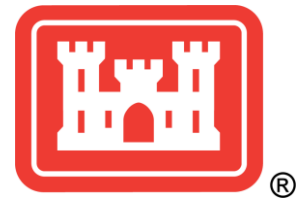# 2019 ANNUAL REPORT
FORMER FORT ORD SITE 39 HABITAT RESTORATION
CONTRACT NO. W91238-18-D-0007
TASK ORDER W9123818F0090

FORMER FORT ORD

Prepared for:
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April 2020

Burleson Consulting Inc.
Woman-Owned Small Business
Environmental Services

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ACRONYMS AND ABBREVIATIONS

Army	US Department of the Army
AMP	Adaptive Management Plan
BRAC	Base Realignment and Closure
Burleson	Burleson Consulting Inc.
BMP	Best Management Practice
CDFA	California Department of Food and Agriculture
CDFW-OSPR	California Department of Fish and Wildlife Office of Spill Prevention and Response
CTS	California Tiger Salamander
Kemron	Kemron Environmental Services, Inc.
HA	Historic Area
HMP	Habitat Management Plan
HRP	Habitat Restoration Plan
lb	Pound
Monitoring Protocol	Protocol for Conducting Vegetation Monitoring in Compliance with the Installation-Wide Multispecies Habitat Management Plan at Former Fort Ord
Propagation Protocol	Site 39 Plant Material Collection, Storage, and Propagation Protocols
Site 39	Site 39 Inland Ranges
SSRP	Site Specific Restoration Plan
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
UXO	Unexploded Ordnance

SPECIES LIST AND CODES

Scientific Name	Common Name	Code	Category
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 bent grass	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
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
Baccharis salicifolia	mule fat	BASA4	NP
Brassica nigra	black mustard	BRNI	NNF
Briza maxima	rattlesnake grass	BRMA	NNF

Scientific Name	Common Name	Code	Category
Briza minor	small quaking grass	BRMI	NNF
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET	NP
Bromus carinatus	California brome	BRCA	NF
Bromus diandrus	ripgut brome	BRDI	NNF
Bromus hordeaceus	soft chess	BRHO	NNF
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR	NNF
Calandrinia breweri	Brewer's redmaids	CABR3	NF
Calandrinia menziesii	red maids	CAME	NF
Callitriche heterophylla	water starwort	CAHE3	NP
Calochortus albus	white globe lily	CAAL	NP
Calyptridium monandrum	common pussypaws	CAMO	NF
Camissonia contorta	contorted primrose	CACO	NF
Camissonia strigulosa	sandysoil suncup	CAST20	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	clustered field sedge	CAPR	NP
Carex sp.	sedge	CA	NP
Carpobrotus edulis	hottentot fig	CAED	NNP
Castilleja affinis	coast paint-brush	CAAF	NP
Castilleja ambigua ssp. *ambigua*	Johnny nip	CAAMA3	NF
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
Castilleja foliolosa	woolly indian paintbrush	CAFO2	NP
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

Scientific Name	Common Name	Code	Category
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
Clarkia unguiculata	elegant clarkia	CLUN	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
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
Dittrichia graveolens	stinkwort	DIGR3	NNF
Drymocallis glandulosa var. *wrangelliana*	sticky cinquefoil	DRGLW	NP
Elatine californica	California waterwort	ELCA	NF
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

Scientific Name	Common Name	Code	Category
*Ericameria fasciculata**	Eastwood's goldenbush	ERFA	NP
Erigeron canadensis	horseweed	ERCA	NF
Eriodictyon californicum	yerba santa	ERCA6	NP
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
Eurybia radulina	roughleaf aster	EURA	NP
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
Heliotropium curassavicum var. *oculatum*	seaside heliotrope	HECUO	NP
Hesperocyparis macrocarpa	Monterey cypress	HEMA22	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

Scientific Name	Common Name	Code	Category
Isoetes howellii	Howell's quillwort	ISHO	NF
Juncus balticus ssp. *ater*	Baltic rush	JUBAA	NP
Juncus bufonius	toad rush	JUBU	NF
Juncus bufonius var. *bufonius*	common toad rush	JUBUB	NF
Juncus bufonius var. *congestus*	clustered toad rush	JUBUC2	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	
Koeleria macrantha	june grass	KOMA	NP
Lastarriaea coriacea	leather spineflower	LACO	NF
Lasthenia glaberrima	smooth goldfields	LAGL3	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
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
Matricaria discoidea	pineapple weed	MADI6	NF
Medicago polymorpha	California burclover	MEPO	NNF

Scientific Name	Common Name	Code	Category
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
Morella californica	wax myrtle	MOCA6	NP
Navarretia atractyloides	Holly-leaf navarretia	NAAT	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 michaelii	Michael's rein orchid	PIMI6	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
Poaceae sp.	unknown grass	PO	
Polycarpon tetraphyllum var. *tetraphyllum*	four-leaved allseed	POTET	NNF
Polygala californica	California milkwort	POCA	NP
Polypogon monspeliensis	rabbitsfoot grass	POMO	NNF
Populus trichocarpa	black cottonwood	POTR	NP
Prunus sp.	unknown cherry	PR	
Pseudognaphalium beneolens	fragrant everlasting	PSBE	NP

Scientific Name	Common Name	Code	Category
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	RUCR4	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
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

Scientific Name	Common Name	Code	Category
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
Triglochin scilloides	flowering-quillwort	TRSC	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	
Xanthium strumarium	rough cockleburr	XAST	NF
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

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1. INTRODUCTION

Burleson Consulting Inc. (Burleson) was issued ID/IQ Contract Number W91238-18-D-0007 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 restoration activities completed from December 2018 through December 2019 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* (Propagation Protocol) (Burleson, 2010). These documents provide necessary information and guidance to conduct restoration activities at Site 39. Of the 19 HAs, 15 have received their full SSRP restoration prescription and are in a monitoring phase. Three of the sites have received more than half their SSRP prescription and one site has not received any restoration to date. This annual report details tasks involved with the execution of habitat restoration on Site 39 in 2019, a progress summary for each HA, and recommendations when altered restoration or monitoring tactics are required.

Work performed in 2019 consisted of:

- Storage of previously collected plant material
- Propagating collected plant material
- Restoration activities at HAs 26, 28, 33, 34, and 37
- Erosion control repairs at HAs 18, 23, 26, 27, 27A, 28, 29, 33, 34, 36, 37, 43, and 48
- 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 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

Site Specific Restoration Plans 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 2019 calendar year, approximately 57 acres were seeded (passive restoration) and about 51,850 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.
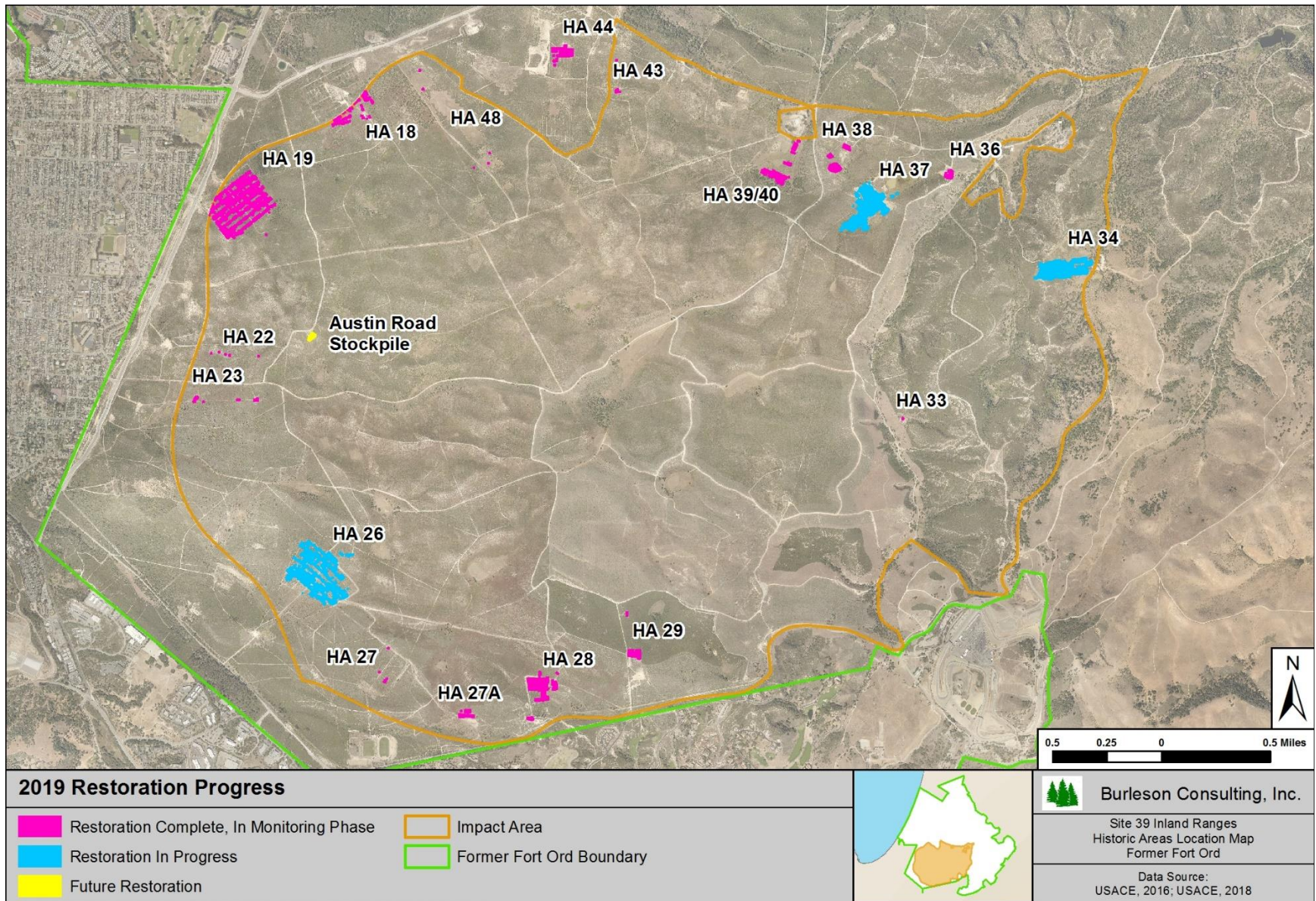
Figure 1-1. Restoration Progress Map

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2. RESTORATION PROTOCOLS AND SITE-SPECIFIC RESTORATION PLANS

Burleson developed the Propagation Protocol and SSRPs for each HA that detail quantities and types of plant material to be collected for former Fort Ord (Burleson, 2010; Burleson, 2013). These 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 Propagation 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 a cool, dry location until ready to be processed. Labeling and tracking of all plant material followed the Propagation 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 continued to implement Best Management Practices (BMP) recommended by the California Department of Food and Agriculture (CDFA) and Monterey County Agricultural Commission at Burleson's Carmel Valley native plant nursery to prevent the spread of plant pathogens – especially *Phytophthora*. BMPs included limiting access points, foot baths at critical access points, mandatory use of new plant containers, sanitation of tools and off-site cuttings, designated areas for soil storage, and raised platforms to keep plants off the ground. If plants show symptoms of pathogens, they are separated from healthy plants by a minimum of 10 ft and treated. If necessary, infected plants are removed from the nursery completely and taken to the landfill.

A pear test is an initial indicator for pathogens and is used before sending samples for a laboratory test. Pear tests are performed on suspect plants by placing a pristine pear in a container with wet soil from the suspected plant's container. The pear will blacken or develop lesions if a pathogen is present (Bernhardt and Swiecki, 2019). Plants from the same propagation date as those being pear tested, and other surrounding plants potentially in danger of being splashed during watering, are quarantined regardless of exhibiting symptoms. Burleson conducted pear tests in March, June, September, and

December of 2019 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-4 in Appendix C illustrate pear test results.

3. SEED COLLECTION

In 2019, 1.6 acres-worth of seed was collected for HAs 26, 33, and 37 (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 Propagation Protocol (Burleson, 2010). All seed collection target goals were met for 2019 except for sky lupine (*Lupinus nanus*) due to limited seed availability. Photographs C-5 through C-10 in Appendix C show seed collection activities.

3.1   Seed Production

In addition to on-site seed collection, Burleson contracted Hedgerow Farms and S&S Seed to grow former Fort Ord-specific bulk seed for four species (see Table 3-1). Burleson purchased sterile barley (*Hordeum* sp.) from Hearne Seed. A seed trade to obtain wedge-leaved horkelia (*Horkelia cuneata*) from the Bureau of Land Management usually occurs but was not available in 2019 due to limited seed availability. Seed production species and quantities produced in 2019 are presented in Table 3-1 and the total seed inventory can be found in Table A-2 in Appendix A. Photographs C-11 through C-13 in Appendix C show production seed plots.

Table 3-1. 2019 Production Plot Seed Yields

Species	Bulk Seed (lb)	Pure Live Seed (lb)
Achillea millefolium (white yarrow)	56.00	41.62
Acmispon glaber (deerweed)	58.80	31.18
Elymus glaucus (blue wild-rye)	176.25	115
Stipa pulchra (purple needle grass)	12.96	12.13

Bulk seed contains seed, inert matter, and other crop material. Pure Live Seed, a measure of seed quality, is the quantity in pounds of viable seed within the bulk seed and is calculated by multiplying bulk seed times the purity from a germination test. Seed test results for three production species are presented in Table A-3, Appendix A. The deerweed (*Acmispon glaber)* plot will be continued, the purple needle grass (*Stipa pulchra*) plot will be replanted in 2020, and the white yarrow and blue wild-rye (*Elymus glaucus*) plots will be discontinued.

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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 Propagation Protocol for 15 common and HMP species used in active restoration (Burleson, 2010). The total 2019 SSRP plant quantity targets, 5,742 plants for HAs 26, 28, and 34, were achieved. The 2019 Adaptive Management Plan (AMP) plant quantity targets totaling 632 plants were achieved for HAs 18, 19, 22, 23, 27, 29, 33, 43, and 48. Additionally, 1,551 surplus plants were installed at HA 26.

To meet SSRP targets overall, suitable surplus plants were used to supplement targets for deficient species. All substitutions were approved by USACE. See Table A-4 in Appendix A for final plant inventories for HAs 18, 19, 22, 23, 26, 27, 28, 29, 33, 34, 43, and 48. Photographs C-14 through C-22 in Appendix C illustrate various aspects of plant propagation.

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5. RESTORATION ACTIVITIES

The objective of restoration activities is to return impacted areas to a natural landscape that resembles adjacent habitat communities in accordance with each SSRP. Restoration activities completed under this contract included passive restoration at HAs 26, 33, and 37, and active restoration at HAs 18, 19, 22, 23, 26, 27, 28, 29, 33, 34, 43 and 48.

5.1   Passive Restoration

Table 5-1 summarizes 2019 passive restoration activities. Generally, passive restoration activities occur annually between October and February, spanning two calendar years, and do not include production seed utilized for erosion control. This report focuses on restoration activities completed within the 2019 calendar year. In late 2019, Burleson performed passive restoration at HAs 26, 33, and 37. Appendix B provides detailed seed quantities, lists of species applied, and seed application locations for each restoration site. The following sections provide a description of passive restoration activities at each HA.

Table 5-1. 2019 Summary of Passive Restoration Activities per HA

HA	Passive Restoration Activities
26	Broadcast 1.0 acre-worth† of SSRP seed mix, enhanced with production seed, and 0.21 lb of Monterey spineflower*
33	Broadcast 0.1 acre-worth† of SSRP seed mix, enhanced with production seed, and 0.01 lb of Monterey spineflower*
37	Broadcast 0.5 acre-worth† of SSRP seed mix, enhanced with production seed

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

5.1.1   HA 26 Passive Restoration Activities

In December 2019, Burleson applied 1.0 acre-worth of SSRP seed mix, enhanced with production seed mix, over 1.0 acre at HA 26 (see Appendix B Figure B-1, Tables B-3 and B-4). The seed was applied to a 1.0-acre portion of Target Area 1 (see Table 9-12). In 2017, Kemron Environmental Services, Inc. (Kemron) partially mulched Target Area 1 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. Photographs C-23 and C-24, Appendix C show restoration efforts at HA 26.

In December 2019, Burleson applied 0.21 pound (lb) of Monterey spineflower (*Chorizanthe pungens* var. *pungens*) in two previously established broadcast plots totaling 0.33 acre at HA 26 (see Appendix B Figure B-1, Table B-5). Seed was spread evenly across plots and raked in.

5.1.2   HA 33 Passive Restoration Activities

In December 2019, Burleson applied 0.10 acre-worth of SSRP seed mix, enhanced with production seed mix, over 0.01 acre at HA 33 (see Appendix B Figure B-4, Tables B-11 and B-13). Seed was broadcast over the entire site except the HMP annual restoration plot, raked in, and covered with fresh straw. Photograph C-25, Appendix C show restoration efforts at HA 33.

In December 2019, Burleson applied 0.01 lb of Monterey spineflower seed in the existing 0.001 acre HMP plot at HA 33 (see Appendix B Figure B-4, Table B-12). Seed was spread evenly across the plot and raked in.

5.1.3 HA 37 Passive Restoration Activities

In December 2019, Burleson applied 0.50 acre-worth of SSRP seed mix, enhanced with production seed mix, over 1.0 acre at HA 37 (see Appendix B Figure B-8, Tables B-18 and B-19). Seed was selectively broadcast throughout the area of the site that had yet to be seeded with SSRP seed mix, raked in, and covered with fresh straw. Photograph C-26, Appendix C show restoration efforts at HA 37.

5.2 Active Restoration

Table 5-2 summarizes 2019 active restoration activities at each site. Burleson installed a total of 7,925 plants at HAs 18, 19, 22, 23, 26, 27, 28, 29, 33, 34, 43, and 48 in late 2018 and early 2019. SSRP planting took place at HAs 26, 28, and 34. Adaptive Management Plan activities occurred at HAs 18, 19, 22, 23, 27, 29, 33, 43, and 48 to supplement sites that did not meet success criteria in 2018. Tables B-22 through B-33 in Appendix B provide detailed information on the species and quantities planted at each HA. When the nursery had surplus inventory of high-value shrubs, they were substituted for early successional species at HA 28 and 34; for example, surplus manzanitas were substituted for deerweed.

Table 5-2. 2019 Summary of Active Restoration Activities per Historic Area

HA	Active Restoration Activities
18	Installed 40 plants
19	Installed 160 plants
22	Installed 145 plants
23	Installed 95 plants
26	Installed 2,451 plants (1.6 acres in Target Area 1 and 2.48 acres in Target Area 2)
27	Installed 44 plants
28	Installed 585 plants (0.31 acre in southern mulched hillside)
29	Installed 15 plants
33	Installed 69 plants
34	Installed 4,257 plants (1.99 acres)
43	Installed 44 plants
48	Installed 20 plants

5.2.1 HA 18 Active Restoration Activities

In February 2019, Burleson installed 40 plants across 1.4 acres at HA 18. Plants were installed evenly throughout barren areas and areas with dense vegetation were avoided. Table B-22 in Appendix B lists installed species and quantities. Photograph C-27 in Appendix C shows AMP planting efforts.

5.2.2 HA 19 Active Restoration Activities

In January 2019, Burleson installed 160 plants across 14 acres at HA 19. Plants were installed evenly throughout barren areas and areas with dense vegetation were avoided. Table B-23 in Appendix B lists installed species and quantities.

5.2.3 HA 22 Active Restoration Activities

In February 2019, Burleson installed 145 plants across 0.05 acre at HA 22. Plants were installed evenly throughout barren areas and areas with dense vegetation were avoided. Table B-24 in Appendix B lists installed species and quantities.

5.2.4   HA 23 Active Restoration Activities

In February 2019, Burleson installed 95 plants across 0.3 acre at HA 23. Plants were installed evenly throughout barren areas and areas with dense vegetation were avoided. Table B-25 in Appendix B lists installed species and quantities. Photograph C-28 in Appendix C shows AMP planting efforts.

5.2.5   HA 26 Active Restoration Activities

In December 2018, Burleson installed 900 plants across 2.48 acres in Target Area 2 at HA 26. Unexploded Ordnance (UXO) escorts accompanied Burleson biologists to ensure planting areas were safe for digging because HA 26 was not cleared to depth in Target Area 2. A portion of the site was covered in mulch from erosion control measures conducted by Kemron. Large plants were installed in mulched areas to increase survivorship. Barren areas were planted more densely than areas with good natural recruitment.

In February 2019, Burleson was approved to install 1,551 surplus plants across 1.6 acres in Target Area 1 at HA 26. UXO escorts did not accompany Burleson biologists during plant installation because Target Area 1 was cleared to depth. Barren areas were planted more densely than areas with good natural recruitment.

Figure B-9 in Appendix B shows the location of planted areas and Table B-26 lists installed species and quantities. Photos C-29 and C-30 in Appendix C represent plant installation at HA 26. Additional planting is required to fulfill the SSRP planting targets for this site.

5.2.6   HA 27 Active Restoration Activities

In February 2019, Burleson installed 44 plants across 0.06 acre at HA 27. Plants were installed evenly throughout barren areas and areas with dense vegetation were avoided. Table B-27 in Appendix B lists installed species and quantities.

5.2.7   HA 28 Active Restoration Activities

Burleson installed 585 plants across 0.31 acre at HA 28 in January 2019. Figure B-10 in Appendix B shows the location of planted areas and Table B-28 lists installed species and quantities. Photograph C-31 in Appendix C demonstrates plant installation at HA 28.

5.2.8   HA 29 Active Restoration Activities

In February 2019, Burleson installed 15 plants across 1.0 acre at HA 29. Plants were installed evenly throughout barren areas and areas with dense vegetation were avoided. Table B-29 in Appendix B lists installed species and quantities.

5.2.9   HA 33 Active Restoration Activities

In February 2019, Burleson installed 69 plants across 0.01 acre at HA 33. Plants were installed evenly throughout barren areas and areas with dense vegetation were avoided. Table B-30 in Appendix B lists installed species and quantities.

5.2.10   HA 34 Active Restoration Activities

Burleson installed 4,257 plants over 1.99 acres at HA 34 in December 2018 and January 2019. Barren areas were planted more densely than areas with good natural recruitment. Additional steps were taken during the installation process in Areas A and B to improve plant survivorship (Figure B-11 in Appendix B). Each plant received two tablespoons of mycorrhizal-fertilizer mix (BioLive 5-4-2), a handful

of mulch mixed in the soil during planting, and a layer of mulch around the base of the plant after installation. Figure B-11 in Appendix B shows the location of planted areas and Table B-31 lists installed species and quantities. Photos C-32 through C-34 in Appendix C demonstrate plant installation at HA 34.

5.2.11 HA 43 Active Restoration Activities

In February 2019, Burleson installed 44 plants across 0.09 acre at HA 43. Plants were installed evenly throughout barren areas and areas with dense vegetation were avoided. Table B-32 in Appendix B lists installed species and quantities.

5.2.12 HA 48 Active Restoration Activities

In February 2019, Burleson installed 20 plants across 0.05 acre at HA 48. Plants were installed evenly throughout barren areas and areas with dense vegetation were avoided. Table B-33 in Appendix B lists installed species and quantities.

6. MONITORING

Burleson conducted photo point documentation, HMP annual density, species richness, vegetative cover, and plant survivorship surveys at relevant HAs in 2019. Monitoring activities were guided by the HRP and the *Protocol for Conducting Vegetation Monitoring in Compliance with the Installation-Wide Multispecies Habitat Management Plan at Former Fort Ord* (Monitoring Protocol) (Shaw, 2009b; Burleson, 2009). Monitoring activities conducted in 2019 are summarized in Table 6-1 by HA. Section 6.1 describes methods for monitoring activities. Monitoring results for 2019 are presented in Section 9 on a site-by-site basis. Photographs C-35 through C-41 in Appendix C illustrate various monitoring tasks.

Table 6-1. 2019 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, including species richness, vegetative cover, and HMP annual density, were compared to the success criteria associated with each objective outlined in the SSRPs (Burleson, 2013). 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 line-intercept 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 HMP annual 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 2019 activities, 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 2019.

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 (*Gilia tenuiflora* ssp. *arenaria*), and seaside bird's beak (*Cordylanthus rigidus* ssp. *littoralis*)) are performed at restoration sites in years 1, 2, 3, 4, 5, and 8 during peak bloom for each species according to the HRP (Shaw, 2009b). HMP annual density was obtained by counting every individual within an HMP annual 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 HA but outside of 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. Discrete patches were assigned a density class or population count dependent on feasibility. 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 Monitoring Protocol (Burleson, 2009). Circle plot data were analyzed in ArcMap using the interpolation tool to develop an HMP annual density model.

HMP annual restoration 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 were 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, and/or seaside bird's beak. 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 meter across and have variable peak bloom time. In August 2017, the 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 events, 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 reports preceding 2018, plants that were in poor condition or plants that were not found were considered dead. From 2018 onward, 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. Prior to 2016, sites were visually assessed for cover. Beginning in 2016, cover of vegetation, thatch, and bare ground were measured using line-intercept transect surveys, as described in the Monitoring Protocol (Burleson, 2009). In 2016, HAs 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 for compatibility with SSRP objectives. Fifty-

meter transects were placed randomly throughout each HA at a rate of one transect per acre; transects were not placed across roads or berms. For HAs that were less than 1 acre, shortened 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 all transects, the vegetative cover was calculated by summing the distance along the transect for each species and dividing by the length of the transect. Percent cover for all transects was then averaged to calculate average site cover by species, native shrubs and perennials, and other categories (Shaw, 2009b). To calculate the site average, the distance along transects was summed for each species and divided by the total transect length.

For each HA, 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 listed 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 3). For non-native vegetative cover, the success criterion was met if percent cover was less than the acceptable limit (Objective 2). In addition, the 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* (Baldwin *et al.*, 2012; CalFlora, 2017; Matthews and Mitchell, 2015). 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

In early 2019, seed broadcast occurred at HAs 18, 23, 27, 29, 33, 43, and 48 to supplement Adaptive Management Plan (AMP) planting for sites not meeting success criteria and wet season repairs occurred at HAs 26, 27A, 28, 34, 36, 37. Seed broadcast occurred in barren areas of each site and areas where HMP annual plants were historically present outside of HMP annual restoration plots were avoided. In late 2019, Burleson completed repairs at HAs 26 and 37. Erosion control and production seed mix details can be found in Appendix B. Photographs C-42 through C-51 in Appendix C document erosion control field activities.

At HA 18, the following work was performed in 2019:
- February 2019
    - Broadcast production seed mix over 0.1 acre
    - Broadcast and crimped straw mulch on 0.1 acre

At HA 23, the following work was performed in 2019:
- February 2019
    - Broadcast production seed mix over 0.1 acre
    - Broadcast and crimped straw mulch on 0.1 acre

At HA 26, the following work was performed in 2019:
- February 2019
    - Collapsed approximately 20 linear feet of rill erosion averaging 6" wide by 12" deep
    - Installed 25 linear feet of straw wattles
    - Broadcast production seed mix over 0.1 acre
    - Broadcast and crimped straw mulch on 0.1 acre
- April 2019
    - Collapsed approximately 15 linear feet of rill erosion averaging 6" wide by 12" deep
    - Installed 75 linear feet of straw wattles
- November 2019
    - Collapsed approximately 75 linear feet of rill erosion averaging 6" wide by 12" deep
    - Installed 75 linear feet of straw wattles
    - Broadcast production seed mix over 0.5 acre
    - Broadcast and crimped straw mulch on 0.5 acre

At HA 27, the following work was performed in 2019:
- February 2019
    - Broadcast production seed mix over 0.05 acre
    - Broadcast and crimped straw mulch on 0.05 acre

At HA 27A, the following work was performed in 2019:
- February through March 2019
    - Collapsed approximately 15 linear feet of rill erosion averaging 6" wide by 12" deep
    - Installed 200 linear feet of straw wattles
    - Broadcast production seed mix over 0.2 acre
    - Broadcast and crimped straw mulch on 0.2 acre

At HA 28, the following work was performed in 2019:
- March 2019
  - Collapsed approximately 20 linear feet of rill erosion averaging 6" wide and 12" deep
  - Installed 125 linear feet of straw wattles
  - Broadcast production seed mix over 0.1 acre
  - Broadcast and crimped straw mulch on 0.1 acre

At HA 29, the following work was performed in 2019:
- February through March 2019
  - Collapsed approximately 3 linear feet of rill erosion averaging 6" wide and 12" deep
  - Installed 37.5 linear feet of straw wattles
  - Broadcast production seed mix over 0.2 acre
  - Broadcast and crimped straw mulch on 0.2 acre

At HA 33, the following work was performed in 2019:
- February 2019
  - Broadcast production seed mix over 0.01 acre
  - Broadcast and crimped straw mulch on 0.01 acre

At HA 34, the following work was performed in 2019:
- February through April 2019
  - Collapsed approximately 185 linear feet of rill erosion averaging 6" wide by 12" deep
  - Installed 687.5 linear feet of straw wattles
  - Installed 1700 square feet of coir fabric
  - Monitored and maintained 10 linear feet of water bars
  - Broadcast erosion control seed mix over 0.1 acre
  - Broadcast production seed mix over 0.95 acre
  - Broadcast and crimped straw mulch over 1.0 acre

At HA 36, the following work was performed in 2019:
- February 2019
  - Collapsed approximately 10 linear feet of rill erosion averaging 6" wide by 12" deep
  - Installed 100 linear feet of straw wattles
  - Installed 650 square feet of coir fabric
  - Broadcast erosion control seed mix over 0.05 acre
  - Broadcast production seed mix over 0.1 acre
  - Broadcast and crimped straw mulch on 0.1 acre

At HA 37, the following work was performed in 2019:
- February through March 2019
  - Repaired approximately 10 linear feet of rill erosion averaging 6" wide by 12" deep
  - Installed 175 linear feet of straw wattles
  - Broadcast production seed mix on 0.2 acre
  - Broadcast and crimped straw mulch over 0.2 acre
- August 2019
  - Broadcast production seed mix over 0.45 acre
  - Broadcast and crimped straw mulch on 0.45 acre

At HA 43, the following work was performed in 2019:
- February 2019
    - Broadcast production seed mix over 0.09 acre
    - Broadcast and crimped straw mulch on 0.09 acre

At HA 48, the following work was performed in 2019:
- February 2019
    - Broadcast production seed mix over 0.05 acre
    - Broadcast and crimped straw mulch on 0.05 acre

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8. IRRIGATION

Burleson maintained and operated a 6,000-gallon capacity irrigation system to irrigate active restoration areas at HA 26. In 2019, Burleson installed an additional 500 emitters to the existing system in Target Area 2; there are now approximately 3,500 emitters. Ten irrigation events occurred between May and November 2019; approximately two gallons were delivered to each plant per irrigation event. Maintenance of the system included repairing lines damaged by wildlife, cleaning buried emitters, replacing malfunctioning emitters, cleaning the water filter, and sealing leaky connections with liquid electrical tape. In addition, Burleson installed three ball valves on each lateral line of the west side of the irrigation system to better control water pressure and address uneven water distribution.

The 3,500 emitters were staked at the base of the following shrub species:

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

Burleson obtained water from Sala Brothers Water Trucking to support irrigation water needs. Table 8-1 provides specific details regarding irrigation events at HA 26. To promote plant establishment and growth, irrigation events occurred in the dry season when plants become drought stressed. Figure 8-1 shows irrigation events in relation to daily precipitation in 2019. Photographs C-52 through C-63 in Appendix C show the status of the irrigated plants and the system.

Table 8-1. Irrigation Events at HA 26

Irrigation Event	Date	Gallons
1	May 29, 2019	6,000
2	June 19, 2019	6,000
3	July 9, 2019	6,000
4	July 25-26, 2019	6,000
5	August 5-6, 2019	6,000
6	August 22, 2019	6,000
7	September 10-11, 2019	6,000
8	October 1, 2019	6,000
9	October 23, 2019	6,000
10	November 20 and 22, 2019	6,000
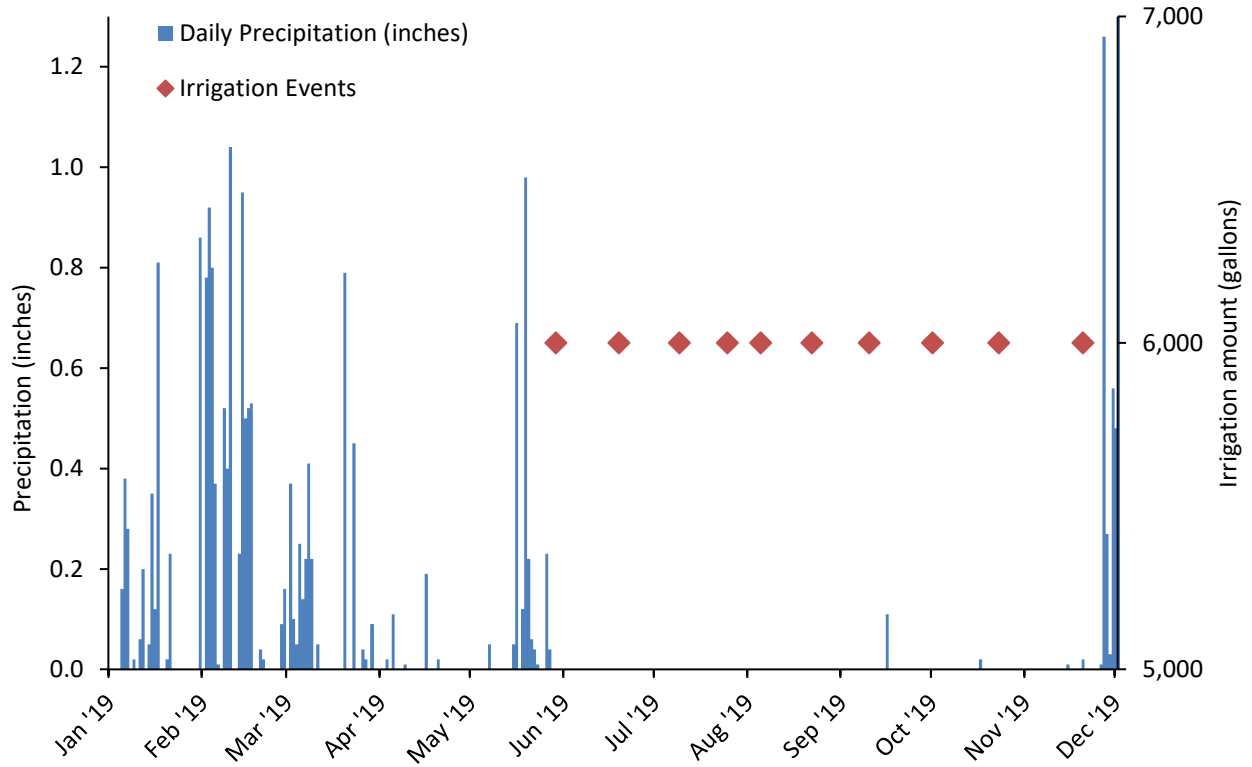
Figure 8-1. Daily Precipitation and Irrigation Events for 2019 (CDEC, 2019)

9. RESTORATION SUMMARY AND MONITORING RESULTS BY HA

To understand restoration progress and discuss 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 2019, monitoring results, comparison to the success criteria, and recommendations for each HA.

9.1   HA 18

HA 18 was used by the US Department of the Army (Army) as a long-distance small-arms firing range that consisted of seven target lanes approximately 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 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.

Restoration at HA 18 occurred in 2011 and 2012 and monitoring began in 2013. The HA was monitored for nine 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	7	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2019	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 and 2019. The total amount of seed broadcast on site was 53.189 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. 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)**	**2019**	**Total by Species**
ACGL	2.800	1.000	1.440	-	2.440
ACMI	-	-	-	0.300	0.300
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	0.800	13.450
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	0.400	2.560
SAME	1.400	0.600	0.820	-	1.420
STCE	7.000	0.300	7.160	-	7.460
STPU	-	-	-	0.500	0.500
TOTAL	**50.220**	**8.672**	**42.517**	**2.000**	**53.189**

* HMP species

No active restoration was prescribed at HA 18; however, an AMP planting event occurred in 2019 per recommendations made in the 2018 Annual Report. A total of 40 plants were installed at HA 18. Table 9-4 summarizes the plants installed during active restoration.

Table 9-4. Summary of Active Restoration Activities for HA 18

Species	Number of Individual Plants	
	2019	**Total by Species**
ADFA	40	40
TOTAL	**40**	**40**

9.1.2 Monitoring Results

HA 18 was in year 7 of monitoring in 2019. Year 7 was not a required monitoring year and only photo documentation was completed.

9.1.3 Discussion

9.1.3.1 Recommendations

HA 18 was in year 7 of monitoring in 2019 and only photo documentation was completed. Recommendations were developed from a combination of prior recommendations and the restoration efforts completed in 2019. The site 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 was planted in 2018/2019 to meet the species richness criterion and Monterey ceanothus is scheduled to be planted in 2019/2020 to meet the HMP shrub cover criterion (Burleson, 2018). The Army also recommends planting dwarf ceanothus (*Ceanothus dentatus*) 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 (see Table 9-1). Table 9-5 summarizes the current status of HA 18 including which success criteria were met and recommendations.

Table 9-5. 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 dwarf ceanothus†
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).
† Not scheduled

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 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 eight years by photo documentation and site visits, six years for HMP annual density in plots, four years for HMP annual density across the HA, three years for species richness and vegetative cover, and four years for plant survivorship (see Table 9-6). Figure 9-2 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 9-7.

Table 9-6. Historic Summary of Restoration and Monitoring Activities at HA 19

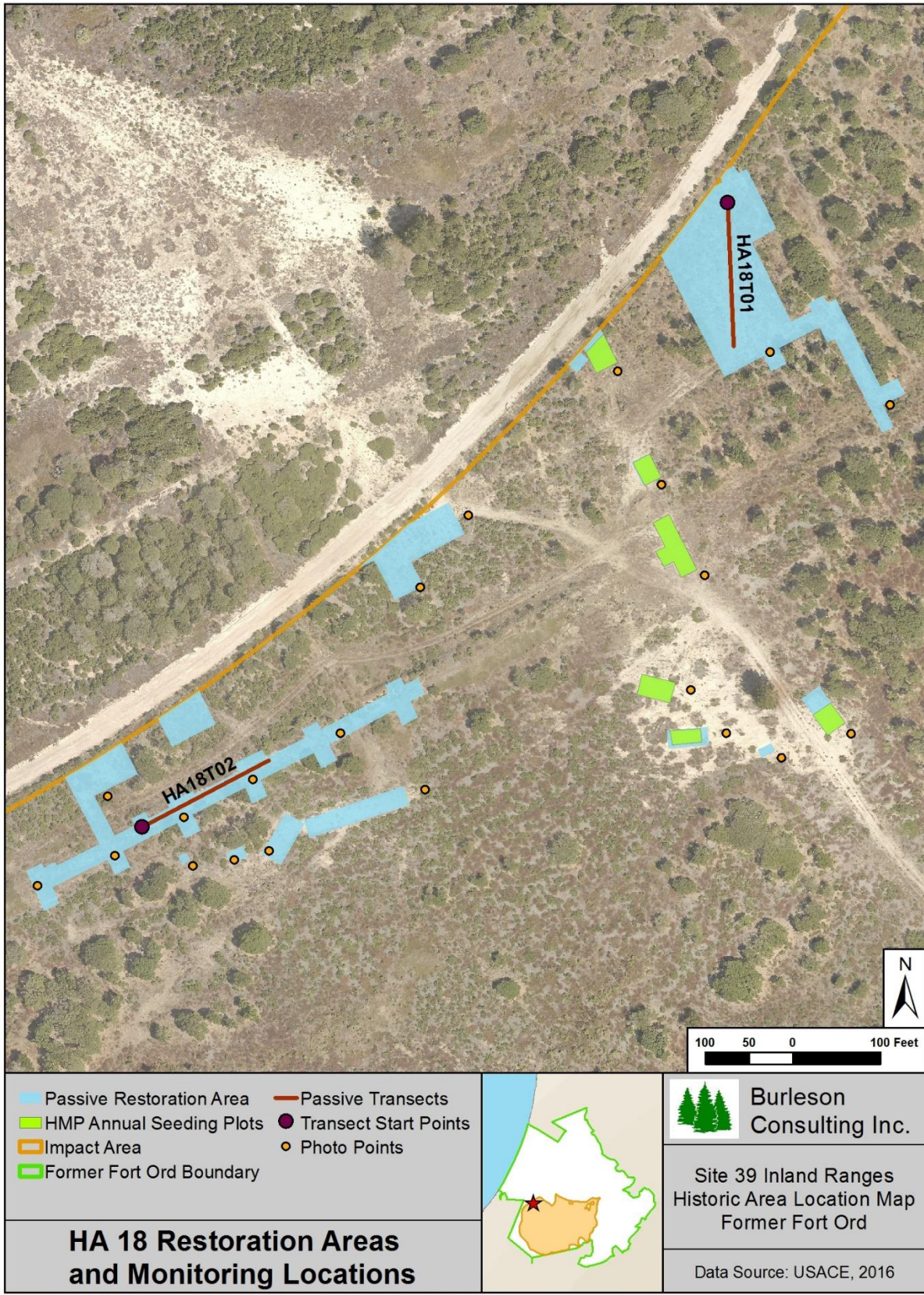| Activity	Monitoring Years									
			1	2	3	4	5	6	8	13
	2012	2013	2014	2015	2016	2017	2018	2019	2021	2026
Restoration: Active and Passive	●	●	●	●	●					
Photo Points and Site Visit	●	●	●	●	●	●	●	●	●	●
Monterey Spineflower Plots			●		●	●	●		●	
Sand Gilia Plots			●	●	●	●	●	●	●	
HMP Annual Density across HA					●	●	●	●	●	
Species Richness					●	●	●		●	●
Vegetative Cover					●	●	●		●	●
Plant Survivorship		●	●	●	●					

Figure 9-2. HA 19 Restoration Areas and Monitoring Locations Map

Table 9-7. 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 9-7. 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 2019. The total amount of seed broadcast on site was 393.85 lb compared to 517.00 lb prescribed in the SSRP. Total seed broadcast is less than SSRP prescription because the site is recovering well and will likely not need the full prescription to meet the success criteria. Table 9-8 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 9-8. 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 conducted in 2013, 2014, and 2019 at HA 19; SSRP planting was completed in 2014. An AMP planting event occurred in 2019 per recommendations made in the 2018 Annual Report (Burleson, 2019). The total number of plants installed at HA 19 was 3,090 compared to 2,462 prescribed in the SSRP. Table 9-9 summarizes the plants installed during active restoration.

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

Species	Number of Individual Plants				
	SSRP Target	2013	2014	2019	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
LECA	-	-	-	160	160
LUAL	-	-	9	-	9
SAME	250	227	25	-	252
STCE	200	200	-	-	200
TOTAL	**2,462**	**2,369**	**561**	**160**	**3,090**

* HMP species

9.2.2   Monitoring Results

HA 19 was in year 6 of monitoring in 2019. Year 6 was not a required monitoring year, however, sand gilia restoration plots were in year 5 of monitoring and were surveyed along with a meandering transect of the site. Photo documentation was also completed.

9.2.2.1   HMP Annual Density

Sand gilia restoration plots were monitored for density at HA 19.

Nine sand gilia plots were surveyed for year 5 density at HA 19 in 2019. The plots are numbered 1-9 on Figure 9-4 and are primarily located on the southwestern portion of the site. Sand gilia densities were low at Plots 3, 4, 5, 6, 8, and 9; medium at Plot 2; and high at Plot 7. Sand gilia was not present at Plot 1. Figure 9-3 presents all the sand gilia restoration plot densities for HA 19.
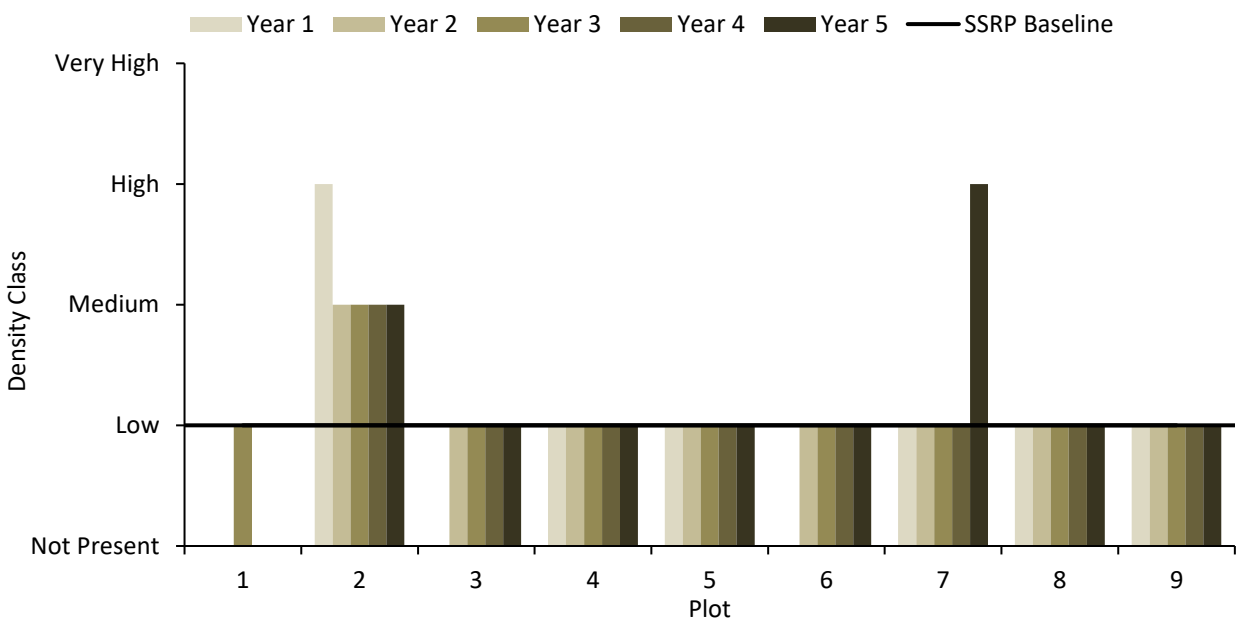
Figure 9-3. HA 19 Comparison of Sand Gilia Density Classes to the SSRP Baseline for Plots 1-9
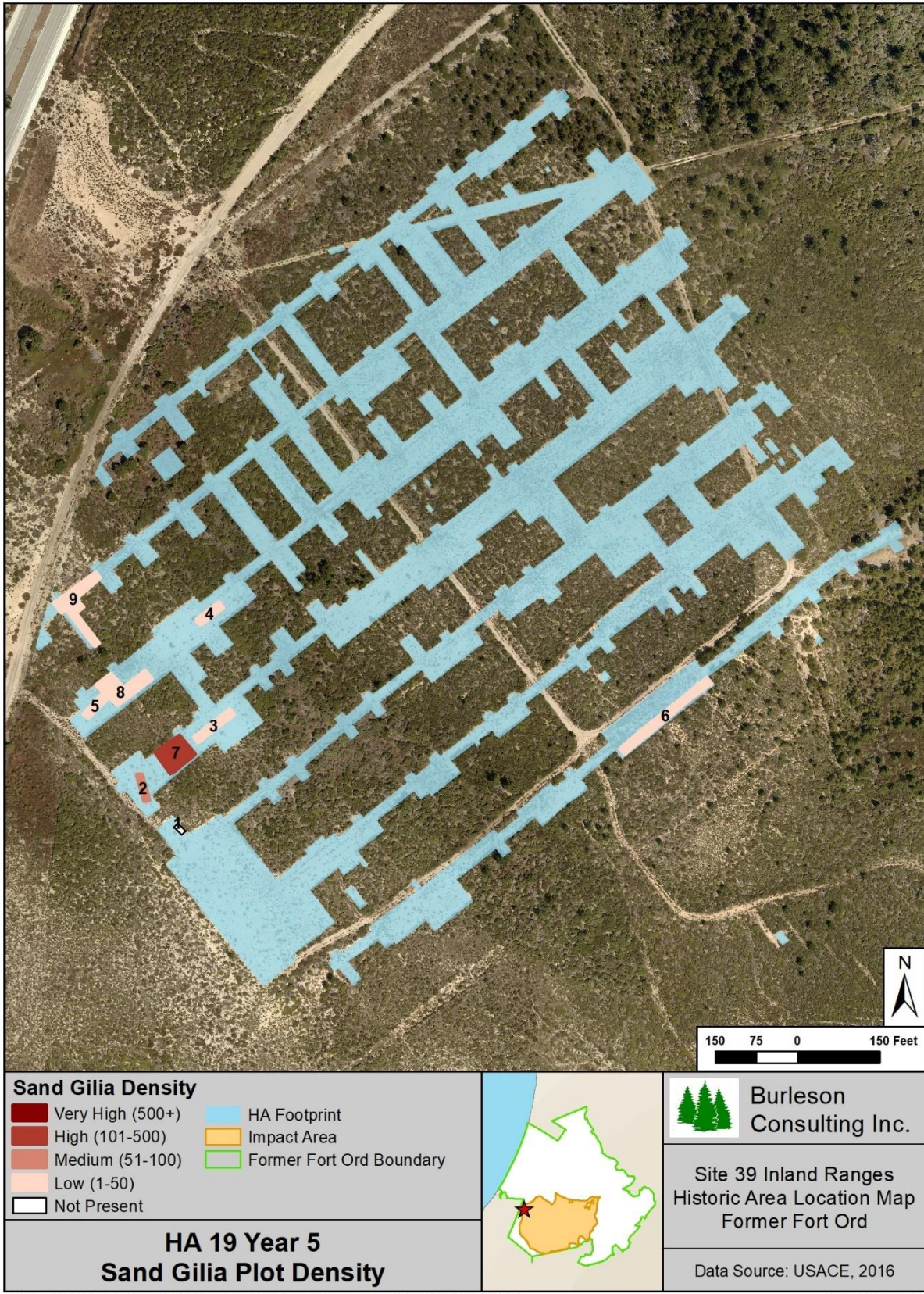
Figure 9-4. HA 19 Year 5 Sand Gilia Plot Density Map

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 at HA 19.

Twenty-six individual plants and 31 discrete patches of sand gilia were mapped and individuals counted within each patch (see Figure 9-5). Densities ranged from low to very high and the total acreage of sand gilia patches with a density at or above the SSRP baseline density class of low was 0.11 acre. From 2018 to 2019, the density and acreage above the SSRP baseline increased.
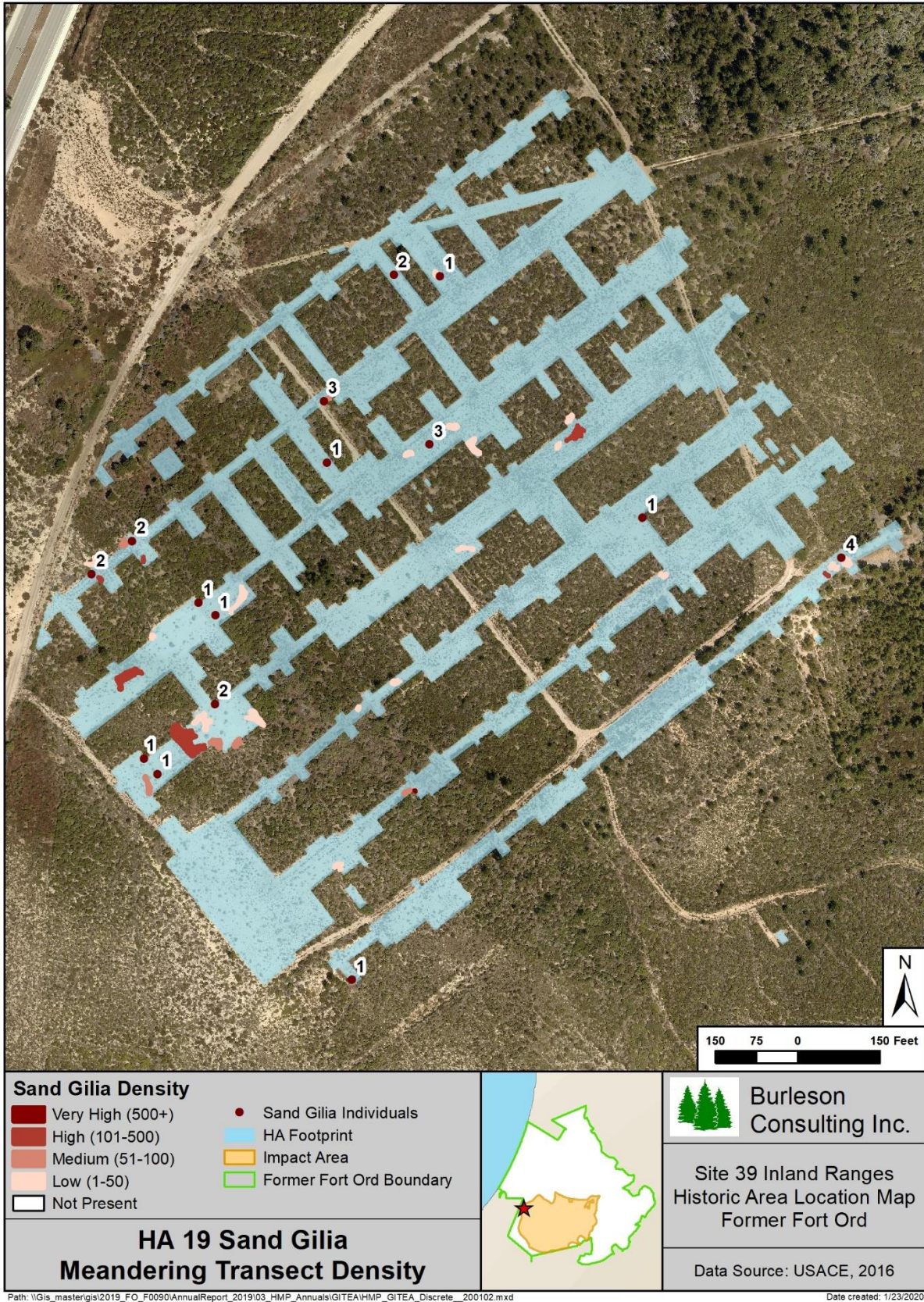
Figure 9-5. HA 19 Sand Gilia Meandering Transect Density Map

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. Tables 9-10 and 9-11 present results by species.

Table 9-10. 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 9-11. 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

No surveys occurred; therefore, no species richness data were collected.

9.2.2.4   Vegetative Cover

No surveys occurred; therefore, no vegetative cover data were collected.

9.2.3   Discussion

9.2.3.1   Recommendations

HA 19 was in year 6 of monitoring in 2019; the only monitoring that occurred was HMP annual density surveys for sand gilia and photo documentation. Recommendations were developed from a combination of prior recommendations and the restoration efforts completed in 2019. The site met three of six success criteria by 2018. Per recommendations in the 2016 Annual Habitat Restoration Report, pitcher sage (*Lepechinia calycina*) was planted in the 2018/2019 season and sandmat manzanita will be planted in the 2019/2020 season to meet the success criteria for species richness and HMP shrub cover (Burleson, 2017). 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).

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 (see Table 9-6). Table 9-12 summarizes the current status of HA 19 including which success criteria were met and recommendations.

Table 9-12. Status and Recommendations for Achieving Success Criteria at HA 19

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	AMP planting occurred in 2019, wait to see how the HA responds
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 2018 Annual Habitat Restoration Report (Burleson, 2019).

9.2.3.2   HMP Annual 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 5 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 0.11 acre 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

No surveys occurred; therefore, no species richness data were collected.

9.2.3.5   Vegetative Cover

No surveys occurred; therefore, no vegetative cover data were collected.

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 acre (Shaw, 2008). HA 22 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of 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.

Restoration at HA 22 occurred in 2011 and 2012. Monitoring at HA 22 began in 2013. HA 22 was monitored for nine 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 9-13). Figure 9-6 shows the historic area footprint, passive restoration area and transect monitoring locations. Success criteria for HA 22 are summarized in Table 9-14.

Table 9-13. 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						●†	●	●	●	●

* Photo points and site visits occur every year regardless of the monitoring year
† Vegetative cover was monitored using quadrats in 2016

Figure 9-6. HA 22 Restoration Areas and Monitoring Locations Map

Table 9-14. 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 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.

Table 9-14. 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 passive restoration activities occurred in 2019. The total amount of seed broadcast on site was 1.219 lb compared to the 1.243 lb prescribed in the SSRP. Table 9-15 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 9-15. 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

No active restoration was prescribed at HA 22; however, an AMP planting event occurred in 2019 per recommendations made in the 2018 Annual Report (Burleson, 2019). A total of 145 plants were installed at HA 22. Table 9-16 summarizes the plants installed during active restoration.

Table 9-16. **Summary of Active Restoration Activities for HA 22**

Species	Number of Individual Plants	
	2019	**Total by Species**
ARPU*	20	20
ARTO	10	10
BAPI	10	10
CEDE	20	20
CERI*	20	20
DIAU	8	8
ERCO	10	10
ERER	6	6
ERFA*	35	35
SAME	6	6
TOTAL	**145**	**145**

*HMP species

9.3.2   Monitoring Results

HA 22 was in year 7 of monitoring in 2019. Year 7 was not a required monitoring year and only photo documentation was completed.

9.3.3   Discussion

9.3.3.1   Recommendations

HA 22 was in year 7 of monitoring in 2019; the only monitoring that occurred was photo documentation. Recommendations were developed from a combination of prior recommendations and the restoration efforts completed in 2019. 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 (*Ericameria ericoides*), Eastwood's goldenbush, golden yarrow (*Eriophyllum confertiflorum*), sticky monkeyflower (*Diplacus aurantiacus*), and black sage were 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 (see Table 9-13). Table 9-17 summarizes the current status of HA 22 including which success criteria were met and recommendations.

Table 9-17. Status and Recommendations for Achieving Success Criteria at HA 22

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	AMP planting occurred in 2019, wait to see how the HA responds
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	AMP planting occurred in 2019, wait to see how the HA responds
Objective 3 – No. 4	HMP shrub cover by species	No	AMP planting occurred in 2019, wait to see how the HA responds
Objective 3 – No. 4	HMP annual density	Yes	None

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 acre (Shaw, 2008). HA 23 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of 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.

Restoration at HA 23 occurred in 2011 and 2012 and monitoring began in 2013. The HA was monitored for nine 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 9-18). Figure 9-7 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 23 are summarized in Table 9-19.

Table 9-18. 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						●‡	●	●	●	●

 * Photo points and site visits occur every year regardless of the monitoring year

 † Monterey spineflower was not monitored in year 1 (2013) because of UXO presence and mastication activities
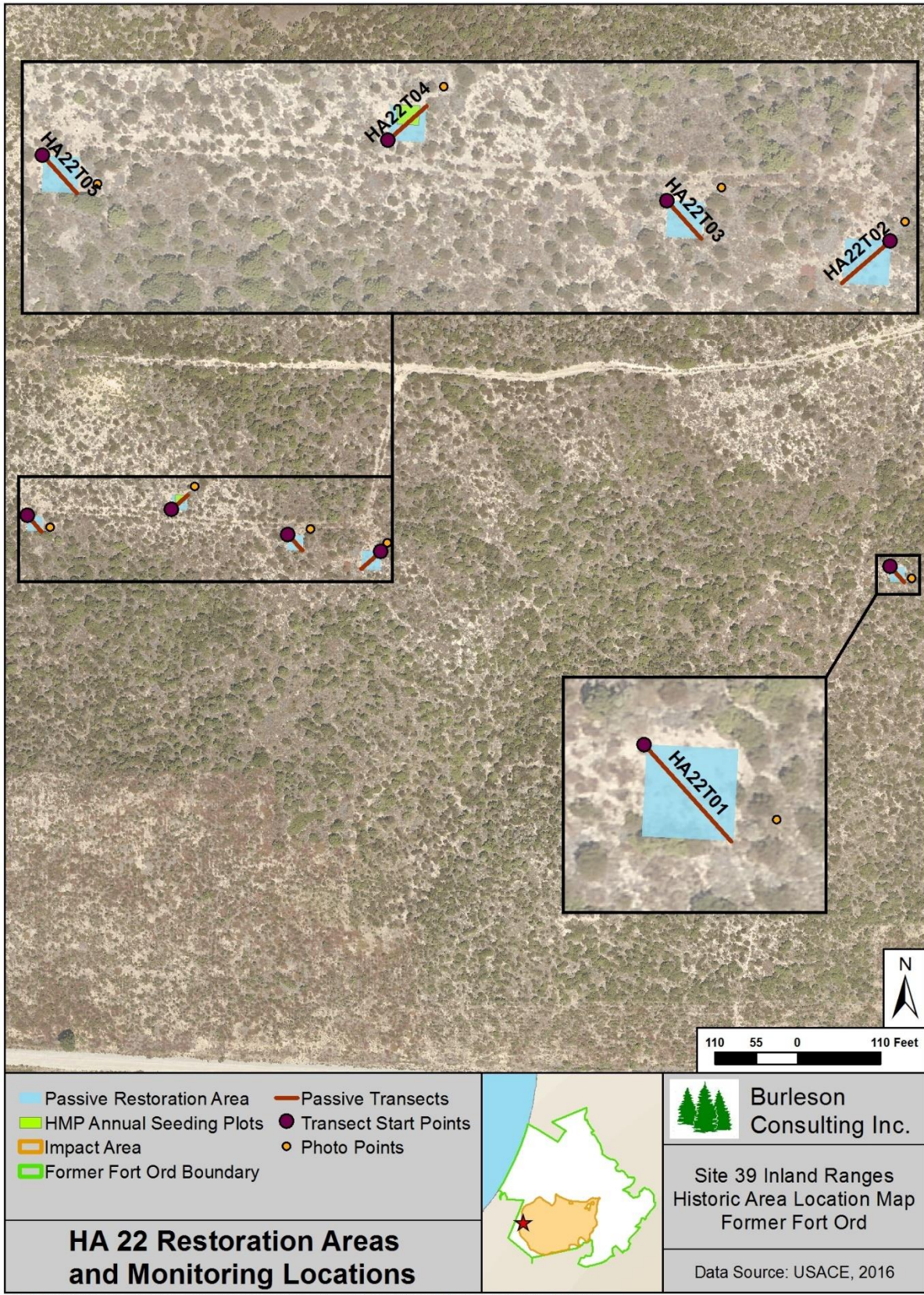
 ‡ Vegetative cover was monitored using quadrats in 2016
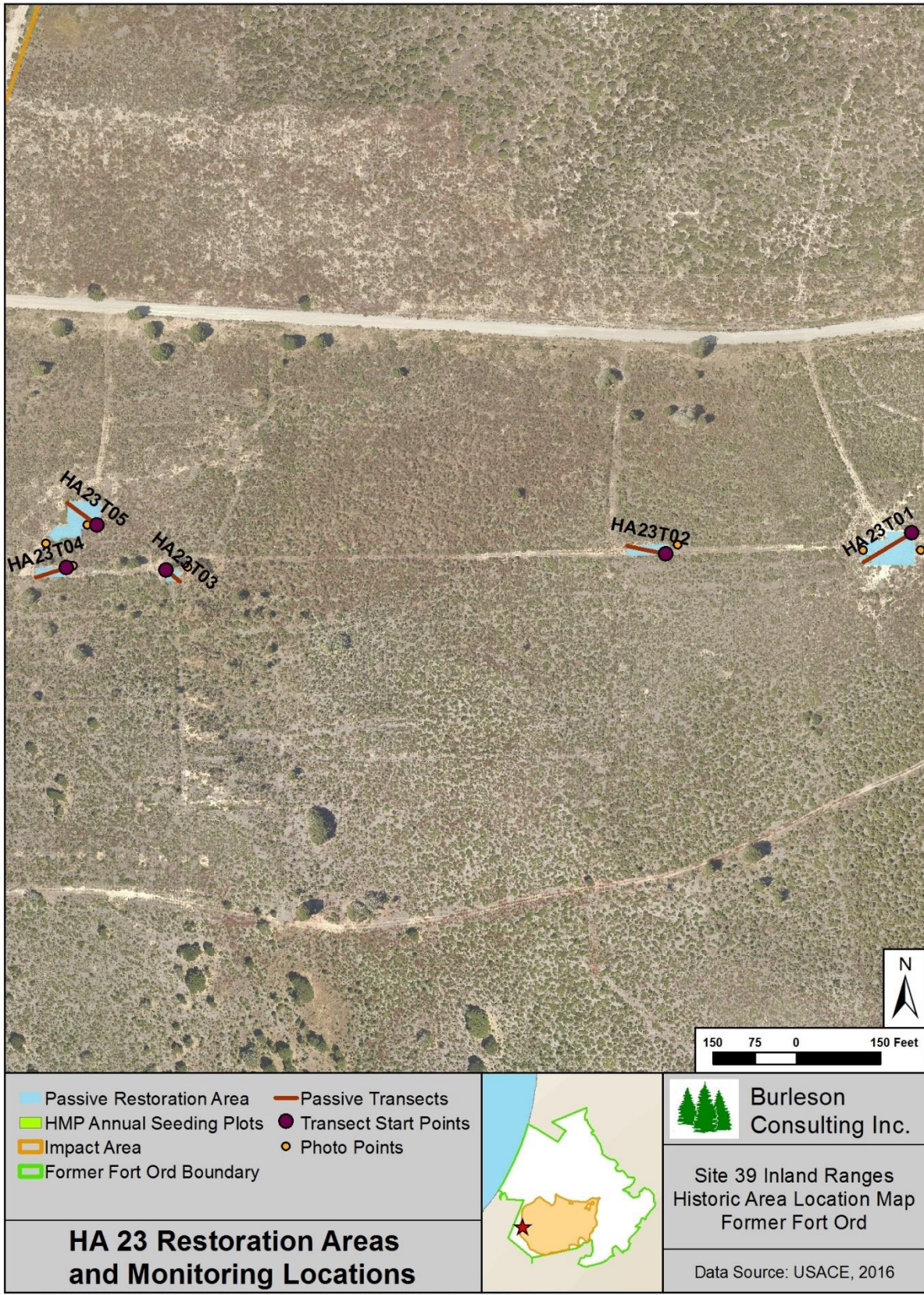
Figure 9-7. HA 23 Restoration Areas and Monitoring Locations Map

Table 9-19. 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, 2012, and 2019. The total amount of seed broadcast on site was 10.052 lb compared to 7.285 lb prescribed in the SSRP. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities. 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 its suitable habitat for Monterey spineflower and adjacent extant populations.

Table 9-20. Summary of Passive Restoration Activities for HA 23

Species	Pounds of Seed Broadcast				
	SSRP Target	2011	2012	2019	Total by Species
ACGL	0.600	0.300	0.306	-	0.606
ACMI	0.300	0.200	0.159	0.300	0.659
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
ELGL	-	-	-	0.800	0.800
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	0.400	1.006
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
STPU	-	-	-	0.500	0.500
TOTAL	**7.285**	**3.936**	**4.116**	**2.000**	**10.052**

* HMP species

No active restoration was prescribed at HA 23; however, an AMP planting event occurred in 2019 per recommendations made in the 2018 Annual Report (Burleson, 2019). A total of 95 plants were installed at HA 23. Table 9-21 summarizes the plants installed during active restoration.

Table 9-21. Summary of Active Restoration Activities for HA 23

Species	Number of Individual Plants	
	2019	**Total by Species**
ARPU*	10	10
BAPI	6	6
CEDE	18	18
CERI*	20	20
ERCO	6	6
ERFA*	35	35
TOTAL	**95**	**95**

*HMP species

9.4.2   Monitoring Results

HA 23 was in year 7 of monitoring in 2019. Year 7 was not a required monitoring year and only photo documentation was completed.

9.4.3   Discussion

9.4.3.1   Recommendations

HA 23 was in year 7 of monitoring in 2019; the only monitoring that occurred was photo documentation. Recommendations were developed from a combination of prior recommendations and the restoration efforts completed in 2019. The site met four of six success criteria by 2018. Per recommendations in the 2018 Annual Habitat Restoration Report, sandmat manzanita, coyote brush, Monterey ceanothus, dwarf ceanothus, golden yarrow, and Eastwood's goldenbush were planted during the 2018/2019 season to support the native vegetation and HMP shrub cover success criteria (Burleson, 2019). 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 (see Table 9-18). Table 9-22 summarizes the current status of HA 23 including which success criteria were met and recommendations.

Table 9-22. 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	AMP planting occurred in 2019, 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	AMP planting occurred in 2019, wait to see how the HA responds
Objective 3 – No. 4	HMP annual density	Yes	None

9.5   HA 26

HA 26 was used by the Army as an intermittent machine gun range, a 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 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 container-grown plant installation.

Restoration and monitoring at HA 26 began in 2016. The HA was monitored for six years by photo documentation and site visits; four years for HMP annual density in plots, HMP annual density across the HA, and species richness; three years for vegetative cover; and two years for plant survivorship (see Table 9-23). Figure 9-8 shows the HA footprint, passive restoration area, and active restoration area. Success criteria for HA 26 are summarized in Table 9-24.

Table 9-23. 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 9-8. HA 26 Restoration Areas and Monitoring Locations Map

Table 9-24. 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, 2018, and 2019. The total amount of seed broadcast on site was 471.19 lb compared to the 303.10 lb prescribed in the SSRP. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities. Table 9-25 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 9-25. Summary of Passive Restoration Activities for HA 26

Species	Pounds of Seed Broadcast					
	SSRP Target	2016	2017	2018	2019	Total by Species
ACMI	14.00	5.24	18.05	9.35	3.30	35.94
ACGL	28.00	10.48	10.17	4.00	7.00	31.65
BAPI	2.10	1.05	0.45	0.80	0.20	2.50
CERI*	14.00	5.24	2.27	4.00	1.00	12.51
CHPUP*	2.10	0.84	-	0.21	0.21	1.26
CRSC	10.50	4.20	1.81	3.20	0.80	10.01
DIAU	7.00	2.62	1.13	2.00	0.50	6.25
ELGL	42.00	15.72	81.36	36.40	11.30	144.78
ERFA*	1.40	0.52	0.23	0.40	0.10	1.25
ERCO	14.00	5.24	2.27	4.00	1.00	12.51
FRCA	-	-	-	0.60	0.15	0.75
GAEL	-	-	-	1.60	0.15	1.75
HO	126.00	47.20	22.65	41.20	10.00	121.05
HOCU	28.00	10.48	9.04	17.80	0.40	37.72
SAME	14.00	5.24	2.27	4.00	1.00	12.51
STPU	-	-	-	22.75	8.00	30.75
TOTAL	303.10	114.07	151.70	152.31	45.11	463.19

* HMP species

Active restoration was conducted at HA 26 in 2018 and 2019. The total number of plants installed at HA 26 was 8,106 compared to 9,845 prescribed in the SSRP. Three distinct areas at HA 26 received active restoration. Shrubs installed in Target Areas 1 and 2 receive supplemental irrigation throughout the dry season (see Section 8). Planting amounts by year and species, in comparison to the SSRP target, are presented for each area in Tables 9-24 through 9-26.

Burleson conducted active restoration at HA 26 Target Area 1 in 2019. The total number of plants installed was 1,551 compared to 3,320 prescribed in the SSRP. Table 9-26 summarizes the plants installed during active restoration at Plot 1.

Table 9-26. Summary of Active Restoration Activities at Target Area 1 for HA 26

Species	Number of Individual Plants		
	SSRP Target Area 1	**2019**	**Total by Species**
ACGL	400	-	-
ACMI	200	-	-
ADFA	175	200	200
ARCA	-	50	50
ARHO	-	157	157
ARPU*	175	-	-
ARMO	-	35	35
ARTO	175	40	40
BAPI	75	50	50
CERI*	175	100	100
CRSC	400	-	-
DIAU	350	-	-
ERCO	420	282	282
ERFA*	200	12	12
HOCU	400	125	125
LUAR	-	200	200
SAME	175	300	300
TOTAL	**3,320**	**1,551**	**1,551**

* HMP Species

Burleson conducted active restoration at HA 26 Target Area 2 in 2018. The total number of plants installed was 4,885 compared to 4,860 prescribed in the SSRP. Table 9-27 summarizes the plants installed during active restoration at Plot 2.

Table 9-27. Summary of Active Restoration Activities at Target Area 2 for HA 26

Species	Number of Individual Plants			
	SSRP Target Area 2	2018 (Jan)	2018 (Dec)	Total by Species
ACGL	580	138	88	226
ACMI	250	289	-	289
ADFA	265	589	67	656
ARPU*	240	644	88	732
ARTO	265	319	69	388
BAPI	120	141	31	172
CERI*	240	290	92	382
CRSC	550	462	31	493
DIAU	480	189	153	342
ERCO	550	50	50	100
ERFA*	500	360	65	425
HOCU	580	271	88	359
LUAR	-	-	15	15
SAME	240	243	63	306
TOTAL	**4,860**	**3,985**	**900**	**4,885**

 * HMP Species

Burleson conducted active restoration at HA 26 Target Area 3 in 2018. The total number of plants installed was 1,670 compared to 1,665 prescribed in the SSRP. Table 9-28 summarizes the plants installed during active restoration at Plot 3.

Table 9-28. Summary of Active Restoration Activities at Target Area 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 4 density at HA 26 in 2019. The plots are numbered 1-9 on Figure 9-10 and are located throughout the site. Monterey spineflower density was low at Plots 1, 2, 3, 4, 5, 6, 8, and 9, and was not present at Plot 7. Figure 9-9 summarizes all the Monterey spineflower restoration plot densities for HA 26.
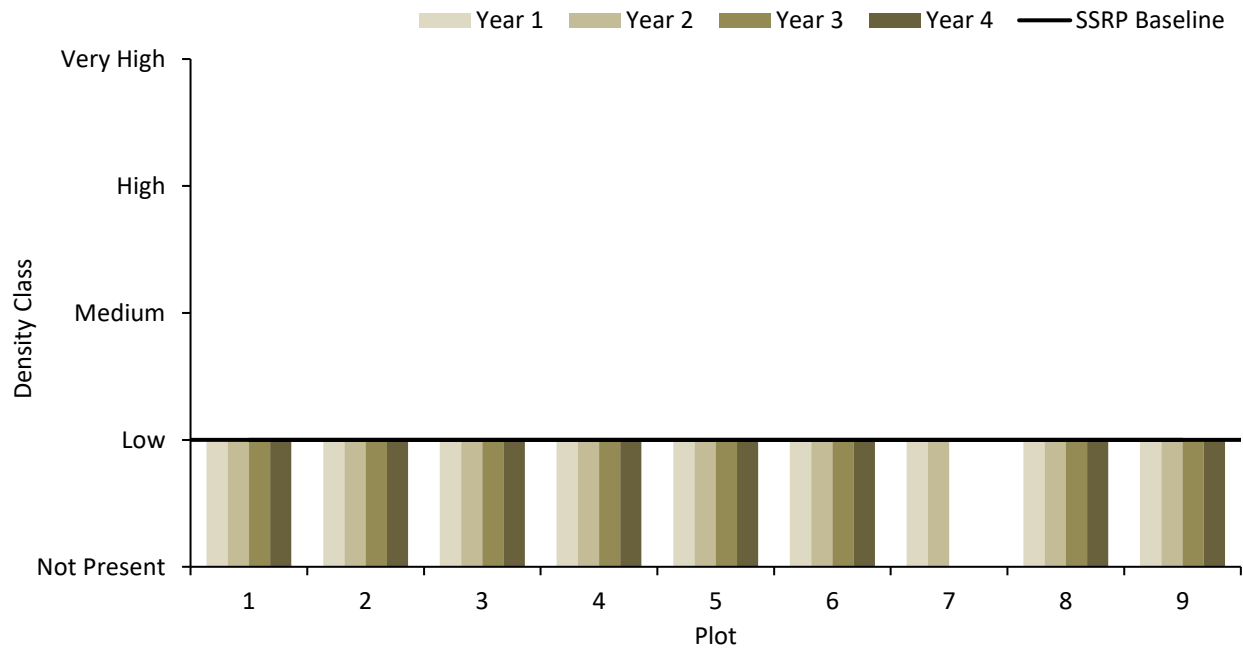
Figure 9-9. HA 26 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots 1-9
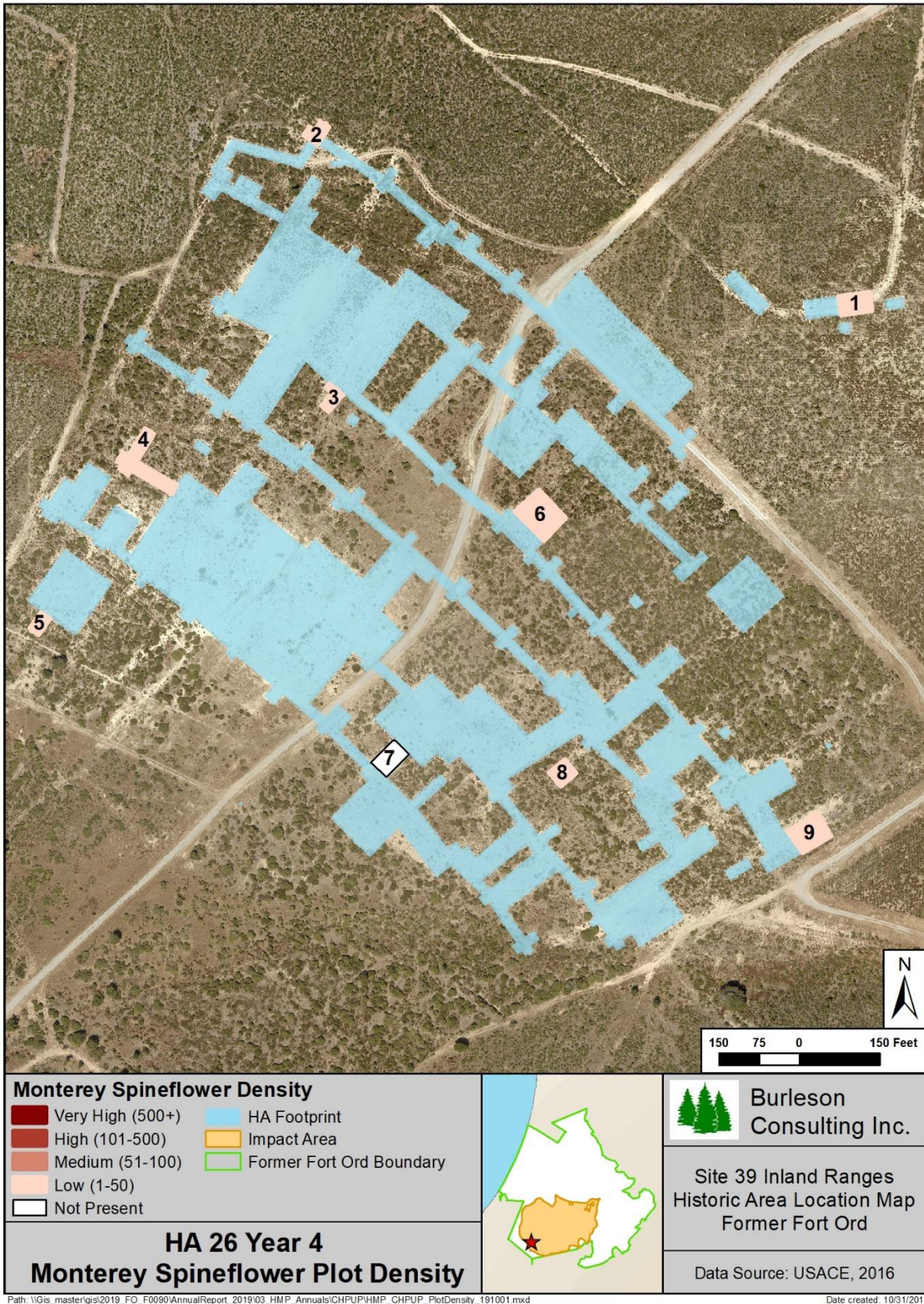
Figure 9-10. HA 26 Year 4 Monterey Spineflower Plot Density Map

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.

Sixty-three individual plants and nine discrete patches of Monterey spineflower were mapped and individual plants were counted within each patch (see Figure 9-11). The density 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 0.031 acre. From 2018 to 2019, the density range and acreage above the SSRP baseline increased. One individual plant and one discrete patch of Monterey spineflower were mapped in 2018.

Three individual plants of seaside bird's beak were counted and mapped at HA 26 (see Figure 9-12). Densities and acreages were not calculated because no discrete patches were observed. Seaside bird's beak is not an SSRP required species at HA 26.
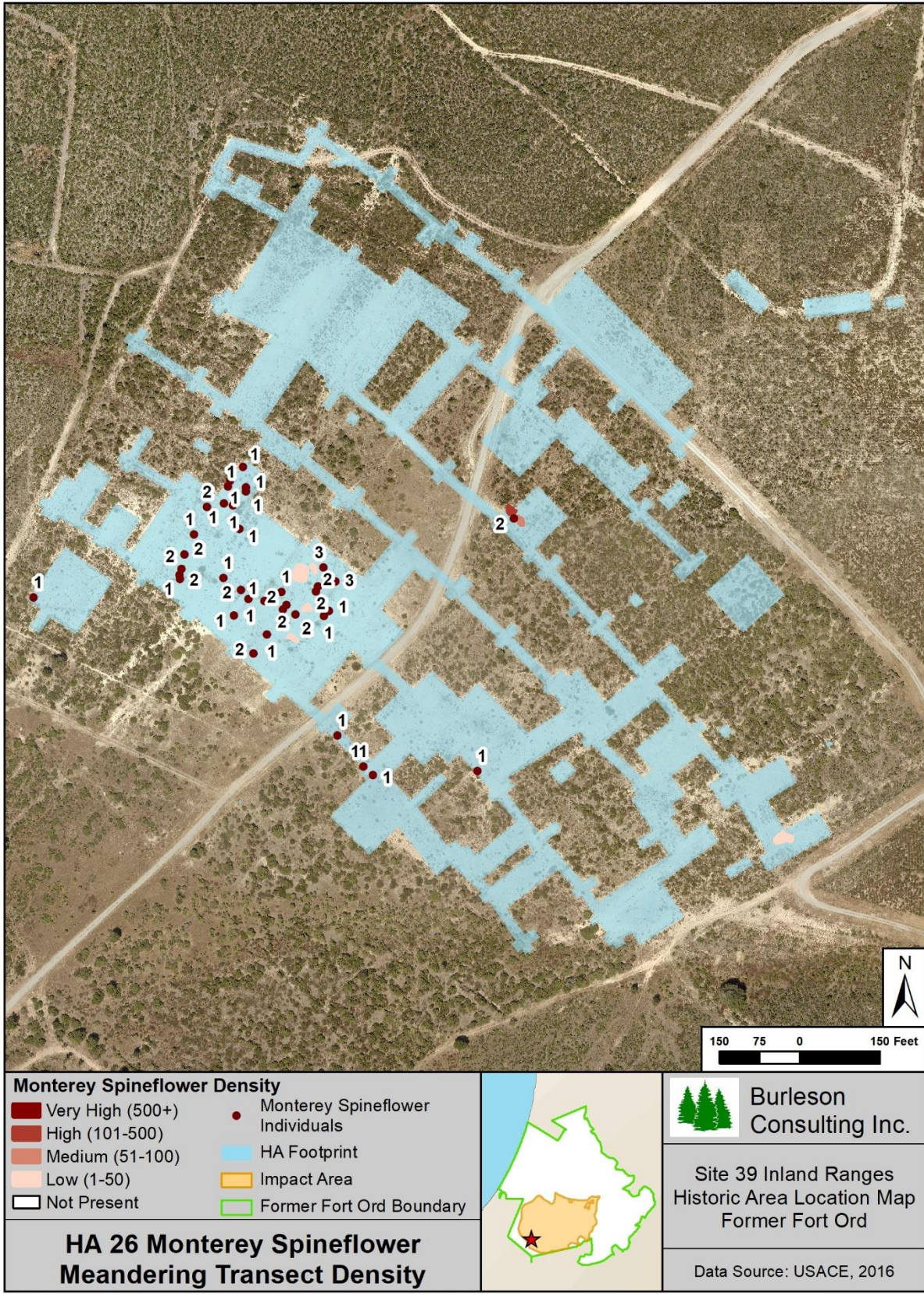
Figure 9-11. HA 26 Monterey Spineflower Meandering Transect Density Map
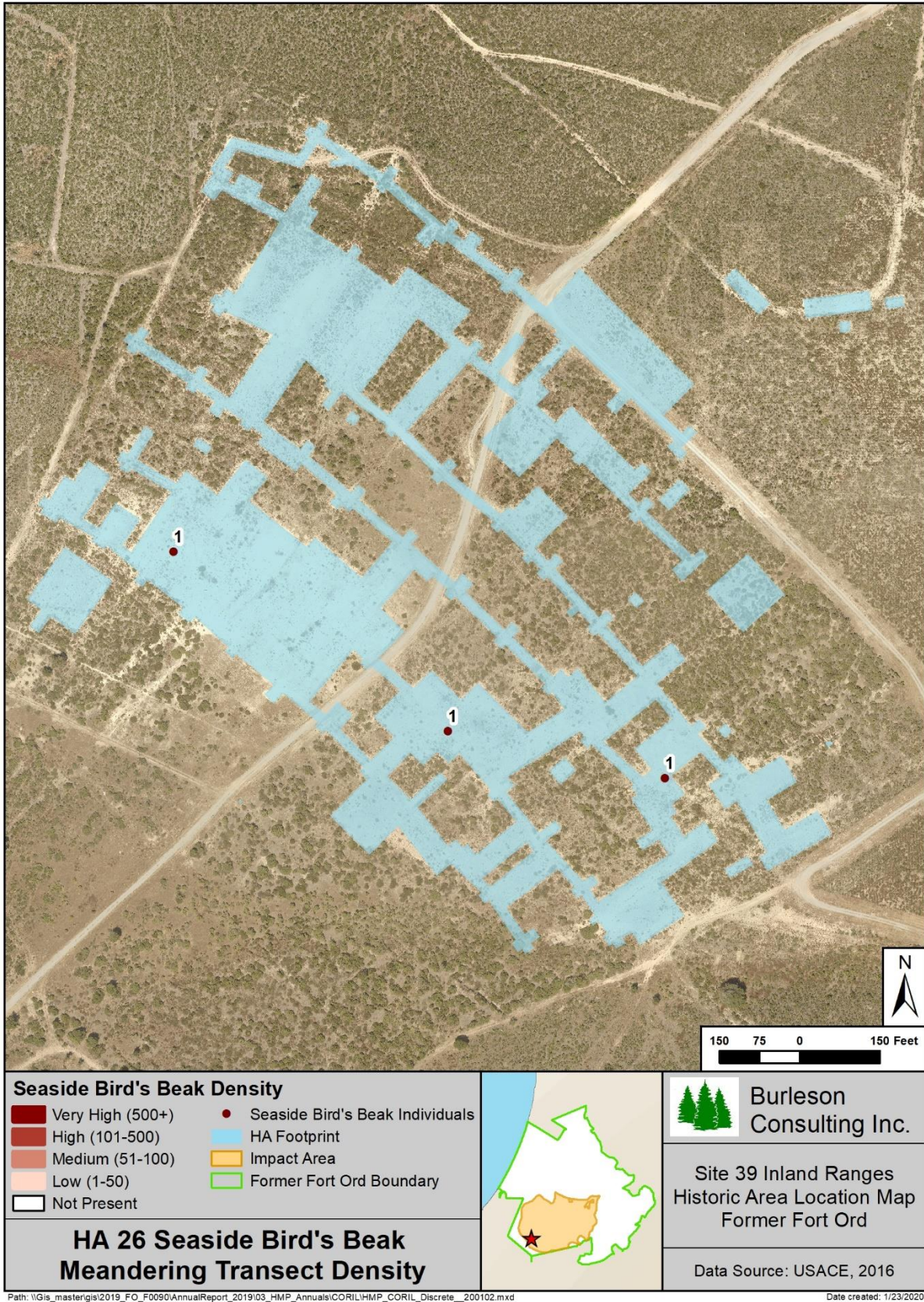
Figure 9-12. HA 26 Seaside Bird's Beak Meandering Transect Density Map

9.5.2.2   Plant Survivorship

Plant survivorship monitoring was conducted at HA 26 for plants installed in 2018 and 2019. A total of eight shrub species and 427 individual plants were monitored for survivorship. In both planting years there are irrigated and non-irrigated plants. By the end of year 2 monitoring for the 2018 planting, survivorship was 74%; survivorship decreased slightly from 79% in 2018. Irrigated and non-irrigated plants had 84% and 13% survivorship, respectively. By the end of year 1 monitoring for the 2019 planting, survivorship was 78%. Irrigated and non-irrigated plants had 95% and 42% survivorship, respectively. Tables 9-29 and 9-30 present results by species.

Table 9-29. Plant Survivorship Monitoring Summary for 2018 Plantings at HA 26

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2018)	Year Two (2019)
			Alive (%)	Alive (%)
ADFA	723	72	94	91
ARPU*	955	92	96	95
ARTO	457	46	96	91
BAPI	202	18	83	83
CERI*	414	41	34	30
ERFA*	475	45	42	41
SAME	368	34	76	56
TOTAL	3,594	348	79	74

* HMP Species

Table 9-30. Plant Survivorship Monitoring Summary for 2019 Plantings at HA 26

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2019)
			Alive (%)
ADFA	67	10	90
ARPU*	88	10	100
ARTO	69	10	100
BAPI	31	10	100
CERI*	92	10	70
ERFA*	65	10	40
LUAR	15	9	22
SAME	63	10	100
TOTAL	490	79	78

* HMP Species

9.5.2.3   Species Richness

Eighty-one species were observed at HA 26. Of those, 33 were native shrubs or perennials, 15 were native annual herbaceous species, 31 were non-native species, and two were not categorized as they were only identified to genus (see Table 9-31). Species richness remained the same since 2018. Native shrub and perennial species richness decreased by one, native herbaceous species richness remained the same, non-native species richness remained the same, and uncategorized species richness increased by one.

Table 9-31. Species Observed on HA 26, 2019

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
Agoseris sp.	agoseris	AG
Aira caryophyllea	silver hair grass	AICA
Aphanes occidentalis	western lady's mantle	APOC
Arbutus menziesii	Pacific madrone	ARME
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
Brassica nigra	black mustard	BRNI
Briza maxima	rattlesnake grass	BRMA
Briza minor	small quaking grass	BRMI
Bromus diandrus	ripgut brome	BRDI
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
Carpobrotus edulis	hottentot fig	CAED
Castilleja exserta ssp. *exserta*	purple owl's clover	CAEX
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus*	Monterey ceanothus	CERI
Ceanothus thyrsiflorus	blueblossom	CETH
Centaurea melitensis	tocalote	CEME
Chlorogalum pomeridianum	wavyleaf soap plant	CHPO
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Cirsium sp.	thistle	CI
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ
Cordylanthus rigidus ssp. *littoralis**	seaside bird's beak	CORIL
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
Dichelostemma capitatum	blue dicks	DICA
Diplacus aurantiacus	sticky monkeyflower	DIAU
Ericameria ericoides	mock heather	ERER
Ericameria fasciculata*	Eastwood's goldenbush	ERFA
Erigeron canadensis	horseweed	ERCA
Eriophyllum confertiflorum	golden yarrow	ERCO

Table 9-31. Species Observed on HA 26, 2019

Scientific Name	Common Name	Code
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filaree	ERCI
Festuca bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Festuca octoflora	sixweeks grass	FEOC
Gamochaeta ustulata	purple cudweed	GAUS
Garrya elliptica	coast silk tassel	GAEL
Gastridium phleoides	nit grass	GAPH
Genista monspessulana	French broom	GEMO
Githopsis specularioides	common bluecup	GISP
Heteromeles arbutifolia	toyon	HEAR
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
Layia platyglossa	tidy-tips	LAPL
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 concinnus	bajada lupine	LUCO
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia exigua	little tarweed	MAEX
Madia gracilis	slender tarweed	MAGR
Matricaria discoidea	pineapple weed	MADI6
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
Petrorhagia prolifera	pink grass	PEPR
Pinus radiata	Monterey pine	PIRA
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Polygala californica	California milkwort	POCA
Polypogon monspeliensis	rabbitsfoot grass	POMO
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium ramosissimum	pink everlasting	PSRA
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

Table 9-31. Species Observed on HA 26, 2019

Scientific Name	Common Name	Code
Senecio sylvaticus	woodland groundsel	SESY
Silene gallica	small-flower catchfly	SIGA
Sonchus asper	prickly sow thistle	SOAS
Stylocline gnaphaloides	everlasting neststraw	STGN
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium campestre	hop clover	TRCA
Trifolium hirtum	rose clover	TRHI
Trifolium sp.	clover	TR
Vicia sativa ssp*. nigra*	narrow-leaved vetch	VISAN
Vicia sp.	vetch	VI
Zeltnera davyi	Davy's centaury	ZEDA

 * HMP species

9.5.2.4   Vegetative Cover

Burleson completed 14 50-meter line-intercept transects at HA 26. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 25.37%. The mean vegetative cover by native shrubs and perennials was greater in 2019 than 2018 by 0.82%. Table 9-32 summarizes vegetative cover and Table 9-33 presents vegetative cover by species. Figure 9-13 presents the percent cover of dominant species at HA 26 in 2017, 2018, and 2019.

Table 9-32. Transect Survey Summary for HA 26

Transect ID	Restoration Type	Total Vegetative Cover (%)	Native Vegetative Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA26T01	Passive	31.80	31.50	0.30	40.74	55.36
HA26T02	Passive	45.80	45.46	0.34	55.14	39.94
HA26T03	Passive	14.14	14.14	0.00	60.72	96.06
HA26T04	Passive	15.50	15.50	0.00	28.44	66.98
HA26T05	Passive	31.38	31.38	0.00	53.32	43.62
HA26T06	Passive	33.76	33.14	0.62	47.72	46.94
HA26T07	Passive	23.44	23.10	0.34	53.76	44.80
HA26T08	Active	18.54	18.54	0.00	51.38	47.48
HA26T09	Active	40.02	40.02	0.00	95.14	4.86
HA26T10	Active	3.74	2.98	0.76	100.00	0.00
HA26T11	Active	20.20	19.92	0.28	93.36	5.64
HA26T12	Active	9.06	9.06	0.00	100.00	0.00
HA26T13	Active	29.18	29.18	0.00	85.32	14.62
HA26T14	Passive	41.22	41.22	0.00	66.92	28.48
Passive Transect Average		29.63	29.43	0.20	50.85	52.77
Active Transect Average		20.12	19.95	0.17	87.53	12.10
Site Average		**25.56**	**25.37**	**0.19**	**66.57**	**35.34**

Table 9-33. Transect Survey Results for HA 26 by Species

Transect	ACGL (%)	ACHEO (%)	ADFA (%)	ARPU* (%)	ARTO (%)	BAPI (%)	CA (%)	CEDE (%)	CERI* (%)	COJU (%)	CRSC (%)
HA26T01	0.84	0.00	0.00	0.00	2.84	0.00	0.54	18.30	0.00	0.00	6.02
HA26T02	0.60	0.00	2.44	0.00	8.52	0.00	0.66	11.90	1.10	0.34	6.54
HA26T03	0.26	0.00	0.00	0.00	3.56	0.00	0.26	2.26	3.92	0.00	3.34
HA26T04	0.78	0.00	0.00	0.00	3.32	0.00	0.69	9.27	0.00	0.00	0.00
HA26T05	3.50	0.00	0.00	3.64	0.38	0.00	0.00	17.16	0.30	0.00	3.56
HA26T06	8.24	0.00	0.00	0.62	0.86	0.00	0.54	14.76	2.30	0.62	4.50
HA26T07	0.68	0.00	0.00	0.00	1.86	0.00	0.00	14.16	0.00	0.34	5.76
HA26T08	0.00	0.00	0.00	0.00	1.54	0.00	0.48	0.64	0.00	0.00	15.88
HA26T09	7.94	0.00	0.00	0.64	2.16	0.00	0.00	19.94	0.00	0.00	7.48
HA26T10	0.20	0.00	0.00	1.70	0.62	0.00	0.00	0.00	0.00	0.00	0.00
HA26T11	1.28	0.00	0.24	0.00	6.68	0.00	0.00	8.30	0.00	0.28	2.90
HA26T12	5.50	2.12	0.00	0.68	0.52	0.00	0.00	0.00	0.24	0.00	0.00
HA26T13	1.34	0.00	0.00	0.22	0.98	0.00	0.30	17.04	0.74	0.00	7.74
HA26T14	0.00	0.00	0.00	0.00	6.02	1.02	0.40	19.28	0.00	0.00	7.58
SITE AVERAGE	**2.23**	**0.15**	**0.19**	**0.54**	**2.85**	**0.07**	**0.28**	**10.93**	**0.61**	**0.11**	**5.09**

* HMP species

Table 9-33 (continued). Transect Survey Results for HA 26 by Species

Transect	DIAU (%)	ERBO (%)	HOCU (%)	HYRA (%)	LECA (%)	LYAR (%)	PSBE (%)	SAME (%)	TODI (%)	TH (%)	BG (%)
HA26T01	0.00	0.00	2.96	0.00	0.00	0.30	0.00	0.00	0.00	40.74	55.36
HA26T02	0.00	0.00	7.16	0.00	1.76	0.00	0.00	4.28	0.50	55.14	39.94
HA26T03	0.00	0.00	0.54	0.00	0.00	0.00	0.00	0.00	0.00	60.72	96.06
HA26T04	0.00	0.00	1.44	0.00	0.00	0.00	0.00	0.00	0.00	28.44	66.98
HA26T05	0.00	0.00	2.84	0.00	0.00	0.00	0.00	0.00	0.00	53.32	43.62
HA26T06	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	1.12	47.72	46.94
HA26T07	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00	53.76	44.80
HA26T08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.38	47.48
HA26T09	0.00	0.00	1.66	0.00	0.00	0.00	0.20	0.00	0.00	95.14	4.86
HA26T10	0.00	0.54	0.46	0.22	0.00	0.00	0.00	0.00	0.00	100.00	0.00
HA26T11	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	93.36	5.64
HA26T12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
HA26T13	0.36	0.00	0.22	0.00	0.00	0.00	0.24	0.00	0.00	85.32	14.62
HA26T14	0.00	0.00	6.92	0.00	0.00	0.00	0.00	0.00	0.00	66.92	28.48
SITE AVERAGE	**0.03**	**0.04**	**1.83**	**0.02**	**0.13**	**0.02**	**0.03**	**0.31**	**0.12**	**66.57**	**35.34**
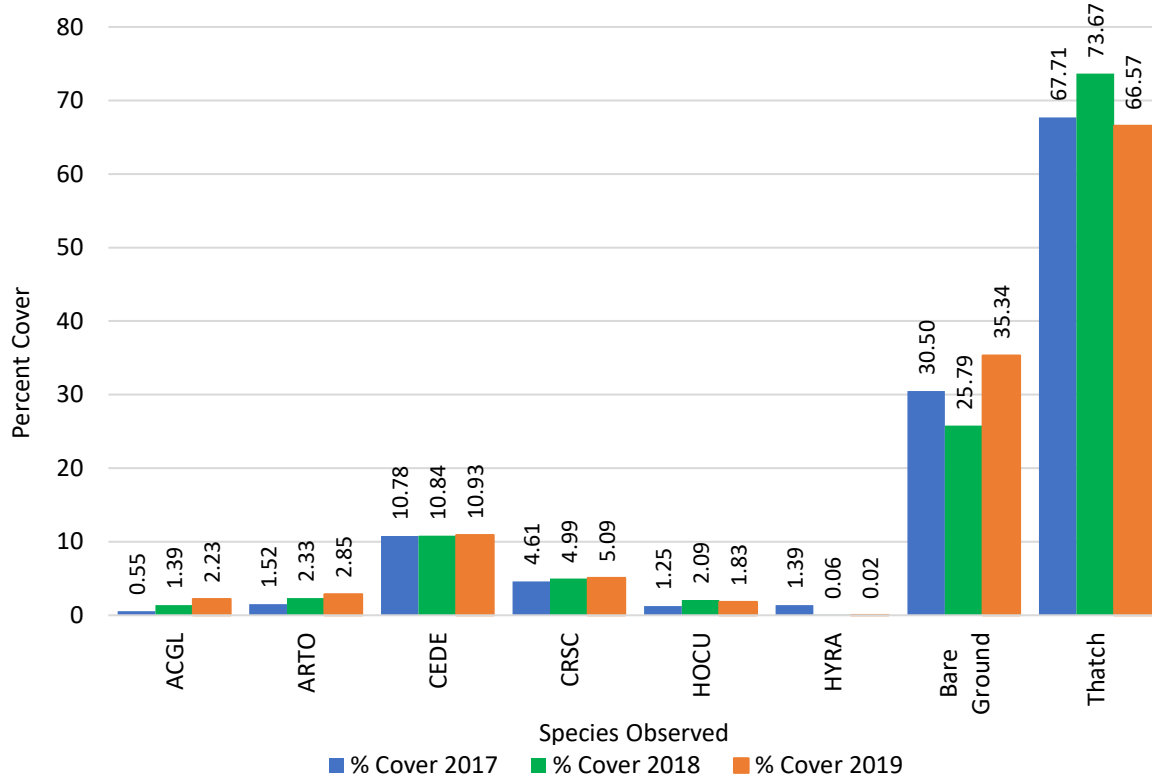
Figure 9-13. Percent Cover of Dominant Species at HA 26 in 2017, 2018, and 2019.

9.5.3   Discussion

9.5.3.1   Recommendations

HA 26 was in year four of monitoring in 2019. The site met three of six success criteria by 2019. The site was broadcast seeded and planted in 2019; no corrective measures are recommended at this time since restoration activities are not complete. Additional SSRP prescribed planting will be conducted in the 2019/2020 season. Monitoring HA 26 once the SSRP prescription is complete will guide future corrective measures. HMP shrub species, especially Monterey ceanothus and Eastwood's goldenbush, will continue to be monitored for survivorship and HMP shrub cover. Overall, HA 26 needs time to respond to the restoration effort and continued monitoring to evaluate areas that 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, species richness meandering transects, and vegetative cover line-intercept transects in year 5, 2020 (see Table 9-23). Table 9-34 summarizes the current status of HA 26 including which success criteria were met and recommendations.

Table 9-34. 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 2019/2020)
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant SSRP species (scheduled 2019/2020)
Objective 3 – No. 4	HMP shrub cover by species	No	Plant SSRP species (scheduled 2019/2020) Continue to irrigate HMP shrubs (scheduled 2020)
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 4 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 0.031 acre of HA 26.

Although not part of the success criterion, seaside bird's beak was present at HA 26. The density was not calculated because only individuals were observed.

9.5.3.3   Plant Survivorship

Overall plant survivorship was moderate for both the 2018 and 2019 planting events at HA 26. Chamise, sandmat manzanita, shaggy-bark manzanita, and coyote brush had high survivorship for both planting events. Black sage had moderate survivorship in the 2018 planting event and high survivorship for the 2019 planting event. Monterey ceanothus had low survivorship in the 2018 planting event and moderate survivorship in the 2019 planting event. Eastwood's goldenbush had low survivorship for both planting events. Yellow bush lupine (*Lupinus arboreus*) was not planted in the 2018 planting event and had low survivorship in the 2019 planting event. It is not surprising that yellow bush lupine had low survivorship since these species did poorly 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. Several areas at HA 26 were mulched which should prevent erosion and help with water retention (Kemron, 2018). Survivorship will be monitored for one more year for the 2018 planting and two more years for the 2019 planting.

9.5.3.4   Species Richness

Chamise, sandmat manzanita, shaggy-bark manzanita, Monterey ceanothus, sticky monkeyflower, Eastwood's goldenbush, and black sage were present. HA 26 included 33 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 13.74% cover to the HA. This success criterion was not met. In 2018, vegetative cover was 13.13%; cover increased by 0.61% (see Figure 9-14).
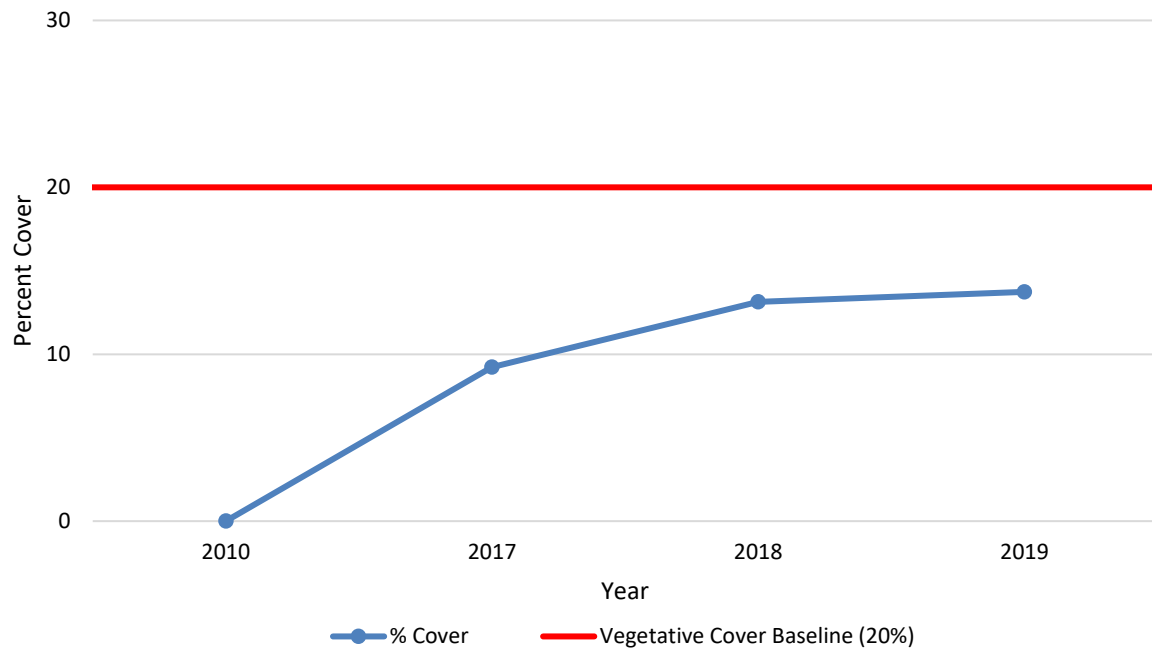
Figure 9-14. Native Vegetative Cover Compared to the Success Criterion at HA 26

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 0.11% which is less than the 5% acceptable limit. There was a decrease of 0.06% from 2018.

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 1.15%; therefore, the HA did not meet this success criterion. This was a decrease from 1.34% in 2018. 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 0.54%, Monterey ceanothus was 0.61%, and Eastwood's goldenbush was not observed on transects (see Figure 9-15). In 2019, only one of the three species, Monterey ceanothus, met the acceptable limit. The success criterion was not met.
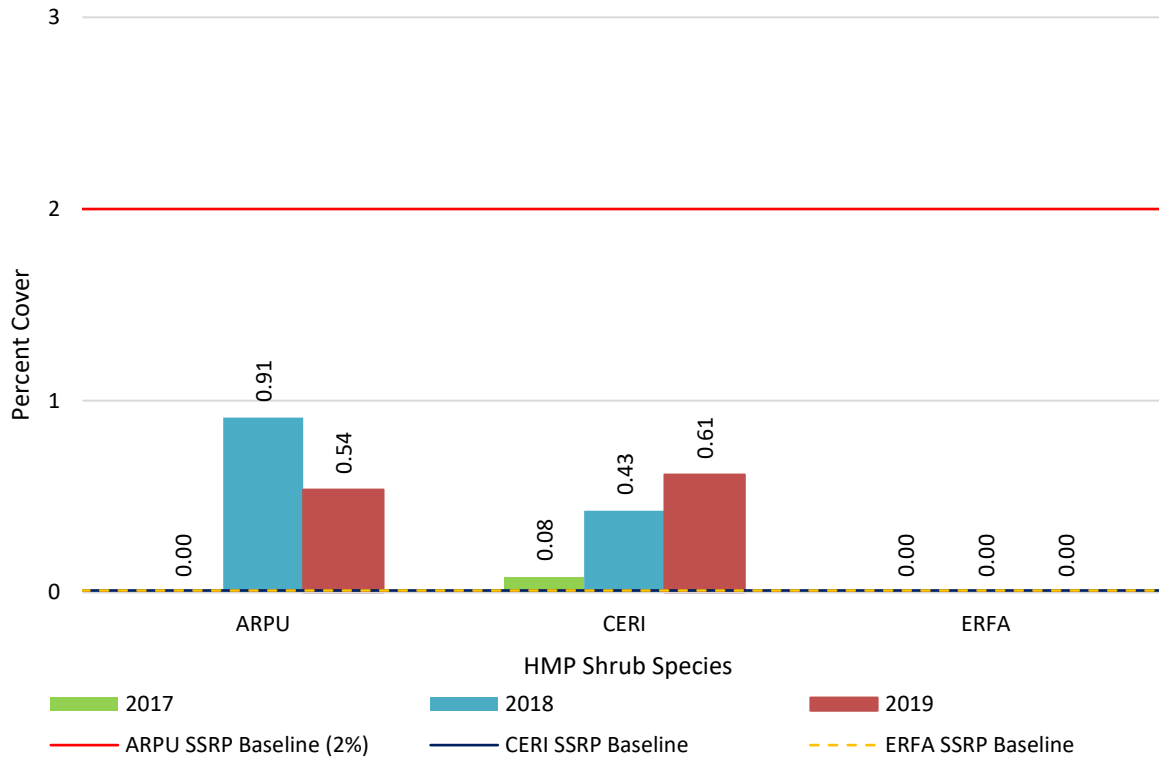
Figure 9-15. HMP Shrub Species Comparison to Success Criteria at HA 26

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 acre (Shaw, 2008). HA 27 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of 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.

Restoration at HA 27 occurred in 2011 and 2012 and monitoring began in 2013. HA 27 was monitored for nine years by photo documentation and site visits and three years for species richness and vegetative cover (see Table 9-35). Figure 9-16 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 27 are summarized in Table 9-36.

Table 9-35. 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						●†	●	●	●	●

* Photo points and site visits occur every year regardless of the monitoring year
† Vegetative cover was monitored using quadrats in 2016

Figure 9-16. HA 27 Restoration Areas and Monitoring Locations Map

Table 9-36. Success Criteria and Acceptable Limits for Restoration of HA 27

	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:
			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 9-36. 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, 2012, and 2019. The total amount of seed broadcast on site was 2.046 lb compared to the 1.270 lb prescribed in the SSRP. Table 9-37 summarizes the SSRP seed target and the amount of seed applied by year and species.

Table 9-37. Summary of Passive Restoration Activities for HA 27

Species	Pounds of Seed Broadcast				
	SSRP Target	**2011**	**2012**	**2019**	**Total by Species**
ACGL	0.12	0.06	0.06	-	0.12
ACMI	-	-	-	0.15	0.15
ARMO*	0.06	0.03	0.04	-	0.08
ARPU*	0.12	0.06	0.07	-	0.13
ARTO	0.12	0.06	0.07	-	0.13
BAPI	0.01	-	0.01	-	0.01
CERI*	0.06	-	0.06	-	0.06
CRSC	0.06	0.03	0.03	-	0.07
ELGL	-	-	-	0.40	0.40
HOCU	0.12	0.06	0.06	0.20	0.32
HO	0.54	-	0.27	-	0.27
SAME	0.06	0.04	0.03	-	0.07
STPU	-	-	-	0.25	0.25
TOTAL	**1.27**	**0.35**	**0.70**	**1.00**	**2.05**

* HMP species

No active restoration was prescribed at HA 27; however, an AMP planting event occurred in 2019 per recommendations made in the 2018 Annual Report (Burleson, 2019). A total of 44 plants were installed at HA 27 for this planting event. Table 9-38 summarizes the plants installed during active restoration.

Table 9-38. Summary of Active Restoration Activities for HA 27

Species	Number of Individual Plants	
	2019	**Total by Species**
ARMO*	20	20
DIAU	14	14
ERCO	10	10
TOTAL	**44**	**44**

*HMP species

9.6.2   Monitoring Results

HA 27 was in year 7 of monitoring in 2019. Year 7 was not a required monitoring year and only photo documentation was completed.

9.6.3   Discussion

9.6.3.1   Recommendations

HA 27 was in year 7 of monitoring in 2019; the only monitoring that occurred was photo documentation. Recommendations were developed from a combination of prior recommendations and the restoration efforts completed in 2019. The site met two of five success criteria by 2018. Per recommendations in the 2016 Annual Habitat Restoration Report, Monterey manzanita (*Arctostaphylos montereyensis*), golden yarrow, and sticky monkeyflower were planted in the 2018/2019 season to support native vegetation cover and HMP shrub cover criteria (Burleson, 2017). Additionally, the Army will plant sandmat manzanita to support the HMP shrub cover success criteria. Overall, HA 27 needs time to respond to the restoration effort and continued monitoring to evaluate areas that require additional 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 (see Table 9-35). Table 9-39 summarizes the current status of HA 27 including which success criteria were met and recommendations.

Table 9-39. 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	AMP planting occurred in 2019; plant more native species*†
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant sandmat manzanita*†
Objective 3 – No. 4	HMP shrub cover by species	No	Plant sandmat manzanita*†
Objective 3 – No. 4	HMP annual density	NA	NA

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

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 acre (Shaw, 2008). HA 27A rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of 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 maritime chaparral and grassland.

Restoration at HA 27A occurred in 2011, 2012, 2016, and 2018 and monitoring began in 2013. HA 27A was monitored for nine years by photo documentation and site visits and three years for species richness and vegetative cover (see Table 9-40). Figure 9-17 shows the HA footprint, passive restoration area, and transect locations. Success criteria for HA 27A are summarized in Table 9-41.

Table 9-40. 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						●	●	●	●	●

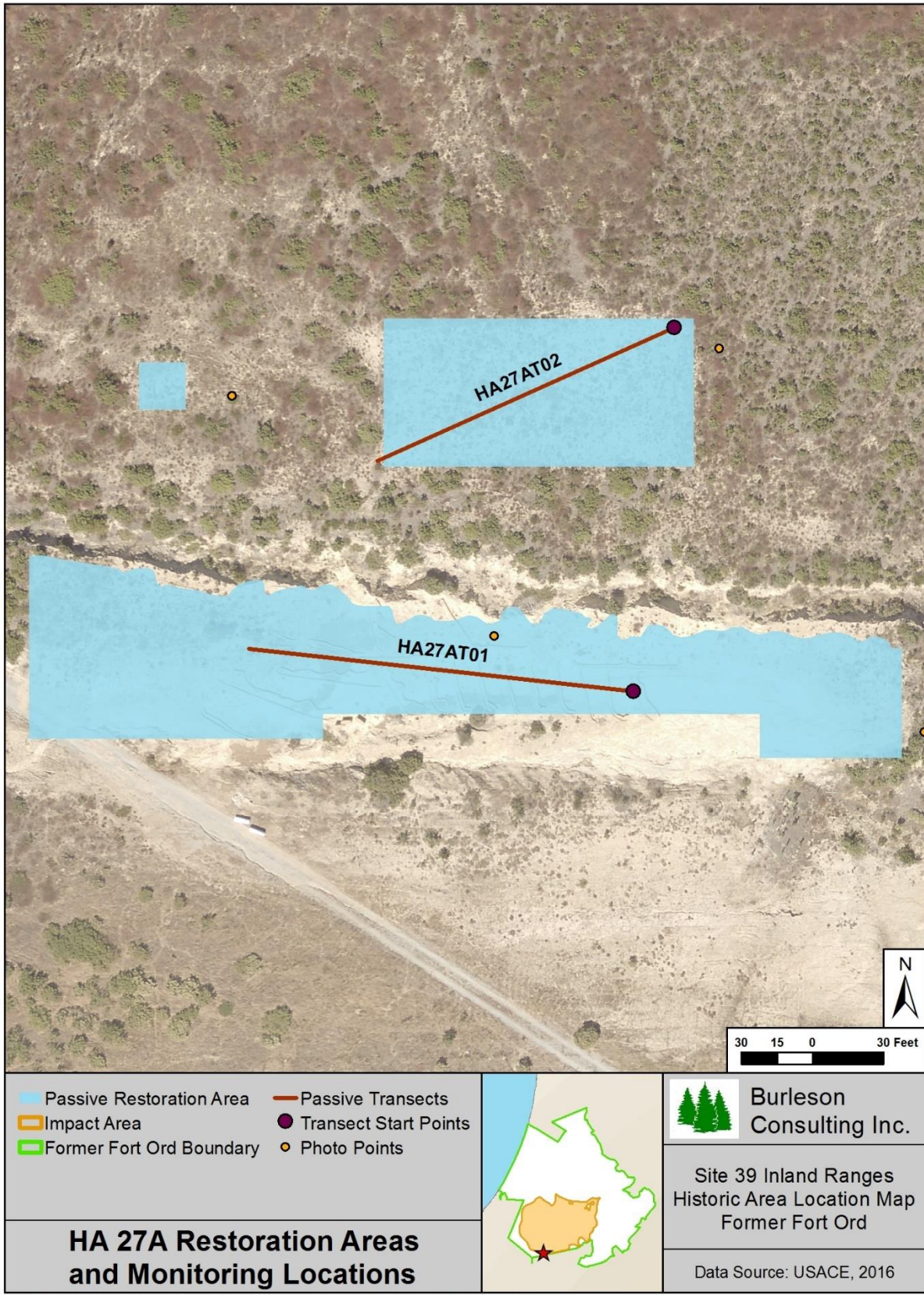* Photo points and site visits occur every year regardless of the monitoring year

Figure 9-17. HA 27A Restoration Areas and Monitoring Location Map

Table 9-41. 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 9-41. 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, 2018, and 2019. The total amount of seed broadcast on site was 58.606 lb compared to 13.530 lb prescribed in the SSRP. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities. No active restoration activities were conducted at HA 27A. Table 9-42 summarizes the SSRP seed target and the amount of seed applied by year and species.

Table 9-42. Summary of Passive Restoration Activities for HA 27A

Species	Pounds of Seed Broadcast						
	SSRP Target	2011	2012	2016	2018	2019	Total by Species
ACGL	1.200	0.600	0.608	0.800	-	-	2.008
ACMI	-	-	-	0.400	0.750	0.600	1.750
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	1.600	18.000
ERCO	0.180	0.093	0.093	-	-	-	0.186
HOCU	1.200	0.600	0.600	11.400	1.000	0.800	14.400
HO	5.400	-	5.421	2.000	-	-	7.421
SAME	0.600	0.300	0.306	-	-	-	0.606
STPU	-	-	-	7.000	1.250	1.000	9.250
TOTAL	**13.530**	**3.893**	**9.713**	**36.000**	**5.000**	**4.000**	**58.606**

* HMP Species

9.7.2   Monitoring Results

HA 27A was in year 7 of monitoring in 2019. Year 7 was not a required monitoring year and only photo documentation was completed.

9.7.3   Discussion

9.7.3.1   Recommendations

HA 27A was in year 7 of monitoring in 2019; the only monitoring that occurred was photo documentation. The site met two of five success criteria by 2018. Per recommendations in the 2017 Annual Habitat Restoration Report, the Army has implemented three actions to support HA 27A in achieving success criteria in future years: 1) continue erosion control efforts, including the use of mulch (Kemron applied mulch to the eastern portion of the polygon in 2018); 2) plant sandmat manzanita, Monterey manzanita, and Monterey ceanothus to support HMP shrub criteria (sandmat manzanita and Monterey ceanothus are scheduled to be planted in the 2020/2021 season); and 3) manage the site in two distinct areas and reevaluate the success criteria for the southern polygon (Burleson, 2018). The site is unlikely to meet the native vegetation and HMP shrub cover criteria without these recommended actions.

Erosion control is necessary to control the movement of water and stabilize denuded areas for future planting. Of the three distinct polygons, the southern polygon is most 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 proposed that the success criteria listed in Table 9-41 shall only be applied to the two northern polygons which are within maritime chaparral habitat (Burleson, 2019). 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. USFWS, Department of Toxic Substances Control (DTSC), and the California Department of Fish and Wildlife Office of Spill Prevention and Response (CDFW-OSPR) supported the recommendations proposed (USFWS, 2019; DTSC and CDFW-OSPR, 2019). 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 (see Table 9-40). Table 9-43 summarizes the current status of HA 27A including which success criteria were met and recommendations.

Table 9-43. 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 and Monterey ceanothus (scheduled 2020/2021)* Plant Monterey manzanita*†
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Plant sandmat manzanita and Monterey ceanothus (scheduled 2020/2021)* Plant Monterey manzanita*† Reevaluate the success criteria*
Objective 3 – No. 4	HMP shrub cover by species	No	Plant sandmat manzanita and Monterey ceanothus (scheduled 2020/2021)* Plant Monterey manzanita*† 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

9.8   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 and partially extends into HA 28. California tiger salamander (*Ambystoma californiense*; CTS) and other aquatic species have been documented within the vernal pool. HA 28 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of 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 seven years by photo documentation and site visits five years for HMP annual density in plots and plant survivorship, and four years for HMP annual density across the HA, species richness, and vegetative cover (see Table 9-44). Figure 9-18 shows the HA footprint, passive restoration area, active restoration area, and transect monitoring locations. Success criteria for HA 28 are summarized in Table 9-45.

Table 9-44. Historic Summary of Restoration and Monitoring Activities at HA 28

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

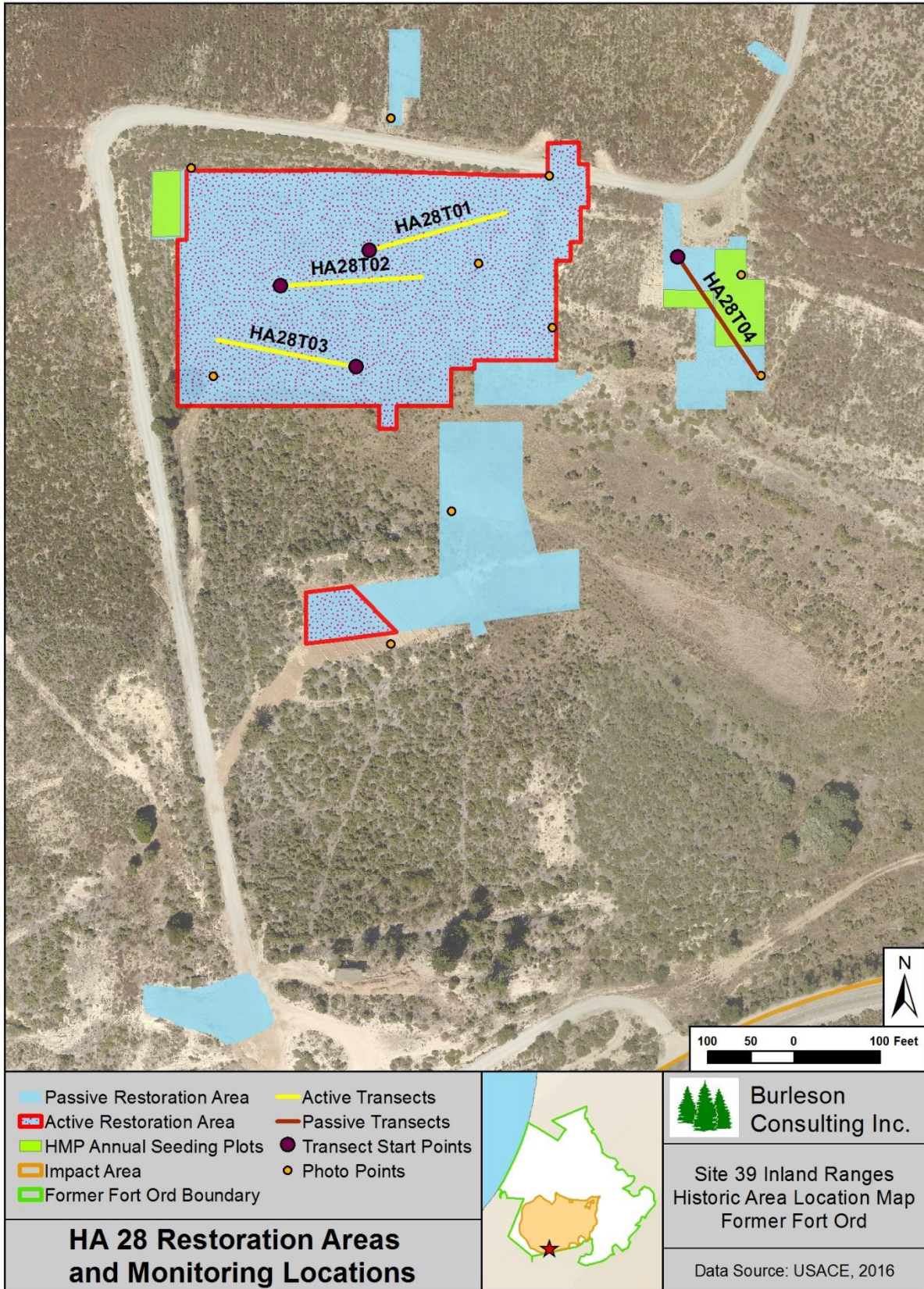*Plant survivorship surveys will continue in 2020 and 2021

Figure 9-18. HA 28 Restoration Areas and Monitoring Locations Map

Table 9-45. Success Criteria and Acceptable Limits for Restoration of HA 28

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 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, 2018, and 2019. The total amount of seed broadcast on site was 289.30 lb compared to 115.80 lb prescribed in the SSRP. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities. Table 9-46 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 9-46. Summary of Passive Restoration Activities for HA 28

Species	Pounds of Seed Broadcast								
	SSRP Target	2013	2014	2015	2016	2017	2018	2019	Total by Species
ACMI	3.40	4.40	-	3.14	-	-	2.10	0.30	9.94
ACGL	6.80	8.50	-	3.72	-	-	-	-	12.22
BAPI	0.50	1.00	-	0.07	-	-	-	-	1.07
CERI*	1.70	1.70	-	0.36	-	-	-	-	2.06
CHPUP*	0.10	-	0.03	-	-	0.03	-	-	0.06
CRSC	2.60	3.50	-	0.29	-	-	-	-	3.79
DIAU	0.50	3.60	-	0.18	-	-	-	-	3.78
ELGL	13.6	33.60	-	15.70	1.20	-	5.60	0.80	56.90
ERCO	4.30	5.30	-	0.36	-	-	-	-	5.66
ERER	-	3.10	-	-	-	-	-	-	3.10
ERFA*	0.70	0.70	-	0.04	-	-	-	-	0.74
HO	68.0	118.00	-	36.40	0.80	-	10.00	-	165.20
HOCU	6.80	8.80	-	0.72	-	-	2.80	0.40	12.72
SAME	6.80	7.70	-	0.36	-	-	-	-	8.06
STPU	-	-	-	-	-	-	3.50	0.50	4.00
TOTAL	115.80	199.90	0.03	61.34	2.00	0.03	24.00	2.00	289.30

* HMP species

Active restoration was conducted in 2015, 2018, and 2019. The total number of plants installed at HA 28 was 4,968 compared to 4,382 prescribed in the SSRP. Table 9-47 summarizes the plants installed during active restoration.

Table 9-47. Summary of Active Restoration Activities for HA 28

Species	Number of Individual Plants				
	SSRP Target	2015	2018	2019	Total by Species
ACGL	237	237	-	20	257
ADFA	473	473	-	60	533
ARCA	-	-	-	75	75
ARHO*	237	237	-	45	282
ARMO*	237	237	-	71	308
ARPU*	947	-	948	44	992
ARTO	592	592	-	-	592
BAPI	237	237	-	105	342
CERI*	237	375	-	30	405
CRSC	237	237	-	10	247
ERCO	237	175	-	10	185
ERFA*	237	161	-	40	201
FRCA	-	-	-	40	40
HOCU	237	237	-	5	242
SAME	237	237	-	30	267
TOTAL	**4,382**	**3,435**	**948**	**585**	**4,968**

* HMP species

9.8.2   Monitoring Results

9.8.2.1   HMP Annual Density

Three Monterey spineflower plots were surveyed for year 5 density at HA 28 in 2019. The plots are numbered 1-3 on Figure 9-20 and are located throughout HA 28. Monterey spineflower density was low at Plot 3 and medium at Plots 1 and 2. Figure 9-19 represents Monterey spineflower restoration plot densities for HA 28.
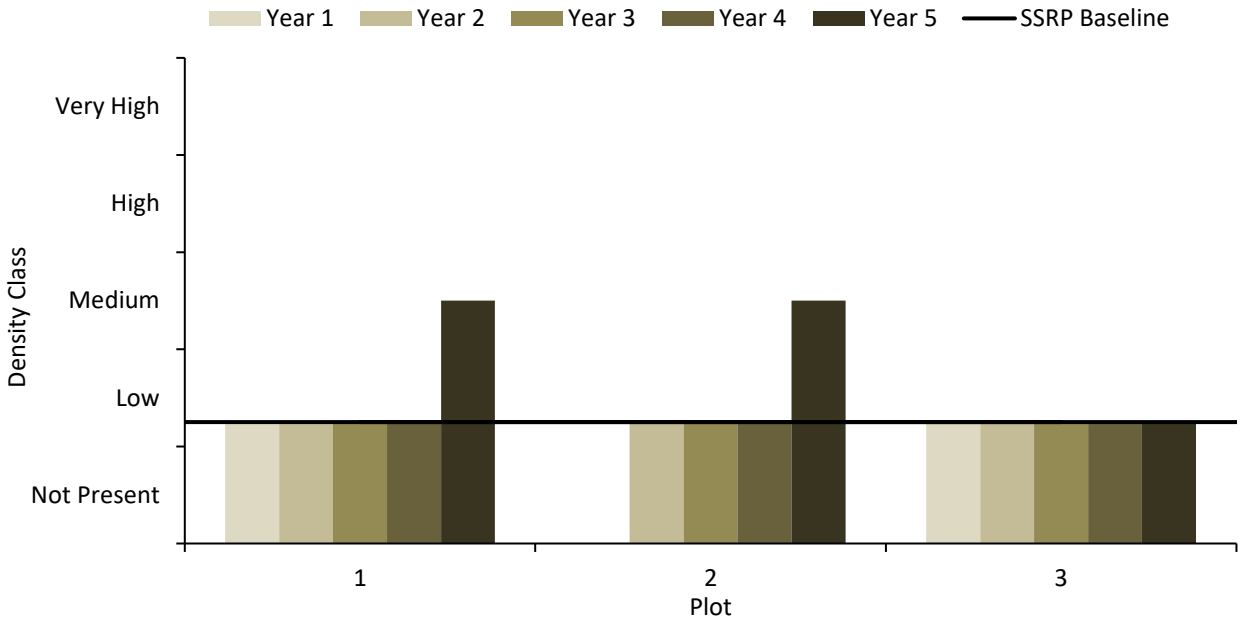

Figure 9-19. HA 28 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots 1-3
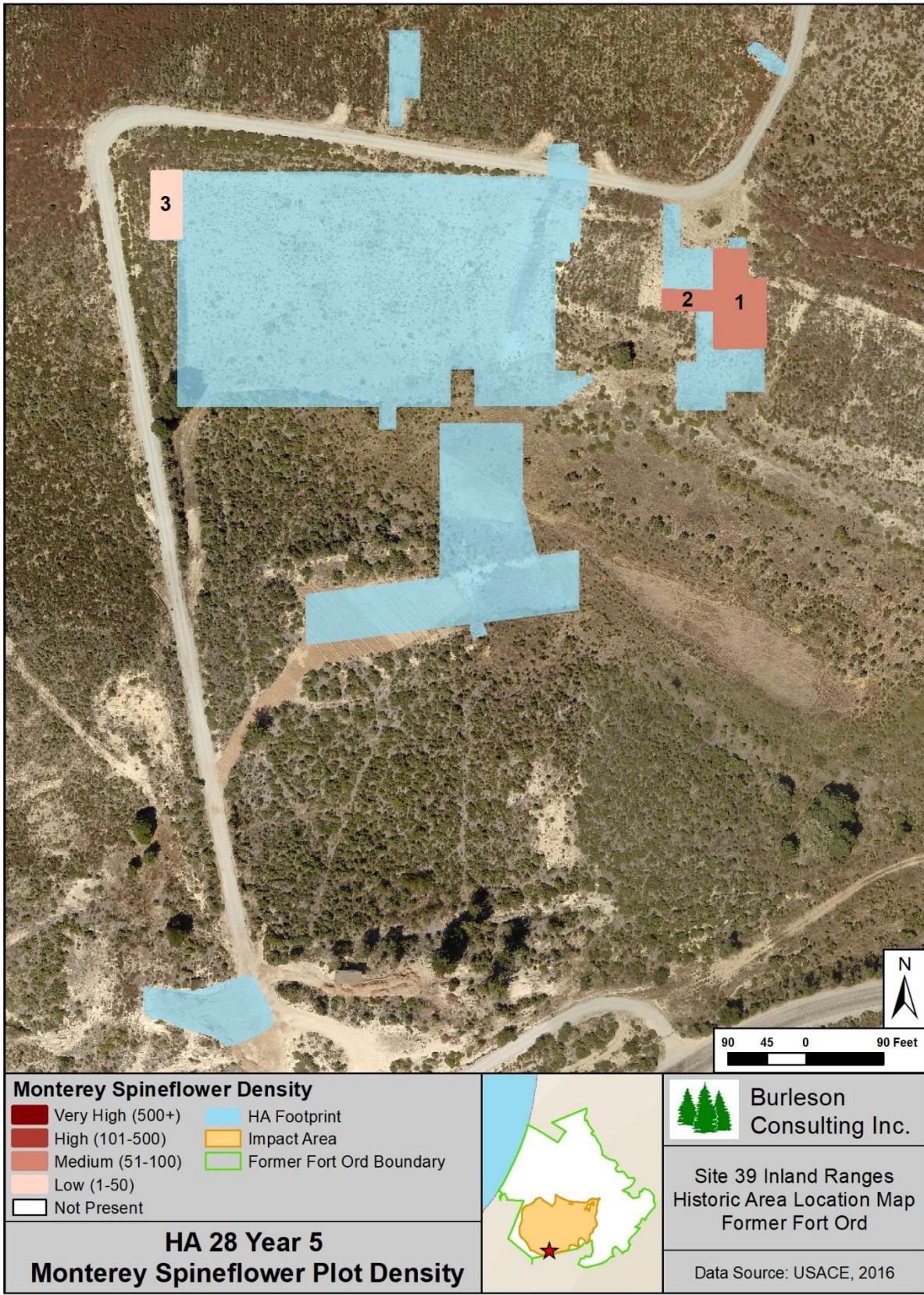
Figure 9-20. HA 28 Year 5 Monterey Spineflower Plot Density Map

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 Monterey spineflower and seaside bird's beak at HA 28.

Forty-six individual plants and one discrete patch of Monterey spineflower were mapped and individual plants were counted within the patch (see Figure 9-21). 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 0.0005 acre. From 2018 to 2019, the density range decreased and the acreage above the SSRP baseline remained the same.

Two individual plants of seaside bird's beak were mapped (see Figure 9-22). Densities and acreages were not calculated because no discrete patches were observed. No seaside bird's beak was mapped in 2018 and it is not an SSRP required species at HA 28.
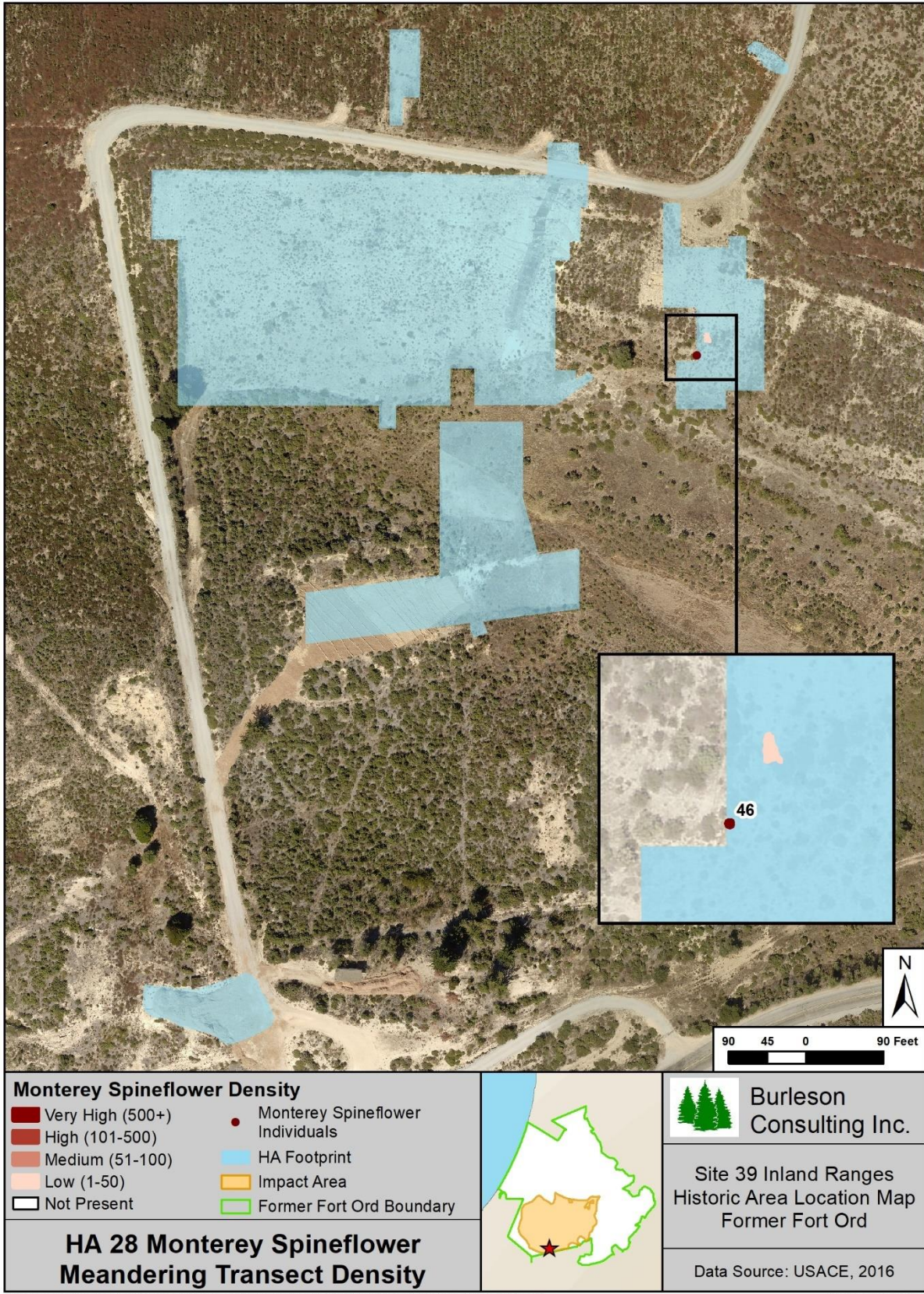
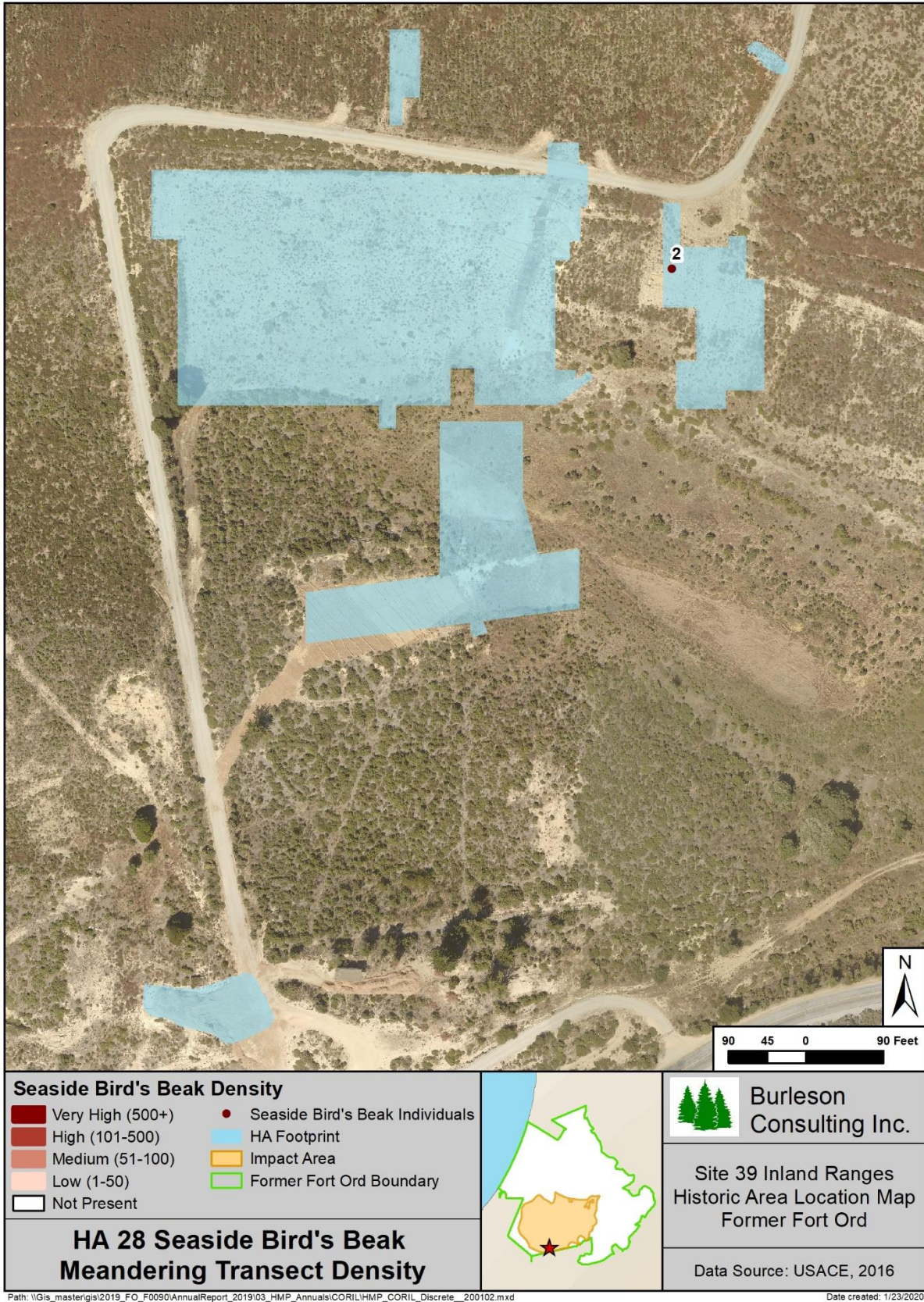**Figure 9-21.** HA 28 Monterey Spineflower Meandering Transect Density Map

Figure 9-22. HA 28 Seaside Bird's Beak Meandering Transect Density Map

9.8.2.2   Plant Survivorship

Plant survivorship monitoring was conducted at HA 28 for plants installed in 2015, 2018, and 2019. A total of ten shrub species and 467 individual plants were monitored. By year 3 of monitoring, survivorship was 79% for the 2015 planting. By year 2 of monitoring for the 2018 planting, survivorship was 87%; survivorship decreased from 91% in 2017. By year 1 of monitoring for the 2019 planting, survivorship was 88%. Tables 9-48 through 9-50 present results by species.

Table 9-48. Plant Survivorship Monitoring Summary for 2015 Planting at HA 28

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2015)	Year Two (2016)	Year Three (2017)
			Alive (%)	Alive (%)	Alive (%)
ADFA	473	47	100	96	96
ARHO*	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 9-49. Plant Survivorship Monitoring Summary for 2018 Plantings at HA 28

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2018)	Year Two (2019)
			Alive (%)	Alive (%)
ARPU*	948	126	91	87
TOTAL	948	126	91	87

* HMP Species

Table 9-50. Plant Survivorship Monitoring Summary for 2019 Planting at HA 28

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2019) Alive (%)
ADFA	60	10	80
ARCA	75	10	100
ARHO*	45	10	100
ARMO*	71	10	80
ARPU	44	10	100
BAPI	105	11	91
CERI*	30	10	80
ERFA*	40	10	90
FRCA	40	10	60
SAME	30	10	100
TOTAL	**540**	**101**	**88**

* HMP Species

9.8.2.3   Species Richness

One hundred and eight species were observed at HA 28. Of those, 50 were native shrubs or perennials, 31 were native annual herbaceous species, 26 were non-native species, and one was not categorized as it was only identified to genus (see Table 9-51). Species richness decreased by one species between 2018 and 2019. Native shrub and perennial species richness remained the same, native herbaceous species richness increased by seven, non-native species richness decreased by nine, and uncategorized species richness increased by one.

Table 9-51. Species Observed on HA 28, 2019

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 parviflorus	hill lotus	ACPA
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Agrostis avenacea	Pacific bent grass	AGAV
Agrostis exarata	spike bent grass	AGEX
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
Artemisia pycnocephala	coastal sagewort	ARPY
Avena barbata	slender wild oat	AVBA
Baccharis glutinosa	salt marsh baccharis	BAGL
Baccharis pilularis	coyote brush	BAPI

Table 9-51. Species Observed on HA 28, 2019

Scientific Name	Common Name	Code
Baccharis salicifolia	mule fat	BASA4
Briza maxima	rattlesnake grass	BRMA
Briza minor	small quaking grass	BRMI
Bromus diandrus	ripgut brome	BRDI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Callitriche heterophylla	water starwort	CAHE3
Calochortus albus	white globe lily	CAAL
Camissonia strigulosa	sandysoil suncup	CAST20
Carex barbarae	Santa Barbara sedge	CABA
Carex globosa	round-fruited sedge	CAGL
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 vulgare	bull thistle	CIVU
Cordylanthus rigidus ssp. *littoralis**	seaside bird's beak	CORIL
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	jubata grass	COJU
Crassula aquatica	water pygmy-weed	CRAQ
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
Elatine californica	California waterwort	ELCA
Eleocharis acicularis	needle spikerush	ELAC
Eleocharis macrostachya	spike rush	ELMA
Elymus glaucus	blue wild-rye	ELGL
Eriastrum virgatum	virgate eriastrum	ERVI
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 bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS
Genista monspessulana	French broom	GEMO

Table 9-51. Species Observed on HA 28, 2019

Scientific Name	Common Name	Code
Geranium dissectum	cut-leaved geranium	GEDI
Gnaphalium palustre	lowland cudweed	GNPA
Heliotropium curassavicum var. *oculatum*	seaside heliotrope	HECUO
Heteromeles arbutifolia	toyon	HEAR
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
Isoetes howellii	Howell's quillwort	ISHO
Juncus balticus ssp. *ater*	Baltic rush	JUBAA
Juncus bufonius	toad rush	JUBU
Juncus phaeocephalus	brown-headed rush	JUPH
Lasthenia glaberrima	smooth goldfields	LAGL3
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
Morella californica	wax myrtle	MOCA6
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHAP
Nuttallanthus texanus	blue toadflax	NUTE
Petrorhagia dubia	hairypink	PEDU
Phalaris lemmonii	Lemmon's cannarygrass	PHLE
Pinus radiata	Monterey pine	PIRA
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Polycarpon tetraphyllum var. *tetraphyllum*	four-leaved allseed	POTET
Polygala californica	California milkwort	POCA
Polypogon monspeliensis	rabbitsfoot grass	POMO
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium luteoalbum	weedy cudweed	PSLU
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium sp.	cudweed	PS
Pseudognaphalium stramineum	cotton-batting plant	PSST
Quercus agrifolia	coast live oak	QUAG
Ribes malvaceum	chaparral currant	RIMA

Table 9-51. Species Observed on HA 28, 2019

Scientific Name	Common Name	Code
Rubus ursinus	California blackberry	RUUR
Rumex acetosella	sheep sorrel	RUAC
Rumex salicifolius	willow leaved dock	RUSA
Salix sp.	willow	SA
Salvia mellifera	black sage	SAME
Schismus barbatus	old han schismus	SCBA
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Solanum umbelliferum	blue witch	SOUM
Sonchus oleraceus	common sow thistle	SOOL
Spergularia rubra	red sand-spurrey	SPRU
Stachys ajugoides	bugle hedge-nettle	STAJ
Stipa pulchra	purple needle grass	STPU
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium dubium	little hop clover	TRDU
Trifolium gracilentum	pinpoint clover	TRGR
Trifolium microcephalum	small-head clover	TRMI
Triglochin scilloides	flowering-quillwort	TRSC
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 surveyed four 50-meter line-intercept transects at HA 28. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 31.02%, which increased by 4.01% from 2018. Table 9-52 summarizes vegetative cover and Table 9-53 presents vegetative cover by species. Figure 9-23 presents the percent cover of dominant species at HA 28 in 2016, 2017, and 2018.

Table 9-52. Transect Survey Summary for HA 28

Transect ID	Total Vegetative Cover (%)	Native Vegetative Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA28T01	42.24	42.24	0.00	79.36	13.08
HA28T02	19.94	19.94	0.00	72.94	22.50
HA28T03	39.86	39.86	0.00	89.64	10.16
HA28T04	27.80	26.86	0.94	68.84	29.76
Site Average	**32.46**	**32.23**	**0.24**	**77.70**	**18.88**

Table 9-53. Transect Survey Results for HA 28 by Species

Transect	ACGL (%)	ACHEO (%)	ADFA (%)	ARHO* (%)	ARMO* (%)	ARPU* (%)	ARTO (%)	BAPI (%)	CEDE (%)	CERI* (%)	CRSC (%)
HA28T01	0.20	0.00	2.88	0.00	0.00	17.12	0.42	0.00	0.00	0.00	8.14
HA28T02	3.12	0.36	0.00	0.00	0.00	6.54	0.00	0.00	0.00	0.00	8.38
HA28T03	0.42	0.00	3.44	2.06	2.66	1.76	6.02	1.16	7.42	9.94	3.60
HA28T04	11.58	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	9.36
SITE AVERAGE	3.83	0.09	1.58	0.52	0.67	6.51	1.61	0.29	1.86	2.49	7.37

Table 9-53 (continued). Transect Survey Results for HA 28 by Species

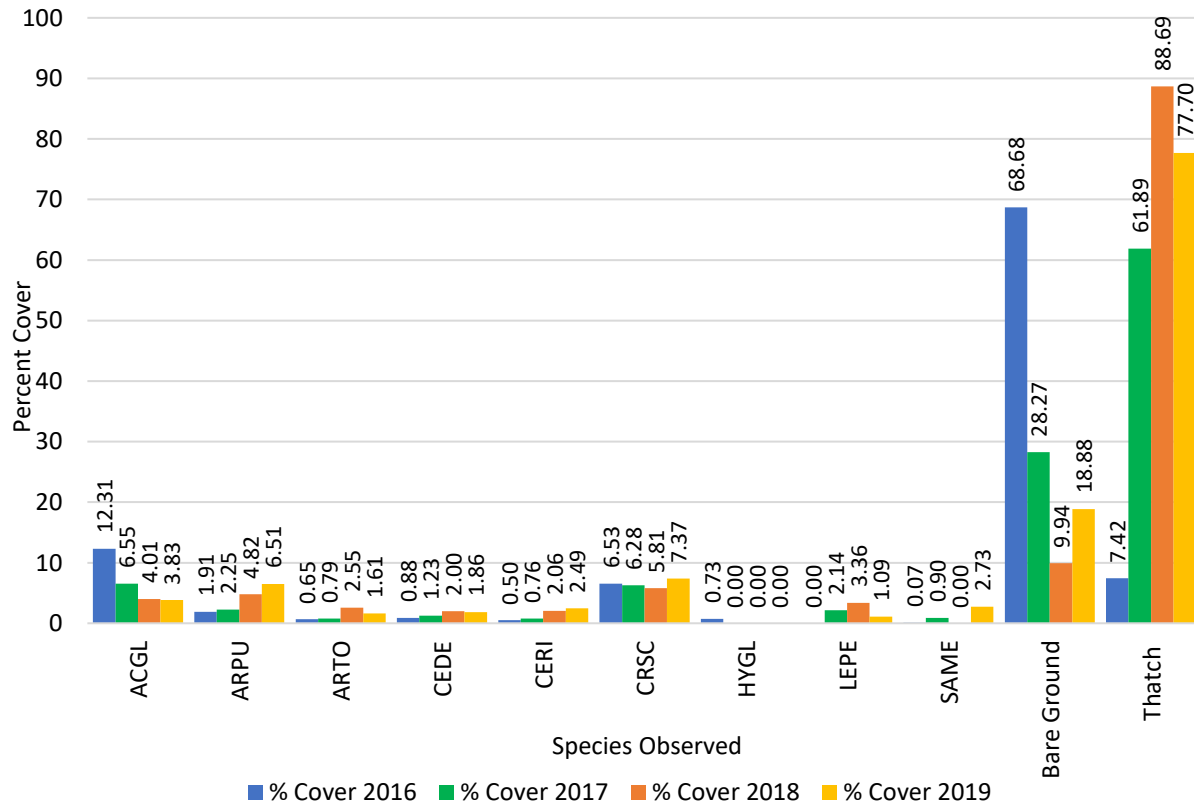| Transect	DIAU (%)	ERCO (%)	ERER (%)	HEGR (%)	HOCU (%)	HYRA (%)	LEPE (%)	LOGA (%)	SAME (%)	TH (%)	BG (%)
HA28T01	1.34	0.22	0.00	0.00	1.00	0.00	0.00	0.00	10.92	79.36	13.08
HA28T02	0.54	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	72.94	22.50
HA28T03	0.00	0.00	0.26	0.26	0.86	0.00	0.00	0.00	0.00	89.64	10.16
HA28T04	0.00	0.32	0.00	0.22	0.42	0.74	4.36	0.20	0.00	68.84	29.76
SITE AVERAGE	0.47	0.14	0.06	0.12	0.82	0.19	1.09	0.05	2.73	77.70	18.88

* HMP Species

Figure 9-23. Percent Cover of Dominant Species at HA 28 in 2016, 2017, 2018, and 2019.

9.8.3   Discussion

9.8.3.1   Recommendations

HA 28 was in year 5 of monitoring in 2019 and responded moderately well to restoration efforts. The site met four of six success criteria by 2019. The SSRP prescription for active restoration was fulfilled in the 2018/2019 season. The Army is considering adding an additional monitoring transect to get data representative of the site's condition. Overall, HA 28 needs time to respond to the restoration effort and continued monitoring to evaluate areas that require additional effort. A qualitative overview was documented by photo points (see Appendix D, page D-8 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, 2022 (see Table 9-44). Table 9-54 summarizes the current status of HA 28 including which success criteria were met and recommendations.

Table 9-54. 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	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	Install additional transect in central mulched area†
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 5 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 less than 0.001 acre of HA 28.

9.8.3.3   Plant Survivorship

Plant survivorship was moderate for the 2015 planting and high for the 2018 and 2019 plantings at HA 28. Coyote brush had low survivorship in the 2015 planting event, whereas all other species had moderate to high survivorship. Sandmat manzanita was the only species installed in the 2018 planting and had high survivorship. California coffeeberry (*Frangula californica*) had moderate survivorship in the 2019 planting event and all other species had high survivorship. Survivorship for the 2018 planting event will be monitored for one more year and the 2019 event 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 provided 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 29.01% cover to the HA and this criterion was not met. In 2018, vegetative cover was 24.45%; cover increased by 4.56% (see Figure 9-24).
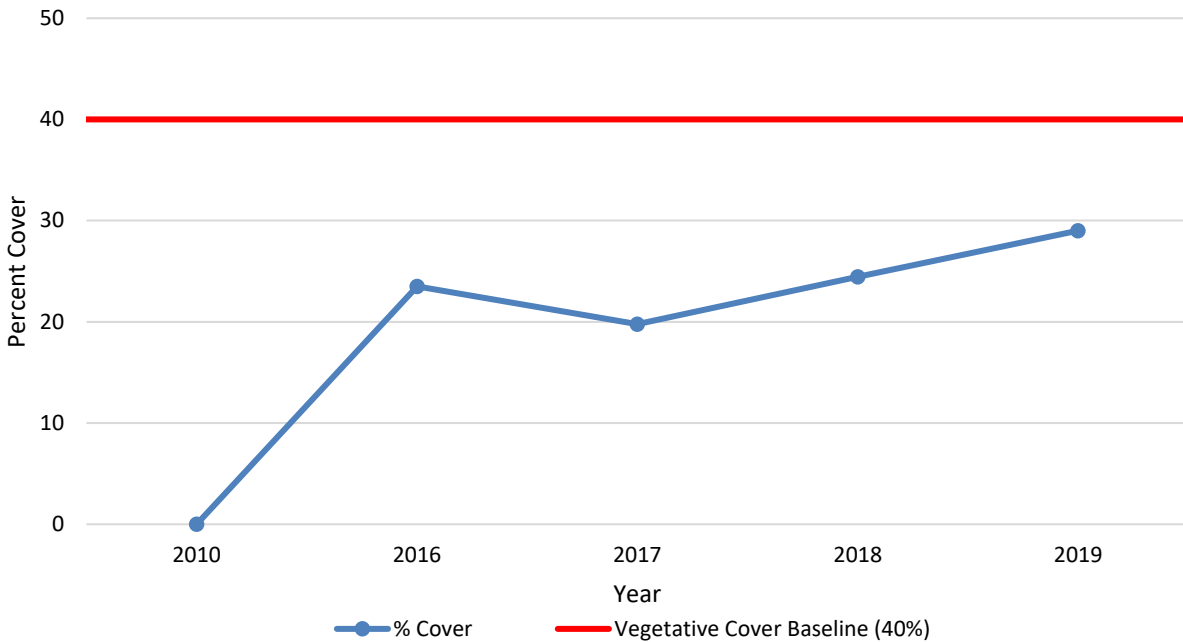
Figure 9-24. Native Vegetative Cover Compared to the Success Criterion at HA 28

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 9.66% and the HA met this success criterion. This was an increase from 7.33% in 2018. 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 6.51%, Monterey ceanothus was 2.49%, and Monterey manzanita was 0.67% (see Figure 9-25). Sandmat manzanita, Monterey ceanothus, and Monterey manzanita increased in cover from 2018 to 2019. In 2019, 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; however, cover increased between 2018 and 2019.
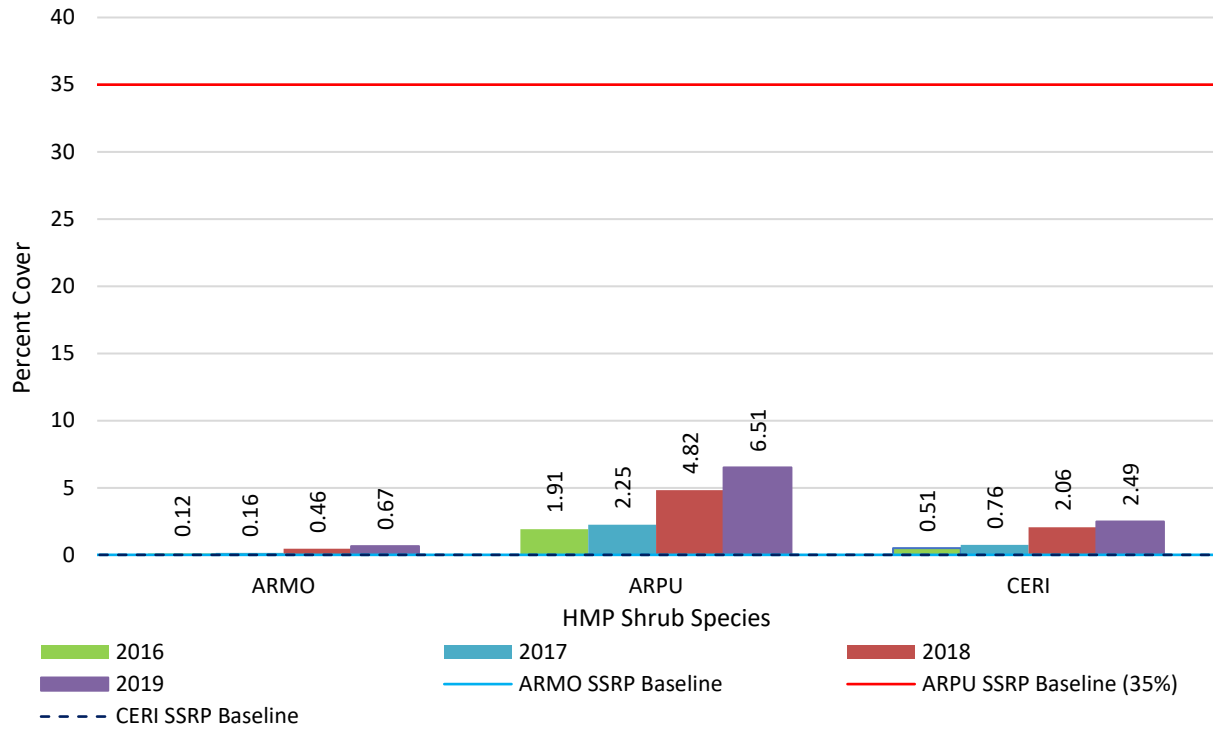
Figure 9-25. HMP Shrub Species Comparison to Success Criteria at HA 28

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 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, 2018, and 2019. The HA was monitored for nine years by photo documentation and site visits and three years for species richness, vegetative cover, and plant survivorship (see Table 9-55). Figure 9-26 shows the HA footprint, passive restoration area, active restoration area, and transect monitoring locations. Success criteria for HA 29 are summarized in Table 9-56.

Table 9-55. 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			●	●	●					

* Photo points and site visits occurred every year regardless of the monitoring year
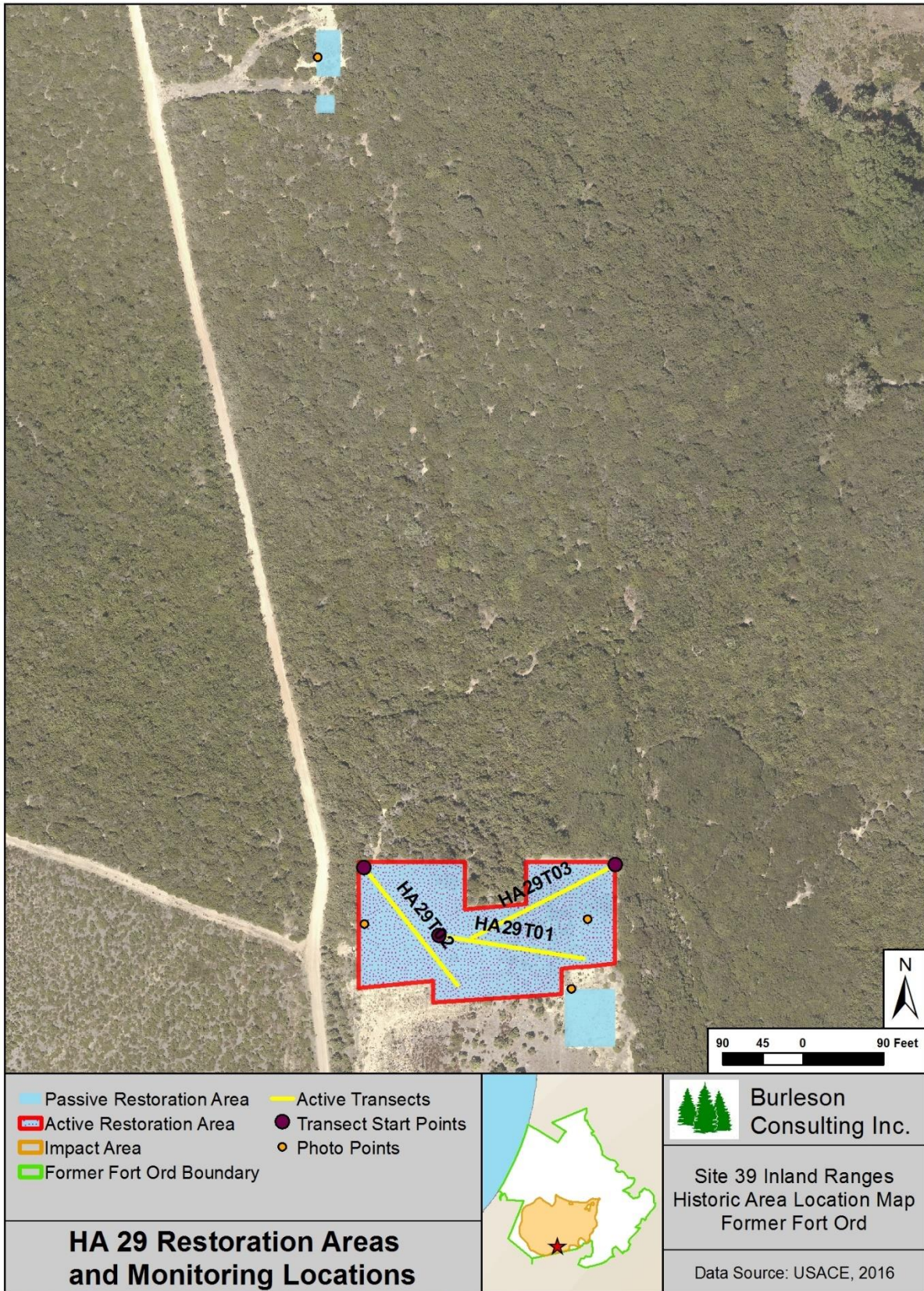
Figure 9-26. HA 29 Restoration Areas and Monitoring Locations Map

Table 9-56. 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 9-56. 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, 2018, and 2019. The total amount of seed broadcast on site was 42.49 lb compared to the 24.65 lb prescribed in the SSRP. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities and adaptive management. Table 9-57 summarizes the SSRP seed target and the amount of seed applied by year and species.

Table 9-57. Summary of Passive Restoration Activities for HA 29

Species	Pounds of Seed Broadcast						
	SSRP Target	2012 (Feb)	2012 (Dec)	2016	2018	2019	Total by Species
ACMI	-	-	-	0.800	0.800	0.600	2.200
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	1.600	5.200
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	0.800	6.021
SAME	1.000	0.600	0.523	-	-	-	1.123
STPU	-	-	-	1.000	2.000	1.000	4.000
TOTAL	**24.650**	**7.658**	**17.832**	**6.600**	**6.400**	**4.000**	**42.490**

* HMP species

Active restoration was conducted in 2012, 2013, and 2019 at HA 29; SSRP planting was completed in 2013. An AMP planting event occurred in 2019 per recommendations made in the 2018 Annual Report (Burleson, 2019). The total number of plants installed at HA 29 was 1,671 compared to 1,374 prescribed in the SSRP. Table 9-58 summarizes the plants installed during active restoration.

Table 9-58. Summary of Active Restoration Activities for HA 29

Species	Number of Individual Plants				
	SSRP Target	2012	2013	2019	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
HEAR	-	-	-	15	15
HOCU	189	225	-	-	225
SAME	189	225	-	-	225
TOTAL	1,374	1,441	215	15	1,671

* HMP species

9.9.2   Monitoring Results

HA 29 was in year 7 of monitoring in 2019. Year 7 was not a required monitoring year and only photo documentation was completed.

9.9.3   Discussion

9.9.3.1   Recommendations

HA 29 was in year 7 of monitoring in 2019; the only monitoring that occurred was photo documentation. Recommendations were developed from a combination of prior recommendations and the restoration efforts completed in 2019. The site met one of five success criteria by 2018. Per recommendations in the 2016 Annual Habitat Restoration Report, toyon (*Heteromeles arbutifolia*) was planted the in 2018/2019 season and Hooker's manzanita (*Arctostaphylos hookeri*), Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush will be planted in the 2020/2021 season 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. Two new transects were added in 2018 to more accurately represent site conditions. Overall, HA 29 needs corrective measures, time to respond to the restoration effort, and continued monitoring to evaluate areas that require 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 (see Table 9-55). Table 9-59 summarizes the current status of HA 29 including which success criteria were met and recommendations.

Table 9-59. Status and Recommendations for Achieving Success Criteria at HA 29

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	AMP planting occurred in 2019, wait to see how the HA responds
Objective 1 – No. 2	Native vegetation cover	No	Plant Hooker's manzanita, Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush* (scheduled 2020/2021)
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* (scheduled 2020/2021)
Objective 3 – No. 4	HMP shrub cover by species	No	Plant Hooker's manzanita, Monterey manzanita, sandmat manzanita, Monterey ceanothus, and Eastwood's goldenbush* (scheduled 2020/2021)
Objective 3 – No. 4	HMP annual density	NA	NA

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

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 acre (Shaw, 2008). HA 33 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of maritime climates (USFS, 2007). HA 33 is relatively flat with southwest and west aspects. Adjacent lands are heavily dominated by hottentot fig (*Carpobrotus edulis*) 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.

Restoration at HA 33 occurred in 2011, 2012, 2016, and 2019 and monitoring began in 2013. The HA was monitored for nine 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 9-60). Figure 9-27 shows the HA footprint, passive restoration area, and transect survey location. Success criteria for HA 33 are summarized in Table 9-61.

Table 9-60. 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						●†	●	●	●	●

* Photo points and site visits occur every year regardless of the monitoring year
† Vegetative cover was monitored using quadrats in 2016

Figure 9-27. HA 33 Restoration Areas and Monitoring Locations Map

Table 9-61. 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, 2012, and 2019. The total amount of seed broadcast on site was 2.987 lb compared to 0.2382 lb prescribed in the SSRP. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities and adaptive management. Table 9-62 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 based on its suitable habitat for Monterey spineflower and adjacent extant populations.

Table 9-62. Summary of Passive Restoration Activities for HA 33

Species	Pounds of Seed Broadcast				
	SSRP Target	2011	2012	2019	Total by Species
ACMI	0.0100	0.007	0.007	0.100	0.114
ACGL	0.0200	0.011	0.011	0.300	0.322
ADFA	0.0100	0.007	0.011	-	0.018
ARMO*	0.0200	0.012	0.011	-	0.023
ARPU*	-	0.007	0.007	-	0.014
BAPI	0.0015	-	0.001	0.100	0.101
CERI*	0.0100	0.010	0.006	0.100	0.116
CHPUP*	0.0002	0.011	0.001	0.010	0.022
CRCA	0.0100	0.007	0.007	-	0.014
CRSC	0.0100	0.007	0.007	-	0.014
DIAU	0.0010	0.003	0.011	0.050	0.064
ELGL	-	-	-	0.880	0.880
ERCO	0.0030	0.003	0.002	0.030	0.035
ERER	0.0025	0.003	0.002	-	0.005
ERFA	-	-	-	0.010	0.010
HO	0.0900	-	0.090	1.000	1.090
HOCU	0.0200	0.011	0.011	0.040	0.062
SAME	0.0100	-	0.011	-	0.011
STCE	0.0200	0.011	0.011	-	0.022
STPU	-	-	-	0.050	0.050
TOTAL	**0.2382**	**0.110**	**0.207**	**2.670**	**2.987**

* HMP species

No active restoration was prescribed at HA 33; however, an AMP planting event occurred in 2019 per recommendations made in the 2018 Annual Report (Burleson, 2019). A total of 69 plants were installed at HA 33. Table 9-63 summarizes the plants installed during active restoration.

Table 9-63. **Summary of Active Restoration Activities for HA 33**

Species	Number of Individual Plants	
	2019	**Total by Species**
ARMO*	12	12
ARTO	5	5
CEDE	15	15
CERI*	12	12
DIAU	10	10
ERCO	5	5
HEAR	5	5
SAME	5	5
TOTAL	**69**	**69**

*HMP species

9.10.2 Monitoring Results

HA 33 was in year 7 of monitoring in 2019. Year 7 was not a required monitoring year and only photo documentation was completed.

9.10.3 Discussion

9.10.3.1 Recommendations

HA 33 was in year 7 of monitoring in 2019; the only monitoring that occurred was photo documentation. Recommendations were developed from a combination of prior recommendations and the restoration efforts completed in 2019. Per recommendations in the 2016 Annual Habitat Restoration Report, shaggy-bark manzanita, Monterey manzanita, dwarf ceanothus, golden yarrow, toyon, sticky monkeyflower, and black sage were planted in the 2018/2019 season and Monterey manzanita and Monterey ceanothus will be planted in the 2019/2020 season to support the species richness and HMP shrub cover success criteria (Burleson, 2017). Following planting, HA 33 will need time to respond and continued monitoring to evaluate success of the additional plantings. 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 (see Table 9-60). Table 9-64 summarizes the current status of HA 33 including which success criteria were met and recommendations.

Table 9-64. Status and Recommendations for Achieving Success Criteria at HA 33

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	No	AMP planting occurred in 2019, wait to see how the HA responds
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 Monterey manzanita and Monterey ceanothus (scheduled 2019/2020)*
Objective 3 – No. 4	HMP shrub cover by species	No	Plant Monterey manzanita and Monterey ceanothus (scheduled 2019/2020)*
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).
† Recommendation repeated from the 2018 Annual Habitat Restoration Report (Burleson, 2019).

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 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 range from 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.

Restoration at HA 34 began in 2012 and is ongoing. Monitoring began in 2015. HA 34 was monitored for eight years by photo documentation and site visits and four years for species richness, vegetative cover, and plant survivorship (see Table 9-65). Figure 9-28 shows the HA footprint, passive restoration area, active restoration area, and transect survey locations. Success criteria for HA 34 are summarized in Table 9-66.

Table 9-65. 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					●	●	●	●*		

*Plant survivorship surveys will continue in 2020 and 2021

Figure 9-28. HA 34 Restoration Areas and Monitoring Locations Map

Table 9-66. 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, 2018, and 2019. The total amount of seed broadcast on site was 1,148.82 lb compared to the 320.41 lb prescribed in the SSRP. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities. Table 9-67 summarizes the SSRP seed target and the amount of seed applied by year and species.

Table 9-67. Summary of Passive Restoration Activities for HA 34

Species	Pounds of Seed Broadcast									
	SSRP Target	2012	2013	2014	2015	2016	2017	2018	2019	Total by Species
ACMI	15.41	9.51	-	1.69	1.00	5.72	0.50	2.00	2.85	23.27
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	8.40	277.57
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	1.20	559.82
HOCU	19.40	18.29	4.60	46.97	2.00	11.40	1.00	2.80	3.80	90.86
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	5.25	38.49
TOTAL	**320.41**	**400.45**	**305.45**	**173.31**	**30.60**	**52.71**	**132.00**	**32.80**	**21.50**	**1,148.82**

* HMP species

Active restoration was conducted in 2016, 2017, and 2019. The total number of plants installed at HA 34 was 10,876 compared to 12,150 prescribed in the SSRP. Table 9-68 summarizes the plants installed during active restoration.

Table 9-68. Summary of Active Restoration Activities for HA 34

Species	Number of Individual Plants				
	SSRP Target	**2016 (Jan)**	**2016-2017 (Dec-Feb)**	**2018-2019 (Dec-Jan)**	**Total by Species**
ACMI	500	54	154	110	318
ACGL	1,500	350	570	441	1,361
ADFA	500	158	372	223	753
ARCA	500	135	208	210	553
ARHO*	500	76	286	272	634
ARMO*	500	76	277	148	501
ARTO	500	76	118	199	393
BAPI	500	95	270	248	613
CERI*	500	132	556	266	954
CRSC	1,500	228	534	391	1,153
DIAU	1,500	246	406	348	1,000
ERCO	800	-	320	295	615
FRCA	-	-	-	10	10
GAEL	-	-	-	9	9
HOCU	1,500	17	91	553	661
LECA	-	-	-	25	25
LUAL	-	-	108	-	108
LUAR	500	95	236	185	516
SAME	850	45	330	324	699
TOTAL	**12,150**	**1,783**	**4,836**	**4,257**	**10,876**

* 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 for plants installed in 2016, 2017, and 2019. A total of 13 shrub species and 596 individual plants were monitored for survivorship. By year 3 of monitoring, survivorship was 60% for the 2016 planting and 23% for the 2017 planting. By year 1 of monitoring for the 2019 planting, survivorship was 43%. Tables 9-69 through 9-71 present results by species.

Table 9-69. 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 9-70. Plant Survivorship Monitoring Summary for 2017 Plantings at HA 34

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2017) Alive (%)	Year Two (2018) Alive (%)	Year Three (2019) Alive (%)
ADFA	372	37	22	20	18
ARCA	208	22	55	38	32
ARHO*	286	32	50	38	33
ARMO*	277	28	36	25	19
ARTO	118	12	33	20	13
BAPI	270	28	86	86	81
CERI*	556	56	27	12	9
LUAL	108	11	18	0	0
LUAR	236	24	21	4	0
SAME	330	34	24	18	16
TOTAL	**2,761**	**285**	**36**	**27**	**23**

* HMP Species

Table 9-71. Plant Survivorship Monitoring Summary for 2019 Plantings at HA 34

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2019) Alive (%)
ADFA	223	21	48
ARCA	210	21	57
ARHO*	272	18	56
ARMO*	148	15	33
ARTO	199	20	40
BAPI	248	24	75
CERI*	266	22	64
FRCA	10	10	0
GAEL	9	8	38
LECA	25	10	20
LUAR	185	19	5
SAME	324	32	38
TOTAL	**2,119**	**220**	**43**

* HMP Species

9.11.2.3 Species Richness

Seventy-nine species were observed at HA 34. Of those, 36 were native shrubs or perennials, 16 were native annual herbaceous species, 26 were non-native species, and one was not categorized because it was only identified to genus (see Table 9-72). Species richness increased by 14 species between 2018 and 2019. Native shrub and perennial species richness increased by seven, native herbaceous species richness increased by four, non-native species richness increased by four, and uncategorized species richness decreased by one. The increase in species richness is likely because the 2018 survey was conducted late in the season after many annual species senesced.

Table 9-72. Species Observed on HA 34, 2019

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 parviflorus	hill lotus	ACPA
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Agoseris grandiflora	large-flowered agoseris	AGGR
Aira caryophyllea	silver hair grass	AICA
Anaphalis margaritacea	pearly everlasting	ANMA
Arctostaphylos hookeri *	Hooker's manzanita	ARHO
Arctostaphylos montereyensis *	Monterey manzanita	ARMO
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Artemisia californica	California sagebrush	ARCA
Atriplex semibaccata	Australian saltbush	ATSE
Avena barbata	slender wild oat	AVBA
Avena fatua	wild oat	AVFA

Table 9-72. Species Observed on HA 34, 2019

Scientific Name	Common Name	Code
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Bromus carinatus	California brome	BRCA
Bromus diandrus	ripgut brome	BRDI
Bromus hordeaceus	soft chess	BRHO
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Cardionema ramosissimum	sand mat	CARA
Carex barbarae	Santa Barbara sedge	CABA
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
Castilleja densiflora	owl's clover	CADE
Castilleja foliolosa	woolly indian paintbrush	CAFO2
Ceanothus rigidus *	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME
Chorizanthe douglasii	Douglas's spineflower	CHDO
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
Deinandra corymbosa	coastal tarweed	DECO
Dichelostemma capitatum	blue dicks	DICA
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wild-rye	ELGL
Ericameria ericoides	mock heather	ERER
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 bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Festuca octoflora	sixweeks grass	FEOC
Festuca perennis	Italian rye grass	FEPE
Frangula californica	California coffeeberry	FRCA
Gamochaeta ustulata	purple cudweed	GAUS
Garrya elliptica	coast silk tassel	GAEL
Heteromeles arbutifolia	toyon	HEAR
Heterotheca grandiflora	telegraph weed	HEGR
Hordeum brachyantherum	meadow barley	HOBR
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 bufonius var. *congestus*	clustered toad rush	JUBUC2
Juncus patens	spreading rush	JUPA

Table 9-72. Species Observed on HA 34, 2019

Scientific Name	Common Name	Code
Juncus sp.	rush	JU
Layia platyglossa	tidy-tips	LAPL
Lepechinia calycina	pitcher sage	LECA
Lessingia pectinata	common lessingia	LEPE
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	miniature lupine	LUBI
Lupinus concinnus	bajada lupine	LUCO
Lupinus nanus	sky lupine	LUNA
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Lysimachia monelli	flaxleaf pimpernel	LYMO
Madia gracilis	slender tarweed	MAGR
Madia sativa	coast tarweed	MASA
Medicago polymorpha	California burclover	MEPO
Medicago sativa	alfalfa	MESA
Melilotus albus	white sweetclover	MEAL
Melilotus indicus	yellow sweetclover	MEIN
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Navarretia squarrosa	skunkweed	NASQ
Piperia sp.	rein orchid	PI
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Plantago lanceolata	English plantain	PLLA
Polygala californica	California milkwort	POCA
Polypogon monspeliensis	rabbitsfoot grass	POMO
Prunus sp.	unknown cherry	PR
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium californicum	California everlasting	PSCA
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 salicifolius	willow leaved dock	RUSA
Rumex sp.	dock	RU
Salix lasiolepis	arroyo willow	SALA6
Salvia mellifera	black sage	SAME
Senecio glomeratus	cutleaf burnweed	SEGL
Silene gallica	small-flower catchfly	SIGA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Sonchus asper	prickly sow thistle	SOAS
Sonchus oleraceus	common sow thistle	SOOL
Spergularia rubra	red sand-spurrey	SPRU
Spergularia villosa	hairy sand-spurrey	SPVI
Stipa cernua	nodding needle grass	STCE
Stipa pulchra	purple needle grass	STPU

Table 9-72. Species Observed on HA 34, 2019

Scientific Name	Common Name	Code
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium dubium	little hop clover	TRDU
Trifolium gracilentum	pinpoint clover	TRGR
Trifolium hirtum	rose clover	TRHI
Trifolium microcephalum	small-head clover	TRMI
Trifolium sp.	clover	TR
Trifolium willdenovii	tomcat clover	TRWI
Vicia sativa	spring vetch	VISA
Xanthium strumarium	rough cockleburr	XAST
Zeltnera davyi	Davy's centaury	ZEDA

 * HMP species

9.11.2.4 Vegetative Cover

Burleson surveyed nine 50-meter line-intercept transects and 48 associated quadrats at HA 34. These surveys indicated that the mean vegetative cover by native shrubs and perennials was 56.40%. The mean vegetative cover by native shrubs and perennials was greater in 2019 than in 2018 by 10.49%. Quadrats were completed along the transect line when 10% or more of the transect line was herbaceous cover, in accordance with the Monitoring Protocol (Burleson, 2009). Quadrats were completed for eight transects (T02 through T09) at HA 34. Table 9-73 summarizes vegetative cover, Table 9-74 presents vegetative cover by species, and Table 9-75 presents quadrat results. Figure 9-29 presents the percent cover of dominant species at HA 34 in 2016, 2017, and 2018.

Table 9-73. Transect Survey Summary for HA 34

Transect ID	Total Vegetative Cover (%)	Native Vegetative Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA34T01	65.24	64.84	0.40	84.76	12.32
HA34T02	55.64	45.46	10.18	95.88	3.30
HA34T03	49.16	40.92	7.78	94.82	4.82
HA34T04	112.28	85.74	26.54	100.00	0.00
HA34T05	73.6	70.30	3.30	100.00	0.00
HA34T06	92.62	70.94	21.68	100.00	0.00
HA34T07	72.98	71.58	1.40	84.66	9.22
HA34T08	108.21	91.33	16.88	97.26	2.04
HA34T09	139.12	96.04	43.08	100.00	0.00
Site Average	**85.43**	**70.79**	**14.58**	**95.26**	**3.52**

Table 9-74. Transect Survey Results for HA 34 by Species

Transect	ACAMA (%)	ACGL (%)	ACHEO (%)	ADFA (%)	AICA (%)	ARCA (%)	ARHO* (%)	ARMO* (%)	BAPI (%)	BRMAR (%)	CRSC (%)
HA34T01	0.00	34.26	0.00	0.00	0.00	17.16	0.00	0.00	12.60	0.20	0.00
HA34T02	6.36	34.80	0.00	0.00	0.00	0.00	0.00	0.00	4.30	0.00	0.00
HA34T03	3.50	29.94	0.00	1.38	0.00	1.62	0.00	0.00	0.74	0.00	0.00
HA34T04	15.18	13.74	4.30	0.00	16.14	21.98	0.00	0.00	26.66	0.00	0.52
HA34T05	13.12	44.00	0.00	0.00	0.00	0.00	0.64	0.38	5.08	0.00	0.00
HA34T06	55.26	8.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HA34T07	11.32	40.70	0.30	0.00	0.00	6.06	0.00	0.00	13.20	0.00	0.00
HA34T08	18.58	34.33	0.66	0.00	6.86	12.40	0.00	0.00	13.76	0.00	0.00
HA34T09	4.54	40.28	0.00	0.00	0.00	1.92	0.00	0.00	19.40	0.00	0.00
SITE AVERAGE	14.21	31.16	0.58	0.15	2.56	6.79	0.07	0.04	10.64	0.02	0.06

* HMP species

Table 9-74 (continued). Transect Survey Results for HA 34 by Species

Transect	DECO (%)	DIAU (%)	ELGL (%)	ERCO (%)	FEMY (%)	HOCU (%)	LUAR (%)	LYAR (%)	MEIN (%)	NAHA (%)	PLCO (%)
HA34T01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HA34T02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.08	0.00	1.28
HA34T03	0.00	1.18	0.20	0.26	0.48	2.10	0.00	0.00	0.00	0.00	2.72
HA34T04	0.00	0.00	0.00	0.00	9.94	0.88	1.00	0.46	0.00	0.32	0.00
HA34T05	0.00	1.18	3.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.42
HA34T06	0.00	0.26	0.00	0.00	0.62	0.00	7.00	0.00	5.84	0.00	0.72
HA34T07	0.00	0.00	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.46
HA34T08	1.36	0.00	0.00	0.00	2.68	8.82	1.16	0.00	0.00	0.00	7.34
HA34T09	0.00	0.00	0.00	0.00	36.22	17.36	2.00	6.54	0.00	0.00	0.00
SITE AVERAGE	0.15	0.29	0.44	0.03	5.65	3.24	1.24	0.78	0.88	0.04	1.66

Table 9-74 (continued). Transect Survey Results for HA 34 by Species

Transect	PSRA (%)	QUAG (%)	SEGL (%)	SIGA (%)	STPU (%)	TODI (%)	TR (%)	TRAN (%)	TRDU (%)	TH (%)	BG (%)
HA34T01	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.20	0.00	84.76	12.32
HA34T02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.82	0.00	95.88	3.30
HA34T03	0.00	0.00	0.00	0.00	0.00	0.00	0.46	1.90	2.68	94.82	4.82
HA34T04	0.00	1.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
HA34T05	0.00	0.00	0.68	0.00	2.18	0.00	0.00	0.20	0.00	100.00	0.00
HA34T06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.50	0.00	100.00	0.00
HA34T07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84.66	9.22
HA34T08	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	97.26	2.04
HA34T09	3.08	0.00	0.00	0.32	5.88	1.58	0.00	0.00	0.00	100.00	0.00
SITE AVERAGE	0.34	0.13	0.08	0.04	1.02	0.18	0.05	2.62	0.30	95.26	3.52
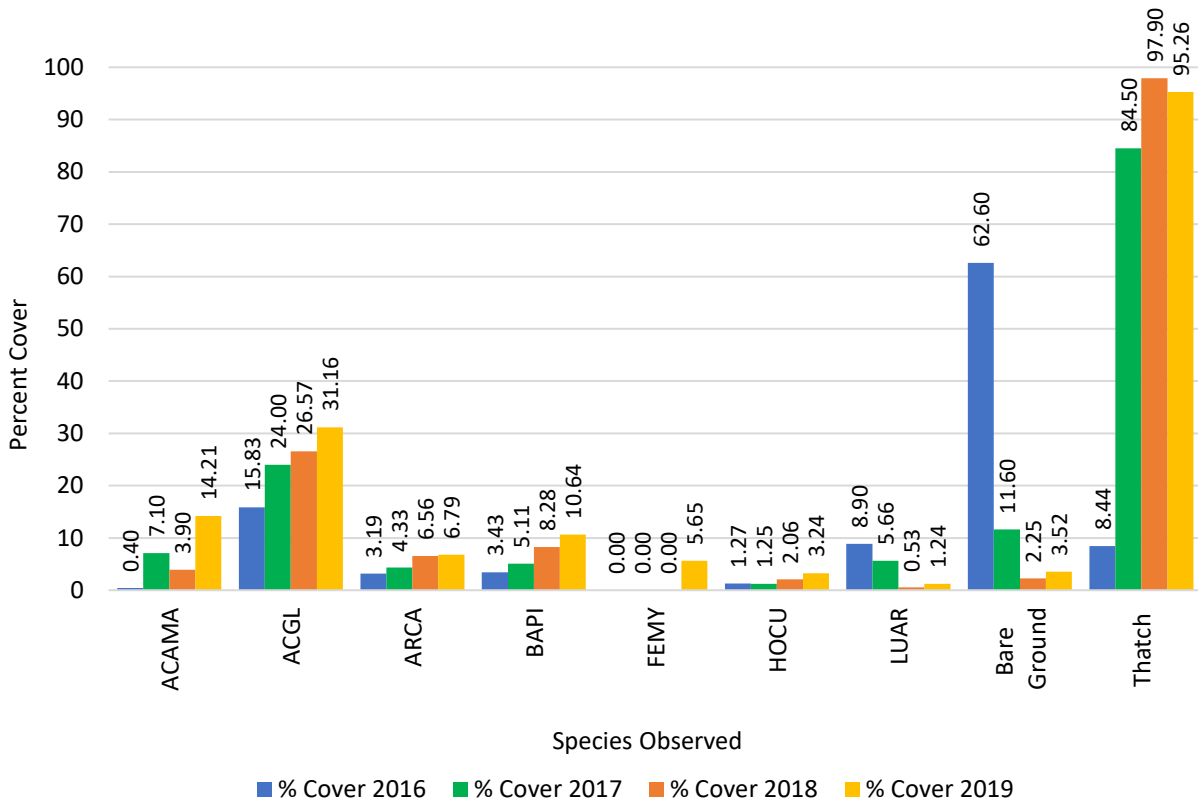
Figure 9-29. Percent Cover of Dominant Species at HA 34 in 2016, 2017, 2018, and 2019.

Table 9-75. Quadrat Summary for HA 34 Transects T02 through T09

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA34T02Q01	77	75	0	2	98	0
HA34T02Q02	32	8	1	23	68	0
HA34T02Q03	20	15	0	5	60	20
HA34T02Q04	67	50	0	17	25	65
HA34T02Q05	48	8	0	40	26	26
HA34T02Q06	24	6	0	18	33	43
HA34T03Q01	33	31	0	2	12	52
HA34T03Q02	83	74	5	4	35	25
HA34T03Q03	8	0	0	8	15	87
HA34T03Q04	0	0	0	0	100	0
HA34T03Q05	50	44	2	4	40	10
HA34T03Q06	47	40	0	7	30	23
HA34T04Q01	37	28	1	8	15	68
HA34T04Q02	45	25	0	20	105	35
HA34T04Q03	30	20	1	9	70	45
HA34T04Q04	38	5	0	33	37	30
HA34T04Q05	85	43	22	20	11	4

Table 9-75 (continued). Quadrat Summary for HA 34 Transects T02 through T09

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA34T04Q06	100	72	0	28	15	35
HA34T05Q01	15	8	0	7	60	25
HA34T05Q02	17	10	6	1	48	35
HA34T05Q03	129	120	5	4	80	3
HA34T05Q04	14	2	3	9	60	26
HA34T05Q05	86	50	35	1	75	5
HA34T05Q06	17	14	1	2	43	40
HA34T06Q01	17	9	0	8	45	38
HA34T06Q02	36	2	30	4	62	2
HA34T06Q03	61	30	20	11	37	2
HA34T06Q04	17	0	9	8	81	2
HA34T06Q05	41	2	35	4	49	10
HA34T06Q06	24	4	15	5	74	2
HA34T07Q01	16	10	0	6	34	50
HA34T07Q02	37	33	0	4	50	13
HA34T07Q03	33	32	0	1	60	7
HA34T07Q04	12	7	1	4	76	12
HA34T07Q05	26	26	0	0	55	19
HA34T07Q06	8	6	2	0	65	27
HA34T08Q01	72	63	0	9	48	40
HA34T08Q02	81	70	0	11	14	5
HA34T08Q03	75	52	8	15	10	15
HA34T08Q04	56	1	3	52	10	34
HA34T08Q05	69	20	10	39	20	15
HA34T08Q06	63	32	8	23	27	3
HA34T09Q01	78	65	0	13	35	30
HA34T09Q02	78	41	0	37	30	15
HA34T09Q03	64	21	0	43	21	15
HA34T09Q04	119	73	1	45	16	20
HA34T09Q05	27	21	0	6	63	10
HA34T09Q06	61	50	0	11	29	10
SITE AVERAGE	**47**	**30**	**5**	**13**	**45**	**23**

9.11.3 Discussion

9.11.3.1 Recommendations

HA 34 was in year 5 of monitoring in 2019 and responded variably to previous restoration efforts. The site met three of five success criteria by 2019. The Army recommends three actions to support HA 34 in achieving success criteria in future years: 1) continue erosion control efforts, including the use of mulch (mulch was applied to plants being installed on top of the hillside); 2) fulfill SSRP prescriptions to support HMP shrub criteria (Hooker's manzanita, Monterey manzanita, and Monterey ceanothus are scheduled to planted in the 2020/2021 season); and 3) reevaluate success criteria of HMP shrub cover and cover by

species. Even with adoption of recommendations one and two, based on current data the site is unlikely to meet the current HMP shrub cover criteria.

Soil remediation and erosion control efforts may have changed soil characteristics from baseline conditions. Remediation included the removal of 26,300 cubic yards of soil, including topsoil. Due to erosion issues the site was regraded and the soil was compacted. Compacted soil often has reduced water infiltration capacity, which can result in sheet flow. At HA 34, this sheet flow moves into the riprap swale and through the drainpipe instead of slowly permeating through the soil. Before remediation, the upper portion of HA 34 was dominated by manzanita and chamise chaparral, which prefer well-drained, sandy soils (Holland, 1986). Plant survivorship surveys at this site have resulted in low survivorship, including HMP shrubs. The Army recommends the reevaluation of success criteria of HMP shrub cover and cover by species because it is unlikely the site will meet the current criteria by year 13. A qualitative overview was documented by photo points (see Appendix D, page D-11 and Appendix E, page E-2).

The site will continue to be monitored by photo documentation, species richness meandering transects, and vegetative cover line-intercept transects in monitoring year 8, 2022 (see Table 9-65). Table 9-76 summarizes the current status of HA 34 including which success criteria were met and recommendations.

Table 9-76. 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 and 2019 plantings at HA 34. Shaggy-bark manzanita and yellow bush lupine had low survivorship for all three planting events. Chamise, Monterey manzanita, and black sage had low survivorship for the 2017 and 2019 plantings and moderate to high survivorship in the 2016 planting. California sagebrush (*Artemisia californica*) and Hooker's manzanita had low survivorship in the 2017 planting and moderate survivorship in the 2016 and 2019 plantings. Monterey ceanothus had low survivorship in the 2016 and 2017 plantings and moderate survivorship in the 2019 planting. California coffeeberry, coast silk tassel (*Garrya elliptica*), and pitcher sage were only installed in 2019 and had low survivorship. Silver bush lupine was only installed in the 2017 planting and had low survivorship. Coyote brush had moderate survivorship in the 2017 planting and high survivorship in the 2016 and 2019 planting. It is not surprising that both lupine

species had low survivorship since these species did poorly at multiple sites. However, many other species planted at HA 34 also had low survivorship.

The low plant survivorship is likely due 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 were mulched which should prevent erosion and help with water retention (Kemron, 2018). The 2019 planting will be monitored for two more years.

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 36 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 55.17% vegetative cover; therefore, this success criterion was met. In 2018, vegetative cover was 44.90%; cover increased by 10.27% (see Figure 9-30).
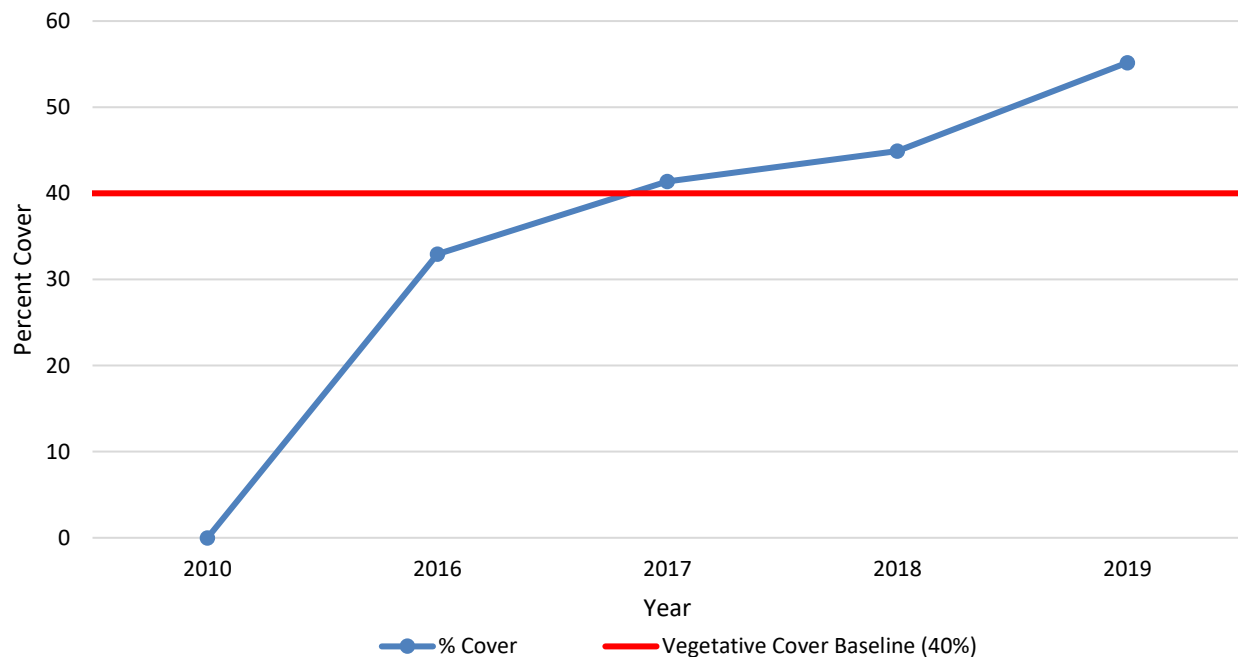
Figure 9-30. Native Vegetative Cover Compared to the Success Criterion at HA 34

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 0.11%. This was an increase from 0.00% in 2018. The HA did not meet 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 0.04%, Monterey ceanothus was 0.00%, and Hooker's manzanita was 0.07% (see Figure 9-31). The success criterion was not met.
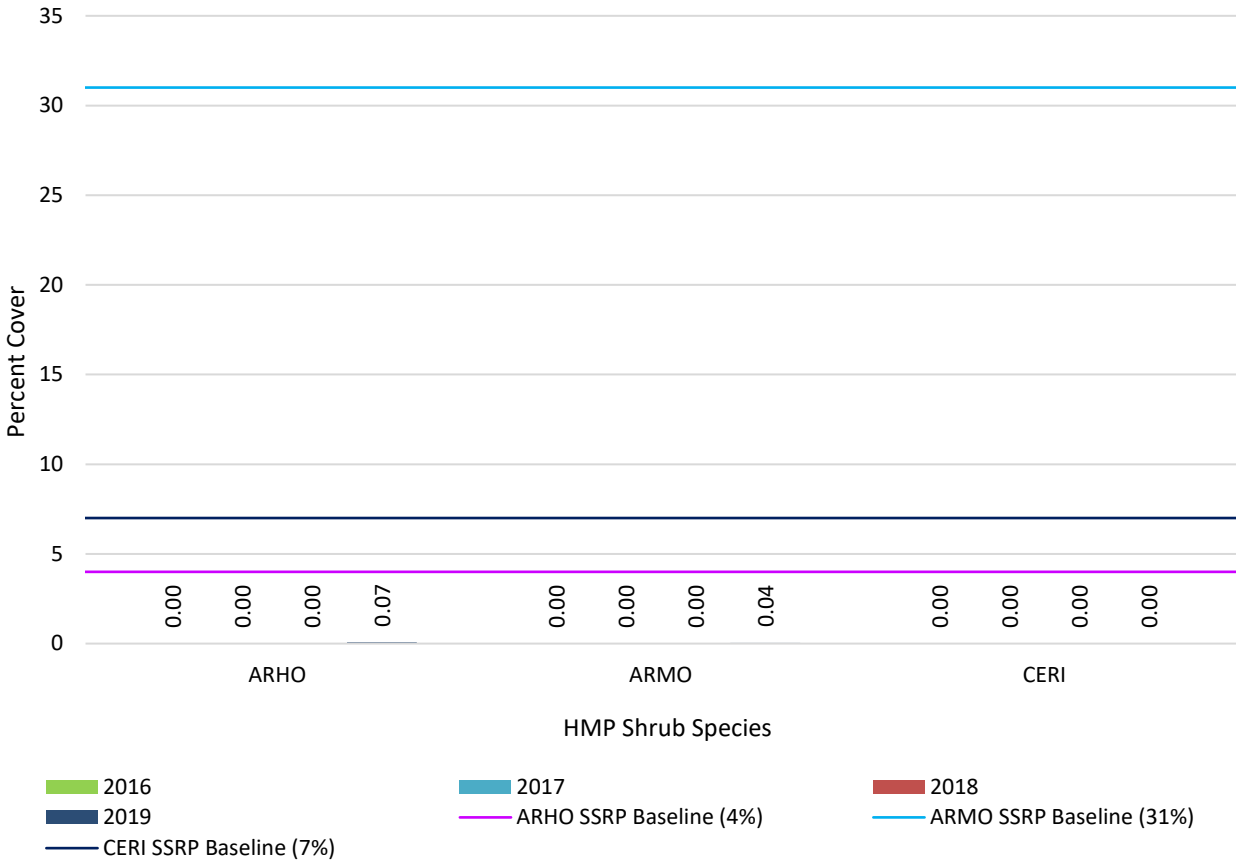
Figure 9-31. HMP Shrub Species Comparison to Success Criteria at HA 34

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 acre (Shaw, 2008). HA 36 rests within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of 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. 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 nine years by photo documentation and site visits and three years for species richness and vegetative cover (see Table 9-77). Figure 9-32 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 36 are summarized in Table 9-78.

Table 9-77. 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						●	●	●	●	●

* Photo points and site visits occur every year regardless of the monitoring year
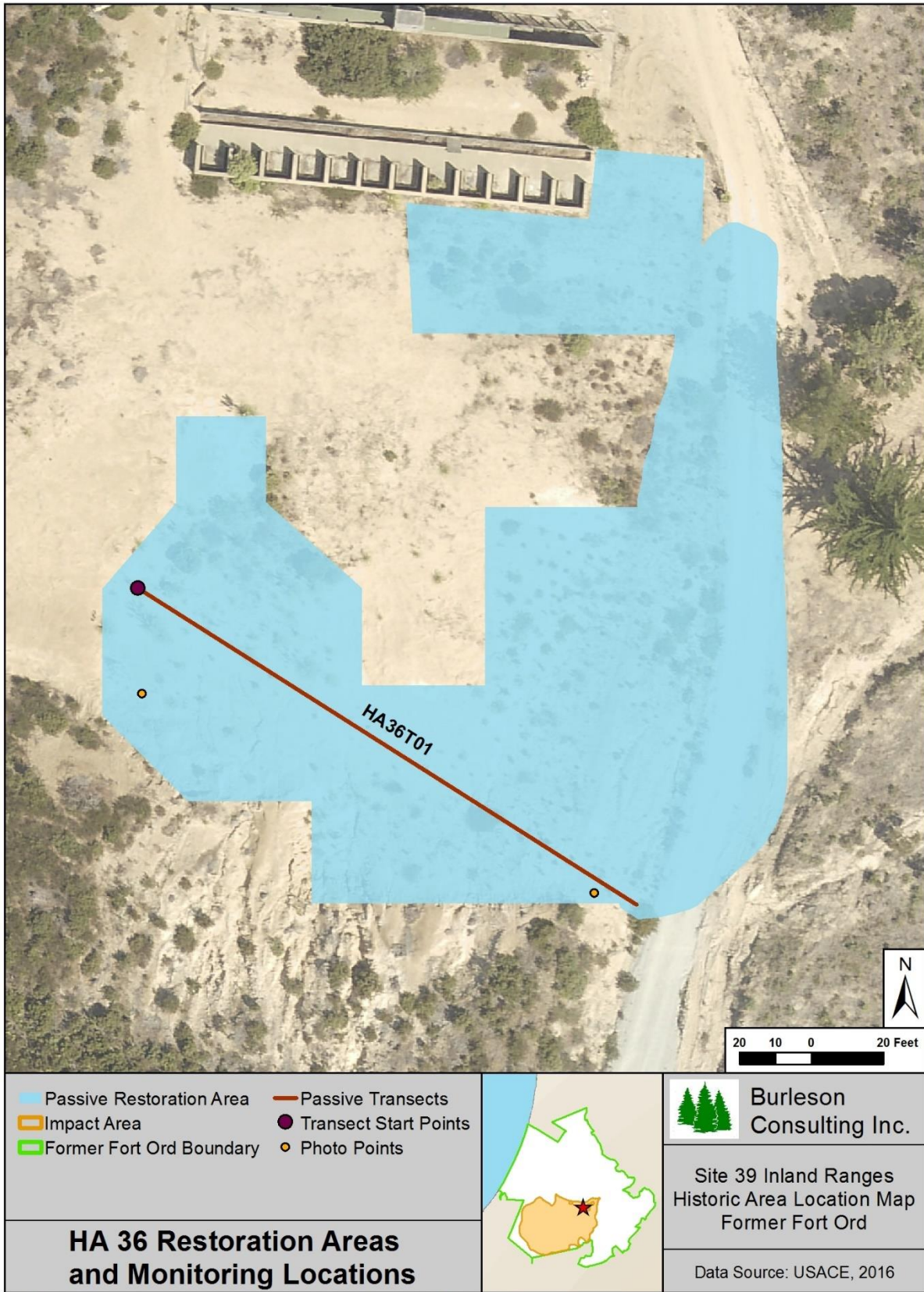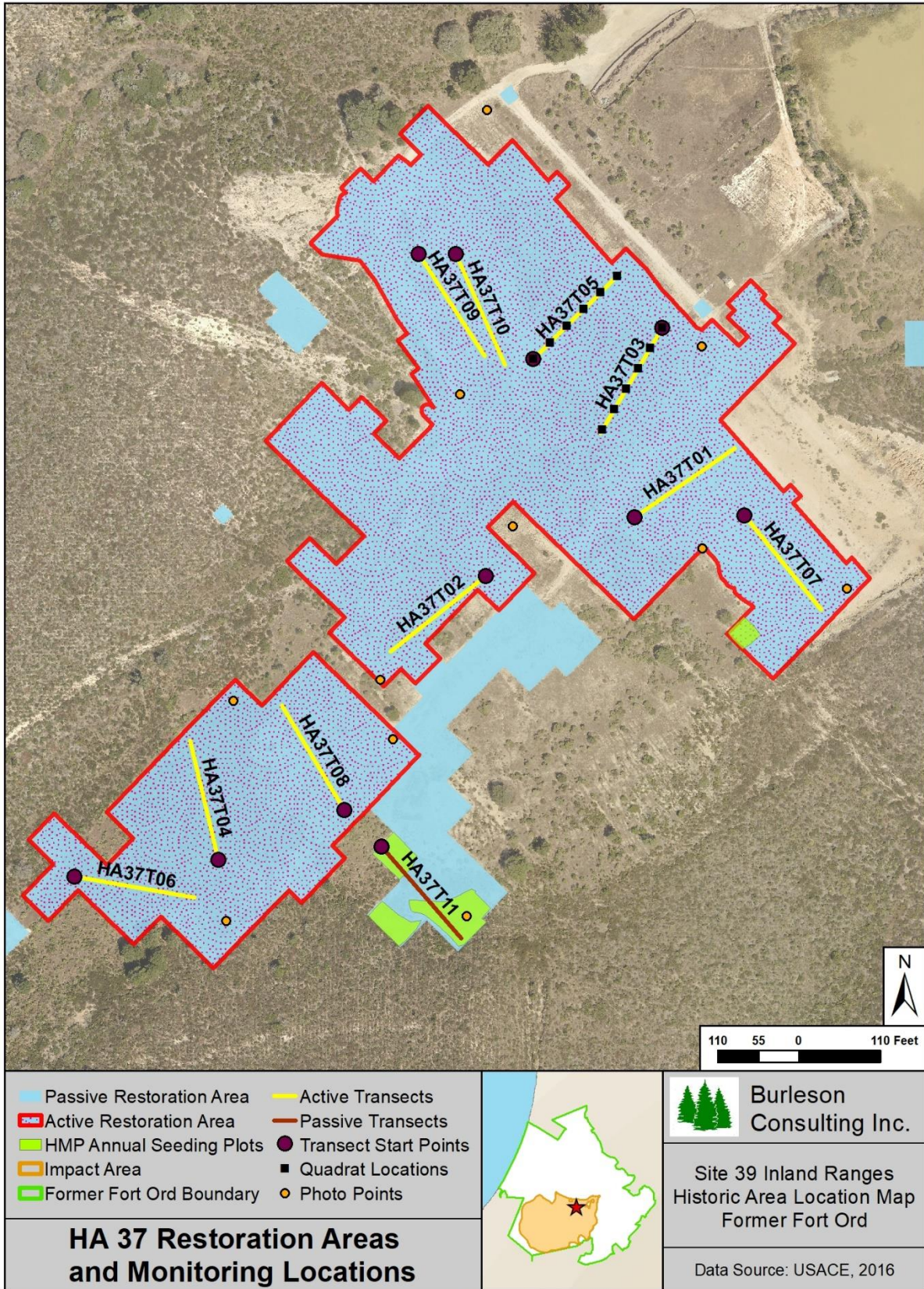
Figure 9-32. HA 36 Restoration Areas and Monitoring Locations Map

Table 9-78. 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 9-78. 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, 2018, and 2019. The total amount of seed broadcast on site was 35.258 lb compared to the 12.775 lb prescribed in the SSRP. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities. Table 9-79 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 at 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 9-79. Summary of Passive Restoration Activities for HA 36

Species	**Pounds of Seed Broadcast**						
	SSRP Target	**2012 (Jan)**	**2012 (Dec)**	**2016**	**2018**	**2019**	**Total by Species**
ACMI	-	-	-	0.900	1.200	0.300	2.400
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	1.200	7.000
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	0.400	4.800
HO	4.500	-	4.510	-	1.200	0.600	6.310
SAME	0.500	0.300	0.251	-	-	-	0.551
STPU	-	-	-	1.100	2.500	0.750	4.350
TOTAL	**12.775**	**4.102**	**8.756**	**7.400**	**10.500**	**3.250**	**34.008**

* HMP species

9.12.2 Monitoring Results

HA 36 was in year 7 of monitoring in 2019. Year 7 was not a required monitoring year and only photo documentation was completed.

9.12.3 Discussion

9.12.3.1 Recommendations

HA 36 was in year 7 of monitoring in 2019; the only monitoring that occurred was photo documentation. Recommendations were developed from a combination of prior recommendations and the restoration efforts completed in 2019. The site met two of five success criteria by 2018. Per recommendations in the 2017 Annual Habitat Restoration Report, HA 36 will receive additional planting of Hooker's manzanita, Monterey manzanita, and Monterey ceanothus in the 2019/2020 season (Burleson, 2018). The Army also recommended planting Eastwood's golden bush and sandmat manzanita. The Army is considering adding an additional monitoring transect to get data representative of the site's condition. Otherwise, HA 36 needs time to respond to restoration efforts and continued monitoring to evaluate areas that require additional effort. 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 (see Table 9-77). Table 9-80 summarizes the current status of HA 36 including which success criteria were met and recommendations.

Table 9-80. 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

9.13   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 maritime climates (USFS, 2007). HA 37 is relatively flat and surrounded by low to very high-quality habitat with documented occurrences 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. 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 seven years by photo documentation and site visits; five years for HMP annual density in plots; four years for HMP annual density across the HA, species richness, and vegetative cover; and six years for plant survivorship (see Table 9-81). Figure 9-33 shows the HA footprint, restoration areas, and transect survey locations. Success criteria for HA 37 are summarized in Table 9-82.

Table 9-81. 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 9-33. HA 37 Restoration Areas and Monitoring Locations Map

Table 9-82. Success Criteria and Acceptable Limits for Restoration of HA 37

	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 black sage coast 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 9-82. 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, 2018, and 2019. The total amount of seed broadcast on site was 842.15 lb compared to 247.00 lb prescribed in the SSRP. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities. Table 9-83 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 9-83. Summary of Passive Restoration Activities for HA 37

Species	Pounds of Seed Broadcast								
	SSRP Target	2014 (Jan)	2014	2015	2016	2017	2018	2019	Total by Species
ACMI	9.40	4.80	2.00	8.07	8.14	8.70	1.80	2.95	36.46
ACGL	18.70	8.70	4.00	10.34	16.10	5.90	-	1.50	46.54
ADFA	-	3.30	-	-	-	-	-	-	3.30
ARCA	-	-	-	2.40	-	-	-	-	2.40
BAPI	1.40	1.40	0.32	0.52	-	0.15	-	0.08	2.47
CERI*	9.40	-	2.00	2.67	-	1.00	-	0.50	6.17
CHPUP*	1.40	-	0.32	0.04	-	-	-	-	0.36
CRSC	7.00	5.20	1.52	2.60	-	0.75	-	0.38	10.45
DIAU	1.40	0.10	0.32	0.28	-	0.15	-	0.08	0.93
ELGL	28.10	100.00	69.00	69.01	19.58	40.74	7.20	6.70	312.23
ERCO	11.70	5.00	1.44	1.06	-	1.25	-	0.63	9.38
ERER	-	4.20	-	-	-	-	-	-	4.20
ERFA*	1.90	-	1.40	0.05	-	0.20	-	0.10	1.75
GAEL	-	-	-	-	-	1.00	-	0.50	1.50
HO	93.50	50.00	20.00	52.70	3.12	113.00	3.60	5.00	247.42
HOCU	18.70	16.10	47.60	5.34	16.10	5.40	2.40	1.53	94.47
LUAR	-	-	1.52	2.40	-	-	-	-	3.92
LUAL	7.00	-	-	-	-	0.75	-	-	0.75
LUCH	-	-	-	-	-	-	-	0.38	0.38
LUNA	-	-	-	0.27	-	1.00	-	0.28	1.55
SAME	18.70	7.10	4.00	2.94	-	2.00	-	1.00	17.04
STCE	-	-	-	0.54	-	2.00	-	-	2.54
STPU	18.70	-	-	5.34	10.10	9.75	4.50	5.25	34.94
TOTAL	**247.00**	**205.90**	**155.44**	**166.57**	**73.14**	**193.74**	**19.50**	**26.86**	**841.15**

* 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 9-84 summarizes the plants installed during active restoration.

Table 9-84. Summary of Active Restoration Activities in HA 37

Species	Number of Individual Plants					
	SSRP Target	2014	2015	2016	2017	Total by Species
ACMI	800	13	252	244	171	680
ACGL	1,000	380	208	213	20	821
ADFA	1,700	636	363	316	140	1,455
ARHO*	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 4 (Plot 4) and year 5 (Plots 1-3) density at HA 37 in 2019. The plots are numbered 1-4 on Figure 9-35 and are located throughout HA 37. Monterey spineflower density was low at Plots 3 and 4. Monterey spineflower was not present at Plots 1 and 2. Figure 9-34 represents Monterey spineflower restoration plot densities for HA 37.
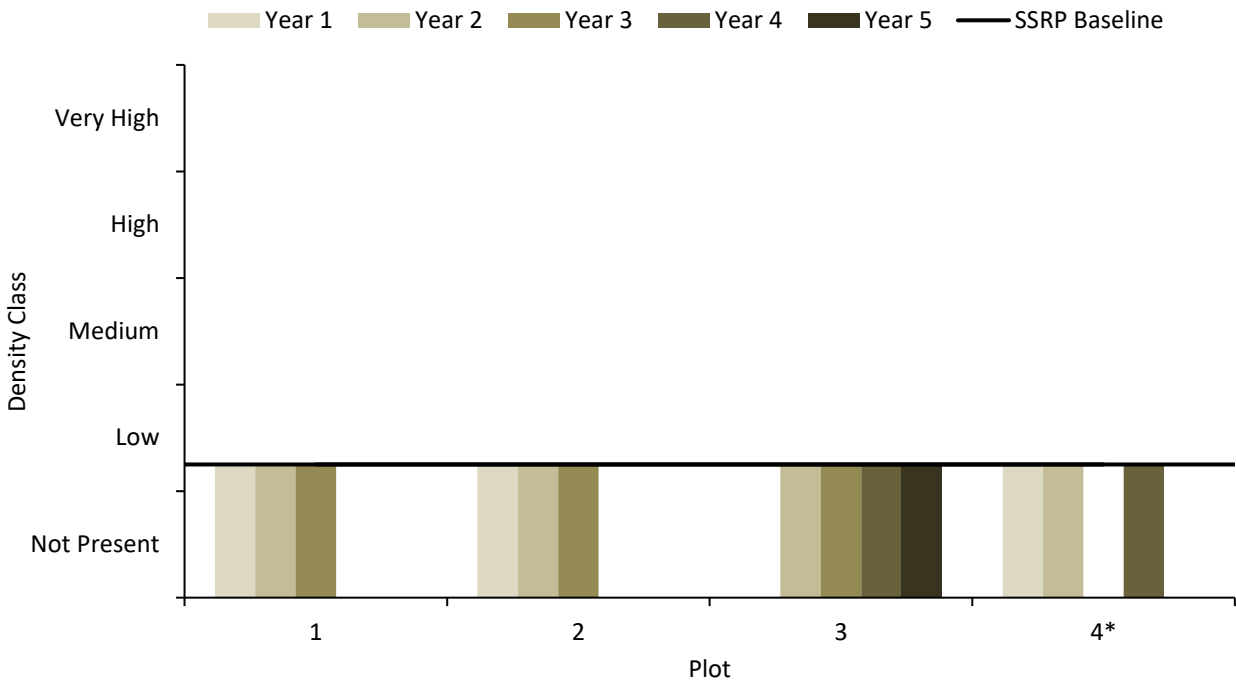
* Plot 4 was established in Nov 2015 and has only been monitored for years 1, 2, 3, and 4

Figure 9-34. HA 37 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots 1-4
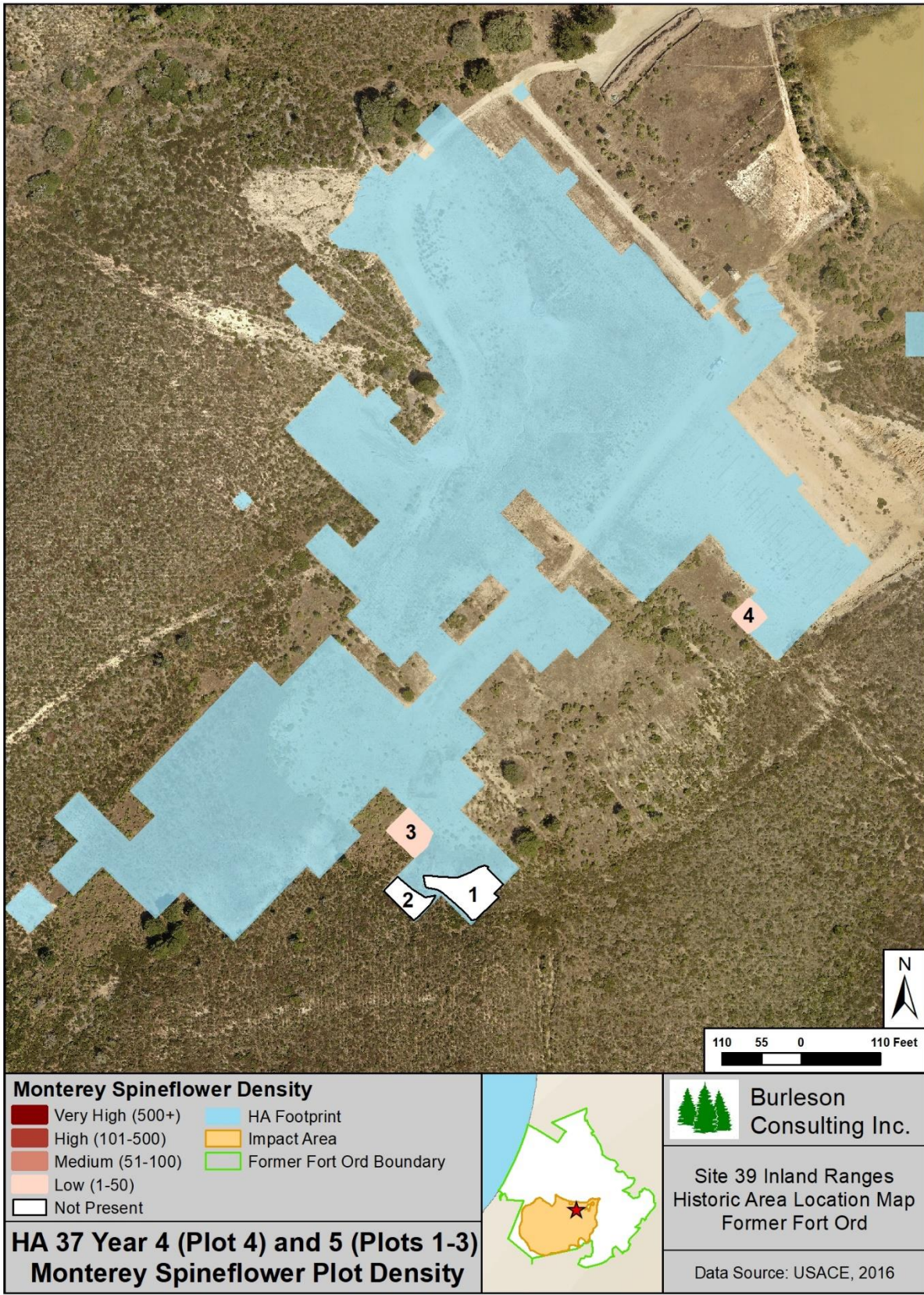
Figure 9-35. HA 37 Year 4 (Plot 4) and Year 5 (Plots 1-3) Monterey Spineflower Plot Density Map

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.

Six individual plants of Monterey spineflower were counted and mapped at HA 37 in 2019 (see Figure 9-36). Densities and acreages were not calculated because no discrete patches were observed. There were no individuals observed outside the restoration plot in 2018.
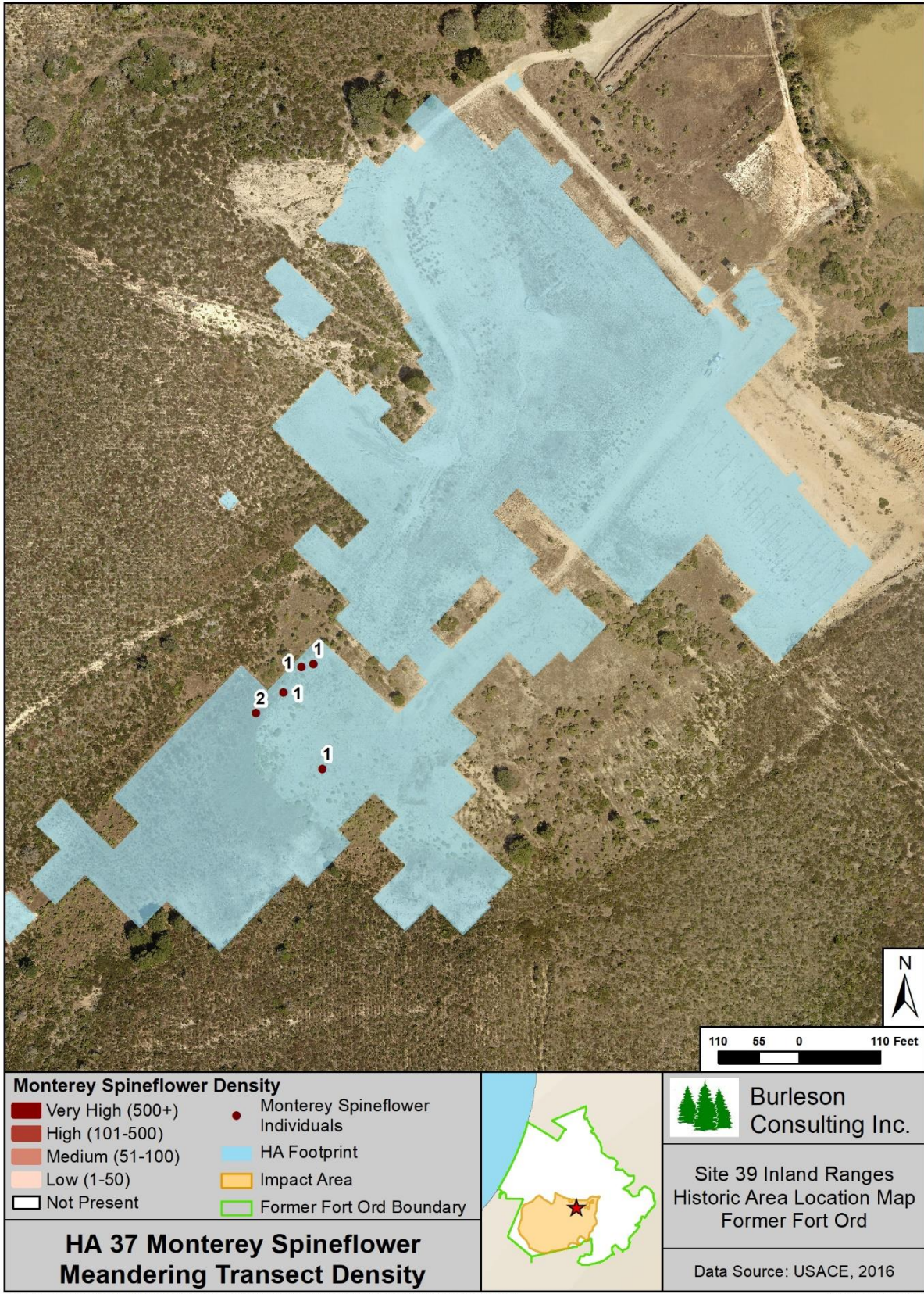
Figure 9-36. HA 37 Monterey Spineflower Meandering Transect Density Map

9.13.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 37 for plants installed in 2014, 2015, 2016, and 2017. A total of 13 shrub species and 1,095 individual plants were monitored for survivorship. By year 3 of monitoring, survivorship was 67% for the 2014 planting, 38% for the 2015 planting, 44% for the 2016 planting, and 50% for the 2017 planting. Survivorship monitoring is complete. Tables 9-85 through 9-88 present results by species.

Table 9-85. Plant Survivorship Monitoring Summary for 2014 Plantings at HA 37

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2014)	Year Two (2015)	Year Three (2016)
			Alive (%)	Alive (%)	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 9-86. Plant Survivorship Monitoring Summary for 2015 Plantings at HA 37

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2015)	Year Two (2016)	Year Three (2017)
			Alive (%)	Alive (%)	Alive (%)
ADFA	363	36	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 9-87. 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	30	93	93	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**	**242**	**57**	**51**	**44**

* HMP Species

Table 9-88. Plant Survivorship Monitoring Summary for 2017 Plantings at HA 37

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2017) Alive (%)	Year Two (2018) Alive (%)	Year Three (2019) Alive (%)
ADFA	140	14	36	29	29
ARCA	155	16	56	88	76
ARHO*	157	16	100	100	100
ARMO*	206	21	76	70	74
ARPU*	237	24	75	48	45
ARTO	356	36	94	77	77
BAPI	329	33	52	50	41
CERI*	140	14	36	14	14
GAEL	2	2	50	100	50
LUAL	242	24	25	29	21
LUAR	262	26	35	12	0
SAME	258	26	73	77	77
TOTAL	**2,484**	**252**	**62**	**55**	**50**

* HMP Species

9.13.2.3 Species Richness

One hundred and six species were observed at HA 37. Of those, 44 were native shrubs or perennials, 26 were native annual herbaceous species, 33 were non-native species, and three were not categorized because they were only identified to genus (see Table 9-89). Species richness increased by 16 species since 2018. Native shrub and perennial species richness remained the same, native herbaceous species

richness increased by five, non-native species richness increased by eight, and uncategorized species richness increased by three.

Table 9-89. Species Observed on HA 37, 2019

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 parviflorus	hill lotus	ACPA
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Agoseris grandiflora	large-flowered agoseris	AGGR
Agoseris sp.	agoseris	AG
Agrostis pallens	leafy bent grass	AGPA
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
Briza maxima	rattlesnake grass	BRMA
Briza minor	small quaking grass	BRMI
Brodiaea terrestris ssp. *terrestris*	dwarf brodiaea	BRTET
Bromus diandrus	ripgut brome	BRDI
Bromus hordeaceus	soft chess	BRHO
Calandrinia menziesii	red maids	CAME
Calochortus albus	white globe lily	CAAL
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 diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Cirsium sp.	thistle	CI
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ
Clarkia unguilculata	elegant clarkia	CLUN
Corethrogyne filaginifolia	common sandaster	COFI
Cortaderia jubata	jubata grass	COJU
Crassula connata	pygmy-weed	CRCO
Crocanthemum scoparium	peak rush-rose	CRSC
Danthonia californica	California oat grass	DACA
Deinandra corymbosa	coastal tarweed	DECO
Diplacus aurantiacus	sticky monkeyflower	DIAU

Table 9-89. Species Observed on HA 37, 2019

Scientific Name	Common Name	Code
Dittrichia gravolens	stinkwort	DIGR3
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
Eriodictyon californicum	yerba santa	ERCA6
Eriophyllum confertiflorum	golden yarrow	ERCO
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filaree	ERCI
Eschscholzia californica	California poppy	ESCA
Festuca bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Galium andrewsii	phlox-leaved bedstraw	GAAN
Galium californicum	California bedstraw	GACA
Galium porrigens	climbing bedstraw	GAPO
Gallium nuttallii	climbing bedstraw	GANU
Gamochaeta ustulata	purple cudweed	GAUS
Garrya elliptica	coast silk tassel	GAEL
Genista monspessulana	French broom	GEMO
Geranium dissectum	cut-leaved geranium	GEDI
Hesperocyparis macrocarpa	Monterey cypress	HEMA22
Heteromeles arbutifolia	toyon	HEAR
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
Isocoma menziesii var. *vernonioides*	Menzies' goldenbush	ISMEV
Juncus bufonius	toad rush	JUBU
Juncus bufonius var. *bufonius*	common toad rush	JUBUB
Juncus sp.	rush	JU
Layia platyglossa	tidy-tips	LAPL
Lepechinia calycina	pitcher sage	LECA
Lessingia pectinata	common lessingia	LEPE
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Logfia sp.	cottonrose	LO
Lupinus albifrons	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	miniature lupine	LUBI
Lupinus concinnus	bajada lupine	LUCO
Lupinus nanus	sky lupine	LUNA
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia elegans	common madia	MAEL
Madia exigua	little tarweed	MAEX
Madia gracilis	slender tarweed	MAGR

Table 9-89. Species Observed on HA 37, 2019

Scientific Name	Common Name	Code
Madia sativa	coast tarweed	MASA
Madia sp.	tarweed	MA
Marah fabacea	wild cucumber	MAFA
Melilotus indicus	yellow sweetclover	MEIN
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Navarretia mellita	skunk navarretia	NAME
Navarretia squarrosa	skunkweed	NASQ
Petrorhagia dubia	hairypink	PEDU
Piperia sp.	rein orchid	PI
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 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
Rumex crispus	curly dock	RUCR
Rumex salicifolius	willow leaved dock	RUSA
Salix sp.	willow	SA
Salvia mellifera	black sage	SAME
Sanicula laciniata	coast sanicle	SALA7
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
Stipa cernua	nodding needle grass	STCE
Stipa pulchra	purple needle grass	STPU
Symphoricarpos albus var. *laevigatus*	common snowberry	SYALL
Taraxia ovata	sun cup	TAOV
Toxicodendron diversilobum	poison oak	TODI
Trifolium angustifolium	narrow-leaved clover	TRAN
Trifolium campestre	hop clover	TRCA
Trifolium dubium	little hop clover	TRDU
Trifolium gracilentum	pinpoint clover	TRGR
Trifolium hirtum	rose clover	TRHI
Trifolium microcephalum	small-head clover	TRMI
Trifolium willdenovii	tomcat clover	TRWI
Triteleia ixioides	pretty face	TRIX
Vicia sativa ssp. *nigra*	narrow-leaved vetch	VISAN
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 surveyed at HA 37 in 2019. These surveys indicated that the mean vegetative cover by native shrubs and perennials was 31.07%. The mean vegetative cover by native shrubs and perennials was lower in 2019 than 2018 by 5.55%. Quadrats were completed along a transect line when 10% or more of the transect line was herbaceous cover, in accordance with the Monitoring Protocol (Burleson, 2009). Quadrats were completed for two transects (T03 and T05) at HA 37. Table 9-90 summarizes vegetative cover, Table 9-91 presents vegetative cover by species, and Table 9-92 presents quadrat results. Figure 9-37 presents the percent cover of dominant species at HA 37 from 2016 through 2019.

Table 9-90. Transect Survey Summary for HA 37

Transect ID	Total Vegetative Cover (%)	Native Vegetative Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA37T01	14.90	12.58	2.32	41.90	53.50
HA37T02	17.08	12.62	4.46	85.88	13.52
HA37T03	27.40	14.98	12.42	94.36	5.44
HA37T04	111.16	107.06	4.10	99.40	0.60
HA37T05	54.24	9.72	44.52	95.54	4.00
HA37T06	105.50	105.50	0.00	99.44	0.56
HA37T07	15.56	11.46	2.38	55.86	39.64
HA37T08	35.80	35.60	0.20	95.44	4.56
HA37T09	20.70	14.04	6.66	70.24	26.00
HA37T10	9.48	6.46	3.02	73.58	25.18
HA37T11	29.88	29.46	0.42	54.74	40.04
Site Average	**40.15**	**32.68**	**7.32**	**78.76**	**19.37**

Table 9-91. Transect Survey Summary for HA 37 by Species

Transect	ACAMA (%)	ACGL (%)	ADFA (%)	AICA (%)	ARCA (%)	ARHO* (%)	ARMO* (%)	ARPU* (%)	ARTO (%)	BAPI (%)	CEDE (%)	CERI* (%)	CRSC (%)	DECO (%)	DIAU (%)
HA37T01	2.26	2.56	3.72	0.00	0.00	0.00	0.00	2.92	0.00	1.12	0.00	0.00	0.00	0.00	0.00
HA37T02	0.68	0.28	2.22	0.00	0.54	1.04	1.32	0.00	0.00	3.80	0.00	0.00	0.94	0.00	0.00
HA37T03	3.58	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.44	1.62	0.00	0.00	0.00	0.94	0.00
HA37T04	0.56	5.86	1.30	0.00	13.36	1.70	5.40	0.00	4.44	1.80	0.00	8.76	0.54	0.00	0.22
HA37T05	0.30	0.98	0.00	3.16	0.82	0.00	0.00	0.00	1.30	0.00	0.00	4.04	0.00	0.98	0.00
HA37T06	0.00	9.66	3.42	0.00	4.30	2.46	2.74	0.48	21.82	6.84	0.00	3.36	0.58	0.52	3.12
HA37T07	6.38	0.28	0.00	0.00	0.00	1.80	0.26	0.00	1.56	0.00	0.00	0.00	0.00	0.00	0.20
HA37T08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.70	0.00	0.00	0.00	0.00	0.00
HA37T09	0.20	7.12	0.00	1.72	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HA37T10	0.40	4.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
HA37T11	0.20	2.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.40	12.52	2.84	0.32	0.74	0.76
SITE AVERAGE	1.32	3.09	0.97	0.44	1.79	0.64	0.88	0.31	2.69	4.84	1.14	1.73	0.22	0.29	0.41

* HMP species

Table 9-91 (continued). Transect Survey Summary for HA 37 by Species

Transect	ELGL (%)	ERCO (%)	FEMY (%)	HOCU (%)	HYRA (%)	JU (%)	LUAR (%)	LYAR (%)	PLCO (%)	QUAG (%)	RUAC (%)	RUUR (%)	SAME (%)	TODI (%)	TH (%)	BG (%)
HA37T01	0.00	0.00	1.58	0.00	0.00	0.00	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	41.90	53.50
HA37T02	0.20	0.00	3.34	1.60	0.00	0.00	0.00	0.00	1.12	0.00	0.00	0.00	0.00	0.00	85.88	13.52
HA37T03	0.24	0.00	3.46	7.94	0.00	0.00	0.00	0.00	8.96	0.00	0.00	0.00	0.00	0.00	94.36	5.44
HA37T04	0.00	0.00	0.00	49.42	0.00	0.00	0.00	4.10	0.00	0.00	0.00	0.00	6.22	7.48	99.40	0.60
HA37T05	0.00	0.00	16.20	1.30	0.00	0.00	0.00	0.00	24.68	0.00	0.48	0.00	0.00	0.00	95.54	4.00
HA37T06	0.00	2.54	0.00	36.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	3.40	0.36	99.44	0.56
HA37T07	0.00	0.00	0.00	0.00	0.00	1.72	0.98	0.00	2.38	0.00	0.00	0.00	0.00	0.00	55.86	39.64
HA37T08	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	95.44	4.56
HA37T09	0.00	1.00	0.58	4.56	0.52	0.00	0.00	0.00	3.84	0.00	0.00	0.00	0.44	0.00	70.24	26.00
HA37T10	0.00	0.00	0.00	1.70	0.22	0.00	0.00	0.00	2.80	0.00	0.00	0.00	0.00	0.00	73.58	25.18
HA37T11	0.00	0.00	0.00	4.38	0.00	0.00	0.00	0.00	0.42	0.62	0.00	0.00	0.00	0.76	54.74	40.04
SITE AVERAGE	0.04	0.32	2.29	9.86	0.07	0.16	0.09	0.37	4.10	0.06	0.04	0.29	0.91	0.78	78.76	19.37
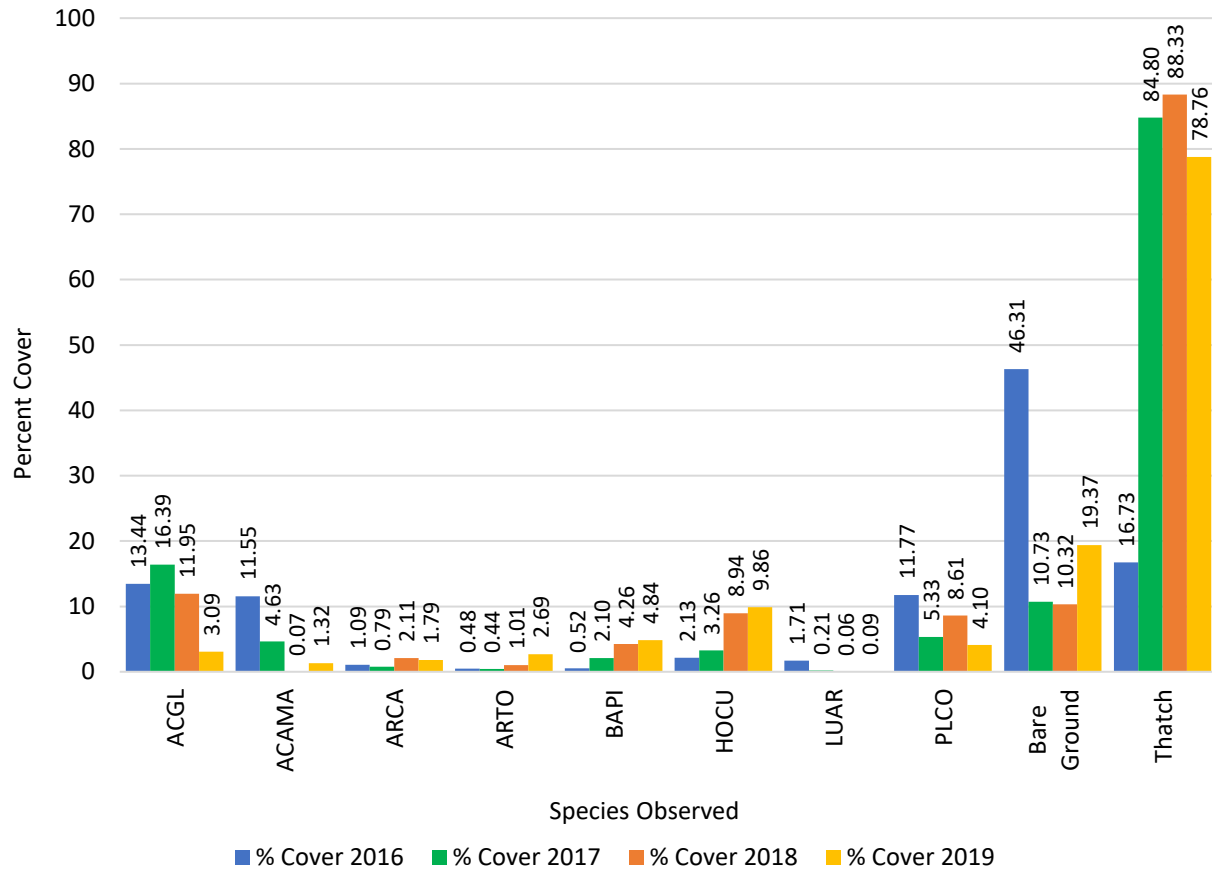
Figure 9-37. Percent Cover of Dominant Species at HA 37 in 2016, 2017, 2018, and 2019.

Table 9-92. 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	95	90	2	3	12	4
HA37T03Q02	40	1	22	17	55	8
HA37T03Q03	45	0	5	40	64	2
HA37T03Q04	37	0	0	37	60	20
HA37T03Q05	70	22	7	41	22	15
HA37T03Q06	20	1	4	15	4	85
HA37T05Q01	32	1	2	29	60	10
HA37T05Q02	31	6	17	8	65	8
HA37T05Q03	32	12	8	12	50	20
HA37T05Q04	53	0	3	50	55	1
HA37T05Q05	13	2	1	10	85	5
HA37T05Q06	29	1	1	27	55	20
SITE AVERAGE	**41**	**11**	**6**	**24**	**49**	**17**

9.13.3 Discussion

9.13.3.1 Recommendations

HA 37 was in year 5 of monitoring in 2019 and has not had sufficient time to respond to restoration efforts since it is highly-disturbed with significant erosion issues. Despite the disturbed nature of the site, it met three of six success criteria by 2019. 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 SSRP prescription is complete to see how the site responds, 2) broadcast seeding Monterey spineflower to fulfill the SSRP target (scheduled for the 2020/2021 season), 3) fulfilling the SSRP planting prescription (1,818 plants scheduled for installation in the 2020/2021 season; Burleson, 2018), and 4) installing future plants strategically where soil conditions are appropriate for the species. Overall, HA 37 needs the SSRP prescription for active and passive restoration fulfilled prior to full evaluation and continued monitoring to evaluate areas that require additional effort. A qualitative overview was documented by photo points (see Appendix D, page D-13 and Appendix E, page E-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 year 8, 2022 (see Table 9-81). Table 9-93 summarizes the current status of HA 37 including which success criteria were met and recommendations.

Table 9-93. 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 2020/2021)
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	No	Fulfill SSRP plant targets (scheduled 2020/2021)
Objective 3 – No. 4	HMP shrub cover by species	No	Fulfill SSRP plant targets (scheduled 2020/2021)
Objective 3 – No. 4	HMP annual density	Yes	Fulfill SSRP seed prescription for Monterey spineflower* (scheduled 2020/2021)

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

9.13.3.2 HMP Annual Density

Monterey spineflower density was 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 5 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 present outside the restoration plots. The density was not calculated because only individuals were observed. 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 and 2017 plantings and low for the 2015 and 2016 plantings at HA 37. Monterey ceanothus and yellow bush lupine had low survivorship for all planting events. Monterey manzanita and shaggy-bark manzanita had low survivorship in the 2015 and 2016

plantings and moderate survivorship in the 2014 and 2017 plantings. Coyote brush had low survivorship in the 2016 and 2017 plantings and moderate to high survivorship in the 2014 and 2015 plantings. Black sage had low survivorship in the 2016 planting and moderate to high survivorship in the other plantings. Hooker's manzanita had high survivorship in the 2017 planting and moderate survivorship in all other planting events. Chamise had low survivorship in the 2017 planting and high survivorship in all other plantings. Sandmat manzanita had low survivorship in the 2017 planting and moderate survivorship in the 2016 planting. Coast silk tassel had low survivorship in the 2016 planting and moderate survivorship in the 2017 planting. Silver beach lupine had low survivorship in the 2015, 2016, and 2017 plantings. California sagebrush was only installed during the 2017 planting event and had moderate survivorship.

Low survivorship for Monterey ceanothus and lupine was not surprising because they had low survivorship at multiple sites, whereas Monterey manzanita and shaggy-bark 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.

9.13.3.4 Species Richness

Chamise, Hooker's manzanita, Monterey manzanita, sandmat manzanita, shaggy-bark manzanita, coyote brush, Monterey ceanothus, silk tassel *(Garrya elliptica)*, 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 27.01% cover; therefore, this success criterion was not met. In 2018, vegetative cover was 31.74%; cover decreased by 4.74% (see Figure 9-38). The decrease in native species cover could in part be caused by an 8.85% decrease in deerweed from 2018 to 2019.
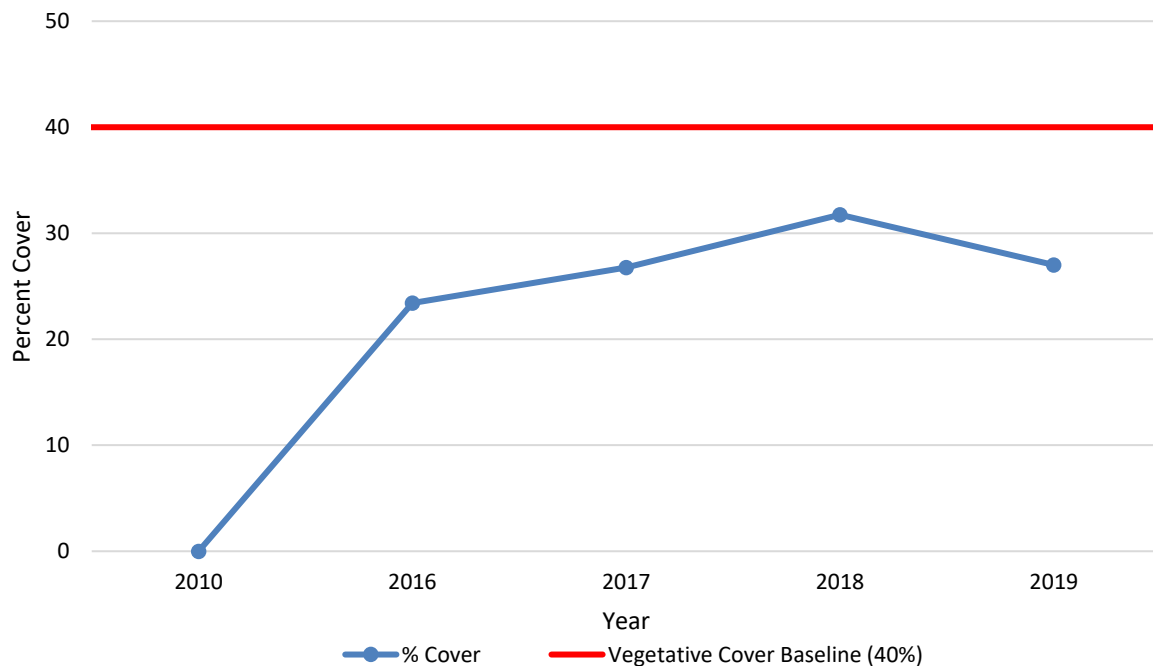
Figure 9-38. Native Vegetative Cover Compared to the Success Criterion at HA 37

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 3.56% which is an increase from 2.72% in 2018; 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 0.31%, Monterey manzanita was 0.88%, Monterey ceanothus was 1.73%, and Hooker's manzanita was 0.64% (see Figure 9-39). Sandmat manzanita, Monterey manzanita, and Monterey ceanothus increased in cover from 2018 to 2019, while Hooker's manzanita decreased. None of the four species met the acceptable limits. The success criterion was not met.
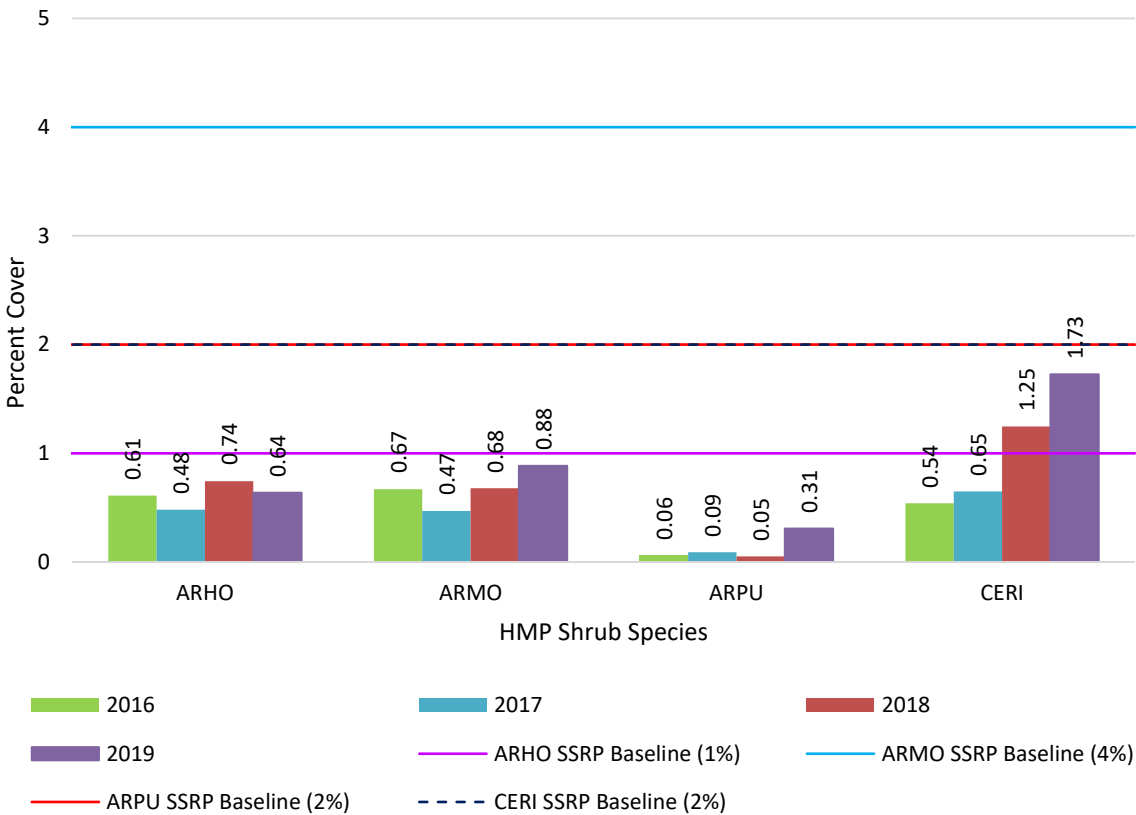
Figure 9-39. HMP Shrub Species Comparison to Success Criteria at HA 37

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 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.

Restoration at HA 38 began in 2013 and was completed in 2017. Monitoring began in 2015. HA 38 was monitored for seven years by photo documentation and site visits, five years for HMP annual density in plots, and four years for HMP annual density across the HA, species richness, vegetative cover, and plant survivorship (see Table 9-94). Figure 9-40 shows the HA footprint, passive restoration area, active restoration area, and transect survey locations. Success criteria for HA 38 are summarized in Table 9-95.

Table 9-94. 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 9-40. HA 38 Restoration Areas and Monitoring Locations Map

Table 9-95. Success Criteria and Acceptable Limits for Restoration of HA 38

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 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 2019. The total amount of seed broadcast on site was 31.425 lb compared to 28.980 lb prescribed in the SSRP. Table 9-96 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 9-96. Summary of Passive Restoration Activities for HA 38

Species	Pounds of Seed Broadcast					
	SSRP Target	2013	2014	2015	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 at HA 38. The total number of plants installed at HA 38 was 1,842, as prescribed in the SSRP. Table 9-97 summarizes the plants installed during active restoration.

Table 9-97. Summary of Active Restoration Activities for HA 38

Species	Number of Individual Plants			
	SSRP Target	2014	2015	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 2 (Plots 2-5) and year 5 (Plot 1) density at HA 38 in 2019. The plots are numbered 1-5 on Figure 9-42 and are located throughout HA 38. Monterey spineflower density was low at Plots 1, 2, 3, 4, and 5. Figure 9-41 presents Monterey spineflower restoration plot densities for HA 38.
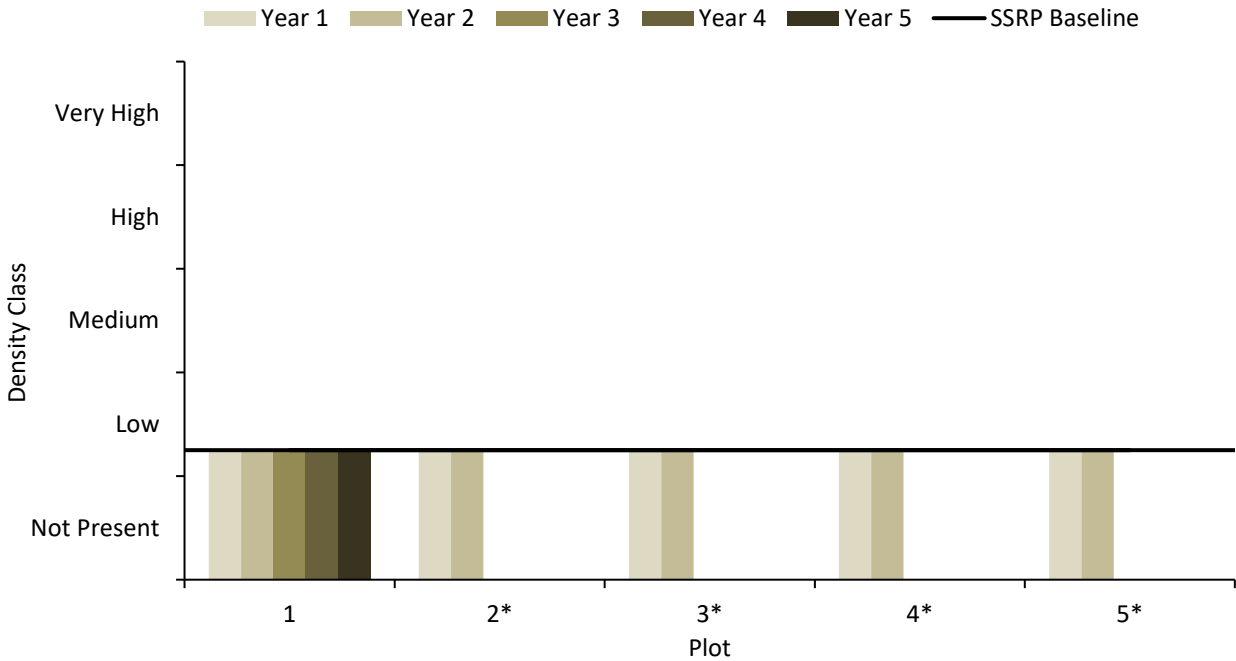
* Plots 2-5 were established in 2017 and have only been monitored for years 1 and 2

Figure 9-41. HA 38 Comparison of Monterey Spineflower Density Classes to the SSRP Baseline for Plots 1-5
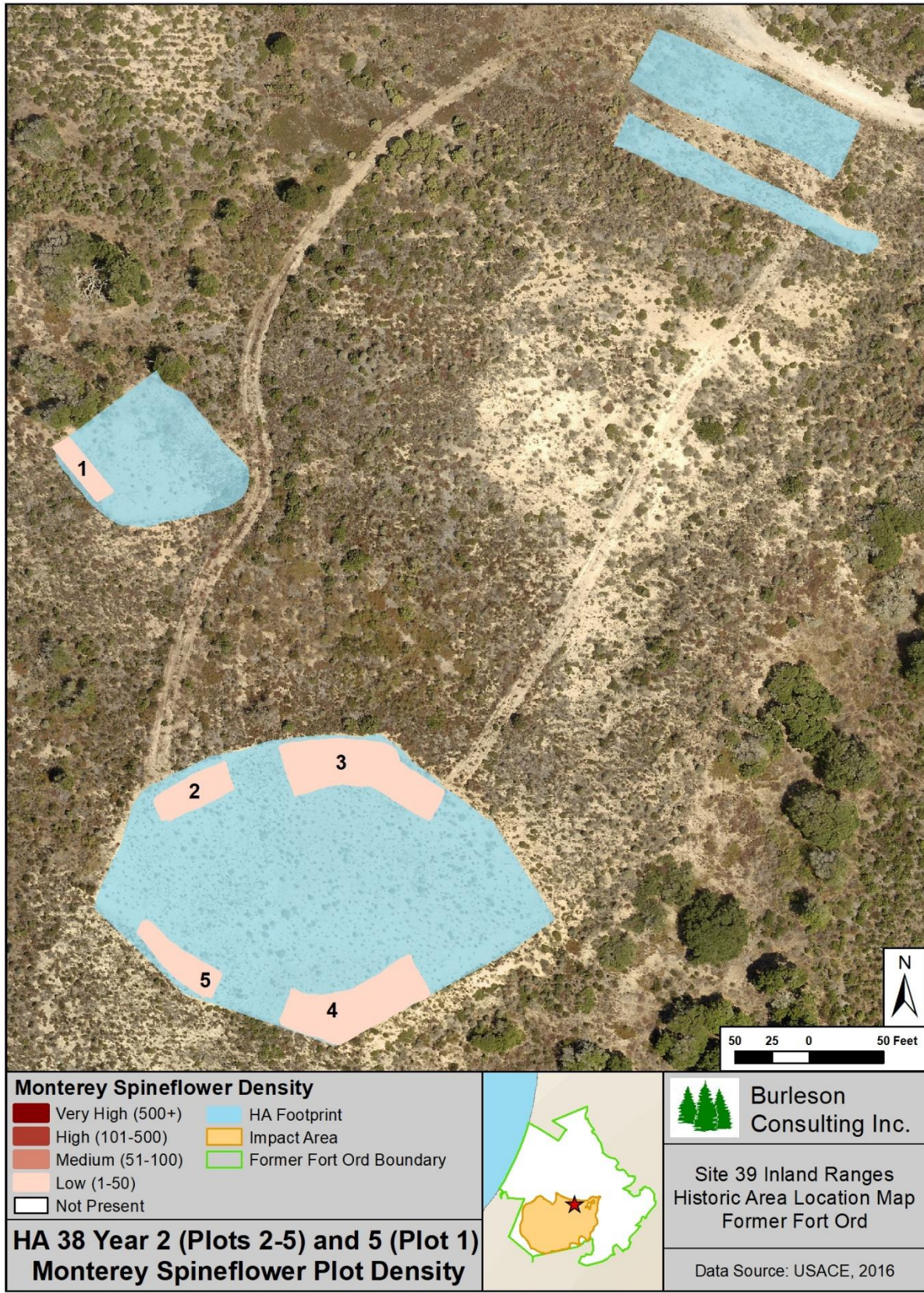
Figure 9-42. HA 38 Year 2 (Plots 2-5) and Year 5 (Plot 1) Monterey Spineflower Plot Density Map

Four sand gilia restoration plots were monitored for year 2 density at HA 38 in 2019. The plots are numbered 1-4 on Figure 9-44 and are located throughout HA 38. Sand gilia density was low at Plots 1 and 3. Sand gilia was not present at Plot 2 in year 2 where it was observed in year 1, and not at Plot 4 in either year. Figure 9-43 presents sand gilia restoration plot densities for HA 38.
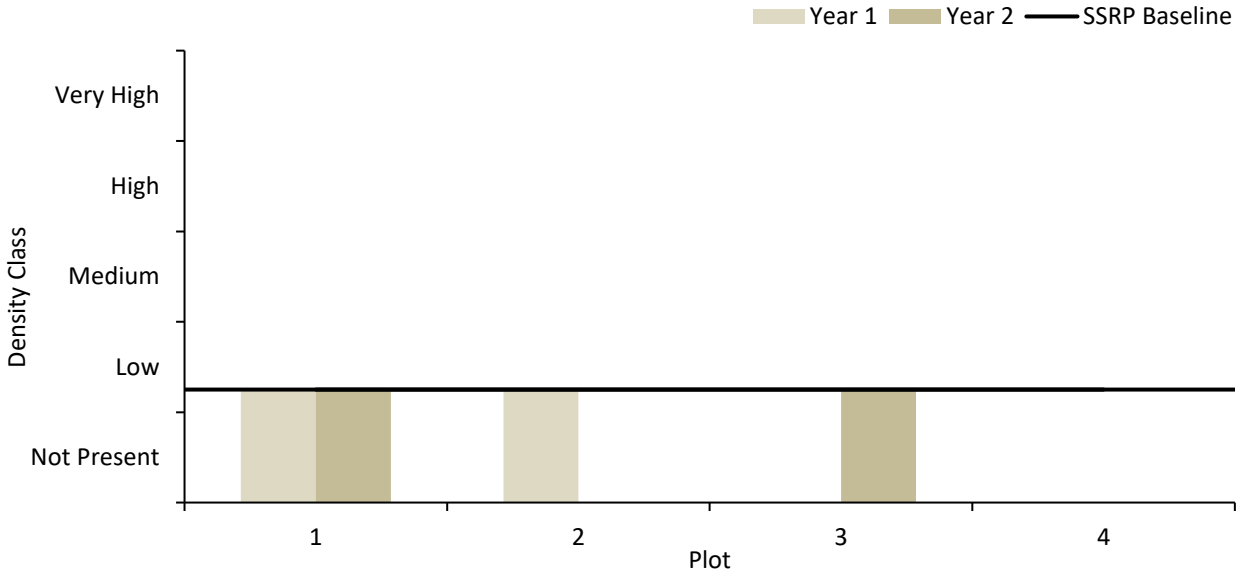
Figure 9-43. HA 38 Comparison of Sand Gilia Density Classes to the SSRP Baseline for Plots 1-4
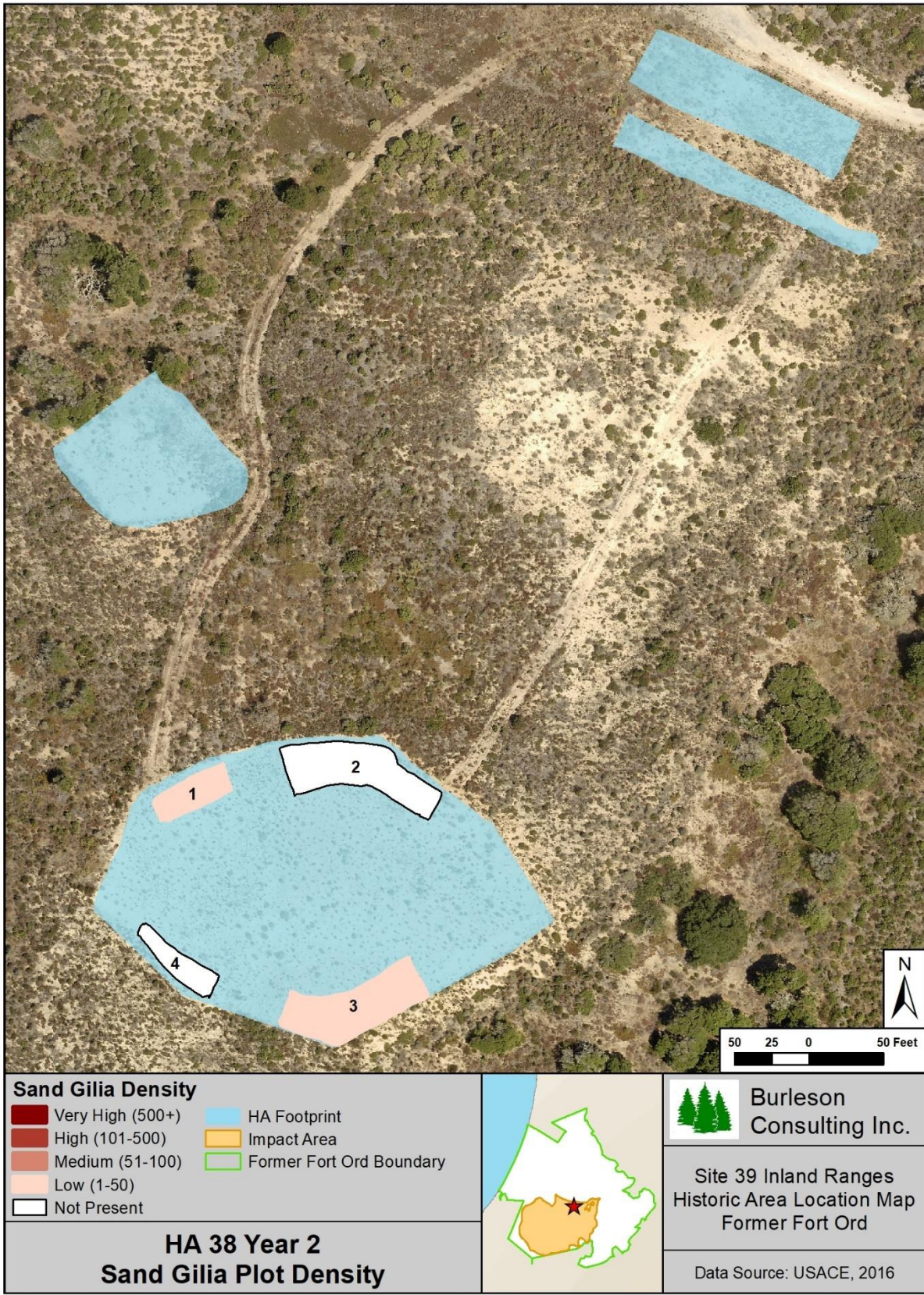
Figure 9-44. HA 38 Year 2 Sand Gilia Plot Density Map

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.

Twenty-five individual plants and 19 discrete patches of Monterey spineflower were mapped and individual plants were counted within each patch (see Figure 9-45). 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 0.14 acre. From 2018 to 2019, the density range increased and acreage above the SSRP baseline remained the same.

Three individual plants and seven discrete patches of sand gilia were mapped and individual plants were counted within each patch (see Figure 9-46). 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 0.014 acre. From 2018 to 2019, the density range and acreage above the SSRP baseline increased.

Seaside bird's beak was not observed at HA 38 in 2019 which is consistent with previous monitoring years.
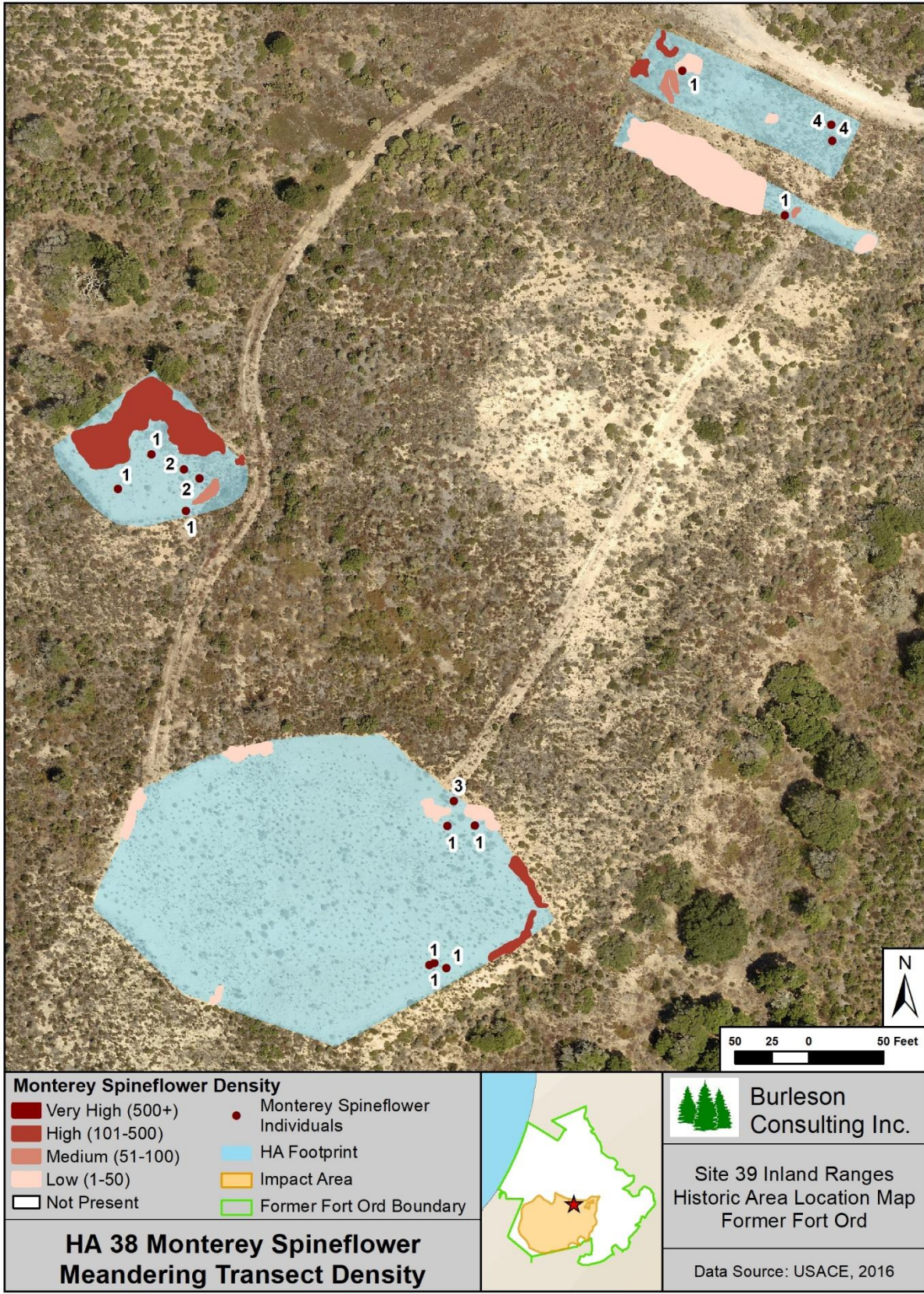
Figure 9-45. HA 38 Monterey Spineflower Meandering Transect Density Map
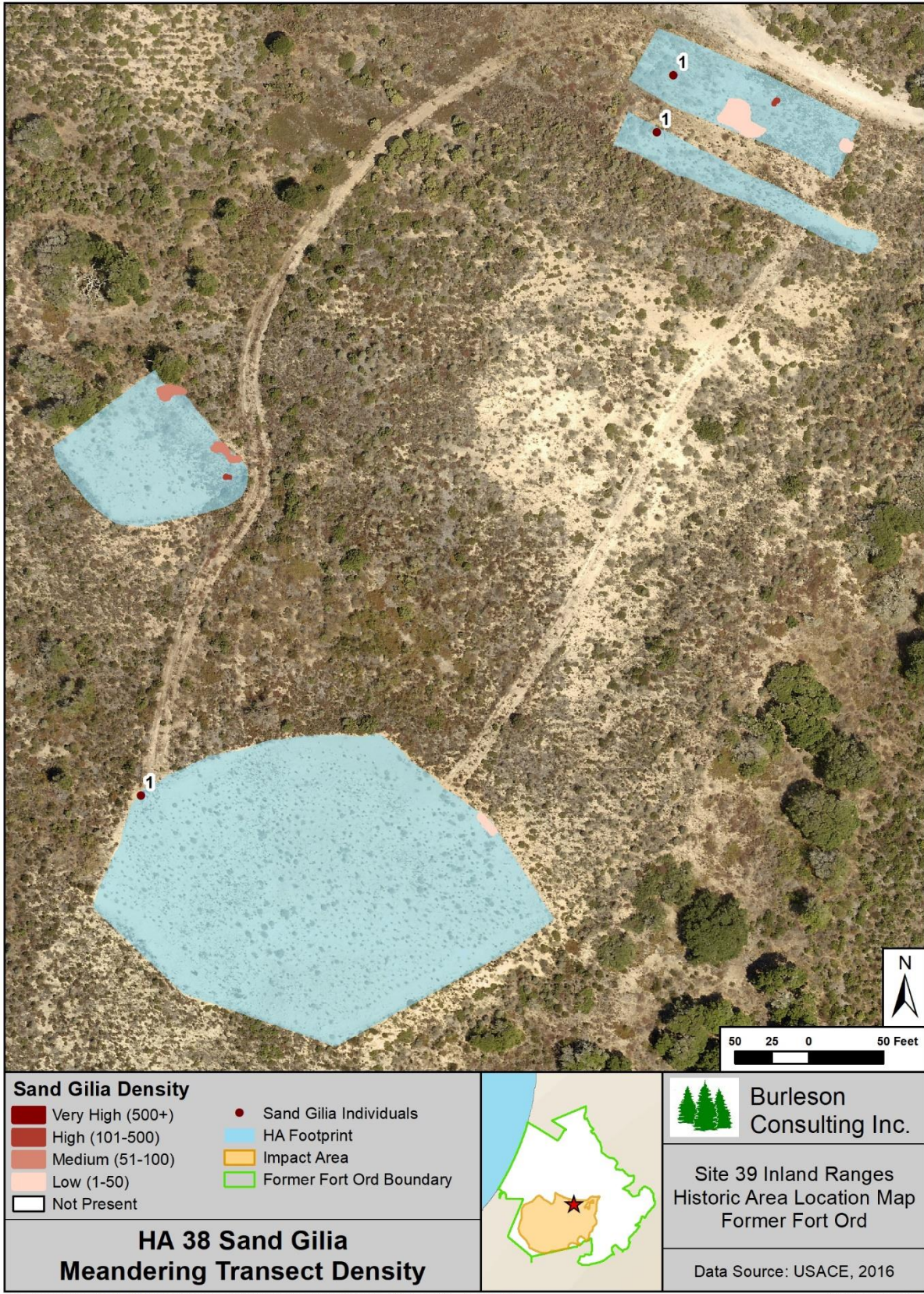
Figure 9-46. HA 38 Sand Gilia Meandering Transect Density Map

9.14.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 38 for plants installed in 2014 and 2015. 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. This increase in survivorship was attributed to some coast silk tassel plants being recorded as dead in year 2 and alive in year 3 due to new growth. Survivorship monitoring is complete. Tables 9-98 and 9-99 present results by species.

Table 9-98. 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 9-99. 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-six species were observed at HA 38. Of those, 31 were native shrubs or perennials, 11 were native annual herbaceous species, and 14 were non-native species (see Table 9-100). Species richness increased by five species between 2018 and 2019. Native shrub and perennial species richness increased by four species, native herbaceous species richness increased by two, and non-native species richness decreased by one.

Table 9-100. Species Observed on HA 38, 2019

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

Table 9-100. Species Observed on HA 38, 2019

Scientific Name	Common Name	Code
*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 diandrus	ripgut brome	BRDI
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Camissoniopsis micrantha	small primrose	CAMI
Carex sp.	sedge	CA
Carpobrotus edulis	hottentot fig	CAED
*Ceanothus rigidus**	Monterey ceanothus	CERI
Centaurea melitensis	tocalote	CEME
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 sp.	cryptantha	CR
Diplacus aurantiacus	sticky monkeyflower	DIAU
Elymus glaucus	blue wild-rye	ELGL
Eriastrum virgatum	virgate eriastrum	ERVI
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
Festuca myuros	rattail sixweeks grass	FEMY
Festuca octoflora	sixweeks grass	FEOC
Frangula californica	California coffeeberry	FRCA
Garrya elliptica	coast silk tassel	GAEL
Gilia tenuiflora ssp. *arenaria**	sand gilia	GITEA
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
Lessingia pectinata	common lessingia	LEPE
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

Table 9-100. Species Observed on HA 38, 2019

Scientific Name	Common Name	Code
Madia gracilis	slender tarweed	MAGR
Piperia michaelii	Michael's rein orchid	PIMI6
Plagiobothrys sp.	popcorn flower	PL
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
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 surveyed 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 49.22%. The mean vegetative cover by native shrubs and perennials was greater in 2019 than 2018 by 5.14%. Table 9-101 summarizes vegetative cover and Table 9-102 presents vegetative cover by species. Figure 9-47 presents the percent cover of dominant species at HA 38 in 2016, 2017, 2018, and 2019.

Table 9-101. Transect Survey Summary for HA 38

Transect ID	Total Vegetative Cover (%)	Native Vegetative Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA38T01	38.76	38.56	0.20	42.40	52.66
HA38T02	63.06	63.06	0.00	60.60	31.74
Site Average*	**49.33**	**49.22**	**0.11**	**50.32**	**43.56**

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

Table 9-102. Transect Survey Results for HA 38 by Species

Transect	ACGL (%)	ADFA (%)	ARMO* (%)	ARPU* (%)	CRSC (%)	ERCO (%)	ERFA* (%)
HA38T01	1.64	8.96	1.08	2.08	3.86	0.30	0.52
HA38T02	1.19	0.00	0.00	1.17	6.21	0.00	0.00
SITE AVERAGE‡	**1.45**	**5.06**	**0.61**	**1.68**	**4.88**	**0.17**	**0.29**

Table 9-102 (continued). Transect Survey Results for HA 38 by Species

Transect	HOCU (%)	LUAL/LUCH[†] (%)	PTAQP (%)	RUAC (%)	SAME (%)	TODI (%)	TH (%)	BG (%)
HA38T01	0.68	18.34	1.10	0.20	0.00	0.00	42.40	52.66
HA38T02	2.31	37.71	6.86	0.00	2.68	4.94	60.60	31.74
SITE AVERAGE‡	**1.39**	**26.77**	**3.60**	**0.11**	**1.16**	**2.15**	**50.32**	**43.56**

* 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 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.
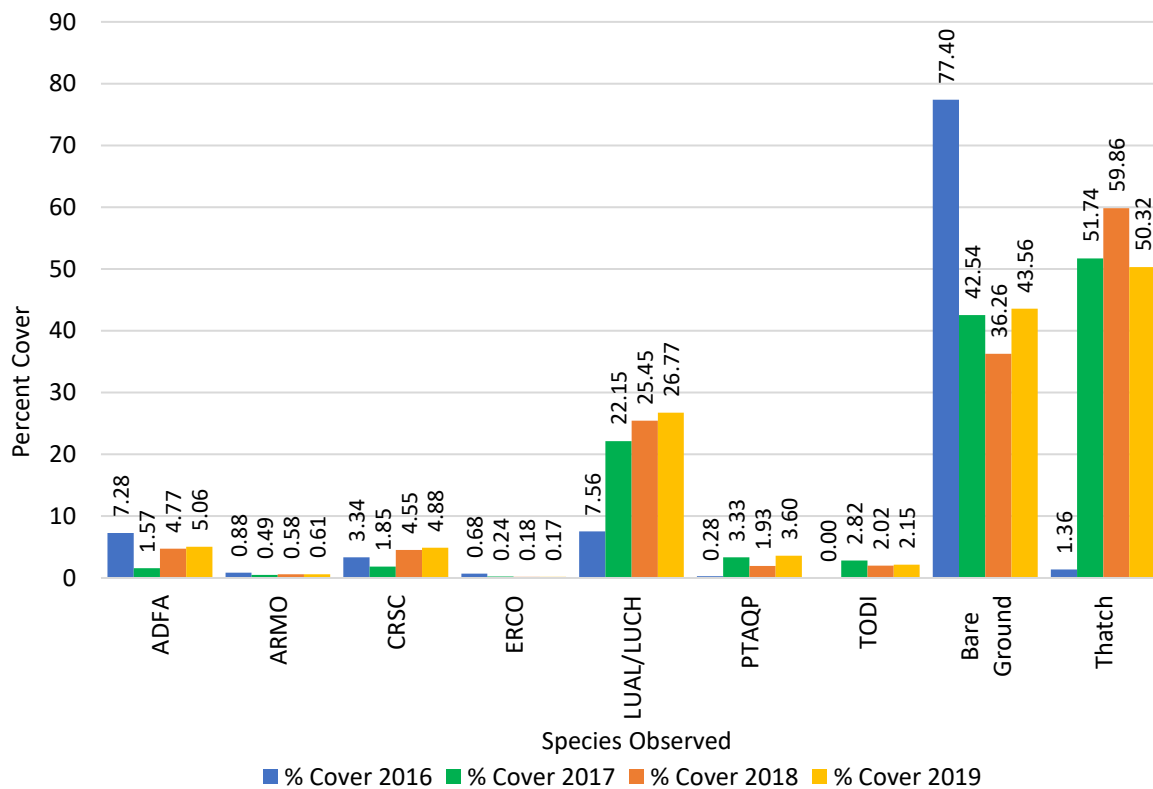
Figure 9-47. Percent Cover of Dominant Species at HA 38 in 2016, 2017, 2018, and 2019.

9.14.3 Discussion

9.14.3.1 Recommendations

HA 38 was in year 5 of monitoring in 2019 and responded well to previous restoration efforts. The site met four of six success criteria by 2019. HA 38 has not received the full SSRP target prescription for passive restoration. The Army will establish restoration plots for seaside bird's beak seed and reseed sand gilia plots in the 2020/2021 season to support the HMP annual density success criterion. The Army will also plant Monterey ceanothus in the 2020/2021 season to support the HMP shrub cover success criteria. Overall, HA 38 needs time to respond to the restoration effort and continued monitoring to

evaluate areas that require additional effort. A qualitative overview was documented by photo points (see Appendix D, page D-14 and Appendix E, page E-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 monitoring year 8, 2022 (see Table 9-94). Table 9-103 summarizes the current status of HA including which success criteria were met and recommendations.

Table 9-103. 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 (scheduled 2020/2021)†
Objective 3 – No. 4	HMP annual density	No	Establish restoration plots for seaside bird's beak and reseed sand gilia plots (scheduled 2020/2021)*

* Recommendation repeated from the 2017 Annual Habitat Restoration Report (Burleson, 2018).
† Recommendation repeated from the 2018 Annual Habitat Restoration Report (Burleson, 2019).

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 2 and year 5 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 acre 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 2 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 0.014 acre of HA 38.

Seaside bird's beak restoration plots have not been established at HA 38 and no discrete patches were observed in 2019. The SSRP baseline density class for seaside bird's beak was low. The site did not meet the success criterion for seaside bird's beak.

9.14.3.3 Plant Survivorship

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

9.14.3.4 Species Richness

Deerweed, chamise, Hooker's manzanita, Monterey manzanita, sandmat manzanita, shaggy-bark manzanita, coyote brush, Monterey ceanothus, and black sage were present. HA 38 included 31 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 43.47% cover to the HA; therefore, this success criterion was met. In 2018, vegetative cover was 39.76%; cover increased by 3.71% (see Figure 9-48).
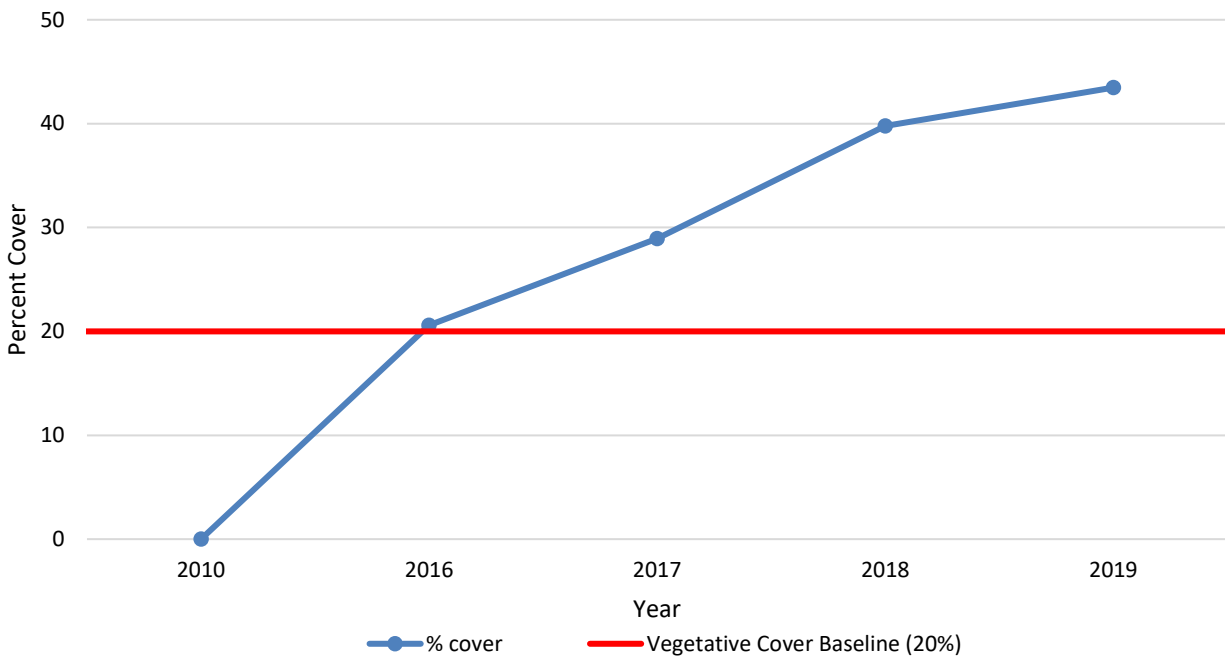
Figure 9-48. Native Vegetative Cover Compared to the Success Criterion at HA 38

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 2.29%, which is an increase from 1.48% in 2018. 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 0.61%, Monterey ceanothus was 0.00%, Hooker's manzanita was 0.00%, and sandmat manzanita was 1.68% (see Figure 9-49). None of the species met the acceptable limit; therefore, the success criterion was not met.
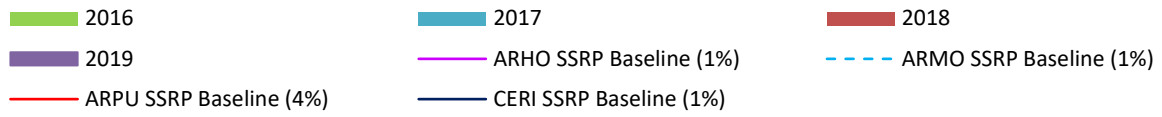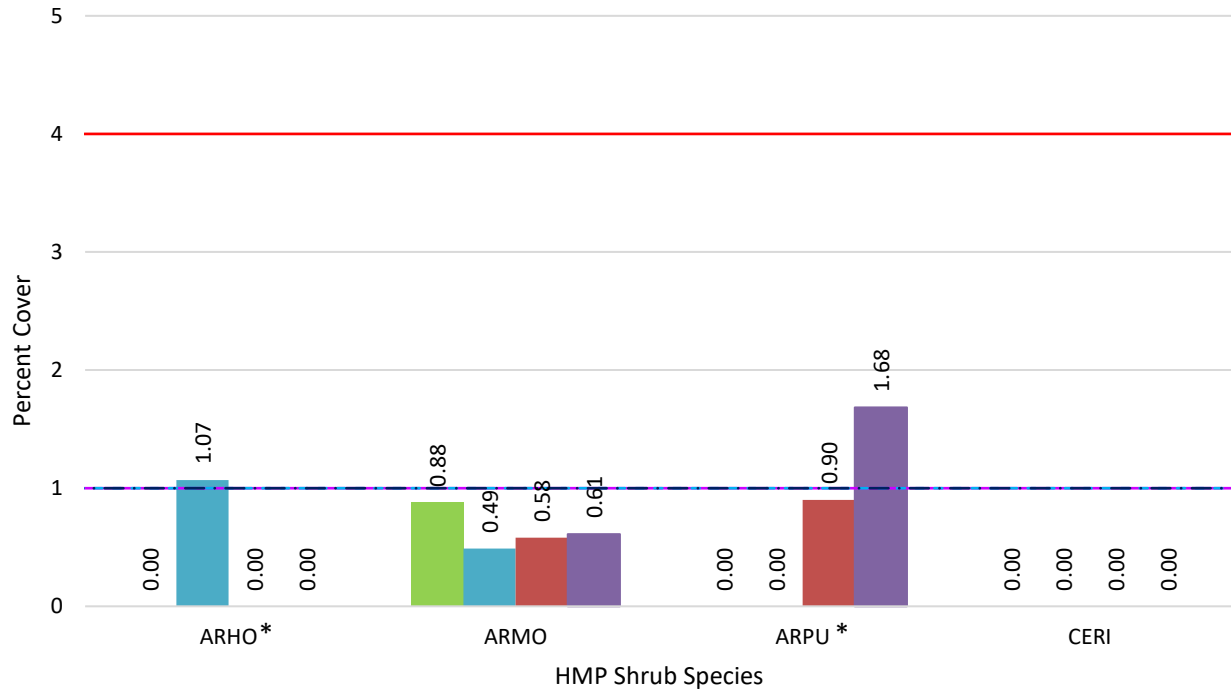
* The decrease in Hooker's manzanita and increase in sandmat manzanita from 2017 to 2018 were due to transect placement.

Figure 9-49. 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 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 were based on baseline data from transects within the footprint as well as supplemental species appropriate for each plot (Shaw, 2009a). Baseline transects were established 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 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 (*Achillea millefolium*) and an average of approximately 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 nine 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 9-104). Figure 9-50 shows the HA footprint, passive restoration area, active restoration area, and transect survey locations. Success criteria for HA 39/40 are summarized in Table 9-105.

Table 9-104. 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						●	●	●	●	●

* Photo points and site visits occur every year regardless of the monitoring year

Figure 9-50. HA 39/40 Restoration Areas and Monitoring Locations Map

Table 9-105. Success Criteria and Acceptable Limits for Restoration of HA 39/40

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:
			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 2019. The total amount of seed broadcast on site was 77.533 lb compared to 77.270 lb prescribed in the SSRP. Table 9-106 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 based on having suitable habitat for the HMP annuals and adjacent extant populations.

Table 9-106. Summary of Passive Restoration Activities for HA 39/40

Species	Pounds of Seed Broadcast				
	SSRP Target	2012 (Jan)	2012 (Dec)	2013	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 9-107 summarizes the plants installed during active restoration.

Table 9-107. Summary of Active Restoration Activities at Plot 4 for HA 39/40

Species	Number of Individual Plants			
	SSRP Target	2012	2013	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 7 of monitoring in 2019. Year 7 was not a required monitoring year and only photo documentation was completed.

9.15.3 Discussion

9.15.3.1 Recommendations

HA 39/40 was in year 7 of monitoring in 2019; the only monitoring that occurred was photo documentation. Recommendations were developed from a combination of prior recommendations and the restoration efforts completed in 2019. 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; the Army recommends establishing a transect in another plot to better assess the restoration progress at the site. Based on qualitative evaluation, Plots 1 and 2 are similar and could be evaluated together 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 has scheduled three corrective measures for the 2020/2021 season to support HA 39/40 in achieving success criteria: 1) broadcast production 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 adaptive management, time to respond to the restoration effort, and continued monitoring to evaluate areas that require 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 (see Table 9-104). Reevaluation of the success criteria may be considered at that time. Table 9-108 summarizes the current status of HA 39/40 including which success criteria were met and recommendations.

Table 9-108. 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 seed and plant coyote brush and yellow bush lupine in Plots 1 and 2; plant *Juncus* sp., clustered field sedge, and saltgrass in Plot 3 (scheduled 2020/2021)* Add transect in Plot 3†
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	NA	NA
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

9.16   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 acre. HA 43 rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of 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.

Restoration at HA 43 occurred in 2011 and 2012. Monitoring began in 2013. HA 43 was monitored for nine years by photo documentation and site visits, six years for HMP annual density in plots, three years for HMP annual density across the HA, and four years for species richness and vegetative cover (see Table 9-109). Figure 9-51 shows the HA footprint, passive restoration area, and transect monitoring locations. Success criteria for HA 43 are summarized in Table 9-110.

Table 9-109. Historic Summary of Restoration and Monitoring Activities at HA 43

Activity			Monitoring Years								
			1	2	3	4	5	6	7	8	13
	2011	2012	2013	2014	2015	2016	2017	2018	2019	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 9-51. HA 43 Restoration Areas and Monitoring Locations Map

Table 9-110. Success Criteria and Acceptable Limits for Restoration of HA 43

	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 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 9-110. 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, 2012, and 2019. The total amount of seed broadcast on site was 4.339 lb compared to 1.943 lb prescribed in the SSRP. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities and adaptive management. Table 9-111 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 based on suitable habitat for the HMP annuals and adjacent extant populations.

Table 9-111. Summary of Passive Restoration Activities for HA 43

Species	Pounds of Seed Broadcast				
	SSRP Target	**2011**	**2012**	**2019**	**Total by Species**
ACMI	-	-	-	0.270	0.270
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
ELGL	-	-	-	0.720	0.720
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	0.360	0.545
SAME	0.090	0.050	0.056	-	0.106
STPU	-	-	-	0.450	0.450
TOTAL	**1.943**	**1.025**	**1.514**	**1.800**	**4.339**

* HMP species

No active restoration was prescribed at HA 43; however, an AMP planting event occurred in 2019 per recommendations made in the 2018 Annual Report (Burleson, 2019). A total of 44 plants were installed at HA 43. Table 9-112 summarizes the plants installed during active restoration.

Table 9-112. **Summary of Active Restoration Activities for HA 43**

Species	Number of Individual Plants	
	2019	**Total by Species**
ADFA	10	10
CERI*	20	20
DIAU	14	14
TOTAL	**44**	**44**

*HMP species

9.16.2   Monitoring Results

HA 43 was in year 7 of monitoring in 2019. Year 7 was not a required monitoring year however species richness, vegetative cover, and photo documentation were completed.

9.16.2.1   HMP Annual Density

No HMP annual surveys occurred; therefore, no density data were collected.

9.16.2.2   Plant Survivorship

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

9.16.2.3   Species Richness

Thirty-six species were observed at HA 43. Of those, 23 were native shrubs or perennials, 10 were native annual herbaceous species, two were non-native species, and one was not categorized as it was only identified to genus (see Table 9-113). Species richness decreased by three species between 2018 and 2019. Native shrub and perennial species richness increased by two, native herbaceous species richness decreased by three, non-native species richness decreased by three, and uncategorized species richness increased by one.

Table 9-113. Species Observed at HA 43, 2019

Scientific Names	Common Names	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Aira caryophyllea	silver hair grass	AICA
Arctostaphylos pumila*	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
Carpobrotus edulis	hottentot fig	CAED
Castilleja ambigua ssp. *ambigua*	Johnny nip	CAAMA3
Ceanothus dentatus	dwarf ceanothus	CEDE
Ceanothus rigidus*	Monterey ceanothus	CERI

Table 9-113. Species Observed at HA 43, 2019

Scientific Names	Common Names	Code
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
Diplacus aurantiacus	sticky monkeyflower	DIAU
Ericameria ericoides	mock heather	ERER
*Ericameria fasciculata**	Eastwood's goldenbush	ERFA
Erigeron canadensis	horseweed	ERCA
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
Lupinus albifrons	silver bush lupine	LUAL
Minuartia californica	sandwort	MICA
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Plagiobothrys chorisianus var. *hickmanii*	Hickman's popcornflower	PLCHH
Plagiobothrys sp.	popcorn flower	PL
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Polygala californica	California milkwort	POCA
Pseudognaphalium californicum	California everlasting	PSCA
Pseudognaphalium sp.	cudweed	PS
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Schismus barbatus	old han schismus	SCBA
Spergularia villosa	hairy sand-spurrey	SPVI
Stylocline gnaphaloides	everlasting neststraw	STGN
Toxicodendron diversilobum	poison oak	TODI

* HMP species

9.16.2.4 Vegetative Cover

Burleson surveyed 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 29.03%. The mean vegetative cover by native shrubs and perennials was greater in 2019 than 2018 by 1.98%. Table 9-114 summarizes vegetative cover and Table 9-115 presents vegetative cover by species. Figure 9-52 presents the percent cover of dominant species at HA 43 in 2017, 2018, and 2019.

Table 9-114. Transect Survey Summary for HA 43

Transect ID	Total Vegetative Cover (%)	Native Vegetative Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA43T01	40.35	40.35	0.00	50.12	45.06
HA43T02	14.25	14.25	0.00	26.33	69.42
HA43T03	39.40	39.40	0.00	60.70	37.60
HA43T04	25.36	25.36	0.00	34.05	61.09
HA43T05	19.25	19.25	0.00	69.50	30.50
Site Average*	29.03	29.03	0.00	46.65	49.84

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

Table 9-115. Transect Survey Results for HA 43 by Species

Transect	ACGL (%)	ARPU* (%)	CERI* (%)	CRSC (%)	ERCO (%)	HOCU (%)	TH (%)	BG (%)
HA43T01	4.59	11.06	8.12	12.82	1.71	2.06	50.12	45.06
HA43T02	0.00	2.00	0.00	12.25	0.00	0.00	26.33	69.42
HA43T03	11.50	18.90	3.10	4.30	0.00	1.60	60.70	37.60
HA43T04	0.00	18.36	0.00	4.64	0.00	2.36	34.05	61.09
HA43T05	0.00	15.63	0.00	3.63	0.00	0.00	69.50	30.50
SITE AVERAGE†	3.33	12.55	2.91	8.41	0.50	1.33	46.65	49.84

* HMP species

† Transect lengths are not equal. Site averages are weighted to reflect differing lengths.
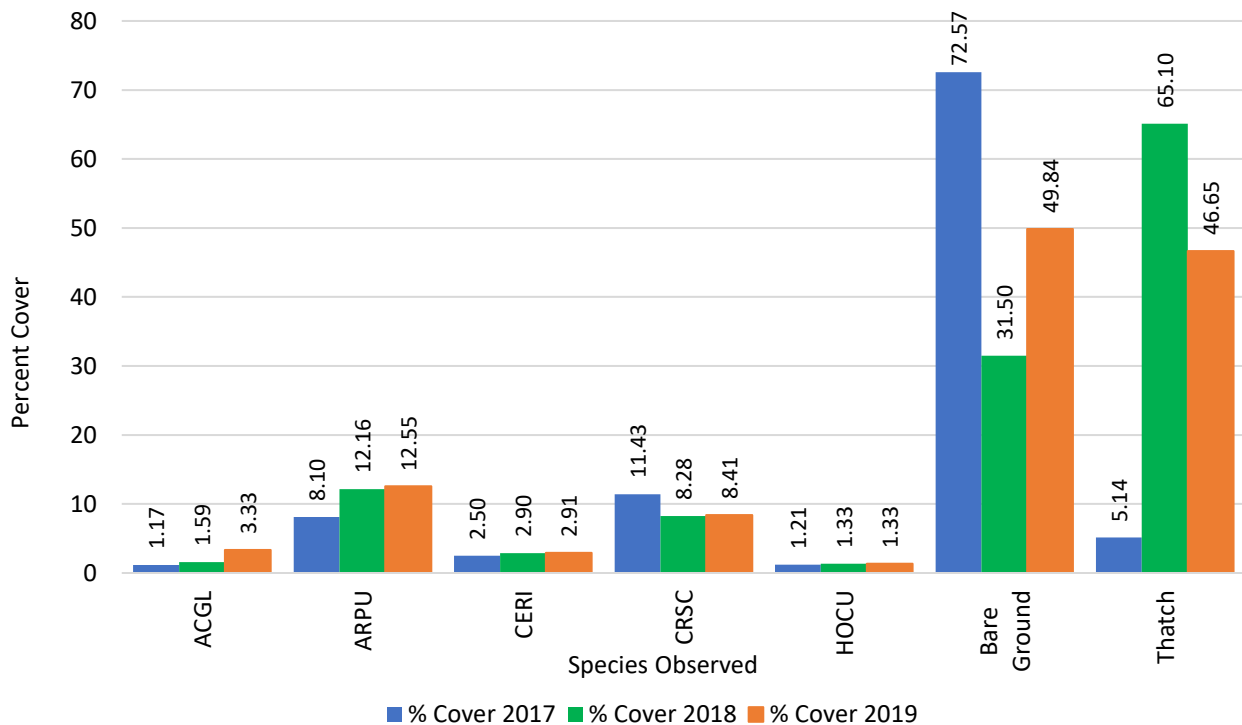
Figure 9-52. Percent Cover of Dominant Species at HA 43 in 2017, 2018, and 2019.

9.16.3 Discussion

9.16.3.1 Recommendations

HA 43 was in year 7 of monitoring in 2019 and responded moderately well to restoration efforts. The site met three of six success criteria by 2019. Per recommendations in the 2016 Annual Habitat Restoration Report, sticky monkeyflower, Monterey ceanothus, and chamise were 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 density. The sand gilia seed broadcast will occur in the 2020/2021 season. 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 (see Table 9-109). Table 9-116 summarizes the current status of HA 43 including which success criteria were met and recommendations.

Table 9-116. Status and Recommendations for Achieving Success Criteria at HA 43

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Wait to see how the HA responds
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	Yes	None
Objective 3 – No. 4	HMP shrub cover by species	No	Plant Eastwood's goldenbush*†
Objective 3 – No. 4	HMP annual density	No	Reseed sand gilia plot (scheduled 2020/2021)*

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

9.16.3.2 HMP Annual Density

No HMP annual surveys occurred; therefore, no density data were collected.

9.16.3.3 Plant Survivorship

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

9.16.3.4 Species Richness

Deerweed, chamise, sandmat manzanita, shaggy-bark manzanita, coyote brush, dwarf ceanothus, Monterey ceanothus, peak rush-rose (*Crocanthemum scoparium*), sticky monkeyflower, golden yarrow, mock heather, coffeeberry (*Frangula californica* formerly *Rhamnus californica*), wedge-leaved horkelia, and black sage were present. HA 43 included 23 native shrub and perennial species and met 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 29.03% cover to the HA; therefore, this success criterion was not met. In 2018, vegetative cover was 26.74%; cover increased by 2.29% (see Figure 9-53).

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.
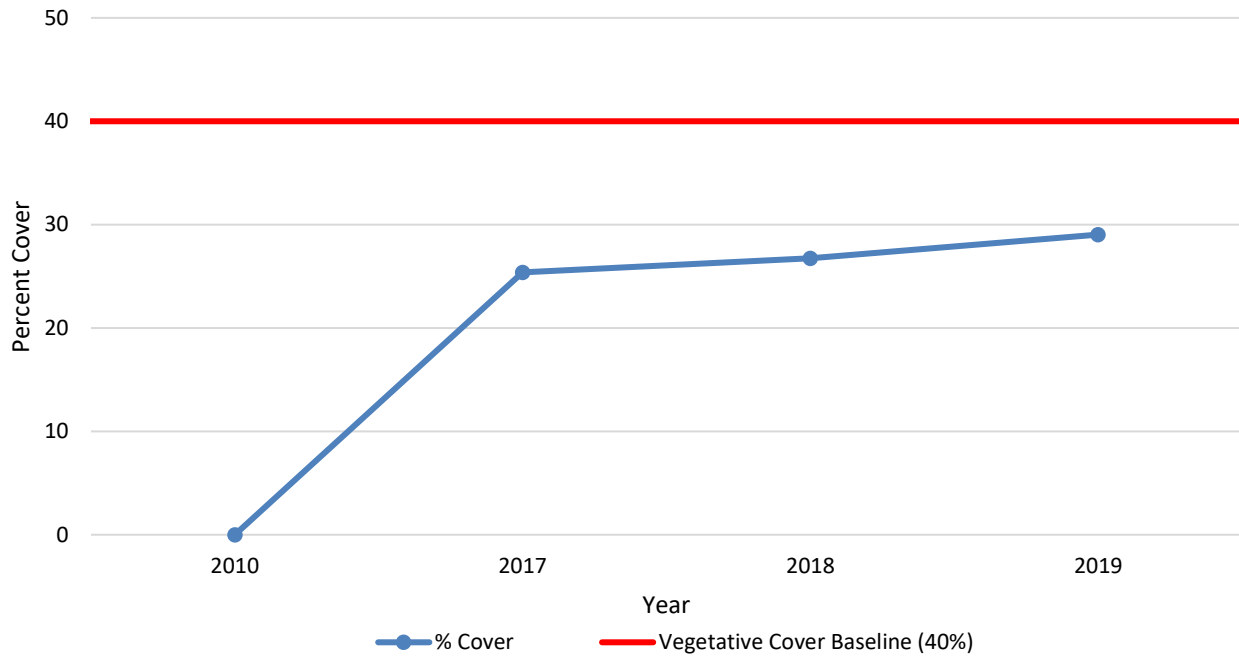
Figure 9-53. Native Vegetative Cover Compared to the Success Criterion at HA 43

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 15.47%, which is an increase from 15.05% in 2018; 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 2.91%, sandmat manzanita was 12.55%, and Eastwood's goldenbush was 0.00% (see Figure 9-54). Only sandmat manzanita met the acceptable limit. The success criterion was not met.
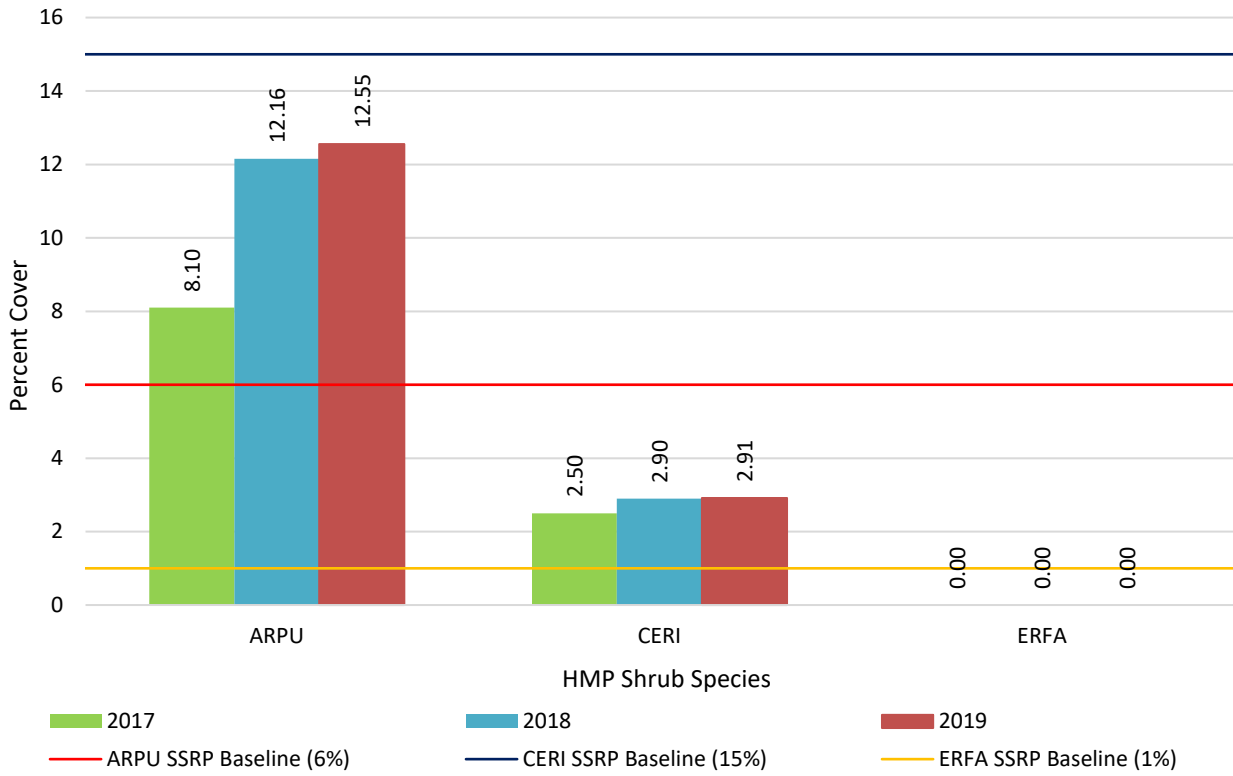
Figure 9-54. HMP Shrub Species Comparison to Success Criteria at HA 43

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 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.

Restoration at HA 44 occurred in 2017 and 2018. The initial monitoring in 2016 was to assess the level of natural recruitment occurring at that site. HA 44 was monitored for four years by photo documentation and site visits, HMP annual density across the HA, species richness, and vegetative cover, and two years for plant survivorship (see Table 9-117). Figure 9-55 shows the HA footprint, restoration areas, and transect monitoring locations. The success criteria for HA 44 are summarized in Table 9-118.

Table 9-117. 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			●	●	●				
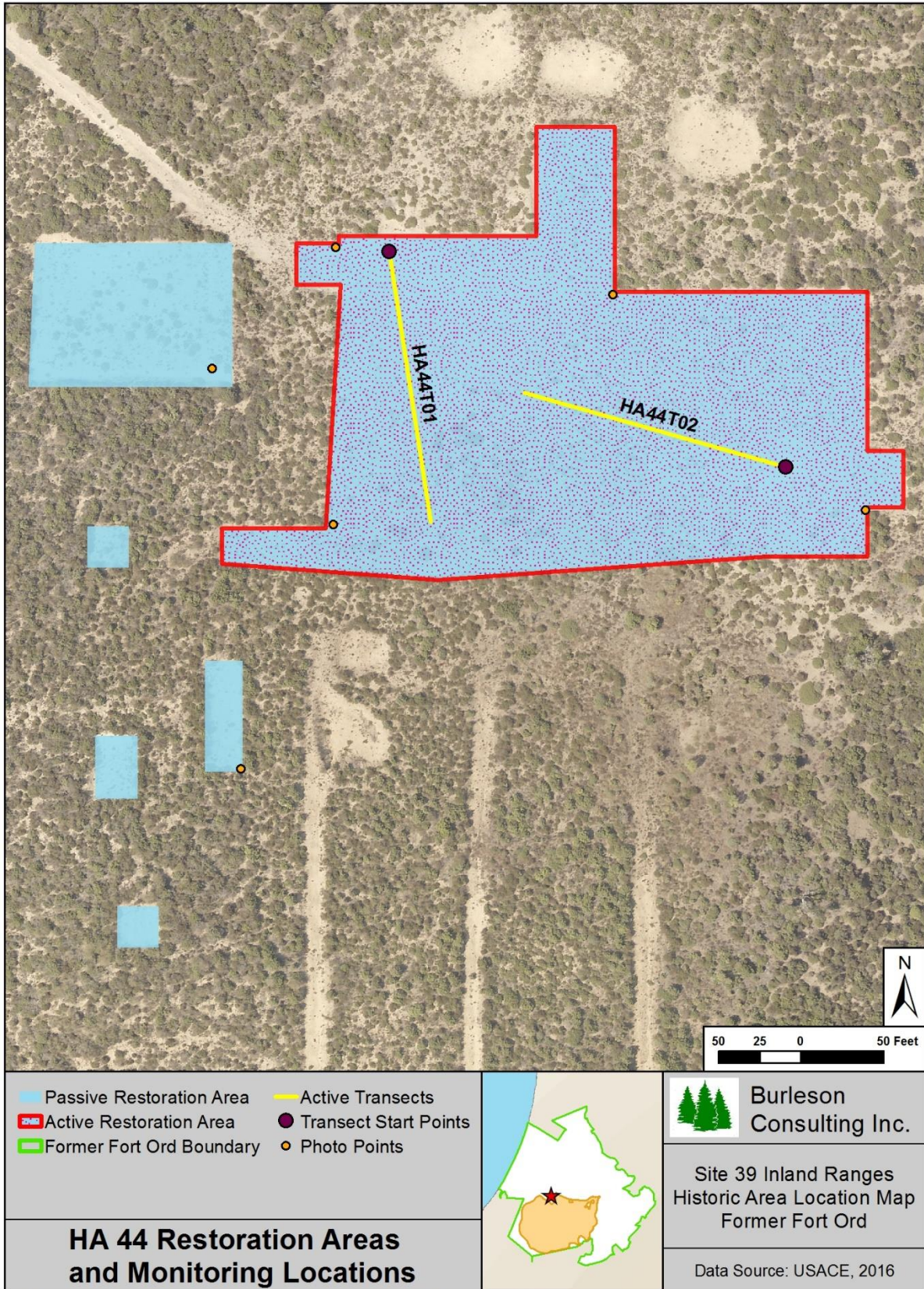
Figure 9-55. HA 44 Restoration Areas and Monitoring Locations Map

Table 9-118. 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. Total seed broadcast exceeded the SSRP prescription because additional seed was broadcast for erosion control activities. Table 9-119 summarizes the SSRP seed target and the amount of seed applied by year and species.

Table 9-119. 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 9-120 summarizes the plants installed during active restoration.

Table 9-120. Summary of Active Restoration Activities for HA 44

Species	Number of Individual Plants		
	SSRP Target	2018	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

No restoration plots were established for HMP annuals at HA 44. However, HMP annuals were mapped as a part of the meandering transect survey. This survey was completed for Monterey spineflower, sand gilia, and seaside bird's beak at HA 44.

Seventy-seven individual plants and 13 discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 9-56). 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 0.02 acre. From 2018 to 2019, the density range increased and acreage above the SSRP baseline decreased.

One individual plant of sand gilia was mapped (see Figure 9-57). Densities and acreages were not calculated because no discrete patches were observed.

Three individual plants and two discrete patches of seaside bird's beak were mapped, and individuals counted within each patch (see Figure 9-58). The density was 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 0.14 acre. From 2018 to 2019, the density range remained the same and acreage above the SSRP baseline increased.
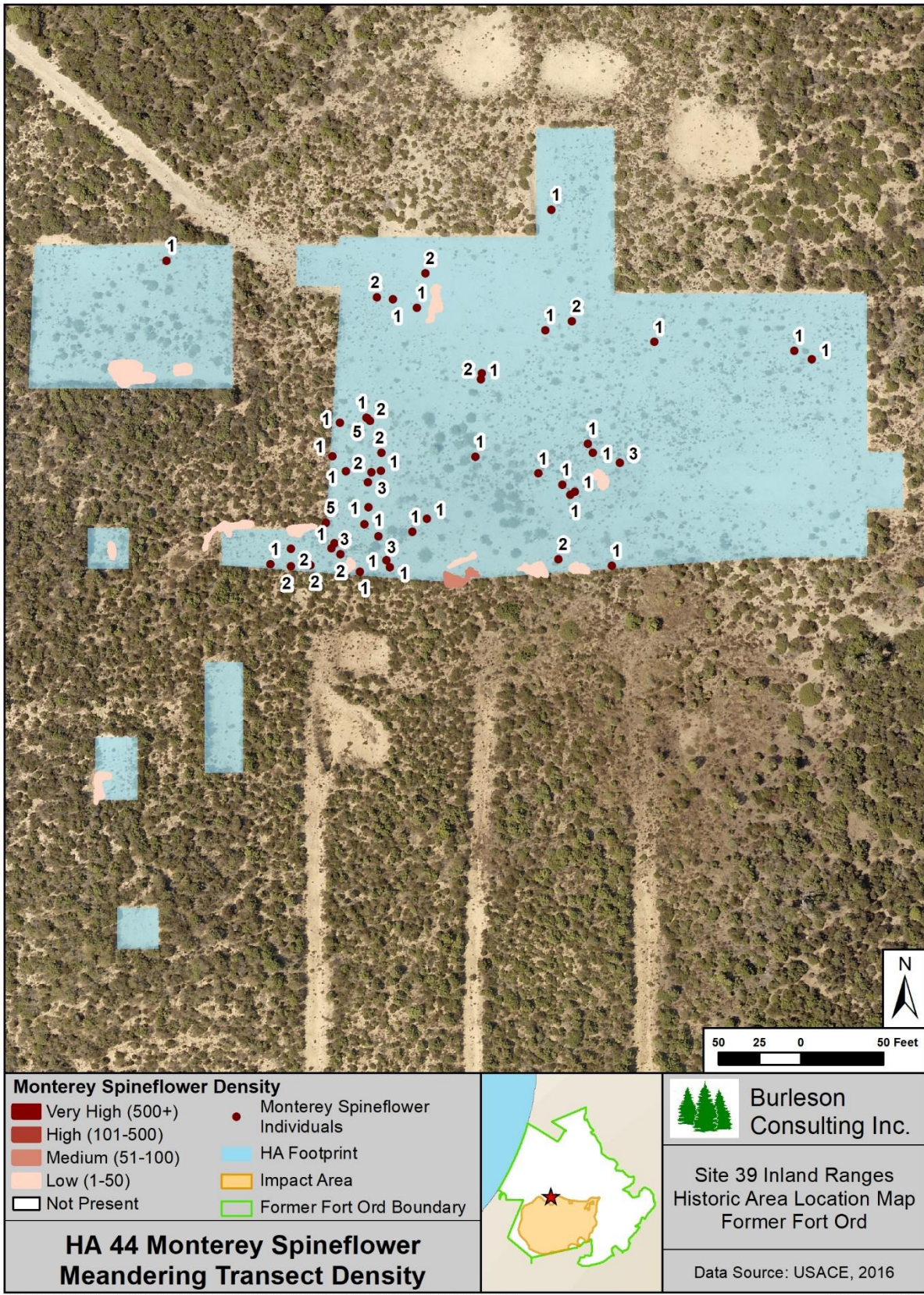
Figure 9-56. HA 44 Monterey Spineflower Meandering Transect Density Map
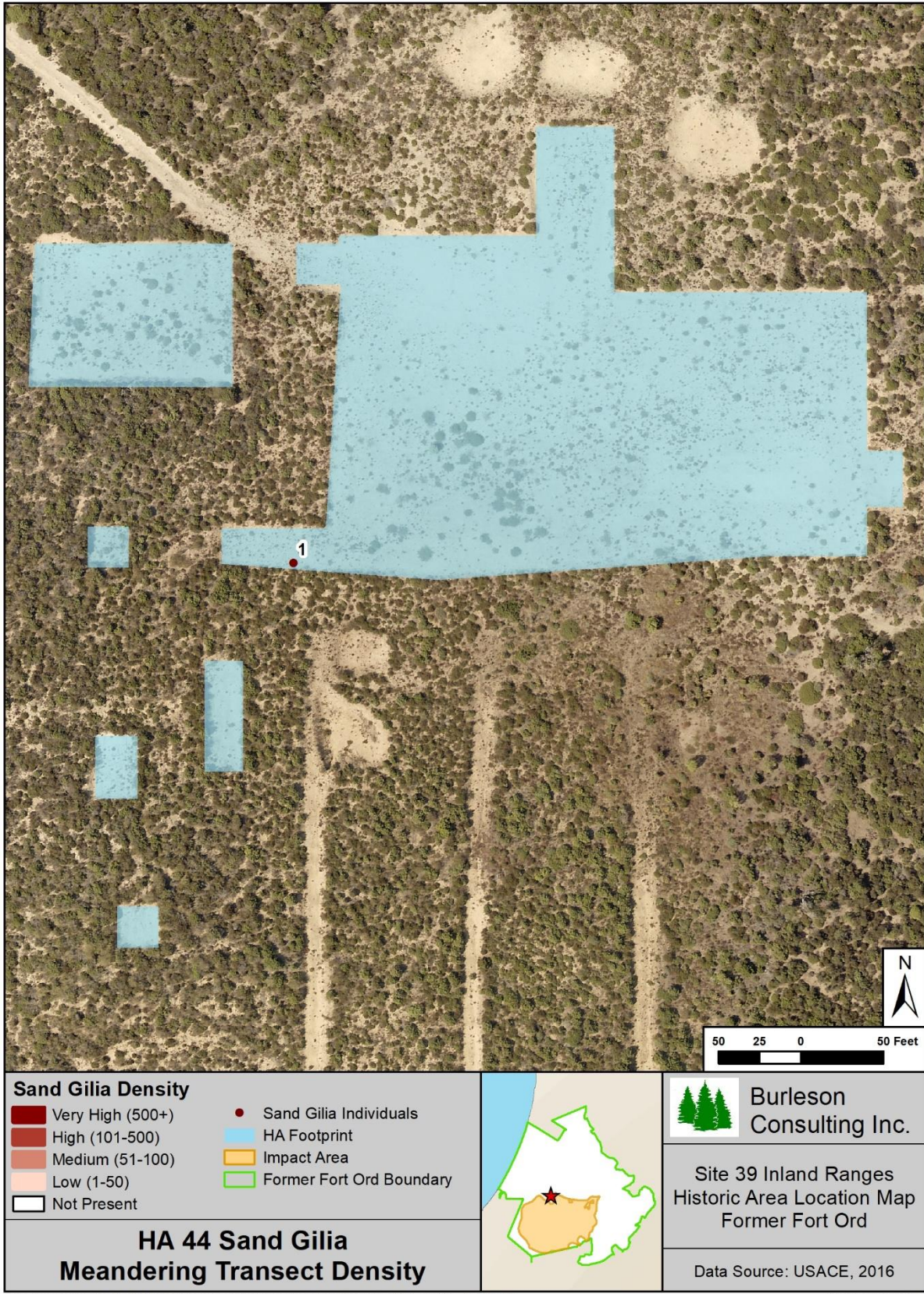
Figure 9-57. HA 44 Sand Gilia Meandering Transect Density Map
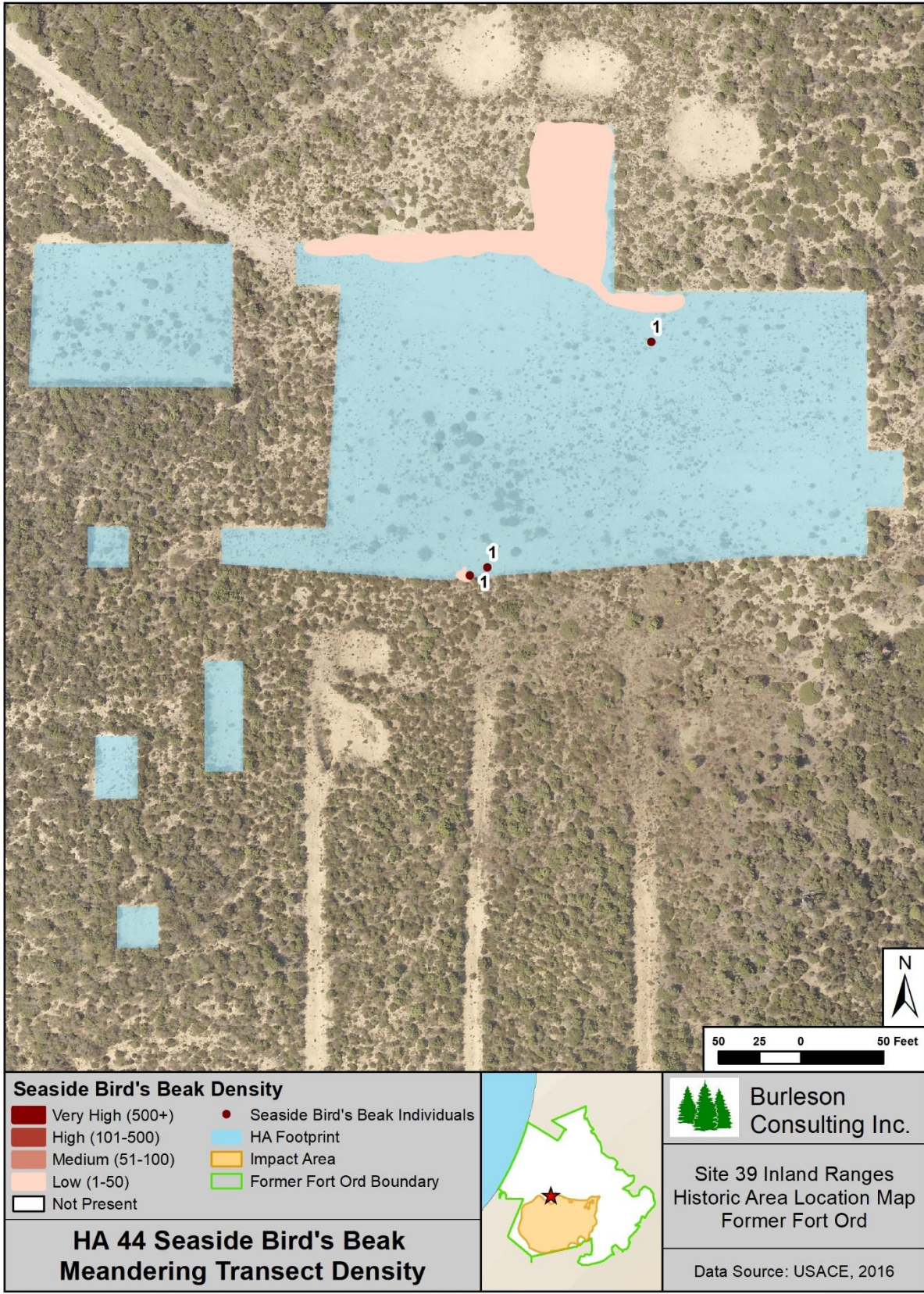
Figure 9-58. HA 44 Seaside Bird's Beak Meandering Transect Density Map

9.17.2.2 Plant Survivorship

Plant survivorship monitoring was conducted at HA 44 for plants installed in 2018. A total of eight shrub species and 86 individual plants were monitored for survivorship. By year 2 of monitoring for the 2018 planting, survivorship was 57%; survivorship decreased from 62% in 2018. Table 9-121 presents results by species.

Table 9-121. Plant Survivorship Monitoring Summary for 2018 Plantings at HA 44

Species	Planted (# ind.)	Monitored (# ind.)	Year One (2018) Alive (%)	Year Two (2019) Alive (%)
ADFA	144	14	79	71
ARPU*	40	4	100	100
ARTO	52	6	50	33
BAPI	87	9	89	89
CERI*	101	10	20	20
FRCA	300	32	63	63
LUAL	68	7	29	14
SAME	37	4	75	50
TOTAL	829	86	62	57

* HMP Species

9.17.2.3 Species Richness

Forty-nine species were observed at HA 44. Of those, 31 were native shrubs or perennials, 12 were native annual herbaceous species, five were non-native species, and one was not categorized as it was only identified to genus (see Table 9-122). Species richness decreased by one species between 2018 and 2019. Native shrub and perennial species richness increased by one, native herbaceous species richness decreased by three, non-native species richness remained the same, and uncategorized species richness increased by one.

Table 9-122. Species Observed on HA 44, 2019

Scientific Names	Common Names	Code
Achillea millefolium	common yarrow	ACMI
Acmispon glaber	deerweed	ACGL
Acmispon strigosus	Bishop's lotus	ACST
Adenostoma fasciculatum	chamise	ADFA
Agoseris apargioides	coast dandelion	AGAP
Aira caryophyllea	silver hair grass	AICA
Anaphalis margaritacea	pearly everlasting	ANMA
Arctostaphylos montereyensis*	Monterey manzanita	ARMO
Arctostaphylos pumila*	sandmat manzanita	ARPU
Arctostaphylos tomentosa	shaggy-bark manzanita	ARTO
Baccharis pilularis	coyote brush	BAPI
Bromus diandrus	ripgut brome	BRDI
Bromus madritensis ssp. *rubens*	foxtail chess	BRMAR
Calyptridium monandrum	common pussypaws	CAMO
Camissoniopsis micrantha	small primrose	CAMI
Cardionema ramosissimum	sand mat	CARA
Carex sp.	sedge	CA

Table 9-122. Species Observed on HA 44, 2019

Scientific Names	Common Names	Code
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
Corethrogyne filaginifolia	common sandaster	COFI
Crocanthemum scoparium	peak rush-rose	CRSC
Cryptantha clevelandii	Cleveland's cryptantha	CRCL
Cryptantha sp.	cryptantha	CR
Daucus pusillus	wild carrot	DAPU
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
*Erysimum ammophilum**	coast wallflower	ERAM
Eschscholzia californica	California poppy	ESCA
Eurybia radulina	roughleaf aster	EURA
Festuca bromoides	brome fescue	FEBR
Festuca myuros	rattail sixweeks grass	FEMY
Frangula californica	California coffeeberry	FRCA
Gamochaeta ustulata	purple cudweed	GAUS
Gilia tenuiflora ssp. *arenaria**	sand gilia	GITEA
Hordeum sp.	sterile barley	HO
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
Logfia sp.	cottonrose	LO
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus albifrons	silver bush lupine	LUAL
Lupinus chamissonis	silver beach lupine	LUCH
Lysimachia arvensis	scarlet pimpernel	LYAR
Madia gracilis	slender tarweed	MAGR
Madia sp.	tarweed	MA
Monardella sinuata ssp. *nigrescens*	curly-leaved monardella	MOSIN
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHAP
Orobanche californica ssp. *californica*	broomrape	ORCAC
Phacelia douglasii	Douglas phacelia	PHDO

Table 9-122. Species Observed on HA 44, 2019

Scientific Names	Common Names	Code
Plagiobothrys sp.	popcorn flower	PL
Plantago coronopus	cut-leaved plantain	PLCO
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 sp.	cudweed	PS
Pseudognaphalium stramineum	cotton-batting plant	PSST
Pteridium aquilinum var. *pubescens*	western bracken fern	PTAQP
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Schismus barbatus	old han schismus	SCBA
Sisyrinchium bellum	western blue-eyed grass	SIBE
Solanum umbelliferum	blue witch	SOUM
Stylocline gnaphaloides	everlasting neststraw	STGN
Symphoricarpos albus var. *laevigatus*	common snowberry	SYALL
Toxicodendron diversilobum	poison oak	TODI
Trifolium hirtum	rose clover	TRHI

 * HMP species

9.17.2.4 Vegetative Cover

Burleson surveyed 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 31.07%. The mean vegetative cover by native shrubs and perennials was greater in 2019 than 2018 by 7.56%. Table 9-123 summarizes vegetative cover and Table 9-124 presents vegetative cover by species. Figure 9-59 presents the percent cover of dominant species at HA 44 in 2016, 2017, 2018, and 2019.

Table 9-123. Transect Survey Summary for HA 44

Transect ID	Total Vegetative Cover (%)	Native Vegetative Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA44T01	28.88	28.88	0.00	55.52	41.94
HA44T02	33.26	33.26	0.00	32.40	49.98
Site Average	**31.07**	**31.07**	**0.00**	**43.96**	**45.96**

Table 9-124. Transect Survey Results for HA 44 by Species

Transect	ACGL (%)	ACMI (%)	ADFA (%)	ARPU* (%)	ARTO (%)	BAPI (%)	CA (%)	CEDE (%)	CERI* (%)
HA44T01	1.30	0.00	2.40	6.80	0.00	0.00	0.74	7.56	2.46
HA44T02	0.00	1.16	0.00	9.98	0.42	0.44	0.00	12.38	0.54
SITE AVERAGE	**0.65**	**0.58**	**1.20**	**8.39**	**0.21**	**0.22**	**0.37**	**9.97**	**1.50**

Table 9-124 (continued). Transect Survey Results for HA 44 by Species

Transect	COFI (%)	CRSC (%)	ERFA* (%)	HOCU (%)	LUAL/LUCH† (%)	SOUM (%)	TH (%)	BG (%)
HA44T01	0.76	0.88	1.76	4.22	0.00	0.00	55.52	41.94
HA44T02	0.00	4.90	0.00	1.12	2.12	0.20	32.40	49.98
SITE AVERAGE	**0.38**	**2.89**	**0.88**	**2.67**	**1.06**	**0.10**	**43.96**	**45.96**

* 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 data and comparison to the success criteria (see section 6.1.4).
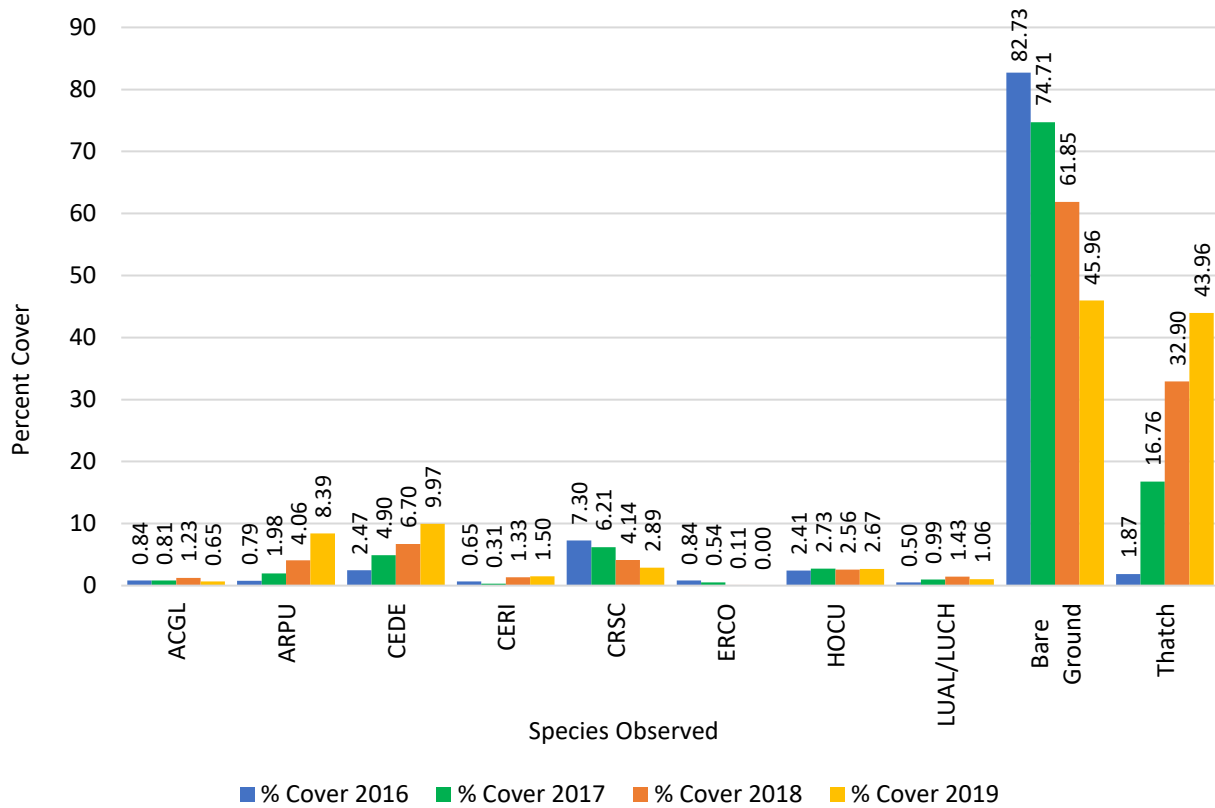
Figure 9-59. Percent Cover of Dominant Species at HA 44 in 2016, 2017, 2018, and 2019.

9.17.3 Discussion

9.17.3.1 Recommendations

HA 44 was in year 2 of monitoring in 2019. HA 44 received part of the SSRP prescription for passive restoration in 2017 and 2018. The site met five of six success criteria by 2019. The Army does not recommend establishing HMP annual restoration plots since these species are thriving throughout the site. HA 44 needs time to respond to the restoration effort and continued monitoring to evaluate areas that may require additional effort in the future. 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 3, 2020 (see Table 9-117). Table 9-125 summarizes the current status of HA 44 including which success criteria were met and recommendations.

Table 9-125. 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	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

9.17.3.2 HMP Annual Density

No restoration plots were established for HMP annuals at HA 44. However, HMP annuals were mapped as part of the meandering transect survey and all three HMP annuals met the density success criterion. Sand gilia presence decreased substantially from 2018 to 2019 due to monitoring after the typical bloom window.

9.17.3.3 Plant Survivorship

Plant survivorship was moderate for the 2018 planting at HA 44. Monterey ceanothus, shaggy-bark manzanita, 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 one more year.

9.17.3.4 Species Richness

Chamise, sandmat manzanita, shaggy-bark manzanita, Monterey ceanothus, and coffeeberry were all present. HA 44 included 31 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 19.37% cover to the HA; therefore, this success criterion was not met. In 2018, vegetative cover was 15.84%; cover increased by 3.53% (see Figure 9-60).
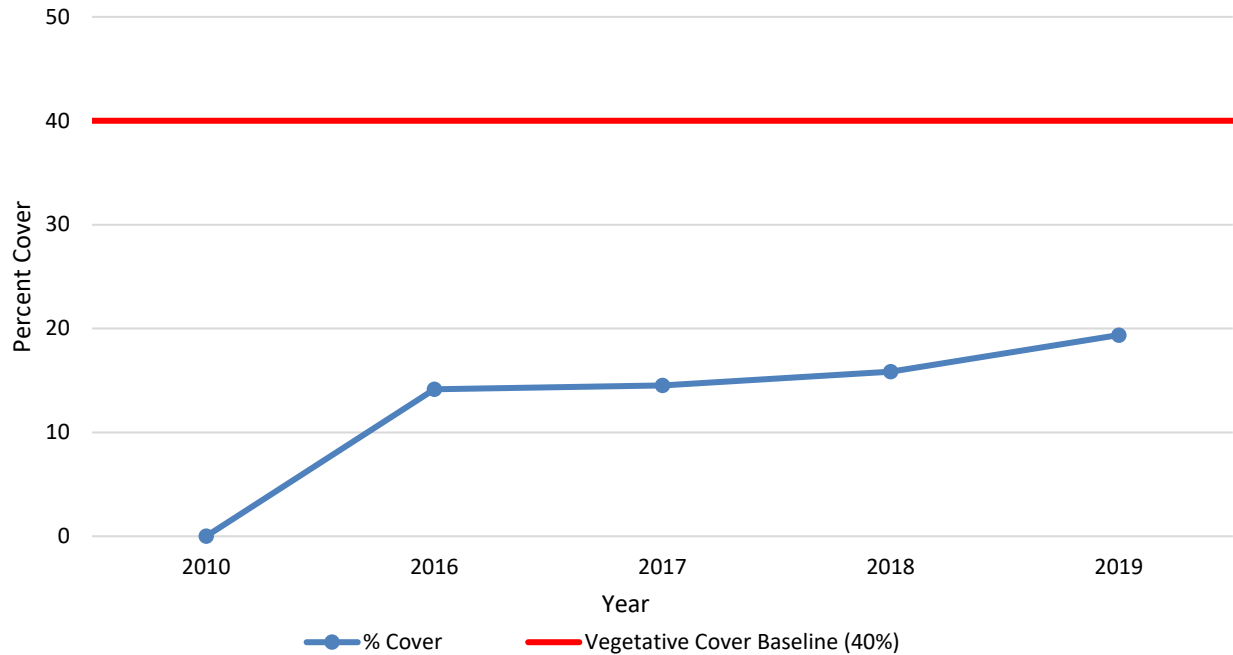
Figure 9-60. Native Vegetative Cover Compared to the Success Criterion at HA 44

Objective 2 considers the percent cover of non-native target weeds. No target weeds were encountered during the transect surveys, 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 44 provided an absolute cover of 9.89%, which increased from 5.39% in 2018; therefore, the HA met 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 8.39% and Monterey ceanothus was 1.50% (see Figure 9-61). Both sandmat manzanita and Monterey ceanothus cover increased from 2018 to 2019 and were within the acceptable limit; therefore, the success criterion was met.
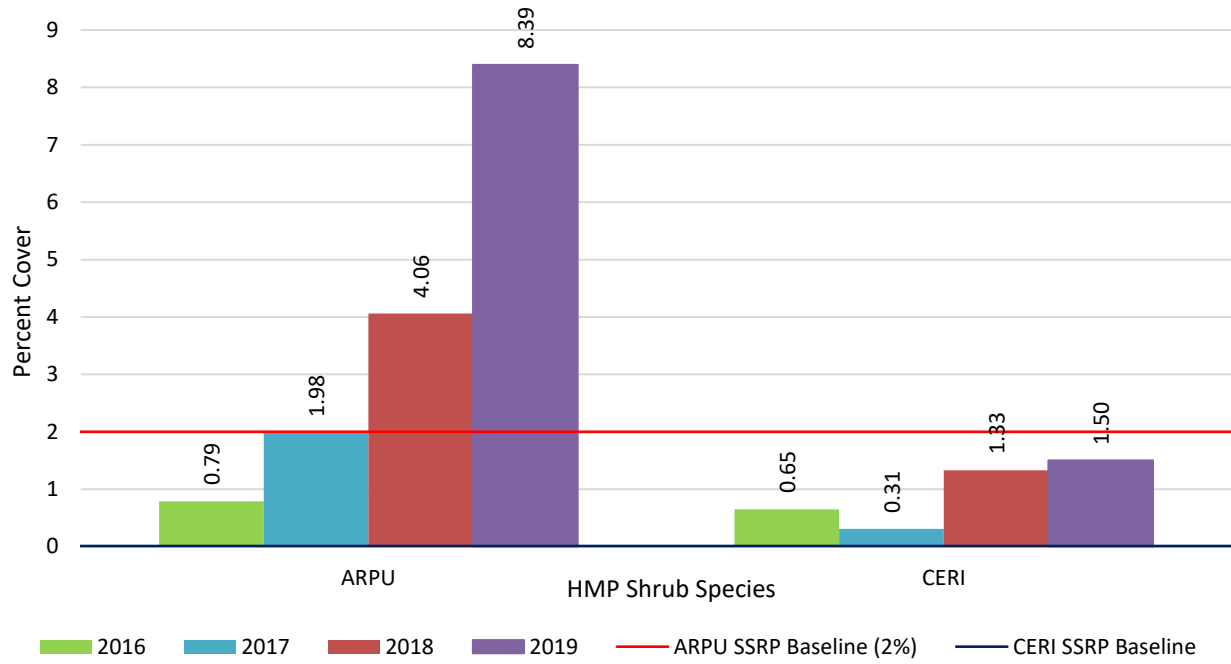
Figure 9-61. HMP Shrub Species Comparison to Success Criteria at HA 44

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 acre. HA 48 is within unprotected maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of 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. HA 48 has little potential for erosion.

Restoration at HA 48 occurred in 2019. Monitoring began in 2016. HA 48 was monitored for four years by photo documentation and site visits, HMP annual density across the HA, and species richness, and three years for vegetative cover (see Table 9-126). Figure 9-62 shows the HA footprint, passive restoration areas, and photo point monitoring locations. Success criteria for HA 48 are summarized in Table 9-127.

Table 9-126. 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
Restoration: Passive and Active				●			
Photo Points and Site Visit	●	●	●	●	●	●	●
HMP Annual Density across HA	●	●	●	●	●	●	
Species Richness	●	●	●	●	●	●	●
Vegetative Cover		●	●	●	●	●	●

Figure 9-62. HA 48 Restoration Areas and Monitoring Locations Map

Table 9-127. 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

Burleson performed passive restoration at HA 48 in 2019. The total amount of seed broadcast on site was 1.00 lb compared to 0.87 lb prescribed in the SSRP. SSRP prescription was not fulfilled at this site because it is comprised of small areas that could recover through natural recruitment; however, seed was broadcast for adaptive management in 2019. Table 9-128 summarizes the SSRP seed target and the amount of seed applied by year and species.

Table 9-128. Summary of Passive Restoration Activities for HA 48

Species	Pounds of Seed Broadcast		
	SSRP Target	2019	Total by Species
ACMI	0.10	0.15	0.15
ACGL	0.15	-	-
BAPI	0.03	-	-
CA	0.05	-	-
CERI*	0.05	-	-
CHPUP*	0.01	-	-
CRSC	0.10	-	-
ELGL	-	0.40	0.40
ERER	0.01	-	-
GITEA*	0.01	-	-
HOCU	0.15	0.20	0.20
LUAR	0.08	-	-
LUCH	0.08	-	-
SAME	0.05	-	-
STPU	-	0.25	0.25
TOTAL	0.87	1.00	1.00

 * HMP species

No active restoration was prescribed at HA 48; however, an AMP planting event occurred in 2019 per recommendations made in the 2018 Annual Report (Burleson, 2019). A total of 20 plants were installed at HA 48. Table 9-129 summarizes the plants installed during active restoration.

Table 9-129. Summary of Active Restoration Activities for HA 48

Species	Number of Individual Plants	
	2019	Total by Species
ADFA	10	10
ERCO	10	10
TOTAL	20	20

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.

Three discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 9-63). 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 0.04 acre. From 2018 to 2019, the density range decreased and acreage above the SSRP baseline remained the same.

Sand gilia was not observed at HA 48 in 2019 but was present with low density in 2018.
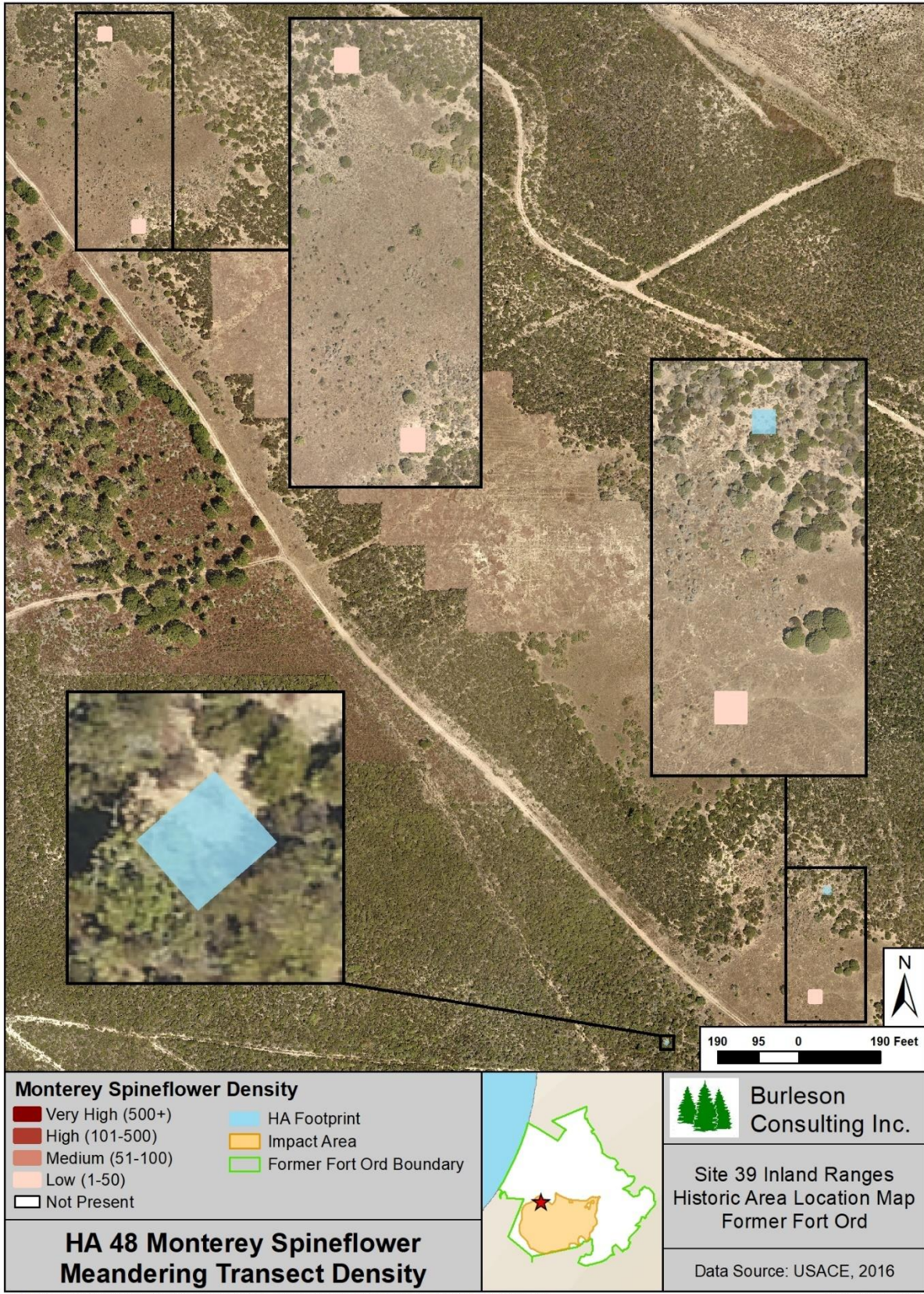
Figure 9-63. HA 48 Monterey Spineflower Meandering Transect Density Map

9.18.2.2   Plant Survivorship

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

9.18.2.3   Species Richness

Fifty-three species were observed at HA 48. Of those, 25 were native shrubs or perennials, 16 were native annual herbaceous species, and 12 were non-native species (see Table 9-130). Species richness decreased by 12 species between 2018 and 2019. Native shrub and perennial species richness increased by one, native herbaceous species richness decreased by 11, and non-native species richness decreased by two. The decrease in native herbaceous species richness is likely due to shorter than average duration of meandering transects because of UXO cleanup activities.

Table 9-130. Species Observed on HA 48, 2019

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
Avena sp.	wild oat	AV
Baccharis pilularis	coyote brush	BAPI
Briza maxima	rattlesnake grass	BRMA
Briza minor	small quaking grass	BRMI
Bromus diandrus	ripgut brome	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
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
Ceanothus thyrsiflorus	blueblossom	CETH
Cerastium glomeratum	sticky mouse-ear chickweed	CEGL
Chorizanthe diffusa	diffuse spineflower	CHDI
Chorizanthe pungens var. *pungens**	Monterey spineflower	CHPUP
Cirsium occidentale var. *candidissimum*	snowy thistle	CIOCC
Clarkia purpurea ssp. *quadrivulnera*	winecup clarkia	CLPUQ
Clarkia sp.	clarkia	CL
Corethrogyne filaginifolia	common sandaster	COFI
Crassula aquatica	water pygmy-weed	CRAQ
Crocanthemum scoparium	peak rush-rose	CRSC
Croton californicus	California croton	CRCA
Cryptantha intermedia	common cryptantha	CRIN
Cryptantha micromeres	minute-flowered cryptantha	CRMI

Table 9-130. Species Observed on HA 48, 2019

Scientific Name	Common Name	Code
Cryptantha sp.	cryptantha	CR
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
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
Festuca myuros	rattail sixweeks grass	FEMY
Festuca octoflora	sixweeks grass	FEOC
Frangula californica	California coffeeberry	FRCA
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
Koeleria macrantha	june grass	KOMA
Layia platyglossa	tidy-tips	LAPL
Lessingia pectinata	common lessingia	LEPE
Logfia filaginoides	California cottonrose	LOFI
Logfia gallica	daggerleaf cottonrose	LOGA
Logfia sp.	cottonrose	LO
Lomatium parvifolium	coastal biscuitroot	LOPA
Lupinus albifrons	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	miniature lupine	LUBI
Lupinus chamissonis	silver beach lupine	LUCH
Lupinus nanus	sky lupine	LUNA
Madia elegans	common madia	MAEL
Madia exigua	little tarweed	MAEX
Madia sativa	coast tarweed	MASA
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Petrorhagia dubia	hairypink	PEDU
Plagiobothrys sp.	popcorn flower	PL
Plantago coronopus	cut-leaved plantain	PLCO
Plantago erecta	California plantain	PLER
Pseudognaphalium californicum	California everlasting	PSCA
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pterostegia drymarioides	woodland threadstem	PTDR
Quercus agrifolia	coast live oak	QUAG
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME

Table 9-130. Species Observed on HA 48, 2019

Scientific Name	Common Name	Code
Schismus barbatus	old han schismus	SCBA
Silene gallica	small-flower catchfly	SIGA
Stylocline gnaphaloides	everlasting neststraw	STGN
Trifolium gracilentum	pinpoint clover	TRGR
Trifolium macraei	Macrae's clover	TRMA
Trifolium microcephalum	small-head clover	TRMI
Vicia sativa ssp. *nigra*	narrow-leaved vetch	VISAN

 * HMP species

9.18.2.4 Vegetative Cover

Burleson surveyed five line-intercept transects ranging from 4.5 to 11 meters in length and four associated quadrats at HA 48. The transect survey results indicated that the mean vegetative cover by native shrubs and perennials was 36.49%. The mean vegetative cover by native shrubs and perennials was greater in 2019 than 2018 by 10.92%. Quadrats were completed along a transect line when 10% or more of the transect line was herbaceous cover, in accordance with the Monitoring Protocol (Burleson, 2009). Quadrats were completed for two transects (T02 and T03) at HA 48. Table 9-131 summarizes vegetative cover, Table 9-132 presents vegetative cover by species, and Table 9-133 presents quadrat results. Figure 9-64 presents the percent cover of dominant species at HA 48 in 2017, 2018, and 2019.

Table 9-131. Transect Survey Summary for HA 48

Transect ID	Total Vegetative Cover (%)	Native Vegetative Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA48T01	63.16	63.16	0.00	77.05	14.95
HA48T02	36.36	21.73	14.64	91.09	7.64
HA48T03	43.62	38.29	5.33	100.00	0.00
HA48T04	40.71	40.71	0.00	85.86	14.14
HA48T05	54.44	54.44	0.00	100.00	0.00
Site Average*	**46.78**	**41.67**	**5.11**	**90.24**	**7.65**

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

Table 9-132. Transect Survey Results for HA 48 by Species

Transect	ACGL (%)	AICA (%)	ARPU* (%)	CA (%)	COFI (%)	CRSC (%)	ERCA (%)	ERER (%)	ESCA (%)
HA48T01	1.79	0.00	59.16	0.00	0.00	0.00	0.00	0.00	0.00
HA48T02	0.00	14.64	0.00	0.00	0.00	0.00	0.00	11.09	0.00
HA48T03	19.81	0.00	0.00	0.00	0.00	0.00	0.95	0.00	3.52
HA48T04	0.00	0.00	35.14	2.29	1.43	1.86	0.00	0.00	0.00
HA48T05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SITE AVERAGE	**5.29**	**3.79**	**19.01**	**0.38**	**0.24**	**0.31**	**0.24**	**2.87**	**0.87**

 * HMP species

Table 9-132 (continued). Transect Survey Results for HA 48 by Species

Transect	HEGR (%)	HOCU (%)	LEPE (%)	LUAR (%)	QUAG (%)	RUAC (%)	TH (%)	BG (%)
HA48T01	0.00	2.21	0.00	0.00	0.00	0.00	77.05	14.95
HA48T02	0.00	0.00	10.64	0.00	0.00	0.00	91.09	7.64
HA48T03	5.33	0.00	0.00	8.67	0.00	5.33	100.00	0.00
HA48T04	0.00	0.00	0.00	0.00	0.00	0.00	85.86	14.14
HA48T05	0.00	0.00	0.00	0.00	54.44	0.00	100.00	0.00
SITE AVERAGE	**1.32**	**0.49**	**2.75**	**2.14**	**5.76**	**1.32**	**90.24**	**7.65**
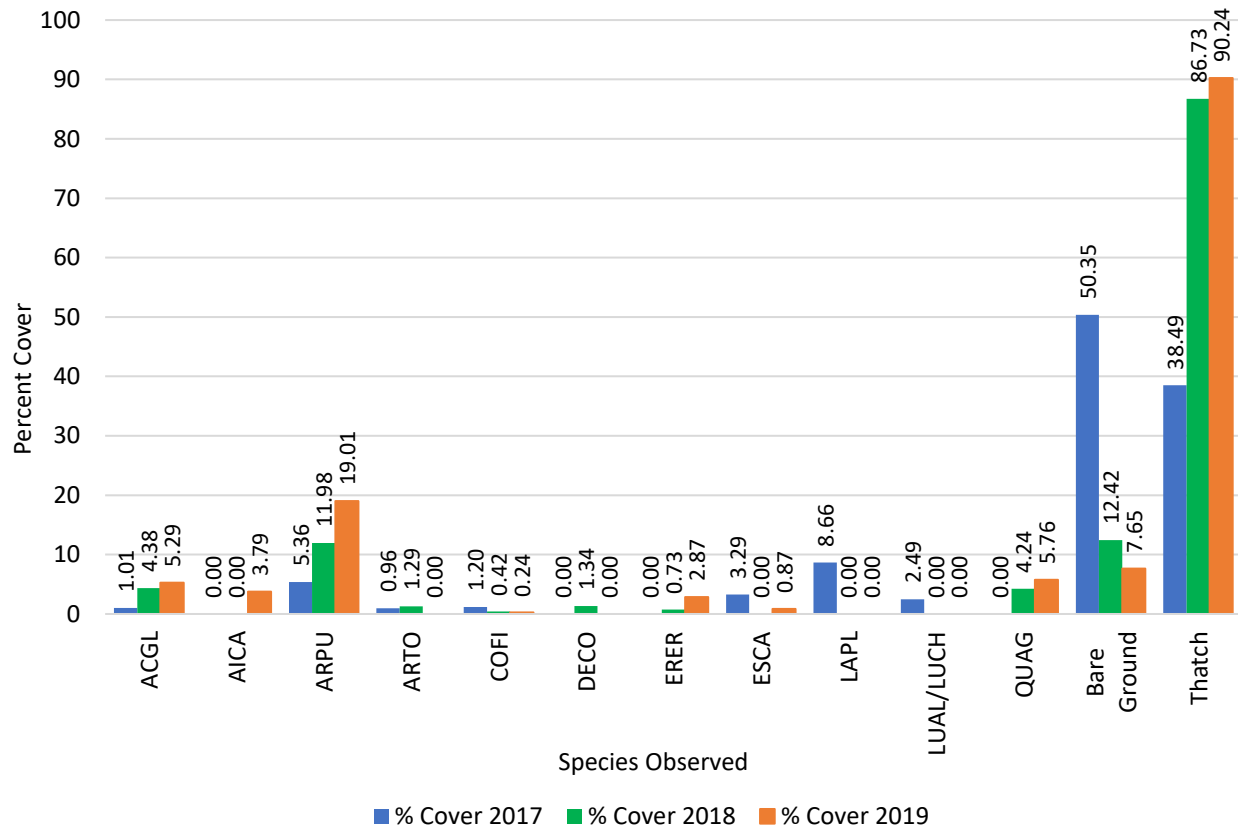
Figure 9-64. Percent Cover of Dominant Species at HA 48 in 2017, 2018, and 2019.

Table 9-133. Quadrat Summary for HA 48 Transects T02 and T03

Quadrat	Total Vegetative Cover (%)	Native Shrub and Perennial Cover (%)	Native Herbaceous Cover (%)	Non-Native Vegetative Cover (%)	Thatch (%)	Bare Ground (%)
HA48T02Q01	13	0	12	1	18	69
HA48T02Q02	56	1	24	31	22	22
HA48T03Q01	14	1	12	1	85	1
HA48T03Q02	54	20	11	23	41	5
SITE AVERAGE	**34**	**6**	**15**	**14**	**42**	**24**

9.18.3 Discussion

9.18.3.1 Recommendations

HA 48 was in year 4 of monitoring in 2019 and has responded well to natural recruitment. The site met three of six success criteria by 2019. SSRP restoration activities have not occurred at HA 48. Per recommendations in the 2016 Annual Habitat Restoration Report, chamise was planted in the 2018/2019 season to support the species richness criterion (Burleson, 2017). The Army does not recommend applying the SSRP prescription for HMP annuals at this time since HMP annual densities met the success criteria in 2018. Additionally, the Army recommends seeing how the site recovers from partial mastication before recommending planting Monterey ceanothus. 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 5, 2020. Table 9-134 summarizes the current status of HA 48 including which success criteria were met and recommendations.

Table 9-134. Status and Recommendations for Achieving Success Criteria at HA 48

Success Criterion	Category	Met or Exceeded	Recommendation
Objective 1 – No. 1	Species richness	Yes	None
Objective 1 – No. 2	Native vegetation cover	No	Wait to see how the HA responds
Objective 2 – No. 3	Non-native target weed cover	Yes	None
Objective 3 – No. 4	HMP shrub cover	Yes	None
Objective 3 – No. 4	HMP shrub cover by species	No	Wait to see how the HA responds
Objective 3 – No. 4	HMP annual density	No	Establishment of restoration plots not necessary; monitor sand gilia during peak bloom

* 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 met the density success criterion but sand gilia did not. Sand gilia was present historically; the absence is likely due to the survey being conducted later than the typical bloom window for sand gilia because of logistical issues.

9.18.3.3 Plant Survivorship

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

9.18.3.4 Species Richness

Chamise, sandmat manzanita, shaggy-bark manzanita, Monterey ceanothus, peak rush-rose, wedge-leaved horkelia, silver bush lupine, and black sage were present. HA 48 included 25 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 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 30.49% cover to the HA. This success criterion was not met. In 2018, vegetative cover was 19.62%; cover increased by 10.87% (see Figure 9-65).
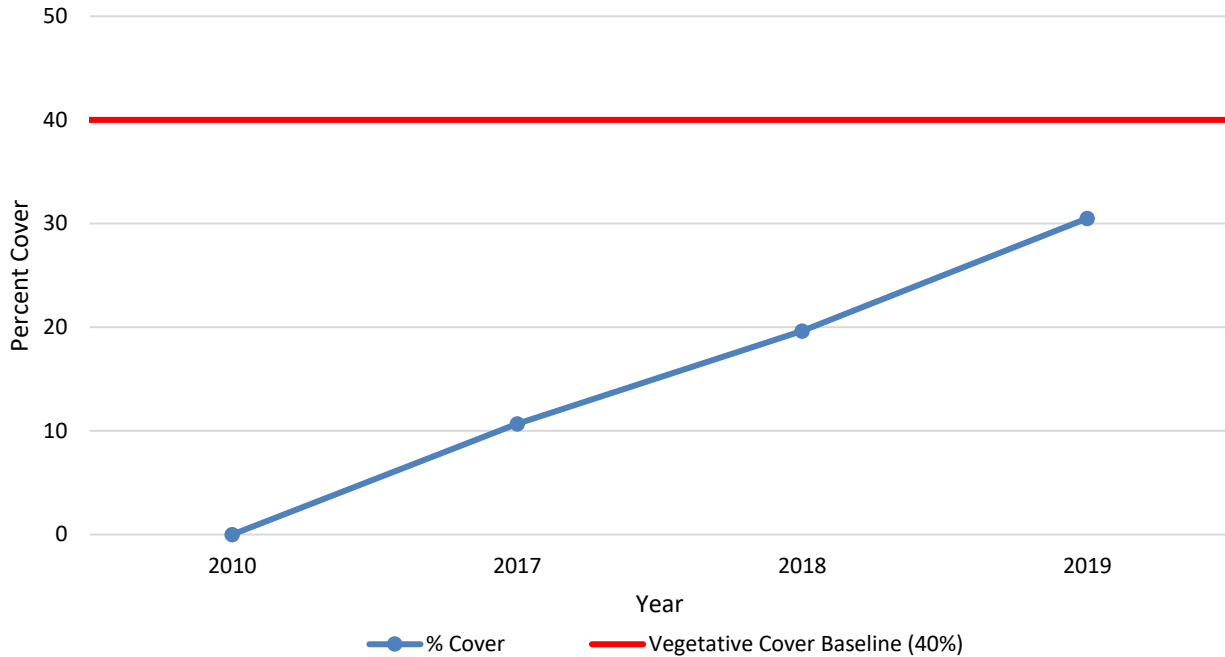
Figure 9-65. Native Vegetative Cover Compared to the Success Criterion at HA 48

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 19.01%; therefore, the HA met this success criterion. This was an increase from 12.54% in 2018. 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 19.01% and Monterey ceanothus was 0.00% (see Figure 9-66). Monterey ceanothus decreased in cover from 2018 to 2019 by 0.56% and was not observed on transects in 2019. Only sandmat manzanita met the acceptable limit; therefore, the success criterion was not met.
The decrease in Monterey ceanothus cover may be due to UXO cleanup activities. The area containing transect T01 was partially masticated, requiring replacement of the transect endpoint. The accuracy of the GPS unit used during replacement has an accuracy of ±1.0 m, which could cause the transect line to fall in a slightly different location. It is also possible that the Monterey ceanothus that was previously on the transect line was masticated. Monterey ceanothus was still present in the restoration area.
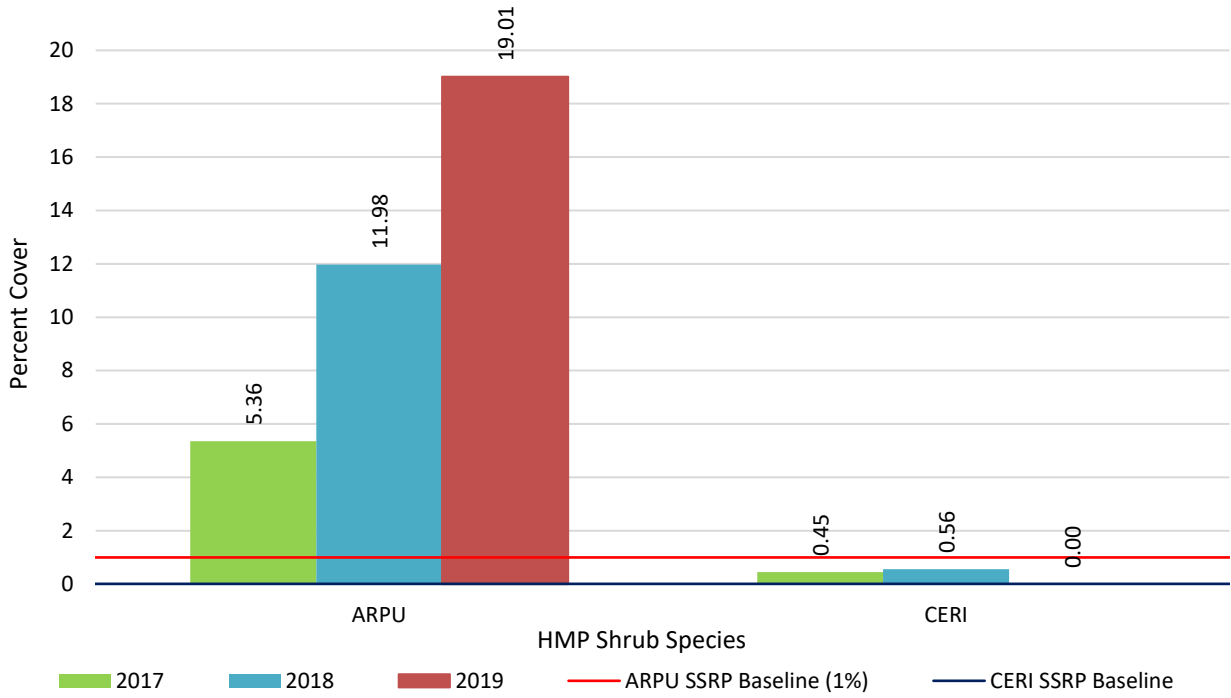
Figure 9-66. HMP Shrub Species Comparison to Success Criteria at HA 48

9.19   Austin Road Stockpile

Austin Road Stockpile encompasses about 0.45 acre 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 removed. The Austin Road Stockpile rests within maritime chaparral with mean annual temperatures ranging between 56° and 58°F and regular fog typical of 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 four years by photo documentation and site visits, HMP annual density across the HA, and species richness (see Table 9-135). Figure 9-67 shows the site footprint, passive restoration area, and photo point monitoring locations. The success criteria for Austin Road Stockpile are summarized in Table 9-136.

Table 9-135. 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	●	●	●	●	●	●	●
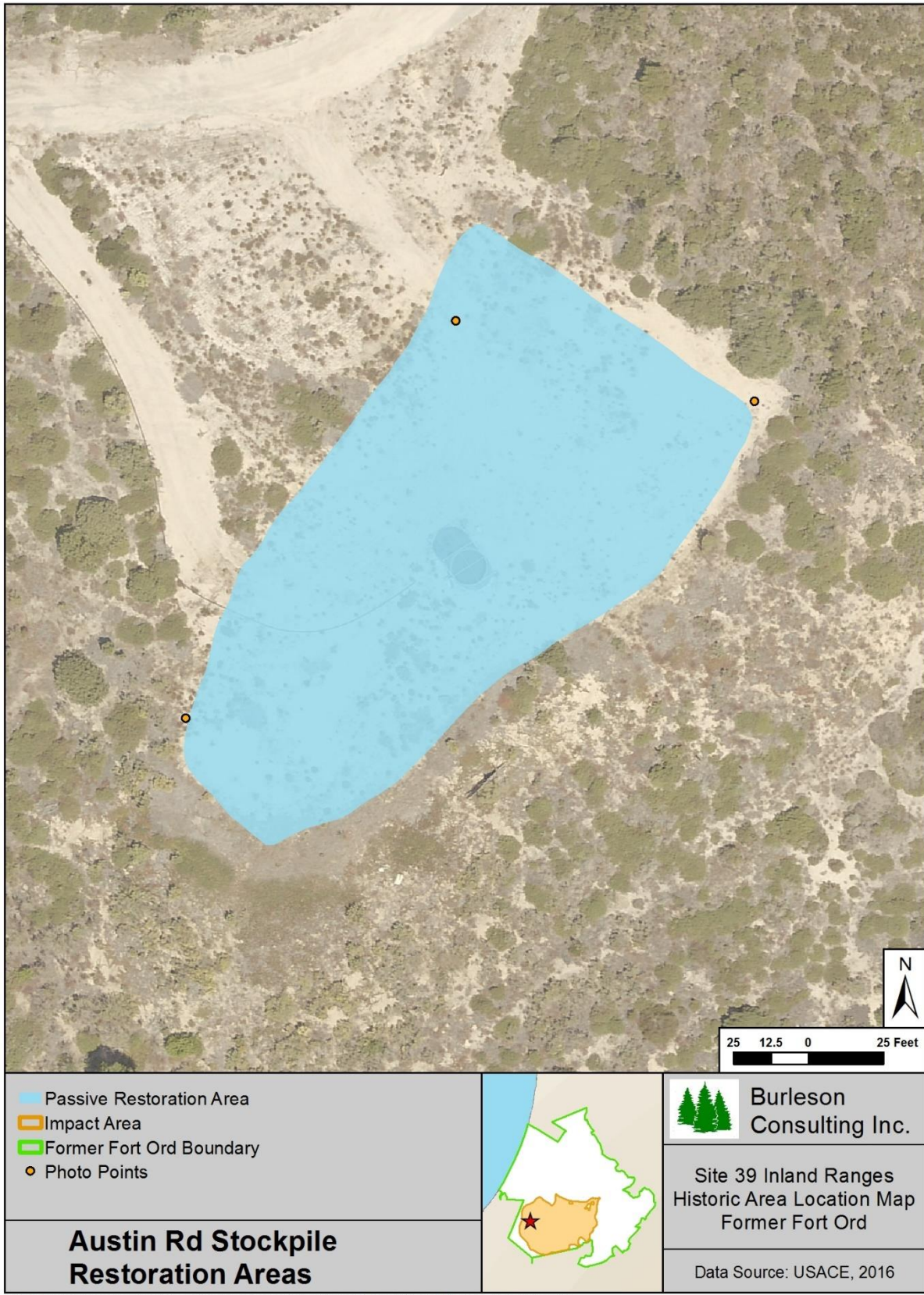
Figure 9-67. Austin Road Stockpile Restoration Areas and Monitoring Locations Map

Table 9-136. 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 9-136. 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 2019.

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.

Three discrete patches of Monterey spineflower were mapped and individuals counted within each patch (see Figure 9-68). 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 0.03 acre. From 2018 to 2019, the density range remained the same and acreage above the SSRP baseline decreased.

Sand gilia was not observed at Austin Road Stockpile in 2019 but has previously been observed on site in 2017.
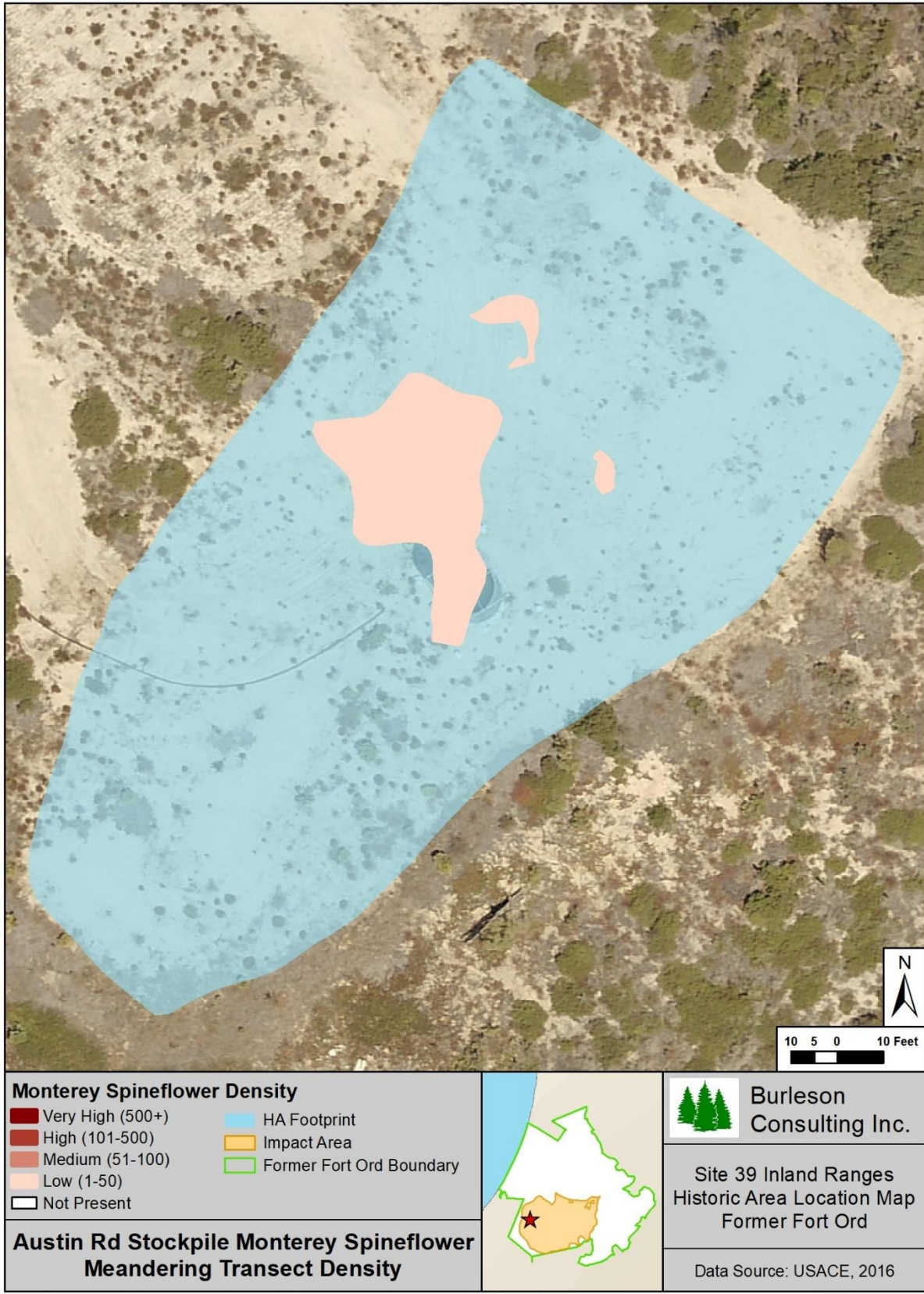
Figure 9-68. Austin Road Stockpile Monterey Spineflower Meandering Transect Density Map

9.19.2.2 Plant Survivorship

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

9.19.2.3 Species Richness

Forty-two species were observed at Austin Road Stockpile. Of those, 23 were native shrubs or perennials, 6 were native annual herbaceous species, 12 were non-native species, and one was not categorized as it was only identified to genus (see Table 9-137). Species richness decreased by four species between 2018 and 2019. Native shrub and perennial species richness increased by three, native herbaceous species richness decreased by four, non-native species richness decreased by four, and uncategorized species richness increased by one.

Table 9-137. Species Observed at Austin Road Stockpile, 2019

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 hookeri*	Hooker's manzanita	ARHO
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 diandrus	ripgut brome	BRDI
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
Ceanothus rigidus*	Monterey ceanothus	CERI
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
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
Erodium botrys	long-beaked filaree	ERBO
Erodium cicutarium	red-stemmed filaree	ERCI
Festuca myuros	rattail sixweeks grass	FEMY
Gamochaeta ustulata	purple cudweed	GAUS

Table 9-137. Species Observed at Austin Road Stockpile, 2019

Scientific Name	Common Name	Code
Gastridium phleoides	nit grass	GAPH
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
Lupinus albifrons	silver bush lupine	LUAL
Lupinus arboreus	yellow bush lupine	LUAR
Lupinus bicolor	miniature lupine	LUBI
Lupinus chamissonis	silver beach lupine	LUCH
Lupinus concinnus	bajada lupine	LUCO
Lupinus nanus	sky lupine	LUNA
Lupinus truncatus	Nuttall's annual lupine	LUTR
Lysimachia arvensis	scarlet pimpernel	LYAR
Navarretia hamata ssp. *parviloba*	hooked navarretia	NAHA
Navarretia sp.	navarretia	NA
Orobanche californica ssp. *californica*	broomrape	ORCAC
Petrorhagia dubia	hairypink	PEDU
Plantago erecta	California plantain	PLER
Pseudognaphalium beneolens	fragrant everlasting	PSBE
Pseudognaphalium ramosissimum	pink everlasting	PSRA
Pseudognaphalium sp.	cudweed	PS
Pseudognaphalium stramineum	cotton-batting plant	PSST
Rumex acetosella	sheep sorrel	RUAC
Salvia mellifera	black sage	SAME
Silene gallica	small-flower catchfly	SIGA
Toxicodendron diversilobum	poison oak	TODI

 * 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 SSRP prescriptions activities by 2019. 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 2020 by photo documentation, HMP annual density surveys, and species richness meandering transects. Table 9-138 summarizes the current status of Austin Road Stockpile including which success criteria were met and recommendations.

Table 9-138. 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

Deerweed, chamise, sandmat manzanita, shaggy-bark manzanita, coyote brush, Monterey spineflower, peak rush-rose, sticky monkeyflower, golden yarrow, mock heather, wedge-leaved horkelia, silver bush lupine, and black sage were present. Common yarrow, Hooker's manzanita, and Monterey ceanothus were not present. Austin Road Stockpile included 23 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 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 7 for monitoring, depending on when the restoration effort took place. Historic Areas 28, 34, 37, and 38 were 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, 27, 27A, 28, 29, 33, 34, 36, 38, 39/40, and 43. 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, 13 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 one 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 9-139 summarizes the status of Site 39 in meeting the success criteria.

The Army recommends the following changes to monitoring and the success criteria:
- HA 34 – reevaluate shrub cover success criteria
- 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 9-139. 2019 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	7	No	Yes	Yes	Yes	No	Yes
19	6	No	No	Yes	Yes	No	Yes
22	7	No	Yes	Yes	No	No	Yes
23	7	Yes	No	Yes	Yes	No	Yes
26	4	Yes	No	Yes	No	No	Yes
27	7	Yes	No	Yes	No	No	NA
27A	7	Yes	No	Yes	No	No	NA
28	**5**	**Yes**	**No**	**Yes**	**Yes**	**No**	**Yes**
29	7	No	No	Yes	No	No	NA
33	7	No	No	Yes	No	No	No
34	**5**	**Yes**	**Yes**	**Yes**	**No**	**No**	**NA**
36	7	Yes	No	Yes	No	No	NA
37	**5**	**Yes**	**No**	**Yes**	**No**	**No**	**Yes**
38	**5**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**
39/40	7	Yes	No	Yes	NA	NA	Yes
43	7	Yes	No	Yes	Yes	No	No
44	2	Yes	No	Yes	Yes	Yes	Yes
48	4	Yes	No	Yes	Yes	No	No
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.

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 Ranges held on February 2, 2019 and July 13, 2019. 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-63 and C-64, 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 evaluated 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 Ninth Annual Site 39 Habitat Restoration and Habitat Monitoring Meeting was held at the BRAC conference room on March 27, 2019, at former Fort Ord, California. Participants included Chenega Support Services, USFWS, California Department of Fish and Wildlife, US Environmental Protection Agency, Department of Toxic Substances Control, USACE, BRAC, Bureau of Land Management, Fort Ord Reuse Authority, Burleson Consulting 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 2018 calendar year and the overall status of restoration progress.

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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	-	0.38	0.39
Ceanothus rigidus *	Monterey ceanothus	26	1.00	1.07
Ceanothus rigidus *	Monterey ceanothus	33	0.10	0.26
Ceanothus rigidus *	Monterey ceanothus	37	0.50	0.84
Chorizanthe pungens var. *pungens* *	Monterey spineflower	26	0.21	0.32
Chorizanthe pungens var. *pungens* *	Monterey spineflower	33	0.01	0.02
Crocanthemum scoparium	peak rush-rose	-	1.18	1.95
Diplacus aurantiacus	sticky monkey flower	-	0.63	1.35
Ericameria fasciculata *	Eastwood's goldenbush	26	0.10	0.10
Ericameria fasciculata *	Eastwood's goldenbush	33	0.01	0.01
Ericameria fasciculata *	Eastwood's goldenbush	37	0.10	0.11
Eriophyllum confertiflorum	golden yarrow	-	1.66	2.16
Frangula californica	California coffeeberry	-	0.15	0.15
Garrya elliptica	coast silk tassel	-	0.65	1.46
Lupinus chamissonis	silver beach lupine	-	0.38	0.59
Lupinus nanus	sky lupine	-	0.50	0.28
Salvia mellifera	black sage	-	2.00	2.23
TOTAL			**9.56**	**13.29**

* HMP species

Table A-2. Production Seed Targets and Inventory

Scientific Name	Common Name	HA	Target Amount (lb)	Inventory (lb)
Achillea millefolium	common yarrow	-	3.07	191.46
Acmispon glaber	deerweed	-	6.80	61.89
Elymus glaucus	blue wildrye	-	10.30	555.79
Hordeum sp.	sterile barley	-	16.00	58.00
Horkelia cuneata	wedge-leaved horkelia	-	9.20	0.00
Stipa pulchra	purple needlegrass	-	7.00	20.08
TOTAL			**52.37**	**887.22**

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	9/12/2019	97.79	76.00	74.32	1,695,542
Acmispon glaber	deerweed	10/29/2019	63.88	83.00	53.02	N/A*
Elymus glaucus	blue wildrye	9/27/2018	96.68	91.00	87.98	92,672
Stipa pulchra	purple needlegrass	9/4/2019	99.53	65.00	93.56	87,104

* Information not tested by S&S Seeds

Table A-4. Plant Propagation Inventory

Scientific Name	Common Name	HA 18 (# individuals)	HA 19 (# individuals)	HA 26 (# individuals)	HA 33 (# individuals)	HA 36 (# individuals)	HA 37 (# individuals)
Achillea millefolium	common yarrow	-	-	125	2	10	35
Acmispon glaber	deerweed	-	-	175	11	80	33
Adenostoma fasciculata†	chamise	-	-	134	78	20	50
Arctostaphylos pumila†*	sandmat manzanita	30	400	125	-	-	25
Arctostaphylos hookeri†*	Hooker's manzanita	-	-	-	3	30	19
Arctostaphylos montereyensis†*	Monterey manzanita	-	-	-	3	30	33
Arctostaphylos tomentosa ssp. *tomentosa†*	shaggy-bark manzanita	-	-	138	3	30	95
Artemisia californica	California sagebrush	-	-	-	29	20	-
Baccharis pilularis	coyote brush	-	-	61	58	20	25
*Ceanothus rigidus**	Monterey ceanothus	30	-	125	4	37	32
Crocanthemum scoparium	peak rush-rose	-	-	200	11	56	33
Diplacus aurantiacus	sticky monkey flower	-	-	125	7	50	33
*Ericameria fasciculata**	Eastwood's goldenbush	30	-	100	-	-	-
Eriophyllum confertiflorum	golden yarrow	-	-	100	6	-	25
Frangula californica	California coffeeberry	-	-	-	10	-	-
Garrya elliptica	coast silk tassel	-	-	-	9	-	25
Horkelia cuneata	wedge-leaved horkelia	-	-	175	11	56	33
Lepechinia calycina	pitcher sage	-	-	-	25	-	-
Lupinus arboreus	yellow bush lupine	-	-	15	4	20	33
Lupinus chamissonis	silver beach lupine	-	-	-	-	-	33
Salvia mellifera	black sage	-	-	125	6	50	40
TOTAL		**90**	**400**	**1,723**	**280**	**509**	**602**

* HMP species

† Species propagated via cuttings

APPENDIX B

Restoration Activities

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Table B-1. HA 18 AMP Production Seed Mix (Feb 2019). Seed Broadcast Occurred Throughout Site.

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.3
Elymus glaucus **(blue wild-rye)**	0.8
Horkelia cuneata **(wedge-leaved horkelia)**	0.4
Stipa pulchra **(purple needlegrass)**	0.5
TOTAL	**2.0**

Table B-2. HA 23 AMP Production Seed Mix (Feb 2019). Seed Broadcast Occurred Throughout Site.

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.3
Elymus glaucus **(blue wild-rye)**	0.8
Horkelia cuneata **(wedge-leaved horkelia)**	0.4
Stipa pulchra **(purple needle grass)**	0.5
TOTAL	**2.0**
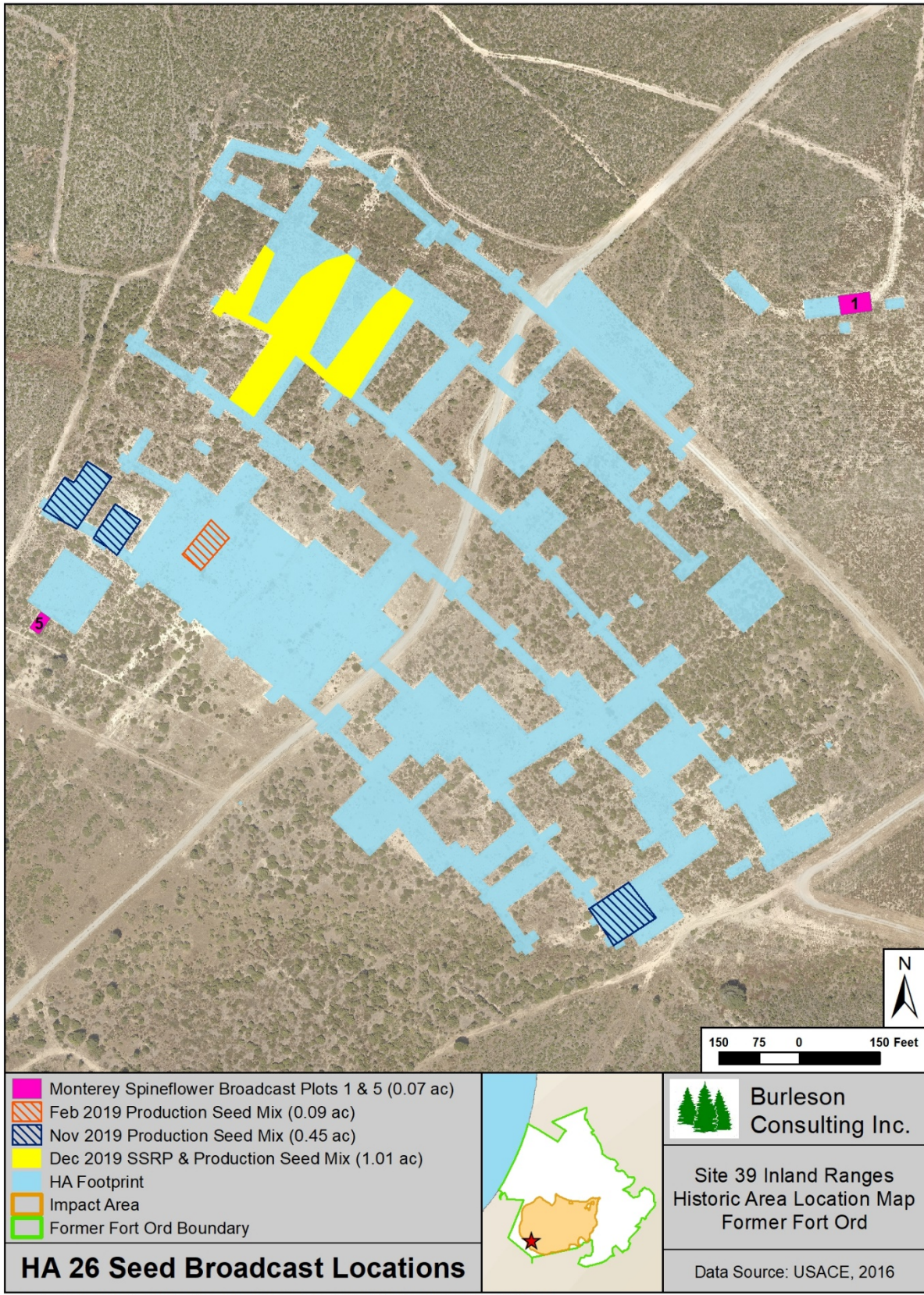
Figure B-1. HA 26 Seed Broadcast Locations, Former Fort Ord

Table B-3. HA 26 SSRP Seed Mix Enhanced with Production Seed (Dec 2019)

Species	Amount (lb)
Achillea millefolium† (common yarrow)	2.0
Acmispon glaber (deerweed)	5.0
Baccharis pilularis (coyote brush)	0.2
Ceanothus rigidus* (Monterey ceanothus)	1.0
Crocanthemum scoparium (peak rush-rose)	0.8
Diplacus aurantiacus (sticky monkeyflower)	0.5
Elymus glaucus† (blue wild-rye)	8.0
Ericameria fasciculata* (Eastwood's golden fleece)	0.1
Eriophyllum confertiflorum (golden yarrow)	1.0
Frangula californica (California coffeeberry)	0.15
Garrya elliptica (coast silk tassel)	0.15
Hordeum sp. (sterile barley)	10.0
Salvia mellifera (black sage)	1.0
Stipa pulchra† (purple needlegrass)	5.0
TOTAL	**34.9**

*HMP species
†production seed

Table B-4. HA 26 Production Seed Mix (Feb and Nov 2019)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	1.8
Acmispon glaber **(deerweed)**	2.0
Elymus glaucus **(blue wild-rye)**	4.8
Horkelia cuneata **(wedge-leaved horkelia)**	0.4
Stipa pulchra **(purple needle grass)**	3.0
TOTAL	**12.0**

Table B-5. HA 26 Monterey Spineflower Seed Broadcast

Plot Name	Plot ID	Plot Area (ft^2)	Date Broadcast	Amount (lb)
1	HA26_CHPUP_01	519	Dec 2019	0.105
5	HA26_CHPUP_05	910	Dec 2019	0.105
TOTAL				**0.210**

Table B-6. HA 27 AMP Production Seed Mix (Feb 2019). Seed Broadcast Occurred Throughout Site.

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.15
Elymus glaucus **(blue wild-rye)**	0.40
Horkelia cuneata **(wedge-leaved horkelia)**	0.20
Stipa pulchra **(purple needle grass)**	0.25
TOTAL	**1.00**
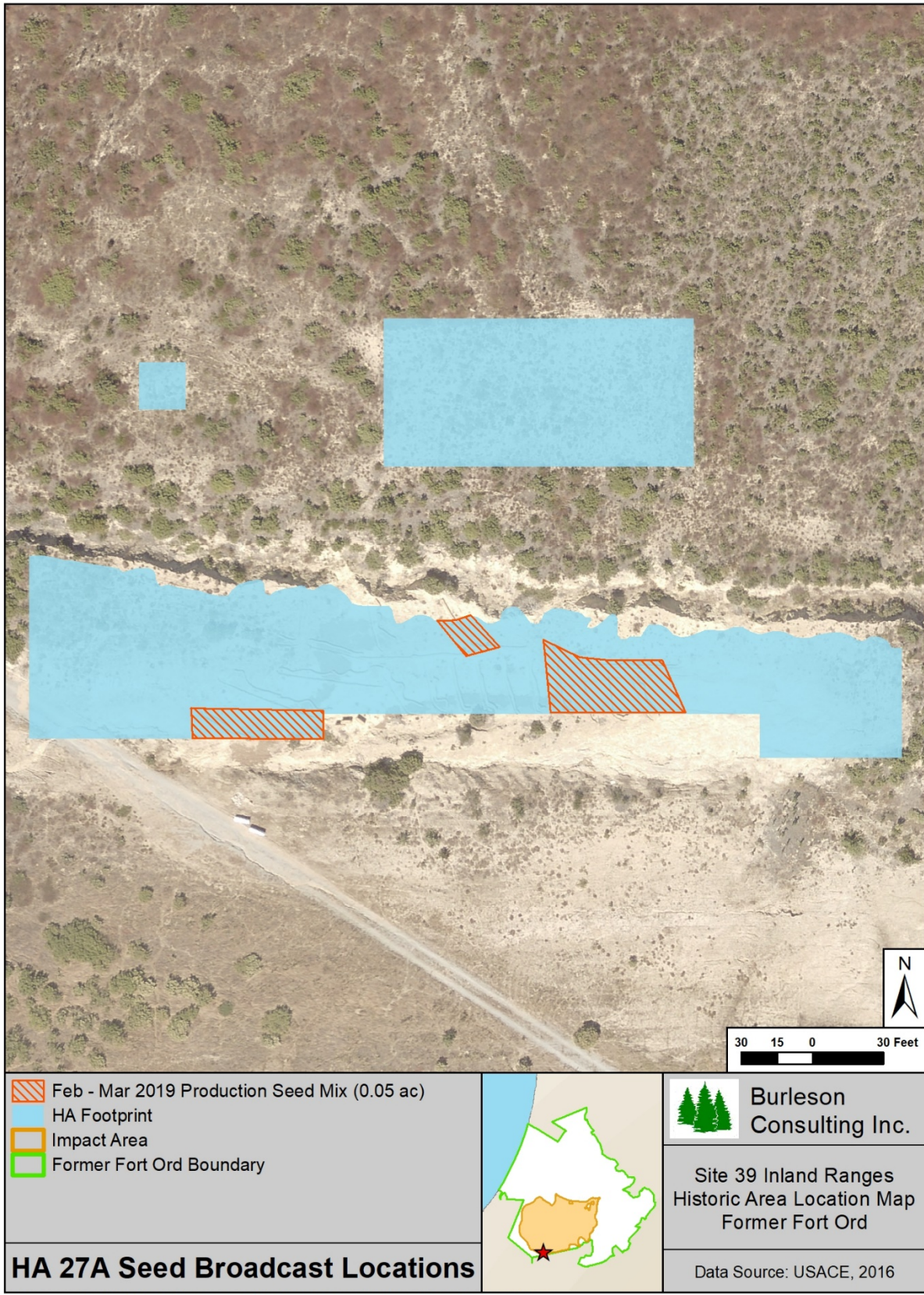
Figure B-2. HA 27A Seed Broadcast Locations, Former Fort Ord

Table B-7. HA 27A Production Seed Mix (Feb – Mar 2019)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.6
Elymus glaucus **(blue wild-rye)**	1.6
Horkelia cuneata **(wedge-leaved horkelia)**	0.8
Stipa pulchra **(purple needle grass)**	1.0
TOTAL	**4.0**
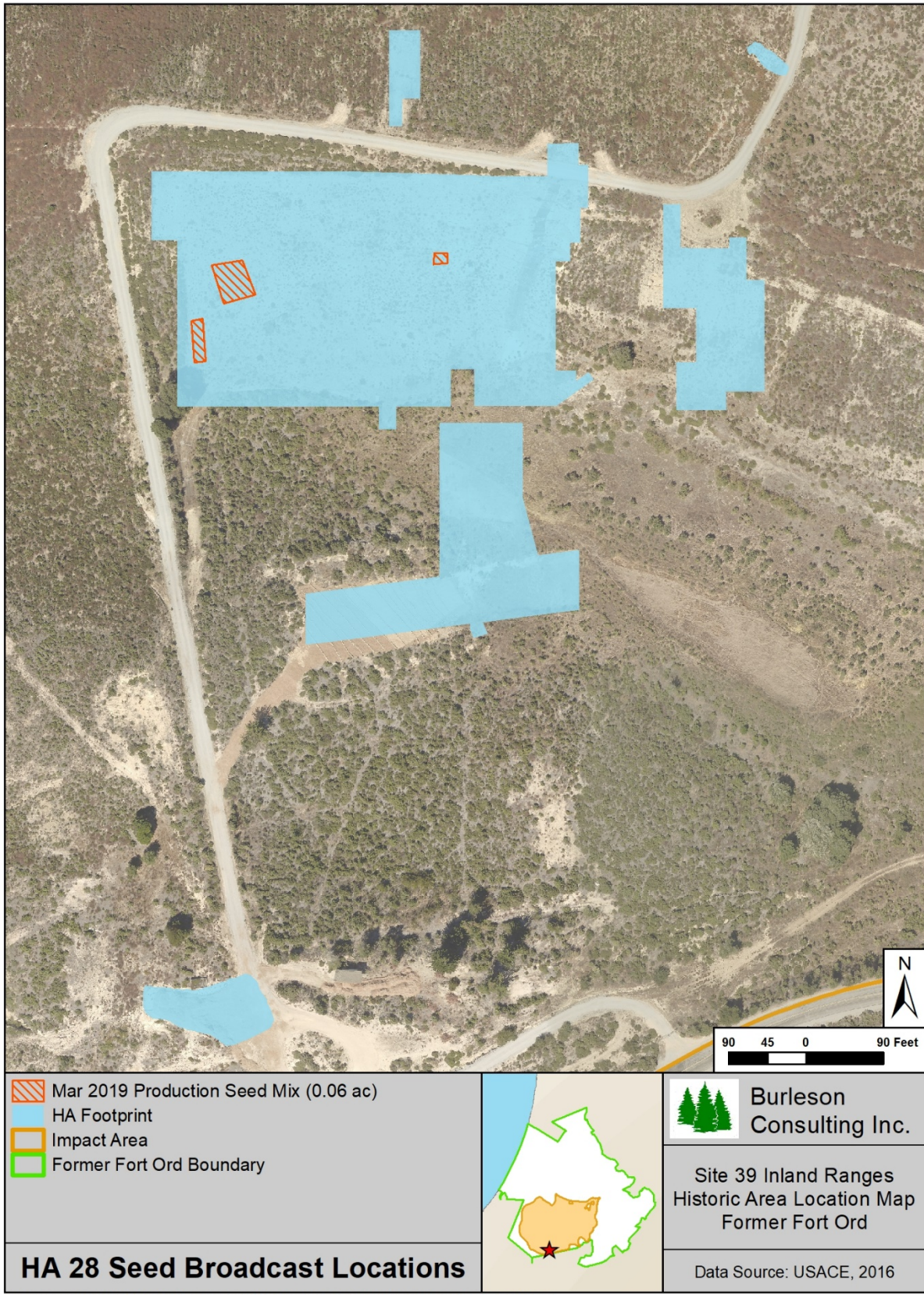
Figure B-3. HA 28 Seed Broadcast Locations, Former Fort Ord

Table B-8. HA 28 Production Seed Mix (Mar 2019)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.3
Elymus glaucus **(blue wild-rye)**	0.8
Horkelia cuneata **(wedge-leaved horkelia)**	0.4
Stipa pulchra **(purple needle grass)**	0.5
TOTAL	**2.0**
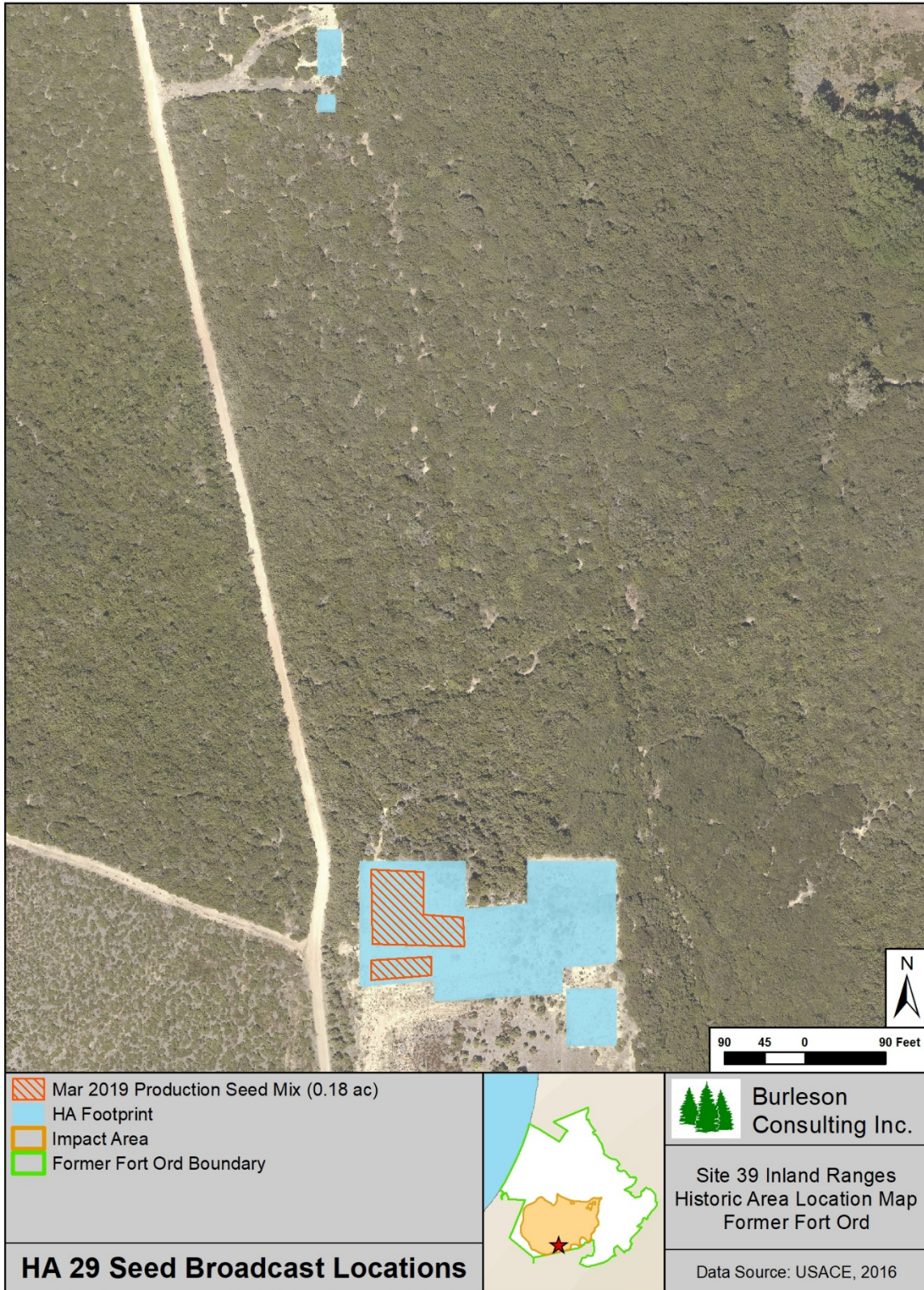
Figure B-4. HA 29 Seed Broadcast Location, Former Fort Ord. AMP Seed Broadcast Also Occurred Throughout Site (see Table B-10).

Table B-9. HA 29 Production Seed Mix (Mar 2019)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.3
Elymus glaucus **(blue wild-rye)**	0.8
Horkelia cuneata **(wedge-leaved horkelia)**	0.4
Stipa pulchra **(purple needle grass)**	0.5
TOTAL	**2.0**

Table B-10. HA 29 AMP Production Seed Mix (Feb 2019). Seed Broadcast Occurred Throughout Site.

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.3
Elymus glaucus **(blue wild-rye)**	0.8
Horkelia cuneata **(wedge-leaved horkelia)**	0.4
Stipa pulchra **(purple needle grass)**	0.5
TOTAL	**2.0**
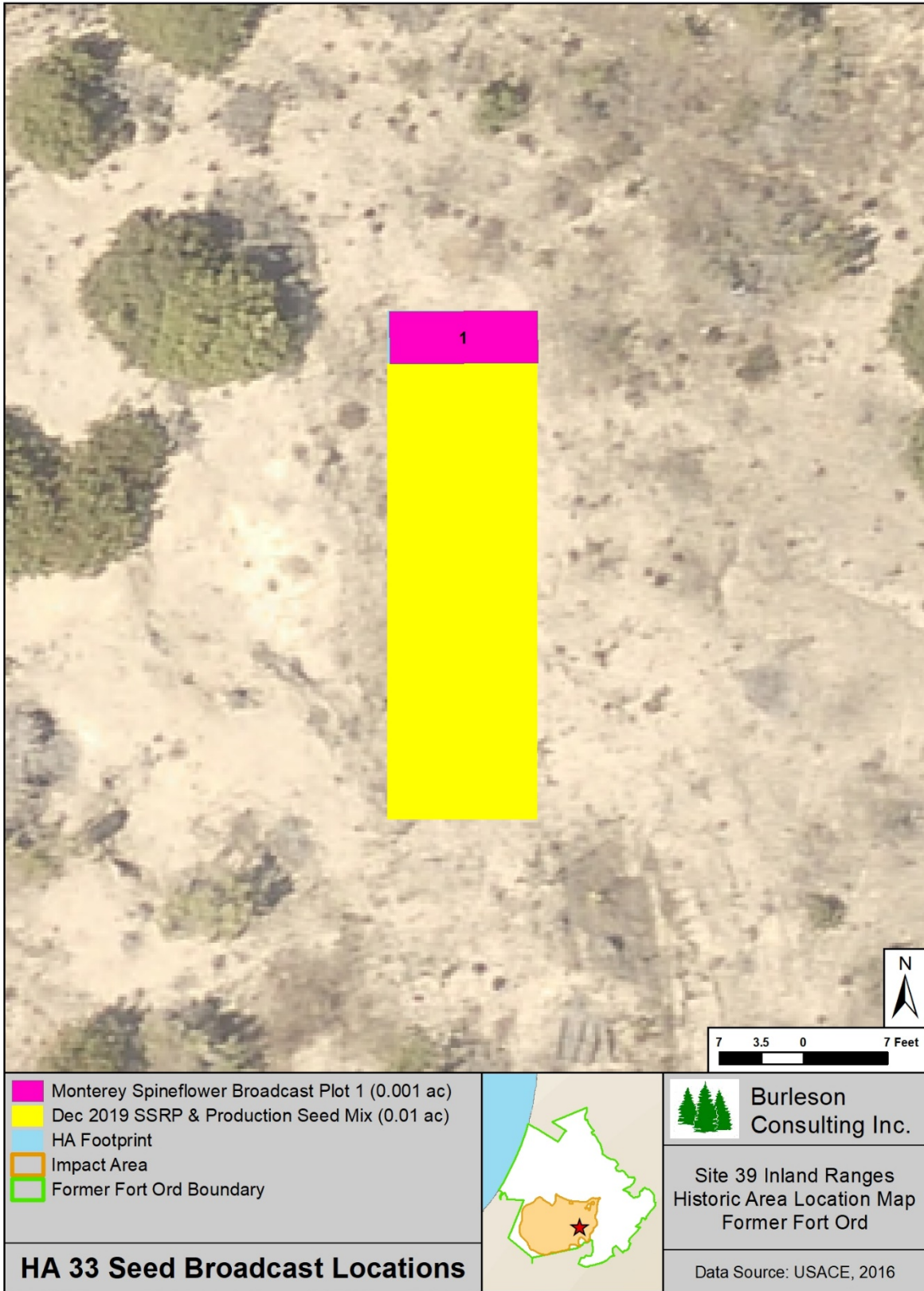
Figure B-5. HA 33 Seed Broadcast Location, Former Fort Ord. AMP Seed Broadcast Also Occurred Throughout Site (see Table B-13).

Table B-11. HA 33 SSRP Seed Mix Enhanced with Production Seed (Dec 2019)

Species	Amount (lb)
Achillea millefolium† (common yarrow)	0.07
Acmispon glaber (deerweed)	0.30
Baccharis pilularis (coyote brush)	0.10
*Ceanothus rigidus** (Monterey ceanothus)	0.10
Diplacus aurantiacus (sticky monkeyflower)	0.05
Elymus glaucus† (blue wild-rye)	0.80
*Ericameria fasciculata** (Eastwood's golden fleece)	0.01
Eriophyllum confertiflorum (golden yarrow)	0.03
Hordeum sp.† (sterile barley)	1.00
TOTAL	**2.46**

*HMP species
†production seed

Table B-12. HA 33 Monterey Spineflower Seed Broadcast

Plot Name	Plot ID	Plot Area (ft²)	Date Broadcast	Amount (lb)
1	HA33_CHPUP_01	54	Dec 2019	0.01
TOTAL				**0.01**

Table B-13. HA 33 AMP Production Seed Mix (Feb 2019). Seed Broadcast Occurred Throughout Site.

Species	Amount (lb)
Achillea millefolium (common yarrow)	0.03
Elymus glaucus (blue wild-rye)	0.08
Horkelia cuneata (wedge-leaved horkelia)	0.04
Stipa pulchra (purple needle grass)	0.05
TOTAL	**0.20**
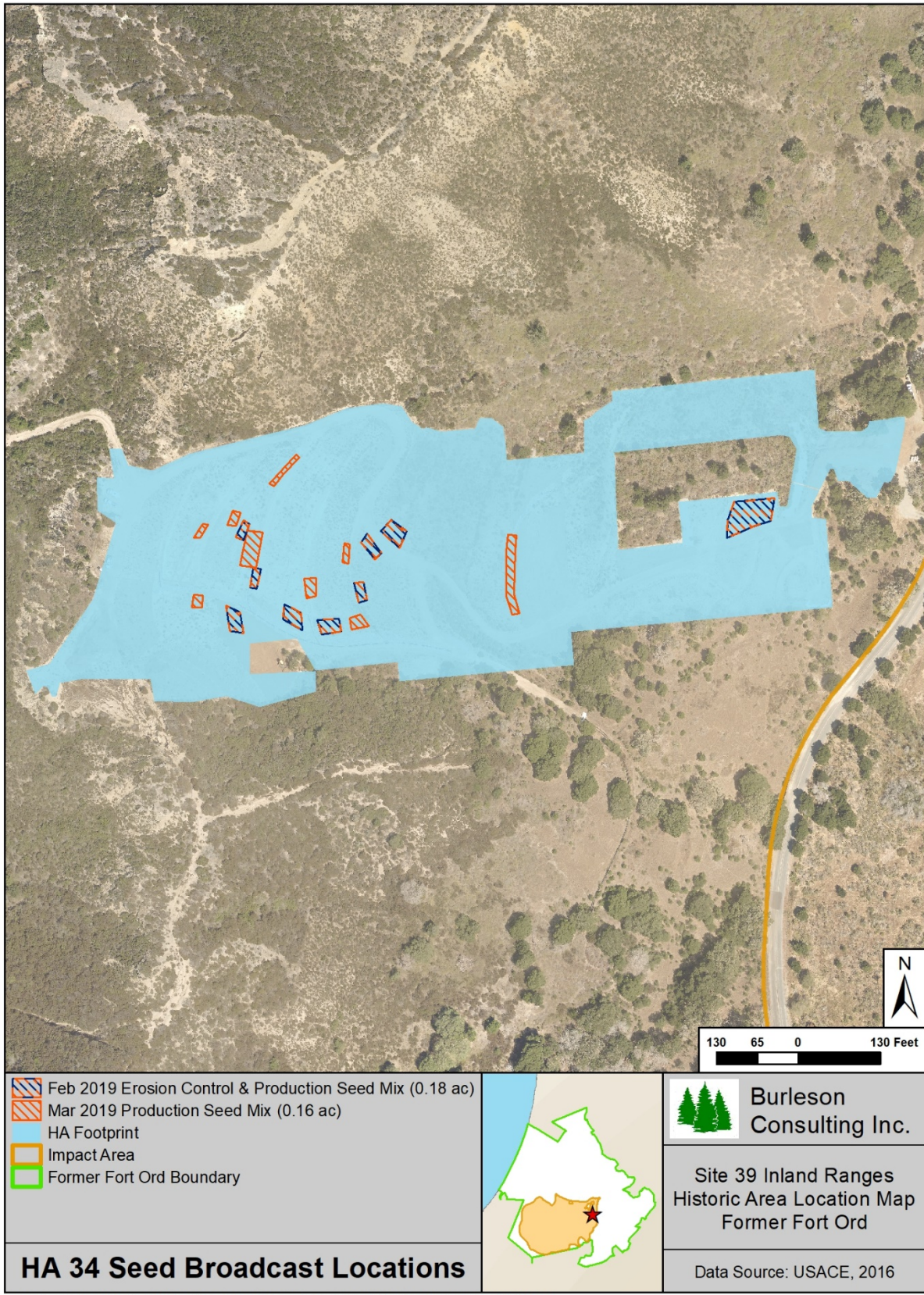
Figure B-6. HA 34 Seed Broadcast Locations, Former Fort Ord

Table B-14. HA 34 Erosion Control Seed Mix (Feb 2019)

Species	Amount (lb)
Elymus glaucus **(blue wild-rye)**	0.8
Hordeum sp. **(sterile barley)**	1.2
Stipa pulchra **(purple needle grass)**	0.5
TOTAL	**2.5**

Table B-15. HA 34 Production Seed Mix (Feb – Mar 2019)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	2.85
Elymus glaucus **(blue wild-rye)**	7.6
Horkelia cuneata **(wedge-leaved horkelia)**	3.8
Stipa pulchra **(purple needle grass)**	4.75
TOTAL	**19.0**
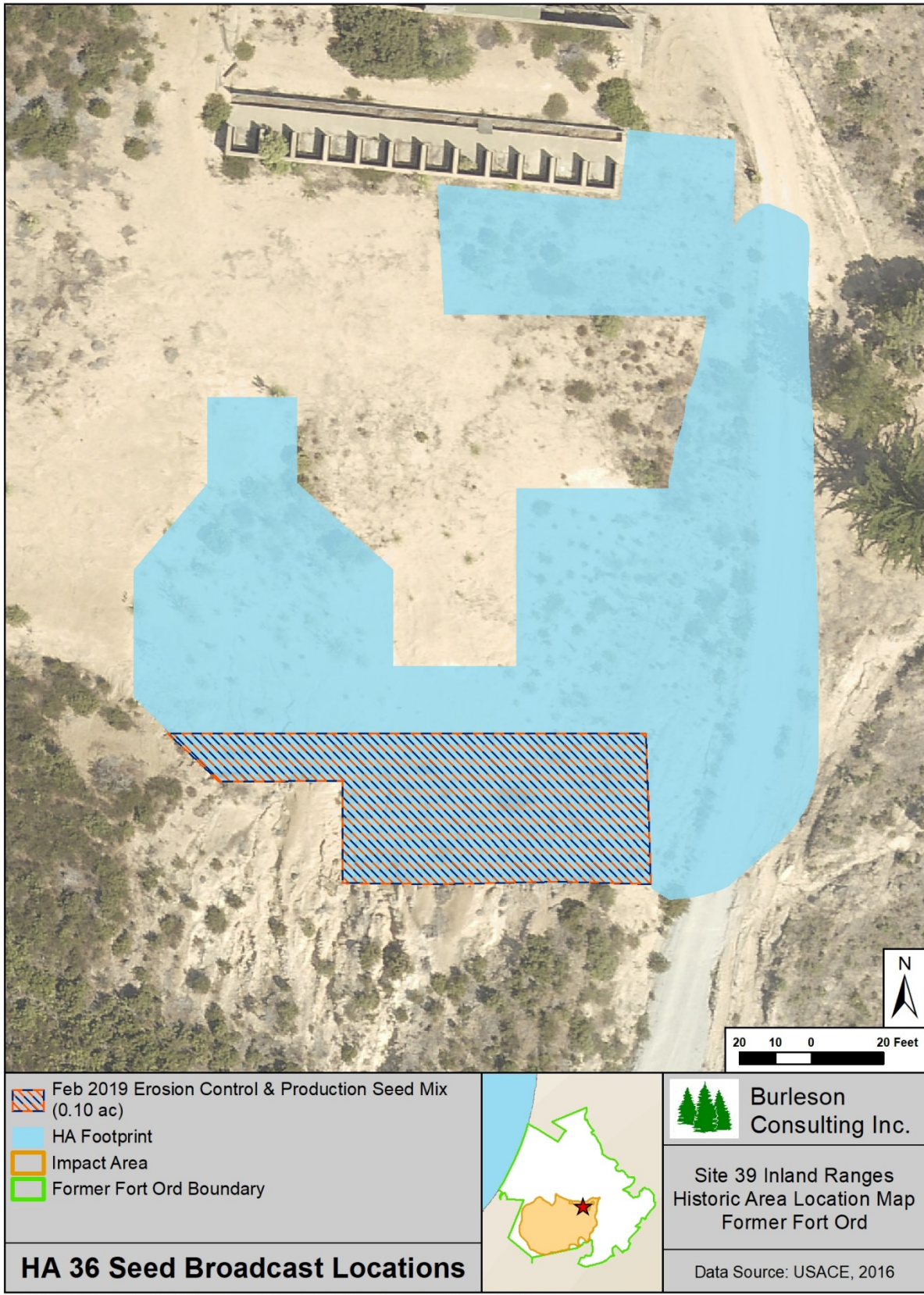
Figure B-7. HA 36 Seed Broadcast Locations, Former Fort Ord

Table B-16. HA 36 Erosion Control Seed Mix (Feb 2019)

Species	Amount (lb)
Elymus glaucus **(blue wild-rye)**	0.4
Hordeum sp. **(sterile barley)**	0.6
Stipa pulchra **(purple needle grass)**	0.25
TOTAL	**1.25**

Table B-17. HA 36 Production Seed Mix (Feb 2019)

Species	Amount (lb)
Achillea millefolium **(common yarrow)**	0.3
Elymus glaucus **(blue wild-rye)**	0.8
Horkelia cuneata **(wedge-leaved horkelia)**	0.4
Stipa pulchra **(purple needle grass)**	0.5
TOTAL	**2.0**
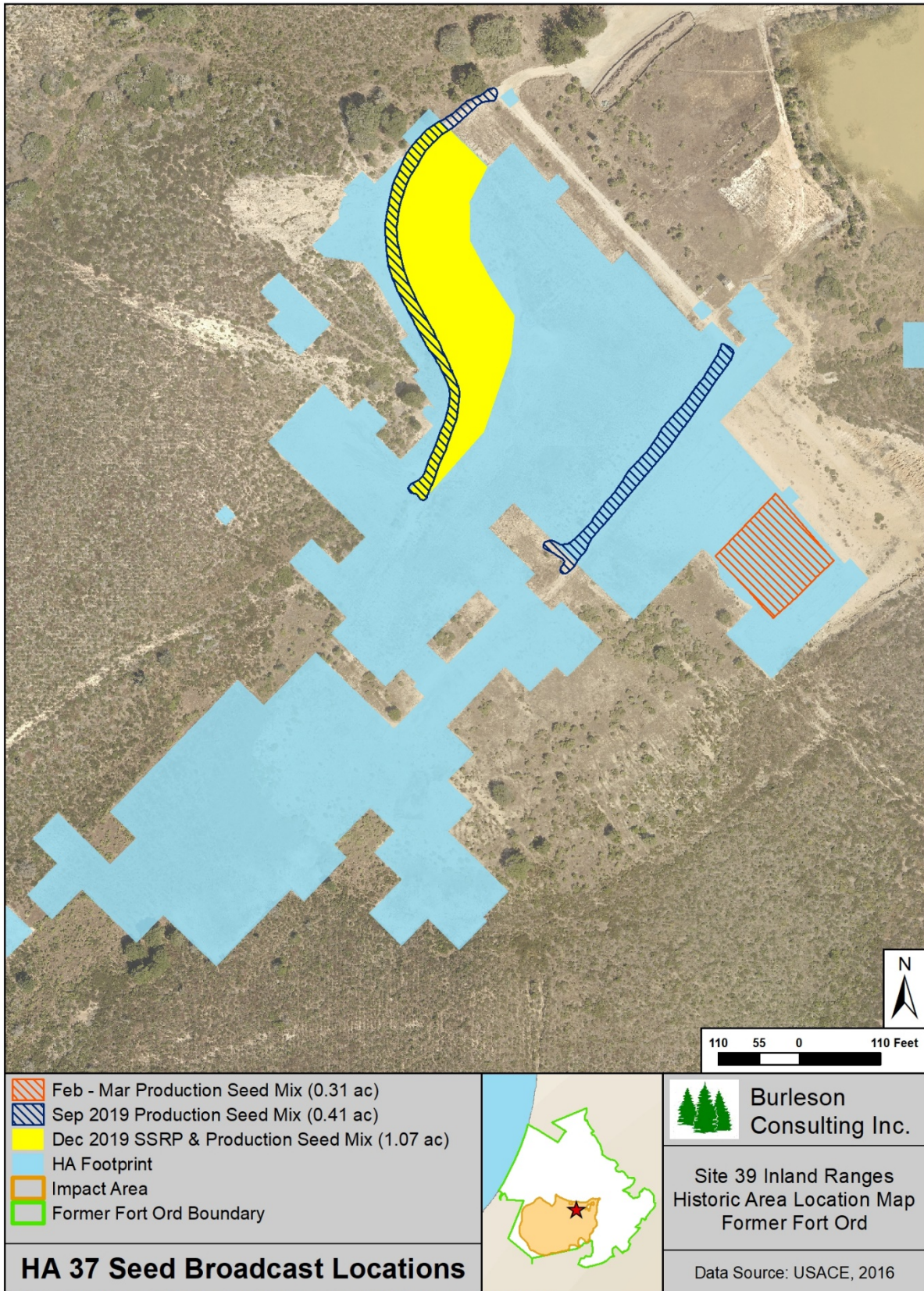
Figure B-8. HA 37 Seed Broadcast Locations, Former Fort Ord

Table B-18. HA 37 SSRP Seed Mix Enhanced with Production Seed (Dec 2019)

Species	Amount (lb)
Achillea millefolium† **(common yarrow)**	1.00
Acmispon glaber **(deerweed)**	1.50
Baccharis pilularis **(coyote brush)**	0.08
*Ceanothus rigidus** **(Monterey ceanothus)**	0.50
Crocanthemum scoparium **(peak rush-rose)**	0.38
Diplacus aurantiacus **(sticky monkeyflower)**	0.08
Elymus glaucus† **(blue wild-rye)**	1.50
*Ericameria fasciculata** **(Eastwood's golden fleece)**	0.10
Eriophyllum confertiflorum **(golden yarrow)**	0.63
Garrya elliptica **(coast silk tassel)**	0.50
Hordeum sp.† **(sterile barley)**	5.00
Lupinus chamissonis **(silver beach lupine)**	0.38
Lupinus nanus **(sky lupine)**	0.28
Salvia mellifera **(black sage)**	1.0
Stipa pulchra† **(purple needlegrass)**	2.0
TOTAL	**14.93**

*HMP species
†production seed

Table B-19. HA 37 Production Seed Mix (Feb – Sept 2019)

Species	Amount (lb)
Achillea millefolium (common yarrow)	1.95
Elymus glaucus (blue wild-rye)	5.20
Horkelia cuneata (wedge-leaved horkelia)	1.53
Stipa pulchra (purple needle grass)	3.25
TOTAL	**11.93**

Table B-20. HA 43 AMP Production Seed Mix (Feb 2019). Seed Broadcast Occurred Throughout Site.

Species	Amount (lb)
Achillea millefolium (common yarrow)	0.27
Elymus glaucus (blue wild-rye)	0.72
Horkelia cuneata (wedge-leaved horkelia)	0.36
Stipa pulchra (purple needlegrass)	0.45
TOTAL	**1.8**

Table B-21. HA 48 AMP Production Seed Mix (Feb 2019). Seed Broadcast Occurred Throughout Site.

Species	Amount (lb)
Achillea millefolium (common yarrow)	0.15
Elymus glaucus (blue wild-rye)	0.4
Horkelia cuneata (wedge-leaved horkelia)	0.2
Stipa pulchra (purple needlegrass)	0.25
TOTAL	**1.0**

Table B-22. HA 18 AMP Plant Installation (Feb 2019). Seed Broadcast Occurred Throughout Site.

Species	Species Code	Total Plants Installed (#)
Adenostoma fasciculata (chamise)	ADFA	40
TOTAL		**40**

Table B-23. HA 19 AMP Plant Installation (Jan 2019). Seed Broadcast Occurred Throughout Site.

Species	Species Code	Total Plants Installed (#)
Lepechinia calycina (pitcher sage)	LECA	160
TOTAL		**160**

Table B-24. HA 22 AMP Plant Installation (Feb 2019). Seed Broadcast Occurred Throughout Site.

Species	Species Code	Total Plants Installed (#)
*Arctostaphylos pumila** **(sandmat manzanita)**	ARPU	20
Arctostaphylos tomentosa ssp. *tomentosa* **(shaggy-bark manzanita)**	ARTO	10
Baccharis pilularis **(coyote brush)**	BAPI	10
*Ceanothus rigidus** **(Monterey ceanothus)**	CERI	20
Ceanothus dentatus **(dwarf ceanothus)**	CEDE	20
Diplacus aurantiacus **(sticky monkey flower)**	DIAU	8
Ericameria ericoides **(mock heather)**	ERER	6
*Ericameria fasciculata** **(Eastwood's goldenbush)**	ERFA	35
Eriophyllum confertiflorum **(golden yarrow)**	ERCO	10
Salvia mellifera **(black sage)**	SAME	6
TOTAL		**145**

*HMP species

Table B-25. HA 23 AMP Plant Installation (Feb 2019). Seed Broadcast Occurred Throughout Site.

Species	Species Code	Total Plants Installed (#)
*Arctostaphylos pumila** **(sandmat manzanita)**	ARPU	10
Baccharis pilularis **(coyote brush)**	BAPI	6
*Ceanothus rigidus** **(Monterey ceanothus)**	CERI	20
Ceanothus dentatus **(dwarf ceanothus)**	CEDE	18
*Ericameria fasciculata** **(Eastwood's goldenbush)**	ERFA	35
Eriophyllum confertiflorum **(golden yarrow)**	ERCO	6
TOTAL		**95**

*HMP species
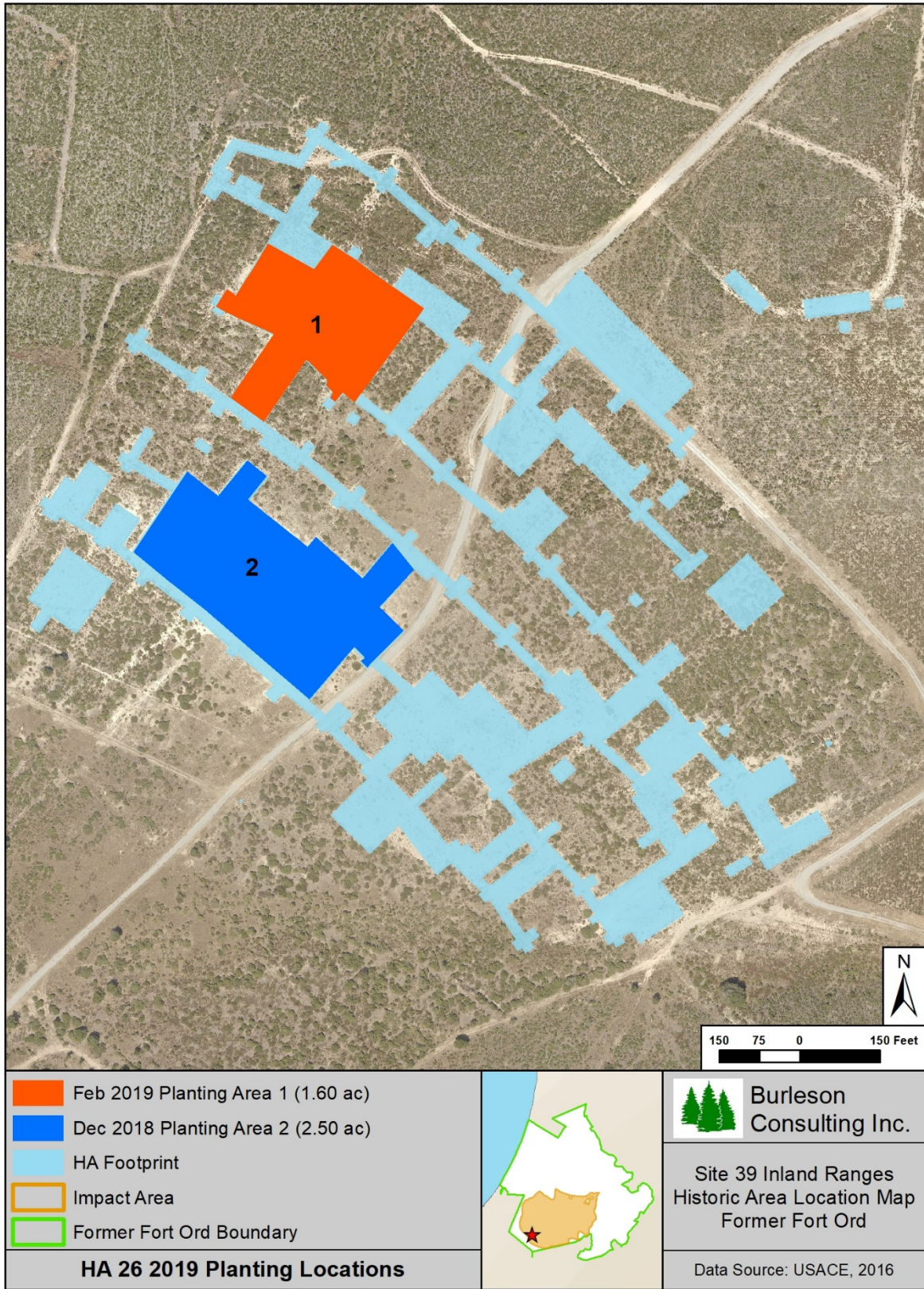
Figure B-9. HA 26 Planting Locations, Former Fort Ord

Table B-26. HA 26 Plant Installation (Dec 2018 – Feb 2019)

Species	Species Code	Plants Installed per HA 26 Sub-Area		Total Plants Installed (#)
		Area 1	Area 2	
Acmispon glaber (deerweed)	ACGL	-	88	88
Adenostoma fasciculatum (chamise)	ADFA	200	67	267
Artemesia californica (California sagebrush)	ARCA	50	-	50
Arctostaphylos hookeri* (Hooker's manzanita)	ARHO	157	-	157
Arctostaphylos montereyensis* (Monterey manzanita)	ARMO	35	-	35
Arctostaphylos pumila* (sandmat manzanita)	ARPU	-	88	88
Arctostaphylos tomentosa ssp. *tomentosa* (shaggy-bark manzanita)	ARTO	40	69	109
Baccharis pilularis (coyote brush)	BAPI	50	31	81
Ceanothus rigidus* (Monterey ceanothus)	CERI	100	92	192
Crocanthemum scoparium (peak rush-rose)	CRSC	-	31	31
Diplacus aurantiacus (sticky monkey flower)	DIAU	-	153	153
Eriophyllum confertiflorum (golden yarrow)	ERCO	282	50	332
Ericameria fasciculata (Eastwood's goldenbush)	ERFA	12	65	77
Horkelia cuneata (wedge-leaved horkelia)	HOCU	125	88	213
Lupinus arboreus (yellow bush lupine)	LUAR	200	15	215
Salvia mellifera (black sage)	SAME	300	63	363
TOTAL		**1,551**	**900**	**2,451**

*HMP species

Table B-27. HA 27 AMP Plant Installation (Feb 2019). Plants Were Installed Throughout Site.

Species	Species Code	Total Plants Installed (#)
Arctostaphylos montereyensis * **(Monterey manzanita)**	ARPU	20
Diplacus aurantiacus **(sticky monkey flower)**	BAPI	14
Eriophyllum confertiflorum **(golden yarrow)**	ERCO	10
TOTAL		**44**

*HMP species
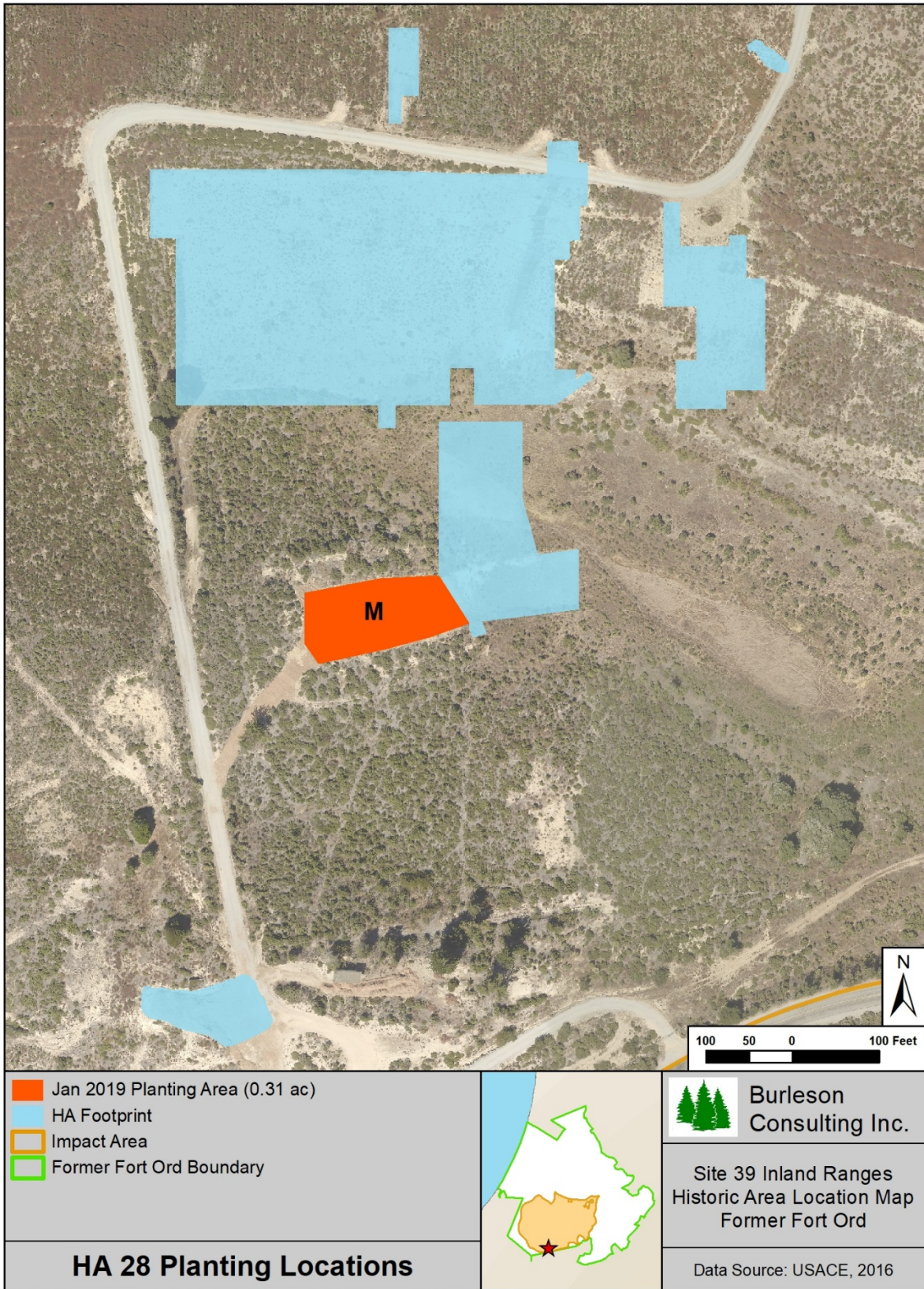
Figure B-10. HA 28 Planting Locations, Former Fort Ord

Table B-28. HA 28 Plant Installation (Jan 2019)

Species	Species Code	Total Plants Installed (#)
Acmispon glaber (deerweed)	ACGL	20
Adenostoma fasciculatum (chamise)	ADFA	60
*Arctostaphylos hookeri** (Hooker's manzanita)	ARHO	45
*Arctostaphylos montereyensis** (Monterey manzanita)	ARMO	71
*Arctostaphylos pumila** (sandmat manzanita)	ARPU	44
Artemisia californica (California sagebrush)	ARCA	75
Baccharis pilularis (coyote brush)	BAPI	105
*Ceanothus rigidus** (Monterey ceanothus)	CERI	30
Crocanthemum scoparium (peak rush-rose)	CRSC	10
Ericameria fasciculata (Eastwood's goldenbush)	ERFA	40
Eriophyllum confertiflorum (golden yarrow)	ERCO	10
Frangula californica (California coffeeberry)	FRCA	40
Horkelia cuneata (wedge-leaved horkelia)	HOCU	5
Salvia mellifera (black sage)	SAME	30
TOTAL		**585**

*HMP species

Table B-29. HA 29 AMP Plant Installation (Feb 2019). Plants Were Installed Throughout Site.

Species	Species Code	Total Plants Installed (#)
Heteromeles arbutifolia **(toyon)**	HEAR	15
TOTAL		**15**

Table B-30. HA 33 AMP Plant Installation (Feb 2019). Plants Were Installed Throughout Site.

Species	Species Code	Total Plants Installed (#)
*Arctostaphylos montereyensis** **(Monterey manzanita)**	ARMO	12
Arctostaphylos tomentosa ssp. *tomentosa* **(shaggy-bark manzanita)**	ARTO	5
Ceanothus dentatus **(dwarf ceanothus)**	CEDE	15
*Ceanothus rigidus** **(Monterey ceanothus)**	CERI	12
Diplacus aurantiacus **(sticky monkey flower)**	DIAU	10
Eriophyllum confertiflorum **(golden yarrow)**	ERCO	5
Heteromeles arbutifolia **(toyon)**	HEAR	5
Salvia mellifera **(black sage)**	SAME	5
TOTAL		**69**

*HMP species
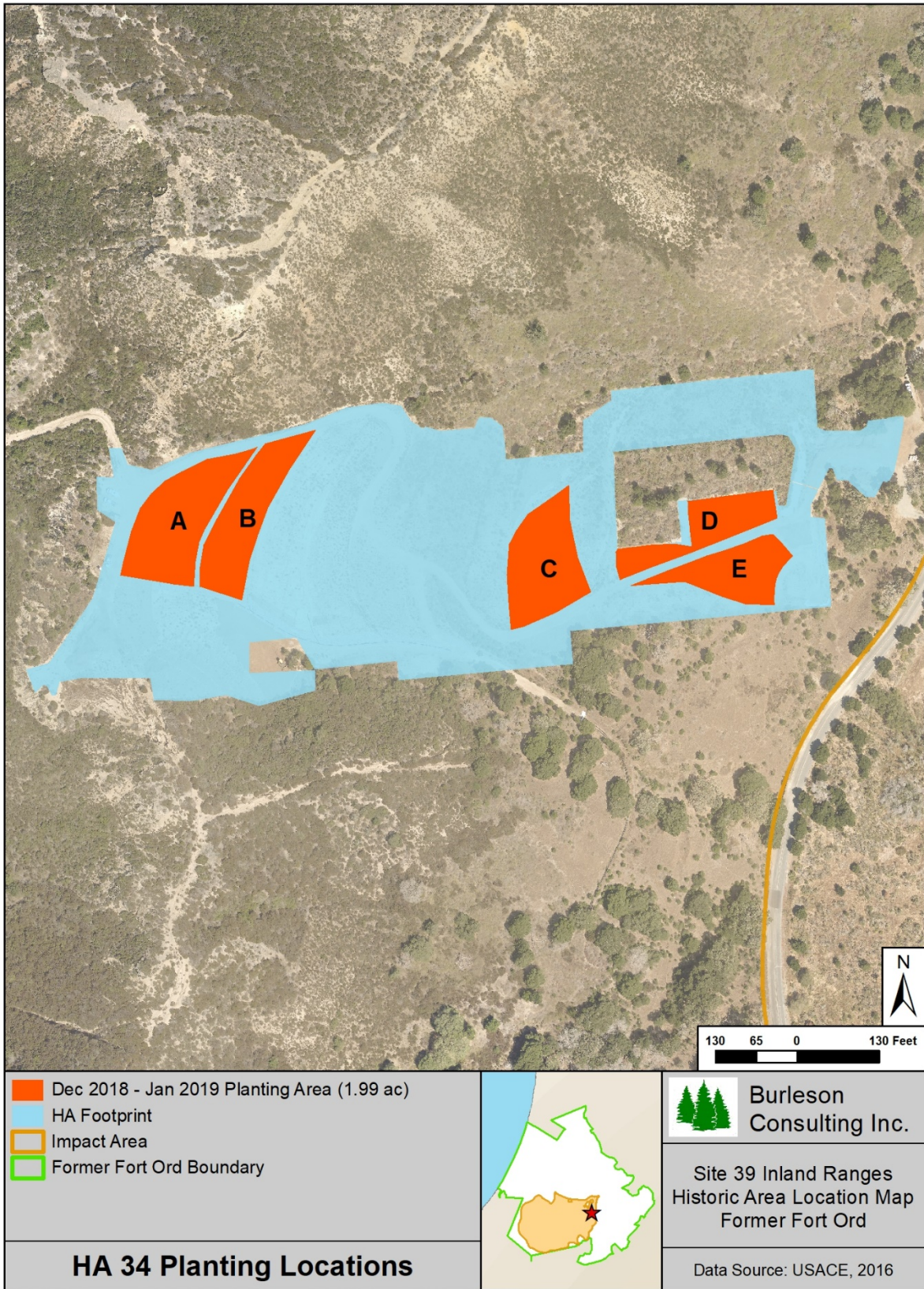
Figure B-11. HA 34 Planting Locations, Former Fort Ord

Table B-31. HA 34 Plant Installation (Dec 2018 – Jan 2019)

Species	Species Code	Plants Installed per HA 34 Sub-Area					Total Plants Installed (#)
		A	B	C	D	E	
Achillea millefolium (common yarrow)	ACMI	25	25	25	30	5	110
Acmispon glaber (deerweed)	ACGL	126	15	40	120	140	441
Adenostoma fasciculatum (chamise)	ADFA	30	30	80	33	50	223
*Arctostaphylos hookeri** (Hooker's manzanita)	ARHO	41	131	70	30	-	272
*Arctostaphylos montereyensis** (Monterey manzanita)	ARMO	30	30	58	30	-	148
Arctostaphylos tomentosa ssp. *tomentosa* (shaggy-bark manzanita)	ARTO	39	41	79	40	-	199
Artemisia californica (California sagebrush)	ARCA	30	30	60	40	50	210
Baccharis pilularis (coyote brush)	BAPI	60	60	28	50	50	248
*Ceanothus rigidus** (Monterey ceanothus)	CERI	52	95	80	39	-	266
Crocanthemum scoparium (peak rush-rose)	CRSC	80	80	100	58	73	391
Diplacus aurantiacus (sticky monkey flower)	DIAU	69	49	120	40	70	348
Eriophyllum confertiflorum (golden yarrow)	ERCO	59	60	88	44	44	295
Frangula californica (California coffeeberry)	FRCA	-	-	10	-	-	10
Garrya elliptica (coast silk tassel)	GAEL	-	-	9	-	-	9
Horkelia cuneata (wedge-leaved horkelia)	HOCU	100	100	153	100	100	553
Lepechinia calycina (pitcher sage)	LECA	-	-	25	-	-	25
Lupinus arboreus (yellow bush lupine)	LUAR	45	45	35	30	30	185
Salvia mellifera (black sage)	SAME	50	50	80	45	99	324
TOTAL		**836**	**841**	**1,140**	**729**	**711**	**4,257**

*HMP species

Table B-32. HA 43 AMP Plant Installation (Feb 2019). Plants Were Installed Throughout Site.

Species	Species Code	Total Plants Installed (#)
Adenostoma fasciculatum **(chamise)**	ADFA	10
*Ceanothus rigidus** **(Monterey ceanothus)**	CERI	20
Diplacus aurantiacus **(sticky monkey flower)**	DIAU	14
TOTAL		**44**

*HMP species
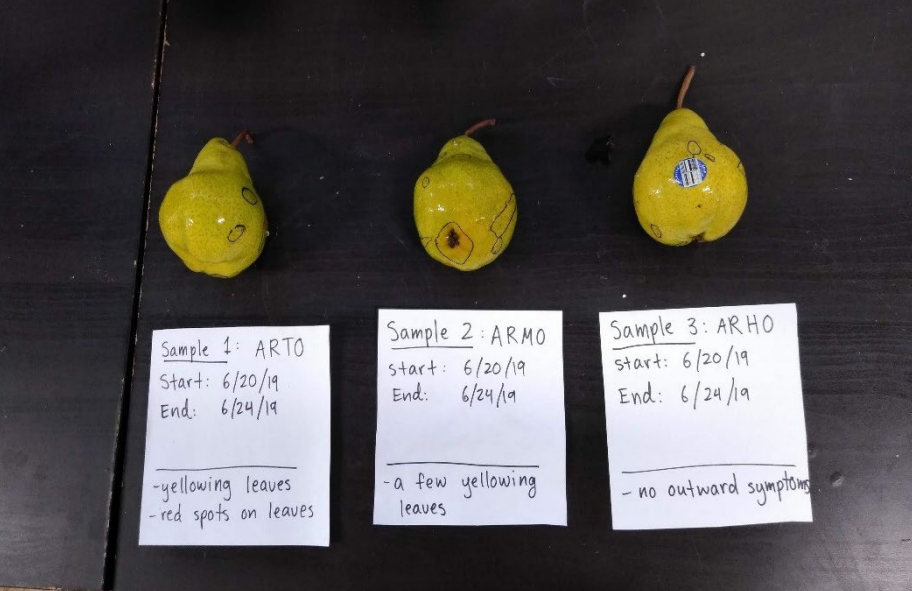
Table B-33. HA 48 AMP Plant Installation (Feb 2019). Plants Were Installed Throughout Site.
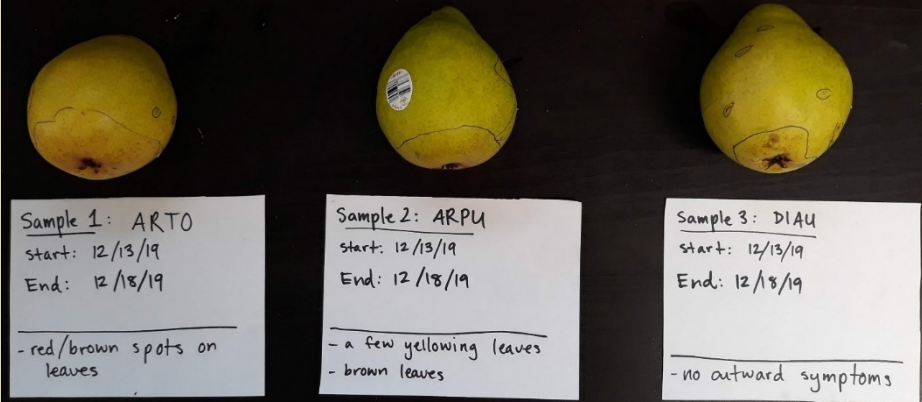
Species	Species Code	Total Plants Installed (#)
Adenostoma fasciculatum **(chamise)**	ADFA	10
Eriophyllum confertiflorum **(golden yarrow)**	ERCO	10
TOTAL		**20**

APPENDIX C

Photo Log

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Photo Description	Photo
Burleson Carmel Valley Native Plant Nursery Negative results of the March pear test **C-1**	
Burleson Carmel Valley Native Plant Nursery Negative results of the June pear test **C-2**	

Photo Description	Photo
Burleson Carmel Valley Native Plant Nursery Negative results of the September pear test **C-3**	
Burleson Carmel Valley Native Plant Nursery Negative results of the December pear test **C-4**	

Photo Description	Photo
Seed Collection Mature Eastwood's goldenbush (*Ericameria fasciculata*) seed ready for collection **C-5**	
Seed Collection Close-up of mature Monterey ceanothus (*Ceanothus rigidus*) seed **C-6**	

Photo Description	Photo
Seed Collection Burleson biologist collecting Monterey ceanothus seed **C-7**	
Seed Collection Burleson biologist collecting sky lupine (*Lupinus nanus*) seed **C-8**	
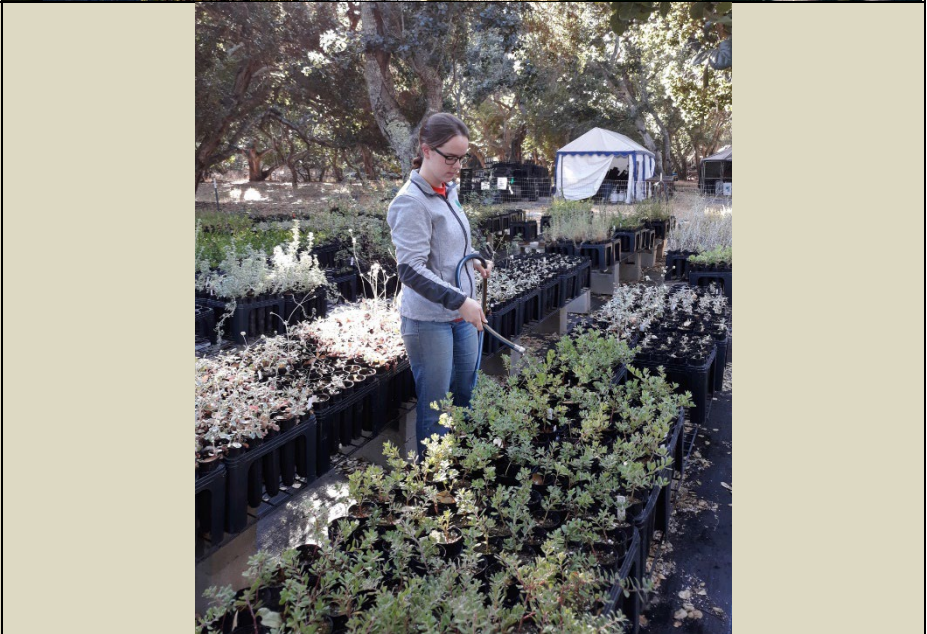
Photo Description	Photo
Seed Collection Burleson biologist collecting Monterey spineflower (*Chorizanthe pungens* var. *pungens*) **C-9**	
Seed Collection Burleson biologist processing golden yarrow (*Eriophyllum confertiflorum*) seed **C-10**	

Photo Description	Photo
Seed Production Deerweed (*Acmispon glaber*) production plot at S&S Seeds **C-11**	
Seed Production Common yarrow (*Achillea millefolium*) production plot at S&S Seeds **C-12**	

Photo Description	Photo
Seed Production Purple needlegrass (*Stipa pulchra*) production plot at S&S Seeds **C-13**	
Plant Propagation Coast silk tassel (*Garrya elliptica*) in seed tray **C-14**	

Photo Description	Photo
Plant Propagation Burleson biologists transplanting Eastwood's goldenbush **C-15**	
Plant Propagation Sandmat manzanita (*Arctostaphylos pumila*) cuttings in the greenhouse **C-16**	

Photo Description	Photo
Plant Propagation Burleson biologist transplanting sandmat manzanita to deepots **C-17**	
Plant Propagation Native plant nursery **C-18**	

Photo Description	Photo
Plant Propagation Coyote brush (*Baccharis pilularis*), black sage (*Salvia mellifera*), and sandmat manzanita at Burleson's native plant nursery **C-19**	
Plant Propagation Burleson biologist maintaining nursery inventory **C-20**	

Photo Description	Photo
Plant Propagation Sandmat manzanita at nursery hoop house **C-21**	
Plant Propagation Upkeep of the nursery hoop houses **C-22**	

Photo Description	Photo
Passive Restoration Burleson biologist raking in seed at HA 26 **C-23**	
Passive Restoration Burleson biologist covering seed with straw at HA 26 **C-24**	

Photo Description	Photo
Passive Restoration Burleson biologist covering seed with straw at HA 33 **C-25**	
Passive Restoration Burleson biologist covering seed with straw at HA 37 **C-26**	

Photo Description	Photo
Active Restoration Burleson biologists installing plants for the Adaptive Management Plan at HA 18 **C-27**	
Active Restoration Close-up of coyote brush with a strong root system installed at HA 23 **C-28**	

Photo Description	Photo
Active Restoration Burleson biologist installing surplus plants at HA 26 in Target Area 1 **C-29**	
Active Restoration Burleson biologists installing plants at HA 26 in Target Area 2 **C-30**	

Photo Description	Photo
Active Restoration Burleson biologists installing plants at HA 28 **C-31**	
Active Restoration Burleson biologist staging plants at HA 34 **C-32**	

Photo Description	Photo
Active Restoration Burleson biologist using an auger for plant installation at HA 34 **C-33**	
Active Restoration Finished plant installation at HA 34 **C-34**	

Photo Description	Photo
Monitoring Monterey spineflower **C-35**	
Monitoring Sand gilia (*Gilia tenuiflora* ssp. *arenaria*) **C-36**	

Photo Description	Photo
Monitoring Burleson biologist monitoring a discrete patch of sand gilia at HA 19 **C-37**	
Monitoring Burleson biologists conducting vegetative cover transect surveys **C-38**	

Photo Description	Photo
Monitoring Burleson biologists conducting vegetative cover quadrat surveys **C-39**	
Monitoring Burleson biologist conducting vegetative cover quadrat survey in shrubs **C-40**	

Photo Description	Photo
Monitoring Burleson biologists conducting plant survivorship surveys **C-41**	
Erosion Control Repairs Bulldozer ripping access road at HA 37 **C-42**	

Photo Description	Photo
Erosion Control Repairs Burleson biologists raking production seed into access road at HA 37 **C-43**	
Erosion Control Repairs Burleson biologists covering seed with straw **C-44**	

Photo Description	Photo
Erosion Control Repairs Wattles installed at HA 27A **C-45**	
Erosion Control Repairs Wattle installation and rill repair at HA 28 **C-46**	

Photo Description	Photo
Erosion Control Repairs Burleson biologists installing wattles at HA 34 **C-47**	
Erosion Control Repairs Installation of coir fabric at HA 34 **C-48**	

Photo Description	Photo
Erosion Control Repairs Installation of coir fabric and logs at HA 36 **C-49**	
Erosion Control Repairs Burleson biologist installing fabric around established plants at HA 36 **C-50**	

Photo Description	Photo
Erosion Control Repairs Burleson biologist covering seed at the base of wattle installation **C-51**	
Irrigation Sala Brothers Water Trucking filling up water tanks at HA 26 **C-52**	

Photo Description	Photo
Irrigation Burleson biologist installing a ball valve to a lateral line on the western side of the irrigation system **C-53**	
Irrigation Installed ball valve on lateral line **C-54**	

Photo Description	Photo
Irrigation Burleson biologist repairing an emitter **C-55**	
Irrigation Burleson biologist installing a new emitter **C-56**	

Photo Description	Photo
Irrigation Burleson biologist installing new drip lines **C-57**	
Irrigation Irrigated Eastwood's goldenbush and shaggy-bark manzanita (*Arctostaphylos tomentosa*) **C-58**	

Photo Description	Photo
Irrigation Irrigated sandmat manzanita growing upslope of wattle **C-59**	
Irrigation New growth on irrigated shaggy-bark manzanita **C-60**	

Photo Description	Photo
Irrigation West side of irrigation system **C-61**	
Irrigation East side of irrigation system **C-62**	

Photo Description	Photo
Irrigation Upslope of west side of irrigation system receiving water **C-63**	
Community Involvement Burleson's tabling display at the Army Open House on February 2, 2019 **C-64**	

Photo Description	Photo
Community Involvement Bus Tour of Site 39 Inland Ranges **C-65**	

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APPENDIX D

Photo Points

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Photo Points

| HA 18 | October 2011 | HA 18 | April 2019 |

Photo Points

| HA 19 | May 2013 | HA 19 | April 2019 |

Photo Points

| HA 22 | October 2011 | HA 22 | April 2019 |

Photo Points
HA 23 | October 2011   HA 23 | April 2019

Photo Points
HA 26 | May 2016   HA 26 | April 2019

Photo Points

| HA 27 | October 2011 | HA 27 | April 2019 |

Photo Points

| HA 27A \| October 2011 | HA 27A \| April 2019 |

Photo Points
HA 28 | April 2014
HA 28 | April 2019

Photo Points

HA 29 | October 2011

HA 29 | April 2019

Photo Points

| HA 33 | October 2011 | HA 33 | April 2019 |

Photo Points	
HA 34	January 2013	HA 34	April 2019

Photo Points

| HA 36 | October 2011 | HA 36 | April 2019 |

Photo Points

| HA 37 | April 2014 | HA 37 | April 2019 |
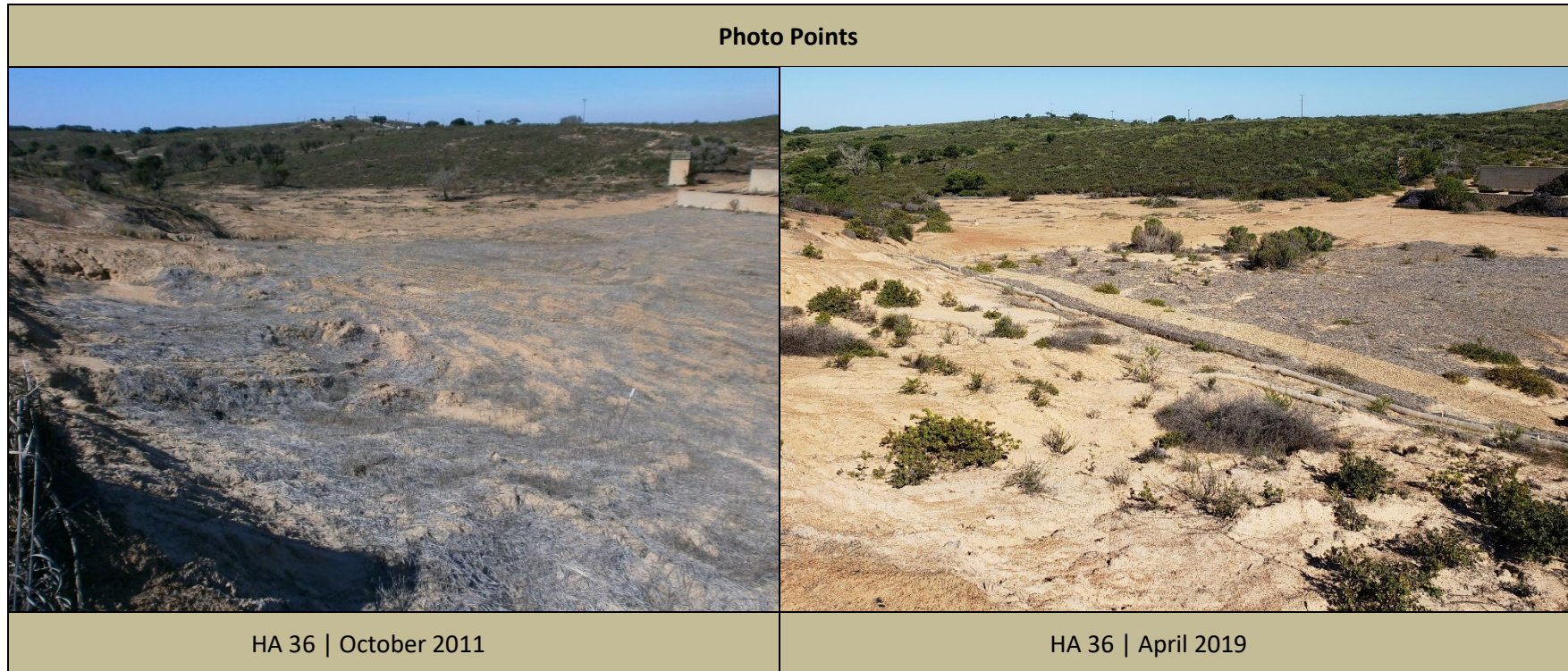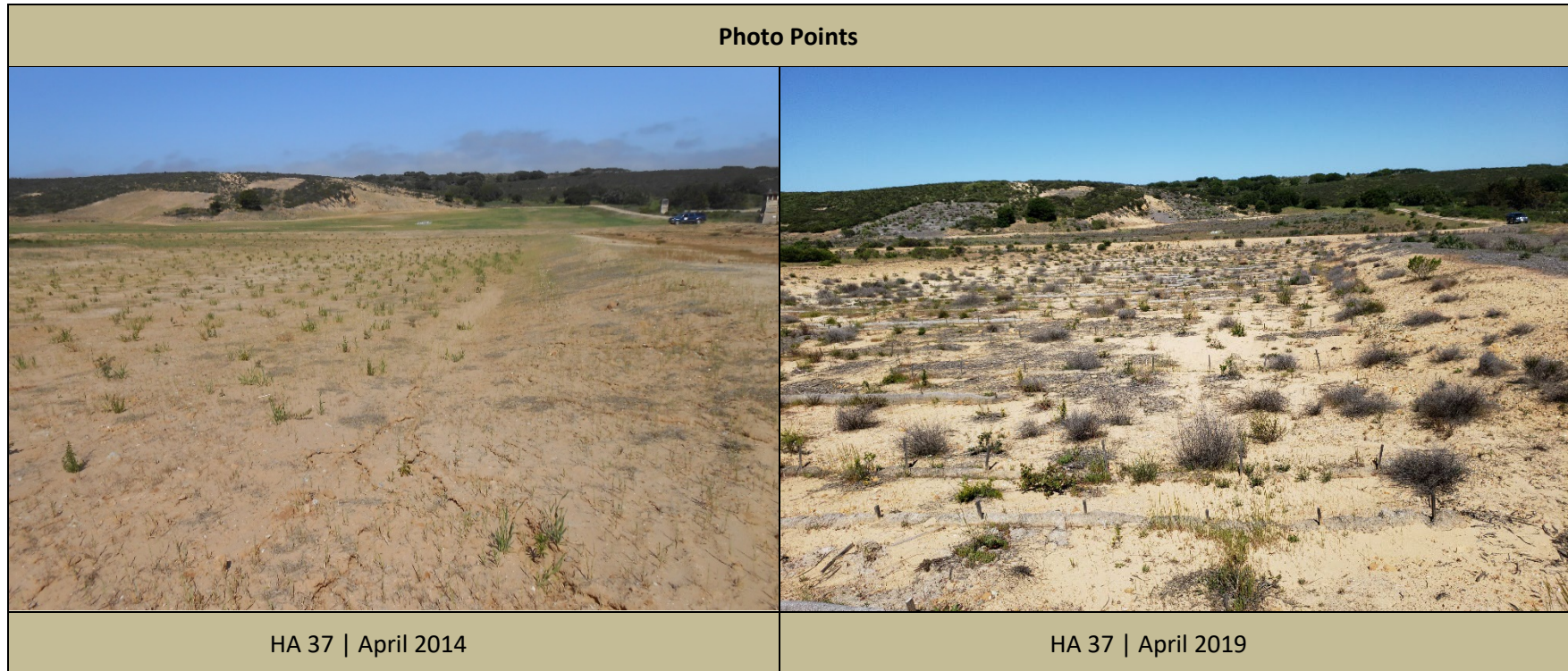
Photo Points

| HA 38 | April 2014 | HA 38 | April 2019 |

Photo Points

| HA 39/40 | October 2011 | HA 39/40 | April 2019 |
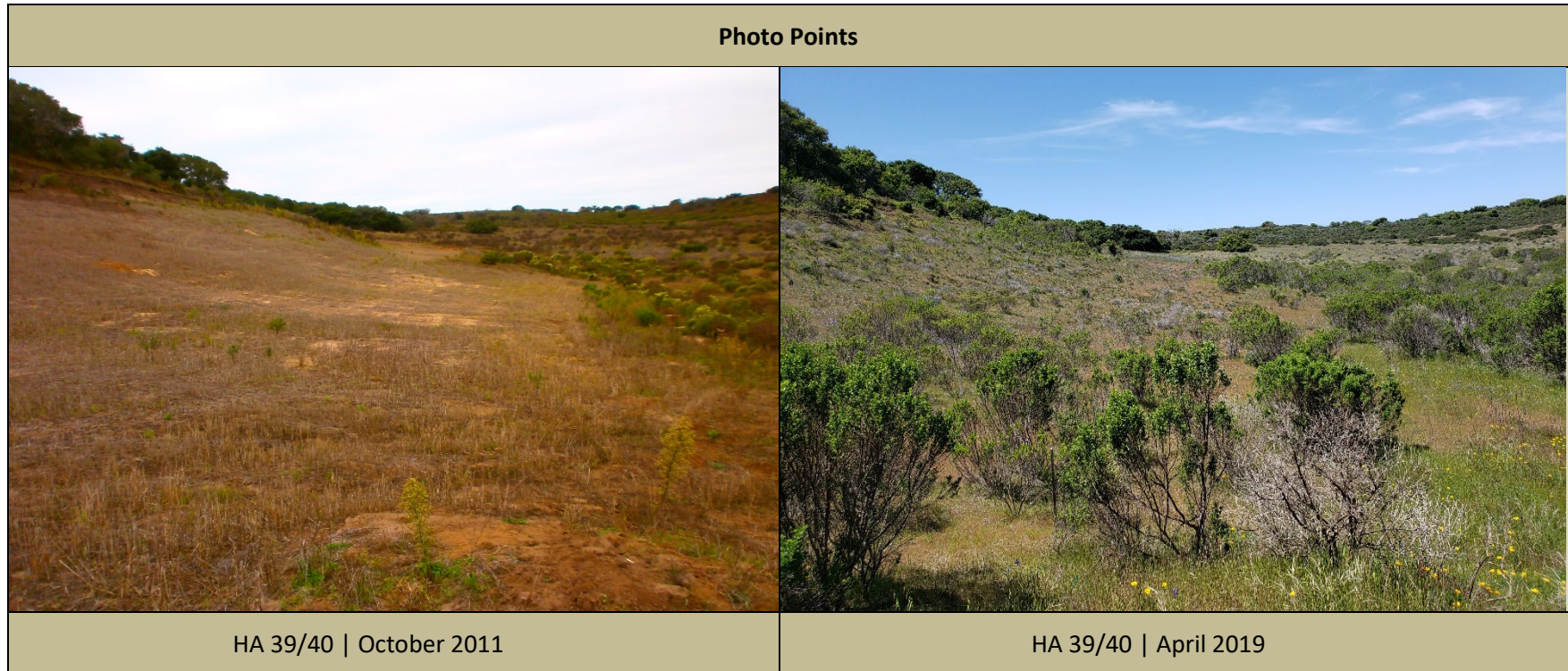
Photo Points

| HA 43 \| October 2011 | HA 43 \| April 2019 |

Photo Points

| HA 44 | May 2016 | HA 44 | April 2019 |

Photo Points

| HA 48 | April 2016 | HA 48 | April 2019 |
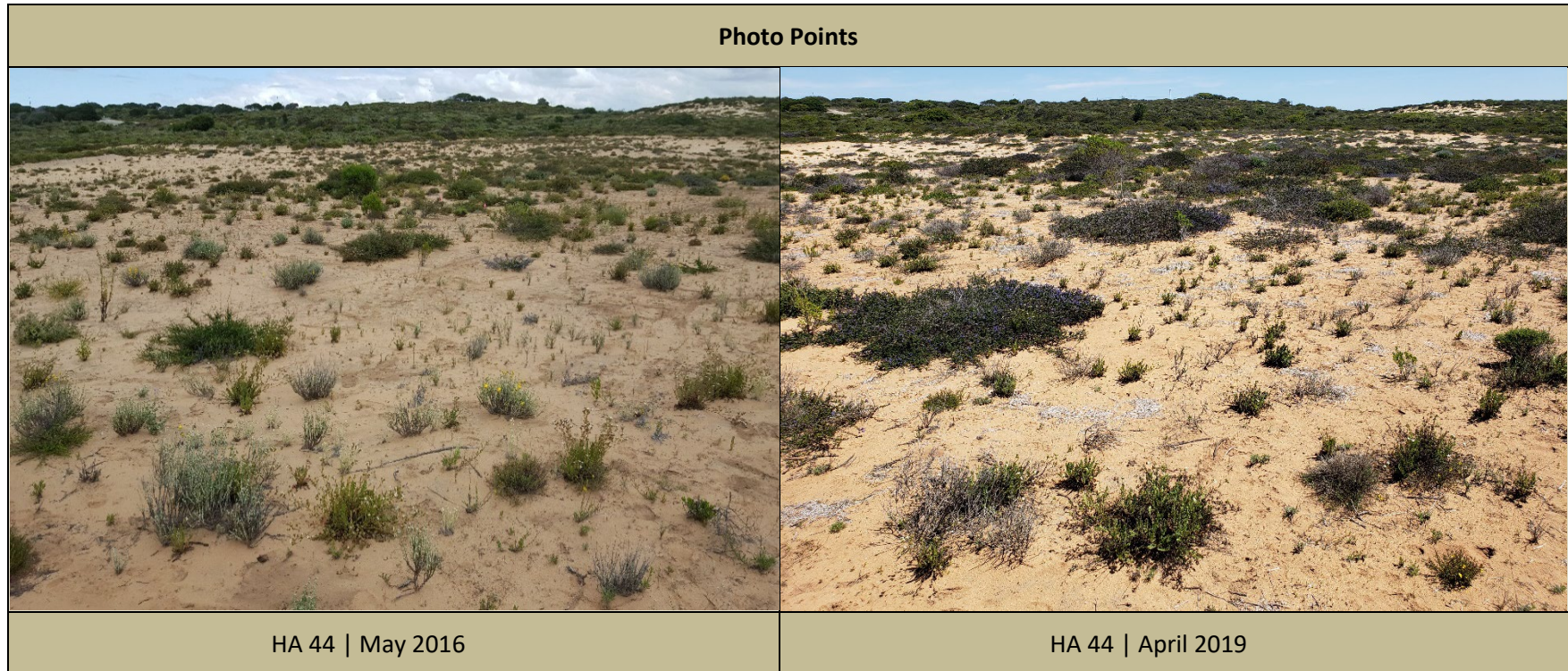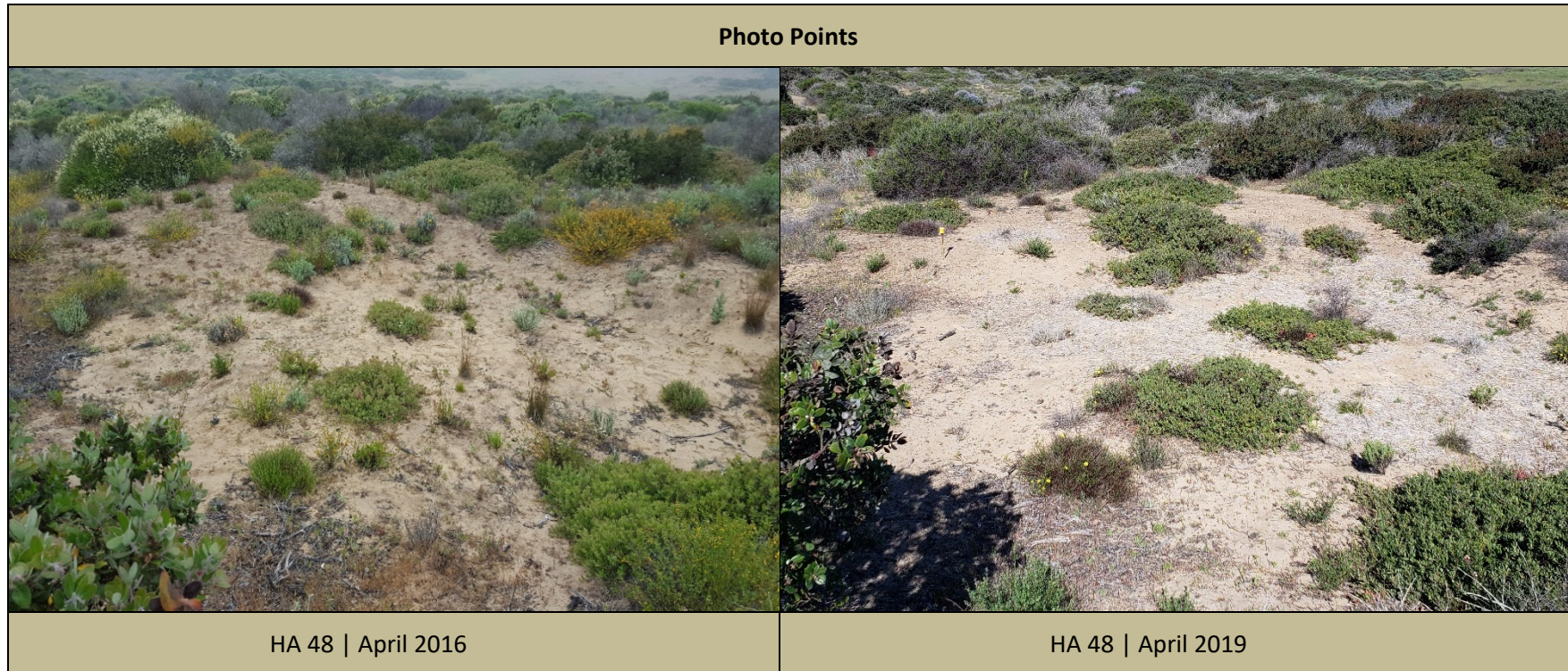
Photo Points

| Austin Road Stockpile \| May 2016 | Austin Road Stockpile \| April 2019 |

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APPENDIX E

Photo Points

Time Lapse Series for HAs in Year 5

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Photo Points – HA 28		
April 2014	April 2015	April 2016
April 2017	May 2018	April 2019

Photo Points – HA 34

| January 2013 | December 2016 | April 2017 |

| May 2018 | April 2019 |

Photo Points – HA 37		
April 2014	April 2016	April 2017
May 2018		April 2019
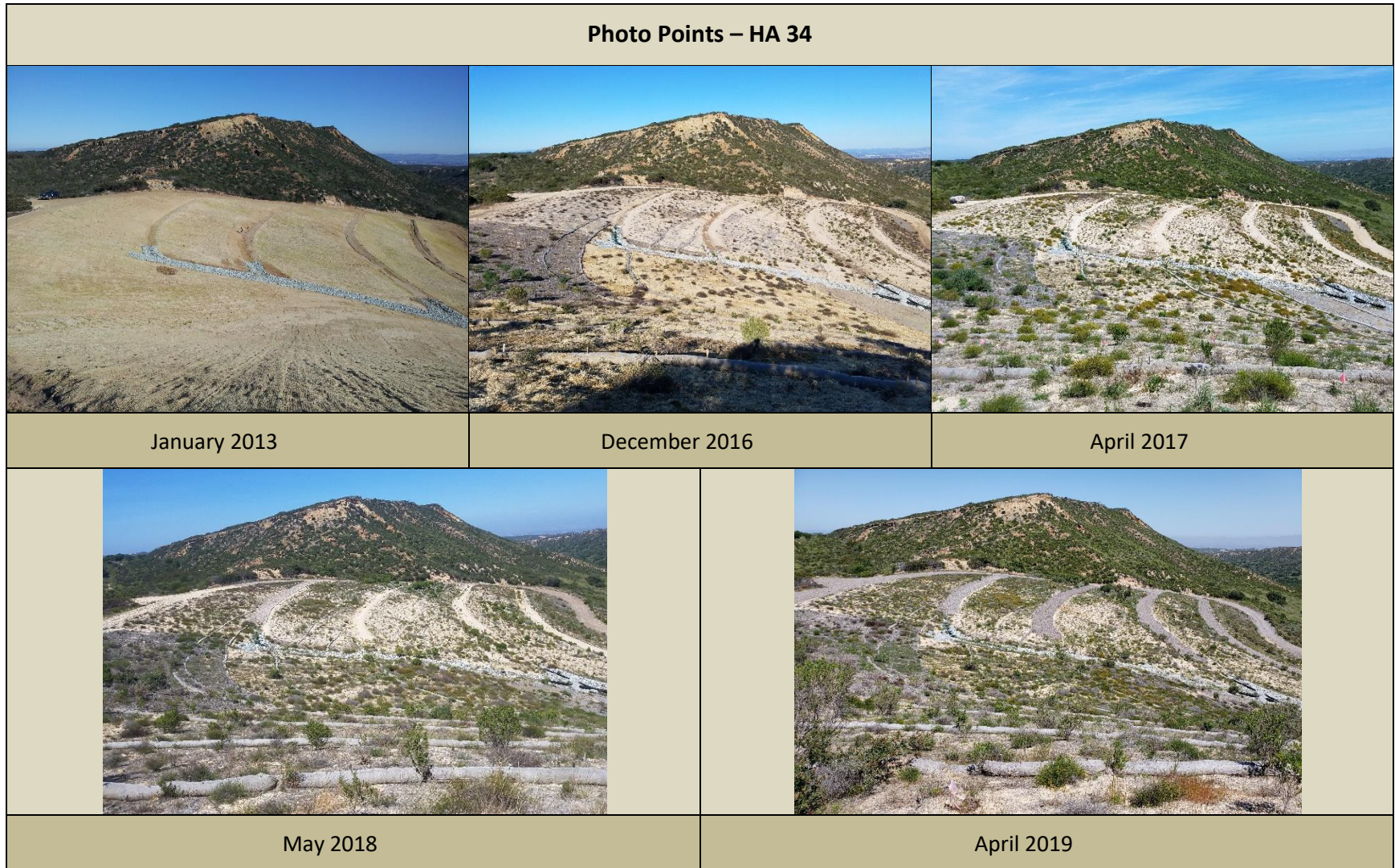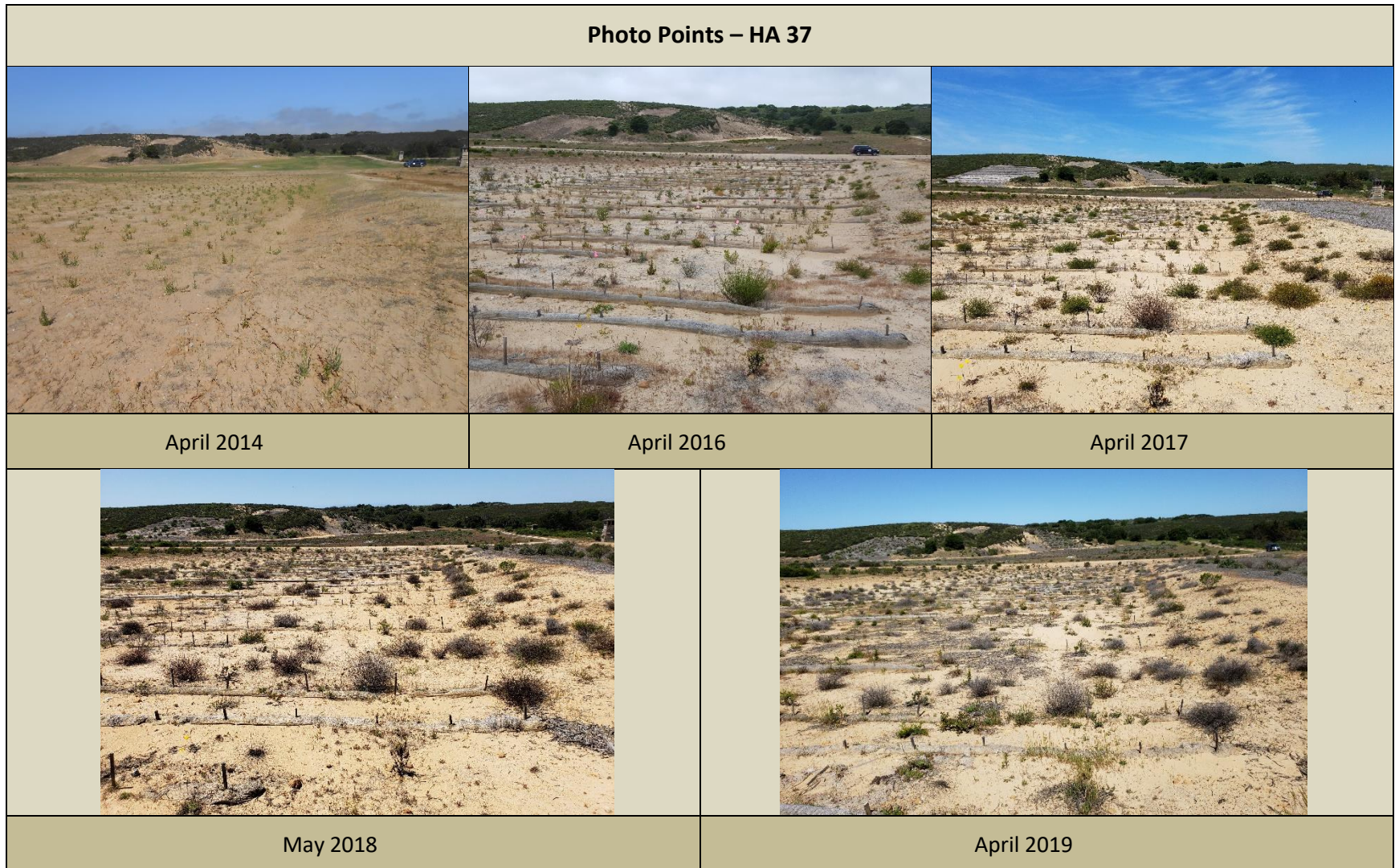
Photo Points – HA 38	
April 2014	January 2015
April 2016	April 2017
May 2018	April 2019