallica	daggerleaf cottonrose	LOGA
Navarretia hamata	hooked navarretia	NAHA
Plantago coronopus	cut-leaved plantain	PLCO
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Silene gallica	small-flower catchfly	SIGA
Stipa cernua	nodding needle grass	STCE

[1]HMP species

8.10.2.4 Vegetative Cover

One 12-meter line-intercept transect survey was completed at HA 33. The survey indicated that vegetative cover by native shrubs and perennials was 4.92%. No vegetative cover by native shrubs and perennials was observed in 2016, however, only one quadrat rather than transects was completed in 2016. Table 8-75 summarizes vegetation cover and Table 8-76 presents vegetation cover by species. Figure 8-63 presents the percent cover of the dominant species at HA 33 in 2017.

Table 8-75. Transect Survey Summary for HA 33

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA33T01	4.92	4.92	0.00	0.00	62.25	37.75
SITE AVERAGE	**4.92**	**4.92**	**0.00**	**0.00**	**62.25**	**37.75**

Table 8-76. Transect Survey Results for HA 33 by Species

Transect	CRSC (%)	STCE (%)	TH (%)	BG (%)
HA33T01	3.17	1.75	62.25	37.75
SITE AVERAGE	**3.17**	**1.75**	**62.25**	**37.75**

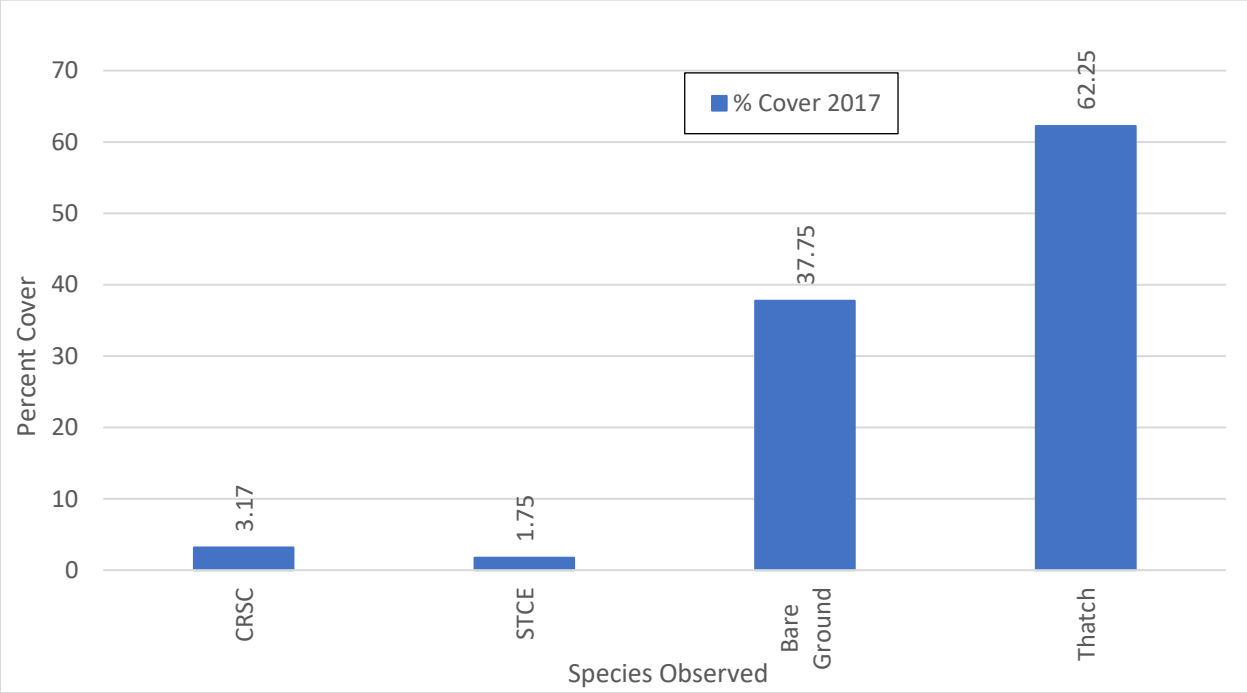


Figure 8-63. Percent Cover of Dominant Species at HA 33 in 2017. Species codes and names are provided in Table 8-74.

8.10.3 Discussion

8.10.3.1 HMP Annual Density

The HMP annual density criterion was met in HA 33 for Monterey spineflower. Its density in the HA 33 restoration plot was low, which met the success criterion of low density.

8.10.3.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.10.3.3 Species Richness

Common yarrow, shaggy-barked manzanita, Monterey manzanita, coyote brush, Monterey ceanothus, dwarf ceanothus, peak rush-rose, wedge-leaved horkelia, and deerweed were all present. The species not observed included golden yarrow, toyon, sticky monkeyflower, and black sage. HA 33 included 18 native shrub and perennial species; however, HA 33 did not meet the success criterion for objective 1 because golden yarrow, sticky monkeyflower, and black sage were not present. Similarly, in 2016 HA 33 did not meet the success criterion for objective 1; however, five additional species were observed in 2017.

8.10.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1, the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes sixteen shrub and perennial species presented in Table 2 of the HA 33 SSRP (Burleson, 2013). Currently the HA includes 4.92% cover and this success criterion was not met (see Figure 8-64). In 2016, a quadrat was completed to provide a preliminary idea of vegetative cover with a limited amount of effort; however, multiple objectives outlined in the SSRP specifically require transect data. The 2016 quadrat data were not compared to the success criteria.

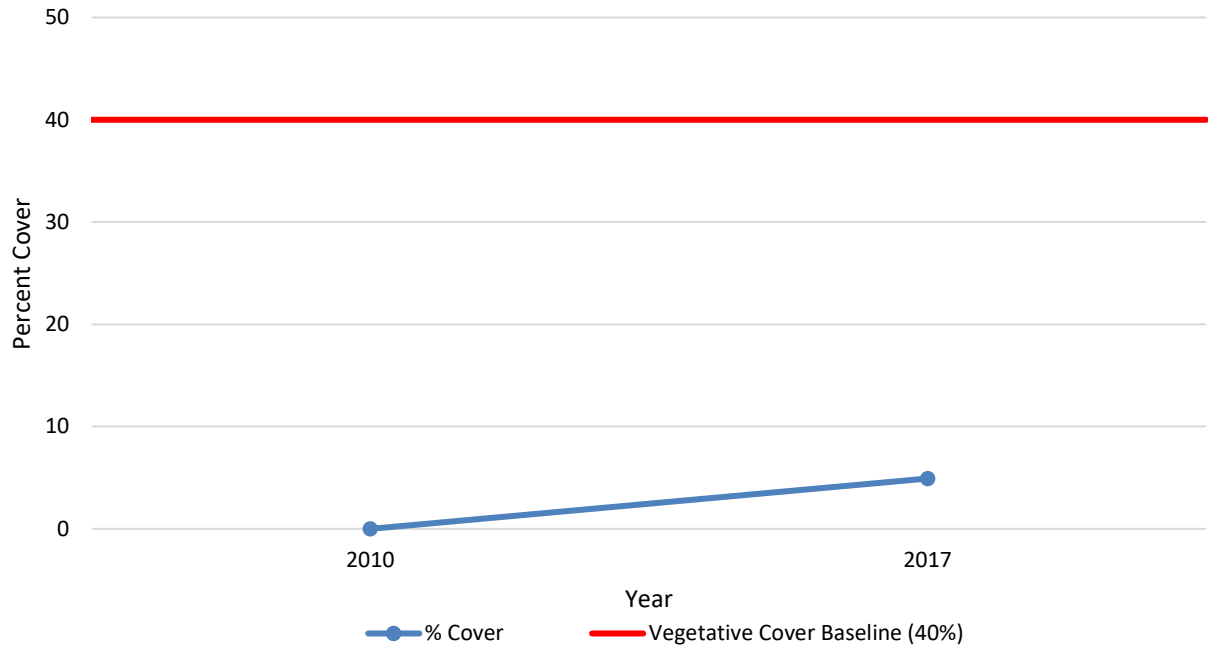


Figure 8-64. Native Vegetative Cover Compared to the Success Criterion at HA 33

Objective 2 considers the percent cover of non-native target weeds. In 2017, the vegetative cover for non-native species was 0.00%. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class was met or exceeded the baseline cover class of 4. Cover class 4 is from 26-50% of absolute cover. The HMP shrub species at HA 33 are providing an absolute cover of 0.00%, and the HA has not yet met this success criterion. The HMP shrub species were observed within the HA even though they were not captured in the transect. The second success criterion is no net loss of HMP shrubs. For HA 33 this means a vegetative cover average of at least 30% for Monterey manzanita (*Arctostaphylos montereyensis*) and 5% for Monterey ceanothus (*Ceanothus rigidus*). The average vegetative cover for Monterey manzanita was 0.00% and Monterey ceanothus 0.00% (see Figure 8-65). In 2017, neither species met the success criterion; therefore, the success criterion was not met.

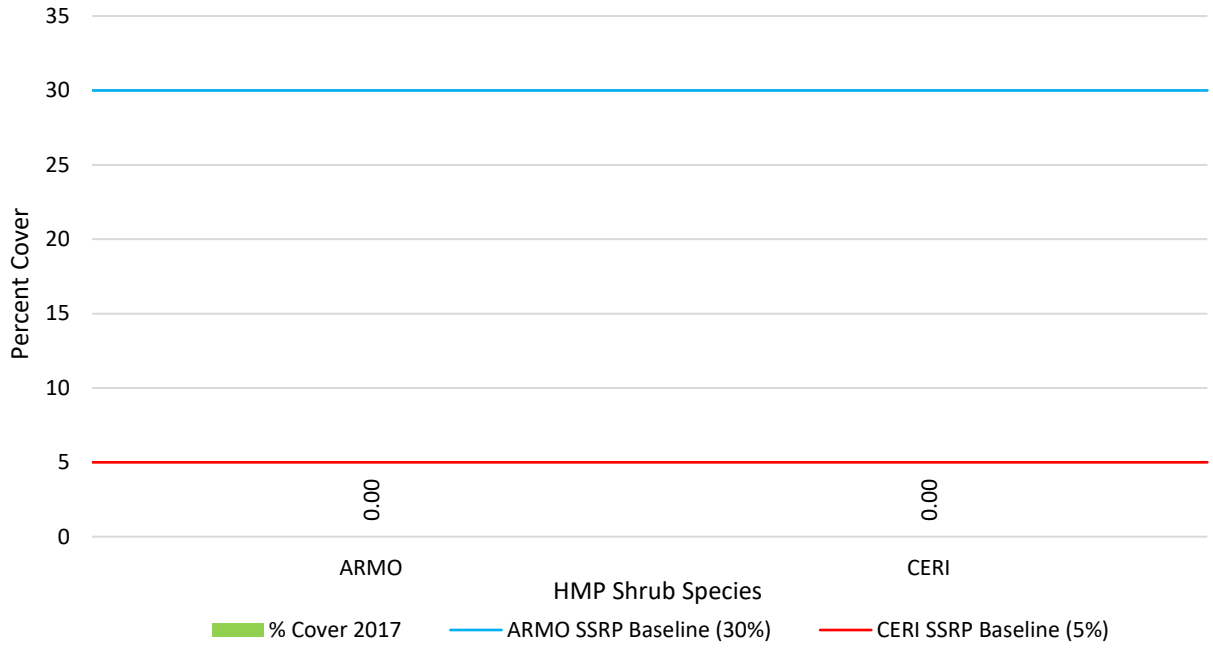


Figure 8-65. HMP Shrub Species Comparison to Success Criteria at HA 33

8.10.3.5 Recommendations

HA 33 was in year 5 of monitoring in 2017 and had only begun to respond marginally well to restoration efforts. The site has met two of the six success criteria. As previously recommended, shaggy-barked manzanita, Monterey manzanita, dwarf ceanothus, golden yarrow, toyon, sticky monkey flower, and black sage will be planted in 2018 to support the species richness success criterion and HMP shrub cover success criteria. Following this planting, HA 33 will need time to respond to the effort. Continued monitoring will allow the evaluation of areas that may need additional effort. A qualitative overview is documented by the reference photo points (see Appendix D, page D-10 and Appendix E, page E-7). The photos illustrate some growth in cover.

The site will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover surveys in monitoring year 8, 2020.

Table 8-77 summarizes the current status of HA 33 including which success criteria have been met as well as our recommendation to move towards meeting all success criteria.

Table 8-77. Status and Recommendations for Achieving the Success Criteria at HA 33

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant shaggy-barked manzanita, Monterey manzanita, dwarf ceanothus, golden yarrow, toyon, sticky monkeyflower and black sage (scheduled 2018)
Objective 1 – No. 2	Native vegetation cover	No	Wait for the HA to respond
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant Monterey manzanita and Monterey ceanothus (scheduled 2018)
Objective 3 – No. 4	HMP shrub cover by species	No	Plant Monterey manzanita and Monterey ceanothus (scheduled 2018)
Objective 3 – No. 4	HMP annual density	Yes	None

8.11 HA 34

HA 34 was used by the Army as a multi-use range that included closed combat course, machine gun assault course, and mortar range. An estimated total of 26,300 cubic yards of soil was excavated, including additional erosion control activities, over approximately 9.7 acres. HA 34 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). The lower portion of HA 34 is moderately sloped, and oriented east-west, with a ridge in the center of the range and resides within low to very high-quality habitat. The upper portion of HA 34 is steep and highly susceptible to erosion.

HA 34 is located on the northeastern portion of Site 39, within the Aromas formation containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

Passive and active restoration activities were prescribed for HA 34. The prescription for passive restoration at HA 34 consisted of hand broadcast non-irrigated seed and annual weed management activities. The prescription for active restoration at HA 34 included transplanting native or greenhouse-grown container plants. The lower portion of HA 34 is moderately sloped with potential for erosion. The upper portion of the site is steep and highly susceptible to erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 34 began in 2012 and is ongoing. Monitoring began in 2012. HA 34 has been monitored for six years by photo documentation and site visits, two years for species richness and vegetative cover, and two years for plant survivorship (see Table 8-78). Figure 8-66 shows the HA

footprint, passive restoration area, active restoration area, and transect survey locations. Success criteria for HA 34 are summarized in Table 8-79.

Table 8-78. Historic Summary of Restoration and Monitoring Activities at HA 34

Activity	Monitoring Years									
				1	2	3	4	5	8	13
	2012	2013	2014	2015	2016	2017	2018	2019	2022	2027
Restoration: Active and Passive	●	●	●	●	●	●	●	●		
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Species Richness					●	●	●	●	●	●
Vegetative Cover					●	●	●	●	●	●
Plant Survivorship					●	●	●	●		

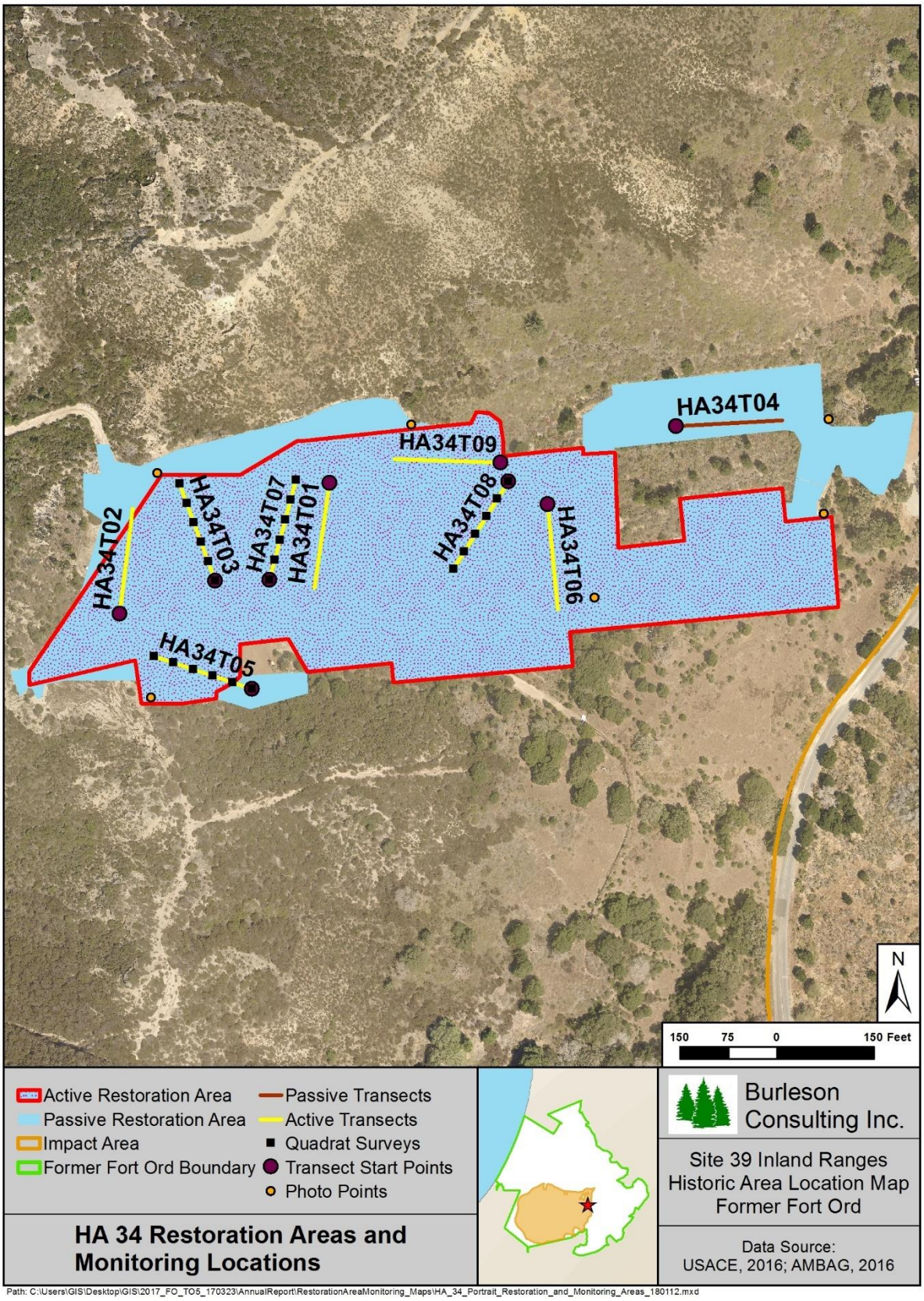


Figure 8-66. HA 34 Restoration Areas and Monitoring Locations Map

Table 8-79. Success Criteria and Acceptable Limits for Restoration of HA 34

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			Monterey manzanita[2]
			shaggy-bark manzanita
			Hooker's manzanita[2]
			Monterey ceanothus[2]
			sticky monkeyflower
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data indicated the non-native target weed species iceplant. No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Monterey manzanita percent cover, as an average of transect data, must be equal or greater than 31

Table 8-79. Success Criteria and Acceptable Limits for Restoration of HA 34

			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 7
			Hooker's manzanita percent cover, as an average of transect data, must be equal or greater than 4
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Not applicable
	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.11.1 Restoration Activities

Burleson performed passive restoration at HA 34 for six years with eleven different applications of seed including twice in 2012, twice in 2014, once in 2015, three times in 2016, and three times in 2017. The total amount of seed broadcast on the site was 994.52 lb compared to the 320.41 lb prescribed in the SSRP. Table 8-80 summarizes the amount of seed applied by year and species, in comparison to the SSRP target.

Table 8-80. HA 34 Passive Restoration Activities between 2012 and 2017

Species	Pounds of Seed Broadcast							
	SSRP Target	2012	2013	2014	2015	2016	2017	Total by Species
ACMI	15.41	9.51	0.00	1.69	1.00	5.72	0.50	18.42
ACGL	19.40	18.29	0.00	3.37	2.00	11.40	1.00	36.06
ADFA	NA	9.50	0.00	0.00	0.00	0.00	0.00	9.50
ARCA	15.50	9.50	4.60	0.00	1.00	0.00	0.00	15.10
ARHO[1]	NA	9.50	0.00	0.00	0.00	0.00	0.00	9.50
ARMO[1]	NA	9.50	0.00	0.00	0.00	0.00	0.00	9.50
ARTO	NA	19.00	0.00	0.00	0.00	0.00	0.00	19.00
BAPI	1.90	1.40	1.35	0.25	0.20	0.00	0.00	3.20
CERI[1]	15.50	9.50	3.30	0.00	1.00	0.00	0.00	13.80
CRSC	15.50	9.15	0.00	1.26	1.00	0.00	0.00	11.41
DIAU	1.50	0.95	0.00	0.25	0.10	0.00	0.00	1.30
ELGL	87.30	85.50	46.00	80.34	9.00	14.88	2.05	237.77
ERCO	2.90	2.85	0.00	2.11	0.30	0.00	0.00	5.26
Hordeum sp.	87.30	150.00	245.00	33.70	9.00	2.32	26.20	466.22
HOCU	19.40	18.29	4.60	46.97	2.00	11.40	1.00	84.26

Table 8-80. HA 34 Passive Restoration Activities between 2012 and 2017

Species	Pounds of Seed Broadcast							
	SSRP Target	2012	2013	2014	2015	2016	2017	Total by Species
LUAR	9.70	9.50	0.00	0.00	1.00	0.00	0.00	10.50
SAME	9.70	9.51	0.60	3.37	1.00	0.00	0.00	14.48
STPU	19.40	19.00	0.00	0.00	2.00	6.99	1.25	29.24
TOTAL	**320.41**	**400.45**	**305.45**	**173.31**	**30.60**	**52.71**	**32.00**	**994.52**

[1]HMP species

Active restoration was conducted in 2016 and 2017 during two planting events. The total number of plants installed at HA 34 was 6,619 compared to 12,150 prescribed in the SSRP. Planting quantities are shown in Table 8-81.

Table 8-81. HA 34 Summary of Active Restoration Plantings

Species	Number of Individual Plants			
	SSRP Target	2016 (Jan)	2016-2017 (Dec-Feb)	Total by Species
ACMI	500	54	154	208
ACGL	1,500	350	570	920
ADFA	500	158	372	530
ARCA	500	135	208	343
ARHO[1]	500	76	286	362
ARMO[1]	500	76	277	353
ARTO	500	76	118	194
BAPI	500	95	270	365
CERI[1]	500	132	556	688
CRSC	1,500	228	534	762
DIAU	1,500	246	406	652
ERCO	800	-	320	320
HOCU	1,500	17	91	108
LUAL	-	-	108	108
LUAR	500	95	236	331
SAME	850	45	330	375
TOTAL	**12,150**	**1,783**	**4,836**	**6,619**

8.11.2 Monitoring Results

8.11.2.1 HMP Annual Density

The baseline data from the SSRP indicated no HMP annual species at HA 34. Therefore, no HMP annuals need to be present at this restoration site.

8.11.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 34. A total of nine shrub species and 376 individual plants were monitored for survivorship. By the end of year 2 monitoring for planting in 2016, 62% of the plants were alive. Survivorship for the 2016 planting decreased from 73% in 2016. By the end of year 1 monitoring for planting in 2017, 37% of the plants were alive. Table 8-82 and Table 8-83 present results by species.

Table 8-82. Plant Survivorship Monitoring Summary and Results for 2016 Plantings at HA 34

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2016)	Year Two (2017)
			Alive (%)	Alive (%)
ADFA	158	16	94	94
ARCA	135	14	79	86
ARHO[1]	76	8	63	63
ARMO[1]	76	8	75	75
ARTO	76	8	75	38
BAPI	95	10	90	90
CERI[1]	132	13	38	23
LUAR	95	10	60	0
SAME	45	5	80	80
TOTAL	**888**	**92**	**73***	**62***

*average

[1]HMP species

Table 8-83. Plant Survivorship Monitoring Summary and Results for 2017 Plantings at HA 34

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2017)
			Alive (%)
ADFA	370	37	22
ARCA	208	22	55
ARHO[1]	286	32	50
ARMO[1]	277	28	36
ARTO	118	12	33
BAPI	270	28	86
CERI[1]	556	56	27
LUAR	108	11	18
SAME	236	24	21
TOTAL	**2,759**	**284**	**37***

*average

[1]HMP species

8.11.2.3 Species Richness

Ninety species were observed at HA 34. Of those, 34 were native shrubs or perennials, 22 were native annual herbaceous species, 32 were non-native species, and two were not catergorized as they were only identified to genus (see Table 8-84). Species richness has increased by 14 species since 2016. Native shrub and perennial species increased by four, native herbaceous species increased by three, and non-native species increased by five.

Table 8-84. Species Observed on HA 34, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon americanus var. *americanus*	Spanish clover	ACAMA
Acmispon glaber	deerweed	ACGL
Acmispon heermannii	Heermann's lotus	ACHE
Acmispon parviflorus	hill lotus	ACPA
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Agoseris grandiflora	large-flowered agoseris	AGGR
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos hookeri[1]	Hooker's manzanita	ARHO
Arctostaphylos montereyensis[1]	Monterey manzanita	ARMO
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Atriplex semibaccata	Australian saltbush	ATSE
Avena barbata	slender oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Bromus diandrus	ripgut brome	BRDI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Carex barbarae	Santa Barbara sedge	CABA
Carpobrotus edulis	ice plant	CAED
Castilleja densiflora	owl's clover	CADE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Cirsium occidentale	cobwebby thistle	CIOC
Clinopodium douglasii	yerba buena	CLDO
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	pampas grass	COJU
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Deinandra corymbosa	coastal tarweed	DECO
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wild-rye	ELGL
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Eschscholzia californica	California poppy	ESCA
Festuca bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Festuca perennis	Italian rye grass	FEPE
Gamochaeta ustulata	purple cudweed	GAUS

Table 8-84. Species Observed on HA 34, 2017

Scientific Name	Common Name	Code
Heterotheca grandiflora	telegraph weed	HEGR
Hordeum sp.	common barley	HO
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Juncus bufonius	toad rush	JUBU
Juncus patens	spreading rush	JUPA
Juncus sp.		JU
Layia platyglossa	tidy tips	LAPL
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	miniature lupine	LUBI
Lupinus concinnus	bajada lupine	LUCO
Lupinus nanus	sky lupine	LUNA
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia gracilis	slender tarweed	MAGR
Madia sativa	coast tarweed	MASA
Medicago polymorpha	California burclover	MEPO
Melilotus indicus	sourclover	MEIN
Navarretia hamata	hooked navarretia	NAHA
Navarretia squarrosa	skunkweed	NASQ
Plantago coronopus	buckhorn plantain	PLCO
Plantago lanceolata	English plantain	PLLA
Polygala californica	California milkwort	POCA
Polypogon monspeliensis	rabbitfoot grass	POMO
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium stramineum	cotton-batting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Salix lasiolepis	arroyo willow	SALA
Salvia mellifera	black sage	SAME
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Sonchus asper	prickly sow thistle	SOAS
Spergularia rubra	red sand-spurrey	SPRU
Spergularia villosa	hairy sand-spurrey	SPVI
Stipa cernua	nodding needle grass	STCE
Stipa pulchra	purple needle grass	STPU
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium dubium	little hop clover	TRDU
Trifolium hirtum	rose clover	TRHI

Table 8-84. Species Observed on HA 34, 2017

Scientific Name	Common Name	Code
Trifolium microcephalum	small-head clover	TRMI
Trifolium willdenovii	tomcat clover	TRWI
Vicia sativa	spring vetch	VISA

[1]HMP species

8.11.2.4 Vegetative Cover

Burleson completed nine 50-meter line-intercept transects and 24 associated quadrats at HA 34. These surveys indicate that the mean vegetative cover by native shrubs and perennials was 42.92%. The mean vegetative cover by native shrubs and perennials was substantially greater in 2017 than in 2016 by 11.43%. However, only four transects were completed in 2016 while nine were completed in 2017. Quadrats were completed along the transect line when 10% or more of the transect line was herbaceous cover, in accordance to the Protocol for Conducting Vegetation Monitoring (Burleson, 2009). Table 8-85 summarizes vegetation cover, Table 8-86 presents vegetation cover by species, Figure 8-67 presents the percent cover of the dominant species at HA 34 in 2016 and 2017, and Table 8-87 presents quadrat results.

Table 8-85. Transect Survey Summary for HA 34

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA34T01	41.66	41.66	0.00	0.00	67.98	22.38
HA34T02	31.16	21.68	5.54	4.20	81.54	13.48
HA34T03	37.92	23.72	13.58	0.62	55.20	35.80
HA34T04	66.12	61.70	4.42	0.00	100.00	0.00
HA34T05	40.44	28.52	9.28	2.64	100.00	0.00
HA34T06	21.56	19.08	2.00	0.48	100.00	0.00
HA34T07	47.28	36.20	6.28	4.80	56.34	32.48
HA34T08	76.72	62.54	13.40	0.78	99.46	0.28
HA34T09	101.02	91.22	9.80	0.00	100.00	0.00
SITE AVERAGE	**51.54**	**42.92**	**7.14**	**1.50**	**84.50**	**11.60**

Table 8-86. Transect Survey Results for HA 34 by Species

Transect	ACAMA (%)	ACMI (%)	ACGL (%)	ACHE (%)	ACST (%)	ADFA (%)	ARCA (%)	ARTO (%)	BAPI (%)	DIAU (%)	ELGL (%)
HA34T01	0.00	0.00	24.98	0.00	0.00	0.00	9.18	0.00	6.12	0.00	6.12
HA34T02	5.54	0.00	18.94	0.00	0.00	0.00	0.00	0.62	1.34	0.62	1.34
HA34T03	13.18	0.22	18.16	0.00	0.70	0.62	1.48	0.00	1.10	0.00	1.10
HA34T04	4.42	0.00	7.52	0.00	0.00	0.00	12.54	0.00	13.80	0.00	13.80
HA34T05	9.28	0.00	22.82	0.00	0.00	0.00	0.00	0.00	1.62	0.00	1.62
HA34T06	2.00	0.00	19.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HA34T07	6.28	0.00	19.18	1.12	0.00	0.00	3.46	0.00	12.44	0.00	12.44
HA34T08	13.40	0.00	38.28	0.00	0.00	0.00	11.66	0.00	2.78	0.00	2.78
HA34T09	9.80	0.86	47.02	0.00	0.00	0.00	0.68	0.00	6.80	0.00	6.80
SITE AVERAGE	**7.10**	**0.12**	**24.00**	**0.12**	**0.08**	**0.07**	**4.33**	**0.07**	**5.11**	**0.07**	**5.11**

Table 8-86 (continued). Transect Survey Results for HA 34 by Species

Transect	ERCA (%)	HOCU (%)	HYRA (%)	LUAR (%)	PLCO (%)	PSRA (%)	ST sp. (%)	STCE (%)	TODI (%)	TH (%)	BG (%)
HA34T01	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	67.98	22.38
HA34T02	0.00	0.20	0.00	0.00	3.94	0.00	0.28	0.00	0.00	81.54	13.48
HA34T03	0.20	0.48	0.62	0.00	0.00	0.20	0.00	0.00	0.00	55.20	35.80
HA34T04	0.00	1.92	0.00	25.92	0.00	0.00	0.00	0.00	0.00	100.00	0.00
HA34T05	0.00	0.00	0.00	0.68	2.64	0.00	0.00	2.22	0.00	100.00	0.00
HA34T06	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.00	0.00	100.00	0.00
HA34T07	0.00	0.00	0.00	0.00	4.80	0.00	0.00	0.00	0.00	56.34	32.48
HA34T08	0.00	0.98	0.00	7.40	0.78	0.00	0.00	0.00	0.00	99.46	0.28
HA34T09	0.00	7.14	0.00	16.98	0.00	0.00	1.42	6.14	2.18	100.00	0.00
SITE AVERAGE	**0.02**	**1.25**	**0.07**	**5.66**	**1.40**	**0.02**	**0.19**	**0.93**	**0.24**	**84.50**	**11.60**

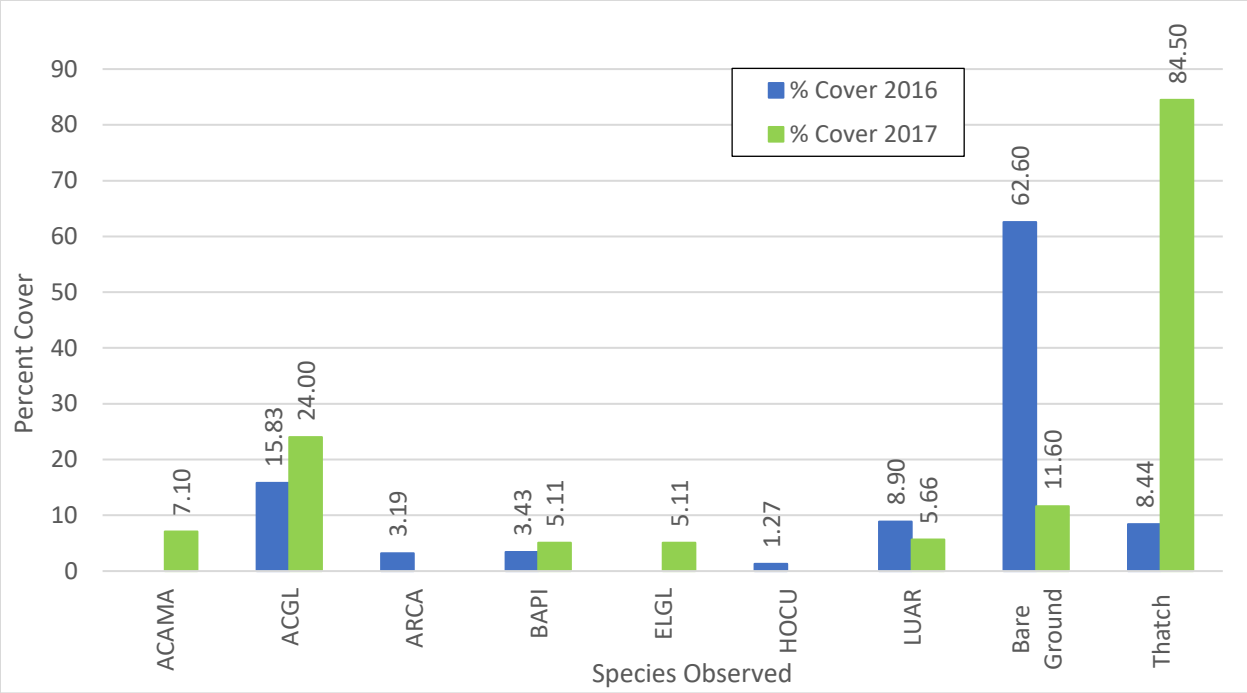


Figure 8-67. Percent Cover of Dominant Species at HA 34 in 2016 and 2017. Species codes and names are provided in Table 8-84.

Table 8-87. Quadrats Along the Transect Line for T03, T05, T07 and T08 Summary for HA34

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA34T03Q01	3	1	1	1	9	88
HA34T03Q02	19	18	1	0	16	65
HA34T03Q03	2	0	1	1	55	41
HA34T03Q04	5	0	5	0	75	20
HA34T03Q05	59	59	0	0	30	30
HA34T03Q06	12	2	8	2	5	83
HA34T05Q01	2	2	0	0	80	18
HA34T05Q02	8	3	4	1	25	66
HA34T05Q03	21	3	18	0	60	19
HA34T05Q04	18	1	1	0	60	22
HA34T05Q05	17	16	0	1	60	23
HA34T05Q06	3	3	0	0	60	37
HA34T07Q01	16	1	0	15	10	74
HA34T07Q02	27	6	20	1	5	68
HA34T07Q03	20	8	12	0	5	75
HA34T07Q04	67	52	15	0	0	31
HA34T07Q05	28	27	1	0	7	65
HA34T07Q06	47	45	2	0	5	48

Table 8-87. Quadrats Along the Transect Line for T03, T05, T07 and T08 Summary for HA34

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA34T08Q01	70	70	0	0	15	15
HA34T08Q02	45	35	8	2	15	40
HA34T08Q03	5	4	1	0	85	10
HA34T08Q04	100	95	0	5	10	2
HA34T08Q05	7	4	1	2	35	58
HA34T08Q06	28	2	21	5	32	40
SITE AVERAGE	**26**	**20**	**5**	**2**	**32**	**43**

8.11.3 Discussion

8.11.3.1 HMP Annual Density

The baseline data from the SSRP indicated no HMP annual species at HA 34. Therefore, no HMP annuals need to be present at this restoration site.

8.11.3.2 Plant Survivorship

Ten shrub species were monitored at HA 34 for years 1 and 2 plant survivorship in 2017. Plantings that occurred in 2016 indicated a moderate survival rate of 62% while plantings that occurred in 2017 had a low rate of 37%. Shaggy-bark manzanita had a low survival rate of 38% in the 2016 planting and 33% in the 2017 planting. Monterey ceanothus had low survival rates of 23% in the 2016 planting and 27% in the 2017 planting. Chamise had a low survival rate of 22% in the 2017 planting. Yellow bush lupine had a rate of 0% in 2016 planting and 18% in the 2017 planting. Black sage also had a low survival rate of 21% in the 2017 planting. It is not surprising that Monterey ceanothus had low survivorship since this has occurred across sites. Additionally, the lupine experienced an aphid infestation that largely contributed to low survivorship. However, there were many other species that were planted at HA 34 that had low survivorship rates. This can largely be attributed to site conditions that are not conducive to good plant survivorship. HA 34 has a lack of top soil and is highly compacted. These factors contribute to sheet flow and are problematic for water infiltration to roots. A more comprehensive evaluation will be provided for HA 34 in year 5 of monitoring.

8.11.3.3 Species Richness

Chamise, Monterey manzanita, shaggy-barked manzanita, Hooker's manzanita, Monterey ceanothus, sticky monkeyflower, and black sage were present. HA 34 included 34 native shrub and perennial species. HA 34 met the success criterion for objective 1.

8.11.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes 18 shrub and perennial species presented in Table 2 of the HA 34 SSRP (Burleson, 2013). Currently the HA includes 42.29% vegetative cover; therefore, this success criterion was met. The vegetative cover in 2016 was 32.8%. Cover increased by 9.49% (see Figure 8-68).

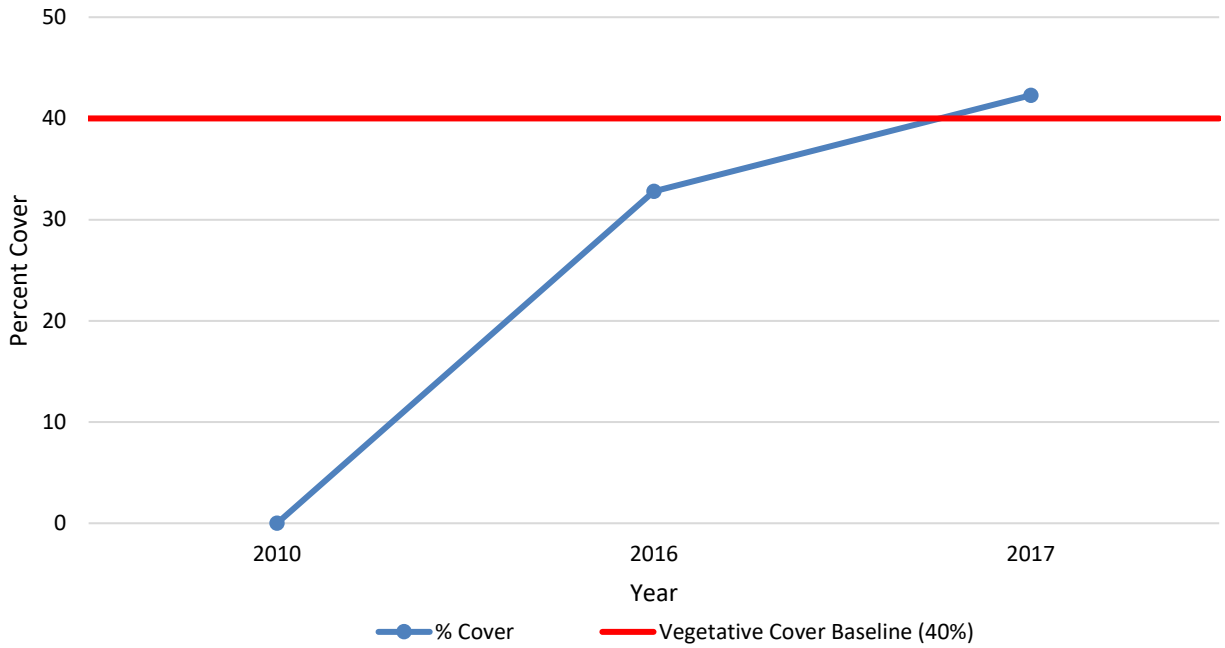


Figure 8-68. Native Vegetative Cover Compared to the Success Criterion at HA 34

Objective 2 considers the percent cover of non-native target weeds. In 2017, target weeds were not observed during transect surveys. The vegetative cover for non-native species was 0.00%. In 2016, no target weeds were observed during transect surveys and vegetative cover was 0.00%. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class met or exceeded the baseline cover class of 3. Cover class 3 is from 6-25% of absolute cover. The HMP shrub species at HA 34 are providing an absolute cover of 0.00%. The HA has not met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 34 this means a vegetative cover average of at least 31% cover for Monterey manzanita (*Arctostaphylos montereyensis*), 7% for Monterey ceanothus (*Ceanothus rigidus*), and 4% for Hooker's manzanita (*Arctostaphylos hookeri*). The average vegetative cover for Monterey manzanita was 0.00%, for Monterey ceanothus 0.00%, and for Hooker's manzanita 0.00% (see Figure 8-69). The success criterion was not met.

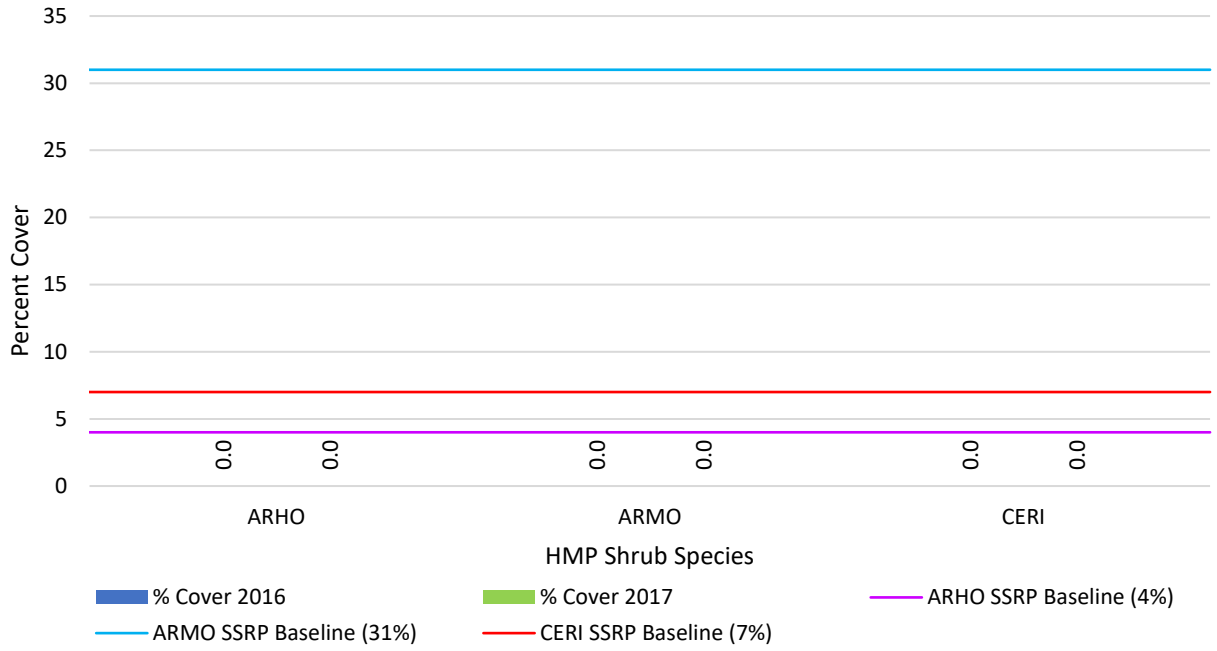


Figure 8-69. HMP Shrub Species Comparison to Success Criteria at HA 34

8.11.3.5 Recommendations

HA 34 was in year 3 of monitoring in 2017 and had variable response to the previous restoration efforts. The site met three of the six success criteria by 2017, one more than in 2016. Due to significant erosion issues, poor site conditions, low survivorship, and low HMP shrub cover, many areas at HA 34 will need further effort and time to respond to restoration efforts. Success criteria should be reevaluated to establish a more reasonable target for the HMP shrub species cover targets at HA 34. These criteria need to reflect the mosaic of habitats present at the site. A qualitative overview is documented by the reference photo points (see Appendix D, page D-11). The site will be re-evaluated when year 5 of monitoring is complete and further recommendations will be made.

The site will continue to be monitored by photo documentation, species richness meandering transects, and vegetative cover line-intercept transects in monitoring year 4, 2018.

Table 8-88 summarizes the current status of HA 34 including which success criteria have been met as well as recommendations to move towards meeting all success criteria.

Table 8-88. Status and Recommendations for Achieving the Success Criteria at HA 34

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	Yes	None
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Reconsider success criteria and install additional plants
Objective 3 – No. 4	HMP shrub cover by species	No	Reconsider success criteria and install additional plants
Objective 3 – No. 4	HMP annual density	NA	NA

8.12 HA 36

HA 36 was used by the Army as both a grenade and explosive ordnance disposal range. Soil remediation was completed in 2010 and resulted in 2,750 cubic yards of soil being excavated from 0.5 acre (Shaw, 2008). HA 36 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 36 is relatively flat with an east aspect. The adjacent lands are disturbed central maritime chaparral.

HA 36 is located on the northeastern portion of Site 39, occurring within the Aromas formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

The prescription for passive restoration at HA 36 consisted of hand broadcast non-irrigated seed and annual weed management activities. HA 36 is relatively flat with some potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Prescribed restoration activities occurred at HA 36 twice in 2012 and once in 2016 and monitoring began in 2013. HA 36 has been monitored for seven years by photo documentation and site visits and two years for species richness and vegetative cover (see Table 8-89). Figure 8-70 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 36 are summarized in Table 8-90.

Table 8-89. Historic Summary of Restoration and Monitoring Activities at HA 36

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2011	2012	2013	2014	2015	2016	2017	2020	2025
Restoration: Active, Passive, Erosion Control, and Corrective Measures	●	●		●		●	●		
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Species Richness						●	●	●	●
Vegetative Cover						●	●	●	●

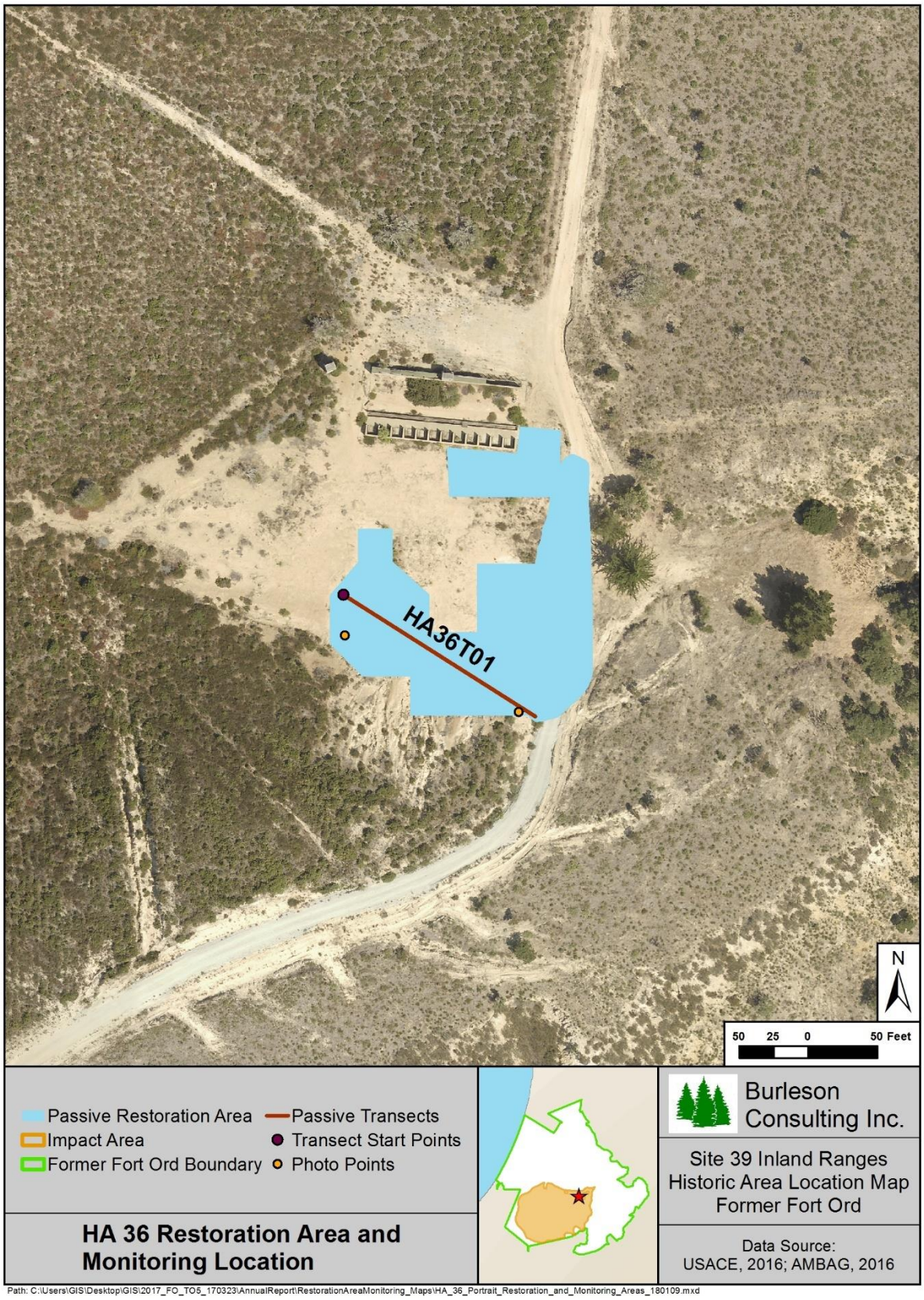


Figure 8-70. HA 36 Restoration Areas and Monitoring Locations Map

Table 8-90. Success Criteria and Acceptable Limits for Restoration of HA 36

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			sandmat manzanita[2]
			Monterey manzanita[2]
			shaggy-bark manzanita
			coyote brush
			Monterey ceanothus[2]
			golden yarrow
			peak rush-rose
			wedge-leaved Horkelia
			deerweed
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data did not indicate non-native target weed species. No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 2
			Monterey manzanita percent cover, as an average of transect data, must be equal or greater than 9
			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 12

Table 8-90. Success Criteria and Acceptable Limits for Restoration of HA 36

			Hooker's manzanita percent cover, as an average of transect data, must be equal or greater than 1
			Eastwood's goldenbush percent cover, as an average of transect data, must be equal or greater than 1
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Not applicable
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.12.1 Restoration Activities

Burleson performed passive restoration at HA 36 for three years with three different applications of seed. Seed was broadcast twice in 2012 and once in 2016. The total amount of seed broadcast on the site was 20.258 lb compared to the 12.775 lb prescribed in the SSRP. Table 8-91 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. No active restoration has been completed at HA 36 by Burleson. However, BRAC installed approximately 300 surplus plants to HA 36 in 2014. In 2017, they installed 100 plants, broadcast approximately 5 lb of production seed, and completed some minor erosion control repairs.

Table 8-91. HA 36 Summary of Passive Restoration Activities

Species	Pounds of Seed Broadcast				
	SSRP Target	2012 (Jan)	2012 (Dec)	2016 (Dec)	Total by Species
ACGL	1.000	0.500	0.507	1.800	2.807
ACMI	-	-	-	0.900	0.900
ADFA	0.500	0.300	0.254	0.000	0.554
ARHO[1]	1.000	0.500	0.518	0.000	1.018
ARMO[1]	1.000	0.500	0.507	0.000	1.007
ARPU[1]	0.500	0.300	0.263	0.000	0.563
ARTO	1.000	0.500	0.514	0.000	1.014
BAPI	0.075	0.000	0.037	0.000	0.037
CERI[1]	0.500	0.000	0.252	0.000	0.252
CRSC	0.500	0.300	0.251	0.000	0.551
ELGL	-	-	-	1.800	1.800
ERCO	0.150	0.077	0.077	0.000	0.154
ERFA[1]	0.050	0.025	0.064	0.000	0.089
FRCA	0.500	0.300	0.251	0.000	0.551
HOCU	1.000	0.500	0.500	1.800	2.800
Hordeum sp.	4.500	0.000	4.510	0.000	4.510
SAME	0.500	0.300	0.251	0.000	0.551
STPU	-	-	-	1.100	1.100
TOTAL	**12.775**	**4.102**	**8.756**	**7.400**	**20.258**

[1]HMP species

8.12.2 Monitoring Results

8.12.2.1 HMP Annual Density

The baseline data from the SSRP indicated no HMP annual species at HA 36. Therefore, no HMP annuals need to be present at this restoration site.

8.12.2.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.12.2.3 Species Richness

Fifty-six species were observed at HA 36. Of those, 26 were native shrubs or perennials, 10 were native annual herbaceous species, 19 were non-native species, and one was not catergorized as it was only identified to genus (see Table 8-92). Species richness has increased by 22 species since 2016. Native shrub and perennial species increased by two, native herbaceous species increased by seven, and non-native species increased by twelve.

Table 8-92. Species Observed on HA 36, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon americanus var. *americanus*	Spanish clover	ACAMA
Acmispon glaber	deerweed	ACGL
Acmispon heermannii	Heermann's lotus	ACHE
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos hookeri[1]	Hooker's manzanita	ARHO
Arctostaphylos montereyensis[1]	Monterey manzanita	ARMO
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Bromus diandrus	ripgut brome	BRDI
Bromus hordeaceus	softchess	BRHO
Bromus madritensis	foxtail brome	BRMA
Calandrinia menziesii	red maids	CAME
Cardionema ramosissimum	sand mat	CARA
Carex sp.		CA?
Carpobrotus edulis	ice plant	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	pampas grass	COJU
Crocanthemum scoparium	peak rush-rose	CRSC
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wildrye	ELGL
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium cicutarium	red-stemmed filareee	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	rough cat's-ear	HYRA
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus concinnus	bajada lupine	LUCO
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia exigua	little tarweed	MAEX
Madia sativa	coast tarweed	MASA
Medicago polymorpha	California burclover	MEPO
Plantago coronopus	cut-leaved plantain	PLCO
Polycarpon tetraphyllum var. *tetraphyllum*	four-leaved allseed	POTET

Table 8-92. Species Observed on HA 36, 2017

Scientific Name	Common Name	Code
Polygala californica	California milkwort	POCA
Pseudognaphalium stramineum	cotton-batting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Rubus ursinus	California blackberry	RUUR
Salvia mellifera	black sage	SAME
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	common fly catch	SIGA
Sonchus asper	prickly sow thistle	SOAS
Zeltnera davyi	Davy's centuary	ZEDA

[1]HMP species

8.12.2.4 Vegetative Cover

One 50-meter line-intercept transect survey was completed at HA 36. The survey indicates that vegetative cover by native shrubs and perennials was 16.40%. The mean vegetative cover by native shrubs and perennials doubled in 2017 with an increase of 8.3% since 2016. Table 8-93 summarizes the vegetation cover and Table 8-94 presents the vegetation cover by species. Figure 8-71 presents the percent cover of the dominant species at HA 36 in 2016 and 2017.

Table 8-93. Transect Survey Summary for HA 36

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA36T01	21.82	16.40	0.00	5.42	32.66	52.34
SITE AVERAGE	**21.82**	**16.40**	**0.00**	**5.42**	**32.66**	**52.34**

Table 8-94. Transect Survey Results for HA 36 by Species

Transect	ACGL (%)	ADFA (%)	ARTO (%)	COJU (%)	ELGL (%)	SAME (%)	TH (%)	BG (%)
HA36T01	11.22	2.04	2.40	5.42	0.32	0.42	32.66	52.34
SITE AVERAGE	**11.22**	**2.04**	**2.40**	**5.42**	**0.32**	**0.42**	**32.66**	**52.34**

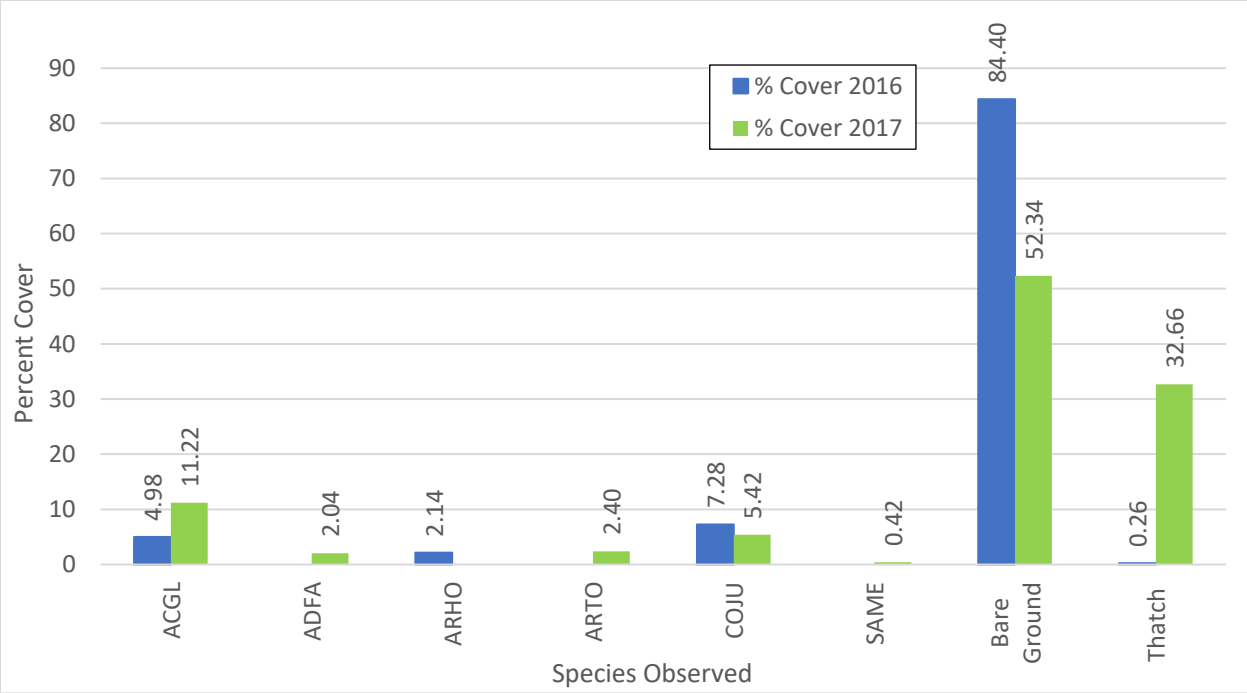


Figure 8-71. Percent Cover of Dominant Species at HA 36 in 2016 and 2017. Species codes and names are provided in Table 8-92.

8.12.3 Discussion

8.12.3.1 HMP Annual Density

The baseline data from the SSRP indicated no HMP annual species at HA 36. Therefore, no HMP annuals need to be present at this restoration site.

8.12.3.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.12.3.3 Species Richness

Chamise, sandmat manzanita, Monterey manzanita, shaggy-barked manzanita, coyote brush, Monterey ceanothus, golden yarrow, peak rush-rose, wedge-leaved horkelia, and black sage were all present. HA 36 included 27 native shrub and perennial species. HA 36 met the success criterion for objective 1.

8.12.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes 15 shrub and perennial species presented in Table 2 of the HA 36 SSRP (Burleson, 2013). Currently the HA contains 16.08% vegetative cover; therefore, this success criterion is not met. The vegetative cover in 2016 was 2.14%. Cover increased by 13.94% (see Figure 8-72).

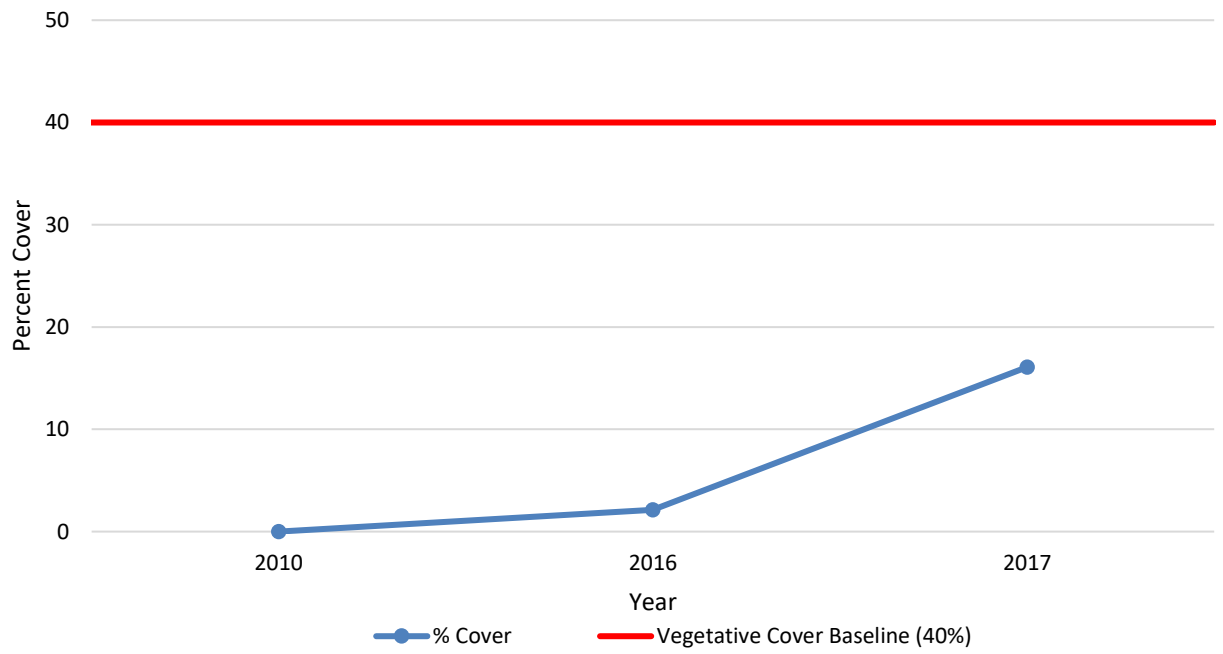


Figure 8-72. Native Vegetative Cover Compared to the Success Criterion at HA 36

Objective 2 considers the percent cover of non-native target weeds. In 2017, pampas grass (*Cortaderia jubata*) cover was 5.42%, more than the maximum allowable threshold of 5% for HA 36. Despite the fact that pampas grass cover decreased by 1.86% from 2016, this success criterion was not met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class has met or exceeded the baseline cover class of 3. Cover class 3 is from 6-25% of absolute cover. The HMP shrub species at HA 36 are providing an absolute cover of 0.00%, which is a decrease from 2.14% in 2016; therefore, the HA has not yet met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 36 this means a vegetative cover average of at least 2% cover for sandmat manzanita (*Arctostaphylos pumila*), 9% Monterey manzanita (*Arctostaphylos montereyensis*), 12% Monterey ceanothus (*Ceanothus rigidus*), 1% Hooker's manzanita (*Arctostaphylos hookeri*), and 1% Eastwood's goldenbush (*Ericameria fasciculata*). The average vegetative cover for sandmat manzanita was 0.00%, for Monterey manzanita 0.00%, for Monterey ceanothus 0.00%, for Hooker's manzanita 0.00% and for Eastwood's goldenbush 0.00% (see Figure 8-73). None of these species met the acceptable limits. The success criterion was not met.

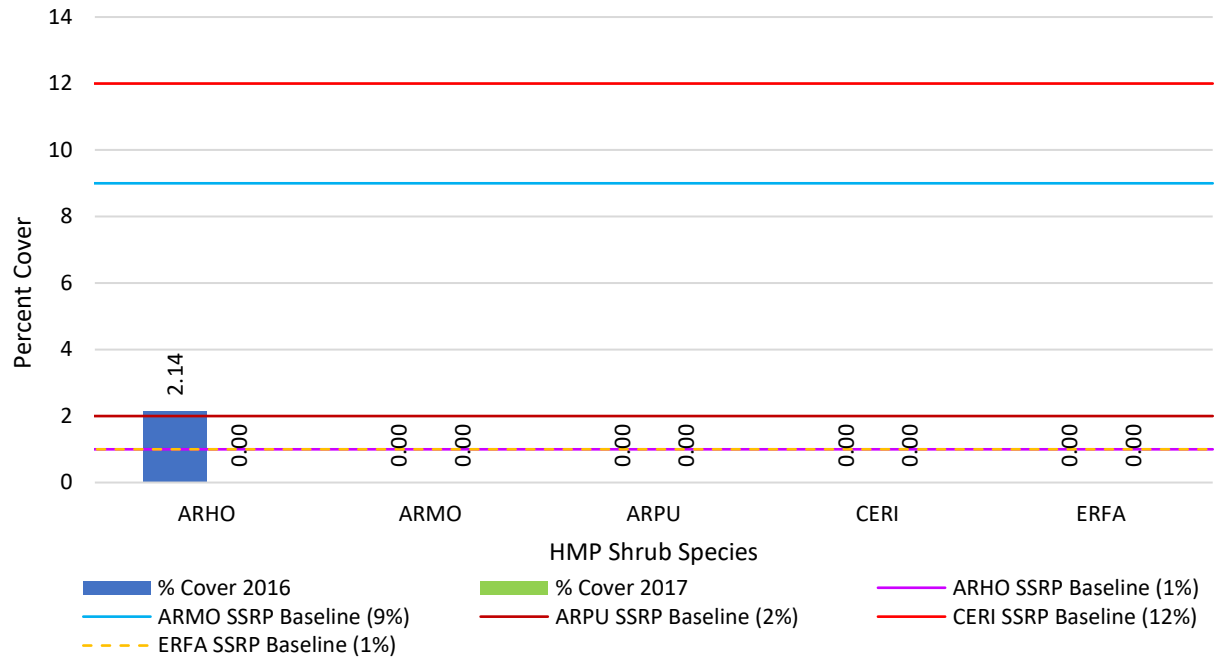


Figure 8-73. HMP Shrub Species Comparison to Success Criteria at HA 36

8.12.3.5 Recommendations

HA 36 was in year 5 of monitoring in 2017 and responded moderately well to the previous restoration efforts. The site met one of five success criteria by 2017. HA 36 is scheduled to receive additional planting of Hooker's manzanita, Monterey manzanita, and Monterey ceanothus in the 2018/2019 planting season. Additional recommendations include 1) planting Eastwood's golden bush and sandmat manzanita, and 2) conduct jubata grass abatement. Otherwise, HA 36 needs time to respond to the restoration efforts and continued monitoring will support its evaluation to determine if additional efforts are necessary. A qualitative overview is documented by the reference photo points (see Appendix D, page D-12 and Appendix E, page E-8). The photos illustrate the progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover line-intercept transects in year 8 in monitoring, 2020.

Table 8-95 summarizes the current status of HA 36 including which success criteria have been met as well as our recommendation to meeting all of the success criteria.

Table 8-95. Status and Recommendations for Achieving the Success Criteria at HA 36

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Plant Hooker's manzanita, Monterey manzanita, Monterey ceanothus, (scheduled 2018) Eastwood's goldenbush, and sandmat manzanita
Objective 2 – No. 3	Non-native target weed cover	No	Eradicate jubata grass
Objective 3 – No. 4	HMP shrub cover	No	Plant Hooker's manzanita, Monterey manzanita, Monterey ceanothus, (scheduled 2018) Eastwood's goldenbush, and sandmat manzanita
Objective 3 – No. 4	HMP shrub cover by species	No	Plant Hooker's manzanita, Monterey manzanita, Monterey ceanothus, (scheduled 2018) Eastwood's goldenbush, and sandmat manzanita
Objective 3 – No. 4	HMP annual density	NA	NA

8.13 HA 37

HA 37 was used by the Army as a short distance firing range, bazooka range, and rifle grenade range. An estimated total of 19,500 cubic yards of soil were excavated over 9.4 acres. HA 37 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 37 is relatively flat and is surrounded by low to very high-quality habitat with known presence of CTS on the range.

HA 37 is located on the northeastern portion of Site 39, within the Aromas formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

Passive and active restoration activities were prescribed for HA 37. The prescription for passive restoration at HA 37 consisted of hand broadcast non-irrigated seed and annual weed management activities. The prescription for active restoration at HA 37 included transplanting native or greenhouse-grown container plants. HA 37 is relatively flat to moderately sloped with potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration and monitoring at HA 37 began in 2013. HA 37 has been monitored for five years by photo documentation and site visits, three years for HMP annual density in plots, two years for HMP annual density across the HA, four years for 2014 planting survivorship, three years for 2015 planting survivorship, two years for 2016 planting survivorship, one year for 2017 survivorship and two years for species richness and vegetative cover (see Table 8-96). Figure 8-74 shows the HA footprint, passive restoration area, and transect survey locations. Success criteria for HA 37 are summarized in Table 8-97.

Table 8-96. Historic Summary of Restoration and Monitoring Activities at HA 37

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2013	2014	2015	2016	2017	2018	2019	2022	2027
Restoration: Active, Passive, and Erosion Control	●	●	●	●	●	●	●		
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
HMP Annual Density across HA				●	●	●	●	●	
Species Richness				●	●	●	●	●	●
Vegetative Cover				●	●	●	●	●	●
Plant Survivorship		●	●	●	●	●	●		

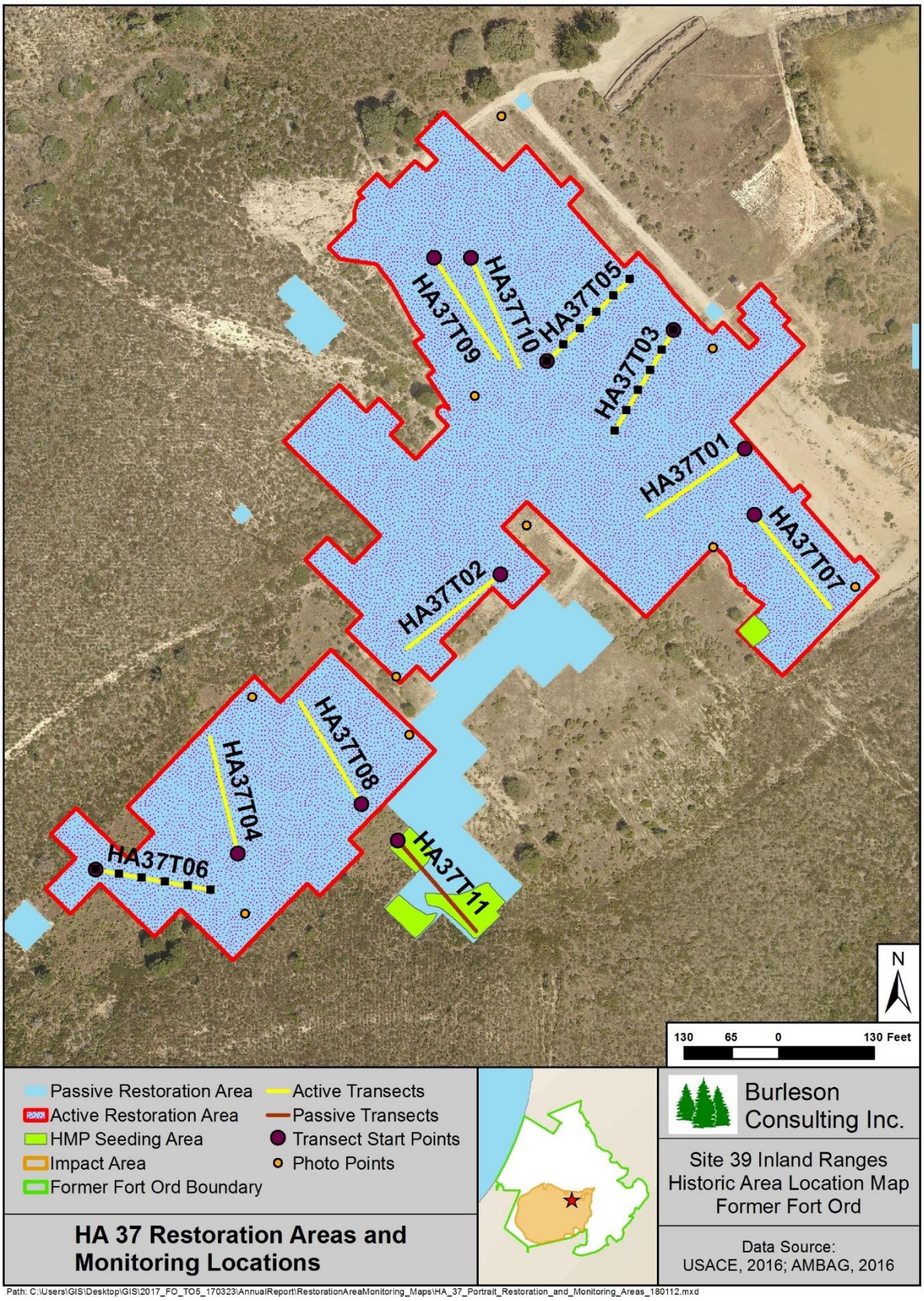


Figure 8-74. HA 37 Restoration Areas and Monitoring Locations Map

Table 8-97. Success Criteria and Acceptable Limits for Restoration of HA 37

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			shaggy-bark manzanita
			chamise
			black sage
			silk tassel
			Monterey manzanita[2]
			Monterey ceanothus[2]
			sandmat manzanita[2]
			coyote brush
			Hooker's manzanita[2]
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data indicates presence of non-native target weed species *Cortaderia jubata* (pampas grass), *Genista* sp. (broom), and *Carpobrotus chilensis* (ice plant). No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Monterey manzanita[2] percent cover, as an average of transect data, must be equal or greater than 4.

Table 8-97. Success Criteria and Acceptable Limits for Restoration of HA 37

			Monterey ceanothus[2] percent cover, as an average of transect data, must be equal or greater than 2.
			Hooker's manzanita[2] percent cover, as an average of transect data, must be equal or greater than 1.
			Sandmat manzanita[2] percent cover, as an average of transect data, must be equal or greater than 2.
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.13.1 Restoration Activities

Burleson performed passive restoration at HA 37 for four years with 13 different applications of seed. Seed was broadcast multiple times in 2014, 2015, 2016, and 2017. The total amount of seed broadcast on the site was 654.20 lb compared to 247.00 lb prescribed in the SSRP. Table 8-98 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. Burleson performed passive restoration for the HMP annual species Monterey spineflower. Four plots were chosen in the HA based on having suitable habitat for the Monterey spineflower and adjacent extant populations.

Table 8-98. Summary of Passive Restoration Activities in HA 37

Species	Pounds of Seed Broadcast						
	SSRP Target	2014 (Jan)	2014	2015	2016	2017	Total by Species
ACMI	9.40	4.80	2.00	8.07	8.14	8.00	31.01
ACGL	18.70	8.70	4.00	10.34	16.10	4.50	43.64
ADFA	-	3.30	0.00	0.00	0.00	-	3.30
ARCA	-	-	0.00	2.40	0.00	-	2.40
BAPI	1.40	1.40	0.32	0.52	0.00	0.15	2.39
CERI[1]	9.40	0.00	2.00	2.67	0.00	1.00	5.67
CHPUP[1]	1.40	0.00	0.32	0.04	0.00	-	0.36
CRSC	7.00	5.20	1.52	2.60	0.00	0.75	10.07
DIAU	1.40	0.10	0.32	0.28	0.00	0.15	0.85
ELGL	28.10	100.00	69.00	69.01	17.90	12.00	267.91
ERCO	11.70	5.00	1.44	1.06	0.00	1.25	8.75

Table 8-98. Summary of Passive Restoration Activities in HA 37

Species	Pounds of Seed Broadcast						
	SSRP Target	2014 (Jan)	2014	2015	2016	2017	Total by Species
ERER	-	4.20	0.00	0.00	0.00	-	4.20
ERFA[1]	1.90	0.00	1.40	0.05	0.00	0.20	1.65
Hordeum sp.	93.50	50.00	63.60	52.70	1.20	10.00	177.5
HOCU	18.70	16.10	4.00	5.34	16.10	4.00	45.54
GAEL	-	-	-	-	-	1.00	1.00
LUAR	-	-	1.52	2.40	0.00	-	3.92
LUAL	7.00	0.00	0.00	0.00	0.00	0.75	0.75
LUNA	-	-	0.00	0.27	0.00	1.00	1.27
SAME	18.70	7.10	4.00	2.94	0.00	2.00	16.04
STCE	-	-	0.00	0.54	0.00	2.00	2.54
STPU	18.70	0.00	0.00	5.34	10.10	8.00	23.44
TOTAL	**247.00**	**205.90**	**155.44**	**166.57**	**69.54**	**56.75**	**654.20**

[1]HMP species

Active restoration was conducted twice in 2014, once in 2015, once in 2016, and once in 2017. The total number of plants installed at HA 37 was 16,912 compared to 17,300 prescribed in the SSRP as presented in Table 8-99.

Table 8-99. Summary of Active Restoration Plantings in HA 37

Species	Number of Individual Plants					
	SSRP Target	2014	2015	2016	2017	Total by Species
ACMI	800	13	252	244	171	680
ACGL	1,000	380	208	213	20	821
ADFA	1,700	636	363	316	140	1,455
ARHO[1]	700	234	325	270	157	986
ARMO[1]	1,000	389	370	141	206	1,106
ARPU[1]	1,000	-	100	220	237	557
ARTO	2,500	621	554	497	356	2,028
ARCA	-	-	-	-	155	155
BAPI	800	234	284	431	329	1,278
CERI[1]	1,000	315	652	239	140	1,346
CRSC	1,000	389	208	22	286	905
DIAU	800	389	250	437	380	1,456
ERCO	500	311	182	-	227	720
GAEL	500	-	-	17	2	19
HOCU	1,000	389	258	32	395	1,074
LUAL	1,000	-	165	146	242	553
LUAR	1,000	208	243	175	262	888
SAME	1,000	362	250	15	258	885
TOTAL	**17,300**	**4,870**	**4,664**	**3,415**	**3,963**	**16,912**

[1]HMP species

8.13.2 Monitoring Results

8.13.2.1 HMP Annual Density

Four Monterey spineflower restoration plots were monitored for density at HA 37 in 2017. Plots 1-3 were established in January 2015 and Plot 4 was established in November 2015. Monterey spineflower monitoring was completed for year 3 for Plots 1-3 and year 2 for Plot 4 (see Figure 8-75). Monterey spineflower density was low for all plots. Figure 8-76 represents Monterey spineflower restoration plot densities for HA 37.

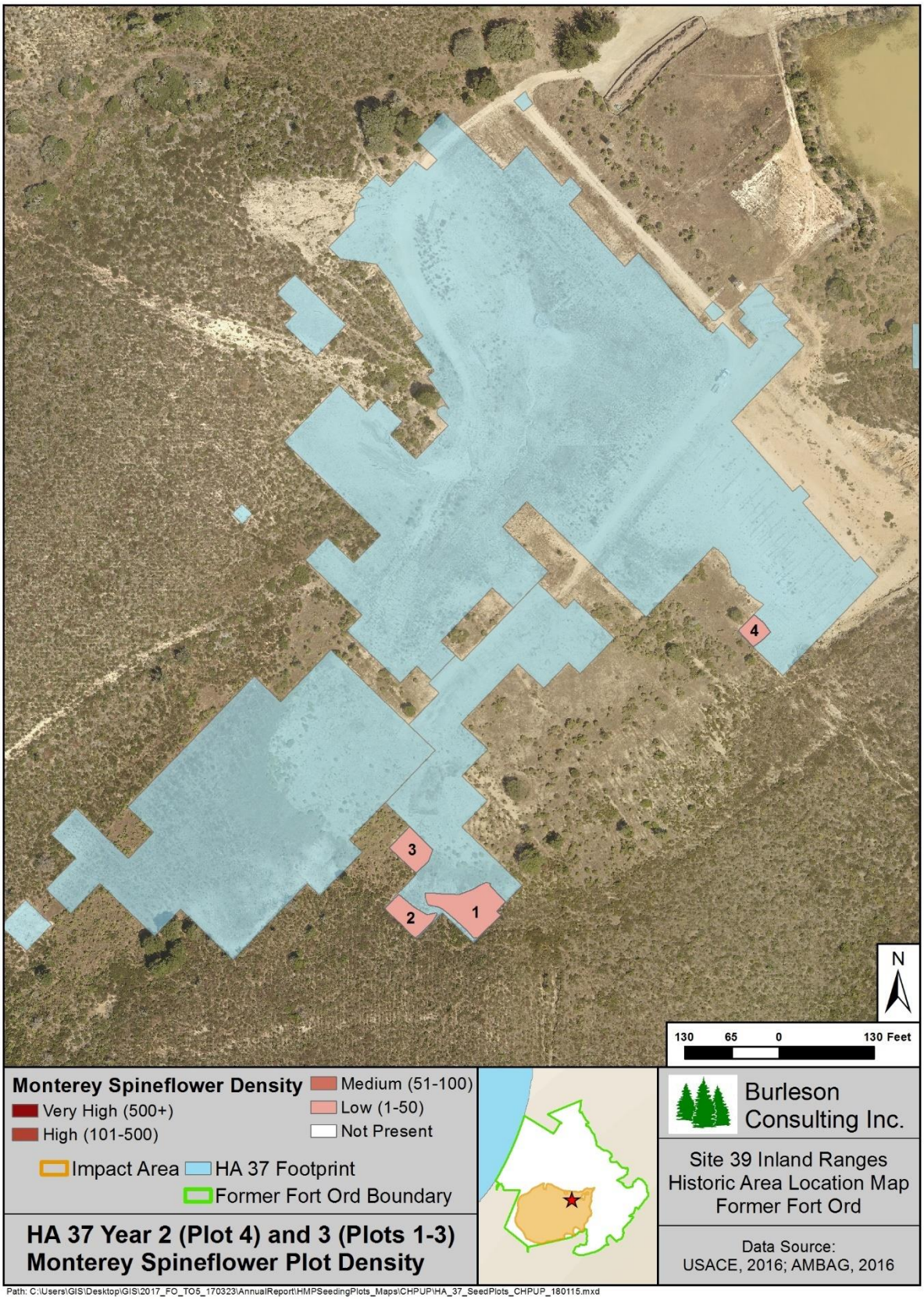
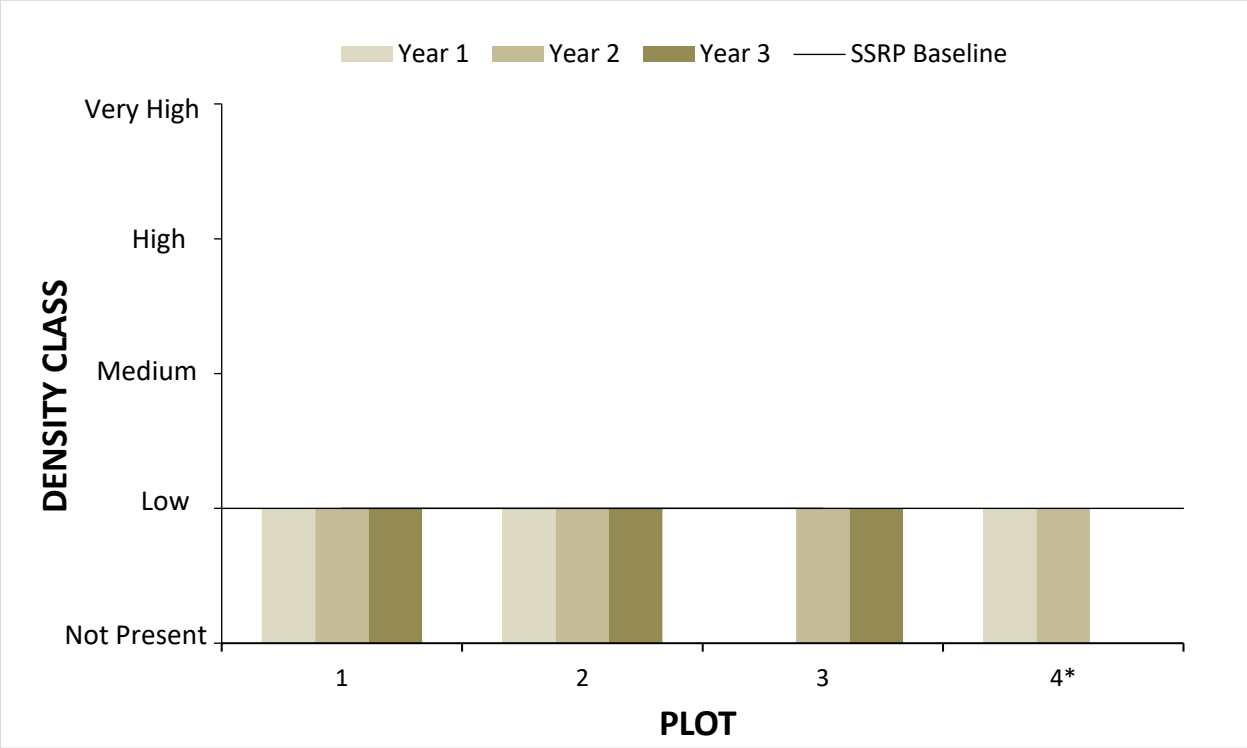


Figure 8-75. HA 37 Year 2 (Plot 4) and Year 3 (Plots 1-3) Monterey Spineflower Plot Density Map



*Plot 4 was established in Nov 2015 and has only been monitored for years 1 and 2

Figure 8-76. HA 37 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline Density Class for Year 1-3 at Restoration Plots 1-4

HMP annual density monitoring includes mapping discrete patches of HMP annuals within the restoration site but outside of the HMP annual restoration plots. None of the three HMP annual species were observed outside the plots.

8.13.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 37. A total of 12 shrub species and 809 individual plants were monitored for survivorship at HA 37. By year 3 monitoring for the 2015 planting, 38% of the plants were alive. By the end of year 2 monitoring for the 2016 planting, 52% of the plants were alive. By the end of year 1 monitoring for the 2017 planting, 64% of the plants were alive. Survivorship decreased from 46% in 2016 for the 2015 planting and from 55% in 2016 for the 2016 planting. See Table 8-100, Table 8-101, and Table 8-102 for results by species.

Table 8-100. Plant Survivorship Monitoring Summary and Results for 2015 Plantings at HA 37

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2015)	Year Two (2016)	Year Three (2017)
			Alive (%)	Alive (%)	Alive (%)
ADFA	363	36	89	83	81
ARHO[1]	325	33	61	58	58
ARMO[1]	370	37	46	27	27
ARTO	554	55	44	35	33
BAPI	284	28	75	61	50
CERI[1]	652	65	40	18	20
LUAL	165	17	65	47	24
LUAR	243	24	38	17	4
SAME	250	25	88	40	52
TOTAL	**3,206**	**320**	**57***	**40***	**38***

*average
[1]HMP species

Table 8-101. Plant Survivorship Monitoring Summary and Results for 2016 Plantings at HA 37

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2016)	Year Two (2017)
			Alive (%)	Alive (%)
ADFA	316	32	88	91
ARHO[1]	270	28	75	71
ARMO[1]	141	14	64	64
ARPU[1]	220	23	70	65
ARTO	497	49	57	53
BAPI	431	43	44	37
CERI[1]	239	24	21	13
GAEL	17	4	25	25
LUAL	146	15	67	20
LUAR	175	18	6	6
SAME	15	2	50	50
TOTAL	**2,292**	**237**	**55***	**52***

*average
[1]HMP species

Table 8-102. Plant Survivorship Monitoring Summary and Results for 2017 Plantings at HA 37

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2017)
			Alive (%)
ADFA	140	14	36
ARCA	155	16	100
ARHO[1]	157	16	100
ARMO[1]	206	21	76
ARPU	237	24	75
ARTO	356	36	94
BAPI	329	33	52
CERI[1]	140	14	36
GAEL	2	2	50
LUAL	242	24	25
LUAR	262	26	35
SAME	258	26	73
TOTAL	**2484**	**252**	**64***

8.13.2.3 Species Richness

Ninety-five species were observed at HA 37. Of those, 44 were native shrubs or perennials, 22 were native annual herbaceous species, 28 were non-native species, and one was not catergorized as it was only identified to genus (see Table 8-103). Species richness increased by fourteen species since 2016. Native shrub and perennial species increased by seven, native herbaceous species increased by one, and non-native species increased by five.

Table 8-103. Species Observed on HA 37, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon americanus var. *americanus*	Spanish clover	ACAMA
Acmispon glaber	deerweed	ACGL
Acmispon heermannii	Heermann's lotus	ACHE
Acmispon parviflorus	hill lotus	ACPA
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Agoseris grandiflora	large-flowered agoseris	AGGR
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos hookeri[1]	Hooker's manzanita	ARHO
Arctostaphylos montereyensis[1]	Monterey manzanita	ARMO
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza minor	small quaking grass	BRMI
Bromus diandrus	ripgut brome	BRDI

Table 8-103. Species Observed on HA 37, 2017

Scientific Name	Common Name	Code
Bromus hordeaceus	softchess	BRHO
Calochortus albus	white globe lily	CAAL
Carduus pycnocephalus	Italian thistle	CAPY
Carpobrotus edulis	ice plant	CAED
Castilleja densiflora	owl's clover	CADE
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME
Crocanthemum scoparium	peak rush-rose	CRSC
Danthonia californica	California oat grass	DACA
Deinandra corymbosa	coastal tarweed	DECO
Diplacus aurantiacus	sticky monkeyflower	DIAU
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW
Elymus glaucus	blue wild-rye	ELGL
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filareee	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Galium andrewsii	phlox-leaved bedstraw	GAAN
Galium californicum	California bedstraw	GACA
Gallium nuttalli	climbing bedstraw	GANU
Gamochaeta ustulata	purple cudweed	GAUS
Genista monspessulana	French broom	GEMO
Geranium dissectum	cutleaf geranium	GEDI
Heterotheca grandiflora	telegraph weed	HEGR
Hordeum sp.		HO
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	hairy cat's-ear	HYRA
Isocoma menziesii var. *vernioides*	coastal goldenbush	ISMEV
Juncus bufonius	toad rush	JUBU
Layia platyglossa	tidy tips	LAPL
Lepechinia calycina	pitcher sage	LECA
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus albifrons var. *albifrons*	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	annual lupine	LUBI
Lupinus concinnus	bajada lupine	LUCO
Lupinus nanus	sky lupine	LUNA
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia exigua	little tarweed	MAEX
Madia gracilis	slender tarweed	MAGR

Table 8-103. Species Observed on HA 37, 2017

Scientific Name	Common Name	Code
Madia sativa	coast tarweed	MASA
Melilotus indicus	sourclover	MEIN
Petrorhagia dubia	hairy pink	PEDU
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Polygala californica	California milkwort	POCA
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium stramineum	cotton-batting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Rubus ursinus	California blackberry	RUUR
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Sanicula laciniata	coast sanicle	SALA
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	blue-eyed grass	SIBE
Solidago velutina ssp. *californica*	California goldenrod	SOVEC
Sonchus oleraceus	common sow thistle	SOOL
Stachys bullata	wood mint	STBU
Symphoricarpos albus var. *laevigatus*	common snowberry	SYALL
Taraxia ovata	sun cup	TAOV
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium campestre	hop clover	TRCA
Trifolium dubium	little hop clover	TRDU
Trifolium gracilentum	pinpoint clover	TRGR
Trifolium hirtum	rose clover	TRHI
Trifolium microcephalum	maiden clover	TRMI
Trifolium willdenovii	tomcat clover	TRWI
Zeltnera davyi	Davy's centaury	ZEDA

[1]HMP species

8.13.2.4 Vegetative Cover

Eleven 50-meter line-intercept transects and 24 associated quadrats were conducted at HA 37. These surveys indicate that the mean vegetative cover by native shrubs and perennials was 30.81%. The mean vegetative cover by native shrubs and perennials was greater in 2017 than 2016 by 8.12%. However, only seven transects were completed in 2016 whereas 11 were completed in 2017. Quadrats were completed along the transect line when 10% or more of the transect line was herbaceous cover, in accordance to the Protocol for Conducting Vegetation Monitoring (Burleson, 2009). Table 8-104 summarizes vegetation cover, Table 8-105 presents vegetation cover by species, Figure 8-77 presents the percent cover of the dominant species at HA 37 in 2016 and 2017, and Table 8-106 presents quadrat results.

Table 8-104. Transect Survey Summary for HA 37

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA37T01	16.66	15.58	0.32	0.76	51.52	35.94
HA37T02	19.28	14.62	2.08	2.58	98.86	1.12
HA37T03	36.48	8.34	6.26	21.88	100.00	0.00
HA37T04	98.26	95.20	2.82	1.20	100.00	0.00
HA37T05	86.90	27.08	30.88	28.94	88.66	10.06
HA37T06	91.46	73.88	11.82	9.68	98.90	1.64
HA37T07	11.88	8.66	2.64	0.58	52.88	40.92
HA37T08	23.46	10.94	0.00	3.64	93.72	4.02
HA37T09	35.66	34.42	3.54	2.94	54.00	19.18
HA37T10	48.56	39.66	3.10	5.80	94.92	4.48
HA37T11	11.44	10.58	0.00	0.86	99.34	0.66
SITE AVERAGE	**43.64**	**30.81**	**5.77**	**7.17**	**84.80**	**10.73**

Table 8-105. Transect Survey Summary for HA 37 by Species

Transect	ACAMA (%)	ACMI (%)	ACGL (%)	ACPA (%)	ACST (%)	ADFA (%)	AGGR (%)	ARCA (%)	ARHO[1] (%)	ARMO[1] (%)	ARPU[1] (%)	ARTO (%)	BAPI (%)	CEDE (%)	CERI[1] (%)	CRSC (%)	DACA (%)	DIAU (%)	ELGL (%)	ERCA (%)	ERCO (%)
HA37T01	0.00	0.24	8.50	0.00	0.00	1.82	0.32	0.00	2.72	0.00	0.00	0.32	0.64	0.00	0.00	0.54	0.00	0.00	0.00	0.00	0.00
HA37T02	1.50	0.20	3.18	0.00	0.00	3.38	0.00	0.62	0.00	1.08	0.00	0.00	0.00	0.00	0.00	0.74	0.36	0.00	0.78	0.00	0.00
HA37T03	4.62	1.08	2.36	0.38	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00
HA37T04	1.00	0.44	50.28	0.00	0.00	0.38	0.00	6.82	0.00	2.80	0.98	0.86	0.00	0.24	5.16	0.00	0.00	0.80	0.40	0.36	0.86
HA37T05	27.74	0.00	13.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.54	0.00	0.00	0.00	4.52	0.00	0.00
HA37T06	9.46	1.42	35.72	0.00	0.00	2.18	0.00	1.22	1.98	1.26	0.00	2.92	2.48	0.00	0.00	0.00	0.00	2.02	0.56	0.00	1.48
HA37T07	0.00	0.00	6.30	0.00	0.00	0.00	0.00	0.00	0.58	0.00	0.00	0.76	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HA37T08	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HA37T09	3.54	0.00	28.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HA37T10	3.10	0.00	38.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HA37T11	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.28	5.68	0.00	1.12	0.00	0.00	0.00	0.00	0.00
SITE AVERAGE	**4.63**	**0.33**	**17.06**	**0.03**	**0.05**	**0.71**	**0.03**	**0.79**	**0.48**	**0.47**	**0.09**	**0.44**	**2.1**	**0.54**	**1.15**	**0.22**	**0.03**	**0.26**	**0.68**	**0.03**	**0.21**

Table 8-105 (continued). Transect Survey Summary for HA 37 by Species

Transect	ERBO (%)	HEGR (%)	HOCU (%)	HYGL (%)	HYRA (%)	JUBU (%)	LUAR (%)	LUCO (%)	LUNA (%)	MASA (%)	MA sp (%)	PLCO (%)	PS sp (%)	RUUR (%)	RUAC (%)	SAME (%)	SIBE (%)	TODI (%)	TR sp (%)	TH (%)	BG (%)
HA37T01	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.52	35.94
HA37T02	0.00	0.00	3.72	0.00	0.00	0.00	0.00	0.58	0.00	0.00	0.00	2.58	0.00	0.00	0.00	0.00	0.56	0.00	0.00	98.86	1.12
HA37T03	0.00	0.00	3.68	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.00	21.84	0.00	0.00	0.00	0.20	0.00	0.00	0.00	100.0	0.00
HA37T04	0.00	0.22	14.30	0.24	0.00	0.00	0.00	0.00	0.00	1.34	0.26	0.00	0.00	0.24	0.00	3.58	0.00	6.70	0.00	100.0	0.00
HA37T05	0.00	0.00	1.18	0.00	0.00	0.00	0.00	0.24	2.90	0.00	0.00	28.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	88.66	10.06
HA37T06	1.78	0.00	10.34	3.32	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.00	1.16	4.02	1.06	3.30	0.00	2.68	0.20	98.90	1.64
HA37T07	0.00	0.00	0.00	0.00	0.00	2.64	0.82	0.00	0.00	0.00	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.88	40.92
HA37T08	0.00	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	93.72	4.02
HA37T09	0.00	0.00	0.20	0.00	0.28	0.00	0.32	0.00	0.00	0.00	0.00	2.66	0.00	0.00	0.00	0.26	0.00	0.00	0.00	54.00	19.18
HA37T10	0.00	0.00	0.24	0.00	0.00	0.00	1.16	0.00	0.00	0.00	0.00	5.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	94.92	4.48
HA37T11	0.00	0.00	1.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.58	0.00	99.34	0.66
SITE AVERAGE	**0.16**	**0.02**	**3.34**	**0.32**	**0.03**	**0.24**	**0.21**	**0.07**	**0.31**	**0.12**	**0.11**	**6.15**	**0.11**	**0.39**	**0.10**	**0.67**	**0.05**	**0.91**	**0.02**	**84.80**	**10.73**

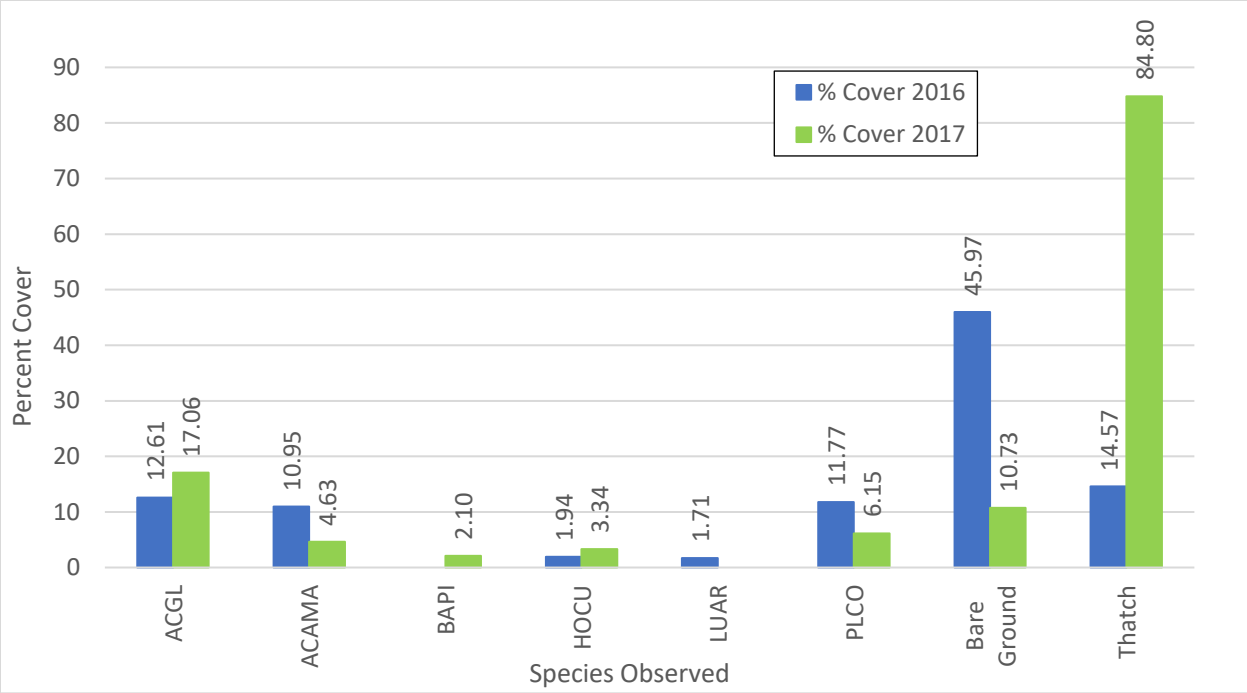


Figure 8-77. Percent Cover of Dominant Species at HA 37 in 2016 and 2017. Species codes and names are provided in Table 8-103.

Table 8-106. Quadrats Along the Transect Line for T03, T05 and T06 Summary for HA37

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA37T03Q01	60	31	2	27	10	30
HA37T03Q02	49	4	4	41	20	32
HA37T03Q03	61	0	1	60	20	20
HA37T03Q04	15	2	1	12	65	22
HA37T03Q05	7	1	1	5	70	23
HA37T03Q06	6	3	1	2	30	74
HA37TO5Q01	28	1	25	2	5	66
HA37TO5Q02	55	0	50	5	35	10
HA37TO5Q03	30	1	19	10	20	50
HA37TO5Q04	27	9	2	16	40	32
HA37TO5Q05	7	2	0	5	40	53
HA37TO5Q06	33	25	0	8	45	22
HA37TO6Q01	74	69	2	3	30	0
HA37TO6Q02	84	78	4	2	17	0
HA37TO6Q03	103	95	2	6	2	0
HA37TO6Q04	36	29	6	1	46	20
HA37TO6Q05	38	31	4	3	35	30
HA37TO6Q06	23	2	5	16	6	75
SITE AVERAGE	**41**	**21**	**7**	**12**	**30**	**31**

8.13.3 Discussion

8.13.3.1 HMP Annual Density

Monterey spineflower density was within the acceptable limits for HMP annual density because the SSRP baseline density class was low, and all plots met the success criterion. The density classes in Plots 1 and 2 were low for all three years of monitoring while Plot 3 increased from not present to low density by year 3. Plot 4 has had two years of monitoring and was also low density. Monterey spineflower was not present outside of the restoration plots although seeding occurred in early and late 2015. It is likely that the site needs to receive the full SSRP prescription of Monterey spineflower seed to spread outside of the restoration plots.

8.13.3.2 Plant Survivorship

Twelve shrub species were monitored at HA 37 for years 1, 2, and 3 for plant survivorship in 2017. Survivorship rates varied by species and year planted. Plantings that occurred in 2015 indicated a low survival rate of 38%, in 2016 a moderate rate of 52%, and in 2017 a moderate rate of 64%. Monterey manzanita had a low survival rate of 27% in the 2015 planting. Monterey ceanothus had low survival rates of 20% in the 2015 planting, 13% in the 2016 planting, and 36% in the 2017 planting. Silver bush lupine had low survivorship with 24% survival in the 2015 planting, 17% in the 2016 planting, and 25% in the 2017 planting. Yellow bush lupine had an exceptionally low survival rate of 4% in the 2015 planting, and a slightly higher rate of 35% in the 2017 planting. Silk tassel had low survivorship of 25% in the 2016 planting. Low survivorship for these species is not surprising, as they have had low survivorship on multiple sites. Effort was made in the 2017 planting to install the manzanita species in Area A where there were sandy well drained soils while more tolerant species were planted in Area B, a flatter area with compact soils and occasional standing water (see Appendix B, Figure B-8). The manzanita species and California sagebrush were the only species with high survivorship from the 2017 planting. In 2019, more Monterey ceanothus, silver bush lupine, yellow bush lupine, Monterey manzanita, and silk tassel will be planted. These species will continue to be monitored closely.

8.13.3.3 Species Richness

Chamise, sandmat manzanita (*Arctostaphylos pumila*), shaggy-barked manzanita, Hooker's manzanita, Monterey manzanita, coyote brush, Monterey ceanothus, silk tassel, and black sage were present. HA 37 included 44 native shrub and perennial species. HA 37 met the success criterion for objective 1.

8.13.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1, the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes 22 shrub and perennial species presented in Table 2 of the HA 37 SSRP (Burleson, 2013). Currently the HA includes 25.06% cover; therefore, this success criterion was not met. The vegetative cover in 2016 was 20.55% cover. Cover increased by 4.51% (see Figure 8-78).

It should be noted that at HA 37 silver bush lupine is identified as *Lupinus chamissonis* in Table 2 of the HA 37 SSRP. However, according to the Jepson Manual, CalFlora, and *The Plants of Monterey County,* silver bush lupine is identified as *Lupinus albifrons* var. *albifrons*. Since 2012, silver bush lupine has been identified in the field during vegetative cover data collection as *Lupinus albifrons* var. *albifrons*. Silver beach lupine (*Lupinus chamissonis*) can be differentiated from silver bush lupine (*Lupinus albifrons* var. *albifrons*) by the absence of hairs on the upper keel margin; silver bush lupine has hairs on the upper keel margin. For the comparison to the success criteria, *Lupinus chamissonis* will be considered as *Lupinus albifrons*.

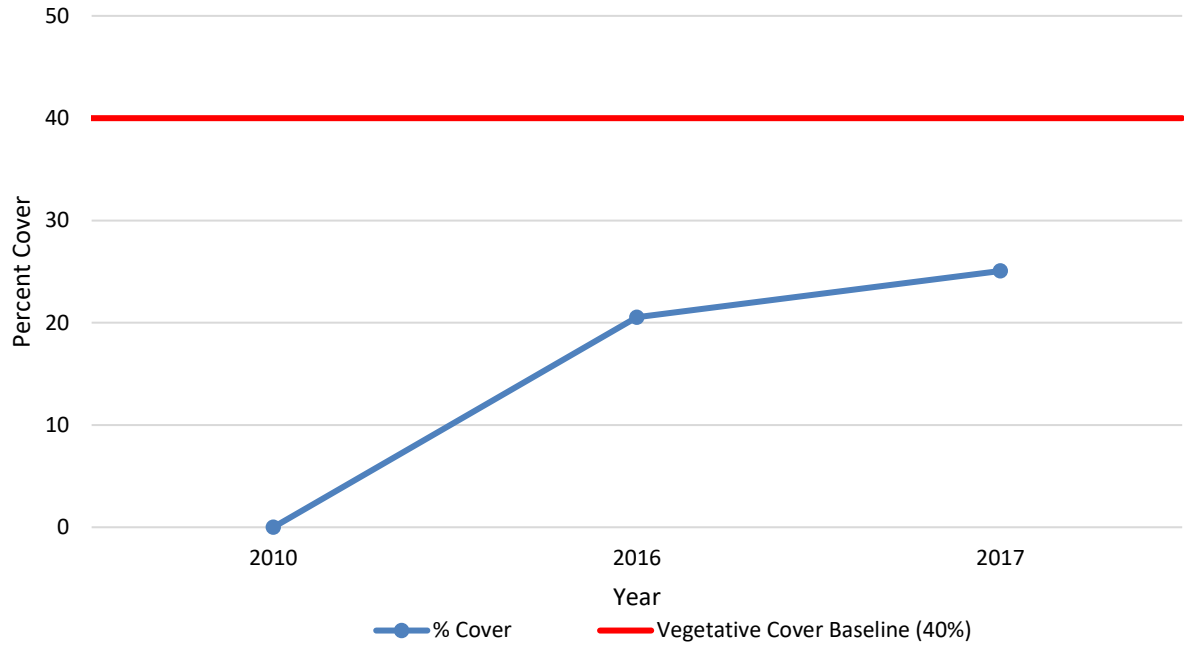


Figure 8-78. Native Vegetative Cover Compared to the Success Criterion at HA 37

Objective 2 considers the percent cover of non-native target weeds. In 2017, target weeds were not observed in the transect surveys. The vegetative cover for non-native species was 0.00%. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class has met or exceeded the baseline cover class of 3. Cover class 3 is from 6-25% of absolute cover. The HMP shrub species at HA 37 are providing an absolute cover of 2.19%, which is an increase from 1.88% in 2016; however, the HA has not yet met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 37 this means a vegetative cover average of at least 2% for sandmat manzanita (*Arctostaphylos pumila*), 4% for Monterey manzanita (*Arctostaphylos montereyensis*), 2% for Monterey ceanothus (*Ceanothus rigidus*), and 1% for Hooker's manzanita (*Arctostaphylos hookeri*). The average vegetative cover for sandmat manzanita was 0.09%, for Monterey manzanita 0.47%, for Monterey ceanothus 1.15%, and for Hooker's manzanita 0.48% (see Figure 8-79). Sandmat manzanita and Monterey ceanothus increased in cover from 2016 to 2017, while Monterey manzanita and Hooker's manzanita decreased slightly. None of the four species met the success criterion.

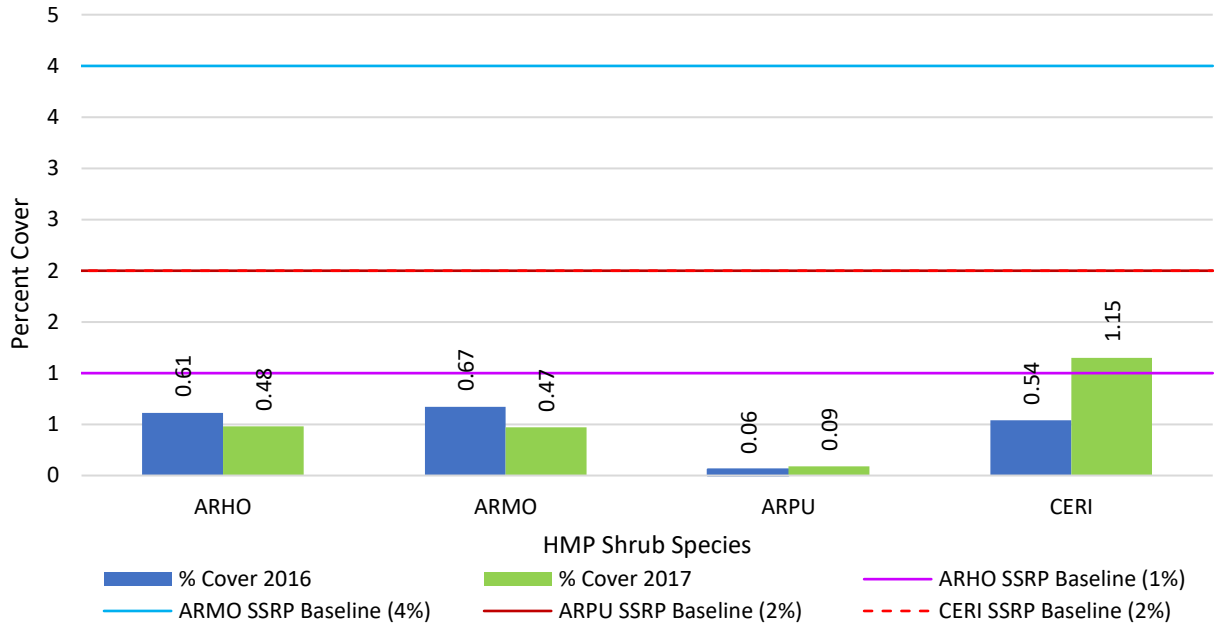


Figure 8-79. HMP Shrub Species Comparison to Success Criteria at HA 37

8.13.3.5 Recommendations

HA 37 was in year 3 of monitoring in 2017 and has not had ample time to respond to restoration efforts since it is highly-disturbed with significant erosion issues. Despite the disturbed nature of the site, it met three of the six success criteria by 2017. The Army recommends two actions to support HA 37 in achieving success criteria: 1) waiting until the restoration prescription is complete to see how the site responds, and 2) conducting Monterey spineflower seeding since the site has only received 0.36 lb of the 1.4 lb SSRP target. Overall, HA 37 needs time and the entire prescription of active and passive restoration efforts prior to full evaluation. Continued monitoring will assist that evaluation as restoration continues and highlight any areas that may require additional effort. The site will be re-evaluated after year 5 of monitoring, 2019, and further recommendations will be made at that time. A qualitative overview is documented by the reference photo points (see Appendix D, page D-13). The photos illustrate the progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover line-intercept transects in year 5.

Table 8-107 summarizes the current status of HA 37 including which success criteria have been met as well as our recommendation to meeting all of the success criteria.

Table 8-107. Status and Recommendations for Achieving the Success Criteria at HA 37

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Wait for the HA to respond
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Wait for the HA to respond
Objective 3 – No. 4	HMP shrub cover by species	No	Wait for the HA to respond
Objective 3 – No. 4	HMP annual density	Yes	Fulfill SSRP seed prescription for Monterey spineflower

8.14 HA 38

HA 38 was used by the Army as a firing range. Soil was excavated over 1.01 acres. HA 38 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 38 is moderately sloped and is surrounded by low to very high-quality habitat.

HA 38 is located on the northeastern portion of Site 39, occurring within the Aromas formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

Passive and active restoration activities were prescribed for HA 38. The prescription for passive restoration at HA 38 consisted of hand broadcast non-irrigated seed and annual weed management activities. The prescription for active restoration at HA 38 included transplanting native or greenhouse-grown container plants. HA 38 is moderately sloped and has little potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 38 began in 2013 and was completed in 2015 except for HMP annuals, and monitoring began in 2013. HA 38 has been monitored for five years by photo documentation and site visits, three years for HMP annual density in plots, two years for HMP annual density across the HA, two years for species richness, two years for vegetative cover, and four years for plant survivorship (see Table 8-108). Figure 8-80 shows the HA footprint, passive restoration area, active restoration area, and transect survey locations. Success criteria for HA 38 are summarized in Table 8-109.

Table 8-108. Historic Summary of Restoration and Monitoring Activities at HA 38

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2013	2014	2015	2016	2017	2018	2019	2022	2027
Restoration: Active and Passive	●	●	●		●				
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
Sand Gilia Plots						●	●	●	
Seaside Bird's Beak Plots									
HMP Annual Density across HA				●	●	●	●	●	
Species Richness				●	●	●	●	●	
Vegetative Cover				●	●	●	●	●	
Plant Survivorship		●	●	●	●				

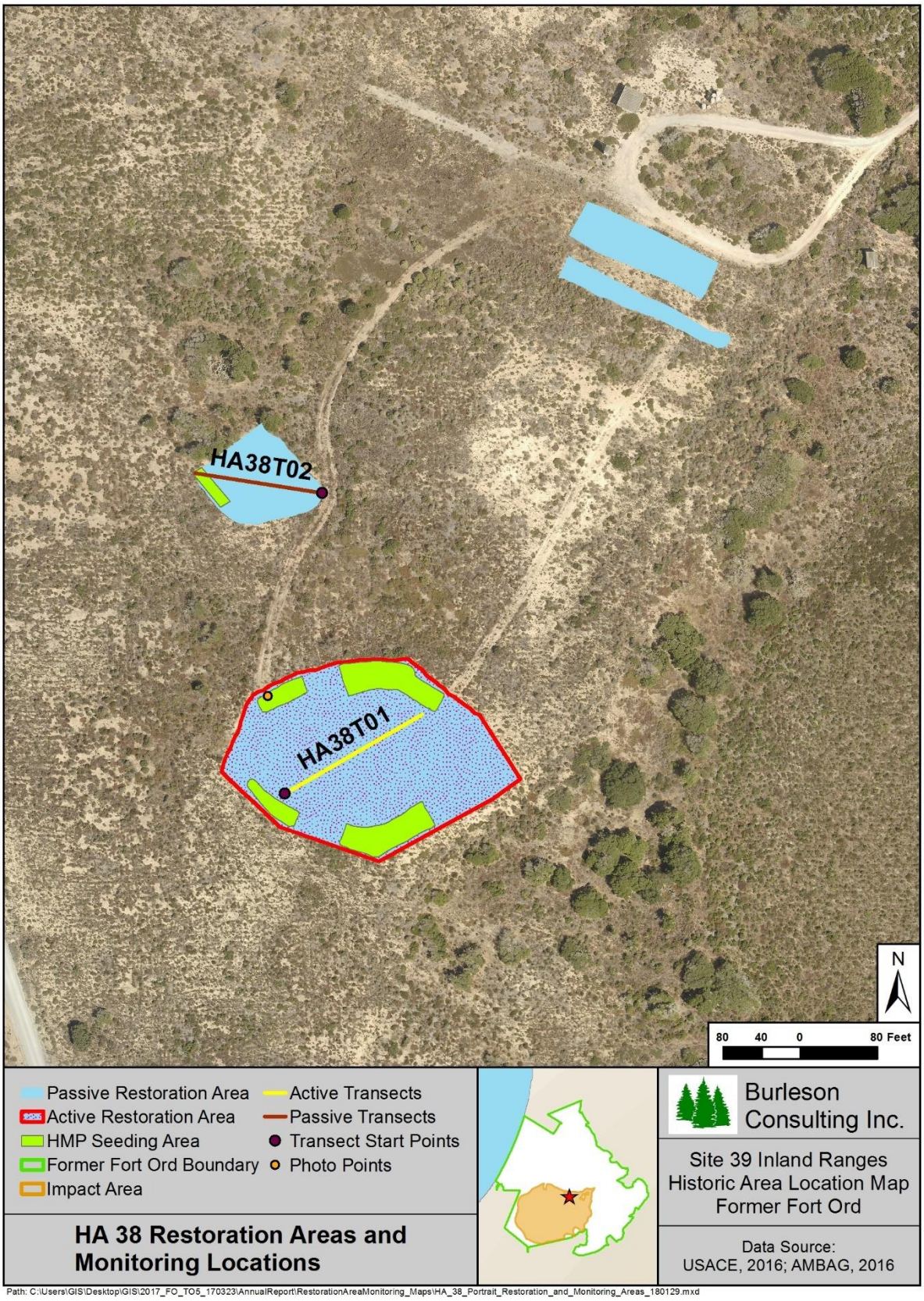


Figure 8-80. HA 38 Restoration Areas and Monitoring Locations Map

Table 8-109. Success Criteria and Acceptable Limits for Restoration of HA 38

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			shaggy-bark manzanita
			chamise
			coyote brush
			deerweed
			black sage
			Monterey manzanita[2]
			Monterey ceanothus[2]
			sandmat manzanita[2]
			Hooker's manzanita[2]
2	Percent cover of native species	Percent cover equals 40 percent for native species[3]	For the restoration area, percent cover monitoring data must meet or exceed 20 percent for native species listed as part of the plant palette in Table 2[3]
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data indicates presence of non-native target weed species *Carpobrotus edulis* (ice plant). No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 2
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Monterey manzanita[2] percent cover, as an average of transect data, must be equal or greater than 1.
			Monterey ceanothus[2] percent cover, as an average of transect data, must be equal or greater than 1.
			Hooker's manzanita[2] percent cover, as an average of transect data, must be equal or greater than 1.

Table 8-109. Success Criteria and Acceptable Limits for Restoration of HA 38

			Sandmat manzanita[2] percent cover, as an average of transect data, must be equal or greater than 4.
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.14.1 Restoration Activities

Burleson performed passive restoration at HA 38 for four years with three different applications of seed broadcast in 2013, 2014, 2015, and 2017. The total amount of seed broadcast on the site was 31.43 lb compared to 28.98 lb prescribed in the SSRP. Table 8-110 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. In 2017, Burleson performed passive restoration for the HMP annual species Monterey spineflower and sand gilia. Five plots were chosen in the HA based on having suitable habitat and adjacent extant populations for Monterey spineflower and one plot sand gilia. Plot 1 of Monterey spineflower was seeded in 2015 and Plots 2-5 were seeded in 2017.

Table 8-110. Summary of Passive Restoration Activities from 2013-2017 for HA 38

Species	Pounds of Seed Broadcast					
	SSRP Target	2013 (Oct)	2014 (Dec)	2015 (Jan)	2017	Total by Species
ACGL	2.020	0.400	1.410	0.000	0.000	1.810
ACMI	1.010	0.200	0.710	0.000	0.000	0.910
BAPI	0.150	0.030	0.080	0.000	0.000	0.110
CERI[1]	1.010	0.000	0.510	0.000	0.000	0.510
CHPUP[1]	0.150	0.000	0.000	0.010	0.015	0.025
CORIL[1]	0.150	0.000	0.000	0.000	0.000	0.000
CRSC	0.760	0.152	0.580	0.000	0.000	0.732
DIAU	0.150	0.180	0.280	0.000	0.000	0.460
ELGL	4.040	0.600	6.600	0.000	0.000	7.200
ERCO	1.260	0.252	0.930	0.000	0.000	1.182
ERFA[1]	0.200	0.000	0.100	0.000	0.000	0.100
GAEL	1.010	0.000	0.000	0.000	0.000	0.000
GITEA[1]	0.150	0.000	0.000	0.000	0.0075	0.0075
HOCU	2.020	0.404	1.410	0.000	0.000	1.814
Hordeum sp.	10.100	2.020	12.000	0.000	0.000	14.020
LUAL	0.760	0.150	0.000	0.000	0.000	0.150
LUAR	NA	0.000	0.580	0.000	0.000	0.580
SAME	2.020	0.404	1.410	0.000	0.000	1.814
STPU	2.020	0.000	0.000	0.000	0.000	0.000
TOTAL	**28.980**	**4.790**	**26.600**	**0.010**	**0.0225**	**31.4325**

[1]HMP species

Active restoration was completed in 2014 and 2015. The total number of plants installed at HA 38 was 1,842 compared to 1,842 prescribed in the SSRP. Table 8-111 summarizes the active restoration plantings.

Table 8-111. Summary of Active Restoration Activities from 2014-2015 for HA 38

Species	Number of Individual Plants			
	SSRP Target	2014 (Feb)	2015 (Feb)	Total by Species
ACGL	82	82	-	82
ACMI	82	82	-	82
ADFA	163	163	-	163
ARHO[1]	123	123	-	123
ARMO[1]	123	123	-	123
ARPU[1]	327	-	327	327
ARTO	204	204	-	204
BAPI	82	82	-	82
CERI[1]	82	82	-	82
CRSC	82	82	-	82
DIAU	82	82	-	82
ERCO	82	82	-	82
GAEL	82	-	82	82
HOCU	82	82	-	82
LUAL	82	-	82	82
SAME	82	82	-	82
TOTAL	**1,842**	**1,351**	**491**	**1,842**

[1]HMP species

8.14.2 Monitoring Results

8.14.2.1 HMP Annual Density

One Monterey spineflower restoration plot was monitored for year 3 density at HA 38 in 2017. The plot is located in the eastern side of the site as shown on Figure 8-81. Monterey spineflower density was low at Plot 1. Figure 8-82 presents Monterey spineflower restoration plot densities for HA 38.

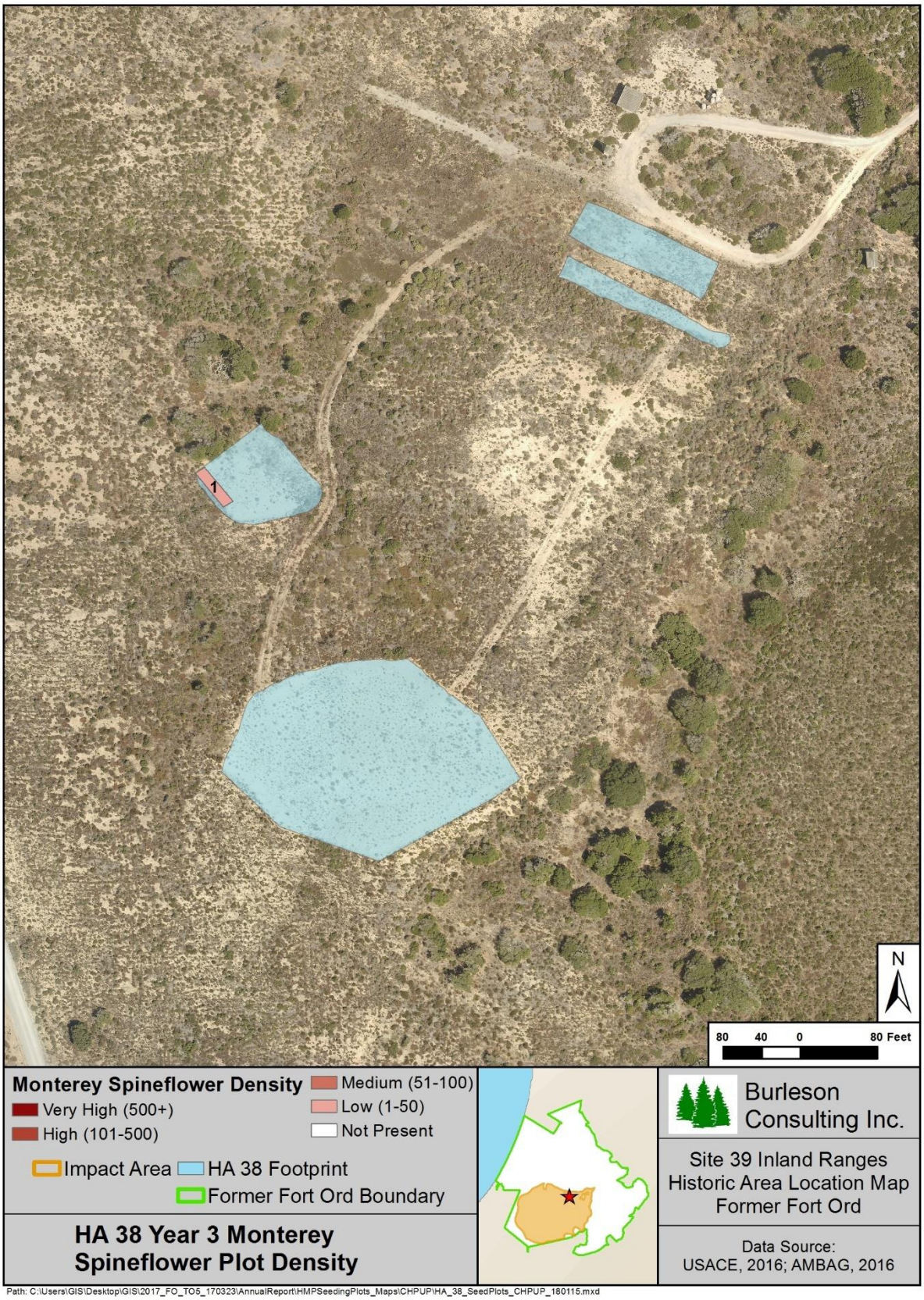


Figure 8-81. HA 38 Year 3 Monterey Spineflower Plot Density Map

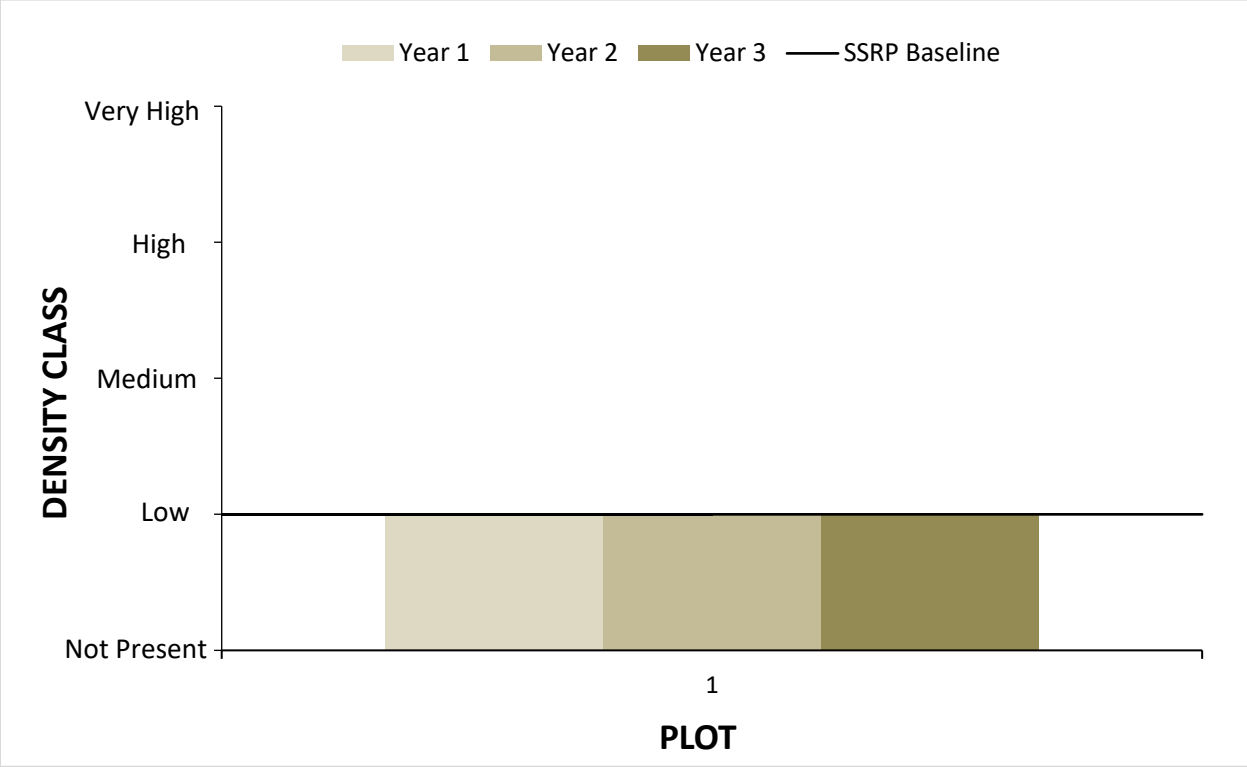


Figure 8-82. HA 38 Comparison of Monterey Spineflower Density Classes to SSRP Baseline Density Class for Years 1-3 at Restoration Plot 1

HMP annual density monitoring included mapping discrete patches of HMP annuals within the restoration area but outside of the HMP annual restoration plots. This survey was completed for Monterey spineflower and sand gilia. Two discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 8-83). The densities were low. The total acreage of Monterey spineflower patches with a density at the SSRP baseline density class of low was 0.10 acre. The total acreage increased from 0.08 acre in 2016 to 0.10 acre.

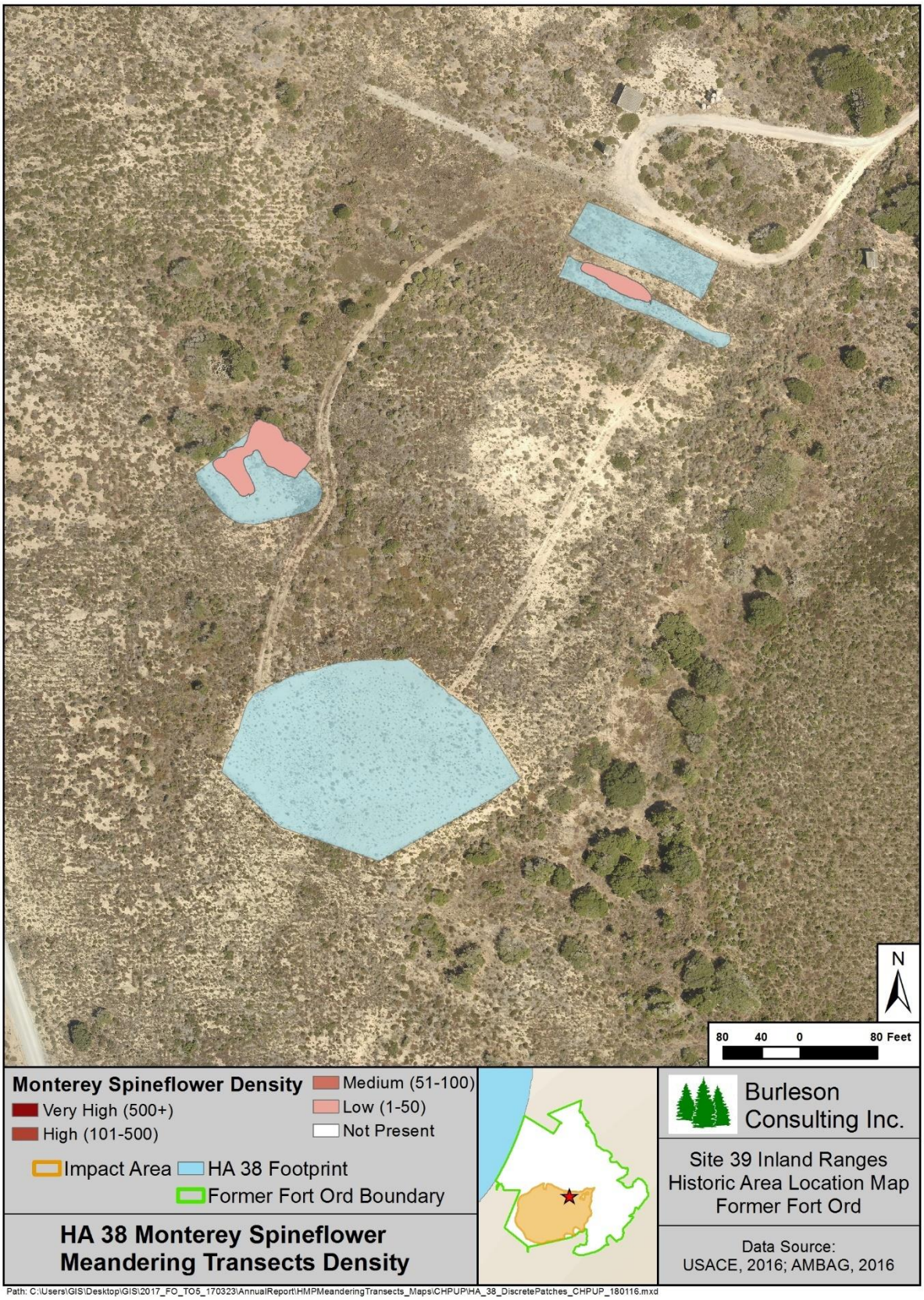


Figure 8-83. HA 38 Monterey Spineflower Meandering Transect Density Map

8.14.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 38. A total of three shrub species and 49 individual plants were monitored for survivorship. By year 3 of monitoring for 2015 planting, 88% of the plants were alive. Survivorship increased from 80% alive in 2016. The increase in survivorship was attributed to some plants being recorded as dead in year 2 but then recorded as alive in years 3 because they showed new growth. Table 8-112 presents results by species.

Table 8-112. Plant Survivorship Monitoring Summary and Results for 2015 Planting at HA 38

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2015)	Year Two (2016)	Year Three (2017)
			Alive (%)	Alive (%)	Alive (%)
ARPU[1]	327	33	91	91	91
GAEL	82	8	88	50	63
LUAL	82	8	100	100	100
TOTAL	**491**	**49**	**93***	**80***	**88***

* average
[1] HMP species

8.14.2.3 Species Richness

Forty-seven species were observed at HA 38. Of those, 28 were native shrubs or perennials, 9 were native annual herbaceous species, seven were non-native species, and three were not catergorized as they were only identified to genus (see Table 8-113). Species richness increased by eight species since 2016. Native shrub and perennial species increased by five species.

Table 8-113. Species Observed on HA 38, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Arctostaphylos hookeri[1]	Hooker's manzanita	ARHO
Arctostaphylos montereyensis[1]	Monterey manzanita	ARMO
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Baccharis pilularis	coyote brush	BAPI
Bromis madritensis ssp. *rubens*	red brome	BRMAR
Carex sp.	sedge	CA
Carpobrotus edulis	Ice plant	CAED
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Corethrogyne filaginifolia	common sandaster	COFI
Crocanthemum scoparium	peak rush-rose	CRSC
Croton californicus	California croton	CRCA
Cryptantha sp.		CR
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wildrye	ELGL
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO

Table 8-113. Species Observed on HA 38, 2017

Scientific Name	Common Name	Code
Erodium cicutarium	red-stemmed filareee	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Frangula californica	California coffeeberry	FRCA
Garrya elliptica	coast silk tassel	GAEL
Gilia tenuiflora ssp. *arenaria*[1]	sand gilia	GITEA
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Lessingia pectinata	common lessingia	LEPE
Logfia gallica	daggerleaf cottonrose	LOGA
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus albifrons var. *albifrons*	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus chamissonis	silver beach lupine	LUCH
Lupinus truncatus	Nuttall's annual lupine	LUTR
Plagiobothrys sp.	popcorn flower	PL
Plantago erecta	California plantain	PLER
Pseudognaphalium californicum	lady's tobacco	PSCA
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Solanum umbellifera	blue witch	SOUM
Toxicodendron diversilobum	poison oak	TODI

[1] HMP species

8.14.2.4 Vegetative Cover

Two line-intercept transects were conducted at HA 38. Transect 1 is a 50 m transect and Transect 2 is a 38.5 m transect. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 35.10%. The mean vegetative cover by native shrubs and perennials was greater in 2017 than 2016 by 14.24%. However, only one transect was completed in 2016 whereas two transects were completed in 2017. Table 8-114 summarizes the vegetation cover and Table 8-115 presents the vegetation cover by species. Figure 8-84 presents the percent cover of the dominant species at HA 38 in 2016 and 2017.

Table 8-114. Transect Survey Summary for HA 38

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA38T01	26.66	26.66	0.00	0.00	52.14	41.74
HA38T02	46.05	46.05	0.00	0.00	24.66	43.58
SITE AVERAGE*	**35.10**	**35.10**	**0.00**	**0.00**	**51.74**	**42.54**

*Transect lengths are not equal. Site averages are weighted to reflect different lengths.

Table 8-115. Transect Survey Results for HA 38 by Species

Transect	ACGL (%)	ADFA (%)	ARHO[1] (%)	ARMO[1] (%)	CRSC (%)	DIAU (%)	ERFA (%)	ERCO (%)	LUAL[2] (%)	PTAQP (%)	TODI (%)	TH (%)	BG (%)
HA38T01	0.82	2.78	1.90	0.86	1.56	0.52	0.80	0.42	16.36	0.64	0.00	52.14	41.74
HA38T02	0.83	0.00	0.00	0.00	2.23	0.00	0.00	0.00	29.66	6.83	6.49	24.66	43.58
SITE AVERAGE	**0.82**	**1.57**	**1.07**	**0.49**	**1.85**	**0.29**	**0.45**	**0.24**	**22.15**	**3.33**	**2.82**	**51.74**	**42.54**

[1]HMP species

[2]As previously mentioned in subsection 8.13.3.4 silver bush lupine has been identified in the field as *Lupinus albifrons* var. *albifrons* rather than *Lupinus chamissonis*

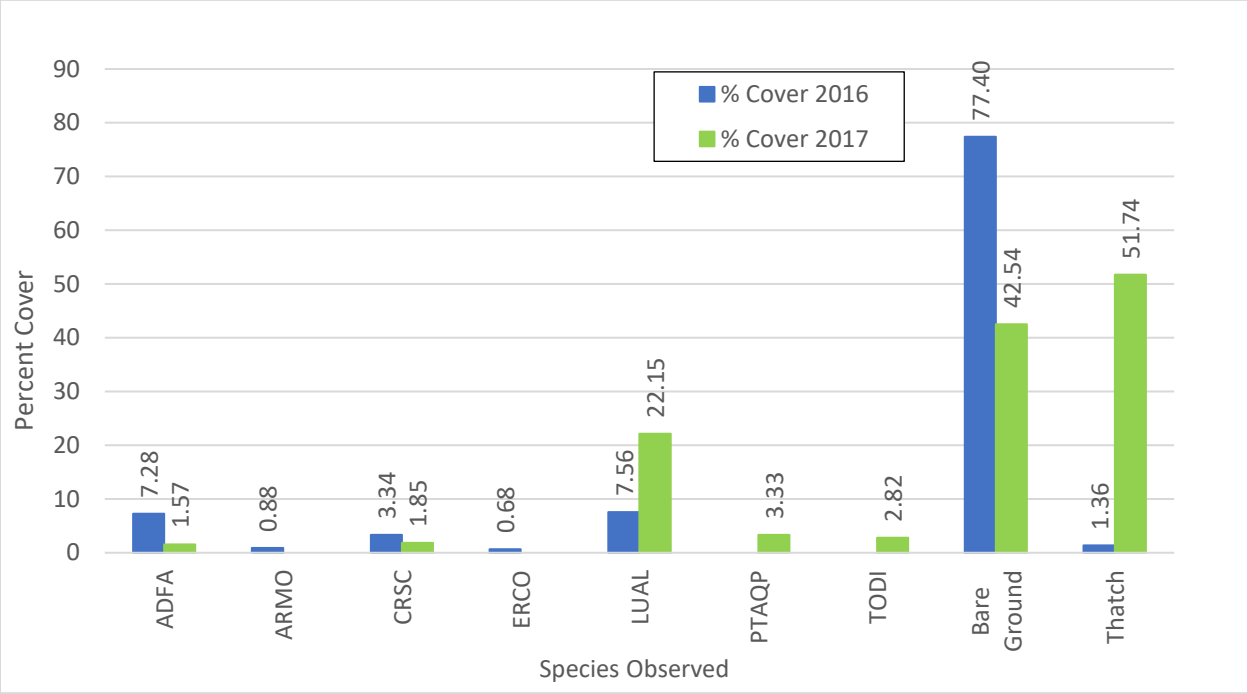


Figure 8-84. Percent Cover of Dominant Species at HA 38 in 2016 and 2017. Species codes and names are provided in Table 8-113.

8.14.3 Discussion

8.14.3.1 HMP Annual Density

Monterey spineflower density was within the acceptable limits for HMP annual density at HA 38. The SSRP baseline density class for Monterey spineflower was low. Restoration plot results show that by year 3 the density met the success criterion under objective 3. In addition, Monterey spineflower was present outside the restoration plots. Discrete patches, with density that met the success criterion, covered 0.10 acre of HA 38.

Sand gilia plots were established in 2017 and will be monitored in 2018. However, despite the fact that plots have not been monitored yet sand gilia was observed next to but outside of the footprint at HA 38. Seaside bird's beak restoration plots have not been established at HA 38.

Because all three HMP annual species were not within the acceptable limits, the site as a whole has not met this success criterion.

8.14.3.2 Plant Survivorship

Three shrub species were monitored at HA 38 for year 3 plant survivorship in 2017. Plantings that occurred in 2015 resulted in an 88% survival rate. Survivorship increased from 80% survival rate in 2016. The increase in survivorship was attributed to some plants being recorded as dead in year 2 but then recorded as alive in years 3 because they showed new growth. Silk tassel was the only species that had moderate survivorship. Sandmat manzanita and silver bush lupine had high survival rates. By year three of plant survivorship monitoring, all species are doing well.

8.14.3.3 Species Richness

Chamise, shaggy-barked manzanita, Monterey manzanita, sandmat manzanita, Hooker's manzanita, Monterey ceanothus, coyote brush, deerweed, and black sage were present. HA 38 included 28 native shrub and perennial species. HA 38 has met the success criterion for objective 1.

8.14.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 20% for native species listed as part of the plant palette. This list includes 23 shrub and perennial species presented in Table 2 of the HA 38 SSRP (Burleson, 2013). Currently the HA includes 28.94% vegetative cover; therefore, this success criterion was met. In 2016 the vegetative cover was 20.58%. Cover increased by 8.36% (see Figure 8-85).

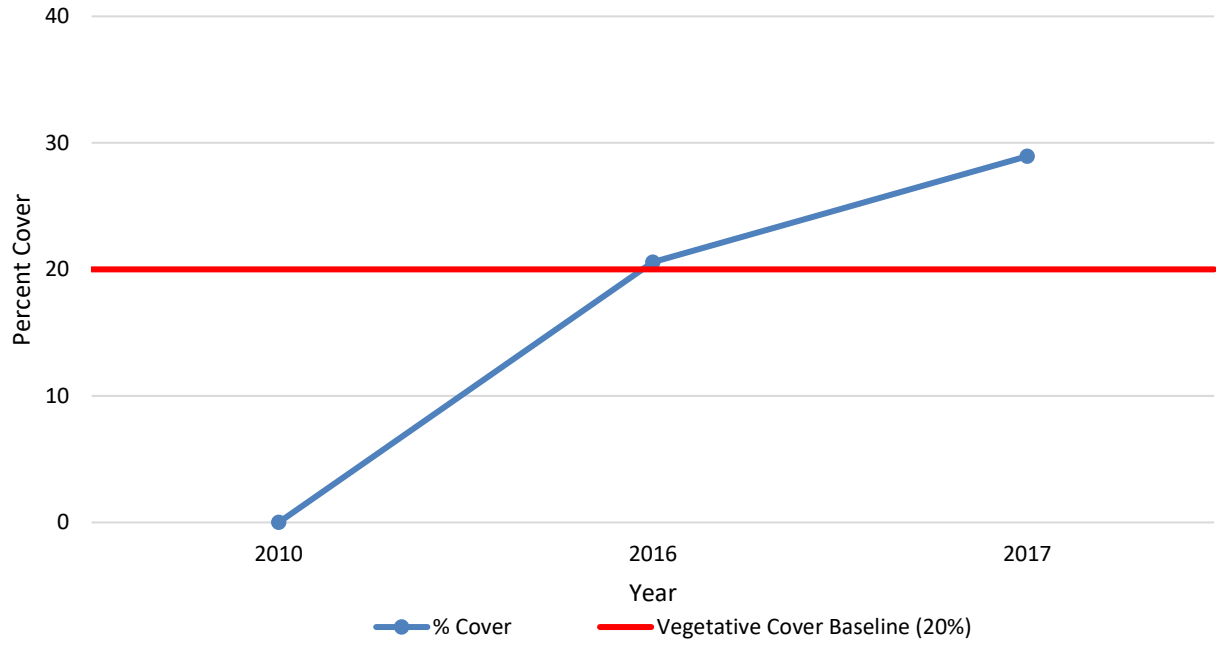


Figure 8-85. Native Vegetative Cover Compared to the Success Criterion at HA 38

Objective 2 considers the percent cover of non-native target weeds. In 2017, the transect surveys did not encounter any target weeds. The vegetative cover for non-native species was 0.00%. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class was met or exceeded the baseline cover class of 2. Cover class 2 is from 1-5% of absolute cover. The HMP shrub species at HA 38 are providing an absolute cover of 1.56%, which is an increase from 0.88% in 2016. The HA has met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 38 this means a vegetative cover average of at least 1% cover for Monterey manzanita (*Arctostaphylos montereyensis*), 1% Monterey ceanothus (*Ceanothus rigidus*), 1% Hooker's manzanita (*Arctostaphylos hookeri*), and 4% sandmat manzanita (*Arctostaphylos pumila*). The average vegetative cover for Monterey manzanita was 0.49%, for Monterey ceanothus 0.00%, for Hooker's manzanita 1.07%, and for sandmat manzanita 0.00% (see Figure 8-86). Only Hooker's manzanita had an increase in cover from 2016 to 2017 and was the only species that met the acceptable limit; therefore, the success criterion was not met.

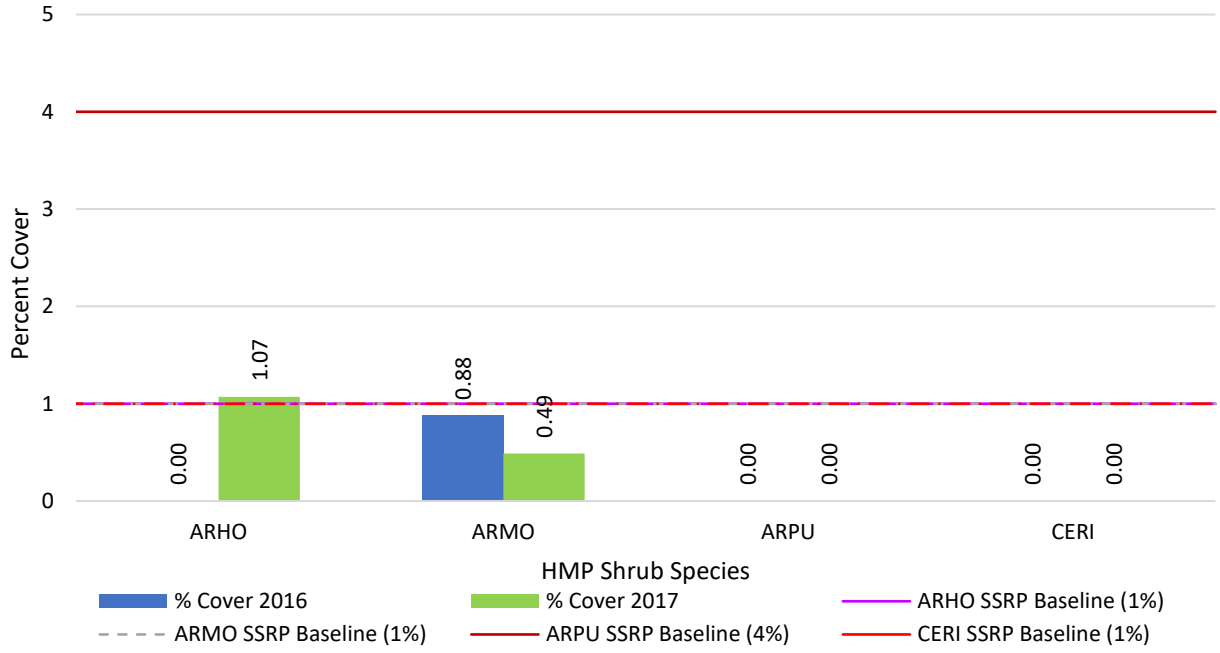


Figure 8-86. HMP Shrub Species Comparison to Success Criteria at HA 38

8.14.3.5 Recommendations

HA 38 was in year 3 of monitoring in 2017 and responded well to previous restoration efforts. The restored area met four of the six success criteria by 2017, one more than was met by 2016. HA 38 has not received the full SSRP target prescription for passive restoration. The Army will apply 0.15 lb of seaside bird's beak to the site to meet the HMP annual density success criterion. Overall, HA 38 needs time to respond to the restoration effort and continued monitoring to evaluate areas that may need additional effort. A qualitative overview is documented by the reference photo points (see Appendix D, page D-14) that illustrate progress, growth, and improvement.

The site will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover line-intercept transects in monitoring year 4, 2018.

Table 8-116 summarizes the current status of HA 38 including which success criteria have been met as well as our recommendation to meeting the success criteria.

Table 8-116. Status and Recommendations for Achieving the Success Criteria at HA 38

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	Yes	None
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	Yes	None
Objective 3 – No. 4	HMP shrub cover by species	No	Wait to see how the HA responds
Objective 3 – No. 4	HMP annual density	No	Establish restoration plots for seaside bird's beak

8.15 HA 39/40

HA 39/40 was used by the Army as a small-arms firing range. Soil remediation was completed in 2010 and resulted in approximately 6,500 cubic yards of soil excavated from 2.4 acres (Shaw, 2008). HA 39/40 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 39/40 is broken up into four distinct areas. Plots 1-4 are located in the upland zone of a vernal pool with surface water runoff from the south draining towards the north into the vernal pool. Plot 1 is grassland habitat, Plot 2 is a combination of grassland and wet meadow, Plot 3 is wet meadow which can be submerged depending on the water-year, and Plot 4 is a combination of coastal scrub and grassland which includes the active restoration area.

The SSRP plant palettes for this site are based off of baseline data from transects within the footprint as well as supplemental species appropriate for each plot (Shaw, 2009a). Baseline transect were located in Plots 1, 3, and 4. In baseline, native species cover for Plot 1 was 24.1%, Plot 3 was 22.7%, and Plot 4 was an average of three transects for 10.3%. Plot 1 had four native species present and was clustered field sedge (*Carex praegracilis*) and rattail sixweeks grass (*Festuca myuros*) dominant. Plot 3 had only one native species presents and was clustered field sedge and ripgut brome (*Bromus diandrus*) dominant. Plot 4 had 16 native species present across three transects and was ripgut brome dominant with a mixture of non-native grasses and common yarrow (*Achillea millefolium*) and an average of ~1% or less of all other native species. Both ripgut brome and rattail sixweeks grass are non-native species.

HA 39/40 is located on the northeastern portion of Site 39, occurring within the Aromas formation containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

Both passive and active restoration areas were designated at HA 39/40. The main focus of restoration was to broadcast non-irrigated seed. However, for the active restoration efforts, container-grown plants were planted. HA 39/40 is relatively flat to moderately sloped and has some potential for erosion where special care should be taken to prevent runoff from entering the vernal pool.

Restoration at HA 39/40 began in 2012 and was completed by 2013. Monitoring began in 2011. HA 39/40 has been monitored for seven years by photo documentation and site visits, five years for HMP annual density in plots, two years for HMP annual density outside of plots, two years for species richness, and two years for vegetative cover (see Table 8-117). Figure 8-87 shows the HA footprint, passive restoration area, active restoration area, and transect survey locations. Success criteria for HA 39/40 are summarized in Table 8-118.

Table 8-117. Historic Summary of Restoration and Monitoring Activities at HA 39/40

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2011	2012	2013	2014	2015	2016	2017	2020	2025
Restoration: Active, Passive, Erosion Control, and Corrective Measures	●	●	●						
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
Sand Gilia Plots			●	●	●	●	●	●	
Seaside Bird's Beak Plots			●	●	●	●	●	●	
HMP Annual Density across HA						●	●	●	
Species Richness						●	●	●	●
Vegetative Cover						●	●	●	●

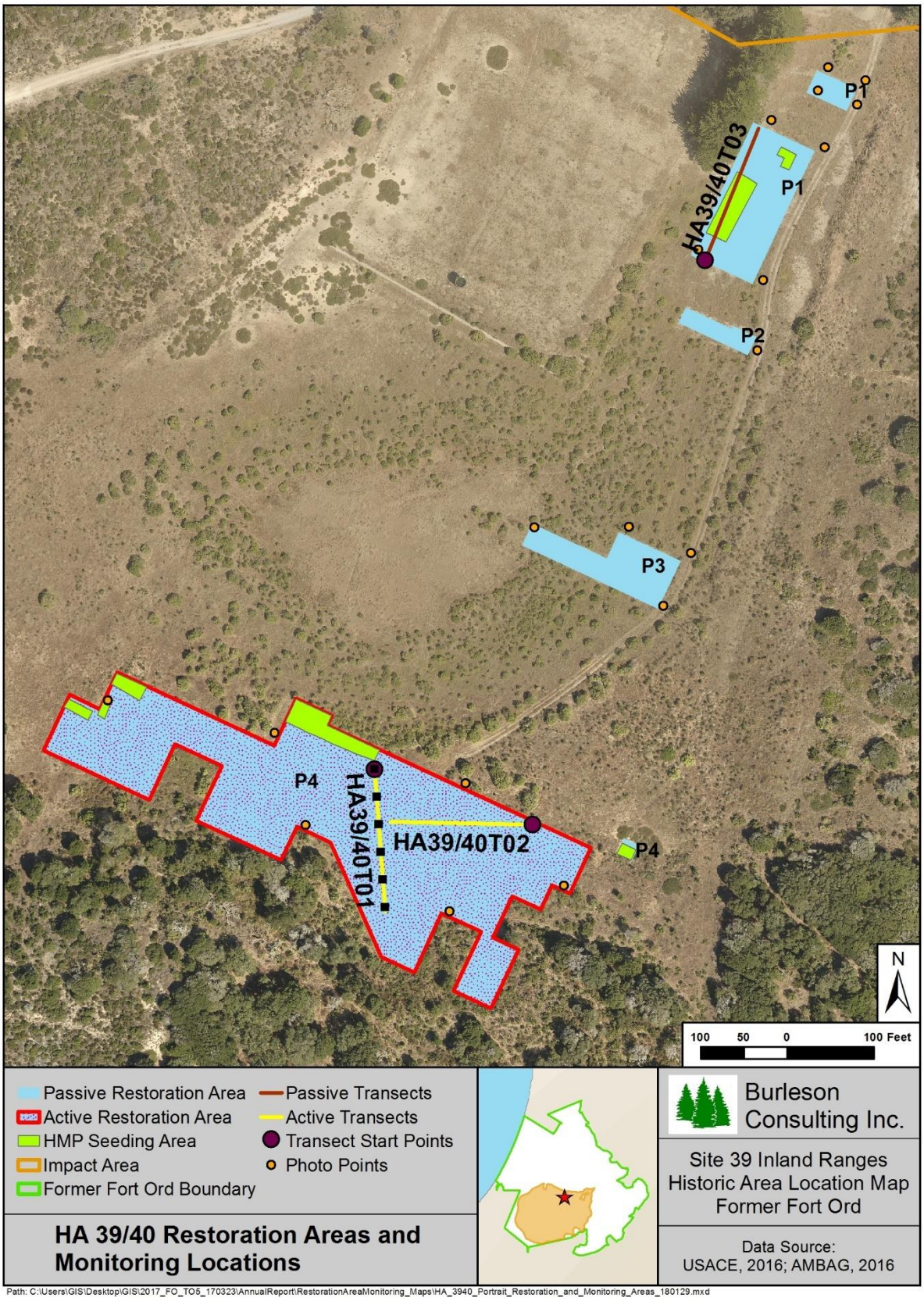


Figure 8-87. HA 39/40 Restoration Areas and Monitoring Locations Map

Table 8-118. Success Criteria and Acceptable Limits for Restoration of HA 39/40

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			common yarrow
			coyote brush
			sedge
			saltgrass
			blue wild-rye
			California poppy
			rush
			wedge-leaved horkelia
			yellow bush lupine
			silver bush lupine
			deerweed
			sticky monkeyflower
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2[2]
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline surveys indicate that non-native weeds were present in lands adjacent to HA-39/40. Therefore, no more than 5% non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 1
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Baseline data indicated no HMP shrubs. Therefore, no HMP shrubs need to be present at this restoration site.
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]Each habitat zone (P1-P4) will be evaluated separately based on its unique plant palette		

8.15.1 Restoration Activities

Burleson performed passive restoration at HA 39/40 with four different applications of seed, twice in 2012 and twice in 2013. The total amount of seed broadcast on the site was 91.63 lb compared to 77.27 lb prescribed in the SSRP. All four distinct areas at HA 39/40 received passive restoration. The amounts of seed applied by year and species, in comparison to the SSRP target, are presented on a plot-by-plot basis. Burleson performed passive restoration for the HMP annual species Monterey spineflower, sand gilia, and seaside bird's beak. Two plots of Monterey spineflower, five plots of sand gilia, and one plot of seaside bird's beak were chosen in the HA based on having suitable habitat for the HMP annuals and adjacent extant populations.

Burleson performed passive restoration at HA 39/40 Plot 1 twice in 2012 and once in 2013. The total amount of seed broadcast on the site was 16.71 lb compared to the 11.42 lb prescribed in the SSRP. Table 8-119 summarizes the amount of seed applied by year and species, compared to the SSRP target.

Table 8-119. Summary of Passive Restoration Activities at Plot 1 from 2012-2017 for HA 39/40

Species	Pounds of Seed Broadcast				
	SSRP Target	2012 (Jan)	2012 (Dec)	2013 (Oct)	Total by Species
ACMI	0.34	0.17	0.17	0.00	0.34
BAPI	0.05	0.00	0.02	0.00	0.02
CHPUP[1]	0.04	0.07	0.04	0.00	0.11
CORIL[1]	0.04	0.00	0.00	0.00	0.00
CRCA	0.34	0.17	0.17	0.00	0.34
DIAU	0.03	0.10	0.10	0.00	0.20
ELGL	3.06	3.00	3.00	0.00	6.00
ESCA	0.34	0.00	0.057	0.00	0.057
GITEA[1]	0.04	0.00	0.00	0.017	0.017
HOCU	0.68	0.34	0.34	0.00	0.68
Hordeum sp.	3.06	3.00	3.00	0.00	6.00
JUPA	0.34	0.17	0.17	0.00	0.34
LUAL	0.34	0.29	0.29	0.00	0.58
LUAR	0.34	0.17	0.17	0.00	0.34
LUNA	0.34	0.00	0.34	0.00	0.34
SOVE	0.34	0.17	0.17	0.00	0.34
STCE	0.68	0.00	0.00	0.00	0.00
STPU	0.68	0.34	0.34	0.00	0.68
TRWI	0.34	0.00	0.34	0.00	0.34
TOTAL	**11.42**	**7.99**	**8.72**	**0.017**	**16.71**

[1]HMP species

Burleson performed passive restoration at HA 39/40 Plot 2 twice in 2012, once for each seeding season. The total amount of seed broadcast on the site was 0.98 lb compared to the 1.28 lb prescribed in the SSRP. Table 8-120 summarizes the amount of seed applied by year and species, in comparison to the SSRP target.

Table 8-120. Summary of Passive Restoration Activities at Plot 2 from 2012-2017 for HA 39/40

Species	Pounds of Seed Broadcast			
	SSRP Target	2012 (Jan)	2012 (Dec)	Total by Species
ACMI	0.04	0.02	0.02	0.04
ARDO	0.04	0.02	0.02	0.04
Carex sp.	0.04	0.00	0.00	0.00
CRCA	0.04	0.02	0.02	0.04
DISP	0.04	0.00	0.00	0.00
ELGL	0.36	0.00	0.36	0.36
ESCA	0.04	0.00	0.04	0.04
Hordeum sp.	0.36	0.04	0.04	0.08
JUPA	0.04	0.02	0.02	0.04
LUAL	0.04	0.09	0.09	0.18
LUAR	0.04	0.02	0.02	0.04
LUNA	0.04	0.00	0.04	0.04
SOVE	0.04	0.02	0.02	0.04
STCE	0.08	0.00	0.00	0.00
TRWI	0.04	0.00	0.04	0.04
TOTAL	**1.28**	**0.25**	**0.73**	**0.98**

Burleson performed passive restoration at HA 39/40 Plot 3 twice in 2012, once for each seeding season. The total amount of seed broadcast on the site is 3.44 lb compared to the 4.76 lb prescribed in the SSRP. Table 8-121 summarizes the amount of seed applied by year and species, in comparison to the SSRP target.

Table 8-121. Summary of Passive Restoration Activities at Plot 3 from 2012-2017 for HA 39/40

Species	Pounds of Seed Broadcast			
	SSRP Target	2012 (Jan)	2012 (Dec)	Total by Species
ARDO	0.17	0.085	0.085	0.17
Carex sp.	0.17	0.00	0.00	0.00
CRCA	0.17	0.09	0.09	0.18
DISP	0.17	0.00	0.00	0.00
ELGL	1.53	0.00	1.50	1.50
Hordeum sp.	1.53	0.36	0.36	0.72
JUPA	0.17	0.09	0.09	0.18
LUNA	0.17	0.00	0.17	0.17
SOVE	0.17	0.09	0.09	0.18
STPU	0.34	0.17	0.17	0.34
TRWI	0.17	0.00	0.00	0.00
TOTAL	**4.76**	**0.89**	**2.56**	**3.44**

Burleson performed passive restoration at HA 39/40 Plot 4 twice in 2012, once for each seeding season, and once in 2013. The total amount of seed broadcast on the site was 70.50 lb compared to the 59.81 lb prescribed in the SSRP. Table 8-122 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. Burleson performed passive restoration for the HMP annual species sand gilia, seaside bird's beak, and Monterey spineflower.

Table 8-122. Summary of Passive Restoration Activities at Plot 4 from 2012-2017 for HA 39/40

Species	Pounds of Seed Broadcast				
	SSRP Target	2012 (Jan)	2012 (Dec)	2013 (Oct)	Total by Species
ACGL	3.82	1.90	0.81	0.00	2.71
ACMI	1.91	0.95	0.95	0.00	1.90
BAPI	0.29	0.00	0.15	0.00	0.15
CHPUP[1]	0.04	0.07	0.04	0.00	0.11
CORIL[1]	0.04	0.04	0.04	0.00	0.08
DIAU	0.19	0.60	0.09	0.00	0.69
ELGL	17.19	0.00	17.22	0.00	17.22
ESCA	1.91	0.00	0.45	0.00	0.45
GITEA[1]	0.04	0.00	0.020	0.004	0.024
HOCU	3.82	1.90	1.90	0.00	3.80
Hordeum sp.	17.19	17.22	17.22	0.00	34.44
LUAL	1.91	0.52	1.01	0.00	1.53
LUAR	1.91	0.95	0.95	0.00	1.90
LUNA	1.91	0.00	1.90	0.00	1.90
STCE	3.82	0.00	0.00	0.00	0.00
STPU	3.82	1.7	1.9	0.00	3.60
TOTAL	**59.81**	**25.85**	**44.56**	**0.00**	**70.50**

[1]HMP species

Burleson completed active restoration only in Plot 4 of HA 39/40 in 2012 and 2013. The total number of plants installed at HA 39/40 was 2,818 compared to 1,950 prescribed in the SSRP. Table 8-123 summarizes active restoration plantings.

Table 8-123. Summary of Active Restoration Activities at Plot 4 from 2012-2017 for HA 39/40

Species	Number of Individual Plants			
	SSRP Target	2012 (Jan)	2013 (Feb)	Total by Species
ACGL	150	150	-	150
ACMI	380	200	-	200
BAPI	75	75	-	75
Carex sp.	NA	-	623	623
DIAU	75	75	-	75
DISP	NA	-	240	240
ELGL	300	300	-	300
ESCA	250	-	260	260
HOCU	150	150	-	150
LUAL	75	-	75	75
LUAR	75	75	-	75
LUNA	150	-	150	150
STCE	250	285	-	285
STPU	200	160	-	160
TOTAL	**1,950**	**1,470**	**1,348**	**2,818**

8.15.2 Monitoring Results

8.15.2.1 HMP Annual Density

Monterey spineflower, sand gilia, and seaside bird's beak restoration plots were monitored for density. Burleson completed year 5 monitoring at HA 39/40 for Monterey spineflower, years 4 and 5 for sand gilia, and year 5 for seaside bird's beak.

Two Monterey spineflower plots were surveyed for year 5 density at HA 39/40 in 2017. The plots are numbered 1 and 2 on Figure 8-88 and are primarily located on the southwestern part of the site. Monterey spineflower densities at Plot 1 was low and Plot 2 was medium. Figure 8-89 presents the Monterey spineflower restoration plot densities.

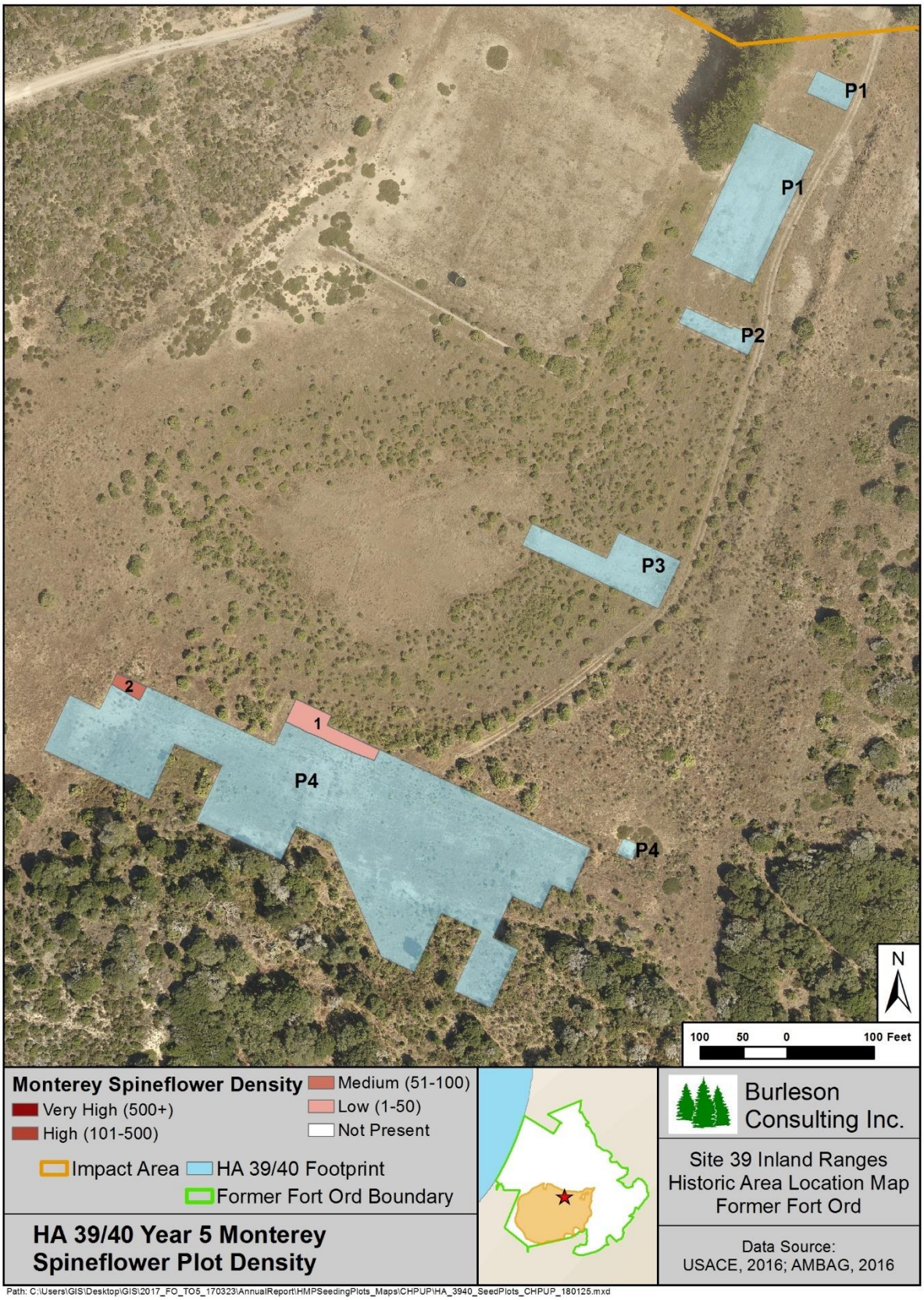


Figure 8-88. HA 39/40 Year 5 Monterey Spineflower Plot Density Map

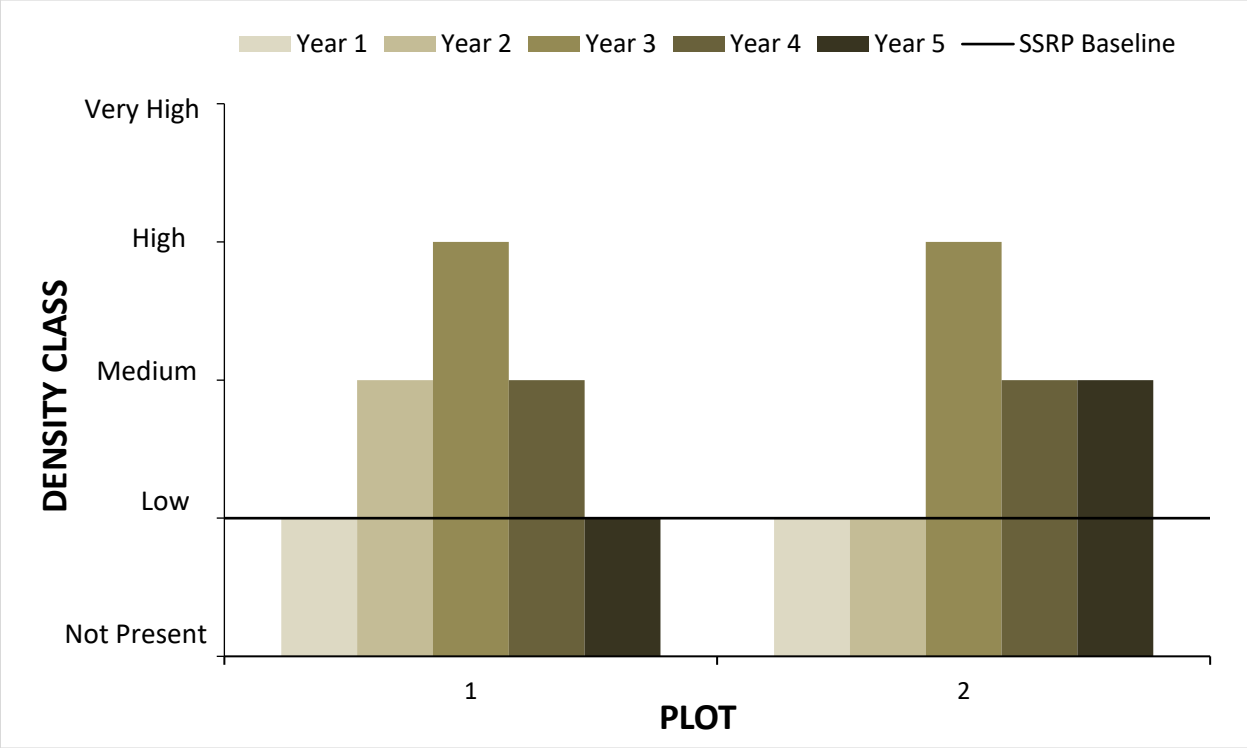


Figure 8-89. HA 39/40 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline Density Class for Years 1-5 at Restoration Plots 1 and 2

Five sand gilia plots were surveyed at HA 39/40 in 2017. Plot 1 was surveyed for year 5 and Plots 2-5 were surveyed for year 4. The plots are numbered 1-5 on Figure 8-90 and are located throughout the site. Sand gilia density was low for Plots 1 and 5, absent from Plots 2 and 3, and medium for Plot 4. Figure 8-91 presents all the sand gilia restoration plot densities for HA 39/40.

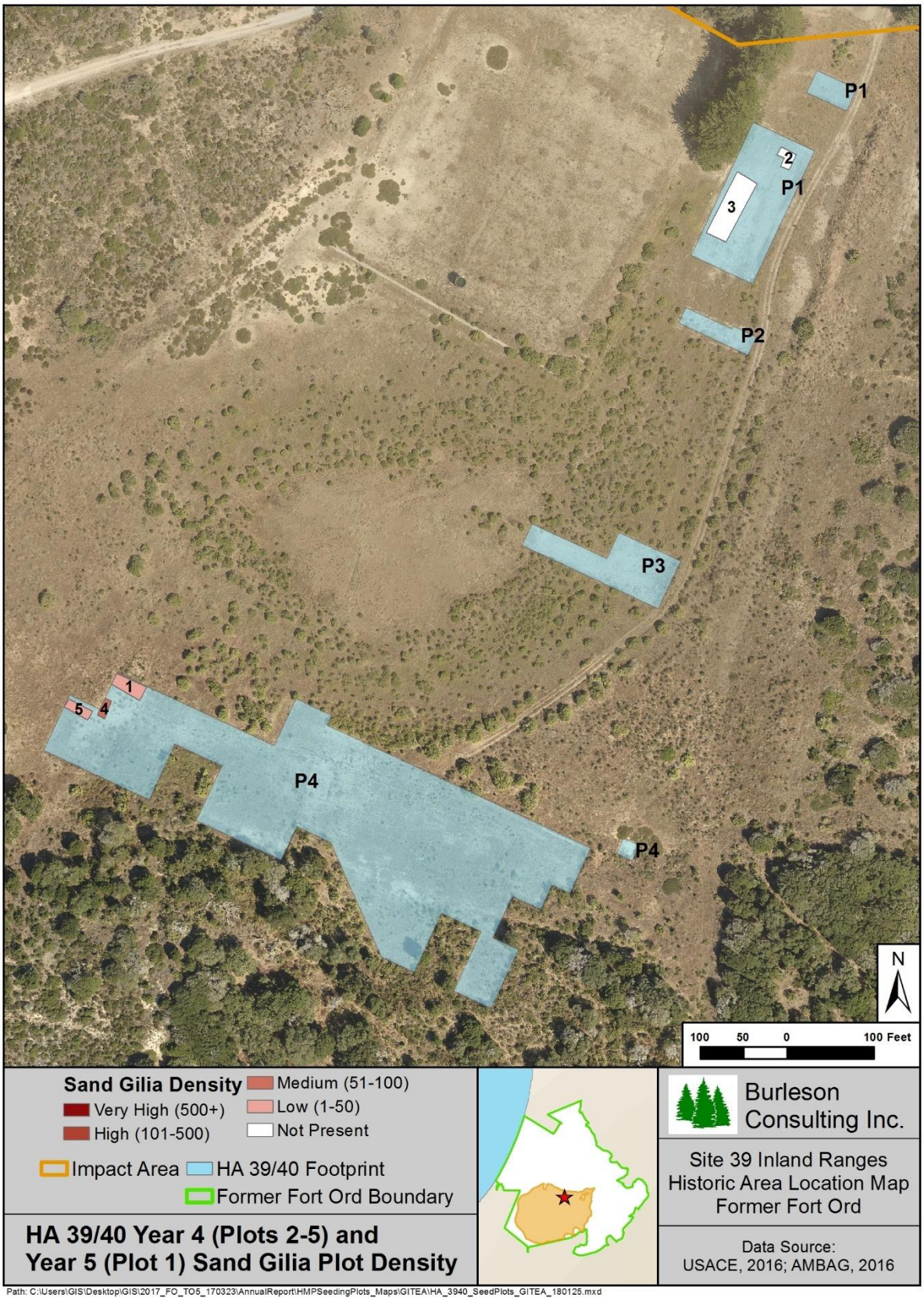
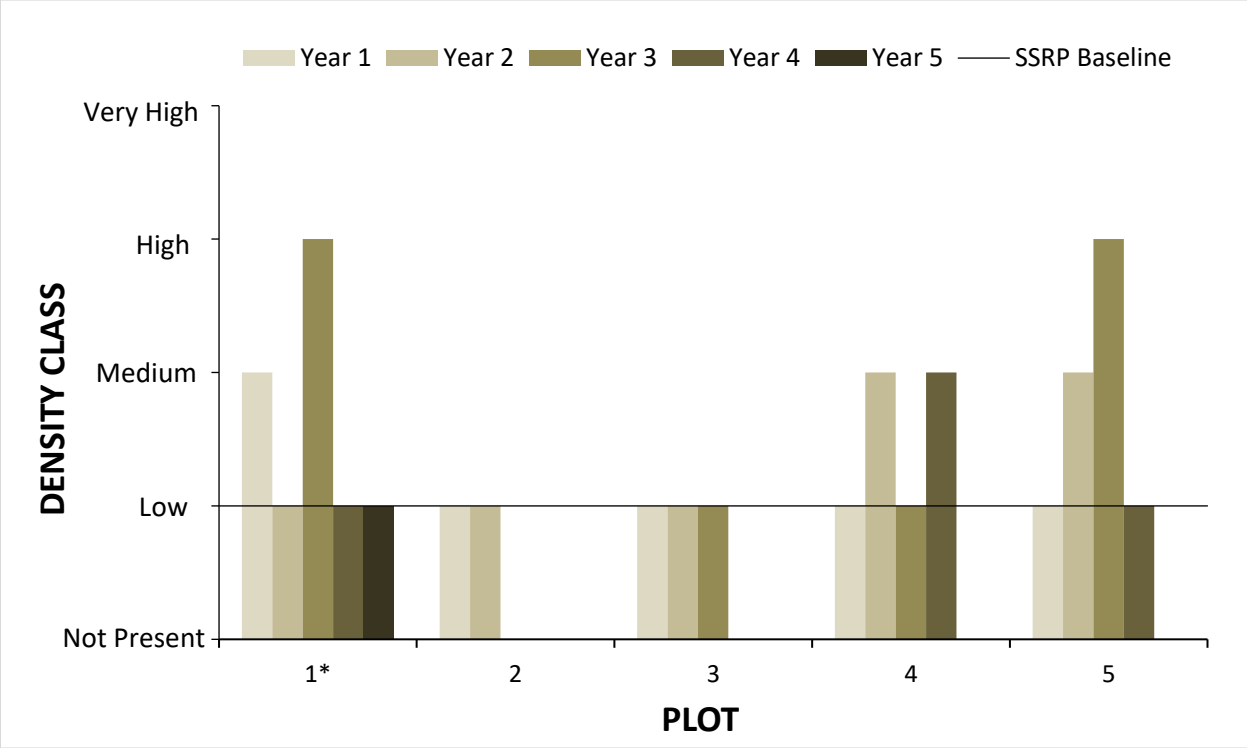


Figure 8-90. HA 39/40 Year 4 (Plots 2-5) and Year 5 (Plot 1) Sand Gilia Plot Density Map



*Plot 1 established in Dec 2012, while Plots 2-5 were established in Oct 2013

Figure 8-91. HA 39/40 Comparison of Sand Gilia Density Classes to the SSRP Baseline Density Class for Years 1-5 at Restoration Plot 1 and Years 1-4 at Restoration Plots 2-5

One seaside bird's beak plot was surveyed for year 5 density at HA 39/40. The plot is numbered 1 on Figure 8-92 and is located on the southeastern part of the site. Seaside bird's beak density was low at Plot 1. Figure 8-93 presents all the seaside bird's beak restoration plot densities for HA 39/40.

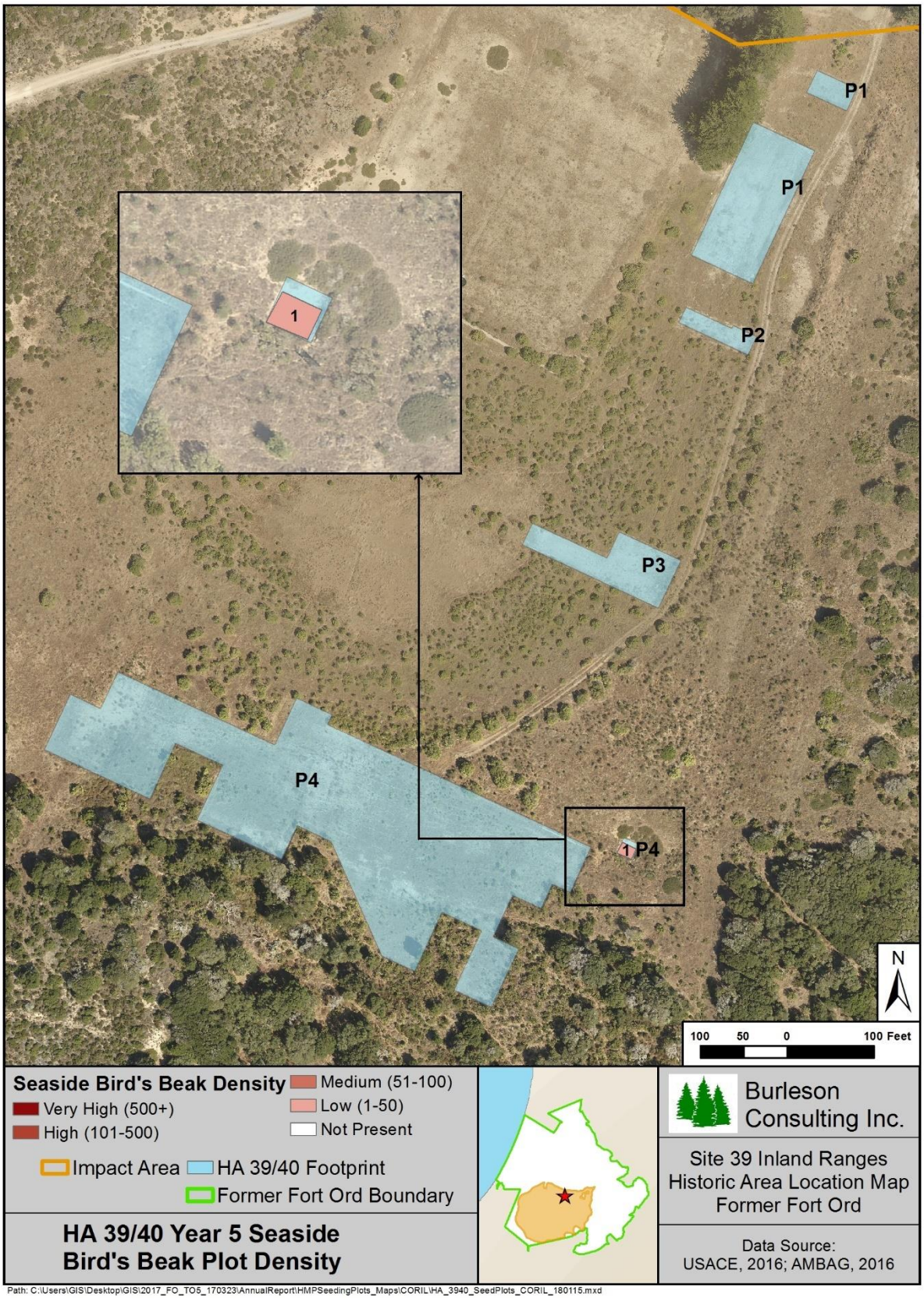


Figure 8-92. HA 39/40 Year 5 Seaside Bird's Beak Plot Density Map

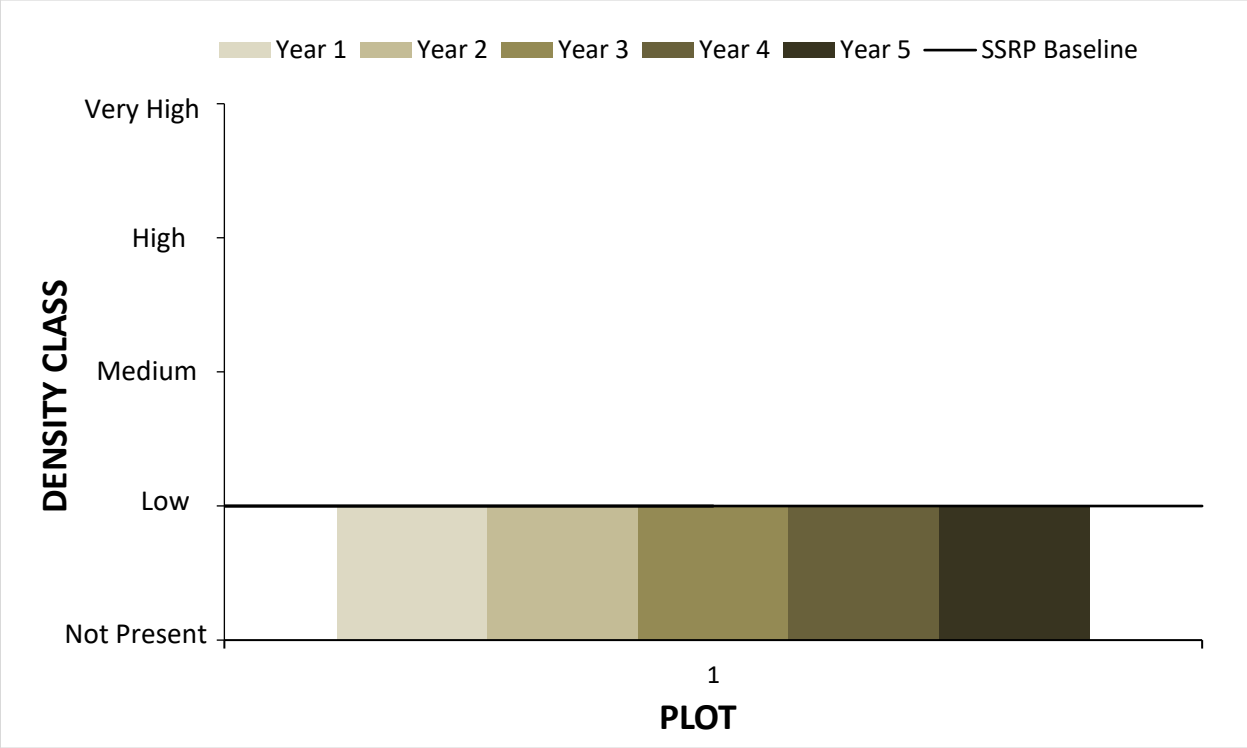


Figure 8-93. HA 39/40 Comparison of Seaside Bird's Beak Density Classes to the SSRP Baseline Density Class for Years 1-5 at Restoration Plot 1

HMP annual density monitoring included mapping discrete patches of HMP annuals within the restoration area but outside of the HMP annual restoration plots. This survey was completed for Monterey spineflower and sand gilia. Two discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 8-94). The densities ranged from low to medium. The total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.03 acre. The total acreage increased from 0.02 acre in 2016, while the density range decreased slightly from low-high in 2016 to low-medium in 2017.

Three discrete patches of sand gilia was mapped and individuals counted within each patch (see Figure 8-95). The densities ranged from low to medium. The total acreage of sand gilia patches with a density at or above the SSRP baseline density class of low was 0.0006 acre. The density range increased from 2016, while the acreage decreased from by 0.0004 acre.

Seaside bird's beak was not observed outside the restoration plot.

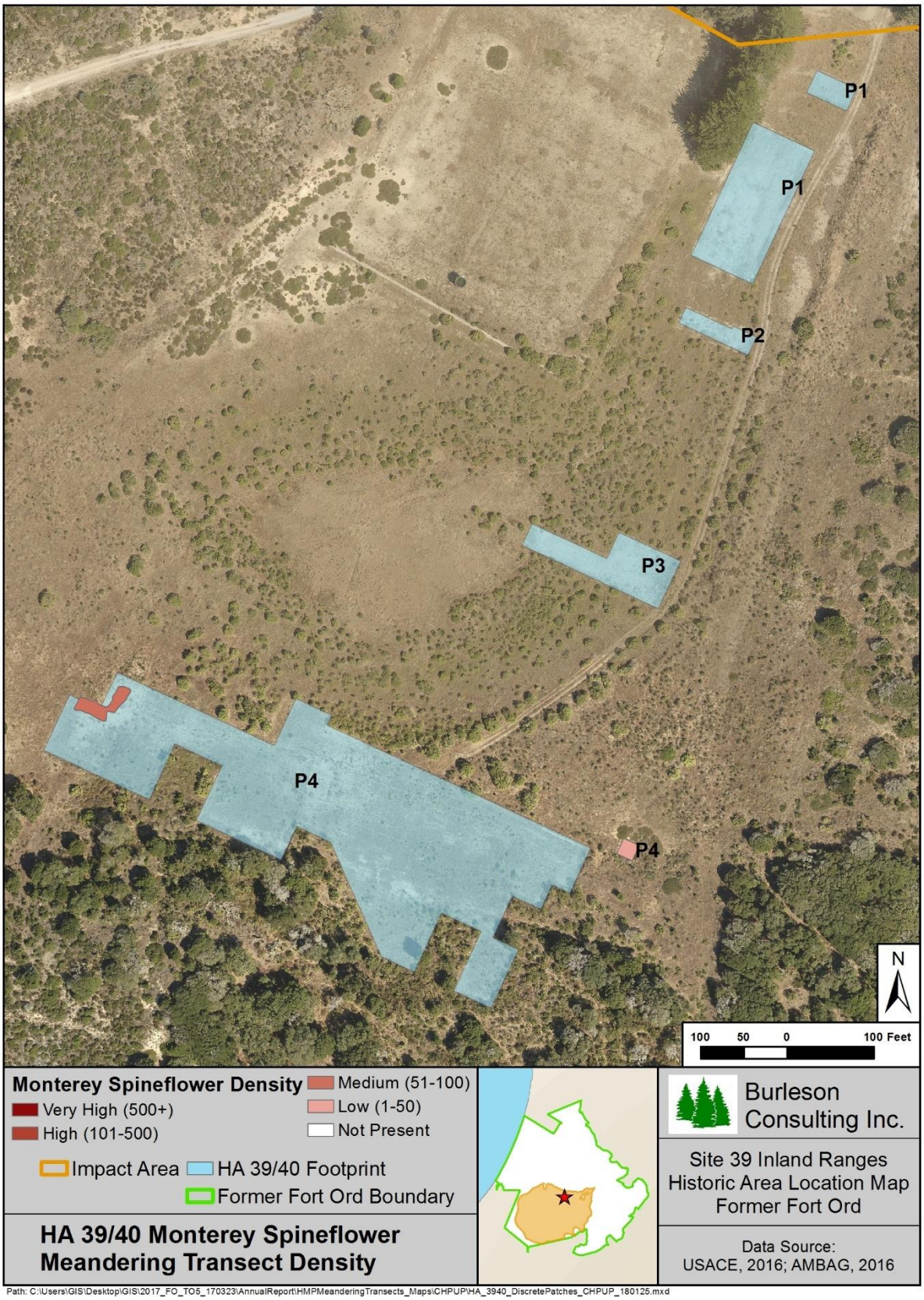


Figure 8-94. HA 39/40 Monterey Spineflower Meandering Transect Density Map

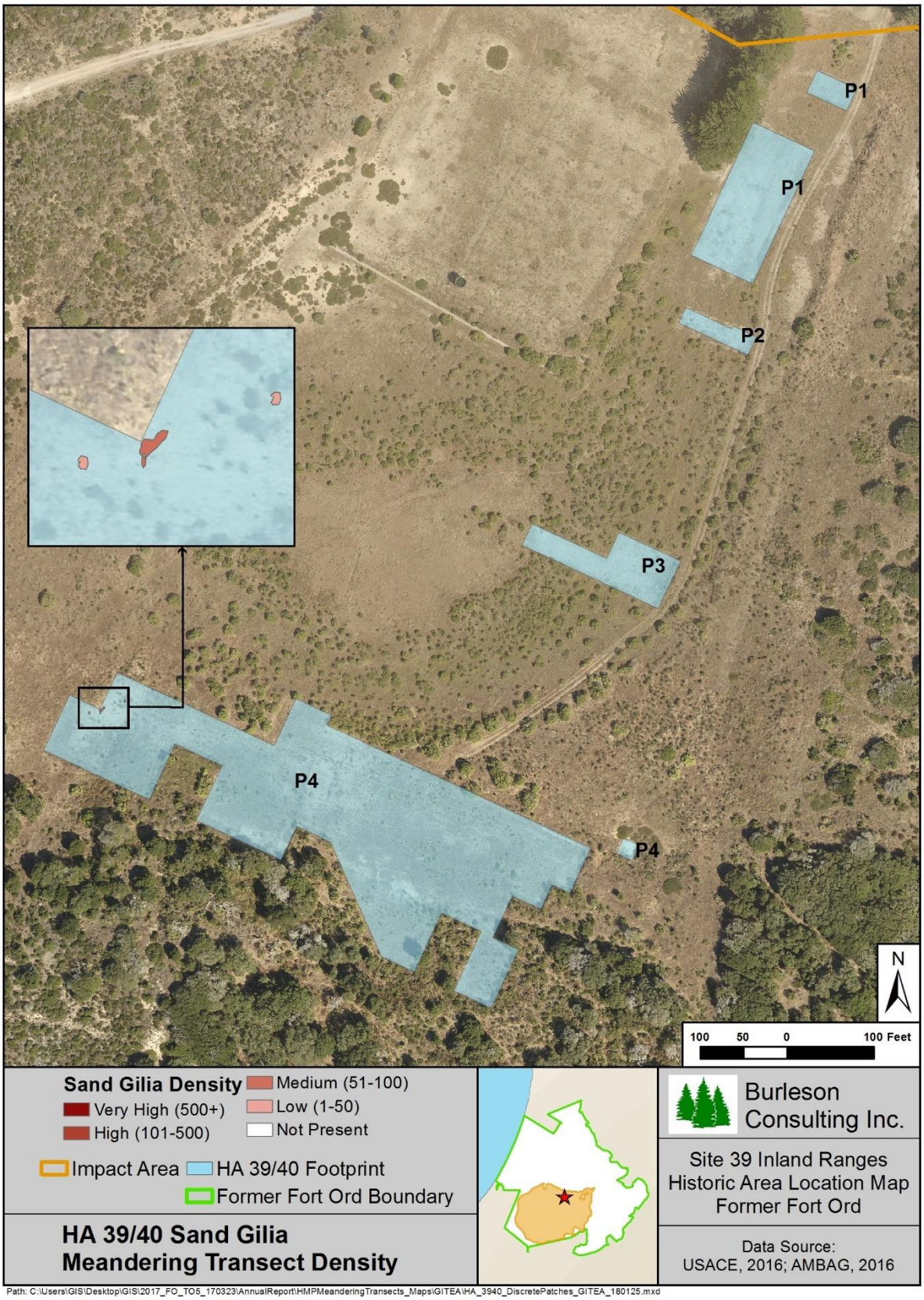


Figure 8-95. HA 39/40 Sand Gilia Meandering Transect Density Map

8.15.2.2 Plant Survivorship

No survivorship data were collected because the planting palette did not include any HMP shrubs.

8.15.2.3 Species Richness

Eighty-six species were observed at HA 39/40. Of those, 37 were native shrubs or perennials, 29 were native annual herbaceous species, and 20 were non-native species (see Table 8-124). Species richness was also 86 species in 2016. However, native shrub and perennial species increased by five and non-native species decreased by five.

Table 8-124. Species Observed on HA 39/40, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon parviflorus	hill lotus	ACPA
Acmispon strigosus	Bishop's lotus	ACST
Agoseris grandiflora	large-flowered agoseris	AGGR
Agoseris heterophylla var. *cryptopleura*	California annual agoseris	AGHEC
Aira caryophyllea	silver hair grass	AICA
Amsinckia intermedia	common fiddleneck	AMIN
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Artemisia douglasiana	mugwort	ARDO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza minor	small quaking grass	BRMI
Bromus diandrus	ripgut brome	BRDI
Bromus hordeaceus	softchess	BRHO
Camissonia contorta	contorted primrose	CACO
Cardionema ramosissimum	sand mat	CARA
Carex brevicaulis	short stem sedge	CABR
Castilleja affinis	coast paint-brush	CAAF
Castilleja exserta ssp. *exserta*	purple owl's-clover	CAEX
Cerastium glomeratum	sticky mouse-ear chickweed	CEGL
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Clarkia lewisii	Lewis' clarkia	CLLE
Claytonia perfoliata	miner's lettuce	CLPE
Cordylanthus rigidus ssp. *littoralis*[1]	Seaside bird's beak	CORIL
Crassula connata	pygmy weed	CRCO
Croton californica	California croton	CRCA
Cyperus eragrostis	tall cyperus	CYER
Delphinium hutchinsoniae	Hutchinson's larkspur	DEHU
Dichelostemma capitatum	blue dicks	DICA
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wild-rye	ELGL
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filareee	ERCI
Eschscholzia californica	California poppy	ESCA
Festuca myuros	rattail sixweeks grass	FEMY

Table 8-124. Species Observed on HA 39/40, 2017

Scientific Name	Common Name	Code
Galium californicum	California bedstraw	GACA
Gamochaeta ustulata	purple cudweed	GAUS
Geranium dissectum	cutleaf geranium	GEDI
Gilia tenuiflora ssp. *arenaria*[1]	Monterey gilia	GITEA
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Juncus occidentalis	western rush	JUOC
Lasthenia gracilis	common goldfields	LAGR
Layia platyglossa	tidy-tips	LAPL
Lessingia pectinata	common lessingia	LEPE
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus albifrons var. *albifrons*	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	annual lupine	LUBI
Lupinus nanus	sky lupine	LUNA
Madia sativa	coast tarweed	MASA
Marah fabacea	wild cucumber	MAFA
Melica torreyana	Torrey's melic	METO
Nuttallanthus texanus	blue toadflax	NUTE
Petrorhagia dubia	hairy pink	PEDU
Plantago coronopus	cut-leaved plantain	PLCO
Platystemon californicus	cream cups	PLCA
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP
Quercus agrifolia	coast live oak	QUAG
Ranunculus californicus var. *californicus*	common buttercup	RACAC
Rubus ursinus	California blackberry	RUUR
Rumex acetosella	sheep sorrel	RUAC
Rumex crassus	willow-leaved dock	RUCR
Senecio glomeratus	cutleaf burnweed	SEGL
Sisyrinchium bellum	blue-eyed grass	SIBE
Solanum umbelliferum	blue witch	SOUM
Stachys ajugoides	hedge nettle	STAJ
Stipa pulchra	purple needle grass	STPU
Thysanocarpus laciniatus	narrow leaved fringe pod	THLA
Toxicodendron diversilobum	poison oak	TODI
Trifolium albopurpureum	Rancheria clover	TRAL
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium dubium	little hop clover	TRDU
Trifolium hirtum	rose clover	TRHI
Trifolium microcephalum	small-head clover	TRMI
Trifolium willdenovii	tomcat clover	TRWI
Triphysaria pusilla	dwarf owl's clover	TRPU
Uropappus lindleyi	silver puffs	URLI
Vicia americana ssp. *americana*	American vetch	VIAMA
Vicia sativa ssp. *nigra*	narrow-leaved vetch	VISAN

[1]HMP species

8.15.2.4 Vegetative Cover

Three 50-meter line-intercept transects were conducted at HA 39/40. These surveys indicate that the mean vegetative cover by native shrubs and perennials was 10.51%. The mean vegetative cover by native shrubs and perennials was greater in 2017 than 2016 by 3.93%. Quadrats were completed along the transect line when 10% or more of the transect line was herbaceous cover, in accordance to the Protocol for Conducting Vegetation Monitoring (Burleson, 2009).Table 8-125 summarizes the vegetation cover, Table 8-126 presents the vegetation cover by species, Figure 8-96 presents the percent cover for the dominant species at HA 39/40 in 2016 and 2017, and Table 8-127 presents quadrat results.

Table 8-125. Transect Survey Summary for HA 39/40

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA39/40T01	20.04	10.40	8.20	3.88	91.80	4.72
HA39/40T02	22.94	19.38	3.00	0.56	97.28	2.28
HA39/40T03	5.12	1.76	1.18	2.18	45.12	51.84
SITE AVERAGE	**16.03**	**10.51**	**4.13**	**2.21**	**78.07**	**19.61**

Table 8-126. Transect Survey Results for HA 39/40 by Species

Transect	ACMI (%)	ACGL (%)	ACPA (%)	BAPI (%)	CARA (%)	ELGL (%)	ESCA (%)	HEGR (%)	HOCU (%)	HYGL (%)	MA sp. (%)
HA39/40T01	0.60	1.18	2.32	1.50	0.00	2.86	0.26	0.00	0.64	0.32	0.00
HA39/40T02	0.00	0.00	0.30	9.20	0.00	3.78	0.96	1.36	0.54	0.56	0.38
HA39/40T03	0.00	0.00	0.00	0.00	0.60	0.28	0.00	0.00	0.88	0.00	0.00
SITE AVERAGE	**0.20**	**0.39**	**0.87**	**3.57**	**0.20**	**2.31**	**0.41**	**0.45**	**0.69**	**0.29**	**0.13**

Table 8-126 (continued). Transect Survey Results for HA 39/40 by Species

Transect	PLCO (%)	RUUR (%)	RUAC (%)	SIBE (%)	STPU (%)	TODI (%)	TRHI (%)	TRMI (%)	VISA (%)	TH (%)	BG (%)
HA39/40T01	0.58	0.34	1.16	0.34	1.24	1.38	1.62	3.50	0.20	91.80	4.72
HA39/40T02	0.00	0.00	0.00	0.76	1.20	3.90	0.00	0.00	0.00	97.28	2.28
HA39/40T03	1.90	0.00	0.28	0.00	0.00	0.00	0.00	1.18	0.00	45.12	51.84
SITE AVERAGE	**0.83**	**0.11**	**0.48**	**0.37**	**0.81**	**1.76**	**0.54**	**1.56**	**0.07**	**78.07**	**19.61**

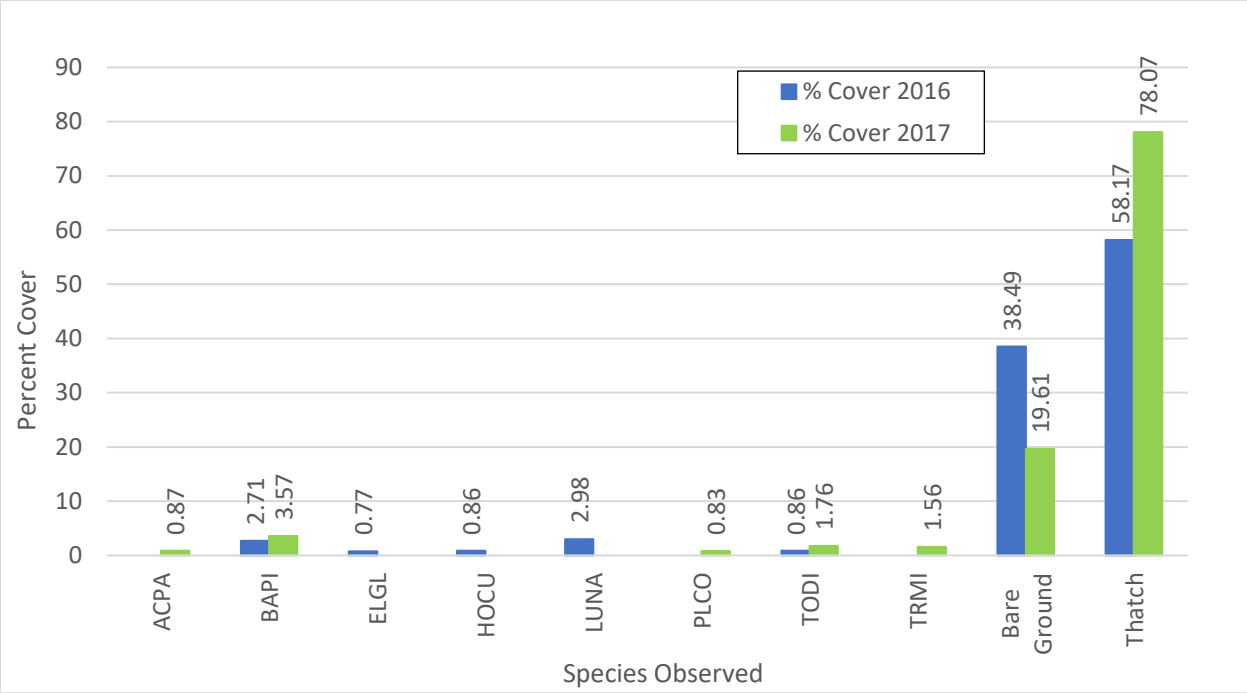


Figure 8-96. Percent Cover of Dominant Species at HA 39/40 in 2016 and 2017. Species codes and names are provided in Table 8-124.

Table 8-127. Quadrats Along the Transect Line for T01 Summary for HA39/40

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA39/40T01Q01	25	16	1	8	50	25
HA39/40T01Q02	25	18	1	6	65	10
HA39/40T01Q03	20	13	0	7	75	5
HA39/40T01Q04	15	9	2	4	70	15
HA39/40T01Q05	5	2	0	3	30	65
HA39/40T01Q06	8	2	3	3	42	50
SITE AVERAGE	**16**	**10**	**1**	**5**	**55**	**28**

8.15.3 Discussion

8.15.3.1 HMP Annual Density

Monterey spineflower density was within the acceptable limits for HMP annual density at HA 39/40. The SSRP baseline density class for Monterey spineflower was low. Plot 1 met the success criterion of low density, while Plot 2 exceeded the success criterion. The success criterion was met. In addition, Monterey spineflower was present outside of the restoration plots with densities that met or exceeded the success criterion at 0.03 acre of HA 39/40.

Sand gilia density was within the acceptable limits for HMP annual density at HA 39/40. The SSRP baseline density class for sand gilia was low and the restoration plot achieved this density for all but

Plots 2 and 3. In 2016, the density for all plots except Plot 2 met the success criterion. In addition, sand gilia was present outside of the restoration plots. Discrete patches, with density that either met or exceeded the success criterion, covered 0.0006 acre. Plots 2 and 3 are located in areas that are not suitable for these species with hard, compacted silty soil, as opposed to a loose sandy soil.

Seaside bird's beak density was within the acceptable limits for HMP annual density at HA 39/40. The SSRP baseline density class for sand gilia was low and results showed that plots met this criterion for all five years of monitoring. Seaside bird's beak was not observed outside of the restoration plot.

Monterey spineflower, sand gilia, and seaside bird's beak restoration plot results indicate that all the HMP species have met the success criterion.

8.15.3.2 Plant Survivorship

No survivorship data were collected because the planting palette did not include any HMP shrubs.

8.15.3.3 Species Richness

Common yarrow, coyote brush, sedge (*Carex* sp.), blue wild-rye, California poppy (*Eschscholzia californica*), wedge leaved horkelia, yellow bush lupine (*Lupinus arboreus*), silver bush lupine (*Lupinus albifrons* var. *albifrons*), saltgrass (*Distichlis spicata*), deerweed, and sticky monkeyflower were all present. HA 39/40 included 37 native shrubs and perennials as well as 29 native annual herbaceous species; it met the success criterion for objective 1.

8.15.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes 20 shrub and perennial species presented in Table 2 of the HA 39/40 SSRP (Burleson, 2013). Currently the HA includes 7.98% native vegetative cover, therefore this success criterion is not met. In 2016 the vegetative cover was 9.83%. Cover was higher in 2016 by 1.85% (see Figure 8-97).

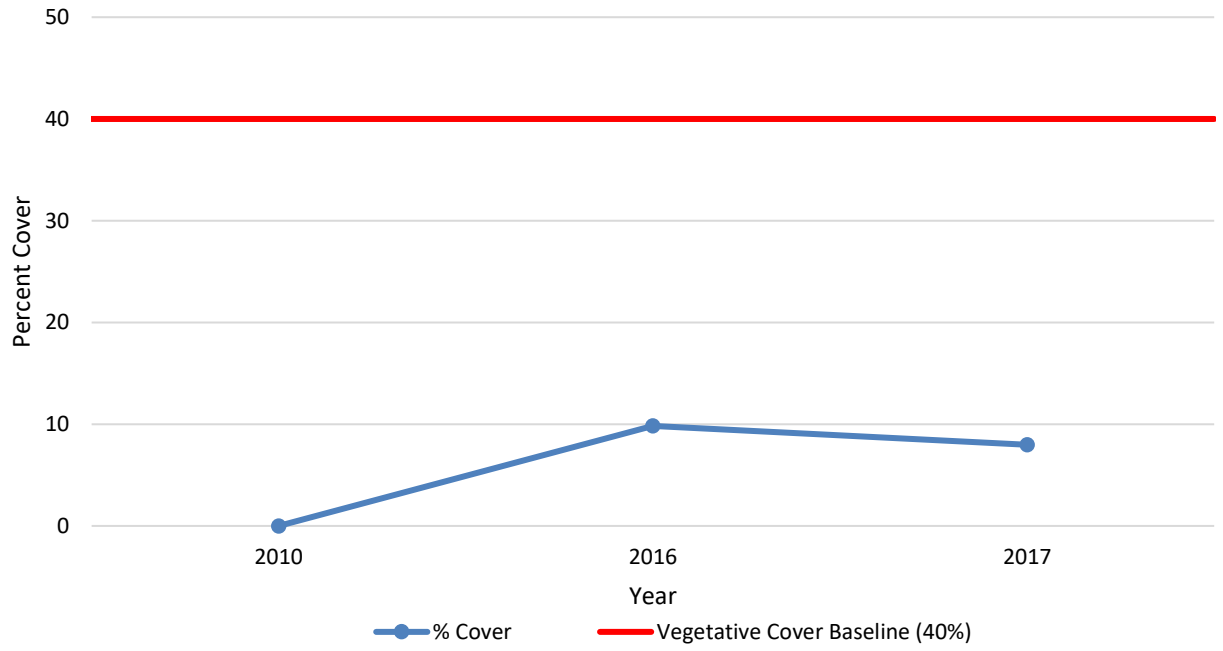


Figure 8-97. Native Vegetative Cover Compared to the Success Criterion at HA 39/40

Objective 2 considers the percent cover of non-native target weeds. In 2017, target weeds were not observed during the transect surveys. The vegetative cover for non-native species was 0.00%. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class was met or exceeded the baseline cover class of 1. Cover class 1 is 0% of absolute cover. The HMP shrub species at HA 39/40 are providing an absolute cover of 0.00%. The HA has met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 39/40, baseline data indicated no HMP shrubs. Therefore, no HMP shrubs need to be present at this restoration site and this success criterion is not applicable.

8.15.3.5 Recommendations

HA 39/40 was in year 5 of monitoring in 2017 and has responded variably well to previous restoration efforts. The historic area as a whole met four of five success criteria by 2017, two more than in 2016. The SSRP success criteria specifies that each habitat zone (Plots 1-4) will be evaluated separately based on its unique plant pallet. Currently, only Plots 1 and 4 have installed transects and the Army recommends establishing another transect to better assess the restoration progress at that site. Based on qualitative evaluation, Plots 1 and 2 are very similar and it may not be necessary to evaluate them separately since Plot 2 already has a transect and Plot 1 is relatively small. The Army will add a transect to Plot 3. Additionally, the Army recommends three corrective measures to support HA 39/40 in achieving success criteria: 1) broadcast production plot seed mix in Plot 1 and Plot 2, 2) plant coyote brush (*Baccharis pilularis*) and yellow bush lupine (*Lupinus arboreous*) in Plot 1 and Plot 2, and 3) plant *Juncus* sp., clustered field sedge (*Carex praegracilis)*, and saltgrass (*Distichlis spicata*) in Plot 3.

Overall, HA 39/40 needs corrective measures as well as time to respond to the restoration effort and continued monitoring to evaluate areas that may need additional effort. A qualitative overview is

documented by the reference photo points (see Appendix D, page D-15 and Appendix E, page E-9). The photos illustrate the progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover line-intercept transects in monitoring year 8, 2020. Reevaluation of the success criteria may be considered at that time.

Table 8-128 summarizes the current status of HA 39/40 including which success criteria have been met as well as our recommendations.

Table 8-128. Status and Recommendations for Achieving the Success Criteria at HA 39/40

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Broadcast production plot seed and plant coyote brush and yellow bush lupine in Plots 1 and 2. Add transect to Plot 3. Plant *Juncus* sp., clustered field sedge, and saltgrass in Plot 3.
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	Yes	None
Objective 3 – No. 4	HMP shrub cover by species	NA	NA
Objective 3 – No. 4	HMP annual density	Yes	None

8.16 HA 43

HA 43 was used by the Army as a long-distance small-arms firing range. Munitions removal and soil remediation was completed in 2010 and resulted in 150 cubic yards of lead-contaminated soil being excavated from 0.09 acre. HA 43 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 43 is relatively flat with surface water runoff draining to the west. The adjacent lands are high quality habitat areas which contain substantial amounts of intact native vegetation that will promote natural recruitment at the restoration areas.

HA 43 is located on the north central portion of Site 39, occurring within the sand hill formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas the surface layer is fine sand (USDA Forest Service, 2007).

The prescription for passive restoration at HA 43 consisted of hand broadcasting non-irrigated seed and annual weed management activities. HA 43 is relatively flat with little potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 43 began in 2011 and was completed in 2012 and monitoring began in 2013. HA 43 has been monitored for seven years by photo documentation and site visits, five years for HMP annual

density in plots, two years for HMP annual density across the HA, two years for species richness, and two years for vegetative cover (see Table 8-129). Figure 8-98 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 43 are summarized in Table 8-130.

Table 8-129. Historic Summary of Restoration and Monitoring Activities at HA 43

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2011	2012	2013	2014	2015	2016	2017	2020	2025
Restoration: Passive	●	●							
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
Sand Gilia Plots			●	●	●	●	●	●	
Seaside Bird's Beak Plots			●	●	●	●	●	●	●
HMP Annual Density across HA						●	●	●	●
Species Richness						●	●	●	●
Vegetative Cover							●	●	●

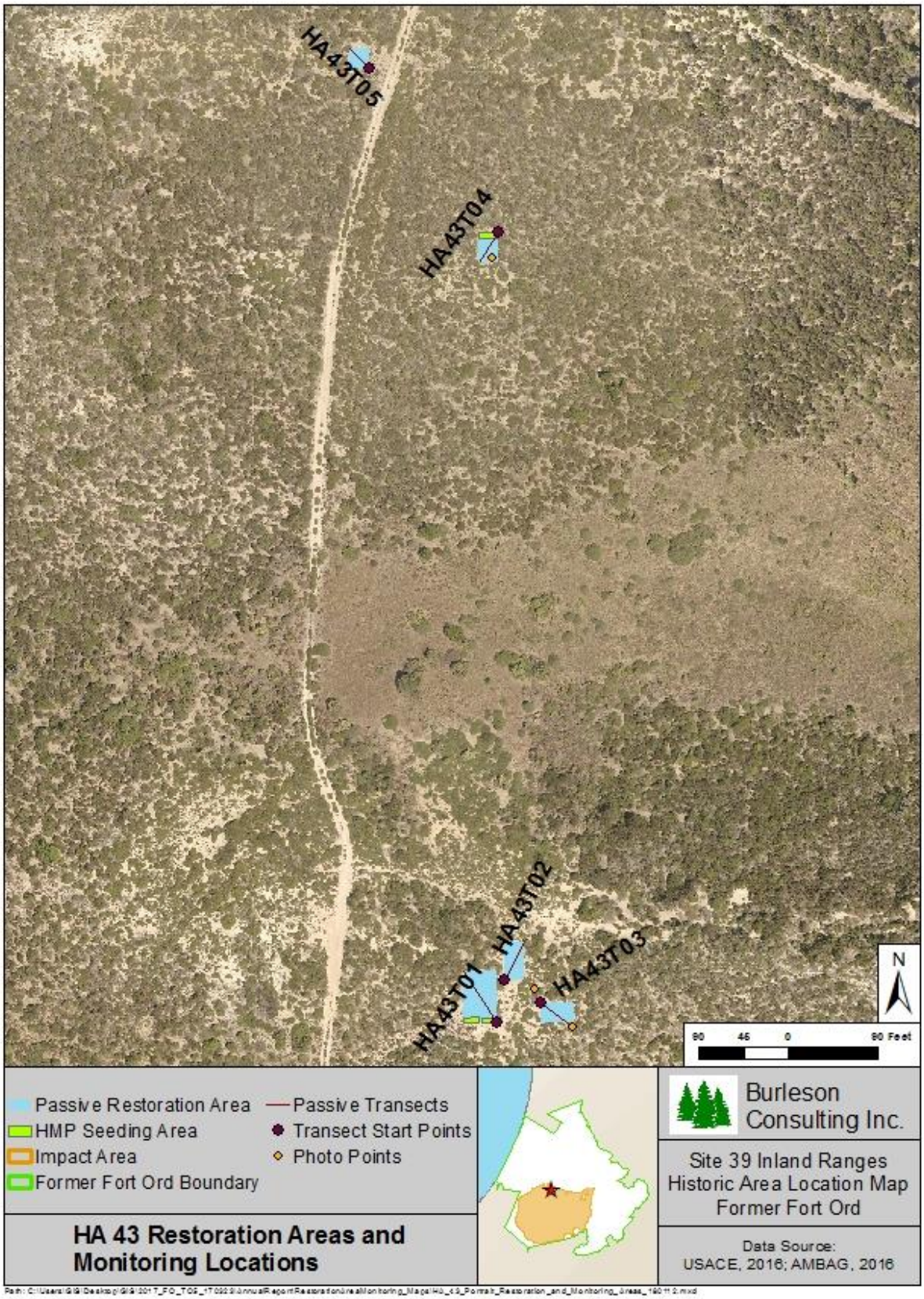


Figure 8-98. HA 43 Restoration Areas and Monitoring Locations Map

Table 8-130. Success Criteria and Acceptable Limits for Restoration of HA 43

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			sandmat manzanita[2]
			shaggy-bark manzanita
			coyote brush
			Monterey ceanothus[2]
			dwarf ceanothus
			mock heather
			golden yarrow
			peak rush-rose
			wedge-leaved horkelia
			deerweed
			sticky monkeyflower
			coffeeberry
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data did not indicate non-native target weed species. No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 6
			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 15

Table 8-130. Success Criteria and Acceptable Limits for Restoration of HA 43

			Eastwood's goldenbush percent cover, as an average of transect data, must be equal or greater than 1
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Medium
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.16.1 Restoration Activities

Burleson performed passive restoration at HA 43 twice with seed broadcast in 2011 and 2012. No additional passive restoration activities occurred at HA 43 in 2017. The total amount of seed broadcast on the site was 2.55 lb compared to 1.94 lb prescribed in the SSRP. Table 8-131 summarizes the amount of seed applied by year and species, in comparison to the SSRP target. Burleson performed passive restoration for the HMP annual species sand gilia, seaside bird's beak, and Monterey spineflower. One plot for each species was chosen in the HA based on suitable habitat for the HMP annuals and adjacent extant populations. No active restoration was prescribed at HA 43.

Table 8-131. Summary of Passive Restoration Activities from 2011-2017 for HA 43

Species	Pounds of Seed Broadcast			
	SSRP Target	2011 (Dec)	2012 (Nov)	Total by Species
ACGL	0.180	0.091	0.099	0.190
ADFA	0.090	0.470	0.050	0.520
ARPU[1]	0.090	0.049	0.059	0.108
ARTO	0.180	0.092	0.102	0.194
BAPI	0.014	0.000	0.008	0.008
CERI[1]	0.090	0.052	0.055	0.107
CHPUP[1]	0.001	0.011	0.002	0.013
CORIL[1]	0.001	0.011	0.007	0.018
CRSC	0.090	0.049	0.069	0.118
ERCO	0.027	0.016	0.023	0.039
ERFA[1]	0.009	0.007	0.006	0.013
FRCA	0.090	0.046	0.046	0.092
GITEA[1]	0.001	0.000	0.002	0.002
Hordeum sp.	0.810	0.000	0.836	0.836
HOCU	0.180	0.091	0.094	0.185
SAME	0.090	0.050	0.056	0.106
TOTAL	**1.940**	**1.040**	**1.510**	**2.550**

[1]HMP species

8.16.2 Monitoring Results

8.16.2.1 HMP Annual Density

Monterey spineflower, sand gilia, and seaside bird's beak restoration plots were monitored for year 5 plant density.

One Monterey spineflower plot was surveyed for year 5 density, shown on Figure 8-99, located in the southern part of the site. Monterey spineflower density was high. Figure 8-100 presents Monterey spineflower restoration plot densities for HA 43. Monterey spineflower density increased from medium in 2016 to high in 2017.

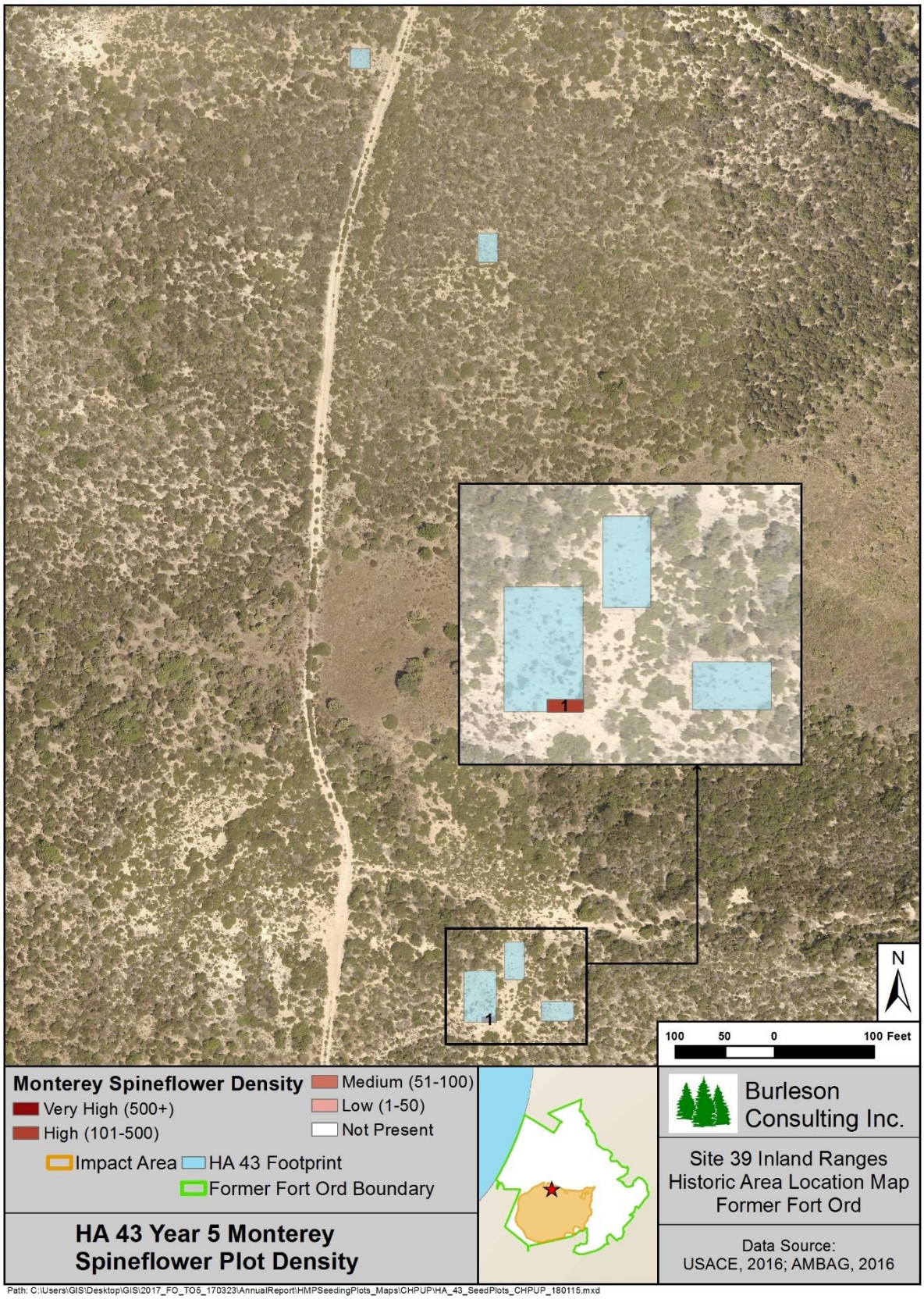


Figure 8-99. HA 43 Year 5 Monterey Spineflower Plot Density Map

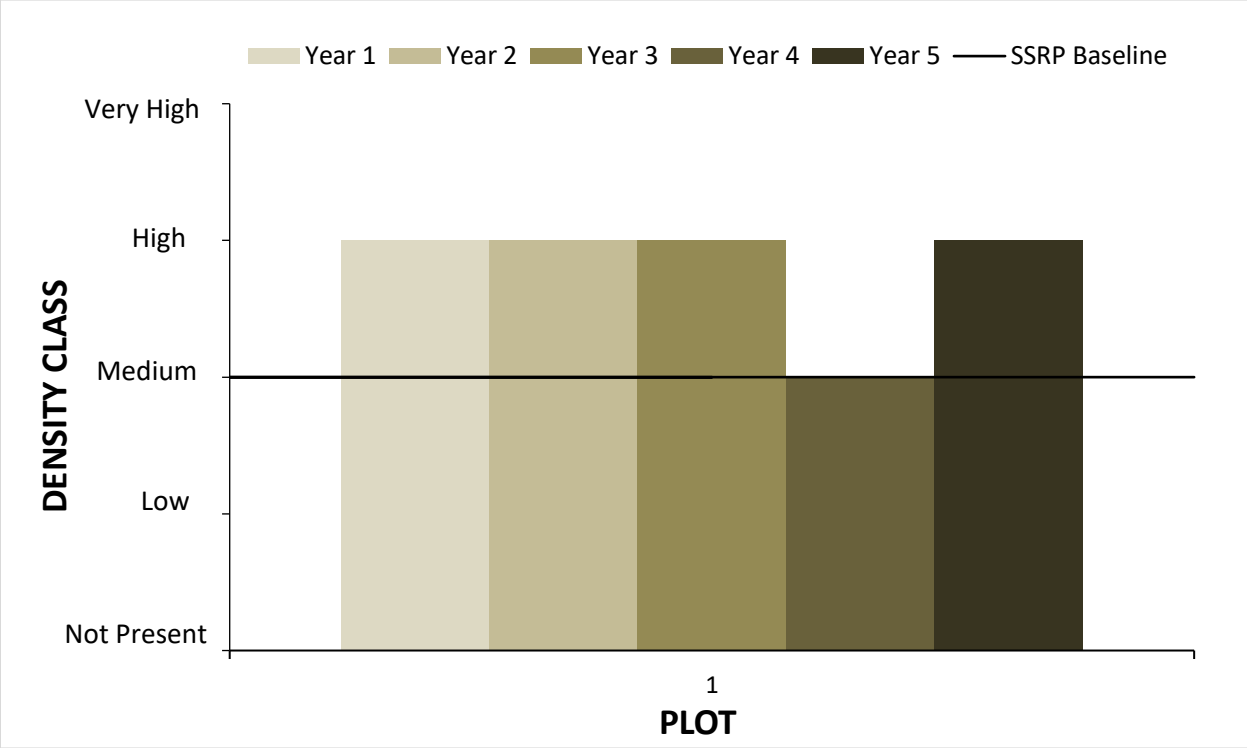


Figure 8-100. HA 43 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline Density Class for Years 1-5 at Restoration Plot 1

One sand gilia plot was surveyed for year 5 density, shown on Figure 8-101 located in the southern part of the site. Sand gilia density was low. Figure 8-102 presents all the sand gilia restoration plot densities for HA 43.

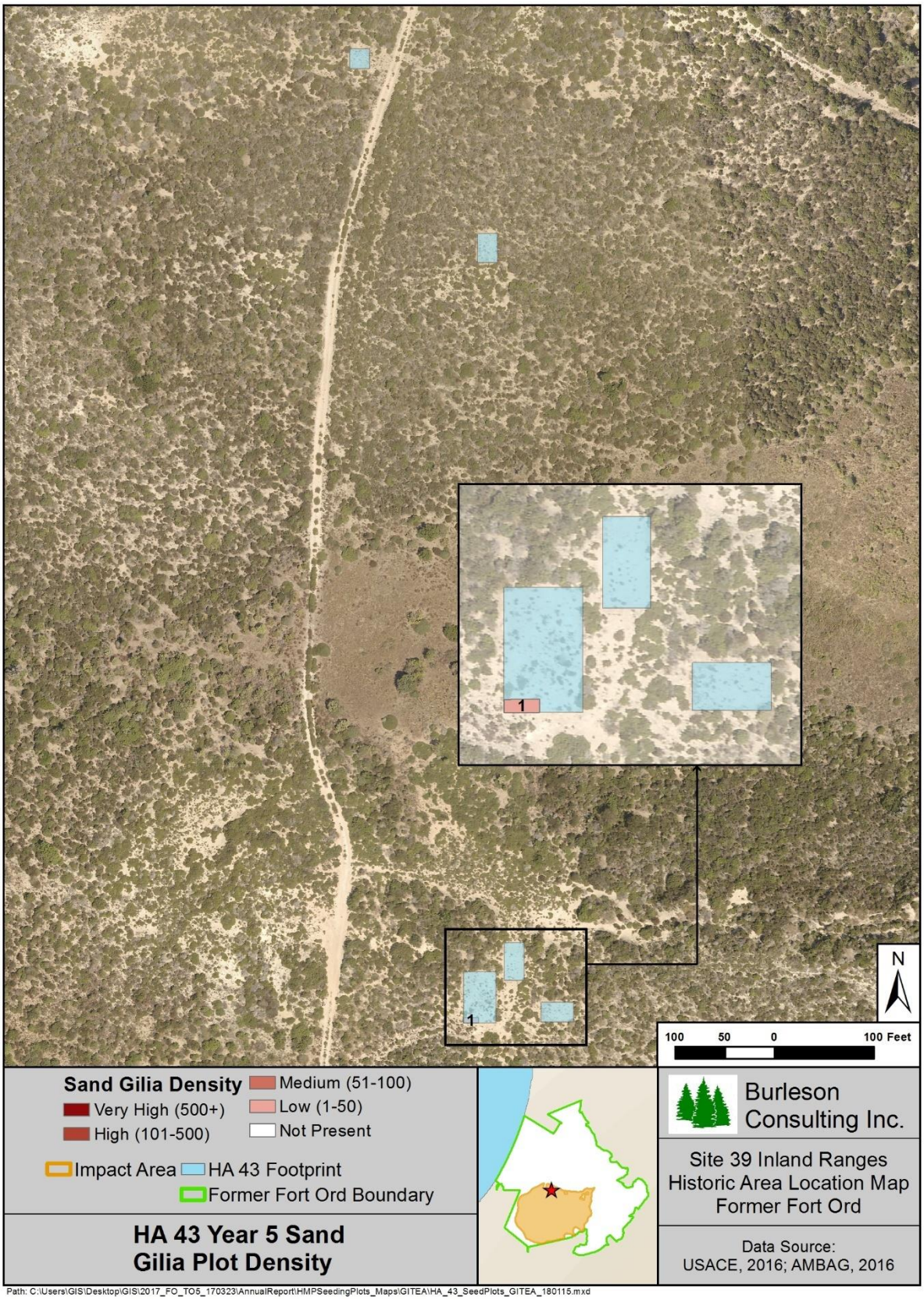


Figure 8-101. HA 43 Year 5 Sand Gilia Plot Density Map

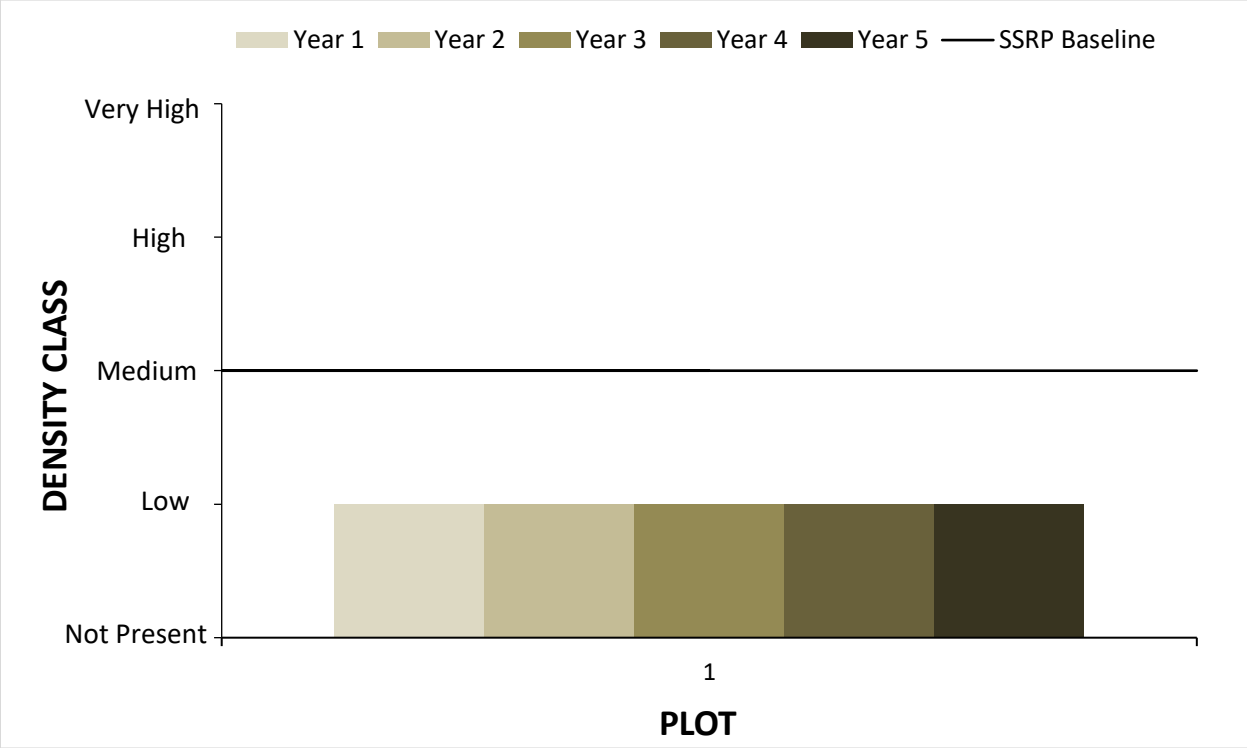


Figure 8-102. HA 43 Comparison of Sand Gilia Density Classes to the SSRP Baseline Density Class for Years 1-5 at Restoration Plot 1

One seaside bird's beak plot was surveyed for year 5 density at HA 43 in 2017. The plot, on Figure 8-103, is in the southern part of the site. Seaside bird's beak density was high. Figure 8-104 presents all the seaside bird's beak restoration plot densities for HA 43. Seaside bird's beak density increased from medium in 2016 to high in 2017.

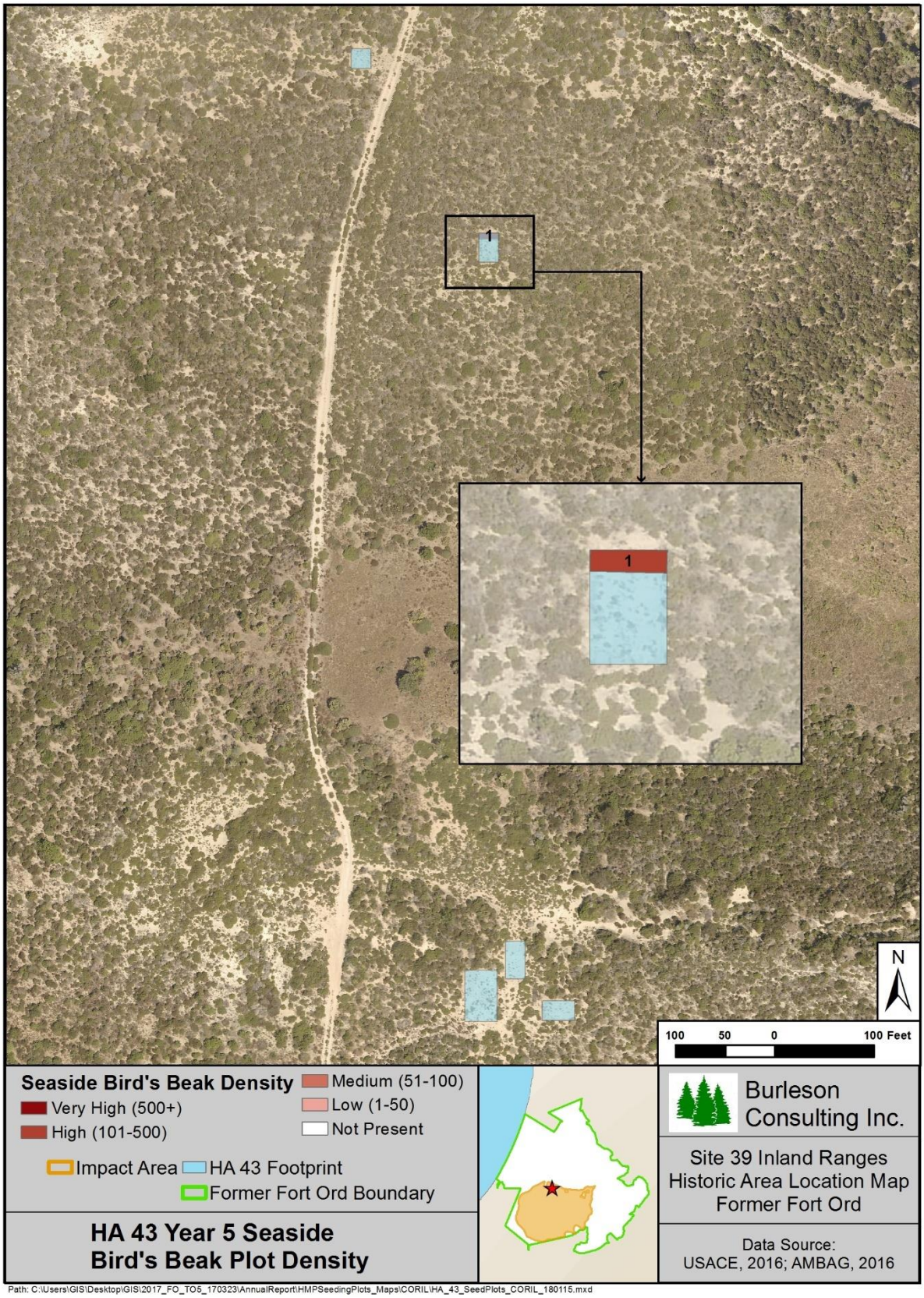


Figure 8-103. HA 43 Year 5 Seaside Bird's Beak Plot Density Map

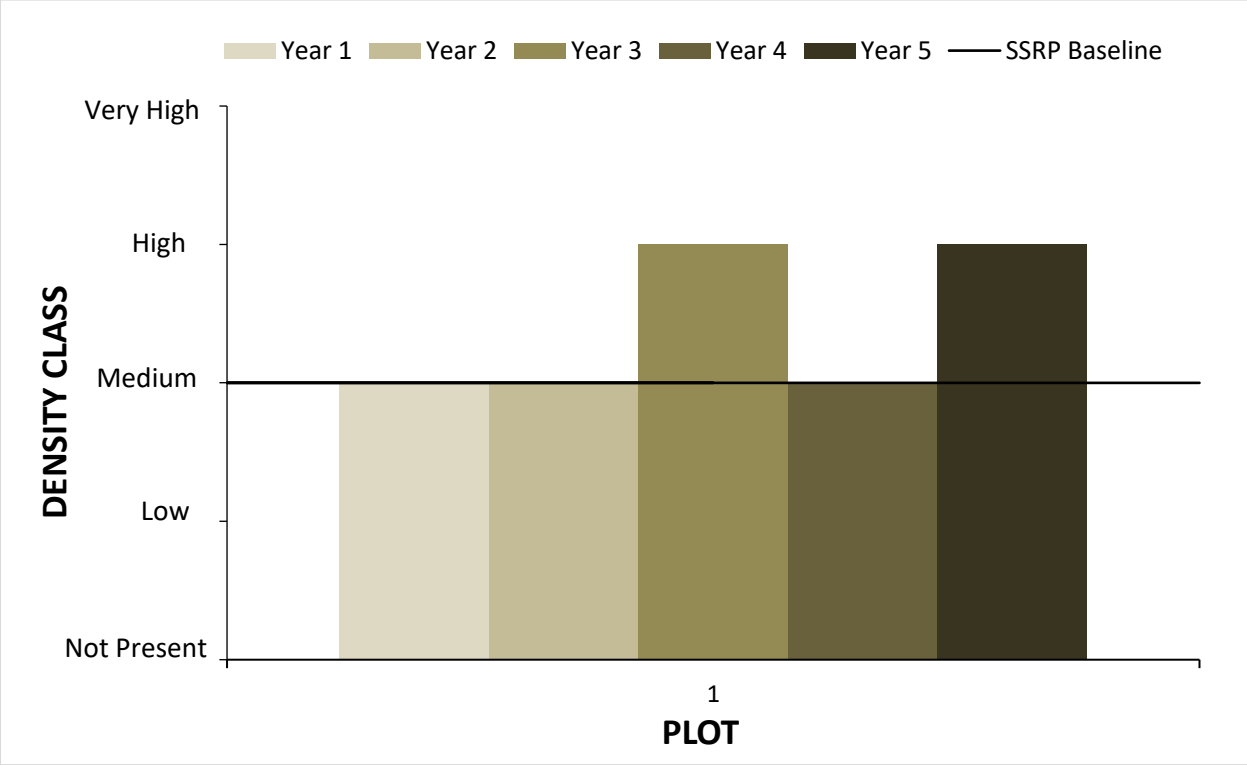


Figure 8-104. HA 43 Comparison of Seaside Bird's Beak Density Classes to the SSRP Baseline Density Class for Years 1-5 at Restoration Plot 1

HMP annual density monitoring included mapping discrete patches of HMP annuals within the restoration area but outside of the HMP annual restoration plots. This survey was completed for Monterey spineflower, sand gilia, and seaside bird's beak. Five discrete patches of Monterey spineflower were mapped and individuals counted within the patch. The densities ranged from low to high. The total acreage of the Monterey spineflower patch with a density above the SSRP baseline density class of medium was 0.01 acre (see Figure 8-105). Both the density range and total acreage increased from 2016, with the total acreage increased by 0.01 acre for patches with density above the SSRP baseline.

One discrete patch of sand gilia was mapped and individuals counted within the patch (see Figure 8-106). The density was low. The patch was not at the SSRP baseline density class of medium, but its total acreage was 0.0021 acre.

Four discrete patches of seaside bird's beak were mapped, and individuals counted. The densities were low for three patches and high for the fourth patch (see Figure 8-107). The total acreage of the seaside bird's beak patch with a density above the SSRP baseline density class of medium was 0.01 acre. Both the density range and the total acreage increased from 2016, with the total acreage increasing by 0.01 acre for patches with a density above the SSRP baseline.

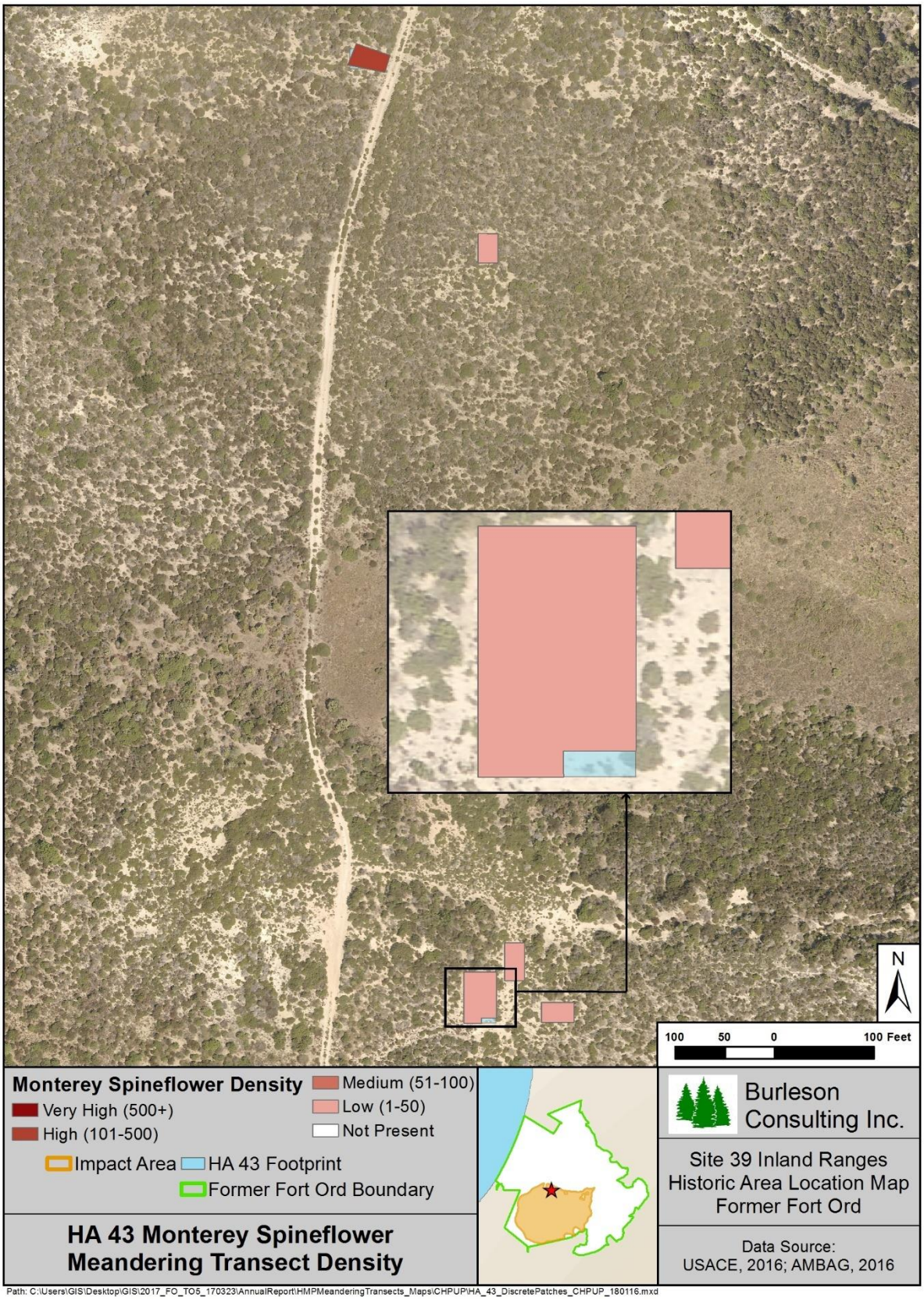


Figure 8-105. HA 43 Monterey Spineflower Meandering Transect Density Map

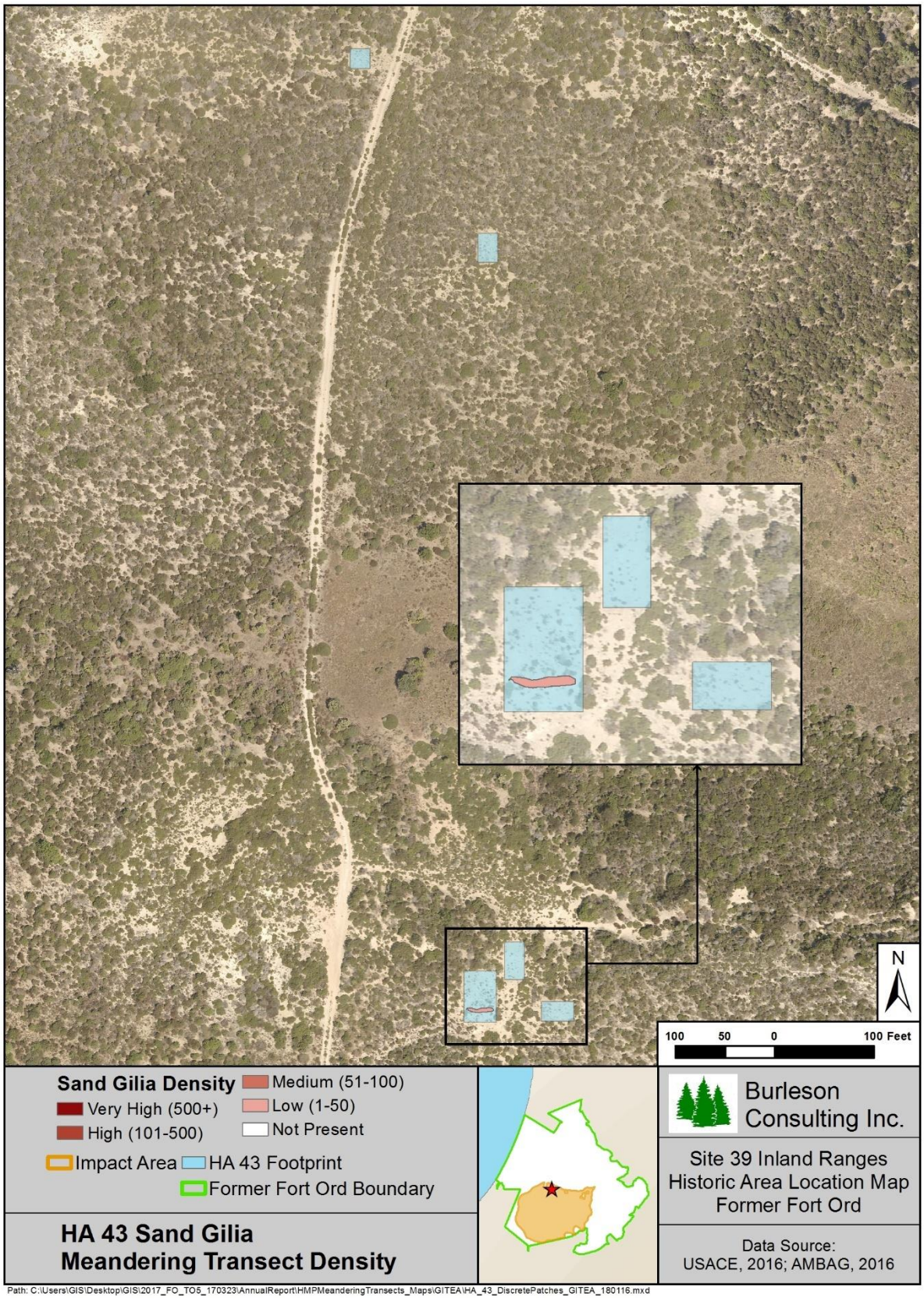


Figure 8-106. HA 43 Sand Gilia Meandering Transect Density Map

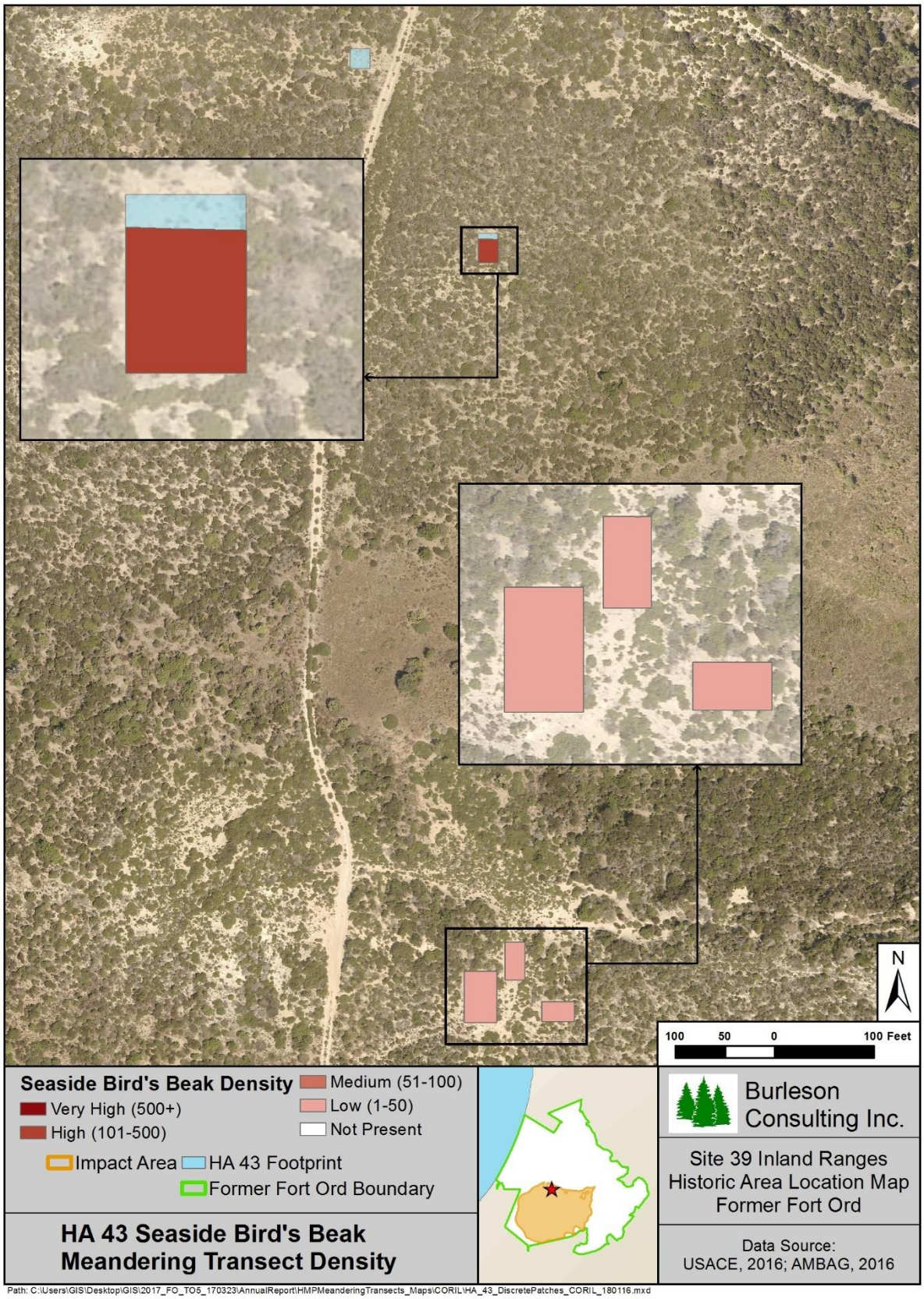


Figure 8-107. HA 43 Seaside Bird's Beak Meandering Transect Density Map

8.16.2.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.16.2.3 Species Richness

Thirty-nine species were observed at HA 43. Of those, 20 were native shrubs or perennials, 12 were native annual herbaceous species, six were non-native species, and one was not catergorized as it was only identified to genus (see Table 8-132). Species richness increased by fourteen species since 2016. Native shrub and perennial species increased by five, native herbaceous species increased by four, and non-native species decreased by four.

Table 8-132. Species Observed at HA 43, 2017

Scientific Names	Common Names	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Baccharis pilularis	coyote brush	BAPI
Camissoniopsis micrantha	small primrose	CAMI
Cardionema ramosissimum	sandmat	CARA
Carex globosa	round-fruited sedge	CAGL
Carex sp.		CA
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Cordylanthus rigidus ssp. *littoralis*[1]	seaside bird's beak	CORIL
Corethrogyne filaginifolia	common sandaster	COFI
Crassula connata	pygmy weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata[1]	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Festuca myuros	rattail sixweeks grass	FEMY
Frangula californica	California coffeeberry	FRCA
Gilia tenuiflora ssp. *arenaria*[1]	Monterey gilia	GITEA
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus albifrons var. *albifrons*	silver bush lupine	LUAL
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Polygala californica	California milkwort	POCA
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP
Salvia mellifera	black sage	SAME
Schismus barbatus	old han schismus	SCBA
Spergularia villosa	hairy sand-spurrey	SPVI
Stylocline gnaphaloides	everlasting neststraw	STGN
Toxicodendron diversilobum	poison oak	TODI

[1]HMP species

8.16.2.4 Vegetative Cover

Burleson completed five line-intercept transects ranging from eight to 17 meters in length at HA 43. Results indicated that the mean vegetative cover by native shrubs and perennials was 25.12%. The mean vegetative cover by native shrubs and perennials more than doubled in 2017, with an increase of 15.12% since 2016. However, five quadrats rather than transects were completed in 2016. Table 8-133 summarizes the vegetation cover and Table 8-134 presents the vegetation cover by species. Figure 8-108 presents the percent cover of the dominant species at HA 43 in 2017.

Table 8-133. Transect Survey Summary for HA 43

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA43T01	35.18	35.18	0.00	0.00	7.12	63.47
HA43T02	19.08	19.08	0.00	0.00	0.00	80.92
HA43T03	23.00	23.00	0.00	0.00	17.70	67.40
HA43T04	4.54	4.24	0.30	0.00	0.00	22.92
HA43T05	23.50	23.50	0.00	0.00	0.00	76.50
SITE AVERAGE*	**25.38**	**25.12**	**0.26**	**0.00**	**5.14**	**72.57**

*Transect lengths are not equal. Site averages are weighted to reflect different lengths.

Table 8-134. Transect Survey Results for HA 43 by Species

Transect	ACGL (%)	ARPU[1] (%)	ARTO (%)	CERI (%)	CORIL[1] (%)	CRSC (%)	ERCO (%)	HOCU (%)	TH (%)	BG (%)
HA43T01	2.35	6.82	0.00	7.41	0.00	13.88	1.76	2.94	7.12	63.47
HA43T02	0.00	2.67	0.00	0.00	0.00	16.42	0.00	0.00	0.00	80.92
HA43T03	2.80	10.80	1.10	1.90	0.00	6.40	0.00	0.00	17.70	67.40
HA43T04	0.00	2.36	0.00	0.00	0.30	1.48	0.00	0.40	0.00	22.92
HA43T05	0.00	12.00	0.00	0.00	0.00	11.50	0.00	0.00	0.00	76.50
SITE AVERAGE	**1.17**	**8.10**	**0.19**	**2.50**	**0.26**	**11.43**	**0.52**	**1.21**	**5.14**	**72.57**

[1] HMP species

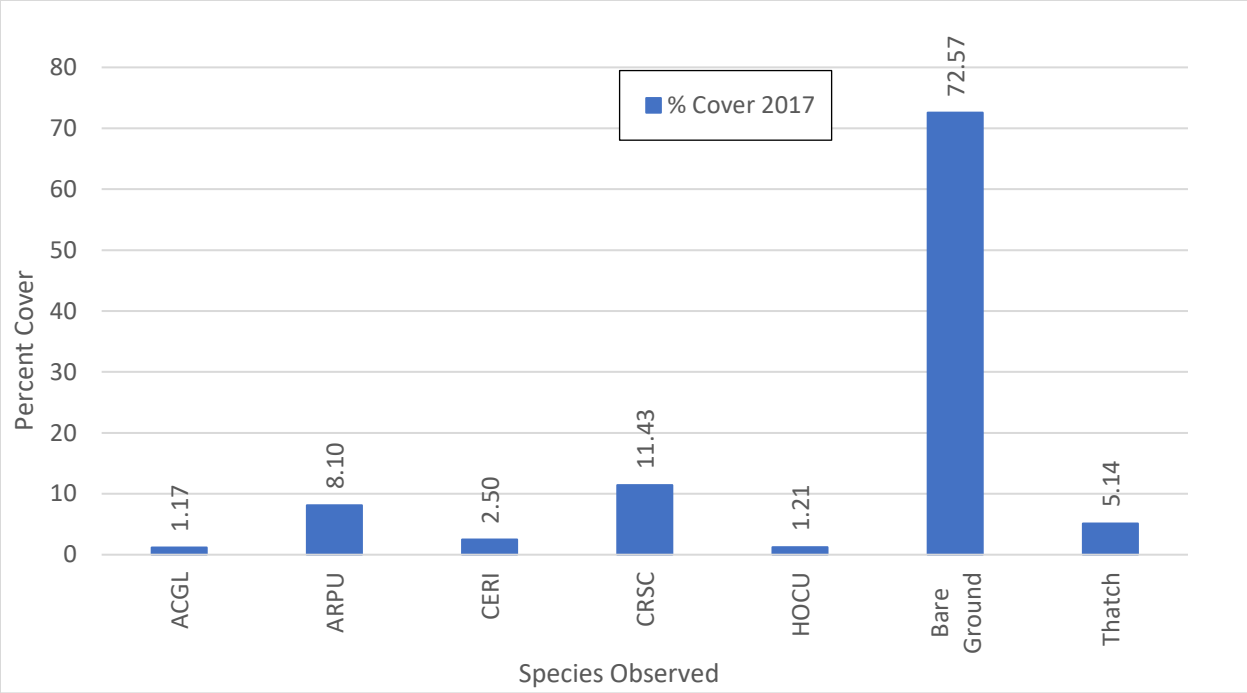


Figure 8-108. Percent Cover of Dominant Species at HA 33 in 2017. Species codes and names are provided in Table 8-132.

8.16.3 Discussion

8.16.3.1 HMP Annual Density

Monterey spineflower density was within the acceptable limits for HMP annual density at HA 43. The SSRP baseline density class for Monterey spineflower was medium. The Monterey spineflower restoration plot exceeded this criterion. In addition, Monterey spineflower was present outside of the restoration plots with densities that exceeded the success criterion at 0.01 acre of HA 43.

Sand gilia density was less than the acceptable limits for the HMP annual density. The SSRP baseline density class for sand gilia was medium. The restoration plot density was low, and its total acreage was 0.0021 acre. Sand gilia has not met the success criterion.

Seaside bird's beak density exceeded the acceptable limits for the HMP annual density. The SSRP baseline density class for seaside bird's beak was medium. In addition to the plots meeting the success criteria, four individual patches were mapped, with three at low density, and one patch at high density. The restoration plot has met the success criterion.

Overall the HMP annual density success criterion were not met.

8.16.3.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.16.3.3 Species Richness

Chamise, sandmat manzanita, shaggy-barked manzanita, coyote brush, Monterey ceanothus, dwarf ceanothus, mock heather, golden yarrow, peak rush-rose, wedge-leaved horkelia, deerweed, coffeeberry, and black sage were present. HA 43 included 20 native shrub and perennial species;

however, HA 43 did not meet the success criterion for objective 1 because sticky monkeyflower was not present.

8.16.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes 16 shrub and perennial species presented in Table 2 of the HA 43 SSRP (Burleson, 2013). Currently the HA includes 25.38% native vegetative cover, therefore this success criterion is not met (see Figure 8-109). In 2016, quadrats were completed to provide a preliminary idea of vegetative cover with a limited amount of effort; however, multiple objectives outlined in the SSRP specifically require transect data. The 2016 quadrat data were not compared to the success criteria.

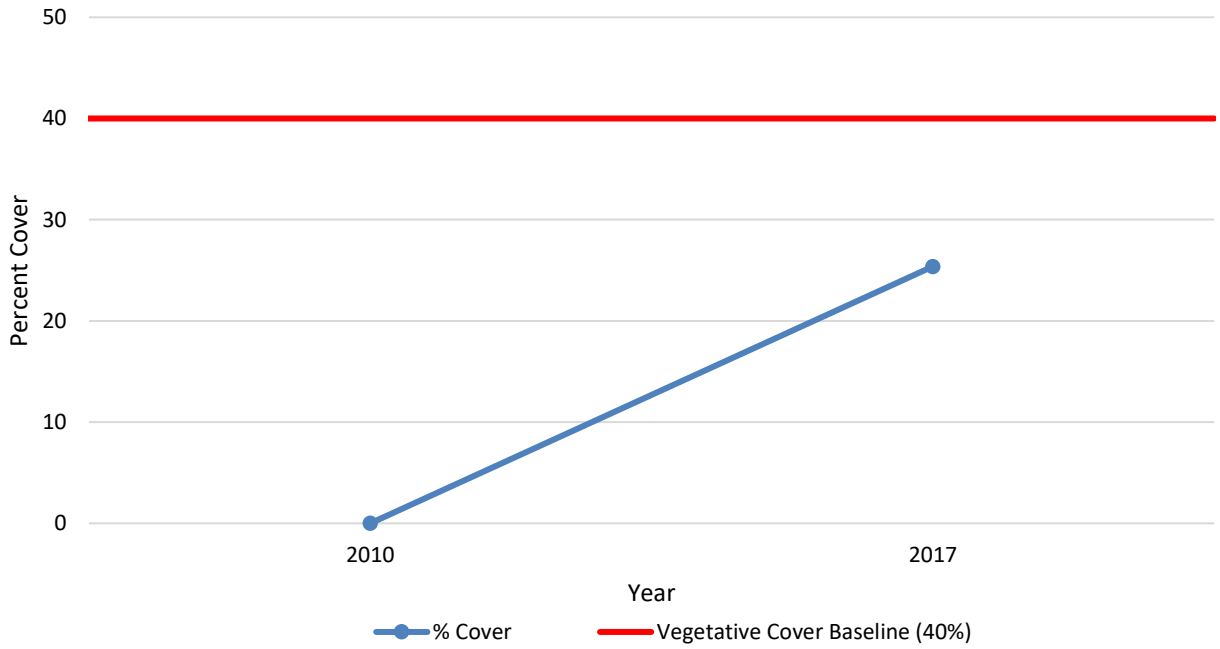


Figure 8-109. Native Vegetative Cover Compared to the Success Criterion at HA 43

Objective 2 considers the percent cover of non-native target weeds. In 2017, target weeds were not observed during the transect surveys. The vegetative cover for non-native species was 0.00%. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class met or exceeded the baseline cover class of 3 from 6-25% of absolute cover. The HMP shrub species at HA 43 are providing an absolute cover of 10.60%; the HA has met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 43 this means a vegetative cover average of at least 15% cover for Monterey ceanothus (*Ceanothus rigidus*), 6% sandmat manzanita (*Arctostaphylos pumila*), and 1% Eastwood's goldenbush (*Ericameria fasciculata*). The average vegetative cover for Monterey ceanothus is 2.50%, for sandmat manzanita 8.10%, and for Eastwood's goldenbush 0.00% (see Figure 8-110). Only sandmat manzanita met the acceptable limit. The success criterion was not met.

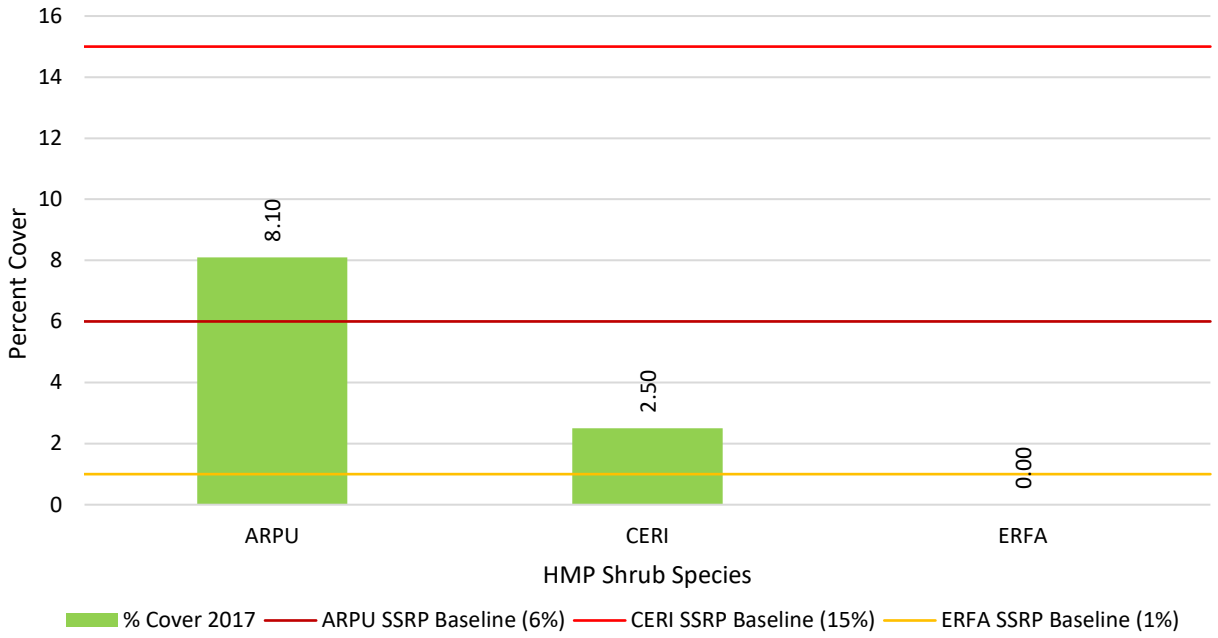


Figure 8-110. HMP Shrub Species Comparison to Success Criteria at HA 43

8.16.3.5 Recommendations

HA 43 was in year 5 of monitoring in 2017 and had responded moderately well to previous restoration efforts. The site met two of the six success criteria. As previously recommended, sticky monkeyflower, Monterey ceanothus, and chamise installation will occur during the 2018/2019 planting season to support species richness. Additionally, the Army will plant Eastwood's golden bush to support HMP shrub cover and broadcast additional sand gilia seed to support HMP annual densities since the species is below its target. A qualitative overview is documented by the reference photo points (see Appendix D, page D-16 and Appendix E, page E-10). The photos illustrate the progress, growth, and improvement of the HA.

The site will continue to be monitored by photo documentation, HMP annual density surveys, and species richness meandering transects in year 8.

Table 8-135 summarizes the current status of HA 43 including which success criteria have been met as well as our recommendation to move towards meeting all of the success criteria.

Table 8-135. Status and Recommendations for Achieving the Success Criteria at HA 43

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant sticky monkeyflower, Monterey ceanothus, and chamise (scheduled 2018)
Objective 1 – No. 2	Native vegetation cover	No	Wait to see how the HA responds
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	Yes	None

Table 8-135. Status and Recommendations for Achieving the Success Criteria at HA 43

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 3 – No. 4	HMP shrub cover by species	No	Plant Monterey ceanothus (scheduled 2018) and Eastwood's goldenbush
Objective 3 – No. 4	HMP annual density	No	Additional seed to sand gilia plot to get to the success criteria of medium density

8.17 HA 44

HA 44 was used by the Army as a range for anti-tank weapons and other explosive munitions. An estimated total of 2,900 cubic yards of soil was excavated over 1.8 acres. HA 44 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 44 is relatively flat with a southwest aspect and is surrounded by very high-quality habitat.

HA 44 is located on the northern portion of Site 39, within the sand hill formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

Passive and active restoration activities were prescribed for HA 44. The prescription for passive restoration at HA 44 consisted of hand broadcast non-irrigated seed and annual weed management activities. The prescription for active restoration at HA 44 included transplanting native or greenhouse-grown individuals. HA 44 is relatively flat with little potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 44 began in 2017 however, monitoring began in 2013 to assess the level of natural recruitment occurring at that site. HA 44 has been monitored for five years by photo documentation and site visits, two years for species richness, and two years for vegetative cover (see Table 8-136). Figure 8-111 shows the HA footprint, passive restoration area, and transect monitoring locations. The success criteria for HA 44 are summarized in Table 8-137.

Table 8-136. Historic Summary of Restoration and Monitoring Activities at HA 44

Activity	Monitoring Years											
						1	2	3	4	5	8	13
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2025	2030
Restoration: Passive and Active					●							
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●	●	●
HMP Annual Density across HA				●	●	●	●	●	●	●	●	
Species Richness				●	●	●	●	●	●	●	●	●
Vegetative Cover				●	●	●	●	●	●	●	●	●
Plant Survivorship						●	●	●				

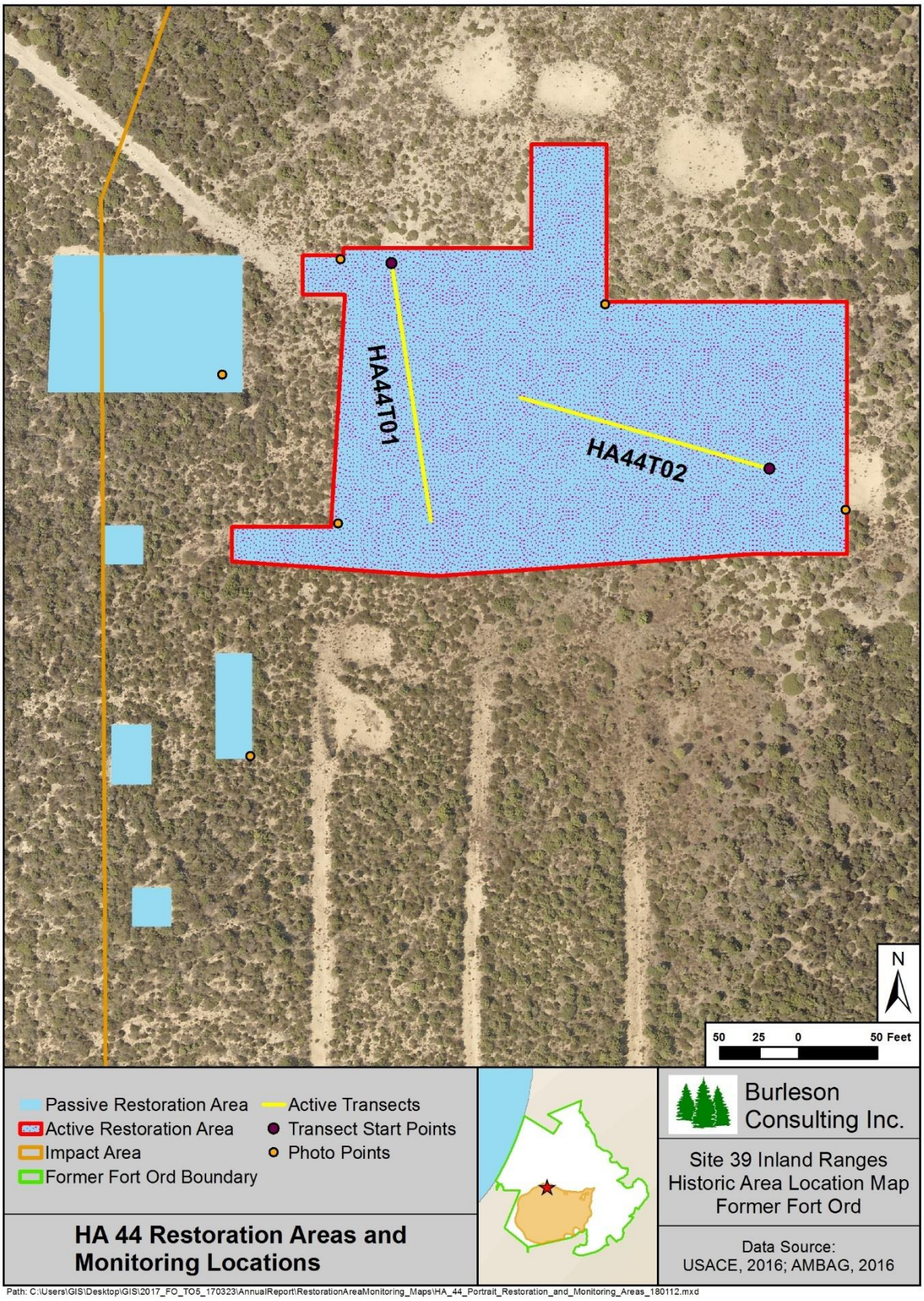


Figure 8-111. HA 44 Restoration Areas and Monitoring Locations Map

Table 8-137. Success Criteria and Acceptable Limits for Restoration of HA 44

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			sandmat manzanita[2]
			shaggy-bark manzanita
			Monterey ceanothus[2]
			California coffeeberry
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data indicated absence of non-native target weed species. In the event of their establishment, no more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 2.
			Monterey ceanothus percent cover, as an average of transect data, must be present however, less than 10 percent is acceptable
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.17.1 Restoration Activities

Burleson performed passive restoration at HA 44 in 2017 with one application of seed. The total amount of seed broadcast on the site was 18.16 lb compared to 42.70 lb prescribed in the SSRP. Table 8-138 summarizes the amount of seed applied by year and species, in comparison to the SSRP target.

Table 8-138. Summary of Passive Restoration Activities in HA 44

Species	Pounds of Seed Broadcast		
	SSRP Target	2017	Total by Species
ACMI	1.80	2.00	2.00
ACGL	5.50	1.69	1.69
BAPI	0.30	0.05	0.05
CERI[1]	1.80	0.25	0.25
CRSC	4.60	0.62	0.62
ELGL	-	9.00	9.00
ERCO	0.50	0.07	0.07
FRCA	1.80	0.25	0.25
Hordeum sp.	18.20	2.48	2.48
HOCU	4.60	1.25	1.25
LUAL	1.80	0.25	0.25
SAME	1.80	0.25	0.25
TOTAL	**42.7**	**18.16**	**18.16**

8.17.2 Monitoring Results

8.17.2.1 HMP Annual Density

No restoration plots have been established for HMP annuals at HA 44. However, HMP annuals were mapped as a part of the meandering transect survey in 2017. The survey was completed for Monterey spineflower, seaside bird's beak, and sand gilia. Six discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 8-112). The densities were low. The total acreage of Monterey spineflower patches with a density equal to or above the SSRP baseline density class of low was 1.38 acres. The total acreage increased by 0.89 acre in 2017.

Four discrete patches of sand gilia were mapped and individuals counted within each patch (see Figure 8-113). The densities were low. The total acreage of sand gilia patches with a density at the SSRP baseline density class of low was 0.22 acre. The density range decreased slightly from 2016 from medium to low, while the total acreage increased by 0.08 acre in 2017.

One discrete patch of seaside bird's beak was mapped and individuals counted within the patch (see Figure 8-114). The density was low. The total acreage of seaside bird's beak patch with a density at the SSRP baseline density class of low was 0.35 acre. The total acreage increased by 0.34 acre in 2017.

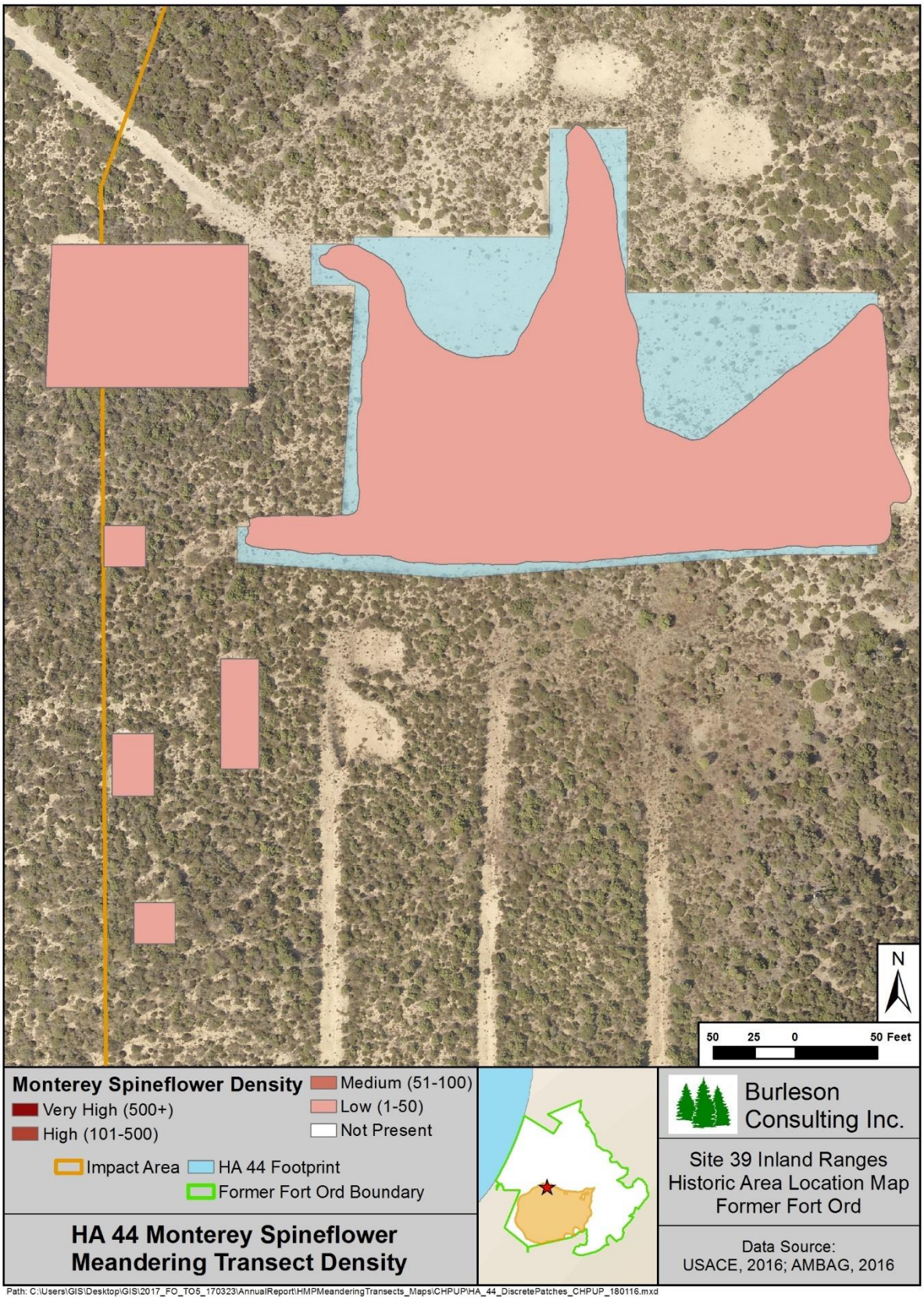


Figure 8-112. HA 44 Monterey Spineflower Meandering Transect Density Map

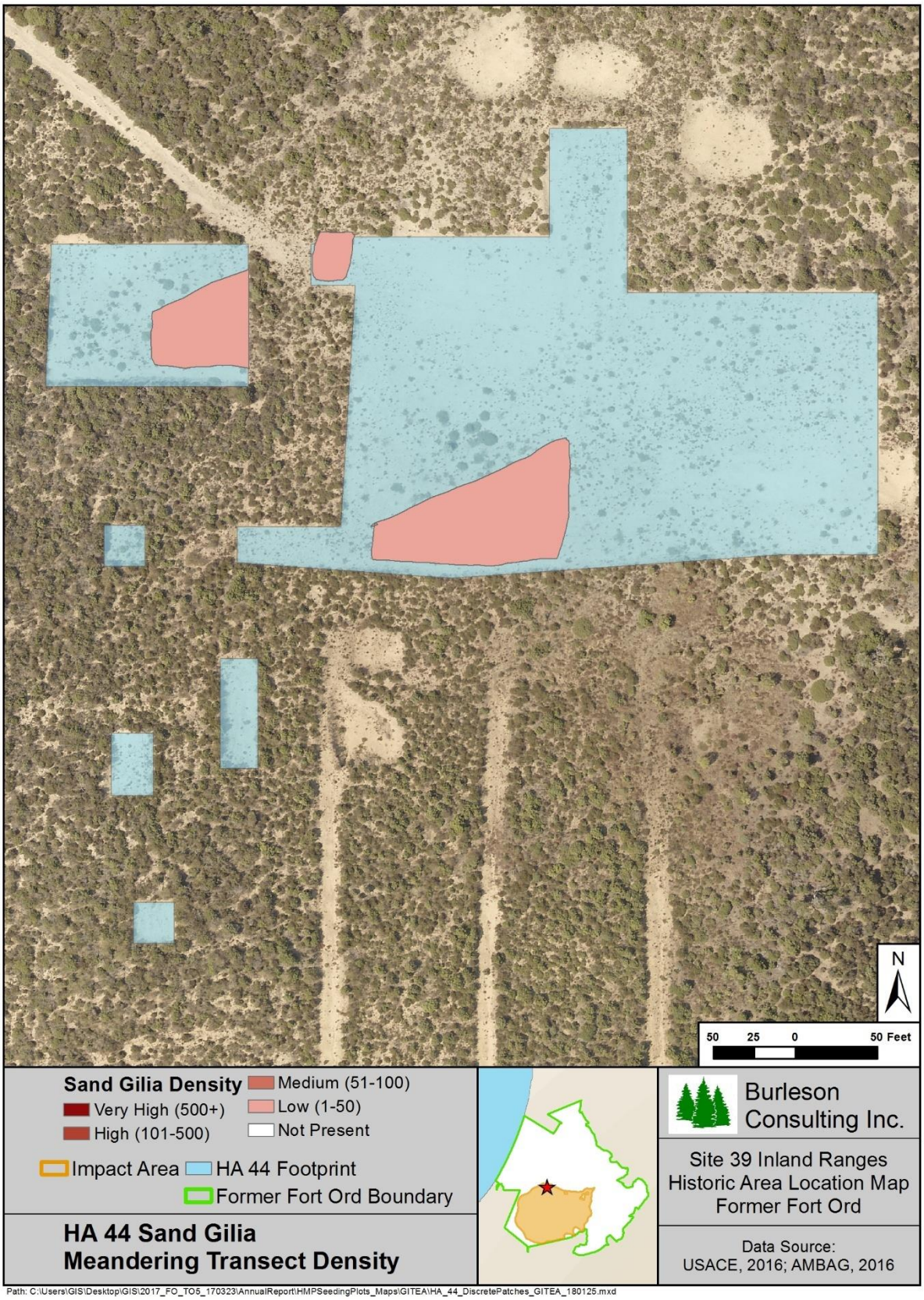


Figure 8-113. HA 44 Sand Gilia Meandering Transect Density Map

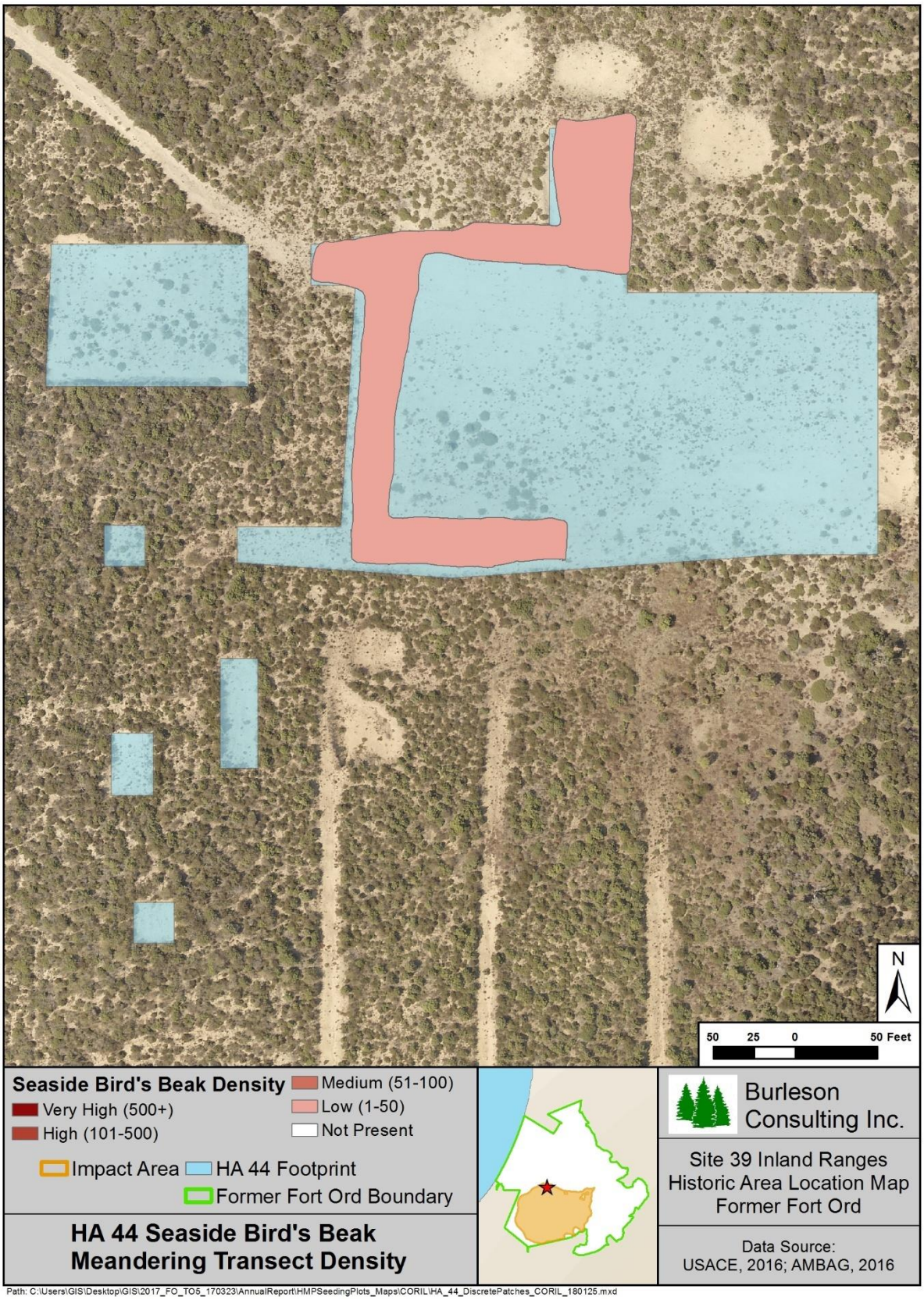


Figure 8-114. HA 44 Seaside Bird's Beak Meandering Transect Density Map

8.17.2.2 Plant Survivorship

No active restoration has occurred at HA 44; therefore, no survivorship data were collected.

8.17.2.3 Species Richness

Fifty species were observed at HA 44. Of those, 25 were native shrubs or perennials, 14 were native annual herbaceous species, nine were non-native species, and two were not catergorized as they were only identified to genus (see Table 8-139). Species richness has decreased by nine species since 2016. Native shrub and perennial species decreased by five, native herbaceous species decreased by five, and non-native species decreased by one. This decrease may be attributed to a normal fluctuation in species richness from year to year.

Table 8-139. Species Observed on HA 44, 2017

Scientific Names	Common Names	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Agoseris apargioides	coast dandelion	AGAP
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Baccharis pilularis	coyote brush	BAPI
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Camissoniopsis micrantha	small primrose	CAMI
Cardionema ramosissimum	sand mat	CARA
Carex sp.	sedge	CA
Carpobrotus edulis	Ice plant	CAED
Castilleja densiflora	owl's clover	CADE
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus[1]	Monterey ceanothous	CERI
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Cirsium occidentale var. *candidissimum*	snowy thistle	CIOCC
Cordylanthus rigidus ssp. *littoralis*[1]	Seaside bird's-beak	CORIL
Corethrogyne filaginifolia	common sand-aster	COFI
Crocanthemum scoparium	peak rush-rose	CRSC
Cryptantha sp.		CR
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata[1]	Eastwood’s goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium cicutarium	red-stemmed filaree	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Frangula californica	California coffeeberry	FRCA
Gilia tenuiflora ssp. *arenaria*[1]	Monterey gilia	GITEA
Horkelia cuneata var. *cuneata*	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat’s-ear	HYGL
Lessingia pectinata	common lessingia	LEPE
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lomatium parvifolium	coastal biscuitroot	LOPA

Table 8-139. Species Observed on HA 44, 2017

Scientific Names	Common Names	Code
Lupinus albifrons var. *albifrons*	silver bush lupine	LUAL
Lysimachia arvensis	scarlet pimpernel	LYAR
Monardella sinuata ssp. *nigrescens*	curly-leaved monardellla	MOSIN
Orobanche californica ssp. *californica*	broomrape	ORCAC
Plantago coronopus	cut-leaf plantain	PLCO
Plantago erecta	California plantain	PLER
Polygala californica	California milkwort	POCA
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium californicum	California everlasting	PSCA
Salvia mellifera	black sage	SAME
Schismus barbatus	old han schismus	SCBA
Solanum umbelliferum	blue witch	SOUM
Stylocline gnaphaloides	everlasting neststraw	STGN
Symphoricarpos albus var. *laevigatus*	snowberry	SYALL

[1]HMP species

8.17.2.4 Vegetative Cover

Burleson completed two 50-meter line-intercept transects at HA 44. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 20.18%. The mean vegetative cover by native shrubs and perennials was greater in 2017 than 2016 by 5.22%. Table 8-140 summarizes the vegetation cover and Table 8-141 presents vegetation cover by species. Figure 8-115 presents the percent cover of the dominant species at HA 44 in 2016 and 2017.

Table 8-140. Transect Survey Summary for HA 44

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA44T01	18.74	18.54	0.00	0.20	16.54	75.70
HA44T02	21.82	21.82	0.00	0.00	16.98	73.72
SITE AVERAGE	20.28	20.18	0.00	0.10	16.76	74.71

Table 8-141. Transect Survey Results for HA 44 by Species

Transect	ACGL (%)	ADFA (%)	ARPU[1] (%)	CA sp. (%)	CAED (%)	CEDE (%)	CERI[1] (%)	CRSC (%)	ERER[1] (%)	ERCO (%)	HOCU (%)	LUAL[2] (%)	TH (%)	BG (%)
HA44T01	1.62	1.92	1.54	0.00	0.20	3.38	0.00	5.32	0.64	0.84	3.28	0.00	16.54	75.70
HA44T02	0.00	0.00	2.42	0.86	0.00	6.42	0.62	7.10	0.00	0.24	2.18	1.98	16.98	73.72
SITE AVERAGE	0.81	0.96	1.98	0.43	0.10	4.90	0.31	6.21	0.32	0.54	2.73	0.99	16.76	74.71

[1]HMP species

[2]As previously mentioned in subsection 8.13.3.4 silver bush lupine has been identified in the field as *Lupinus albifrons* var. *albifrons* rather than *Lupinus chamissonis*

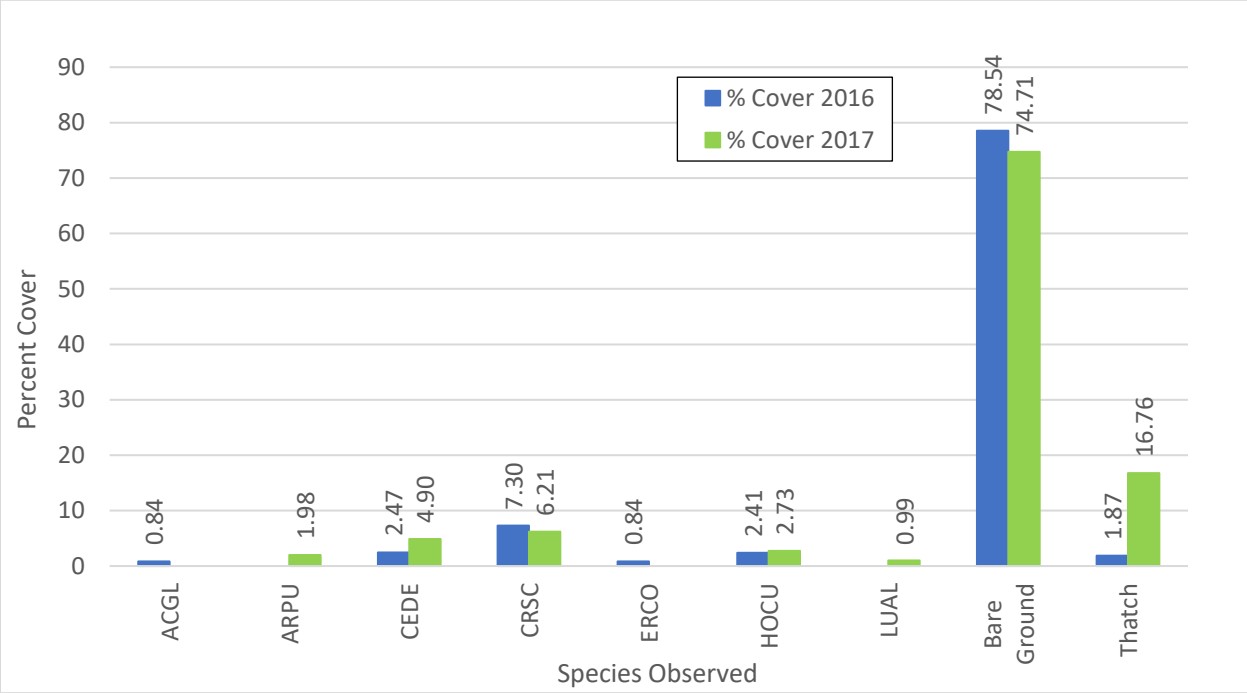


Figure 8-115. Percent Cover of Dominant Species at HA 44 in 2016 and 2017. Species codes and names are provided in Table 8-139.

8.17.3 Discussion

8.17.3.1 HMP Annual Density

No restoration plots have been established for HMP annuals at HA 44. However, HMP annuals were mapped as a part of the meandering transect survey and all three HMP annuals met the density success criteria.

8.17.3.2 Plant Survivorship

No active restoration has occured; therefore, no survivorship data were collected.

8.17.3.3 Species Richness

Chamise, sandmat manzanita, shaggy-barked manzanita, Monterey ceanothus, and coffeeberry (*Frangula californica*, formerly *Rhamnus californica*) were all present. HA 44 included 25 native shrub and perennial species. HA 44 met the success criterion for objective 1.

8.17.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes fourteen shrub and perennial species and three annual species presented in Table 2 of the HA 44 SSRP (Burleson, 2013). Currently the HA has 14.53% vegetative cover; therefore, this success criterion was not met. However, in 2016, the vegetative cover was 13.33%. Cover increased by 1.2% (see Figure 8-116).

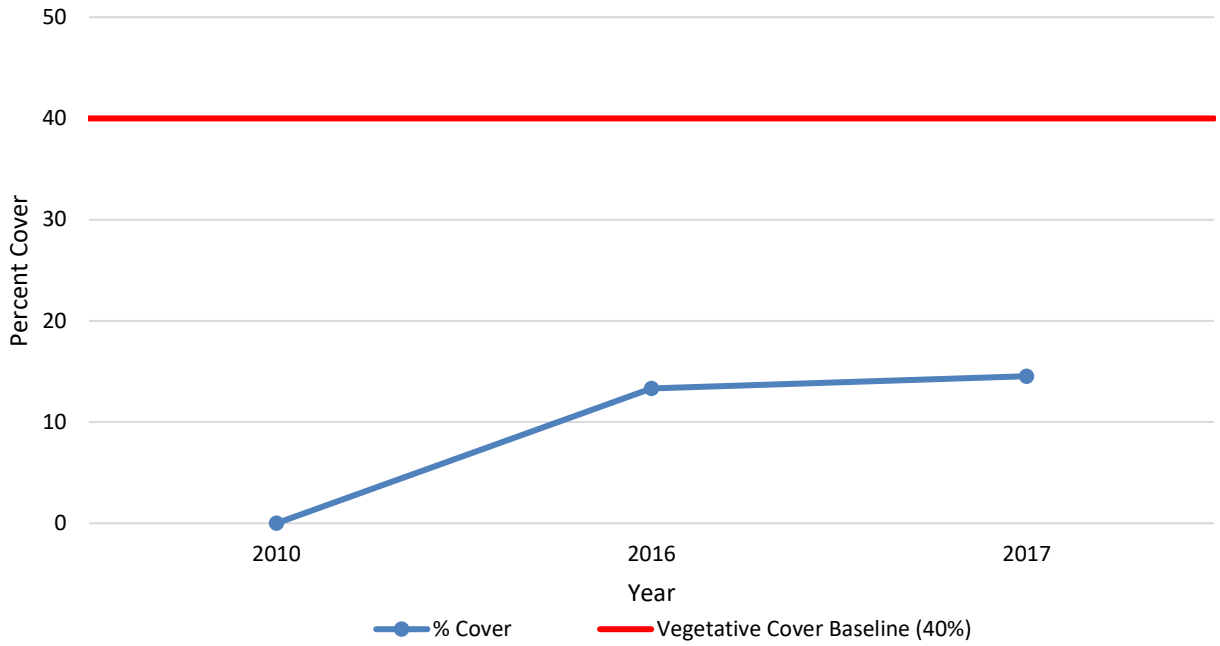


Figure 8-116. Native Vegetative Cover Compared to the Success Criterion at HA 44

Objective 2 considers the percent cover of non-native target weeds. In 2017, iceplant (*Carpobrotus edulis*) was observed during transect surveys. The vegetative cover for non-native species was 0.10%. In 2016, vegetative cover for non-native species was 0.00%. However, because the vegetative cover in both years was below the 5% acceptable limit, this success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class was met or exceeded the baseline cover class of 3. Cover class 3 is from 6-25% of absolute cover. The HMP shrub species at HA 44 are providing an absolute cover of 2.29%, which has increased slightly by 0.11% since 2016; however, the HA has not yet met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 44 this means a vegetative cover average for sandmat manzanita must be at least 2% and Monterey ceanothus must be present. The average vegetative cover for sandmat manzanita (*Arctostaphylos pumila*) was 1.98% and Monterey ceanothus (*Ceanothus rigidus*) was 0.31% (see Figure 8-117). Both sandmat manzanita and Monterey ceanothus increased in cover from 2016 to 2017. Both species were within acceptable limits; the success criterion was met.

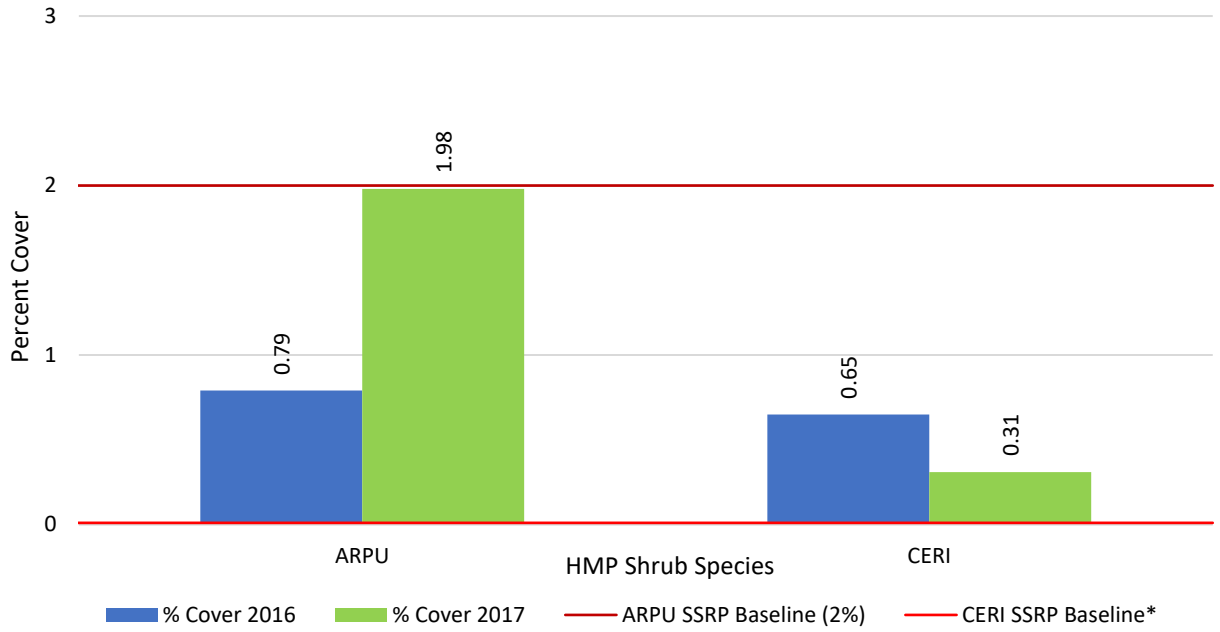


Figure 8-117. HMP Shrub Species Comparison to Success Criteria at HA 44

8.17.3.5 Recommendations

HA 44 only received a partial amount of its SSRP prescription for passive restoration in 2017. Despite this, the site met four of the six success criteria by 2017, one more than had been achieved by 2016. A qualitative overview of the site across a three-year span was documented by the reference photo points (see Appendix D, page D-17). HA 44 met the success criteria for species richness, non-native target weed cover, HMP shrub cover by species, and HMP annual density. The Army does not recommend that the SSRP prescription for HMP annuals be applied to the HA since these species are already thriving. As restoration efforts progress in the future, HA 44 will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover line-intercept transects.

Table 8-142 summarizes the current status of HA 44 including which success criteria have been met and which have not as well as our recommendation to move towards meeting all of the success criteria at HA 44.

Table 8-142. Status and Recommendations for Achieving the Success Criteria at HA 44

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Wait to see how the HA responds
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Wait to see how the HA responds
Objective 3 – No. 4	HMP shrub cover by species	Yes	None
Objective 3 – No. 4	HMP annual density	Yes	Establishment of restoration plots is not necessary

8.18 HA 48

HA 48 was used by the Army as a range for various uses including mortars, weapons demonstrations, sniper training, anti-tank weapons, and various other weapons. An estimated total of 150 cubic yards of soil was excavated over 0.05 acre. HA 48 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). HA 48 is relatively flat with a southeast aspect and is surrounded by very high-quality habitat.

HA 48 is located on the northern portion of Site 39, within the sand hill formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

The prescription for passive restoration at HA 48 consisted of hand broadcast non-irrigated seed and annual weed management activities. HA 48 is relatively flat with little potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration activities have not commenced at HA 48; however, monitoring began in 2013. HA 48 has been monitored for five years by photo documentation and site visits, two years for species richness, and one year for vegetative cover (see Table 8-143). Figure 8-118 shows the HA footprint and passive restoration area and photo point monitoring locations. Success criteria for HA 48 are summarized in Table 8-144.

Table 8-143. Historic Summary of Restoration and Monitoring Activities at HA 48

Activity	Monitoring Years									
				1	2	3	4	5	8	13
	2013	2014	2015	2016	2017	2018	2019	2020	2023	2028
Restoration						●				
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
HMP Annual Density in Plots										
HMP Annual Density across HA				●	●	●	●	●	●	
Species Richness				●	●	●	●	●	●	●
Vegetative Cover					●	●	●	●	●	●

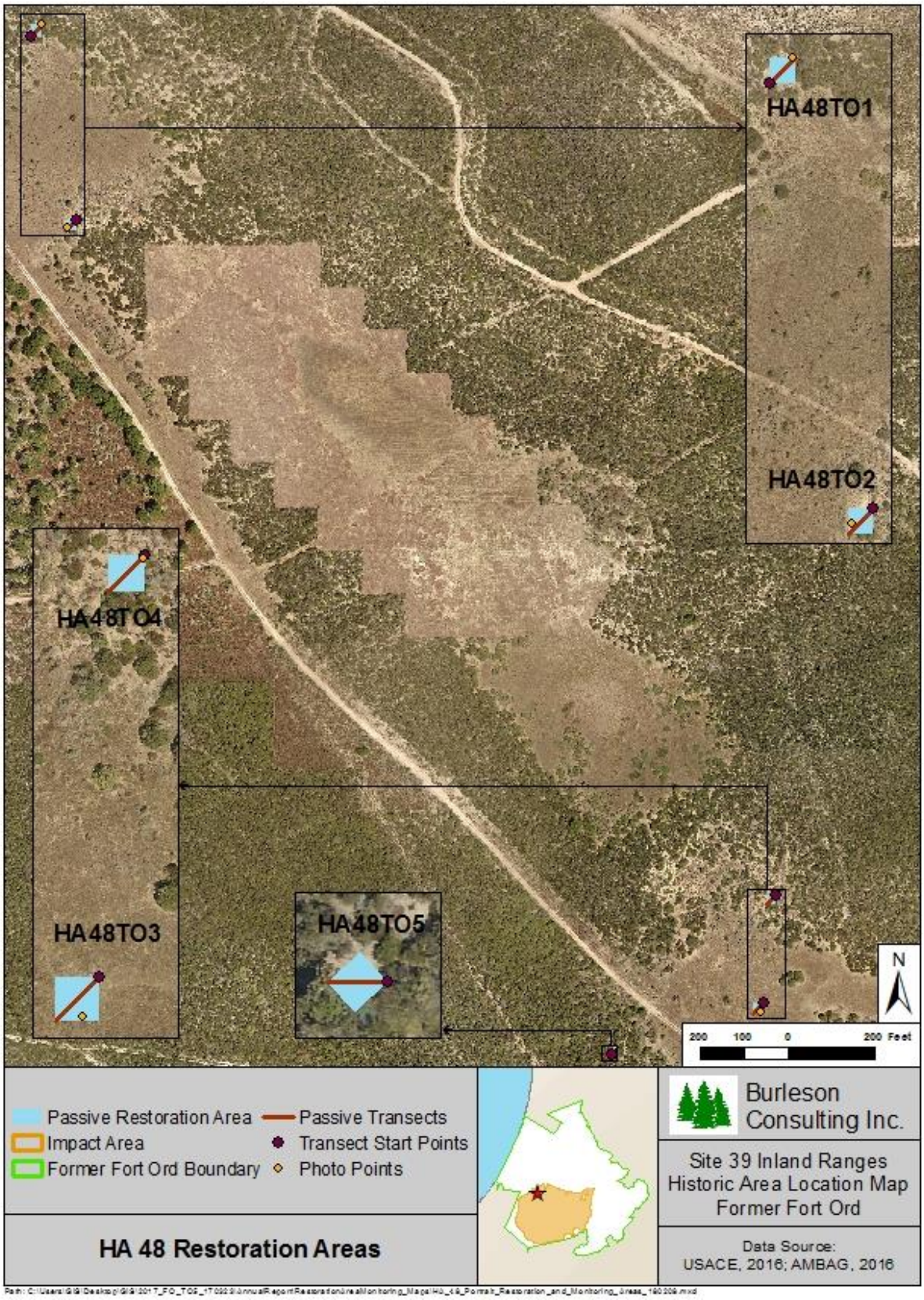


Figure 8-118. HA 48 Restoration Areas and Monitoring Locations Map

Table 8-144. Success Criteria and Acceptable Limits for Restoration of HA 48

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			chamise
			sandmat manzanita[2]
			shaggy-bark manzanita
			Monterey ceanothus[2]
			horkelia
			black sage
			silver bush lupine
			peak rush-rose
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data did not indicate presence of non-native target weed species. No more than 5 percent non- native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or less than 1 percent.
			Monterey ceanothus percent cover, as an average of transect data, must be present however, less than 4 percent is acceptable
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.18.1 Restoration Activities

No passive or active restoration activities have occurred at HA 48 as of 2017.

8.18.2 Monitoring Results

8.18.2.1 HMP Annual Density

No restoration plots have been established for HMP annuals at HA 48. However, HMP annuals were mapped as a part of the meandering transect survey. This survey was completed for Monterey spineflower and sand gilia. Five discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 8-119). The densities ranged from low to medium. The total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.06 acre. The total acreage increased by 0.02 acre from 2016.

One discrete patch of sand gilia was mapped and individuals counted within the patch (see Figure 8-120). The density was low. The total acreage of sand gilia patches with a density at the SSRP baseline density class of low was 0.0035 acre. The total acreage decreased by 0.0045 acre from 2016.

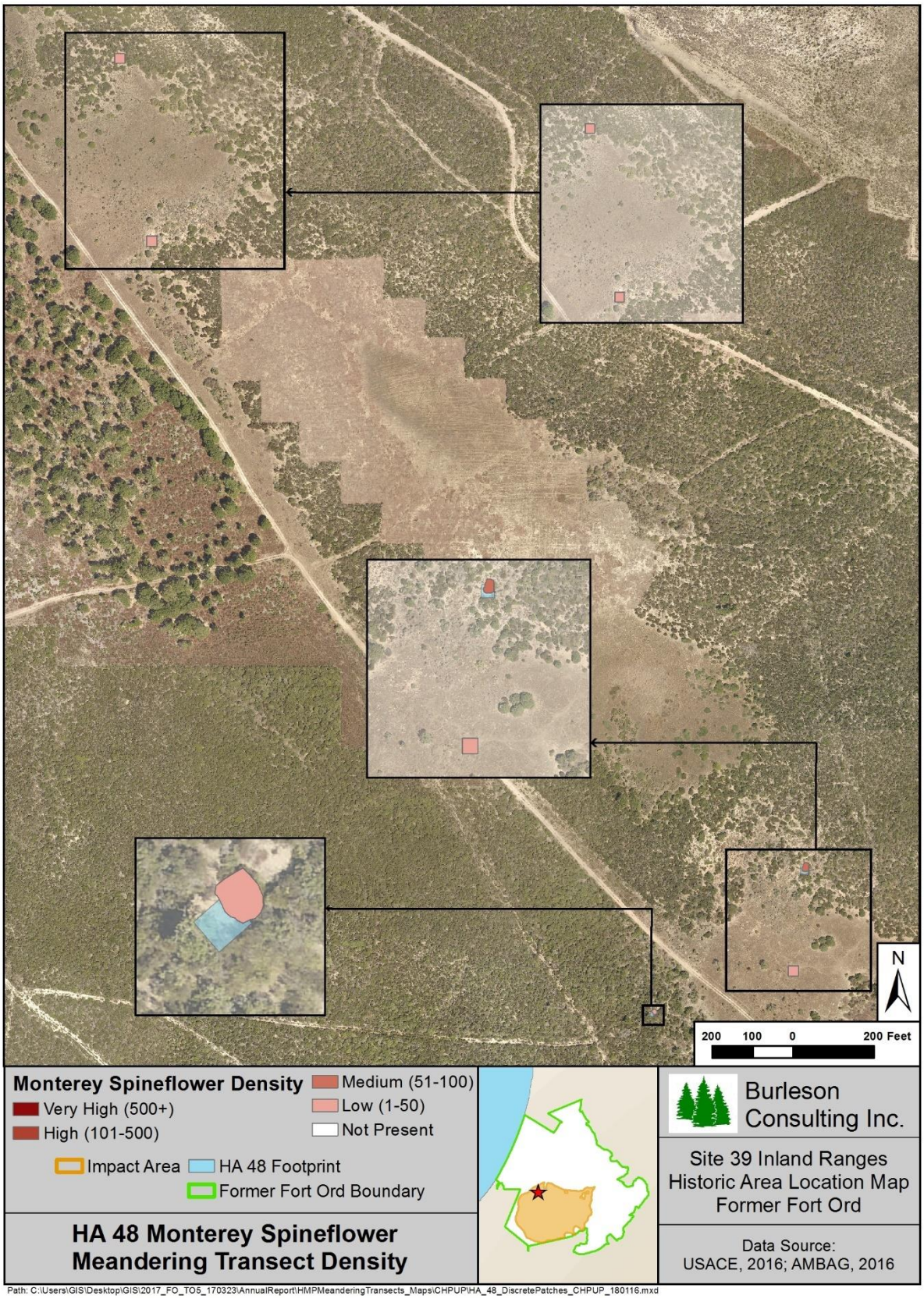


Figure 8-119. HA 48 Monterey Spineflower Meandering Transect Density Map

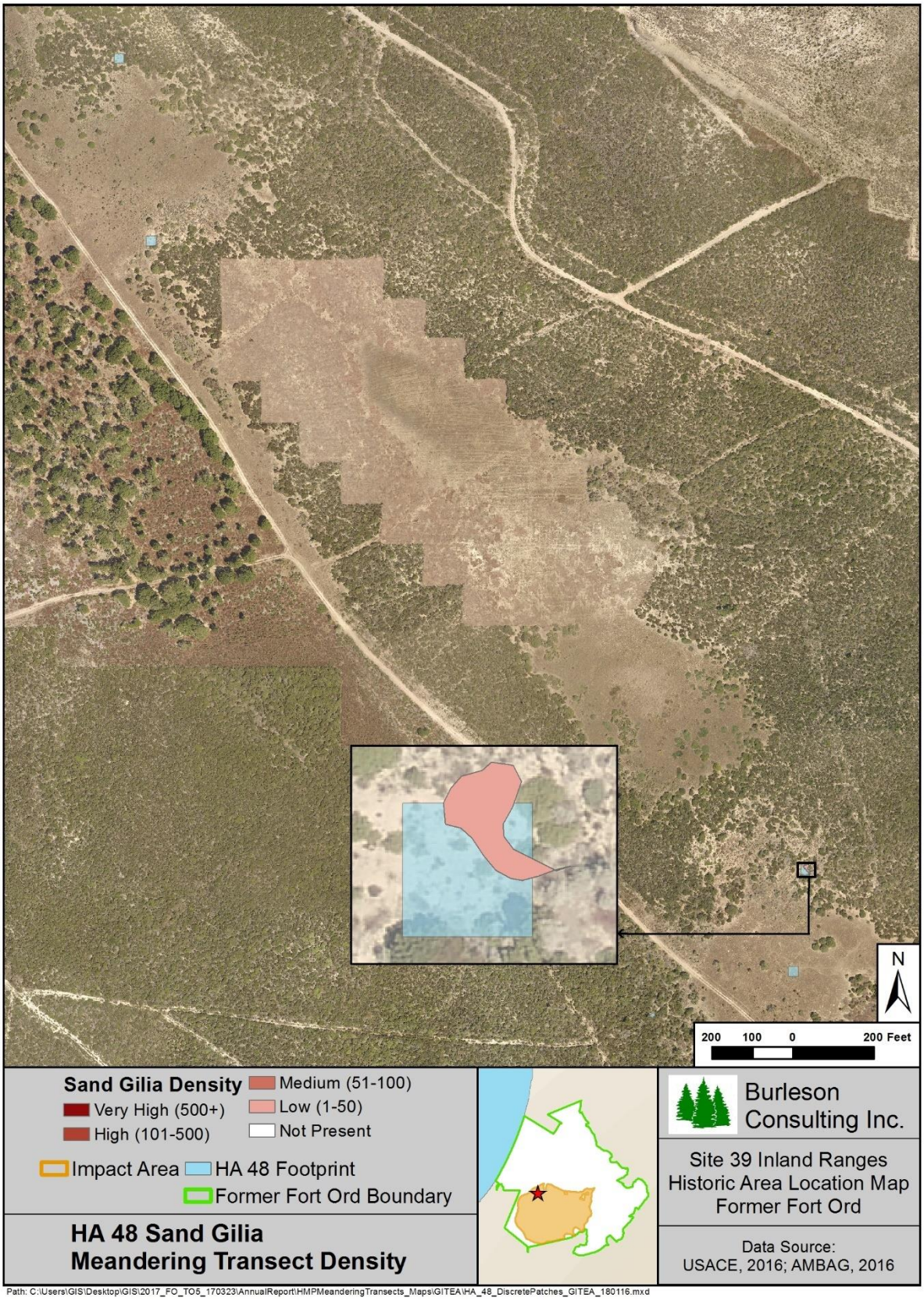


Figure 8-120. HA 48 Sand Gilia Meandering Transect Density Map

8.18.2.2 Plant Survivorship Monitoring

No active restoration was prescribed; therefore, no survivorship data were collected.

8.18.2.3 Species Richness

Fifty-eight species were observed at HA 48. Of those, 20 were native shrubs or perennials, 19 were native annual herbaceous species, 16 were non-native species, and three were not catergorized as they were only identified to genus (see Table 8-145). Species richness increased by fifteen species since 2016. Native shrub and perennial species increased by two, native herbaceous species increased by six, and non-native species increased by four. Species richness data for ten feet on either side of the transect were not collected due to the small areas of the polygons.

Table 8-145. Species Observed on HA 48, 2017

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculata	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Briza maxima	rattlesnake weed	BRMA
Bromus diandrus	ripgut brome	BRDI
Bromus madritensis ssp. *rubens*	red brome	BRMA
Cardionema ramosissimum	sand mat	CARA
Carex sp.	sedge	CA
Castilleja densiflora	owl's clover	CADE
Ceanothus rigidus[1]	Monterey ceanothus	CERI
Cerastium glomeratum	sticky mouse-ear chickweed	CEGL
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Cirsium occidentale var. *candidisssimum*	snowy thistle	CIOCC
Clarkia sp.		CL
Corethrogyne filaginifolia	common sand-aster	COFI
Crassula aquatica	water pygmy-weed	CRAQ
Crocanthemum scoparium	peak rush-rose	CRSC
Croton californicus	California croton	CRCA
Cryptantha sp.		CR?
Deinandra corymbosa	coast tarweed	DECO
Diplacus aurantiacus	sticky monkeyflower	DIAU
Eriastrum virgatum	virgate eriastrum	ERVI
Ericameria ericoides	mock heather	ERER
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filareee	ERCI
Eschscholzia californica	California poppy	ESCA
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Gilia tenuiflora ssp. *arenaria*[1]	sand gilia	GITEA
Horkelia cuneata	wedge-leaved horkelia	HOCU

Table 8-145. Species Observed on HA 48, 2017

Scientific Name	Common Name	Code
Hypochaeris glabra	rough cat's-ear	HYGL
Layia platyglossa	tidy tips	LAPL
Lessingia pectinata	common lessingia	LEPE
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus albifrons var. *albifrons*	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus nanus	sky lupine	LUNA
Madia exigua	little tarweed	MAEX
Madia sativa	coast tarweed	MASA
Navarretia hamata	hooked navarretia	NAHA
Petrorhagia dubia	hairy pink	PEDU
Plantago erecta	California plantain	PLER
Pseudognaphalium californicum	California everlasting	PSCA
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Schismus barbata	old han schismus	SCBA
Silene gallica	small-flower catchfly	SIGA
Stylocline gnaphaloides	everlasting neststraw	STGN
Trifolium gracilentum	pinpoint clover	TRGR
Trifolium macraei	Macrae's clover	TRMA
Trifolium microcephalum	small-head clover	TRMI

[1]HMP species

8.18.2.4 Vegetative Cover

Burleson completed five line-intercept transects ranging from 4.5 to 11 meters in length at HA 48. The transect survey results indicate that the mean vegetative cover by native shrubs and perennials was 20.18%. 2017 is the first year that vegetative cover surveys have been completed at HA 48. Table 8-146 summarizes the vegetation cover, Table 8-147 presents vegetation cover by species, Figure 8-121 presents the percent cover of the dominant species at HA 43 in 2017, and Table 8-148 presents the quadrat results.

Table 8-146. Transect Survey Summary for HA 48

Transect	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA48T01	37.58	37.58	0.00	0.00	0.00	62.42
HA48T02	15.27	9.64	5.64	0.00	18.18	71.82
HA48T03	53.43	2.10	50.29	1.05	99.33	0.00
HA48T04	0.00	0.00	0.00	0.00	6.14	93.86
HA48T05	0.42	0.20	0.00	0.22	7.00	2.00
SITE AVERAGE*	26.05	11.65	13.88	**0.52**	**38.49**	**50.35**

*Transect lengths are not equal. Site averages are weighted to reflect different lengths.

Table 8-147. Transect Survey Results for HA 48 by Species

Transect	ACMI (%)	ACGL (%)	ARPU[1] (%)	ARTO (%)	CERI[1] (%)	COFI (%)	ESCA (%)	FEMY (%)	LAPL (%)	LEPE (%)	LUAL[2] (%)	LUNA (%)	SAME (%)	SIGA (%)	TH (%)	BG (%)
HA48T01	0.00	2.21	24.00	4.32	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.05	0.00	0.00	62.42
HA48T02	0.00	0.00	0.00	0.00	0.00	4.64	0.00	0.00	0.00	1.00	9.64	0.00	0.00	0.00	18.18	71.82
HA48T03	0.00	2.10	0.00	0.00	0.00	0.00	13.33	0.00	35.05	0.00	0.00	1.90	0.00	1.05	99.33	0.00
HA48T04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.14	93.86
HA48T05	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	7.00	2.00
SITE AVERAGE	**0.24**	**1.01**	**5.36**	**0.96**	**0.45**	**1.20**	**3.29**	**0.26**	**8.66**	**0.26**	**2.49**	**0.47**	**1.13**	**0.26**	**38.49**	**50.35**

[1]HMP species

[2]As previously mentioned in subsections 8.13.3.4 silver bush lupine has been identified in the field as *Lupinus albifrons* var. *albifrons* rather than *Lupinus chamissonis*

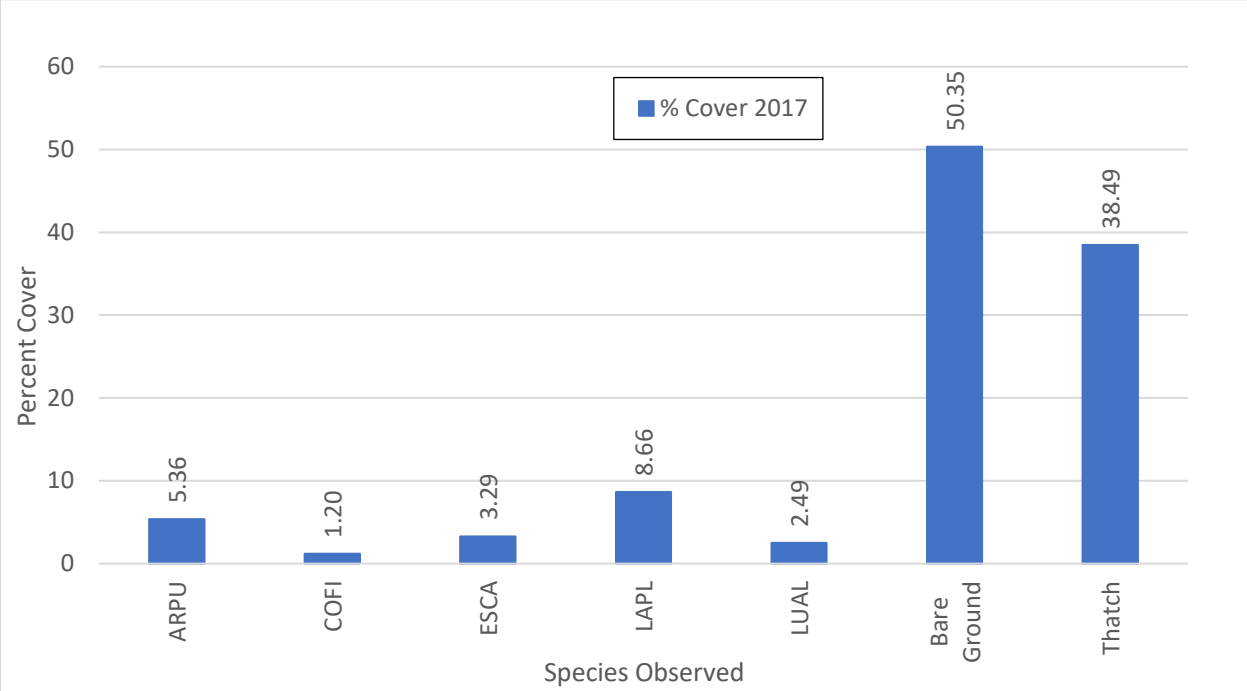


Figure 8-121. Percent Cover of Dominant Species at HA 48 in 2017. Species codes and names are provided in Table 8-132.

Table 8-148. Quadrats Along the Transect Line for T03 Summary for HA48*

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA48T03Q01	20	0	14	6	55	25
HA48T03Q02	52	0	39	13	25	23
SITE AVERAGE	**36**	**0**	**27**	**10**	**40**	**24**

*Only two quadrats were surveyed at Transect 3 because the transect ended at 10.5 meters.

8.18.3 Discussion

8.18.3.1 HMP Annual Density

No restoration plots have been established for HMP annuals at HA 48. However, HMP annuals were mapped as a part of the meandering transect survey. Monterey spineflower and sand gilia met the density success criteria.

8.18.3.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.18.3.3 Species Richness

Sandmat manzanita, shaggy-barked manzanita, Monterey ceanothus, wedge-leaved horkelia, silver bush lupine, black sage, chamise, and peak rush-rose were present. HA 48 included 20 native shrub and perennial species. HA 48 met the species richness success criterion for objective 1.

8.18.3.4 Vegetative Cover

Line-intercept transect surveys provide vegetative cover data for multiple objectives outlined in the SSRP. For objective 1 the data must meet or exceed 40% for native species listed as part of the plant palette. This list includes fourteen shrub and perennial species and three annual species presented in Table 2 of the HA 48 SSRP (Burleson, 2013). However, this list did not include sandmat manzanita even though it is a required HMP shrub species for the site. Therefore, it was included in the calculation for the vegetative cover. Currently the HA has 10.68% vegetative cover; therefore, this success criterion was not met (see Figure 8-122).

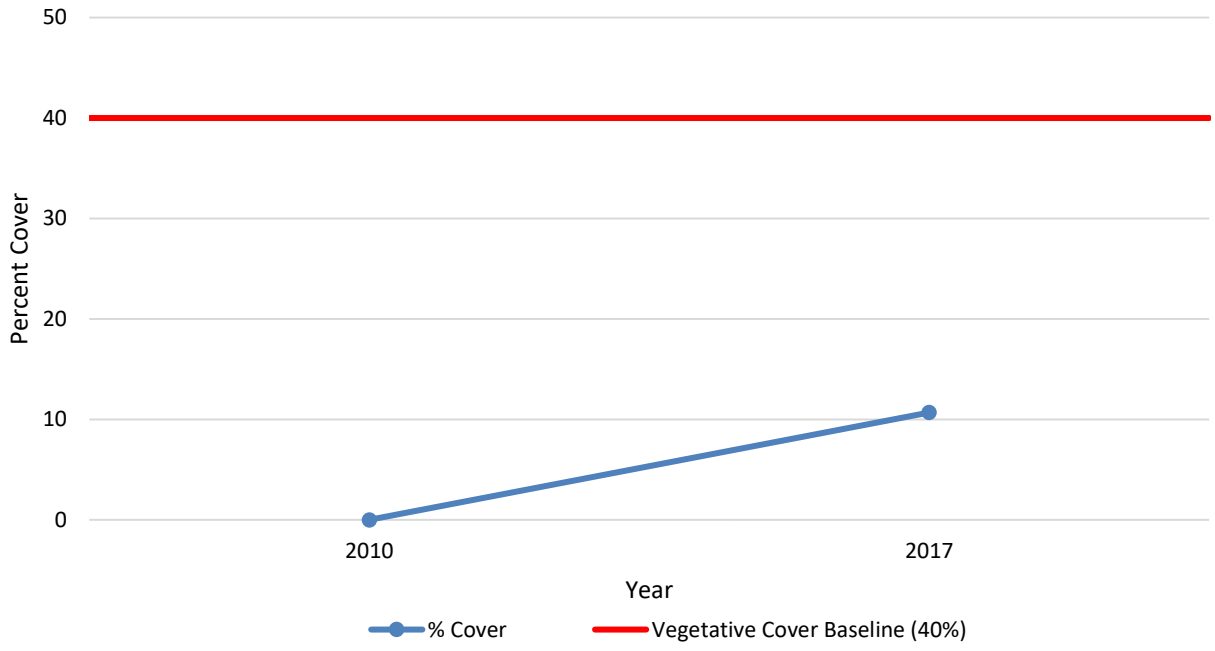


Figure 8-122. Native Vegetative Cover Compared to the Success Criterion at HA 48

Objective 2 considers the percent cover of non-native target weeds. In 2017, target weeds were not observed during transect surveys. The vegetative cover for non-native species was 0.00%. This success criterion was met.

Objective 3 has multiple success criteria relating to vegetative cover. The first is whether the HMP shrub cover class was met or exceeded the baseline cover class of 3. Cover class 3 is from 6-25% of absolute cover. The HMP shrub species at HA 48 are providing an absolute cover of 5.81%, and the HA has not yet met this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 48 this means a vegetative cover average for sandmat manzanita (*Arctostaphylos pumila*) must be equal or greater than 1% and Monterey ceanothus (*Ceanothus rigidus*) must be present. The average vegetative cover for sandmat manzanita was 5.36% and Monterey ceanothus was 0.45% (see Figure 8-123). Sandmat manzanita and Monterey ceanothus were within acceptable limits. The success criterion was met.

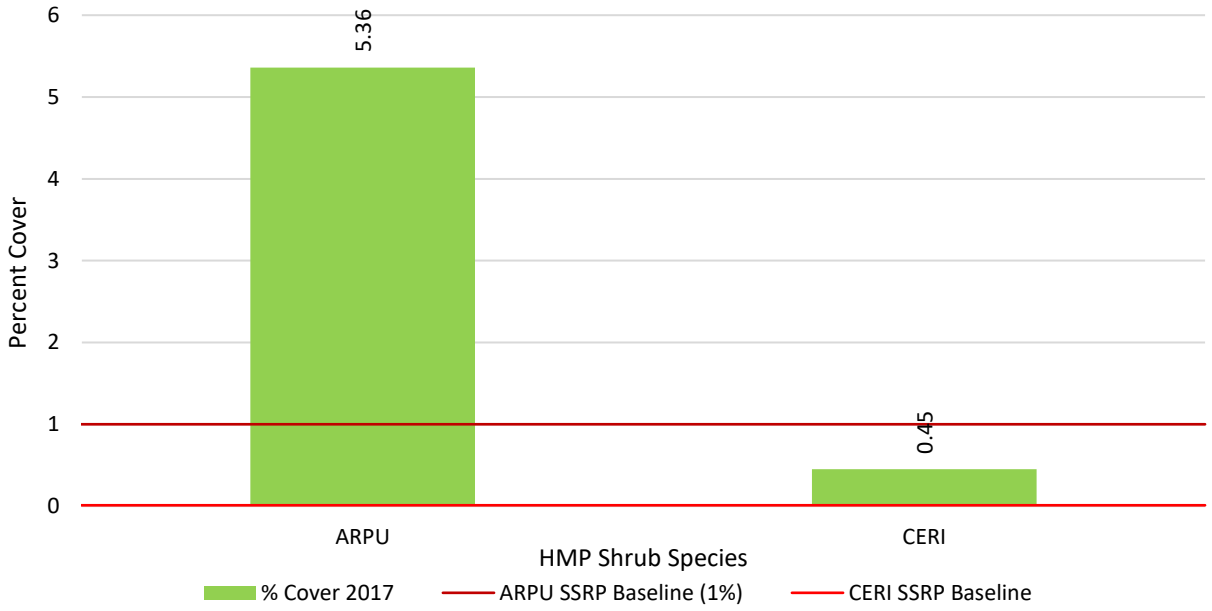


Figure 8-123. HMP Shrub Species Comparison to Success Criteria at HA 48

8.18.3.5 Recommendations

HA 48 was in year 2 of monitoring in 2017 and had generally responded well to natural recruitment. The restoration area met four of the six success criteria by the 2017 monitoring year. Restoration activities will continue to occur in HA 48. As previously recommended, chamise will be planted to maintain meeting the species richness criterion. The Army does not recommend applying the SSRP prescription for HMP annuals to the HA at this time since they are thriving and the site has already achieved the HMP annuals success criteria. A qualitative overview of the site can be observed in the photo point (see Appendix D, page D-18).

HA 48 will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, and vegetative cover line-intercept transects in monitoring year 3, 2018.

Table 8-149 summarizes the current status of HA 48 including which success criteria have been met and which have not as well as our recommendation to move towards meeting all of the success criteria at HA 48.

Table 8-149. Status and Recommendations for Achieving the Success Criteria at HA 48

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	Plant chamise (scheduled 2018)
Objective 1 – No. 2	Native vegetation cover	No	Wait to see how the HA responds
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Wait to see how the HA responds
Objective 3 – No. 4	HMP shrub cover by species	Yes	None
Objective 3 – No. 4	HMP annual density	Yes	Establishment of restoration plots is not necessary

8.19 Austin Road Stockpile

The Austin Road Stockpile encompasses about 0.45 acre and was used by the Army as a stockpile for soil remediation in the area and the site has been used by the Presidio of Monterey Fire Department to provide water to helicopters. The top six inches of soil at the Austin Road Stockpile were already removed. The Austin Road Stockpile rests within maritime chaparral with mean annual temperatures ranging between 56° and 58° F, and regular fog typical with similar maritime climates (USDA Forest Service, 2007). The Austin Road Stockpile is relatively flat. The adjacent lands are not developed and contain substantial amounts of intact native vegetation that will promote natural recruitment at the restoration areas.

The Austin Road Stockpile is located on the western portion of Site 39, occurring within sand hill formation maritime chaparral containing the Baywood soils series based on previous baseline data (USACE, 1992). Baywood soils consist of very deep, somewhat excessively drained soils on old sand dunes and in narrow valleys. Typically, the surface layer is brown, slightly acid loamy sand, 17 inches thick. The underlying material to a depth of 61 inches is brown, slightly acid loamy sand, and sand. In a few areas, the surface layer is fine sand (USDA Forest Service, 2007).

No restoration efforts have occurred at Austin Road Stockpile as of 2017; however, monitoring began in 2016. Austin Road Stockpile was monitored for two years by photo documentation and two years for species richness.

The prescription for passive restoration at the Austin Road Stockpile consisted of hand broadcast non-irrigated seed and annual weed management activities. Austin Road Stockpile is relatively flat with little potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration activities have not commenced at Austin Road Stockpile; however, monitoring began in 2016. Austin Road Stockpile has been monitored for two years by photo documentation and site visits, two years for species richness, and two years for vegetative cover (see Table 8-150). Figure 8-124 shows the site footprint and passive restoration area and photo point monitoring locations. The success criteria for Austin Road Stockpile are summarized in Table 8-151.

Table 8-150. Historic Summary of Restoration and Monitoring Activities at Austin Road Stockpile

Activity	Monitoring Years						
	2016	2017	2018	2019	2020	2021	2026
Photo Points and Site Visit	●	●	●	●	●	●	●
HMP Annual Density across HA	●	●	●				
Species Richness	●	●	●				

8.19.1 Restoration Activities

No passive or active restoration activities have occurred at Austin Road Stockpile as of 2017.

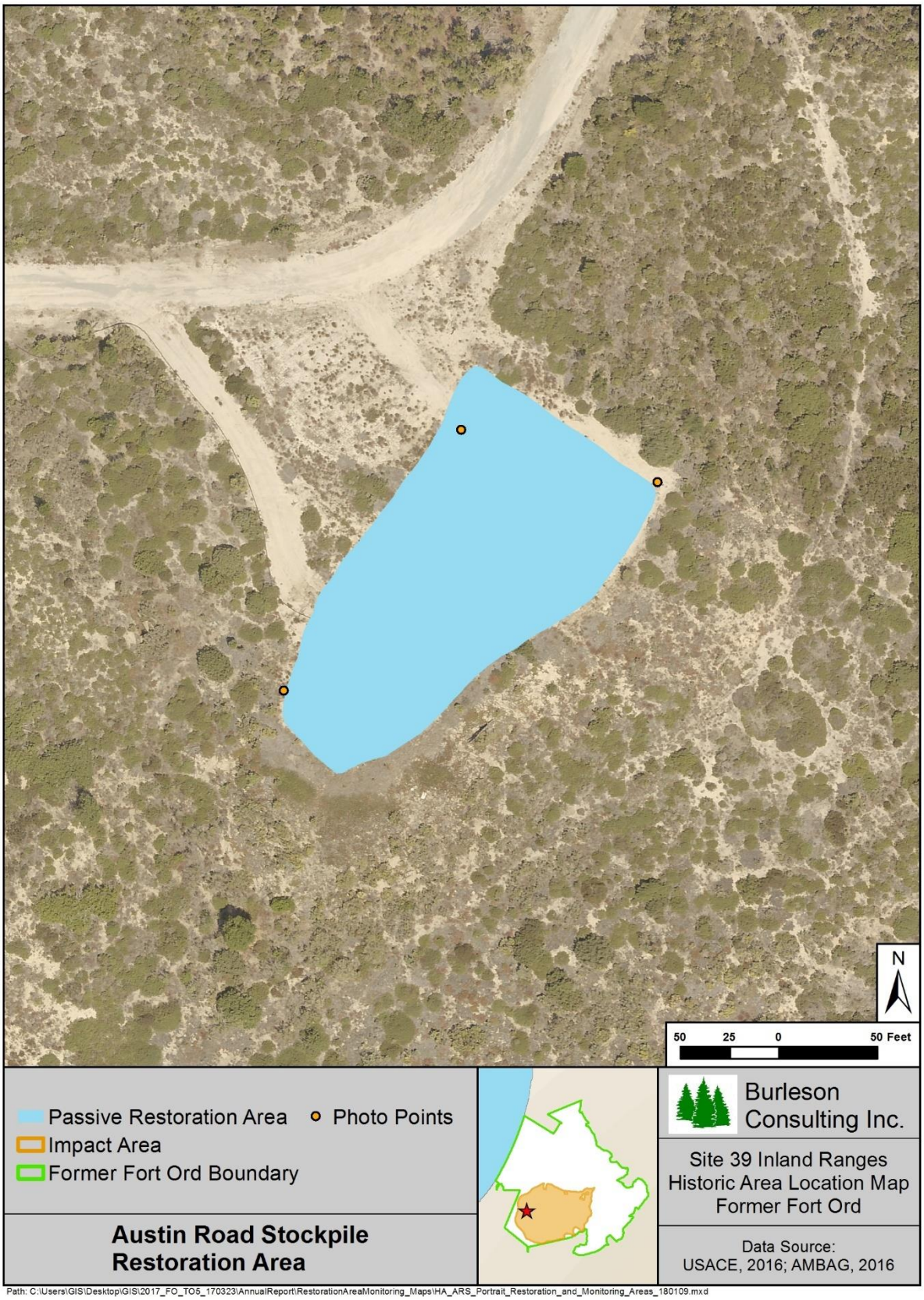


Figure 8-124. Austin Road Stockpile Restoration Areas and Monitoring Locations Map

Table 8-151. Success Criteria and Acceptable Limits for Restoration of Austin Road Stockpile

	Objective 1[1]		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline data.	Native species that must be present to demonstrate richness:
			common yarrow
			chamise
			Hooker's manzanita[2]
			shaggy-bark manzanita
			sandmat manzanita[2]
			coyote brush
			Monterey ceanothus[2]
			Monterey spineflower[2]
			mock heather
			golden yarrow
			peak rush-rose
			horkelia
			deerweed
			silver bush lupine
			sticky monkeyflower
			black sage
2	Percent cover of native species	Percent cover equals 40 percent for native species	For the restoration area, percent cover monitoring data must meet or exceed 40 percent for native species listed as part of the plant palette in Table 2
	Objective 2[1]		
3	Percent cover of non-native target weeds	Percent cover of non-native target weeds must be equal or less than baseline data or equal or less than 5 percent [whichever is lower]	Baseline data did not indicate non-native target weed species. No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3[1]		
4	HMP shrubs percent cover, density, and diversity	HMP shrub cover class must meet or exceed baseline data	Cover class: 3
		No net-loss of HMP shrubs, percent cover, density, diversity must equal baseline HMP data	Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 25.

Table 8-151. Success Criteria and Acceptable Limits for Restoration of Austin Road Stockpile

			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 4.
			Hooker's manzanita percent cover, as an average of transect data, must be equal or greater than 1.
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Low
Notes:	[1]Objectives presented in HRP (Shaw, 2009b)		
	[2]HMP Species		

8.19.2 Monitoring Results

8.19.2.1 HMP Annual Density

No restoration plots have been established for HMP annuals at Austin Road Stockpile. However, HMP annuals were mapped as a part of the meandering transect survey. Four discrete patches of Monterey spineflower were mapped and individuals counted within each patch. The densities ranged from low to high. The total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.01 acre. Both the density range and total acreage increased from 2016, with the total acreage increasing by 0.001 acre from 2016. Figure 8-125 shows the Monterey spineflower meandering transect locations and densities. In addition, one individual sand gilia was mapped (see Figure 8-126).

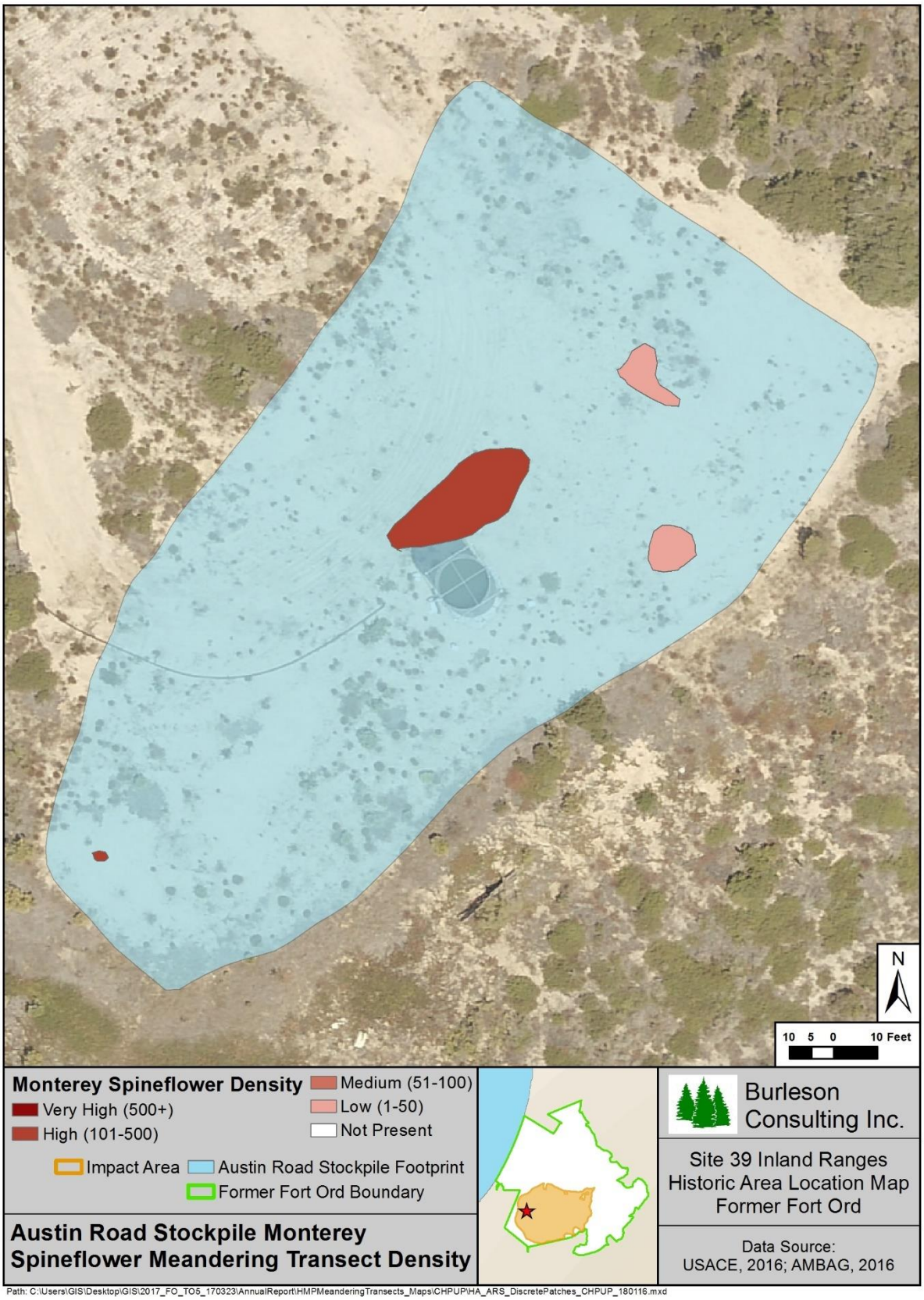


Figure 8-125. Austin Road Stockpile Monterey Spineflower Meandering Transect Density Map

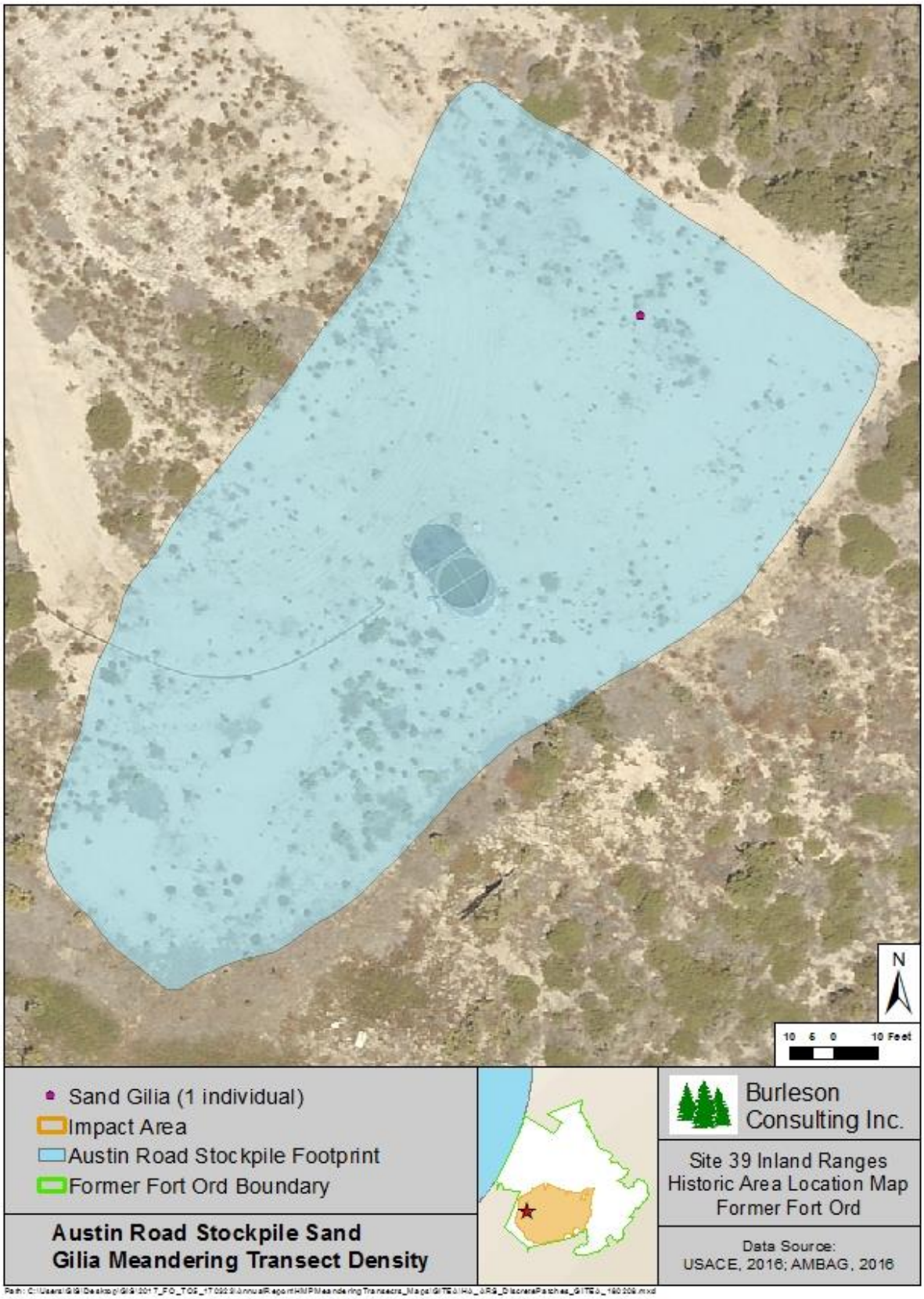


Figure 8-126. Austin Road Stockpile Sand Gilia Meandering Transect Density Map

8.19.2.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.19.2.3 Species Richness

Forty-one species were observed at Austin Road Stockpile. Of those, 16 were native shrubs or perennials, 10 were native annual herbaceous species, 14 were non-native species, and one was not categorized as it was only identified to genus (see Table 8-152). Species richness increased by eight species since 2016. Native shrub and perennial species increased by one, native herbaceous species increased by three, and non-native species increased by three.

Table 8-152. Species Observed at Austin Road Stockpile, 2017

Scientific Name	Common Name	Code
Acmispon glaber	deerweed	ACGL
Acmispon heermannii	Heermann's lotus	ACHE
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Arctostaphylos pumila[1]	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-barked manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Bromus diandrus	ripgut brome	BRDI
Bromus madritensis ssp. *rubens*	red brome	BRMAR
Cardionema ramosissimum	sand mat	CARA
Carpobrotus edulis	Ice plant	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	CHPUP
Corethrogyne filaginifolia	common sandaster	COFI
Crassula tillaea	moss pygmy weed	CRTI
Crocanthemum scoparium	peak rush-rose	CRSC
Ericameria ericoides	mock heather	ERER
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filareee	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Gilia tenuiflora ssp. arenaria[1]	Monterey gilia	GITEA
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's-ear	HYGL
Hypochaeris radicata	hairy cat's-ear	HYRA
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus concinnus	bajada lupine	LUCO
Lupinus nanus	sky lupine	LUNA
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Navarretia sp.		NA
Plantago erecta	California plantain	PLER

Table 8-152. Species Observed at Austin Road Stockpile, 2017

Scientific Name	Common Name	Code
Pseudognaphalium stramineum	cotton-batting plant	PSST
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Silene gallica	small-flower catchfly	SIGA

[1]HMP species

8.19.2.4 Vegetative Cover

No transects or quadrat surveys have been completed at Austin Road Stockpile.

8.19.3 Discussion

8.19.3.1 HMP Annual Density

No restoration plots have been established for HMP annuals at Austin Road Stockpile. However, HMP annuals were mapped as a part of the meandering transect survey. Monterey spineflower has met the density success criterion.

8.19.3.2 Plant Survivorship

No active restoration was prescribed; therefore, no survivorship data were collected.

8.19.3.3 Species Richness

Chamise, sandmat manzanita, shaggy-barked manzanita, coyote brush, Monterey spineflower, mock heather, golden yarrow, peak rush-rose, wedge-leaved horkelia, deerweed, silver bush lupine, and black sage were all present. Austin Road Stockpile included 16 native shrub and perennial species. However, Austin Road Stockpile did not meet the success criterion for objective 1 because common yarrow, Hooker's manzanita, Monterey ceanothus, and sticky monkeyflower were not present.

8.19.3.4 Vegetative Cover

No transects or quadrat surveys have been completed at Austin Road Stockpile.

8.19.3.5 Recommendations

Austin Road Stockpile did not receive any restoration prescriptions by 2017. A qualitative overview of the site can be observed in the photo points from 2016 (see Appendix D, page D-19). Restoration activities will occur in the future at the site.

Austin Road Stockpile will be monitored in 2019 by photo documentation, HMP annual density surveys, and species richness meandering transects.

Table 8-153 summarizes the current status of Austin Road Stockpile including which success criteria have been met and which have not as well as our recommendation to move towards meeting all of the success criteria at Austin Road Stockpile.

Table 8-153. Status and Recommendations for Achieving the Success Criteria at Austin Road Stockpile

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Wait for restoration to begin
Objective 1 – No. 2	Native vegetation cover	Cannot assess	Install transects when appropriate
Objective 2 – No. 3	Non-native target weed cover	Cannot assess	Install transects when appropriate
Objective 3 – No. 4	HMP shrub cover	Cannot assess	Install transects when appropriate
Objective 3 – No. 4	HMP shrub cover by species	Cannot assess	Install transects when appropriate
Objective 3 – No. 4	HMP annual density	Yes	Establishment of restoration plots is not necessary

8.20 Summary of Former Fort Ord Inland Ranges Site 39

HAs are in the early stages of restoration and monitoring. Passive and/or active restoration has been implemented in all but HA 48 and Austin Road Stockpile. Restoration is complete in HAs 18, 19, 22, 23, 27, 27A, 29, 33, 36, 38, 39/40, and 43. HAs range from year 1 to year 5 for monitoring, depending on when the restoration effort took place. HAs 18, 22, 23, 27, 27A, 29, 33, 36, 39/40, 43 are all in year 5 of monitoring. According to the HRP, at the fifth year, each site undergoes a five-year review to determine whether substantial corrective measures should be undertaken to put the site on target for success at year 13 (Shaw, 2009b). The Army recommends corrective measures for HAs 18, 22, 27, 27A, 29, 33, 36, and 43. These corrective measures are outlined in the recommendations subsection for each HA.

Overall, none of the 19 HAs have yet met the complete success criteria. Of the 19, 11 have met the species richness criterion, five have met the native vegetation cover criterion, 17 have met the non-native target weed cover criterion, five have met the HMP shrub cover class criterion, and two have met the HMP shrub cover by species criterion. Out of the thirteen sites that have HMP annual criteria, eleven have met the HMP annual density criterion. Table 8-154 summarizes the status of Site 39 in meeting the success criteria.

Table 8-154. 2017 Status for Achieving Success Criteria at Historic Areas in Former Fort Ord Inland Ranges Site 39

HA	Monitoring Year	Success Criteria					
		Species Richness	Native Vegetation Cover	Non-native Target Weed Cover	HMP Shrub Cover Class	HMP Shrub Cover by Species	HMP Annual Density
18	**5**	**No**	**Yes**	**Yes**	**No**	**No**	**Yes**
19	4	No	Yes	Yes	Yes	No	Yes
22	**5**	**No**	**Yes**	**Yes**	**No**	**No**	**Yes**
23	**5**	**Yes**	**No**	**Yes**	**Yes**	**No**	**Yes**
26	2	Yes	No	Yes	No	No	Yes
27	**5**	**No**	**No**	**Yes**	**No**	**No**	**NA**
27A	**5**	**Yes**	**No**	**Yes**	**No**	**No**	**NA**
28	3	Yes	No	Yes	No	No	Yes
29	**5**	**No**	**No**	**Yes**	**No**	**No**	**NA**
33	**5**	**No**	**No**	**Yes**	**No**	**No**	**Yes**
34	3	Yes	Yes	Yes	No	No	NA
36	**5**	**Yes**	**No**	**No**	**No**	**No**	**NA**
37	4	Yes	No	Yes	No	No	Yes
38	3	Yes	Yes	Yes	Yes	No	No
39/40	**5**	**Yes**	**No**	**Yes**	**Yes**	**NA**	**Yes**
43	**5**	**No**	**No**	**Yes**	**Yes**	**No**	**No**
44	0	Yes	No	Yes	No	Yes	Yes
48	2	Yes	No	Yes	No	Yes	Yes
Austin Rd Stockpile	0	No	Cannot assess*	Cannot assess*	Cannot assess*	Cannot assess*	Yes

*HAs where transect monitoring has not been complete cannot be compared to the success criterion. Transect monitoring will be performed in the future.
NA - the success criterion does not apply.

9. COMMUNITY INVOLVEMENT WORKSHOP / OPEN HOUSE BUS TOUR

In addition to general restoration activities, Burleson participated in the former Fort Ord Clean-Up Open House at the Kemron Building and Bus Tour of Site 39 Inland Range held on February 25, 2017 and July 15, 2017. The Open House provided an opportunity to inform members of the community about the cleanup efforts happening at former Fort Ord.

Burleson personnel prepared a poster highlighting the restoration efforts within Site 39, along with a display of native seeds and plants (see Photo C-47, Appendix C). Burleson biologists interpreted the poster and provided community engagement during the open house and bus tour.

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10. SEVENTH ANNUAL SITE 39 HABITAT RESTORATION MEETING

In accordance with the HRP, annual meetings are held with regulatory agencies and USACE to review and discuss restoration site data, restoration activities, annual monitoring results, and proposed adaptive management strategies for improving restoration success. These meetings also evaluate weed management, sampling protocols, passive versus active restoration approaches, the need to implement corrective measures, and assessment of the 13-year monitoring end point proposed in the HRP.

The Seventh Annual Site 39 Habitat Restoration and Habitat Monitoring Meeting was held at the Base Realignment and Closure conference room on February 21, 2018, at former Fort Ord, California. Participants included USFWS, CDFW, Department of Toxic Substances Control, USACE, Bureau of Land Management, Burleson Consulting Inc., HydroGeologic Inc., Ahtna, Arcadis, Denise Duffy & Associates, EcoSystems West, and Kemron/Gilbane.

Burleson presented information on Site 39 habitat restoration activities for the 2017 calendar year and the overall status of restoration progress.

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APPENDIX A

Seed and Plant Tables

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Table A-1. Seed Collection Targets and Inventory

Scientific Name	Common Name	HA	Target Amount (lb)	Collected (lb)
Achillea millefolium[2]	common yarrow	-	7.03	7.03
Acmispon glaber[2]	deerweed	-	10.91	10.91
Baccharis pilularis	coyote bush	-	0.65	0.65
Ceanothus rigidus[1]	Monterey ceanothus	26	2.27	2.27
Ceanothus rigidus[1]	Monterey ceanothus	37	1.00	1.00
Ceanothus rigidus[1]	Monterey ceanothus	44	0.25	0.25
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	28	0.03	0.03
Chorizanthe pungens var. *pungens*[1]	Monterey spineflower	38	0.02	0.02
Crocanthemum scoparium	rush rose	-	3.18	3.18
Diplacus aurantiacus	sticky monkey flower	-	1.28	1.28
Elymus glaucus[2]	blue wild rye	-	25.62	25.62
Ericameria fasciculata[1]	Eastwood's gold fleece	26	0.23	0.23
Ericameria fasciculata[1]	Eastwood's gold fleece	37	0.20	0.20
Eriophyllum confertiflorum	golden yarrow	-	3.59	3.59
Frangula californica	California coffeeberry	-	0.25	0.25
Garrya elliptica	coast silk tassel	-	1.00	1.00
Gilia tenuiflora ssp. *arenaria*[1]	sand gilia	38	0.0075	0.0075
Hordeum sp.[2]	sterile barley	-	35.13	35.13
Horkelia cuneata	wedge-leaved horkelia			
Lupinus albifrons var. *albifrons*	silver bush lupine	-	1.00	1.00
Lupinus nanus	sky lupine	-	1.00	1.00
Salvia mellifera	black sage	-	4.52	4.52
Stipa cernua	nodding needle grass	-	2.00	2.00
Stipa pulchra	purple needle grass	-	4.00	4.00
Total			**112.32**	**112.32**

Notes:

[1] HMP species

[2] Production or purchased seed

Table A-2. Production Seed Tests Results

Scientific Name	Common Name	Test Date	Pure Seed (%)	Germination (%)	Live seeds per lb
Achillea millefolium	common yarrow	9/26/2017	97.08	75.00	N/A
Acmispon glaber	deerweed	9/26/2017	83.14	77.00	N/A
Elymus glaucus	blue wild-rye	8/24/2017	98.53	83.00	102,592
Horkelia cuneata	wedge-leaved horkelia	-	10.40	-	-
Stipa pulchra	purple needle grass	10/16/2017	99.77	87.00	105,680

Table A-3. Plant Propagation Inventory

Scientific Name	Common Name	HA 26 Inventory	HA 28 Inventory	HA 44 Inventory
Achillea millefolium	common yarrow	414	-	100
Acmispon glaber	deerweed	190	-	35
Adenostoma fasciculatum[2]	chamise	723	-	144
Arctostaphylos pumila[1,2]	sandmat manzanita	1002	948	40
Arctostaphylos tomentosa ssp. *tomentosa*[2]	shaggy-barked manzanita	457	-	58
Baccharis pilularis	coyote brush	202	-	87
Ceanothus rigidus[1]	Monterey ceanothus	414	-	101
Crocanthemum scoparium	peak rush-rose	662	-	150
Diplacus aurantiacus	sticky monkey flower	314	-	-
Eriophyllum confertiflorum	golden yarrow	71	-	-
Ericameria fasciculata[2]	Eastwood's goldenbush	381	-	-
Frangula californica	California coffeeberry	-	-	200
Horkelia cuneata	wedge-leaved horkelia	457	-	122
Lupinus albifrons var. *albifrons*	silver bush lupine	-	-	58
Salvia mellifera	black sage	368	-	15
Total		**5,655**	**948**	**1,110**

Notes:

[1] HMP species

[2] Plant species propagated via cuttings

APPENDIX B

Restoration Activities

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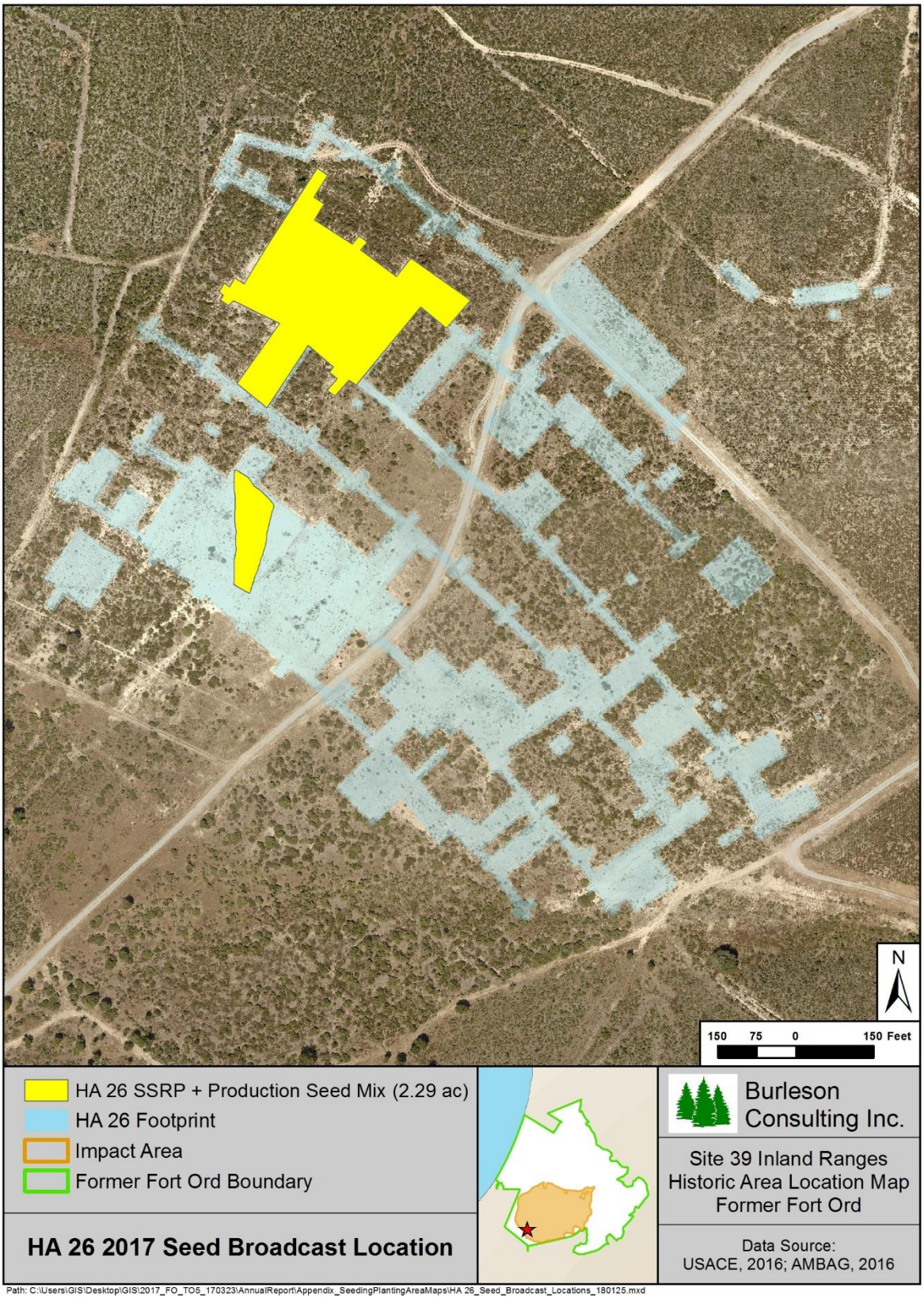

Figure B-1. HA 26 Seed Broadcast Location, Former Fort Ord

Table B-1. HA 26 SSRP Seed Mix Enhanced with Production Seed (Nov 2017)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	18.08
Acmispon glaber **(deerweed)**	10.17
Baccharis pilularis **(coyote brush)**	0.45
Ceanothus rigidus[1] **(Monterey ceanothus)**	2.27
Crocanthemum scoparium **(peak rush-rose)**	1.81
Diplacus aurantiacus **(sticky monkey flower)**	1.13
Elymus glaucus **(blue wild-rye)**	81.36
Ericameria fasciculata[1] **(Eastwood's goldenbush)**	0.23
Eriophyllum confertiflorum **(golden yarrow)**	2.27
Hordeum sp. **(common barley)**	22.65
Horkelia cuneata **(wedge-leaved horkelia)**	9.04
Salvia mellifera **(black sage)**	2.27
TOTAL	**151.73**

[1]HMP species

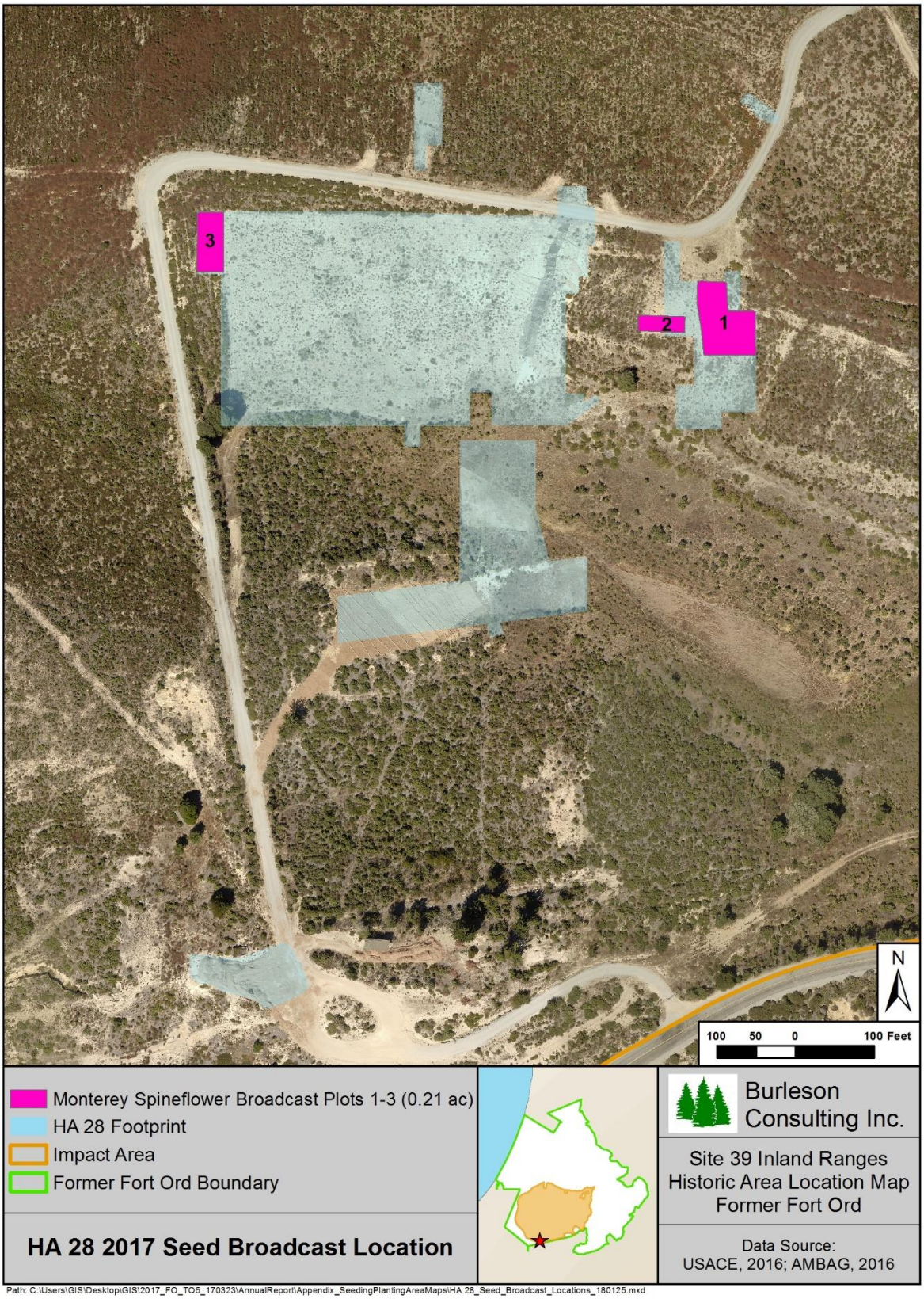

Figure B-2. HA 28 Seed Broadcast Location, Former Fort Ord

Table B-2. HA 28 Monterey Spineflower Seed Broadcast

Plot Name	Date	Amount (lb)	Plot ID	Area (ft^2)
1	Nov 2017	0.020	HA28_CHPUP_01	5,741
2	Nov 2017	0.004	HA28_CHPUP_02	1,204
3	Nov 2017	0.008	HA28_CHPUP_03	2,503
TOTAL		**0.032**		

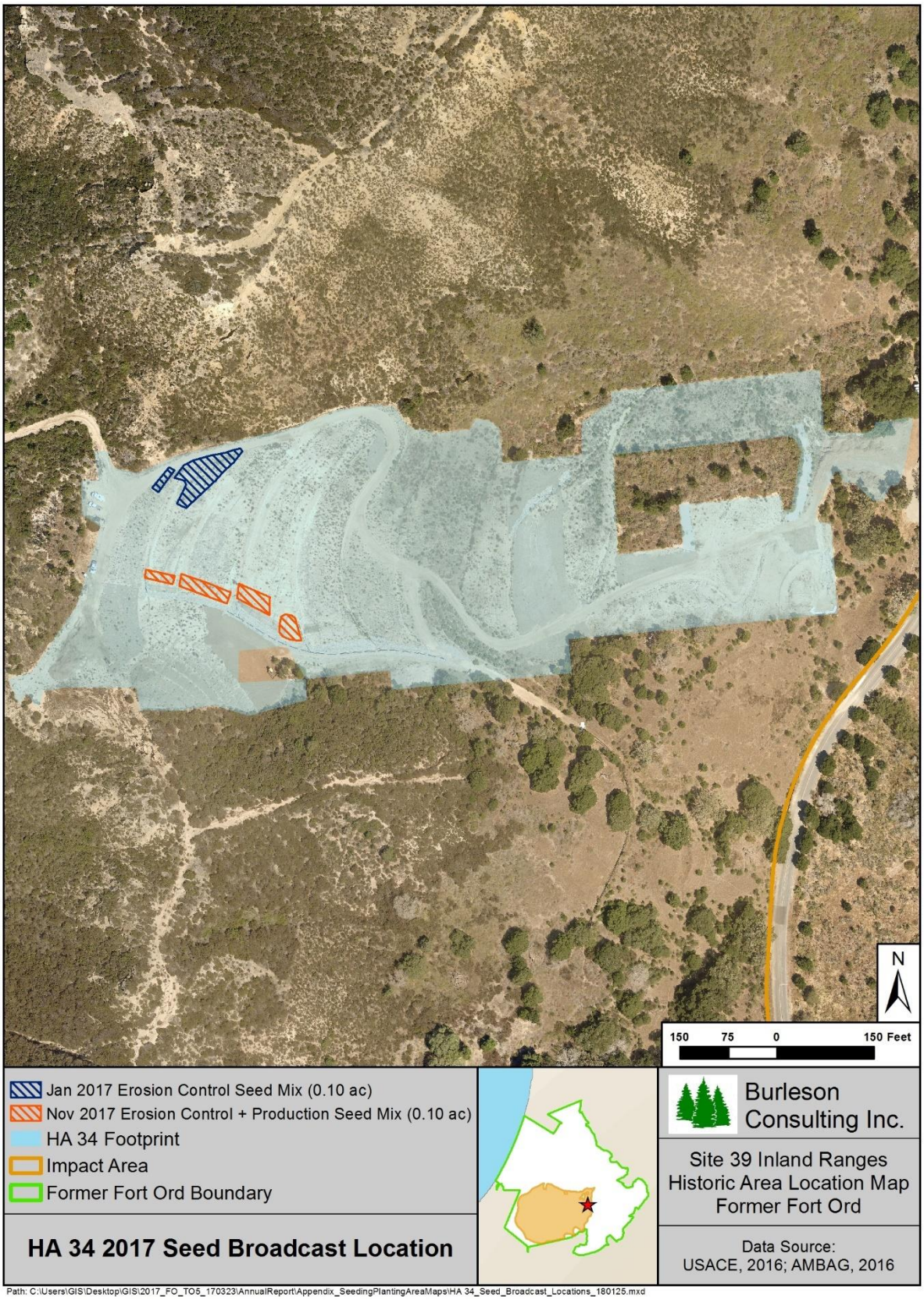

Figure B-3. HA 34 Seed Broadcast Location, Former Fort Ord

Table B-3. HA 34 Erosion Control Seed Mix (Jan 2017)

Species	Amount (lb)
Hordeum sp. **(sterile barley)**	50.00
TOTAL	**50.00**

Table B-4. HA 34 Erosion Control + Production Seed Mix (Nov 2017)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.50
Acmispon glaber **(deerweed)**	1.00
Elymus glaucus **(blue wild-rye)**	27.05
Hordeum sp. **(sterile barley)**	51.20
Horkelia cuneata **(wedge-leaved horkelia)**	1.00
Stipa pulchra **(purple needle grass)**	1.25
TOTAL	**82.00**

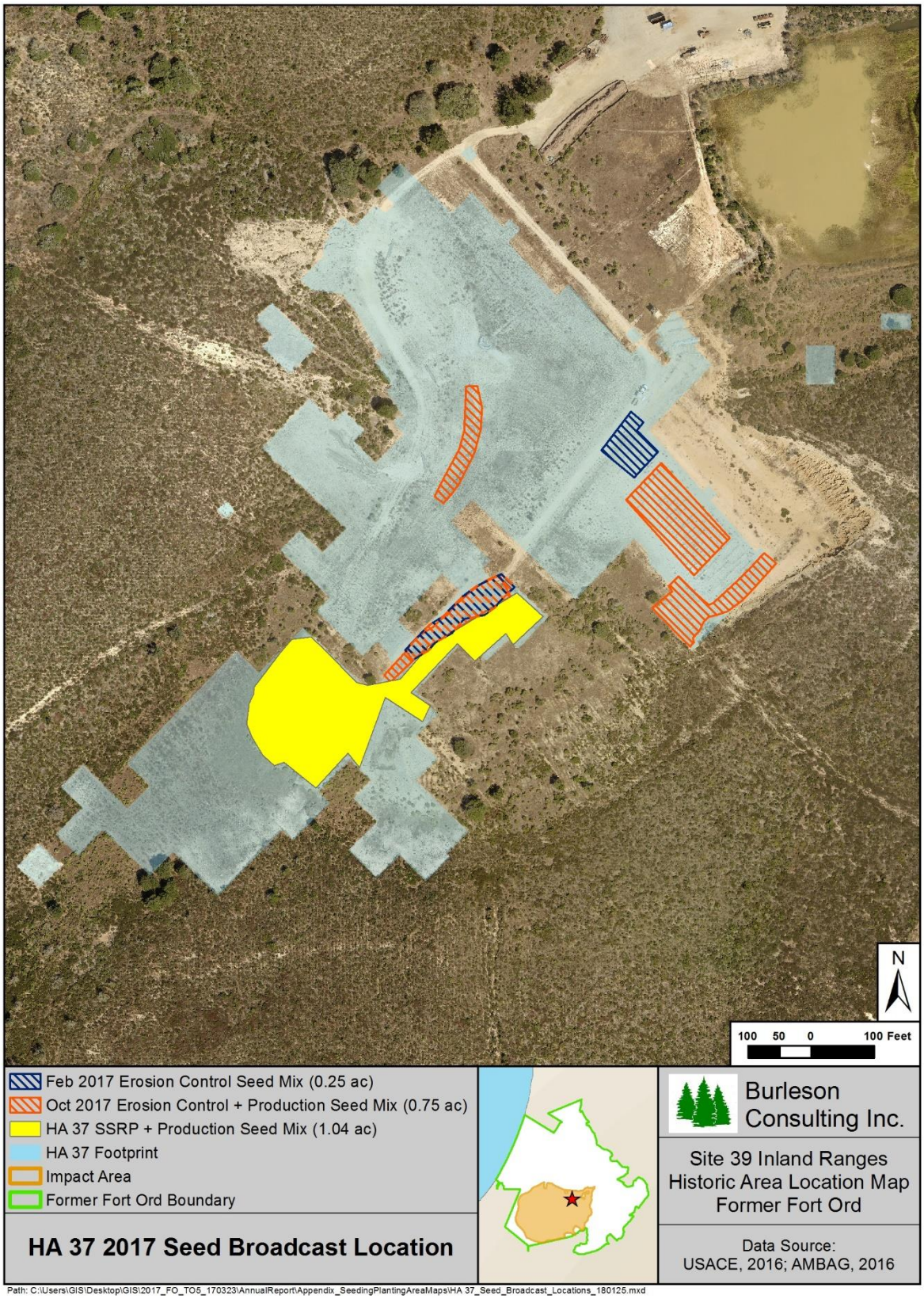

Figure B-4. HA 37 Seed Broadcast Location, Former Fort Ord

Table B-5. HA 37 Erosion Control Seed Mix (Feb 2017)

Species	Amount (lb)
Hordeum sp. **(sterile barley)**	50.00
TOTAL	**50.00**

Table B-6. HA 37 Erosion Control + Production Seed Mix (Oct 2017)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.70
Acmispon glaber **(deerweed)**	1.40
Elymus glaucus **(blue wild-rye)**	28.75
Hordeum sp. **(sterile barley)**	53.00
Horkelia cuneata **(wedge-leaved horkelia)**	1.40
Stipa pulchra **(purple needle grass)**	1.75
TOTAL	**87.00**

Table B-7. HA 37 SSRP Seed Mix Enhanced with Production Seed (Nov 2017)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	8.00
Acmispon glaber **(deerweed)**	4.50
Artemisia californica **(California sagebrush)**	0.00
Baccharis pilularis **(coyote brush)**	0.15
Ceanothus rigidus[1] **(Monterey ceanothus)**	1.00
Crocanthemum scoparium **(peak rush-rose)**	0.75
Diplacus aurantiacus **(sticky monkey flower)**	0.15
Elymus glaucus **(blue wild-rye)**	12.00
Ericameria fasciculata[1] **(Eastwood's goldenbush)**	0.20
Eriophyllum confertiflorum **(golden yarrow)**	1.25
Garrya elliptica **(coast silk tassel)**	1.00
Hordeum sp. **(sterile barley)**	10.00
Horkelia cuneata **(wedge-leaved horkelia)**	4.00
Lupinus albifrons var. *albifrons* **(silver bush lupine)**	0.75
Lupinus nanus **(sky lupine)**	1.00
Salvia mellifera **(black sage)**	2.00
Stipa cernua **(nodding needle grass)**	2.00
Stipa pulchra **(purple needle grass)**	8.00
TOTAL	**56.75**

[1]HMP species

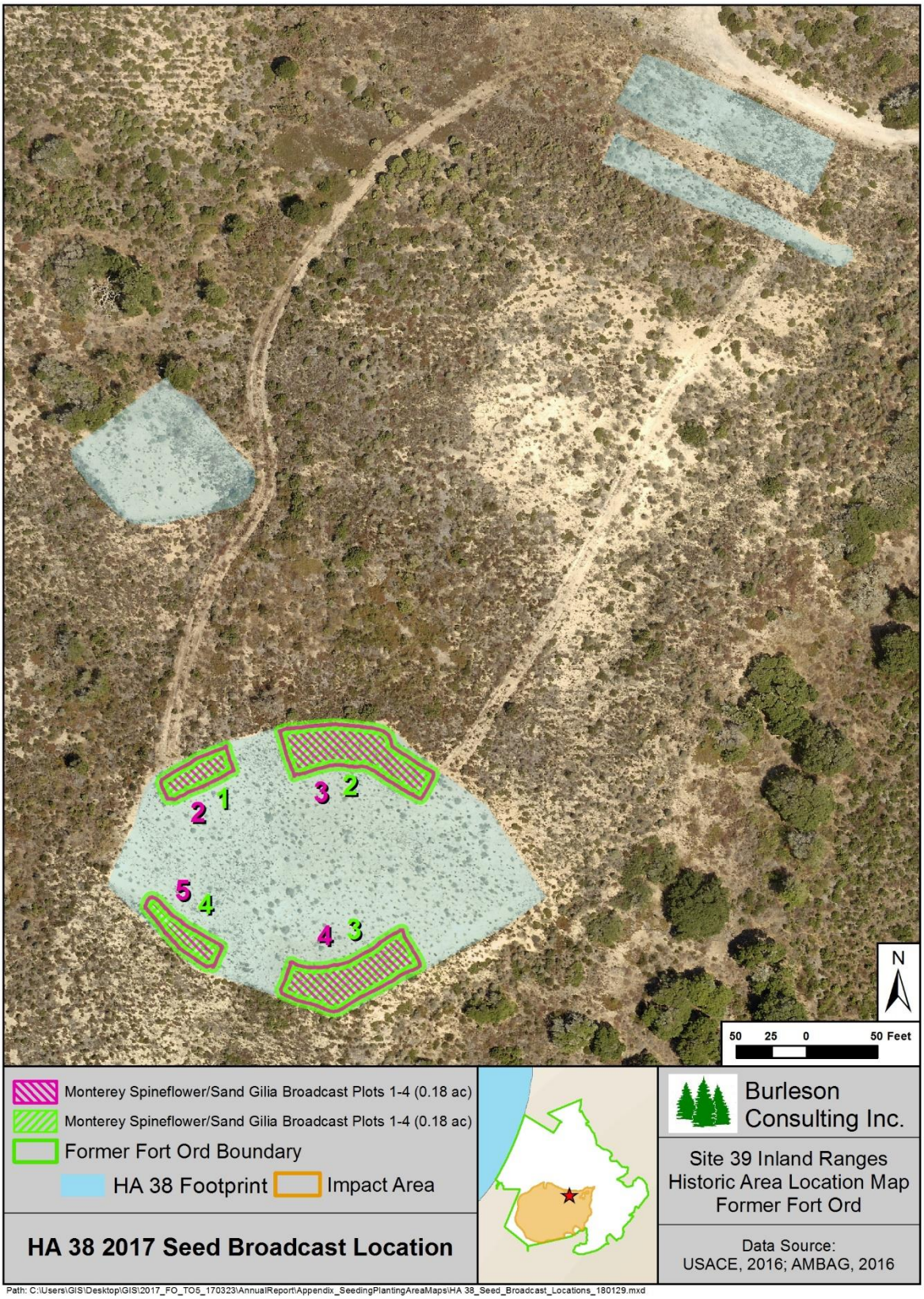

Figure B-5. HA 38 Seed Broadcast Locations, Former Fort Ord

Table B-8 HA 38 Monterey Spineflower Seed Broadcast

Plot Name	Date	Amount (lb)	Plot ID	Area (ft^2)
2	Nov 2017	0.002	HA38_CHPUP_01	939
3	Nov 2017	0.006	HA38_CHPUP_02	2,921
4	Nov 2017	0.005	HA38_CHPUP_03	2,638
5	Nov 2017	0.002	HA38_CHPUP_04	910
TOTAL		**0.015**		

Table B-9. HA 38 Sand Gilia Seed Broadcast

Plot Name	Date	Amount (lb)	Plot ID	Area (ft^2)
1	Nov 2017	0.00093	HA38_GITEA_01	939
2	Nov 2017	0.00290	HA38_GITEA _02	2,921
3	Nov 2017	0.00280	HA38_GITEA _03	2,638
4	Nov 2017	0.00091	HA38_GITEA_04	910
TOTAL		**0.0075**		

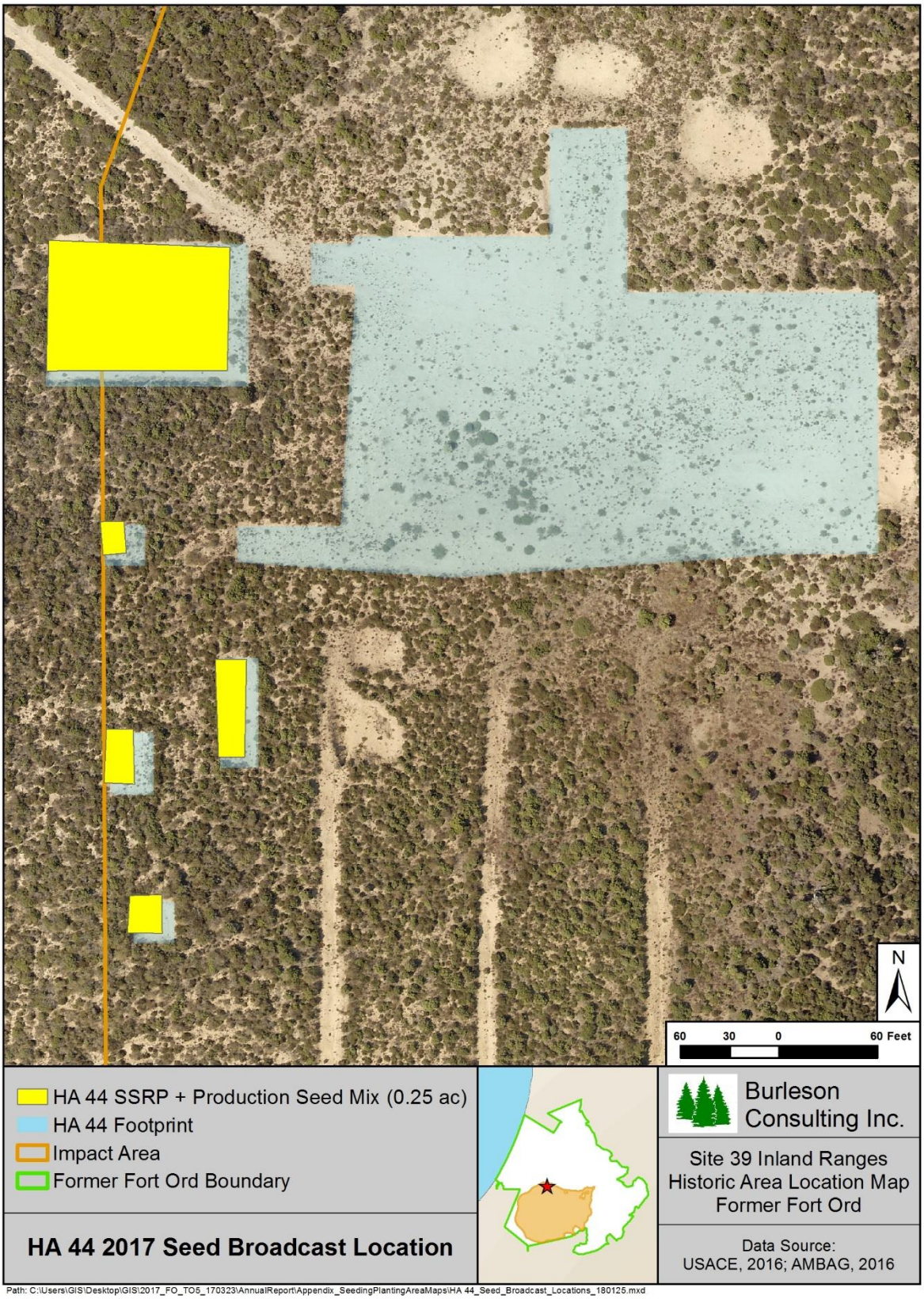

Figure B-6. HA 44 Seed Broadcast Locations, Former Fort Ord

Table B-10. HA 44 SSRP Seed Mix Enhanced with Production Seed (Nov 2017)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	2.00
Acmispon glaber **(deerweed)**	1.69
Baccharis pilularis **(coyote brush)**	0.05
Ceanothus rigidus[1] **(Monterey ceanothus)**	0.25
Crocanthemum scoparium **(peak rush-rose)**	0.62
Elymus glaucus **(blue wild-rye)**	9.00
Eriophyllum confertiflorum **(golden yarrow)**	0.07
Frangula californica **(California coffeeberry)**	0.25
Hordeum sp. **(sterile barley)**	2.48
Horkelia cuneata **(wedge-leaved horkelia)**	1.25
Lupinus albifrons var. albifrons **(silver bush lupine)**	0.25
Salvia mellifera **(black sage)**	0.25
Total	**18.16**

[1]HMP species

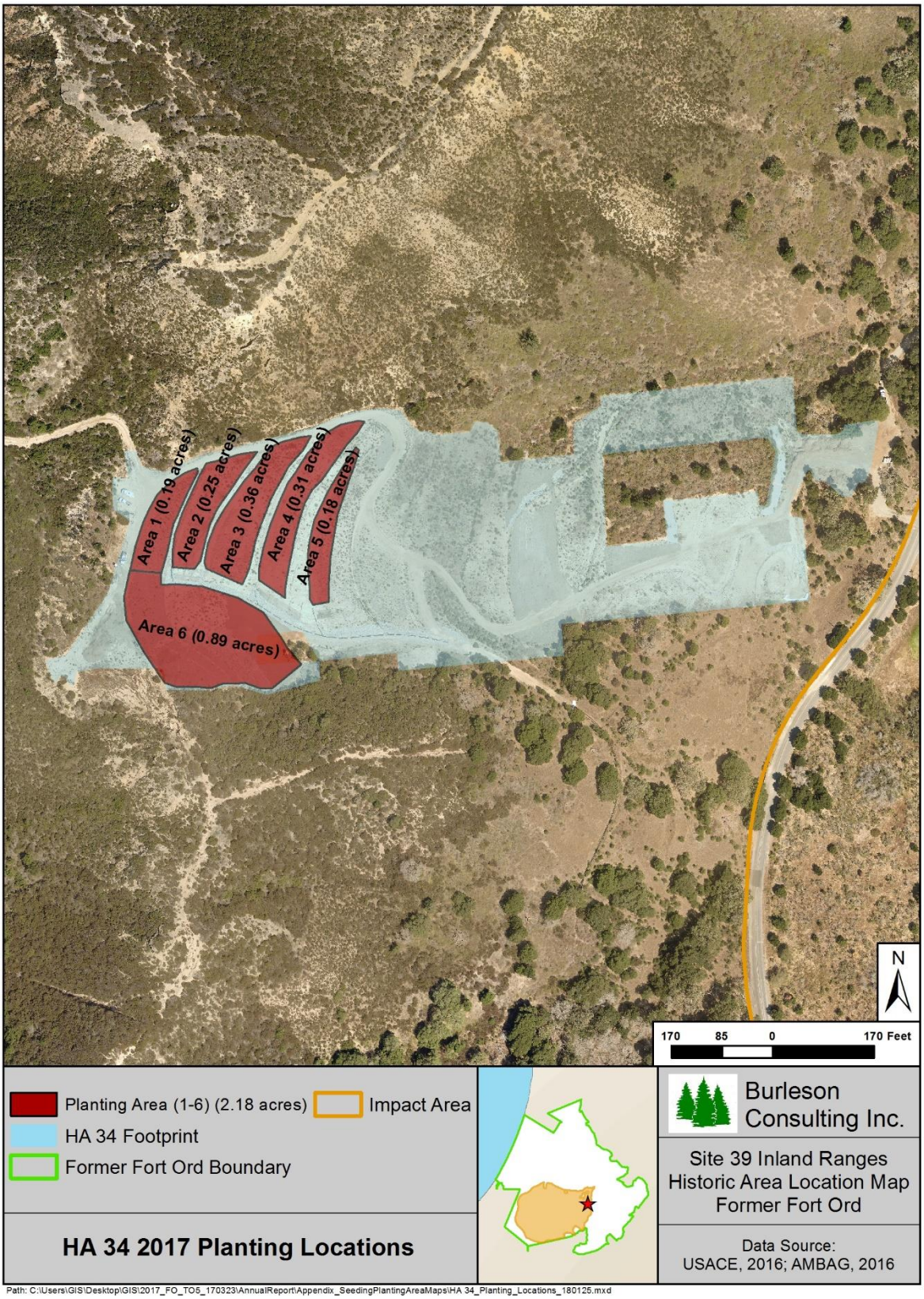

Figure B-7. HA 34 Planting Locations, Former Fort Ord

Table B-11. HA 34 Plant Installation (December 2016 – February 2017)

Species	Species Code	Amount (#)
Achillea millefolium **(common yarrow)**	ACMI	154
Acmispon glaber **(deerweed)**	ACGL	570
Adenostoma fasciculatum **(chamise)**	ADFA	372
Arctostaphylos hookeri[1] **(Hooker's manzanita)**	ARHO	286
Arctostaphylos montereyensis[1] **(Monterey manzanita)**	ARMO	277
Arctostaphylos tomentosa ssp. *tomentosa* **(shaggy-bark manzanita)**	ARTO	118
Artemisia californica **(California sagebrush)**	ARCA	208
Baccharis pilularis **(coyote brush)**	BAPI	270
Ceanothus rigidus[1] **(Monterey ceanothus)**	CERI	556
Crocanthemum scoparium **(peak rush-rose)**	CRSC	534
Diplacus aurantiacus **(sticky monkey flower)**	DIAU	406
Horkelia cuneata **(wedge-leaved horkelia)**	HOCU	91
Lupinus albifrons var. *albifrons* **(silver bush lupine)**	LUAL	108
Lupinus arboreus **(yellow bush lupine)**	LUAR	236
Salvia mellifera **(black sage)**	SAME	30
TOTAL		**4,836**

[1]HMP species

Table B-12. HA 34 Plant Installation (December 2016 – February 2017)

Species Code	Plants Installed per HA 34 Sub-Area (#)						Total # per Species
	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	
ACMI	14	22	24	28	16	50	154
ACGL	13	103	120	126	18	190	570
ADFA	34	44	58	65	37	134	372
ARHO	10	10	10	10	10	236	286
ARMO	10	10	10	10	10	227	277
ARTO	0	0	0	0	0	118	118
ARCA	9	43	51	57	28	20	208
BAPI	35	47	62	44	27	55	270
CERI	31	65	82	81	47	250	556
CRSC	34	70	94	96	40	200	534
DIAU	45	45	84	96	41	75	386
ERCO	13	54	57	64	32	100	320
HOCU	10	20	23	25	13	0	91
LUAL	11	24	28	30	15	0	108
LUAR	9	44	48	58	37	40	236
SAME	35	70	76	86	63	0	330
TOTAL	**313**	**691**	**827**	**876**	**434**	**1695**	**4,836**

[1]HMP species

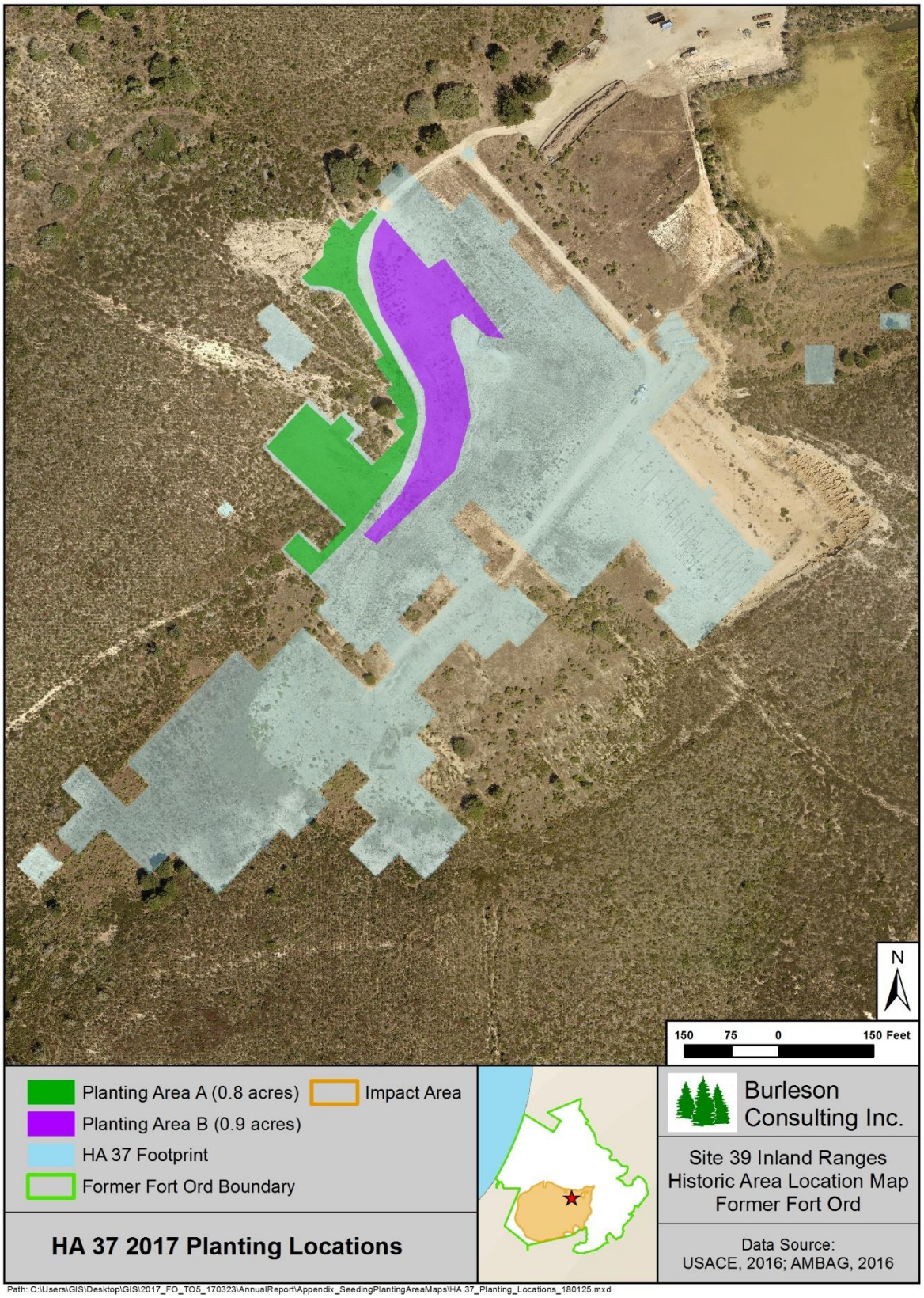

Figure B-8. HA 37 Planting Locations, Former Fort Ord

Table B-13. HA 37 Plant Installation (February – March 2017)

Species	Species Code	Amount (#)
Achillea millefolium **(common yarrow)**	ACMI	171
Acmispon glaber **(deerweed)**	ACGL	20
Adenostoma fasciculatum **(chamise)**	ADFA	140
Arctostaphylos hookeri[1] **(Hooker's manzanita)**	ARHO	157
Arctostaphylos montereyensis[1] **(Monterey manzanita)**	ARMO	206
Arctostaphylos pumila[1] **(sandmat manzanita)**	ARPU	237
Arctostaphylos tomentosa var. *tomentosa* **(shaggy-barked manzanita)**	ARTO	356
Artemisia californica **(California sagebrush)**	ARCA	155
Baccharis pilularis **(coyote brush)**	BAPI	329
Ceanothus rigidus[1] **(Monterey ceanothus)**	CERI	140
Crocanthemum scoparium **(peak rush-rose)**	CRSC	286
Diplacus aurantiacus **(sticky monkey flower)**	DIAU	380
Eriophyllum confertiflorum **(golden yarrow)**	ERCO	227
Garrya elliptica **(coast silk tassel)**	GAEL	2
Horkelia cuneata **(wedge-leaved horkelia)**	HOCU	395
Lupinus albifrons var. *albifrons* **(silver bush lupine)**	LUAL	242
Lupinus arboreus **(yellow bush lupine)**	LUAR	262
Salvia mellifera **(black sage)**	SAME	258
TOTAL		**3,963**

[1]HMP species

Table B-14. HA 37 Plant Installation by Sub-Area (February – March 2017)

Species Code	Plants Installed per HA 37 Sub-Area (#)	
	Area A	Area B
ACMI	81	90
ACGL	20	0
ADFA	52	88
ARHO	137	20
ARMO	186	20
ARPU	217	20
ARTO	356	0
ARCA	0	155
BAPI	49	280
CERI	100	40
CRSC	37	249
DIAU	135	245
ERCO	113	114
GAEL	2	0
HOCU	72	323
LUAL	100	142
LUAR	100	162
SAME	158	100
TOTAL	**1,915**	**2,048**

[1]HMP species

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APPENDIX C

Photo Log

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Photo Description	Photo
Plant Salvage Burleson biologist collecting *Frangula californica* seed on Fort Ord National Monument. **C-1**	
Plant Salvage Burleson biologist collecting *Ceanothus rigidus* seed on Fort Ord National Monument. **C-2**	

Photo Description	Photo
Plant Salvage *Ceanothus rigidus* seed during collection. **C-3**	
Plant Salvage *Stipa cernua* seed during collection. **C-4**	

Photo Description	Photo
Plant Salvage Burleson biologist collecting *Arctostaphylos pumila* cuttings near HA 28. **C-5**	
Plant Salvage *Arctostaphylos pumila* cuttings collected near HA 28. **C-6**	

Photo Description	Photo
Plant Material Storage, Processing and Propagation Seed stored in drying racks at Burleson's native plant nursery. **C-7**	
Plant Material Storage, Processing and Propagation Burleson biologist processing *Arctostaphylos tomentosa* cuttings. **C-8**	

Photo Description	Photo
Plant Material Storage, Processing and Propagation Burleson biologist sowing *Crocanthemum scoparium* seed. **C-9**	
Plant Material Storage, Processing and Propagation *Arctostaphylos* sp. cuttings propagating in Burleson's greenhouse. **C-10**	

Photo Description	Photo
Plant Material Storage, Processing and Propagation *Achillea millefolium* propagating in Burleson's greenhouse. **C-11**	
Plant Material Storage, Processing and Propagation *Diplacus aurantiacus* propagation. **C-12**	

Photo Description	Photo
Plant Material Storage, Processing and Propagation *Baccharis pilularis* propagation. **C-13**	
Plant Material Storage, Processing and Propagation Transplanting *Arctostaphylos pumila* cutting with strong root growth. **C-14**	

Photo Description	Photo
Plant Material Storage, Processing and Propagation *Arctostaphylos pumila* cuttings propagating in Burleson's hoop houses. **C-15**	
Plant Material Storage, Processing and Propagation *Frangula californica* propagation. **C-16**	

Photo Description	Photo
Plant Material Storage, Processing and Propagation Burleson greenhouse manager watering plants at the nursery. **C-17**	
Seed Production *Acmispon glaber* growing in the seed production plot. **C-18**	

Photo Description	Photo
Seed Production *Achillea millefolium* cut from production plot. **C-19**	
Seed Production *Stipa pulchra* cut from production plot. **C-20**	

Photo Description	Photo
Seed Production *Achillea millefolium* and *Stipa pulchra* seed from production plots. **C-21**	
Restoration Activities Burleson biologist broadcasting seed at HA 26. **C-22**	

Photo Description	Photo
Restoration Activities Burleson biologist raking in broadcast seed to establish good seed-soil contact at HA 26. **C-23**	
Restoration Activities Restoration team applying fresh straw over broadcast seed at HA 26. **C-24**	

Photo Description	Photo
Restoration Activities Fresh straw applied to broadcast seed at HA 26. **C-25**	
Restoration Activities Burleson biologist broadcasting *Chorizanthe pungens* var. *pungens* seed at HA 28. **C-26**	

Photo Description	Photo
Restoration Activities Seed mixed and ready for broadcast at HA 37. **C-27**	
Restoration Activities Burleson biologist broadcasting seed at HA 37. **C-28**	

Photo Description	Photo
Restoration Activities Burleson biologists raking in seed for good seed-soil contact at HA 37. **C-29**	
Restoration Activities Burleson biologist applying fresh straw over broadcast seed at HA 37. **C-30**	

Photo Description	Photo
Restoration Activities Fresh straw applied to seed after broadcast at HA 37. **C-31**	
Restoration Activities *Gilia tenuiflora* ssp. *arenaria* seed ready for broadcast at HA 38. **C-32**	

Photo Description	Photo
Restoration Activities Burleson biologist broadcasting *Gilia tenuiflora* ssp. *arenaria* seed at HA 38. **C-33**	
Restoration Activities *Chorizanthe pungens* var. *pungens* seed ready for broadcast at HA 38. **C-34**	

Photo Description	Photo
Restoration Activities *Chorizanthe pungens* var. *pungens* seed broadcast at HA 38. **C-35**	
Restoration Activities Burleson biologist raking in *Chorizanthe pungens* var. *pungens* and *Gilia tenuiflora* ssp. *arenaria* seed at HA 38. **C-36**	

Photo Description	Photo
Restoration Activities Burleson biologist broadcasting seed at HA 44. **C-37**	
Restoration Activities Fresh straw applied to seed after broadcast at HA 44. **C-38**	

Photo Description	Photo
Restoration Activities Burleson biologists laying out plants for installation at HA 34. **C-39**	
Restoration Activities Plants laid out for installation at HA 34. **C-40**	

Photo Description	Photo
Restoration Activities Burleson biologists installing plants at HA 34. **C-41**	
Restoration Activities Burleson biologist auguring holes for plant installation at HA 37. **C-42**	

Photo Description	Photo
Restoration Activities Burleson biologist laying out plants on netting for installation at HA 37. **C-43**	
Restoration Activities Burleson biologist installing plants in mulch at HA 37. **C-44**	

Photo Description	Photo
Erosion Control Activities Burleson receiving erosion control materials. **C-45**	
Erosion Control Activities Erosion control supplies stored at Burleson's storage unit in Del Rey Oaks. **C-46**	

Photo Description	Photo
Erosion Control Activities Erosion features to be fixed at HA 34. **C-47**	
Erosion Control Activities Burleson team breaking down rills and trenching in straw wattles at HA 34. **C-48**	

Photo Description	Photo
Erosion Control Activities Burleson team applying mulch to collapsed rills at HA 34. **C-49**	
Erosion Control Activities Burleson biologist applying *Hordeum* sp. seed to mulched areas at HA 34. **C-50**	

Photo Description	Photo
Erosion Control Activities Burleson biologist collapsing rills at HA 37. **C-51**	
Erosion Control Activities Mulch application in collapsed rills at HA 37. **C-52**	

Photo Description	Photo
Erosion Control Activities Mulch in collapsed rills at HA 37. **C-53**	
Erosion Control Activities Burleson team rolling out coir fabric at HA 37. **C-54**	

Photo Description	Photo
Erosion Control Activities Burleson team installing coir fabric and straw wattles at HA 37. **C-55**	
Erosion Control Activities Coir fabric and straw wattles installed at HA 37. **C-56**	

Photo Description	Photo
Monitoring Activities Burleson biologist conducting HMP forb density surveys at HA 22. **C-57**	
Monitoring Activities Line-intercept transect at HA 19. **C-58**	

Photo Description	Photo
Monitoring Activities Burleson biologist conducting meandering transect survey at HA 26. **C-59**	
Monitoring Activities Burleson biologist conducting survivorship monitoring at HA 28. **C-60**	

Photo Description	Photo
BRAC Open House Burleson biologists showing the public native plants at the BRAC Open House. **C-61**	

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APPENDIX D

Photo Points

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Photo Points	
	
HA 18 | October 2011	HA 18 | April 2017

Photo Points	
	
HA 19 | May 2013	HA 19 | May 2017

Photo Points	
	
HA 22 | October 2011	HA 22 | April 2017

Photo Points	
	
HA 23 | October 2011	HA 23 | April 2017

Photo Points	
	
HA 26 | May 2016	HA 26 | May 2017

Photo Points	
	
HA 27 | October 2011	HA 27 | April 2017

Photo Points	
	
HA 27A | October 2011	HA 27A | April 2017

Photo Points	
	
HA 28 | April 2014	HA 28 | April 2017

Photo Points	
	
HA 29 | October 2011	HA 29 | April 2017

Photo Points	
	
HA 33 | October 2011	HA 33 | January 2018

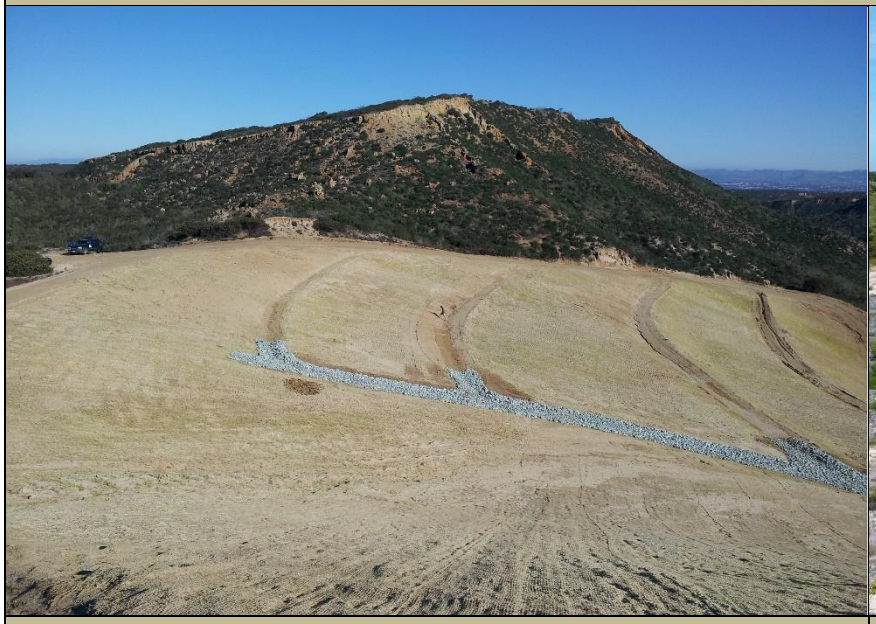
Photo Points	
	
HA 34 | January 2013	HA 34 | April 2017

Photo Points	
	
HA 36 | October 2011	HA 36 | April 2017

Photo Points	
	
HA 37 | April 2014	HA 37 | April 2017

Photo Points	
	
HA 38 | April 2014	HA 38 | April 2017

Photo Points	
	
HA 39/40 | October 2011	HA 39/40 | April 2017

Photo Points	
	
HA 43 | October 2011	HA 43 | April 2017

Photo Points	
	
HA 44 | May 2016	HA 44 | June 2017

Photo Points	
	
HA 48 | April 2016	HA 48 | October 2017

Photo Points	
	
Austin Rd Stockpile | May 2016	Austin Rd Stockpile | April 2017

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APPENDIX E

Photo Points
Time Lapse Series for HAs in Year 5

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Photo Points – HA 18

October 2011

April 2012

April 2013

April 2015

April 2016

April 2017

Photo Points – HA 22

October 2011

October 2012

April 2013

April 2015

April 2016

April 2017

Photo Points – HA 23

October 2011

April 2013

April 2014

April 2015

December 2016

April 2017

Photo Points – HA 27		
		
October 2011	April 2013	April 2014
		
April 2015	May 2016	April 2017

Photo Points – HA 27A

October 2011

April 2013

April 2014

April 2015

April 2016

April 2017

Photo Points – HA 29

October 2011

April 2013

April 2014

April 2015

May 2016

April 2017

Photo Points – HA 33

October 2011

April 2013

April 2014

April 2015

May 2016

January 2018

Photo Points – HA 36

October 2011

April 2013

April 2014

April 2015

April 2016

April 2017

Photo Points – HA 39/40

October 2011

April 2013

April 2014

April 2015

April 2016

April 2017

Photo Points – HA 43

October 2011

April 2013

April 2014

April 2015

April 2016

April 2017