2018 ANNUAL REPORT
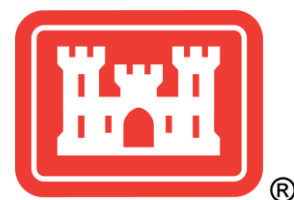# FORMER FORT ORD SITE 39 HABITAT RESTORATION
CONTRACT NO. W91238-14-D-0010
TASK ORDER W9123817F0024

FORMER FORT ORD

Prepared for:

US Army Corps of Engineers
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Burleson Consulting Inc.
Woman-Owned Small Business
Environmental Services

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ACRONYMS AND ABBREVIATIONS

Army	US Department of the Army
BRAC	Base Realignment and Closure
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
Kemron	Kemron Environmental Services, Inc.
HA	Historic Area
HMP	Habitat Management Plan
HRP	Habitat Restoration Plan
lb	Pound
OU-2 GWTP	Operable Unit 2 Groundwater Treatment Plant
PLS	Pure Live Seed
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
~	Approximate

SPECIES LIST AND CODES

Scientific Name	Common Name	Code	Category
Acacia sp.	acacia	AC	NNP
Achillea millefolium	common yarrow	ACMI	NP
Acmispon americanus var. *americanus*	Spanish clover	ACAMA	NF
Acmispon glaber	deerweed	ACGL	NP
Acmispon heermannii var. *orbicularis*	Heermann's lotus	ACHEO	NP
Acmispon parviflorus	hill lotus	ACPA	NF
Acmispon strigosus	Bishop's lotus	ACST	NF
Acmispon wrangelianus	Chile lotus	ACWR	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.	agoseris	AG	
Agrostis avenacea	Pacific bentgrass	AGAV	NNP
Agrostis exarata	spike bent grass	AGEX	NP
Agrostis hallii	Hall's bent grass	AGHA	NP
Agrostis pallens	Leafy bent grass	AGPA	NP
Aira caryophyllea	silver hair grass	AICA	NNF
Amsinckia intermedia	common fiddleneck	AMIN	NF

Scientific Name	Common Name	Code	Category
Amsinckia spectabilis var. *spectabilis*	Seaside fiddleneck	AMSPS	NF
Anaphalis margaritacea	pearly everlasting	ANMA	NP
Aphanes occidentalis	Western lady's mantle	APOC	NF
Arbutus menziesii	Pacific madrone	ARME	NP
*Arctostaphylos hookeri**	Hooker's manzanita	ARHO	NP
*Arctostaphylos montereyensis**	Monterey manzanita	ARMO	NP
*Arctostaphylos pumila**	sandmat manzanita	ARPU	NP
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO	NP
Artemisia californica	California sagebrush	ARCA	NP
Artemisia douglasiana	mugwort	ARDO	NP
Artemisia pycnocephala	coastal sagewort	ARPY	NP
Asteraceae sp.	daisy species	AS	
Atriplex semibaccata	Australian saltbush	ATSE	NNP
Avena barbata	slender wild oat	AVBA	NNF
Avena fatua	wild oat	AVFA	NNF
Avena sp.	wild oat	AV	NNF
Baccharis glutinosa	salt marsh baccharis	BAGL	NP
Baccharis pilularis	coyote brush	BAPI	NP
Brassica nigra	black mustard	BRNI	NNF
Briza maxima	rattlesnake grass	BRMA	NNF
Briza minor	small quaking grass	BRMI	NNF
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	NP
Bromus carinatus	California brome	BRCA	NF
Bromus diandrus	ripgut grass	BRDI	NNF
Bromus hordeaceus	soft chess	BRHO	NNF
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR	NNF
Calandrinia menziesii	red maids	CAME	NF
Calandrinia breweri	Brewer's redmaids	CABR3	NF
Calochortus albus	white globe lily	CAAL	NP
Calyptridium monandrum	common pussypaws	CAMO	NF
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 ssp. *pycnocephalus*	Italian thistle	CAPYP	NNF
Carex barbarae	Santa Barbara sedge	CABA	NP
Carex brevicaulis	short stem sedge	CABR8	NP
Carex globosa	round-fruited sedge	CAGL	NP
Carex praegracilis	freeway sedge	CAPR	NP
Carex sp.	sedge	CA	NP
Carpobrotus edulis	hottentot fig	CAED	NNP
Castilleja affinis	coast paint-brush	CAAF	NP

Scientific Name	Common Name	Code	Category
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**	Monterey ceanothus	CERI	NP
Ceanothus thyrsiflorus	blueblossom	CETH	NP
Ceanothus thyrsiflorus var. *griseus*	Carmel ceanothus	CETHG	NP
Centaurea melitensis	tocalote	CEME	NNF
Cerastium glomeratum	sticky mouse-ear chickweed	CEGL	NNF
Chenopodium californicum	California goosefoot	CHCA	NP
Chlorogalum pomeridianum	wavyleaf soap plant	CHPO	NP
Chorizanthe diffusa	diffuse spineflower	CHDI	NF
Chorizanthe douglasii	Douglas's spineflower	CHDO	NF
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP	NF
Cirsium occidentale	cobwebby thistle	CIOC	NP
Cirsium occidentale var. *candidissimum*	snowy thistle	CIOCC	NP
Cirsium sp.	thistle	CI	
Cirsium vulgare	bull thistle	CIVU	NNP
Clarkia lewisii	Lewis' clarkia	CLLE	NF
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ	NF
Clarkia sp.	clarkia	CL	NF
Claytonia parviflora	narrow leaved miner's lettuce	CLPA	NF
Claytonia perfoliata	miner's lettuce	CLPE	NF
Clinopodium douglasii	yerba buena	CLDO	NP
Collinsia heterophylla var. *heterophylla*	Chinese-houses	COHEH	NF
Conicosia pugioniformis	narrowleaf iceplant	COPU	NNP
Cordylanthus rigidus ssp. *littoralis**	seaside bird's-beak	CORIL	NF
Corethrogyne filaginifolia	common sandaster	COFI	NP
Cortaderia jubata	jubata 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 intermedia	common cryptantha	CRIN	NF
Cryptantha intermedia var. *intermedia*	common cryptantha	CRINI	NF
Cryptantha micromeres	minute-flowered cryptantha	CRMI	NF
Cryptantha sp.	cryptantha	CR	NF
Cyperus eragrostis	tall cyperus	CYER	NP
Danthonia californica	California oat grass	DACA	NP
Daucus pusillus	wild carrot	DAPU	NF

Scientific Name	Common Name	Code	Category
Deinandra corymbosa	coastal tarweed	DECO	NF
Delphinium hutchinsoniae	Hutchinson's larkspur	DEHU	NP
Dichelostemma capitatum	blue dicks	DICA	NP
Diplacus aurantiacus	sticky monkeyflower	DIAU	NP
Distichlis spicata	salt grass	DISP	NP
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW	NP
Eleocharis acicularis	needle spikerush	ELAC	NP
Eleocharis macrostachya	spike rush	ELMA	NP
Elymus condensatus	giant wild-rye	ELCO	NP
Elymus glaucus	blue wild-rye	ELGL	NP
Elymus triticoides	beardless wild rye	ELTR	NP
Eriastrum virgatum	virgate eriastrum	ERVI	NF
Ericameria ericoides	mock heather	ERER	NP
*Ericameria fasciculata**	Eastwood's goldenbush	ERFA	NP
Erigeron canadensis	horseweed	ERCA	NF
Eriogonum nudum	naked buckwheat	ERNU	NP
Eriophyllum confertiflorum	golden yarrow	ERCO	NP
Erodium botrys	long-beaked filaree	ERBO	NNF
Erodium cicutarium	red-stemmed filaree	ERCI	NNF
*Erysimum ammophilum**	coast wallflower	ERAM	NP
Eschscholzia californica	California poppy	ESCA	NF
Euthamia occidentalis	western goldenrod	EUOC	NP
Festuca bromoides	brome fescue	FEBR	NNF
Festuca myuros	rattail sixweeks grass	FEMY	NNF
Festuca octoflora	sixweeks grass	FEOC	NF
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	GAAN2	NP
Galium aparine	goose grass	GAAP	NF
Galium californicum	California bedstraw	GACA	NP
Galium porrigens	climbing bedstraw	GAPO	NF
Galium porrigens var. *porrigens*	climbing bedstraw	GAPOP	NP
Gallium nuttallii	climbing bedstraw	GANU	NP
Gamochaeta ustulata	purple cudweed	GAUS	NP
Garrya elliptica	coast silk tassel	GAEL	NP
Gastridium phleoides	nit grass	GAPH	NNF
Genista monspessulana	French broom	GEMO	NNP
Geranium dissectum	cut-leaved geranium	GEDI	NNF
Gilia tenuiflora ssp. *arenaria**	sand gilia	GITEA	NF
Githopsis specularioides	common bluecup	GISP	NF
Gnaphalium palustre	lowland cudweed	GNPA	NF

Scientific Name	Common Name	Code	Category
Heliotropium curassavicum var. *oculatum*	seaside heliotrope	HECUO	NP
Hesperocyparis macrocarpa	Monterey cypress	HEMA	NP
Heteromeles arbutifolia	toyon	HEAR	NP
Heterotheca grandiflora	telegraph weed	HEGR	NF
Hordeum brachyantherum	meadow barley	HOBR	NP
Hordeum sp.	sterile barley	HO	NNF
Horkelia cuneata	wedge-leaved horkelia	HOCU	NP
Horkelia cuneata var. *cuneata*	Wedge-leaved horkelia	HOCUC	NP
Hypochaeris glabra	smooth cat's ear	HYGL	NNF
Hypochaeris radicata	rough cat's ear	HYRA	NNP
Isocoma menziesii var. *vernonioides*	Menzies' goldenbush	ISMEV	NP
Juncus balticus ssp. *ater*	baltic rush	JUBAA	NP
Juncus bufonius	toad rush	JUBU	NF
Juncus bufonius var. *bufonius*	common toad rush	JUBUB	NF
Juncus capitatus	Dwarf rush	JUCA	NNF
Juncus occidentalis	western rush	JUOC	NP
Juncus patens	spreading rush	JUPA	NP
Juncus phaeocephalus	brown-headed rush	JUPH	NP
Juncus sp.	rush	JU	
Lastarriaea coriacea	leather spineflower	LACO	NF
Lasthenia gracilis	common goldfields	LAGR	NF
Lathyrus angulatus	angled pea vine	LAAN	NNP
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
Logfia sp.	cottonrose	LO	
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
Luzula comosa var. *comosa*	Pacific wood rush	LUCOC	NP
Lysimachia arvensis	scarlet pimpernel	LYAR	NNF
Lysimachia minima	chaffweed	LYMI	NF
Lysimachia monelli	flaxleaf pimpernel	LYMO	NNP
Lythrum hyssopifolia	grass poly	LYHY	NNF
Madia elegans	common madia	MAEL	NF

Scientific Name	Common Name	Code	Category
Madia exigua	little tarweed	MAEX	NF
Madia gracilis	slender tarweed	MAGR	NF
Madia sativa	coast tarweed	MASA	NF
Madia sp.	tarweed	MA	NF
Marah fabacea	wild cucumber	MAFA	NP
Medicago polymorpha	California burclover	MEPO	NNF
Medicago sativa	alfalfa	MESA	NNP
Melica imperfecta	coast range melic	MEIM	NP
Melica sp.	melic	ME	NP
Melica torreyana	Torrey's melic	METO	NP
Melilotus albus	white sweetclover	MEAL	NNF
Melilotus indicus	yellow sweetclover	MEIN	NNF
Minuartia californica	sandwort	MICA	NF
Monardella sinuata ssp. *nigrescens*	curly-leaved monardella	MOSIN	NF
Navarretia atractyloides	Holly-leaf navarretia	NAAT	NF
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA	NF
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHAP	NF
Navarretia mellita	skunk navarretia	NAME	NF
Navarretia sp.	navarretia	NA	NF
Navarretia squarrosa	skunkweed	NASQ	NF
Nuttallanthus texanus	blue toadflax	NUTE	NF
Orobanche californica ssp. *californica*	broomrape	ORCAC	NP
Pennisetum clandestinum	Kikuyu grass	PECL	NNP
Pentagramma triangularis	gold back fern	PETR	NP
Persicaria lapathifolia	willow weed	PELA	NF
Petrorhagia dubia	hairypink	PEDU	NNF
Petrorhagia prolifera	pink grass	PEPR	NNF
Phacelia douglasii	Douglas phacelia	PHDO	NF
Phacelia malvifolia	stinging phacelia	PHMA	NF
Phalaris lemmonii	Lemmon's cannarygrass	PHLE	NF
Phalaris sp.	canary grass	PH	
Pinus radiata	Monterey pine	PIRA	NP
Piperia sp.	rein orchid	PI	NP
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH	NF
Plagiobothrys sp.	popcorn flower	PL	NF
Plantago coronopus	cut-leaved plantain	PLCO	NNF
Plantago erecta	California plantain	PLER	NF
Plantago lanceolata	English plantain	PLLA	NNF
Plantago major	common plantain	PLMA	NNP
Platystemon californicus	cream cups	PLCA	NF
Polycarpon tetraphyllum var. *tetraphyllum*	four-leaved allseed	POTET	NNF
Polygala californica	California milkwort	POCA	NP

Scientific Name	Common Name	Code	Category
Polypogon monspeliensis	rabbitsfoot grass	POMO	NNF
Populus trichocarpa	black cottonwood	POTR	NP
Prunus sp.	unknown cherry	PR	
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 sp.	cudweed	PS	
Pseudognaphalium stramineum	cotton-batting plant	PSST	NP
Psilocarphus tenellus	slender woolly-marbles	PSTE	NF
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP	NP
Pterostegia drymarioides	woodland threadstem	PTDR	NF
Quercus agrifolia	coast live oak	QUAG	NP
Ranunculus californicus var. *californicus*	common buttercup	RACAC	NP
Ribes malvaceum	chaparral currant	RIMA	NP
Ribes speciosum	fuchsia-flowered gooseberry	RISP	NP
Rubus ursinus	California blackberry	RUUR	NP
Rumex acetosella	sheep sorrel	RUAC	NNP
Rumex crassus	willow leaved dock	RUCR2	NP
Rumex crispus	curly dock	RUCR	NNP
Rumex salicifolius	willow leaved dock	RUSA	NP
Rumex sp.	dock	RU	
Salix laevigata	red willow	SALA3	NP
Salix lasiolepis	arroyo willow	SALA6	NP
Salix sp.	willow	SA	NP
Salvia mellifera	black sage	SAME	NP
Sanicula crassicaulis	Pacific sanicle	SACR	NP
Sanicula laciniata	coast sanicle	SALA7	NP
Schismus barbatus	old han schismus	SCBA	NNF
Senecio glomeratus	cutleaf burnweed	SEGL	NNF
Senecio sylvaticus	woodland groundsel	SESY	NNF
Senecio vulgaris	common groundsel	SEVU	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
Sonchus oleraceus	common sow thistle	SOOL	NNF
Sonchus sp.	sow thistle	SO	NNF
Spergularia rubra	red sand-spurrey	SPRU	NNF
Spergularia villosa	hairy sand-spurrey	SPVI	NNP
Stachys ajugoides	bugle hedge-nettle	STAJ	NP

Scientific Name	Common Name	Code	Category
Stachys bullata	wood mint	STBU	NP
Stipa cernua	nodding needle grass	STCE	NP
Stipa pulchra	purple needle grass	STPU	NP
Stipa sp.	needle grass	ST	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 depauperatum var. *truncatum*	truncate sack clover	TRDET	NF
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 sp.	clover	TR	
Trifolium willdenovii	tomcat clover	TRWI	NF
Triphysaria pusilla	dwarf owl's clover	TRPU	NF
Triteleia ixioides	pretty face	TRIX	NP
Uropappus lindleyi	silver puffs	URLI	NF
Verbena bracteata	bracted verbena	VEBR	NP
Verbena lasiostachys var. *lasiostachys*	western vervain	VELAL	NP
Vicia americana ssp. *americana*	American vetch	VIAMA	NP
Vicia benghalensis	purple vetch	VIBE	NNF
Vicia hassei	slender vetch	VIHA	NF
Vicia ludoviciana ssp. *ludoviciana*	slender vetch	VILUL	NF
Vicia sativa	spring vetch	VISA	NNF
Vicia sativa ssp. *nigra*	narrow-leaved vetch	VISAN	NNF
Vicia sp.	vetch	VI	
Zeltnera davyi	Davy's centaury	ZEDA	NF

* HMP species
NP = Native Perennial (Shrubs and Perennial Herbs/Forbs)
NF = Native Forb (Annual Herbs/Forbs)
NNP = Non-Native Perennial
NNF = Non-Native Forb

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 2018 calendar year as well as a progress summary for each Historic Area (HA) and recommendations for future adaptive management.

1.1 Purpose

Former military ranges underwent soil remediation and subsequent habitat restoration in areas that ranged in size from 0.05 to 14 acres and were scattered around the perimeter of the Site 39 Inland Ranges area (Site 39) of former Fort Ord. Approximately 62 acres of soil remediation area needed restoration at HAs 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 was 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 areas contain primarily rare central maritime chaparral habitat with smaller inclusions of coastal sage scrub, oak woodland, grassland, and vernal pool habitats.

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 necessary information and guidance to conduct restoration activities at Site 39. This annual report details the tasks involved with the execution of habitat restoration on Site 39 in 2018 as well as a progress summary for each HA and recommendations.

Work performed in 2018 consisted of:

- Storage of previously collected plant material
- Propagating collected plant material
- Restoration activities at HAs 26, 28, 34, and 44
- Erosion control repairs at HAs 26, 27A, 28, 29, 34, 36, and 37
- Monitoring restoration sites to evaluate vegetative establishment
- Irrigation at HA 26

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 were developed for 18 HAs and one stockpile area requiring habitat restoration for 61.71 acres. The 19 SSRPs prescribed passive restoration (seeding) for 61.71 acres and active restoration (planting) for 29.84 acres. Active restoration requires installation of approximately 52,000 plants. Figure 1-1 presents the status of restoration sites within Site 39.

Both active and passive restoration activities began in 2011 and are ongoing. By the end of the 2018 calendar year, approximately 57 acres were seeded (passive restoration) and about 41,713 plants were installed (active restoration). Of the 19 restoration sites, 15 received their full SSRP restoration prescription and were in a monitoring phase (see Figure 1-1). Three of the sites received more than half their SSRP restoration prescription and one site has not received any restoration to date.
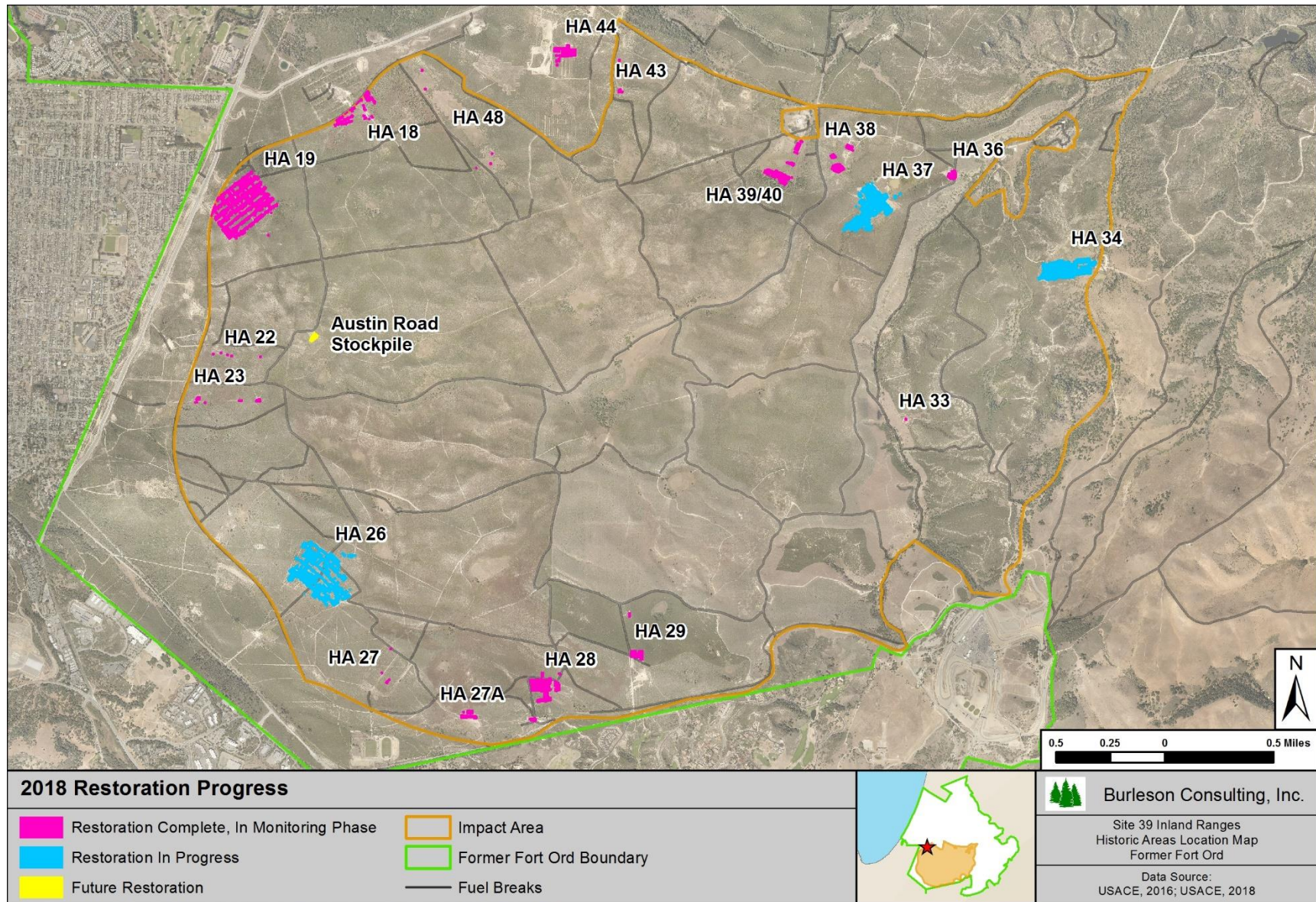
Figure 1-1. Restoration Progress Map

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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 plant 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, to the extent possible. Seed weight totals were entered into the seed inventory database once 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 biologists maintained a spreadsheet database so that plant and seed inventories were 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 implemented Best Management Practices (BMP) recommended by the California Department of Food and Agriculture (CDFA) and Monterey County Agricultural Commission at the native plant nursery. The BMPs included foot baths at 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, and caged seedling trays for rodent protection. If plants are suspected to be infected with pathogens, affected plants are relocated a minimum of 10 feet from unaffected plants. When necessary, infected plants are removed from the nursery completely. In addition, pear tests were performed regularly on any suspect plants by placing a clean, unblemished pear in a container with wet soil from the suspected plant's cone or deepot. A pear test is an initial indicator for pathogens and is used before sending samples for a laboratory test. The pear will blacken or develop lesions if a pathogen is present. Plants from the same propagation date as those being pear tested, and other surrounding plants in danger of being splashed during watering, are quarantined regardless of exhibiting symptoms.

Burleson conducted pear tests in April, August, and December of 2018 and found negative results for *Phytophthora*. If the plants were found to be positive, they would have been sent to a CDFA laboratory for further testing and identification of *Phytophthora* species. Photographs C-1 through C-3 in Appendix C illustrate the results of the pear tests.

3. SEED COLLECTION

In 2018, five acres-worth of seed was collected for HAs 26 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 (Burleson, 2010). All seed collection target goals were met for 2018. Photographs C-4 through C-9 in Appendix C show seed collection activities.

3.1 Seed Production

In addition to on-site seed collection, Burleson contracted with Hedgerow Farms and S&S Seed to grow former Fort Ord-specific bulk seed for three species (see Table 3-1). Burleson also obtained wedge-leaved horkelia (*Horkelia cuneata*) through a seed trade with the Bureau of Land Management and purchased sterile barley (*Hordeum* sp.) from Hearne Seed. A half-acre deerweed seed production plot was reestablished in the fall of 2018 for future seed needs. Seed production species and quantities produced in 2018 are presented in Table 3-1 and the total seed inventory can be found in Table A-2 in Appendix A. Photographs C-10 through C-12 in Appendix C show production seed plots.

Table 3-1. 2018 Production Plot Seed Yields

Species	Bulk Seed (lb)	Pure Live Seed (lb)
Achillea millefolium **(white yarrow)**	48.82	44.17
Elymus glaucus **(blue wildrye)**	226.94	116.5
Stipa pulchra **(purple needlegrass)**	30.5	27.99

Bulk seed contains seed, inert matter, and other crop material. Pure Live Seed (PLS) is the quantity in pounds of viable seed within the bulk seed and is calculated by multiplying bulk seed times the purity indicated from a germination test. PLS clarifies the quality of the seed being broadcast on restoration sites. Seed test results for three production species are presented in Table A-3, Appendix A. All seed production plots will be continued in 2019.

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4. PLANT PROPAGATION

Plant propagation activities occurred at the Burleson native plant nursery in Carmel Valley, CA. 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 2018 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, surplus plants were used to supplement missed targets. See Table A-4 in Appendix A for final plant inventories for HAs 26, 28, and 44. Photographs C-13 through C-23 in Appendix C illustrate various aspects of plant propagation.

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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 2018 included passive restoration at HAs 26 and 44, and active restoration at HAs 26, 28, and 44.

5.1 Passive Restoration

Table 5-1 summarizes 2018 passive restoration activities. Generally, passive restoration activities occur annually between October and February, spanning two calendar years. This report focuses on restoration activities completed within the 2018 calendar year. In late 2018, Burleson performed passive restoration at HAs 26 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. 2018 Summary of Passive Restoration Activities per HA

HA	Passive Restoration Activities
26	Broadcast 4.0 acres-worth† of SSRP seed mix, enhanced with production seed and 0.21 lb of Monterey spineflower*
44	Broadcast 1.0 acre-worth† of SSRP seed mix, enhanced with production seed.

 * HMP Species
 † Acres-worth of seed = amount of seed prescribed to restore 1 acre of area in accordance with the SSRP

5.1.1 HA 26 Passive Restoration Activities

In December 2018, Burleson selectively applied 4.0 acres-worth of SSRP seed mix, enhanced with production seed mix, over 3.8 acres at HA 26 (see Appendix B Figure B-1, Tables B-1 and B-2). The seed was divided between two locations: a 2.82-acre lower west active restoration polygon and a 0.98-acre lower east active restoration polygon. Last year, Kemron Environmental Services, Inc. (Kemron) partially mulched both areas as part of erosion control efforts. No seed was applied to the mulched areas unless there was soil visible. In non-mulched areas, seed was spread evenly, raked in, and covered with fresh straw. Sections of HA 26 have not been cleared to depth and an unexploded ordnance (UXO) escort was present to support seed broadcast. Photographs C-24 through C-29, Appendix C show restoration efforts at HA 26.

In December 2018, Burleson applied 0.21 lb of Monterey spineflower (*Chorizanthe pungens* var. *pungens*) in two existing HMP plots totaling 0.18 acres at HA 26 (see Appendix B Figure B-1, Table B-3). Seed was spread evenly across each plot and raked in.

5.1.2 HA 44 Passive Restoration Activities

In November 2018, Burleson applied 1.0 acre-worth of SSRP seed mix over 1.5 acres to the large active restoration polygon at HA 44 (see Appendix B Figure B-8, Table B-11). HA 44 is broken up into six restoration polygons; five received passive restoration in November 2017 and the sixth and largest polygon received active restoration in January and February 2018 and passive restoration in November 2018. Seed was applied evenly throughout the restoration polygon receiving both active and passive restoration, raked in, and covered with fresh straw. Photographs C-30 through C-32 show restoration efforts at HA 44.

5.2   Active Restoration

Table 5-2 summarizes 2018 active restoration activities at each site. Burleson installed a total of 7,713 plants at HAs 26, 28, and 44 in early 2018. Tables B-12, B-13, B-14, and B-15 in Appendix B provide detailed information on species and quantities planted at HAs 26, 28, and 44. When the nursery had surplus inventory of high-value shrubs, they were substituted for early successional species at HA 26 and 44; for example, surplus manzanitas were substituted for common yarrow.

Table 5-2. 2018 Summary of Active Restoration Activities per Historic Area

HA	Active Restoration Activities
26	Installed 5,655 plants (3.31 acres in two distinct areas)
28	Installed 948 plants (2.37 acres in two distinct areas)
44	Installed 1,110 plants (1.5 acres throughout site)

5.2.1   HA 26 Active Restoration Activities

From December 2017 to February 2018, Burleson installed 5,655 plants across 3.31 acres in two active restoration areas at HA 26. Due to portions of HA 26 not being cleared to depth, UXO escorts accompanied Burleson biologists to ensure planting areas were safe for digging. A portion of the site was covered in mulch from Kemron's erosion control measures. Larger plants with deeper roots were installed in these areas to increase survivorship in the mulched areas. Additionally, areas with good natural recruitment were not planted as densely as more barren areas. Figure B-9 in Appendix B shows the location of planted areas and Tables B-12 and B-13 list installed species and quantities. Photos C-33 through C-35 in Appendix C represent plant installation at HA 26. Additional planting is required to fulfill the SSRP planting targets for this site.

5.2.2   HA 28 Active Restoration Activities

Burleson installed 948 sandmat manzanita across 2.37 acres in two distinct planting areas at HA 28 in January 2018. This installation compensated for missed targets from previous planting years. Figure B-10 in Appendix B shows the location of planted areas and Table B-14 lists installed species and quantities. Photos C-36 through C-38 in Appendix C represents plant installation at HA 28. The SSRP planting targets were fulfilled for this site.

5.2.3   HA 44 Active Restoration Activities

Burleson installed 1,110 plants over 1.5 acres at HA 44 in January and February 2018. Areas with good natural recruitment were not planted as densely as more barren areas. Figure B-11 in Appendix B shows the location of planted areas and Table B-15 lists installed species and quantities. Photos C-39 through C-40 in Appendix C represent plant installation at HA 44. The SSRP planting targets were fulfilled for this site.

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 2018. 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 2018. The following sections provide detailed descriptions of monitoring activities. Expanded 2018 monitoring results are presented in Section 8 on a site-by-site basis. Photographs C-41 through C-47 in Appendix C illustrate various monitoring tasks.

Table 6-1. 2018 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). Species richness, vegetative cover, and HMP annual density were used for comparison to the success criteria. 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 transect survey and 10-feet on either side of transect
Objective 1 – No. 2	Native vegetation cover	Line-intercept transect percent cover
Objective 2 – No. 3	Non-native target weed cover	Line-intercept transect percent cover
Objective 3 – No. 4	HMP shrub cover	Line-intercept transect percent cover
Objective 3 – No. 4	HMP shrub cover by species	Line-intercept transect percent cover
Objective 3 – No. 4	HMP annual density	HMP annual plot density surveys and meandering transect survey to map discrete patches of HMP annuals outside of restoration plots

6.1.1   Photo Points and Photo Documentation

Multiple permanent photo points were established at each restoration site to document progress. Photos were taken annually in the spring at every photo point and again in the fall at select photo points. Additionally, photo documentation of restoration activities occurred throughout the year. See Appendix C for a photo log of activities during 2018, Appendix D for photo point comparisons for all sites, and Appendix E for photos illustrating restoration progress of HAs in year 5 of monitoring in 2018.

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 was 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 (see Table 6-3).

Table 6-3. HMP Annual Density Classes

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 were mapped during meandering transect surveys using a Trimble® Juno® T41/5B Series GPS unit with an external Trimble® R1 GNSS receiver. These patches were assigned a density class or population count if it was easy to do so. If the HMP annual occupied area was 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 were analyzed in ArcMap using the interpolation tool to develop an HMP annual density model.

HMP annual plot and discrete patch densities were evaluated together to compare to the Objective 3 success criterion. For a given year, the combination of plots and discrete patches monitored that year were compared to baseline density requirements. The success criterion was met if plots and discrete patches combined indicated that the site maintained or exceeded baseline densities for each applicable HMP annual species. It was not necessary for HMP annuals to meet baseline density in all plots if discrete patches are present. At year 8, data for all monitoring years will be evaluated together to determine whether the site met the success criterion.

The method used to measure HMP annual cover for Objective 3 was changed in 2017 from what was described in the SSRPs to a more appropriate evaluation method. Prior to 2017, the success criterion for monitoring HMP annuals required greater than or equal to 1% transect cover for Monterey spineflower, sand gilia (*Gilia tenuiflora* ssp. *arenaria*), and/or seaside bird's beak (*Cordylanthus rigidus* ssp. *littoralis*). However, transects were designed to measure shrub and perennial plants with cover greater than 0.1 meters. HMP annual cover was underrepresented by transect surveys because patches of HMP annuals are often less than 0.1 meters across and have variable peak bloom time. In August 2017, US Fish and Wildlife Service (USFWS) approved the abandonment of transect percent cover as a measure of HMP annual cover and the associated success criterion (USFWS, 2017). Instead of using transect surveys to assess HMP annuals, USFWS approved comparing HMP annual seeded plot densities and discrete patches to the success criterion as recommended in the 2016 Habitat Restoration Annual Report (Burleson, 2017).

6.1.3   Plant Survivorship Monitoring

Annual plant survivorship surveys are completed for three years after plant installation. A random sample of at least 10% of each shrub species were tagged and monitored annually. Survivorship monitoring events occurred in the fall at the end of the dry season when plant mortality rates were highest. During monitoring visits, all tagged plants were counted as alive or dead to calculate survivorship percentages. All plants monitored were evergreens that should have live leaves year-round. Plants with live leaves were recorded as alive. Plants with no leaves or leaves that appeared dead were recorded as dead. Plant survivorship data was not compared to the success criteria. Plant survivorship classifications are presented in Table 6-4.

Table 6-4. Plant Survivorship Classifications

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

In previous reports, plants that were in poor condition or plants that were not found were considered dead. For the 2018 report, plant survivorship for all years was recalculated to consider plants that were in poor condition as alive and plants that were not found were excluded from the percent alive calculation.

6.1.4   Vegetative Cover

Vegetative cover is monitored in years 1, 2, 3, 4, 5, 8, and 13 following restoration, typically from May to July. In the first few years of monitoring, sites were 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). In 2016, some HAs including HA 22, 23, 27, 33, and 43 were surveyed using randomly placed quadrats to provide a preliminary idea of

vegetative cover with a limited amount of effort. From 2017 onward, line-intercept transect surveys were completed instead as multiple objectives outlined in the SSRP specifically require transect data. Fifty-meter transects were placed randomly in portions of the site where similar restoration activities took place at a rate of one transect per acre. When applicable, transects were stratified by year and consideration was given to topography and local features (for example, avoidance of roads or berms). For HAs that were less than 1 acre, transects were placed diagonally through each plot. The corners of each plot were numbered 1-4 and the start point was determined using a random number generator. Quadrat sampling along transects was completed when annual herbaceous cover on the transect line was 10% or greater.

Vegetative cover was calculated 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 for each species and dividing by 50. Percent cover for all transects was then averaged to calculate average site cover by species, native shrubs and perennials, and other categories (Shaw, 2009b). For sites with transects shorter than 50 meters, total cover was calculated to account for varying transect lengths. To calculate the site average, the distance along transects was summed for each species and divided by the total transect length.

For each HA, the native vegetative cover, non-native vegetative cover, total HMP shrub cover, and HMP shrub cover by species were evaluated against baseline objectives specified in the SSRPs. Results were compared to previous years to discern trends over time. Native vegetative cover was calculated by summing the percent cover of all species in Table 2 of the SSRPs for each site. The success criteria for native vegetative cover and HMP shrub cover were met if percent cover met or exceeded baseline percent cover (objectives 1 and 2). For non-native vegetative cover, the success criterion was met if percent cover was less than the acceptable limit (Objective 2). In addition, five species with the greatest percent cover for each HA were compared graphically across monitoring years.

At HA 37, 38, 39/40, 44, and 48, silver bush lupine was identified as *Lupinus chamissonis* in Table 2 of the SSRPs. However, according to the Jepson Manual, Calflora, and *The Plants of Monterey County,* silver bush lupine is identified as *Lupinus albifrons* var. *albifrons*. Both species are present on Fort Ord and are difficult to identify unless flowers are present. 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 analysis of transect data and comparison to the success criteria, silver beach lupine and silver bush lupine data were combined.

6.1.5   Species Richness

A species list for each HA is developed by conducting meandering transects in years 1, 2, 3, 4, 5, 8, and 13 and by recording all species observed within 10 feet on either side of line-intercept transects, if applicable. Species richness was evaluated by comparing the quantities of native shrubs and perennials, native annual and herbaceous species, and non-native species observed to the quantities observed in previous years. The success criterion for species richness was met if all species listed in Table 3 of the SSRPs were present on site (Objective 1).

7. EROSION CONTROL ACTIVITIES

Burleson completed dry and wet season erosion control at several sites. Production seed and mycorrhizal-fertilizer mix were applied to support restoration activities.

7.1   Erosion Control Repairs

In early 2018, Burleson completed the 2017/2018 wet season erosion control repairs at HAs 28 and 34. In late 2018, Burleson completed dry season erosion control repairs at HAs 26, 27A, 28, 29, 34, 36 and 37. Erosion control and production seed mix details can be found in Appendix B. Photographs C-48 through C-53 in Appendix C document erosion control field activities.

At HA 26, the following work was performed in 2018:
- September/October 2018
  - Collapsed approximately 70 linear feet of rill erosion ranging from 6"-24" deep
  - Installed 150 linear feet of straw wattles
  - Broadcast erosion control seed mix over approximately (~) 0.1 acres
  - Broadcast production seed mix over ~0.45 acres
  - Broadcast ~3 cubic yards of mulch over 0.31 acres
- December 2018
  - Collapsed approximately 20 linear feet of rill erosion ranging from 6"-24" deep
  - Installed 25 linear feet of straw wattles

At HA 27A, the following work was performed in 2018:
- October/November 2018
  - Installed 600 linear feet of straw wattles
  - Broadcast production seed mix over ~0.25 acres
  - Broadcast and crimped straw on 0.19 acres

At HA 28, the following work was performed in 2018:
- March 2018
  - Collapsed approximately 200 linear feet of rill erosion ranging from 6"-24" deep
  - Installed 275 linear feet of straw wattles
  - Broadcast 10 lb *Hordeum* sp. seed over ~0.04 acres
  - Broadcast and crimped straw mulch on ~0.04 acres
- November 2018
  - Broadcast production seed mix over ~0.42 acres

At HA 29, the following work was performed in 2018:
- March 2018
  - Broadcast production seed mix over ~0.4 acres
  - Broadcast ~6 cubic yards mulch over ~0.4 acres

At HA 34, the following work was performed in 2018:
- February 2018
  - Collapsed approximately 140 linear feet of rill erosion ranging from 6"-24" deep
  - Installed 225 linear feet of straw wattles
  - Broadcast mulch over ~0.05 acres
  - Broadcast production seed mix over ~0.05 acres

- October/November 2018
    - o Repaired approximately 480 linear feet of rill erosion ranging from 6-24 inches deep
    - o Installed 750 linear feet of straw wattles
    - o Monitored and maintained 50 linear feet of water bars
    - o Broadcast production seed mix over ~0.6 acres
    - o Broadcast erosion control seed mix over ~0.1 acres

At HA 36, the following work was performed in 2018:
- September 2018
    - o Collapsed approximately 130 linear feet of rill erosion ranging from 6"-24" deep
    - o Installed 80 linear feet of coir logs
    - o Installed 650 feet^2 of coir fabric
    - o Broadcast erosion control seed mix over ~0.1 acres
    - o Broadcast production seed mix over ~0.4 acres
    - o Broadcast ~6 cubic yards of mulch over ~0.2 acres

At HA 37, the following work was performed in 2018:
- September-November 2018
    - o Installed 150 linear feet of straw wattles
    - o Broadcast production seed mix over ~0.6 acres
    - o Broadcast erosion control seed mix over ~0.3 acres
    - o Broadcast ~6 cubic yards of mulch over ~0.46 acres

The ~ indicates that acreage is approximate.

7.2   Production Seed, Mulch, and Mycorrhizal Mix Broadcast

Production seed is utilized to support erosion control measures and enhance SSRP mixes and restoration sites as needed. Burleson broadcast production seed and mulch in approximately 0.4 acres at HA 29 and 0.46 acres at HA 37. Additionally, Burleson applied a mycorrhizal-fertilizer mix (Bio-Live 5-4-2) to stunted shrubs and spread a layer of mulch around the base of each treated plant at HAs 29 and 37. The mycorrhizae and fertilizer promote root and foliage growth while the mulch application builds localized organics and helps to retain soil moisture. A six-inch drill bit was used to drill four holes diagonally into the root zone. One tablespoon of Bio-Live 5-4-2 was poured into each hole, giving each plant a total of four tablespoons. A layer of mulch was then spread around the base of each treated plant. A total of 540 shrubs were treated at HA 29 and 611 shrubs were treated at HA 37 (see Figure B-4 and B-7, Appendix B).

A detailed breakdown of production seed species, quantities, and broadcast locations can be found in Appendix A. Photographs C-54 through C-58 in Appendix C show production seed broadcast and mycorrhizal-fertilizer mix application.

8. IRRIGATION

The Burleson team designed and installed a 6,000-gallon irrigation system with 3,000 emitters to irrigate active restoration areas at HA 26. Installation began in early 2018 and the system was fully operational by March. Ten irrigation events occurred between May and October, where approximately two to three gallons were delivered to each plant per irrigation event.

The 3,000 emitters were staked at the base of the following shrub species:

- chamise (*Adenostoma fasciculatum*)
- sandmat manzanita (*Arctostaphylos pumila*)
- shaggy-barked manzanita (*Arctostaphylos tomentosa*)
- coyote brush (*Baccharis pilularis*)
- Monterey ceanothus (*Ceanothus rigidus*)
- Eastwood's goldenbush (*Ericameria fasciculata*)

After installation of the irrigation system, herbivory and natural die-off affected a portion of the shrub species that were to be irrigated. Burleson replaced a total of 235 damaged or dead plants at emitters using available surplus nursery stock to ensure irrigation lines where delivering water to a live plant (see Table 8-1).

Table 8-1. HA 26 Replacement Plants

Scientific Name	Common Name	Replacement Plants
Acmispon glaber	deerweed	7
Adenostoma fasciculatum	chamise	2
*Arctostaphylos pumila**	sandmat manzanita	8
Baccharis pilularis	coyote brush	61
*Ceanothus rigidus**	Monterey ceanothus	26
Crocanthemum scoparium	peak rush-rose	13
Diplacus aurantiacus	sticky monkeyflower	8
*Ericameria fasciculata**	Eastwood's goldenbush	3
Eriophyllum confertiflorum	golden yarrow	71
Lepechinia calycina	pitcher sage	5
Lupinus arboreus	yellow bush lupine	5
Salvia mellifera	black sage	26

* HMP Species

Burleson obtained recycled water from Operable Unit 2 Ground Water Treatment Plant (OU-2 GWTP) to support irrigation water needs. The treated water from OU-2 GWTP was non-potable but clean and safe to use for plants. Table 8-2 provides specific details regarding irrigation events at HA 26. Figure 8-1 shows irrigation events in relation to precipitation volume in 2018. Photographs C-59 through C-69 in Appendix C show the status of the irrigated plants and the system.

Table 8-2. Irrigation Events at HA 26

Irrigation Event	Date	Volume (gallons)
1	May 21, 2018	6,000
2	June 6 and 7, 2018	6,000
3	June 21 and 26, 2018	8,000
4	July 5 and 10, 2018	9,000
5	July 20 and 24, 2018	9,000
6	August 3, 2018	9,000
7	August 17, 2018	9,000
8	September 4, 2018	6,000
9	September 24, 2018	9,000
10	October 29, 2018	6,000

To promote plant establishment and growth, irrigation events occurred in the dry season when plants become water stressed. Figure 8-1 shows the timing of irrigation events in relation to natural precipitation events.
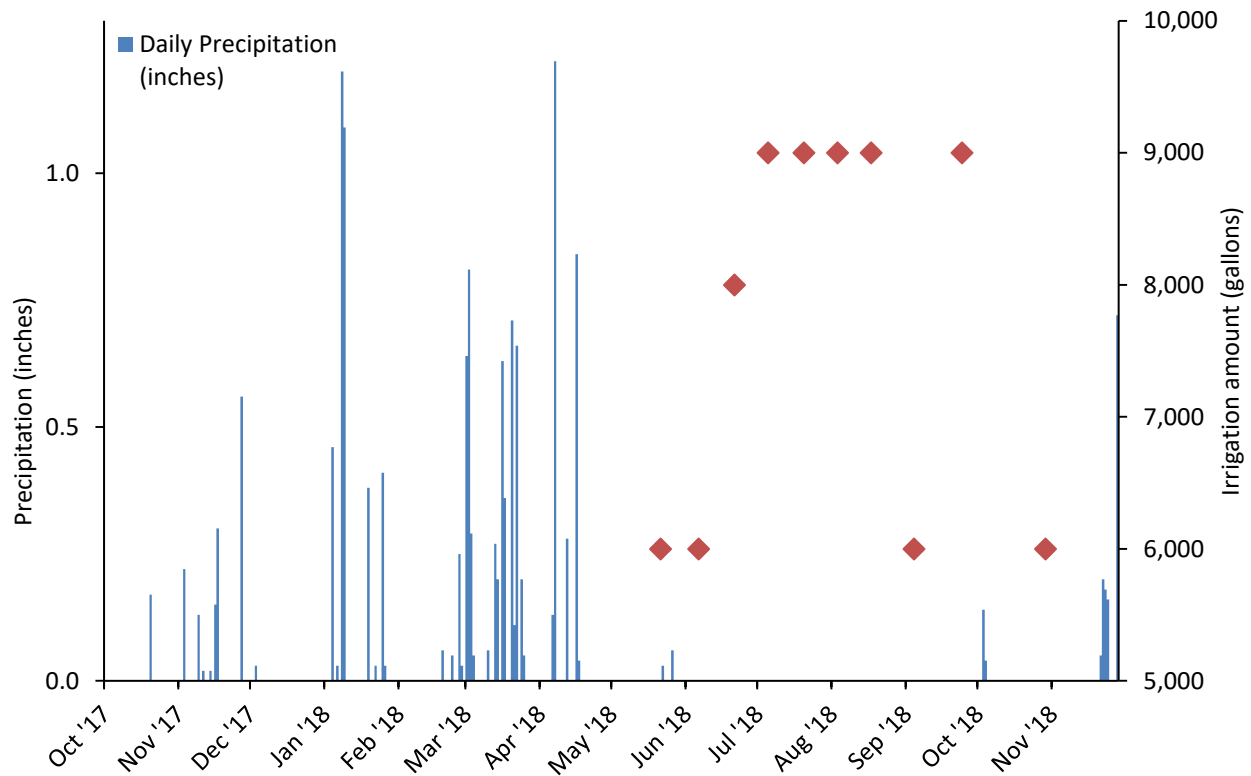
Figure 8-1. Daily Precipitation for 2017-2018 Water-Year and Irrigation Events (CDEC, 2018)

9. RESTORATION SUMMARY AND MONITORING RESULTS BY HA

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 9 is an overview of the restoration effort through 2018, monitoring results, comparison to the success criteria, and recommendations for each HA.

9.1   HA 18

HA 18 was used by the U.S Department of the Army (Army) as a long-distance small-arms firing range that 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 of similar maritime climates (USFS, 2007). HA 18 is relatively flat with northwest and west aspects. Adjacent lands are high quality habitat with intact native vegetation that may promote natural recruitment within 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 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 (USFS, 2007).

The SSRP 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 2011 and 2012 and monitoring began in 2013. The HA was monitored for eight years by photo documentation and site visits, six years for HMP annual density in plots, and three years for HMP annual density across the HA, species richness, and vegetative cover (see Table 9-1). Figure 9-1 shows the passive restoration area, photo documentation locations, and transect monitoring locations. Success criteria for HA 18 are summarized in Table 9-2.

Table 9-1. Historic Summary of Restoration and Monitoring Activities at HA 18

Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2020	2025
Restoration: Passive and Erosion Control	●	●								
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	●	
HMP Annual Density across HA						●	●	●	●	
Species Richness						●	●	●	●	●
Vegetative Cover						●	●	●	●	●

Figure 9-1. HA 18 Restoration Areas and Monitoring Locations Map

Table 9-2. Success Criteria and Acceptable Limits for Restoration of HA 18

	Objective 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† dwarf ceanothus mock heather Eastwood's goldenbush† 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 of the SSRP
	Objective 2*		
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*		
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
			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

Table 9-2. Success Criteria and Acceptable Limits for Restoration of HA 18

	Objective 3*		
4	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Monterey spineflower density class: Low

* Objectives presented in HRP (Shaw, 2009b)
† HMP Species

9.1.1   Restoration Activities

Burleson performed passive restoration at HA 18 in 2012. No active restoration activities were prescribed at HA 18 and no additional passive restoration activities occurred in 2018. The total amount of seed broadcast on site was 51.189 lb compared to the 50.220 lb prescribed in the SSRP. Table 9-3 summarizes the SSRP seed target and the amount of seed applied by year and species. Species code names are presented in Table 9-4. 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 9-3. Summary of Passive Restoration Activities for HA 18

Species	Pounds of Seed Broadcast			
	SSRP Target	**2012 (Jan)**	**2012 (Dec)**	**Total by Species**
ACGL	2.800	1.000	1.440	2.440
ADFA	1.400	0.500	0.770	1.270
ARPU*	1.400	1.100	1.000	2.100
ARTO	2.800	1.000	1.450	2.450
ARCA	1.400	0.500	0.730	1.230
BAPI	0.200	0.500	0.110	0.610
CERI*	1.400	0.500	0.780	1.280
CHPUP*	0.020	0.400	0.047	0.447
CRSC	1.400	0.500	0.770	1.270
DIAU	0.100	0.300	0.390	0.690
ELGL	12.600	-	12.650	12.650
ERER	0.400	0.200	0.230	0.430
ERFA*	0.100	0.072	0.070	0.142
ERCO	0.400	0.200	0.240	0.440
HO	12.600	-	12.700	12.700
HOCU	2.800	1.000	1.160	2.160
SAME	1.400	0.600	0.820	1.420
STCE	7.000	0.300	7.160	7.460
TOTAL	**50.220**	**8.672**	**42.517**	**51.189**

* HMP species

9.1.2   Monitoring Results

HA 18 was in year 6 of monitoring in 2018. Even though year 6 was not a required monitoring year, monitoring occurred and results are presented below.

9.1.2.1   HMP Annual Density

Six Monterey spineflower plots were surveyed for year 6 density at HA 18 in 2018. The plots are numbered 1-6 on Figure 9-3 and are primarily located in the eastern part of the site. Monterey spineflower density was low at Plots 1, 4 and 5, medium at Plots 2 and 6, and high at Plot 3. Figure 9-2 presents Monterey spineflower restoration plot densities for HA 18.
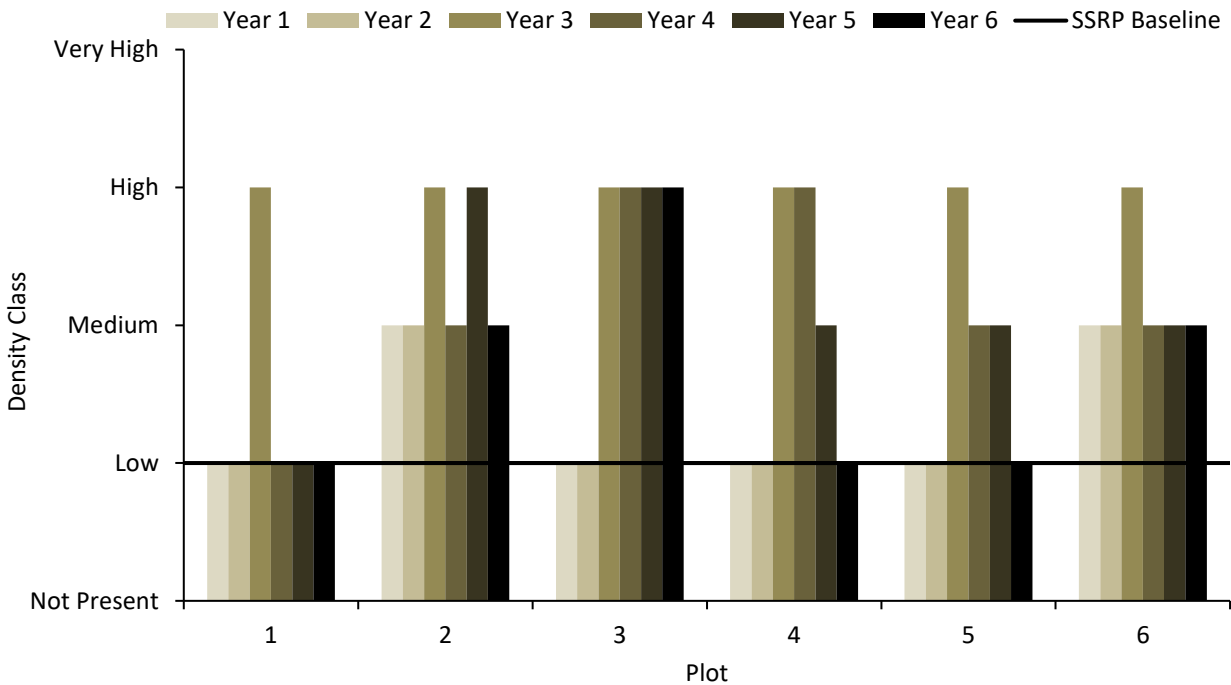
Figure 9-2. HA 18 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots 1-6

Figure 9-3. HA 18 Year 6 Monterey Spineflower Plot Density Map

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 at HA 18.

Five individual plants and nineteen discrete patches of Monterey spineflower were mapped and individual plants were counted within each patch (see Figure 9-4). Densities ranged from low to high and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.21 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline increased.

Figure 9-4. HA 18 Monterey Spineflower Meandering Transect Density Map

9.1.2.2   Plant Survivorship

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

9.1.2.3   Species Richness

Eighty species were observed at HA 18. Of those, 37 were native shrubs or perennials, 22 were native annual herbaceous species, and 21 were non-native species (see Table 9-4). Species richness increased by four species since 2017. Native shrub and perennial species increased by five, native herbaceous species decreased by two, non-native species increased by three, and uncategorized species decreased by two.

Table 9-4. Species Observed at HA 18, 2018

Scientific Name	Common Name	Code
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Agrostis pallens	Leafy bent grass	AGPA
Aira caryophyllea	silver hair grass	AICA
*Arctostaphylos pumila**	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark 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 grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Cardionema ramosissimum	sand mat	CARA
Carex globosa	round-fruited sedge	CAGL
Carpobrotus edulis	hottentot fig	CAED
Castilleja densiflora	owl's clover	CADE
*Ceanothus rigidus**	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Cirsium occidentale	cobwebby thistle	CIOC
Clinopodium douglasii	yerba buena	CLDO
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	jubata grass	COJU
Crassula connata	pygmy-weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Cryptantha clevelandii	Cleveland's cryptantha	CRCL
Cryptantha sp.	cryptantha	CR
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**	Eastwood's goldenbush	ERFA
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filaree	ERCI

Table 9-4. Species Observed at HA 18, 2018

Scientific Name	Common Name	Code
Festuca myuros	rattail sixweeks grass	FEMY
Festuca octoflora	sixweeks grass	FEOC
Galium porrigens	climbing bedstraw	GAPO
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 filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus concinnus	bajada lupine	LUCO
Luzula comosa var. *comosa*	Pacific wood rush	LUCOC
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia exigua	little tarweed	MAEX
Madia gracilis	slender tarweed	MAGR
Madia sativa	coast tarweed	MASA
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Pentagramma triangularis	gold back fern	PETR
Petrorhagia dubia	hairypink	PEDU
Phacelia malvifolia	stinging phacelia	PHMA
Pinus radiata	Monterey pine	PIRA
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Pseudognaphalium californicum	California everlasting	PSCA
Pseudognaphalium ramosissimum	pink everlasting	PSRA
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
Sonchus asper	prickly sow thistle	SOAS
Stachys bullata	wood mint	STBU
Stipa cernua	nodding needle grass	STCE
Stipa pulchra	purple needle grass	STPU
Toxicodendron diversilobum	poison oak	TODI
Trifolium microcephalum	small-head clover	TRMI
Vicia americana ssp. *americana*	American vetch	VIAMA
Zeltnera davyi	Davy's centaury	ZEDA

* HMP species

9.1.2.4   Vegetative Cover

Burleson completed two 50-meter line-intercept transects at HA 18. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 64.43%. The mean vegetative cover by native shrubs and perennials was higher in 2018 than 2017 by 11.09%. Table 9-5 summarizes vegetative cover and Table 9-6 presents vegetative cover by species. Figure 9-5 presents the percent cover of dominant species at HA 18 in 2016, 2017 and 2018.

Table 9-5. 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	81.28	80.50	0.54	0.24	100.00	0.00
HA18T02	51.16	48.36	0.00	2.80	98.60	1.40
SITE AVERAGE	**66.22**	**64.43**	**0.27**	**1.52**	**99.30**	**0.70**

Table 9-6. Transect Survey Results for HA 18 by Species

Transect	ACGL (%)	ARPU* (%)	ARTO (%)	BAPI (%)	CAED (%)	CERI* (%)	CRSC (%)	DIAU (%)	ERER (%)	ERFA* (%)	HEGR (%)	LUAR (%)	TODI (%)	TH (%)	BG (%)
HA18T01	43.56	0.48	10.34	3.66	0.24	0.20	0.28	1.06	0.00	1.34	0.54	3.36	16.22	100.00	0.00
HA18T02	33.74	1.28	7.20	0.00	2.80	0.00	5.22	0.52	0.40	0.00	0.00	0.00	0.00	98.60	1.40
SITE AVERAGE	**38.65**	**0.88**	**8.77**	**1.83**	**1.52**	**0.10**	**2.75**	**0.79**	**0.20**	**0.67**	**0.27**	**1.68**	**8.11**	**99.30**	**0.70**

* HMP species
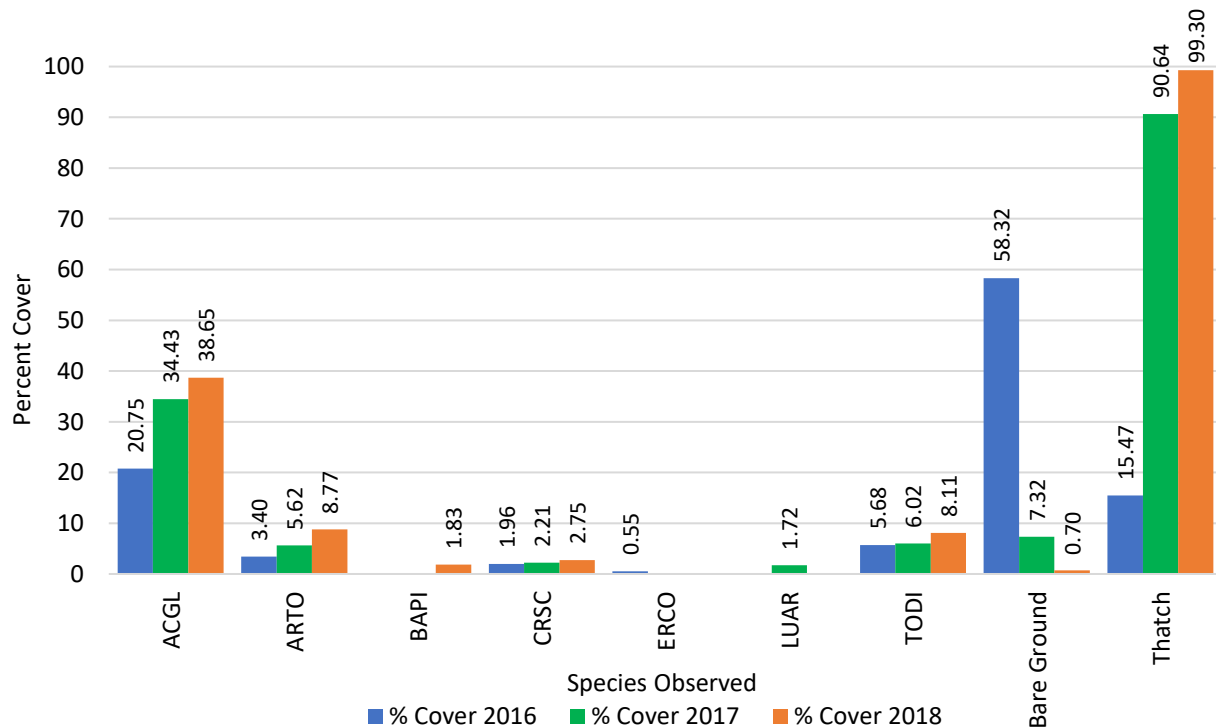
Figure 9-5. Percent Cover of Dominant Species at HA 18 in 2016, 2017, and 2018.

9.1.3   Discussion

9.1.3.1   Recommendations

HA 18 was in year 6 of monitoring in 2018 and responded well to previous restoration efforts. The restored area met four of six success criteria by 2018, one more than was achieved by 2017. Per recommendations in the 2017 Annual Habitat Restoration Report, chamise will be planted in 2018/2019 to meet the species richness criterion and Monterey ceanothus will be planted in 2019/2020 to meet the HMP shrub cover criterion (Burleson, 2018). The Army also recommends planting dwarf ceanothus to meet the success criterion for species richness. Overall, HA 18 needs time to respond to restoration and continued monitoring to evaluate areas that may need additional effort. A qualitative overview was documented by photo points (see Appendix D, page D-1).

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 9-7 summarizes the current status of HA 18 including which success criteria were met and recommendations.

Table 9-7. 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 and dwarf ceanothus (scheduled 2018/2019)*
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	Plant Monterey ceanothus (scheduled 2019/2020)*
Objective 3 – No. 4	HMP annual density	Yes	None

* Recommendation repeated from the 2017 Annual Habitat Restoration Report (Burleson, 2018).

9.1.3.2   HMP Annual Density

Monterey spineflower density was within the acceptable limit for HMP annual density at HA 18. The SSRP baseline density class for Monterey spineflower was low. Year 6 Monterey spineflower restoration plot results show that densities met or exceeded the success criterion under Objective 3 for all plots. In addition, Monterey spineflower was present outside of the restoration plots. Discrete patches, with densities that either met or exceeded the success criterion, covered 0.21 acres of HA 18.

9.1.3.3   Plant Survivorship

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

9.1.3.4   Species Richness

Shaggy-bark manzanita, California sagebrush (*Artemisia californica*), coyote brush, Monterey ceanothus, mock heather (*Ericameria ericoides*), Eastwood's goldenbush, golden yarrow (*Eriophyllum confertiflorum*), peak rush-rose (*Crocanthemum scoparium*), deerweed, sticky monkeyflower (*Diplacus aurantiacus*), coast live oak (*Quercus agrifolia),* and black sage were present. Chamise and dwarf ceanothus (*Ceanothus dentatus*) were not present. HA 18 included 37 native shrub and perennial species; however, the site did not meet the success criterion for Objective 1.

9.1.3.5   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). These species contributed 54.64% cover to the HA; therefore, this success criterion was met. In 2017, vegetative cover was 45.34%; cover increased by 9.30% (see Figure 9-6).
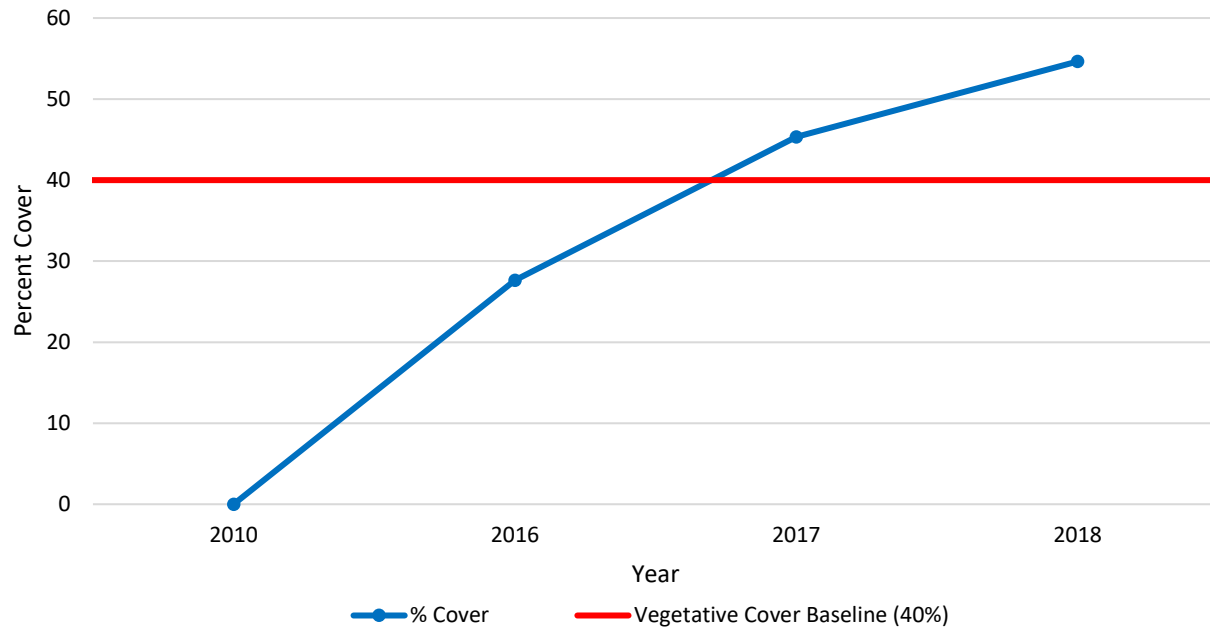
Figure 9-6. Native Vegetative Cover Compared to the Success Criterion at HA 18

Objective 2 considers the percent cover of non-native target weeds. The transect surveys contained iceplant (*Carpobrotus edulis*); however, vegetative cover for non-native species was 1.52% which is less than the 5% acceptable limit. There was an increase of 0.72% from 2017. Despite the 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 ranges from 1-5% of absolute cover. The HMP shrub species at HA 18 provided an absolute cover of 1.65%; therefore, the HA met this success criterion. This was an increase from 0.69% in 2017 when the HA did not meet the 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 and sandmat manzanita and Eastwood's goldenbush must be present. The average vegetative cover for Monterey ceanothus was 0.10%, sandmat manzanita was 0.88%, and Eastwood's goldenbush was 0.67% (see Figure 9-7). Monterey ceanothus, sandmat manzanita, and Eastwood's goldenbush increased in cover from 2017 to 2018. In 2018, two of the three species, sandmat manzanita and Eastwood's goldenbush, met the criterion. The success criterion was not met because Monterey ceanothus cover was less than 4%, although there was measured improvement.
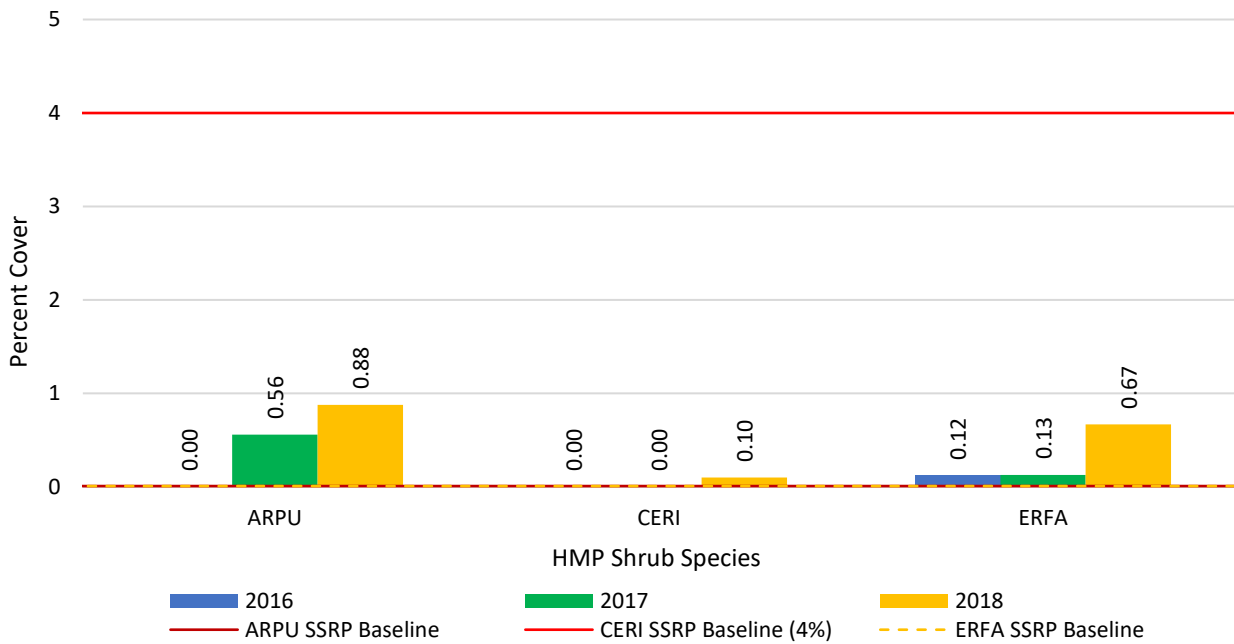
Figure 9-7. HMP Shrub Species Comparison to Success Criteria at HA 18

9.2   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 of similar maritime climates (USFS, 2007). HA 19 is relatively flat with a western aspect. Adjacent lands are high quality habitat with intact native vegetation that may promote natural recruitment within 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 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.

The SSRP restoration procedure for HA 19 included both passive and active restoration consisting of hand broadcast non-irrigated seed mix and installing container-grown plants. 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. Areas larger than 1.0 acre and greater than 100 feet across received both active and passive restoration efforts.

Restoration activities at HA 19 began in 2012 and were completed in 2016. Monitoring at HA 19 began in 2013. HA 19 was monitored for seven years by photo documentation and site visits, five years for HMP annual density in plots, three years for HMP annual density across the HA, species richness, and vegetative cover, and four years for plant survivorship (see Table 9-8). Figure 9-8 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 9-9.

Table 9-8. Historic Summary of Restoration and Monitoring Activities at HA 19

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	2012	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 9-8. HA 19 Restoration Areas and Monitoring Locations Map

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

	Objective 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† shaggy-bark manzanita California sagebrush coyote brush Monterey ceanothus† mock heather Eastwood's goldenbush† 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 of the SSRP
	Objective 2*		
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*		
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 present however, less than 1 percent is acceptable.

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

	Objective 3*		
4	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Monterey spineflower density class: Low Sand gilia density class: Low

* Objectives presented in HRP (Shaw, 2009b)
† HMP Species

9.2.1   Restoration Activities

Burleson performed passive restoration at HA 19 in 2013, 2015, and 2016. No additional passive restoration activities occurred in 2018. The total amount of seed broadcast on site was 393.85 lb compared to 517.00 lb prescribed in the SSRP. Table 9-10 summarizes the SSRP seed target and the amount of seed applied by year and species. 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 9-10. Summary of Passive Restoration Activities 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	-	7.99	16.49
ACGL	28.00	7.00	10.00	-	16.00	33.00
ADFA	14.00	3.50	-	-	4.00	7.50
ARPU*	14.00	3.90	5.00	-	-	8.90
ARTO	28.00	7.00	-	-	-	7.00
ARCA	14.00	3.50	5.00	-	4.00	12.50
BAPI	2.10	0.53	1.00	-	4.00	5.53
CEDE	-	-	-	-	4.00	4.00
CERI*	14.00	3.70	5.00	-	4.00	12.70
CHPUP*	0.20	0.18	-	-	-	0.18
CRSC	14.00	3.50	5.00	-	4.00	12.50
DIAU	1.40	2.10	3.00	-	0.40	5.50
ELGL	126.00	31.70	45.00	-	36.00	112.70
ERER	3.50	0.88	0.50	-	-	1.38
ERFA*	1.40	0.37	1.50	-	0.40	2.27
ERCO	4.20	1.10	1.50	-	5.20	7.80
GITEA*	0.20	-	-	0.20	-	0.20
HO	126.00	31.70	45.00	-	-	76.70
HOCU	28.00	7.00	10.00	-	16.00	33.00
LUAR	-	-	-	-	3.00	3.00
LUNA	-	-	-	-	1.00	1.00
SAME	14.00	3.50	5.00	-	4.00	12.50
STCE	70.00	17.50	-	-	-	17.50
TOTAL	**517.00**	**132.16**	**147.50**	**0.20**	**113.99**	**393.85**

* 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 9-11 summarizes the plants installed during active restoration.

Table 9-11. Summary of Active Restoration Activities for HA 19

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

* HMP species

9.2.2   Monitoring Results

9.2.2.1   HMP Annual Density

Monterey spineflower and sand gilia restoration plots were monitored for density at HA 19.

Nine Monterey spineflower plots were surveyed for year 5 density at HA 19 in 2018. The plots are numbered 1-9 on Figure 9-10 and located throughout HA 19. Monterey spineflower density was low at Plots 2, 3, 4, and 9, medium at Plot 1, high at Plot 8, and very high at Plots 5, 6, and 7. Figure 9-9 presents all the Monterey spineflower restoration plot densities for HA 19.
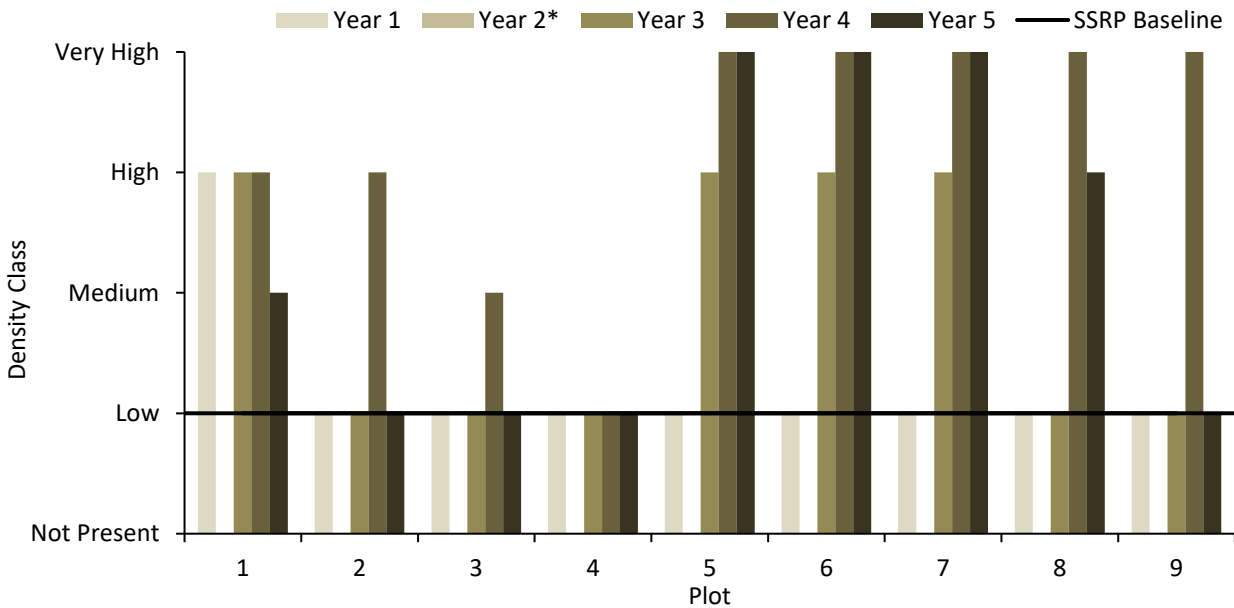
* HA 19 Monterey spineflower plots were not surveyed in year 2

Figure 9-9. HA 19 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots 1-9
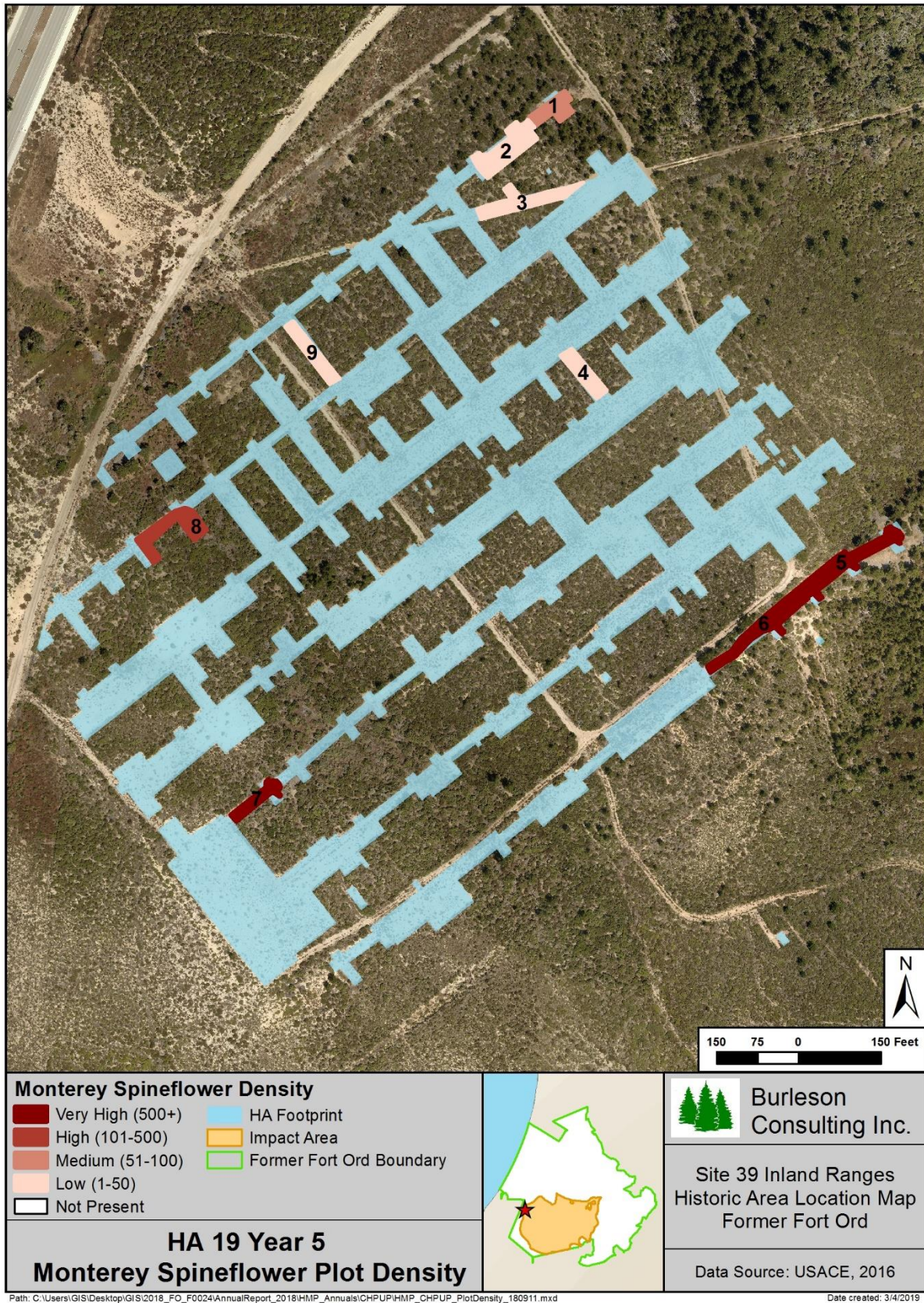
Figure 9-10. HA 19 Year 5 Monterey Spineflower Plot Density Map

Nine sand gilia plots were surveyed for year 4 density at HA 19 in 2018. The plots are numbered 1-9 on Figure 9-12 and are primarily located on the southwestern part of the site. Sand gilia densities were low at Plots 3, 4, 5, 6, 7, 8, and 9 and medium at Plot 2. Sand gilia was not present at Plot 1. Figure 9-11 presents all the sand gilia restoration plot densities for HA 19.
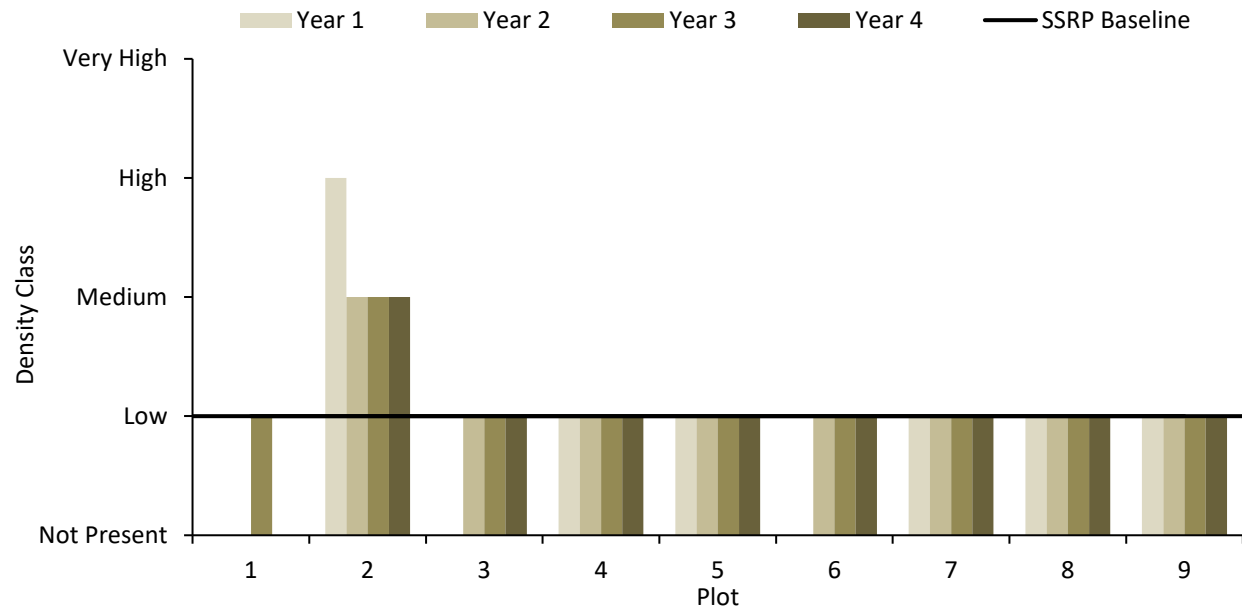
Figure 9-11. HA 19 Comparison of Sand Gilia Density Classes to the SSRP Baseline for Plots 1-9
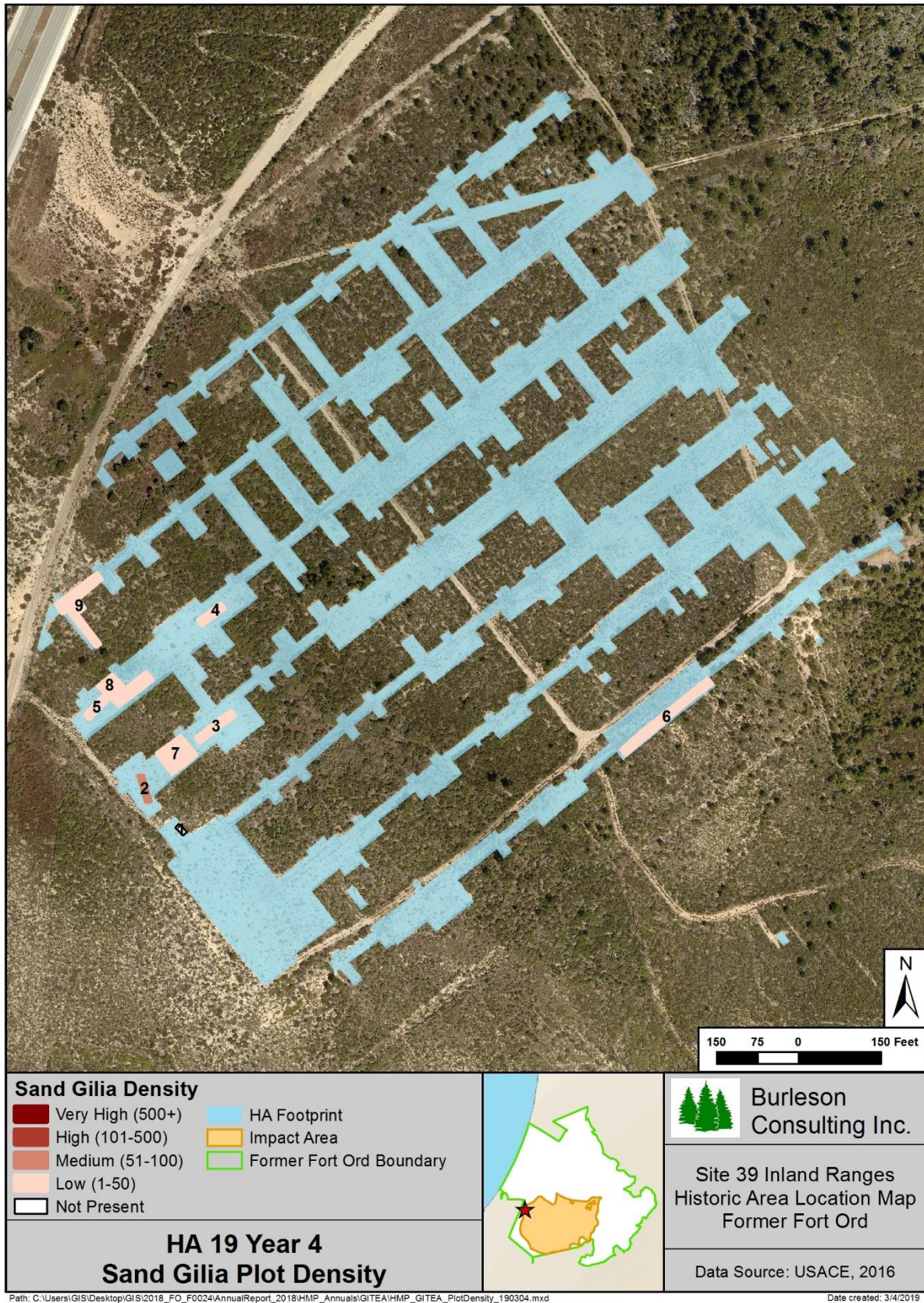
Figure 9-12. HA 19 Year 4 Sand Gilia Plot Density Map

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 at HA 19.

Sixteen discrete patches of sand gilia were mapped and individuals counted within each patch (see Figure 9-13). Densities ranged from low to high and the total acreage of sand gilia patches with a density at or above the SSRP baseline density class of low was 0.05 acres. From 2017 to 2018, the density range increased and acreage above the SSRP baseline decreased.

The Monterey spineflower population was very dense and patches were indistinguishable throughout HA 19. Burleson biologists used the circle plot method to evaluate density across the site. Circle plot data was used to create a Monterey spineflower density interpolation model with the interpolation tool, spline with barriers, in ArcGIS. Figure 9-14 presents results of the density interpolation model for Monterey spineflower.
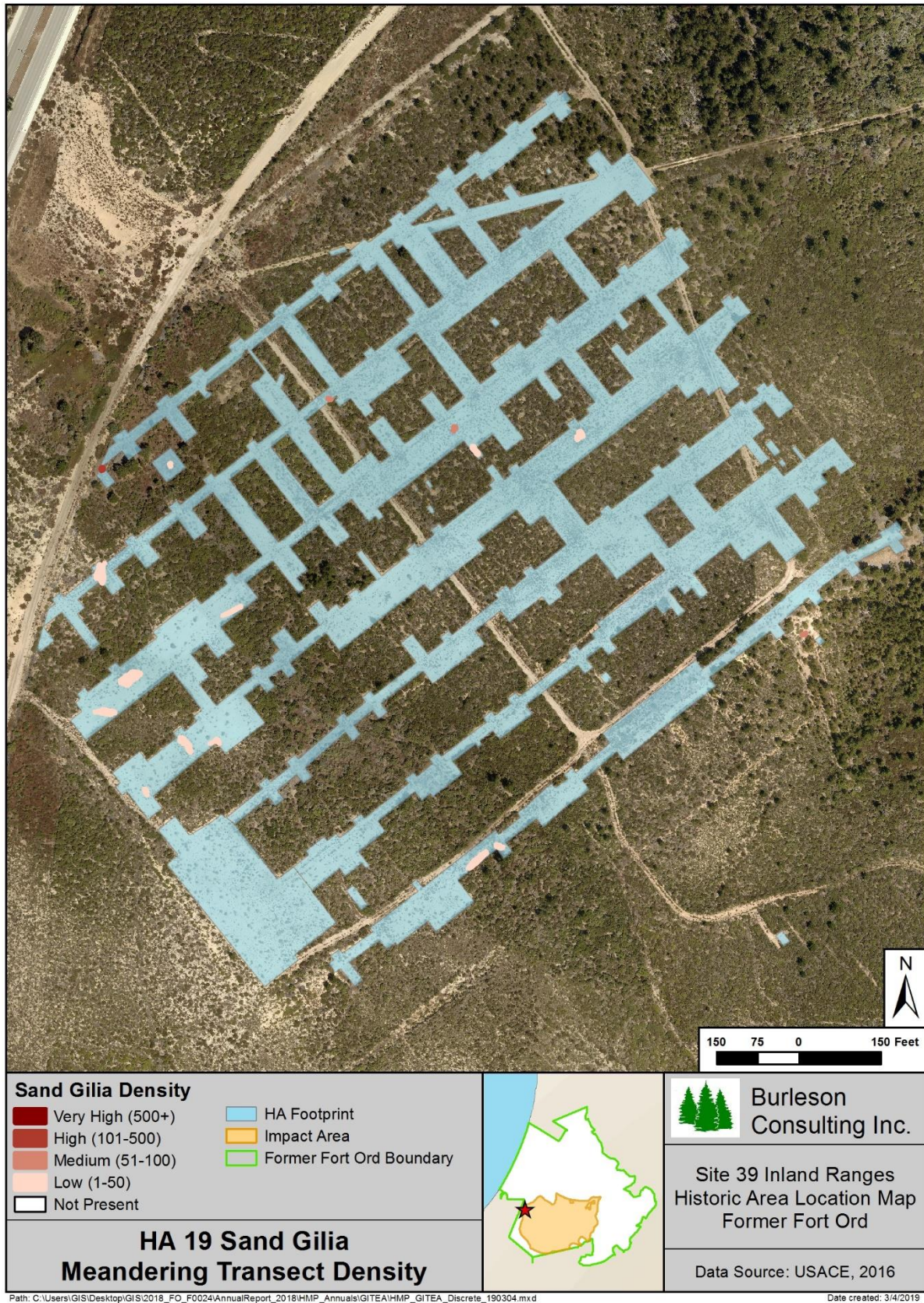
Figure 9-13. HA 19 Sand Gilia Meandering Transect Density Map
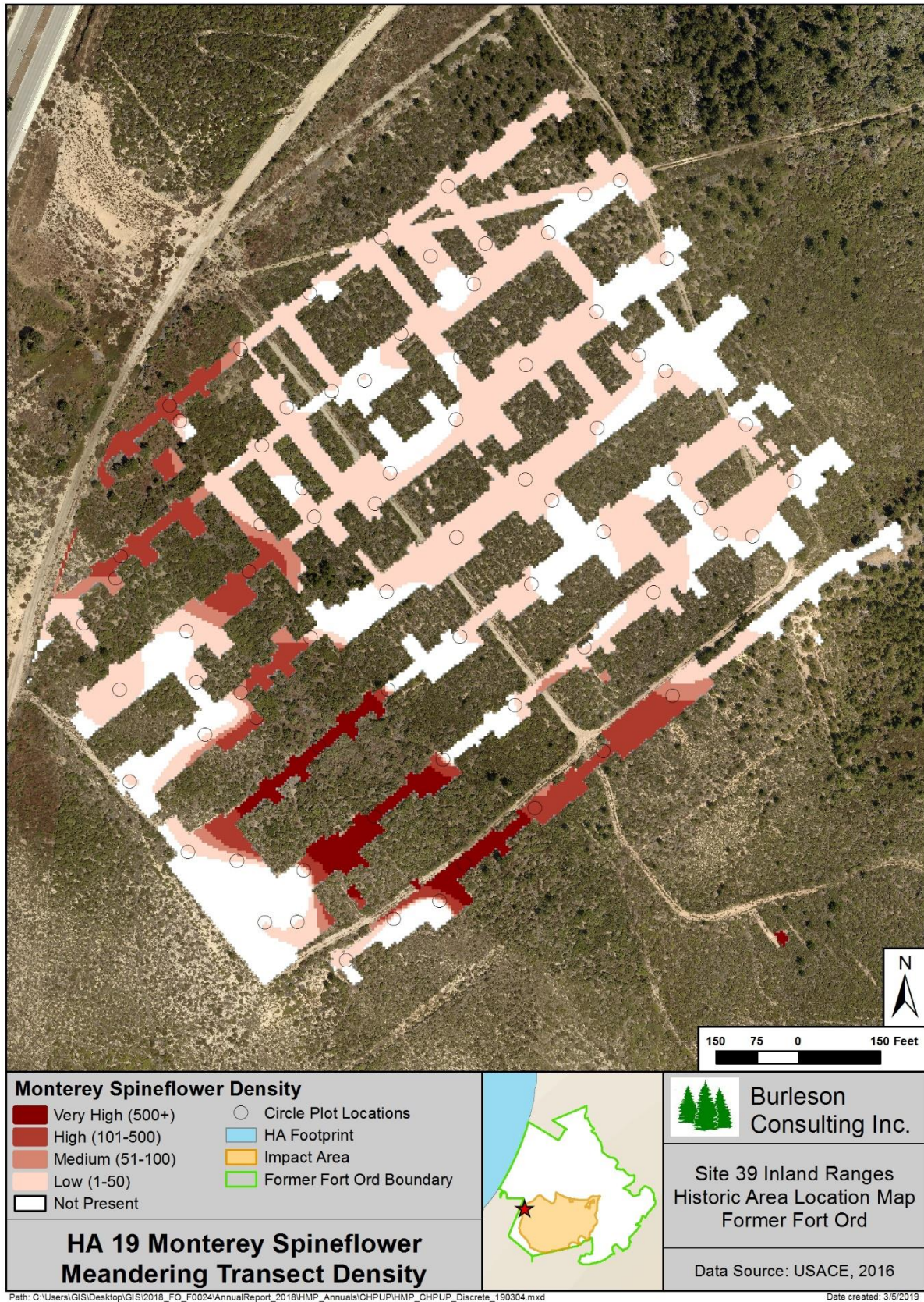
Figure 9-14. HA 19 Monterey Spineflower Density Map

9.2.2.2   Plant Survivorship

Plant survivorship monitoring was completed at HA 19 for plants installed in 2013 and 2014. A total of nine shrub species and 187 individual plants were monitored for survivorship. By year 3 of monitoring, survivorship was 72% for the 2013 planting and 20% for the 2014 planting. Survivorship monitoring is complete. Table 9-12 and Table 9-13 present results by species.

Table 9-12. Plant Survivorship Monitoring Summary for 2013 Planting at HA 19

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2013) Alive (%)	Year Two (2014) Alive (%)	Year Three (2015) Alive (%)
ADFA	37	31	68	67	68
ARCA	68	17	88	80	65
ARPU*	255	28	96	83	83
ARTO	24	10	80	80	80
BAPI	150	14	86	83	85
CERI*	66	29	48	36	34
ERER	33	19	84	79	79
ERFA*	97	18	89	90	95
SAME	227	16	94	100	80
TOTAL	**957**	**182**	**79**	**75**	**72**

* HMP species

Table 9-13. Plant Survivorship Monitoring Summary for 2014 Planting at HA 19

Species	Planted	Monitored	Year One (2014) Alive (%)	Year Two (2015) Alive (%)	Year Three (2016) Alive (%)
ADFA	63	5	100	100	20
TOTAL	**63**	**5**	**100**	**100**	**20**

9.2.2.3   Species Richness

Seventy-six species were observed at HA 19. Of those, 40 were native shrubs or perennials, 21 were native annual herbaceous species, and 15 were non-native species (see Table 9-14). Species richness decreased by three species since 2017. Native shrub and perennial species increased by two, native herbaceous species remained the same, and non-native species decreased by five. The decrease in species richness was largely due to reduced presence of non-native species.

Table 9-14. Species Observed at HA 19, 2018

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Amsinckia spectabilis var. *spectabilis*	Seaside fiddleneck	AMSPS
Arctostaphylos pumila*	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Bromus diandrus	ripgut grass	BRDI
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Camissoniopsis micrantha	small primrose	CAMI
Cardionema ramosissimum	sand mat	CARA
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus*	Monterey ceanothus	CERI
Chenopodium californicum	California goosefoot	CHCA
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Claytonia parviflora	narrow leaved miner's lettuce	CLPA
Claytonia perfoliata	miner's lettuce	CLPE
Clinopodium douglasii	yerba buena	CLDO
Conicosia pugioniformis	narrowleaf iceplant	COPU
Corethrogyne filaginifolia	common sandaster	COFI
Crassula connata	pygmy-weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Cryptantha clevelandii	Cleveland's cryptantha	CRCL
Cryptantha micromeres	minute-flowered cryptantha	CRMI
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wild-rye	ELGL
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata*	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
Festuca octoflora	sixweeks grass	FEOC
Frangula californica	California coffeeberry	FRCA
Galium porrigens var. *porrigens*	climbing bedstraw	GAPOP

Table 9-14. Species Observed at HA 19, 2018

Scientific Name	Common Name	Code
Gamochaeta ustulata	purple cudweed	GAUS
Gilia tenuiflora ssp. *arenaria**	sand gilia	GITEA
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 filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus albifrons	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus chamissonis	silver beach lupine	LUCH
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Marah fabacea	wild cucumber	MAFA
Melica imperfecta	coast range melic	MEIM
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Nuttallanthus texanus	blue toadflax	NUTE
Pinus radiata	Monterey pine	PIRA
Plantago erecta	California plantain	PLER
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium stramineum	cotton-batting plant	PSST
Psilocarphus tenellus	slender woolly-marbles	PSTE
Pterostegia drymarioides	woodland threadstem	PTDR
Quercus agrifolia	coast live oak	QUAG
Rubus ursinus	California blackberry	RUUR
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Silene gallica	small-flower catchfly	SIGA
Solanum umbelliferum	blue witch	SOUM
Sonchus asper	prickly sow thistle	SOAS
Stipa pulchra	purple needle grass	STPU
Toxicodendron diversilobum	poison oak	TODI
Uropappus lindleyi	silver puffs	URLI

* HMP species

9.2.2.4   Vegetative Cover

Burleson completed 14 50-meter line-intercept transects at HA 19. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 39.39%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 4.58%. Table 9-15 summarizes vegetative cover and Table 9-16 presents vegetative cover by species. Figure 9-15 presents the percent cover of dominant species at HA 19 in 2016, 2017, and 2018.

Table 9-15. 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	33.56	33.56	0.00	0.00	57.44	37.82
HA19T02	37.74	37.74	0.00	0.00	70.18	27.66
HA19T03	73.94	73.94	0.00	0.00	87.38	10.10
HA19T04	34.48	34.48	0.00	0.00	53.60	42.22
HA19T05	29.00	29.00	0.00	0.00	54.80	42.06
HA19T06	52.50	52.50	0.00	0.00	75.74	21.58
HA19T07	32.66	32.66	0.00	0.00	68.54	28.89
HA19T08	43.12	43.12	0.00	0.00	78.30	21.20
HA19T09	55.46	55.46	0.00	0.00	78.92	20.56
HA19T10	28.64	28.64	0.00	0.00	76.84	22.26
HA19T11	40.82	40.82	0.00	0.00	67.52	32.24
HA19T12	38.18	38.18	0.00	0.00	83.68	14.14
HA19T13	17.06	17.06	0.00	0.00	35.94	61.24
HA19T14	34.26	34.26	0.00	0.00	61.62	35.56
SITE AVERAGE	**39.39**	**39.39**	**0.00**	**0.00**	**67.89**	**29.82**

Table 9-16. Transect Survey Results for HA 19 by Species

Transect	ACGL (%)	ADFA (%)	ARCA (%)	ARPU* (%)	ARTO (%)	BAPI (%)	CA sp. (%)	CEDE (%)	CERI* (%)	COFI (%)	CRSC (%)	DIAU (%)	ERCO (%)	ERER (%)	ERFA* (%)	HOCU (%)	LUAL/ LUCH† (%)	QUAG (%)	SAME (%)	TODI (%)	TH (%)	BG (%)
HA19T01	5.18	0.00	0.00	10.26	2.56	0.00	0.00	0.00	0.00	0.00	4.14	1.60	0.00	0.00	0.40	0.44	2.00	0.00	0.00	6.98	57.44	37.82
HA19T02	7.54	0.00	2.72	8.10	5.48	1.04	0.00	0.00	0.24	0.00	7.50	0.00	1.52	0.00	0.00	0.00	0.00	0.00	3.60	0.00	70.18	27.66
HA19T03	9.24	0.00	0.26	15.82	3.70	0.54	0.00	6.56	0.00	1.40	28.22	0.00	0.34	0.00	0.00	0.56	3.72	0.00	3.58	0.00	87.38	10.10
HA19T04	1.64	0.00	0.00	15.38	6.58	0.00	0.00	4.60	0.00	0.00	2.92	0.00	2.60	0.00	0.00	0.76	0.00	0.00	0.00	0.00	53.60	42.22
HA19T05	7.16	0.00	0.00	5.22	0.00	0.00	0.00	0.00	0.00	1.06	14.12	0.00	0.38	0.00	0.00	0.00	0.00	0.00	1.06	0.00	54.80	42.06
HA19T06	2.18	0.76	0.00	15.42	2.00	0.00	0.00	4.52	0.00	0.32	27.06	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	75.74	21.58
HA19T07	0.26	0.00	0.00	12.18	0.92	0.00	0.00	0.64	0.26	2.88	14.44	0.00	0.68	0.00	0.00	0.40	0.00	0.00	0.00	0.00	68.54	28.89
HA19T08	0.00	0.00	0.00	11.32	2.02	0.00	0.00	4.70	0.22	0.22	22.60	0.00	2.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	78.30	21.20
HA19T09	8.66	0.90	0.00	19.96	0.00	0.00	0.00	0.00	0.00	0.66	23.64	0.00	0.56	0.00	0.00	0.00	1.08	0.00	0.00	0.00	78.92	20.56
HA19T10	4.06	0.00	0.00	5.80	1.14	0.86	0.00	5.10	0.00	0.00	8.26	0.00	1.56	0.00	0.20	1.66	0.00	0.00	0.00	0.00	76.84	22.26
HA19T11	2.98	0.00	0.00	3.52	5.40	0.00	0.00	0.00	0.00	0.00	9.40	0.00	0.00	0.00	0.00	0.00	3.38	0.00	16.14	0.00	67.52	32.24
HA19T12	21.10	0.00	0.00	7.80	0.80	0.00	0.00	0.00	0.00	0.00	2.54	0.32	0.32	0.46	0.00	0.26	0.00	3.82	0.00	0.76	83.68	14.14
HA19T13	0.00	0.00	0.00	2.04	0.68	0.00	0.00	0.00	0.36	0.00	10.00	0.00	1.14	0.00	2.84	0.00	0.00	0.00	0.00	0.00	35.94	61.24
HA19T14	0.96	0.00	0.00	15.44	0.56	0.00	0.46	0.00	0.00	0.00	9.06	0.00	0.68	0.00	0.00	0.30	6.80	0.00	0.00	0.00	61.62	35.56
SITE AVERAGE	**5.07**	**0.12**	**0.21**	**10.59**	**2.27**	**0.17**	**0.03**	**1.87**	**0.08**	**0.47**	**13.14**	**0.14**	**0.84**	**0.03**	**0.25**	**0.33**	**1.21**	**0.27**	**1.74**	**0.55**	**67.89**	**29.82**

* HMP species

† Due to subtle phenological differences between *Lupinus albifrons* var. *albifrons* and *Lupinus chamissonis* and the timing of surveys, the two species were combined for analysis of transect survey data and comparison to the success criteria (see section 6.1.4).
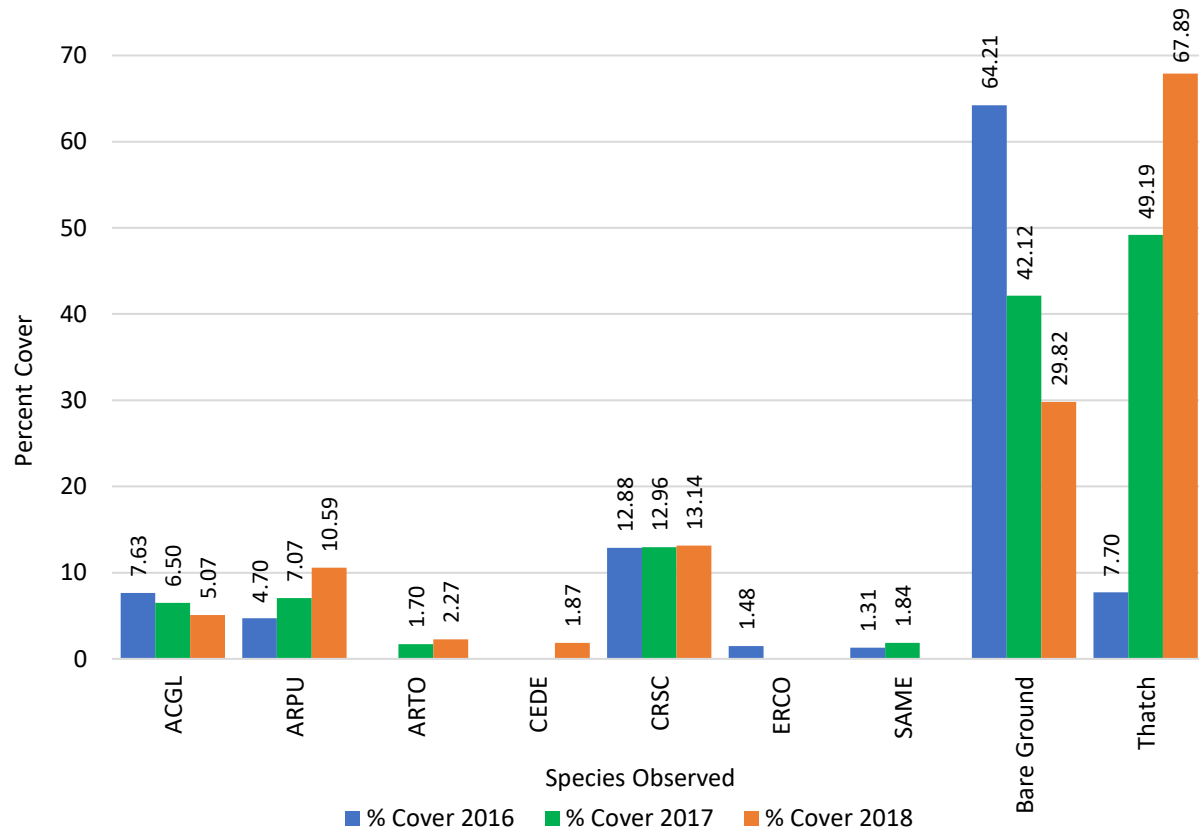
Figure 9-15. Percent Cover of Dominant Species at HA 19 in 2016, 2017, and 2018.

9.2.3 Discussion

9.2.3.1 Recommendations

HA 19 was in year 5 of monitoring in 2018 and responded well to previous restoration efforts. The restored area met three of six success criteria by 2018. Per recommendations in the 2016 Annual Habitat Restoration Report, pitcher sage and sandmat manzanita will be planted in the 2018/2019 and 2019/2020 seasons to meet the success criteria for species richness and HMP shrub cover (Burleson, 2018). The Army also recommends closing the access road. 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 was documented by photo points (see Appendix D, page D-2 and Appendix E, page E-1).

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, 2021. Table 9-17 summarizes the current status of HA 19 including which success criteria were met and recommendations.

Table 9-17. Status and Recommendations for Achieving Success Criteria at HA 19

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant pitcher sage (scheduled 2018/2019)*
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	Plant sandmat manzanita (scheduled 2019/2020)
Objective 3 – No. 4	HMP annual density	Yes	None

* Recommendation repeated from the 2017 Annual Habitat Restoration Report (Burleson, 2018).

9.2.3.2   HMP Annual Density

Monterey spineflower density was within the acceptable limit for HMP annual density at HA 19. The SSRP baseline density class for Monterey spineflower was low. Year 5 Monterey spineflower restoration plot results show that all plots met or exceeded the success criterion. 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. The Monterey spineflower population outside of the restoration plots responded very well. Circle plot data indicated Monterey spineflower densities ranged from not present to very high. The density model indicated that more than 10% of HA 19 was utilized by Monterey spineflower (approximately 9.0 acres; see Figure 9-14). HA 19 met the success criterion for Monterey spineflower density.

Sand gilia density was within the acceptable limit for HMP annual density at HA 19. The SSRP baseline density class for sand gilia was low. Year 4 sand gilia restoration plot results show that eight out of nine plot 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 0.05 acres of HA 19.

9.2.3.3   Plant Survivorship

Plant survivorship was moderate for the 2013 planting and low for the 2014 planting at HA 19. The 2014 planting was an additional effort to meet the planting target for chamise. While chamise survivorship for the 2014 planting was low, the total monitored chamise alive after year 3 was 61% (includes both planting events). Monterey ceanothus had low survivorship for the 2013 planting. Monterey ceanothus had low survivorship at multiple sites and possibly had difficulty establishing at HA 19 due to wind erosion including wind scour and sand deposition. If future plantings occur, it is recommended that wind breaks be installed to provide protection from high winds and erosion.

9.2.3.4   Species Richness

Chamise, sandmat manzanita, shaggy-bark 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 40 native shrub and perennial species; however, the site did not meet the success criterion for Objective 1.

9.2.3.5   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 19 SSRP (Burleson, 2013). These species contributed 34.98% cover to the HA. This success criterion is on an excellent trajectory but is not yet met. In 2017, vegetative cover was 32.13%; cover increased by 2.85% (see Figure 9-16).
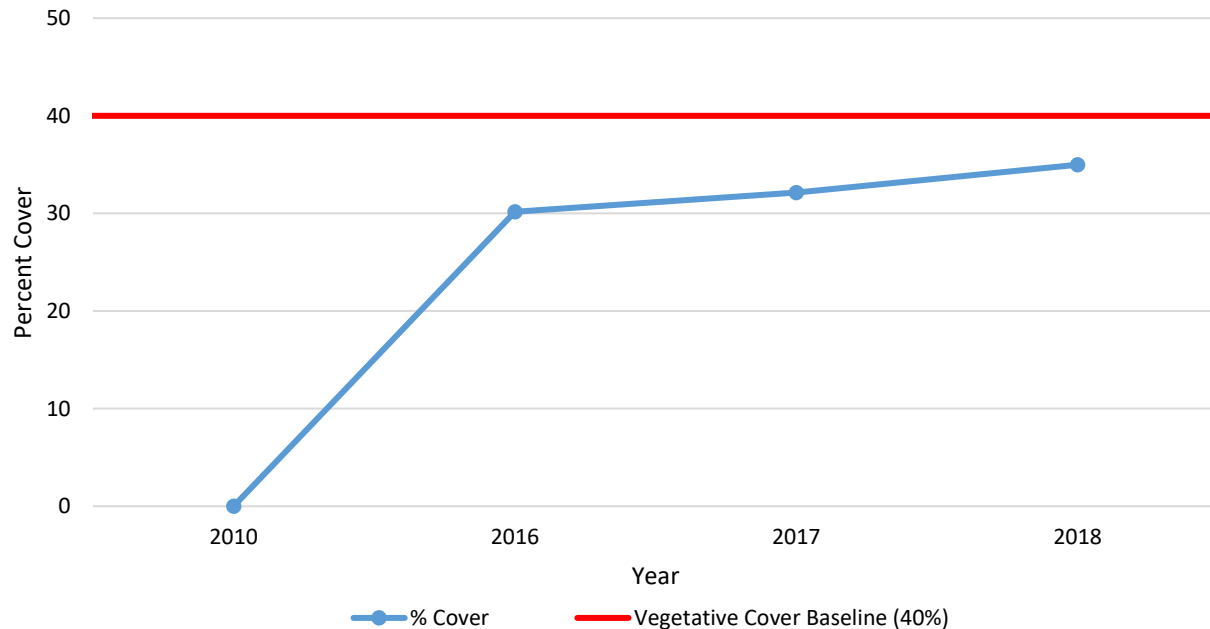
Figure 9-16. Native Vegetative Cover Compared to the Success Criterion at HA 19

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 ranges from 6-25% of absolute cover. The HMP shrub species at HA 19 provided an absolute cover of 10.91%; therefore, the HA met this success criterion. This was an increase from 7.27% in 2017. 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 and presence of Monterey ceanothus and Eastwood's goldenbush. The average vegetative cover for sandmat manzanita was 10.59%, Monterey ceanothus was 0.08%, and Eastwood's goldenbush was 0.25% (see Figure 9-17). All three species increased in cover from 2017 to 2018. In 2018, 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 although there was measured improvement.
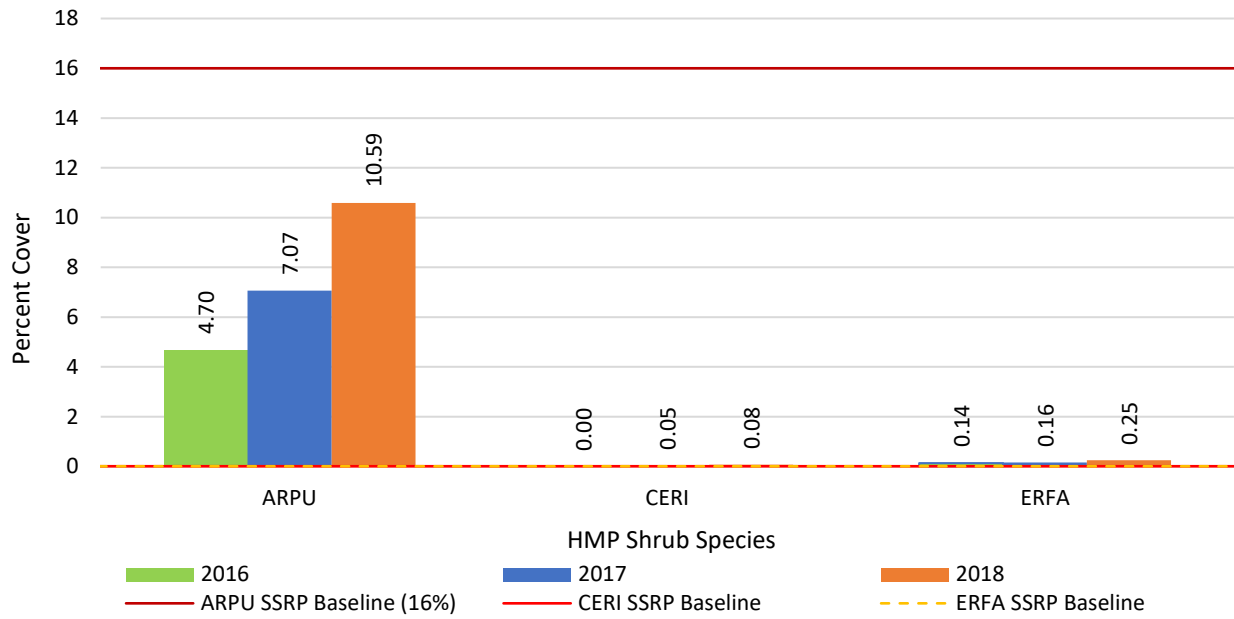
Figure 9-17. HMP Shrub Species Comparison to Success Criteria at HA 19

9.3   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; 100 cubic yards of lead-contaminated soil were excavated from 0.05 acres (Shaw, 2008). HA 22 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of similar maritime climates (USFS, 2007). HA 22 is relatively flat with northwest and west aspects. Adjacent lands were not developed and contain intact native vegetation that may promote natural recruitment within restoration areas.

HA 22 is located in the western portion of Site 39 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 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 (USFS, 2007).

The SSRP prescription for passive restoration at HA 22 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 2013. HA 22 was monitored for eight years by photo documentation and site visits, six years for HMP annual density in plots, and three years for HMP annual density across the HA, species richness, and vegetative cover (see Table 9-18). Figure 9-18 shows the historic area footprint, passive restoration area and transect monitoring locations. Success criteria for HA 22 are summarized in Table 9-19.

Table 9-18. Historic Summary of Restoration and Monitoring Activities at HA 22

Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2020	2025
Restoration: Passive	●	●								
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	●	
HMP Annual Density across HA						●	●	●	●	
Species Richness						●	●	●	●	●
Vegetative Cover						●*	●	●	●	●

* Vegetative cover was monitored using quadrats in 2016

Figure 9-18. HA 22 Restoration Areas and Monitoring Locations Map

Table 9-19. Success Criteria and Acceptable Limits for Restoration of HA 22

	Objective 1*		
No.	**Success Element**	**Decision Rule**	**Acceptable Limits**
1	Restoration demonstrates native species richness	Equivalent native species richness equal to baseline	Native species that must be present to demonstrate richness: chamise shaggy-bark manzanita sandmat manzanita† Coyote brush Monterey ceanothus† dwarf ceanothus Monterey spineflower† mock heather Eastwood's goldenbush† 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 of the SSRP
	Objective 2*		
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*		
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.
			Eastwood's goldenbush percent cover, as an average of transect data, must be equal or greater than 1.

Table 9-19. Success Criteria and Acceptable Limits for Restoration of HA 22

	Objective 3*		
4	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Monterey spineflower density class: Low

* Objectives presented in HRP (Shaw, 2009b)

† HMP Species

9.3.1   Restoration Activities

Burleson performed passive restoration at HA 22 in 2011 and 2012. No additional restoration activities occurred in 2018. The total amount of seed broadcast on site was 1.219 lb compared to the 1.243 lb prescribed in the SSRP. No active restoration activities were required for HA 22. Table 9-20 summarizes the SSRP seed target and the amount of seed applied by year and species. Burleson performed passive restoration for the HMP annual species Monterey spineflower. One plot was chosen in the HA based on having suitable habitat for Monterey spineflower and adjacent extant populations.

Table 9-20. **Summary of Passive Restoration Activities 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*	0.050	0.027	0.040	0.067
ARTO	0.100	0.052	0.062	0.114
BAPI	0.008	-	0.006	0.006
CERI*	0.050	0.028	0.028	0.056
CHPUP*	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*	0.001	-	0.002	0.002
HOCU	0.100	0.051	0.058	0.109
HO	0.450	-	0.239	0.239
SAME	0.050	0.037	0.032	0.069
STCE	0.100	0.051	0.060	0.111
TOTAL	**1.243**	**0.452**	**0.767**	**1.219**

* HMP species

9.3.2   Monitoring Results

HA 22 was in year 6 of monitoring in 2018. Even though year 6 was not a required monitoring year, monitoring occurred and results are presented below.

9.3.2.1   HMP Annual Density

One Monterey spineflower plot was surveyed for year 6 density at HA 22 in 2018. The plot is numbered 1 on Figure 9-20 and is located in the central part of the site. Monterey spineflower density was low at Plot 1. Figure 9-19 presents Monterey spineflower restoration plot densities for HA 22.
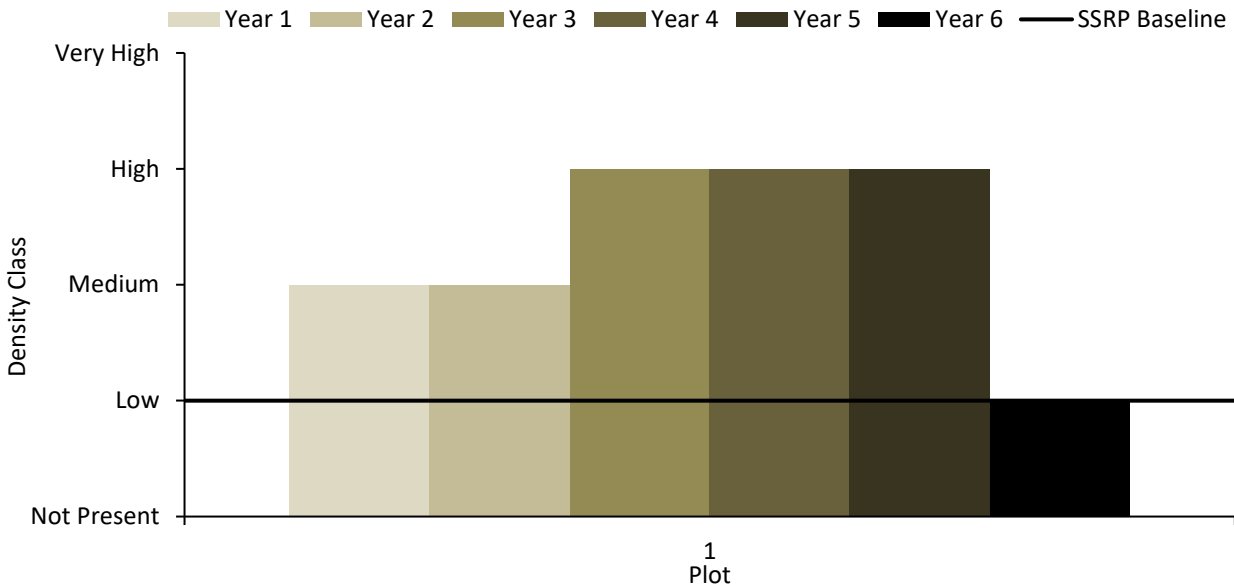
Figure 9-19. HA 22 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plot 1
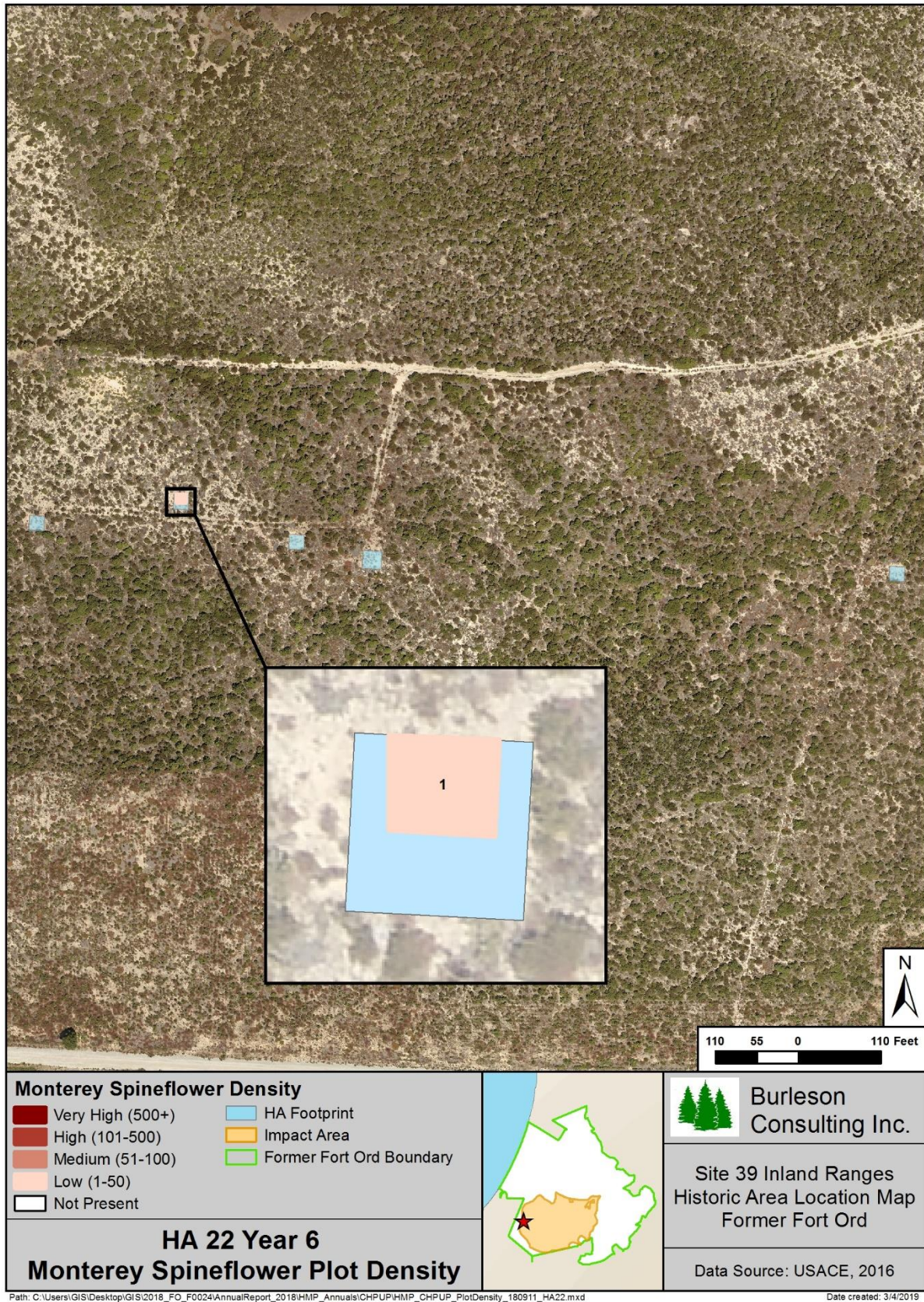
Figure 9-20. HA 22 Year 6 Monterey Spineflower Plot Density Map

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 at HA 22.

Five discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 9-21). Densities ranged from low to high and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.05 acres. From 2017 to 2018, the density range and acreage above the SSRP baseline decreased.

One discrete patch of sand gilia was mapped and individuals counted within the patch (see Figure 9-22). The density was low and the total acreage of sand gilia patches with a density at the SSRP baseline density class of low was 0.001 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline decreased.
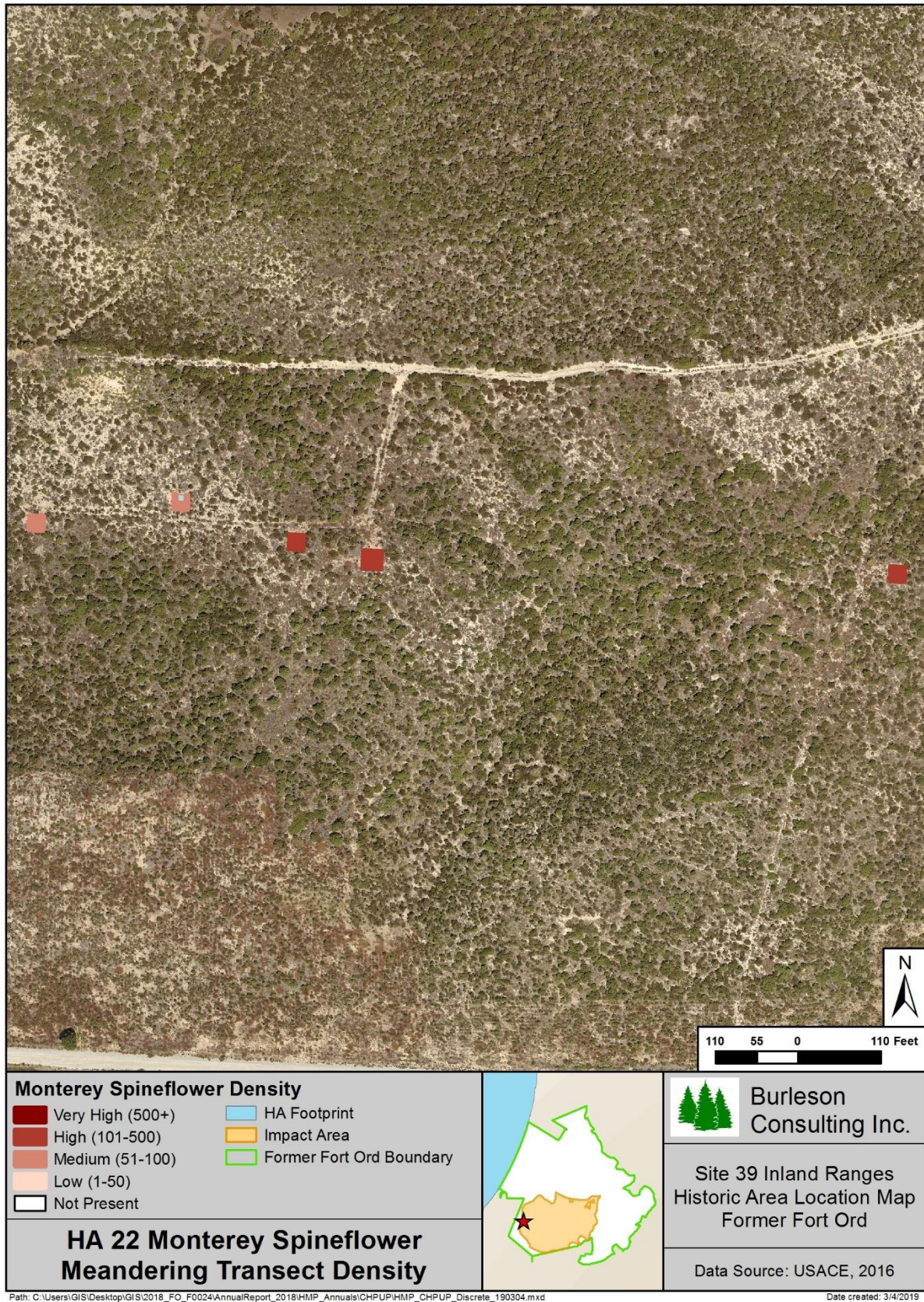
Figure 9-21. HA 22 Monterey Spineflower Meandering Transect Density Map
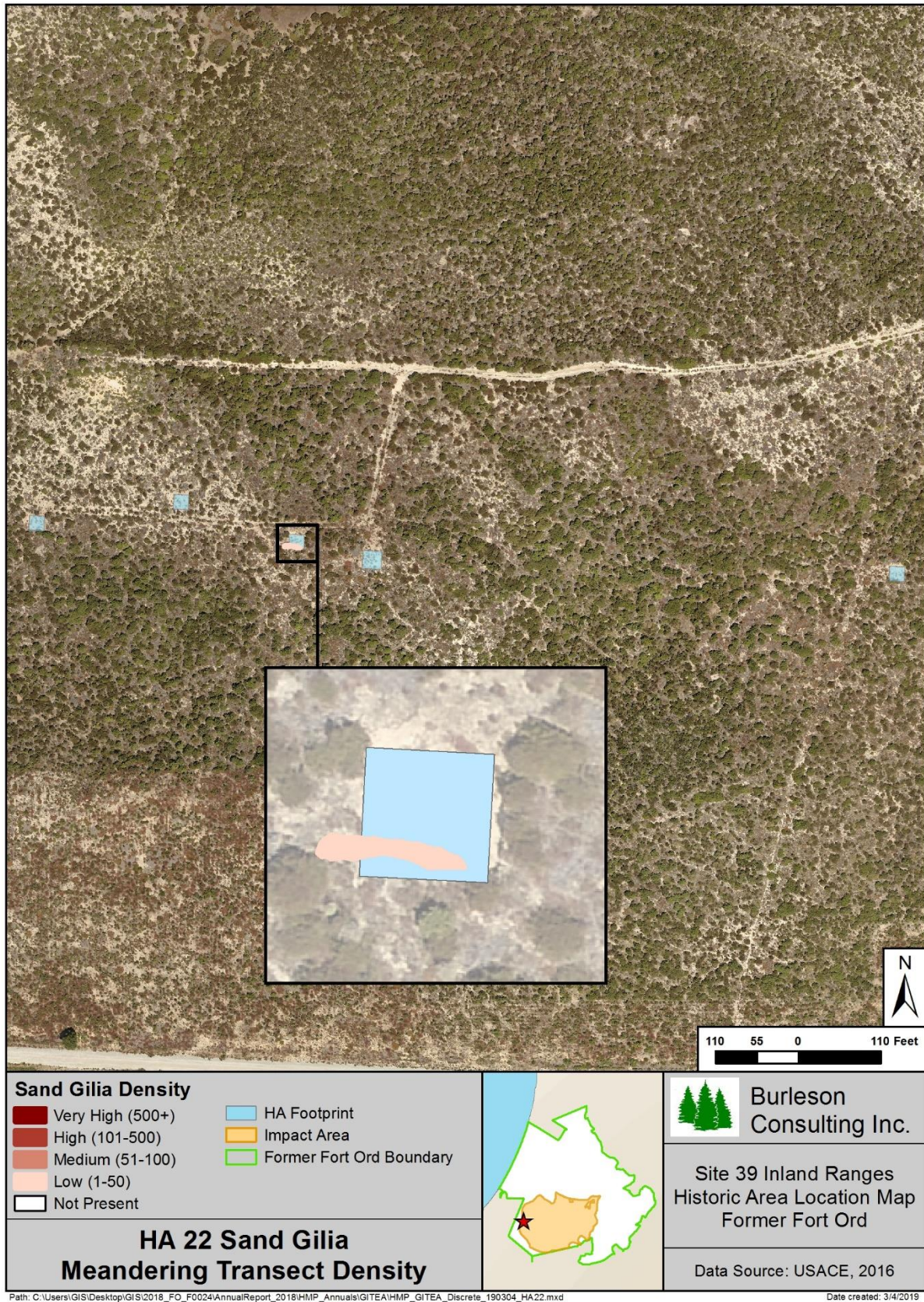
Figure 9-22. HA 22 Sand Gilia Meandering Transect Density Map

9.3.2.2   Plant Survivorship

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

9.3.2.3   Species Richness

Twenty-eight species were observed at HA 22 as shown in Table 9-21. Of those, 16 were native shrubs or perennials, eight were native annual herbaceous species, and four were non-native species (see Table 9-21). Species richness decreased by seven species since 2017. Native shrub and perennial species increased by one, native herbaceous species decreased by four, and non-native species decreased by four. The decrease in species richness was partly due to reduced presence of non-native species.

Table 9-21. Species Observed at HA 22, 2018

Scientific Name	Common Name	Code
Acmispon glaber	deerweed	ACGL
Adenostoma fasciculatum	chamise	ADFA
*Arctostaphylos pumila**	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Artemisia pycnocephala	coastal sagewort	ARPY
Camissoniopsis micrantha	small primrose	CAMI
Cardionema ramosissimum	sand mat	CARA
Carpobrotus edulis	hottentot fig	CAED
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Corethrogyne filaginifolia	common sandaster	COFI
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 filaree	ERCI
Gilia tenuiflora ssp. *arenaria**	sand 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
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Salvia mellifera	black sage	SAME
Toxicodendron diversilobum	poison oak	TODI

* HMP species

9.3.2.4   Vegetative Cover

Burleson completed five line-intercept transects ranging from seven to 11 meters in length at HA 22. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 46.88%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 3.88%. Table 9-22 summarizes vegetative cover and Table 9-23 presents vegetative cover by species. Figure 9-23 presents the percent cover of dominant species at HA 22 in 2017 and 2018.

Table 9-22. 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	32.38	32.38	0.00	0.00	85.38	14.63
HA22T02	40.73	40.73	0.00	0.00	90.18	9.55
HA22T03	74.86	74.86	0.00	0.00	90.00	6.71
HA22T04	35.44	35.44	0.00	0.00	83.89	14.00
HA22T05	58.25	58.25	0.00	0.00	77.25	19.50
SITE AVERAGE*	**46.88**	**46.88**	**0.00**	**0.00**	**85.53**	**12.81**

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

Table 9-23. Transect Survey Results for HA 22 by Species

Transect	ACGL (%)	ARPU* (%)	COFI (%)	CRCA (%)	CRSC (%)	DIAU (%)	ERER (%)	HOCU (%)	TH (%)	BG (%)
HA22T01	22.38	0.00	0.00	0.00	4.63	0.00	1.63	3.75	85.38	14.63
HA22T02	34.64	0.00	0.00	0.00	0.00	1.91	4.18	0.00	90.18	9.55
HA22T03	63.71	0.00	0.00	11.14	0.00	0.00	0.00	0.00	90.00	6.71
HA22T04	19.89	0.00	0.00	0.00	0.00	0.00	15.56	0.00	83.89	14.00
HA22T05	15.63	9.75	2.00	4.88	4.25	0.00	14.00	7.75	77.25	19.50
SITE AVERAGE†	**30.47**	**1.81**	**0.37**	**2.72**	**1.65**	**0.49**	**7.23**	**2.14**	**85.53**	**12.81**

* HMP Species
† Transect lengths are not equal. Site averages are weighted to reflect differing lengths.
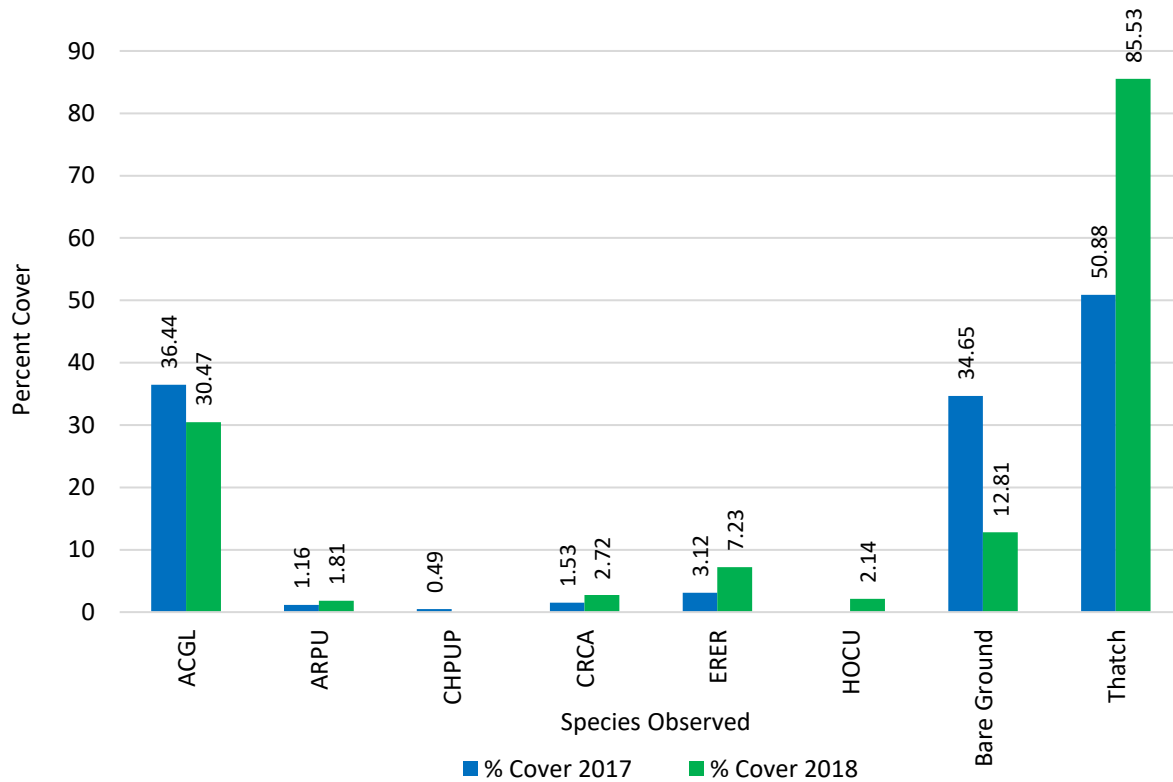
Figure 9-23. Percent Cover of Dominant Species at HA 22 in 2018.

9.3.3   Discussion

9.3.3.1   Recommendations

HA 22 was in year 6 of monitoring in 2018 and responded well to previous restoration efforts. The site met three of six success criteria by 2018. Per recommendations in the 2016 Annual Habitat Restoration Report, sandmat manzanita, shaggy-bark 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 was documented by photo points (see Appendix D, page D-3).

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 9-24 summarizes the current status of HA 22 including which success criteria were met and recommendations.

Table 9-24. Status and Recommendations for Achieving Success Criteria at HA 22

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant sandmat manzanita, shaggy-bark manzanita, coyote brush, Monterey ceanothus, dwarf ceanothus, mock heather, Eastwood's goldenbush, golden yarrow, sticky monkeyflower and black sage (scheduled 2018/2019)*
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 2018/2019)*
Objective 3 – No. 4	HMP shrub cover by species	No	Plant sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush (scheduled 2018/2019)*
Objective 3 – No. 4	HMP annual density	Yes	None

* Recommendation repeated from the 2016 Annual Habitat Restoration Report (Burleson, 2017).

9.3.3.2   HMP Annual Density

Monterey spineflower density was within the acceptable limit for HMP annual density at HA 22. The SSRP baseline density class for Monterey spineflower was low. Year 6 Monterey spineflower restoration plot results show that the density exceeded the success criterion under Objective 3. In addition, Monterey spineflower was present outside the restoration plots. Discrete patches of Monterey spineflower, with densities that met or exceeded the success criterion, covered 0.05 acres of HA 22.

Although not part of the success criterion, sand gilia was present at HA 22. Sand gilia covered less than 0.001 acres at low density.

9.3.3.3   Plant Survivorship

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

9.3.3.4   Species Richness

Chamise, golden yarrow, peak rush-rose, deerweed, sandmat manzanita, shaggy-bark manzanita, mock heather, sticky monkeyflower, Monterey spineflower, and black sage were present. However, coyote brush, Monterey ceanothus, dwarf ceanothus, and Eastwood's goldenbush were not present. HA 22 included 16 native shrub and perennial species; however, the site did not meet the success criterion for Objective 1.

9.3.3.5   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 22 SSRP (Burleson, 2013). These species contributed 46.51% cover to the HA. This success criterion was met. In 2017, vegetative cover was 43.49%; cover increased by 3.02% (see Figure 9-24). In 2016, quadrats were completed to provide a preliminary idea of vegetative cover with a limited amount of effort. From 2017 onward, line-intercept transect surveys were used as multiple objectives outlined in the SSRP specifically require transect data. The 2016 quadrat data were not compared to the success criteria.
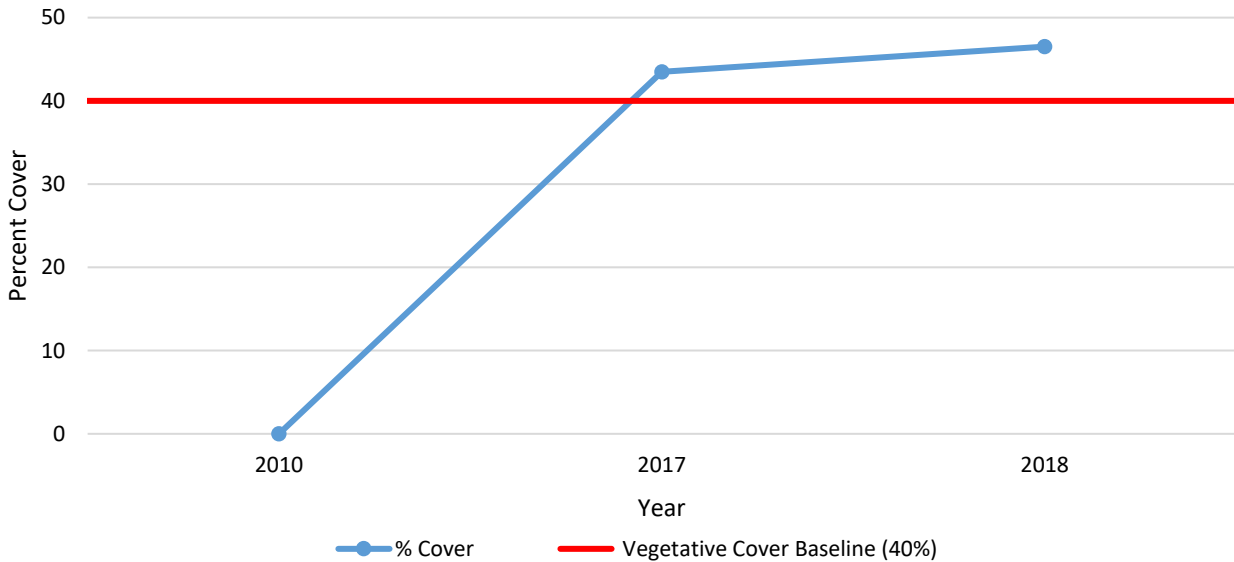
Figure 9-24. Native Vegetative Cover Compared to the Success Criterion at HA 22

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 ranges from 6-25% of absolute cover. The HMP shrub species at HA 22 provided an absolute cover of 1.81%; therefore, the HA did not meet this success criterion. This was an increase from 1.16% in 2017. 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, 4% Monterey ceanothus, and 1% Eastwood's goldenbush. The average vegetative cover for sandmat manzanita was 1.81%, Monterey ceanothus was 0.00%, and Eastwood's goldenbush was 0.00% (see Figure 9-25). In 2017, none of the species met the acceptable limit. Therefore, the success criterion was not met.
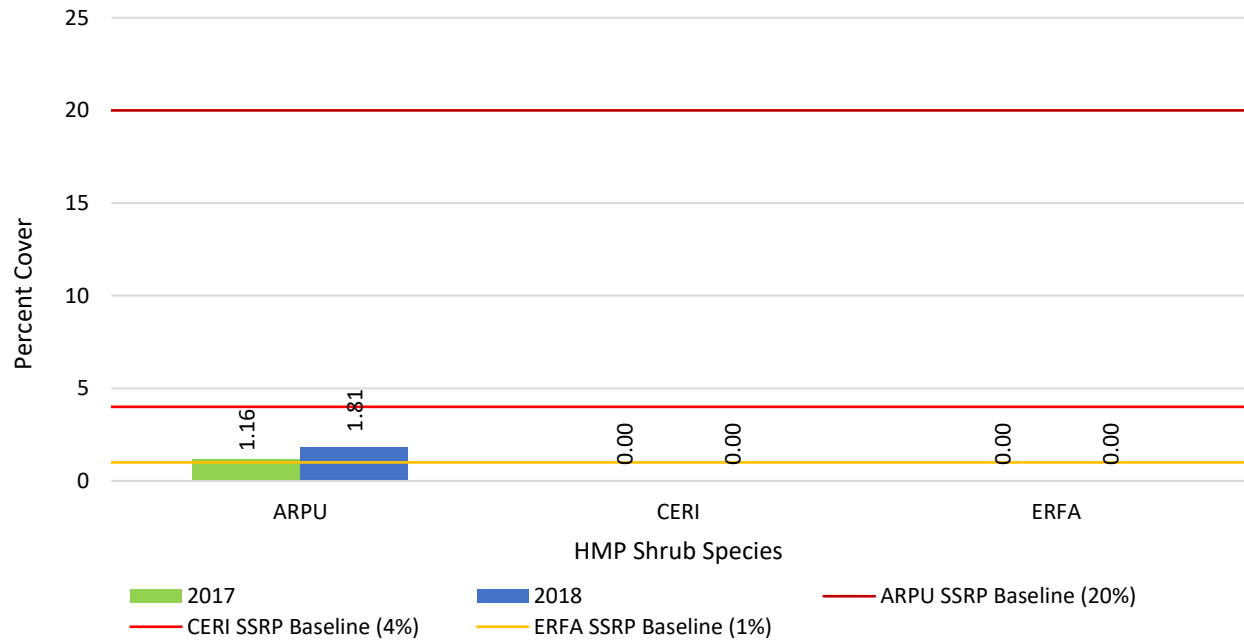
Figure 9-25. HMP Shrub Species Comparison to Success Criteria at HA 22

9.4   HA 23

HA 23 was used by the Army as a small-arms firing range. Soil remediation was completed in 2010; 450 cubic yards of lead-contaminated soil were excavated from 0.3 acres (Shaw, 2008). HA 23 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of similar maritime climates (USFS, 2007). HA 23 is relatively flat with a west aspect. Adjacent lands were not developed and contain intact native vegetation that may promote natural recruitment within 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 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 (USFS, 2007).

The SSRP 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 occurred in 2011 and 2012 and monitoring began in 2013. The HA was monitored for eight years by photo documentation and site visits, five years for HMP annual density in plots, and three years for HMP annual density across the HA, species richness, and vegetative cover (see Table 9-25). Figure 9-26 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 23 are summarized in Table 9-26.

Table 9-25. Historic Summary of Restoration and Monitoring Activities at HA 23

Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2020	2025
Restoration: Passive	●	●								
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			*	●	●	●	●	●	●	
HMP Annual Density across HA						●	●	●	●	
Species Richness						●	●	●	●	●
Vegetative Cover						●[†]	●	●	●	●

*Monterey spineflower was not monitored in year 1 (2013) because of UXO presence and mastication activities
† Vegetative cover was monitored using quadrats in 2016
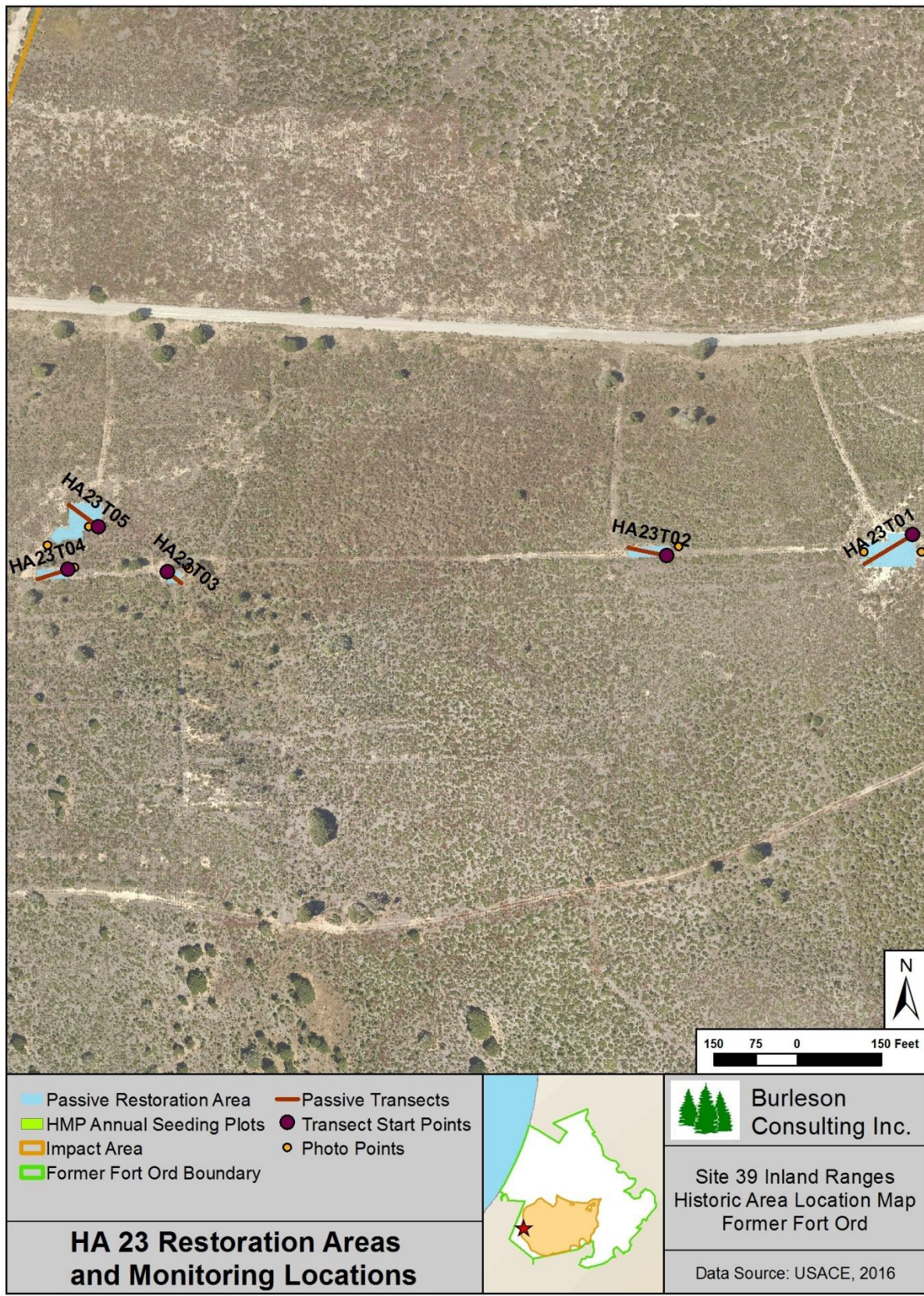
Figure 9-26. HA 23 Restoration Areas and Monitoring Locations Map

Table 9-26. Success Criteria and Acceptable Limits for Restoration of HA 23

	Objective 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† coyote brush Monterey ceanothus† dwarf ceanothus Monterey spineflower† mock heather Eastwood's goldenbush† 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 of the SSRP
	Objective 2*		
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*		
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.
			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	Monterey spineflower density class: Low

* Objectives presented in HRP (Shaw, 2009b)

† HMP Species

9.4.1   Restoration Activities

Burleson performed passive restoration at HA 23 in 2011 and 2012. No additional restoration activities occurred in 2018. The total amount of seed broadcast on site was 8.052 lb compared to 7.285 lb prescribed in the SSRP. Table 9-27 summarizes the SSRP seed target and the amount of seed applied by year and species. 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 9-27. Summary of Passive Restoration Activities for HA 23

Species	Pounds of Seed Broadcast			
	SSRP Target	2011	2012	Total by Species
ACGL	0.600	0.300	0.306	0.606
ACMI	0.300	0.200	0.159	0.359
ADFA	0.300	0.200	0.159	0.359
ARPU*	0.300	0.600	0.175	0.775
ARTO	0.600	0.300	0.326	0.626
BAPI	0.050	-	0.028	0.028
CERI*	0.300	0.088	0.248	0.336
CHPUP*	0.005	0.022	0.003	0.025
CRCA	0.080	0.200	0.158	0.358
CRSC	0.300	0.200	0.168	0.368
DIAU	0.030	0.088	0.105	0.193
ERCO	0.090	0.490	0.058	0.548
ERER	0.080	0.420	0.044	0.464
ERFA*	0.050	0.028	0.026	0.054
HOCU	0.600	0.300	0.306	0.606
HO	2.700	-	1.370	1.370
SAME	0.300	0.200	0.162	0.362
STCE	0.600	0.300	0.315	0.615
TOTAL	**7.285**	**3.936**	**4.116**	**8.052**

* HMP species

9.4.2   Monitoring Results

HA 23 was in year 6 of monitoring in 2018. Even though year 6 was not a required monitoring year, monitoring occurred and results are presented below.

9.4.2.1   HMP Annual Density

One Monterey spineflower plot was surveyed for year 6 density at HA 23 in 2018. The plot is numbered 1 on Figure 9-28 and is located in the eastern polygon on the site. Monterey spineflower density was low at Plot 1. Figure 9-27 presents Monterey spineflower restoration plot densities for HA 23. Monterey spineflower was not monitored in year 1 (2013) due to UXO activity and associated accessibility restrictions.
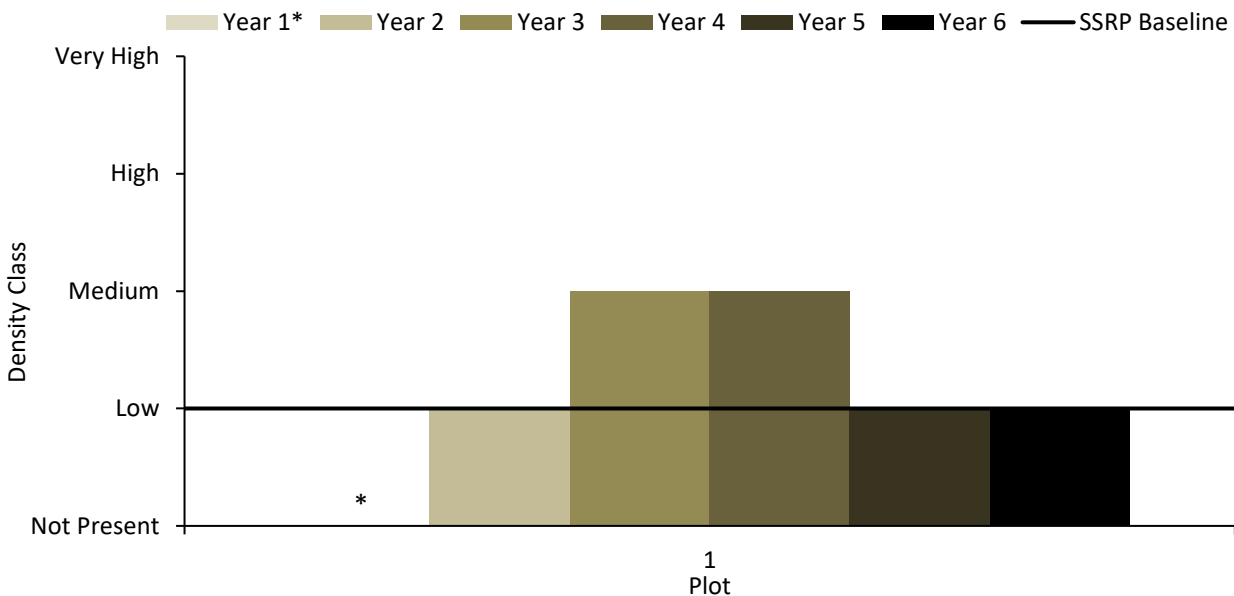
* Plot 1 was not surveyed in year 1 due to UXO activity

Figure 9-27. HA 23 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plot 1
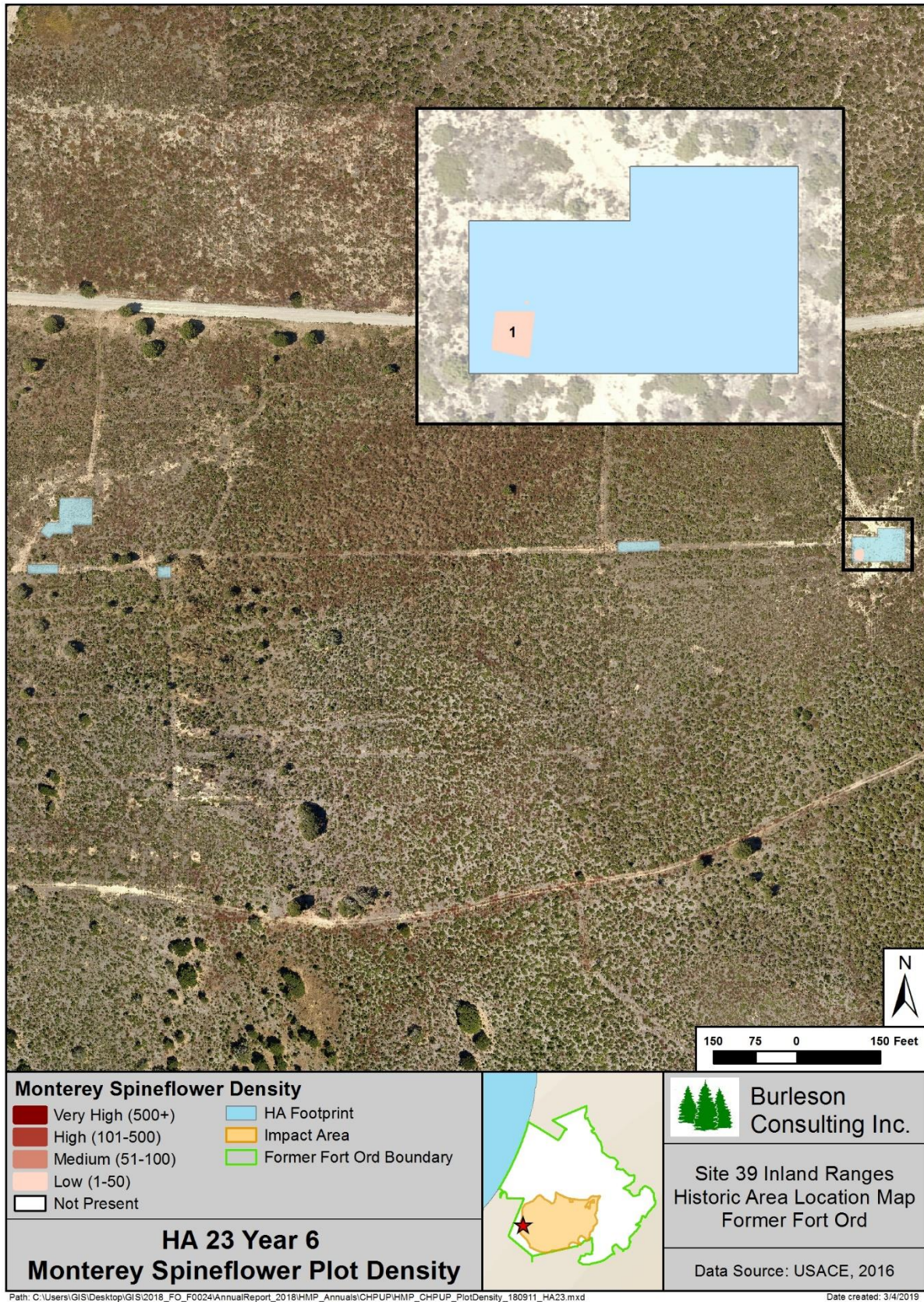
Figure 9-28. HA 23 Year 6 Monterey Spineflower Plot Density Map

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 at HA 23.

Four individual plants and eight discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 9-29). The densities ranged from low to high and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.05 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline decreased.

One individual plant and one discrete patch of sand gilia were mapped and individuals counted within the patch (see Figure 9-30). The density was low and the total acreage of sand gilia patches with a density at or above the SSRP baseline density class of low was 0.002 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline decreased.

Two discrete patches of seaside bird's beak were mapped and individuals counted within each patch (see Figure 9-31). The densities were low and the total acreage of seaside bird's beak patches with a density at or above the SSRP baseline density class of low was 0.09 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline increased.
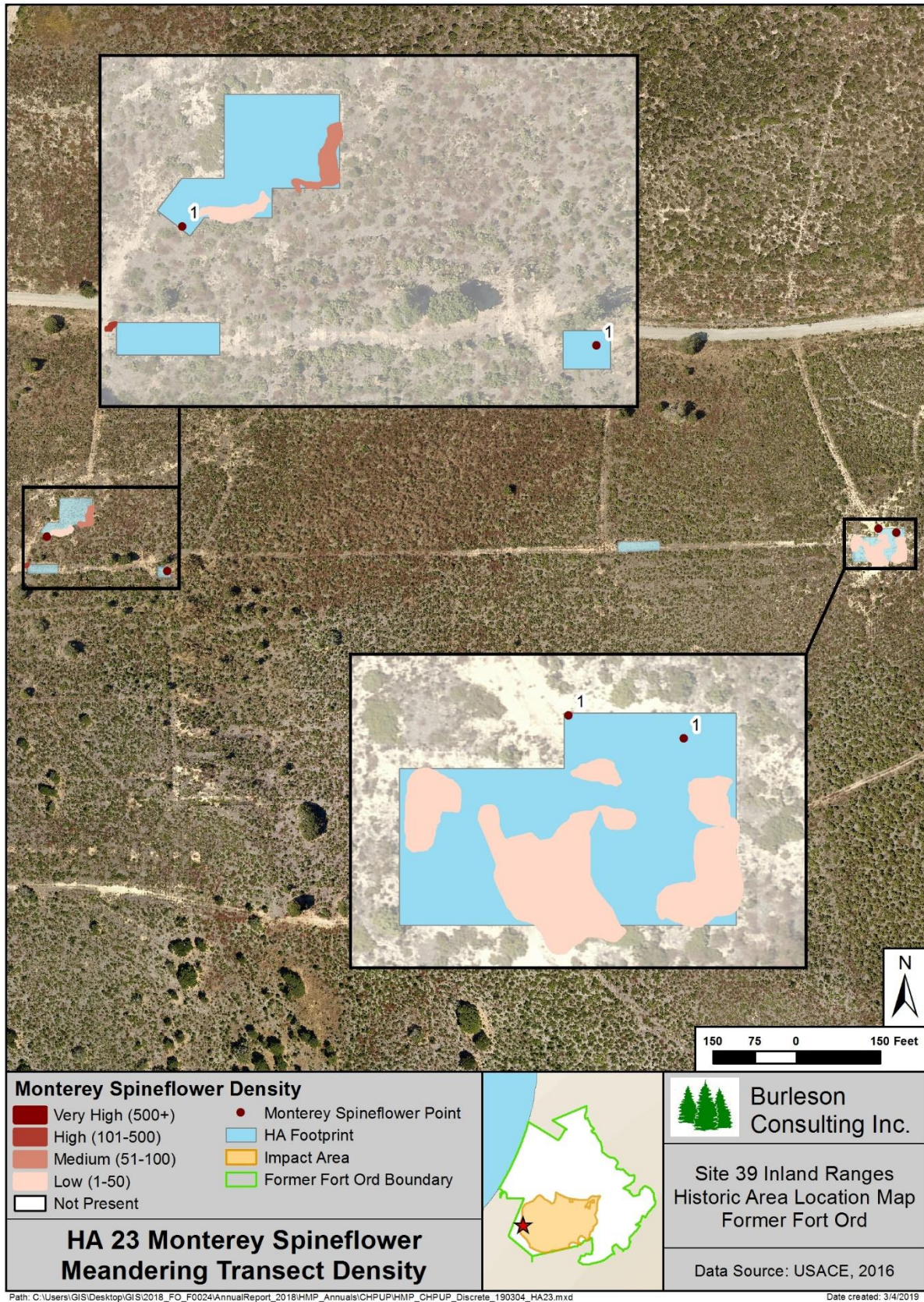
Figure 9-29. HA 23 Monterey Spineflower Meandering Transect Density Map
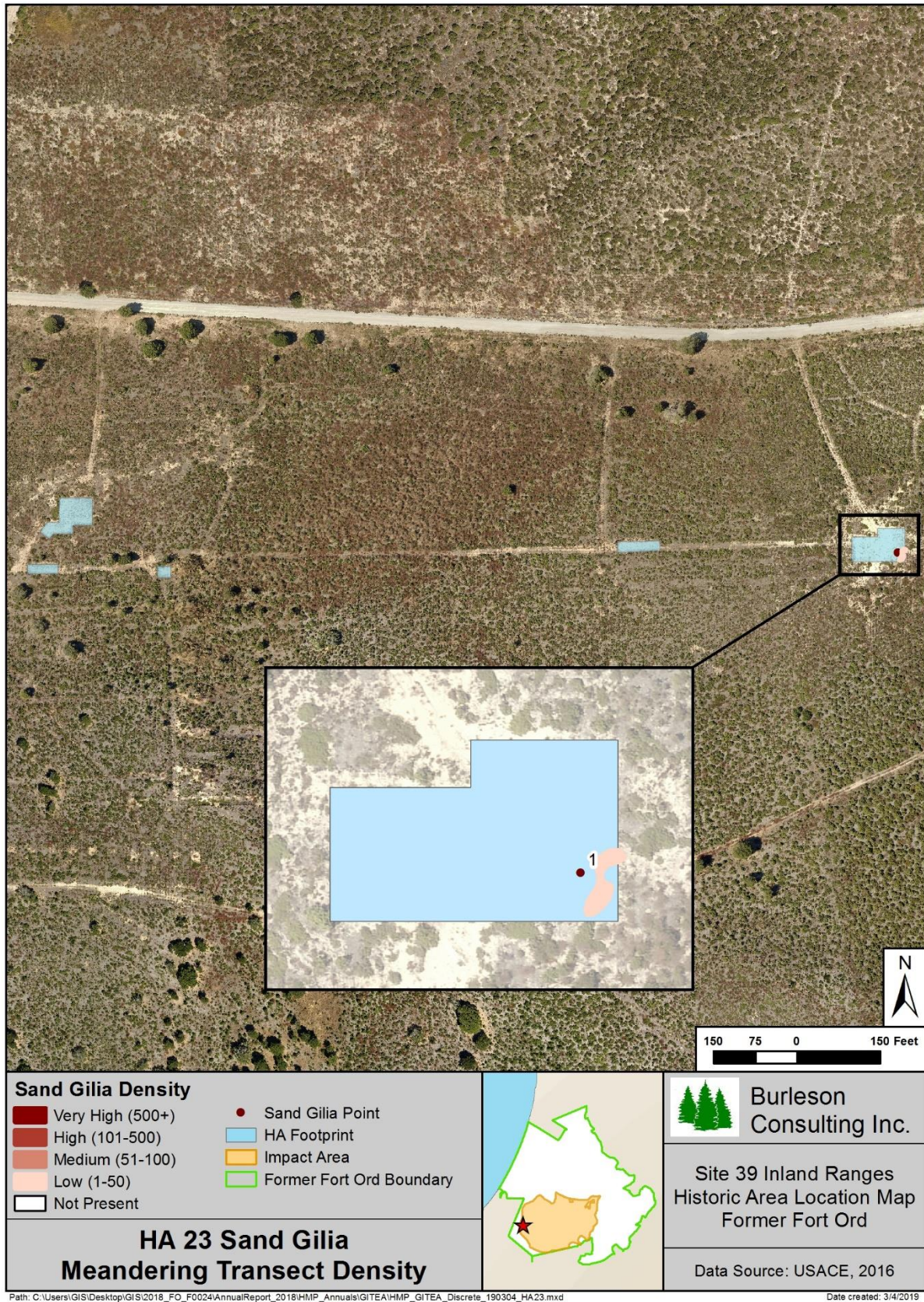
Figure 9-30. HA 23 Sand Gilia Meandering Transect Density Map
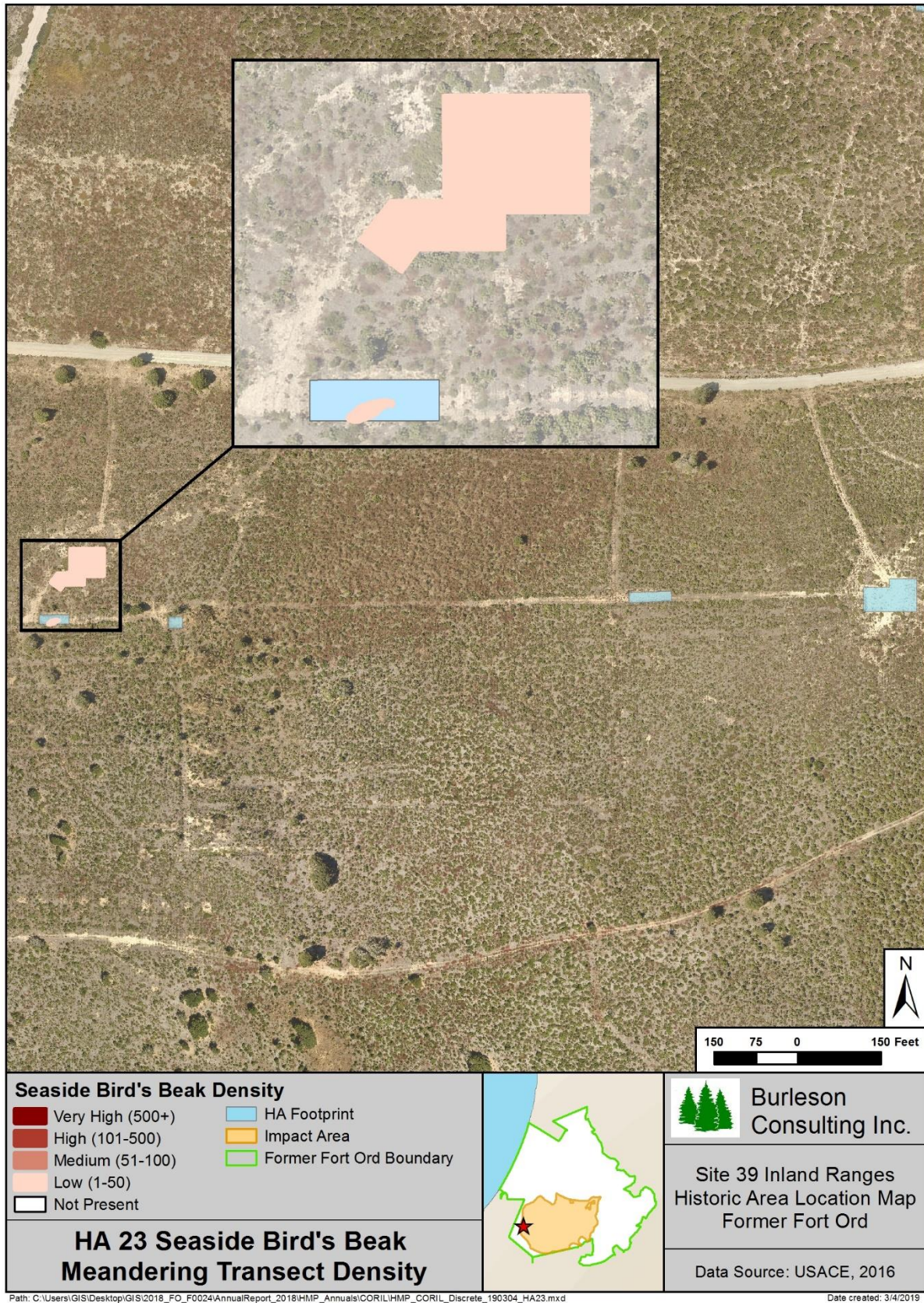
Figure 9-31. HA 23 Seaside Bird's Beak Meandering Transect Density Map

9.4.2.2   Plant Survivorship

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

### 9.4.2.3   Species Richness

Fifty-one species were observed at HA 23. Of those, 30 were native shrubs or perennials, 13 were native annual herbaceous species, and 8 were non-native species (see Table 9-28). Species richness decreased by six species since 2017. Native shrub and perennial species increased by two, native herbaceous species remained the same, and non-native species decreased by eight. The decrease in species richness was largely due to reduced presence of non-native species.

Table 9-28. Species Observed on HA 23, 2018

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 montereyensis**	Monterey manzanita	ARMO
*Arctostaphylos pumila**	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Baccharis pilularis	coyote brush	BAPI
Camissoniopsis micrantha	small primrose	CAMI
Carex brevicaulis	short stem sedge	CABR8
Carex globosa	round-fruited sedge	CAGL
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
*Ceanothus rigidus**	Monterey ceanothus	CERI
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Cordylanthus rigidus ssp. *littoralis**	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 intermedia var. *intermedia*	common cryptantha	CRINI
Diplacus aurantiacus	sticky monkeyflower	DIAU
Ericameria ericoides	mock heather	ERER
*Ericameria fasciculata**	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed e	ERCI
Festuca octoflora	sixweeks grass	FEOC
Gamochaeta ustulata	purple cudweed	GAUS
Garrya elliptica	coast silk tassel	GAEL
Gilia tenuiflora ssp. *arenaria**	sand gilia	GITEA
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

Table 9-28. Species Observed on HA 23, 2018

Scientific Name	Common Name	Code
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Plantago erecta	California plantain	PLER
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium stramineum	cotton-batting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Salvia mellifera	black sage	SAME
Sonchus asper	prickly sow thistle	SOAS
Stipa cernua	nodding needle grass	STCE
Toxicodendron diversilobum	poison oak	TODI

* HMP species

9.4.2.4   Vegetative Cover

Burleson completed five line-intercept transects ranging from eight to 32 meters in length at HA 23. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 29.11%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 4.73%. Table 9-29 summarizes vegetative cover and Table 9-30 presents vegetative cover by species. Figure 9-32 presents the percent cover of dominant species at HA 23 in 2017 and 2018.

Table 9-29. 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	22.44	22.44	0.00	0.00	31.66	62.13
HA23T02	12.00	12.00	0.00	0.00	81.59	18.14
HA23T03	36.88	36.88	0.00	0.00	97.25	2.75
HA23T04	43.60	43.60	0.00	0.00	100.00	0.00
HA23T05	43.90	43.90	0.00	0.00	79.67	19.76
SITE AVERAGE*	**29.11**	**29.11**	**0.00**	**0.00**	**68.97**	**28.82**

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

Table 9-30. Transect Survey Results for HA 23 by Species

Transect	ACGL (%)	ACMI (%)	ARPU* (%)	ARTO (%)	CABR8 (%)	CEDE (%)	CERI* (%)	COFI (%)	CRSC (%)	DIAU (%)	ERCO (%)	ERER (%)	HOCU (%)	TODI (%)	TH (%)	BG (%)
HA23T01	2.28	0.00	3.84	0.00	0.00	0.00	2.69	3.56	8.72	0.00	0.53	0.00	0.81	0.00	31.66	62.13
HA23T02	2.95	0.00	2.45	4.05	0.00	1.45	0.00	0.00	0.00	0.64	0.45	0.00	0.00	0.00	81.59	18.14
HA23T03	23.00	0.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	3.63	1.75	0.00	6.00	0.00	97.25	2.75
HA23T04	1.40	0.67	18.13	0.00	1.27	0.00	0.00	0.00	16.67	0.00	0.73	0.67	0.93	3.13	100.00	0.00
HA23T05	1.67	0.00	22.57	1.57	0.00	0.00	0.00	1.71	13.57	0.95	1.86	0.00	0.00	0.00	79.67	19.76
SITE AVERAGE†	**3.86**	**0.10**	**9.62**	**1.24**	**0.19**	**0.33**	**0.88**	**1.53**	**8.31**	**0.64**	**0.93**	**0.10**	**0.90**	**0.48**	**68.97**	**28.82**

* HMP species

† Transect lengths are not equal. Site averages are weighted to reflect differing lengths.
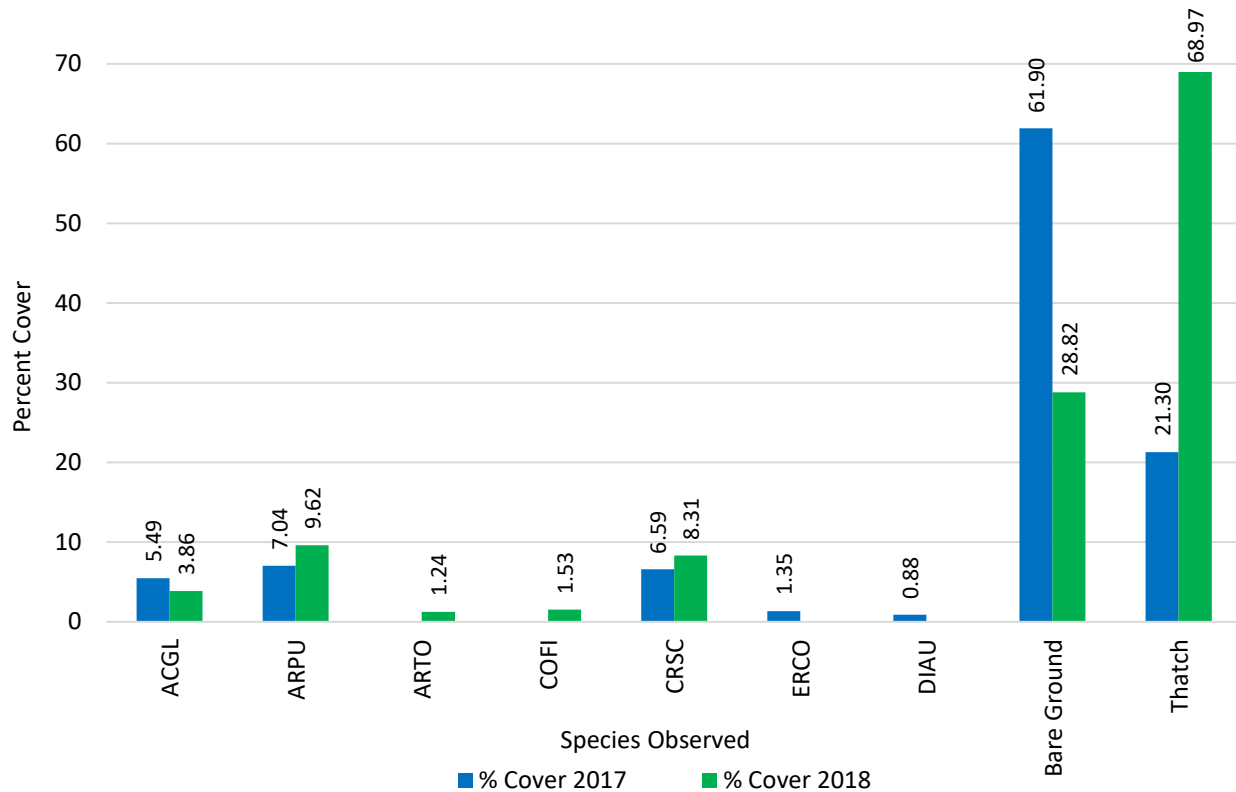
Figure 9-32. Percent Cover of Dominant Species at HA 23 in 2017 and 2018.

9.4.3   Discussion

9.4.3.1   Recommendations

HA 23 was in year 6 of monitoring in 2018 and responded well to previous restoration efforts. The restoration area met four of six success criteria by 2018. The Army recommends planting sandmat manzanita, coyote brush, Monterey ceanothus, dwarf ceanothus, golden yarrow, and Eastwood's goldenbush in the 2018/2019 season to meet the native vegetation and HMP shrub cover success criteria. 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 was documented by photo points (see Appendix D, page D-4).

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, 2020. Table 9-31 summarizes the current status of HA 23 including which success criteria were met and recommendations.

Table 9-31. Status and Recommendations for Achieving 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	Plant sandmat manzanita, coyote brush, Monterey ceanothus, dwarf ceanothus, golden yarrow, and Eastwood's goldenbush (scheduled 2018/2019)
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	Plant sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush (scheduled for 2018/2019)
Objective 3 – No. 4	HMP annual density	Yes	None

9.4.3.2   HMP Annual Density

Monterey spineflower density was within the acceptable limit for HMP annual density at HA 23. The SSRP baseline density class for Monterey spineflower was low. Year 6 Monterey spineflower restoration plot results show that the density within the plot met the success criterion under Objective 3. In addition, Monterey spineflower was present outside the restoration plot. Discrete patches, with density that met or exceeded the success criterion, covered 0.05 acres of HA 23.

Although not part of the success criterion, sand gilia and seaside bird's beak were both present at HA 23. Sand gilia covered 0.002 acres and seaside bird's beak covered 0.09 acres; discrete patches for both species had low density.

9.4.3.3   Plant Survivorship

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

9.4.3.4   Species Richness

Chamise, sandmat manzanita, shaggy-bark 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 30 native shrub and perennial species and met the success criterion for Objective 1.

9.4.3.5   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 23 SSRP (Burleson, 2013). These species contributed 26.58% cover to the HA. This success criterion was not met. In 2017, vegetative cover was 22.99%; cover increased by 3.59% (see Figure 9-33). In 2016, quadrats were completed to provide a preliminary idea of vegetative cover with a limited amount of effort. From 2017 onward, line-intercept transect surveys were used as multiple objectives outlined in the SSRP specifically require transect data. The 2016 quadrat data were not compared to the success criteria.
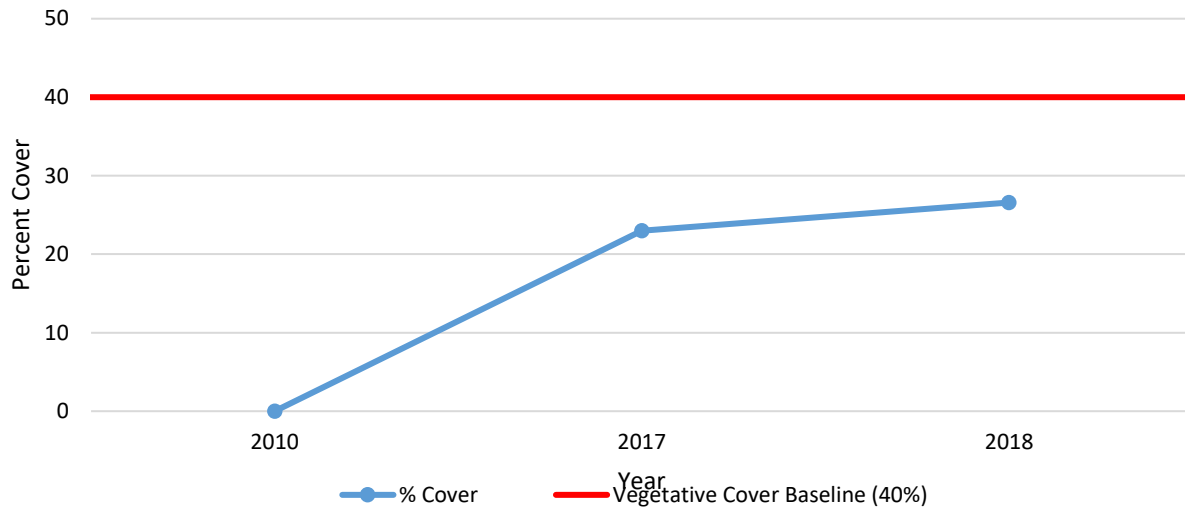
Figure 9-33. Native Vegetative Cover Compared to the Success Criterion at HA 23

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 ranges from 6-25% of absolute cover. The HMP shrub species at HA 23 provided an absolute cover of 10.50%; therefore, the HA met this success criterion. This was an increase from 7.46% in 2017. 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, 4% Monterey ceanothus, and 1% Eastwood's goldenbush. The average vegetative cover for sandmat manzanita was 9.62%, Monterey ceanothus was 0.88%, and Eastwood's goldenbush was 0.00% (see Figure 9-34). In 2017, none of the species met the acceptable limit. Therefore, the success criterion was not met.
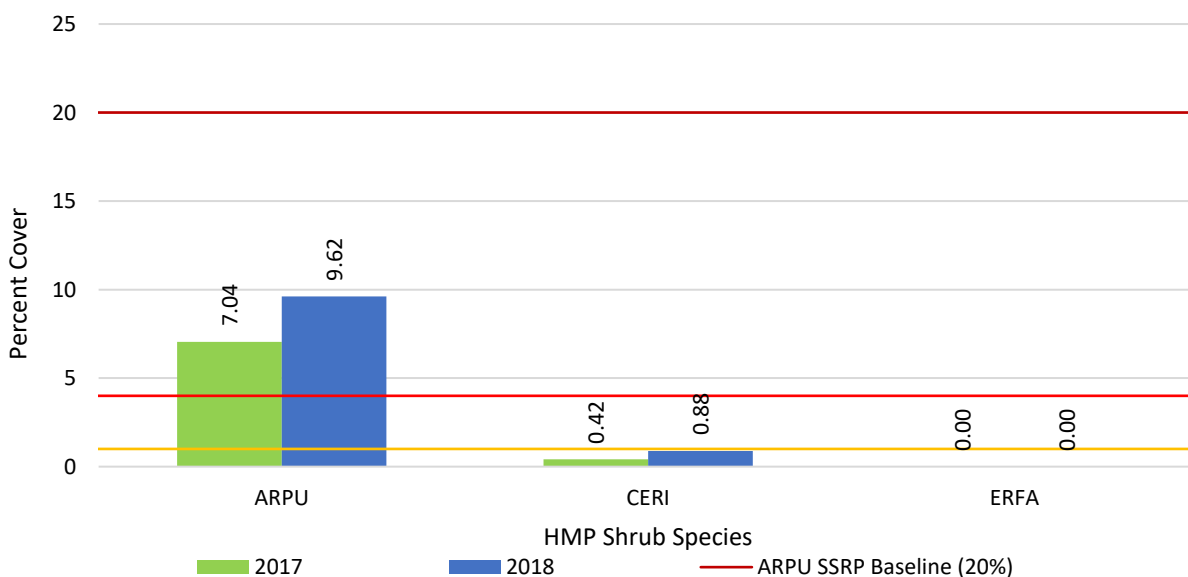
Figure 9-34. HMP Shrub Species Comparison to Success Criteria at HA 23

9.5   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 possibly aided 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 of similar maritime climates (USFS, 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 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 (USFS, 2007).

The SSRP restoration procedure for HA 26 included both passive and active restoration consisting of hand broadcast non-irrigated seed, annual weed management activities, and installing container-grown plants. 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 was monitored for five years by photo documentation and site visits, three years for HMP annual density in plots, HMP annual density across the HA, and species richness, two years for vegetative cover, and one year for plant survivorship (see Table 9-32). Figure 9-35 shows the HA footprint, passive restoration area, and active restoration area. Success criteria for HA 26 are summarized in Table 9-33.

Table 9-32. 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, Erosion Control, and Irrigation			●	●	●	●			
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	
HMP Annual Density across HA			●	●	●	●	●	●	
Species Richness			●	●	●	●	●	●	●
Vegetative Cover				●	●	●	●	●	●
Plant Survivorship					●	●	●		

Figure 9-35. HA 26 Restoration Areas and Monitoring Locations Map

Table 9-33. Success Criteria and Acceptable Limits for Restoration of HA 26

No.	Success Element	Decision Rule	Acceptable Limits
Objective 1*			
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† shaggy-bark manzanita Monterey ceanothus† Eastwood's goldenbush† sticky monkeyflower black sage
2	Percent cover of native species	Percent cover equals 20 percent for native species‡	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 of the SSRP‡
Objective 2*			
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 jubata grass. No more than 5 percent non-native target weeds may be present at this restoration site.
Objective 3*			
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	Monterey spineflower density class: Low

* Objectives presented in HRP (Shaw, 2009b)

† HMP Species

‡ 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.

9.5.1   Restoration Activities

Burleson performed passive restoration at HA 26 in 2016, 2017, and 2018. The total amount of seed broadcast on site was 418.08 lb compared to the 303.10 lb prescribed in the SSRP. Table 9-34 summarizes the SSRP seed target and the amount of seed applied by year and species. 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 9-34. Summary of Passive Restoration Activities for HA 26

Species	Pounds of Seed Broadcast				
	SSRP Target	2016	2017	2018	Total by Species
ACMI	14.00	5.24	18.05	9.35	32.64
ACGL	28.00	10.48	10.17	4.00	24.65
BAPI	2.10	1.05	0.45	0.80	2.30
CERI*	14.00	5.24	2.27	4.00	11.51
CHPUP*	2.10	0.84	-	0.21	1.05
CRSC	10.50	4.20	1.81	3.20	9.21
DIAU	7.00	2.62	1.13	2.00	5.75
ELGL	42.00	15.72	81.36	36.40	133.48
ERFA*	1.40	0.52	0.23	0.40	1.15
ERCO	14.00	5.24	2.27	4.00	11.51
FRCA	-	-	-	0.60	0.60
GAEL	-	-	-	1.60	1.60
HO	126.00	47.20	22.65	41.20	111.05
HOCU	28.00	10.48	9.04	17.80	37.32
SAME	14.00	5.24	2.27	4.00	11.51
STPU	-	-	-	22.75	22.75
TOTAL	303.10	114.07	151.70	152.31	418.08

 * HMP species

Active restoration was conducted in 2018. The total number of plants installed at HA 26 was 5,655 compared to 9,845 prescribed in the SSRP. Two distinct areas at HA 26 received active restoration. Planting amounts by year and species, in comparison to the SSRP target, are presented for each area.

Burleson conducted active restoration at HA 26 Plot 2 in 2018. The total number of plants installed was 3,985 compared to 4,860 prescribed in the SSRP. Table 9-35 summarizes the plants installed during active restoration.

Table 9-35. Summary of Active Restoration Activities at Plot 2 for HA 26

Species	Number of Individual Plants		
	SSRP Target Area 2	2018 (Jan)	Total by Species
ACGL	580	138	138
ACMI	250	289	289
ADFA	265	589	589
ARPU*	240	644	644
ARTO	265	319	319
BAPI	120	141	141
CERI*	240	290	290
CRSC	550	462	462
DIAU	480	189	189
ERCO	550	50	50
ERFA*	500	360	360
HOCU	580	271	271
SAME	240	243	243
TOTAL	**4,860**	**3,985**	**3,985**

 * HMP Species

Burleson conducted active restoration at HA 26 Plot 3 in 2018. The total number of plants installed was 1,670 compared to 1,665 prescribed in the SSRP. Table 9-36 summarizes the plants installed during active restoration.

Table 9-36. Summary of Active Restoration Activities at Plot 3 for HA 26

Species	Number of Individual Plants		
	SSRP Target Area 3	2018 (Jan)	Total by Species
ACGL	200	57	57
ACMI	50	125	125
ADFA	95	134	134
ARPU*	85	311	311
ARTO	100	138	138
BAPI	50	61	61
CERI*	85	124	124
CRSC	200	200	200
DIAU	200	125	125
ERCO	200	32	32
ERFA*	100	115	115
HOCU	200	123	123
SAME	100	125	125
TOTAL	**1,665**	**1,670**	**1,670**

 * HMP Species

9.5.2   Monitoring Results

9.5.2.1   HMP Annual Density

Nine Monterey spineflower plots were surveyed for year 3 density at HA 26 in 2018. The plots are numbered 1-9 on Figure 9-37 and are located throughout the site. Monterey spineflower density was low at Plots 1, 2, 3, 4, 5, 6, 8, and 9. Monterey spineflower was not present at Plot 7. Figure 9-36 summarizes all the Monterey spineflower restoration plot densities for HA 26.
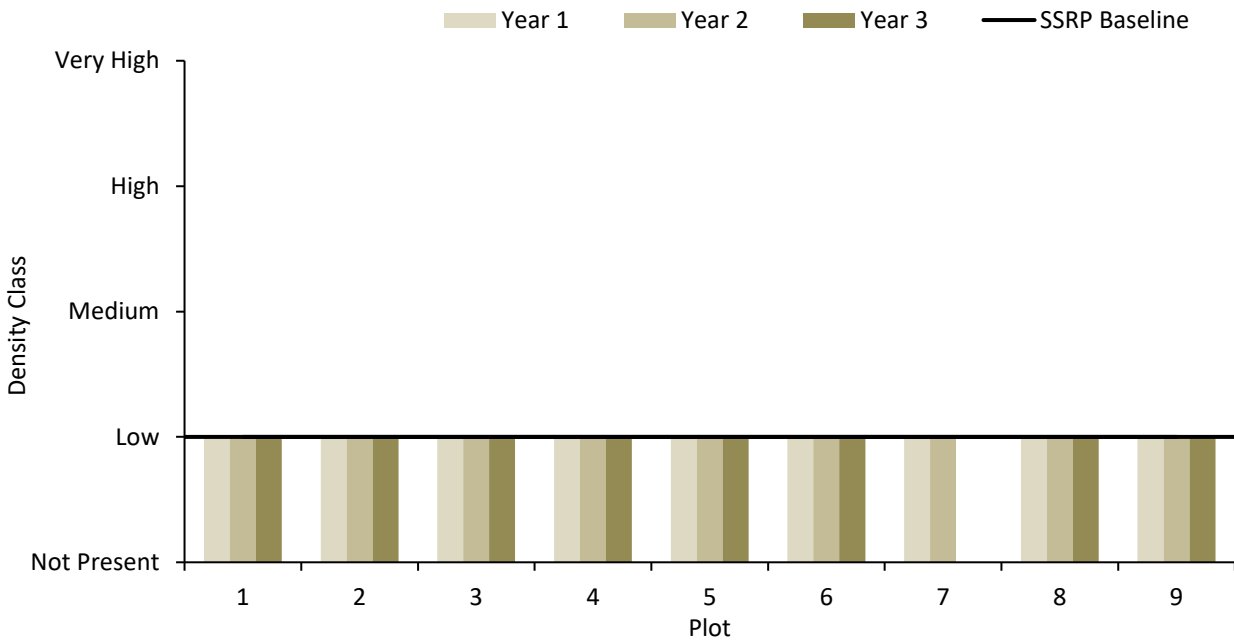
Figure 9-36. HA 26 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots 1-9
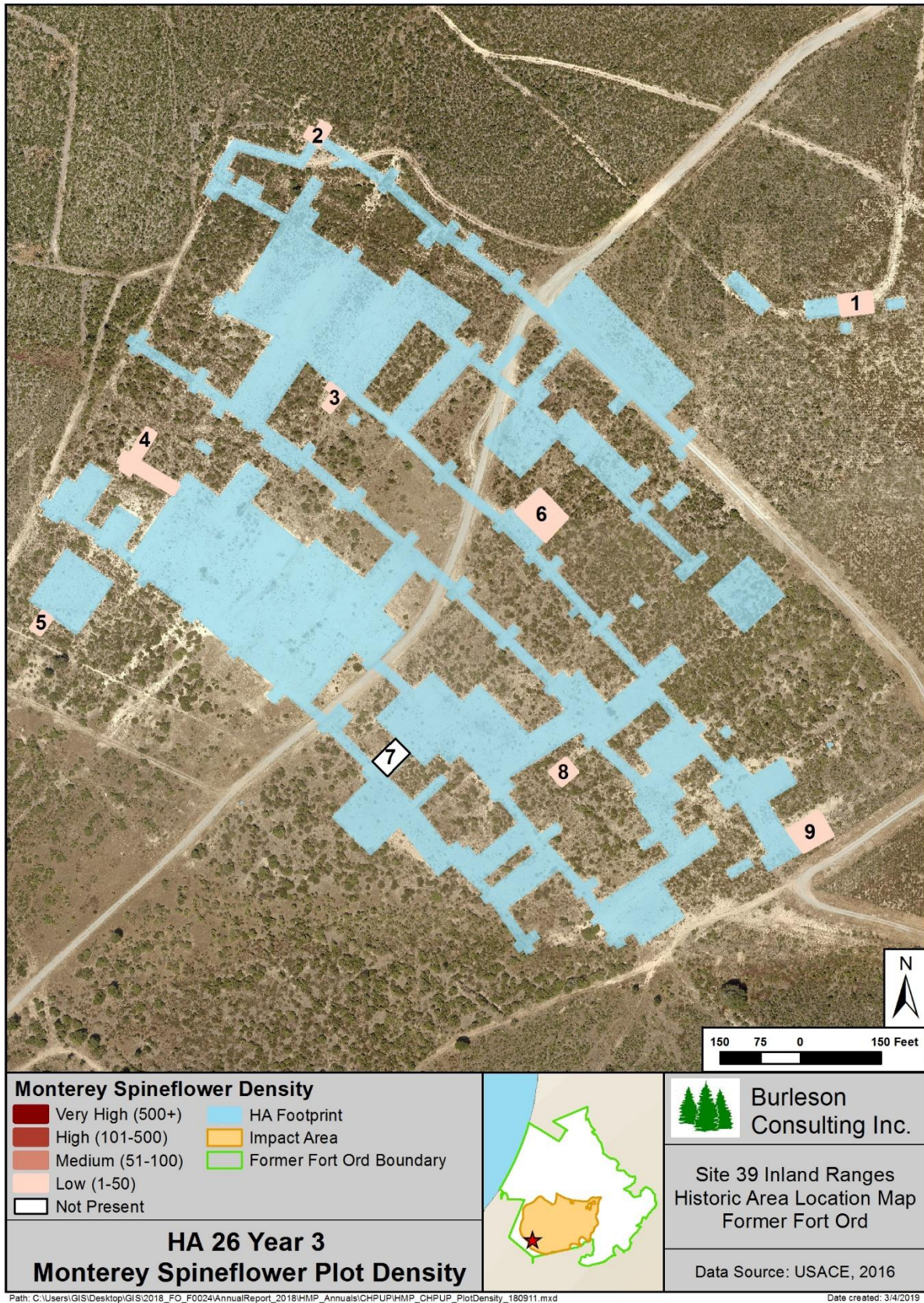
Figure 9-37. HA 26 Year 3 Monterey Spineflower Plot Density Map

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 seaside bird's beak at HA 26.

One individual plant and one discrete patch of Monterey spineflower were mapped and individual plants were counted within the patch (see Figure 9-38). The density was low and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.003 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline increased. Only one Monterey spineflower individual was mapped in 2017.

One individual plant and one discrete patch of seaside bird's beak were mapped and individual plants were counted within the patch (see Figure 9-39). The density was low and the total acreage of seaside bird's beak patches with a density of low was less than 0.001 acres. From 2017 to 2018, the density range and acreage increased; no seaside bird's beak was mapped at HA 26 in 2017. Seaside bird's beak is not an SSRP required species at HA 26.
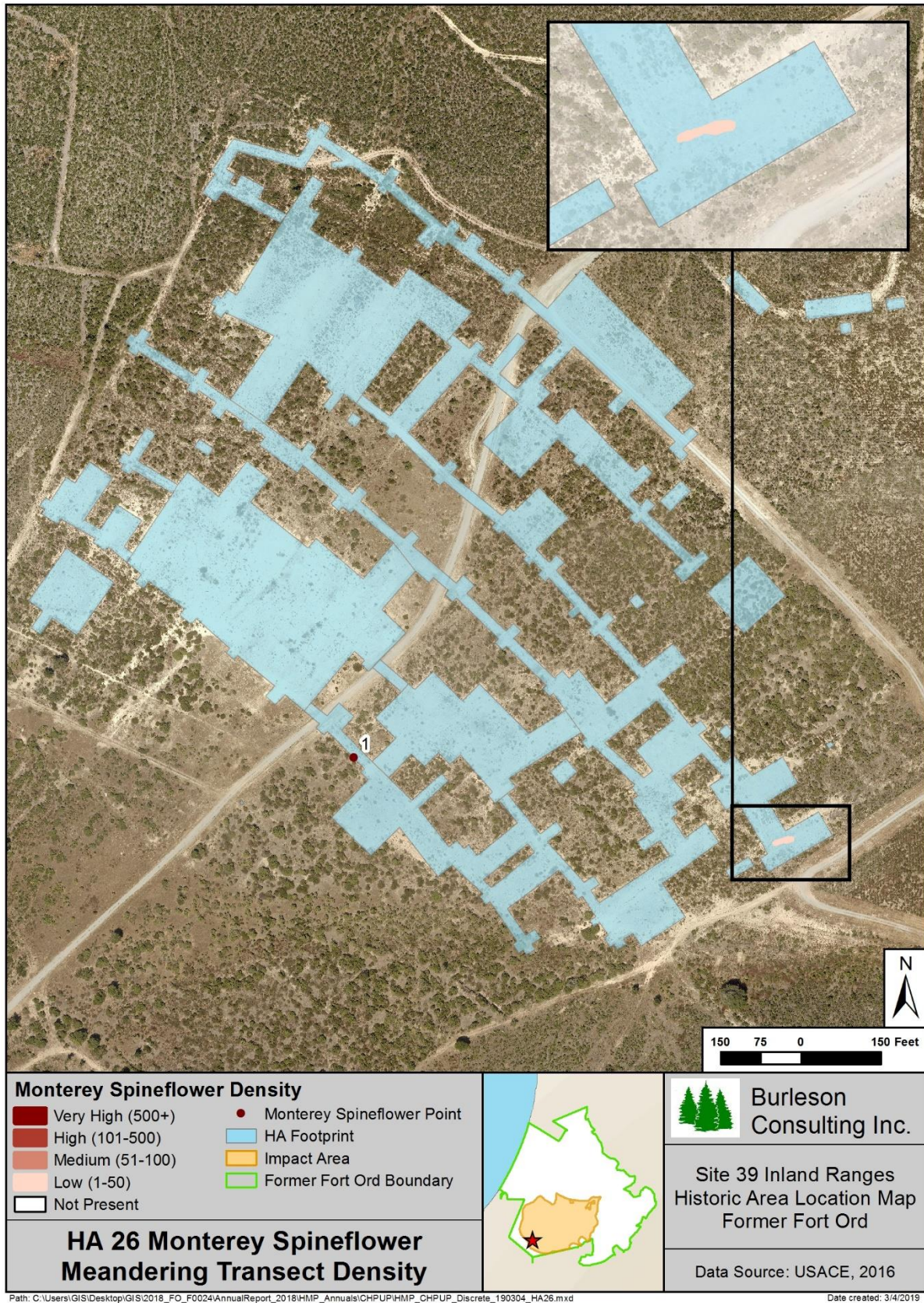
Figure 9-38. HA 26 Monterey Spineflower Meandering Transect Density Map
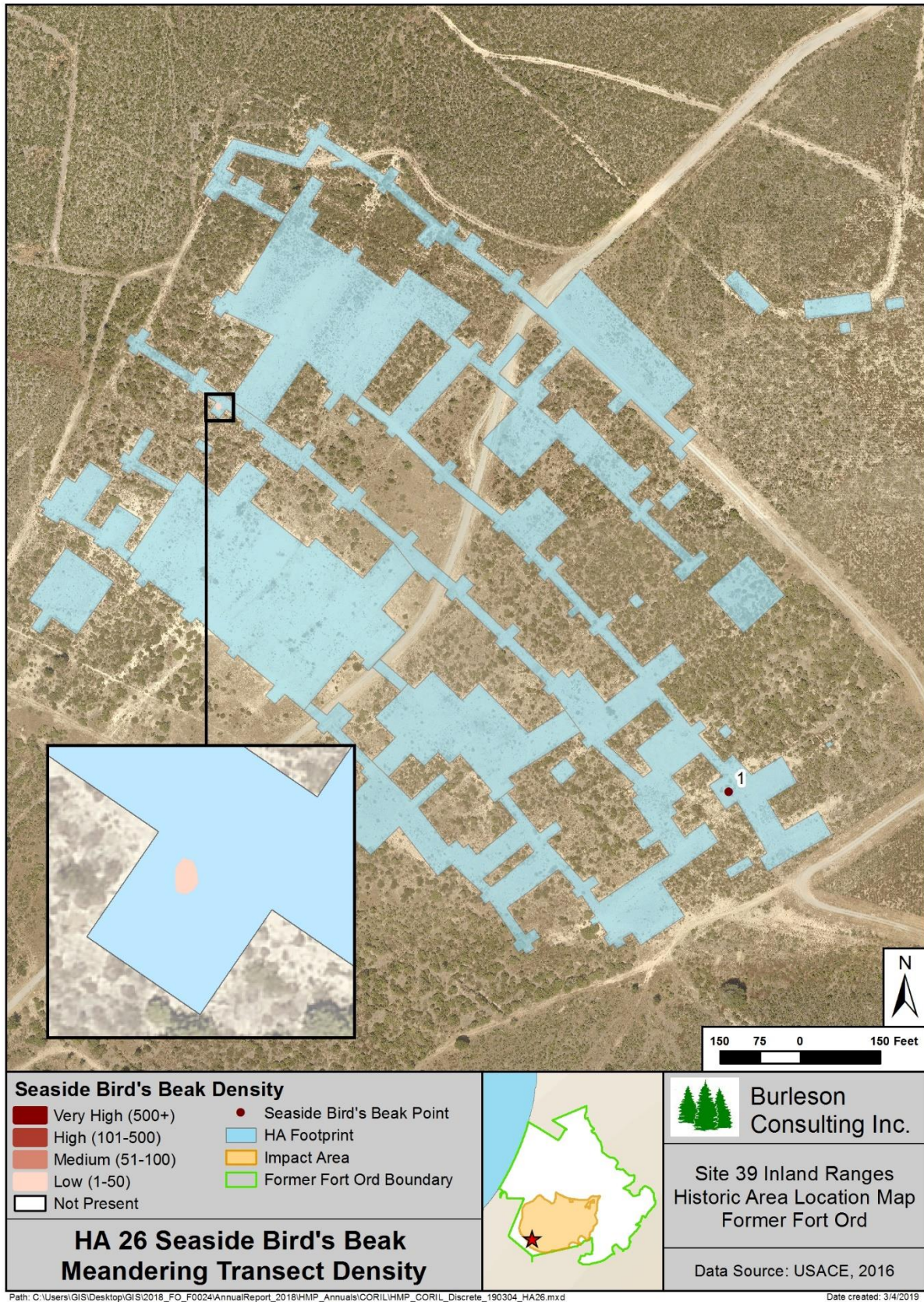
Figure 9-39. HA 26 Seaside Bird's Beak Meandering Transect Density Map

9.5.2.2   Plant Survivorship

Plant survivorship monitoring was conducted at HA 26. A total of seven shrub species and 348 individual plants were monitored for survivorship. By the end of year 1 monitoring for the 2018 planting, survivorship was 79%. Table 9-37 presents results by species.

Table 9-37. Plant Survivorship Monitoring Summary for 2018 Plantings at HA 26

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2018) Alive (%)
ADFA	723	72	94
ARPU*	955	92	96
ARTO	457	46	96
BAPI	202	18	83
CERI*	414	41	34
ERFA*	475	45	42
SAME	368	34	76
TOTAL	3,594	348	79

 * HMP Species

9.5.2.3   Species Richness

Eighty-one species were observed at HA 26. Of those, 34 were native shrubs or perennials, 15 were native annual herbaceous species, 31 were non-native species, and one was not categorized as it was only identified to genus (see Table 9-38). Species richness increased by 11 species since 2017. Native shrub and perennial species increased by one, native herbaceous species increased by one, and non-native species increased by nine.

Table 9-38. Species Observed on HA 26, 2018

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon heermannii var. *orbicularis*	Heermann's lotus	ACHEO
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
*Arctostaphylos montereyensis**	Monterey manzanita	ARMO
*Arctostaphylos pumila**	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Briza minor	small quaking grass	BRMI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Calochortus albus	white globe lily	CAAL
Camissoniopsis cheiranthifolia	beach evening primrose	CACH
Carduus pycnocephalus ssp. *pycnocephalus*	Italian thistle	CAPYP
Carex brevicaulis	short stem sedge	CABR8
Carex sp.	sedge	CA

Table 9-38. Species Observed on HA 26, 2018

Scientific Name	Common Name	Code
Carpobrotus edulis	hottentot fig	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
*Ceanothus rigidus**	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME
Chlorogalum pomeridianum	wavyleaf soap plant	CHPO
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	jubata grass	COJU
Crassula connata	pygmy-weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Deinandra corymbosa	coastal tarweed	DECO
Diplacus aurantiacus	sticky monkeyflower	DIAU
Erigeron canadensis	horseweed	ERCA
Ericameria ericoides	mock heather	ERER
*Ericameria fasciculata**	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
Festuca octoflora	sixweeks grass	FEOC
Gamochaeta ustulata	purple cudweed	GAUS
Gastridium phleoides	nit grass	GAPH
Genista monspessulana	French broom	GEMO
Heteromeles arbutifolia	toyon	HEAR
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
Layia platyglossa	tidy-tips	LAPL
Lepechinia calycina	pitcher sage	LECA
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lomatium parvifolium	coastal biscuitroot	LOPA
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia exigua	little tarweed	MAEX
Medicago polymorpha	California burclover	MEPO
Melilotus indicus	yellow sweetclover	MEIN
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Nuttallanthus texanus	blue toadflax	NUTE
Petrorhagia dubia	hairypink	PEDU
Pinus radiata	Monterey pine	PIRA
Plantago erecta	California plantain	PLER
Polygala californica	California milkwort	POCA
Polypogon monspeliensis	rabbitsfoot grass	POMO
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium luteoalbum	weedy cudweed	PSLU

Table 9-38. Species Observed on HA 26, 2018

Scientific Name	Common Name	Code
Pseudognaphalium sp.	cudweed	PS
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
Senecio sylvaticus	woodland groundsel	SESY
Silene gallica	small-flower catchfly	SIGA
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium campestre	hop clover	TRCA
Trifolium hirtum	rose clover	TRHI
Vicia sativa ssp. *nigra*	narrow-leaved vetch	VISAN
Zeltnera davyi	Davy's centaury	ZEDA

* HMP species

9.5.2.4   Vegetative Cover

Burleson completed seven 50-meter line-intercept transects at HA 26 in passive restoration areas. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 24.54%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 3.83%. Table 9-39 summarizes vegetative cover and Table 9-40 presents vegetative cover by species. Figure 9-40 presents the percent cover of dominant species at HA 26 in 2017 and 2018.

Table 9-39. 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	36.70	36.70	0.00	0.00	71.96	27.68
HA26T02	43.32	42.98	0.00	0.34	76.40	21.84
HA26T03	10.82	10.82	0.00	0.00	61.30	37.86
HA26T04	12.28	12.28	0.00	0.00	86.96	12.72
HA26T05	27.20	27.20	0.00	0.00	69.10	30.68
HA26T06	25.80	25.16	0.20	0.44	86.88	12.92
HA26T07	17.84	16.66	0.00	1.18	63.12	36.82
SITE AVERAGE	**24.85**	**24.54**	**0.03**	**0.28**	**73.67**	**25.79**

Table 9-40. Transect Survey Results for HA 26 by Species

Transect	ACGL (%)	ADFA (%)	AICA (%)	ARPU* (%)	ARTO (%)	BAPI (%)	CA sp. (%)	CEDE (%)	CERI* (%)	COJU (%)	CRSC (%)	ERCA (%)	HOCU (%)	HYRA (%)	LECA (%)	SAME (%)	TODI (%)	TH (%)	BG (%)
HA26T01	0.28	0.00	0.00	0.00	2.34	0.00	0.26	22.48	0.00	0.00	6.28	0.00	5.06	0.00	0.00	0.00	0.00	71.96	27.68
HA26T02	0.30	2.22	0.34	0.00	6.94	0.20	0.34	12.50	0.86	0.00	6.00	0.00	7.08	0.00	1.82	4.50	0.22	76.40	21.84
HA26T03	0.86	0.00	0.00	0.00	2.26	0.00	0.64	1.78	1.92	0.00	3.36	0.00	0.00	0.00	0.00	0.00	0.00	61.30	37.86
HA26T04	2.66	0.00	0.00	0.00	1.64	0.00	0.00	4.76	0.00	0.00	2.06	0.00	1.16	0.00	0.00	0.00	0.00	86.96	12.72
HA26T05	2.84	0.00	0.00	6.38	0.00	0.00	0.34	11.32	0.00	0.00	5.88	0.00	0.44	0.00	0.00	0.00	0.00	69.10	30.68
HA26T06	2.80	0.00	0.00	0.00	1.64	0.00	0.00	12.96	0.20	0.00	7.20	0.20	0.00	0.44	0.00	0.00	0.36	86.88	12.92
HA26T07	0.00	0.00	0.00	0.00	1.52	0.00	0.00	10.08	0.00	1.18	4.14	0.00	0.92	0.00	0.00	0.00	0.00	63.12	36.82
SITE AVERAGE	1.39	0.32	0.05	0.91	2.33	0.03	0.23	10.84	0.43	0.17	4.99	0.03	2.09	0.06	0.26	0.64	0.08	73.67	25.79

* HMP species
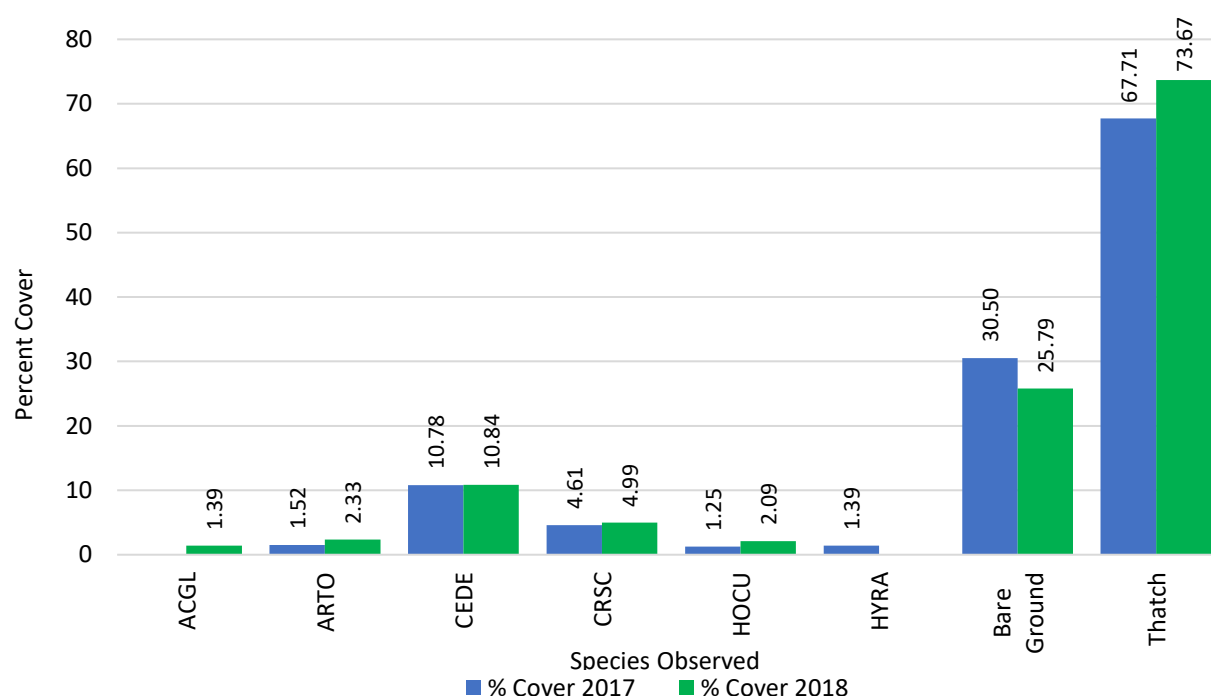
Figure 9-40. Percent Cover of Dominant Species at HA 26 in 2017 and 2018.

9.5.3   Discussion

9.5.3.1   Recommendations

HA 26 was in year three of monitoring in 2018. The restoration area met three of six success criteria by 2018. The site was broadcast seeded and planted in 2018; no corrective measures are recommended at this time since restoration activities are not complete. Additional SSRP prescribed planting will be conducted in the 2018/2019 season. Monitoring HA 26 response at the end of restoration will guide future corrective measures. Effort will be made to irrigate HMP shrub species, especially Monterey ceanothus and Eastwood's goldenbush, to improve survivorship and increase HMP shrub cover. Overall, HA 26 needs time to respond to the restoration effort and continued monitoring to evaluate areas that may require additional effort. A qualitative overview was documented by photo points (see Appendix D, page D-5).

The site will continue to be monitored by photo documentation, HMP annual density surveys, and species richness meandering transects, and vegetative cover line-intercept transects in year 4. Table 9-41 summarizes the current status of HA 26 including which success criteria were met and recommendations.

Table 9-41. Status and Recommendations for Achieving 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	Plant SSRP species (scheduled 2018/2019)
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant SSRP species (scheduled 2018/2019)
Objective 3 – No. 4	HMP shrub cover by species	No	Focus irrigation on HMP shrubs
Objective 3 – No. 4	HMP annual density	Yes	None

9.5.3.2   HMP Annual Density

Monterey spineflower density was within the acceptable limit for HMP annual density at HA 26. The SSRP baseline density class for Monterey spineflower was low. Year 3 Monterey spineflower restoration plot results show that eight out of nine plot densities met the success criterion. In addition, Monterey spineflower was present outside the restoration plots. Discrete patches, with density that met or exceeded the success criterion, covered 0.003 acres of HA 26.

Although not part of the success criterion, seaside bird's beak was present at HA 26. Seaside bird's beak covered less than 0.001 acres at low density.

9.5.3.3   Plant Survivorship

Plant survivorship was moderate for the 2018 planting at HA 26. Monterey ceanothus and Eastwood's goldenbush had low survivorship, whereas all other species had moderate to high survivorship. Monterey ceanothus had low survivorship at multiple sites. HA 26 lacks top soil and has fine, silty soil which contributes to sheet flow and inhibits water infiltration. Plants that were irrigated had higher survivorship than those that were not irrigated (89% and 20% respectively). Several areas at HA 26 have been mulched which should prevent erosion and help with water retention (Kemron, 2018). Survivorship will be monitored for two more years.

9.5.3.4   Species Richness

Chamise, sandmat manzanita, shaggy-bark manzanita, Monterey ceanothus, Eastwood's goldenbush, sticky monkeyflower, and black sage were present. HA 26 included 34 native shrub and perennial species and met the success criterion for Objective 1.

9.5.3.5   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 16 shrub and perennial species presented in Table 2 of the HA 26 SSRP (Burleson, 2013). These species contributed 13.13% cover to the HA. This success criterion was not met. In 2017, vegetative cover was 9.22%; cover increased by 3.91% (see Figure 9-41).
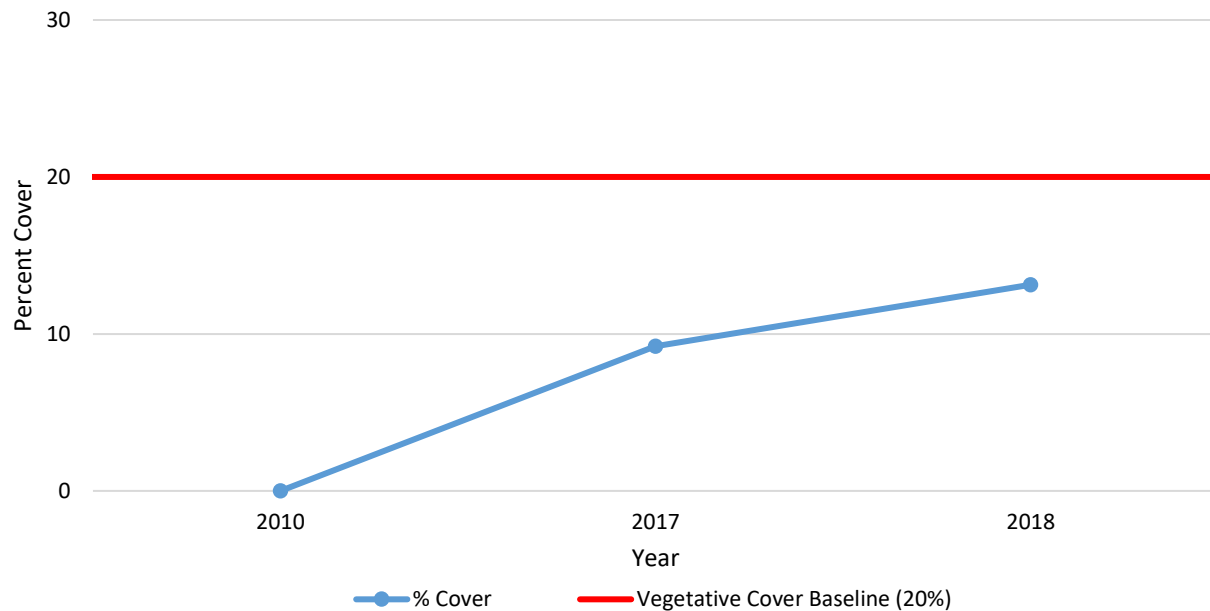
Figure 9-41. Native Vegetative Cover Compared to the Success Criterion at HA 26

Objective 2 considers the percent cover of non-native target weeds. The transect surveys contained jubata grass (*Cortaderia jubata*); however, vegetative cover for non-native species was 0.17% which is less than the 5% acceptable limit. There was an increase of 0.12% from 2017. 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 3. Cover class 3 ranges from 6-25% of absolute cover. The HMP shrub species at HA 26 provided an absolute cover of 1.34%; therefore, the HA did not meet this success criterion. This was an increase from 0.08% in 2017. 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 and presence of Monterey ceanothus and Eastwood's goldenbush. The average vegetative cover for sandmat manzanita was 0.91%, Monterey ceanothus was 0.43%, and Eastwood's goldenbush was 0.00% (see Figure 9-42). In 2018, only one of the three species, Monterey ceanothus, met the acceptable limit. The success criterion was not met.
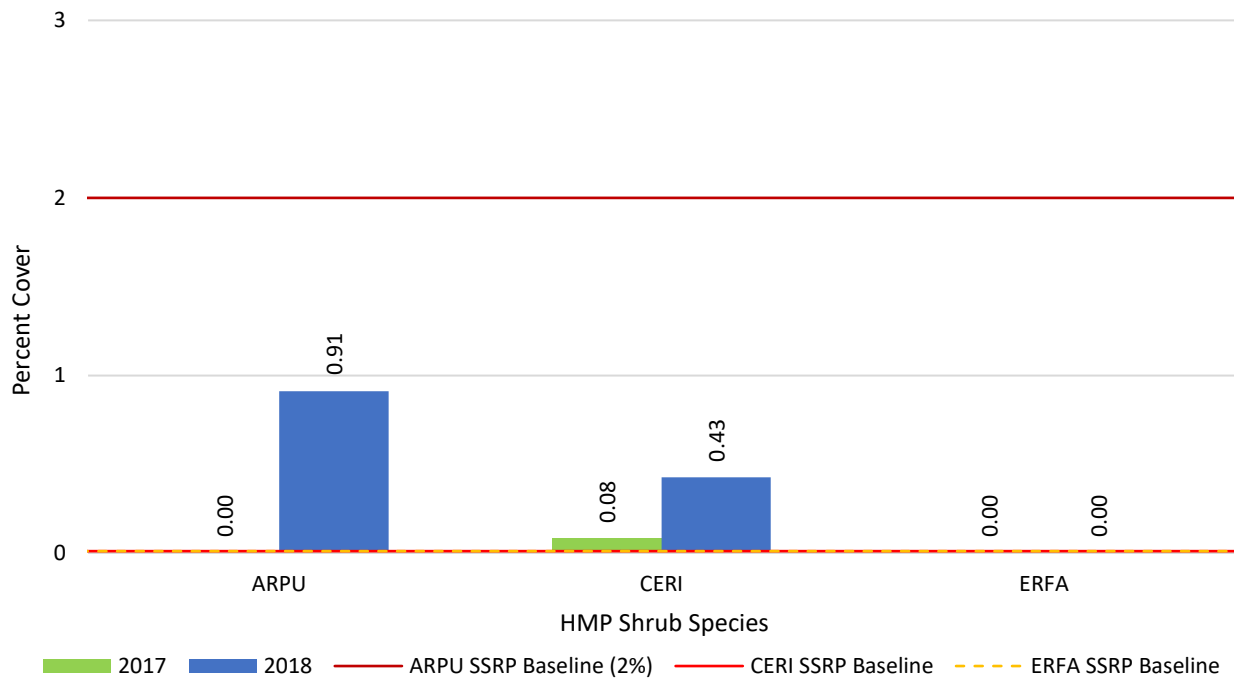
Figure 9-42. HMP Shrub Species Comparison to Success Criteria at HA 26

9.6   HA 27

HA 27 was used by the Army as a small-arms firing range. Soil remediation was completed in 2010; 100 cubic yards of lead-contaminated soil was excavated from 0.06 acres (Shaw, 2008). HA 27 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of similar maritime climates (USFS, 2007). HA 27 is relatively flat and sits on exposed bedrock with surface water runoff in its western portion. Adjacent lands were not developed and contain intact native vegetation that may promote natural recruitment within 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 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 (USFS, 2007).

The SSRP prescription for passive restoration at HA 27 consisted of hand-broadcast non-irrigated seed and annual weed management activities. 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 was monitored for eight years by photo documentation and site visits and three years for species richness and vegetative cover (see Table 9-42). Figure 9-43 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 27 are summarized in Table 9-43.

Table 9-42. Historic Summary of Restoration and Monitoring Activities at HA 27

Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2020	2025
Restoration: Passive	●	●								
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Species Richness						●	●	●	●	●
Vegetative Cover						●*	●	●	●	●

* Vegetative cover was monitored using quadrats in 2016

Figure 9-43. HA 27 Restoration Areas and Monitoring Locations Map

Table 9-43. Success Criteria and Acceptable Limits for Restoration of HA 27

No.	Success Element	Decision Rule	Acceptable Limits
Objective 1*			
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†
			shaggy-bark manzanita
			sandmat manzanita†
			coyote brush
			Monterey ceanothus†
			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 of the SSRP
Objective 2*			
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*			
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.
			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.

Table 9-43. Success Criteria and Acceptable Limits for Restoration of HA 27

	Objective 3*		
4	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Not applicable

* Objectives presented in HRP (Shaw, 2009b)
† HMP Species

9.6.1 Restoration Activities

Burleson performed passive restoration at HA 27 in 2011 and 2012. No additional restoration activities occurred in 2018. The total amount of seed broadcast on site was 1.046 lb compared to the 1.270 lb prescribed in the SSRP. No active restoration activities were conducted at HA 27. Table 9-44 summarizes the SSRP seed target and the amount of seed applied by year and species.

Table 9-44. Summary of Passive Restoration Activities 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*	0.060	0.032	0.043	0.075
ARPU*	0.120	0.063	0.067	0.130
ARTO	0.120	0.062	0.067	0.129
BAPI	0.010	-	0.005	0.005
CERI*	0.060	-	0.063	0.063
CRSC	0.060	0.033	0.033	0.066
HOCU	0.120	0.062	0.060	0.122
HO	0.540	-	0.268	0.268
SAME	0.060	0.035	0.031	0.066
TOTAL	**1.270**	**0.349**	**0.697**	**1.046**

* HMP species

9.6.2 Monitoring Results

HA 27 was in year 6 of monitoring in 2018. Even though year 6 was not a required monitoring year, monitoring occurred and results are presented below.

9.6.2.1 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.

9.6.2.2 Plant Survivorship

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

9.6.2.3 Species Richness

Twenty-six species were observed at HA 27. Of those, 19 were native shrubs or perennials, three were native annual herbaceous species, and four were non-native species (see Table 9-45). Species richness

decreased by 15 species since 2017. Native shrub and perennial species remained the same, native herbaceous species decreased by seven, non-native species decreased by seven, and uncategorized species decreased by one. The decrease in species richness was likely because HA 27 was surveyed in late July after many annual species senesced.

Table 9-45. Species Observed on HA 27, 2018

Scientific Name	Common Name	Code
Acmispon glaber	deerweed	ACGL
Adenostoma fasciculatum	chamise	ADFA
*Arctostaphylos montereyensis**	Monterey manzanita	ARMO
*Arctostaphylos pumila**	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Baccharis pilularis	coyote brush	BAPI
Carex sp.	sedge	CA
Ceanothus dentatus	dwarf ceanothus	CEDE
*Ceanothus rigidus**	Monterey ceanothus	CERI
Chorizanthe diffusa	diffuse spineflower	CHDI
Corethrogyne filaginifolia	common sandaster	COFI
Crocanthemum scoparium	peak rush-rose	CRSC
Diplacus aurantiacus	sticky monkeyflower	DIAU
Eriophyllum confertiflorum	golden yarrow	ERCO
Festuca myuros	rattail sixweeks grass	FEMY
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris radicata	rough cat's ear	HYRA
Lepechinia calycina	pitcher sage	LECA
Lysimachia arvensis	scarlet pimpernel	LYAR
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Pinus radiata	Monterey pine	PIRA
Plantago coronopus	cut-leaved plantain	PLCO
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Salvia mellifera	black sage	SAME

 * HMP species

9.6.2.4   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 41.43%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 6.29%. Table 9-46 summarizes vegetative cover and Table 9-47 presents vegetative cover results by species. Figure 9-44 presents the percent cover of dominant species at HA 27 in 2017 and 2018.

Table 9-46. 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	66.33	66.33	0.00	0.00	88.67	11.33
HA27T02	40.00	40.00	0.00	0.00	98.00	2.00
HA27T03	11.13	11.13	0.00	0.00	85.38	5.13
HA27T04	43.18	43.18	0.00	0.00	96.71	2.53
SITE AVERAGE*	41.43	41.43	0.00	0.00	93.07	4.81

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

Table 9-47. Transect Survey Results for HA 27 by Species

Transect	ACGL (%)	ARMO* (%)	ARTO (%)	CEDE (%)	CERI* (%)	CRSC (%)	HOCU (%)	LECA (%)	SAME (%)	TH (%)	BG (%)
HA27T01	6.22	2.00	0.00	24.89	0.00	24.89	8.33	0.00	0.00	88.67	11.33
HA27T02	14.25	0.00	3.00	0.00	0.00	20.63	2.13	0.00	0.00	98.00	2.00
HA27T03	0.00	0.00	0.00	0.00	0.00	11.13	0.00	0.00	0.00	85.38	5.13
HA27T04	5.94	0.00	22.18	0.00	5.53	0.82	3.12	4.06	1.53	96.71	2.53
SITE AVERAGE†	6.45	0.43	9.55	5.33	2.24	11.71	3.45	1.64	0.62	93.07	4.81

* HMP Species

† Transect lengths are not equal. Site averages are weighted to reflect differing lengths.
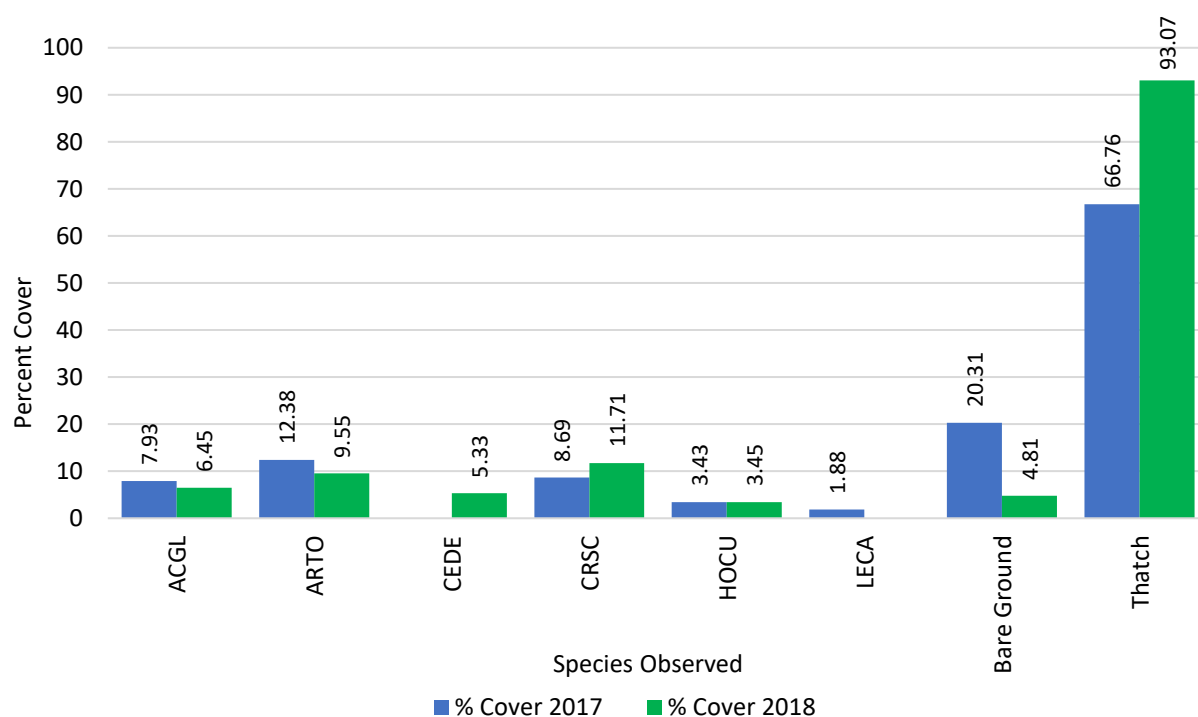
Figure 9-44. Percent Cover of Dominant Species at HA 27 in 2017 and 2018.

9.6.3   Discussion

9.6.3.1   Recommendations

HA 27 was in year 6 of monitoring in 2018 and responded marginally well to previous restoration efforts. The restoration area met two of its six success criteria by 2018. Per recommendations in the 2016 Annual Habitat Restoration Report, Monterey manzanita, golden yarrow, and sticky monkeyflower will be planted in the 2018/2019 season to support the species richness and HMP shrub cover criteria (Burleson, 2017). Additionally, the Army will plant sandmat manzanita and Monterey ceanothus to further support the HMP shrub cover success criteria. Neither sandmat manzanita nor Monterey manzanita are likely to meet criteria without corrective measures. Overall, HA 27 needs time to further respond to the restoration effort. A qualitative overview was documented by photo points (see Appendix D, page D-6).

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 9-48 summarizes the current status of HA 27 including which success criteria were met and recommendations.

Table 9-48. Status and Recommendations for Achieving Success Criteria at HA 27

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Plant native species (scheduled 2018/2019)*
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant Monterey manzanita, sandmat manzanita, and Monterey ceanothus (scheduled 2018/2019)*
Objective 3 – No. 4	HMP shrub cover by species	No	Plant Monterey manzanita, sandmat manzanita, and Monterey ceanothus (scheduled 2018/2019)*
Objective 3 – No. 4	HMP annual density	NA	NA

* Recommendation repeated from the 2016 Annual Habitat Restoration Report (Burleson, 2017).

9.6.3.2   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.

9.6.3.3   Plant Survivorship

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

9.6.3.4   Species Richness

Monterey manzanita (*Arctostaphylos montereyensis*), shaggy-bark manzanita, sandmat manzanita, coyote brush, Monterey ceanothus, peak rush-rose, sticky monkeyflower, golden yarrow, wedge-leaved horkelia, deerweed, and black sage were present. HA 27 included 19 native shrub and perennial species and met the success criterion for Objective 1.

9.6.3.5   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 shrub and perennial species presented in Table 2 of the HA 27 SSRP (Burleson, 2013). These species contributed 34.45% cover to the HA; therefore, this success criterion was not met. In 2017, vegetative cover was 32.69%; cover increased by 1.76% (see Figure 9-45). In 2016, quadrats were completed to provide a preliminary idea of vegetative cover with a limited amount of effort. From 2017 onward, line-intercept transect surveys were used as multiple objectives outlined in the SSRP specifically require transect data. The 2016 quadrat data were not compared to the success criteria.
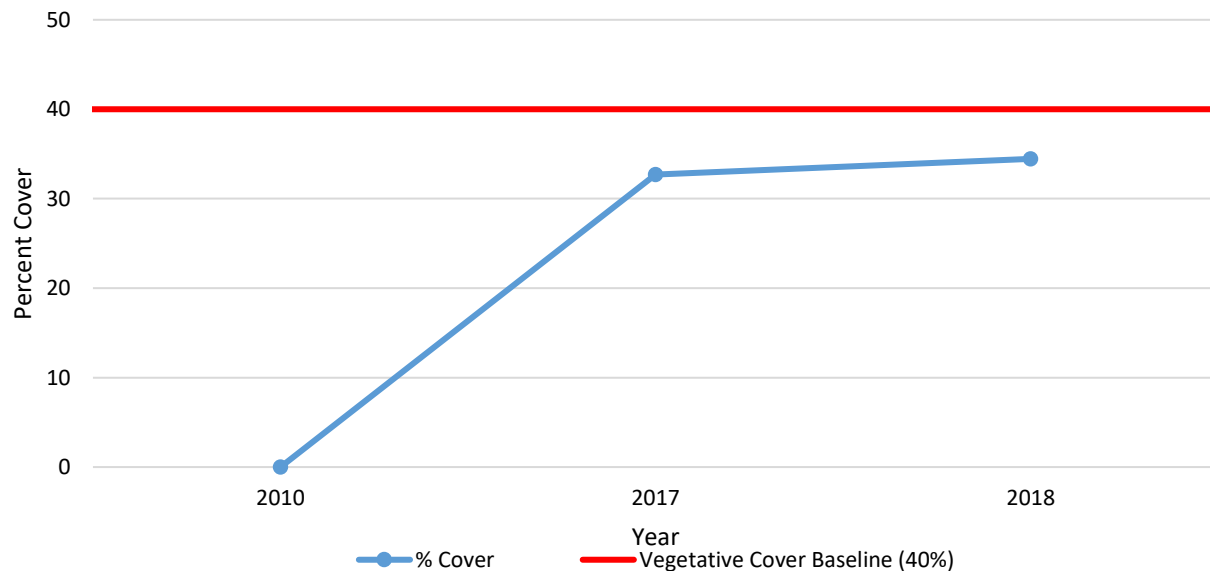
Figure 9-45. Native Vegetative Cover Compared to the Success Criterion at HA 27

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. Cover of non-native target weeds decreased from 1.00% in 2017.

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 ranges from 26-50% of absolute cover. The HMP shrub species at HA 27 provided an absolute cover of 2.67%. HA 27 did not meet this success criterion. This was an increase from 0.00% in 2017. 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, at least 2% cover for Monterey manzanita, and at least 1% cover for Monterey ceanothus. The average vegetative cover for sandmat manzanita was 0.00%, Monterey manzanita was 0.43%, and Monterey ceanothus was 2.24% (see Figure 9-46). In 2018, only one of the three species, Monterey ceanothus, met the acceptable limit. Therefore, the success criterion was not met.
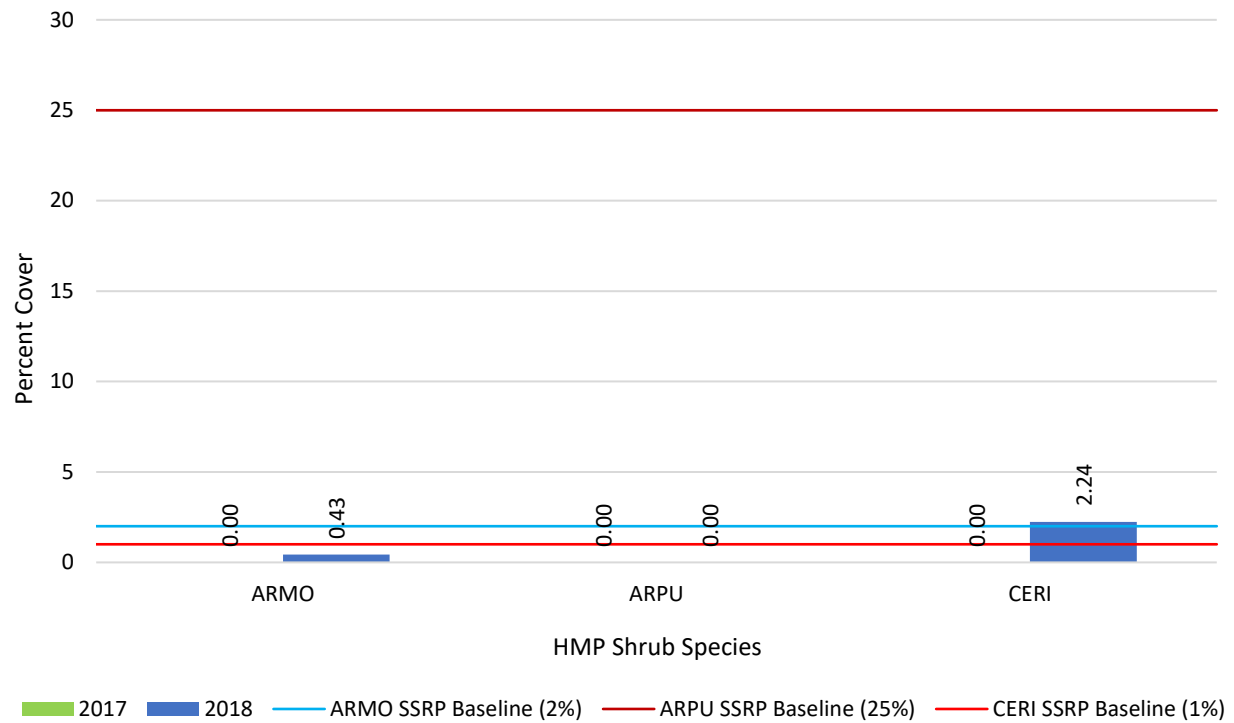
Figure 9-46. HMP Shrub Species Comparison to Success Criteria at HA 27

9.7   HA 27A

HA 27A was used by the Army as a small-arms firing range. Soil remediation was completed in 2010; 1,100 cubic yards of lead-contaminated soil were excavated from 0.6 acres (Shaw, 2008). HA 27A rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of similar maritime climates (USFS, 2007). HA 27A is relatively flat with a west aspect. Adjacent lands were not developed and contain intact native vegetation that may promote natural recruitment within 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 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 (USFS, 2007).

The SSRP 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 lacks top soil, has 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, 2016, and 2018 and monitoring began in 2013. HA 27A was monitored for eight years by photo documentation and site visits and three years for species richness and vegetative cover (see Table 9-49). Figure 9-47 shows the HA footprint, passive restoration area, and transect locations. Success criteria for HA 27A are summarized in Table 9-50.

Table 9-49. Historic Summary of Restoration and Monitoring Activities at HA 27A

Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2020	2025
Restoration: Passive and Erosion Control	●	●				●		●		
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Species Richness						●	●	●	●	●
Vegetative Cover						●	●	●	●	●

Figure 9-47. HA 27A Restoration Areas and Monitoring Location Map

Table 9-50. Success Criteria and Acceptable Limits for Restoration of HA 27A

	Objective 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†
			shaggy-bark manzanita
			sandmat manzanita†
			coyote brush
			Monterey ceanothus†
			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 of the SSRP
	Objective 2*		
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*		
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.
			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.

Table 9-50. Success Criteria and Acceptable Limits for Restoration of HA 27A

	Objective 3*		
4	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Not applicable

* Objectives presented in HRP (Shaw, 2009b)
† HMP Species

9.7.1   Restoration Activities

Burleson performed passive restoration at HA 27A in 2011, 2012, 2016, and 2018. The total amount of seed broadcast on site was 54.606 lb compared to 13.530 lb prescribed in the SSRP. No active restoration activities were conducted at HA 27A. Table 9-51 summarizes the SSRP seed target and the amount of seed applied by year and species.

Table 9-51. Summary of Passive Restoration Activities for HA 27A

Species	Pounds of Seed Broadcast					
	SSRP Target	2011	2012	2016	2018	Total by Species
ACGL	1.200	0.600	0.608	0.800	-	2.008
ACMI	-	-	-	0.400	0.750	1.150
ADFA	0.600	0.300	0.308	-	-	0.608
ARMO*	1.200	0.600	0.611	-	-	1.211
ARPU*	0.600	0.300	0.308	-	-	0.608
ARTO	1.200	0.600	0.612	-	-	1.212
BAPI	0.090	-	0.046	-	-	0.046
CERI*	0.600	-	0.314	-	-	0.314
CRSC	0.600	0.300	0.303	-	-	0.603
DIAU	0.060	0.200	0.183	-	-	0.383
ELGL	-	-	-	14.400	2.000	16.400
ERCO	0.180	0.093	0.093	-	-	0.186
HOCU	1.200	0.600	0.600	11.400	1.000	13.600
HO	5.400	-	5.421	2.000	-	7.421
SAME	0.600	0.300	0.306	-	-	0.606
STPU	-	-	-	7.000	1.250	8.250
TOTAL	**13.530**	**3.893**	**9.713**	**36.000**	**5.000**	**54.606**

* HMP Species

9.7.2   Monitoring Results

HA 27A was in year 6 of monitoring in 2018. Even though year 6 was not a required monitoring year, monitoring occurred and results are presented below.

9.7.2.1   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.

9.7.2.2   Plant Survivorship

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

9.7.2.3   Species Richness

Fifty species were observed at HA 27A. Of those, 29 were native shrubs or perennials, six were native annual herbaceous species, and 15 were non-native species (see Table 9-52). Species richness decreased by four species since 2017. Native shrub and perennial species increased by three, native herbaceous species remained the same, and non-native species decreased by seven.

Table 9-52. Species Observed on HA 27A, 2018

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon heermannii var. *orbicularis*	Heermann's lotus	ACHEO
Adenostoma fasciculatum	chamise	ADFA
Agrostis exarata	spike bent grass	AGEX
Aira caryophyllea	silver hair grass	AICA
Arbutus menziesii	Pacific madrone	ARME
Arctostaphylos hookeri*	Hooker's manzanita	ARHO
Arctostaphylos montereyensis*	Monterey manzanita	ARMO
Arctostaphylos pumila*	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus*	Monterey ceanothus	CERI
Cortaderia jubata	jubata grass	COJU
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*	Eastwood's goldenbush	ERFA
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
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
Lythrum hyssopifolia	grass poly	LYHY
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA

Table 9-52. Species Observed on HA 27A, 2018

Scientific Name	Common Name	Code
Pinus radiata	Monterey pine	PIRA
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Polypogon monspeliensis	rabbitsfoot grass	POMO
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium stramineum	cotton-batting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Salix sp.	willow	SA
Salvia mellifera	black sage	SAME
Trifolium angustifolium	narrow-leaved clover	TRAN

* HMP species

9.7.2.4   Vegetative Cover

Burleson completed one 50-meter and one 44-meter line-intercept transects at HA 27A. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 20.59%. The mean vegetative cover by native shrubs and perennials was lower in 2018 than 2017 by 3.40%. Table 9-53 summarizes vegetative cover and Table 9-54 presents vegetative cover by species. Figure 9-48 presents the percent cover of dominant species at HA 27A in 2016, 2017, and 2018.

Table 9-53. 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	6.60	5.70	0.00	0.90	83.48	16.48
HA27AT02	37.50	37.50	0.00	0.00	91.27	15.39
SITE AVERAGE*	**21.06**	**20.59**	**0.00**	**0.48**	**87.13**	**15.97**

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

Table 9-54. Transect Survey Results for HA27A by Species

Transect	ACGL (%)	ADFA (%)	ARMO* (%)	ARPU* (%)	ARTO (%)	CA sp. (%)	CRSC (%)
HA27AT01	3.30	0.00	0.00	0.00	0.00	0.00	2.40
HA27AT02	2.39	1.61	0.98	2.68	9.70	0.50	16.05
SITE AVERAGE†	**2.87**	**0.76**	**0.46**	**1.26**	**4.54**	**0.23**	**8.79**

Table 9-54 (continued). Transect Survey Results for HA27A by Species

Transect	DIAU (%)	ERCO (%)	HOCU (%)	HYRA (%)	PLCO (%)	TH (%)	BG (%)
HA27AT01	0.00	0.00	0.00	0.34	0.56	83.48	16.48
HA27AT02	0.27	1.55	1.77	0.00	0.00	91.27	15.39
SITE AVERAGE†	**0.13**	**0.72**	**0.83**	**0.18**	**0.30**	**87.13**	**15.97**

* HMP species

† Transect lengths are not equal. Site averages are weighted to reflect differing lengths.
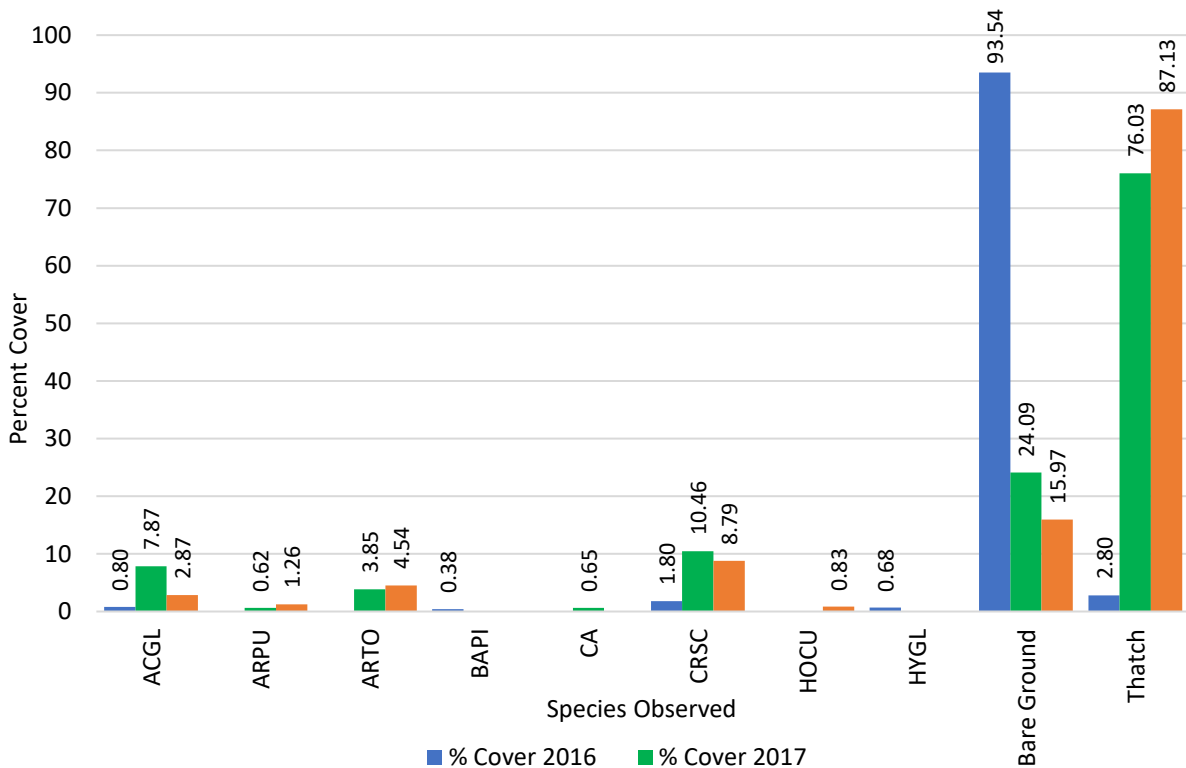
Figure 9-48. Percent Cover of Dominant Species at HA 27A in 2016, 2017, and 2018. One transect was monitored in 2016 and two transects were monitored in 2017 and 2018.

9.7.3   Discussion

9.7.3.1   Recommendations

HA 27A was in year 6 of monitoring in 2018 and responded marginally to restoration efforts. The restoration site met two of five success criteria by 2018. 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 (mulch was applied to the eastern portion of the southern polygon in 2018); 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, lacks top soil, has 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 9-50 shall only be applied to the two northern polygons which are within maritime chaparral habitat. The southern polygon will receive treatment for erosion control and invasive species, additional seeding with pioneer species, and monitoring. The qualitative objective for the southern polygon will be that, at the end of monitoring year 13, the area will resemble an early successional stage of maritime chaparral. A qualitative overview was documented by photo points (see Appendix D, page D-7).

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 9-55 summarizes the current status of HA 27A including which success criteria were met and recommendations.

Table 9-55. Status and Recommendations for Achieving 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.*†
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

* Recommendation repeated from the 2017 Annual Habitat Restoration Report (Burleson, 2018).
† Not scheduled

9.7.3.2   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.

9.7.3.3   Plant Survivorship

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

9.7.3.4   Species Richness

Chamise, Monterey manzanita, sandmat manzanita, shaggy-bark manzanita, coyote brush, Monterey ceanothus, golden yarrow, peak rush-rose, wedge-leaved horkelia, deerweed, sticky monkeyflower, and black sage were present. HA 27A included 29 native shrub and perennial species and met the success criterion for Objective 1.

9.7.3.5   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 13 shrub and perennial species presented in Table 2 of the HA 27A SSRP (Burleson, 2013). These species contributed 20.35% cover to the HA; therefore, this success criterion was not met. In 2017, vegetative cover was 23.34%; cover decreased by 2.99% (see Figure 9-49).
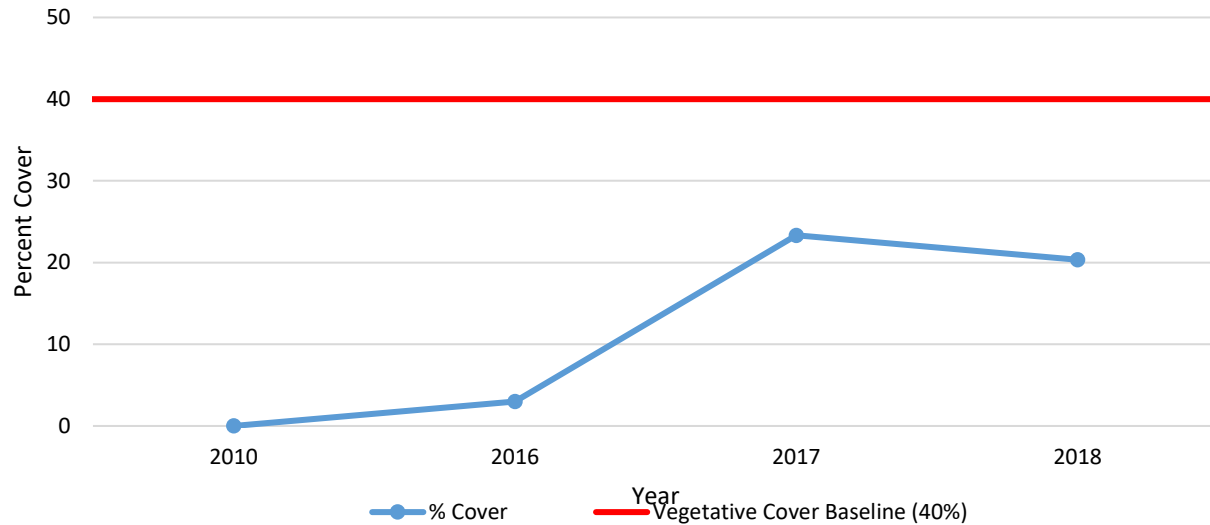
Figure 9-49. Native Vegetative Cover Compared to the Success Criterion at HA 27A

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 4. Cover class 4 ranges from 26-50% of absolute cover. The HMP shrub species at HA 27A provided an absolute cover of 1.71%, therefore the HA did not meet this success criterion. This was an increase from 0.62% in 2017. 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, 2% or greater for Monterey manzanita, and 1% or greater for Monterey ceanothus. The average vegetative cover for sandmat manzanita was 1.26%, Monterey manzanita was 0.46%, and Monterey ceanothus was 0.00% (see Figure 9-50). None of the species met the acceptable limit although they were present on the site. This success criterion was not met.
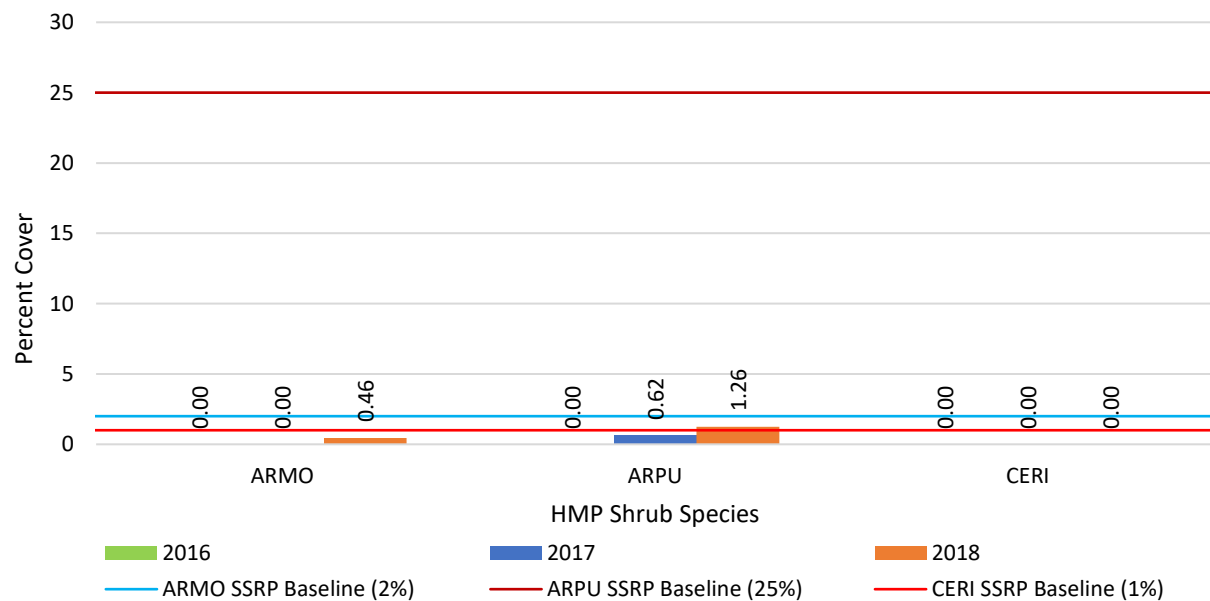
Figure 9-50. HMP Shrub Species Comparison to Success Criteria at HA 27A

9.8   HA 28

HA 28 was used by the Army as a range for automatic rifles. Soil was excavated over 4.3 acres. A vernal pool comprised ponds 30A, 30B, and 30C partially extends into HA 28. California tiger salamander (*Ambystoma californiense,* CTS) and other aquatic species have been documented within this feature. HA 28 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of similar maritime climates (USFS, 2007). HA 28 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 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 (USFS, 2007).

The SSRP restoration procedure for HA 28 included both passive and active restoration consisting of hand broadcast non-irrigated seed, annual weed management activities, and installing native container-grown plants. HA 28 is moderately sloped with some potential for erosion.

Restoration activities at HA 28 began in 2013 and are ongoing. Monitoring began in 2015. The HA was monitored for six years by photo documentation and site visits, four years for HMP annual density in plots, three years for HMP annual density across the HA, species richness, and vegetative cover, and four years for plant survivorship (see Table 9-56). Figure 9-51 shows the HA footprint, passive restoration area, active restoration area, and transect monitoring locations. Success criteria for HA 28 are summarized in Table 9-57.

Table 9-56. Historic Summary of Restoration and Monitoring Activities at HA 28

Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2013	2014	2015	2016	2017	2018	2019	2020	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 9-51. HA 28 Restoration Areas and Monitoring Locations Map

Table 9-57. Success Criteria and Acceptable Limits for Restoration of HA 28

	Objective 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† sandmat manzanita† shaggy-bark manzanita Monterey ceanothus† wedge-leaved 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 of the SSRP
	Objective 2*		
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 jubata grass. No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3*		
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
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Monterey spineflower density class: Low

* Objectives presented in HRP (Shaw, 2009b)
† HMP Species

9.8.1   Restoration Activities

Burleson performed passive restoration at HA 28 in 2013, 2014, 2015, 2016, 2017, and 2018. The total amount of seed broadcast on site was 287.30 lb compared to 115.80 lb prescribed in the SSRP. Table 9-58 summarizes the SSRP seed target and the amount of seed applied by year and species. 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 9-58. Summary of Passive Restoration Activities for HA 28

Species	Pounds of Seed Broadcast							
	SSRP Target	2013	2014	2015	2016	2017	2018	Total by Species
ACMI	3.40	4.400	-	3.140	-	-	2.100	9.640
ACGL	6.80	8.500	-	3.720	-	-	-	12.220
BAPI	0.50	1.000	-	0.070	-	-	-	1.070
CERI*	1.70	1.700	-	0.360	-	-	-	2.060
CHPUP*	0.10	-	0.028	-	-	0.032	-	0.060
CRSC	2.60	3.500	-	0.290	-	-	-	3.790
DIAU	0.50	3.600	-	0.180	-	-	-	3.780
ELGL	13.60	33.600	-	15.700	1.200	-	5.600	56.100
ERCO	4.30	5.300	-	0.360	-	-	-	5.660
ERER	-	3.100	-	-	-	-	-	3.100
ERFA*	0.70	0.700	-	0.040	-	-	-	0.740
HO	68.00	118.000	-	36.400	0.800	-	10.000	165.200
HOCU	6.80	8.800	-	0.720	-	-	2.800	12.320
SAME	6.80	7.700	-	0.360	-	-	-	8.060
STPU	-	-	-	-	-	-	3.500	3.500
TOTAL	**115.80**	**199.900**	**0.028**	**61.340**	**2.000**	**0.032**	**24.000**	**287.300**

 * HMP species

Active restoration was conducted in 2015 and 2018. The total number of plants installed at HA 28 was 4,383 compared to 4,382 prescribed in the SSRP. Table 9-59 summarizes the plants installed during active restoration.

Table 9-59. Summary of Active Restoration Activities for HA 28

Species	Number of Individual Plants			
	SSRP Target	**2015 (Jan)**	**2018 (Feb)**	**Total by Species**
ACGL	237	237	-	237
ADFA	473	473	-	473
ARHO*	237	237	-	237
ARMO*	237	237	-	237
ARPU*	947	-	948	948
ARTO	592	592	-	592
BAPI	237	237	-	237
CERI*	237	375	-	375
CRSC	237	237	-	237
ERCO	237	175	-	175
ERFA*	237	161	-	161
HOCU	237	237	-	237
SAME	237	237	-	237
TOTAL	**4,382**	**3,435**	**948**	**4,383**

* HMP species

9.8.2   Monitoring Results

9.8.2.1   HMP Annual Density

Three Monterey spineflower plots were surveyed for year 4 density at HA 28 in 2018. The plots are numbered 1-3 on Figure 9-53 and are located throughout HA 28. Monterey spineflower density was low at Plots 1, 2, and 3. Figure 9-52 represents Monterey spineflower restoration plot densities for HA 28.
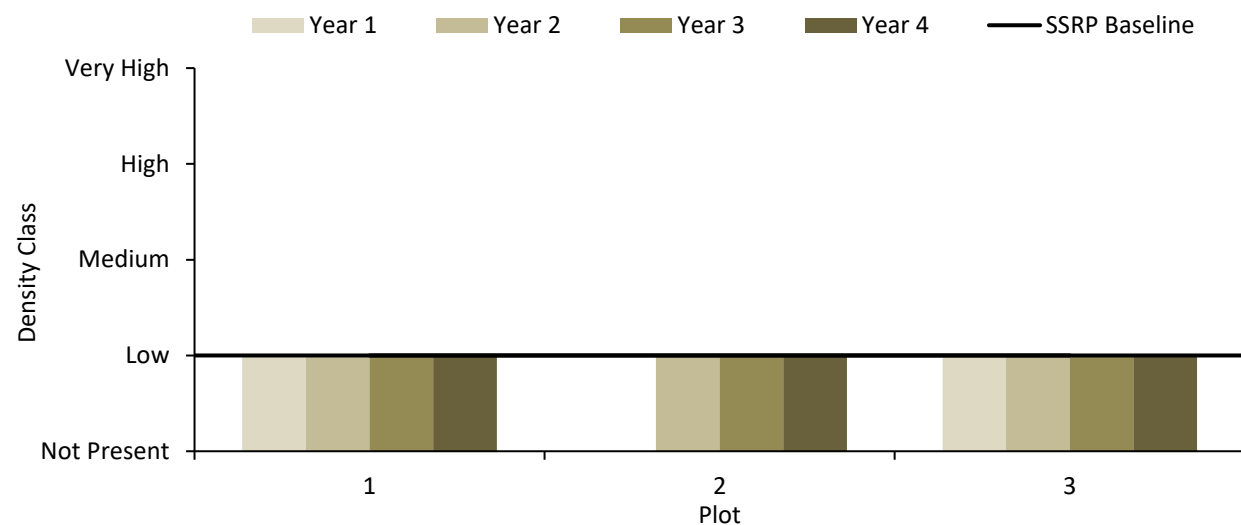
Figure 9-52. HA 28 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots 1-3
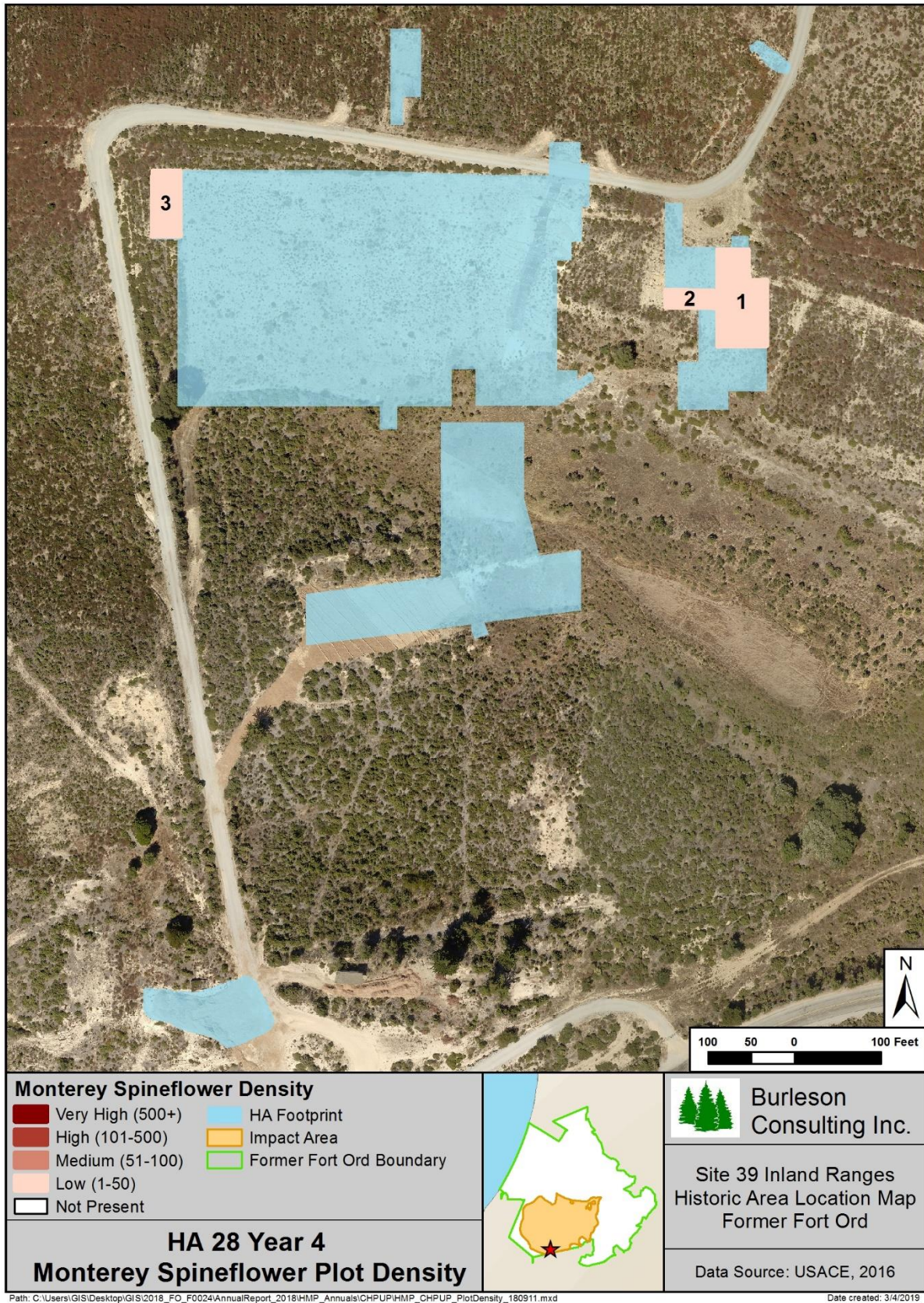
Figure 9-53. HA 28 Year 4 Monterey Spineflower Plot Density Map

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 at HA 28.

Two individual plants and one discrete patch of Monterey spineflower were mapped and individual plants were counted within the patch (see Figure 9-54). The density was high and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.001 acres. From 2017 to 2018, the density range and acreage above the SSRP baseline increased; no Monterey spineflower were observed outside of the restoration plots in 2017.
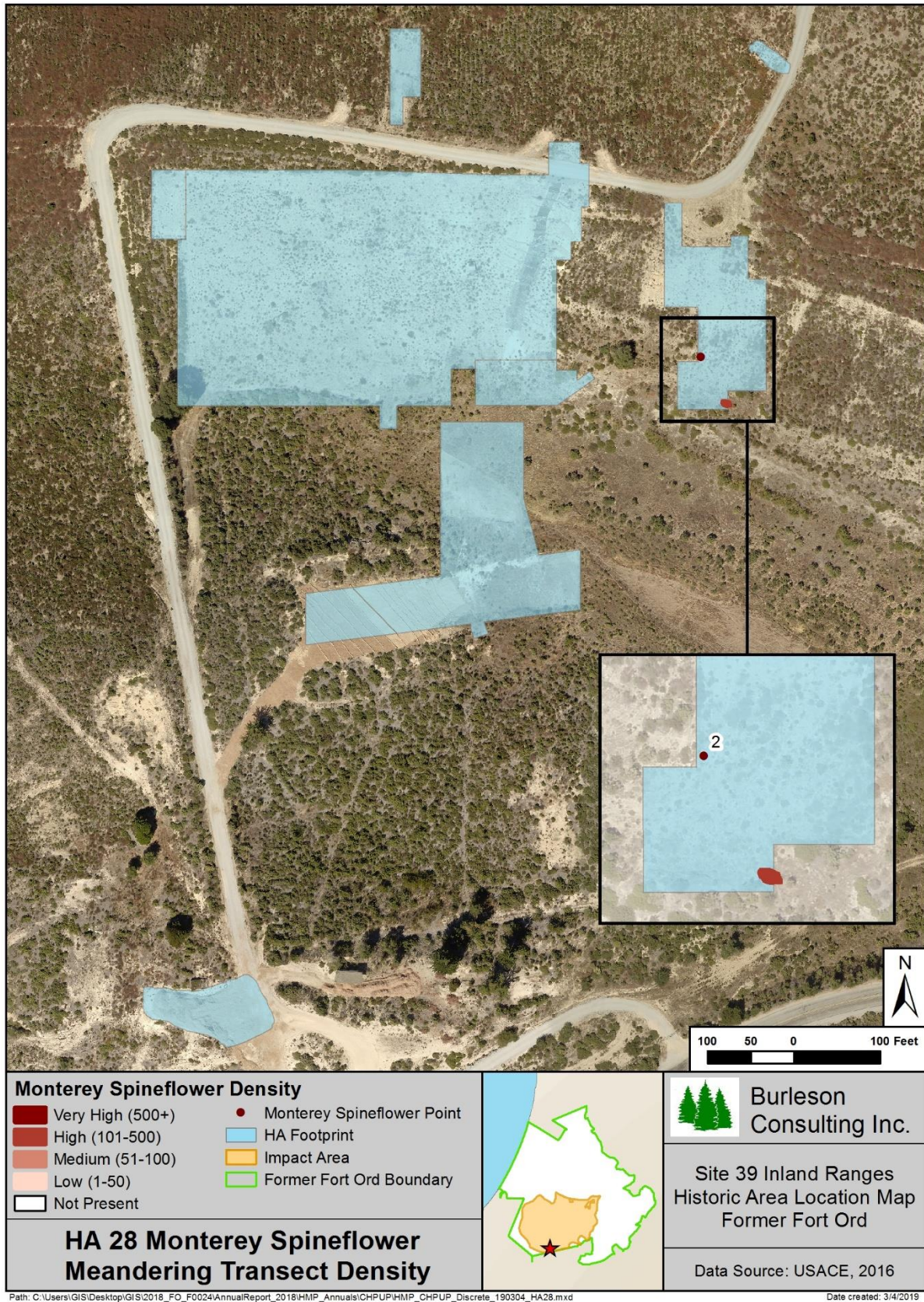
Figure 9-54. HA 28 Monterey Spineflower Meandering Transect Density Map

9.8.2.2   Plant Survivorship

Plant survivorship monitoring was conducted at HA 28. A total of nine shrub species and 369 individual plants were monitored. By year 3 of monitoring, survivorship was 79% for the 2015 planting. By year 1 of monitoring for the 2018 planting, survivorship was 91%. Table 9-60 and Table 9-61 present results by species.

Table 9-60. Plant Survivorship Monitoring Summary for 2015 Planting at HA 28

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2015) Alive (%)	Year Two (2016) Alive (%)	Year Three (2017) Alive (%)
ADFA	473	47	100	96	96
ARHO*	237	22	95	91	92
ARMO*	237	24	83	83	83
ARTO	592	60	87	85	83
BAPI	237	24	83	50	33
CERI*	375	24	71	58	50
ERFA*	161	16	94	81	69
SAME	237	23	100	100	100
TOTAL	2,549	240	90	83	79

* HMP Species

Table 9-61. Plant Survivorship Monitoring Summary for 2018 Plantings at HA 28

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2018) Alive (%)
ARPU*	948	126	91
TOTAL	948	126	91

* HMP Species

9.8.2.3   Species Richness

One hundred and nine species were observed at HA 28. Of those, 50 were native shrubs or perennials, 24 were native annual herbaceous species, and 35 were non-native species (see Table 9-62). Species richness increased by 47 species since 2017. Native shrub and perennial species increased by 19, native herbaceous species increased by ten, and non-native species increased by 18.

Table 9-62. Species Observed on HA 28, 2018

Scientific Name	Common Name	Code
Acacia sp.	acacia	AC
Achillea millefolium	common yarrow	ACMI
Acmispon americanus var. *americanus*	Spanish clover	ACAMA
Acmispon glaber	deerweed	ACGL
Acmispon heermannii var. *orbicularis*	Heermann's lotus	ACHEO
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Agrostis avenacea	Pacific bentgrass	AGAV
Agrostis exarata	spike bent grass	AGEX

Table 9-62. Species Observed on HA 28, 2018

Scientific Name	Common Name	Code
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos hookeri*	Hooker's manzanita	ARHO
Arctostaphylos montereyensis*	Monterey manzanita	ARMO
Arctostaphylos pumila*	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Artemisia douglasiana	mugwort	ARDO
Avena barbata	slender wild oat	AVBA
Baccharis glutinosa	salt marsh baccharis	BAGL
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Briza minor	small quaking grass	BRMI
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Carex globosa	round-fruited sedge	CAGL
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Castilleja densiflora	owl's clover	CADE
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus*	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Cirsium vulgare	bull thistle	CIVU
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	jubata grass	COJU
Crassula connata	pygmy-weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Cyperus eragrostis	tall cyperus	CYER
Deinandra corymbosa	coastal tarweed	DECO
Diplacus aurantiacus	sticky monkeyflower	DIAU
Distichlis spicata	salt grass	DISP
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW
Eleocharis acicularis	needle spikerush	ELAC
Eleocharis macrostachya	spike rush	ELMA
Elymus glaucus	blue wild-rye	ELGL
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata*	Eastwood's goldenbush	ERFA
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filaree	ERCI
Euthamia occidentalis	western goldenrod	EUOC
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Genista monspessulana	French broom	GEMO
Geranium dissectum	cut-leaved geranium	GEDI

Table 9-62. Species Observed on HA 28, 2018

Scientific Name	Common Name	Code
Gnaphalium palustre	lowland cudweed	GNPA
Heliotropium curassavicum var. *oculatum*	seaside heliotrope	HECUO
Heterotheca grandiflora	telegraph weed	HEGR
Hordeum sp.	sterile 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
Lathyrus angulatus	angled pea vine	LAAN
Lepechinia calycina	pitcher sage	LECA
Lessingia pectinata	common lessingia	LEPE
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	miniature lupine	LUBI
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Lysimachia minima	chaffweed	LYMI
Lythrum hyssopifolia	grass poly	LYHY
Madia exigua	little tarweed	MAEX
Madia gracilis	slender tarweed	MAGR
Madia sativa	coast tarweed	MASA
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Petrorhagia dubia	hairypink	PEDU
Phalaris lemmonii	Lemmon's cannarygrass	PHLE
Pinus radiata	Monterey pine	PIRA
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Polypogon monspeliensis	rabbitsfoot 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
Ribes malvaceum	chaparral currant	RIMA
Rubus ursinus	California blackberry	RUUR
Rumex acetosella	sheep sorrel	RUAC
Rumex salicifolius	willow leaved dock	RUSA
Salvia mellifera	black sage	SAME
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Solanum umbelliferum	blue witch	SOUM
Sonchus oleraceus	common sow thistle	SOOL
Stachys ajugoides	bugle hedge-nettle	STAJ
Toxicodendron diversilobum	poison oak	TODI

Table 9-62. Species Observed on HA 28, 2018

Scientific Name	Common Name	Code
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium dubium	little hop clover	TRDU
Trifolium microcephalum	small-head clover	TRMI
Verbena bracteata	bracted verbena	VEBR
Verbena lasiostachys var. *lasiostachys*	western vervain	VELAL
Zeltnera davyi	Davy's centaury	ZEDA

* HMP species

9.8.2.4   Vegetative Cover

Burleson completed four 50-meter line-intercept transects and six associated quadrats at HA 28. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 27.01%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 5.95%. Quadrats were completed along the transect line when 10% or more of the transect line was herbaceous cover, in accordance with the *Protocol for Conducting Vegetation Monitoring* (Burleson, 2009). Quadrats were completed for one transect (T04) at HA 28. Table 9-63 summarizes vegetative cover and Table 9-64 presents vegetative cover by species. Figure 9-55 presents the percent cover of dominant species at HA 28 in 2016, 2017, and 2018 and Table 9-65 presents quadrat results.

Table 9-63. 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	43.08	43.08	0.00	0.00	90.48	6.84
HA28T02	13.16	13.16	0.00	0.00	76.66	22.02
HA28T03	41.50	40.84	0.66	0.00	87.62	10.90
HA28T04	24.38	10.94	13.44	0.00	100.00	0.00
SITE AVERAGE	**30.53**	**27.01**	**3.53**	**0.00**	**88.69**	**9.94**

Table 9-64. Transect Survey Results for HA 28 by Species

Transect	ACGL (%)	ACHEO (%)	ADFA (%)	ARHO* (%)	ARMO* (%)	ARPU* (%)	ARTO (%)	BAPI (%)	CEDE (%)
HA28T01	10.40	0.00	4.24	1.70	0.86	13.74	1.44	0.00	0.00
HA28T02	1.10	0.00	0.00	0.00	0.00	3.46	0.00	0.00	0.00
HA28T03	0.00	1.42	3.82	2.46	0.96	2.06	8.76	1.40	7.98
HA28T04	4.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SITE AVERAGE	4.01	0.36	2.02	1.04	0.46	4.82	2.55	0.35	2.00

Table 9-64 (continued). Transect Survey Results for HA 28 by Species

Transect	CERI* (%)	COFI (%)	CRSC (%)	DIAU (%)	ERER (%)	HEGR (%)	HOCU (%)	LEPE (%)	TH (%)	BG (%)
HA28T01	0.00	0.00	6.24	3.08	0.60	0.00	0.78	0.00	90.48	6.84
HA28T02	0.00	0.00	7.80	0.48	0.00	0.00	0.32	0.00	76.66	22.02
HA28T03	8.22	0.24	2.98	0.00	0.00	0.66	0.54	0.00	87.62	10.90
HA28T04	0.00	0.00	6.20	0.00	0.00	0.00	0.22	13.44	100.00	0.00
SITE AVERAGE	2.06	0.06	5.81	0.89	0.15	0.17	0.46	3.36	88.69	9.94

* HMP Species
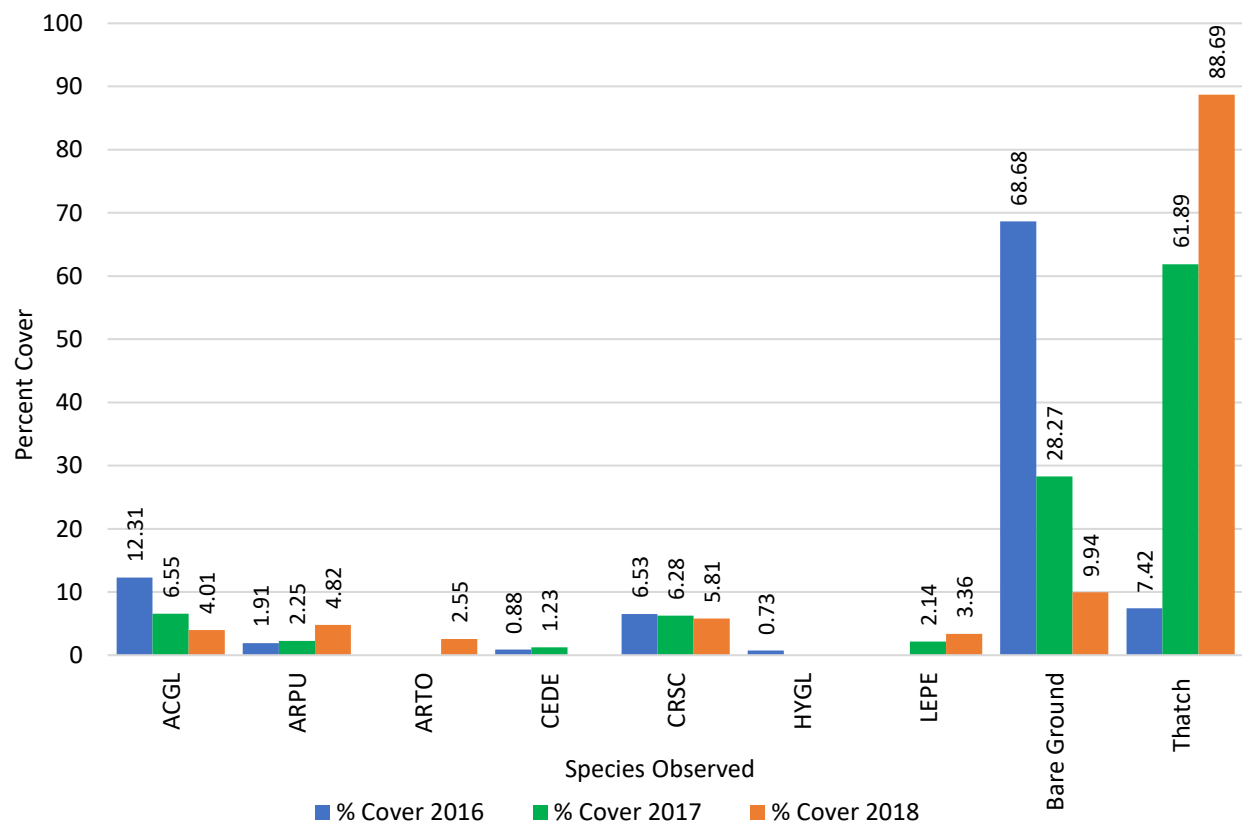
Figure 9-55. Percent Cover of Dominant Species at HA 28 in 2016, 2017, and 2018.

Table 9-65. Quadrat Summary for HA 28 Along T04 Transect Line

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA28T04Q1	23	22	1	0	33	44
HA28T04Q2	15	13	1	1	28	57
HA28T04Q3	4	2	1	1	12	84
HA28T04Q4	6	1	2	3	40	54
HA28T04Q5	25	0	25	0	10	65
HA28T04Q6	10	0	10	0	83	7
SITE AVERAGE	**14**	**6**	**7**	**1**	**34**	**52**

9.8.3   Discussion

9.8.3.1   Recommendations

HA 28 was in year 4 of monitoring in 2018 and responded moderately well to restoration efforts. The site met four of six success criteria. The SSRP prescription for active restoration will be fulfilled in the 2018/2019 season. The Army recommends installing an additional vegetation transect in the central mulched area to expand inferential capacity for informing corrective measures. Overall, HA 28 needs time to respond to the restoration effort and continued monitoring. A qualitative overview was documented by photo points (see Appendix D, page D-8).

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, 2019. Table 9-66 summarizes the current status of HA 28 including which success criteria were met and recommendations.

Table 9-66. Status and Recommendations for Achieving 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	Fulfill SSRP planting in erosion control areas (scheduled 2018/2019). Install additional transect in central mulched area†
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	Planted sandmat manzanita in February 2018
Objective 3 – No. 4	HMP annual density	Yes	None

† Not scheduled

9.8.3.2   HMP Annual Density

Monterey spineflower density was within the acceptable limit for HMP annual density at HA 28. The SSRP baseline density class for Monterey spineflower was low. Year 4 Monterey spineflower restoration

plot results show that the density met the success criterion under Objective 3 for all plots. In addition, Monterey spineflower was present outside the restoration plots. Discrete patches, with density that met or exceeded the success criterion, covered 0.001 acres of HA 28.

9.8.3.3   Plant Survivorship

Plant survivorship was moderate for the 2015 planting and high for the 2018 planting at HA 28. Coyote brush had low survivorship for the 2015 planting, whereas all other species had moderate to high survivorship. The 2018 planting will be monitored for two more years.

9.8.3.4   Species Richness

Chamise, Monterey manzanita, sandmat manzanita, shaggy-bark manzanita, Monterey ceanothus, wedge-leaved horkelia, and black sage were present. HA 28 included 50 native shrub and perennial species and met the success criterion for Objective 1.

9.8.3.5   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 and perennial species presented in Table 2 of the HA 28 SSRP (Burleson, 2013). These species contributed 24.45% cover to the HA; therefore, this criterion was not met. In 2017, vegetative cover was 19.77%; cover increased by 4.68% (see Figure 9-56).
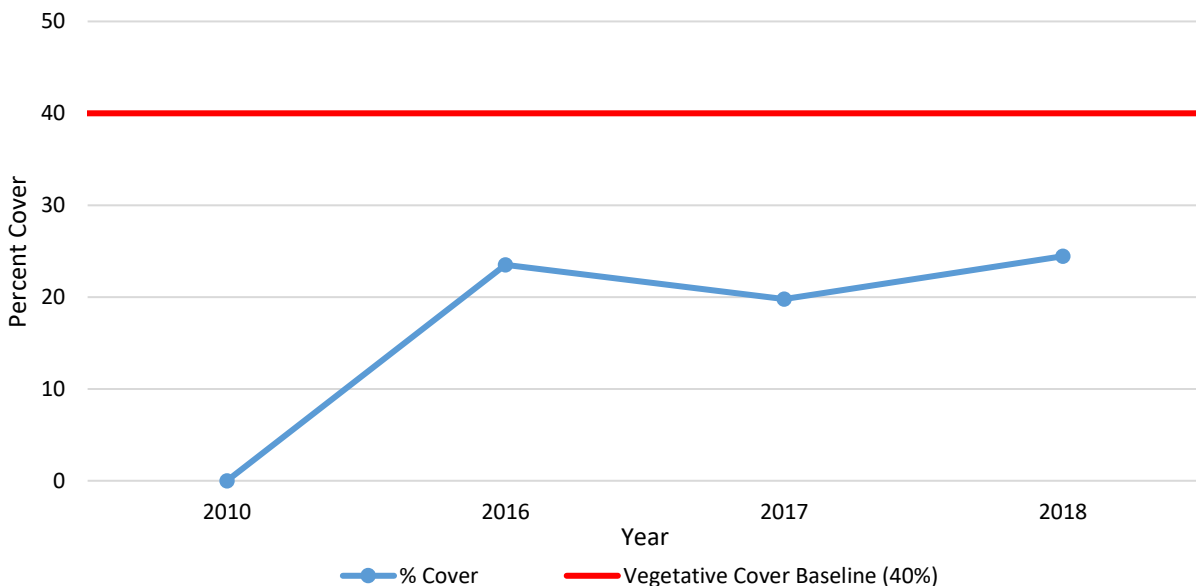
Figure 9-56. Native Vegetative Cover Compared to the Success Criterion at HA 28

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 ranges from 6-25% of absolute cover. The HMP shrub species at HA 28 provided an absolute cover of 7.33%; therefore, the HA met this success criterion. This was an increase from 3.17% in 2017 when the HA did not meet this success criterion. 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 and presence of Monterey ceanothus and Monterey manzanita. The average vegetative cover for sandmat manzanita was 4.82%, Monterey ceanothus was 2.06%, and Monterey manzanita was 0.46% (see Figure 9-57). Sandmat manzanita, Monterey ceanothus, and Monterey manzanita increased in cover from 2017 to 2018. In 2018, two of the three species, Monterey ceanothus and Monterey manzanita, met the success criterion but sandmat manzanita did not. The success criterion was not met although there was measured improvement.
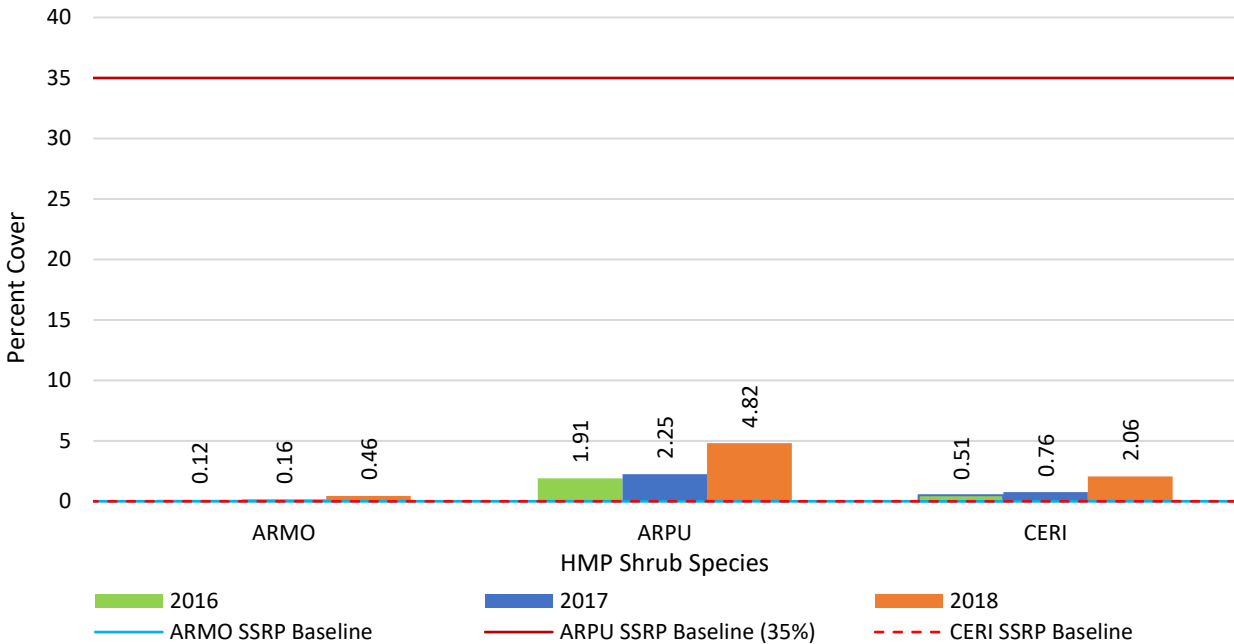
Figure 9-57. HMP Shrub Species Comparison to Success Criteria at HA 28

9.9   HA 29

HA 29 was used by the Army as a small-arms firing range. Soil remediation was completed in 2010; 1,700 cubic yards of soil were 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 of similar maritime climates (USFS, 2007). HA 29 varies in elevation with a west aspect. Adjacent lands were not developed and contain substantial amounts of intact native vegetation that may promote natural recruitment in restoration areas. HA 29 was heavily disturbed and covered with jubata grass prior to soil remediation. Approximately half of HA 29 has compacted soil.

HA 29 is located on the southern portion of Site 39 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 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 (USFS, 2007).

The SSRP restoration procedure for HA 29 included both passive and active restoration consisting of hand broadcast non-irrigated seed, annual weed management activities, and installing native container-grown plants, cuttings, and burls. Areas within HA 29 which are 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 both active and passive restoration efforts. The potential for erosion at HA 29 exists along slopes surrounding excavated areas.

Restoration at HA 29 began in 2011 and was completed in 2013. Monitoring began in 2013 and additional seed was broadcast in 2016. The HA was monitored for eight years by photo documentation and site visits and three years for species richness, vegetative cover, and plant survivorship (see Table 9-67). Figure 9-58 shows the HA footprint, passive restoration area, active restoration area, and transect monitoring locations. Success criteria for HA 29 are summarized in Table 9-68.

Table 9-67. Historic Summary of Restoration and Monitoring Activities at HA 29

Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2020	2025
Restoration: Active, Passive, Erosion Control, and Corrective Measures	●	●	●			●				
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Species Richness						●	●	●	●	●
Vegetative Cover						●	●	●	●	●
Plant Survivorship			●	●	●					

Figure 9-58. HA 29 Restoration Areas and Monitoring Locations Map

Table 9-68. Success Criteria and Acceptable Limits for Restoration of HA 29

	Objective 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† Monterey manzanita† shaggy-bark manzanita sandmat manzanita† coyote brush Monterey ceanothus† Eastwood's goldenbush† 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 of the SSRP
	Objective 2*		
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*		
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
			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

Table 9-68. Success Criteria and Acceptable Limits for Restoration of HA 29

	Objective 3*		
4			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

* Objectives presented in HRP (Shaw, 2009b)
† HMP Species

9.9.1   Restoration Activities

Burleson performed passive restoration at HA 29 in 2012, 2016, and 2018. The total amount of seed broadcast on site was 38.49 lb compared to the 24.65 lb prescribed in the SSRP. Table 9-69 summarizes the SSRP seed target and the amount of seed applied by year and species.

Table 9-69. Summary of Passive Restoration Activities for HA 29

Species	Pounds of Seed Broadcast					
	SSRP Target	**2012 (Feb)**	**2012 (Dec)**	**2016**	**2018**	**Total by Species**
ACMI	-	-	-	0.800	0.800	1.600
ACGL	2.000	1.000	1.025	1.600	-	3.625
ADFA	1.000	0.500	0.505	-	-	1.005
ARHO*	2.000	1.000	1.019	-	-	2.019
ARMO*	2.000	1.000	1.011	-	-	2.011
ARPU*	1.000	0.500	0.520	-	-	1.020
ARTO	2.000	1.000	1.010	-	-	2.010
BAPI	0.150	-	0.083	-	-	0.083
CERI*	1.000	-	1.035	-	-	1.035
CRSC	1.000	0.500	0.515	-	-	1.015
DIAU	0.100	0.300	0.316	-	-	0.616
ELGL	-	-	-	1.600	2.000	3.600
ERCO	0.300	0.200	0.160	-	-	0.360
ERFA*	0.100	0.058	0.059	-	-	0.117
HO	9.000	-	9.030	-	-	9.030
HOCU	2.000	1.000	1.021	1.600	1.600	5.221
SAME	1.000	0.600	0.523	-	-	1.123
STPU	-	-	-	1.000	2.000	3.000
TOTAL	**24.650**	**7.658**	**17.832**	**6.600**	**6.400**	**38.490**

 * HMP species

Active restoration was conducted in 2012 and 2013. The total number of plants installed at HA 29 was 1,656 compared to 1,374 prescribed in the SSRP. Table 9-70 summarizes the plants installed during active restoration.

Table 9-70. Summary of Active Restoration Activities for HA 29

Species	Number of Individual Plants			
	SSRP Target	2012 (Feb)	2013 (Feb)	Total by Species
ACGL	189	225	-	225
ADFA	101	-	120	120
ARHO*	4	-	5	5
ARMO*	13	-	15	15
ARPU*	17	-	20	20
ARTO	21	-	25	25
BAPI	76	91	-	91
CERI*	4	-	5	5
CRSC	189	225	-	225
DIAU	189	225	-	225
ERCO	189	225	-	225
ERFA*	4	-	25	25
HOCU	189	225	-	225
SAME	189	225	-	225
TOTAL	1,374	1,441	215	1,656

 * HMP species

9.9.2   Monitoring Results

HA 29 was in year 6 of monitoring in 2018. Even though year 6 was not a required monitoring year, monitoring occurred and results are presented below.

9.9.2.1   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.

9.9.2.2   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 3 of monitoring, survivorship was 89% for the 2013 planting. Survivorship monitoring is complete. See Table 9-71 for results by species.

Table 9-71. Plant Survivorship Monitoring Summary for 2013 Planting at HA 29

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2013) Alive (%)	Year Two (2014) Alive (%)	Year Three (2015) Alive (%)
ADFA	120	45	96	95	91
ARHO*	5	5	100	100	100
ARMO*	15	15	93	93	87
ARPU*	20	20	95	95	90
ARTO	25	25	92	88	88
BAPI	91	20	95	100	75
CERI*	5	5	100	80	80
ERFA*	5	5	100	100	100
SAME	225	20	100	100	95
TOTAL	511	160	96	95	89

* HMP Species

9.9.2.3   Species Richness

Fifty species were observed at HA 29. Of those, 32 were native shrubs or perennials, five were native annual herbaceous species, and 13 were non-native species (see Table 9-72). Species richness decreased by three species since 2017. Native shrub and perennial species increased by four, native herbaceous species decreased by one, and non-native species decreased by six.

Table 9-72. Species Observed on HA 29, 2018

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arbutus menziesii	Pacific madrone	ARME
*Arctostaphylos hookeri**	Hooker's manzanita	ARHO
*Arctostaphylos montereyensis**	Monterey manzanita	ARMO
*Arctostaphylos pumila**	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Baccharis pilularis	coyote brush	BAPI
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
*Ceanothus rigidus**	Monterey ceanothus	CERI
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	jubata grass	COJU
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

Table 9-72. Species Observed on HA 29, 2018

Scientific Name	Common Name	Code
Ericameria fasciculata*	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
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
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 ssp. *parviloba*	hooked navarretia	NAHA
Piperia sp.	rein orchid	PI
Plantago coronopus	cut-leaved plantain	PLCO
Polypogon monspeliensis	rabbitsfoot grass	POMO
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Salix laevigata	red willow	SALA3
Salix lasiolepis	arroyo willow	SALA6
Salvia mellifera	black sage	SAME
Toxicodendron diversilobum	poison oak	TODI
Verbena lasiostachys var. *lasiostachys*	western vervain	VELAL

* HMP species

9.9.2.4   Vegetative Cover

Burleson completed three 50-meter line-intercept transects at HA 29, two of which were installed in 2018. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 27.03%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than in 2017 by 12.73%. Two transects were added in 2018, which may explain the difference in vegetative cover between 2017 and 2018. Table 9-73 summarizes vegetative cover and Table 9-74 presents vegetative cover by species. Figure 9-59 presents the percent cover of dominant species at HA 28 in 2016, 2017, and 2018.

Table 9-73. 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	22.40	22.16	0.00	0.24	91.02	8.76
HA29T02	22.12	5.90	0.00	16.22	96.96	3.04
HA29T03	53.58	53.04	0.00	0.54	90.68	9.32
SITE AVERAGE	32.70	27.03	0.00	5.67	92.89	7.04

Table 9-74. Transect Survey Results for HA 29 by Species

Transect	ACGL (%)	ADFA (%)	ARMO* (%)	ARPU* (%)	ARTO (%)	BAPI (%)	CEDE (%)	COJU (%)	CRSC (%)	DIAU (%)	HOCU (%)	HYRA (%)	SAME (%)	TH (%)	BG (%)
HA29T01	2.54	0.00	0.00	5.14	0.00	6.14	4.82	0.24	1.70	0.00	1.20	0.00	0.62	91.02	8.76
HA29T02	1.96	0.98	0.00	0.00	0.00	0.22	0.00	0.00	1.00	0.00	0.62	16.22	1.12	96.96	3.04
HA29T03	1.66	2.00	2.26	10.18	10.28	0.00	15.78	0.54	3.90	1.60	2.10	0.00	3.28	90.68	9.32
SITE AVERAGE	2.05	0.99	0.75	5.11	3.43	2.12	6.87	0.26	2.20	0.53	1.31	5.41	1.67	92.89	7.04

* HMP species
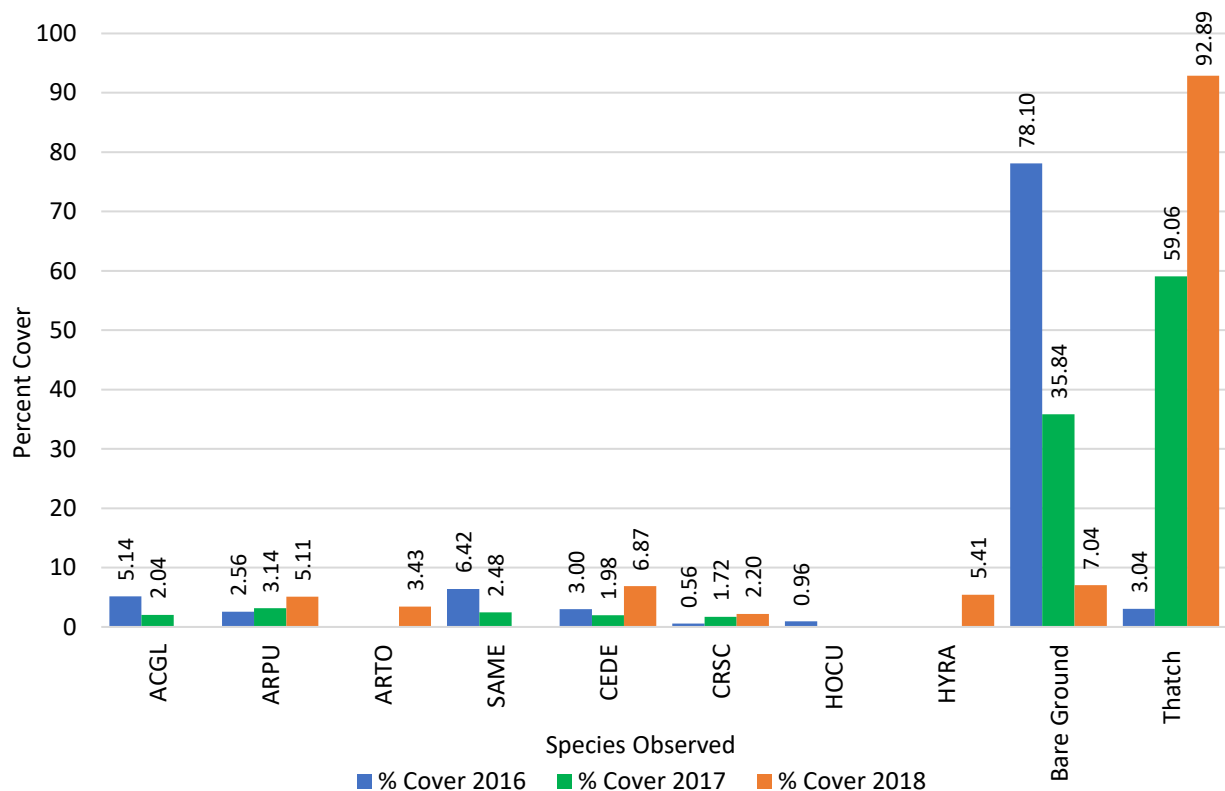
Figure 9-59. Percent Cover of Dominant Species at HA 29 in 2016, 2017, and 2018.

9.9.3   Discussion

9.9.3.1   Recommendations

HA 29 was in year 6 of monitoring in 2018 and responded marginally to restoration efforts. The site met one of five success criteria by the 2018 monitoring season. Per recommendations in the 2016 Annual Habitat Restoration Report, toyon will be planted in 2018/2019 to support the species richness and HMP shrub cover criteria (Burleson, 2017). Mulch and mycorrhizal-fertilizer mix (Bio-Live 5-4-2) was applied in March 2018. The Army recommends future planting of Hooker's manzanita, Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush to support HMP shrub cover success criteria. Two new transects were added in 2018 to more accurately represent site conditions. 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 was documented by photo points (see Appendix D, page D-9).

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 9-75 summarizes the current status of HA 29 including which success criteria were met and recommendations.

Table 9-75. Status and Recommendations for Achieving Success Criteria at HA 29

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant toyon (scheduled 2018/2019)
Objective 1 – No. 2	Native vegetation cover	No	Plant Hooker's manzanita, Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush*†
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant Hooker's manzanita, Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush*†
Objective 3 – No. 4	HMP shrub cover by species	No	Plant Hooker's manzanita, Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush*†
Objective 3 – No. 4	HMP annual density	NA	NA

* Recommendation repeated from the 2016 Annual Habitat Restoration Report (Burleson, 2017).
† Not scheduled

9.9.3.2   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.

9.9.3.3   Plant Survivorship

Plant survivorship was moderate for coyote brush and high for all other species for the 2013 planting at HA 29. Survivorship monitoring is complete.

9.9.3.4   Species Richness

Chamise, Hooker's manzanita, Monterey manzanita, sandmat manzanita, shaggy-bark 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 (*Heteromeles arbutifolia*) was not present. HA 29 included 32 native shrub and perennial species; however, the site did not meet the success criterion for Objective 1.

### 9.9.3.5   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 14 shrub and perennial species presented in Table 2 of the HA 29 SSRP (Burleson, 2013). Currently the HA includes 20.17% cover; therefore, this success criterion was not met. In 2017, vegetative cover was 12.32%; cover increased by 7.85% (see Figure 9-60).
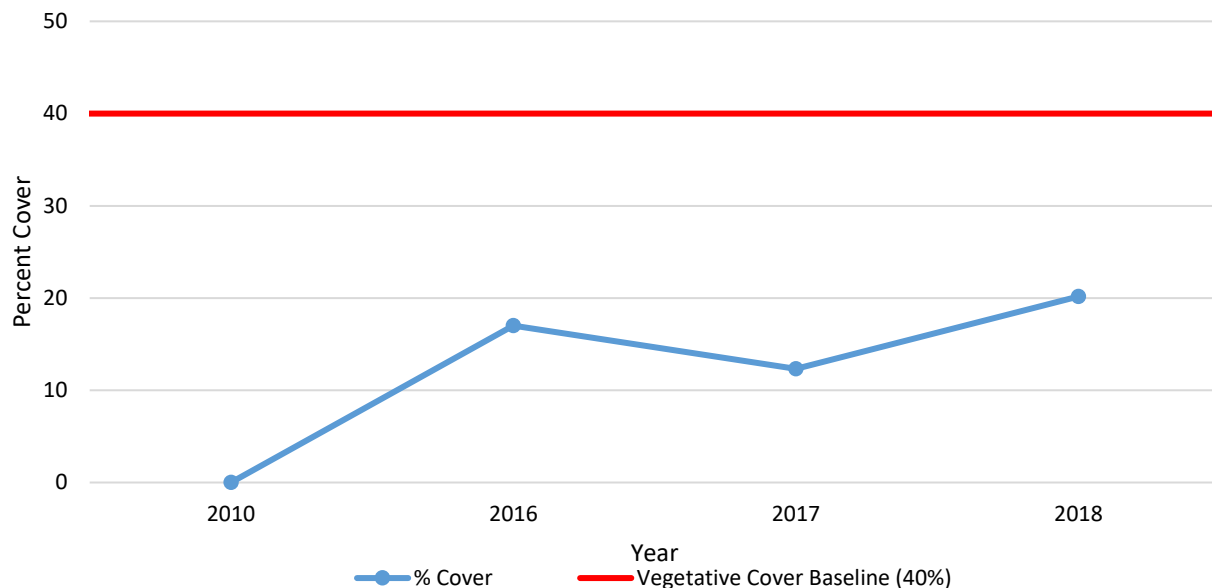
Figure 9-60. Native Vegetative Cover Compared to the Success Criterion at HA 29

Objective 2 considers the percent cover of non-native target weeds. In 2018, iceplant and jubata grass were observed during the transect surveys. The vegetative cover for target non-native species was 0.26%, which is less than the 5% acceptable limit. There was a decrease of 0.44% since 2017; therefore, 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 ranges from 26-50% of absolute cover. The HMP shrub species at HA 29 provided an absolute cover of 5.86%. This was an increase from 3.14% in 2017; however, the HA did not meet 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, 7% for Monterey manzanita, 27% for sandmat manzanita, 1% for Monterey ceanothus, and 2% for Eastwood's goldenbush. The average vegetative cover for Hooker's manzanita was 0.00%, Monterey manzanita was 0.75%, sandmat manzanita was 5.11%, Monterey ceanothus was 0.00%, and Eastwood's goldenbush was 0.00% (see Figure 9-61). Sandmat manzanita and Monterey manzanita increased in cover from 2017 to 2018 but the success criterion was not met.
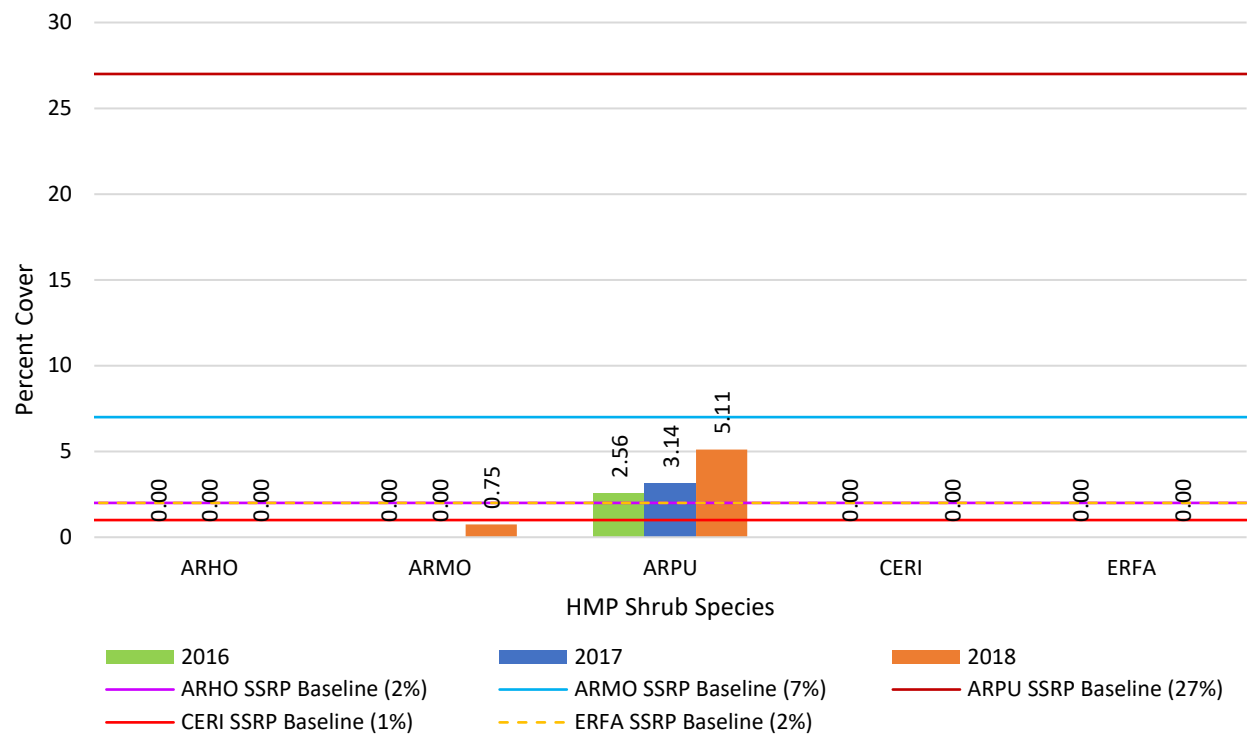
Figure 9-61. HMP Shrub Species Comparison to Success Criteria at HA 29

9.10   HA 33

HA 33 was used by the Army as a demolitions range. Soil remediation was completed in 2010; 20 cubic yards of soil was excavated from 0.01 acres (Shaw, 2008). HA 33 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of similar maritime climates (USFS, 2007). HA 33 is relatively flat with southwest and west aspects. 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 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 (USFS, 2007).
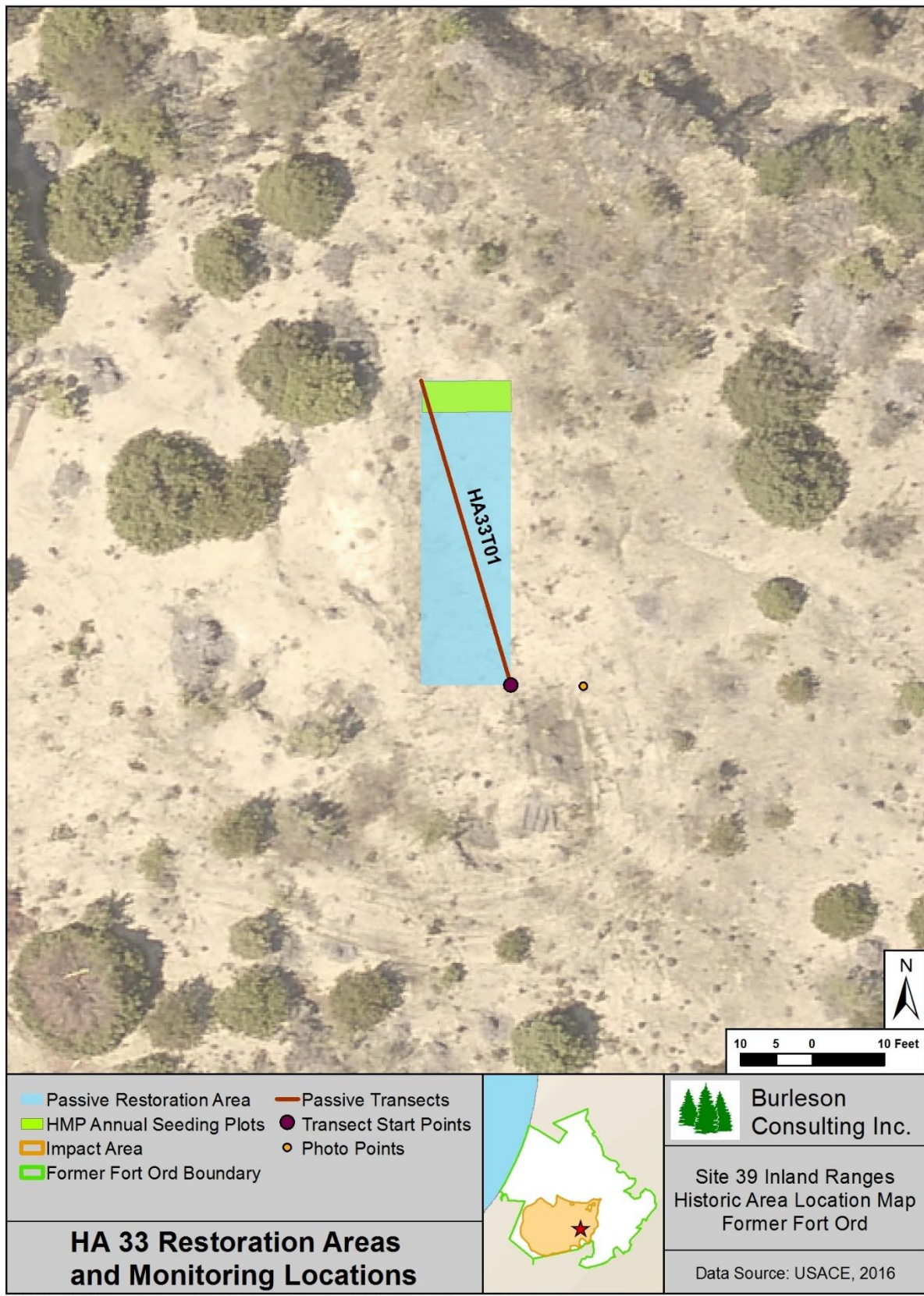
The SSRP prescription for passive restoration at HA 33 consisted of hand broadcast non-irrigated seed and annual weed management activities. HA 33 is relatively flat with little potential for erosion. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 33 occurred in 2011, 2012, and 2016 and monitoring began in 2013. The HA was monitored for eight years by photo documentation and site visits, six years for HMP annual density in plots, and three years for HMP annual density across the HA, species richness, and vegetative cover (see Table 9-76). Figure 9-62 shows the HA footprint, passive restoration area, and transect survey location. Success criteria for HA 33 are summarized in Table 9-77.

Table 9-76. Historic Summary of Restoration and Monitoring Activities at HA 33

Activity			Monitoring Years							
			1	2	3	4	5	6	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2020	2025
Restoration: Passive and Corrective Measures	●	●				●				
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●	●	●	●	●	●	●	
HMP Annual Density across HA						●	●	●	●	
Species Richness						●	●	●	●	●
Vegetative Cover						●*	●	●	●	●

* Vegetative cover was monitored using quadrats in 2016

Figure 9-62. HA 33 Restoration Areas and Monitoring Locations Map

Table 9-77. Success Criteria and Acceptable Limits for Restoration of HA 33

	Objective 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† shaggy-bark manzanita coyote brush Monterey ceanothus† 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 of the SSRP
	Objective 2*		
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‡. Therefore, no more than 5% non-native target weeds may be present at this restoration site.
	Objective 3*		
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
	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Monterey spineflower density class: Low

* Objectives presented in HRP (Shaw, 2009b)
† HMP Species
‡ Source: Shaw 2009a

9.10.1 Restoration Activities

Burleson performed passive restoration at HA 33 in 2011 and 2012. No additional restoration activities occurred in 2018. The total amount of seed broadcast on site was 0.3170 lb compared to 0.2382 lb prescribed in the SSRP. Table 9-78 summarizes the SSRP seed target and the amount of seed applied by year and species. No active restoration activities were 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 9-78. Summary of Passive Restoration Activities 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*	0.0200	0.0120	0.0110	0.0230
ARPU*	-	0.0070	0.0070	0.0140
BAPI	0.0015	-	0.0010	0.0010
CERI*	0.0100	0.0100	0.0060	0.0160
CHPUP*	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
HO	0.0900	-	0.0900	0.0900
HOCU	0.0200	0.0110	0.0110	0.0220
SAME	0.0100	-	0.0110	0.0110
STCE	0.0200	0.0110	0.0110	0.0220
TOTAL	**0.2382**	**0.1100**	**0.2070**	**0.3170**

 * HMP species

9.10.2 Monitoring Results

HA 33 was in year 6 of monitoring in 2018. Even though year 6 was not a required monitoring year, monitoring occurred and results are presented below.

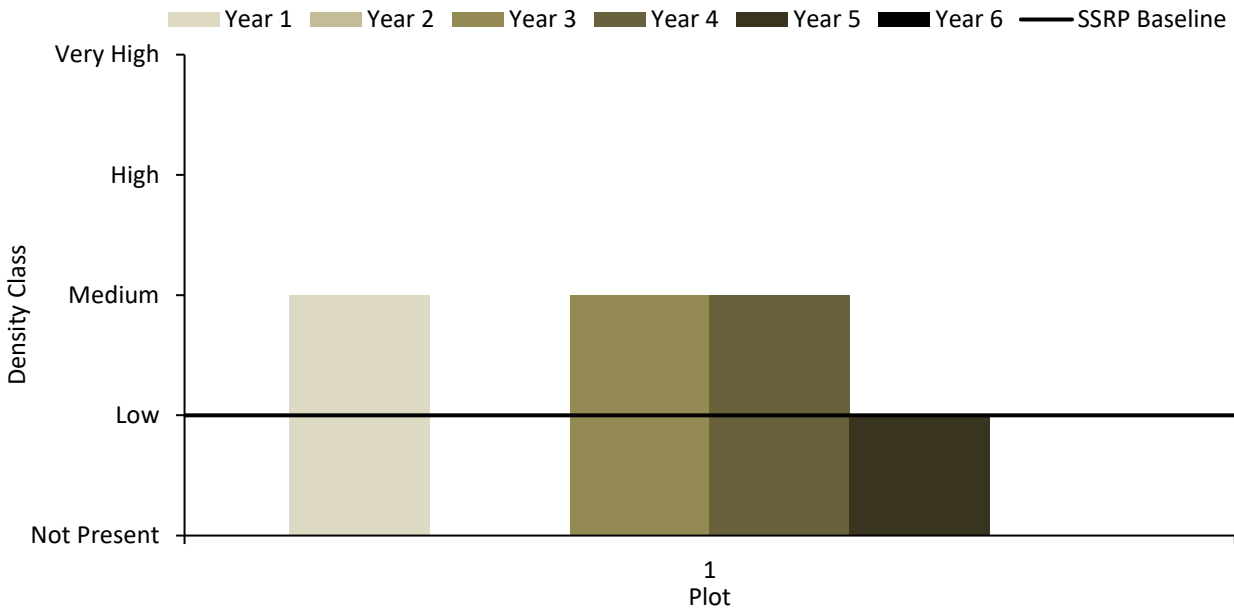9.10.2.1 HMP Annual Density

One Monterey spineflower restoration plot was monitored for year 6 density at HA 33 in 2018. The plot is numbered 1 on Figure 9-63 and located in the northern part of the site. Monterey spineflower was not present at Plot 1. Figure 9-64 represents Monterey spineflower restoration plot densities for HA 33.
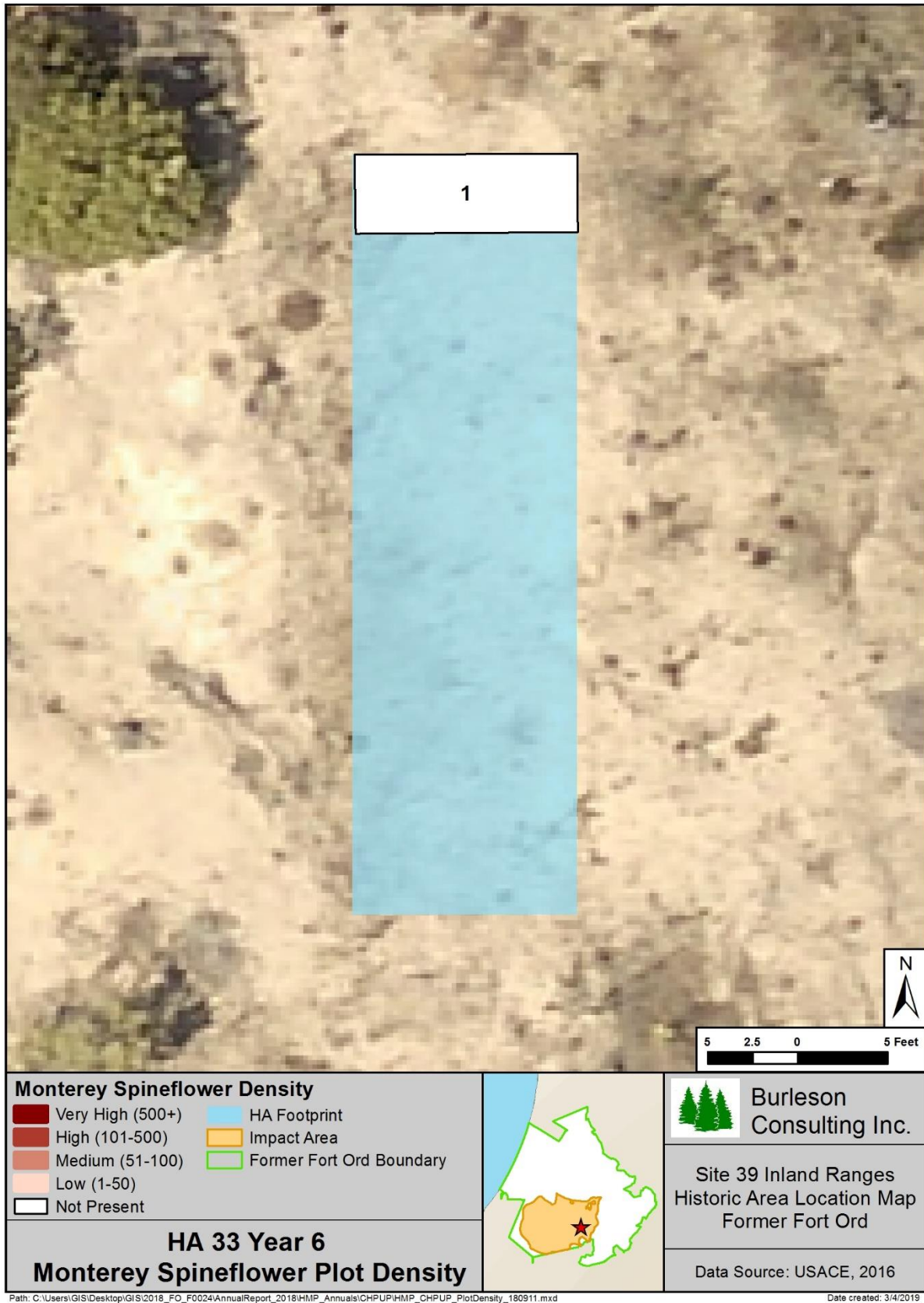
Figure 9-63. HA 33 Year 6 Monterey Spineflower Plot Density Map

Figure 9-64. HA 33 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plot 1

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 at HA 33; however, no individuals were observed outside of the restoration plot.

9.10.2.2 Plant Survivorship

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

9.10.2.3 Species Richness

Thirty-eight species were observed at HA 33. Of those, 20 were native shrubs or perennials, four were native annual herbaceous species**,** and 14 were non-native species (see Table 9-79). Species richness increased by five species since 2017. Native shrub and perennial species increased by one, native herbaceous species decreased by one, and non-native species increased by five.

Table 9-79. Species Observed on HA 33, 2018

Scientific Name	Common Names	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Agrostis exarata	spike bent grass	AGEX
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos hookeri*	Hooker's manzanita	ARHO
Arctostaphylos montereyensis*	Monterey manzanita	ARMO
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Cardionema ramosissimum	sand mat	CARA
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE

Table 9-79. Species Observed on HA 33, 2018

Scientific Name	Common Names	Code
Ceanothus rigidus *	Monterey ceanothus	CERI
Cortaderia jubata	jubata grass	COJU
Crocanthemum scoparium	peak rush-rose	CRSC
Croton californicus	California croton	CRCA
Ericameria ericoides	mock heather	ERER
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Gastridium phleoides	nit grass	GAPH
Geranium dissectum	cut-leaved geranium	GEDI
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Juncus bufonius	toad rush	JUBU
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Luzula comosa var. *comosa*	Pacific wood rush	LUCOC
Lysimachia arvensis	scarlet pimpernel	LYAR
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Plantago coronopus	cut-leaved plantain	PLCO
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Silene gallica	small-flower catchfly	SIGA
Spergularia villosa	hairy sand-spurrey	SPVI
Stipa cernua	nodding needle grass	STCE

* HMP species

9.10.2.4 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 14.42%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than in 2017 by 9.50%. Table 9-80 summarizes vegetative cover and Table 9-81 presents vegetative cover by species. Figure 9-65 presents the percent cover of dominant species at HA 33 in 2017 and 2018.

Table 9-80. 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	15.33	14.42	0.00	0.92	80.92	18.17
SITE AVERAGE	**15.33**	**14.42**	**0.00**	**0.92**	**80.92**	**18.17**

Table 9-81. Transect Survey Results for HA 33 by Species

Transect	ACGL (%)	CRSC (%)	HOCU (%)	RUAC (%)	STCE (%)	TH (%)	BG (%)
HA33T01	4.33	5.92	0.92	0.92	3.25	80.92	18.17
SITE AVERAGE	**4.33**	**5.92**	**0.92**	**0.92**	**3.25**	**80.92**	**18.17**
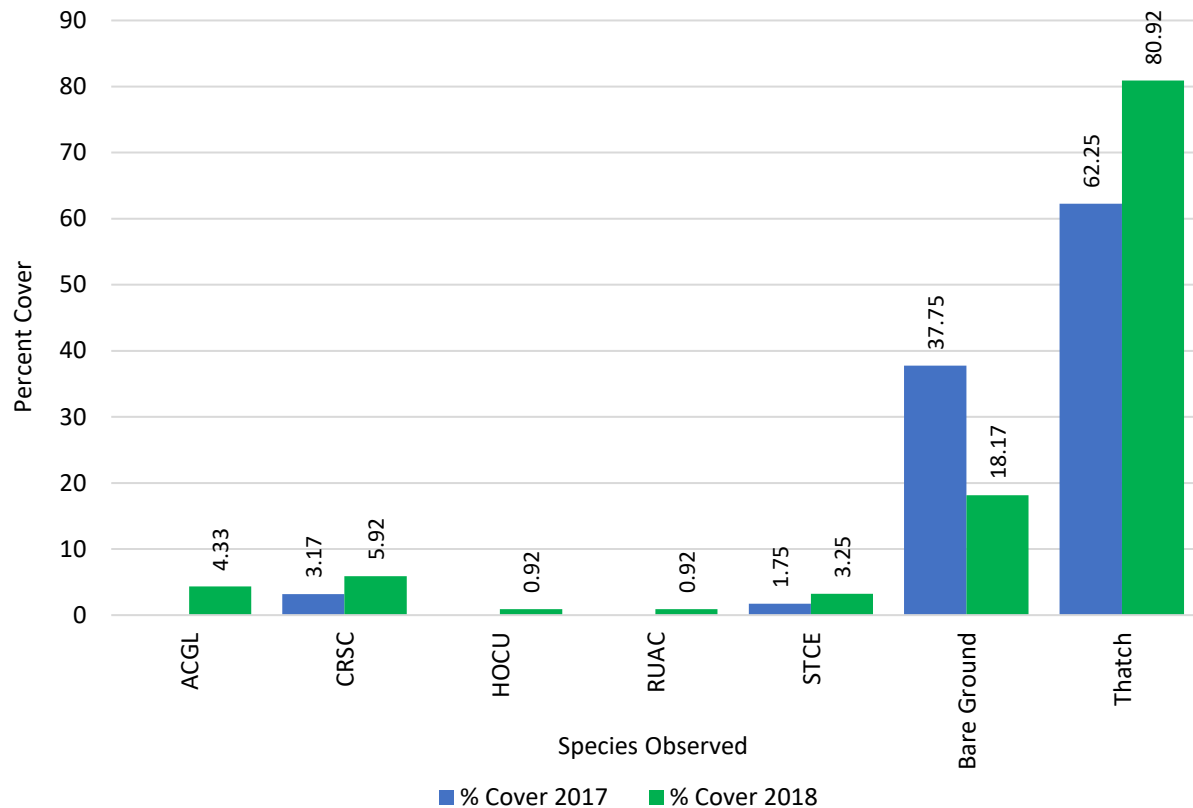
Figure 9-65. Percent Cover of Dominant Species at HA 33 in 2017 and 2018.

9.10.3 Discussion

9.10.3.1 Recommendations

HA 33 was in year 6 of monitoring in 2018 and responded marginally to restoration efforts. The site met one of six success criteria. Per recommendations in the 2016 Annual Habitat Restoration Report, shaggy-bark manzanita, Monterey manzanita, dwarf ceanothus, golden yarrow, toyon, sticky monkeyflower, and black sage will be planted in the 2018/2019 season to support the species richness success criterion and HMP shrub cover success criteria (Burleson, 2017). Following planting, HA 33 will need time to respond to the effort and continued monitoring to evaluate the success of the additional planting. A qualitative overview was documented by photo points (see Appendix D, page D-10).

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 9-82 summarizes the current status of HA 33 including which success criteria were met and recommendations.

Table 9-82. Status and Recommendations for Achieving Success Criteria at HA 33

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	Plant shaggy-bark manzanita, Monterey manzanita, dwarf ceanothus, golden yarrow, toyon, sticky monkeyflower and black sage (scheduled 2018/2019)*
Objective 1 – No. 2	Native vegetation cover	No	Plant native species (scheduled 2018/2019)
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 2018/2019)*
Objective 3 – No. 4	HMP shrub cover by species	No	Plant Monterey manzanita and Monterey ceanothus (scheduled 2018/2019)*
Objective 3 – No. 4	HMP annual density	No	Return to survey at year 8

* Recommendation repeated from the 2016 Annual Habitat Restoration Report (Burleson, 2017).

9.10.3.2 HMP Annual Density

Monterey spineflower density was not within the acceptable limit for HMP annual density at HA 33. The SSRP baseline density class for Monterey spineflower was low. Monterey spineflower was not present in the restoration plot in year 6. In addition, Monterey spineflower was not present outside the restoration plots.

9.10.3.3 Plant Survivorship

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

9.10.3.4 Species Richness

Common yarrow (*Achillea millefolium*), shaggy-bark manzanita, Monterey manzanita, coyote brush, Monterey ceanothus, dwarf ceanothus, peak rush-rose, wedge-leaved horkelia, and deerweed were present. The species not observed were golden yarrow, toyon, sticky monkeyflower, and black sage. HA 33 included 20 native shrub and perennial species; however, HA 33 did not meet the success criterion for Objective 1.

9.10.3.5 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 33 SSRP (Burleson, 2013). These species contributed 14.42% cover to the HA; therefore, this success criterion was not met. In 2017, vegetative cover was 4.92%; cover increased by 9.50% (see Figure 9-66). In 2016, a quadrat survey was completed to provide a preliminary idea of vegetative cover with a limited amount of effort. From 2017 onward, line-intercept transect surveys were used, as multiple objectives outlined in the SSRP specifically require transect data. The 2016 quadrat data were not compared to the success criteria.
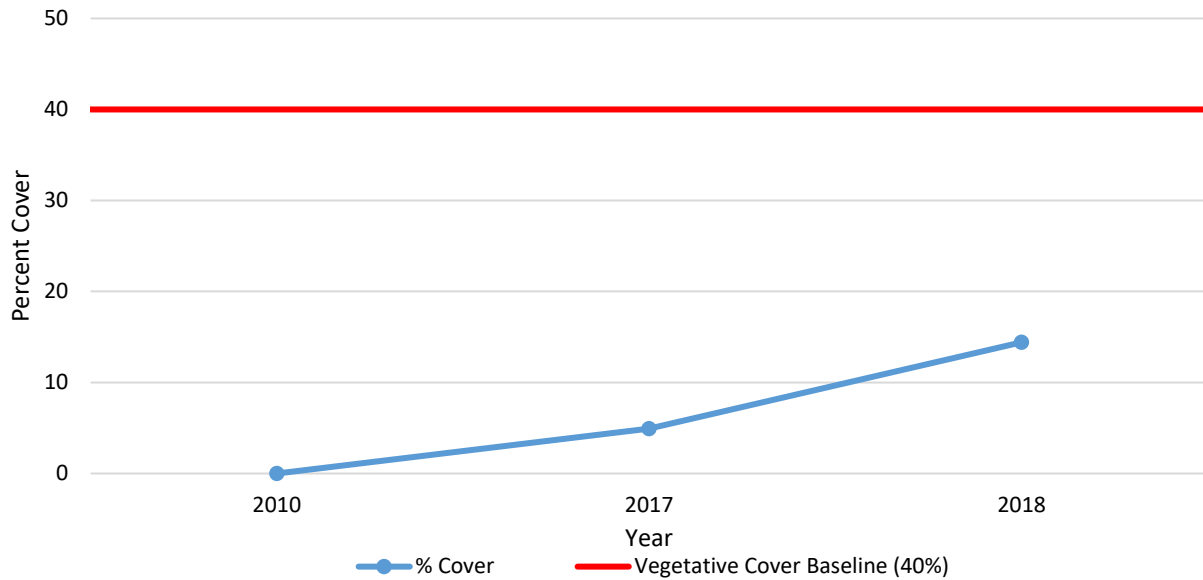
Figure 9-66. Native Vegetative Cover Compared to the Success Criterion at HA 33

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 4. Cover class 4 ranges from 26-50% of absolute cover. The HMP shrub species at HA 33 provided an absolute cover of 0.00%; therefore, the HA did not meet this success criterion. 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 and 5% for Monterey ceanothus. The average vegetative cover for Monterey manzanita was 0.00% and Monterey ceanothus 0.00% (see Figure 9-67). Neither species met the acceptable limit; therefore, the success criterion was not met.
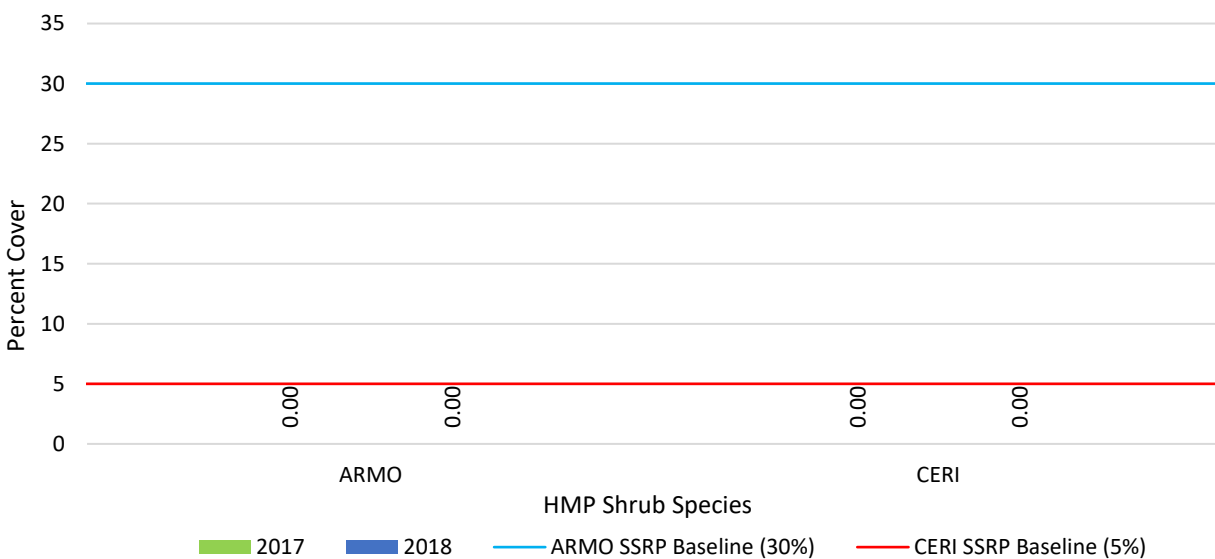
Figure 9-67. HMP Shrub Species Comparison to Success Criteria at HA 33

9.11   HA 34

HA 34 was used by the Army as a multi-use range that included a closed combat course, machine gun assault course, and mortar range. An estimated total of 26,300 cubic yards of soil was excavated, including 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 of similar maritime climates (USFS, 2007). The lower portion of HA 34 is moderately sloped and oriented east-west with a ridge in the center of the range. The upper portion of HA 34 is steep and highly susceptible to erosion. Adjacent lands are low to very high-quality habitat.

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 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 (USFS, 2007).
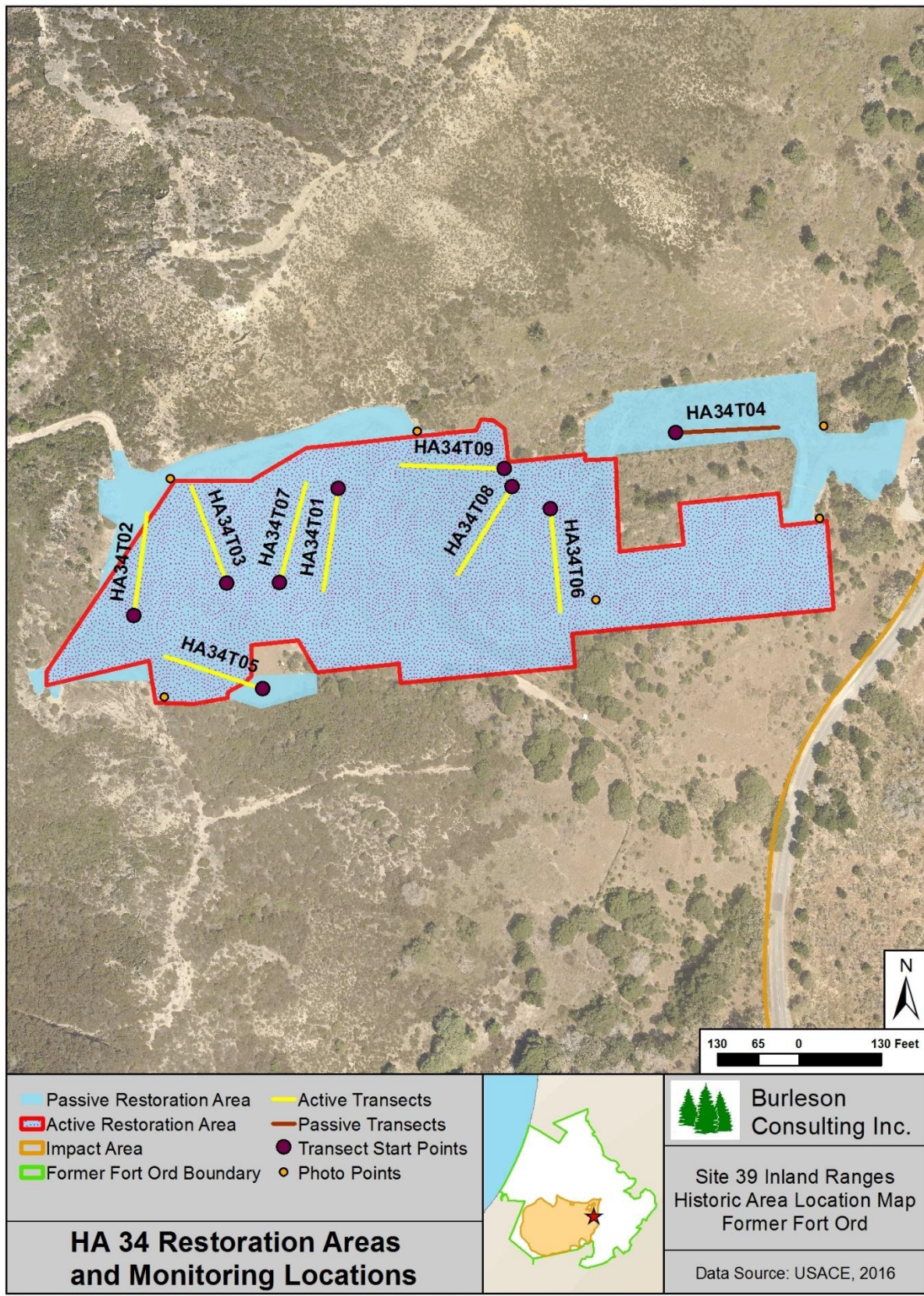
The SSRP restoration procedure for HA 34 included both passive and active restoration consisting of hand broadcast non-irrigated seed, annual weed management activities, and installing native container-grown plants. Broadcast seed has greater success if completed during the rainy season, November through March.

Restoration at HA 34 began in 2012 and is ongoing. Monitoring began in 2015. HA 34 was monitored for seven years by photo documentation and site visits, and three years for species richness, vegetative cover, and plant survivorship (see Table 9-83). Figure 9-68 shows the HA footprint, passive restoration area, active restoration area, and transect survey locations. Success criteria for HA 34 are summarized in Table 9-84.

Table 9-83. 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, Passive, and Erosion Control	●	●	●	●	●	●	●	●		
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Species Richness					●	●	●	●	●	●
Vegetative Cover					●	●	●	●	●	●
Plant Survivorship					●	●	●	●		

Figure 9-68. HA 34 Restoration Areas and Monitoring Locations Map

Table 9-84. Success Criteria and Acceptable Limits for Restoration of HA 34

	Objective 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† shaggy-bark manzanita Hooker's manzanita† Monterey ceanothus† 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 of the SSRP
	Objective 2*		
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*		
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
			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

* Objectives presented in HRP (Shaw, 2009b)

† HMP Species

9.11.1 Restoration Activities

Burleson performed passive restoration at HA 34 in 2012, 2013, 2014, 2015, 2016, 2017, and 2018. The total amount of seed broadcast on site was 1,127.32 lb compared to the 320.41 lb prescribed in the SSRP. Table 9-85 summarizes the SSRP seed target and the amount of seed applied by year and species.

Table 9-85. Summary of Passive Restoration Activities for HA 34

Species	Pounds of Seed Broadcast								
	SSRP Target	2012	2013	2014	2015	2016	2017	2018	Total by Species
ACMI	15.41	9.51	-	1.69	1.00	5.72	0.50	2.00	20.42
ACGL	19.40	18.29	-	3.37	2.00	11.40	1.00	0.20	36.26
ADFA	-	9.50	-	-	-	-	-	-	9.50
ARCA	15.50	9.50	4.60	-	1.00	-	-	-	15.10
ARHO*	-	9.50	-	-	-	-	-	-	9.50
ARMO*	-	9.50	-	-	-	-	-	-	9.50
ARTO	-	19.00	-	-	-	-	-	-	19.00
BAPI	1.90	1.40	1.35	0.25	0.20	-	-	-	3.20
CERI*	15.50	9.50	3.30	-	1.00	-	-	-	13.80
CRSC	15.50	9.15	-	1.26	1.00	-	-	-	11.41
DIAU	1.50	0.95	-	0.25	0.10	-	-	-	1.30
ELGL	87.30	85.50	46.00	80.34	9.00	14.88	27.05	6.40	269.17
ERCO	2.90	2.85	-	2.11	0.30	-	-	-	5.26
HO	87.30	150.00	245.00	33.70	9.00	2.32	101.20	17.40	558.62
HOCU	19.40	18.29	4.60	46.97	2.00	11.40	1.00	2.80	87.06
LUAR	9.70	9.50	-	-	1.00	-	-	-	10.50
SAME	9.70	9.51	0.60	3.37	1.00	-	-	-	14.48
STPU	19.40	19.00	-	-	2.00	6.99	1.25	4.00	33.24
TOTAL	**320.41**	**400.45**	**305.45**	**173.31**	**30.60**	**52.71**	**132.00**	**32.80**	**1,127.32**

* HMP species

Active restoration was conducted in 2016 and 2017. The total number of plants installed at HA 34 was 6,619 compared to 12,150 prescribed in the SSRP. Table 9-86 summarizes the plants installed during active restoration.

Table 9-86. Summary of Active Restoration Activities for HA 34

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*	500	76	286	362
ARMO*	500	76	277	353
ARTO	500	76	118	194
BAPI	500	95	270	365
CERI*	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**

* HMP Species

9.11.2 Monitoring Results

9.11.2.1 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.

9.11.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 34. A total of ten shrub species and 377 individual plants were monitored for survivorship. By year 3 of monitoring for the 2016 planting, survivorship was 60%. By year 2 of monitoring for the 2017 planting, survivorship was 27%; survivorship decreased from 36% in 2017. Table 9-87 and Table 9-88 present results by species.

Table 9-87. Plant Survivorship Monitoring Summary for 2016 Plantings at HA 34

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2016) Alive (%)	Year Two (2017) Alive (%)	Year Three (2018) Alive (%)
ADFA	158	16	100	94	94
ARCA	135	14	86	92	79
ARHO*	76	8	63	63	63
ARMO*	76	8	75	75	63
ARTO	76	8	75	38	38
BAPI	95	10	90	90	90
CERI*	132	13	38	25	15
LUAR	95	10	60	10	0
SAME	45	5	100	100	100
TOTAL	**888**	**92**	**76**	**66**	**60**

* HMP Species

Table 9-88. Plant Survivorship Monitoring Summary for 2017 Plantings at HA 34

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2017) Alive (%)	Year Two (2018) Alive (%)
ADFA	372	37	22	20
ARCA	208	22	55	38
ARHO*	286	32	50	38
ARMO*	277	28	36	25
ARTO	118	12	33	20
BAPI	270	28	86	86
CERI*	556	56	27	12
LUAL	108	11	18	0
LUAR	236	24	21	4
SAME	330	34	24	18
TOTAL	**2,761**	**285**	**36**	**27**

* HMP Species

9.11.2.3 Species Richness

Sixty-five species were observed at HA 34. Of those, 29 were native shrubs or perennials, 12 were native annual herbaceous species, 22 were non-native species, and two were not categorized as they were only identified to genus (see Table 9-89). Species richness decreased by 25 species since 2017. Native shrub and perennial species decreased by five, native herbaceous species decreased by ten, non-native species decreased by 11, and uncategorized species increased by one. The decrease in species richness was likely because HA34 was surveyed in late July after many annual species senesced.

Table 9-89. Species Observed on HA 34, 2018

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon americanus var. *americanus*	Spanish clover	ACAMA
Acmispon glaber	deerweed	ACGL
Acmispon heermannii var. *orbicularis*	Heermann's lotus	ACHEO
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos hookeri*	Hooker's manzanita	ARHO
Arctostaphylos montereyensis*	Monterey manzanita	ARMO
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Carex barbarae	Santa Barbara sedge	CABA
Carpobrotus edulis	hottentot fig	CAED
Ceanothus rigidus*	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME
Chorizanthe douglasii	Douglas's spineflower	CHDO
Cortaderia jubata	jubata grass	COJU
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
Eriogonum nudum	naked buckwheat	ERNU
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Eschscholzia californica	California poppy	ESCA
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Heteromeles arbutifolia	toyon	HEAR
Heterotheca grandiflora	telegraph weed	HEGR
Hordeum sp.	sterile barley	HO
Horkelia cuneata	wedge-leaved horkelia	HOCU
Juncus patens	spreading rush	JUPA
Lessingia pectinata	common lessingia	LEPE
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus arboreus	yellow bush lupine	LUAR
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia gracilis	slender tarweed	MAGR
Madia sativa	coast tarweed	MASA
Melilotus albus	white sweet clover	MEAL
Melilotus indicus	yellow sweetclover	MEIN
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA

Table 9-89. Species Observed on HA 34, 2018

Scientific Name	Common Name	Code
Navarretia squarrosa	skunkweed	NASQ
Plantago coronopus	cut-leaved plantain	PLCO
Prunus sp.	unknown cherry	PR
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
Rumex sp.	dock	RU
Salix lasiolepis	arroyo willow	SALA6
Salvia mellifera	black sage	SAME
Senecio glomeratus	cutleaf burnweed	SEGL
Sonchus asper	prickly sow thistle	SOAS
Stipa pulchra	purple needle grass	STPU
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Vicia sativa	spring vetch	VISA

* HMP species

9.11.2.4 Vegetative Cover

Burleson completed nine 50-meter line-intercept transects at HA 34. These surveys indicated that the mean vegetative cover by native shrubs and perennials was 45.91%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than in 2017 by 3.04%. Table 9-90 summarizes vegetative cover and Table 9-91 presents vegetative cover by species. Figure 9-69 presents the percent cover of dominant species at HA 34 in 2016, 2017, and 2018.

Table 9-90. 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	42.56	42.36	0.00	0.20	98.36	3.18
HA34T02	34.96	30.64	2.58	1.74	95.10	5.00
HA34T03	25.90	24.20	1.70	0.00	92.76	7.18
HA34T04	63.92	63.92	0.00	0.00	100.00	0.00
HA34T05	42.84	36.92	4.14	1.78	99.02	0.98
HA34T06	39.76	23.38	16.12	0.26	100.00	0.00
HA34T07	49.20	46.66	2.14	0.40	95.90	3.94
HA34T08	67.24	57.40	9.40	0.44	100.00	0.00
HA34T09	87.74	87.74	0.00	0.00	100.00	0.00
SITE AVERAGE	**50.46**	**45.91**	**4.01**	**0.54**	**97.90**	**2.25**

Table 9-91. Transect Survey Results for HA 34 by Species

Transect	ACAMA (%)	ACGL (%)	ACHEO (%)	ACMI (%)	ADFA (%)	ARCA (%)	BAPI (%)	DECO (%)	DIAU (%)	ELGL (%)
HA34T01	0.00	15.72	0.00	0.00	0.00	15.42	10.82	0.00	0.00	0.40
HA34T02	2.58	27.44	0.00	0.00	0.00	0.00	3.20	0.00	0.00	0.00
HA34T03	1.70	19.36	0.00	0.20	0.98	1.26	0.60	0.00	0.00	0.80
HA34T04	0.00	11.92	0.00	0.00	0.00	27.62	22.14	0.00	0.00	0.28
HA34T05	4.14	29.16	0.00	0.00	0.00	0.00	2.98	0.00	0.92	2.42
HA34T06	16.12	22.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HA34T07	2.14	23.76	1.26	0.00	0.00	6.90	14.48	0.00	0.00	0.00
HA34T08	8.40	38.98	0.00	0.00	0.00	7.18	5.62	1.00	0.00	0.00
HA34T09	0.00	49.92	0.00	0.00	0.00	0.68	14.72	0.00	0.00	0.00
SITE AVERAGE	3.90	26.57	0.14	0.02	0.11	6.56	8.28	0.11	0.10	0.43

Table 9-91 (continued). Transect Survey Results for HA 34 by Species

Transect	HEAR (%)	HOCU (%)	LUAR (%)	PLCO (%)	PSRA (%)	STPU (%)	TODI (%)	TRAN (%)	TH (%)	BG (%)
HA34T01	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	98.36	3.18
HA34T02	0.00	0.00	0.00	0.72	0.00	0.00	0.00	1.02	95.10	5.00
HA34T03	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	92.76	7.18
HA34T04	0.00	1.96	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
HA34T05	0.26	0.00	0.00	1.78	0.00	1.18	0.00	0.00	99.02	0.98
HA34T06	0.00	0.00	0.54	0.26	0.00	0.00	0.00	0.00	100.00	0.00
HA34T07	0.00	0.00	0.00	0.40	0.00	0.26	0.00	0.00	95.90	3.94
HA34T08	0.00	3.16	2.46	0.44	0.00	0.00	0.00	0.00	100.00	0.00
HA34T09	0.00	12.42	1.80	0.00	5.44	0.62	2.14	0.00	100.00	0.00
SITE AVERAGE	0.03	2.06	0.53	0.42	0.60	0.23	0.24	0.11	97.90	2.25
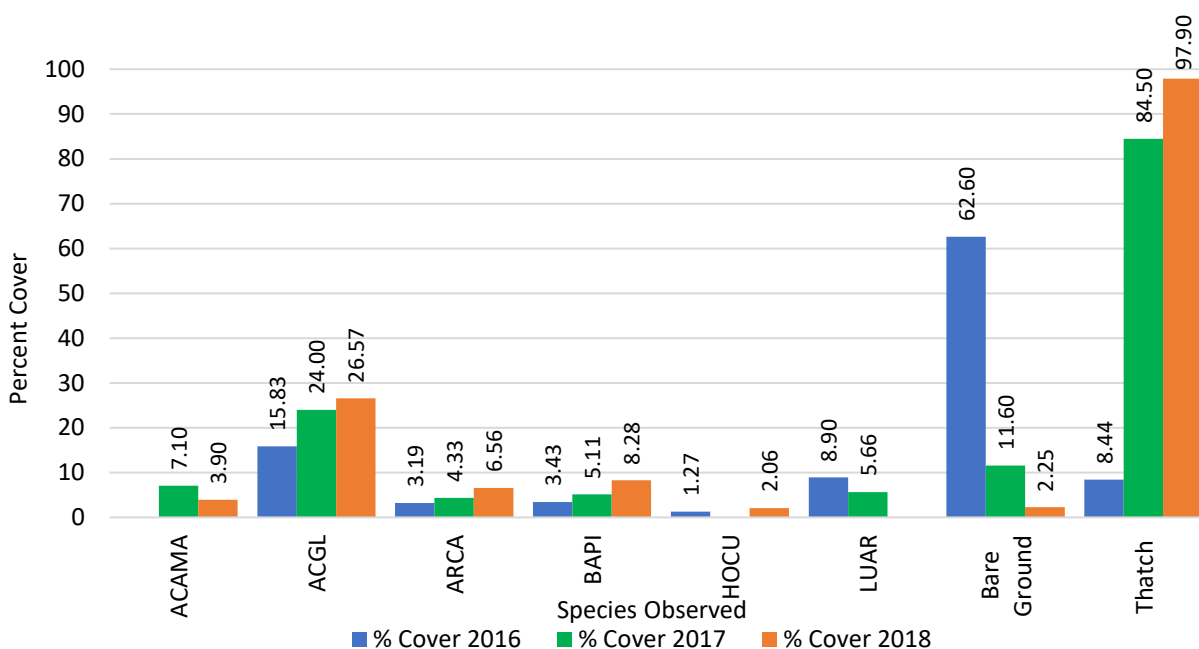
Figure 9-69. Percent Cover of Dominant Species at HA 34 in 2016, 2017, and 2018.

9.11.3 Discussion

9.11.3.1 Recommendations

HA 34 was in year 4 of monitoring in 2018 and responded variably to the previous restoration efforts. The site met three of five success criteria by 2018. Additional SSRP plants will be installed in 2018/2019. The Army recommends adding mulch and compost when installing HMP shrubs to improve survivorship. Due to significant erosion issues, poor site conditions, low survivorship, and low HMP shrub cover, many areas at HA 34 need further effort and time to respond to restoration efforts. The site will be re-evaluated when year 5 of monitoring is complete. A qualitative overview was documented by photo points (see Appendix D, page D-11).

The site will continue to be monitored by photo documentation, species richness meandering transects, and vegetative cover line-intercept transects in monitoring year 5, 2019. Table 9-92 summarizes the current status of HA 34 including which success criteria were met and recommendations.

Table 9-92. Status and Recommendations for Achieving 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 fulfill SSRP plant targets*
Objective 3 – No. 4	HMP shrub cover by species	No	Reconsider success criteria and fulfill SSRP plant targets*
Objective 3 – No. 4	HMP annual density	NA	NA

* Recommendation repeated from the 2017 Annual Habitat Restoration Report (Burleson, 2018).

9.11.3.2 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.

9.11.3.3 Plant Survivorship

Plant survivorship was moderate for the 2016 planting and low for the 2017 planting at HA 34. Shaggy-bark manzanita, Monterey ceanothus, and yellow bush lupine had low survivorship for both planting events. Chamise, California sagebrush, Hooker's manzanita, Monterey manzanita, and black sage had high survivorship for the 2016 planting and low survivorship for the 2017 planting. Only coyote brush had high survivorship for both planting events. It is not surprising that Monterey ceanothus had low survivorship since this species did poorly at many sites. Additionally, lupine experienced an aphid infestation that contributed to low survivorship. However, many other species planted at HA 34 also had low survivorship. This can be attributed to site conditions that are not conducive to plant growth. HA 34 lacks top soil and is highly compacted; these factors contribute to sheet flow and inhibit water infiltration. Several areas at HA 34 have been mulched which should prevent erosion and help with water retention (Kemron, 2018). The 2017 planting will be monitored for one more year.

9.11.3.4 Species Richness

Chamise, Monterey manzanita, shaggy-bark manzanita, Hooker's manzanita, Monterey ceanothus, sticky monkeyflower, and black sage were present. HA 34 included 29 native shrub and perennial species and met the success criterion for Objective 1.

9.11.3.5 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 44.90% vegetative cover; therefore, this success criterion was met. In 2017, vegetative cover was 41.36%; cover increased by 3.54% (see Figure 9-70).
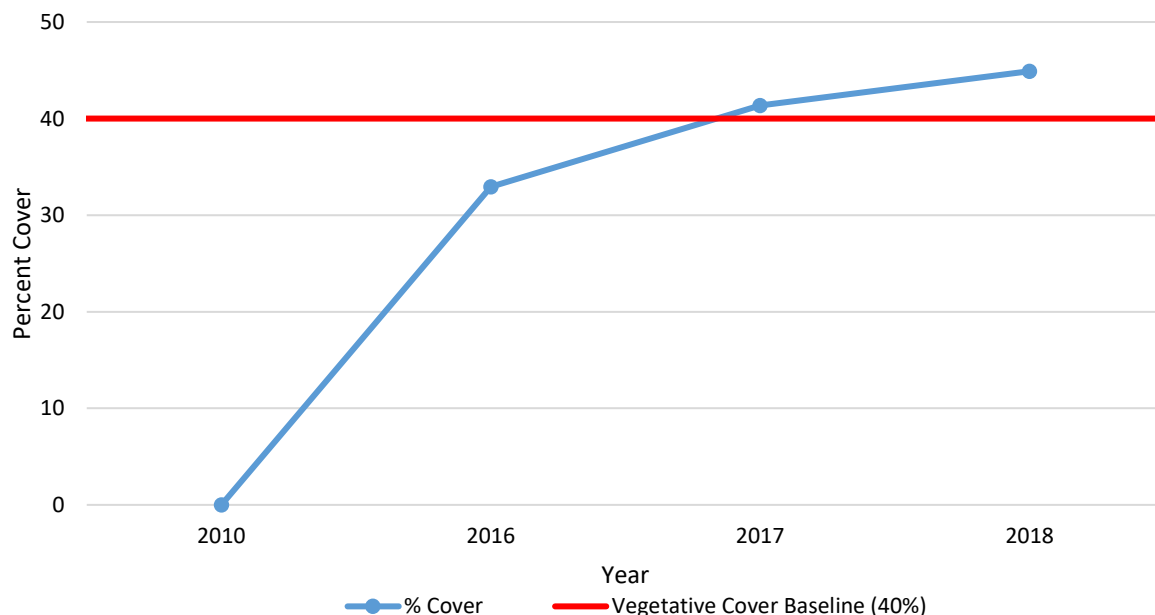
Figure 9-70. Native Vegetative Cover Compared to the Success Criterion at HA 34

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 ranges from 6-25% of absolute cover. The HMP shrub species at HA 34 provided 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, 7% for Monterey ceanothus, and 4% for Hooker's manzanita. The average vegetative cover for Monterey manzanita was 0.00%, Monterey ceanothus was 0.00%, and Hooker's manzanita was 0.00% (see Figure 9-71). The success criterion was not met.
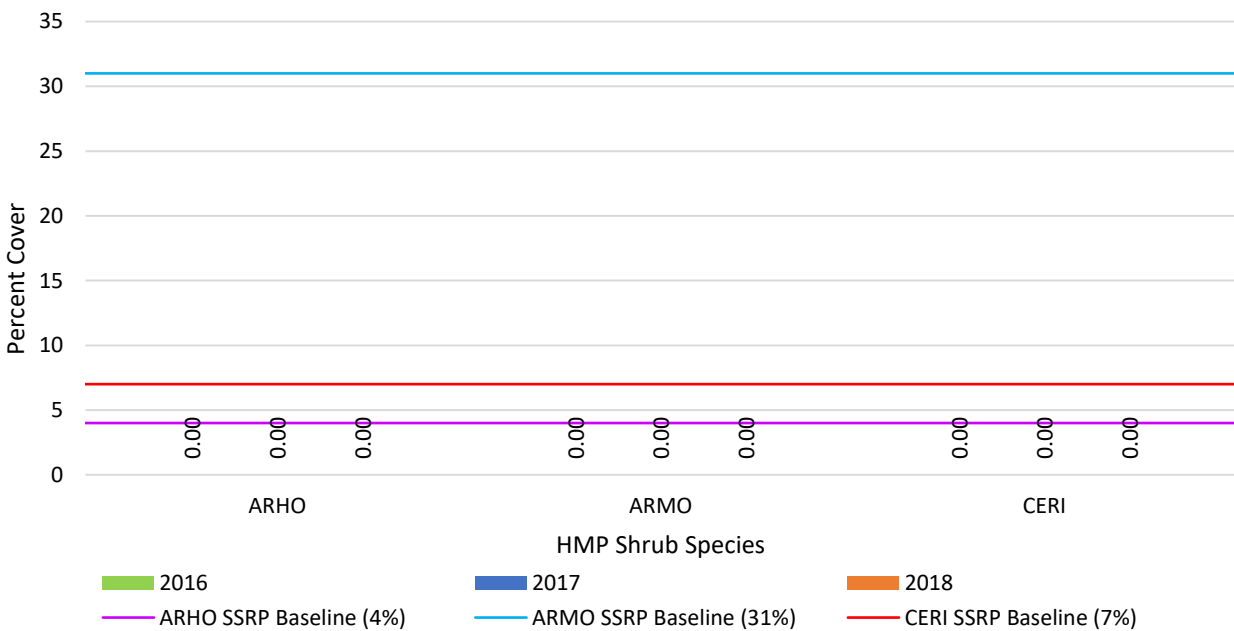
Figure 9-71. HMP Shrub Species Comparison to Success Criteria at HA 34

9.12   HA 36

HA 36 was used by the Army as a grenade and explosive ordnance disposal range. Soil remediation was completed in 2010; 2,750 cubic yards of soil were excavated from 0.5 acres (Shaw, 2008). HA 36 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of similar maritime climates (USFS, 2007). HA 36 is relatively flat with an east aspect. 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 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 (USFS, 2007).

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

Restoration at HA 36 occurred in 2011, 2012, 2016, and 2018. Monitoring began in 2013. HA 36 was monitored for eight years by photo documentation and site visits and three years for species richness and vegetative cover (see Table 9-93). Figure 9-72 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 36 are summarized in Table 9-94.

Table 9-93. Historic Summary of Restoration and Monitoring Activities at HA 36

Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2020	2025
Restoration: Passive, Erosion Control, and Corrective Measures	●	●				●		●		
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Species Richness						●	●	●	●	●
Vegetative Cover						●	●	●	●	●
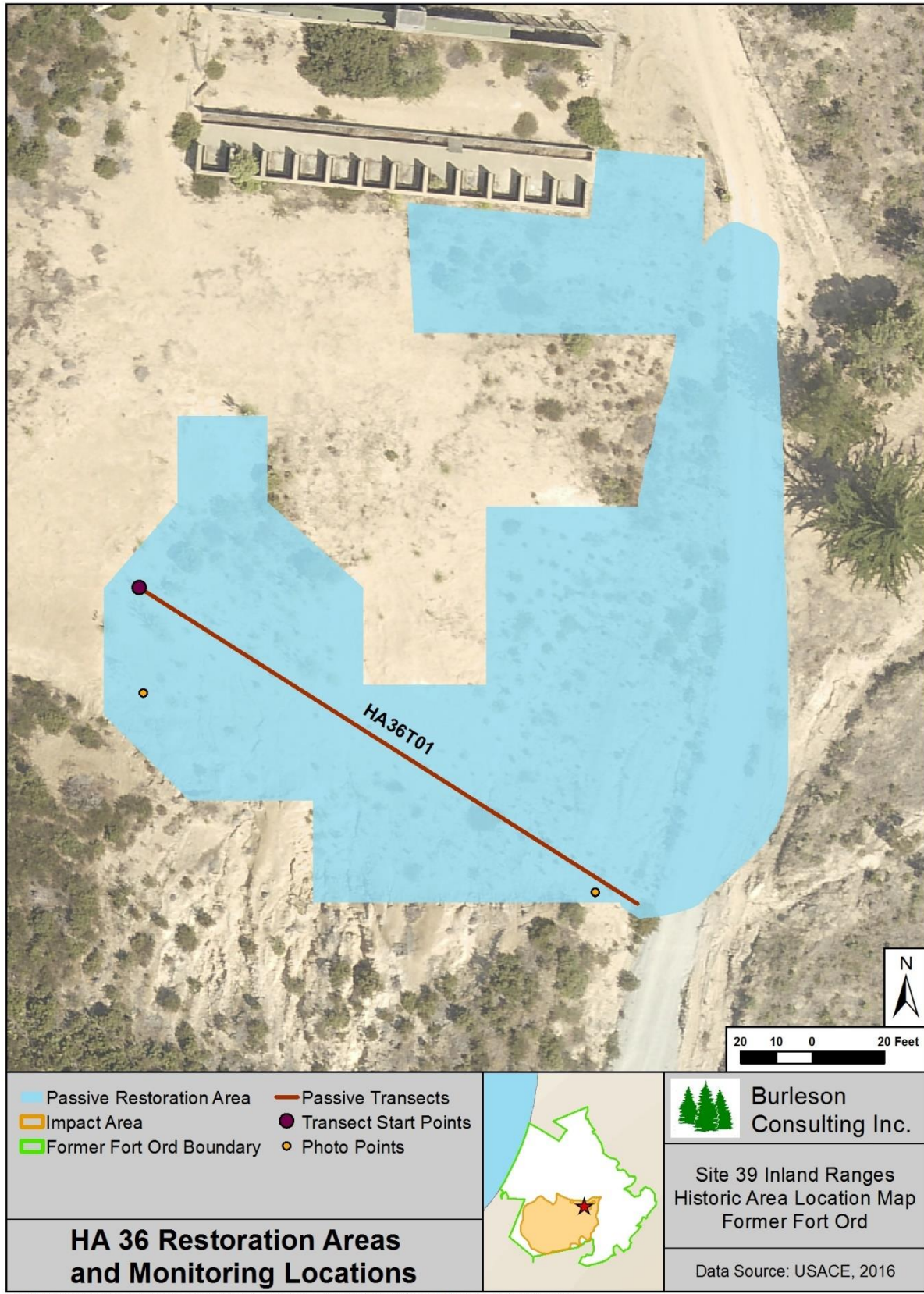
Figure 9-72. HA 36 Restoration Areas and Monitoring Locations Map

Table 9-94. Success Criteria and Acceptable Limits for Restoration of HA 36

No.	Success Element	Decision Rule	Acceptable Limits
Objective 1*			
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† Monterey manzanita† shaggy-bark manzanita coyote brush Monterey ceanothus† 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 of the SSRP
Objective 2*			
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*			
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
			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

Table 9-94. Success Criteria and Acceptable Limits for Restoration of HA 36

	Objective 3*		
4	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Density class: Not applicable

* Objectives presented in HRP (Shaw, 2009b)

† HMP Species

9.12.1 Restoration Activities

Burleson performed passive restoration at HA 36 in 2012, 2016, and 2018. The total amount of seed broadcast on site was 30.758 lb compared to the 12.775 lb prescribed in the SSRP. Table 9-95 summarizes the SSRP seed target and the amount of seed applied by year and species. No active restoration was completed at HA 36 by Burleson. However, Base Realignment and Closure (BRAC) staff installed approximately 300 surplus plants to HA 36 in 2014. In 2017, BRAC staff installed 100 plants, broadcast approximately 5 lb of production seed, and completed some minor erosion control repairs.

Table 9-95. Summary of Passive Restoration Activities for HA 36

Species	Pounds of Seed Broadcast					
	SSRP Target	**2012 (Jan)**	**2012 (Dec)**	**2016 (Dec)**	**2018 (Dec)**	**Total by Species**
ACMI	-	-	-	0.900	1.200	2.100
ACGL	1.000	0.500	0.507	1.800	-	2.807
ADFA	0.500	0.300	0.254	-	-	0.554
ARHO*	1.000	0.500	0.518	-	-	1.018
ARMO*	1.000	0.500	0.507	-	-	1.007
ARPU*	0.500	0.300	0.263	-	-	0.563
ARTO	1.000	0.500	0.514	-	-	1.014
BAPI	0.075	-	0.037	-	-	0.037
CERI*	0.500	-	0.252	-	-	0.252
CRSC	0.500	0.300	0.251	-	-	0.551
ELGL	-	-	-	1.800	4.000	5.800
ERCO	0.150	0.077	0.077	-	-	0.154
ERFA*	0.050	0.025	0.064	-	-	0.089
FRCA	0.500	0.300	0.251	-	-	0.551
HOCU	1.000	0.500	0.500	1.800	1.600	4.400
HO	4.500	-	4.510	-	1.200	5.710
SAME	0.500	0.300	0.251	-	-	0.551
STPU	-	-	-	1.100	2.500	3.600
TOTAL	**12.775**	**4.102**	**8.756**	**7.400**	**10.500**	**30.758**

* HMP species

9.12.2   Monitoring Results

HA 36 was in year 6 of monitoring in 2018. Even though year 6 was not a required monitoring year, monitoring occurred and results are presented below.

9.12.2.1   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.

9.12.2.2   Plant Survivorship

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

9.12.2.3   Species Richness

Forty-three species were observed at HA 36. Of those, 29 were native shrubs or perennials, three were native annual herbaceous species, and 11 were non-native species (see Table 9-96). Species richness decreased by 13 species since 2017. Native shrub and perennial species increased by one, native herbaceous species decreased by six, and non-native species decreased by eight. The decrease in species richness was likely because HA 36 was surveyed in late July after many annual species senesced.

Table 9-96. Species Observed on HA 36, 2018

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon heermannii var. *orbicularis*	Heermann's lotus	ACHEO
Adenostoma fasciculatum	chamise	ADFA
Agrostis hallii	Hall's bent grass	AGHA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos hookeri*	Hooker's manzanita	ARHO
Arctostaphylos montereyensis*	Monterey manzanita	ARMO
Arctostaphylos pumila*	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus*	Monterey ceanothus	CERI
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	jubata grass	COJU
Crocanthemum scoparium	peak rush-rose	CRSC
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wild-rye	ELGL
Ericameria fasciculata*	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Festuca myuros	rattail sixweeks grass	FEMY
Frangula californica	California coffeeberry	FRCA
Gamochaeta ustulata	purple cudweed	GAUS
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU

Table 9-96. Species Observed on HA 36, 2018

Scientific Name	Common Name	Code
Hypochaeris radicata	rough cat's ear	HYRA
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus nanus	sky lupine	LUNA
Pinus radiata	Monterey pine	PIRA
Plantago coronopus	cut-leaved plantain	PLCO
Polypogon monspeliensis	rabbitsfoot grass	POMO
Pseudognaphalium stramineum	cotton-batting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Rubus ursinus	California blackberry	RUUR
Rumex acetosella	sheep sorrel	RUAC
Salix lasiolepis	arroyo willow	SALA6
Salvia mellifera	black sage	SAME
Senecio glomeratus	cutleaf burnweed	SEGL
Zeltnera davyi	Davy's centaury	ZEDA

* HMP species

9.12.2.4 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 10.22%. The mean vegetative cover by native shrubs and perennials decreased from 2017 to 2018 by 6.18%. Table 9-97 summarizes vegetative cover and Table 9-98 presents vegetative cover by species. Figure 9-73 presents the percent cover of dominant species at HA 36 in 2016, 2017, and 2018.

Table 9-97. 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	12.32	10.22	0.00	2.10	64.20	31.40
SITE AVERAGE	**12.32**	**10.22**	**0.00**	**2.10**	**64.20**	**31.40**

Table 9-98. Transect Survey Results for HA 36 by Species

Transect	ACGL (%)	ADFA (%)	ARHO* (%)	ARTO (%)	COJU (%)	ELGL (%)	SAME (%)	TH (%)	BG (%)
HA36T01	3.78	2.60	0.96	1.80	2.10	0.24	0.84	64.20	31.40
SITE AVERAGE	**3.78**	**2.60**	**0.96**	**1.80**	**2.10**	**0.24**	**0.84**	**64.20**	**31.40**

* HMP Species
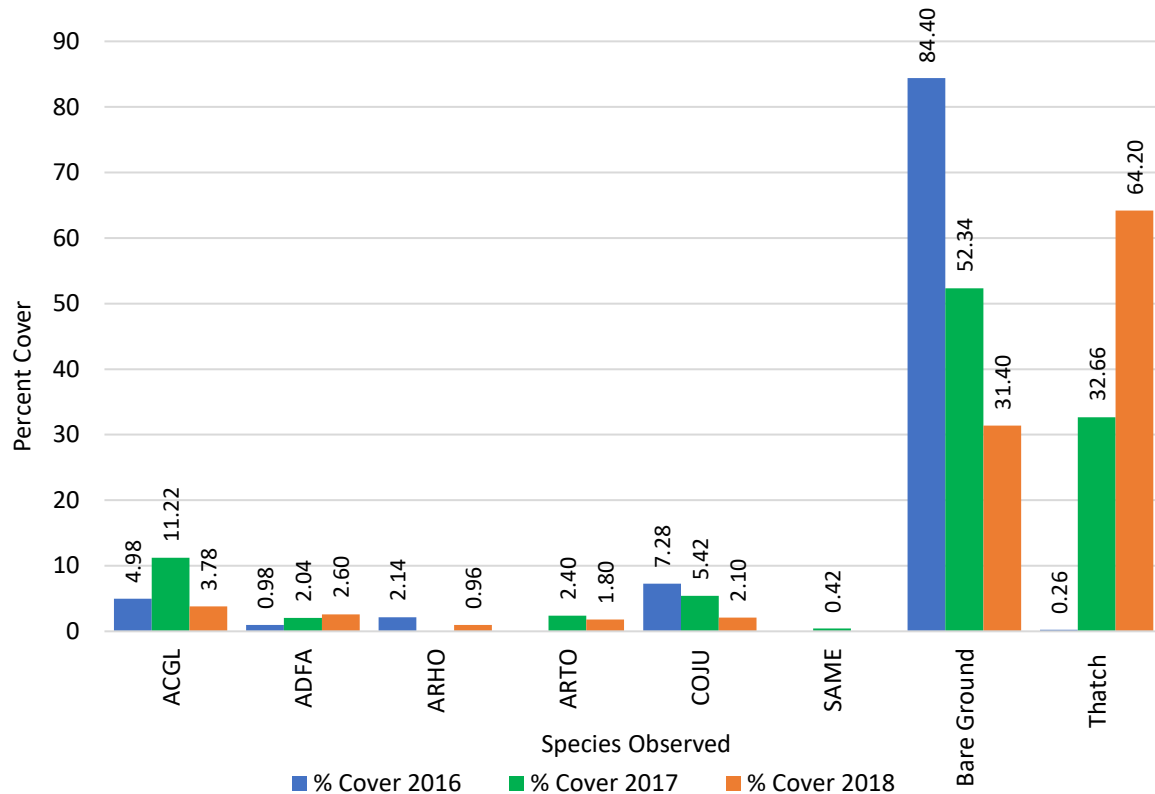
Figure 9-73. Percent Cover of Dominant Species at HA 36 in 2016, 2017, and 2018.

9.12.3 Discussion

9.12.3.1 Recommendations

HA 36 was in year 6 of monitoring in 2018 and responded marginally to restoration efforts. The site met two of five success criteria by 2018. Per recommendations in the 2017 Annual Habitat Restoration Report, HA 36 is scheduled to receive additional planting of Hooker's manzanita, Monterey manzanita, and Monterey ceanothus in 2019/2020 (Burleson, 2018). The Army also recommends planting Eastwood's golden bush and sandmat manzanita. Otherwise, HA 36 needs time to respond to restoration efforts and continued monitoring to evaluate whether additional efforts are necessary. A qualitative overview was documented by photo points (see Appendix D, page D-12).

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, 2020. Table 9-99 summarizes the current status of HA 36 including which success criteria were met and recommendations.

Table 9-99. Status and Recommendations for Achieving 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 native species (scheduled 2019/2020)*
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant Hooker's manzanita, Monterey manzanita, Monterey ceanothus (scheduled 2019/2020), 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 2019/2020), Eastwood's goldenbush, and sandmat manzanita*†
Objective 3 – No. 4	HMP annual density	NA	NA

* Recommendation repeated from the 2017 Annual Habitat Restoration Report (Burleson, 2018).
† Not scheduled

9.12.3.2 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.

9.12.3.3 Plant Survivorship

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

9.12.3.4 Species Richness

Chamise, sandmat manzanita, Monterey manzanita, shaggy-bark manzanita, coyote brush, Monterey ceanothus, golden yarrow, peak rush-rose, wedge-leaved horkelia, deerweed, and black sage were all present. HA 36 included 29 native shrub and perennial species and met the success criterion for Objective 1.

9.12.3.5 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 9.98% vegetative cover; therefore, this success criterion was not met. In 2017, vegetative cover was 16.08%; cover decreased by 6.10% (see Figure 9-74).
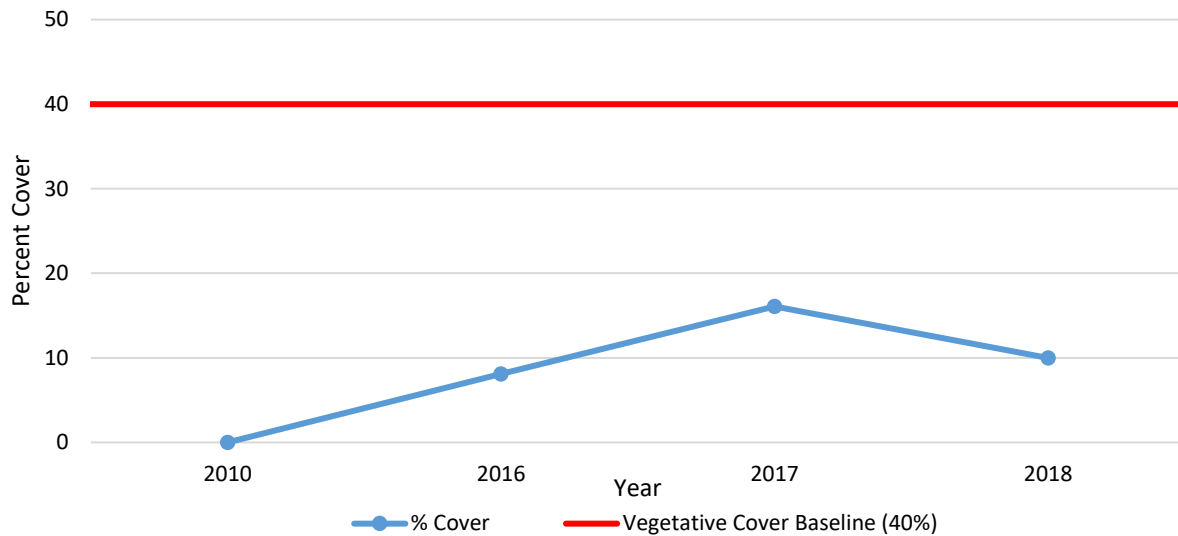
Figure 9-74. Native Vegetative Cover Compared to the Success Criterion at HA 36

Objective 2 considers the percent cover of non-native target weeds. The transect surveys contained jubata grass; however, vegetative cover for non-native species was 2.10% which is less than the maximum allowable threshold of 5%. Jubata grass cover decreased by 3.32% from 2017; therefore, 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 ranges from 6-25% of absolute cover. The HMP shrub species at HA 36 provided an absolute cover of 0.96%. This was an increase from 0.00% in 2017 but the HA did not meet 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, 9% for Monterey manzanita, 12% for Monterey ceanothus, 1% for Hooker's manzanita, and 1% for Eastwood's goldenbush. The average vegetative cover for sandmat manzanita was 0.00%, Monterey manzanita was 0.00%, Monterey ceanothus was 0.00%, Hooker's manzanita was 0.96%, and Eastwood's goldenbush was 0.00% (see Figure 9-75). None of these species met the acceptable limits. The success criterion was not met.
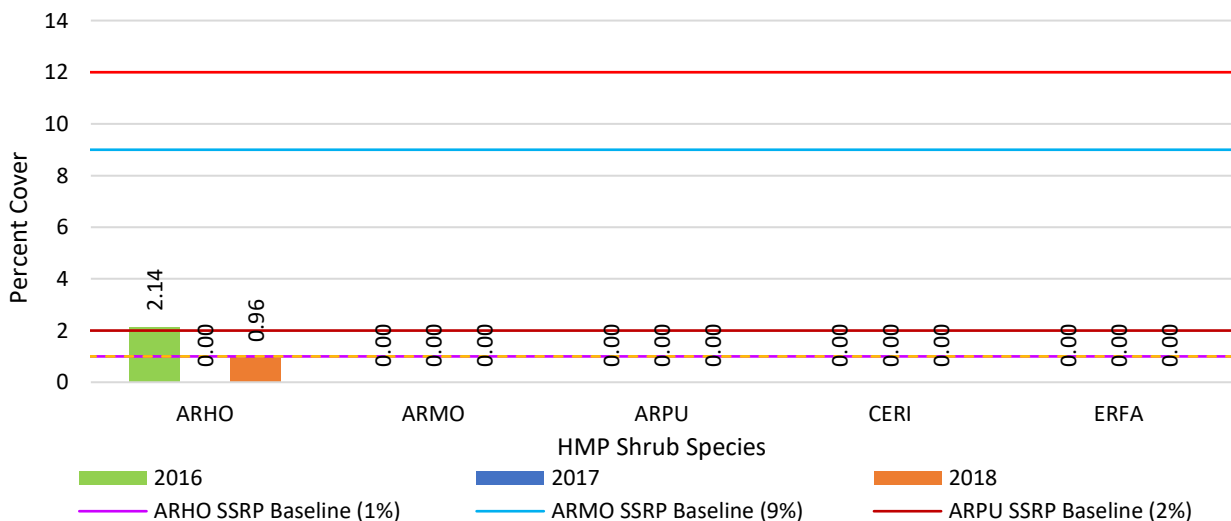
Figure 9-75. HMP Shrub Species Comparison to Success Criteria at HA 36

9.13   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 of similar maritime climates (USFS, 2007). HA 37 is relatively flat and 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 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 (USFS, 2007).

The SSRP restoration procedure for HA 37 included both passive and active restoration consisting of hand broadcast non-irrigated seed, annual weed management activities, and installing native container-grown plants. Broadcast seed has greater success if completed during the rainy season, November through March. HA 37 has some potential for erosion.

Restoration at HA 37 began in 2013 and is ongoing. Monitoring began in 2015. HA 37 was monitored for six years by photo documentation and site visits, four years for HMP annual density in plots, three years for HMP annual density across the HA, species richness, and vegetative cover, and five years for plant survivorship (see Table 9-100). Figure 9-76 shows the HA footprint, restoration areas, and transect survey locations. Success criteria for HA 37 are summarized in Table 9-101.

Table 9-100. 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 9-76. HA 37 Restoration Areas and Monitoring Locations Map

Table 9-101. Success Criteria and Acceptable Limits for Restoration of HA 37

No.	Success Element	Decision Rule	Acceptable Limits
	Objective 1*		
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† Monterey ceanothus† sandmat manzanita† coyote brush Hooker's manzanita†
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 of the SSRP
	Objective 2*		
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 jubata grass, broom (*Genista* sp.), and ice plant. No more than 5 percent non-native target weeds may be present at this restoration site.
	Objective 3*		
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 4.
			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 2.
			Hooker's manzanita percent cover, as an average of transect data, must be equal or greater than 1.
			Sandmat manzanita percent cover, as an average of transect data, must be equal or greater than 2.

Table 9-101. Success Criteria and Acceptable Limits for Restoration of HA 37

	Objective 3*		
4	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Monterey spineflower density class: Low

* Objectives presented in HRP (Shaw, 2009b)

† HMP Species

9.13.1 Restoration Activities

Burleson performed passive restoration at HA 37 in 2014, 2015, 2016, 2017, and 2018. The total amount of seed broadcast on site was 814.29 lb compared to 247.00 lb prescribed in the SSRP. Table 9-102 summarizes the SSRP seed target and the amount of seed applied by year and species. Burleson performed passive restoration for the HMP annual species Monterey spineflower. Four plots were chosen in the HA because they had suitable habitat for Monterey spineflower and adjacent populations.

Table 9-102. Summary of Passive Restoration Activities for HA 37

Species	**Pounds of Seed Broadcast**							
	SSRP Target	**2014 (Jan)**	**2014**	**2015**	**2016**	**2017**	**2018**	**Total by Species**
ACMI	9.400	4.800	2.000	8.070	8.140	8.700	1.800	33.510
ACGL	18.700	8.700	4.000	10.340	16.100	5.900	-	45.040
ADFA	-	3.300	-	-	-	-	-	3.300
ARCA	-	-	-	2.400	-	-	-	2.400
BAPI	1.400	1.400	0.320	0.520	-	0.150	-	2.390
CERI*	9.400	-	2.000	2.670	-	1.000	-	5.670
CHPUP*	1.400	-	0.320	0.040	-	-	-	0.360
CRSC	7.000	5.200	1.520	2.600	-	0.750	-	10.070
DIAU	1.400	0.100	0.320	0.280	-	0.150	-	0.850
ELGL	28.100	100.000	69.000	69.010	19.580	40.740	7.200	305.530
ERCO	11.700	5.000	1.440	1.060	-	1.250	-	8.750
ERER	-	4.200	-	-	-	-	-	4.200
ERFA*	1.900	-	1.400	0.050	-	0.200	-	1.650
GAEL	-	-	-	-	-	1.000	-	1.000
HO	93.500	50.000	20.000	52.700	3.120	113.000	3.600	242.420
HOCU	18.700	16.100	47.600	5.340	16.100	5.400	2.400	92.940
LUAR	-	-	1.520	2.400	-	-	-	3.920
LUAL	7.000	-	-	-	-	0.750	-	0.750
LUNA	-	-	-	0.270	-	1.000	-	1.270
SAME	18.700	7.100	4.000	2.940	-	2.000	-	16.040
STCE	-	-	-	0.540	-	2.000	-	2.540
STPU	18.700	-	-	5.340	10.100	9.750	4.500	29.690
TOTAL	**247.000**	**205.900**	**155.440**	**166.570**	**73.140**	**193.740**	**19.500**	**814.290**

* HMP species

Active restoration was conducted in 2014, 2015, 2016, and 2017. The total number of plants installed at HA 37 was 16,912 compared to 17,300 prescribed in the SSRP. Table 9-103 summarizes the plants installed during active restoration.

Table 9-103. Summary of Active Restoration Activities in HA 37

Species	Number of Individual Plants					
	SSRP Target	2014 (Feb-Mar)	2015 (Mar)	2016 (Feb)	2017 (Feb-Mar)	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*	700	234	325	270	157	986
ARMO*	1,000	389	370	141	206	1,106
ARPU*	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*	1,000	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**

* HMP species

9.13.2 Monitoring Results

9.13.2.1 HMP Annual Density

Four Monterey spineflower restoration plots were monitored for year 3 (Plot 4) and year 4 (Plots 1-3) density at HA 37 in 2018. The plots are numbered 1-4 on Figure 9-78 and are located throughout HA 37. Monterey spineflower density was low at Plot 3. Monterey spineflower was not present at Plots 1, 2, and 4. Figure 9-77 represents Monterey spineflower restoration plot densities for HA 37.
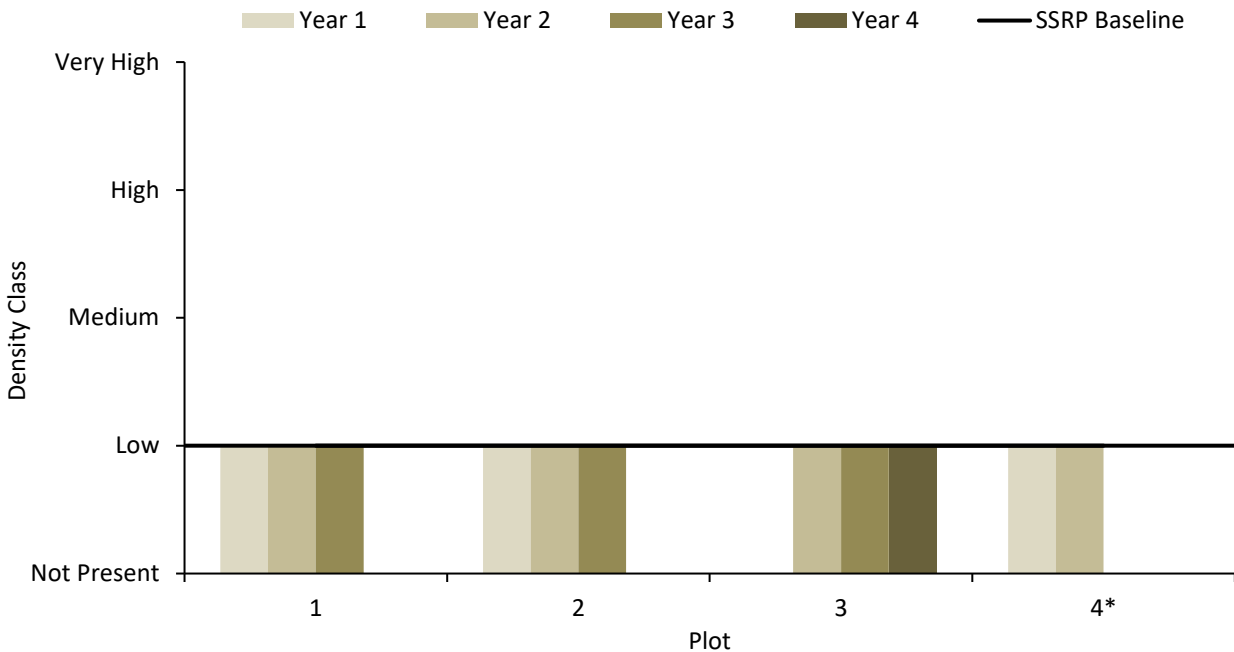
* Plot 4 was established in Nov 2015 and has only been monitored for years 1, 2, and 3

Figure 9-77. HA 37 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots 1-4
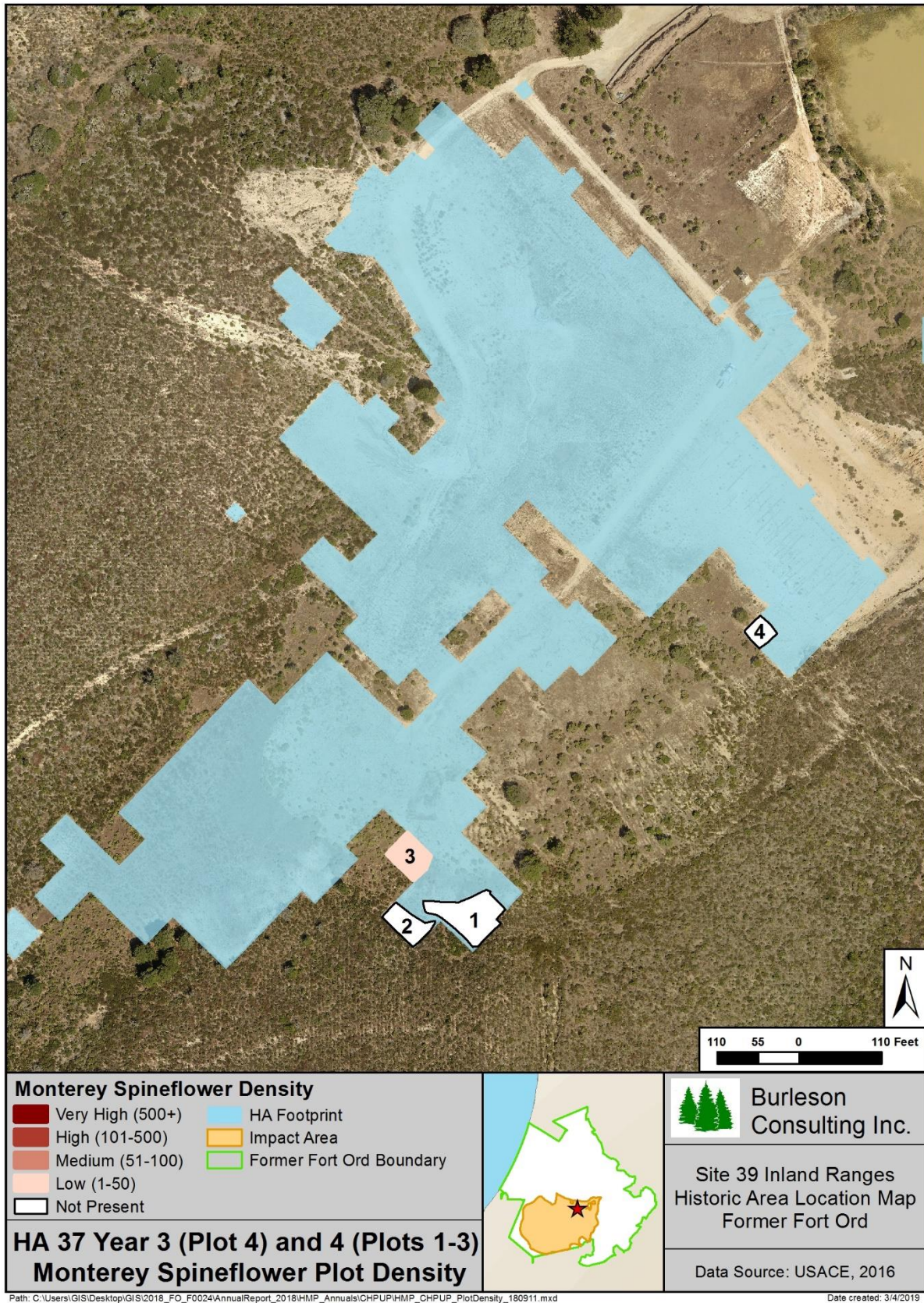
Figure 9-78. HA 37 Year 3 (Plot 4) and Year 4 (Plots 1-3) Monterey Spineflower Plot Density Map

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 at HA 37; however, no individuals were observed outside the restoration plot.

9.13.2.2   Plant Survivorship

Plant survivorship monitoring was conducted at HA 37. A total of 12 shrub species and 1,101 individual plants were monitored for survivorship. By year 3 of monitoring, survivorship was 67% for the 2014 planting, 38% for the 2015 planting, and 44% for the 2016 planting. By year 2 of monitoring for the 2017 planting, survivorship was 55%; survivorship decreased from 61% in 2017. Table 9-104, Table 9-105, Table 9-106, and Table 9-107 present results by species.

Table 9-104. Plant Survivorship Monitoring Summary for 2014 Plantings at HA 37

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2014) Alive (%)	Year Two (2015) Alive (%)	Year Three (2016) Alive (%)
ADFA	636	61	97	93	90
ARHO*	234	23	87	70	65
ARMO*	389	39	82	62	56
ARTO	621	62	74	68	65
BAPI	234	24	100	100	83
CERI*	315	32	56	44	38
LUAR	208	16	81	31	31
SAME	362	25	100	100	84
TOTAL	2,999	282	84	73	67

 * HMP Species

Table 9-105. Plant Survivorship Monitoring Summary for 2015 Plantings at HA 37

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2015) Alive (%)	Year Two (2016) Alive (%)	Year Three (2017) Alive (%)
ADFA	363	36	97	88	81
ARHO*	325	33	67	61	58
ARMO*	370	37	51	27	27
ARTO	554	54	48	35	33
BAPI	284	28	82	64	50
CERI*	652	65	40	18	20
LUAL	165	17	71	47	24
LUAR	243	24	38	17	4
SAME	250	25	92	52	52
TOTAL	3,206	319	61	42	38

 * HMP Species

Table 9-106. Plant Survivorship Monitoring Summary for 2016 Plantings at HA 37

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2016) Alive (%)	Year Two (2017) Alive (%)	Year Three (2018) Alive (%)
ADFA	316	31	90	90	90
ARHO*	270	26	73	72	67
ARMO*	141	14	64	64	43
ARPU*	220	23	70	64	56
ARTO	497	49	57	53	48
BAPI	431	41	46	41	33
CERI*	239	20	30	20	15
GAEL	17	4	25	25	25
LUAL	146	15	67	20	0
LUAR	175	18	6	6	0
SAME	15	2	50	50	0
TOTAL	**2,467**	**243**	**57**	**51**	**44**

* HMP Species

Table 9-107. Plant Survivorship Monitoring Summary for 2017 Plantings at HA 37

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2017) Alive (%)	Year Two (2018) Alive (%)
ADFA	140	14	36	29
ARCA	155	17	53	88
ARHO*	157	16	100	100
ARMO*	206	21	76	70
ARPU*	237	24	75	48
ARTO	356	36	94	77
BAPI	329	33	52	50
CERI*	140	14	36	14
GAEL	2	2	50	100
LUAL	242	24	25	29
LUAR	262	26	35	12
SAME	258	26	73	77
TOTAL	**2,484**	**253**	**61**	**55**

* HMP Species

9.13.2.3   Species Richness

Ninety species were observed at HA 37. Of those, 44 were native shrubs or perennials, 21 were native annual herbaceous species, and 25 were non-native species (see Table 9-108). Species richness decreased by six species since 2017. Native shrub and perennial species decreased by one, native herbaceous species decreased by one, and non-native species decreased by four. The decrease in species richness was largely due to reduced presence of non-native species.

Table 9-108. Species Observed on HA 37, 2018

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon americanus var. *americanus*	Spanish clover	ACAMA
Acmispon glaber	deerweed	ACGL
Acmispon parviflorus	hill lotus	ACPA
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos hookeri*	Hooker's manzanita	ARHO
Arctostaphylos montereyensis*	Monterey manzanita	ARMO
Arctostaphylos pumila*	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Carduus pycnocephalus ssp. *pycnocephalus*	Italian thistle	CAPYP
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Castilleja densiflora	owl's clover	CADE
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus*	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	jubata grass	COJU
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*	Eastwood's goldenbush	ERFA
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filaree	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Galium californicum	California bedstraw	GACA
Galium porrigens	climbing bedstraw	GAPO
Gamochaeta ustulata	purple cudweed	GAUS
Garrya elliptica	coast silk tassel	GAEL
Genista monspessulana	French broom	GEMO
Heteromeles arbutifolia	toyon	HEAR
Heterotheca grandiflora	telegraph weed	HEGR

Table 9-108. Species Observed on HA 37, 2018

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
Juncus bufonius	toad rush	JUBU
Lepechinia calycina	pitcher sage	LECA
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus albifrons	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus nanus	sky lupine	LUNA
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia elegans	common madia	MAEL
Madia exigua	little tarweed	MAEX
Madia gracilis	slender tarweed	MAGR
Madia sativa	coast tarweed	MASA
Marah fabacea	wild cucumber	MAFA
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Navarretia mellita	skunk navarretia	NAME
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Polygala californica	California milkwort	POCA
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
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
Salix sp.	willow	SA
Salvia mellifera	black sage	SAME
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Solanum umbelliferum	blue witch	SOUM
Solidago velutina ssp. *californica*	California goldenrod	SOVEC
Sonchus asper	prickly sow thistle	SOAS
Sonchus oleraceus	common sow thistle	SOOL
Stachys bullata	wood mint	STBU
Symphoricarpos albus var. *laevigatus*	common snowberry	SYALL
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium dubium	little hop clover	TRDU
Triteleia ixioides	pretty face	TRIX
Zeltnera davyi	Davy's centaury	ZEDA

* HMP species

9.13.2.4 Vegetative Cover

Eleven 50-meter line-intercept transects and 12 associated quadrats were conducted at HA 37. These surveys indicated that the mean vegetative cover by native shrubs and perennials was 36.61%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 7.11%. Quadrats were completed along a transect line when 10% or more of the transect line was herbaceous cover, in accordance with the *Protocol for Conducting Vegetation Monitoring* (Burleson, 2009). Table 9-109 summarizes vegetative cover and Table 9-110 presents vegetative cover by species. Figure 9-79 presents the percent cover of dominant species at HA 37 in 2016, 2017, and 2018 and Table 9-111 presents quadrat results.

Table 9-109. 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	18.00	15.96	0.00	2.04	84.84	13.14
HA37T02	17.26	15.40	0.00	1.86	97.34	2.60
HA37T03	65.54	11.52	1.64	52.38	100.00	0.00
HA37T04	115.38	111.20	0.00	4.18	99.64	0.36
HA37T05	36.52	10.78	0.00	25.74	99.08	0.60
HA37T06	116.04	116.04	0.00	0.00	100.00	0.00
HA37T07	17.10	10.28	0.22	6.60	90.56	9.06
HA37T08	31.78	31.78	0.00	0.00	100.00	0.00
HA37T09	29.64	26.94	0.32	2.38	66.28	28.88
HA37T10	40.78	38.08	0.20	2.50	37.08	55.78
HA37T11	16.54	14.78	0.30	1.46	96.80	3.10
SITE AVERAGE	**45.87**	**36.61**	**0.24**	**9.01**	**88.33**	**10.32**

Table 9-110. Transect Survey Summary for HA 37 by Species

Transect	ACAMA (%)	ACGL (%)	ADFA (%)	ARCA (%)	ARHO* (%)	ARMO* (%)	ARPU* (%)	ARTO (%)	BAPI (%)	CEDE (%)	CERI* (%)	CRSC (%)	DECO (%)	DIAU (%)
HA37T01	0.00	8.52	2.40	0.00	2.98	0.00	0.00	0.00	1.10	0.00	0.00	0.00	0.00	0.00
HA37T02	0.00	2.26	1.56	0.30	0.76	0.94	0.00	0.00	4.82	0.00	0.00	1.48	0.00	0.00
HA37T03	0.00	1.56	0.00	0.00	0.00	0.00	0.00	0.44	1.02	0.00	0.00	0.00	1.64	0.00
HA37T04	0.00	11.28	0.60	13.62	1.34	4.02	0.00	4.20	1.72	0.00	8.80	0.00	0.00	0.00
HA37T05	0.00	5.96	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	3.30	0.00	0.00	0.00
HA37T06	0.00	33.84	2.68	8.18	2.40	2.26	0.56	5.34	6.22	0.00	1.34	1.24	0.00	3.38
HA37T07	0.22	7.62	0.00	0.00	0.70	0.24	0.00	1.10	0.00	0.00	0.00	0.00	0.00	0.22
HA37T08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.52	0.00	0.00	0.00	0.00	0.00
HA37T09	0.32	26.34	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	0.20	34.06	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.70
HA37T11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.42	6.28	0.26	1.56	0.30	0.00
SITE AVERAGE	**0.07**	**11.95**	**0.66**	**2.11**	**0.74**	**0.68**	**0.05**	**1.01**	**4.26**	**0.57**	**1.25**	**0.50**	**0.18**	**0.39**

* HMP species

Table 9-110 (continued). Transect Survey Summary for HA 37 by Species

Transect	ELGL (%)	ERCO (%)	ERER (%)	HOCU (%)	HYRA (%)	LUAR (%)	LYAR (%)	PLCO (%)	PSRA (%)	RUUR (%)	SAME (%)	SIBE (%)	TODI (%)	TH (%)	BG (%)
HA37T01	0.00	0.00	0.00	0.96	0.00	0.00	0.00	2.04	0.00	0.00	0.00	0.00	0.00	84.84	13.14
HA37T02	0.00	0.00	0.00	2.96	0.00	0.00	0.00	1.86	0.00	0.00	0.00	0.32	0.00	97.34	2.60
HA37T03	0.88	0.00	0.00	7.40	0.00	0.22	0.00	52.38	0.00	0.00	0.00	0.00	0.00	100.00	0.00
HA37T04	0.00	0.48	0.00	45.52	0.00	0.00	4.18	0.00	0.28	0.74	6.66	0.00	11.94	99.64	0.36
HA37T05	0.00	0.22	0.00	1.10	0.00	0.00	0.00	25.74	0.00	0.00	0.00	0.00	0.00	99.08	0.60
HA37T06	0.00	2.78	0.34	34.18	0.00	0.00	0.00	0.00	0.28	5.72	2.92	0.00	2.38	100.00	0.00
HA37T07	0.00	0.00	0.00	0.00	0.00	0.40	0.00	6.60	0.00	0.00	0.00	0.00	0.00	90.56	9.06
HA37T08	0.00	0.00	0.00	1.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
HA37T09	0.00	0.00	0.20	0.40	0.00	0.00	0.00	2.38	0.00	0.00	0.00	0.00	0.00	66.28	28.88
HA37T10	0.00	0.00	0.46	0.74	0.20	0.00	0.00	2.30	0.00	0.00	0.00	0.00	0.00	37.08	55.78
HA37T11	0.00	0.00	0.00	3.86	0.00	0.00	0.00	1.46	0.00	0.00	0.00	0.00	1.40	96.80	3.10
SITE AVERAGE	**0.08**	**0.32**	**0.09**	**8.94**	**0.02**	**0.06**	**0.38**	**8.61**	**0.05**	**0.59**	**0.87**	**0.03**	**1.43**	**88.33**	**10.32**
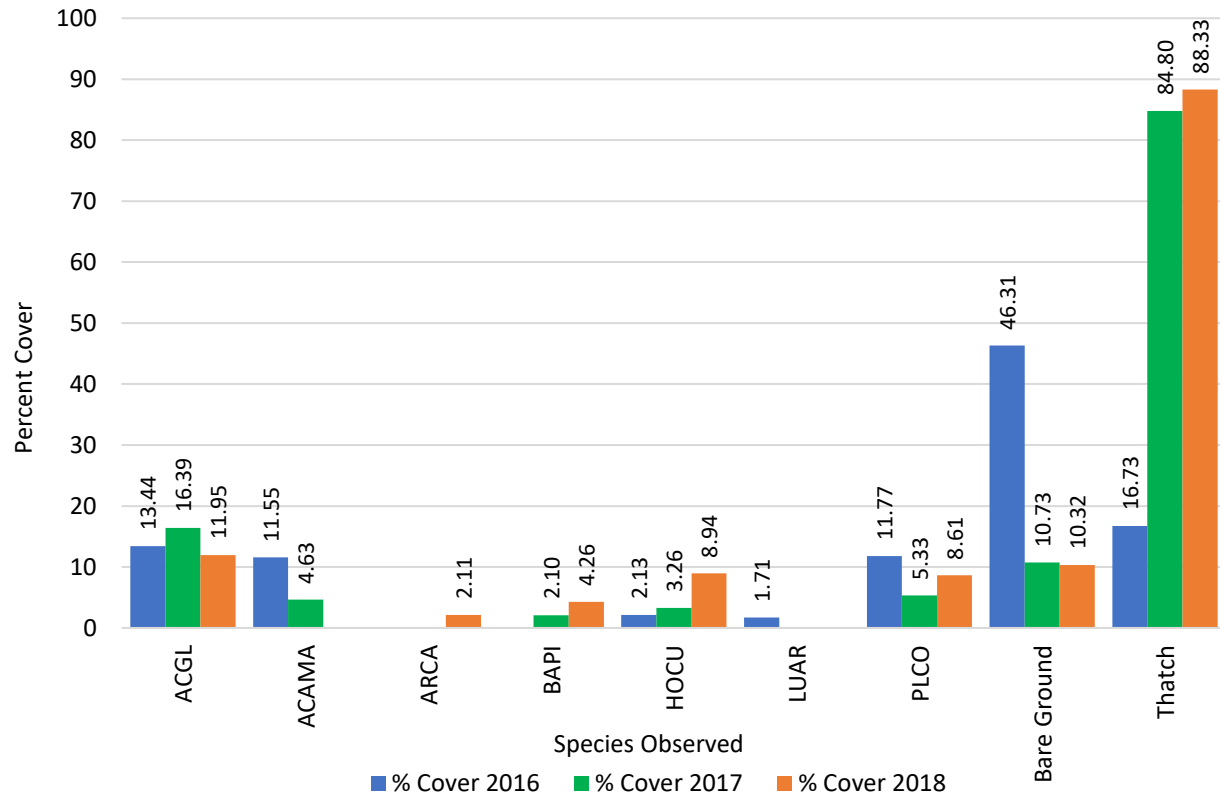
Figure 9-79. Percent Cover of Dominant Species at HA 37 in 2016, 2017, and 2018.

Table 9-111. Quadrat Summary for HA 37 Transects T03 and T05

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA37T03Q01	42	37	0	5	41	17
HA37T03Q02	15	0	0	15	73	12
HA37T03Q03	40	0	0	40	42	18
HA37T03Q04	25	0	0	25	63	12
HA37T03Q05	34	16	3	15	53	13
HA37T03Q06	8	4	0	4	36	56
HA37TO5Q01	11	0	1	10	54	35
HA37TO5Q02	5	0	1	4	79	16
HA37TO5Q03	45	37	2	6	45	10
HA37TO5Q04	37	20	1	16	61	2
HA37TO5Q05	14	0	0	14	28	58
HA37TO5Q06	37	26	0	11	43	20
SITE AVERAGE	**26**	**12**	**1**	**14**	**52**	**22**

9.13.3 Discussion

9.13.3.1 Recommendations

HA 37 was in year 4 of monitoring in 2018 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 two of six success criteria by 2018. As stated in the 2017 Annual Habitat Restoration Report, the Army recommends three 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) broadcast seeding Monterey spineflower since the site has only received 0.36 lb of the 1.4 lb SSRP target 3) fulfilling the SSRP planting prescription (597 plants scheduled for installation in the 2019/2020 season; Burleson, 2018). Overall, HA 37 needs time and the entire prescription of active and passive restoration efforts prior to full evaluation. Continued monitoring will assist with 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, if necessary, further recommendations will be made at that time. A qualitative overview was documented by photo points (see Appendix D, page D-13).

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, 2019. Table 9-112 summarizes the current status of HA 37 including which success criteria were met and recommendations.

Table 9-112. Status and Recommendations for Achieving 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	Fulfill SSRP plant targets (scheduled 2019/2020)
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Fulfill SSRP plant targets (scheduled 2019/2020)
Objective 3 – No. 4	HMP shrub cover by species	No	Fulfill SSRP plant targets (scheduled 2019/2020)
Objective 3 – No. 4	HMP annual density	No	Fulfill SSRP seed prescription for Monterey spineflower*†

* Recommendation repeated from the 2017 Annual Habitat Restoration Report (Burleson, 2018).
† Not scheduled

9.13.3.2 HMP Annual Density

Monterey spineflower density was not within the acceptable limit for HMP annual density at HA 37. The SSRP baseline density class for Monterey spineflower was low. Year 4 and year 3 Monterey spineflower restoration plot results show that the density met the success criterion under Objective 3 for one out of four plots. In addition, Monterey spineflower was not present outside the restoration plots. HA 37 has not received the full SSRP prescription for Monterey spineflower.

9.13.3.3 Plant Survivorship

Plant survivorship was moderate for the 2014 planting, low for the 2015 planting, low for the 2016 planting, and moderate for the 2017 planting at HA 37. Monterey ceanothus, silver bush lupine, and yellow bush lupine had low survivorship for all planting events. Monterey manzanita and shaggy-barked

manzanita had low survivorship for the 2015 and 2016 planting events and moderate survivorship for the 2014 and 2017 planting events. Silk tassel had low survivorship for the 2016 planting event and high survivorship for the 2017 planting event. Coyote brush had low survivorship for the 2016 planting event and moderate to high survivorship for all other planting years. Low survivorship for Monterey ceanothus and lupine was not surprising because they had low survivorship at multiple sites, whereas Monterey manzanita typically did well at other sites. In 2017, manzanitas were installed in areas with sandy, well-drained soils while more tolerant species were planted in flatter areas with compact soils and occasional standing water. The 2017 planting will be monitored for one more year.

9.13.3.4 Species Richness

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

9.13.3.5 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 contains 31.74% cover; therefore, this success criterion was not met. In 2017, vegetative cover was 26.77%; cover increased by 4.97% (see Figure 9-80).
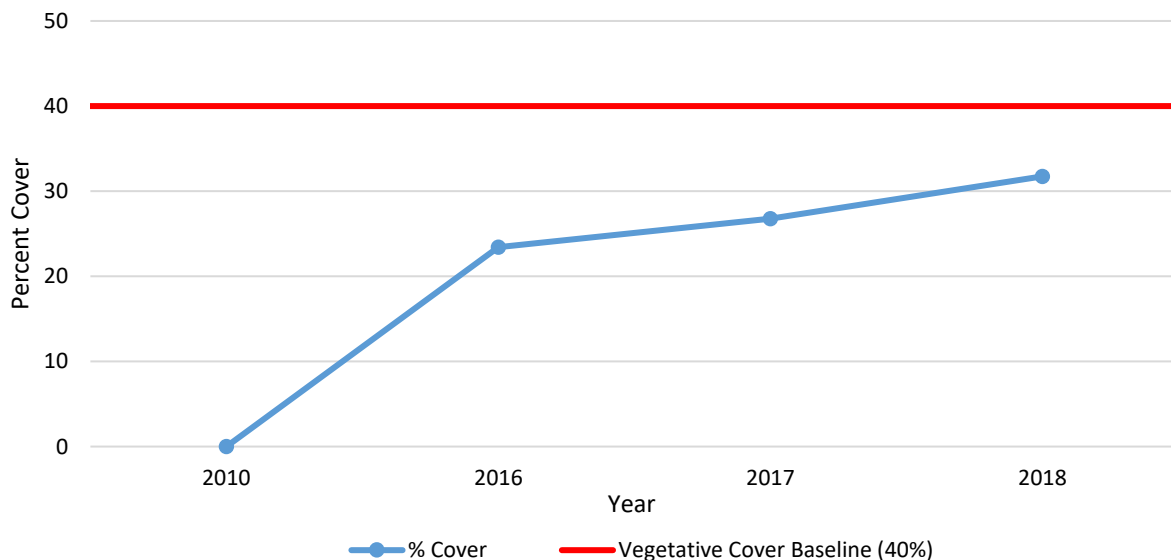
Figure 9-80. Native Vegetative Cover Compared to the Success Criterion at HA 37

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 ranges from 6-25% of absolute cover. The HMP shrub species at HA 37 provided an absolute cover of 2.72% which is an increase from 1.69% in 2017; however, the HA did not meet 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, 4% for Monterey manzanita, 2% for Monterey ceanothus, and 1% for Hooker's manzanita.

The average vegetative cover for sandmat manzanita was 0.05%, Monterey manzanita was 0.68%, Monterey ceanothus was 1.25%, and Hooker's manzanita was 0.74% (see Figure 9-81). Monterey manzanita, Monterey ceanothus, and Hooker's manzanita increased in cover from 2017 to 2018, while sandmat manzanita decreased. None of the four species met the acceptable limits. The success criterion was not met.
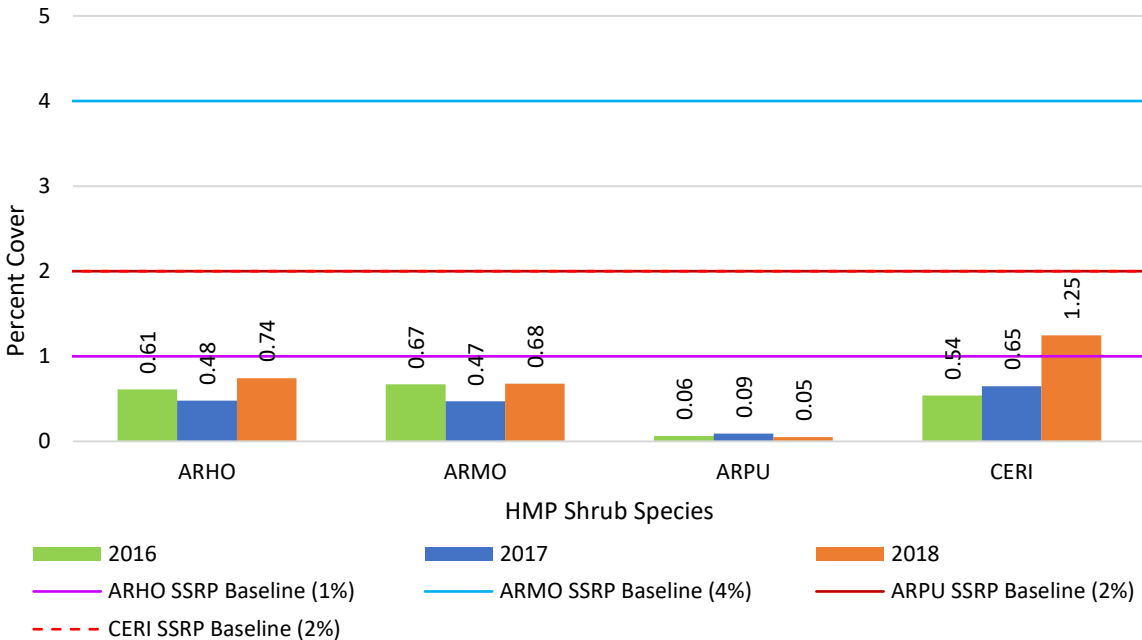
Figure 9-81. HMP Shrub Species Comparison to Success Criteria at HA 37

9.14   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 of similar maritime climates (USFS, 2007). HA 38 is moderately sloped and 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 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 (USFS, 2007).

The SSRP restoration procedure for HA 38 included both passive and active restoration consisting of hand broadcast non-irrigated seed, annual weed management activities, and installing native container-grown 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 2017. Monitoring began in 2015. HA 38 was monitored for six years by photo documentation and site visits, four years for HMP annual density in plots, three years for HMP annual density across the HA, species richness, and vegetative cover, and four years for plant survivorship (see Table 9-113). Figure 9-82 shows the HA footprint, passive restoration area, active restoration area, and transect survey locations. Success criteria for HA 38 are summarized in Table 9-114.

Table 9-113. 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						●	●	●	
HMP Annual Density across HA				●	●	●	●	●	
Species Richness				●	●	●	●	●	●
Vegetative Cover				●	●	●	●	●	●
Plant Survivorship		●	●	●	●				

Figure 9-82. HA 38 Restoration Areas and Monitoring Locations Map

Table 9-114. Success Criteria and Acceptable Limits for Restoration of HA 38

	Objective 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† Monterey ceanothus† sandmat manzanita† Hooker's manzanita†
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 20 percent for native species listed as part of the plant palette in Table 2 of the SSRP
	Objective 2*		
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*		
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 percent cover, as an average of transect data, must be equal or greater than 1.
			Monterey ceanothus percent cover, as an average of transect data, must be equal or greater than 1.
			Hooker's manzanita percent cover, as an average of transect data, must be equal or greater than 1.
			Sandmat 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	Monterey spineflower density class: Low Sand gilia density class: Low Seaside bird's beak density class: Low

* Objectives presented in HRP (Shaw, 2009b)
† HMP Species

9.14.1 Restoration Activities

Burleson performed passive restoration at HA 38 in 2013, 2014, 2015, and 2017. No additional passive restoration activities occurred in 2018. The total amount of seed broadcast on site was 31.425 lb compared to 28.980 lb prescribed in the SSRP. Table 9-115 summarizes the SSRP seed target and the amount of seed applied by year and species. 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 for sand gilia.

Table 9-115. Summary of Passive Restoration Activities for HA 38

Species	Pounds of Seed Broadcast					
	SSRP Target	2013 (Oct)	2014 (Dec)	2015 (Jan)	2017	Total by Species
ACMI	1.010	0.200	0.710	-	-	0.910
ACGL	2.020	0.400	1.410	-	-	1.810
BAPI	0.150	0.030	0.080	-	-	0.110
CERI*	1.010	-	0.510	-	-	0.510
CHPUP*	0.150	-	-	0.010	0.015	0.025
CORIL*	0.150	-	-	-	-	-
CRSC	0.760	0.152	0.580	-	-	0.732
DIAU	0.150	0.180	0.280	-	-	0.460
ELGL	4.040	0.600	6.600	-	-	7.200
ERCO	1.260	0.252	0.930	-	-	1.182
ERFA*	0.200	-	0.100	-	-	0.100
GAEL	1.010	-	-	-	-	-
GITEA*	0.150	-	-	-	0.008	0.008
HOCU	2.020	0.404	1.410	-	-	1.814
HO	10.100	2.020	12.000	-	-	14.020
LUAL	0.760	0.150	-	-	-	0.150
LUAR	-	-	0.580	-	-	0.580
SAME	2.020	0.404	1.410	-	-	1.814
STPU	2.020	-	-	-	-	-
TOTAL	**28.980**	**4.792**	**26.600**	**0.010**	**0.023**	**31.425**

* HMP species

Active restoration was completed in 2014 and 2015. The total number of plants installed at HA 38 was 1,842, as prescribed in the SSRP. Table 9-116 summarizes the plants installed during active restoration.

Table 9-116. Summary of Active Restoration Activities 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*	123	123	-	123
ARMO*	123	123	-	123
ARPU*	327	-	327	327
ARTO	204	204	-	204
BAPI	82	82	-	82
CERI*	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**

* HMP species

9.14.2 Monitoring Results

9.14.2.1 HMP Annual Density

Monterey spineflower and sand gilia restoration plots were monitored for density at HA 38.

Five Monterey spineflower restoration plots were monitored for year 1 (Plots 2-5) and year 4 (Plot 1) density at HA 38 in 2018. The plots are numbered 1-5 on Figure 9-84 and are located throughout HA 38. Monterey spineflower density was low at Plots 1-5. Figure 9-83 presents Monterey spineflower restoration plot densities for HA 38.
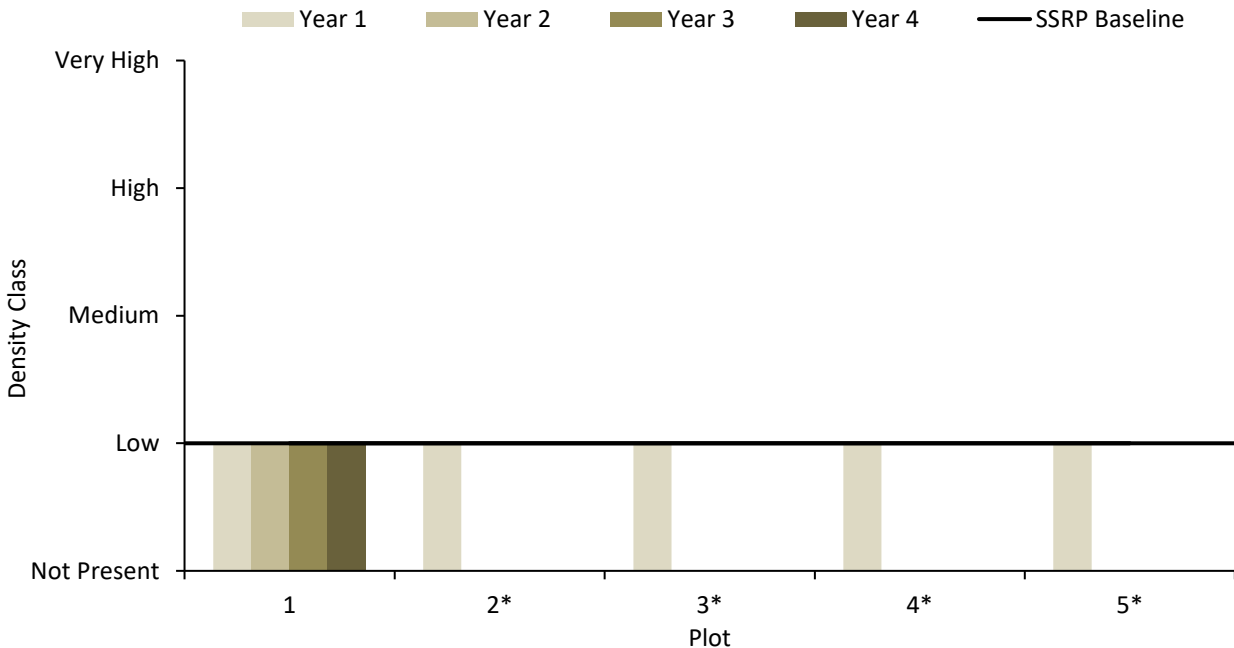
* Plots 2-5 were established in 2017 and have only been monitored for year 1

Figure 9-83. HA 38 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots 1-5
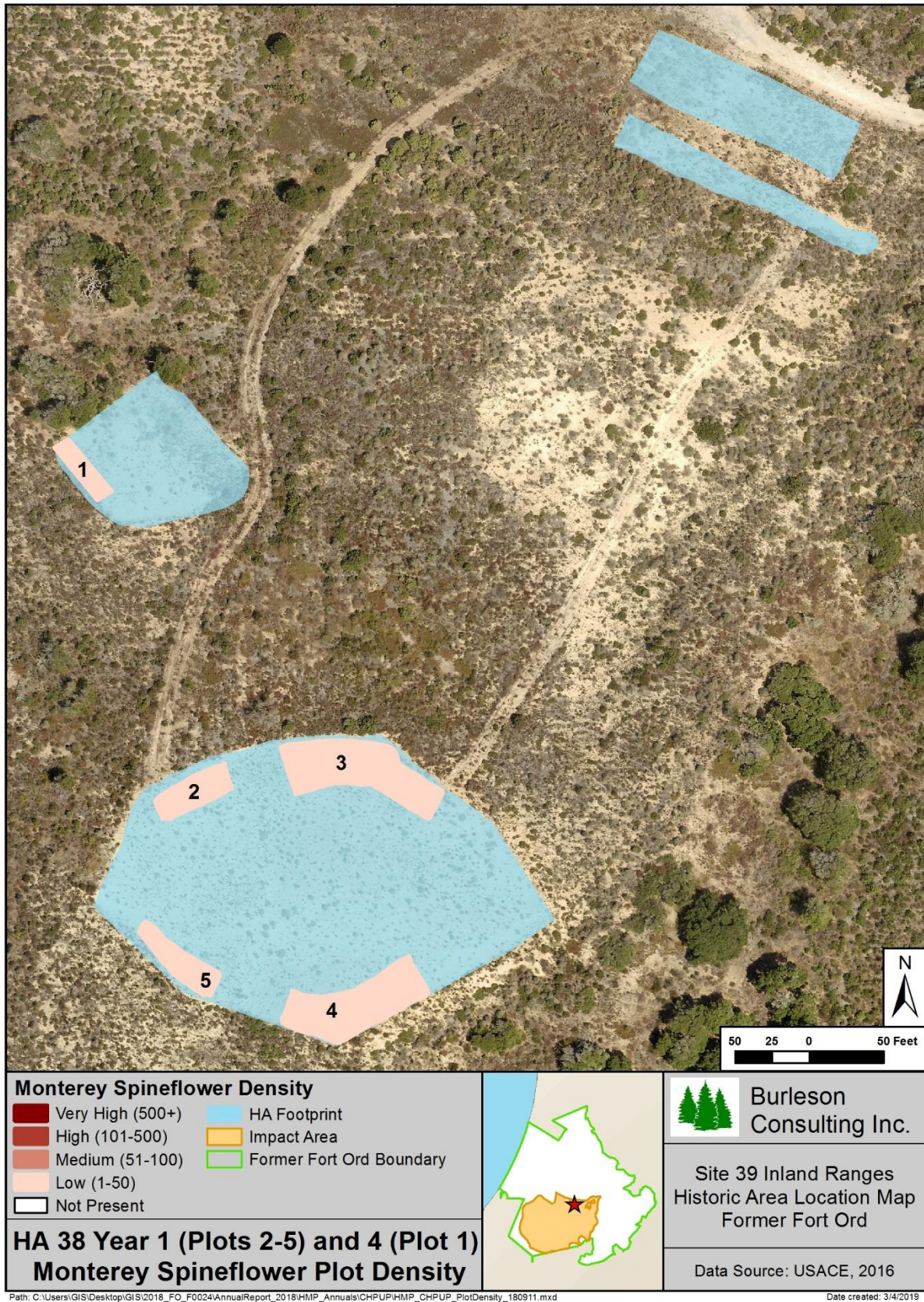
Figure 9-84. HA 38 Year 1 (Plots 2-5) and Year 4 (Plot 1) Monterey Spineflower Plot Density Map

Four sand gilia restoration plots were monitored for year 1 density at HA 38 in 2018. The plots are numbered 1-4 on Figure 9-86 and are located throughout HA 38. Sand gilia density was low at Plots 1 and 2. Sand gilia was not present at Plots 3 and 4. Figure 9-85 presents sand gilia restoration plot densities for HA 38.
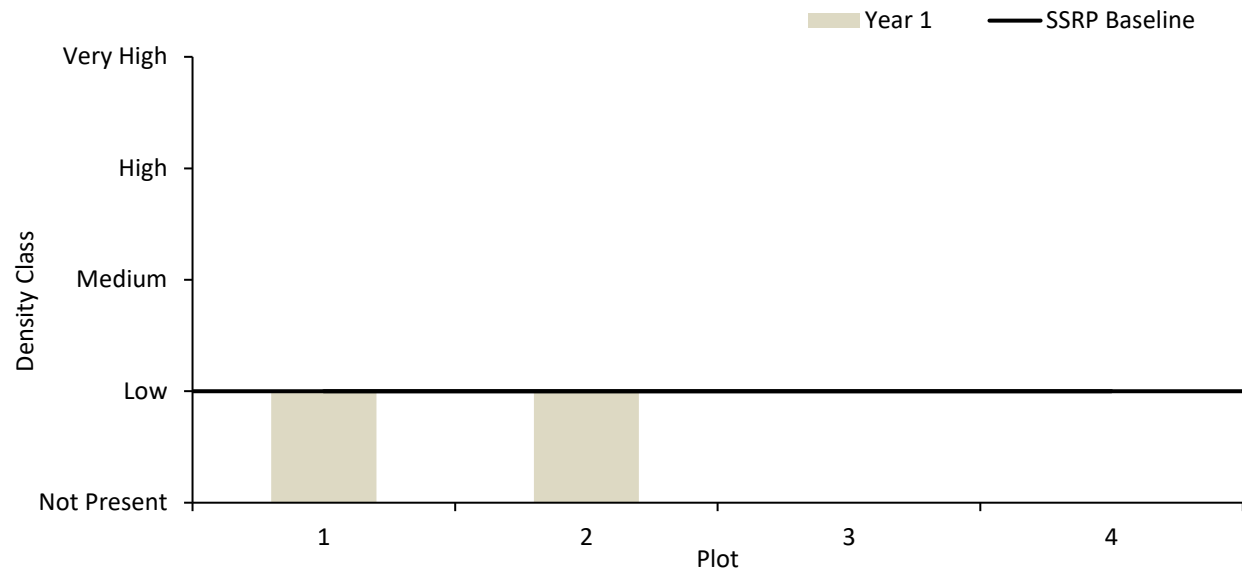
Figure 9-85. HA 38 Comparison of Sand Gilia Density Classes to the SSRP Baseline for Plots 1-4
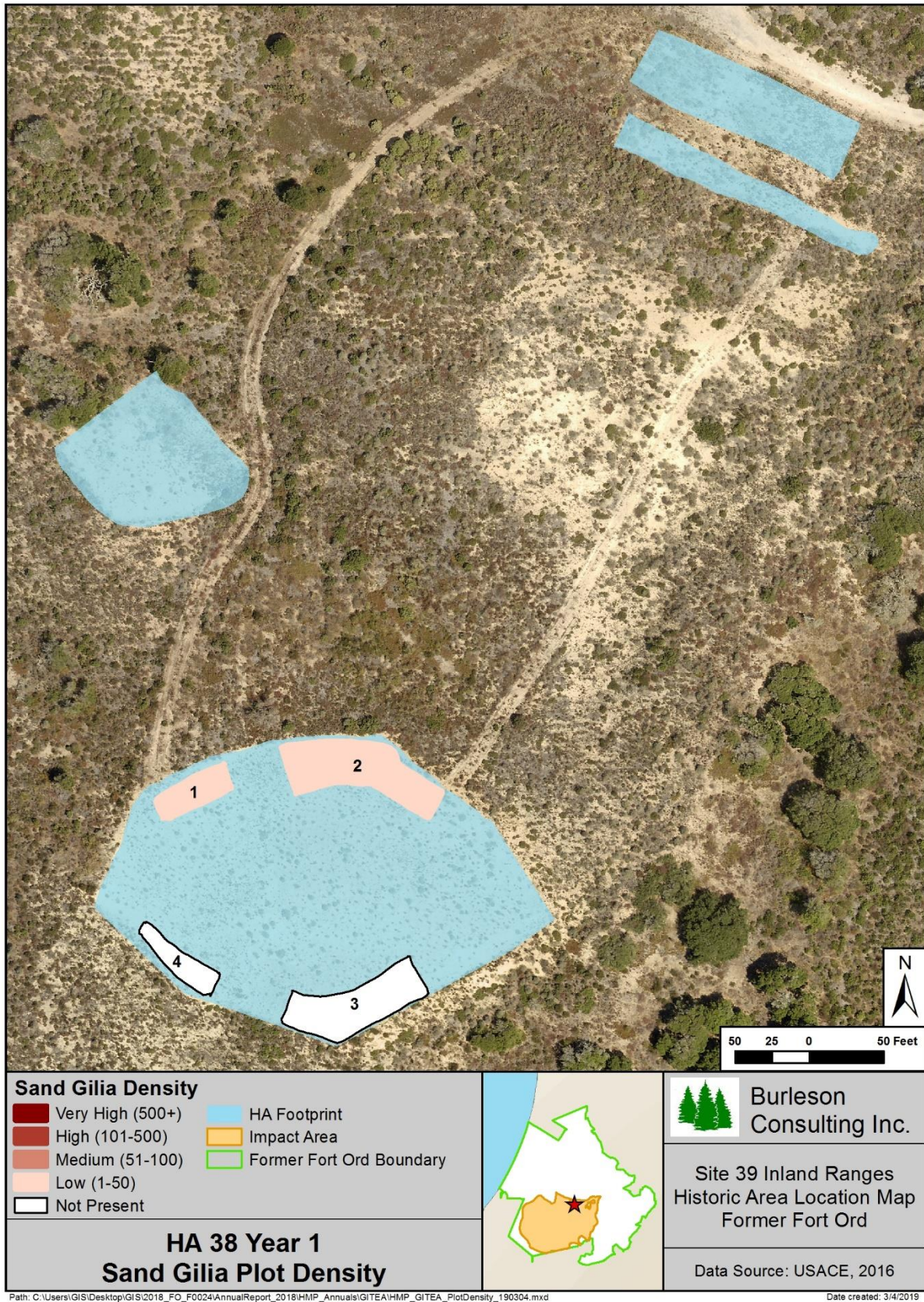
Figure 9-86. HA 38 Year 1 Sand Gilia Plot Density Map

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 at HA 38.

Eight discrete patches of Monterey spineflower were mapped and individual plants were counted within each patch (see Figure 9-87). The densities ranged from low to medium and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.14 acres. From 2017 to 2018, the density range and acreage above the SSRP baseline increased.

Three individual plants and two discrete patches of sand gilia were mapped and individual plants were counted within each patch (see Figure 9-88). Densities ranged from low to medium and the total acreage of sand gilia patches with a density at or above the SSRP baseline density class of low was 0.002 acres. From 2017 to 2018, the density range and acreage above the SSRP baseline increased; no sand gilia individuals were observed outside of the restoration plots in 2017.

Seaside bird's beak was not observed at HA 38 in 2018.
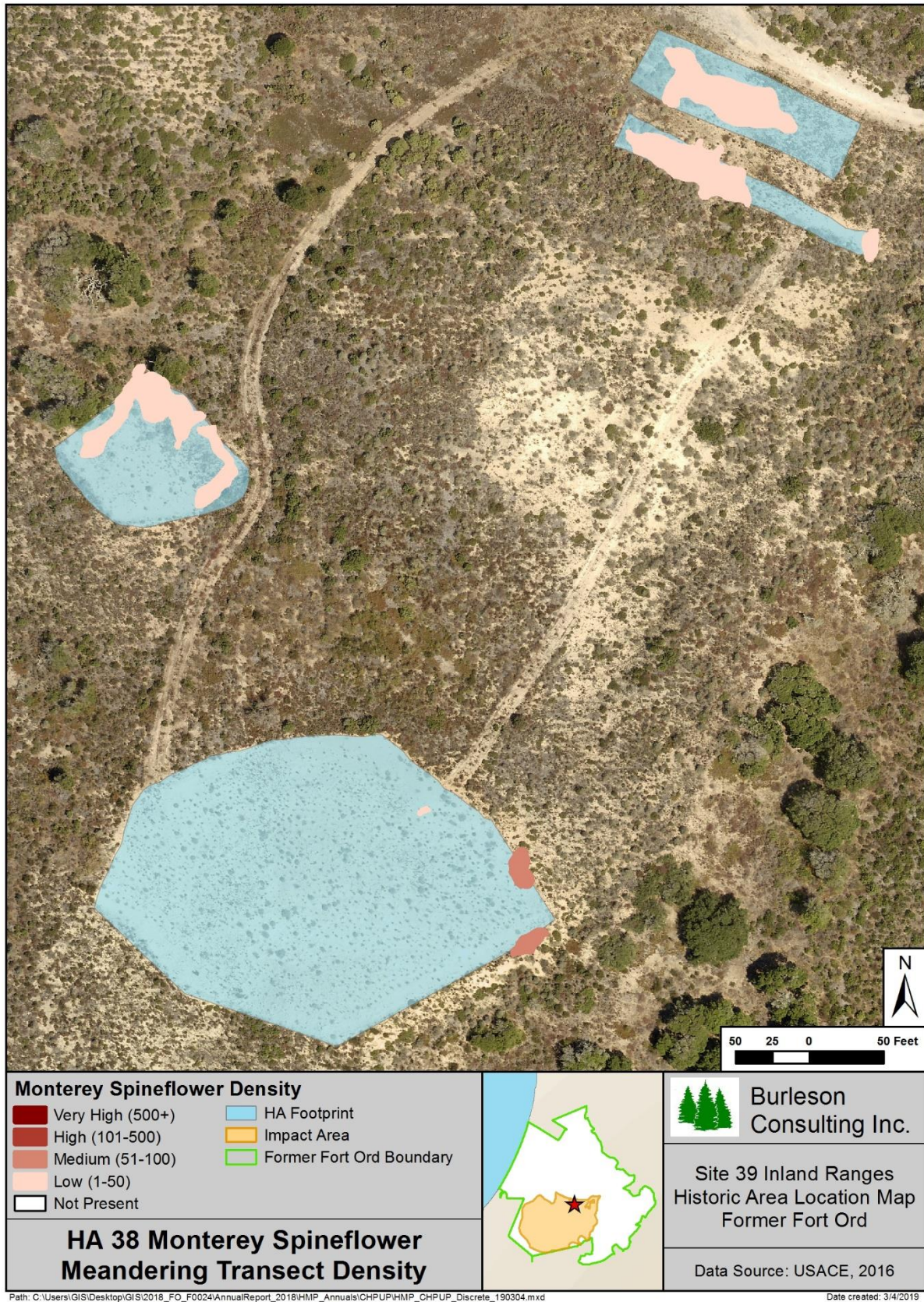
Figure 9-87. HA 38 Monterey Spineflower Meandering Transect Density Map
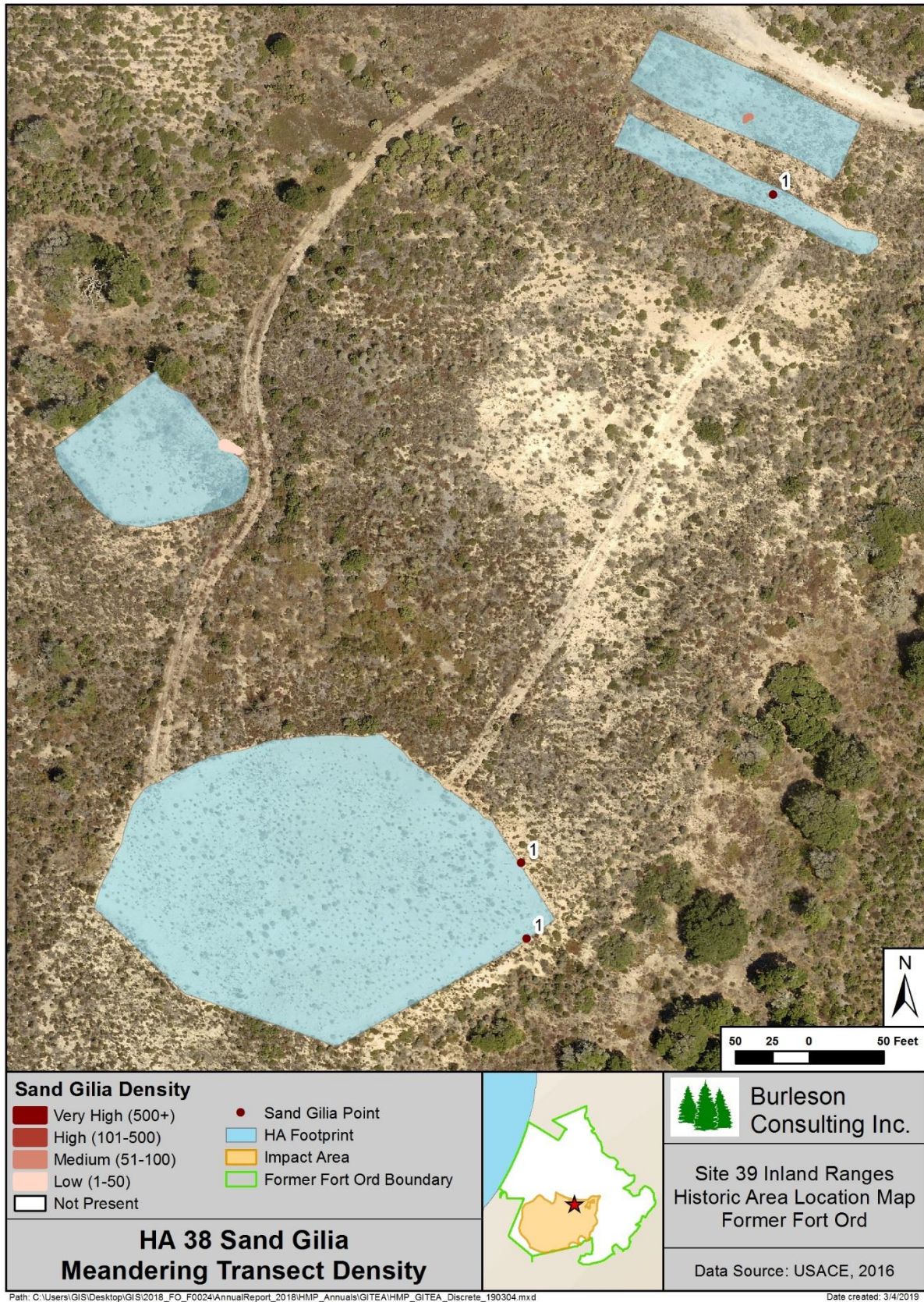
Figure 9-88. HA 38 Sand Gilia Meandering Transect Density Map

9.14.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 38. A total of ten shrub species and 133 individual plants were monitored for survivorship. By year 3 of monitoring, survivorship was 92% for the 2014 planting and 90% for the 2015 planting. Survivorship increased from 89% in 2016 for the 2015 planting. The increase in survivorship was attributed to some silk tassel plants being recorded as dead in year 2 and alive in year 3 due to new growth. Table 9-117 and Table 9-118 present results by species.

Table 9-117. Plant Survivorship Monitoring Summary for 2014 Planting at HA 38

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2014)	Year Two (2015)	Year Three (2016)
			Alive (%)	Alive (%)	Alive (%)
ADFA	163	16	100	100	100
ARHO*	123	12	100	100	100
ARMO*	123	12	100	100	100
ARTO	204	20	100	100	100
BAPI	82	8	100	75	75
CERI*	82	8	88	75	50
SAME	82	8	100	100	88
TOTAL	859	84	99	95	92

 * HMP Species

Table 9-118. Plant Survivorship Monitoring Summary for 2015 Planting at HA 38

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2015)	Year Two (2016)	Year Three (2017)
			Alive (%)	Alive (%)	Alive (%)
ARPU*	327	33	91	91	91
GAEL	82	8	100	67	75
LUAL	82	8	100	100	100
TOTAL	491	49	94	89	90

 * HMP Species

9.14.2.3 Species Richness

Fifty-one species were observed at HA 38. Of those, 27 were native shrubs or perennials, nine were native annual herbaceous species, and 15 were non-native species (see Table 9-119). Species richness increased by four species since 2017. Native shrub and perennial species decreased by four species, native herbaceous species remained the same, and non-native species increased by eight.

Table 9-119. Species Observed on HA 38, 2018

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**	Hooker's manzanita	ARHO
*Arctostaphylos montereyensis**	Monterey manzanita	ARMO
*Arctostaphylos pumila**	sandmat manzanita	ARPU

Table 9-119. Species Observed on HA 38, 2018

Scientific Name	Common Name	Code
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Bromus diandrus	ripgut grass	BRDI
Camissoniopsis micrantha	small primrose	CAMI
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
*Ceanothus rigidus**	Monterey ceanothus	CERI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Corethrogyne filaginifolia	common sandaster	COFI
Crocanthemum scoparium	peak rush-rose	CRSC
Croton californicus	California croton	CRCA
Diplacus aurantiacus	sticky monkeyflower	DIAU
*Ericameria fasciculata**	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filaree	ERCI
Eschscholzia californica	California poppy	ESCA
Festuca myuros	rattail sixweeks grass	FEMY
Festuca octoflora	sixweeks grass	FEOC
Garrya elliptica	coast silk tassel	GAEL
Gilia tenuiflora ssp. *arenaria**	sand gilia	GITEA
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
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus albifrons	silver bush lupine	LUAL
Lupinus chamissonis	silver beach lupine	LUCH
Lysimachia arvensis	scarlet pimpernel	LYAR
Plagiobothrys sp.	popcorn flower	PL
Plantago erecta	California plantain	PLER
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
Senecio vulgaris	common groundsel	SEVU
Silene gallica	small-flower catchfly	SIGA
Solanum umbelliferum	blue witch	SOUM
Toxicodendron diversilobum	poison oak	TODI

* HMP species

9.14.2.4 Vegetative Cover

Two line-intercept transects were conducted at HA 38. Transect 1 is 50 m and Transect 2 is 38.5 m. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 44.08%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 8.98%. Table 9-120 summarizes vegetative cover and Table 9-121 presents vegetative cover by species. Figure 9-89 presents the percent cover of dominant species at HA 38 in 2016, 2017, and 2018.

Table 9-120. 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	41.00	41.00	0.00	0.00	55.94	39.80
HA38T02	48.08	48.08	0.00	0.00	64.96	31.66
SITE AVERAGE*	**44.08**	**44.08**	**0.00**	**0.00**	**59.86**	**36.26**

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

Table 9-121. Transect Survey Results for HA 38 by Species

Transect	ACGL (%)	ADFA (%)	ARMO* (%)	ARPU* (%)	BAPI (%)	COFI (%)	CRSC (%)	DIAU (%)
HA38T01	0.64	8.44	1.02	1.60	0.00	0.64	5.24	0.76
HA38T02	1.30	0.00	0.00	0.00	1.53	0.00	3.66	0.00
SITE AVERAGE‡	**0.93**	**4.77**	**0.58**	**0.90**	**0.67**	**0.36**	**4.55**	**0.43**

Table 9-121 (continued). Transect Survey Results for HA 38 by Species

Transect	ERCO (%)	ERFA* (%)	HOCU (%)	LUAL/LUCH[†] (%)	PTAQP (%)	SAME (%)	TODI (%)	TH (%)	BG (%)
HA38T01	0.32	0.22	0.52	20.60	1.00	0.00	0.00	55.94	39.80
HA38T02	0.00	0.00	0.00	31.74	3.14	2.05	4.65	64.96	31.66
SITE AVERAGE‡	**0.18**	**0.12**	**0.29**	**25.45**	**1.93**	**0.89**	**2.02**	**59.86**	**36.26**

* HMP species
† Due to subtle phenological differences between *Lupinus albifrons* var. *albifrons* and *Lupinus chamissonis* and the timing of surveys, the two species were combined for analysis of transect survey data and comparison to the success criteria (see section 6.1.4).
‡ Transect lengths are not equal. Site averages are weighted to reflect differing lengths.
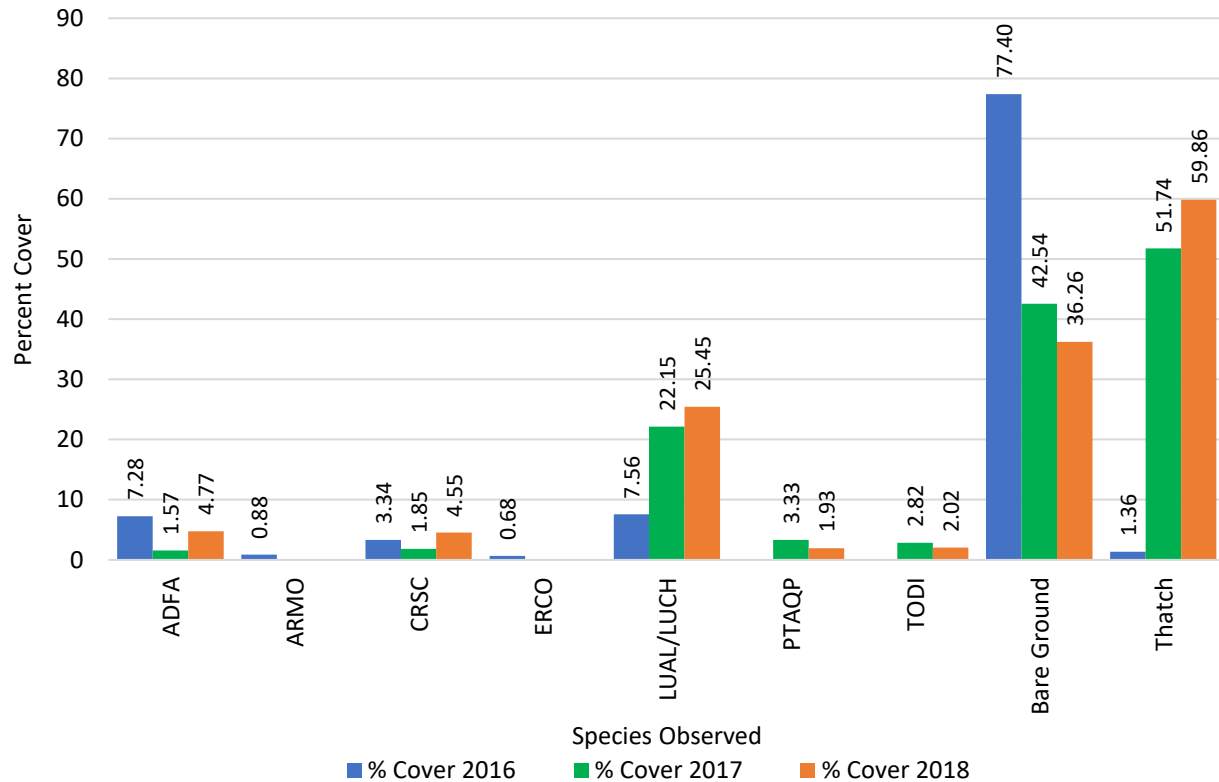
Figure 9-89. Percent Cover of Dominant Species at HA 38 in 2016, 2017, and 2018.

9.14.3 Discussion

9.14.3.1 Recommendations

HA 38 was in year 4 of monitoring in 2018 and responded well to previous restoration efforts. The site met four of six success criteria by 2018. 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. The Army also recommends planting Monterey ceanothus to support the HMP shrub cover success criteria. Overall, HA 38 needs time to respond to the restoration effort and continued monitoring to evaluate its progress. A qualitative overview was documented by photo points (see Appendix D, page D-14).

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 5, 2019. Table 9-122 summarizes the current status of HA including which success criteria were met and recommendations.

Table 9-122. Status and Recommendations for Achieving 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	Plant Monterey ceanothus†
Objective 3 – No. 4	HMP annual density	No	Establish restoration plots for seaside bird's beak*†

* Recommendation repeated from the 2017 Annual Habitat Restoration Report (Burleson, 2018).
† Not scheduled

9.14.3.2 HMP Annual Density

Monterey spineflower density was within the acceptable limit for HMP annual density at HA 38. The SSRP baseline density class for Monterey spineflower was low. Year 4 and year 1 Monterey spineflower restoration plot results show that the density met the success criterion under Objective 3 for all plots. In addition, Monterey spineflower was present outside the restoration plots. Discrete patches, with density that met or exceeded the success criterion, covered 0.14 acres of HA 38.

Sand gilia density was within the acceptable limit for HMP annual density at HA 38. The SSRP baseline density class for sand gilia was low. Year 1 sand gilia restoration plot results show that the density met the success criterion under Objective 3 for two out of four plots. In addition, sand gilia was present outside the restoration plots. Discrete patches, with density that met or exceeded the success criterion, covered 0.002 acres of HA 38.

9.14.3.3 Plant Survivorship

Plant survivorship was high for the 2014 and 2015 plantings at HA 38. Monterey ceanothus, coyote brush, and silk tassel had moderate survivorship and all other species had high survivorship.

9.14.3.4 Species Richness

Chamise, shaggy-bark manzanita, Monterey manzanita, sandmat manzanita, Hooker's manzanita, Monterey ceanothus, coyote brush, deerweed, and black sage were present. HA 38 included 27 native shrub and perennial species and met the success criterion for Objective 1.

9.14.3.5 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). These species contributed 39.76% cover to the HA; therefore, this success criterion was met. In 2017, vegetative cover was 28.94%; cover increased by 10.82% (see Figure 9-90).
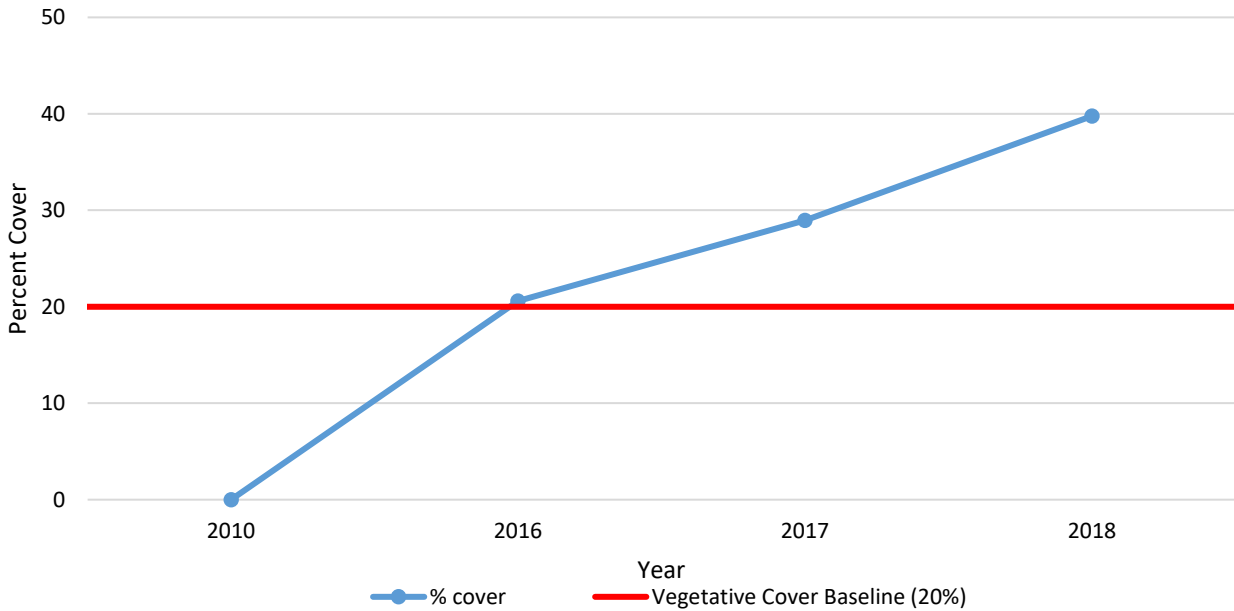
Figure 9-90. Native Vegetative Cover Compared to the Success Criterion at HA 38

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 2. Cover class 2 ranges from 1-5% of absolute cover. The HMP shrub species at HA 38 provided an absolute cover of 1.48%, which is a decrease from 1.56% in 2017. The HA 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, 1% for Monterey ceanothus, 1% for Hooker's manzanita, and 4% for sandmat manzanita. The average vegetative cover for Monterey manzanita was 0.58%, Monterey ceanothus was 0.00%, Hooker's manzanita was 0.00%, and sandmat manzanita was 0.90% (see Figure 9-91). None of the species met the acceptable limit; therefore, the success criterion was not met. Transect HA38T01 was difficult to place because it spanned a hill so that the start and end were not both visible when laying the tape; this resulted in slight differences in transect placement that were reflected in the decrease in Hooker's manzanita and increase in sandmat manzanita from 2017 to 2018.

* The decrease in Hooker's manzanita and increase in sandmat manzanita from 2017 to 2018 were due to transect placement.
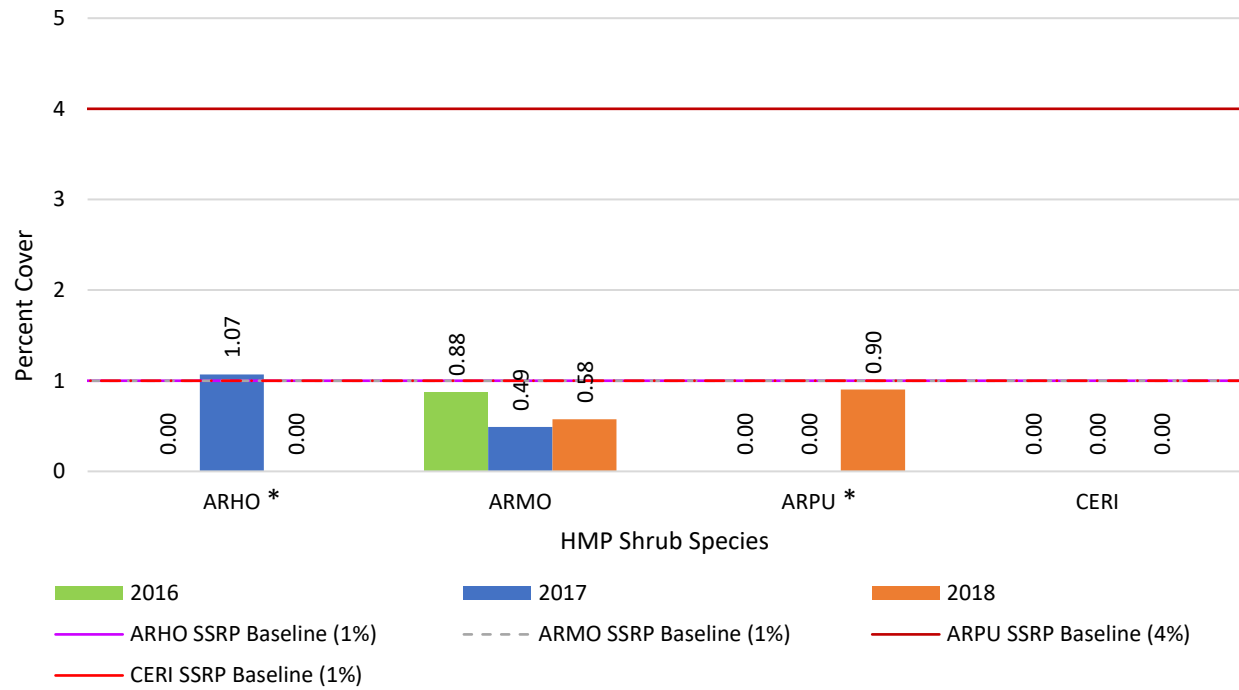
Figure 9-91. HMP Shrub Species Comparison to Success Criteria at HA 38

9.15   HA 39/40

HA 39/40 was used by the Army as a small-arms firing range. Soil remediation was completed in 2010; approximately 6,500 cubic yards of soil were 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 of similar maritime climates (USFS, 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 on baseline data from transects within the footprint as well as supplemental species appropriate for each plot (Shaw, 2009a). Baseline transects 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 dominated by clustered field sedge (*Carex praegracilis*) and rattail sixweeks grass (*Festuca myuros*). Plot 3 had one native species present and was dominated by clustered field sedge and ripgut brome (*Bromus diandrus*). Plot 4 had 16 native species present across three transects and was dominated by ripgut brome with a mixture of non-native grasses and common yarrow 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 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 (USFS, 2007).

The SSRP restoration procedure for HA 39/40 included both passive and active restoration consisting of hand broadcast non-irrigated seed and installing native container-grown plants. HA 39/40 is relatively flat to moderately sloped and has some potential for erosion; special care should be taken to prevent runoff from entering the vernal pool.

Restoration at HA 39/40 began in 2011 and was completed in 2013. Monitoring began in 2013. HA 39/40 was monitored for eight years by photo documentation and site visits, six years for HMP annual density in plots, and three years for HMP annual density across the HA, species richness, and vegetative cover (see Table 9-123). Figure 9-92 shows the HA footprint, passive restoration area, active restoration area, and transect survey locations. Success criteria for HA 39/40 are summarized in Table 9-124.

Table 9-123. Historic Summary of Restoration and Monitoring Activities at HA 39/40

Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2020	2025
Restoration: Active, Passive, Erosion Control	●	●	●							
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 9-92. HA 39/40 Restoration Areas and Monitoring Locations Map

Table 9-124. Success Criteria and Acceptable Limits for Restoration of HA 39/40

	Objective 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 of the SSRP†
	Objective 2*		
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*		
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	Monterey spineflower density class: Low Sand gilia density class: Low Seaside bird's beak density class: Low

* Objectives presented in HRP (Shaw, 2009b)
† Each habitat zone (P1-P4) will be evaluated separately based on its unique plant palette

9.15.1 Restoration Activities

Burleson performed passive restoration at HA 39/40 in 2012 and 2013. No additional passive restoration activities occurred in 2018. The total amount of seed broadcast on site was 77.533 lb compared to 77.270 lb prescribed in the SSRP. Table 9-125 summarizes the SSRP seed target and the amount of seed applied by year and species. 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.

Table 9-125. Summary of Passive Restoration Activities for HA 39/40

Species	Pounds of Seed Broadcast				
	SSRP Target	2012 (Jan)	2012 (Dec)	2013 (Oct)	Total by Species
ACGL	3.820	1.900	1.914	-	3.814
ACMI	2.290	1.200	1.140	-	2.340
ARDO	0.210	0.105	0.105	-	0.210
BAPI	0.340	-	0.618	-	0.618
Carex sp.	0.210	-	-	-	-
CHPUP*	0.080	0.070	0.040	-	0.110
CORIL*	0.080	0.046	0.040	-	0.086
CRCA	0.550	0.300	0.275	-	0.575
DIAU	0.220	0.700	0.177	-	0.877
DISP	0.210	-	-	-	-
ELGL	22.140	-	23.400	-	23.400
ESCA	2.290	-	0.551	-	0.551
GITEA*	0.080	-	0.018	0.021	0.039
HOCU	4.500	2.300	2.251	-	4.551
HO	22.140	0.000	26.918	-	26.918
JUPA	0.550	0.400	0.275	-	0.675
LUAL	2.290	0.900	1.387	-	2.287
LUAR	2.290	1.300	1.146	-	2.446
LUNA	2.460	-	2.461	-	2.461
SOVE	0.550	0.300	0.275	-	0.575
STCE	4.580	-	-	-	-
STPU	4.840	2.200	2.420	-	4.620
TRWI	0.550	-	0.380	-	0.380
TOTAL	**77.270**	**11.721**	**65.791**	**0.021**	**77.533**

* HMP species

Burleson completed active restoration 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 2,130 prescribed in the SSRP. Table 9-126 summarizes the plants installed during active restoration.

Table 9-126. Summary of Active Restoration Activities at Plot 4 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.	-	-	623	623
DIAU	75	75	-	75
DISP	-	-	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	**2,130**	**1,470**	**1,348**	**2,818**

9.15.2 Monitoring Results

HA 39/40 was in year 6 of monitoring in 2018. Even though year 6 was not a required monitoring year, monitoring occurred and results are presented below.

9.15.2.1 HMP Annual Density

Monterey spineflower, sand gilia, and seaside bird's beak restoration plots were monitored for density at HA 39/40.

Two Monterey spineflower plots were surveyed for year 6 density at HA 39/40 in 2018. The plots are numbered 1 and 2 on Figure 9-94 and are primarily located on the southwestern part of the site. Monterey spineflower density was low at Plots 1 and 2. Figure 9-93 presents Monterey spineflower restoration plot densities.
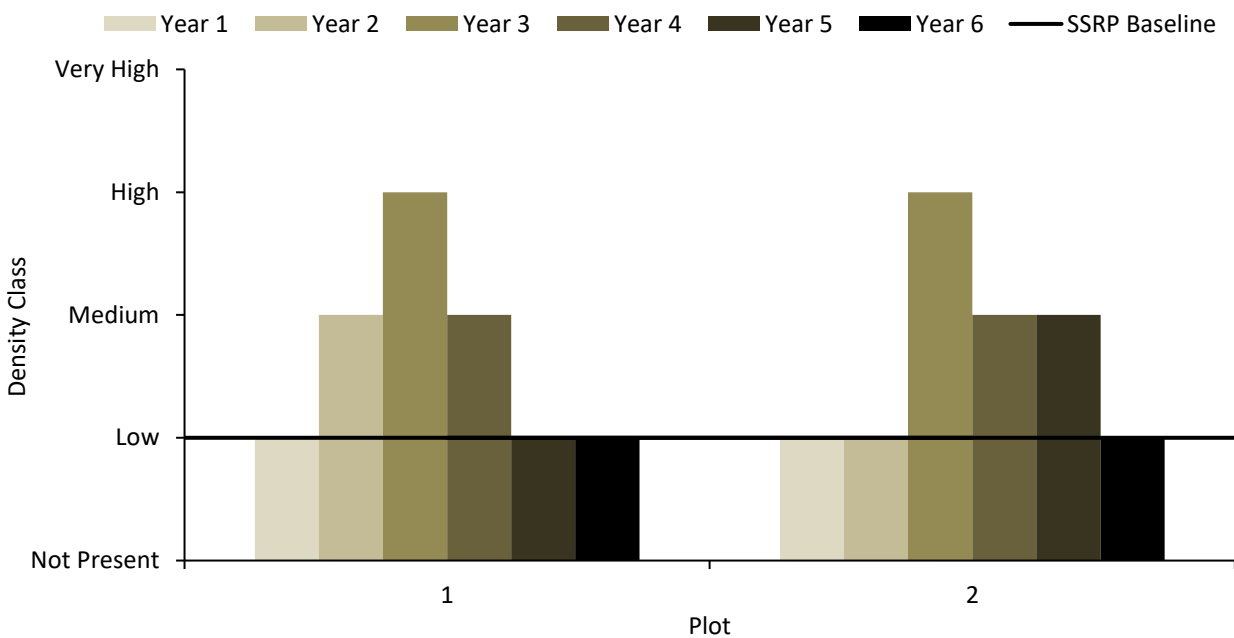
Figure 9-93. HA 39/40 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots-1-2
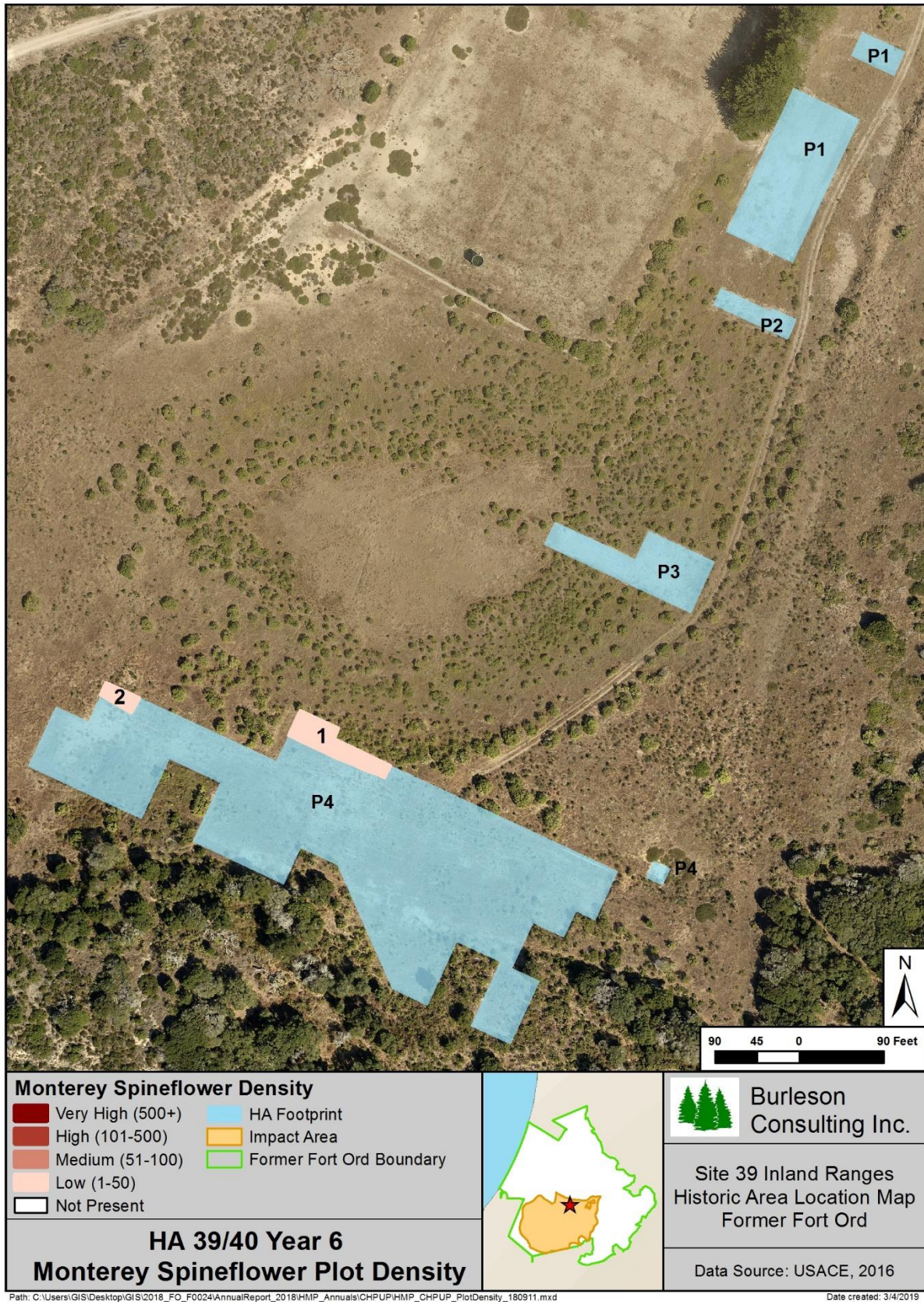
Figure 9-94. HA 39/40 Year 6 Monterey Spineflower Plot Density Map

Five sand gilia plots were surveyed for year 5 (Plots 2-5) and year 6 (Plot 1) density at HA 39/40 in 2018. The plots are numbered 1-5 on Figure 9-96 and are located throughout the site. Sand gilia density was low at Plots 1, 4, and 5. Sand gilia was not present at Plots 2 and 3. Figure 9-95 presents sand gilia restoration plot densities for HA 39/40.
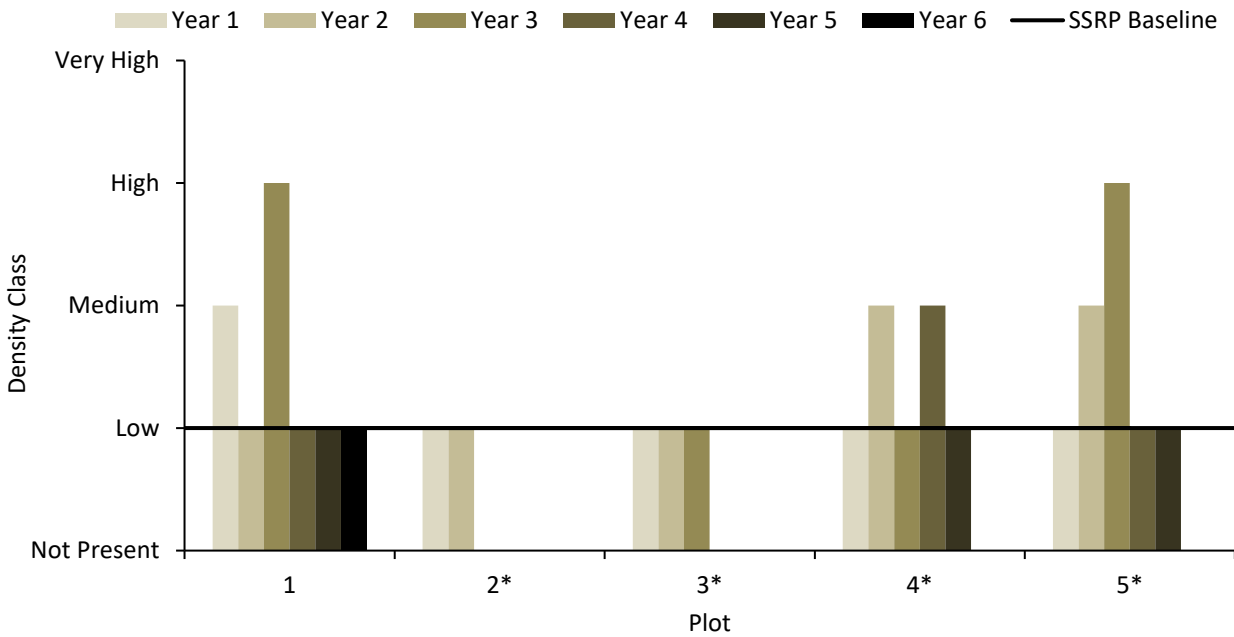
* Plots 2-5 were established in 2014 and have only been monitored for years 1-5

Figure 9-95. HA 39/40 Comparison of Sand Gilia Density Classes to the SSRP Baseline for Plots 1-5
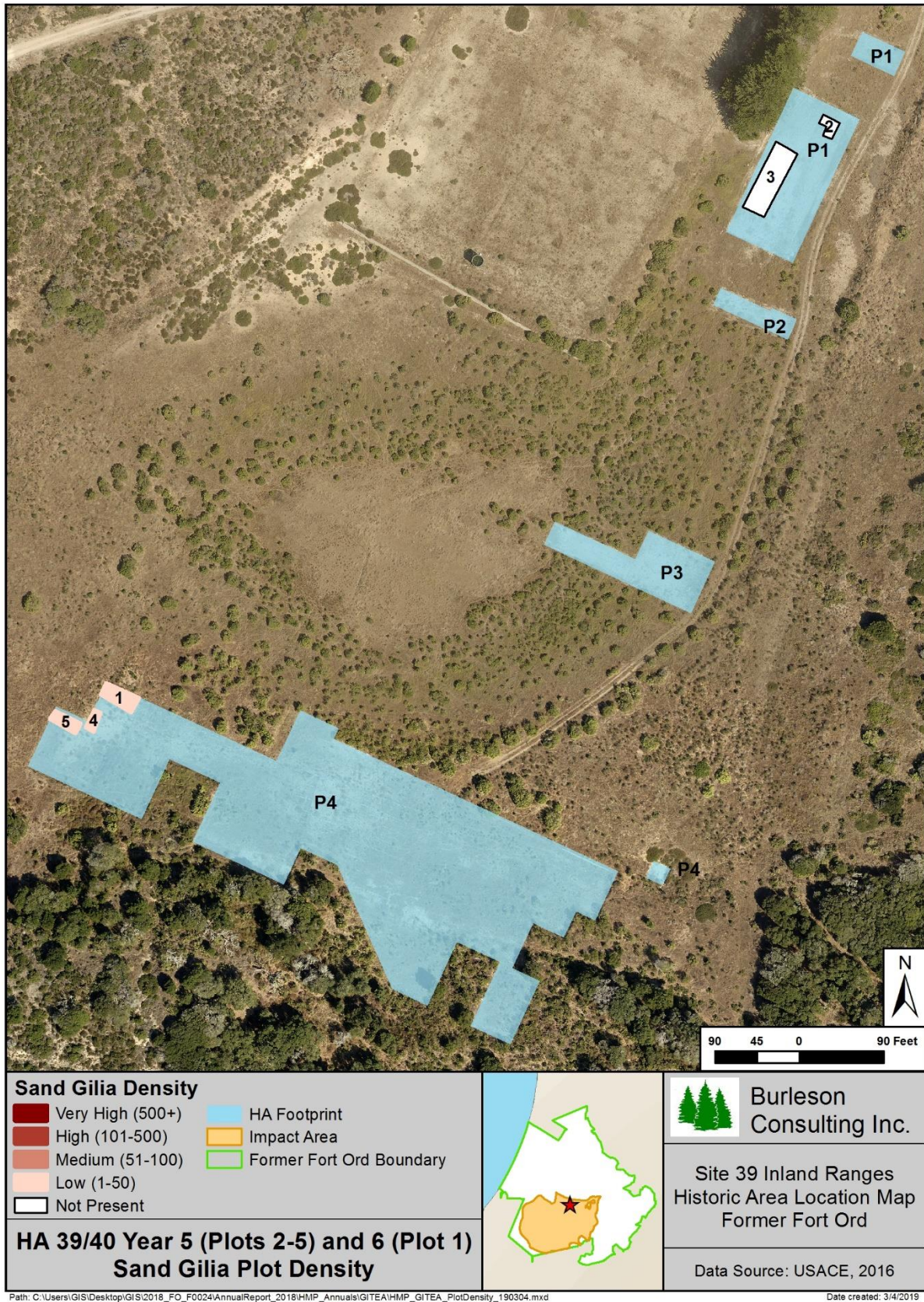
Figure 9-96. HA 39/40 Year 5 (Plots 2-5) and Year 6 (Plot 1) Sand Gilia Plot Density Map

One seaside bird's beak plot was surveyed for year 6 density at HA 39/40 in 2018. The plot is numbered 1 on Figure 9-98 and is located on the southeastern part of the site. Seaside bird's beak density was low at Plot 1. Figure 9-97 presents seaside bird's beak restoration plot densities for HA 39/40.
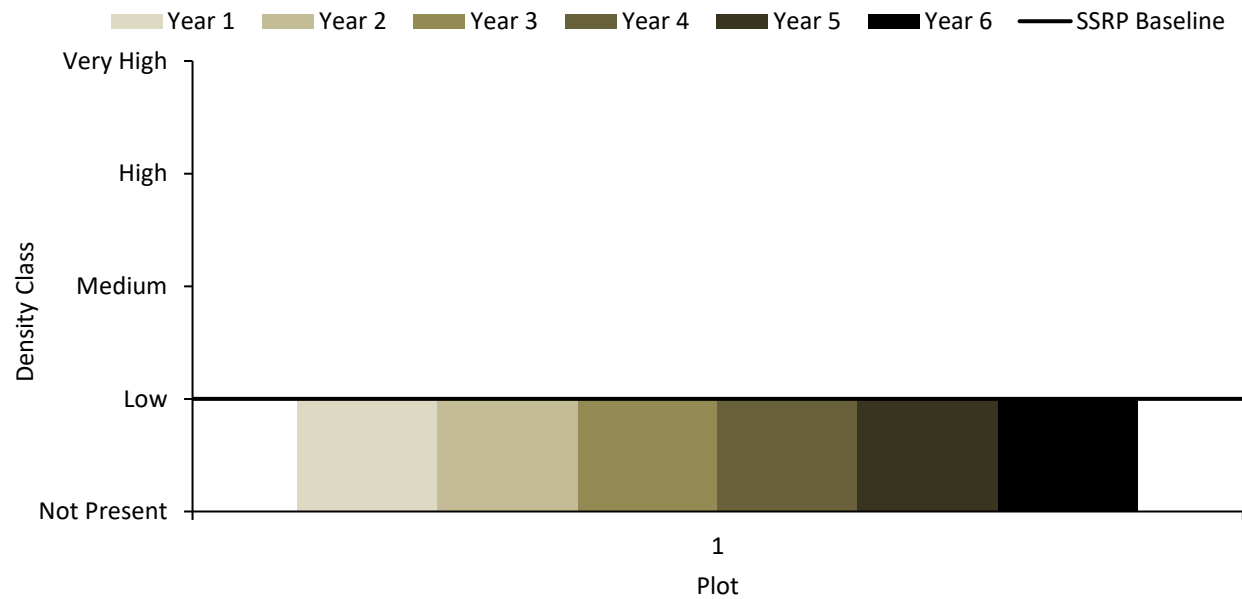
Figure 9-97. HA 39/40 Comparison of Seaside Bird's Beak Density Classes to the SSRP Baseline for Plot 1
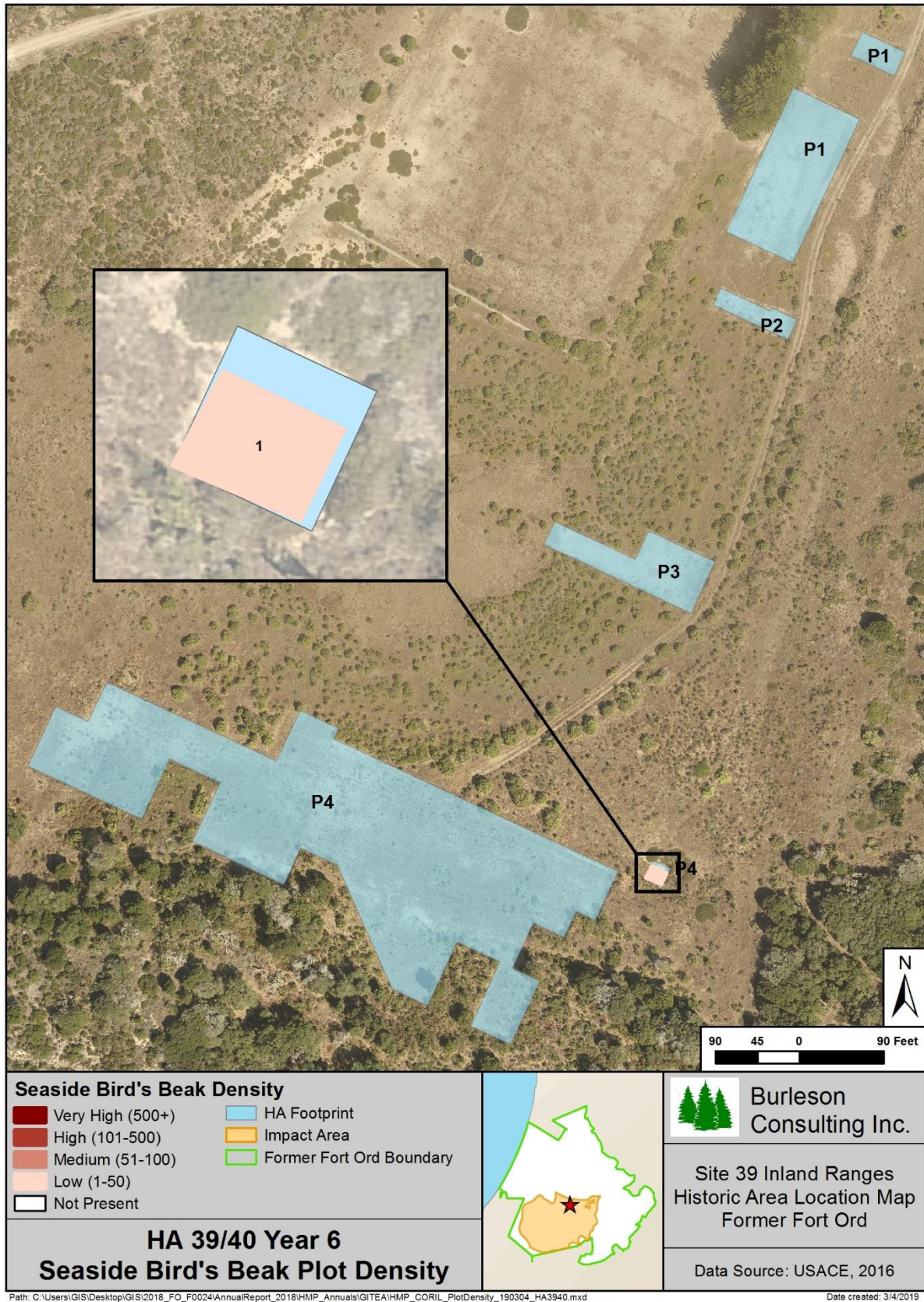
Figure 9-98. HA 39/40 Year 6 Seaside Bird's Beak Plot Density Map

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 at HA 39/40.

Six individual plants and five discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 9-99). The densities ranged from low to high and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.07 acres. From 2017 to 2018, the density range and acreage above the SSRP baseline increased.

Sand gilia was not observed outside the restoration plots in 2018.

Seaside bird's beak was not observed outside the restoration plot in 2018.
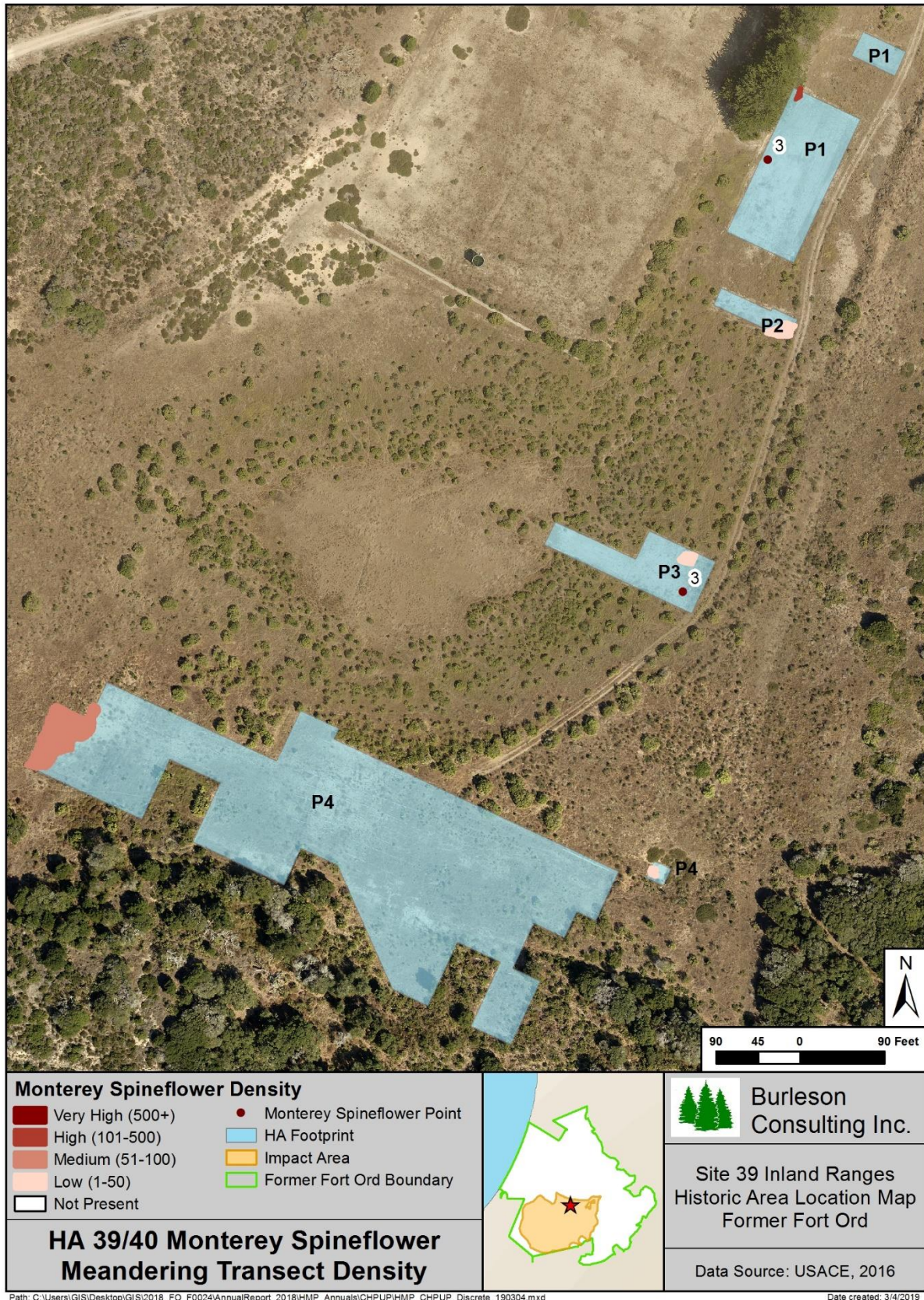
Figure 9-99. HA 39/40 Monterey Spineflower Meandering Transect Density Map

9.15.2.2 Plant Survivorship

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

### 9.15.2.3 Species Richness

One hundred forty-four species were observed at HA 39/40. Of those, 70 were native shrubs or perennials, 42 were native annual herbaceous species, and 32 were non-native species (see Table 9-127). Species richness increased by 56 species since 2017. Native shrub and perennial species increased by 31, native herbaceous species increased by 13, and non-native species increased by 12.

Table 9-127. Species Observed on HA 39/40, 2018

Scientific Name	Common Name	Code
Achillea millefolium	common yarrow	ACMI
Acmispon americanus var. *americanus*	Spanish clover	ACAMA
Acmispon glaber	deerweed	ACGL
Acmispon parviflorus	hill lotus	ACPA
Acmispon strigosus	Bishop's lotus	ACST
Agoseris grandiflora	large-flowered agoseris	AGGR
Agrostis exarata	spike bent grass	AGEX
Agrostis hallii	Hall's bent grass	AGHA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos pumila*	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Artemisia douglasiana	mugwort	ARDO
Avena barbata	slender wild oat	AVBA
Baccharis glutinosa	salt marsh baccharis	BAGL
Baccharis pilularis	coyote brush	BAPI
Briza minor	small quaking grass	BRMI
Bromus carinatus	California brome	BRCA
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Camissonia contorta	contorted primrose	CACO
Cardionema ramosissimum	sand mat	CARA
Carex barbarae	Santa Barbara sedge	CABA
Carex brevicaulis	short stem sedge	CABR8
Carex praegracilis	freeway sedge	CAPR
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
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**	Monterey spineflower	CHPUP
Cirsium occidentale	cobwebby thistle	CIOC
Clarkia lewisii	Lewis' clarkia	CLLE
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ
Claytonia perfoliata	miner's lettuce	CLPE
Clinopodium douglasii	yerba buena	CLDO
Collinsia heterophylla var. *heterophylla*	Chinese-houses	COHEH
Cordylanthus rigidus ssp. *littoralis**	seaside bird's-beak	CORIL
Corethrogyne filaginifolia	common sandaster	COFI
Crassula connata	pygmy-weed	CRCO

Table 9-127. Species Observed on HA 39/40, 2018

Scientific Name	Common Name	Code
Crocanthemum scoparium	peak rush-rose	CRSC
Croton californicus	California croton	CRCA
Cyperus eragrostis	tall cyperus	CYER
Danthonia californica	California oat grass	DACA
Dichelostemma capitatum	blue dicks	DICA
Diplacus aurantiacus	sticky monkeyflower	DIAU
Distichlis spicata	salt grass	DISP
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW
Elymus condensatus	giant wild-rye	ELCO
Elymus glaucus	blue wild-rye	ELGL
Elymus triticoides	beardless wild rye	ELTR
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata*	Eastwood's goldenbush	ERFA
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filaree	ERCI
Eschscholzia californica	California poppy	ESCA
Euthamia occidentalis	western goldenrod	EUOC
Festuca myuros	rattail sixweeks grass	FEMY
Galium aparine	goose grass	GAAP
Galium californicum	California bedstraw	GACA
Galium porrigens	climbing bedstraw	GAPO
Gamochaeta ustulata	purple cudweed	GAUS
Geranium dissectum	cut-leaved geranium	GEDI
Gilia tenuiflora ssp. *arenaria**	sand gilia	GITEA
Heliotropium curassavicum var. *oculatum*	seaside heliotrope	HECUO
Hesperocyparis macrocarpa	Monterey cypress	HEMA
Heterotheca grandiflora	telegraph weed	HEGR
Hordeum brachyantherum	meadow barley	HOBR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's ear	HYGL
Hypochaeris radicata	rough cat's ear	HYRA
Juncus balticus ssp. *ater*	baltic rush	JUBAA
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus capitatus	Dwarf rush	JUCA
Juncus phaeocephalus	brown-headed rush	JUPH
Lastarriaea coriacea	leather spineflower	LACO
Lasthenia gracilis	common goldfields	LAGR
Layia platyglossa	tidy-tips	LAPL
Lepechinia calycina	pitcher sage	LECA
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus albifrons	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	miniature lupine	LUBI
Lupinus nanus	sky lupine	LUNA
Luzula comosa var. *comosa*	Pacific wood rush	LUCOC

Table 9-127. Species Observed on HA 39/40, 2018

Scientific Name	Common Name	Code
Lysimachia arvensis	scarlet pimpernel	LYAR
Lythrum hyssopifolia	grass poly	LYHY
Madia gracilis	slender tarweed	MAGR
Madia sativa	coast tarweed	MASA
Marah fabacea	wild cucumber	MAFA
Medicago polymorpha	California burclover	MEPO
Melica torreyana	Torrey's melic	METO
Melilotus indicus	yellow sweetclover	MEIN
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHAP
Nuttallanthus texanus	blue toadflax	NUTE
Pennisetum clandestinum	Kikuyu grass	PECL
Petrorhagia dubia	hairypink	PEDU
Piperia sp.	rein orchid	PI
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Plantago lanceolata	English plantain	PLLA
Platystemon californicus	cream cups	PLCA
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium stramineum	cotton-batting plant	PSST
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP
Quercus agrifolia	coast live oak	QUAG
Ranunculus californicus var. *californicus*	common buttercup	RACAC
Ribes speciosum	fuchsia-flowered gooseberry	RISP
Rubus ursinus	California blackberry	RUUR
Rumex acetosella	sheep sorrel	RUAC
Rumex crassus	willow leaved dock	RUCR2
Rumex salicifolius	willow leaved dock	RUSA
Salix sp.	willow	SA
Sanicula crassicaulis	Pacific sanicle	SACR
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Solanum umbelliferum	blue witch	SOUM
Sonchus asper	prickly sow thistle	SOAS
Stachys ajugoides	bugle hedge-nettle	STAJ
Stachys bullata	wood mint	STBU
Stipa cernua	nodding needle grass	STCE
Stipa pulchra	purple needle grass	STPU
Symphoricarpos albus var. *laevigatus*	common snowberry	SYALL
Thysanocarpus laciniatus	narrow leaved fringe pod	THLA
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium depauperatum var. *truncatum*	truncate sack clover	TRDET
Trifolium dubium	little hop clover	TRDU
Trifolium gracilentum	pinpoint clover	TRGR

Table 9-127. Species Observed on HA 39/40, 2018

Scientific Name	Common Name	Code
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 ludoviciana ssp. *ludoviciana*	slender vetch	VILUL
Vicia sativa ssp. *nigra*	narrow-leaved vetch	VISAN
Zeltnera davyi	Davy's centaury	ZEDA

* HMP species

9.15.2.4 Vegetative Cover

Three 50-meter line-intercept transects and six associated quadrats were conducted at HA 39/40. These surveys indicated that the mean vegetative cover by native shrubs and perennials was 17.27%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 6.86%. Quadrats were completed along the transect line when 10% or more of the transect line was herbaceous cover, in accordance with the *Protocol for Conducting Vegetation Monitoring* (Burleson, 2009).Table 9-128 summarizes vegetative cover and Table 9-129 presents vegetative cover by species. Figure 9-100 presents the percent cover of dominant species at HA 39/40 in 2016, 2017, and 2018 and Table 9-130 presents quadrat results.

Table 9-128. 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	25.64	22.50	0.22	2.92	100.00	0.00
HA39/40T02	32.30	26.38	5.92	0.00	100.00	0.00
HA39/40T03	28.56	2.92	2.38	23.26	100.00	0.00
SITE AVERAGE	**28.83**	**17.27**	**2.84**	**8.73**	**100.00**	**0.00**

Table 9-129. Transect Survey Results for HA 39/40 by Species

Transect	ACGL (%)	ACMI (%)	BAPI (%)	ELGL (%)	ERCA (%)	GAUS (%)	HEGR (%)	HOCU (%)
HA39/40T01	2.70	1.12	6.20	5.06	0.00	0.82	0.00	1.80
HA39/40T02	0.00	0.00	13.50	1.26	0.00	0.94	4.60	0.00
HA39/40T03	0.00	0.00	0.30	0.00	0.34	0.00	2.04	2.08
SITE AVERAGE	0.90	0.37	6.67	2.11	0.11	0.59	2.21	1.29

Table 9-129 (continued). Transect Survey Results for HA 39/40 by Species

Transect	LUAR (%)	MAGR (%)	PLCO (%)	RUAC (%)	STPU (%)	TODI (%)	TH (%)	BG (%)
HA39/40T01	0.00	0.22	0.50	2.42	3.44	1.36	100.00	0.00
HA39/40T02	0.00	1.32	0.00	0.00	7.98	2.70	100.00	0.00
HA39/40T03	0.54	0.00	23.26	0.00	0.00	0.00	100.00	0.00
SITE AVERAGE	0.18	0.51	7.92	0.81	3.81	1.35	100.00	0.00
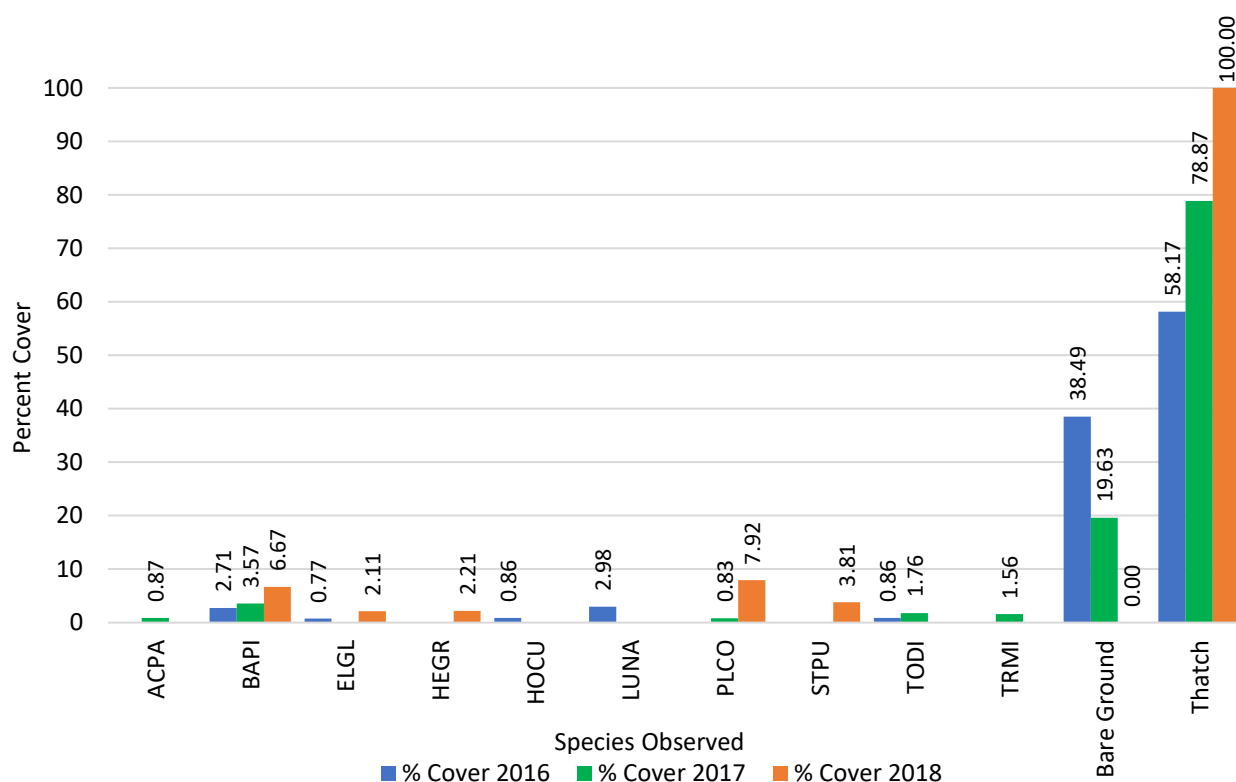
Figure 9-100. Percent Cover of Dominant Species at HA 39/40 in 2016, 2017, and 2018.

Table 9-130. Quadrat Summary for HA39/40 Transect T01

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA39/40T01Q01	7	0	5	2	40	53
HA39/40T01Q02	8	0	1	7	45	47
HA39/40T01Q03	15	5	1	9	20	65
HA39/40T01Q04	8	0	1	7	25	67
HA39/40T01Q05	15	0	3	12	65	20
HA39/40T01Q06	12	2	6	4	30	58
SITE AVERAGE	**11**	**1**	**3**	**7**	**38**	**52**

9.15.3 Discussion

9.15.3.1 Recommendations

HA 39/40 was in year 6 of monitoring in 2018 and responded variably well to previous restoration efforts. The site met four of five success criteria by 2018. The SSRP success criteria specified that each habitat zone (Plots 1-4) will be evaluated separately based on its unique plant pallet. Currently, only Plots 1 and 4 have 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 similar and it may not be necessary to evaluate them separately since Plot 1 already has a transect and Plot 2 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 Plots 1 and 2, 2) plant coyote brush and yellow bush lupine in Plots 1 and 2, and 3) plant *Juncus* sp., clustered field sedge, and saltgrass 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 was documented by photo points (see Appendix D, page D-15).

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 9-131 summarizes the current status of HA 39/40 including which success criteria were met and recommendations.

Table 9-131. Status and Recommendations for Achieving 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 and 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

* Recommendation repeated from the 2017 Annual Habitat Restoration Report (Burleson, 2018).
† Not scheduled

9.15.3.2 HMP Annual Density

Monterey spineflower density was within the acceptable limit for HMP annual density at HA 39/40. The SSRP baseline density class for Monterey spineflower was low. Year 6 Monterey spineflower restoration plot results show that the density met or exceeded the success criterion under Objective 3 for all plots. In addition, Monterey spineflower was present outside the restoration plots. Discrete patches, with density that met or exceeded the success criterion, covered 0.07 acres of HA 39/40.

Sand gilia density was within the acceptable limit for HMP annual density at HA 39/40. The SSRP baseline density class for sand gilia was low. Year 6 and year 5 sand gilia restoration plot results show that the density met or exceeded the success criterion under Objective 3 for three out of five plots. Sand gilia was not observed outside the restoration plots. Plots 2 and 3 were located in an area with compacted silty soil, instead of loose sandy soil that is better suited for sand gilia.

Seaside bird's beak density was within the acceptable limit for HMP annual density at HA 39/40. The SSRP baseline density class for seaside bird's beak was low. Year 6 seaside bird's beak restoration plot results show that the density met or exceeded the success criterion under Objective 3. Seaside bird's beak was not observed outside of the restoration plot.

Monterey spineflower, sand gilia, and seaside bird's beak restoration plot results indicated that all the HMP species met the success criterion.

9.15.3.3 Plant Survivorship

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

9.15.3.4 Species Richness

Common yarrow, coyote brush, sedge (*Carex* sp.), blue wild-rye (*Elymus glaucus*), California poppy (*Eschscholzia californica*), wedge leaved horkelia, yellow bush lupine (*Lupinus arboreous*), silver bush lupine, saltgrass (*Distichlis spicata*), deerweed, sticky monkeyflower, and rush (*Juncus* sp.) were present. HA 39/40 included 70 native shrubs and perennials and met the success criterion for Objective 1.

9.15.3.5 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 15.33% native vegetative cover; therefore, this success criterion was not met. In 2017, vegetative cover was 8.37%; cover increased by 6.96% (see Figure 9-101).
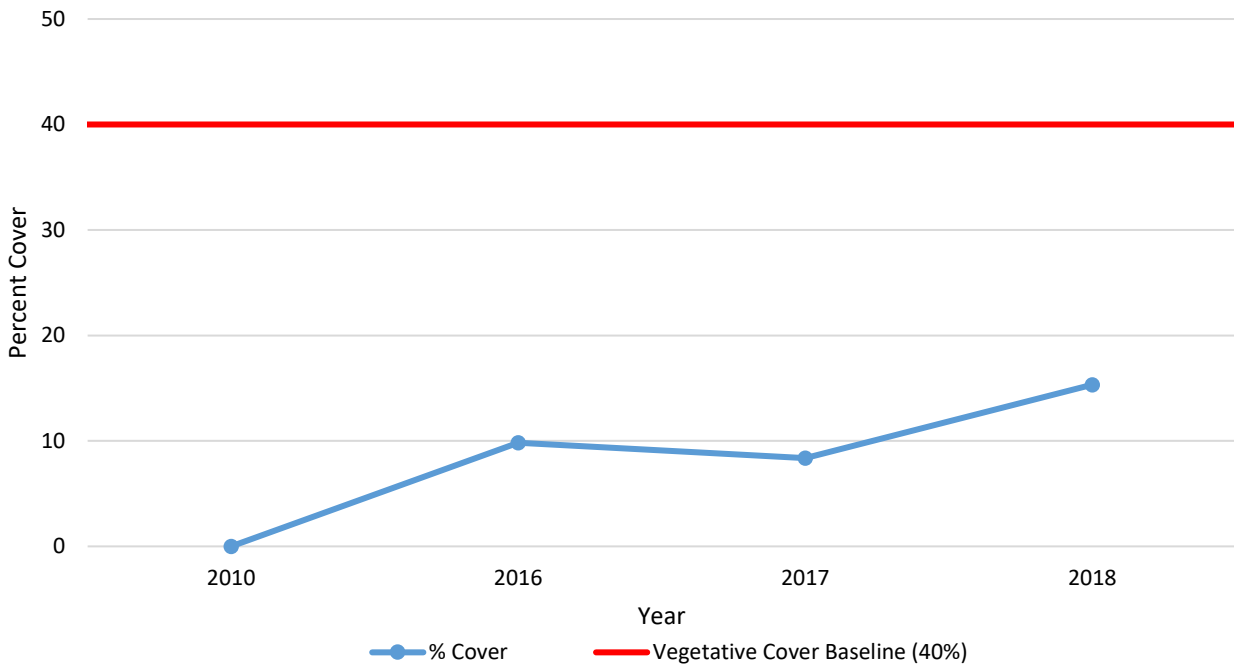
Figure 9-101. Native Vegetative Cover Compared to the Success Criterion at HA 39/40

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 1. Cover class 1 is 0% of absolute cover. The HMP shrub species at HA 39/40 provided an absolute cover of 0.00%. The HA 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.

9.16   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; 150 cubic yards of lead-contaminated soil were excavated from 0.09 acres. HA 43 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of similar maritime climates (USFS, 2007). HA 43 is relatively flat with surface water runoff draining to the west. Adjacent lands are high quality habitat areas which contain intact native vegetation that may promote natural recruitment within 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 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 (USFS, 2007).

The SSRP 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 occurred in 2011 and 2012. Monitoring began in 2013. HA 43 was monitored for eight years by photo documentation and site visits, six years for HMP annual density in plots, and three years for HMP annual density across the HA, species richness, and vegetative cover (see Table 9-132). Figure 9-102 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 43 are summarized in Table 9-133.

Table 9-132. Historic Summary of Restoration and Monitoring Activities at HA 43

Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	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						●*	●	●	●	●

* Vegetative cover was monitored using quadrats in 2016

Figure 9-102. HA 43 Restoration Areas and Monitoring Locations Map

Table 9-133. Success Criteria and Acceptable Limits for Restoration of HA 43

| No.	Success Element	Decision Rule	Acceptable Limits
Objective 1*			
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† shaggy-bark manzanita coyote brush Monterey ceanothus† 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 of the SSRP
Objective 2*			
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*			
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
			Eastwood's goldenbush percent cover, as an average of transect data, must be equal or greater than 1

Table 9-133. Success Criteria and Acceptable Limits for Restoration of HA 43

	Objective 3*		
4	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Monterey spineflower density class: Medium Sand gilia density class: Medium Seaside bird's beak density class: Medium

* Objectives presented in HRP (Shaw, 2009b)

† HMP Species

9.16.1 Restoration Activities

Burleson performed passive restoration at HA 43 in 2011 and 2012. No additional passive restoration activities occurred in 2018 and no active restoration was prescribed. The total amount of seed broadcast on site was 2.539 lb compared to 1.943 lb prescribed in the SSRP. Table 9-134 summarizes the SSRP seed target and the amount of seed applied by year and species. 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.

Table 9-134. Summary of Passive Restoration Activities 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*	0.090	0.049	0.059	0.108
ARTO	0.180	0.092	0.102	0.194
BAPI	0.014	-	0.008	0.008
CERI*	0.090	0.052	0.055	0.107
CHPUP*	0.001	0.011	0.002	0.013
CORIL*	0.001	0.001	0.007	0.008
CRSC	0.090	0.049	0.069	0.118
ERCO	0.027	0.016	0.023	0.039
ERFA*	0.009	0.007	0.006	0.013
FRCA	0.090	0.046	0.046	0.092
GITEA*	0.001	-	0.002	0.002
HO	0.810	-	0.836	0.836
HOCU	0.180	0.091	0.094	0.185
SAME	0.090	0.050	0.056	0.106
TOTAL	**1.943**	**1.025**	**1.514**	**2.539**

* HMP species

9.16.2 Monitoring Results

HA 43 was in year 6 of monitoring in 2018. Even though year 6 was not a required monitoring year, monitoring occurred and results are presented below.

9.16.2.1 HMP Annual Density

Monterey spineflower, sand gilia, and seaside bird's beak restoration plots were monitored for density at HA 43.

One Monterey spineflower plot was surveyed for year 6 density at HA 43 in 2018. The plot is numbered 1 on Figure 9-104 and located in the southern part of the site. Monterey spineflower density was low in Plot 1. Figure 9-103 presents Monterey spineflower restoration plot densities for HA 43.
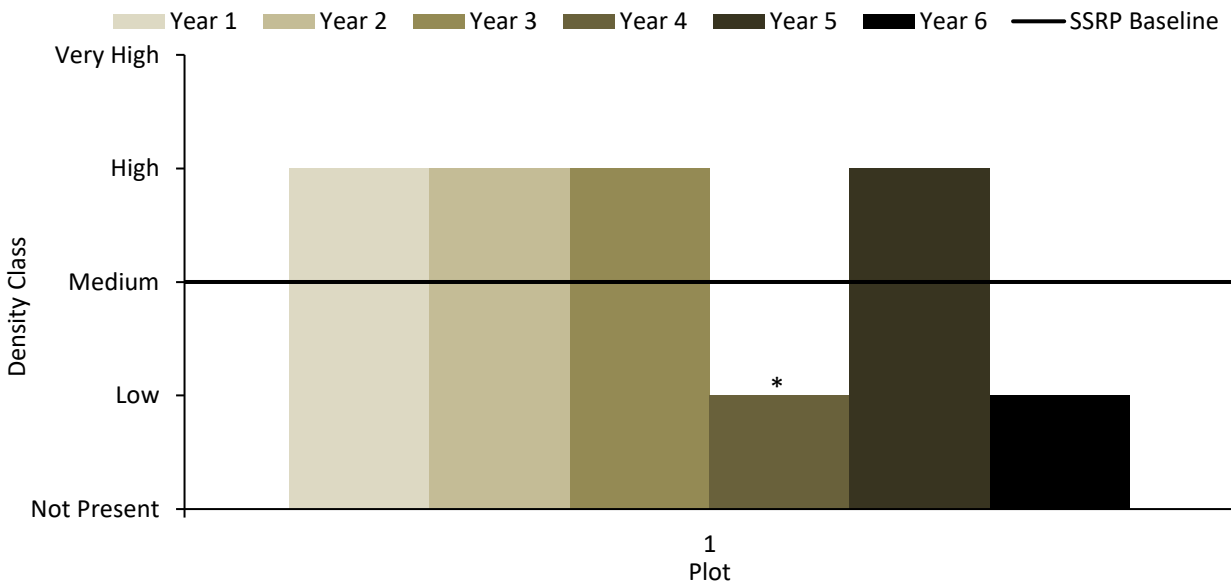
* Year 4 was misreported as medium in the 2017 Annual Report.

Figure 9-103. HA 43 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plot 1
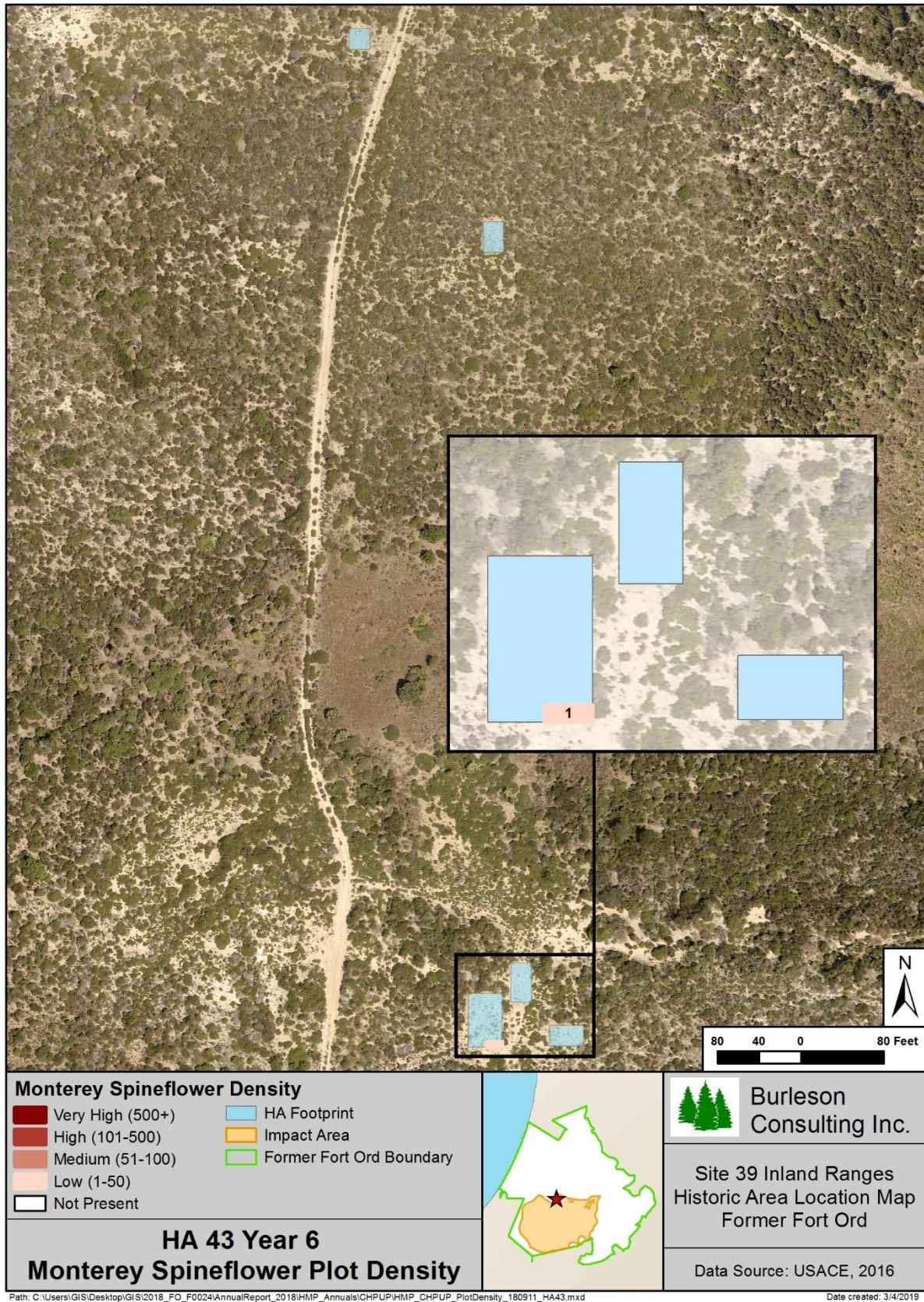
Figure 9-104. HA 43 Year 6 Monterey Spineflower Plot Density Map

One sand gilia plot was surveyed for year 6 density at HA 43 in 2018. The plot is numbered 1 on Figure 9-106 and located in the southern part of the site. Sand gilia was not present in Plot 1. Figure 9-105 presents sand gilia restoration plot densities for HA 43.
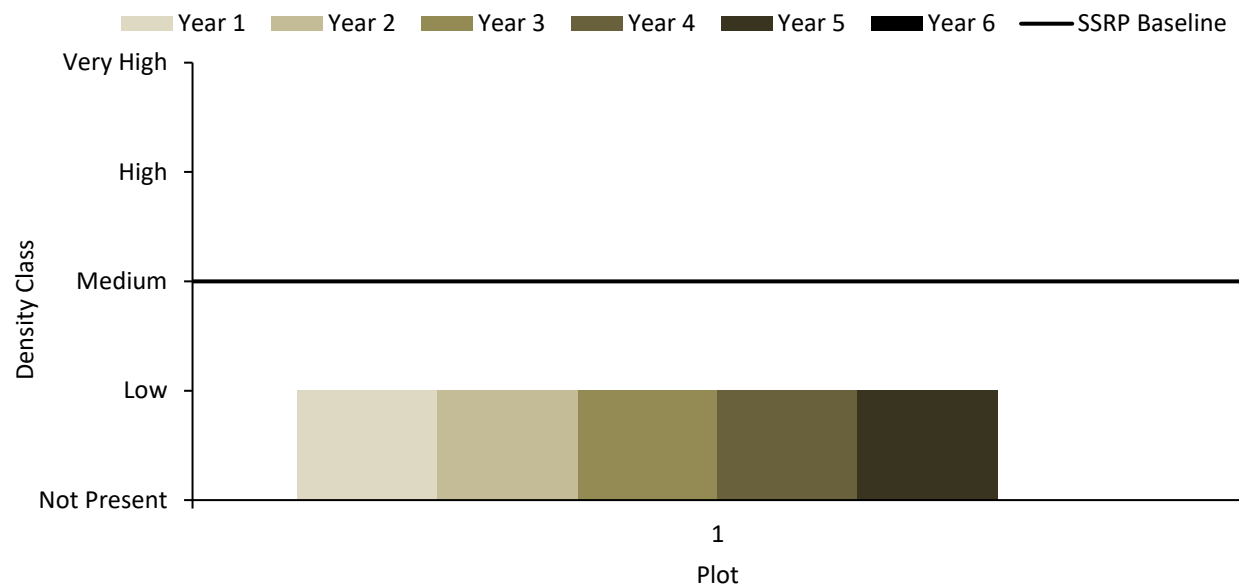
Figure 9-105. HA 43 Comparison of Sand Gilia Density Classes to the SSRP Baseline for Plot 1
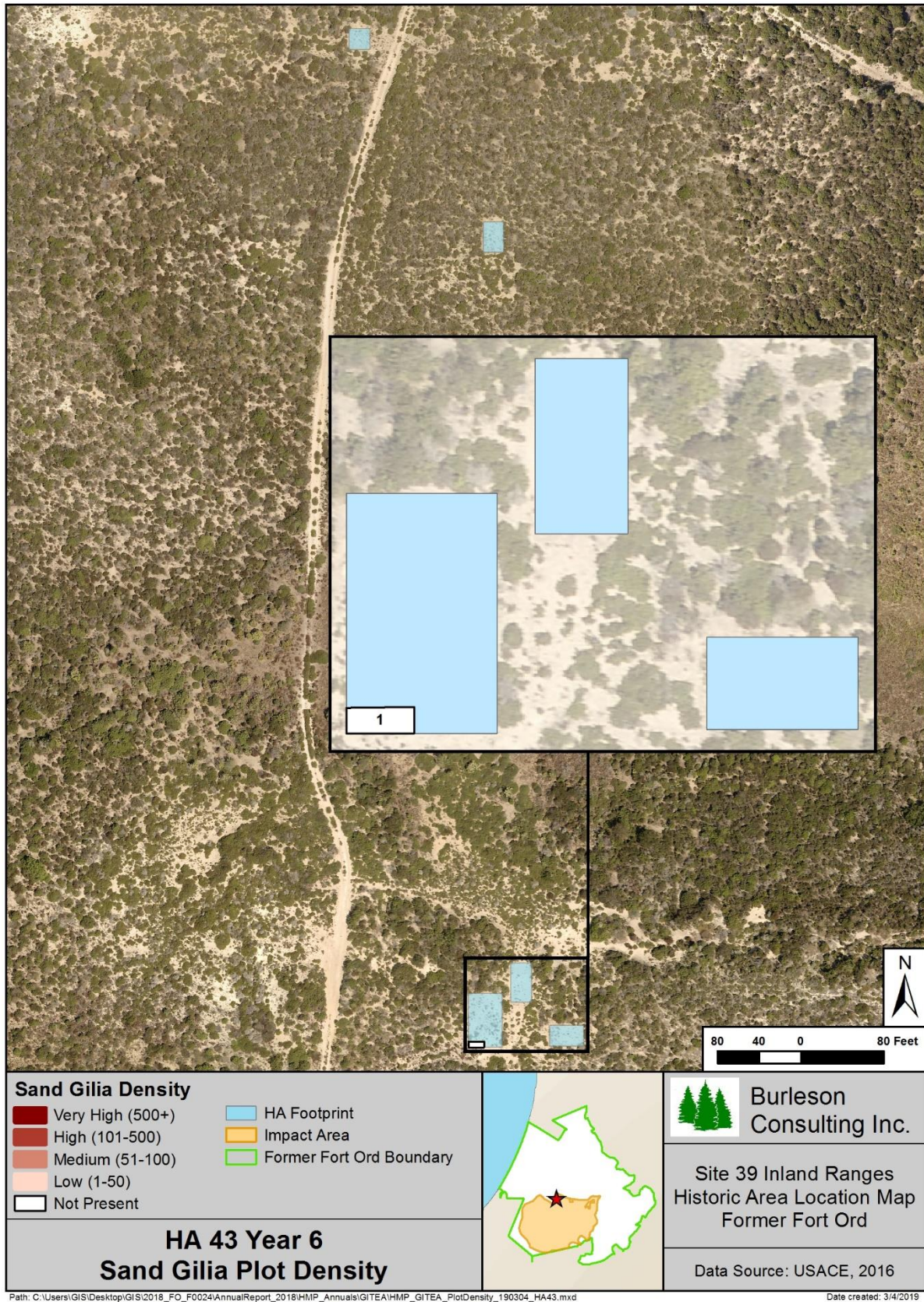
Figure 9-106. HA 43 Year 6 Sand Gilia Plot Density Map

One seaside bird's beak plot was surveyed for year 6 density at HA 43 in 2018. The plot is numbered 1 on Figure 9-108 and is located in the northern part of the site. Seaside bird's beak density was low in Plot 1. Figure 9-107 presents seaside bird's beak restoration plot densities for HA 43.
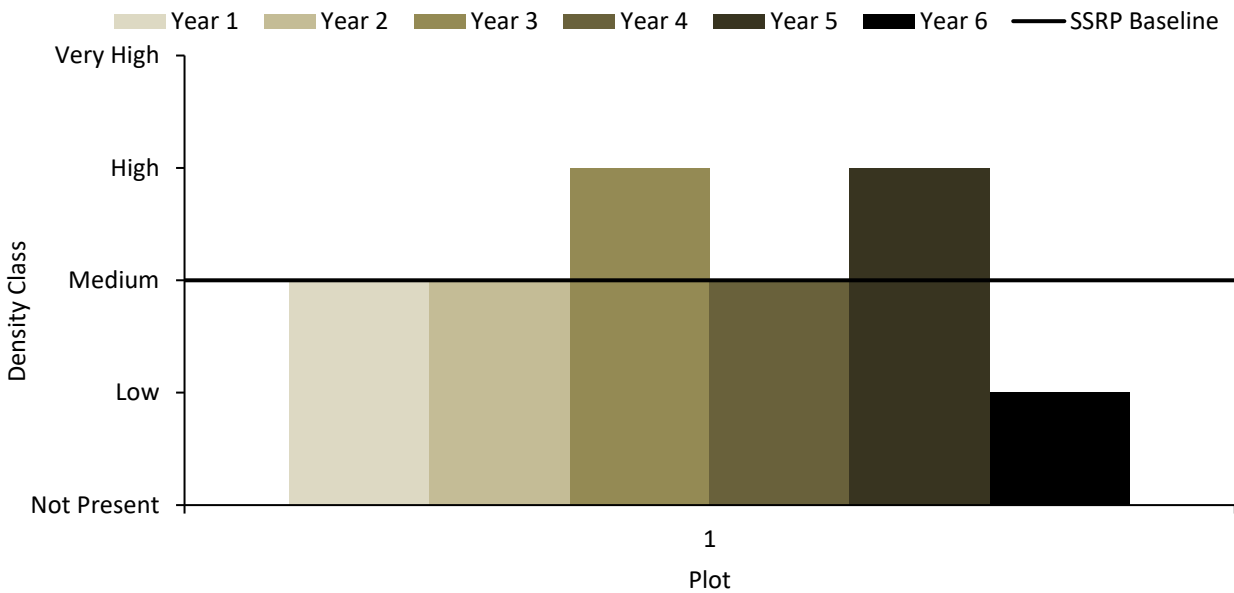
Figure 9-107. HA 43 Comparison of Seaside Bird's Beak Density Classes to the SSRP Baseline for Plot 1
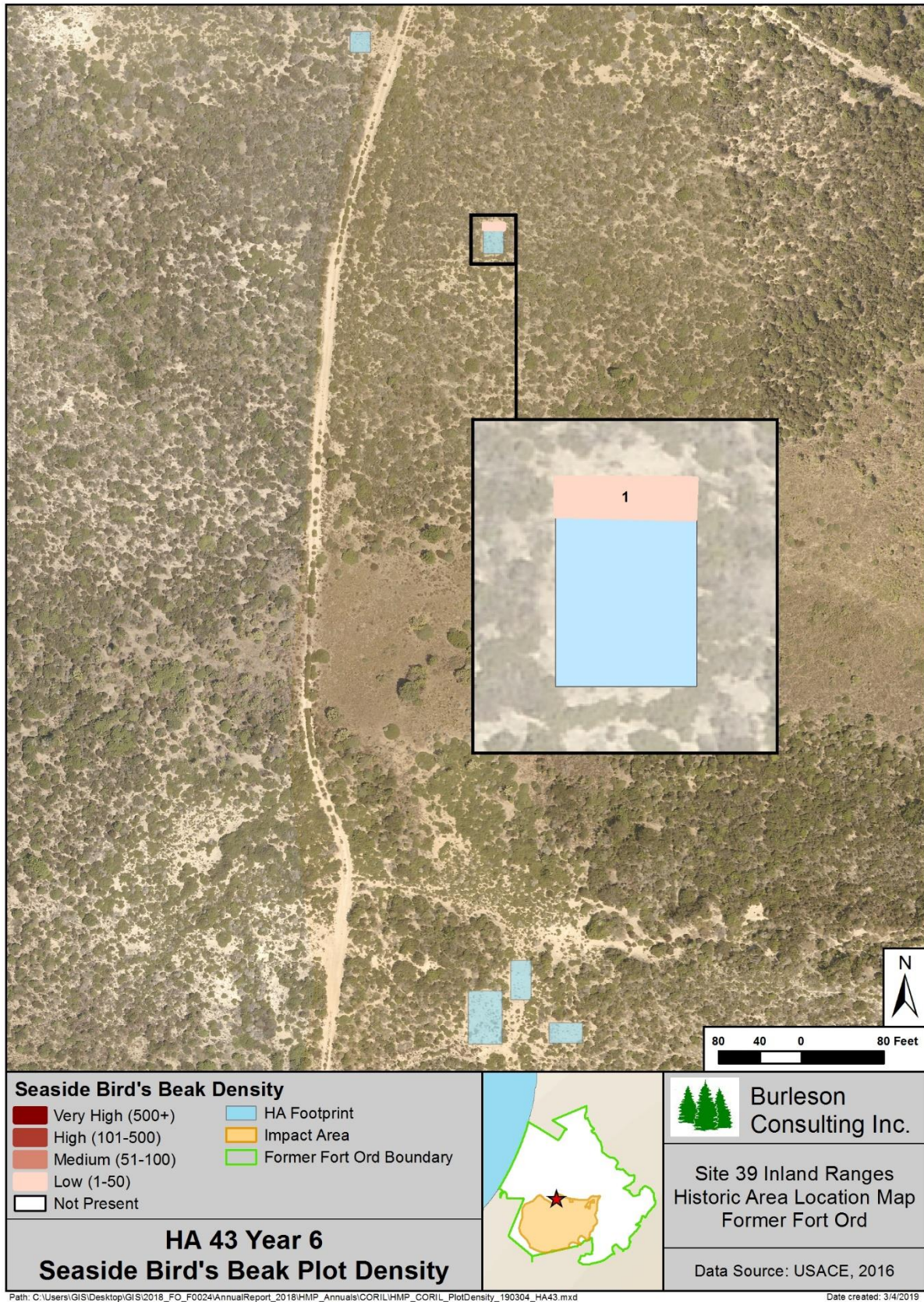
Figure 9-108. HA 43 Year 6 Seaside Bird's Beak Plot Density Map

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 at HA 43.

Three individual plants and five discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 9-109). Densities ranged from low to medium and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of medium was 0.01 acres. Total acreage of Monterey spineflower patches within HA 43 was 0.05 acres. From 2017 to 2018, the density range decreased and acreage above the SSRP baseline remained the same.

Sand gilia was not observed outside the restoration plots in 2018.

Four discrete patches of seaside bird's beak were mapped and individuals counted within the patch (see Figure 9-110). Densities were low and no discrete patches of seaside bird's beak were at or above the SSRP baseline density class of medium. Total acreage of seaside bird's beak patches within HA 43 was 0.05 acres. From 2017 to 2018, the density range and acreage above the SSRP baseline decreased.
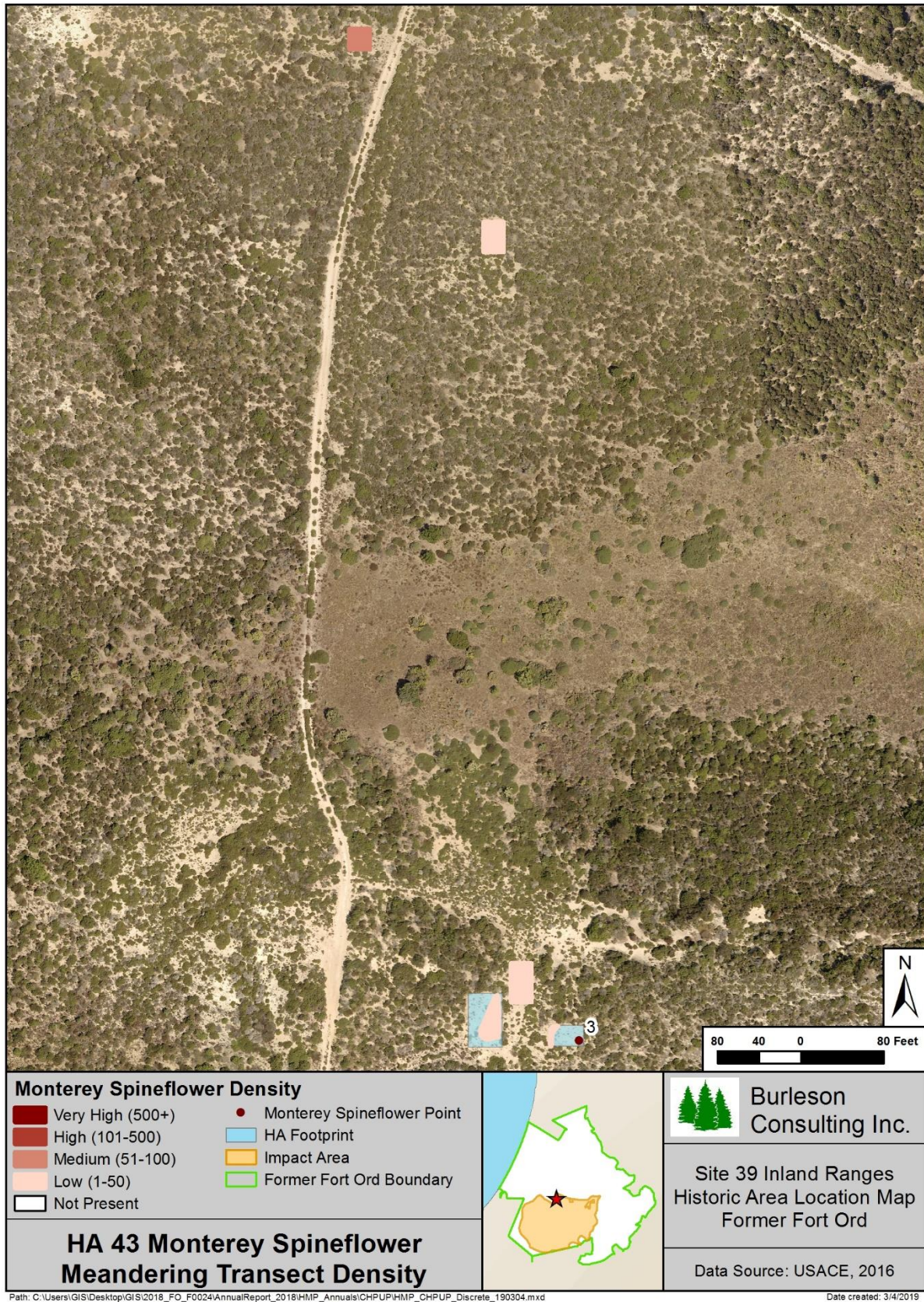
Figure 9-109. HA 43 Monterey Spineflower Meandering Transect Density Map
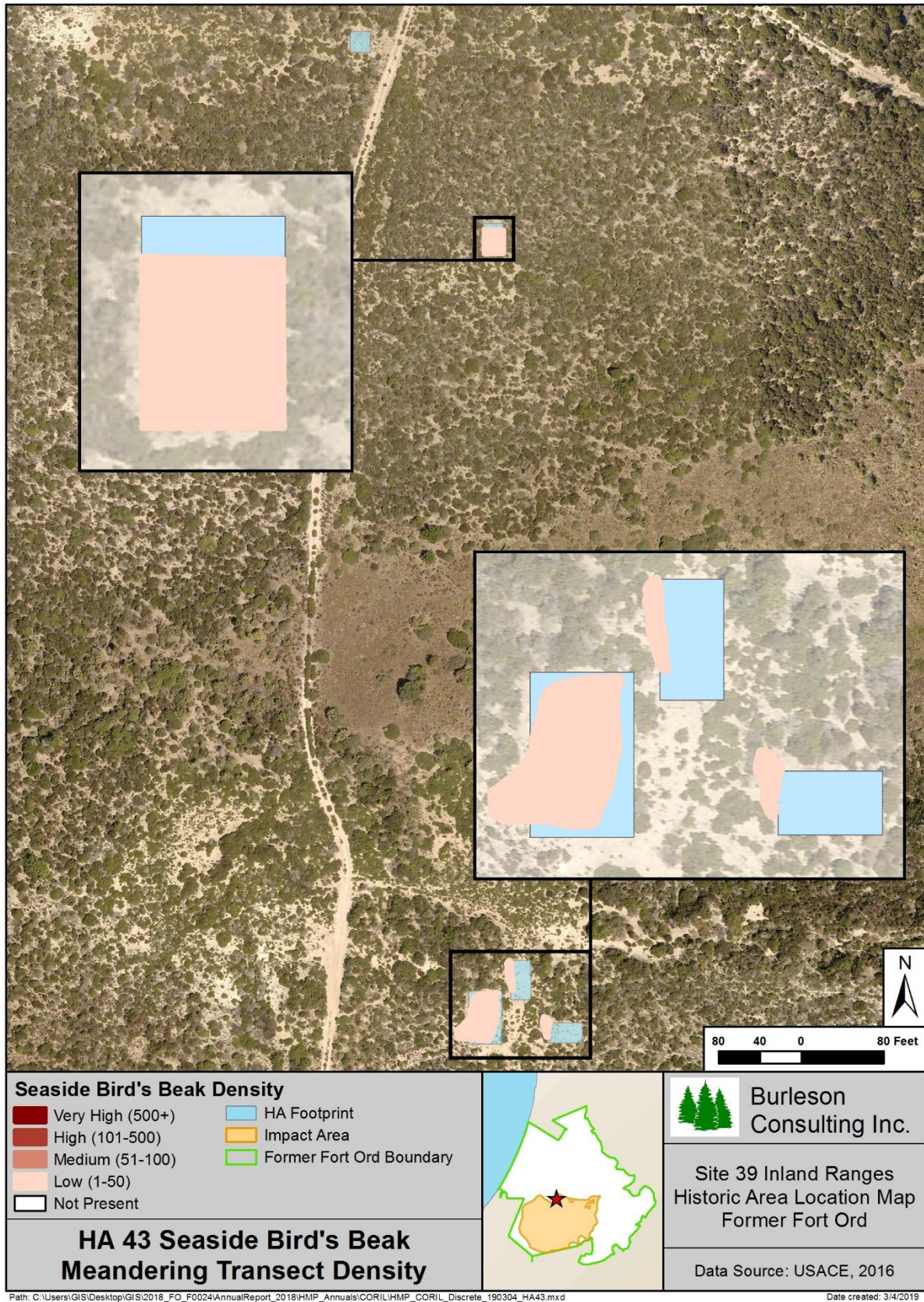
Figure 9-110. HA 43 Seaside Bird's Beak Meandering Transect Density Map

9.16.2.2 Plant Survivorship

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

9.16.2.3 Species Richness

Thirty-nine species were observed at HA 43. Of those, 21 were native shrubs or perennials, 13 were native annual herbaceous species, and five were non-native species (see Table 9-135). Species richness remained the same since 2017. Native shrub and perennial species decreased by two, native herbaceous species increased by three, and non-native species decreased by one.

Table 9-135. Species Observed at HA 43, 2018

Scientific Names	Common Names	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Arctostaphylos pumila*	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Baccharis pilularis	coyote brush	BAPI
Camissoniopsis micrantha	small primrose	CAMI
Cardionema ramosissimum	sand mat	CARA
Carex globosa	round-fruited sedge	CAGL
Carex sp.	sedge	CA
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus*	Monterey ceanothus	CERI
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Cordylanthus rigidus ssp. *littoralis**	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*	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium cicutarium	red-stemmed filaree	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Festuca octoflora	sixweeks grass	FEOC
Frangula californica	California coffeeberry	FRCA
Gilia tenuiflora ssp. *arenaria**	sand gilia	GITEA
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth cat's ear	HYGL
Hypochaeris radicata	rough cat's ear	HYRA
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Minuartia californica	sandwort	MICA
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Plantago erecta	California plantain	PLER
Polygala californica	California milkwort	POCA
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP
Salvia mellifera	black sage	SAME
Stylocline gnaphaloides	everlasting neststraw	STGN

* HMP species

9.16.2.4 Vegetative Cover

Burleson completed five line-intercept transects ranging from eight to 17 meters in length at HA 43. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 27.05%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 1.93%. Table 9-136 summarizes vegetative cover and Table 9-137 presents vegetative cover by species. Figure 9-111 presents the percent cover of dominant species at HA 43 in 2017 and 2018.

Table 9-136. 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	36.71	36.71	0.00	0.00	73.53	25.12
HA43T02	19.67	19.67	0.00	0.00	70.25	24.58
HA43T03	31.50	31.50	0.00	0.00	49.00	42.30
HA43T04	18.55	18.55	0.00	0.00	68.82	29.82
HA43T05	23.75	23.75	0.00	0.00	54.50	44.25
SITE AVERAGE*	27.05	27.05	0.00	0.00	65.10	31.50

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

Table 9-137. Transect Survey Results for HA 43 by Species

Transect	ACGL (%)	ARPU* (%)	CA sp. (%)	CERI* (%)	CRSC (%)	ERCO (%)	HOCU (%)	SAME (%)	TH (%)	BG (%)
HA43T01	1.35	9.29	0.00	8.18	13.47	0.82	2.71	0.88	73.53	25.12
HA43T02	0.00	8.00	0.00	0.00	11.67	0.00	0.00	0.00	70.25	24.58
HA43T03	6.90	17.10	0.00	2.90	2.70	0.00	1.90	0.00	49.00	42.30
HA43T04	0.00	13.00	1.64	0.00	2.82	0.00	1.09	0.00	68.82	29.82
HA43T05	0.00	17.13	0.00	0.00	6.62	0.00	0.00	0.00	54.50	44.25
SITE AVERAGE†	1.59	12.16	0.31	2.90	8.28	0.24	1.33	0.26	65.10	31.50

* HMP species

† Transect lengths are not equal. Site averages are weighted to reflect differing lengths.
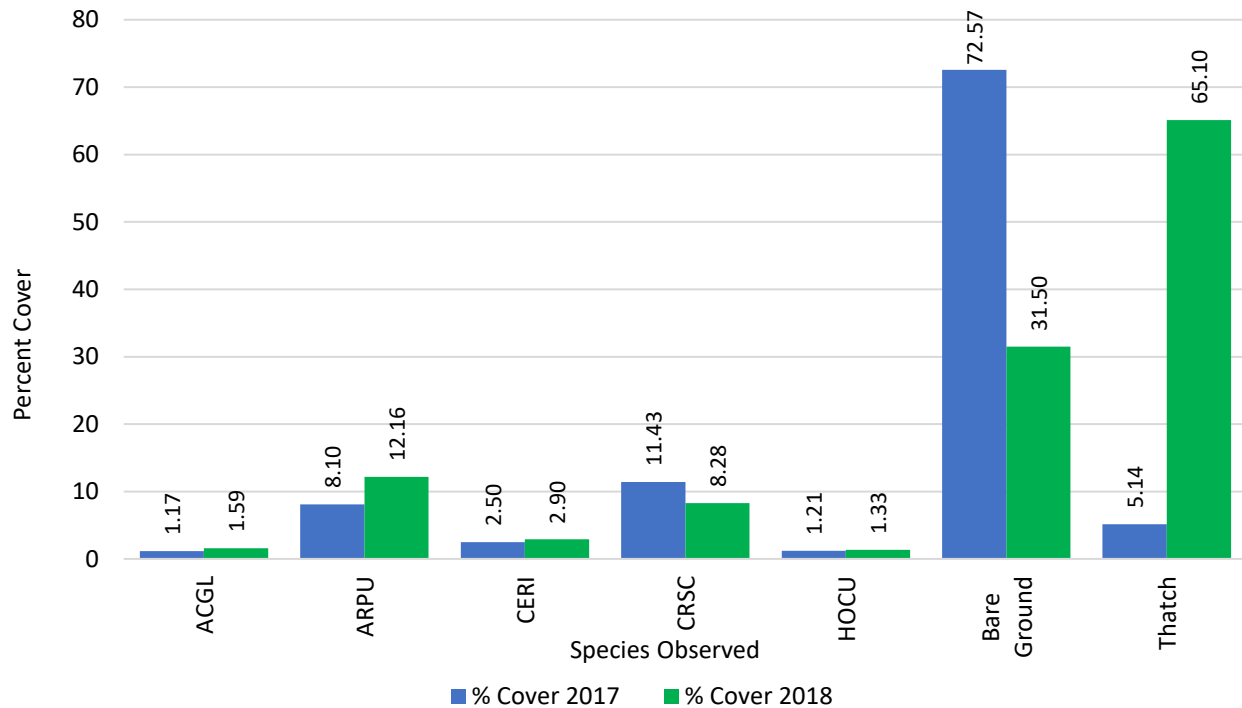
Figure 9-111. Percent Cover of Dominant Species at HA 43 in 2017 and 2018.

9.16.3   Discussion

9.16.3.1   Recommendations

HA 43 was in year 6 of monitoring in 2018 and responded moderately well to restoration efforts. The site met two of six success criteria by 2018. Per recommendations in the 2016 Annual Habitat Restoration Report, sticky monkeyflower, Monterey ceanothus, and chamise will be installed during the 2018/2019 season to support species richness (Burleson, 2017). 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 was documented by reference photo points (see Appendix D, page D-16).

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, 2020. Table 9-138 summarizes the current status of HA 43 including which success criteria were met and recommendations.

Table 9-138. Status and Recommendations for Achieving 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 2018/2019)*
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	Plant Monterey ceanothus (scheduled 2018/2019) and Eastwood's goldenbush*†
Objective 3 – No. 4	HMP annual density	No	Seed sand gilia plot*†

* Recommendation repeated from the 2016 Annual Habitat Restoration Report (Burleson, 2017).
† Not scheduled

9.16.3.2 HMP Annual Density

Monterey spineflower density was within the acceptable limit for HMP annual density at HA 43. The SSRP baseline density class for Monterey spineflower was medium. The Monterey spineflower restoration plot did not meet this criterion; however, Monterey spineflower was present outside of the restoration plots. Densities that met or exceeded the success criterion covered 0.01 acres of HA 43.

Sand gilia density did not meet the acceptable limit for HMP annual density at HA 43. The SSRP baseline density class for sand gilia was medium. Sand gilia was not present in the restoration plot in year 6 and was not observed outside the restoration plot.

Seaside bird's beak density did not meet the acceptable limit for HMP annual density at HA 43. The SSRP baseline density class for seaside bird's beak was medium. Year 6 seaside bird's beak restoration plot density was low and did not meet the success criterion. In addition, seaside bird's beak was present outside the restoration plots, however the discrete patch density did not meet the success criterion.

Overall the HMP annual density success criterion was not met at HA 43.

9.16.3.3 Plant Survivorship

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

9.16.3.4 Species Richness

Chamise, sandmat manzanita, shaggy-bark manzanita, coyote brush, Monterey ceanothus, dwarf ceanothus, mock heather, golden yarrow, peak rush-rose, wedge-leaved horkelia, deerweed, coffeeberry (*Frangula californica*, formerly *Rhamnus californica*), and black sage were present. Sticky monkeyflower was not present. HA 43 included 21 native shrub and perennial species; however, the site did not meet the success criterion for Objective 1.

9.16.3.5 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). These species contributed 26.74% cover to the HA; therefore, this success criterion was not met. In 2017, vegetative cover was 25.38%; cover increased by 1.36% (see Figure 9-112). In 2016, quadrat surveys were completed to provide a preliminary idea of vegetative cover with a limited amount of effort. From 2017 onward, line-intercept transect surveys were used, as multiple objectives outlined in the SSRP specifically require transect data. The 2016 quadrat data were not compared to the success criteria.
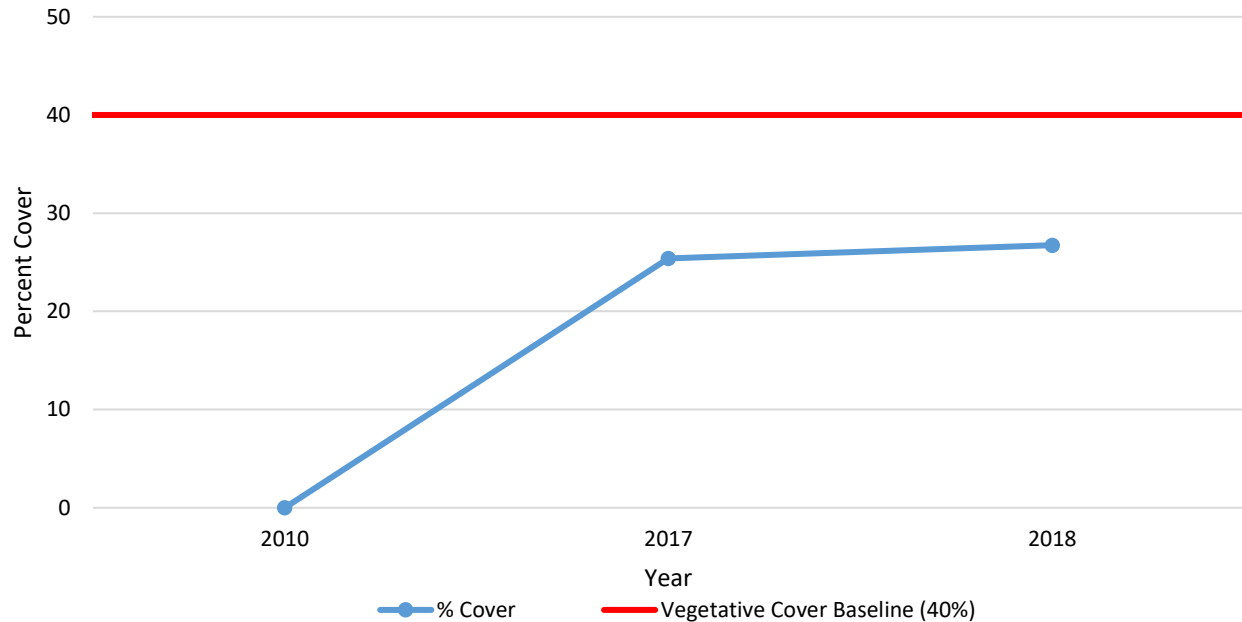
Figure 9-112. Native Vegetative Cover Compared to the Success Criterion at HA 43

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 from 6-25% of absolute cover. The HMP shrub species at HA 43 provided an absolute cover of 15.05%, which is an increase from 10.60% in 2017; therefore, the HA 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, 6% for sandmat manzanita, and 1% for Eastwood's goldenbush. The average vegetative cover for Monterey ceanothus was 2.90%, sandmat manzanita was 12.16%, and Eastwood's goldenbush was 0.00% (see Figure 9-113). Only sandmat manzanita met the acceptable limit. The success criterion was not met.
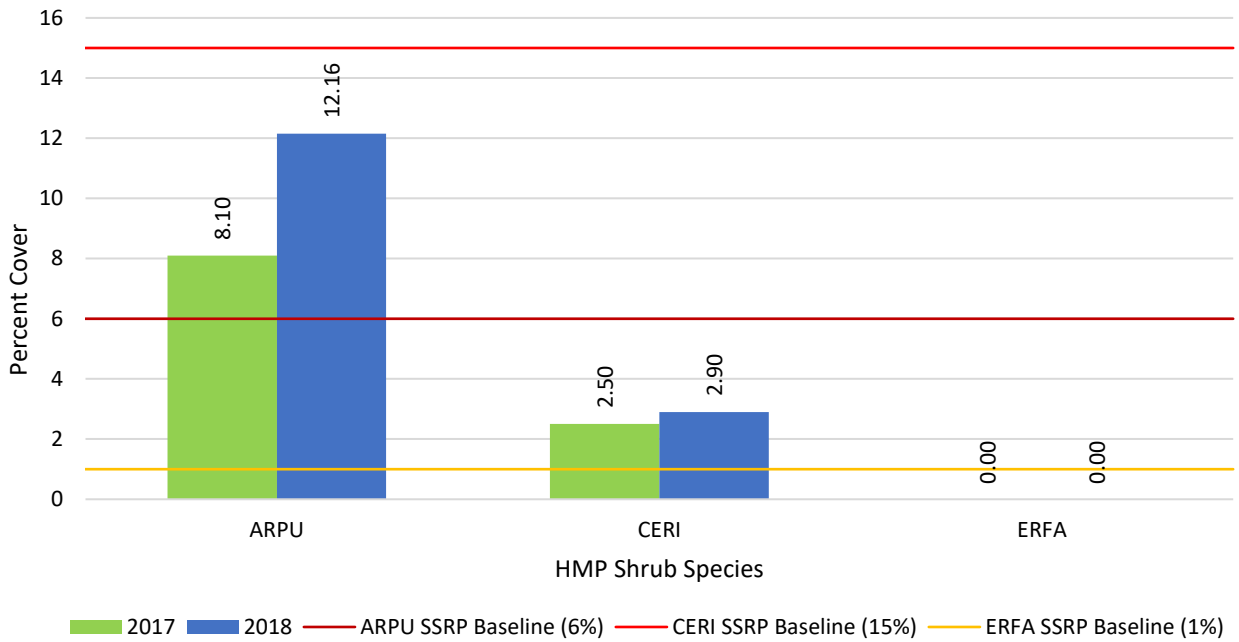
Figure 9-113. HMP Shrub Species Comparison to Success Criteria at HA 43

9.17   HA 44

HA 44 was used by the Army as a range for anti-tank weapons and other explosive munitions. Approximately 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 of similar maritime climates (USFS, 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 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 (USFS, 2007).

The SSRP restoration procedure for HA 44 included both passive and active restoration consisting of hand broadcast non-irrigated seed, annual weed management activities, and installing native container-grown plants. 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 occurred in 2017 and 2018. Monitoring began in 2016 to assess the level of natural recruitment occurring at that site. HA 44 was monitored for three years by photo documentation and site visits, HMP annual density across the HA, species richness, and vegetative cover, and one year for plant survivorship (see Table 9-139). Figure 9-114 shows the HA footprint, restoration areas, and transect monitoring locations. The success criteria for HA 44 are summarized in Table 9-140.

Table 9-139. Historic Summary of Restoration and Monitoring Activities at HA 44

Activity	Monitoring Years								
			1	2	3	4	5	8	13
	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			●	●	●				
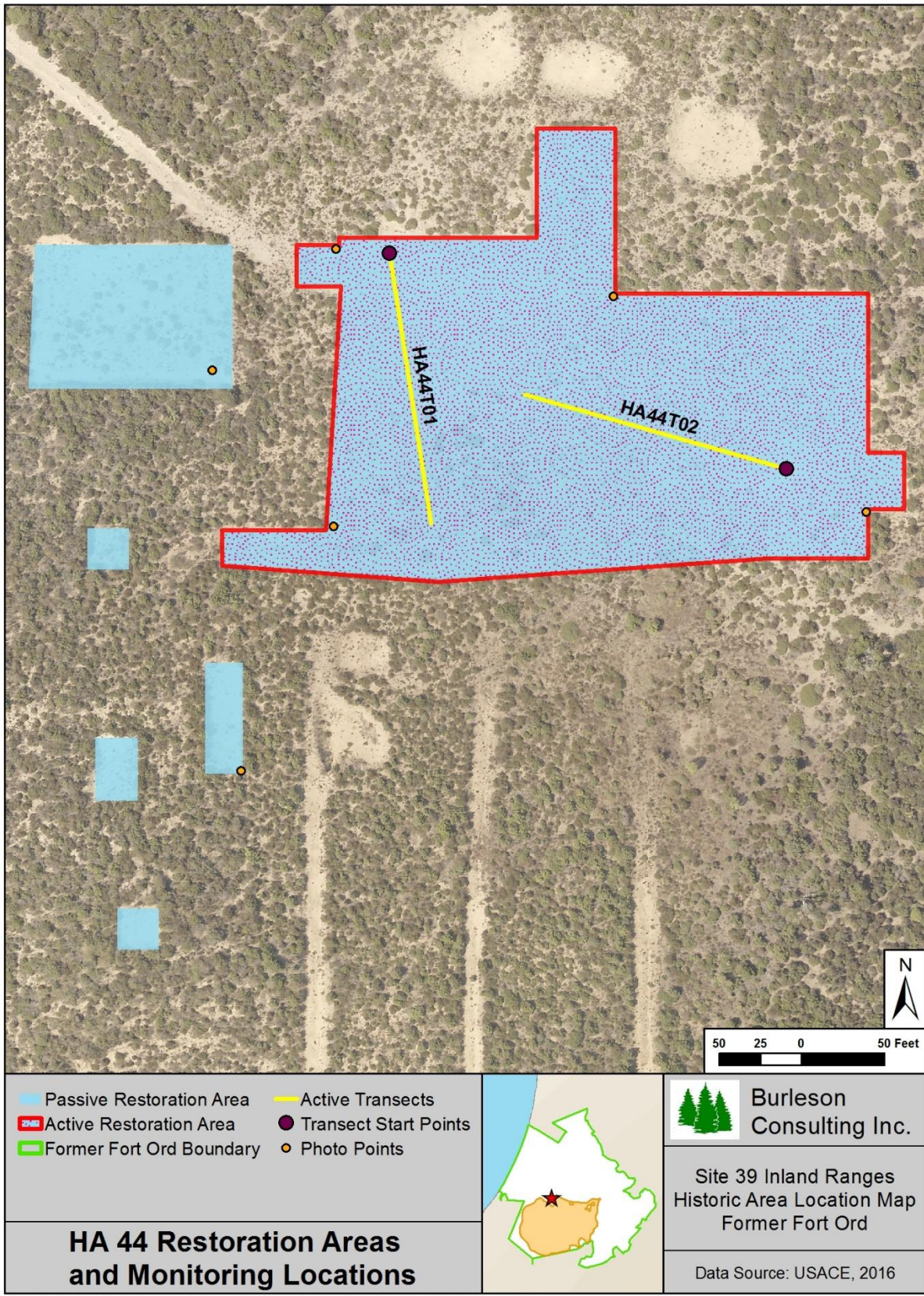
Figure 9-114. HA 44 Restoration Areas and Monitoring Locations Map

Table 9-140. Success Criteria and Acceptable Limits for Restoration of HA 44

Objective 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† shaggy-bark manzanita Monterey ceanothus† 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 of the SSRP
Objective 2*			
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*			
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	Monterey spineflower density class: Low Sand gilia density class: Low Seaside bird's beak density class: Low

* Objectives presented in HRP (Shaw, 2009b)

† HMP Species

9.17.1 Restoration Activities

Burleson performed passive restoration at HA 44 in 2017 and 2018. The total amount of seed broadcast on site was 59.37 lb compared to 42.70 lb prescribed in the SSRP. Table 9-141 the SSRP seed target and the amount of seed applied by year and species.

Table 9-141. Summary of Passive Restoration Activities for HA 44

Species	Pounds of Seed Broadcast			
	SSRP Target	2017	2018	Total by Species
ACMI	1.80	2.00	2.00	4.00
ACGL	5.50	1.69	1.00	2.69
BAPI	0.30	0.05	0.20	0.25
CERI*	1.80	0.25	1.00	1.25
CHPUP*	-	-	0.21	0.21
CRSC	4.60	0.62	2.50	3.12
ELGL	-	9.00	8.00	17.00
ERCO	0.50	0.07	0.30	0.37
FRCA	1.80	0.25	1.00	1.25
HO	18.20	2.48	10.00	12.48
HOCU	4.60	1.25	8.00	9.25
LUAL	1.80	0.25	1.00	1.25
SAME	1.80	0.25	1.00	1.25
STPU	-	-	5.00	5.00
TOTAL	42.70	18.16	41.21	59.37

* HMP species

Burleson completed active restoration at HA 44 in 2018. The total number of plants installed at HA 44 was 1,110, as prescribed in the SSRP. Table 9-142 summarizes the plants installed during active restoration.

Table 9-142. Summary of Active Restoration Activities for HA 44

Species	Number of Individual Plants		
	SSRP Target	2018 (Feb)	Total by Species
ACGL	200	31	31
ACMI	100	100	100
ADFA	40	144	144
ARPU*	30	40	40
ARTO	40	52	52
BAPI	40	87	87
CERI*	30	101	101
CRSC	150	150	150
ERCO	150	-	-
FRCA	50	300	300
HOCU	200	-	-
LUAL	50	68	68
SAME	30	37	37
TOTAL	1,110	1,110	1,110

* HMP Species

9.17.2 Monitoring Results

9.17.2.1 HMP Annual Density

While Monterey spineflower seed was broadcast on the site in 2018, no restoration plots were established for HMP annuals at HA 44. However, HMP annuals were mapped as a part of the meandering transect survey. The survey was completed for Monterey spineflower, seaside bird's beak, and sand gilia at HA 44.

Three individual plants and seven discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 9-115). Densities were low and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.38 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline decreased.

Two individual plants and three discrete patches of sand gilia were mapped and individuals counted within each patch (see Figure 9-116). The densities were low and the total acreage of sand gilia patches with a density at or above the SSRP baseline density class of low was 0.02 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline decreased.

Two discrete patches of seaside bird's beak were mapped and individuals counted within each patch (see Figure 9-117). Densities were low and the total acreage of seaside bird's beak patches with a density at or above the SSRP baseline density class of low was 0.13 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline decreased.
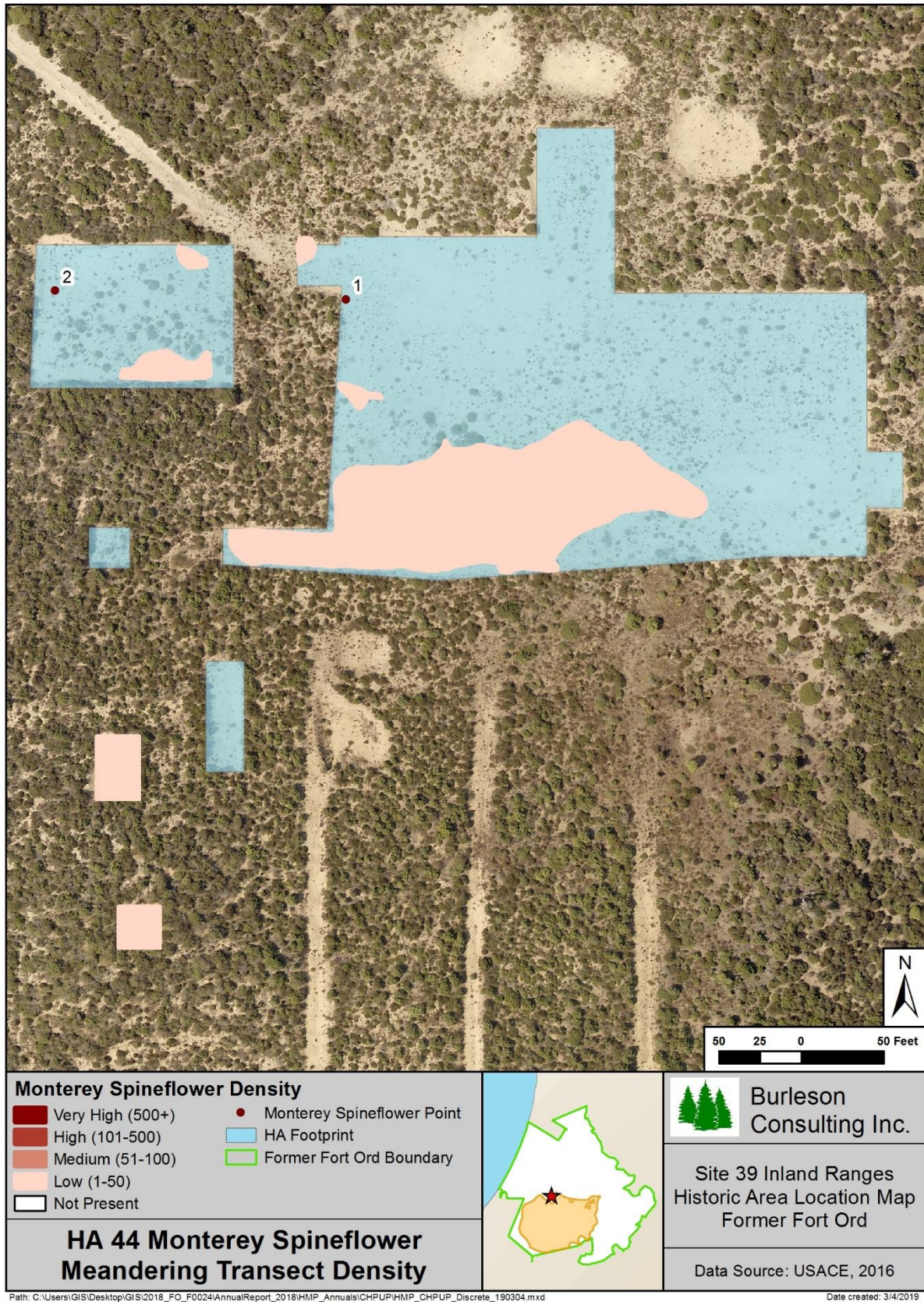
Figure 9-115. HA 44 Monterey Spineflower Meandering Transect Density Map
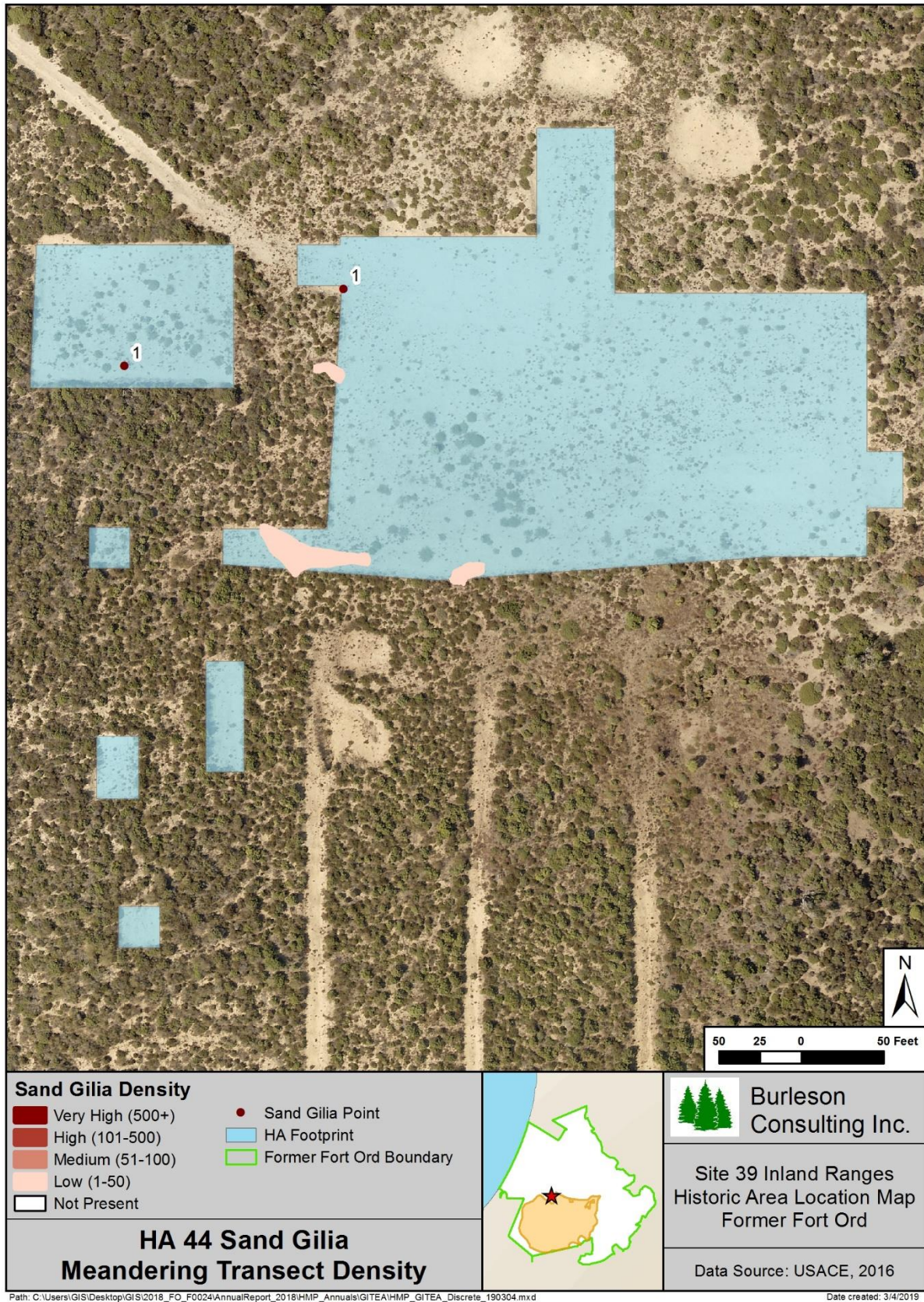
Figure 9-116. HA 44 Sand Gilia Meandering Transect Density Map
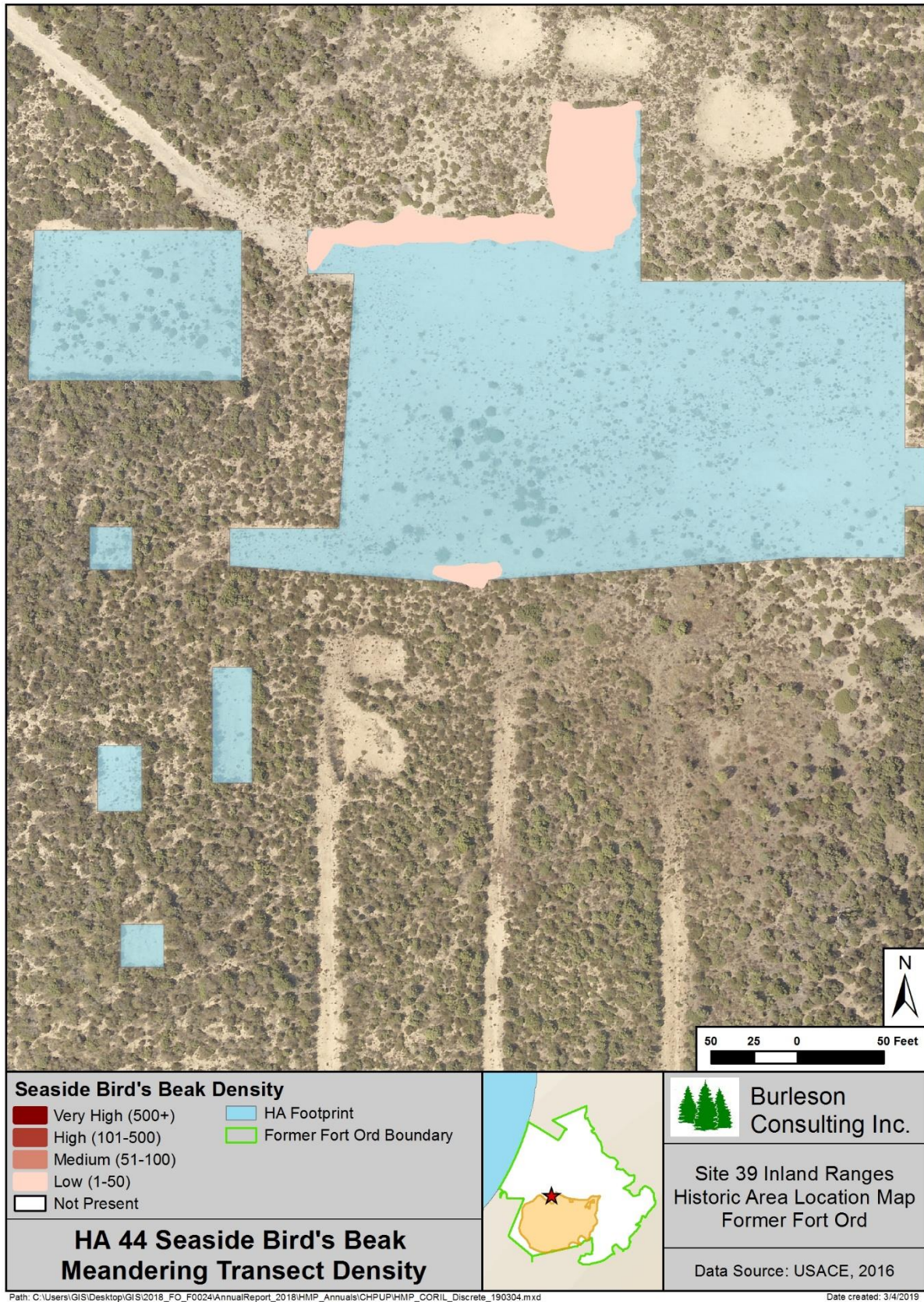
Figure 9-117. HA 44 Seaside Bird's Beak Meandering Transect Density Map

9.17.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 44. A total of eight shrub species and 86 individual plants were monitored for survivorship. By year 1 of monitoring for the 2018 planting, survivorship was 62%. Table 9-143 presents results by species.

Table 9-143. Plant Survivorship Monitoring Summary for 2018 Plantings at HA 44

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2018)
			Alive (%)
ADFA	144	14	79
ARPU*	40	4	100
ARTO	52	6	50
BAPI	87	9	89
CERI*	101	10	20
FRCA	300	32	63
LUAL	68	7	29
SAME	37	4	75
TOTAL	**829**	**86**	**62**

 * HMP Species

9.17.2.3 Species Richness

Fifty species were observed at HA 44. Of those, 30 were native shrubs or perennials, 15 were native annual herbaceous species, and five were non-native species (see Table 9-144). Species richness has remained the same since 2017. Native shrub and perennial species increased by two, native herbaceous species increased by two, and non-native species decreased by four.

Table 9-144. Species Observed on HA 44, 2018

Scientific Names	Common Names	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
*Arctostaphylos pumila**	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Baccharis pilularis	coyote brush	BAPI
Bromus diandrus	ripgut grass	BRDI
Camissoniopsis micrantha	small primrose	CAMI
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Castilleja densiflora	owl's clover	CADE
Castilleja exserta ssp. *exserta*	purple owl's-clover	CAEX
Ceanothus dentatus	dwarf ceanothus	CEDE
*Ceanothus rigidus**	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Cirsium occidentale var. *candidissimum*	snowy thistle	CIOCC
Cordylanthus rigidus ssp. *littoralis**	seaside bird's-beak	CORIL

Table 9-144. Species Observed on HA 44, 2018

Scientific Names	Common Names	Code
Corethrogyne filaginifolia	common sandaster	COFI
Crocanthemum scoparium	peak rush-rose	CRSC
Cryptantha sp.	cryptantha	CR
Daucus pusillus	wild carrot	DAPU
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata*	Eastwood's goldenbush	ERFA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium cicutarium	red-stemmed filaree	ERCI
Frangula californica	California coffeeberry	FRCA
Gilia tenuiflora ssp. *arenaria**	sand gilia	GITEA
Horkelia cuneata	wedge-leaved horkelia	HOCU
Layia platyglossa	tidy-tips	LAPL
Logfia filaginoides	California cottonrose	LOFI
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus albifrons	silver bush lupine	LUAL
Lupinus chamissonis	silver beach lupine	LUCH
Monardella sinuata ssp. *nigrescens*	curly-leaved monardella	MOSIN
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHAP
Plantago erecta	California plantain	PLER
Polygala californica	California milkwort	POCA
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium californicum	California everlasting	PSCA
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium stramineum	cotton-batting plant	PSST
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Solanum umbelliferum	blue witch	SOUM
Symphoricarpos albus var. *laevigatus*	common snowberry	SYALL
Toxicodendron diversilobum	poison oak	TODI

* HMP species

9.17.2.4 Vegetative Cover

Burleson completed two 50-meter line-intercept transects at HA 44. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 23.51%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 3.33%. Table 9-145 summarizes vegetative cover and Table 9-146 presents vegetative cover by species. Figure 9-118 presents the percent cover of dominant species at HA 44 in 2016, 2017, and 2018.

Table 9-145. 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	21.32	21.32	0.00	0.00	31.00	65.00
HA44T02	25.70	25.70	0.00	0.00	34.80	58.70
SITE AVERAGE	**23.51**	**23.51**	**0.00**	**0.00**	**32.90**	**61.85**

Table 9-146. Transect Survey Results for HA 44 by Species

Transect	ACGL (%)	ACMI (%)	ADFA (%)	ARPU* (%)	CEDE (%)	CERI* (%)	CRSC (%)	ERCO (%)	ERFA* (%)	HOCU (%)	LUAL/ LUCH† (%)	SOUM (%)	TH (%)	BG (%)
HA44T01	2.46	0.00	1.50	2.46	4.94	2.16	2.04	0.00	1.72	3.48	0.56	0.00	31.00	65.00
HA44T02	0.00	0.46	0.00	5.66	8.46	0.50	6.24	0.22	0.00	1.64	2.30	0.22	34.80	58.70
SITE AVERAGE	**1.23**	**0.23**	**0.75**	**4.06**	**6.70**	**1.33**	**4.14**	**0.11**	**0.86**	**2.56**	**1.43**	**0.11**	**32.90**	**61.85**

* HMP species

† Due to subtle phenological differences between *Lupinus albifrons* var. *albifrons* and *Lupinus chamissonis* and the timing of surveys, the two species were combined for analysis of transect survey data and comparison to the success criteria (see section 6.1.4).
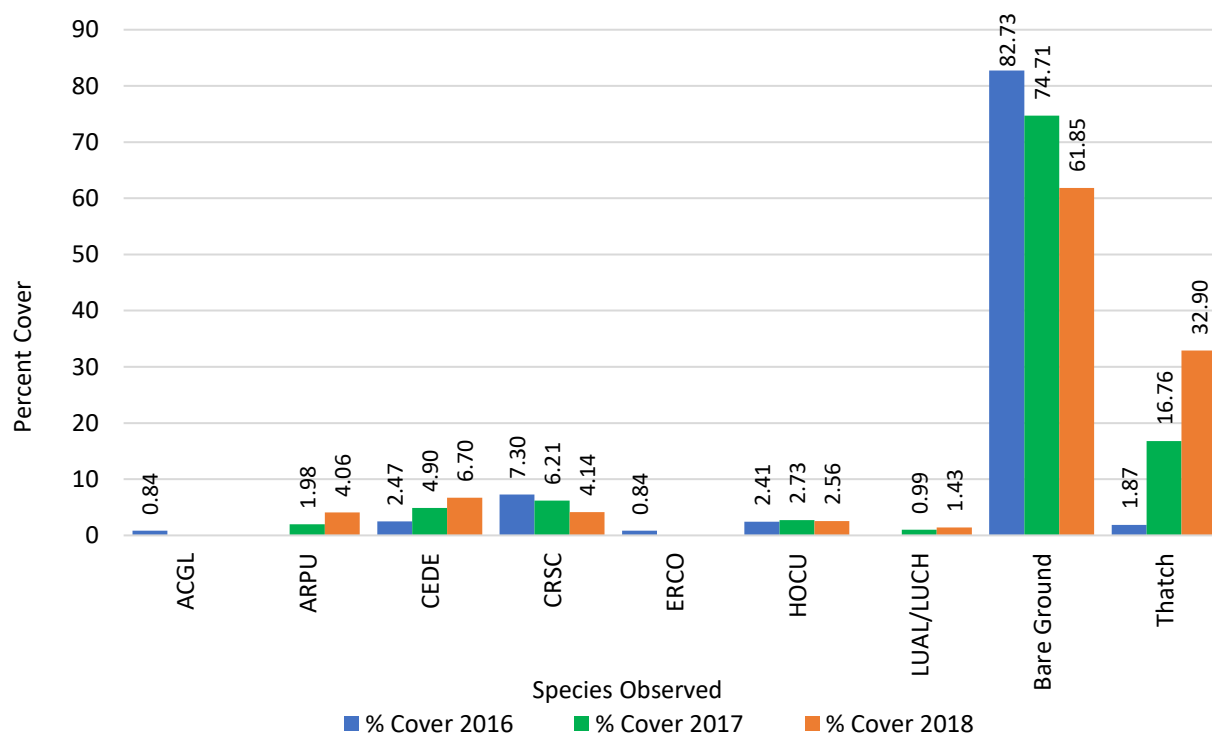
Figure 9-118. Percent Cover of Dominant Species at HA 44 in 2016, 2017, and 2018.

9.17.3 Discussion

9.17.3.1 Recommendations

HA 44 was in year 1 of monitoring in 2018. HA 44 received a partial amount of the SSRP prescription for passive restoration in 2017 and 2018. Despite this, the site met four of six success criteria by 2018. The Army does not recommend establishing HMP annual restoration plots since these species are already thriving throughout the site. A qualitative overview was documented by photo points (see Appendix D, page D-17).

The site will continue to be monitored by photo documentation, HMP annual density surveys, species richness meandering transects, vegetative cover line-intercept transects, and plant survivorship in monitoring year 2, 2019. Table 9-147 summarizes the current status of HA 44 including which success criteria were met and recommendations.

Table 9-147. Status and Recommendations for Achieving 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 not necessary

9.17.3.2 HMP Annual Density

No restoration plots were 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 criterion.

9.17.3.3 Plant Survivorship

Plant survivorship was moderate for the 2018 planting at HA 44. Monterey ceanothus and silver bush lupine had low survivorship, whereas all other species had moderate to high survivorship. Low survivorship for Monterey ceanothus and lupine was not surprising because they had low survivorship at multiple sites. The 2018 planting will be monitored for two more years.

9.17.3.4 Species Richness

Chamise, sandmat manzanita, shaggy-bark manzanita, Monterey ceanothus, and coffeeberry were all present. HA 44 included 30 native shrub and perennial species and met the success criterion for Objective 1.

9.17.3.5 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 14 shrub and perennial species and three annual species presented in Table 2 of the HA 44 SSRP (Burleson, 2013). These species contributed 15.84% cover to the HA; therefore, this success criterion was not met. In 2017, vegetative cover was 14.53%; cover increased by 1.31% (see Figure 9-119).
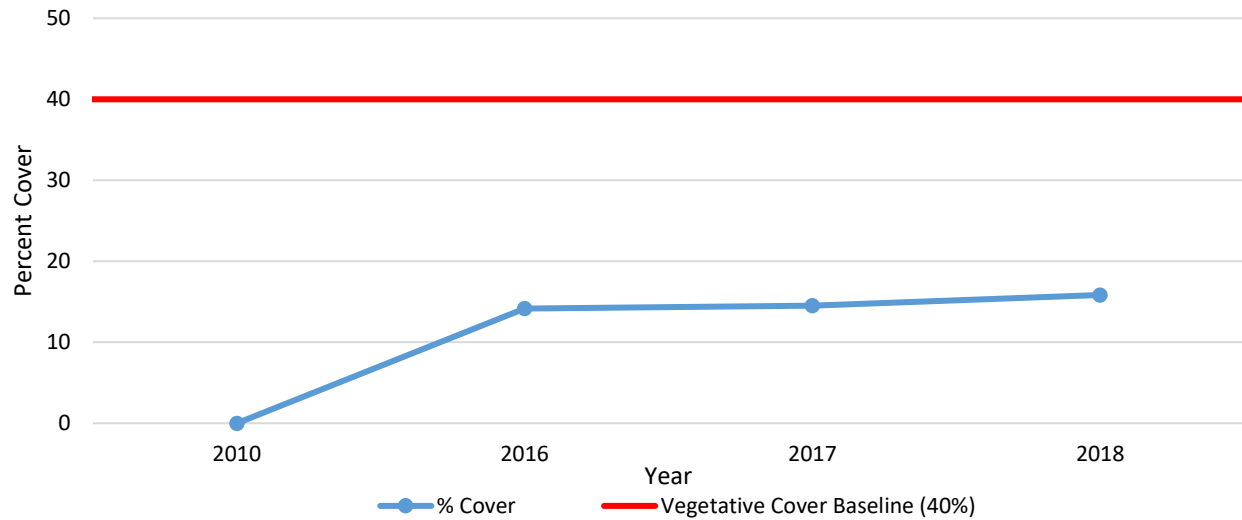
Figure 9-119. Native Vegetative Cover Compared to the Success Criterion at HA 44

Objective 2 considers the percent cover of non-native target weeds. No target weeds were encountered during the transect surveys in 2018, resulting in 0.00% vegetative cover. Iceplant cover decreased by 0.10% from 2017. 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 ranges from 6-25% of absolute cover. The HMP shrub species at HA 44 provided an absolute cover of 5.39%, which increased from 2.29% in 2017; however, the HA did not meet this success criterion. The second success criterion is no net loss of HMP shrubs. For HA 44, this means a vegetative cover average of at least 2% for sandmat manzanita and Monterey ceanothus must be present. The average vegetative cover for sandmat manzanita was 4.06% and Monterey ceanothus was 1.33% (see Figure 9-120). Both sandmat manzanita and Monterey ceanothus cover increased from 2017 to 2018. Both species were within the acceptable limit; therefore, the success criterion was met.
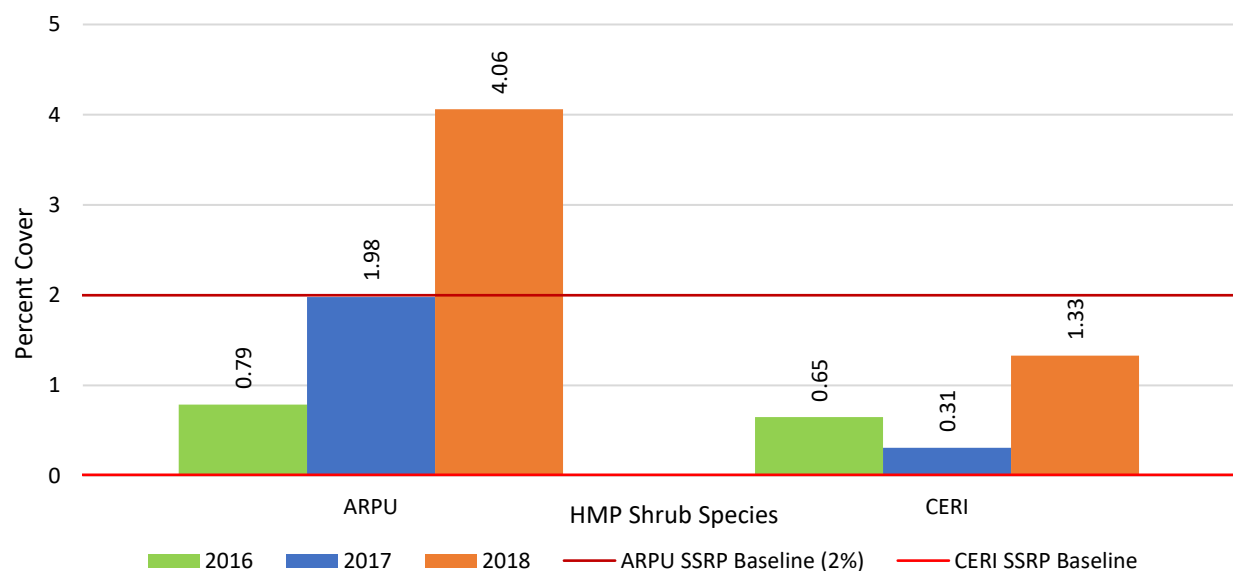
Figure 9-120. HMP Shrub Species Comparison to Success Criteria at HA 44

9.18   HA 48

HA 48 was used by the Army as a range for mortars, weapons demonstrations, sniper training, anti-tank weapons, and various other weapons. Approximately 150 cubic yards of soil was excavated over 0.05 acres. HA 48 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of similar maritime climates (USFS, 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 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 (USFS, 2007).

The SSRP prescription for passive restoration at HA 48 consisted of hand broadcast non-irrigated seed and annual weed management activities. Broadcast seed has greater success if completed during the rainy season, November through March. HA 48 has little potential for erosion.

Restoration activities have not occurred at HA 48. Monitoring began in 2016. HA 48 was monitored for three years by photo documentation and site visits, HMP annual density across the HA, and species richness and two years for vegetative cover (see Table 9-148). Figure 9-121 shows the HA footprint, passive restoration areas, and photo point monitoring locations. Success criteria for HA 48 are summarized in Table 9-149.

Table 9-148. Historic Summary of Restoration and Monitoring Activities at HA 48

Activity	Monitoring Years						
	1	2	3	4	5	8	13
	2016	2017	2018	2019	2020	2023	2028
Photo Points and Site Visit	●	●	●	●	●	●	●
HMP Annual Density across HA	●	●	●	●	●	●	
Species Richness	●	●	●	●	●	●	●
Vegetative Cover		●	●	●	●	●	●
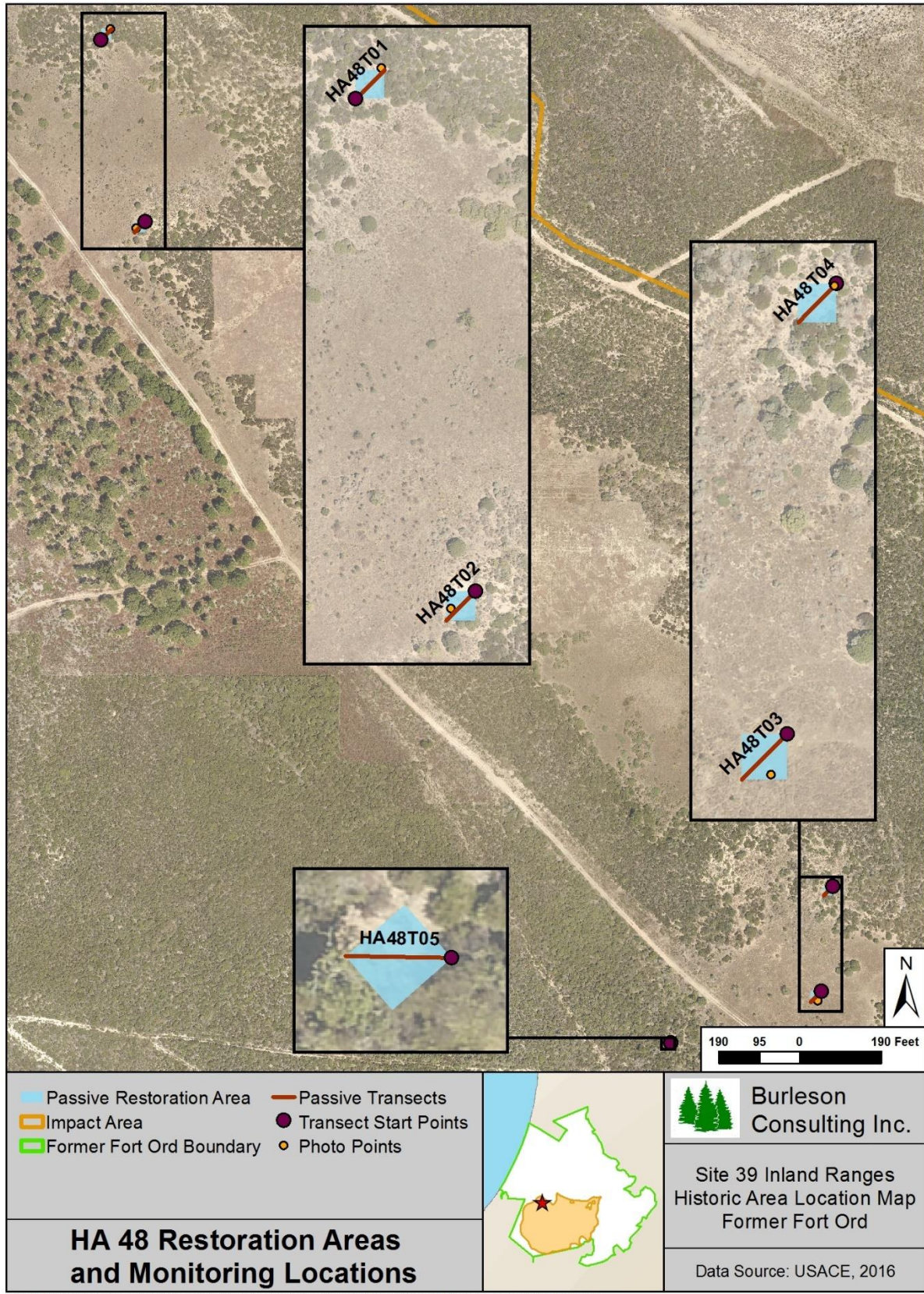
Figure 9-121. HA 48 Restoration Areas and Monitoring Locations Map

Table 9-149. Success Criteria and Acceptable Limits for Restoration of HA 48

	Objective 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† shaggy-bark manzanita Monterey ceanothus† wedge-leaved 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 of the SSRP
	Objective 2*		
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*		
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	Monterey spineflower density class: Low Sand gilia density class: Low

* Objectives presented in HRP (Shaw, 2009b)
† HMP Species

9.18.1 Restoration Activities

No passive or active restoration activities occurred at HA 48 as of 2018.

9.18.2 Monitoring Results

9.18.2.1 HMP Annual Density

No restoration plots were 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 at HA 48.

Five discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 9-122). Densities ranged from low to medium and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.05 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline decreased.

One discrete patch of sand gilia was mapped and individuals counted within the patch (see Figure 9-123). The density was low and the total acreage of sand gilia patches with a density at or above the SSRP baseline density class of low was 0.001 acres. From 2017 to 2018, the density range remained the same and acreage above the SSRP baseline decreased.
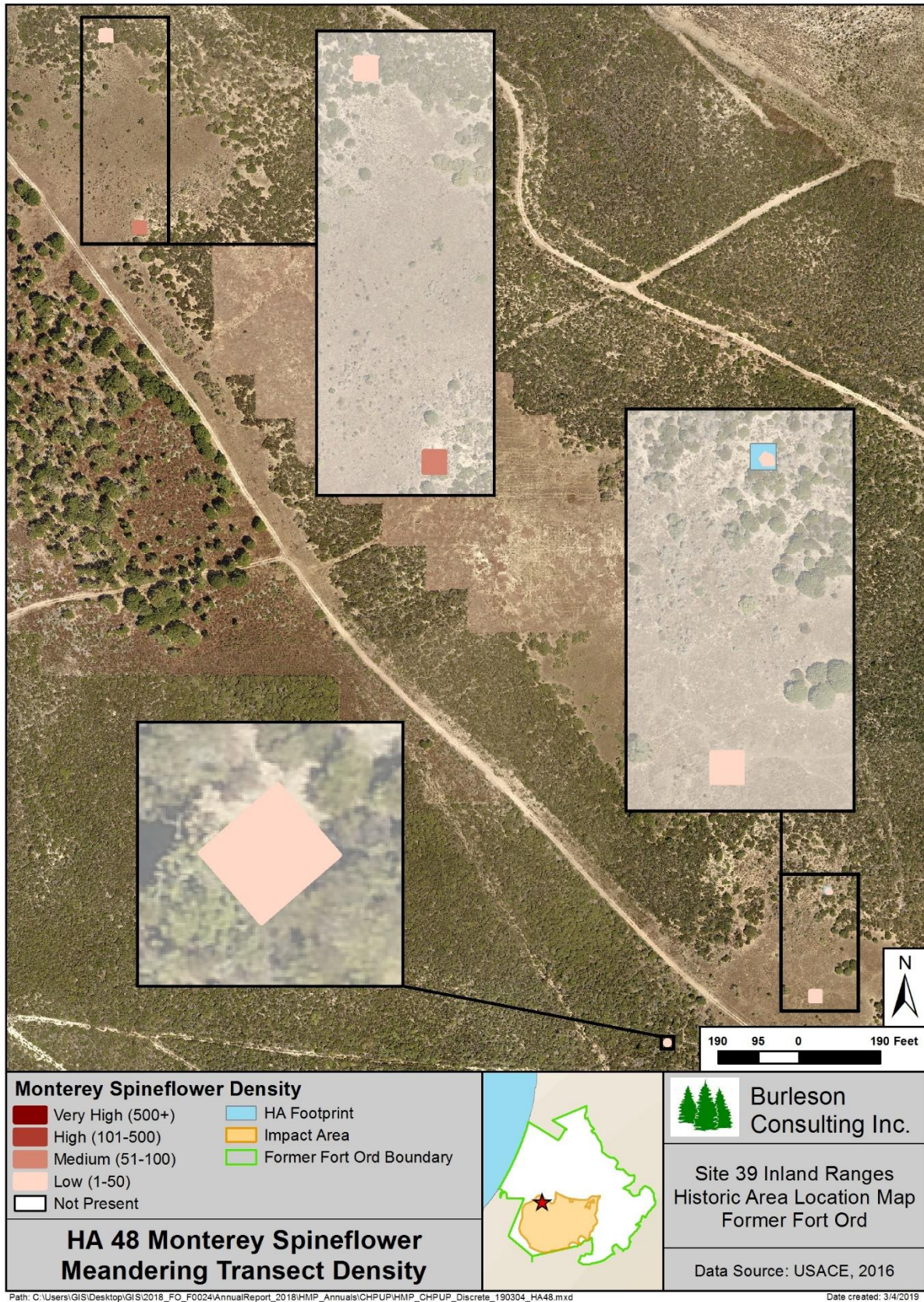
Figure 9-122. HA 48 Monterey Spineflower Meandering Transect Density Map
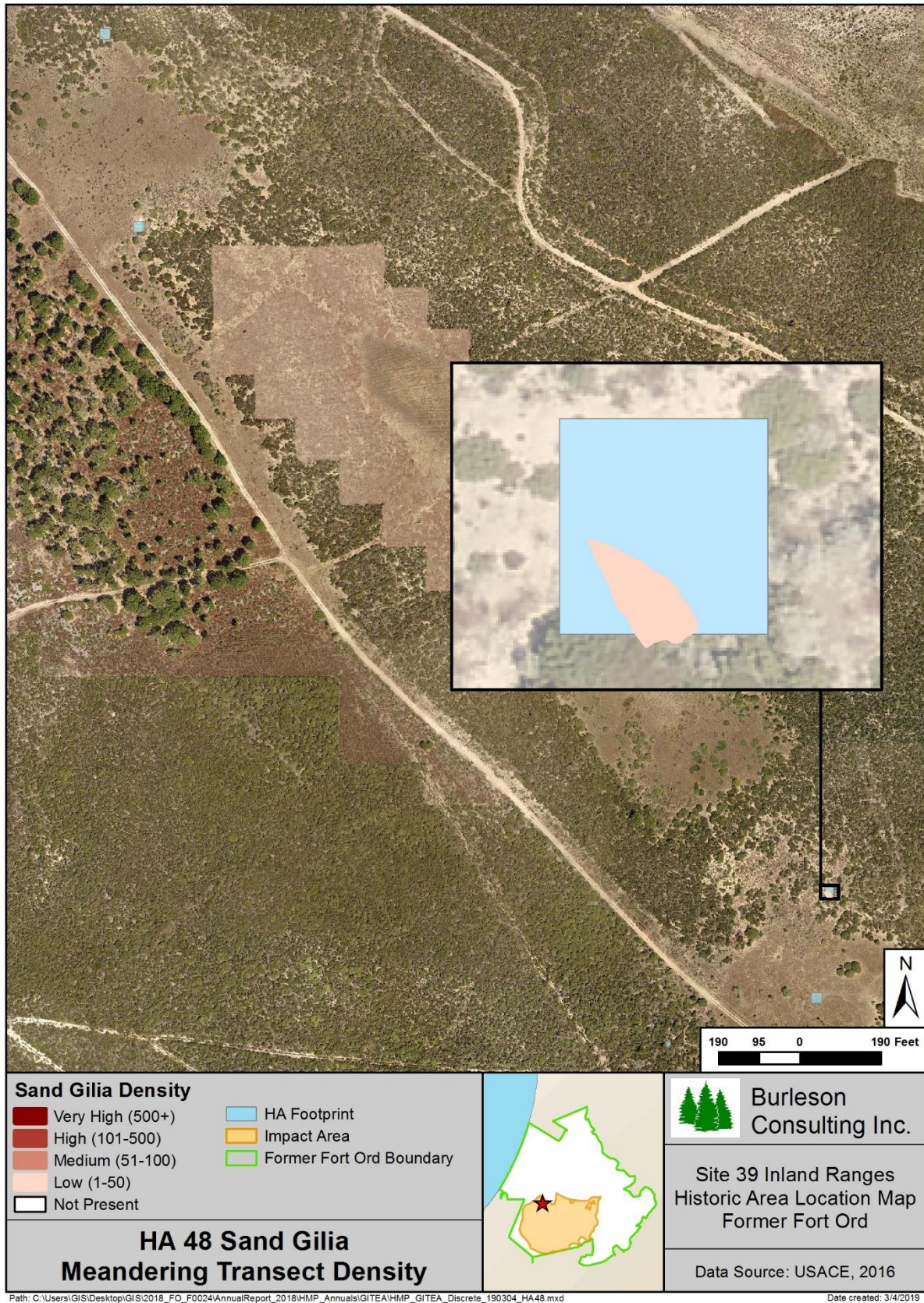
Figure 9-123. HA 48 Sand Gilia Meandering Transect Density Map

9.18.2.2 Plant Survivorship

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

9.18.2.3 Species Richness

Sixty-five species were observed at HA 48. Of those, 24 were native shrubs or perennials, 27 were native annual herbaceous species, and 14 were non-native species (see Table 9-150). Species richness increased by seven species since 2017. Native shrub and perennial species increased by three, native herbaceous species increased by five, and non-native species decreased by one.

Table 9-150. Species Observed on HA 48, 2018

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
Amsinckia intermedia	common fiddleneck	AMIN
*Arctostaphylos pumila**	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Bromus diandrus	ripgut grass	BRDI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Camissoniopsis micrantha	small primrose	CAMI
Cardionema ramosissimum	sand mat	CARA
Carex sp.	sedge	CA
Castilleja densiflora	owl's clover	CADE
Ceanothus dentatus	dwarf ceanothus	CEDE
*Ceanothus rigidus**	Monterey ceanothus	CERI
Ceanothus thyrsiflorus	blueblossom	CETH
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ
Corethrogyne filaginifolia	common sandaster	COFI
Crocanthemum scoparium	peak rush-rose	CRSC
Croton californicus	California croton	CRCA
Cryptantha intermedia	common cryptantha	CRIN
Cryptantha micromeres	minute-flowered cryptantha	CRMI
Deinandra corymbosa	coastal tarweed	DECO
Dichelostemma capitatum	blue dicks	DICA
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wild-rye	ELGL
Eriastrum virgatum	virgate eriastrum	ERVI
Ericameria ericoides	mock heather	ERER
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filaree	ERCI
Eschscholzia californica	California poppy	ESCA
Festuca myuros	rattail sixweeks grass	FEMY

Table 9-150. Species Observed on HA 48, 2018

Scientific Name	Common Name	Code
Frangula californica	California coffeeberry	FRCA
Gilia tenuiflora ssp. *arenaria**	sand gilia	GITEA
Heterotheca grandiflora	telegraph weed	HEGR
Horkelia cuneata	wedge-leaved horkelia	HOCU
Hypochaeris glabra	smooth 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	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	miniature lupine	LUBI
Lupinus nanus	sky lupine	LUNA
Madia sativa	coast tarweed	MASA
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Petrorhagia dubia	hairypink	PEDU
Plantago erecta	California plantain	PLER
Pterostegia drymarioides	woodland threadstem	PTDR
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Silene gallica	small-flower catchfly	SIGA
Stylocline gnaphaloides	everlasting neststraw	STGN
Trifolium gracilentum	pinpoint clover	TRGR
Trifolium macraei	Macrae's clover	TRMA
Vicia sativa ssp. *nigra*	narrow-leaved vetch	VISAN

* HMP species

9.18.2.4 Vegetative Cover

Burleson completed five line-intercept transects ranging from 4.5 to 11 meters in length at HA 48. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 25.58%. The mean vegetative cover by native shrubs and perennials was greater in 2018 than 2017 by 12.73%. Table 9-151 summarizes vegetative cover and Table 9-152 presents vegetative cover by species. Figure 9-124 presents the percent cover of dominant species at HA 43 in 2017 and 2018.

Table 9-151. 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	49.79	49.79	0.00	0.00	68.00	28.21
HA48T02	8.00	2.82	5.18	0.00	89.45	10.55
HA48T03	20.00	14.86	5.14	0.00	100.00	0.00
HA48T04	35.29	35.29	0.00	0.00	79.43	20.57
HA48T05	40.00	40.00	0.00	0.00	100.00	0.00
SITE AVERAGE*	**28.19**	**25.58**	**2.61**	**0.00**	**86.73**	**12.42**

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

Table 9-152. Transect Survey Results for HA 48 by Species

Transect	ACGL (%)	ARPU* (%)	ARTO (%)	CA sp. (%)	CERI* (%)	COFI (%)	CRSC (%)	DECO (%)	ERER (%)	HEGR (%)	QUAG (%)	SAME (%)	TH (%)	BG (%)
HA48T01	3.16	32.53	5.79	0.00	2.53	0.00	0.00	0.00	0.00	0.00	0.00	5.79	68.00	28.21
HA48T02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.18	2.82	0.00	0.00	0.00	89.45	10.55
HA48T03	14.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.14	0.00	0.00	100.00	0.00
HA48T04	0.00	28.57	0.00	2.71	0.00	2.57	1.43	0.00	0.00	0.00	0.00	0.00	79.43	20.57
HA48T05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	0.00	100.00	0.00
SITE AVERAGE†	4.38	11.98	1.29	0.45	0.56	0.42	0.24	1.34	0.73	1.27	4.24	1.29	86.73	12.42

* HMP species

† Transect lengths are not equal. Site averages are weighted to reflect differing lengths.
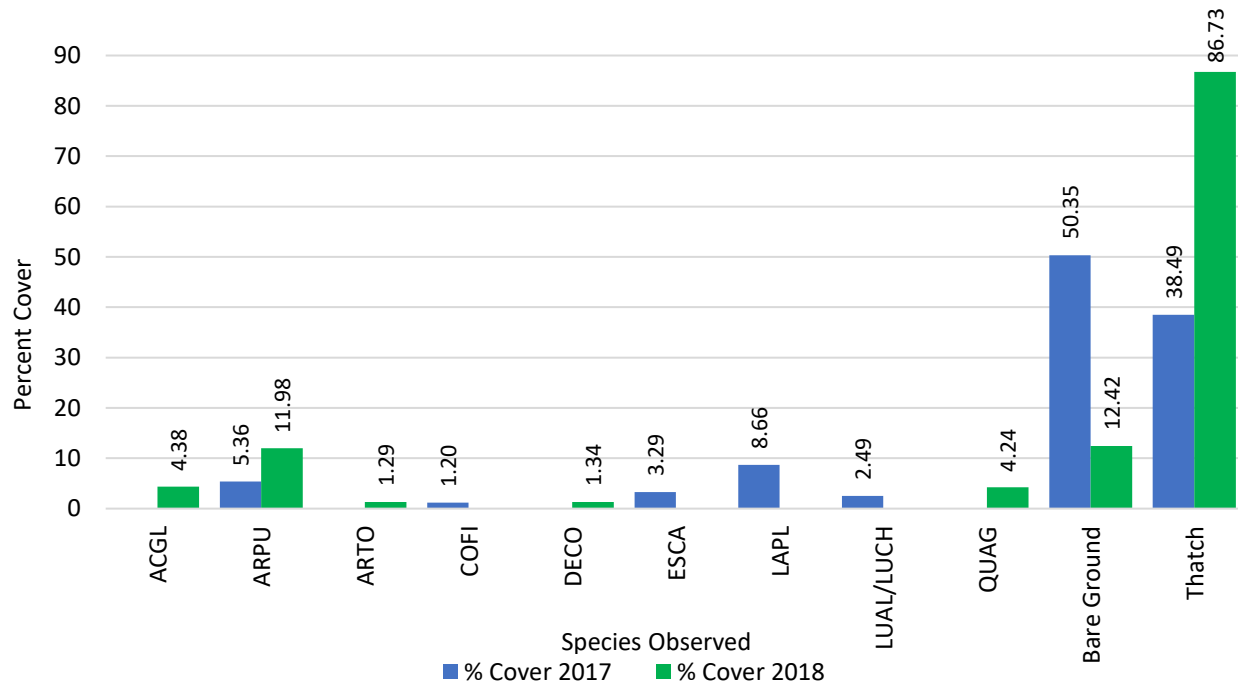
Figure 9-124. Percent Cover of Dominant Species at HA 48 in 2017 and 2018.

9.18.3 Discussion

9.18.3.1 Recommendations

HA 48 was in year 3 of monitoring in 2018 and responded well to natural recruitment. The site met five of six success criteria by 2018. Restoration activities have not occurred at HA 48. Per recommendations in the 2016 Annual Habitat Restoration Report, chamise will be planted in 2018/2019 to maintain the species richness criterion (Burleson, 2017). 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 already achieved the HMP annual density success criteria. A qualitative overview was documented by photo points (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 4, 2019. Table 9-153 summarizes the current status of HA 48 including which success criteria were met and recommendations.

Table 9-153. Status and Recommendations for Achieving Success Criteria at HA 48

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	Plant chamise (scheduled 2018/2019)*
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	Yes	None
Objective 3 – No. 4	HMP annual density	Yes	Establishment of restoration plots not necessary

* Recommendation repeated from the 2016 Annual Habitat Restoration Report (Burleson, 2017).

9.18.3.2 HMP Annual Density

No restoration plots were established for HMP annuals at HA 48. However, HMP annuals were mapped as part of the meandering transect survey. Monterey spineflower and sand gilia met the density success criterion.

9.18.3.3 Plant Survivorship

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

9.18.3.4 Species Richness

Sandmat manzanita, shaggy-bark manzanita, Monterey ceanothus, wedge-leaved horkelia, silver bush lupine, black sage, chamise, and peak rush-rose were present. HA 48 included 24 native shrub and perennial species and met the species richness success criterion for Objective 1.

9.18.3.5 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 14 shrub and perennial species and three annual species presented in Table 2 of the HA 48 SSRP (Burleson, 2013). The list did not include sandmat manzanita even though it is a required HMP shrub species for the site; however, sandmat manzanita was included in the calculation for the vegetative cover. These species contributed 19.62% cover to the HA. This success criterion was not met. In 2017, vegetative cover was 10.68%; cover increased by 8.94% (see Figure 9-125).
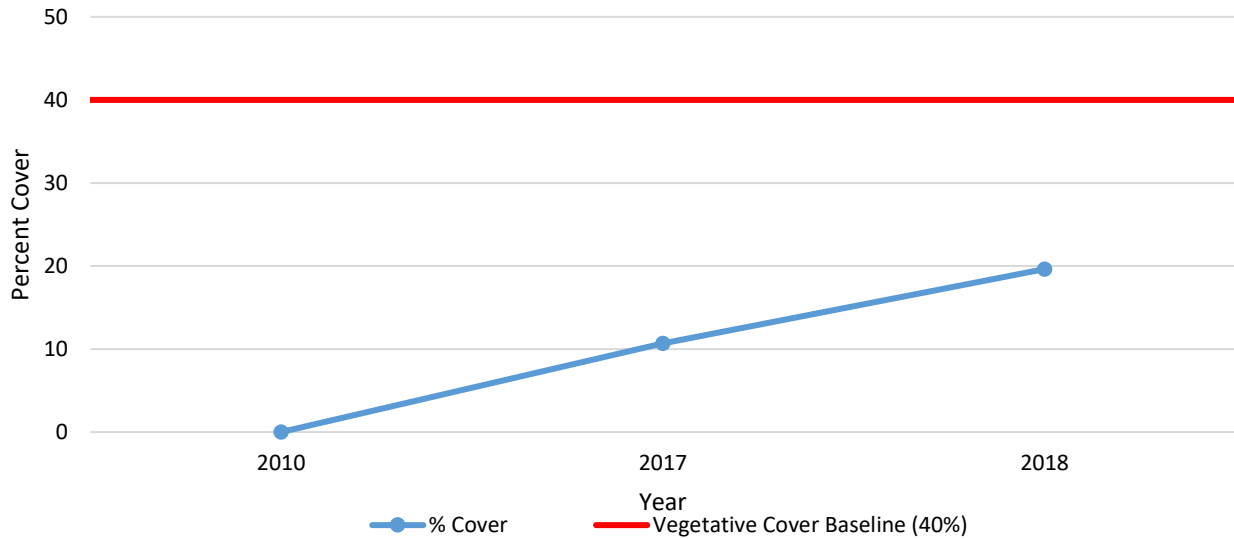
Figure 9-125. Native Vegetative Cover Compared to the Success Criterion at HA 48

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 ranges from 6-25% of absolute cover. The HMP shrub species at HA 48 provided an absolute cover of 12.54%; therefore, the HA met this success criterion. This was an increase from 5.81% in 2017. The second success criterion is no net loss of HMP shrubs. For HA 48, this means a vegetative cover average of at least 1% for sandmat manzanita and Monterey ceanothus must be present. The average vegetative cover for sandmat manzanita was 11.98% and Monterey ceanothus was 0.56% (see Figure 9-126). Sandmat manzanita and Monterey ceanothus were within the acceptable limit. The success criterion was met.
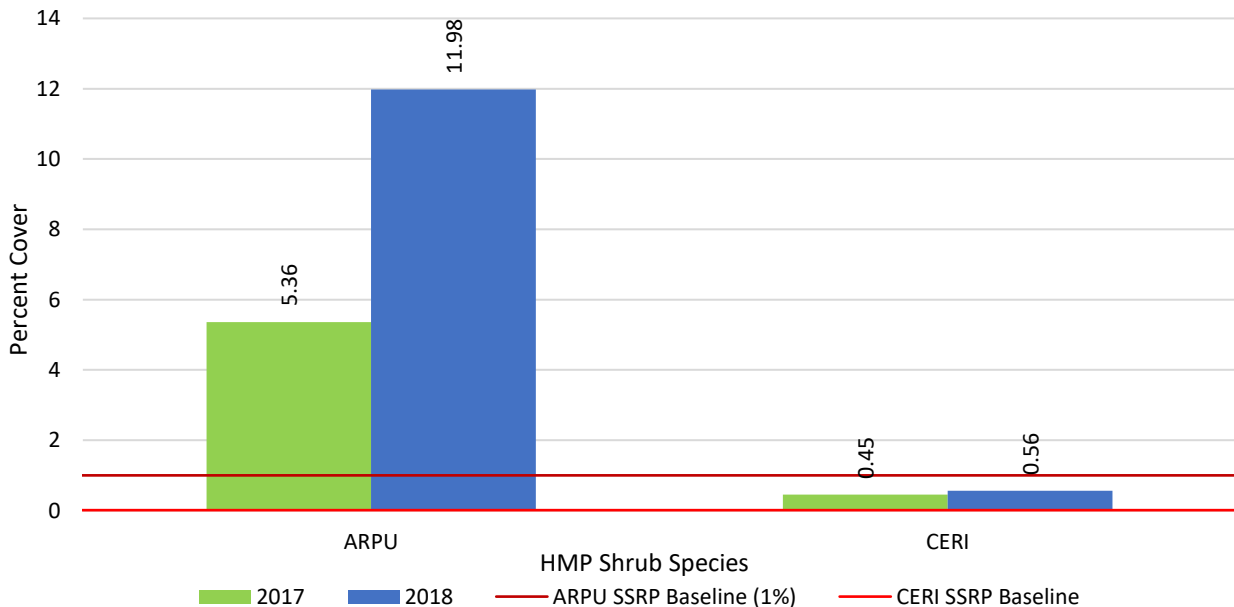
Figure 9-126. HMP Shrub Species Comparison to Success Criteria at HA 48

9.19   Austin Road Stockpile

Austin Road Stockpile encompasses about 0.45 acres and was used by the Army as a stockpile for soil remediation and 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 of similar maritime climates (USFS, 2007). The Austin Road Stockpile is relatively flat. Adjacent lands were not developed and contain intact native vegetation that may promote natural recruitment within 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 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 (USFS, 2007).

The SSRP 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 occurred at Austin Road Stockpile. Monitoring began in 2016. Austin Road Stockpile was monitored for three years by photo documentation and site visits, HMP annual density across the HA, and species richness (see Table 9-154). Figure 9-127 shows the site footprint, passive restoration area, and photo point monitoring locations. The success criteria for Austin Road Stockpile are summarized in Table 9-155.

Table 9-154. 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	●	●	●	●	●	●	●
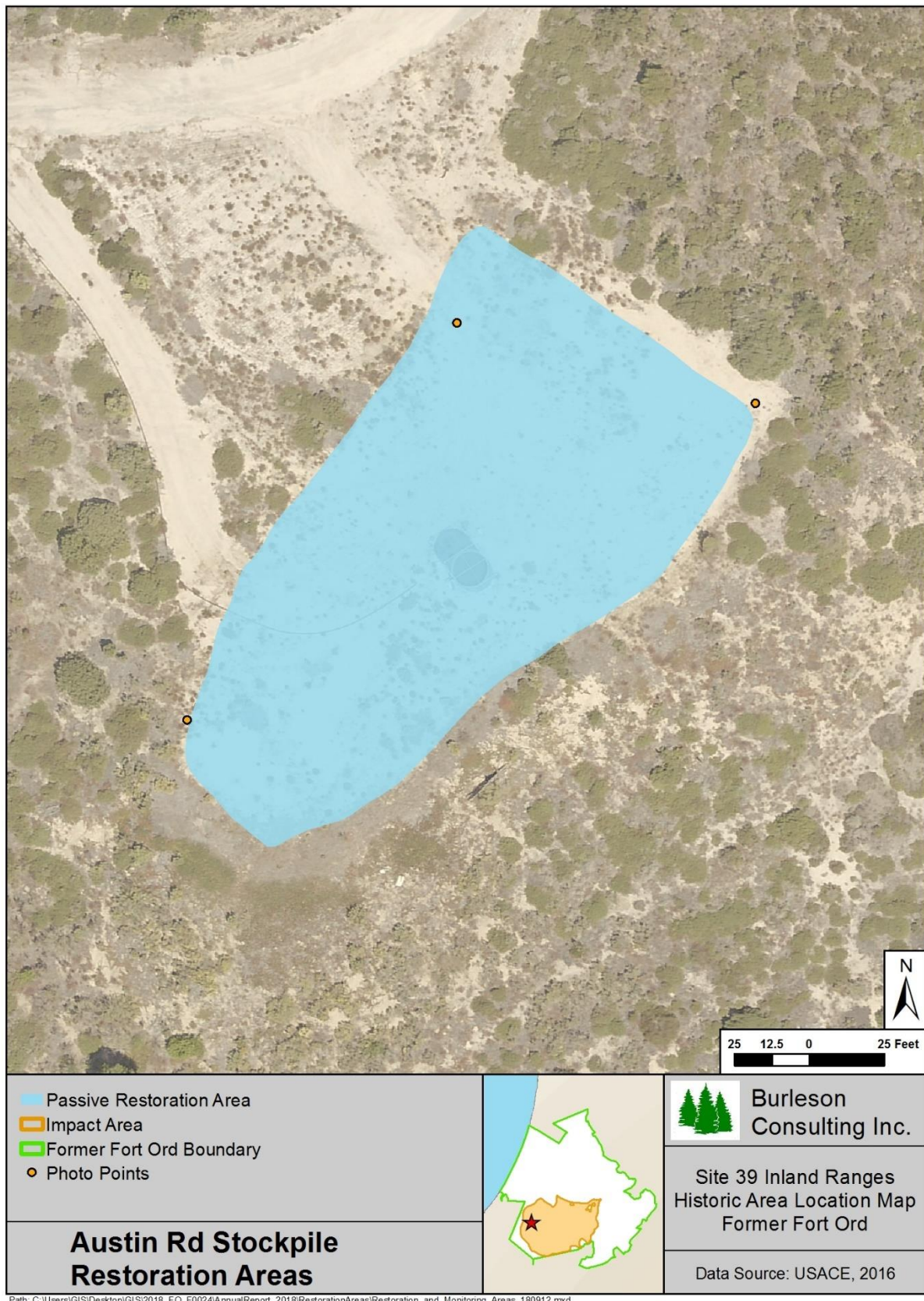
Figure 9-127. Austin Road Stockpile Restoration Areas and Monitoring Locations Map

Table 9-155. Success Criteria and Acceptable Limits for Restoration of Austin Road Stockpile

	Objective 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†
			shaggy-bark manzanita
			sandmat manzanita†
			coyote brush
			Monterey ceanothus†
			Monterey spineflower†
			mock heather
			golden yarrow
			peak rush-rose
			wedge-leaved 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 of the SSRP
	Objective 2*		
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*		
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.
			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.

Table 9-155. Success Criteria and Acceptable Limits for Restoration of Austin Road Stockpile

	Objective 3*		
4	HMP annuals percent cover and abundance [density class]	HMP annuals density class must meet or exceed baseline data	Monterey spineflower density class: Low

* Objectives presented in HRP (Shaw, 2009b)
† HMP Species

9.19.1 Restoration Activities

No passive or active restoration activities occurred at Austin Road Stockpile as of 2018.

9.19.2 Monitoring Results

9.19.2.1 HMP Annual Density

No restoration plots were established for HMP annuals at Austin Road Stockpile. However, HMP annuals were mapped as a part of the meandering transect survey. This survey was completed for Monterey spineflower and sand gilia at Austin Road Stockpile.

Six individual plants and nine discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 9-128). Densities were low and the total acreage of Monterey spineflower patches with a density at or above the SSRP baseline density class of low was 0.06 acres. From 2017 to 2018, the density range decreased and acreage above the SSRP baseline increased.

Sand gilia was not observed at Austin Road Stockpile in 2018.
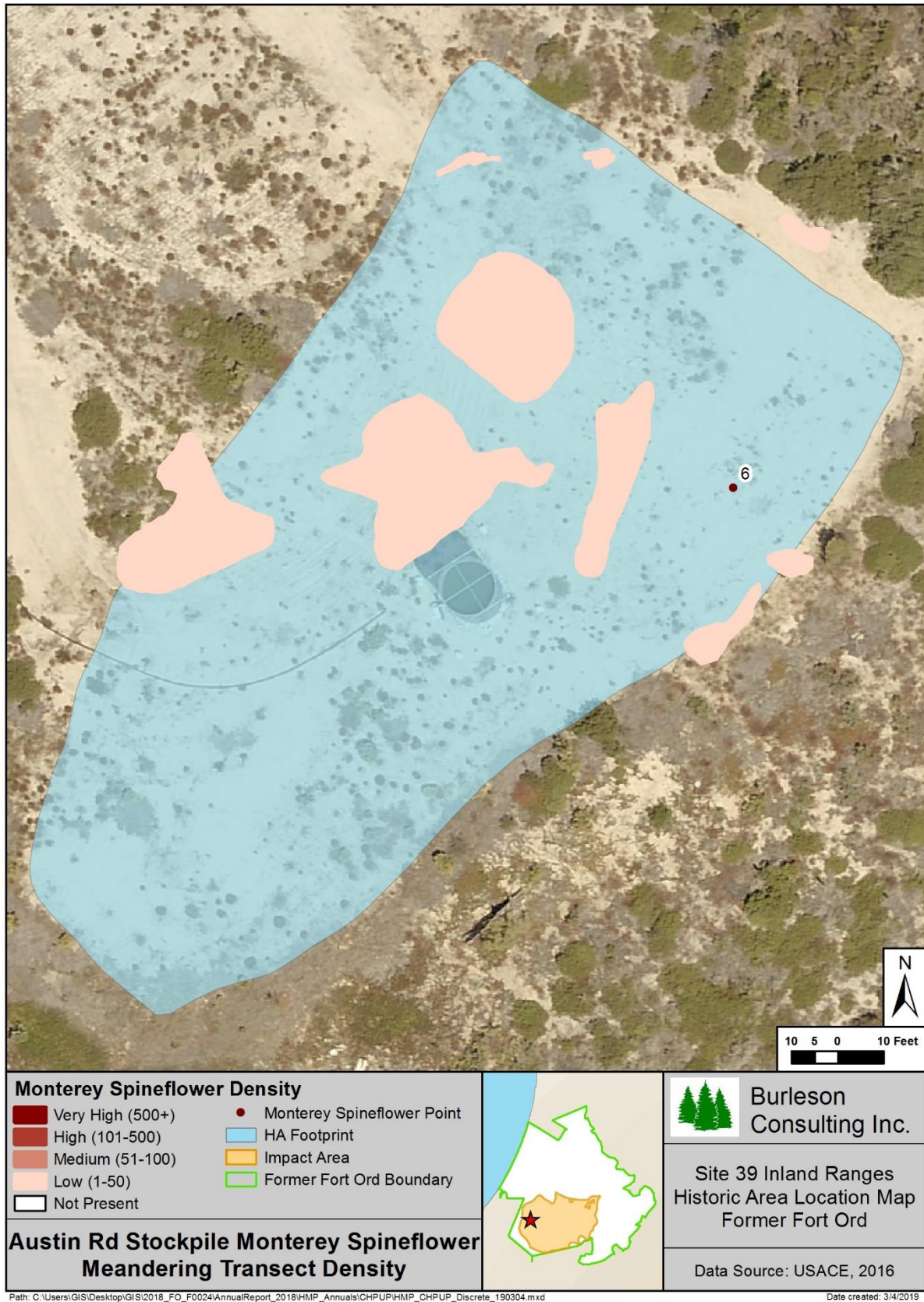
Figure 9-128. Austin Road Stockpile Monterey Spineflower Meandering Transect Density Map

9.19.2.2 Plant Survivorship

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

9.19.2.3 Species Richness

Forty-six species were observed at Austin Road Stockpile. Of those, 20 were native shrubs or perennials, 10 were native annual herbaceous species, and 16 were non-native species (see Table 9-156). Species richness increased by four species since 2017. Native shrub and perennial species increased by three, native herbaceous species remained the same, and non-native species increased by one.

Table 9-156. Species Observed at Austin Road Stockpile, 2018

Scientific Name	Common Name	Code
Acmispon glaber	deerweed	ACGL
Acmispon heermannii var. *orbicularis*	Heermann's lotus	ACHEO
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
*Arctostaphylos pumila**	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Avena barbata	slender wild oat	AVBA
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Cardionema ramosissimum	sand mat	CARA
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Ceanothus dentatus	dwarf ceanothus	CEDE
Centaurea melitensis	tocalote	CEME
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Corethrogyne filaginifolia	common sandaster	COFI
Crassula tillaea	moss pygmy-weed	CRTI
Crocanthemum scoparium	peak rush-rose	CRSC
Cryptantha intermedia	common cryptantha	CRIN
Ericameria ericoides	mock heather	ERER
*Ericameria fasciculata**	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
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 albifrons	silver bush lupine	LUAL
Lupinus bicolor	miniature lupine	LUBI
Lupinus concinnus	bajada lupine	LUCO
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA

Table 9-156. Species Observed at Austin Road Stockpile, 2018

Scientific Name	Common Name	Code
Petrorhagia dubia	hairypink	PEDU
Plantago erecta	California plantain	PLER
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium stramineum	cotton-batting plant	PSST
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Silene gallica	small-flower catchfly	SIGA

 * HMP species

9.19.2.4 Vegetative Cover

No transect or quadrat surveys were completed at Austin Road Stockpile.

9.19.3 Discussion

9.19.3.1 Recommendations

Austin Road Stockpile did not receive any restoration prescriptions by 2018. A qualitative overview was documented by photo points (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 9-157 summarizes the current status of Austin Road Stockpile including which success criteria were met and recommendations.

Table 9-157. Status and Recommendations for Achieving Success Criteria at Austin Rd 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 not necessary

9.19.3.2 HMP Annual Density

No restoration plots were established for HMP annuals at Austin Road Stockpile. However, HMP annuals were mapped as a part of the meandering transect survey. Monterey spineflower met the density success criterion.

9.19.3.3 Plant Survivorship

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

9.19.3.4 Species Richness

Chamise, sandmat manzanita, shaggy-bark manzanita, coyote brush, Monterey spineflower, mock heather, golden yarrow, peak rush-rose, wedge-leaved horkelia, deerweed, silver bush lupine, and black sage were present. Common yarrow, Hooker's manzanita, Monterey ceanothus, and sticky monkeyflower were not present. Austin Road Stockpile included 20 native shrub and perennial species; however, the site did not meet the success criterion for Objective 1.

9.19.3.5 Vegetative Cover

No transect or quadrat surveys were completed at Austin Road Stockpile.

9.20   Summary of Former Fort Ord Inland Ranges Site 39

HAs are in the final stages of restoration and early stages of monitoring. Passive and/or active restoration was implemented in all but HA 48 and Austin Road Stockpile. Restoration is complete at HAs 18, 19, 22, 23, 27, 27A, 28, 29, 33, 36, 38, 39/40, 43, 44, and 48. HAs range from year 1 to year 6 for monitoring, depending on when the restoration effort took place. Even though year 6 was not a required monitoring year, monitoring occurred and results were presented in this report. HA 19 was the only historic area 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, 19, 22, 23, 27, 27A, 29, 33, 36, 38, 39/40, 43, and 48. Corrective measures are outlined in the recommendations subsection for each HA.

Overall, none of the 19 HAs met the complete success criteria. Of the 19 sites, 12 met the species richness criterion, four met the native vegetation cover criterion, 18 met the non-native target weed cover criterion, eight met the HMP shrub cover class criterion, and two met the HMP shrub cover by species criterion. Of the 14 sites that have HMP annual criteria, ten met the HMP annual density criterion. Table 9-158 summarizes the status of Site 39 in meeting the success criteria.

The Army recommends the following changes to monitoring and the success criteria:
- HA 27A – manage the site in two distinct areas and reevaluate the success criteria for the southern polygon.
- HA 28 – install an additional transect in the central mulched area.
- HA 34 – reevaluate shrub cover success criteria at year 5.
- HA 39/40 – install an additional transect in Plot 3 to better assess restoration progress.
- HA 44 and 48 – establishment of HMP annual plots is not necessary because the species are already abundant on site.

Table 9-158. 2018 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	6	No	Yes	Yes	Yes	No	Yes
19	**5**	**No**	**No**	**Yes**	**Yes**	**No**	**Yes**
22	6	No	Yes	Yes	No	No	Yes
23	6	Yes	No	Yes	Yes	No	Yes
26	3	Yes	No	Yes	No	No	Yes
27	6	Yes	No	Yes	No	No	NA
27A	6	Yes	No	Yes	No	No	NA
28	4	Yes	No	Yes	Yes	No	Yes
29	6	No	No	Yes	No	No	NA
33	6	No	No	Yes	No	No	No
34	4	Yes	Yes	Yes	No	No	NA
36	6	Yes	No	Yes	No	No	NA
37	4	Yes	No	Yes	No	No	No
38	4	Yes	Yes	Yes	Yes	No	No
39/40	6	Yes	No	Yes	Yes	NA	Yes
43	6	No	No	Yes	Yes	No	No
44	1	Yes	No	Yes	No	Yes	Yes
48	3	Yes	No	Yes	Yes	Yes	Yes
Austin Rd Stockpile	0	No	Cannot assess*	Cannot assess*	Cannot assess*	Cannot assess*	Yes

* HAs where transect monitoring has not been completed cannot be compared to the success criterion. Transect monitoring will be performed in the future.
NA - the success criterion does not apply.

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10.   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 3, 2018 and July 14, 2018. 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 Photos C-70 through C-71, Appendix C). Burleson biologists interpreted the poster and provided community engagement during the open house and bus tour.

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11.   ANNUAL SITE 39 HABITAT RESTORATION MEETING

In accordance with the HRP, annual meetings were 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 Eighth Annual Site 39 Habitat Restoration and Habitat Monitoring Meeting was held at the BRAC conference room on February 21, 2018, at former Fort Ord, California. Participants included Chenega Support Services, USFWS, CDFW, Department of Toxic Substances Control, USACE, Bureau of Land Management, Burleson Consulting Inc., HydroGeologic Inc., Ahtna, Arcadis, Denise Duffy & Associates, UC Santa Cruz Natural Reserves, 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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12.   REFERENCES

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APPENDIX A

Seed and Plant Tables

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Table A-1. Site Specific Restoration Plan Seed Collection Targets and Inventory

Scientific Name	Common Name	HA	Target Amount (lb)	Collected Amount (lb)
Baccharis pilularis	coyote brush	-	1.00	1.05
Ceanothus rigidus*	Monterey ceanothus	26	4.00	4.87
Ceanothus rigidus*	Monterey ceanothus	44	1.00	1.32
Chorizanthe pungens var. *pungens**	Monterey spineflower	26	0.21	0.21
Chorizanthe pungens var. *pungens**	Monterey spineflower	44	0.21	0.22
Crocanthemum scoparium	peak rush-rose	-	5.70	5.71
Diplacus aurantiacus	sticky monkey flower	-	2.00	3.18
Ericameria fasciculata*	Eastwood's goldenbush	26	0.40	0.50
Eriophyllum confertiflorum	golden yarrow	-	4.30	4.70
Frangula californica	California coffeeberry	-	1.60	1.67
Garrya elliptica	coast silk tassel	-	0.60	2.06
Lupinus chamissonis	silver beach lupine	-	1.00	1.29
Salvia mellifera	black sage	-	5.00	6.83
TOTAL			**27.02**	**33.61**

* HMP species

Table A-2. Production Seed Targets and Inventory

Scientific Name	Common Name	HA	Target Amount (lb)	Collected Amount (lb)
Achillea millefolium	common yarrow	-	10.00	123.00
Acmispon glaber	deerweed	-	25.00	5.00
Elymus glaucus	blue wildrye	-	40.00	629.14
Hordeum sp.	sterile barley	-	50.00	113.00
Horkelia cuneata	wedge-leaved horkelia	-	40.00	44.00
Stipa pulchra	purple needlegrass	-	25.00	60.50
TOTAL			**190.00**	**974.64**

Table A-3. Production Seed Test Results

Scientific Name	Common Name	Test Date	Pure Seed (%)	Germination (%)	Pure Live Seed (%)	Live seeds per lb
Achillea millefolium	common yarrow	7/30/2018	96.26	94	90.48	N/A*
Elymus glaucus	blue wildrye	8/31/2018	96.86	53	51.34	74,744
Stipa pulchra	purple needlegrass	8/10/2018	99.75	92	91.77	N/A*

* Information not tested by S&S Seeds

Table A-4. Plant Propagation Inventory

Scientific Name	Common Name	HA 26 Inventory	HA 28 Inventory	HA 34 Inventory
Achillea millefolium	common yarrow	63	-	110
Acmispon glaber	deerweed	88	30	553
Adenostoma fasciculata†	chamise	67	60	223
Arctostaphylos pumila†*	sandmat manzanita	63	35	-
Arctostaphylos hookeri†*	Hooker's manzanita	-	30	148
Arctostaphylos montereyensis†*	Monterey manzanita	-	30	148
Arctostaphylos tomentosa ssp. *tomentosa†*	shaggy-bark manzanita	69	-	148
Artemisia californica	California sagebrush	-	75	210
Baccharis pilularis	coyote brush	31	105	239
*Ceanothus rigidus**	Monterey ceanothus	63	30	185
Ceanothus dentatus	dwarf ceanothus	-	-	-
Crocanthemum scoparium	peak rush-rose	100	30	553
Diplacus aurantiacus	sticky monkey flower	63	-	368
*Ericameria fasciculata**	Eastwood's goldenbush	50	30	-
Eriophyllum confertiflorum	golden yarrow	50	30	295
Frangula californica	California coffeeberry	-	40	10
Garrya elliptica	coast silk tassel	-	-	9
Horkelia cuneata	wedge-leaved horkelia	88	30	553
Lepechinia calycina	pitcher sage	-	-	25
Lupinus arboreus	yellow bush lupine	15	-	185
Lupinus chamissonis	silver beach lupine	-	-	-
Salvia mellifera	black sage	63	30	295
TOTAL		**873**	**585**	**4,257**

* HMP species
† Species propagated via cuttings

APPENDIX B

Restoration Activities

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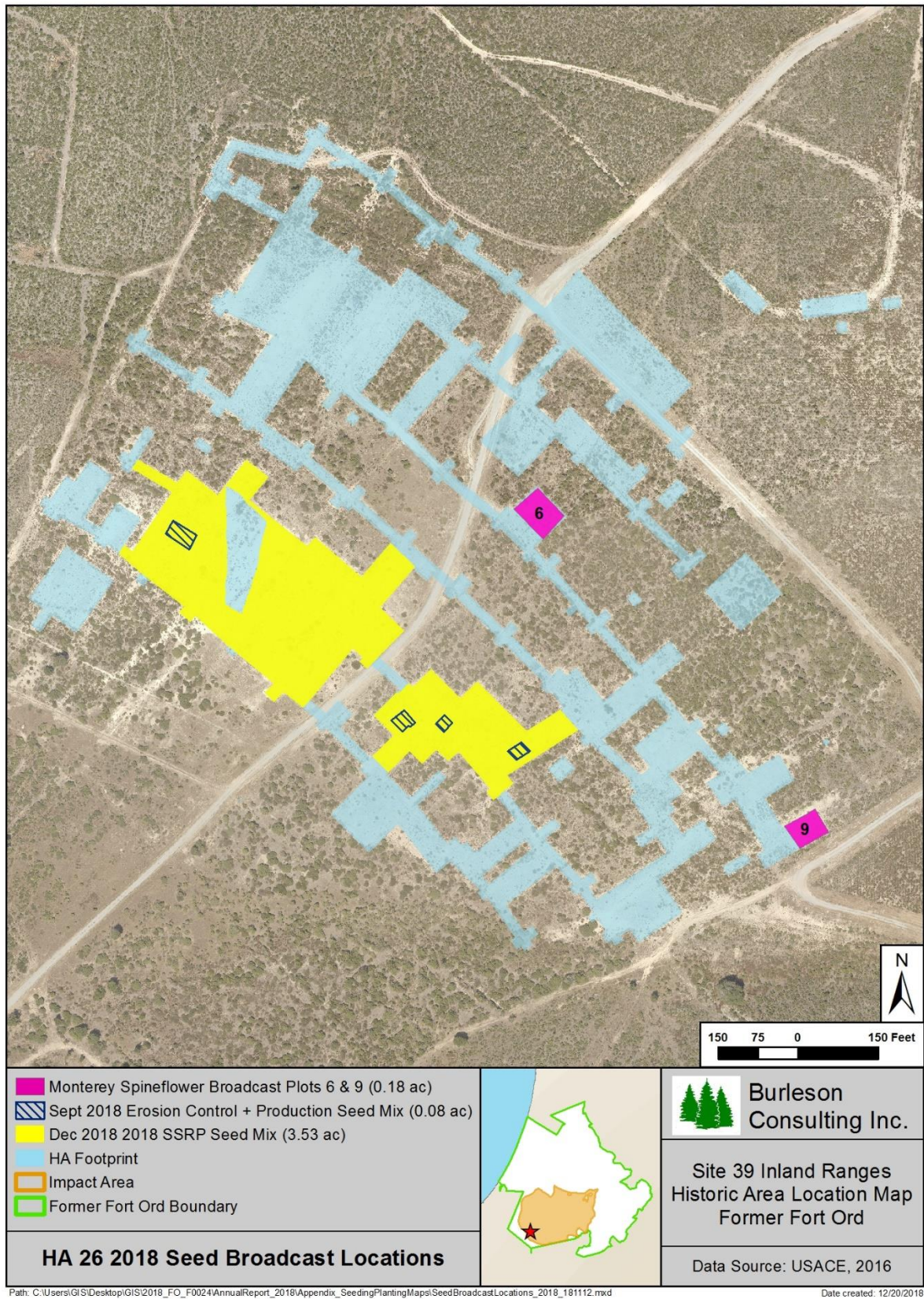
Figure B-1. HA 26 Seed Broadcast Location, Former Fort Ord

Table B-1. HA 26 SSRP Seed Mix Enhanced with Production Seed (Dec 2018)

Species	Amount (lb)
Achillea millefolium† (common yarrow)	8.0
Acmispon glaber† (deerweed)	4.0
Baccharis pilularis (coyote brush)	0.8
*Ceanothus rigidus** (Monterey ceanothus)	4.0
Crocanthemum scoparium (peak rush-rose)	3.2
Diplacus aurantiacus (sticky monkey flower)	2.0
Elymus glaucus† (blue wild-rye)	32.0
*Ericameria fasciculata** (Eastwood's goldenbush)	0.4
Eriophyllum confertiflorum (golden yarrow)	4.0
Frangula californica (California coffeeberry)	0.6
Garrya elliptica (silk tassel)	1.6
Hordeum sp.† (common barley)	40.0
Horkelia cuneata† (wedge-leaved horkelia)	16.0
Salvia mellifera (black sage)	4.0
Stipa pulchra† (purple needlegrass)	20.0
TOTAL	**136.6**

* HMP species
† Production seed

Table B-2. HA 26 Erosion Control and Production Seed Mix (Sept 2018)

Species	Amount (lb)
Achillea millefolium (common yarrow)	1.35
Elymus glaucus (blue wild-rye)	4.40
Hordeum sp. (sterile barley)	1.20
Horkelia cuneata (wedge-leaved horkelia)	1.80
Stipa pulchra (purple needle grass)	2.75
TOTAL	**11.50**

Table B-3. HA 26 Monterey Spineflower Seed Broadcast

Plot Name	Plot ID	Plot Area (ft^2)	Date Broadcast	Amount (lb)
6	HA26_CHPUP_06	4,482	Dec 2018	0.105
9	HA26_CHPUP_09	3,267	Dec 2018	0.105
TOTAL				**0.210**
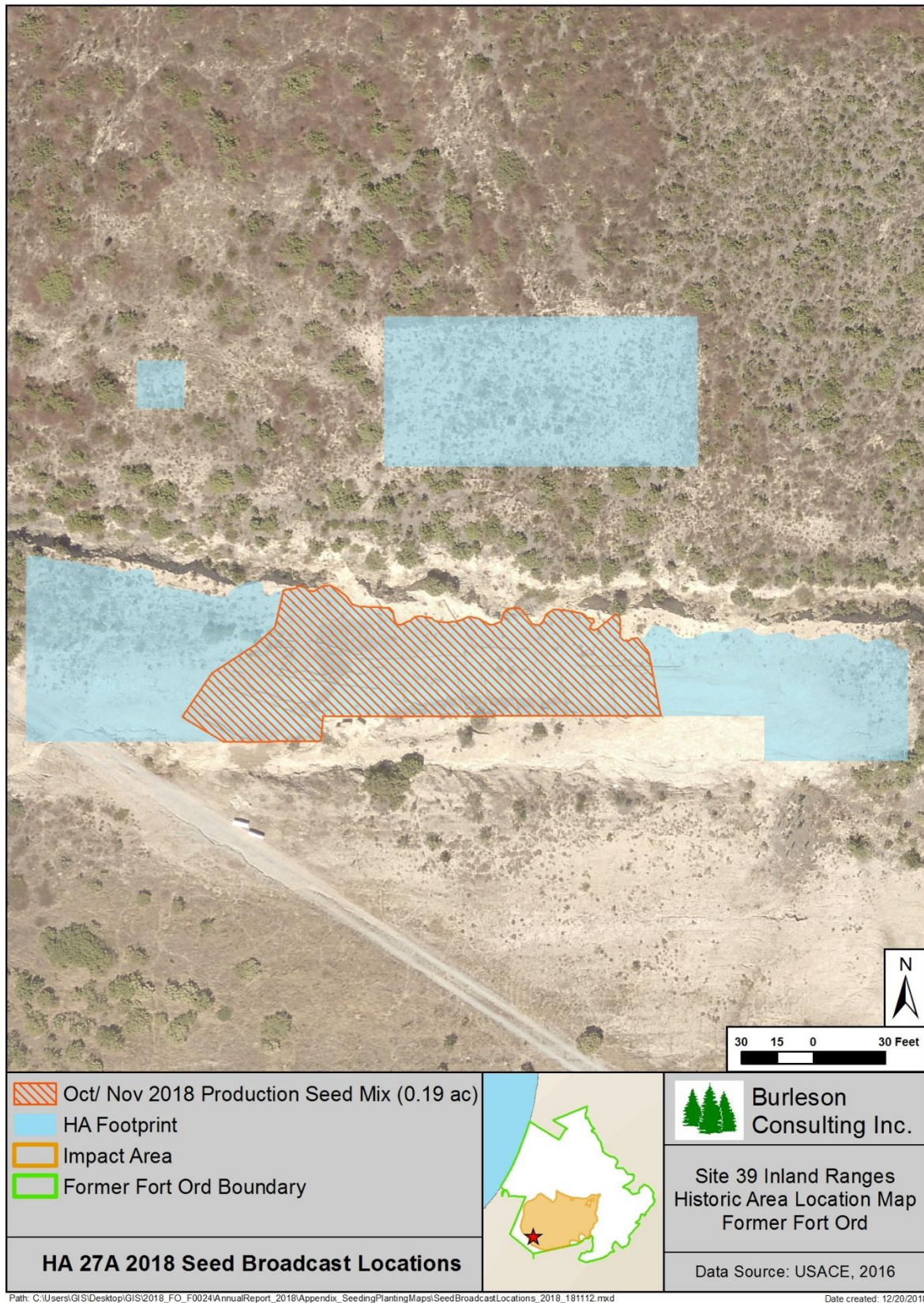
Figure B-2. HA 27A Seed Broadcast Location, Former Fort Ord

Table B-4. HA 27A Production Seed Mix (Oct – Nov 2018)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.75
Elymus glaucus **(blue wild-rye)**	2.00
Horkelia cuneata **(wedge-leaved horkelia)**	1.00
Stipa pulchra **(purple needle grass)**	1.25
TOTAL	**5.00**
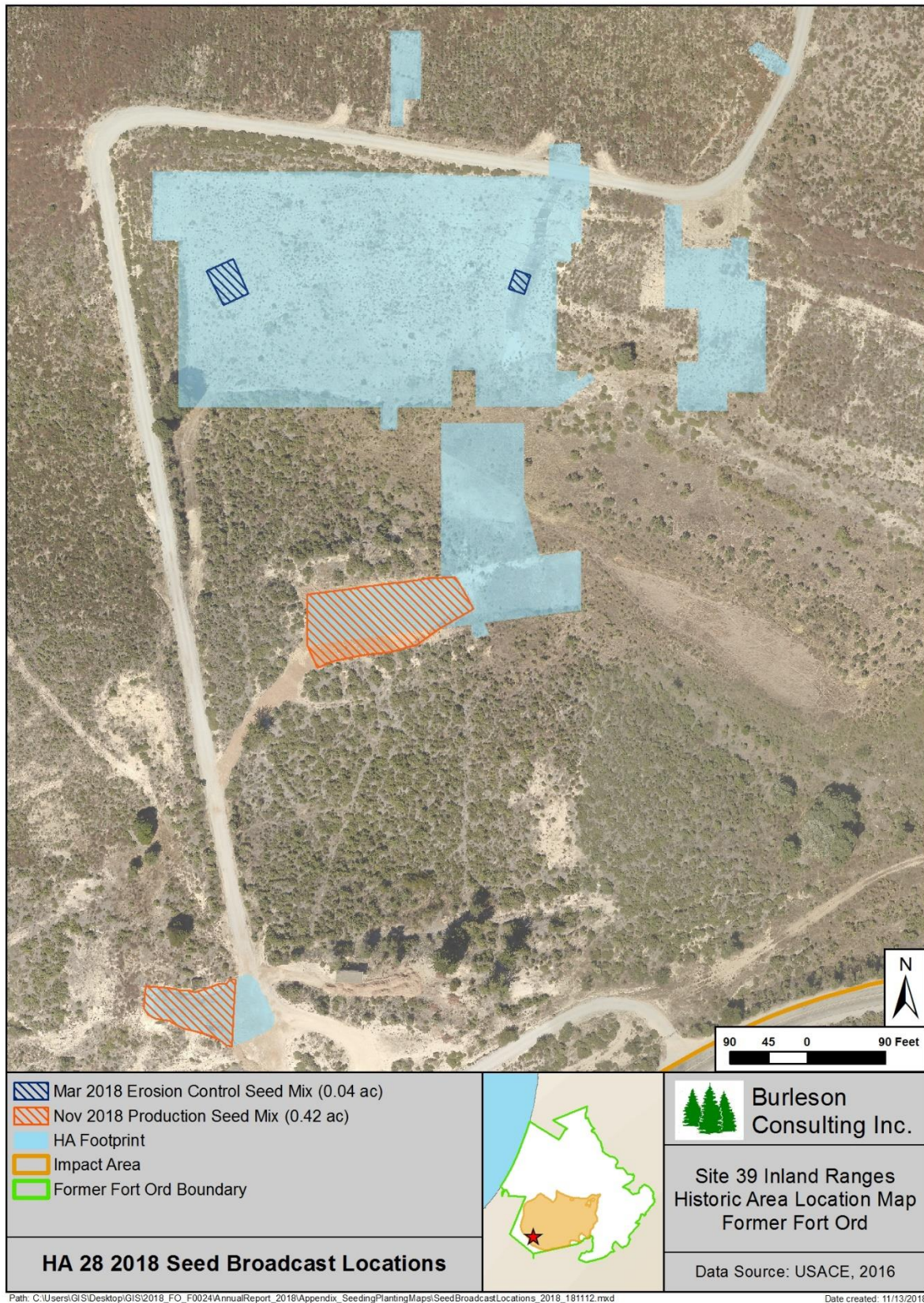
Figure B-3. HA 28 Seed Broadcast Locations, Former Fort Ord

Table B-5. HA 28 Erosion Control Seed Mix (Mar 2018)

Species	Amount (lb)
Hordeum sp. **(sterile barley)**	10.0
TOTAL	**10.0**

Table B-6. HA 28 Production Seed Mix (Nov 2018)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	2.1
Elymus glaucus **(blue wild-rye)**	5.6
Horkelia cuneata **(wedge-leaved horkelia)**	2.8
Stipa pulchra **(purple needle grass)**	3.5
TOTAL	**14.0**
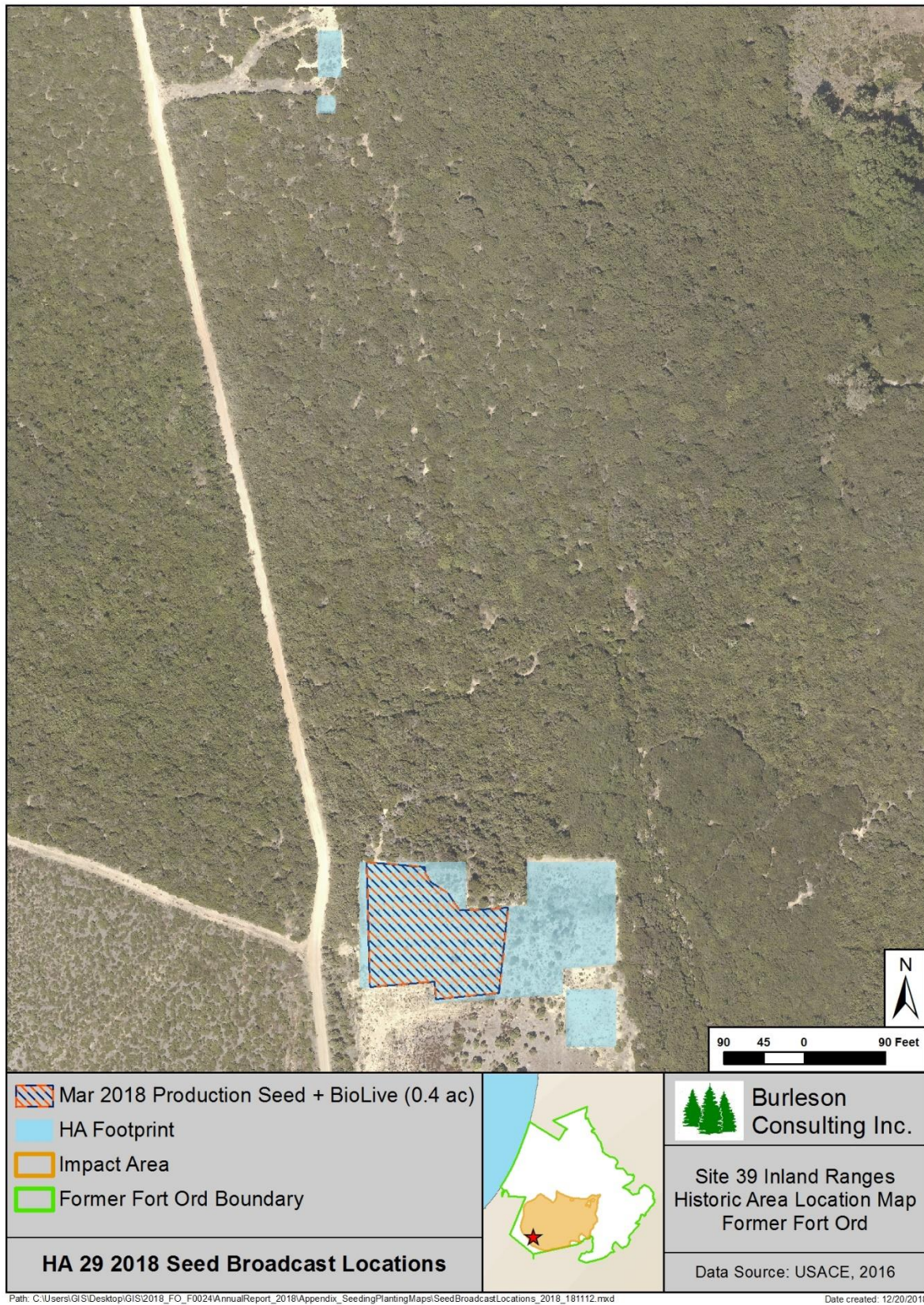
Figure B-4. HA 29 Seed Broadcast Location, Former Fort Ord

Table B-7. HA 29 Production Seed Mix (Mar 2018)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.8
Elymus glaucus **(blue wild-rye)**	2.0
Horkelia cuneata **(wedge-leaved horkelia)**	1.6
Stipa pulchra **(purple needle grass)**	2.0
TOTAL	**6.4**
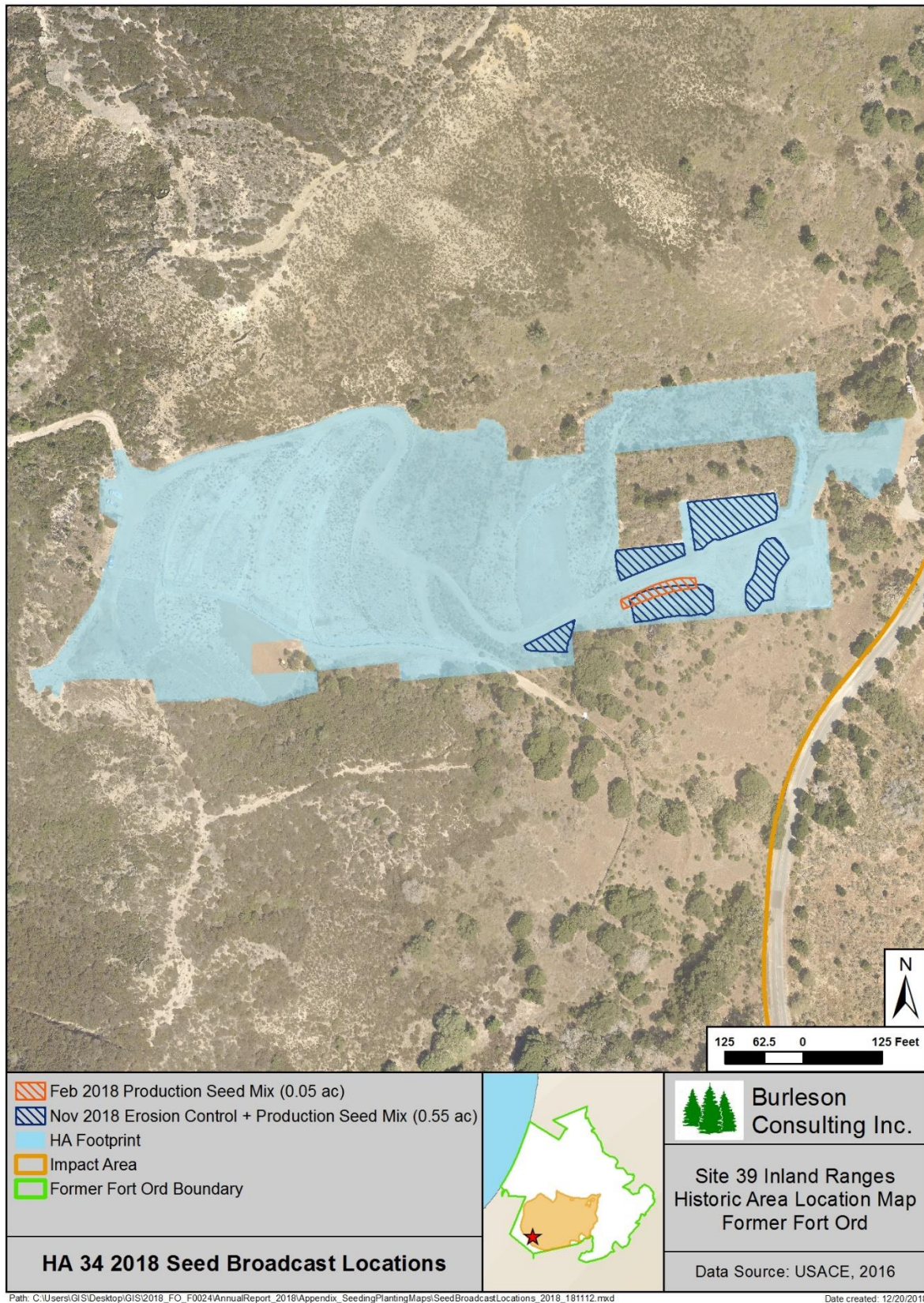
Figure B-5. HA 34 Seed Broadcast Locations, Former Fort Ord

Table B-8. HA 34 Production Seed Mix (Feb 2018)

Species	Amount (lb)
Acmispon glaber **(deerweed)**	0.2
Achillea millefolium **(common yarrow)**	0.2
Elymus glaucus **(blue wild-rye)**	0.8
Hordeum sp. **(sterile barley)**	16.2
Horkelia cuneata **(wedge-leaved horkelia)**	0.4
Stipa pulchra **(purple needle grass)**	0.5
TOTAL	**18.3**

Table B-9. HA 34 Erosion Control and Production Seed Mix (Nov 2018)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	1.8
Elymus glaucus **(blue wild-rye)**	5.6
Hordeum sp. **(sterile barley)**	1.2
Horkelia cuneata **(wedge-leaved horkelia)**	2.4
Stipa pulchra **(purple needle grass)**	3.5
TOTAL	**14.5**
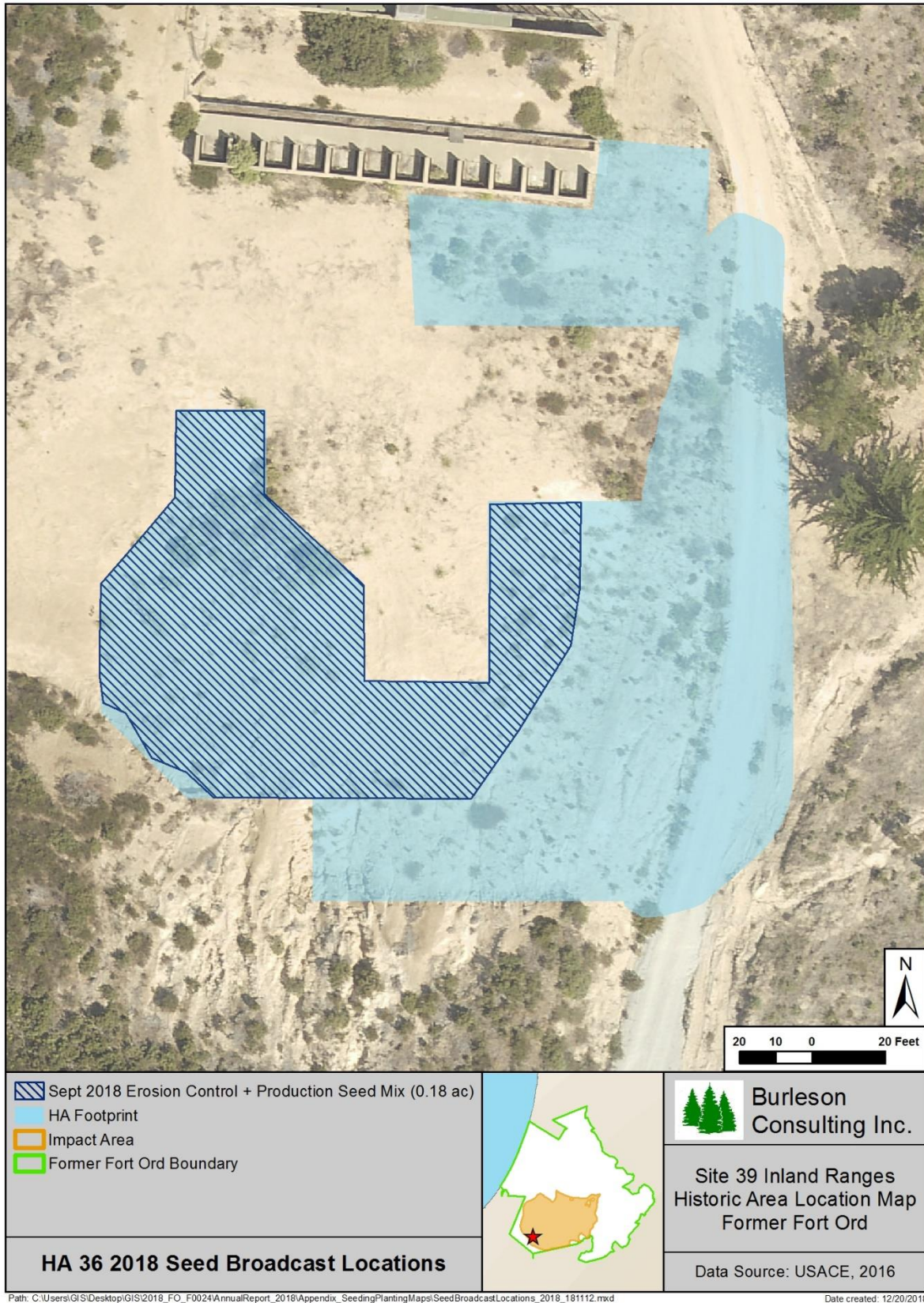
Figure B-6. HA 36 Seed Broadcast Location, Former Fort Ord

Table B-10. HA 36 Erosion Control and Production Seed Mix (Nov 2018)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	1.2
Elymus glaucus **(blue wild-rye)**	4.0
Hordeum sp. **(sterile barley)**	1.2
Horkelia cuneata **(wedge-leaved horkelia)**	1.6
Stipa pulchra **(purple needle grass)**	2.5
TOTAL	**10.5**
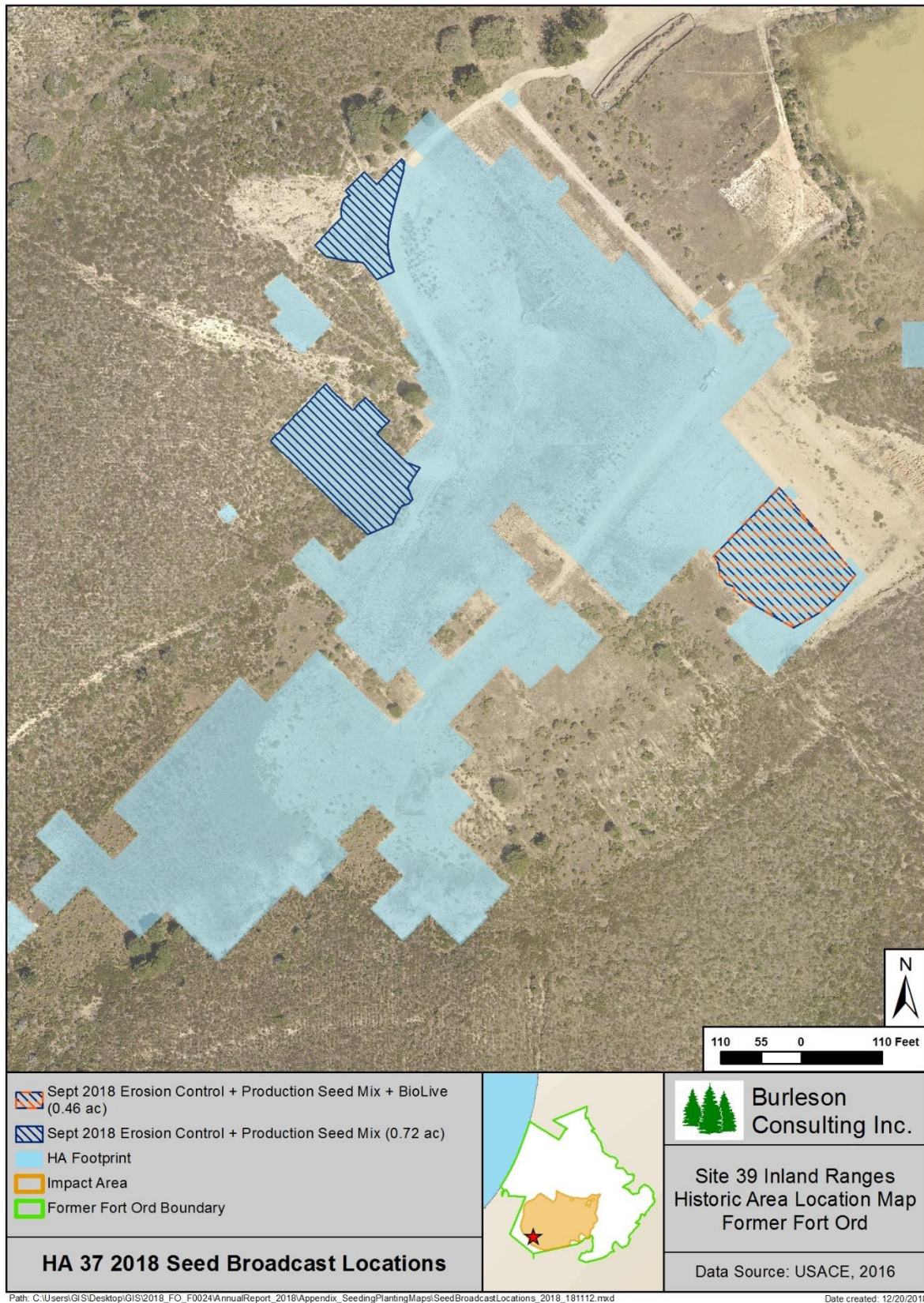
Figure B-7. HA 37 Seed Broadcast Locations, Former Fort Ord

Table B-11. HA 37 Erosion Control and Production Seed Mix (Nov 2018)

Species	Amount (lb)
Achillea millefolium (common yarrow)	1.8
Elymus glaucus (blue wild-rye)	7.2
Hordeum sp. (sterile barley)	3.6
Horkelia cuneata (wedge-leaved horkelia)	2.4
Stipa pulchra (purple needle grass)	4.5
TOTAL	**19.5**
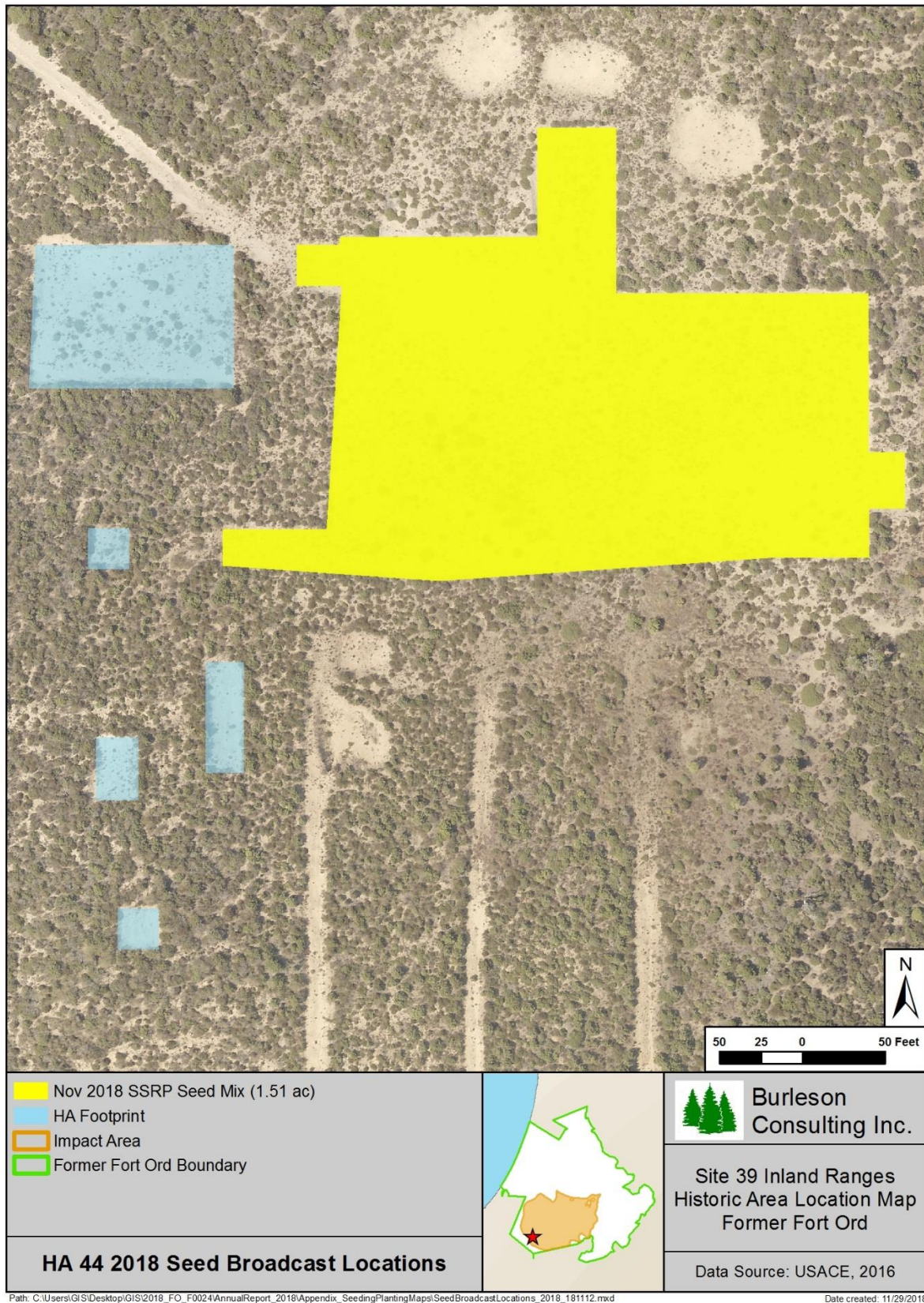
Figure B-8. HA 44 Seed Broadcast Locations, Former Fort Ord

Table B-12. HA 44 SSRP Seed Mix Enhanced with Production Seed (Nov 2018)

Species	Amount (lb)
Achillea millefolium† **(common yarrow)**	2.00
Acmispon glaber† **(deerweed)**	1.00
Baccharis pilularis **(coyote brush)**	0.20
*Ceanothus rigidus** **(Monterey ceanothus)**	1.00
Chorizanthe pungens var. *pungens** **(Monterey spineflower)**	0.21
Crocanthemum scoparium **(peak rush-rose)**	2.50
Elymus glaucus† **(blue wild-rye)**	8.00
Eriophyllum confertiflorum **(golden yarrow)**	0.30
Frangula californica **(California coffeeberry)**	1.00
Hordeum sp.† **(sterile barley)**	10.00
Horkelia cuneata† **(wedge-leaved horkelia)**	8.00
Lupinus albifrons var. albifrons **(silver bush lupine)**	1.00
Salvia mellifera **(black sage)**	1.00
Stipa pulchra† **(purple needlegrass)**	5.00
Total	**41.21**

*HMP species
† Production seed
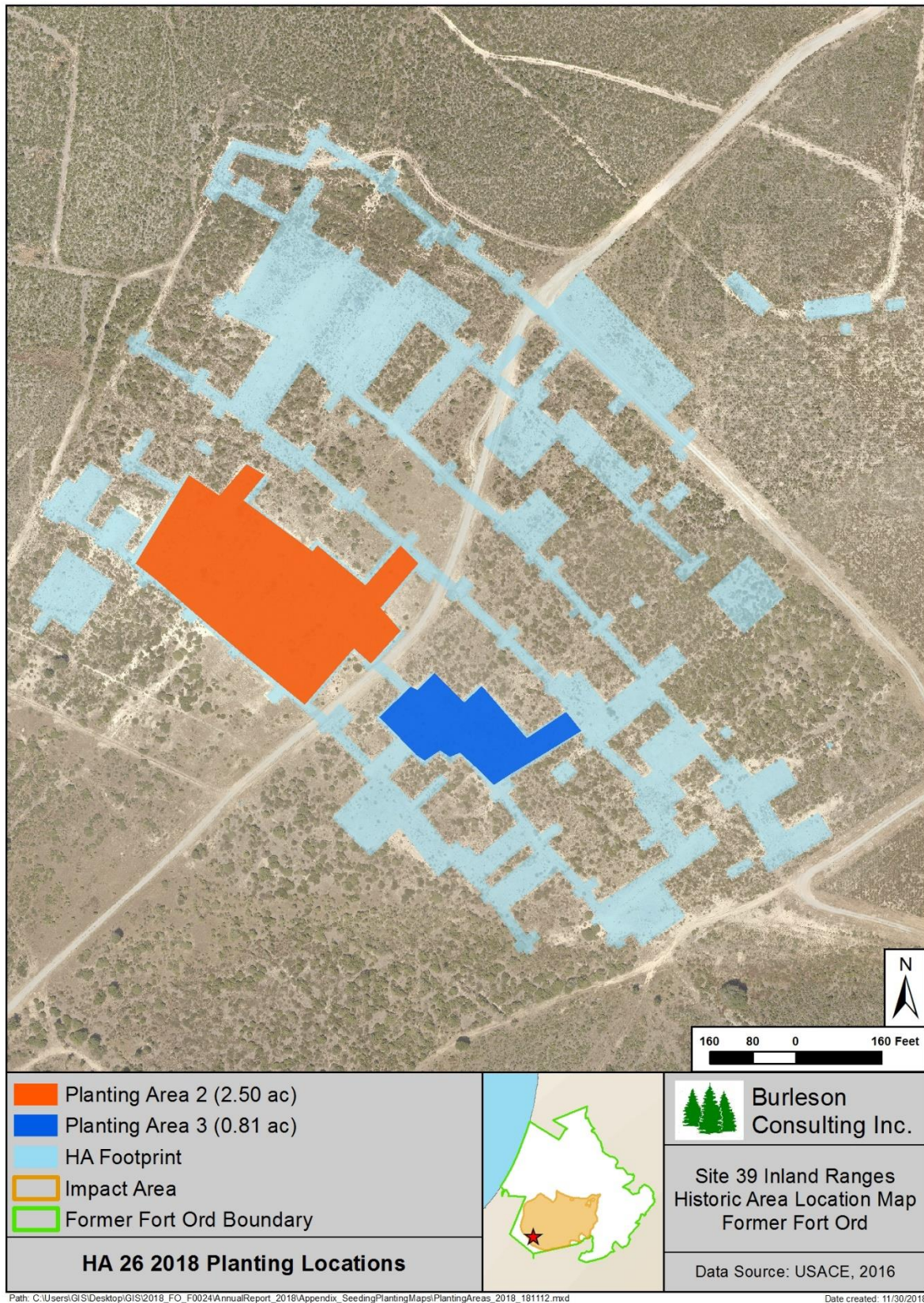
Figure B-9. HA 26 Planting Locations, Former Fort Ord

Table B-13. HA 26 Plant Installation (Dec 2017 – Jan 2018)

Species	Species Code	Plants Installed per HA 26 Sub-Area		Total Plants Installed (#)
		Area 2	Area 3	
Achillea millefolium (common yarrow)	ACMI	289	125	414
Acmispon glaber (deerweed)	ACGL	138	57	195
Adenostoma fasciculatum (chamise)	ADFA	589	134	723
*Arctostaphylos pumila** (sandmat manzanita)	ARPU	644	311	955
Arctostaphylos tomentosa ssp. *tomentosa* (shaggy-bark manzanita)	ARTO	319	138	457
Baccharis pilularis (coyote brush)	BAPI	141	61	202
*Ceanothus rigidus** (Monterey ceanothus)	CERI	290	124	414
Crocanthemum scoparium (peak rush-rose)	CRSC	462	200	662
Diplacus aurantiacus (sticky monkey flower)	DIAU	189	125	314
Eriophyllum confertiflorum (golden yarrow)	ERCO	50	32	82
Ericameria fasciculata (Eastwood's goldenbush)	ERFA	360	115	475
Horkelia cuneata (wedge-leaved horkelia)	HOCU	271	123	394
Salvia mellifera (black sage)	SAME	243	125	368
TOTAL		**3,985**	**1,670**	**5,655**

*HMP species
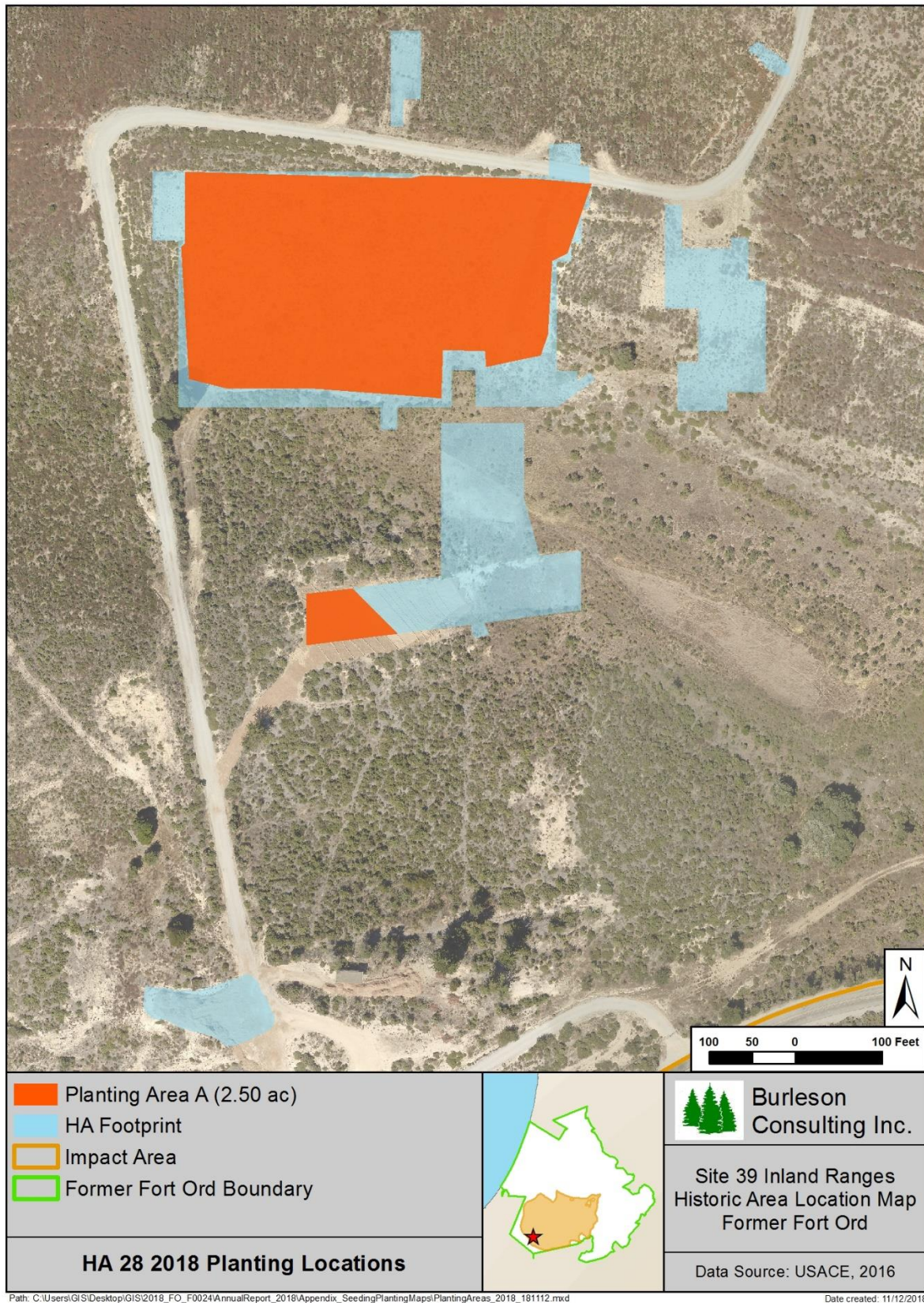
Figure B-10. HA 28 Planting Locations, Former Fort Ord

Table B-14. HA 28 Plant Installation (Jan 2018)

Species	Species Code	Total Plants Installed (#)
*Arctostaphylos pumila** **(sandmat manzanita)**	ARPU	948
TOTAL		**948**

*HMP species
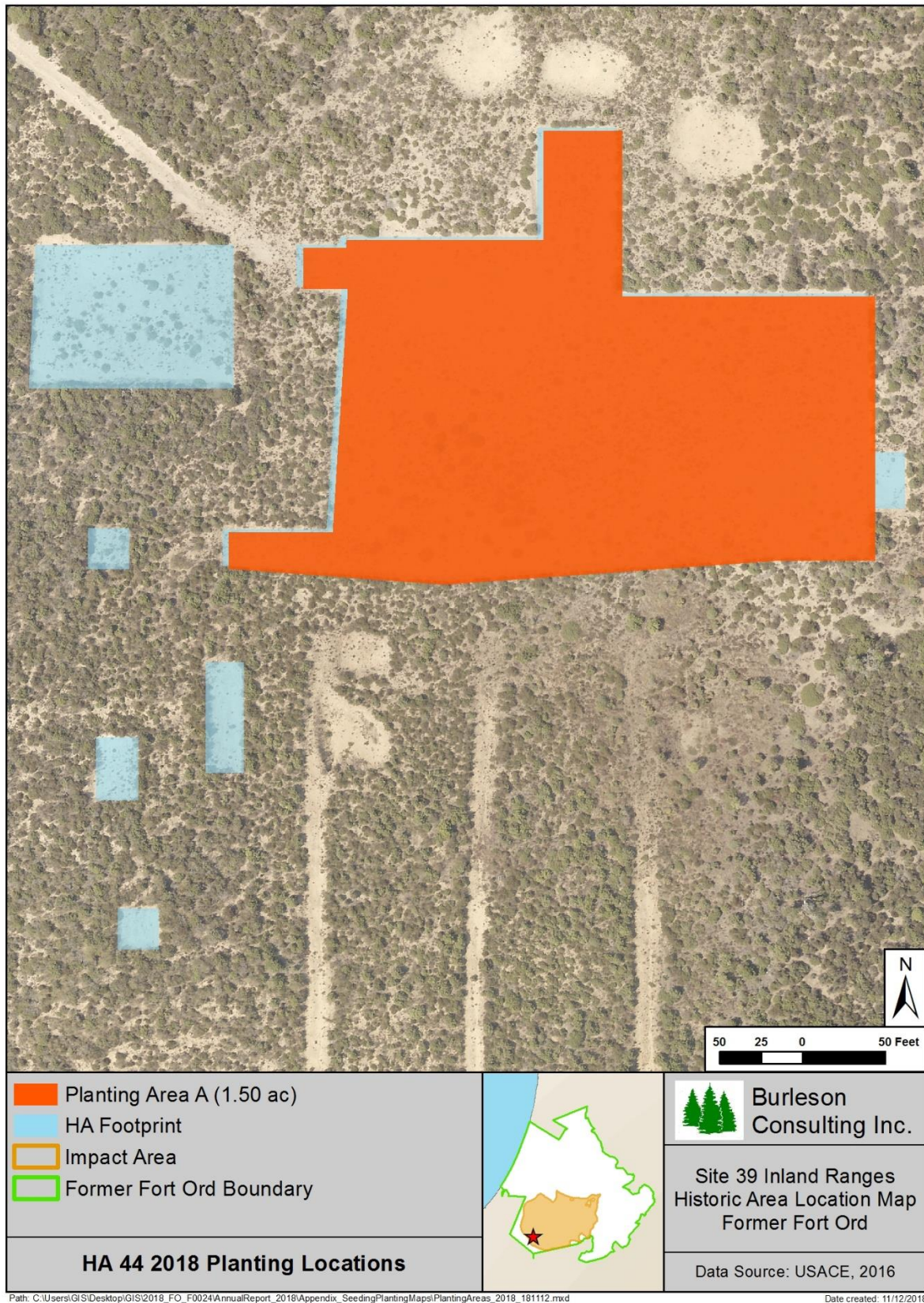
Figure B-11. HA 44 Planting Locations, Former Fort Ord

Table B-15. HA 44 Plant Installation (Jan – Feb 2018)

Species	Species Code	Total Plants Installed (#)
Achillea millefolium (common yarrow)	ACMI	100
Acmispon glaber (deerweed)	ACGL	31
Adenostoma fasciculatum (chamise)	ADFA	144
Arctostaphylos pumila* (sandmat manzanita)	ARPU	40
Arctostaphylos tomentosa var. *tomentosa* (shaggy-barked manzanita)	ARTO	52
Baccharis pilularis (coyote brush)	BAPI	87
Ceanothus rigidus* (Monterey ceanothus)	CERI	101
Crocanthemum scoparium (peak rush-rose)	CRSC	150
Frangula californica (California coffeeberry)	FRCA	300
Lupinus albifrons var. *albifrons* (silver bush lupine)	LUAL	68
Salvia mellifera (black sage)	SAME	37
TOTAL		**1,010**

*HMP species

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APPENDIX C

Photo Log

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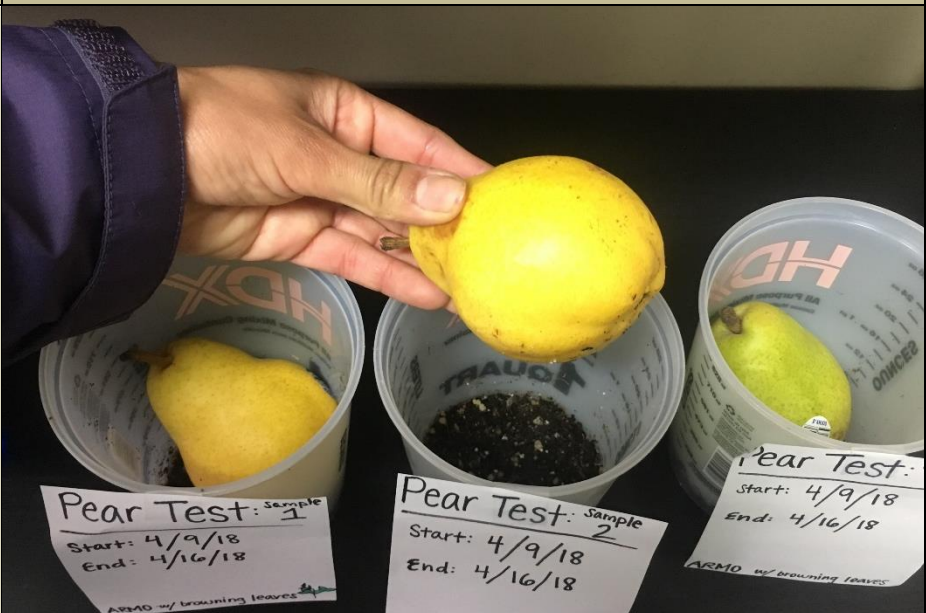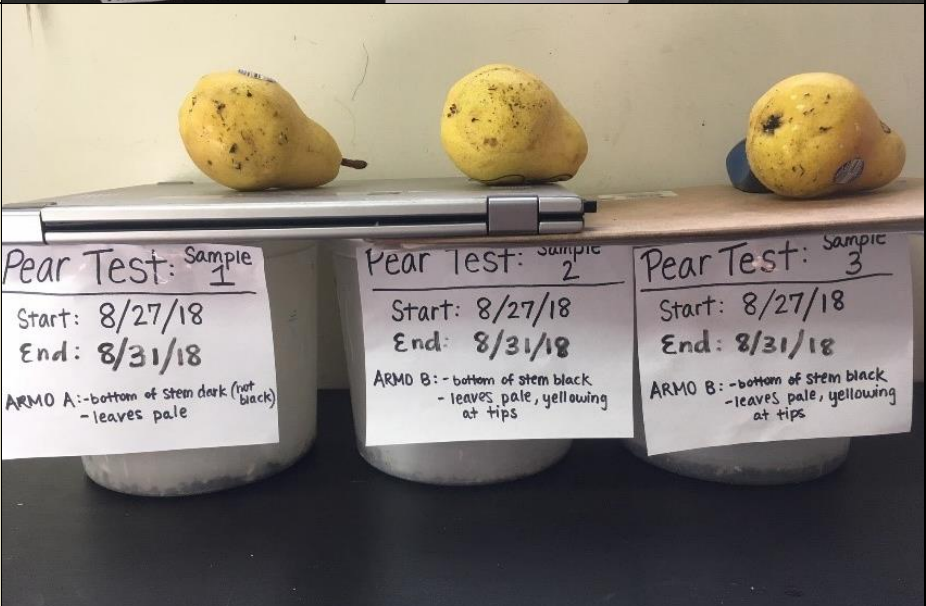
Photo Description	Photo
Burleson Carmel Valley Native Plant Nursery Negative results of the first pear test done in April **C-1**	
Burleson Carmel Valley Native Plant Nursery Negative results of the second pear test done in August **C-2**	
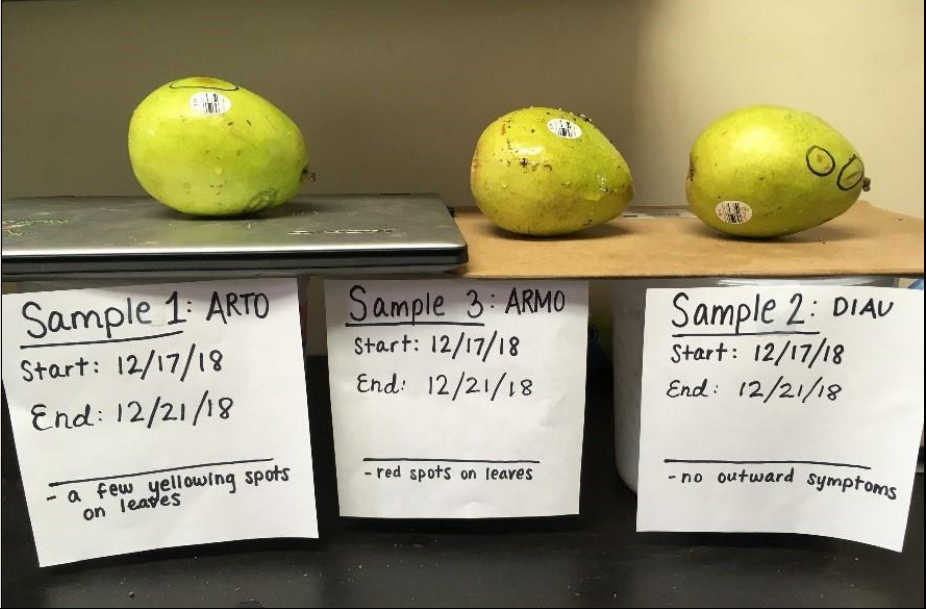
Photo Description	Photo
Burleson Carmel Valley Native Plant Nursery Negative results of the third pear test done in December **C-3**	
Seed Collection Burleson biologists collecting golden yarrow (*Eriophyllum confertiflorum*) **C-4**	

Photo Description	Photo
Seed Collection Mature Monterey ceanothus (*Ceanothus rigidus*) seed ready for collection **C-5**	
Seed Collection Eastwood's goldenbush (*Ericameria fasciculata*) seed **C-6**	

Photo Description	Photo
Seed Collection California coffeeberry's (*Frangula californica*) dark berries ready for collection **C-7**	
Seed Collection Silver bush lupine (*Lupinus albifrons*) seed after processing is complete **C-8**	

Photo Description	Photo
Seed Collection Burleson biologists processing silver bush lupine seed **C-9**	
Seed Production Common yarrow (*Achillea millefolium*) production plot at S&S Seeds **C-10**	

Photo Description	Photo
Seed Production Close-up of flowering common yarrow **C-11**	
Seed Production Purple needlegrass (*Stipa pulchra*) production plot at S&S Seeds **C-12**	

Photo Description	Photo
Plant Propagation Monterey manzanita (*Arctostaphylos montereyensis*) cuttings collected within 1 km of planting site **C-13**	
Plant Propagation Manzanita and chamise (*Adenostoma fasciculatum*) cuttings in the greenhouse **C-14**	

Photo Description	Photo
Plant Propagation Sandmat manzanita (*Arctostaphylos pumila*) cutting being transplanted into deepot **C-15**	
Plant Propagation Sandmat manzanita deepots after transplanting from cutting trays **C-16**	

Photo Description	Photo
Plant Propagation Wedge-leaved horkelia (*Horkelia cuneata*) in seed trays **C-17**	
Plant Propagation Mock heather (*Ericameria ericoides*) seedling being transplanted into cone **C-18**	

Photo Description	Photo
Plant Propagation Coyote brush (*Baccharis pilularis*) cone being transplanted to deepot **C-19**	
Plant Propagation Yellow bush lupine (*Lupinus arboreus*) inside a hoop house at the nursery **C-20**	

Photo Description	Photo
Plant Propagation Monterey manzanita in deepots **C-21**	
Plant Propagation Pitcher sage (*Lepechinia calycina*), sticky monkeyflower (*Diplacus aurantiacus*), and manzanita species in hoop house **C-22**	

Photo Description	Photo
Plant Propagation Burleson biologist maintaining nursery inventory **C-23**	
Passive Restoration Site Specific Restoration Plan (SSRP) seed staged for broadcast at HA 26 **C-24**	

Photo Description	Photo
Passive Restoration SSRP seed mix during broadcast at HA 26 **C-25**	
Passive Restoration Burleson biologists broadcast straw over SSRP seed at HA 26 **C-26**	
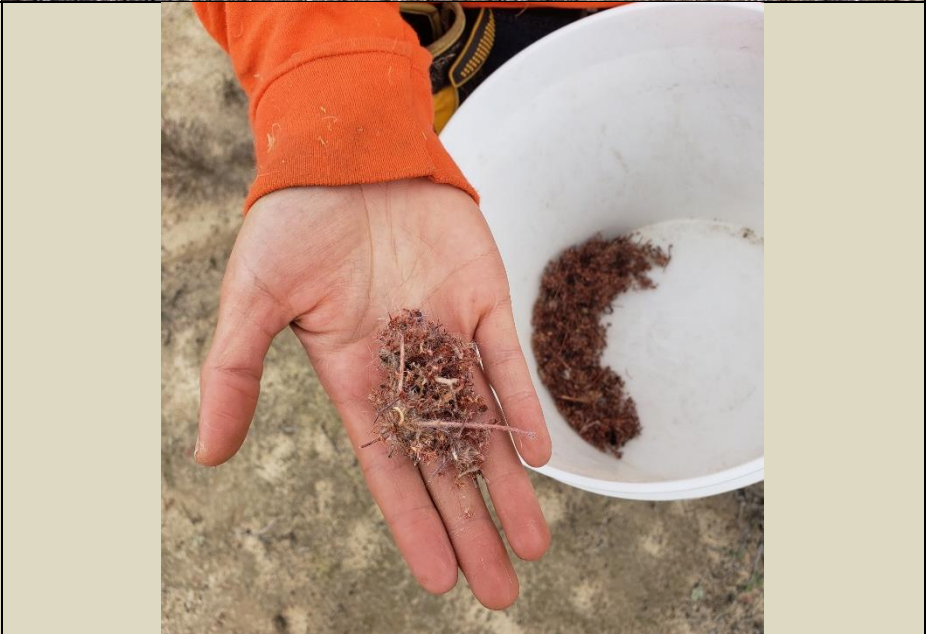
Photo Description	Photo
Passive Restoration Overview of HA 26 after seed broadcast **C-27**	
Passive Restoration Close-up of Monterey spineflower (*Chorizanthe pungens* var. *pungens*) before broadcast **C-28**	

Photo Description	Photo
Passive Restoration Burleson biologists broadcast and raking in Monterey spineflower seed at HA 26 **C-29**	
Passive Restoration Close-up of SSRP seed mix for HA 44 **C-30**	

Photo Description	Photo
Passive Restoration Burleson biologists raking in seed after broadcast at HA 44 **C-31**	
Passive Restoration Overview of HA 44 after broadcast of seed and straw **C-32**	

Photo Description	Photo
Active Restoration Plants staged for planting at HA 26 **C-33**	
Active Restoration UXO escort using Schonstedt to ensure planting areas are clear at HA 26 **C-34**	

Photo Description	Photo
Active Restoration Burleson biologist installing coyote brush at HA 26 **C-35**	
Active Restoration Plants staged at HA 28 **C-36**	

Photo Description	Photo
Active Restoration Burleson biologist using a dibbler to install plant through fabric at HA 28 **C-37**	
Active Restoration Sandmat manzanita after installation at HA 28 **C-38**	

Photo Description	Photo
Active Restoration Plants staged at HA 44 **C-39**	
Active Restoration Burleson biologist installing plants at HA 44 **C-40**	

Photo Description	Photo
Monitoring Close-up of Monterey spineflower and sand gilia (*Gilia tenuiflora* ssp. *arenaria*), two HMP annual species **C-41**	
Monitoring Close-up of Seaside bird's beak (*Cordylanthus rigidus* ssp. *littoralis*), an HMP annual **C-42**	

Photo Description	Photo
Monitoring Burleson biologist monitoring for HMP annual species **C-43**	
Monitoring Burleson biologists making circle plots to monitor for HMP annual species at HA 19 **C-44**	

Photo Description	Photo
Monitoring Burleson biologist mapping discrete patch of sand gilia **C-45**	
Monitoring Burleson biologist conducting vegetative cover transect surveys **C-46**	

Photo Description	Photo
Monitoring Burleson biologist conducting vegetative cover quadrat surveys **C-47**	
Erosion Control Repairs Burleson biologist broadcast seed after erosion control repairs at HA 34 **C-48**	

Photo Description	Photo
Erosion Control Repairs Overview of erosion control repair completed at HA 34 **C-49**	
Erosion Control Repairs Burleson biologists driving stakes to depth at HA 34 **C-50**	

Photo Description	Photo
Erosion Control Repairs Overview of erosion control repair at HA 34 **C-51**	
Erosion Control Repairs Wet season erosion control repair completed at HA 26 **C-52**	

Photo Description	Photo
Erosion Control Repairs Stakes staged at HA 27A **C-53**	
Production Seed, Mulch, and Mycorrhizal Mix Broadcast Burleson biologist drilling at base of stunted plants for BioLive 5-4-2 treatment at HA 37 **C-54**	

Photo Description	Photo
Production Seed, Mulch, and Mycorrhizal Mix Broadcast Close-up of drilled holes at the base of a stunted chamise at HA 37 **C-55**	
Production Seed, Mulch, and Mycorrhizal Mix Broadcast Sandmat manzanita receiving BioLive 5-4-2 treatment at HA 29 **C-56**	

Photo Description	Photo
Production Seed, Mulch, and Mycorrhizal Mix Broadcast Stunted black sage (*Salvia mellifera*) after BioLive 5-4-2 and mulch treatment at HA 29 **C-57**	
Production Seed, Mulch, and Mycorrhizal Mix Broadcast Overview of HA 29 after seed broadcast and mulch **C-58**	

Photo Description	Photo
Irrigation Rana Creek staff leveling ground for water storage tank installation at HA 26 **C-59**	
Irrigation High visibility T-posts installed around water storage tanks at HA 26 **C-60**	

Photo Description	Photo
Irrigation Rana Creek staff installing irrigation pump at HA 26 **C-61**	
Irrigation Rana Creek staff installing main and lateral PVC piping of the west side of HA 26 **C-62**	

Photo Description	Photo
Irrigation Rana Creek staff installing an emitter at the end of spaghetti tubing for a sandmat manzanita at HA 26 **C-63**	
Irrigation Overview of irrigation at HA 26 **C-64**	

Photo Description	Photo
Irrigation Irrigation event occurring at HA 26 **C-65**	
Irrigation Close-up of chamise and Monterey spineflower during irrigation at HA 26 **C-66**	

Photo Description	Photo
Irrigation Close-up of Monterey ceanothus during irrigation **C-67**	
Irrigation Close-up of Eastwood's goldenbush during irrigation **C-68**	

Photo Description	Photo
Irrigation Example of before (left) and after (right) repair to the irrigation lines at HA 26 **C-69**	
Community Involvement Burleson biologist showing native plants to the public **C-70**	

Photo Description	Photo
Community Involvement Burleson's tabling display at the Army Open House on July 14, 2018 **C-71**	

APPENDIX D

Photo Points

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Photo Points

| HA 18 | October 2011 | HA 18 | May 2018 |

Photo Points

| HA 19 \| May 2013 | HA 19 \| May 2018 |

Photo Points
HA 22 | October 2011
HA 22 | May 2018

Photo Points

| HA 23 | October 2011 | HA 23 | May 2018 |

Photo Points

| HA 26 | May 2016 | HA 26 | May 2018 |

Photo Points

| HA 27 \| October 2011 | HA 27 \| May 2018 |

Photo Points

| HA 27A \| October 2011 | HA 27A \| May 2018 |

Photo Points

HA 28 | April 2014	HA 28 | May 2018

Photo Points
HA 29 | October 2011
HA 29 | May 2018

Photo Points

| HA 33 | October 2011 | HA 33 | May 2018 |

Photo Points

| HA 34 \| January 2013 | HA 34 \| May 2018 |

Photo Points

| HA 36 | October 2011 | HA 36 | May 2018 |

Photo Points

| HA 37 \| April 2014 | HA 37 \| May 2018 |

Photo Points

| HA 38 | April 2014 | HA 38 | May 2018 |

Photo Points

| HA 39/40 | October 2011 | HA 39/40 | May 2018 |

Photo Points
HA 43	October 2011 HA 43	April 2018

Photo Points

| HA 44 | May 2016 | HA 44 | May 2018 |

Photo Points
HA 48 | April 2016
HA 48 | May 2018

Photo Points

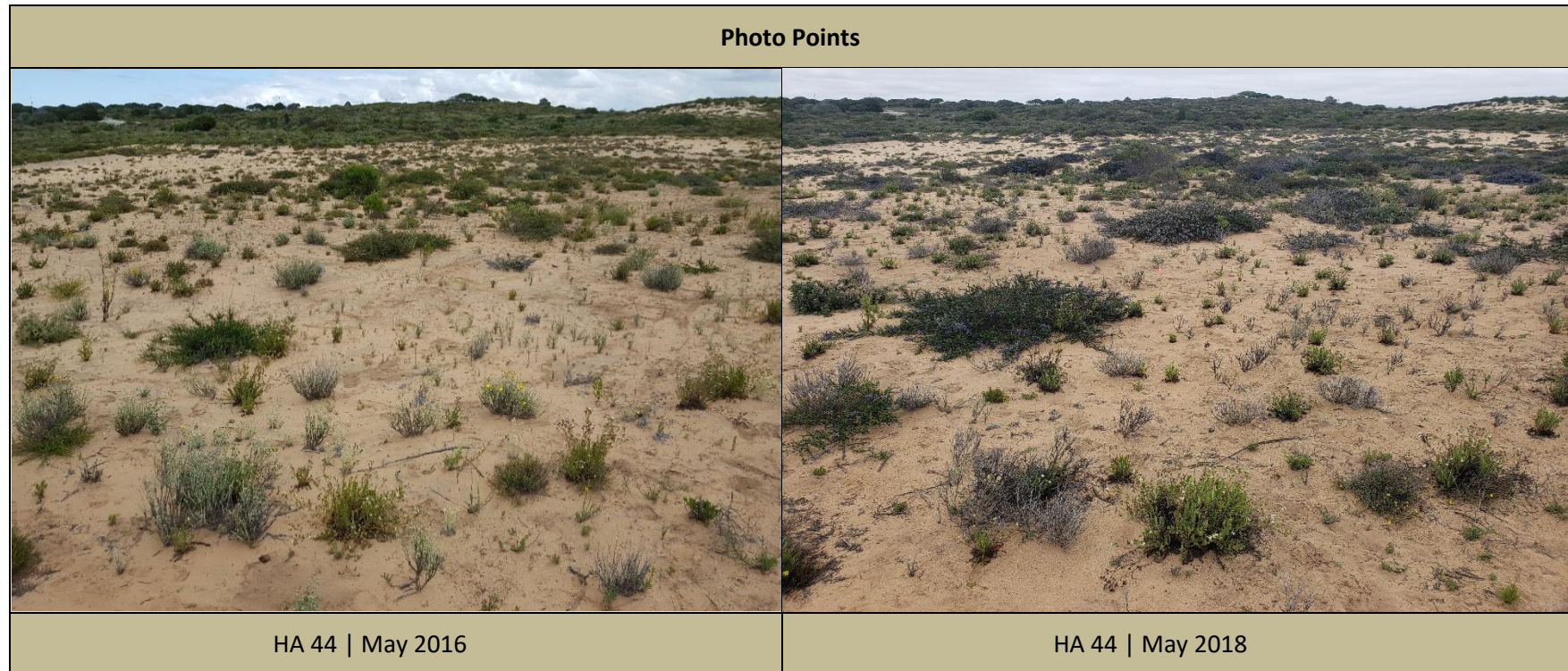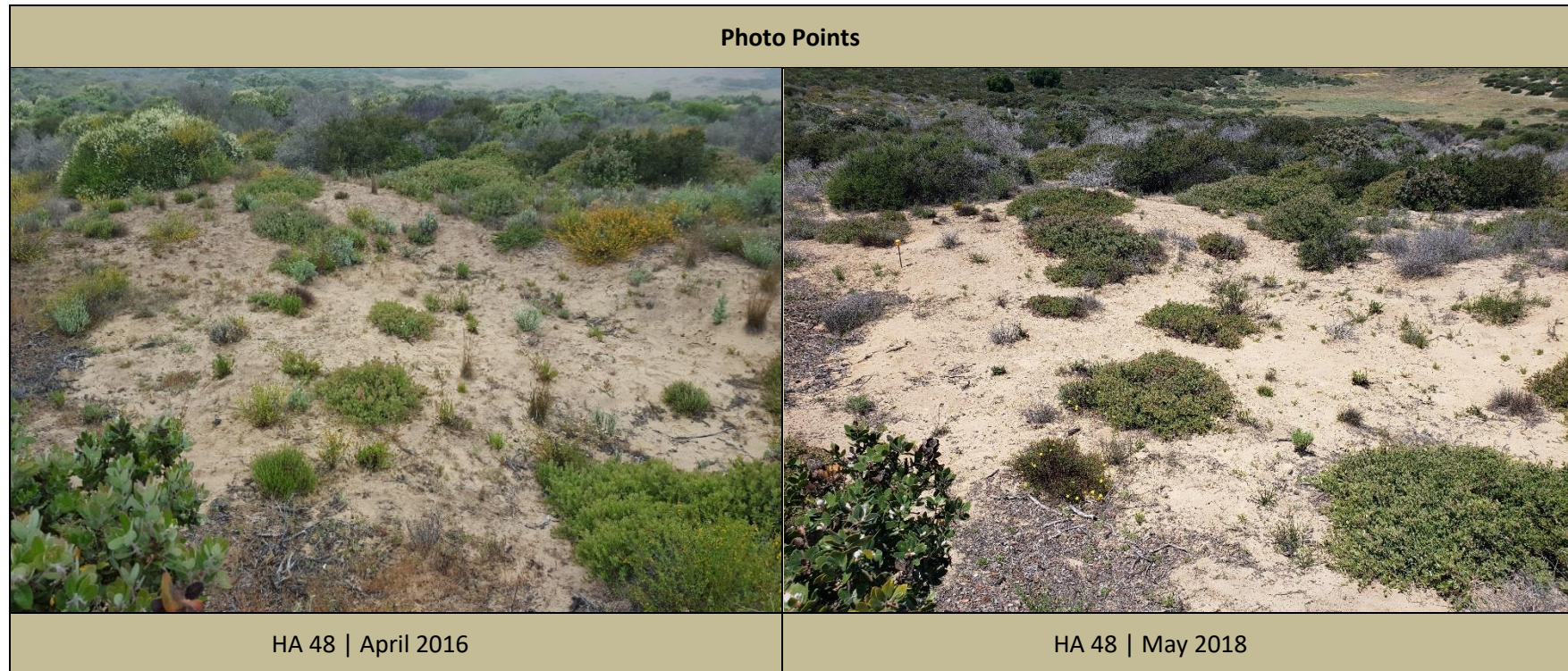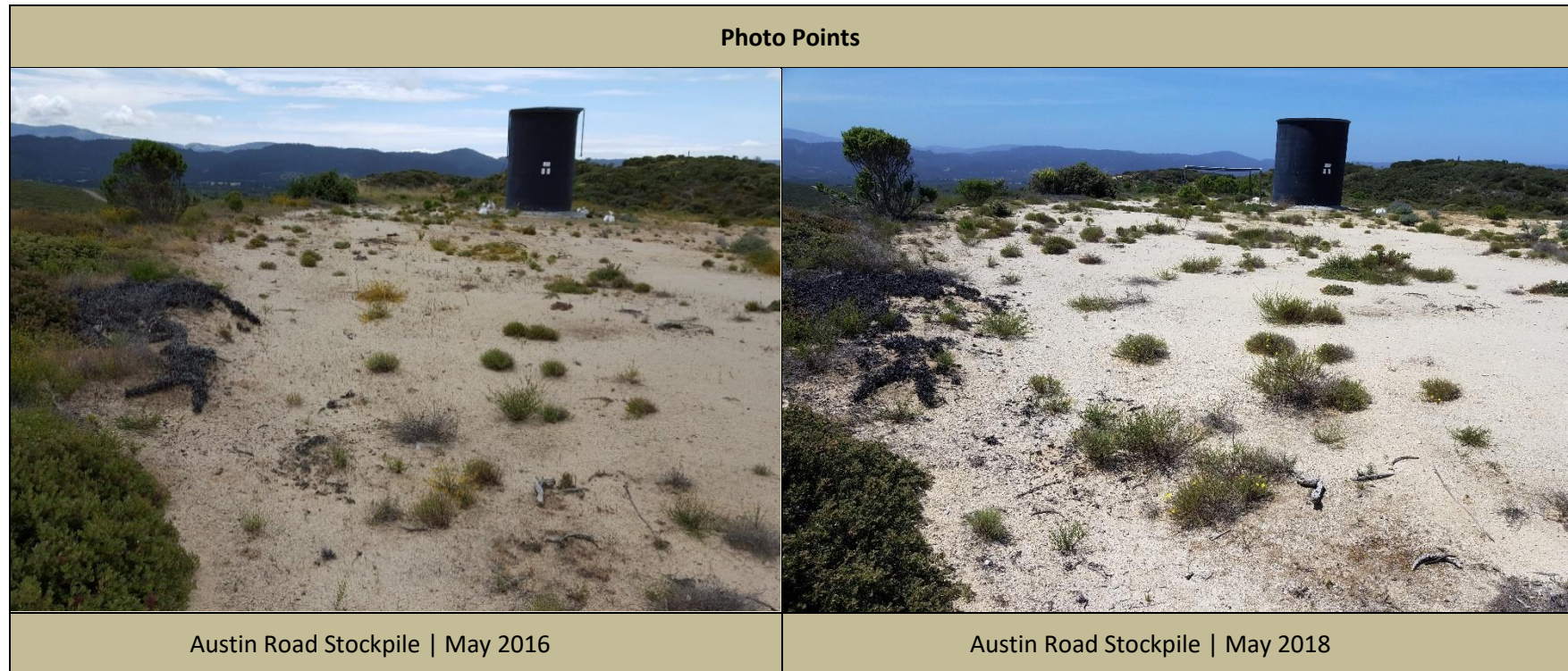

| Austin Road Stockpile \| May 2016 | Austin Road Stockpile \| May 2018 |
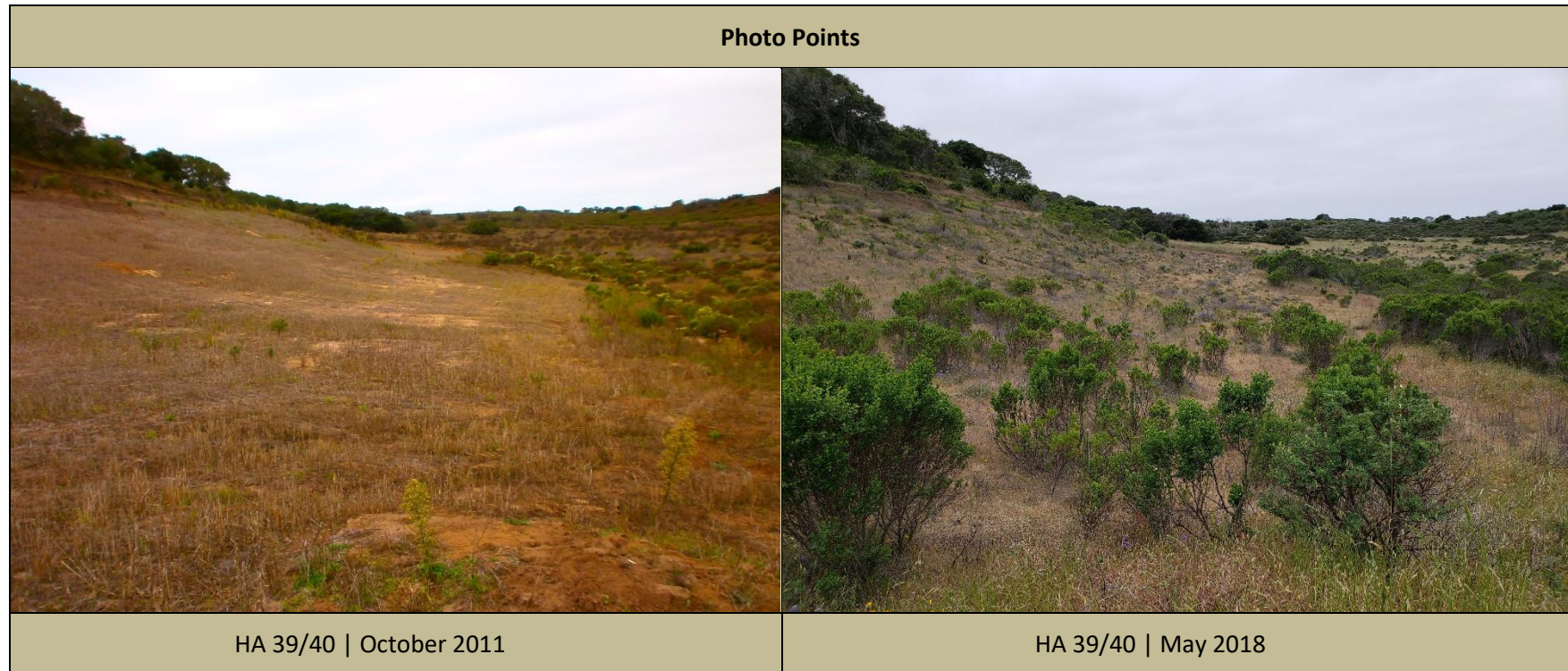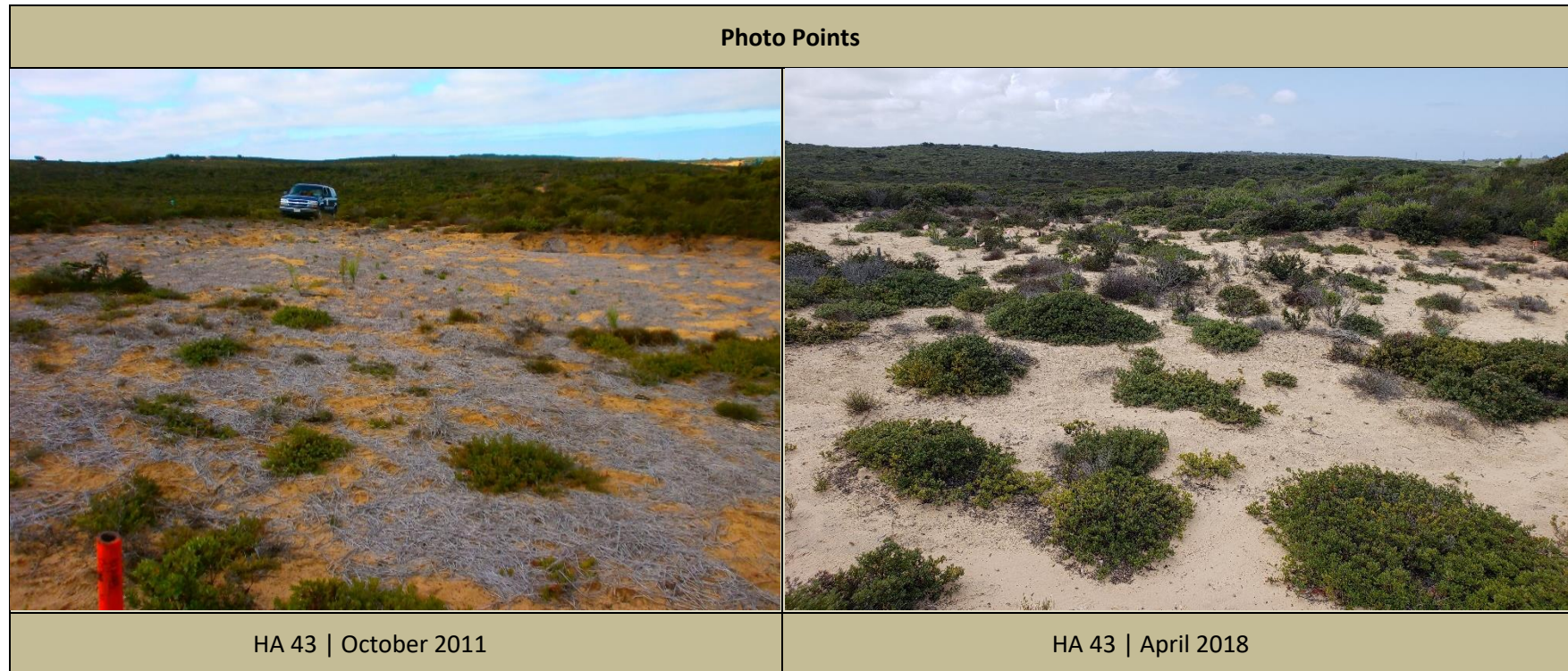
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APPENDIX E

Photo Points

Time Lapse Series for HAs in Year 5

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Photo Points – HA 19		
May 2013	April 2014	April 2015
May 2016	April 2017	May 2018