CLARK COUNTY DCP AND NATIONAL PARK SERVICE

Boulder City Conservation Easement Weed Sentry 2016 Final Report

Clark County DCP Project Number 2007-NPS-714K

Deuser, Curtis

11/4/2016

Final Report

Project Title: Boulder City Conservation Easement Weed Sentry

Project Number: 2007-NPS-714K

Deliverable: D24

Executive Summary:

Clark County, NV and the National Park Service Lake Mead Exotic Plant Management Team (LAKE EPMT) entered into a three year partnership agreement beginning in January 2014 to survey and treat weeds species on the Clark County Desert Conservation Program (DCP) Boulder City Conservation Easement (BCCE) properties.

The main purpose of this project was to conduct surveys of routes in the BCCE to detect non-native vegetation and conduct targeted treatments of existing occurrences of invasive, non-native vegetation. The survey area includes 95 miles of open public roads and 43 miles of private right of way maintenance roads. The location and extent of infestations were recorded with GPS units, and treatments of exotics were completed on a prioritized basis. Project Deliverables and Milestones were due and reported on a quarterly, bi-annual and annual basis during the three year project. A lot of valuable information has been exchanged and vegetation management work has been accomplished on the ground to meet current site objectives.

The project has been successful at detecting and controlling small populations of high priority weeds such as sahara mustard (*Brassica tournefortii*) in isolated areas within the BCCE. Most of the acreage and routes within the BCCE do not currently contain many weeds.

This work was supported by the Clark County Desert Conservation Program and funded by Section 10, as project #2007-NPS-714K, to further implement or develop the Clark County Multiple Species Habitat Conservation Plan.

Introduction:

The primary purpose of this project is to conduct weed surveys along the BCCE travel routes and conduct targeted treatments of priority weeds. Non-native invasive plants and other weeds are commonly known to degrade ecological habitats, alter potential desirable native plant community recovery, reduce overall potential for wildlife diversity and increase wildfire potential including fire frequency and intensity. Some weeds are categorized by the State of Nevada as noxious, which land owners are required by law to control. Weed management is a

vital component of not only being a good land steward and neighbor within a community but is a critical step toward restoring lands for maximizing native species habitats. The goal of this project is to support vegetation management and maintenance activities in the BCCE to maintain and improve desert tortoise habitat. The objectives include conducting winter, spring and summer weed surveys and control treatments by surveying roadsides within the BCCE. Weed treatments will focus on incipient populations to prevent new weeds from establishing on a widespread basis. A list of native plants observed is provided along with data and reports.

Methods and Materials:

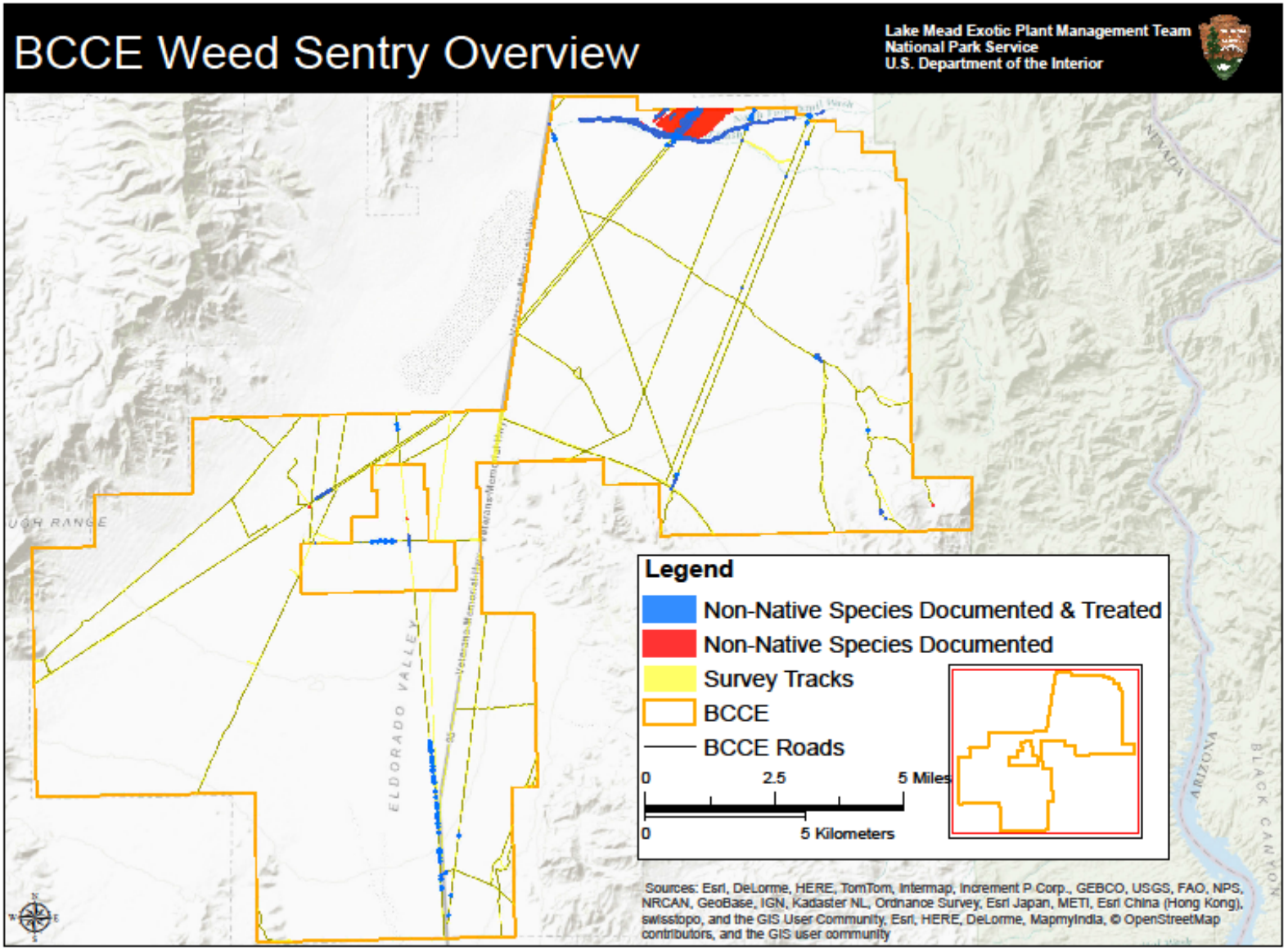
Methods include on the ground ocular surveys primarily by vehicle and sometimes on foot by field crews. Surveys were conducted up to 10 meters on each side of roads/routes. However, once targeted weedy plants were detected within this survey zone continued surveys would occur on foot beyond the 10 meters of roadside to determine the extent of the population. Typically a driver and a passenger/surveyor conducted the surveys in a four wheel drive pick-up truck travelling 5 to 10 miles per hour, road conditions permitting. Locations of noxious weeds and treatments were recorded with mapping-grade global positioning system (Trimble GPS) units and input and processed into GIS computer programs back in the office. Treatment methods included selective spot foliar herbicide applications to targeted weeds using 4 gallon backpack sprayers with adjustable nozzles and pressure. This is a low impact and selective method that causes minimal to no harm to existing desirable vegetation on site. Hand pulling and hoeing of weeds was also utilized when appropriate.

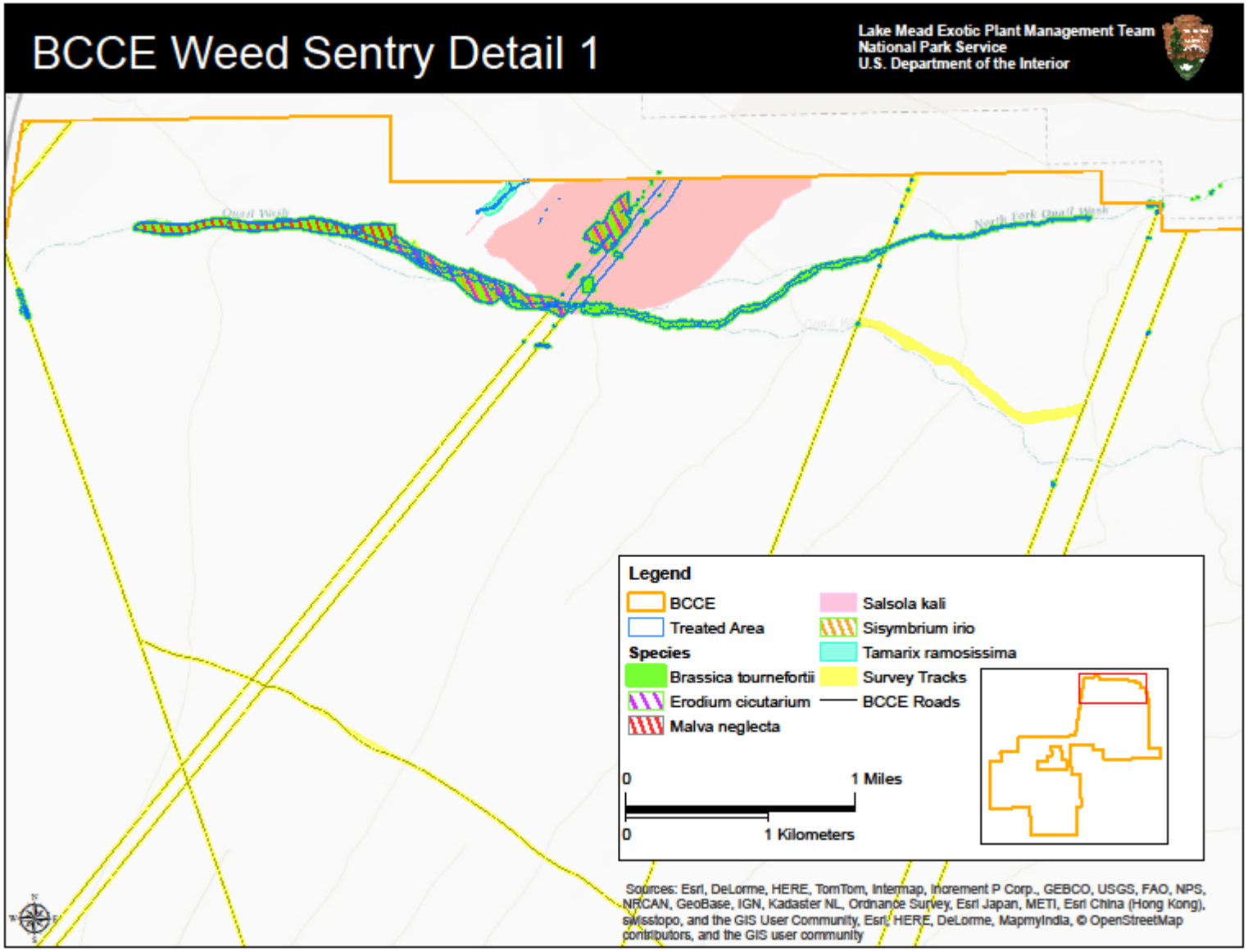
Non-native plant surveys were conducted at least twice a year during the winter and spring/summer time periods for three consecutive years (2014, 2015 and 2016). Twice-a-year surveys during these time periods were designed to detect a variety of species that may emerge during weather patterns related to these seasons. Non-native annual and perennial plant species were documented during surveys and geospatially recorded using hand held global positioning system (GPS units) devices. All plant inventories and treatments were recorded with GPS using standards according to the North American Invasive Species Management Association (NAISMA.org). Project related photographs were taken using digital cameras.

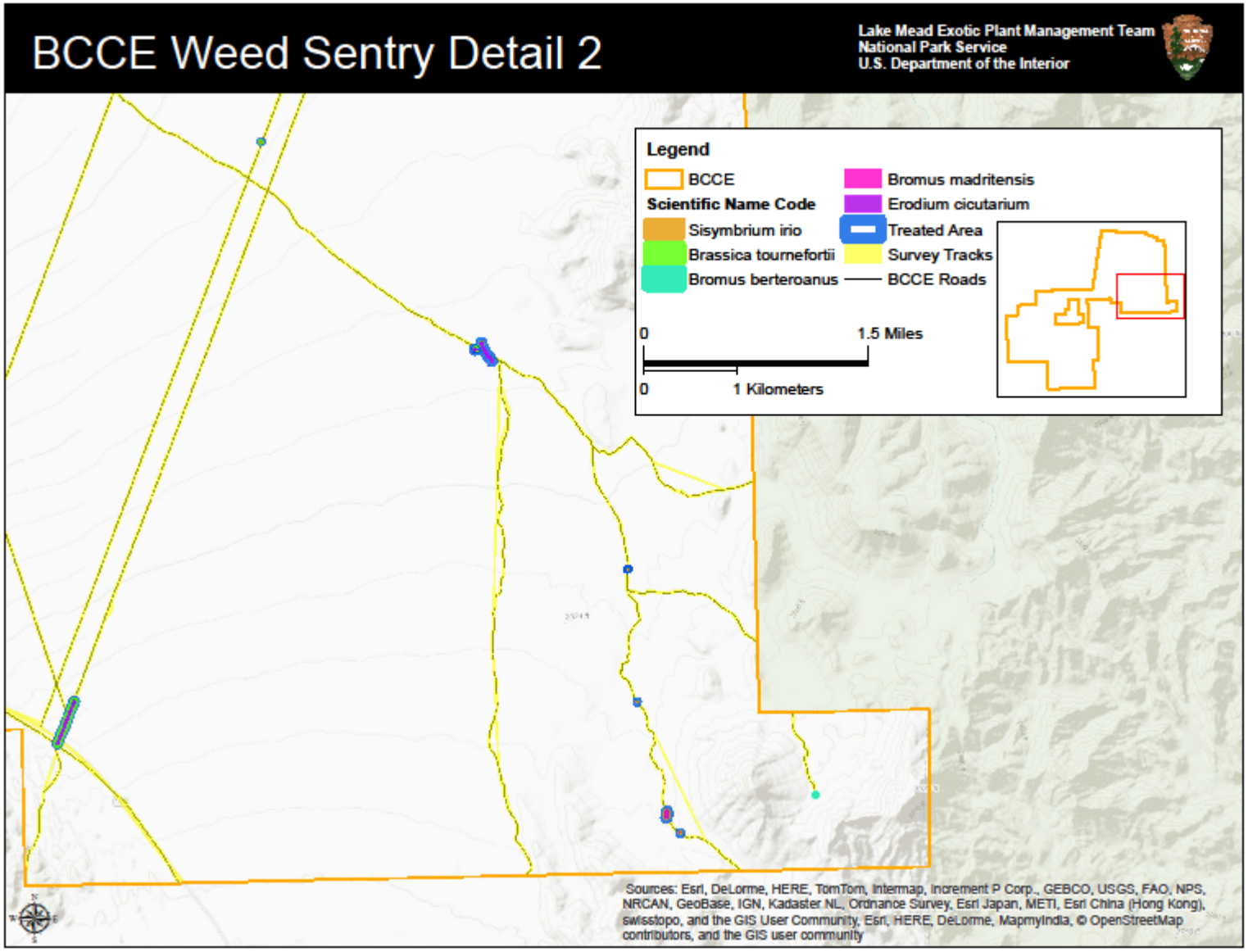
Five to 7 miles of a wash running west to east on the northern boundary of the northeast unit just south of Boulder City was also surveyed and treated on foot since higher densities of sahara mustard were found in this area. Tamarisk trees from the Boulder City water treatment facility drainage adjacent to this wash within the BCCE were also treated by using the cut stump method which includes cutting the trees with chainsaws and applying herbicide to the freshly cut stumps.

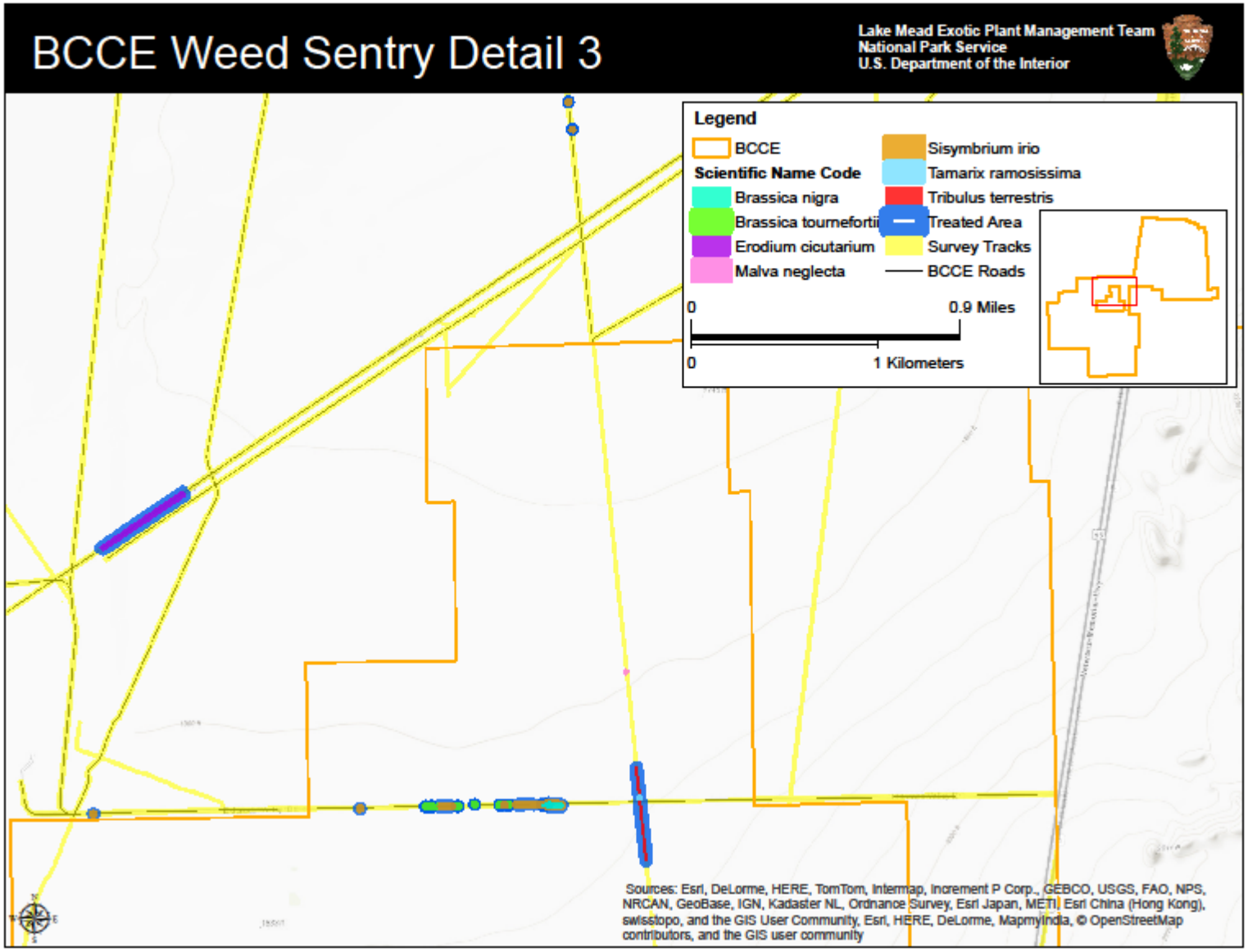
Results:

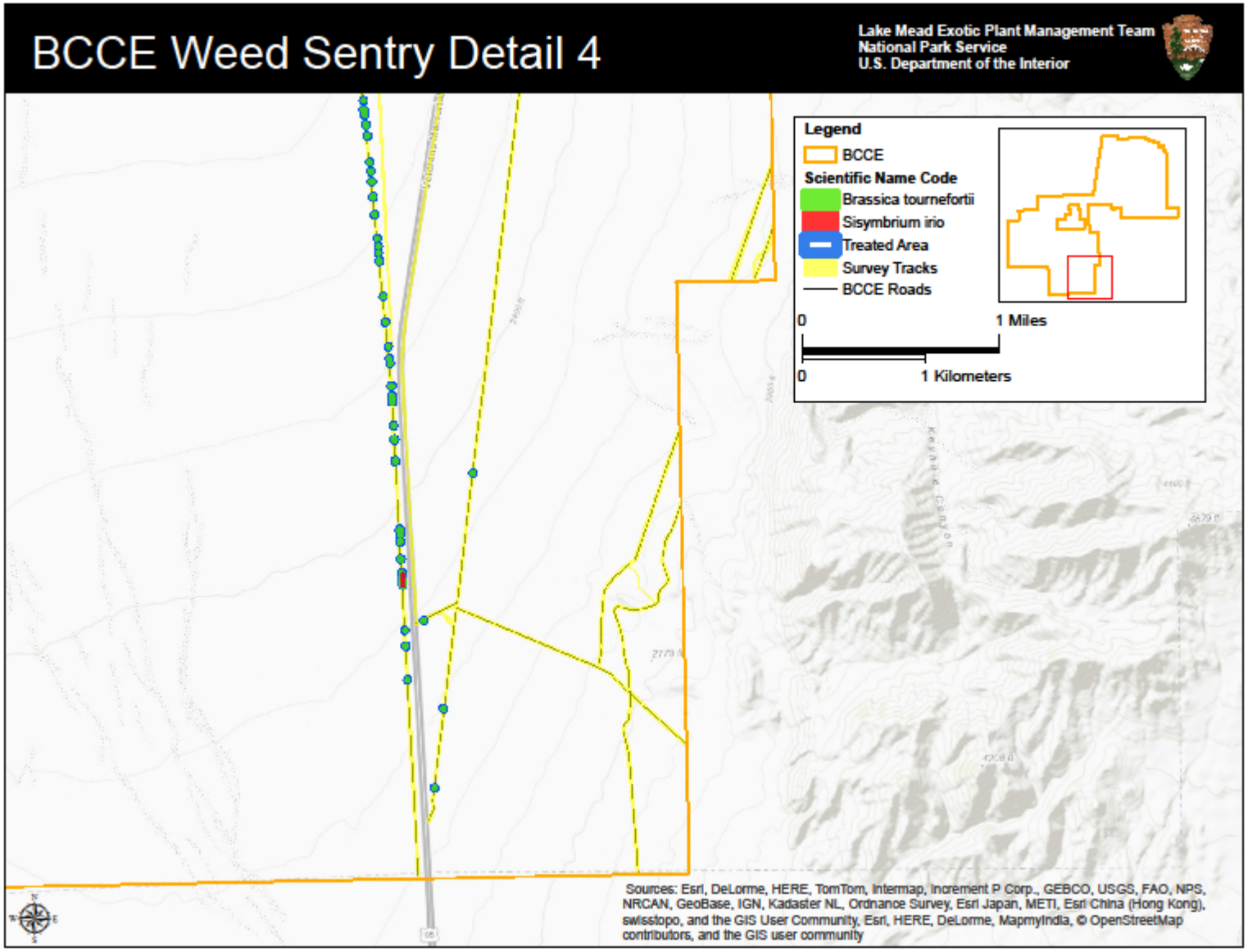
For project results please refer to the following Maps, Table Data Summaries and List.


BCCE Weed Sentry Overview
Lake Mead Exotic Plant Management Team
National Park Service
U.S. Department of the Interior
Legend
Non-Native Species Documented & Treated
Non-Native Species Documented
Survey Tracks
BCCE
BCCE Roads
0
2.5
5 Miles
0
5 Kilometers
ELDORADO VALLEY
NEVADA
ARIZONA
Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community


BCCE Weed Sentry Detail 1
Lake Mead Exotic Plant Management Team
National Park Service
U.S. Department of the Interior
Legend
BCCE
Treated Area
Species
Brassica tournefortii
Erodium cicutarium
Malva neglecta
Salsola kali
Sisymbrium irio
Tamarix ramosissima
Survey Tracks
BCCE Roads
0
1 Miles
0
1 Kilometers
Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community


BCCE Weed Sentry Detail 2
Lake Mead Exotic Plant Management Team
National Park Service
U.S. Department of the Interior
Legend
BCCE
Scientific Name Code
Sisymbrium irio
Brassica tournefortii
Bromus berteroanus
Bromus madritensis
Erodium cicutarium
Treated Area
Survey Tracks
BCCE Roads
0
1.5 Miles
0
1 Kilometers
Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community


BCCE Weed Sentry Detail 3
Lake Mead Exotic Plant Management Team
National Park Service
U.S. Department of the Interior
Legend
BCCE
Scientific Name Code
Brassica nigra
Brassica tournefortii
Erodium cicutarium
Malva neglecta
Sisymbrium irio
Tamarix ramosissima
Tribulus terrestris
Treated Area
Survey Tracks
BCCE Roads
0
0.9 Miles
0
1 Kilometers
Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community


BCCE Weed Sentry Detail 4
Lake Mead Exotic Plant Management Team
National Park Service
U.S. Department of the Interior
Legend
BCCE
Scientific Name Code
Brassica tournefortii
Sisymbrium irio
Treated Area
Survey Tracks
BCCE Roads
0
1 Miles
0
1 Kilometers
Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

BCCE Final Project Weed Acreage Summary
Lake Mead Exotic Plant Management Team Treatments

Partner: Clark County Desert Conservation Program
Location: Boulder City Conservation Easement (BCCE)

Accomplishments

Species	Total Surveyed Acres	Infested Acres	Gross Infested Acres	Treated Acres
Arundo donax Giant reed	6,468	0.01 (dead stand)	0.02	0.00
Brassica nigra Black mustard	6,468	0.005	0.37	0.005
Brassica tournefortii Sahara mustard	6,468	2.49	134.48	2.49
Bromus berteroanus Chilean brome	6,468	0.0001	0.0001	0
Bromus madritensis Compact brome	6,468	0.03	0.74	0.03
Erodium cicutarium Redstem filaree	6,468	0.49	58.7	0.49
Malva neglecta Common mallow	6,468	0.17	34.12	0.17
Salsola kali Russian thistle	6,468	19.01	393.8	1.39
Sisymbrium irio London rocket	6,468	0.27	51.76	0.27
Tamarix ramosissima Salt cedar	6,468	0.93	8.25	0.73
Tribulus terrestris Punctureveine	6,468	0.01	1.25	0.01

These definitions are based on NAISMA standards please visit www.naisma.org for more information. These definitions can also be found on the back of this report. For Questions please contact Curt Deuser at curt_deuser@nps.gov (702) 293 – 8979. Refer to following page for definitions.

Acreage Definitions

Surveyed Area

Any area covered during the course of weed management / control activities. An area may be considered "surveyed" regardless of the presence / absence of target weed species. Surveyed area is obtained by GPSing the perimeter, GPSing perimeter points or digitized on screen using landform references.

Gross Infested Area

The gross infested area is defined as the general perimeter of the infestation. Gross infested areas contain the target species and the spaces between populations or individuals. A gross infested area is calculated by adding up the total acreage of all mapped weed infestations, without taking into account percent cover.

Infested Area

Actual area occupied by weed species within the gross infested area, which does not contain the spaces between individuals and populations. The total infest area (with the gross infested area) may be comprised of multiple infested areas, described by polygons, buffered points, buffered lines, or be calculated as the result of a stem count in which each individual is assigned a coverage multiplier.

Treated Area

Treated area is either the infested area or subset of an infested area which has received treatment action. Treatment area is calculated using the same standards as infested area.

*** All of these terms apply to single species measurements. When there is more than one weed species in an area, the above measurements need to be applied to each species (population) individually.**

Boulder City Conservation Easement Plant Species List (2014-2016)

Abronia pogonantha	Mojave sand verbena N
Abronia villosa	Hairy sand verbena N
Acacia greggii	Catclaw acacia N
Adenophyllum cooperi	Coopers dogweed
Amaranthus fimbriatus	Fringed amaranth
Ambrosia dumosa	White bursage N
Amsinckia tessellata	Bristly fiddleneck N
Argythamnia neomexicana	New mexico silverbush N
Arundo donax	**Giant reed E (dead)**
Astragalus tephrodes	Ashen milkvetch (possible) N
Atriplex polycarpa	Cattle saltbush (possible) N
Boerhavia coccinea.	Scarlet spiderling N
Boerhavia wrightii	Wright's boerhavia N
Bouteloua aristidoides	Needle grama N
Bouteloua barbata	Sixweeks grama N
Brassica juncea	**Indian mustard E**
Brassica nigra	**Black mustard E (may be *Hirschfeldia incana*, need to verify)**
Brassica tournefortii	**Sahara mustard E**
Bromus trinii	**Chillian brome (possible) E**
Camissonia brevipes	Golden suncup N
Camissonia campestris	Mojave suncup N
Castilleja angustifolia	Indian paintbrush N
Chondrilla juncea	**Rush skeleton weed (possible) E**
Condea emoryi	Desert lavender N
Cryptantha sp. N	Forget-me-not sp. N
Cylindropuntia bigelovii	Teddy-bear cholla N

Dalea mollisima	Silk dalea	N
Dasyochloa pulchella	Desert fluff-grass	N
Echinocactus sp.	Barrel cactus	N
Encelia farinosa	Brittlebush	N
Ephedra californica	Mormon tea	N
Euphorbia abramsiana	Abram's spurge	N
Euphorbia albomarginata	Rattle snake sandmat	N
Euphorbia arizonica	Ariizona spurge	N
Eriogonum fasciculatum	Eastern Mojave buckwheat	N
Erodium cicutarium	**Redstem filaree, Stork's bill**	**E**
Eschscholzia glyptosperma	Mojave poppy	N
Ferocactus cylindraceus	California barrel cactus	N
Kallstroemia californica	California caltrop	N
Larrea tridentata	Creosotebush	N
Lotus strigosus	Hairy lotus	N
Lupinus arizonicus	Arizona lupine	N
Malacothrix glabrata	Desert dandelion	N
Malva sp.	**Big-leaf mallow**	**E**
Mentzelia affinis	Yellow comet	N
Mentzelia ivolucrata	Sand blazing star	N
Nicotiana attenuata	Coyote tobacco	N
Oenethera deltoids	Dune evening primrose	N
Opunitia basilares	Beavertail cactus	N
Optunia versicolor	Staghorn cholla	N
Pectis papposa	Cinchweed	N
Perityle emoryi	Rock daisy	N
Phacelia crenulata	Notch-leaf phacelia	N
Phacelia ivesiana	Ives phacelia	N

Physalis crassifolia	Ground cherry N
Plantago ovate	Desert plantain N
Pleuraphis rigida	Big galleta N
Prosopis glandulosa	Honey mesquite N
Salsola kali	**Russian thistle E**
Salvia columbariae	Mojave desert chia N
Salazaria Mexicana	Paper bag bush
Senna armata	Desert senna N
Sisymbrium iro	**London rocket E**
Sphaeralcea ambigua	Desert mallow N
Tamarix ramosissima	**Salt cedar E**
Tiquilia plicata	Fan-leaf Crinklemat N
Tragia ramose	Noseburn (possible) N

N = native / E = exotic / (possible) = identification tentative, specimen or photo lacking defining characteristics

List reflects quick, non-vouchered observations recorded spring/summer 2014 primarily developed by Daniel Townsend, NPS Lake Mead EPMT, Contact Curt Deuser 702-293-8979

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Evaluation and Discussion of Results:

Most of the BCCE is relatively weed free on an overall acreage basis.

It is important to note that it is most effective to control weeds early before they become well established and develop seed banks making it difficult for long term control. This approach is referred to in weed management as early detection rapid response. There are some examples of early detection and control that were found and controlled by treatment during this project within the BCCE: Sahara mustard (*Brassica tournefortii*), and puncture vine (*Tribulus terrestris)* both of these are Nevada Department of Agriculture state listed Noxious weeds that are widespread common problems in Clark County although they have not established up to their potential within the BCCE yet. The biggest threat to the BCCE appears to be coming from Boulder City lands adjacent to the northern boundary of the BCCE. The extreme northern portions of roads I, G, and D and adjacent power line right of way roads contained the most weeds within the BCCE. In 2014 fairly large dense populations of Russian thistle (*Salsola spp*) existed along some of these roads in the sandy areas, some treatment occurred adjacent to the roads to prevent and reduce vehicle transport of these weed seeds into the areas south of the BCCE. However in 2015 and 2016 these same areas contained much less Russian thistle populations presumably due to weather variance and how it relates to germination and subsequent production. There is a natural wash that flows across these roads from east to west that also contained a lot of Sahara Mustard escaping into the more natural areas. Also a ditch that drains the reclaimed Boulder City treatment water contains a variety of weeds that ebb and flow according to the amount of water released into the ditch. This ditch flows into the BCCE and is where a significant tamarisk forest had established. The tamarisk was treated using the cut stump method and the low volume basal spray method. The tamarisk leaf beetle (biological control) was also observed in 2014 foraging and defoliating all of the tamarisk within the ditch. This is short lived as most of the tamarisk did sprout back within a couple of months. All of these roads, washes and ditches are vectors for weed spread beyond and further into the BCCE. An aggressive control strategy was implemented by the NPS EPMT via this agreement, (although it was beyond the original scope of work which was limited to 10 meters on either side of the roads). We wanted to take a more proactive approach to control these species and push back the further encroachment of these weeds into the BCCE which is inevitable without management actions. The southern portions of Road K also contained a few small populations of weed species such as sahara mustard, puncture vine and London rocket (*Sisymbrium irio*).

Also worth noting that during the spring of 2015 large populations of the native wildflower forb *Pectis papposa* was observed throughout much of the BCCE. The result of this bloom created beautiful fields of yellow flowers that could be seen for miles.

Conclusions and Recommendations:

Mediterranean annual grass (*Schismus spp, barbatus and/ or arabicus*) is the most widespread common exotic plant species within the BCCE, however this is typically not a high priority weed species to manage and it does not appear to form dense enough or continuous patches to become a wildfire threat. Observationally *Schismus* grass did not consistently produce large stands and it will commonly vary in cover from year to year based on weather conditions. It is widespread and common throughout the region and Mojave Desert and is likely futile to manage for control in most circumstances. Additionally I believe that Schismus does provide forage for desert tortoise when green (should be verified by a tortoise biologist). Another low priority common weed found in the BCCE is the annual Filaree (*Erodium circutarium*); an exotic from Eurasia is one of the more common roadside weeds in the BCCE but is still limited to certain roads and is not widespread throughout the area.

Continuation of this project is important to maintain successes and to prevent weeds from further impacting the entire BCCE. There are a few tamarisk trees that remain and need to be treated in the future that are below the water treatment ditches. More project time and effort (proportionally) should be spent on the northern boundary of the BCCE since most of the threats exist in that area. The Boulder City water treatment drainage ditch needs more surveys and potential treatments since that is also a point source for weeds moving south into the BCCE. However, according to John Brekke, DCP, who had a recent conversation with Boulder City staff that they found alternative uses of this water which would result in less to no more water being run through the ditch. If the channel/ditch is de-watered it should produce fewer weeds in the future. The Eldorado Valley solar energy complex includes a lot of construction related disturbances and this area and adjacent roads should also be a focus of continued weed surveys and treatments. Although the existing solar energy fields do not contain many weeds within the fenced areas, presumably due to their aggressive vegetation management program of zero tolerance since the solar energy areas contain bare ground. The Boulder City Bypass (Interstate 11) project is being constructed within ½ mile of the entire northern boundary of the BCCE. It will be important to keep an eye out for potential new weeds that may establish within the I-11 construction right of way during the next couple of years and future coordination should be established to manage weeds after the highway opens. The adjacent Highway 95 corridor/right of way is relatively weed free, communication with NDOT has recently occurred through the Southern NV Cooperative Weed Management Area to ensure this road corridor is maintained weed free. If Sahara Mustard is observed within the corridor we plan to notify NDOT and the Contractor to inform them of weed emergence so they can be treated in a timely manner. Communications and coordination with Boulder City Staff needs to be developed to address weeds since most of the threats occur on the southern boundaries of the city. A land status map surrounding the BCCE units, particularly the northern unit should be

looked at in detail to determine potential partners to coordinate weed management with. For example I believe some of the lands along the northern boundary of the BCCE belong to Bureau of Land Management, if so then the NPS EPMT already has functioning agreements with the BLM to manage weeds throughout the Southern Nevada District. The purpose of all of this coordination with adjacent entities is to reduce the amount of weeds just outside of the BCCE to prevent their continued encroachment into the BCCE which will help preserve vegetation communities and habitats of the BCCE. Another recommendation is to have DCP Staff and its contractors notify the NPS EPMT if they observe weeds within the BCCE so the EPMT can respond and implement treatments in a timely since many of the priority target weeds are annuals which typically have a relatively short window before going to seed. This notification can be sent by email to curt_deuser@nps.gov or phone call at 702-293-8979, with a description of the location or provide a simple GPS point of the area. This method is referred to as casual opportunistic weed observations and can be effective to manage weeds which supplement the more systematic seasonal weed surveys.

Acknowledgements:

Report prepared by the Lake Mead Exotic Plant Management Team (LAKE EPMT). Project reporting and data management production by Timothy Federal, LAKE EPMT. Report analysis and recommendations prepared by Curt Deuser, LAKE EPMT Liaison. Thanks to the field work completed by many individuals from the LAKE EPMT. Special thanks to Daniel Townsend for his detailed data collection, plant identification and photography skills. Also thanks to James Holland, expert local botanist for plant identification and verification.

This work was supported by the Clark County Desert Conservation Program and funded by Section 10, as project #2007-NPS-714K, to further implement or develop the Clark County Multiple Species Habitat Conservation Plan.

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