LAKE MEAD
NATIONAL PARK SERVICE
EPMT

Muddy River Botanical Inventory, Mapping, and Weed Treatment

January 2012

For

Clark County Desert Conservation Program (DCP)

Cover Photos (Clockwise from top left):

Lake Mead Exotic Plant Management Team (EPMT) treating exotic plant species on the Clark County Muddy River Reserve.

Using GPS to record an *Acroptilon repens* (Russian Knapweed) population.

The landscape in Unit E varied from riparian, to open disturbed meadow and upland slopes. The vegetation cover class also changed along with landscape. This is represented in within the report.

Sphaeralcea angustifolia (copper globemallow) was commonly found in the disturbed open areas of Units A, and C. In Units E and F, *S. angustifolia* was found growing in the low lying areas amongst other native species.

Agency Organization: National Park Service- Lake Mead National Recreation Area

Project Number: 2005-NPS-561N

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Overview

Clark County contacted the National Park Service (NPS) in December 2011 inquiring if the Lake Mead Exotic Plant Management Team (LAKE EPMT) could inventory and treat exotic species on the Clark County Desert Conservation Program (DCP) Muddy River Properties. The project was to take place in January 2012, including all field work, data processing, and final report due to the County before the end of January. The agreement was entered into on January 3, 2012, and LAKE EPMT began field work on January 4th.

Figure 1 - January 4, 2012 Kickoff Meeting

The main goal of this project was to map exotic vegetation and treat weeds on nine DCP properties (Reserve Units A, B, C, D, E, F, G, H and I). LAKE EPMT inventoried and mapped exotic species on all nine units between January 4th and 18th 2012. The location and extent of infestations were recorded with GPS units, and treatments of exotics were completed on a prioritized basis. Appendix A includes a summary of the inventory and treatments.

In addition, LAKE EPMT was able to complete an inventory of native species on the properties, including mapping and photo-documentation. A narrative description of native species in each unit is provided in this report, along with photos and GIS data. A list of all native plants inventoried can be found in Appendix B, and notes on the extent of natives in each unit can be found in Appendix C.

Inventoried Exotic Species

Of the exotic species identified (see Appendix A), there are a few species that warrant special attention due to the extremity of their invasiveness or their currently limited presence in the area. *Centaurea melitensis* (Malta starthistle) is ranked as a "Category A weed" by the Nevada Department of Agriculture and has potential to spread rapidly by wind dispersal. Malta starthistle (Figure 2) was limited to a few small populations in Reserve Units A, C, and F, however, was also observed along the access road and within the BLM land neighboring Reserve Unit F. The close proximity of all observed Malta starthistle to roads suggests that vehicle and ATV activities help facilitate spread and treatment of these populations should be a priority.

Acroptilon repens (Russian knapweed) is a rhizotomous perennial that has allelopathic effects that help it to compete aggressively and develop dense mono-specific stands. There are several small isolated populations of Russian knapweed in Reserve Unit E and three well established populations in Reserve Unit F. A brief inspection of the BLM land east of Reserve Unit F, and west of the Muddy River, uncovered extensive populations of Russian knapweed. What was believed to be the majority of the infestation was mapped and included with this report.

Tribulus terrestris (puncturevine) is a low growing annual that forms dense mats up to 5 feet in diameter produces very spiky seedpods. Each plant is capable of producing 200 to 5,000 seeds in a single growing season, and seeds may remain viable for up to 5 years. The spiky seedpods are commonly dispersed by adhering to tires, shoes, and animals. Puncturevine typically germinates in the spring and summer, suggesting that what plants were found during this project represent a much larger infestation.

Figure 2 – *Acroptilon repens, (*Russian knapweed) and *Centaurea melitensis* (Malta starthistle) following herbicide treatment in the NE corner of unit F.

Atriplex semibaccata (Australian saltbush) is a nonnative perennial herb that is tolerant of dry saline conditions making it capable of rapidly invading a wide range of habitat. It is a low growing ground cover that can be readily identified by its small red berries. This plant deserves special attention because populations are currently limited in Clark County. Treatment of this species is critical at this early stage of infestation in order to prevent further spread. Australian saltbush is also currently being targeted as a priority weed species in Moapa Valley National Wildlife Refuge.

Figure 3 - *Malcolmia africana* (African mustard) in its basal rosette stage.

Malcolmia africana (African mustard) (Figure 3) is an exotic annual herb from the Mediterranean Basin that is currently wide spread throughout the Southwest and is considered invasive in Nevada and Utah. It can be identified by its stiff hairy stems, pinkish mustard-like flowers, large siliques, and normally remains visible throughout the winter. African mustard can be effectively controlled with herbicide in priority areas. African mustard is also currently being targeted for control in the Moapa Valley National Wildlife Refuge.

Some of the exotic annual species such as Malta starthistle, Australian saltbush, African mustard, puncturevine, London rocket, Russian thistle, and prickly lettuce will likely need future treatments as they emerge from the seedbank during warmer months. Russian knapweed is a perennial rhizotomous species that can be treated throughout the year however treatment during dormancy is very effective using either aminopyralid or imazapyr herbicide. The annuals that were treated during this project were either late survivors from last year or in basal rosette life stage.

Infestations of exotic grass species such as red brome, Bermudagrass, and cheatgrass are capable of carrying fire and increase the risk of a widespread extreme wildfire event. Controlling exotic grasses is an important part of any hazard fuel reduction program and can be effectively accomplished with a post emergent foliar application of glyphosate based herbicide or with imazapic herbicide for pre-emergent applications. These exotic grasses vary in degree of infestation at the Muddy River Properties and should be considered on a case by case basis depending on site objectives.

Treatments and Herbicide

Treatments consisted primarily of spot foliar application of herbicides using 4-gallon backpack sprayers. Low volume basal application of Garlon 4 Ultra and JLB improved oil plus, at a rate of 1:4, was used on resprouting *Tamarix ramosissima* (tamarisk) found on site from previous cut stump treatments. We recommend that any previous tamarisk control efforts within the properties should be maintained. Milestone VM (Dow), aminopyralid, was used to treat *Acroptilon repens* (Russian knapweed) in open areas and Polaris (Nufarm), imazapyr, was used when the knapweed occurred within the dripline of mesquite trees. The primary herbicide used throughout the project for treatment of exotic forb species was Veteran 720 (Nufarm), a mixture of 2,4-D and dicamba. During the scope of the project several species of exotic annuals were present only as chaff or as dead plant material remaining after senescence. These species were mapped and inventoried to represent their presence, it is likely that these species will emerge from the seedbank during other times of the year and if desired treatment should occur anytime from rosette stage to pre-mature fruit stage to avoid future seed production.

Native Plants by Unit

Lake Mead Exotic Plant Management Team performed both an exotic and native species inventory of Units A through I on the Muddy River Reserve. What follows is a general vegetation description of the species found during the winter season typically a time for plant dormancy. This list is not intended to be a complete comprehensive species list. During the warmer spring and summer months other species both native and/or exotic may emerge.

Unit A

This unit had an overall lack of native vegetation presence throughout. The native species populations were found along the units edges, especially near the riverbank. Along the eastern edge, *Atriplex lentiformis* (quailbush), and *Tessaria sericea* (arrowweed), were the dominate species found. *Atriplex elegans* (wheelscale saltbush), *Sphaeralcea angustifolia* (copper globemallow) (Figure 4) were observed

Figure 4 - *Sphaeralcea angustifolia* (copper globemallow). Commonly found in the disturbed open areas of Units A, and C. In Units E and F, *S. angustifolia* was found growing in the low lying areas amongst other native species.

sparsely scattered throughout the central area. A small population of *Anemopsis californica* (yerba mansa), was found in the SE along the riverbank as well as isolated patches of *Lycium pallidum* (wolfberry ; pale desert-thorn) on the eastern border.

The exotic species found here included: *Tribulus terrestris* (puncturevine), *Centaurea melitensis* (Malta starthistle), *Erodium cicutarium* (redstem stork's bill), *Cynodon dactylon* (Bermudagrass), *Malcolmia africana* (African mustard), *Atriplex semibaccata* (Australian saltbush), *Convolvulus arvensis* (field bindweed), *Bromus rubens* (red brome), *Sisymbrium irio* (London rocket), and *Tamarix ramosissima* (saltcedar). Of the ten species documented *S. irio,* and *B. rubens* were the most dominate while *A. semibaccata* and *M. africana* were also very common.

Unit B

The dominate native species in this area was composed primarily of *Atriplex lentiformis* (quailbush), concentrated in the SW quarter. The central part of the unit was an open area void of native vegetation. The northern and eastern boarder's had a dense population of *A. lentiformis*, *Tessaria sericea* (arrowweed), along the river's edge. *Fraxinus velutina* (singleleaf ash), *Lycium pallidum* (wolfberry ; pale desert-thorn), *Prosopis glandulosa* (honey mesquite) were also common species found along the river bank.

The exotic species recorded in this section comprised of: *Sisymbrium irio* (London rocket), *Bromus rubens* (red brome), *Atriplex semibaccata* (Australian saltbush), *Cynodon dactylon* (Bermudagrass), *Bassia hyssopifolia* (fivehook bassia), and *Tamarix ramosissima* (saltcedar). Of these five species, *S. irio,* and *A. semibaccata* were the most dominate while *B. rubens* was common in the north.

Unit C

The dominant native species found in this unit comprises of *Atriplex lentiformis* (quailbush). It covers a quarter of this entire section. The areas to the west of the *A. lentiformis* are very sparse, lacking in vegetation coverage. *Sphaeralcea angustifolia* (copper globemallow) is found in scattered patches in the SW edge and *Brickellia desertorum* (desert brickellbush) is found spread along the northern edge. The NW corner is the most disturbed portion of this section with a large dirt mount in the center of it. Here, *Helianthus sp.* (sunflower) can be the found throughout this portion of the section.

Three exotic species were mapped in this section: *Sisymbrium irio* (London rocket), *Cynodon dactylon* (Bermudagrass), and *Centaurea melitensis* (Malta starthistle). *S. irio* was the dominate species here and was found throughout the central and western areas of this section.

Unit D

The dominate species in this section primarily consists of *Atriplex lentiformis* (quailbush) which covers a large portion of the NE quarter and a section in the south central region. The topography in the west changes to a steep rocky slope dominated by a large population of *Atriplex polycarpa* (cattle saltbush), with scattered *A. lentiformis* on the southern edge. In the SE, the terrain is open and flat, with large areas of various grass species dominating the field. Other common weeds such as *Conyza canadensis* (horseweed) and *Lactuca serriola* (prickly lettuce) are also found in this section.

The exotic species found here were: *Malcolmia africana* (African mustard), *Conyza canadensis* (horseweed), *Lactuca serriola* (prickly lettuce), and *Convolvulus arvensis* (field bindweed). *C. arvensis* is the most dominate species found in primarily in the SE corner of this section.

Unit E

The topography and vegetation classification varied throughout this region. In the north, a flat field area was found void of native vegetation with only traces of *Sphaeralcea angustifolia* (copper globemallow). Along the riverbank in the NE, *Tessaria sericea* (arrowweed), *Atriplex lentiformis* (quailbush) were the dominate species with *Atriplex canescens* (4-winged saltbush), *Atriplex polycarpa* (cattle saltbush), and *Lycium pallidum* (wolfberry ; pale desert-thorn), scattered throughout. *Prosopis glandulosa* (honey mesquite) is present in the central region, along with dominant species of *A. lentiformis*. In the area south of the pond the elevation the plant communities change. Along the slopes *Eriogonum inflatum* (desert trumpet), *Plantago ovata* (desert plantain), *Larrea tridentata* (creosote bush) and *Ambrosia dumosa* (white bursage) can be found.

There were eight exotic species recorded in this section: *Malcolmia africana* (African mustard), *Cynodon dactylon* (Bermudagrass), *Convolvulus arvensis* (field bindweed), *Salsola kali* (Russian thistle), *Bassia hyssopifolia* (fivehook bassia), *Tamarix ramosissima* (saltcedar), *Acroptilon repens* (Russian knapweed), and *Atriplex semibaccata* (Australian saltbush). *S. kali* was mapped in large section in both the north and south regions of this section. Other dominant species included *M. africana,* found primarily in the southern 3/4th of the area, as well as *C. dactylon,* and *C. arvensis,* which were both mapped in the low lying areas of the north.

Unit F

The majority of this unit lies in an undisturbed higher elevation with a different vegetation cover class. The dominate species on the rocky slopes consist of *Ambrosia dumosa* (white bursage), and *Krameria grayi* (white ratany) (Figure 5) with the less dominate species *Larrea tridentata* (creosote bush), various cactus species, *Plantago ovata* (desert plantain) and *Ephedra californica* (Mormon tea). Within the ravines and low lying areas *Suaeda torreyana* (sea-blite), *Prosopis glandulosa* (honey mesquite), and *Atriplex lentiformis* (quailbush) were the most prevalent species observed while other species such as *Distichlis spicata* (saltgrass), *Atriplex canescens* (4-winged saltbush), *Lycium andersonii* (wolfberry) were also common. A small population of *Acacia greggii* (catclaw) was observed in a wash in the NW region.

The exotic species documented in this section consisted of: *Malcolmia africana* (African mustard), *Tamarix ramosissima* (saltcedar), *Salsola kali* (Russian thistle), *Acroptilon repens* (Russian knapweed),

Atriplex semibaccata (Australian saltbush), *Centaurea melitensis* (Malta starthistle), and *Bromus rubens* (red brome). Of the seven species, only *M. africana* is pervasive throughout the area while *T. ramosissima* is the primarily located in the SE corner low lying areas. *A. repens* is not dense within this reserve unit , however there are significant encroaching populations on the adjacent BLM lands to the east of this unit.

Figure 5 - *Krameria grayi* (white ratany) is a common medium sized bush that was discovered on most of the higher elevation slopes of Units E, F, G and I. One of the distinguishing features of *K. grayi* are the barbs at the tips of the fruit spines.

Unit G

The dominant native species in this unit consist of *Atriplex lentiformis* (quailbush) and *Suaeda torreyana* (sea-blite). *Allenrolfea occidentalis* (Iodinebush), *Sporobolus airoides* (alkali sacatone grass) (Figure 6) and *Prosopis glandulosa* (honey mesquite) are also present. *S. airoides* is found in low lying area of the NW corner. The majority of the *P. glandulosa* is located in the mid-central area of this section. The habitat changes in the SE to dry rocky slopes where *Larrea tridentata* (creosote bush) and *Ambrosia dumosa* (white bursage) become the dominate species. A cliff like wall is present in the south central part of this section. *Lycium andersonii* (wolfberry) can be found scattered, but predominately on the SE slopes, which have higher vegetation diversity than the rest of the section. Other native species found on the southern slopes are *Sphaeralcea ambigua* (desert globemallow), *Eriogonum inflatum* (desert trumpet), *Plantago ovata* (desert plantain), and *Ephedra californica* (Mormon tea).

Only two exotic species were recorded in this section: *Tamarix ramosissima* (saltcedar) is found in the lower areas of section G, with the most dominate infestation in the western and NE. *Malcolmia africana* (African mustard), is scattered throughout the rocky slopes in the south.

Unit H

This unit has very limited vegetation diversity throughout the area. The dominate native species found here are *Atriplex lentiformis* (quailbush) and *Suaeda torreyana* (sea-blite). *S. torreyana* can be found throughout; however the population density is highest in the SE quarter of the section. *A. lentiformis* is also found in patches, with its heaviest portions in the SW corner and along the western edge of the section. *Allenrolfea occidentalis* (iodinebush) has the least presence here, and can be found more common along the SE edge. The NE quarter has a high population of *Sporobolus airoides* (alkali sacatone grass), with a mixed of *S. torreyana*. As *S. torreyana* density lessens, the NE ground coverage of *S. airoides* over takes the population density to 80-90 percent.

Figure 6 - *Sporobolus airoides* (alkali sacatone grass) is a as species of grass that can be found in large patches in the NW corner of Unit G and NE corner of Unit H.

Only two exotic species were recorded in this section: *Tamarix ramosissima* (saltcedar) and *Malcolmia africana* (African mustard). *T. ramosissima* is the most prevalent species throughout the entire section. *Bassia hyssopifolia* (fivehook bassia) was not recorded in this section, however, a population of it was recorded outside the western boundary line.

Figure 7 - Mixed native community on the east side of Unit G

Unit I

The dominant native species of this unit include *Larrea tridentata* (creosote bush) and *Ambrosia dumosa* (white bursage). These species can be found scattered throughout the section. The terrain of this unit composed of rocky, slopes which have sparse vegetation coverage. Some of the more common herbaceous species found here are *Eriogonum inflatum* (desert trumpet), *Plantago ovata* (desert plantain), *Thymophylla pentachaeta* (fiveneedle pricklyleaf), *Machaeranthera tortifolia* (Mojave aster) and *Chorizanthe rigida* (spiny herb) can be found in the higher elevations of this section.

The only exotic species found in this small section was *Malcolmia africana* (African mustard), and it is scattered throughout this area.

Recommendations

Special consideration should be given to the southernmost Reserve Units, F, G, H and I. These lower areas have seen fewer disturbances than the upper sections in recent years and therefore consist of a mature native shrub community dominated by *Suaeda torreyana* (sea-blite) and *Atriplex lentiformis* (quailbush), and include both screwbean and honey mesquites. There is a ditch in Reserve Units G and H that is altering hydrologic surface flow, re-contouring of this ground disturbance feature could be considered in order to restore the hydrologic processes. *Sporobolus airoides* (alkali sacatone grass) is present in both Reserve Units G and H and is a valuable native grass often used for habitat restoration in riparian areas in the desert Southwest due to the ability to thrive in salt rich soils and as forage for wildlife (Johnson, 2000). Alkali sacatone is highly drought tolerant yet often found near marshes and where ground water is not deeper than three feet from the surface. Alkali sacatone is present in Reserve Unit H and G in a few isolated pockets yet remnants of a much larger distribution is visible as stubble underneath much of the shrub layer in much of the central portion of the Unit H.

We believe that a reduction in sacatone grass is a result of previous grazing and possible altering of the hydrology of the site due to the ditch construction (Figure 8). The property across the boundary fence to the north of Reserve Unit H (Figure 9) have dominate stands of alkali sacatone creating a meadow like community. Since the soils , elevation, proximity to the river and water table are similar to reserve Unit H, the difference in vegetation community is likely a result of past land uses. Alkali sacatone is very intolerant of shade and reduction of the tamarisk and shrub species would most likely be necessary if restoration of Alkali sacatone is desired.

Figure 8 – *Sporobolus airoides* (alkali sacatone grass) stubble as evidence of overgrazing or possible altering of the hydrology of the site due to the ditch construction

Figure 9 - *Sporobolus airoides* (alkali sacatone grass) field on adjacent property to the north of unit H

One option for restoration is prescribed fire followed by seeding or plugging of sactone grass. Another species of interest is *Distichlis spicata* (saltgrass), which was found in only one location in Reserve Unit F. Saltgrass is another salt tolerant grass species that can be used for habitat restoration in disturbed areas for erosion control. Salt grass has stolons and is capable forming dense ground cover which can impede weeds making it ideal for the proposed use of stream bank erosion control along the Muddy River in Reserve Units A and B.

Additional recommendations include working with the BLM to control Russian knapweed in the land between the access road to Reserve Unit F and the Muddy River. ATV use is also a concern for spreading Russian knapweed and Malta starthistle seeds. There is an ATV trail that travels through a fence in the BLM lands, continues through a monoculture patch of Russian knapweed, and exits through a “gate” in the fence adjacent to Reserve Unit F. Malta starthistle and African mustard were also observed next to this trail and close to the access road. There is evidence of ATV travel throughout Reserve Unit F as well.

The dense populations of *Malcomia Africana* (African mustard) in the uplands and western half of Unit F were left untreated due to limited time and funding allowed in this agreement. Feasibility for complete control of this winter annual species will be difficult due to the extent of the population in the surrounding areas outside of the reserve. Typically this plant should be prioritized for control in isolated areas, restoration sites or where it competes with rare plants.

Tamarisk impacts to riparian ecosystems are well known and include increased fire risk, displaced native vegetation, decreased habitat for some species, and consumption of water resources. There are currently large mature stands of tamarisk in Reserve Units F and H and resprouting stumps of previously treated tamarisk in Reserve Unit G. The tamarisk resprouts were treated during this project with a low volume basal spray, possible follow up treatments may be necessary in the Fall of 2012 on a small

percentage of individuals that may not die from this treatment. The tamarisk leaf beetle, (*Diorhabda* spp) has recently established on this portion of the Muddy River. Widespread defoliation of tamarisk trees in this drainage was observed in early August of 2011, however all of the tamarisk appeared to re-foliate in September 2011 and through the fall. If the beetle persists in the area it is likely that eventual suppression of the tamarisk will occur over the next several years, however long term effects of the beetle are still largely unknown. If beetles are effective at controlling tamarisk then active revegetation with Ash trees, mesquite trees, quailbush and sacatone grass may be desirable to provide diverse plant community replacement. Other tamarisk control alternatives within the Muddy River Reserve Units include ground crews using the cut stump method or the foliar herbicide application method, or tree extraction with heavy equipment. Either triclopyr or imazapyr based herbicides could be used with these methods.

Controlling exotic annual grasses and forbs will require periodic monitoring to determine germination events that are dependent upon weather conditions. Typical timing of monitoring should occur within 10 -14 days following precipitation events, this should allow germinating plants to be large enough to detect. Treatments should occur prior to mature seed development in order to prevent future seed production. 2,4-D or glyphosate based herbicides should be effective at controlling most if not all of the annual forb species throughout rosette, bolting and flowering life stages. Glyphosate based herbicides should control all of the grass species targeted for control.

Figure 10 - *Centaurea melitensis* (Malta starthistle), *Malcolmia africana* (African mustard), and *Lactuca serriola* (prickly lettuce)

Acknowledgements

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Special thanks to Jim Holland for plant identification and verification.

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Appendix A

Inventory and Treatment Summary Report

Lake Mead Exotic Plant Management Team

Inventory and Treatments

Client: **Clark County, Nevada**

Location: **Muddy River Reserve**

Dates: **January 2012**

Treatments and Herbicide Used

Herbicide	Treatment	Volume of Undiluted Herbicide (gallons)	Total Mix (gallons)
Garlon 4 Ultra	Basal Bark (*Tamarix ramosissima* only)	2.15	10.75
Milestone VM	Foliar Spot	0.000625	0.25
Polaris		0.61	6.5
Rodeo		0.04	4
Veteran 720		0.47	46

Accomplishments				
Species	**Total Inventoried Acres**	**Infested Acres**	**Gross Infested Acres Treated**	**Treated Acres**
Acroptilon repens Russian knapweed	117	0.14 1.08 (adjacent BLM)	14.5	0.14
Atriplex semibaccata Australian saltbush	117	0.22	21.1	0.2
Bassia hyssopifolia fivehook bassia	117	0.09	13.6	N/A
Bromus rubens red brome	117	0.35	9.3	N/A
Centaurea melitensis Malta starthistle	117	0.06	10.9	0.05
Convolvulus arvensis field bindweed	117	0.25	15.2	0.004
Conyza canadensis horseweed, marestail	117	0.00001	0.00001	N/A
Cynodon dactylon Bermudagrass	117	0.18	21.8	N/A
Erodium cicutarium redstem stork's bill	117	0.002	0.065	0.002
Lactuca serriola prickly lettuce	117	0.01	0.05	N/A
Malcolmia africana African mustard	117	9.7	80.1	0.93
Salsola kali Russian thistle	117	0.2	24.3	N/A
Sisymbrium irio London rocket	117	1.03	18.5	1.03
Tamarix ramosissima saltcedar	117	8.6	66.7	0.38
Tribulus terrestris puncturevine	117	0.04	1.7	0.04
TOTAL SPECIES ACRES	**117**	**20.87**	**297.82**	**2.78**

These definitions are based on NAWMA standards please visit www.nawma.org for more information. These definitions can also be found on the next page of this report.

For Questions please contact Curt Deuser at Curt_Deuser@nps.gov (702) 293-8979 or Vanessa Truitt at vanessa_truitt@nps.gov (702) 293 -8973

Acreage Definitions

Inventoried Area
Any area covered during the course of weed management / control activities. An area may be considered "inventoried" regardless of the presence / absence of target weed species. Inventoried 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 described by a polygon, or a line feature (i.e. riparian course, roadway) which is buffered to account for the maximum distribution of individuals within the inventoried area.

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 infested area (within 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.

Monitored Area
Any area revisited for the purposes of inventory or to assess treatment efficacy: gross infested, infested, or treated area. Area may be done by sweep (as in inventoried) or permanent monitoring points set in "infested" areas. Monitored areas (acreages) may reflect more than one monitoring visit/ year due to the potential for multiple generations in a season, and the need to monitor for re-treatment.

Retreated Area
Actual area of re-treatment (of original treated area) is comprised of a subset of, or the entire original treatment 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.**

Appendix B

List of Inventoried Native and Exotic Plants

Inventoried Native Plants

Scientific Name	Common Name	Symbol	Photo ID
Acacia greggii	catclaw	ACGR	
Allenrolfea occidentalis	iodinebush	ALOC2	MRR_LAKE_ALOC2_#
Ambrosia dumosa	white bursage ; burrobush	AMDU2	MRR_LAKE_AMDU2_#
Amsinckia sp.	fiddleneck	AMSIN	MRR_LAKE_AMSIN_#
Anemopsis californica	yerba mansa	ANCA10	MRR_LAKE_ANCA10_#
Atriplex canescens	4-winged saltbush	ATCA2	MRR_LAKE_ATCA2_#
Atriplex elegans	saltbush; wheelscale saltbush	ATEL	MRR_LAKE_ATEL_#
Atriplex hymenelytra	desertholly	ATHY	MRR_LAKE_ATHY_#
Atriplex lentiformis	quailbush	ATLE	
Atriplex polycarpa	*cattle saltbush*	ATPO	MRR_LAKE_ATPO_#
Brickellia desertorum	desert brickellbush	BRDE3	MRR_LAKE_BRDE3_#
Chorizanthe rigida	spiny herb	CHRI	MRR_LAKE_CHRI_#
Chrysothamnus nauseosus	rabbitbrush	CHNAB6	
Conyza canadensis	horseweed, marestail	COCA5	MRR_LAKE_COCA5_#
Distichlis spicata	saltgrass	DISP	MRR_LAKE_DISP_#
Echinocereus sp.	hedgehog cactus	ECHIN3	MRR_LAKE_ECHIN3_#
Ephedra californica	Mormon tea	EPCA2	
Eriogonum deflexum	skeleton weed ; flatcrown buckwheat	ERDE6	MRR_LAKE_ERDE6_#
Eriogonum inflatum	desert trumpet	ERINC2	MRR_LAKE_ERINC2_#
Ferocactus cylindraceus	barrel cactus	FECY	MRR_LAKE_FECY_#
Fraxinus velutina	singleleaf ash	FRVE2	MRR_LAKE_FRVE2_#
Gutierrezia sp.	snakeweed	GUTIE	MRR_LAKE_GUTIE_#
Helianthus sp.	sunflower	HELIA3	MRR_LAKE_HELIA3_#
Krameria grayi	white ratany	KRGR	MRR_LAKE_KRGR_#
Lactuca serriola	prickly lettuce	LASE	MRR_LAKE_LASE_#
Larrea tridentata	creosote bush	LATR2	
Lycium andersonii	wolfberry; water jacket	LYAN	MRR_LAKE_LYAN_#
Lycium pallidum	wolfberry ; pale desert-thorn	LYPA	MRR_LAKE_LYPA_#
Machaeranthera tortifolia	Mojave aster	MATO4	MRR_LAKE_MATO4_#
Malva neglecta	*common mallow*	MANE	
Mirabilis sp.	four o'clock	MIRAB	MRR_LAKE_MIRAB_#
Opuntia basilaris	beavertail pricklypear	OPBA2	MRR_LAKE_OPBA2_#
Phragmites australis	common reed	PHAU7	MRR_LAKE_PHAU7_#
Plantago ovata	desert plantain	PLOV	MRR_LAKE_PLOV_#
Pleuraphis jamesii	James' galleta	PLJA	MRR_LAKE_PLJA_#
Prosopis glandulosa	honey mesquite	PRGL2	
Prosopis pubescens	screwbean mesquite	PRPU	

Scientific Name	Common Name	Symbol	Photo ID
Psorothamnus fremontii	indigo bush	PSFR	
Salix sp.	willow	SALIX	
Sphaeralcea ambigua	desert globemallow	SPAM2	
Sphaeralcea angustifolia	copper globemallow	SPAN3	MRR_LAKE_SPAN3_#
Sporobolus airoides	alkali sacatone grass	SPAI	MRR_LAKE_SPAI_#
Suaeda torreyana	Iodine weed; sea-blite	SUTO	MRR_LAKE_SUTO_#
Tessaria sericea	arrowweed	TESE4	
Thymophylla pentachaeta	fiveneedle pricklyleaf	THPE4	MRR_LAKE_THPE4_#
Typha sp.	cattail sp.	TYPHA	MRR_LAKE_TYPHA_#
UNID # 18 Polypogon monspeliensis?	Rabbitsfoot grass?, too dead to positively ID	POMO?	MRR_LAKE_UNID18_#

Inventoried Exotic Plants

Scientific Name	Common name	symbol	photo ID
Acroptilon repens	Russian knapweed	ACRE3	
Atriplex semibaccata	Australian saltbush	ATSE	MRR_LAKE_ATSE_#
Bassia hyssopifolia	fivehook bassia	BAHY	
Bromus rubens	red brome	BRRU2	
Centaurea melitensis	Malta starthistle	CEME2	MRR_LAKE_CEME2_#
Convolvulus arvensis	field bindweed	COAR4	
Conyza canadensis	horseweed, marestail	COCA5	MRR_LAKE_COCA5_#
Cynodon dactylon	Bermudagrass	CYDA	MRR_LAKE_CYDA_#
Erodium cicutarium	redstem stork's bill	ERCI6	
Lactuca serriola	prickly lettuce	LASE	MRR_LAKE_LASE_#
Malcolmia africana	African mustard	MAAF	MRR_LAKE_MAAF_#
Salsola kali	Russian thistle	SAKA	
Sisymbrium irio	London rocket	SIIR	
Tamarix ramosissima	saltcedar	TARA	
Tribulus terrestris	puncturevine	TRTE	

Appendix C

Native Plant Notes by Unit

Note: species symbols come from the USGS plant plant database.
For reference please use: http://plants.usda.gov/about_plants.html

Unit A

Native species	Common name	notes	Symbol	Photo name
Amsinckia sp.	fiddleneck	1%; growing in shade; fuzzy long leaves	AMSIN	MRR_LAKE_AMSIN_#
Anemopsis californica	yerba mansa	< 1% ; near waters edge; vine like with 1-2" narrow seed head	ANCA10	MRR_LAKE_ANCA10_#
Atriplex elegans	saltbush; wheelscale saltbush	1% ; through out mid sec; small 4-5" tall; seedpods disk/star shaped 1-2 cm; leaves light green, narrow, and alternate	ATEL	MRR_LAKE_ATEL_#
Atriplex lentiformis	quailbush	5%(gps) majority in SE corner	ATLE	
Atriplex polycarpa	cattle saltbush	one plant; leaves small, whirled of three leaves in young, singular leave with two leaflets on older leaves	ATPO	MRR_LAKE_ATPO_#
Brickellia desertorum	desert brickellbush	3% Oak like leaves on lower branches; aster like flower heads; one domimate plant with smaller ones scattered throughout.	BRDE3	MRR_LAKE_BRDE3_#
Chrysothamnus nauseosus	rabbitbrush	3% (gps)	CHNAB6	
Fraxinus velutina	singleleaf ash	only 2 (gps) leaves similar to dogwood, but some are compound at twig tip, others are simple; opposite	FRAN2	MRR_LAKE_FRAN2_#
Lycium pallidum	wolfberry ; pale desert-thorn	2% (gps)planted or native? Along upper stream bank; leaves on thorns; similar to young oak present, but has thorns	LYPA	MRR_LAKE_LYPA_#
Prosopis glandulosa	honey mesquite	1% (gps)	PRGL2	
Salix sp.	willow	1% gps	SALIX	
Sphaeralcea angustifolia	copper globemallow	5% --scattered throughout; type of mallow; red/pink flowers	SPAN3	MRR_LAKE_SPAN3_#
Tessaria sericea	arrowweed	5% (gps)	TESE4	
Typha sp.	cattail sp.	(gps) narrow leaves,	TYPHA	MRR_LAKE_TYPHA_#

Unit B

Native species	Common name	notes	Symbol	Photo name
Atriplex lentiformis	quailbush	(gps)	ATLE	
Atriplex polycarpa	cattle saltbush	3 in mid section; leaves small, whirled of three leaves in young, singular leave with two leaflets on older leaves	ATPO	MRR_LAKE_ATPO_#
Fraxinus velutina	singleleaf ash	only 2 (gps) leaves similar to dogwood, but some are compound at twig tip, others are simple; opposite	FRAN2	MRR_LAKE_FRAN2_#
Lycium pallidum	wolfberry ; pale desert-thorn	(gps); Along upper stream bank; leaves on thorns; similar to young oak present, but has thorns	LYPA	MRR_LAKE_LYPA_#
Prosopis glandulosa	honey mesquite	(gps)	PRGL2	
Salix sp.	willow	gps	SALIX	
Tessaria sericea	arrowweed	(gps)	TESE4	

Unit C

Native species	Common name	notes	Symbol	Photo name
Atriplex lentiformis	quailbush	1/4 of area; (gps) majority in East	ATLE	
Atriplex polycarpa	cattle saltbush	(GPS) hilside covered; leaves small, whirled of three leaves in young, singular leave with two leaflets on older leaves	ATPO	MRR_LAKE_ATPO_#
Brickellia desertorum	desert brickellbush	5 plants for far %	BRDE3	MRR_LAKE_BRDE3_#
Helianthus sp.	sunflower	< 1% ; burdock like, except with round seed heads; just in NW corner; 5-6 ft tall	HELIA3	MRR_LAKE_HELIA3_#
Malva neglecta	common mallow		MANE	
Sphaeralcea angustifolia	copper globemallow	3% --scattered throughout SW edge; type of mallow; red/pink flowers	SPAN3	MRR_LAKE_SPAN3_#

Unit D

Native species	Common name	notes	Symbol	Photo name
Atriplex lentiformis	quailbush	1/4 of area; (gps) majority in East	ATLE	
Atriplex polycarpa	cattle saltbush	(GPS) large patch on side of hill; leaves small, whirled of three leaves in young, singular leave with two leaflets on older leaves	ATPO	MRR_LAKE_ATPO_#
Brickellia desertorum	desert brickellbush	1 plants for far %	BRDE3	MRR_LAKE_BRDE3_#
Conyza canadensis	horseweed, marestail	4-5 plants observed; thin leaves, small flowers, in open area, 4-5 ft tall	COCA5	MRR_LAKE_COCA5_#
Helianthus sp.	sunflower	3-4 plants observed; burdock like, except with round seed heads; just in NW corner; 5-6 ft tall	HELIA3	MRR_LAKE_HELIA3_#
Lactuca serriola	prickly lettuce	4-5 plants observed; light brown; leaf clasping at stem; flower cluster is more wider then previous plant.	LASE	MRR_LAKE_LASE_#
Larrea tridentata	creosote bush	5%-on south slope only	LATR2	
Sphaeralcea angustifolia	copper globemallow	</= 0.25% --scattered throughout SW edge; type of mallow; red/pink flowers	SPAN3	MRR_LAKE_SPAN3_#
Suaeda torreyana	Iodine weed; sea-blite	<1% cover	SUTO	MRR_LAKE_SUTO_#
UNID #18 Hordeum marinum?	grass (barely?)	gps; large patch; thicker than what the red brome is; seed heads smaller, mostly dry with green leaves underneath		MRR_LAKE_UNID18_#

Unit E

Native species	Common name	notes	Symbol	Photo name
Atriplex polycarpa	cattle saltbush	5% ; leaves small, whirled of three leaves in young, singular leave with two leaflets on older leaves	ATPO	MRR_LAKE_ATPO_#
Ambrosia dumosa	white bursage ; burrobush	>/= 5% ; on hillside	AMDU2	
Atriplex canescens	4-winged saltbush	</= 1% ; lancolet leaflets in clusters; alternate; 5' tall; some GPS but not all of it	ATCA2	MRR_LAKE_ATCA2_#
Atriplex hymenelytra	desertholly	1 plant observed	ATHY	MRR_LAKE_ATHY_#
Atriplex lentiformis	quailbush	along water and other larger patches; (gps) majority in East	ATLE	
Brickellia desertorum	desert brickellbush	< 1% ; along edge of pond; Oak like leaves on lower branches; aster like flower heads; one domimate plant with smaller ones scattered throughout.	BRDE3	MRR_LAKE_BRDE3_#
Conyza canadensis	horseweed, marestail	only around pond area; thin leaves, small flowers, in open area, 4-5 ft tall	COCA5	MRR_LAKE_COCA5_#
Ephedra californica	Mormon tea	3-4 plants observed south of pond	EPCA2	
Eriogonum inflatum	desert trumpet	< 1% ; on hillside south on pond	ERIN4	
Ferocactus cylindraceus	barrel cactus	1 plant observed	FECY	MRR_LAKE_FECY_#
Fraxinus velutina	singleleaf ash	(gps) leaves similar to dogwood, but some are compound at twig tip, others are simple; opposite	FRAN2	MRR_LAKE_FRAN2_#
Gutierrezia sp.	snakeweed	2-3 plants oberved on area south of pond;	GUTIE	MRR_LAKE_GUTIE_#
Helianthus sp.	sunflower	3-4 plants; burdock like, except with round seed heads; just in NW corner; 5-6 ft tall ; by river and pond	HELIA3	MRR_LAKE_HELIA3_#
Krameria grayi	white ratany	3-4 --shrub observed on hillside; like wolfberry, but leaves and fruit are different (seed pods are fuzzy with spikes that have barbs at tip)	KRGR	MRR_LAKE_KRGR_#
Larrea tridentata	creosote bush	5% on hillside	LATR2	
Lycium andersonii	wolfberry; water jacket	only one plant observed on hill south of pond	LYAN	MRR_LAKE_LYAN_#
Lycium pallidum	wolfberry ; pale desert-thorn	gps	LYPA	
Phragmites australis	common reed	8-9 ft tall; along water's edge (GPS)	PHAU7	MRR_LAKE_PHAU7_#
Plantago ovata	desert plantain	< 1 % ; on hillside south of pond only	PLOV	

Native species	Common name	notes	Symbol	Photo name
Pleuraphis jamesii	James' galleta	</= 1 % ; near road south of pond; seed heads had reddish tint and were hairy ; 0.25 - 0.5 ' tall	PLJA	MRR_LAKE_PLJA_#
Prosopis glandulosa	honey mesquite	(gps)	PRGL2	
Sphaeralcea ambigua	desert globemallow	< 1%; near road south of pond	SPAM2	
Sporobolus airoides	alkali sacatone grass	two punch patches near pond; </= 6' tall	SPAI	MRR_LAKE_SPAI_#
Suaeda torreyana	Iodine weed; sea-blite	< 0.25 % cover	SUTO	MRR_LAKE_SUTO_#
Tessaria sericea	arrowweed	along waters edge (gps)	TESE4	
Typha sp.	cattail sp.	(gps) narrow leaves,	TYPHA	MRR_LAKE_TYPHA_#
UNID # 18 Hordeum marinum?	grass (barely?)	</= 5% ; throughout even on hillside		MRR_LAKE_UNID18_#

Unit F

Native species	Common name	notes	Symbol	Photo name
Acacia greggii	catclaw	< 1% ; all observed plants where GPS'd	ACGR	
Ambrosia dumosa	white bursage ; burrobush	5% most dominate on hillside	AMDU2	
Atriplex canescens	4-winged saltbush	</= 1% ; lancolet leaflets in clusters; alternate; 5' tall; some GPS but not all of it	ATCA2	MRR_LAKE_ATCA2_#
Atriplex lentiformis	quailbush	(gps)	ATLE	
Atriplex polycarpa	cattle saltbush	</= 1% ; dominate on the base of the hillsides; leaves small, whirled of three leaves in young, singular leave with two leaflets on older leaves	ATPO	MRR_LAKE_ATPO_#
Chorizanthe rigida	spiny herb	1 plant observed	CHRI	MRR_LAKE_CHRI_#
Distichlis spicata	saltgrass	(GPS) ; extensive patch on Eastern edge; mapped	DISP	MRR_LAKE_DISP_#
Echinocereus sp.	hedgehog cactus	4 observed; 0.5 ' tall;	ECHIN3	MRR_LAKE_ECHIN3_#
Ephedra californica	Mormon tea	< 1% ; frequent on mesa top	EPCA2	
Eriogonum deflexum	skeleton weed ; flatcrown buckwheat	< 1%	ERDE6	MRR_LAKE_ERDE6_#
Eriogonum inflatum	desert trumpet	< 1% on slope only	ERIN4	MRR_LAKE_ERIN4_#
Gutierrezia sp.	snakeweed	<1%; frequent in central wash; 0.5-1.0 ' tall, 1-2' wide, many flowers, many stems coming from one base; (looks like *Suaeda* but not)	GUTIE	MRR_LAKE_GUTIE_#
Krameria grayi	white ratany	</= 2-3 % througout hillsides, mainly in ravaine areas; --shrub observed on hillside; like wolfberry, but leaves and fruit are different (seed pods are fuzzy with spikes that have barbs at tip)	KRGR	MRR_LAKE_KRGR_#
Larrea tridentata	creosote bush	5%-2nd dominate species on hills only	LATR2	
Lycium andersonii	wolfberry; water jacket	(GPS) ; huge polygone under mequites with various other plants spread through out other ravines	LYAN	MRR_LAKE_LYAN_#
Machaeranthera tortifolia	Mojave aster	3-4 plants observed	MATO4	MRR_LAKE_MATO4_#
Mirabilis sp.	four o'clock	3-4 plants observed; opposite leaves; habitat- on hill side, growing in 0.5' wide and 5.0 ' long wash out ravine, that was shaded and dominated by red brome);	MIRAB	MRR_LAKE_MIRAB_#
Opuntia basilaris	beavertail pricklypear	2 plants observed; more then one plant per base.	OPBA2	MRR_LAKE_OPBA2_#
Plantago ovata	desert plantain	3-4% on slopes only	PLOV	MRR_LAKE_PLOV_#
Prosopis glandulosa	honey mesquite	5% (gps)	PRGL2	

Native species	Common name	notes	Symbol	Photo name
Sphaeralcea ambigua	desert globemallow	< 1%; only frequent in mid-central wash	SPAM2	
Sphaeralcea angustifolia	copper globemallow	<1 % --scattered cetral wash; type of mallow; red/pink flowers	SPAN3	MRR_LAKE_SPAN3_#
Suaeda torreyana	Iodine weed; sea-blite	70 % cover in low lands only **(GPS'd)**	SUTO	MRR_LAKE_SUTO_#

Unit G

Native species	Common name	notes	Symbol	Photo name
Allenrolfea occidentalis	iodinebush	10% cover	ALOC2	MRR_LAKE_ALOC2_#
Ambrosia dumosa	white bursage ; burrobush	10%-on south slope only	AMDU2	MRR_LAKE_AMDU2_#
Atriplex lentiformis	quailbush	20% cover	ATLE	
Ephedra californica	Mormon tea	3 plants	EPCA2	
Eriogonum inflatum	desert trumpet	2%-on south slope only	ERINC2	MRR_LAKE_ERINC2_#
Ferocactus cylindraceus	barrel cactus	1 plant	FECY	MRR_LAKE_FECY_#
Larrea tridentata	creosote bush	15%-on south slope only	LATR2	
Lycium andersonii	wolfberry; water jacket	1 large plant (gps)	LYAN	MRR_LAKE_LYAN_#
Machaeranthera tortifolia	Mojave aster	</= 0.5 %	MATO4	MRR_LAKE_MATO4_#
Plantago ovata	desert plantain	5%-on south slope only	PLOV	MRR_LAKE_PLOV_#
Prosopis glandulosa	honey mesquite	5% (gps)	PRGL2	
Prosopis pubescens	screwbean mesquite		PRPU	
Sphaeralcea ambigua	desert globemallow	1%-on South slope only	SPAM2	
Sporobolus airoides	alkali sacatone grass	(gps)	SPAI	MRR_LAKE_SPAI_#
Suaeda torreyana	Iodine weed; sea-blite	30% cover	SUTO	MRR_LAKE_SUTO_#
Thymophylla pentachaeta	fiveneedle pricklyleaf	1% 3-4" bushy plant	THPE4	MRR_LAKE_THPE4_#

Unit H

Native species	Common name	notes	Symbol	Photo name
Allenrolfea occidentalis	Iodinebush	2-3 % cover	ALOC2	MRR_LAKE_ALOC2_#
Atriplex lentiformis	quailbush	15% cover	ATLE	
Sporobolus airoides	alkali sacatone grass	15 % (gps)	SPAI	MRR_LAKE_SPAI_#
Suaeda torreyana	Iodine weed; sea-blite	50 % cover	SUTO	MRR_LAKE_SUTO_#

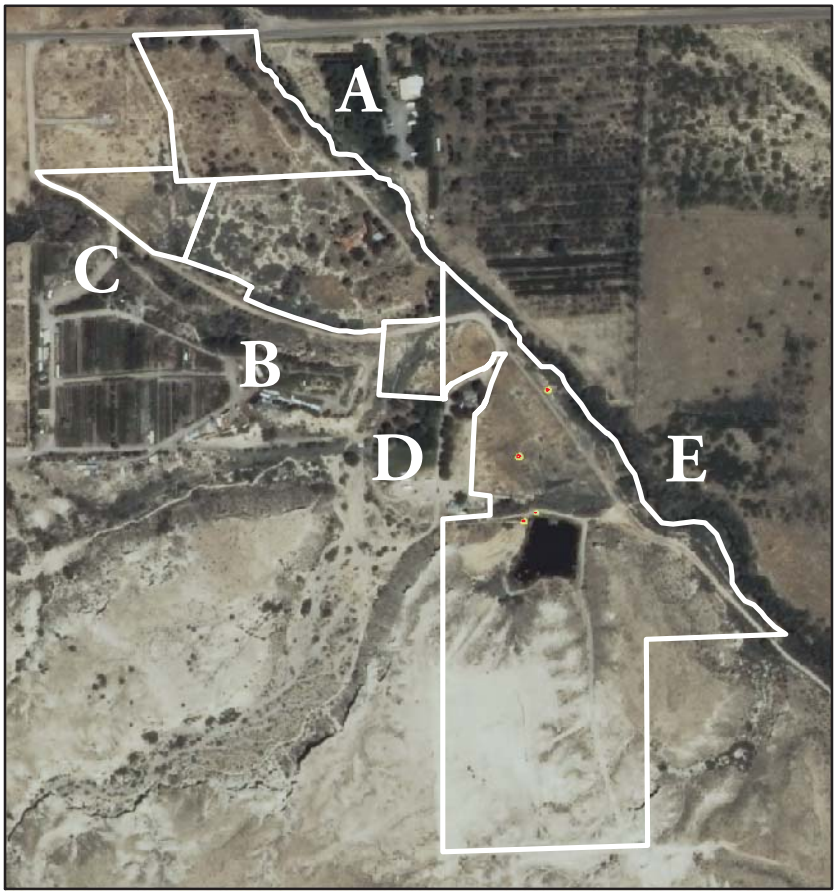
Unit I

Native species	Common name	notes	Symbol	Photo name
Ambrosia dumosa	white bursage ; burrobush	10%	AMDU2	MRR_LAKE_AMDU2_#
Atriplex hymenelytra	desertholly	2 plants	ATHY	MRR_LAKE_ATHY_#
Chorizanthe rigida	spiny herb	1%	CHRI	MRR_LAKE_CHRI_#
Eriogonum deflexum	skeleton weed ; flatcrown buckwheat	1%	ERDE6	MRR_LAKE_ERDE6_#
Eriogonum inflatum	desert trumpet	3%	ERINC2	MRR_LAKE_ERINC2_#
Krameria grayi	white ratany	1 plant --shrub, like wolfberry, but leaves and fruit are different	KRGR	MRR_LAKE_KRGR_#
Larrea tridentata	creosote bush	10%	LATR2	
Machaeranthera tortifolia	Mojave aster	1% cover	MATO4	MRR_LAKE_MATO4_#
Plantago ovata	desert plantain	5%	PLOV	MRR_LAKE_PLOV_#
Psorothamnus fremontii	indigo bush	2%	PSFR	
Sphaeralcea ambigua	desert globemallow	1%	SPAM2	
Thymophylla pentachaeta	fiveneedle pricklyleaf	2% ----3-4" bushy plant	THPE4	MRR_LAKE_THPE4_#

Appendix D

Exotic Inventory and Treatment Maps by Species

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Acroptilon repens

Russian knapweed

Gross Infested: 14.5 acres

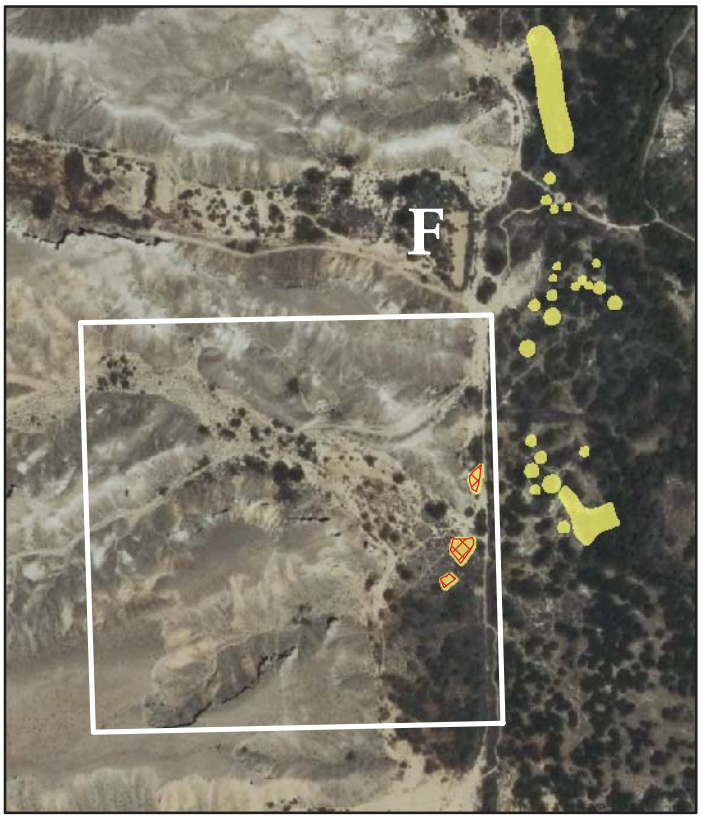
Infested: 0.14 acres*

Treated: 0.14 acres

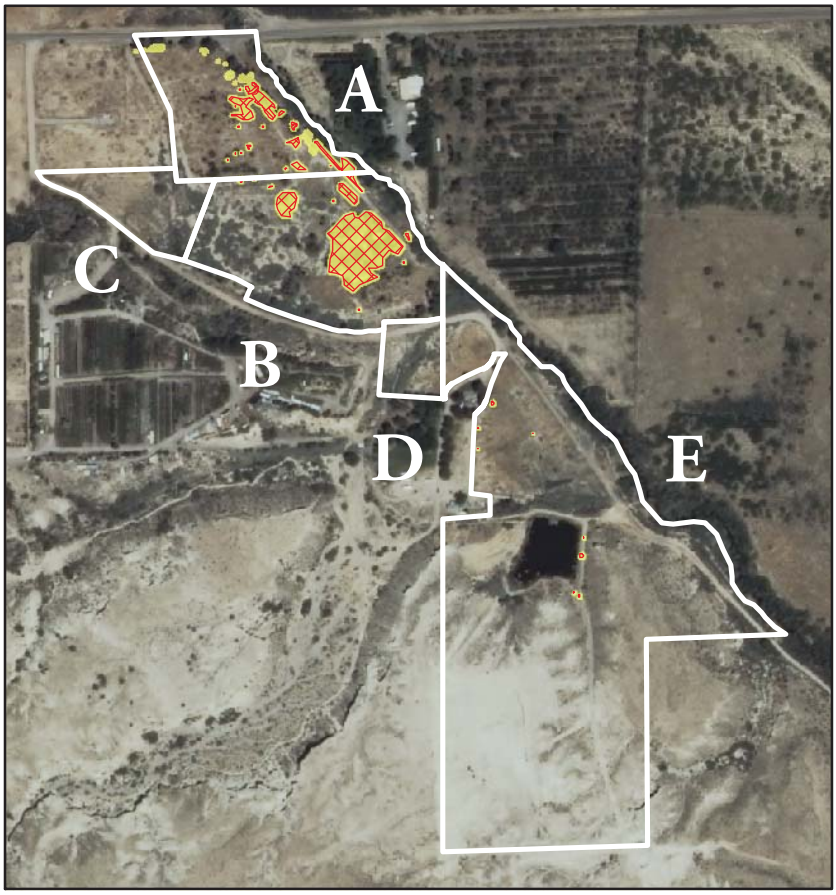
*Additional 1.08 acres inventoried on adjacent BLM lands

0 0.1 0.2 Miles

1:7500 NAD83 UTM Zone 11N



Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Atriplex semibaccata

Australian saltbush

Gross Infested: 21.1 acres

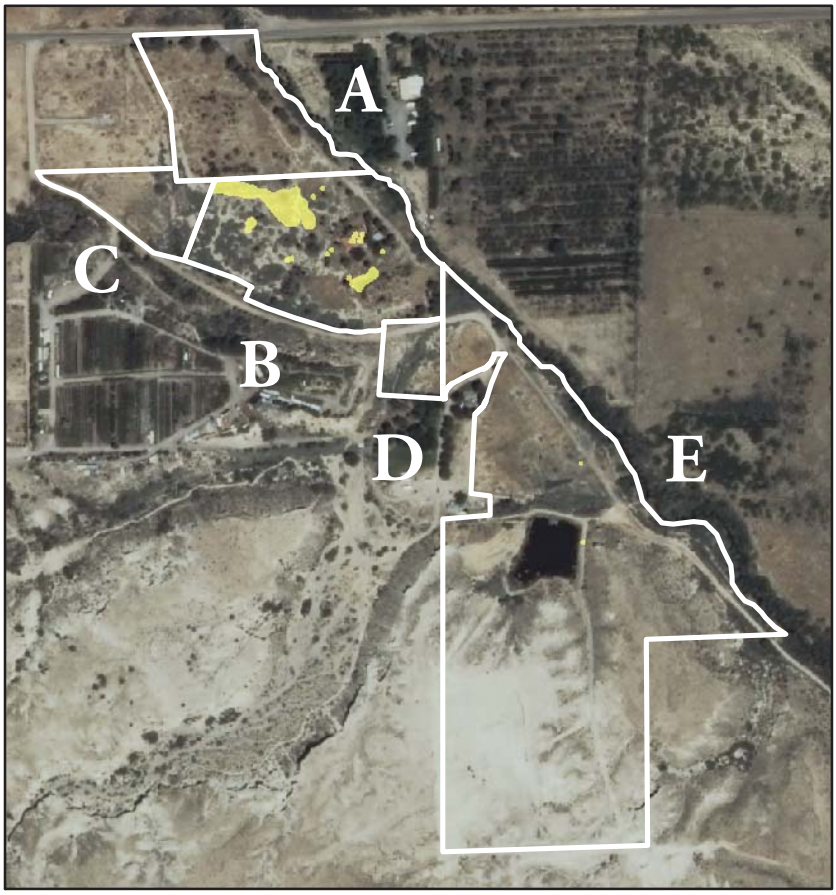
Infested: 0.22 acres

Treated: 0.20 acres

0 0.1 0.2 Miles

1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

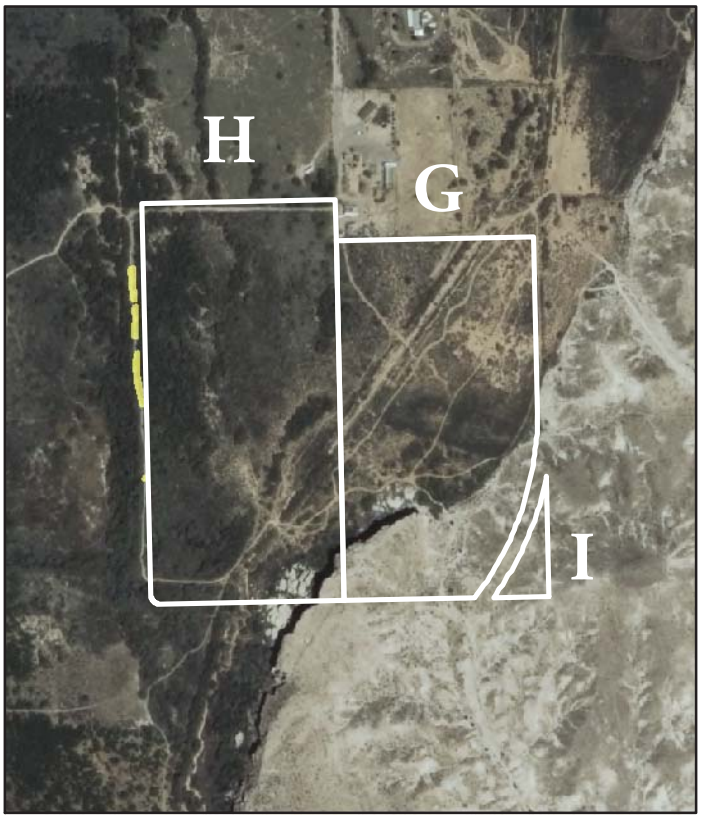
Bassia hyssopifolia
fivehook bassia

Gross Infested: 13.6 acres

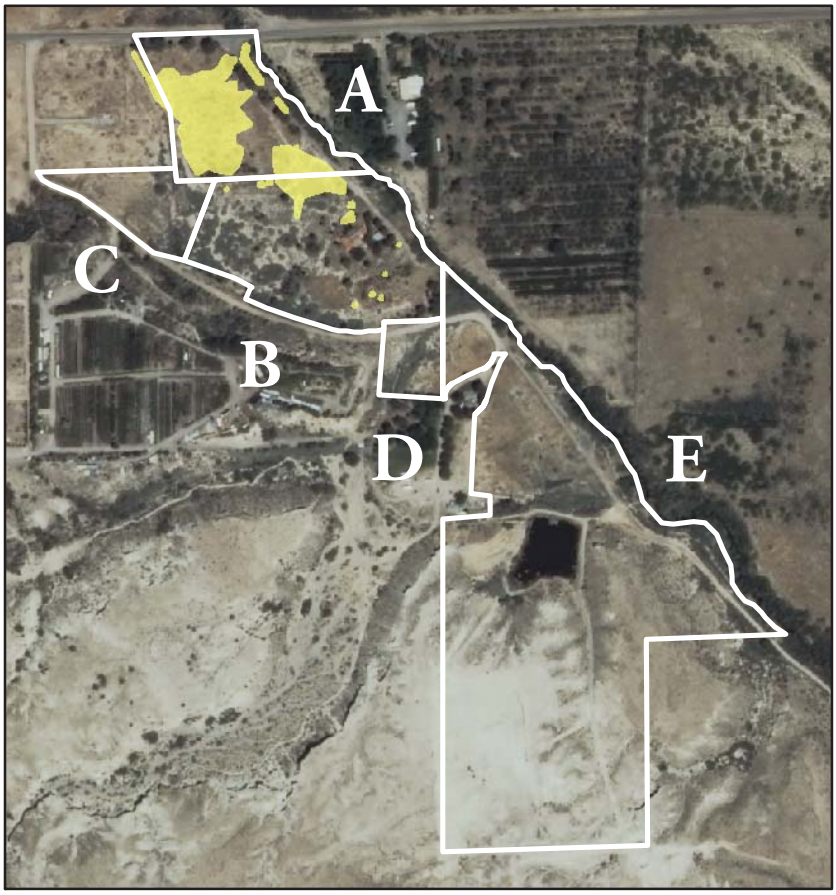
Infested: 0.09 acres

Treated: not treated

0 0.1 0.2 Miles
1:7500 NAD83 UTM Zone 11N



Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Bromus rubens
red brome

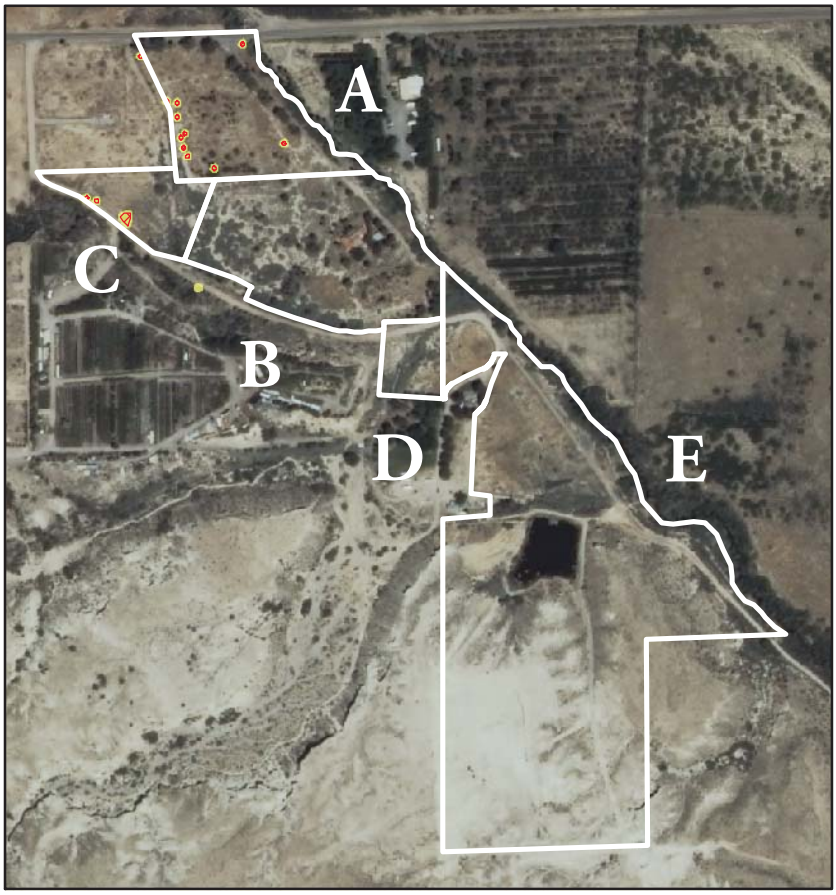
Gross Infested: 9.3 acres

Infested: 0.35 acres

Treated: not treated

0 0.1 0.2 Miles
1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Centaurea melitensis

Malta starthistle

Gross Infested: 10.9 acres

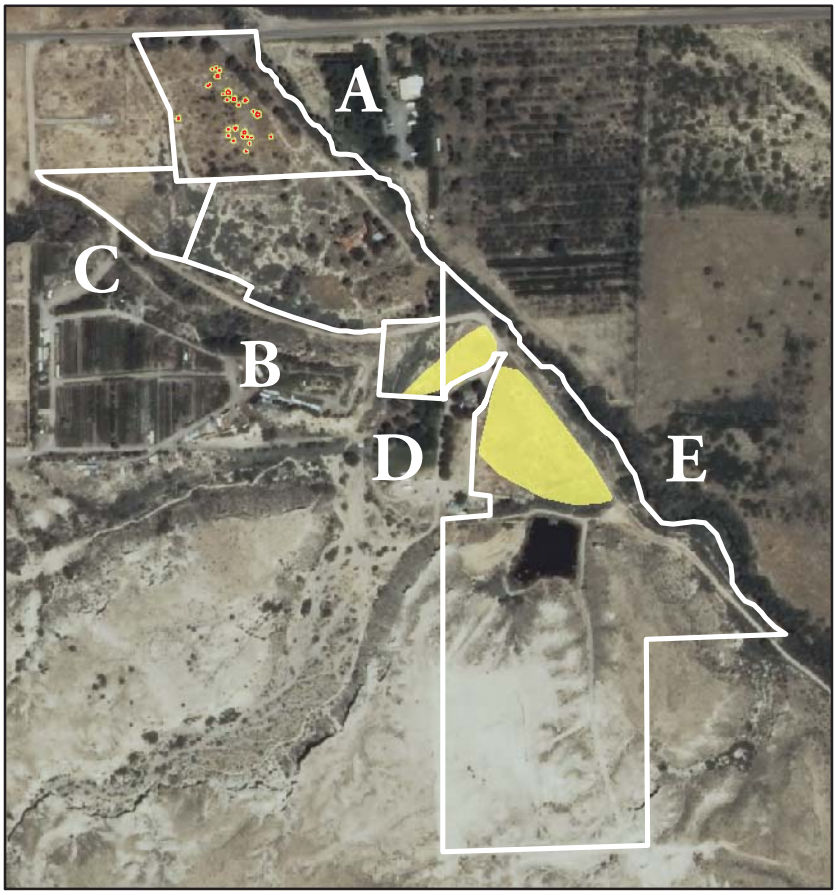
Infested: 0.06 acres

Treated: 0.05 acres

0 0.1 0.2 Miles

1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Convolvulus arvensis
field bindweed

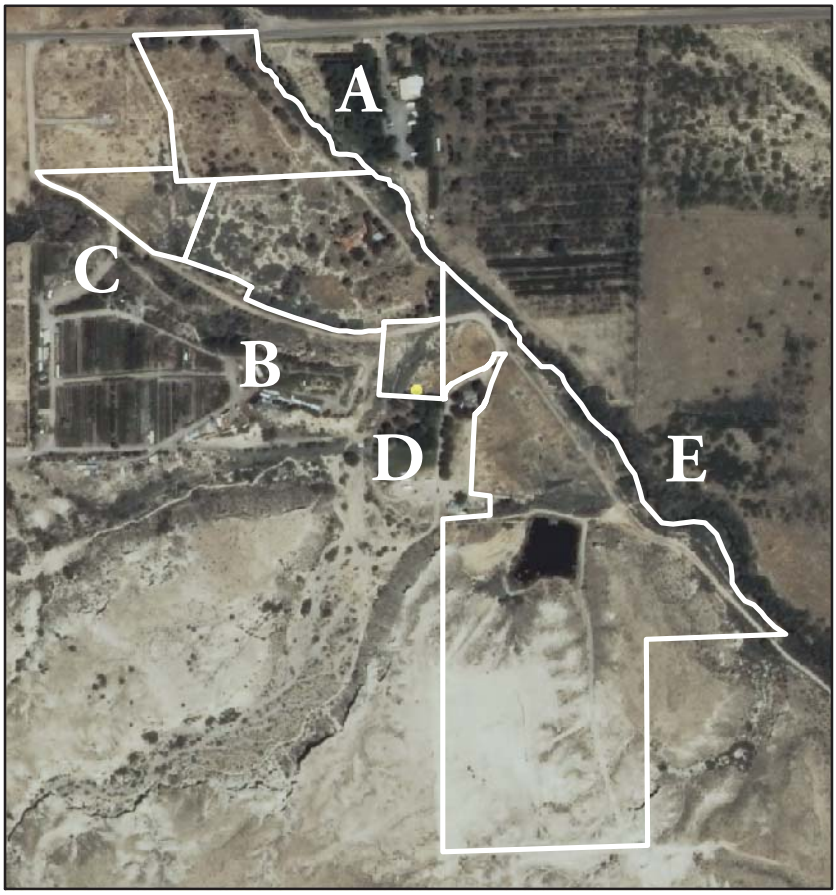
Gross Infested: 15.2 acres

Infested: 0.25 acres

Treated: 0.004 acres

0 0.1 0.2 Miles
1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Conyza canadensis

horseweed, marestail

Gross Infested: 0.00001 acres

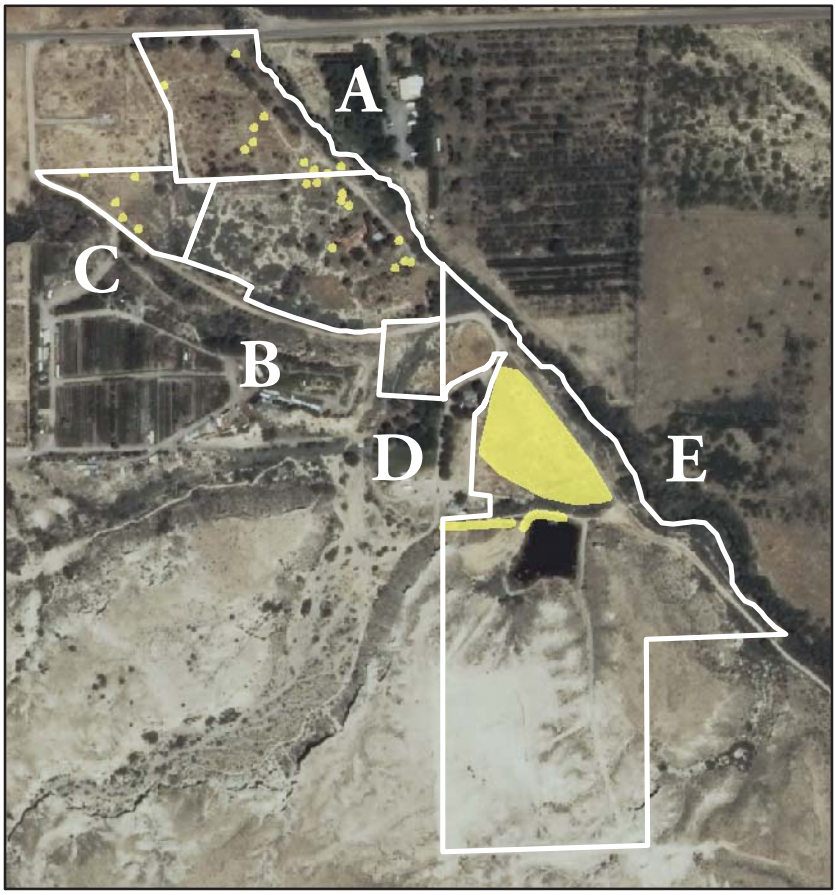
Infested: 0.00001 acres

Treated: not treated

0 0.1 0.2 Miles

1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Cynodon dactylon
Bermudagrass

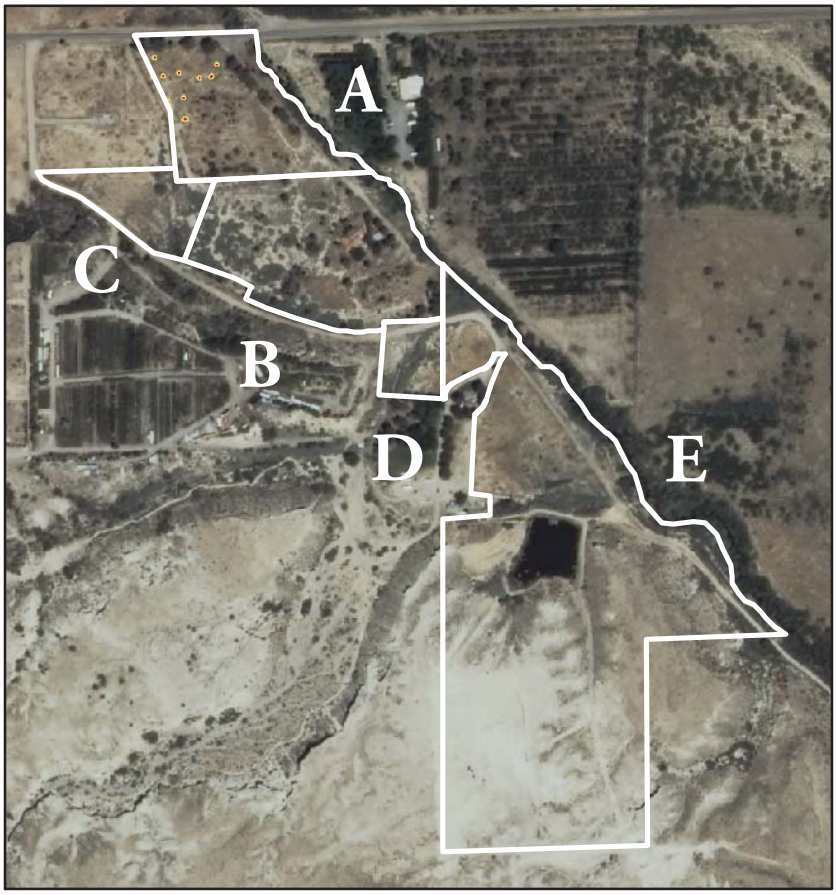
Gross Infested: 21.8 acres

Infested: 0.18 acres

Treated: not treated

0 0.1 0.2 Miles
1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Erodium cicutarium

redstem stork's bill

Gross Infested: 0.065 acres

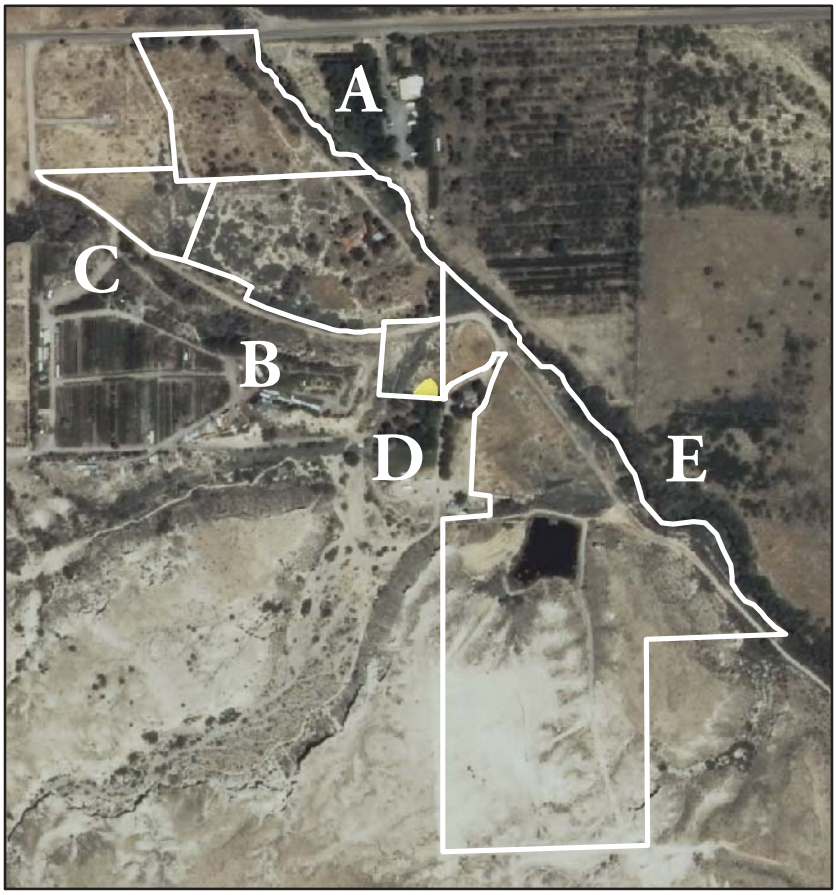
Infested: 0.002 acres

Treated: 0.002 acres

0 0.1 0.2 Miles

1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Lactuca serriola
prickly lettuce

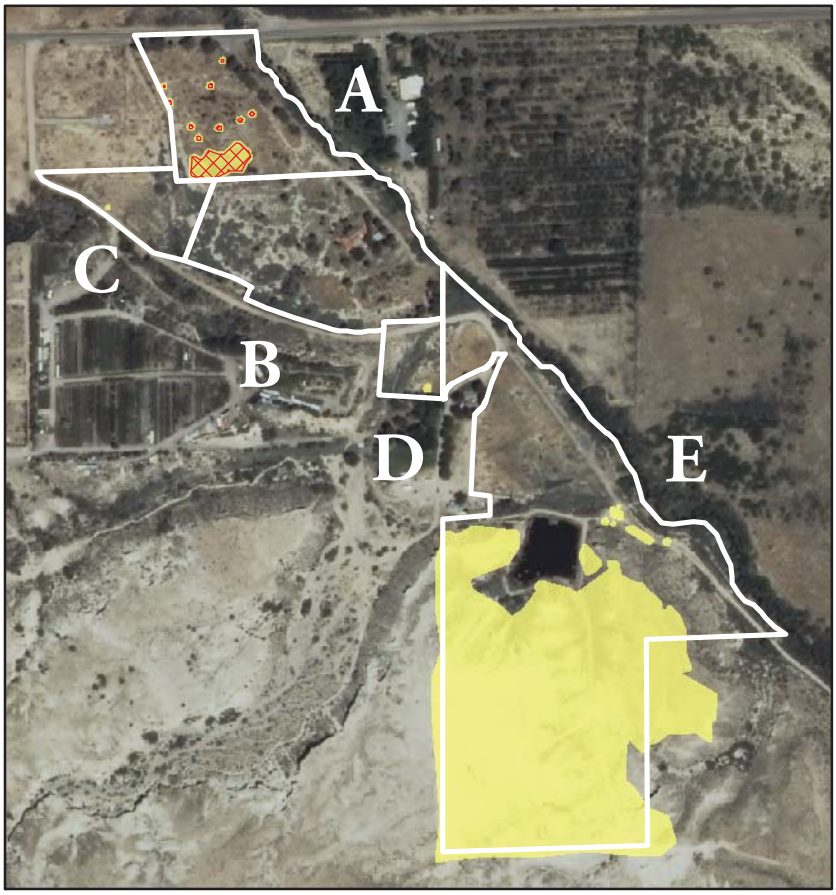
Gross Infested: 0.05 acres

Infested: 0.01 acres

Treated: not treated

0 0.1 0.2 Miles
1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Malcolmia africana

African mustard

Gross Infested: 80.1 acres

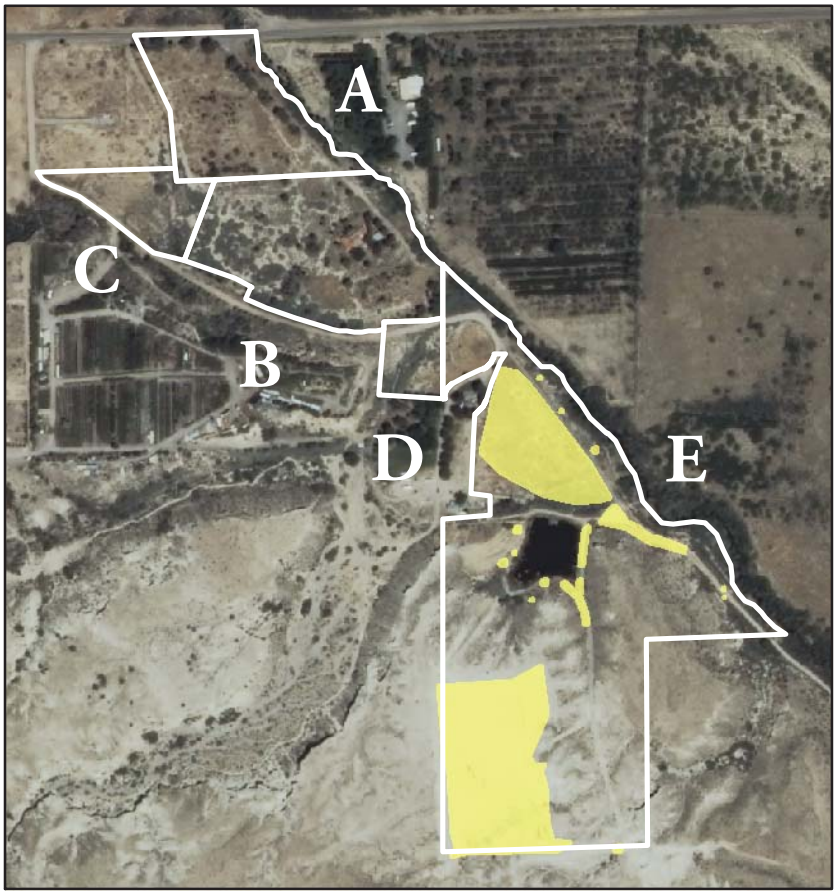
Infested: 9.7 acres

Treated: 0.93 acres

0 0.1 0.2 Miles

1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Salsola kali
Russian thistle

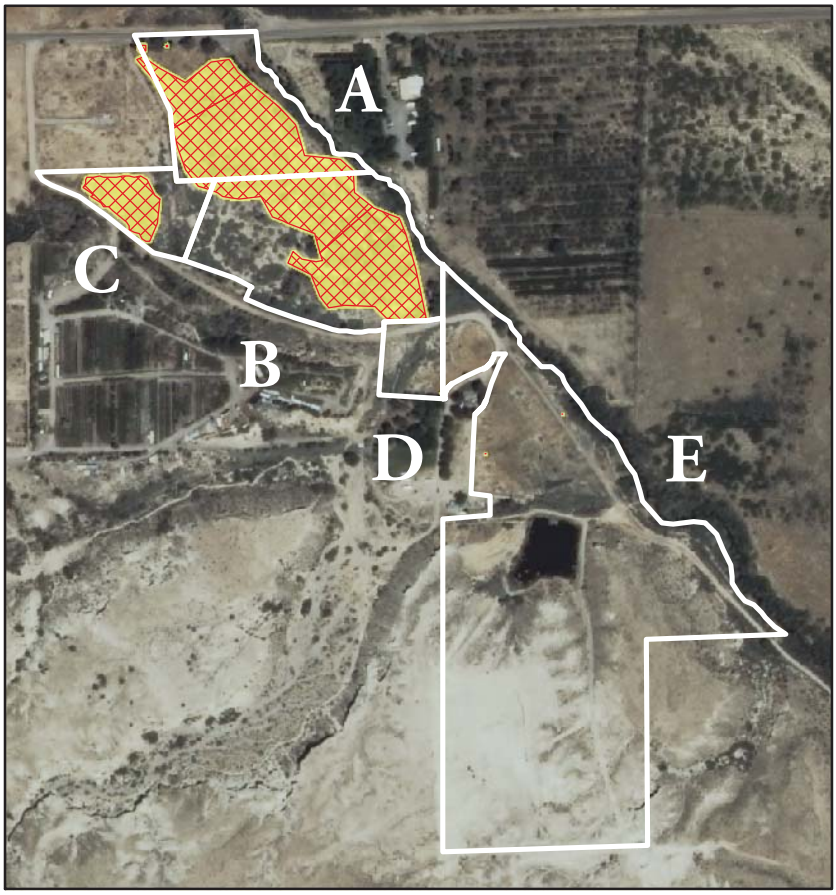
Gross Infested: 24.3 acres

Infested: .02 acres

Treated: not treated

0 0.1 0.2 Miles
1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Sisymbrium irio
London rocket

Gross Infested: 18.5 acres

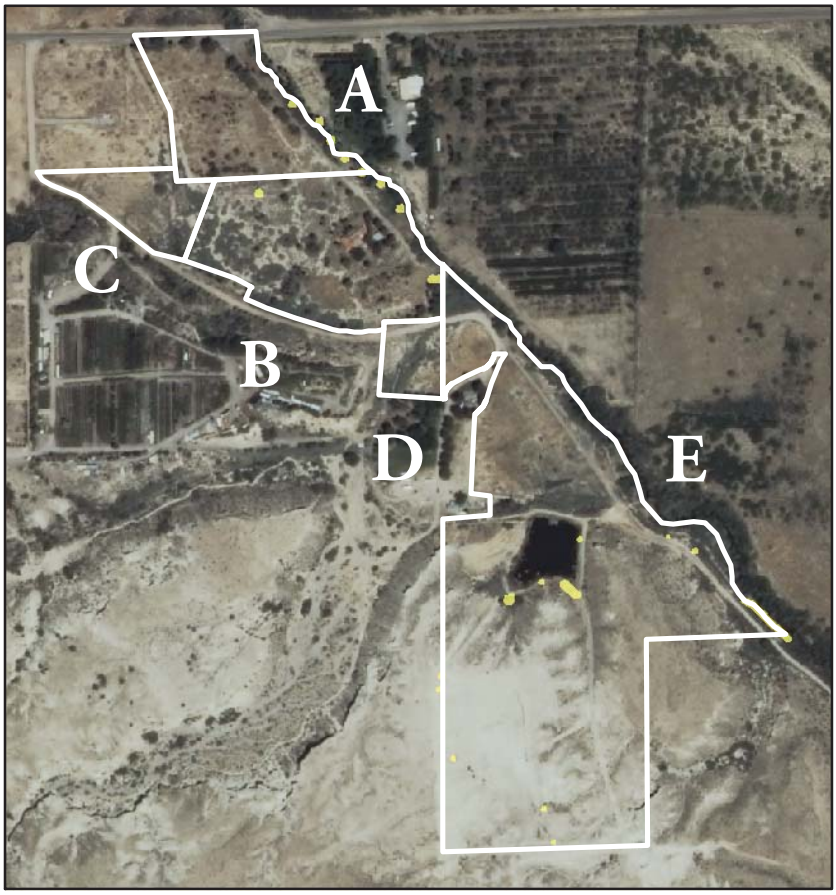
Infested: 1.03 acres

Treated: 1.03 acres

0 0.1 0.2 Miles

1:7500 NAD83 UTM Zone 11N

Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Tamarix ramosissima

saltcedar

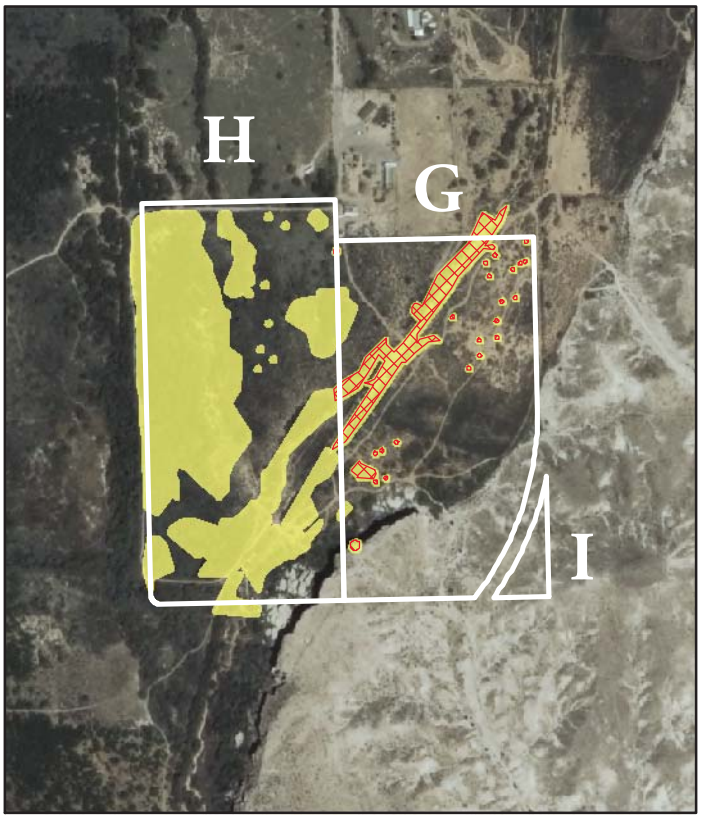
Gross Infested: 66.7 acres

Infested: 8.6 acres

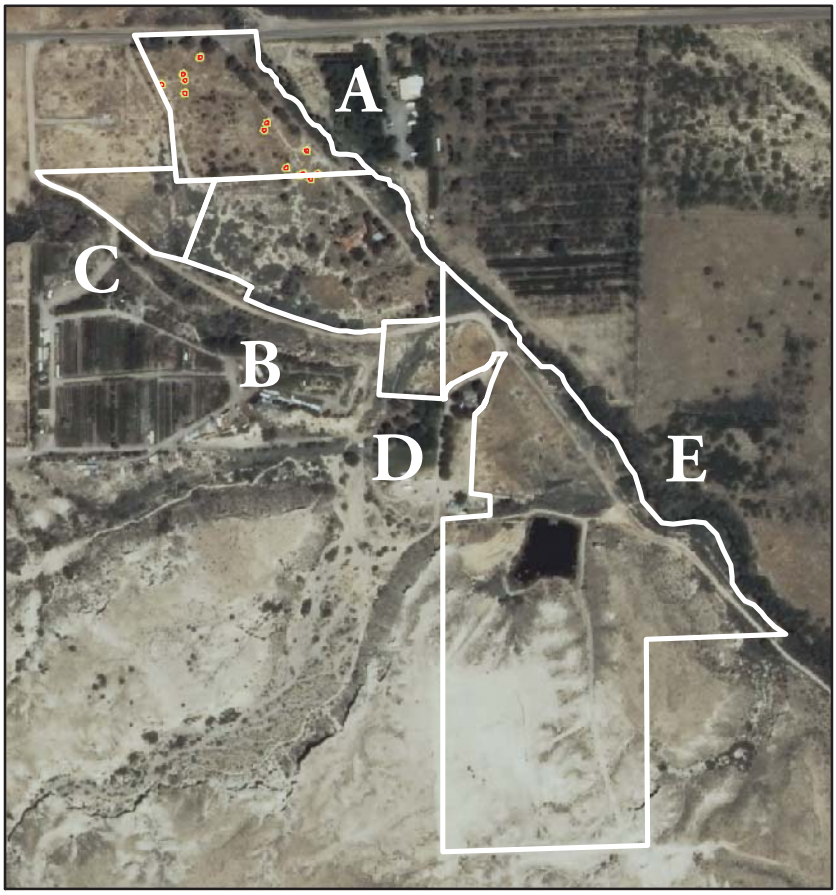
Treated: 0.38 acres

0 0.1 0.2 Miles

1:7500 NAD83 UTM Zone 11N



Lake Mead EPMT Inventory and Treatments



Clark County
Muddy River Reserve
January 2012

Tribulus terrestris
puncturevine

Gross Infested: 1.7 acres

Infested: 0.04 acres

Treated: 0.04 acres

0 0.1 0.2 Miles

1:7500 NAD83 UTM Zone 11N