San Elijo Lagoon CONSERVANCY
Connecting communities. Protecting nature.
P.O. Box 230634 Encinitas, CA 92023-0634

October 13, 2017

Sarah Pierce
SANDAG
401 B Street, Suite 800
San Diego, CA 92101-4231

RE: San Diego Association of Governments *TransNet* Environmental Mitigation Program Land Management Grant FINAL REPORT; Reporting Period: September 8, 2015 – September 8, 2017; SANDAG Contract Number: 5004734

Dear Sarah,

This letter includes the final reporting and submittal of all outstanding deliverables for the San Diego Association of Governments (SANDAG) Contract Number 5004734 (Project). The Project was initiated through a grant proposal agreement between the SANDAG and the San Elijo Lagoon Conservancy (SELC) signed on September 8. 2015. The agreement confirmed SELC's submittal of a successful application for TransNet Environmental Mitigation Program (EMP) Regional Habitat Conservation funds.

Executive Summary
The Project was designed to accomplish the following objectives:

- conduct three years of invasive plant re-treatments and limited new treatments throughout the Carlsbad Hydrologic Unit (CHU);
- conduct three years of revegetation and habitat restoration; and
- conduct detailed mapping of invasive plant infestations within the Core and Linkage Areas included in the Multiple Habitat Conservation Program Plan (2003).

The Project was a continuation of the CHU Invasive Vegetation Control and Habitat Restoration Program (Program) that monitored invasive plant conditions and restores habitat in seven watersheds (135,604 acres) in northern San Diego County. The former Program included continual monitoring and treatment of invasive plants throughout the CHU and included the maintenance and expansion of SELC's right-of-entry database.

Target invasive species included Management Level 3, 4, and 5 species as identified in SANDAG's Management Priorities for Invasive Non-native Plants: *A Strategy for Regional Implementation, San Diego County, California* (IPSP) (CBI et.al 2012). Project goals included habitat enhancement and restoration in riparian, coastal sage scrub, chaparral, salt and freshwater marsh, and coastal dune vegetation communities. Project activities directly and indirectly benefitted at-risk native species in the region by reducing threat of non-native species invasions and increasing habitat connectivity through native plant revegetation.

The Project intended to treat/retreat a minimum of 301 acres of invasive species, revegetate a minimum of 4.62 acres of native vegetation communities, maintain and expand SELC's extensive right-of-entry database, and reach out to a minimum of 2,000 individuals in the communities surrounding the Project sites. Project activities included biomass removal, avian monitoring, invasive species control, irrigation, invasive species mapping, and planting. A total of 1,105.85 acres were subject to Project activities. **Table 1: Total Acres of Habitat per Project Activity** summarizes total Project acres per activity type.

Project deliverables include a report of total acres treated between Task 1 and Task 2, a report of total acres revegetated, and an invasive plant species location submittal to the San Diego Management and Monitoring Program (SDMMP). All acreage deliverables are included in the Final Report, including a map of invasive species occurrences. In addition, an invasive species location shapefile[1] will be included with the Final Report for submittal to the SDMMP.

SELC anticipates engaging in long-term strategic planning and maintenance for the sites addressed by the Project, as well as adjacent and contiguous sites. SANDAG's support reinforced a critical regional mapping effort that will inform future project site locations and lend to an adaptive management approach to habitat enhancement and restoration in north San Diego County and beyond. During the Project implementation period, SELC learned that habitat enhancement and restoration must progress to accommodate expected ecological changes such as rising seas and temperatures and ensuing landscape alterations. Thus, ecological enhancement and restoration projects are ongoing and dynamic, and require continued cooperation at all levels of land management—from communities to municipalities to the resource agencies—in order to build resiliency into future habitats and associated urban environments.

In terms of proposed actions contrasted with Project execution, SELC underestimated the average cost per acre of invasive species treatments, retreatments and biomass removal combined. The original proposal projected that a total of 301 acres of invasive species treatments, retreatments and biomass removal would occur ($178.71 per acre). Actual costs for all invasive species treatments and biomass removal combined cost an average of $282.69 per acre. Thus, a total of 190.29 acres of habitat were subject to invasive species treatments, retreatments and biomass removal as opposed to the proposed 301 acres.

[1] Submitted as a .zip containing .shp, .shx, .dbf, and .prj files.

Table 1: Total Acres of Habitat per Project Activity

Holland[2] Vegetation Type	Biomass Removal	Avian Monitoring	Invasive Species Control	Irrigation	Mapping/Weed Survey	Planting	Total
11200 Disturbed Wetland	0.00	2.59	2.59	0.00	6.04	0.00	**11.22**
11300 Disturbed Habitat	0.00	13.38	14.07	0.07	23.48	0.00	**51.00**
12000 Urban/Developed	0.00	2.73	6.17	0.14	222.90	0.00	**231.94**
18100 Orchards and Vineyards	0.00	0.00	0.00	0.00	5.04	0.00	**5.04**
18200 Intensive Agriculture - Dairies, Nurseries, Chicken Ranches	0.00	0.08	0.08	0.00	5.11	0.00	**5.28**
18300 Extensive Agriculture - Field/Pasture, Row Crops	0.00	0.00	0.00	0.00	6.78	0.00	**6.78**
18310 Field/Pasture	0.00	0.00	0.00	0.00	149.29	0.00	**149.29**
32500 Diegan Coastal Sage Scrub	0.99	0.08	9.21	0.09	129.56	0.00	**139.92**
37000 Chaparral	0.00	0.00	0.00	0.00	24.90	0.00	**24.90**
37120 Southern Mixed Chaparral	0.00	0.00	0.00	0.00	20.56	0.00	**20.56**
37C30 Southern Maritime Chaparral	0.00	0.00	0.00	0.00	5.55	0.00	**5.55**
37G00 Coastal Sage-Chaparral Transition	0.00	0.00	0.00	0.00	0.45	0.00	**0.45**
42000 Valley and Foothill Grassland	2.66	0.00	3.82	0.82	0.00	0.00	**7.30**
42200 Non-Native Grassland	0.00	0.38	15.85	0.23	14.58	0.00	**31.04**
52120 Southern Coastal Salt Marsh	0.95	1.12	8.12	0.00	0.00	0.00	**10.18**

[2] Based on the State of California The Resource Agency Department of Fish and Game Preliminary Descriptions of the Terrestrial Natural Communities of California by Robert F. Holland, Ph. D. (October 1996). "Disturbed" vegetation types and "Urban/Developed" do not reflect post-enhancement/restoration vegetation types (e.g. following enhancement/restoration a "Disturbed Wetland" will be re-mapped as a functional wetland type such as salt marsh).

Holland[2] Vegetation Type	Biomass Removal	Avian Monitoring	Invasive Species Control	Irrigation	Mapping/Weed Survey	Planting	Total
52300 Alkali Marsh	0.48	16.28	18.77	0.00	6.05	0.00	**41.59**
52310 Cismontane Alkali Marsh	0.00	0.02	2.64	0.00	0.00	0.00	**2.67**
52400 Freshwater Marsh	0.00	0.00	0.00	0.00	0.00	0.00	**0.01**
52410 Coastal and Valley Freshwater Marsh	0.00	3.62	6.64	0.16	0.03	0.00	**10.45**
61000 Riparian Forests	0.00	0.00	0.00	0.00	12.18	0.00	**12.18**
61310 Southern Coast Live Oak Riparian Forest	0.00	0.00	0.00	0.00	6.86	0.00	**6.86**
62400 Southern Sycamore-Alder Riparian Woodland	0.00	0.00	0.00	0.00	116.97	0.00	**116.97**
63300 Southern Riparian Scrub	37.03	45.97	53.90	1.59	50.12	1.59	**190.20**
63320 Southern Willow Scrub	0.00	0.00	0.00	0.00	0.15	0.00	**0.15**
64130 Estuarine	0.00	0.53	0.75	0.00	0.00	0.00	**1.28**
64140 Freshwater	0.00	0.00		0.00	3.69	0.00	**3.69**
64400 Beach	0.00	0.53	2.15	0.00	0.00	0.00	**2.68**
71161 Open Coast Live Oak Woodland	0.00	0.00	0.00	0.00	4.57	0.00	**4.57**
71162 Dense Coast Live Oak Woodland	0.00	0.00	0.00	0.00	2.22	0.00	**2.22**
79100 Eucalyptus Woodland	1.03	1.87	2.40	0.26	4.32	0.00	**9.89**
Total	**43.13**	**89.19**	**147.16**	**3.37**	**821.41**	**1.59**	**1,105.85**

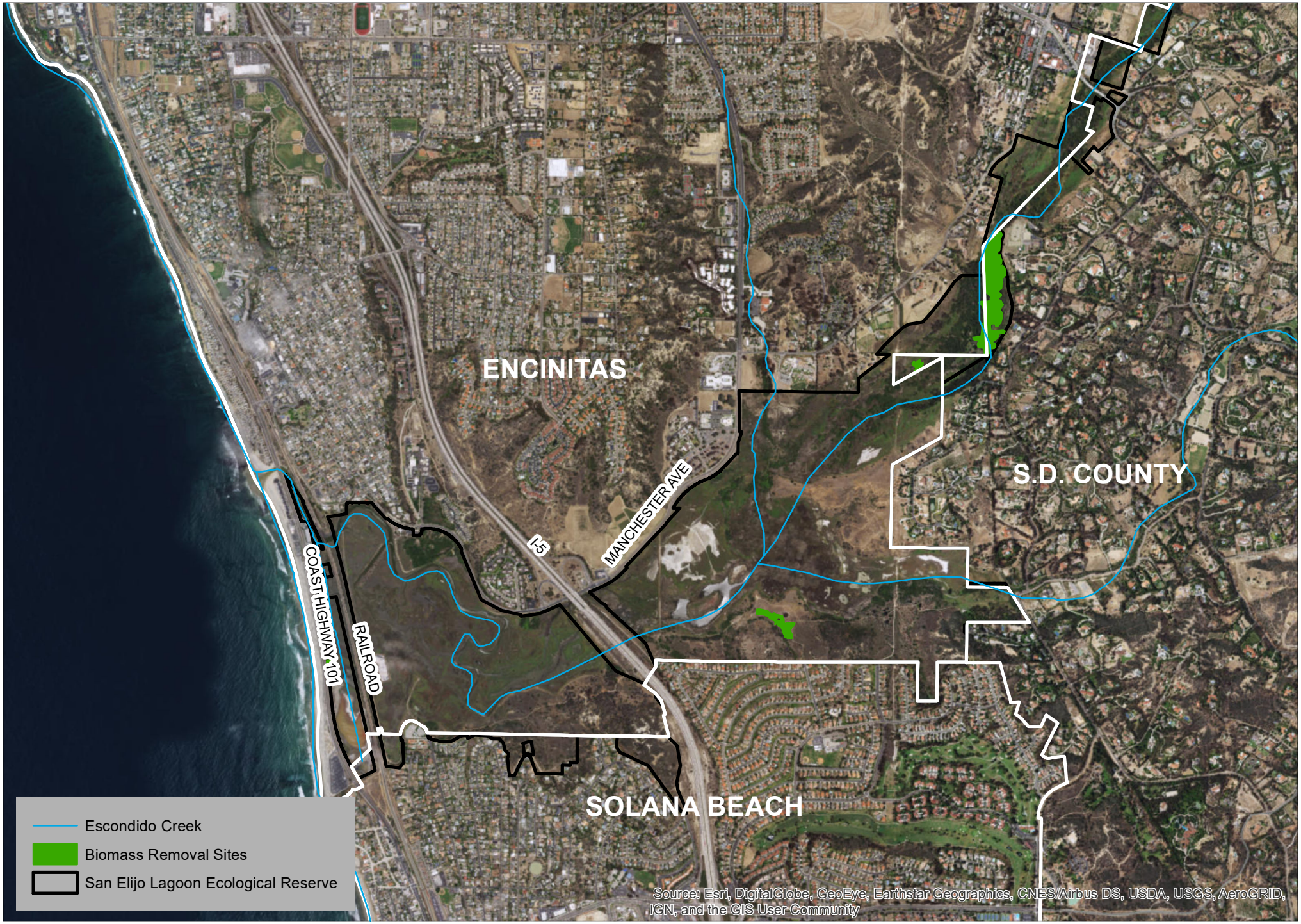
Project Completion – Summaries by Task

Task 1/2- Retreatments & Biomass Reduction /Treatments of New Infestations & Biomass Reduction

The Project treated and/or retreated a total of 147.16 acres of invasive species. In addition, a total of 43.13 acres of biomass was removed from various Project sites. Biomass includes: eucalyptus (*Eucalyptus* spp.) debris (i.e. large lumber, limbs, and leaves); tamarisk (*Tamarix* spp.) limbs, leaves and trunks; palm trees (*Phoenix canariensis* and *Washingtonia robusta*); giant reed (*Arundo donax*); and myoporum (*Myoporum* spp.) limbs, leaves and trunks, and brassicaceous species (*Brassica* spp. and *Lepidium latifolium*). **Table 2: Biomass Removal and Invasive Species Treatments per Vegetation Type** summarizes the biomass removal and invasive species treatment acreages per habitat type. **Figure 1: Biomass Removal Sites** and **Figure 2: Invasive Species Treatment Sites** show the locations of all invasive species treatments and biomass removal that occurred over the span of the Project. **Table 3: Treatment Acreage per Species** lists the total Project acreage per invasive species treated.

Table 2: Biomass Removal and Invasive Species Treatments per Vegetation Type

Holland Vegetation Type	Biomass Removal (Acres)	Invasive Species Control (Acres)
11200 Disturbed Wetland	0.00	2.59
11300 Disturbed Habitat	0.00	14.07
12000 Urban/Developed	0.00	6.17
18100 Orchards and Vineyards	0.00	0.00
18200 Intensive Agriculture - Dairies, Nurseries, Chicken Ranches	0.00	0.08
18300 Extensive Agriculture - Field/Pasture, Row Crops	0.00	0.00
18310 Field/Pasture	0.00	0.00
32500 Diegan Coastal Sage Scrub	0.99	9.21
37000 Chaparral	0.00	0.00
37120 Southern Mixed Chaparral	0.00	0.00
37C30 Southern Maritime Chaparral	0.00	0.00
37G00 Coastal Sage-Chaparral Transition	0.00	0.00
42000 Valley and Foothill Grassland	2.66	3.82
42200 Non-Native Grassland	0.00	15.85
52120 Southern Coastal Salt Marsh	0.95	8.12
52300 Alkali Marsh	0.48	18.77
52310 Cismontane Alkali Marsh	0.00	2.64
52400 Freshwater Marsh	0.00	0.00
52410 Coastal and Valley Freshwater Marsh	0.00	6.64
61000 Riparian Forests	0.00	0.00
61310 Southern Coast Live Oak Riparian Forest	0.00	0.00
62400 Southern Sycamore-Alder Riparian Woodland	0.00	0.00
63300 Southern Riparian Scrub	37.03	53.90
63320 Southern Willow Scrub	0.00	0.00
64130 Estuarine	0.00	0.75
64140 Freshwater	0.00	0.00
64400 Beach	0.00	2.15
71161 Open Coast Live Oak Woodland	0.00	0.00
71162 Dense Coast Live Oak Woodland	0.00	0.00
79100 Eucalyptus Woodland	1.03	2.40
Total	**43.13**	**147.16**

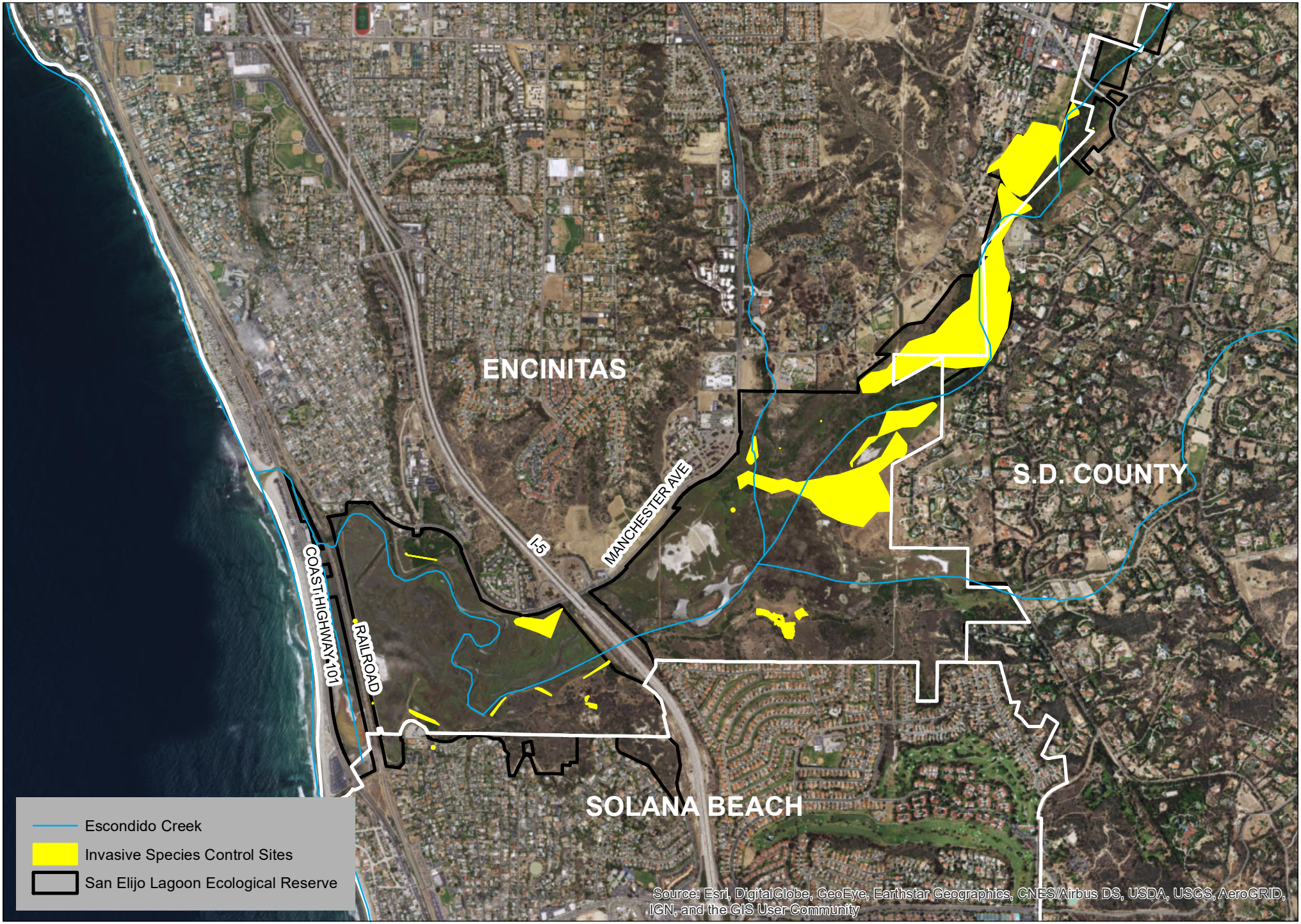


SANDAG TransNet EMP Land Management Grant
Figure 1: Biomass Removal Sites

0 500 1,000 2,000 Feet

N

Imagery Date: 2017
Map Date: OCT 2017
Data Sources: SELC & SANGIS



SANDAG TransNet EMP Land Management Grant
Figure 2: Invasive Species Treament Sites

0 500 1,000 2,000 Feet

N

Imagery Date: 2017
Map Date: OCT 2017
Data Sources: SELC & SANGIS

Table 3: Treatment Acreage per Species

Scientific Name	Common Name	Management Level (ML)[3]	Acres[4]
Avena barbata	slender wild oat	N.A.	0.09
Brassica sp.	mustard	N.A.	0.44
Bromus diandrus	ripgut grass	N.A.	0.09
Bromus madritensis	foxtail chess	N.A.	0.09
Centaurea melitensis	Maltese star-thistle	N.A.	0.09
Erodium cicutarium	restem filaree	N.A.	0.09
Foeniculum vulgare	fennel	ML 4 - Directed Management (sub-management unit or reserve)	31.26
Lepidium latifolium	perennial pepperweed	ML 3 - Containment (management unit or watershed)	106.29
mixed weeds	N.A.	N.A.	5.08
Theba pisana[5]	white garden snail	N.A.	3.64
		Total:	**147.16**

Task 3- Revegetation

The Project planted a total of 1.59 acres of native plants at a southern riparian scrub restoration site located adjacent Escondido Creek in the northeastern portion of the San Elijo Lagoon Ecological Reserve (SELER) (**Figure 3: Planting Location**). **Table 4: Southern Riparian Scrub Planting Palette** lists the native plant species and quantities installed. In addition, the Project irrigated 3.37 acres of native plantings at various locations in the SELER (**Figure 4: Irrigation Sites**).

Table 4: Southern Riparian Scrub Planting Palette

Scientific Name	Common Name	Size	Quantity
Anemopsis californica	yerba mansa	1 gallon	70
Baccharis pilularis	coyote bush	1 gallon	185
Iva hayesiana	San Diego marsh elder	1 gallon	75
Juglans californica	Southern California black walnut	1 gallon	300
Juncus mexicanus	Mexican rush	1 gallon	74
Rosa californica	California rose	1 gallon	30
Sambucus nigra subsp. caerulea	blue elderberry	5 gallon	90

[3] Per the Management Priorities for Invasive Non-native Plants *A Strategy for Regional Implementation, San Diego County, California* (Dendra Inc. 2012)
[4] Includes new treatments and retreatments.
[5] Removed manually and disposed off-site.

SANDAG TransNet EMP
Figure 3: Planting Location

0 500 1,000 2,000 Feet

N

Imagery Date: 2017
Map Date: OCT 2017
Data Sources: SELC & SANGIS

SANDAG TransNet EMP Land Management Grant
Figure 4: Irrigation Sites

0 500 1,000 2,000 Feet

N

Imagery Date: 2017
Map Date: OCT 2017
Data Sources: SELC & SANGIS

Task 4- Invasive Species Mapping

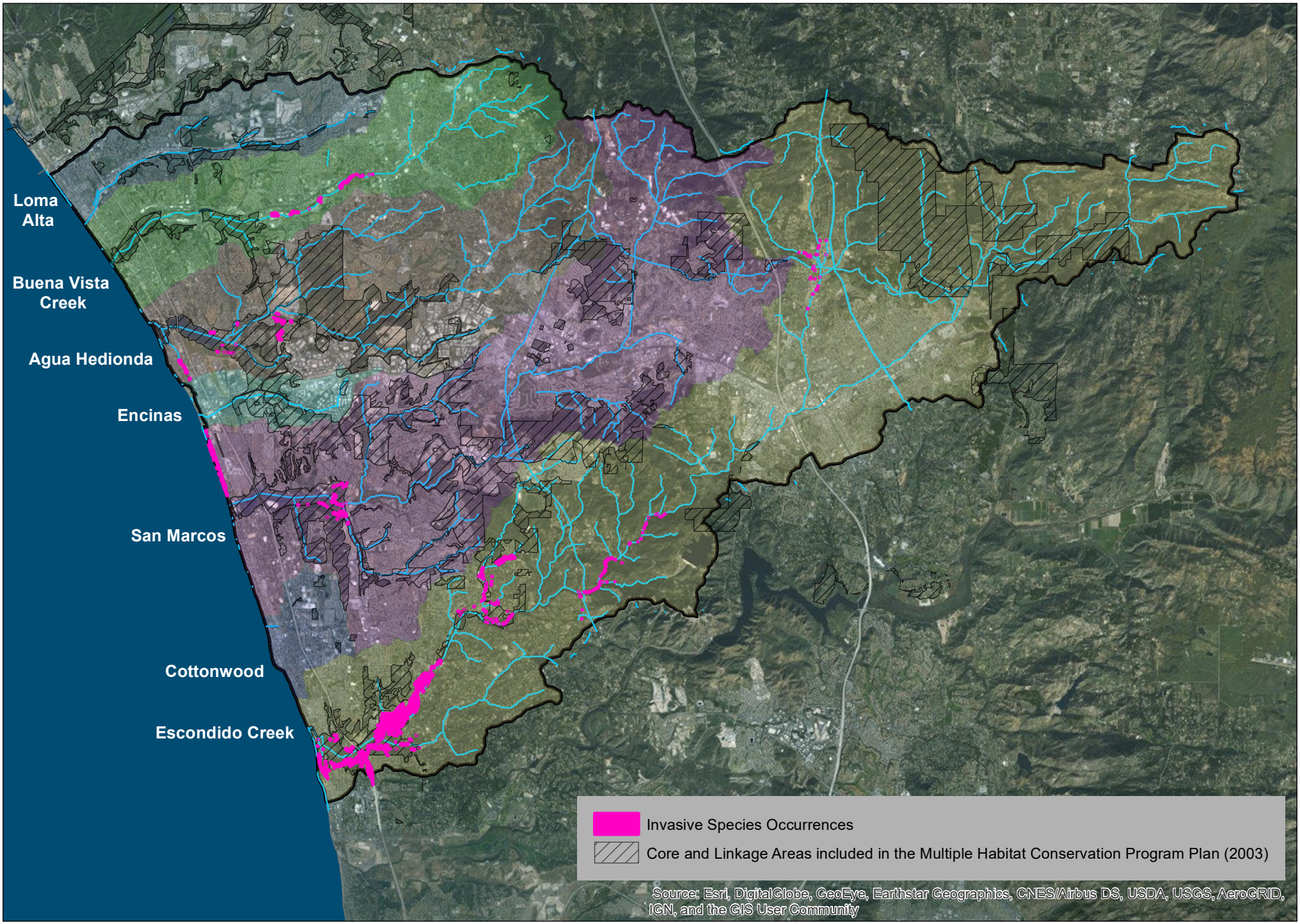
The Project mapped 535.47 acres of invasive species occurrences in the Buena Vista Creek, Agua Hedionda, Encinas, San Marcos, Cottonwood and Escondido Creek Watersheds (**Figure 5: Mapped Invasive Species Occurrences). Table 5: Mapped Invasive Species Acreages per Species** summarizes the acreage mapped per species.

Table 5: Mapped Invasive Species Acreages per Species

Scientific Name	Total Acres Mapped	Scientific Name	Total Acres Mapped
Acacia[6]	0.00	*Iris pseudacorus*	9.53
Acacia sp.	0.00	*Lepidium latifolium*	109.59
Acacia cyclops	1.25	*Limonium duriusculum*	1.31
Acacia sp.	0.08	*Limonium perezii*	2.61
Acacia spp.	0.00	*Limonium ramosissimum*	1.68
Apium graveolens	0.00	*Limonium sinuatum*	5.61
Aptenia cordifolia	0.22	*Limonium sp.*	0.00
Arundo	0.00	*Malephora crocea*	0.01
Arundo donax	6.57	*Marrubium vulgare*	0.00
Asparagus asparagoides	3.35	*Melaleuca sp.*	0.02
Asphodelus fistulosus	0.55	*Mesembryanthemum crystallinum*	3.12
Atriplex prostrata	2.27	*Mesembryanthemum nodiflorum*	0.00
Atriplex semibaccata	1.36	*mixed weeds*	22.86
Avena barbata	1.93	*Myoporum laetum*	0.25
Brassica nigra	8.91	*Myoporum parviflorum*	0.01
Brassica spp.	107.30	*Nicotiana glauca*	2.38
Brassica tournefortii	0.02	*Nicotiniana glauca*	18.66
Bromus diandrus	2.28	*Oncosiphon piluliferum*	0.00
Bromus hordeaceus	1.36	*Oxalis spp.*	3.35
Bromus madritensis	0.57	*palm*	9.95
Bromus madritensis ssp. rubens	1.36	*Parthenocissus quinquefolia*	3.35
Cakile maritima	1.54	*Paspalum vaginatum*	0.00
Cakile martima	1.24	*Pennisetum setaceum*	0.01
Carpobrotus edulis	5.52	*Phoenix canariensis*	0.32
Carpobrotus sp.	0.01	*Phoenix sp.*	0.01
Cenchrus sp.	0.00	*Phoenix spp.*	0.02
Centaurea melitensis	4.28	*Pluchea sericea*	0.03
Centaurea solstitialis	0.57	*Polygonum aviculare*	1.36
Conium maculatum	0.24	*Raphanus sativus*	2.30
Cortaderia	0.03	*Ricinis communis*	0.01

[6] Individual shrubs and trees that are less than 0.01 acres in area do not contribute to the total acreage.

Scientific Name	Total Acres Mapped	Scientific Name	Total Acres Mapped
Cortaderia jubata	1.53	*Ricinus communis*	5.37
Cortaderia selloana	7.47	*Salsola spp.*	0.51
Cortaderia sp.	0.06	*Salsola tragus*	1.52
Cortaderia spp.	31.86	*Schimus terebinthifolius*	0.00
Cynara cardunculus	2.23	*Schinus molle*	0.01
Cynodon dactylon	0.01	*Schinus terebinthifolius*	0.02
Delairea odorata	0.00	*Silybum marianum*	0.73
Dittrichia graveolens	2.47	*Sisymbrium irio*	2.99
Echinochloa colona	0.00	*Sonchus asper*	2.85
Ehrharta calycina	24.42	*Tamarisk*	0.01
Ehrharta erecta	1.30	*Tamarix*	0.03
Encelia farinosa	0.00	*Tamarix ramosissima*	22.63
Erodium botrys	1.63	*Tamarix sp.*	0.08
Erodium cicutarium	0.12	*Tamarix spp.*	0.64
Eucalyptus	0.00	*Tetragonia tetragonioides*	0.23
Eucalyptus sp.	0.51	*Tribulus terrestris*	1.36
Eucalyptus spp.	29.35	*Tropaeolum majus*	0.24
Euphorbia maculata	1.08	*Urtica urens*	0.57
Festuca perennis	1.36	*Vinca major*	0.01
Foeniculum vulgare	30.87	*Washingtnia robusta*	0.00
Glebionis coronaria	7.99	*Washingtonia*	0.04
Hedera canariensis	0.01	*Washingtonia robusta*	0.12
Hedera helix	0.00	*Washingtonia sp.*	0.04
Hirschfeldia incana	0.00	*Washingtonia spp.*	0.00
		Total	**535.47**



SANDAG TransNet EMP Land Management Grant
Figure 5: Mapped Invasive Species Occurrences

0 3,600 7,200 14,400 Feet

N

Imagery Date: 2017
Map Date: AUG 2017
Data Sources: SELC & SANGIS