

NATIONAL PARK SERVICE

Virgin River Weed Management 2020/21 Final Report

Clark County DCP Project Number 2017-NPS-1720A



Final Project Report

Project Title: Virgin River Weed Management 2020/21

Project Number: 2017-NPS-1720A

Deliverable: D17

Executive Summary:

Clark County, NV and the National Park Service Lake Mead Invasive Plant Management Team (LAKE IPMT) entered into a three year partnership agreement beginning in late February 2018 to inventory non-native vegetation and conduct weed control treatments on the Clark County Desert Conservation Program (DCP) Virgin and Muddy River Properties.

The main goal of this project is to support vegetation management and maintenance activities along the Riparian Reserve Units for enhancement of native riparian species of concern within the Multiple Species Habitat Conservation Plan. Weed surveys and project activities were conducted on multiple recently acquired DCP properties along the Virgin River. The location and extent of infestations were recorded with GPS units, and treatments of exotic plant species were completed on a prioritized basis and also included targeted species listed in the agreement.

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. Since this project has been initiated, similar weed management and restoration activities have been simultaneously occurring by other adjacent land managers within the corridor. This collaborative effort will help ensure long term vegetation management success not only within the Clark County Muddy River Properties but throughout the river corridor.

This work was supported by the Clark County Desert Conservation Program and funded by Section 10, as project #2015-NPS-1520B, to further implement or develop the Clark County Multiple Species Habitat Conservation Plan.

Introduction:

The purpose of this project was to conduct inventories of non-native vegetation and weed treatment on the Clark County Desert Conservation Program (DCP) Virgin and Muddy River Properties. The main intent of the work effort was to focus on the recently acquired parcels within the Virgin River Reserve Unit by Clark County due to their value and/or potential value to meet actions addressed in the Multiple Species Habitat Conservation Plan.

The goal of this project was to support vegetation management and maintenance activities along the Virgin and Muddy River for enhancement of native riparian species of concern of the Multiple Species Habitat Conservation Plan.

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. 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. 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.

Methods and Materials:

Plant surveys and treatments were accomplished by systematically covering the area on foot by using a grid type pattern to ensure thorough coverage.

Non-native plant surveys were conducted annually on foot during the winter and spring/summer time periods for three consecutive years (2018, 2019 and 2020). 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 including computer tablets and mobile phones. 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, and cameras within phones and tablets.

Weed treatments primarily consisted of two methods including mechanical and chemical. Mechanical methods included hand pulling or hoeing with a hand tool for small isolated annual weed populations encountered. The majority of weeds were treated using spot foliar herbicide method applied with backpack sprayers equipped with adjustable nozzles.

Results:

For project results please refer to the following tables, data summaries and maps.

Location: Virgin River Reserve – Lower Mormon Mesa and Riverside Bridge

Dates: May 2018

Treatment Methods: Foliar Spot

Herbicide Concentrate: 0.03125 gal Roundup Pro Concentrate

0.18 gal Weedmaster

0.3 gal Rodeo

Herbicide Mixture Rate: Mix #1: 5% Roundup Pro Concentrate (0.5% surfactant)

Mix #2: 5% Rodeo, 2% Weedmaster (0.5% surfactant)

Mix #3: 1% Weedmaster (0.5% surfactant)

Herbicide Total Mix: Mix #1: 0.625 gal

Mix #2: 6 gal

Mix #3: 6 gal

Acreage Summary				
Species	Total Surveyed Acres	Net Infested Acres	Gross Infested Acres Treated	Net Treated Acres
<i>Centaurea melitensis</i> Malta Starthistle	0.2	0.07	0.2	0.07
<i>Lepidium latifolium</i> Tall whitetop	0.43	0.16	0.43	0.16



Lower Mormon Mesa 2018 Treatments

Lake Mead Invasive Plant Management Team
National Park Service
U.S. Department of the Interior





Riverside Bridge 2018 Treatments

Lake Mead IPMT
National Park Service
U.S. Department of the Interior



Source: Esri, Maxar, GeoEye, Earthstar, GeoEye
Compiled by Anna Wheeler 2/8/21
Contact Curt Deuser curt_deuser@nps.gov

Location:

Muddy River Reserve

Dates: May 2018, June 2018, August 2018, February 2019

Treatment Methods: Basal Bark, Cut Stump, Foliar

Herbicide Concentrate: 0.875 fl oz Transline
0.384 fl oz Milestone
0.105 gal Weedestroy AM-40
0.3477 gal Weedar 64
0.242 gal Weedmaster
0.45 gal Garlon 4 Ultra
1.8 gal JLB Oil Plus Improved

Herbicide Mixture Rate: Mix #1: 1.5 fl oz/gal Weedar 64, 0.5 fl oz/gal Transline (0.5% Target Pro Spreader)
Mix #2: 1% Weedmaster, 0.2% Milestone (1 fl oz/gal MSO)
Mix #3: 1% Weedestroy AM-40, 1% Roundup Pro Concentrate (0.5% Target Pro Spreader)
Mix #4: 1% Weedmaster, 1% Roundup Pro Concentrate
Mix #5: 1 fl oz/gal Weedmaster, 1% Roundup Pro Concentrate (0.5% Alligare Surface)
Mix #6: 1% Weedar 64, 1% Roundup Pro Concentrate (0.5% Target Pro Spreader)
Mix #7: 20% Garlon 4 Ultra, 80% JLB Oil Plus Improved

Herbicide Total Mix: Mix #1: 1.75 gal
Mix #2: 1.5 gal
Mix #3: 10.5 gal
Mix #4: 12.75 gal
Mix #5: 12 gal
Mix #6: 32.77 gal
Mix #7: 2.25

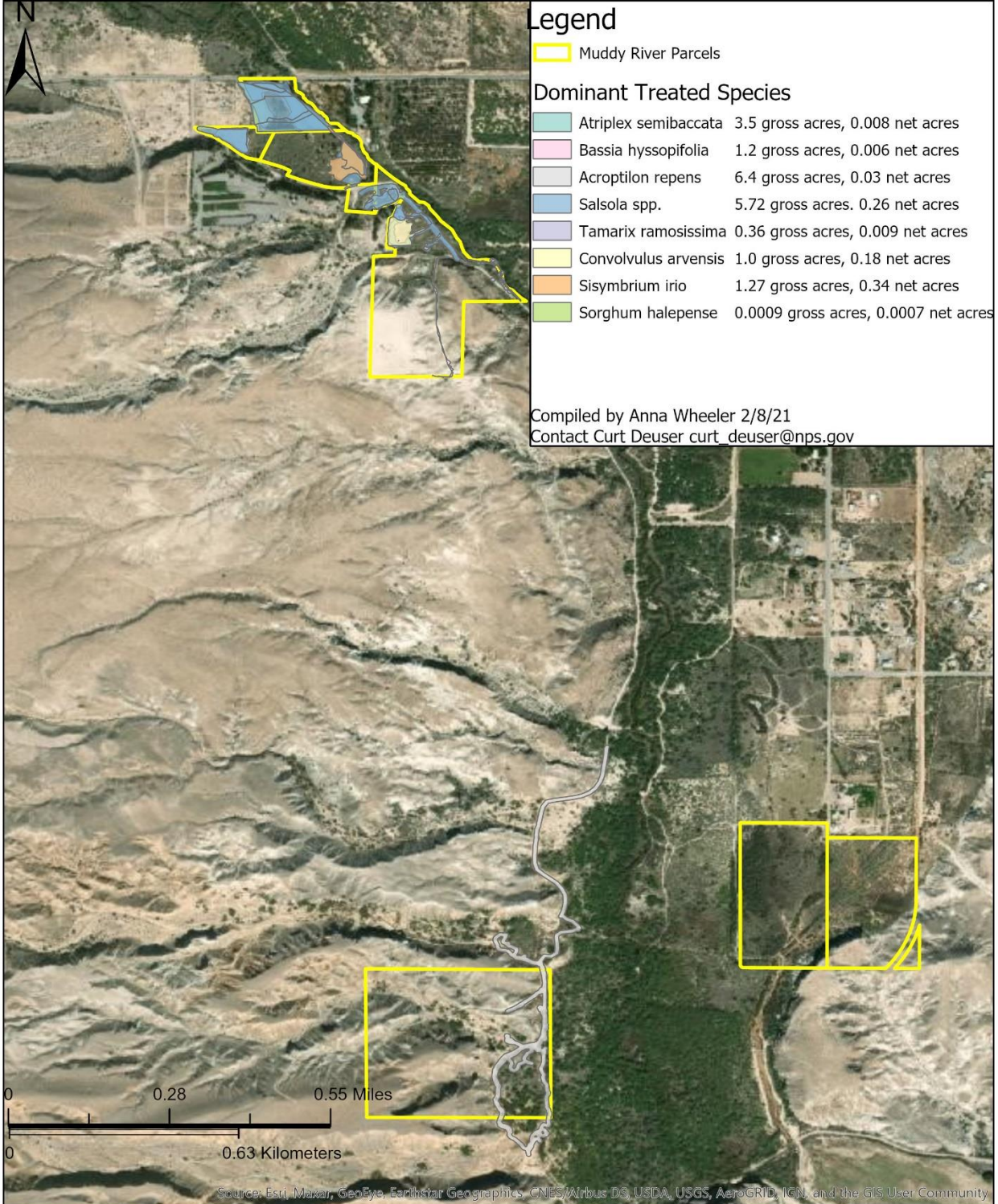
Accomplishments

Species	Total Surveyed Acres	Infested Acres	Gross Infested Acres Treated	Treated Acres
<i>Acroptilen repens</i> Russian knapweed	26.4	0.03	6.4	0.03
<i>Atriplex semibaccata</i> Australian saltbush	26.4	0.015	5.5	0.015
<i>Bassia hyssopifolia</i> Five hook Bassia	26.4	0.025	5.49	0.025
<i>Convolvulus arvensis</i> Field Bindweed	26.4	0.2	5.5	0.2
<i>Centaurea melitensis</i> Malta Starthistle	26.4	0.016	3.2	0.016
<i>Sisymbrium irio</i> London Rocket	26.4	0.36	7.96	0.36
<i>Salsola spp.</i> Russian Thistle	26.77	0.27	26.77	0.27
<i>Sorghum halepense</i> Johnsongrass	26.4	0.0027	0.4	0.0027
<i>Tamarix ramosissima</i> Salt cedar	26.4	0.009	0.36	0.009



Muddy River Reserve 2018 Treatments

Lake Mead IPMT
National Park Service
U.S. Department of the Interior



Location: Virgin River Reserve – Bunkerville

Dates: February 2019

Treatment Methods: Basal Bark

Herbicide Concentrate: 19.7 gal Garlon 4 Ultra

Herbicide Mixture Rate: 20% Garlon 4 Ultra (80% JLB Oil Plus Improved)

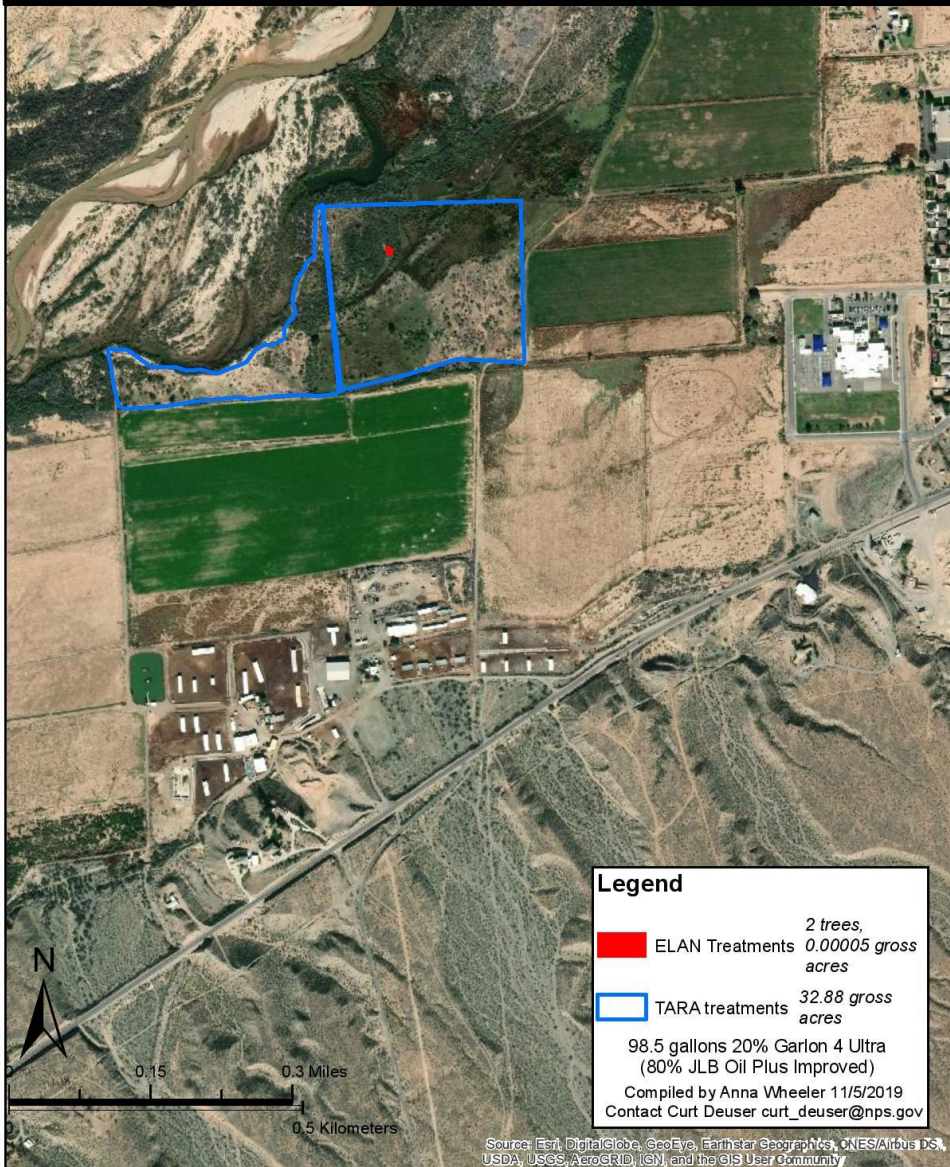
Herbicide Total Mix: 98.5 gal

Acreage Summary

Species	Total Surveyed Acres	Net Infested Acres	Gross Infested Acres Treated	Net Treated Acres
<i>Tamarix ramosissima</i> Tamarisk	32.88	3.5	32.88	3.5
<i>Elaeagnus angustifolia</i> Russian olive	32.88	0.006	0.007	0.006

2019 LAKE IPMT Virgin River

Lake Mead IPMT
National Park Service
U.S. Department of the Interior



Location: Virgin River Reserve – Lower Mormon Mesa

Dates: October 2019

Treatment Methods: Foliar Spot

Herbicide Concentrate: 8.5 grams Escort XP

Herbicide Mixture Rate: 1 gram/gal Escort XP (0.5% surfactant)

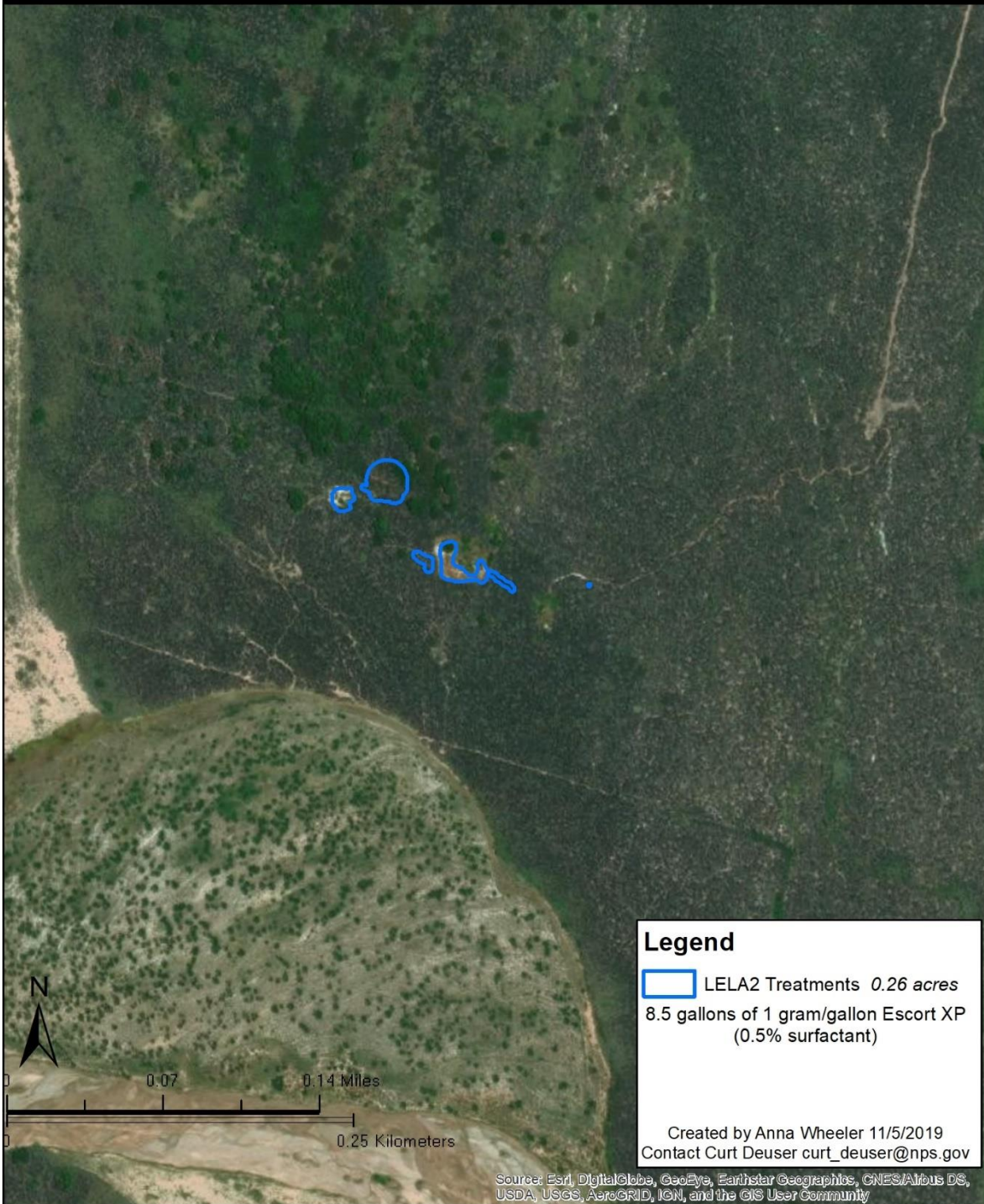
Herbicide Total Mix: 8.5 gal

Acreage Summary

Species	Total Surveyed Acres	Net Infested Acres	Gross Infested Acres Treated	Net Treated Acres
<i>Lepidium latifolium</i> Tall whitetop	0.26	0.08	0.26	0.08

2019 LAKE IPMT Virgin River LELA2

Lake Mead EPMT
National Park Service
U.S. Department of the Interior



Location: Muddy River Reserve Unit F

Dates: 11/30/2020-12/3/2020, 12/8-14/2020, 1/12-14/2021

Treatment Methods: Basal Bark, Cut Stump

Herbicide Concentrate: 4 gal Garlon 4 Ultra
16 gal JLB Oil Plus Improved

Herbicide Mixture Rate: 20% Garlon 4 Ultra, 80% JLB Oil Plus Improved

Herbicide Total Mix: 20 gal

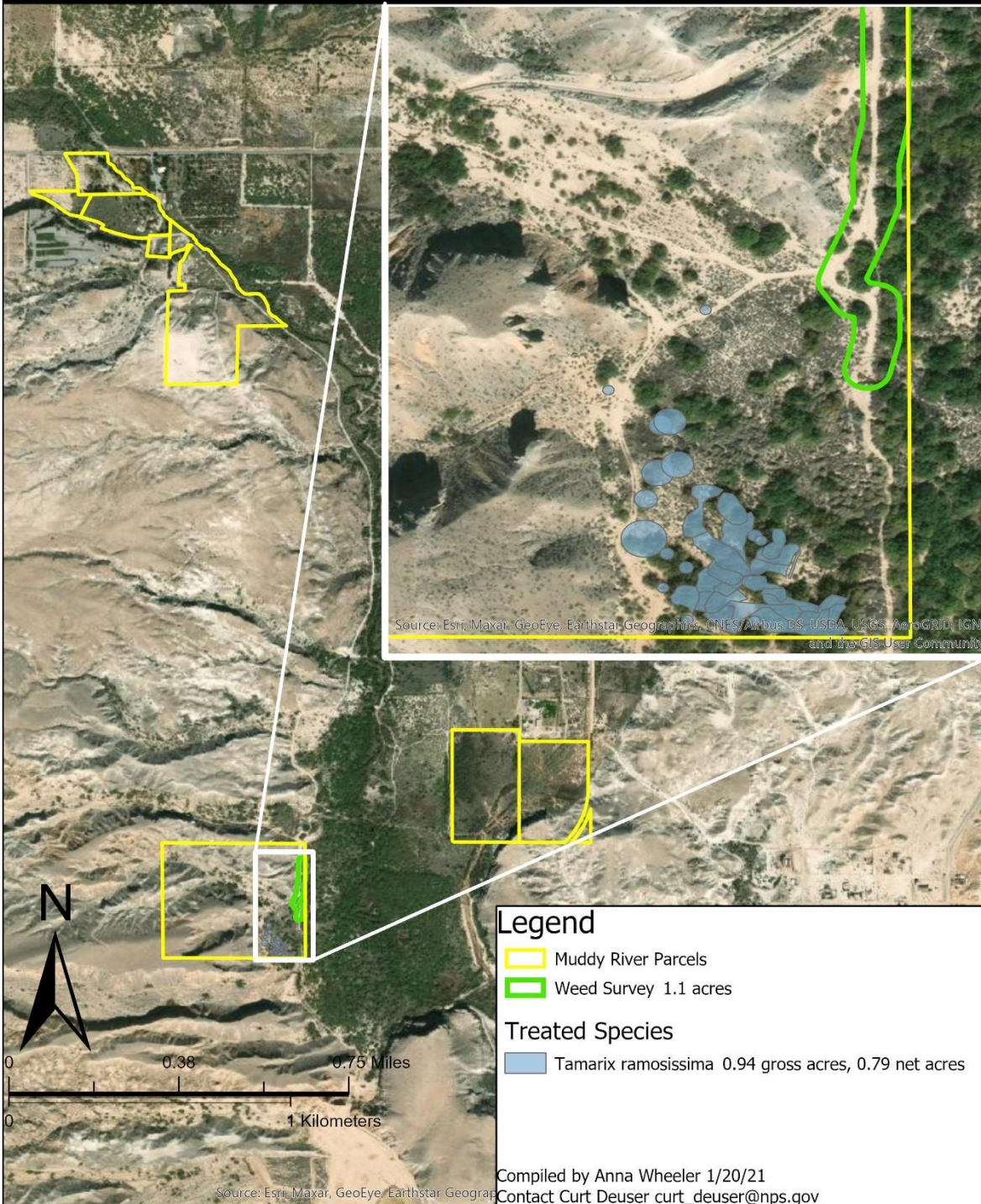
Accomplishments

Species	Total Surveyed Acres	Infested Acres	Gross Infested Acres Treated	Treated Acres
<i>Tamarix ramosissima</i> Salt cedar	2.04	0.79	0.94	0.79



Muddy River Reserve - Unit F Nov. 2020 - Jan. 2021

Lake Mead IPMT
National Park Service
U.S. Department of the Interior



Legend

- Muddy River Parcels
- Weed Survey 1.1 acres

Treated Species

- Tamarix ramosissima* 0.94 gross acres, 0.79 net acres

Compiled by Anna Wheeler 1/20/21
Contact Curt Deuser curt_deuser@nps.gov

Location: Virgin River Reserve (Bunkerville, Lower Mormon Mesa, Riverside Bridge)

Dates: 11/13/2019, 1/21/2020, 6/30/2020, 9/8/2020, 11/10/2020, 11/12/2020

Treatment Methods: Cut Stump, Basal Bark, Foliar

Herbicide Concentrate: 8.1 gal Garlon 4 Ultra

0.0975 gal Habitat

18 fl oz Polaris

Herbicide Mixture Rate: Mix #1: 20% Garlon 4 Ultra, 80% JLB Oil Plus Improved

Mix #2: 20% Garlon 4 Ultra, 10 fl oz/gal Polaris, 72% JLB Oil Plus Improved

Mix #3: 1% Habitat (0.5% Kinetic)

Mix #4: 32 fl oz/acre Polaris (0.5% Kinetic)

Herbicide Total Mix: Mix #1: 40 gal

Mix #2: 0.53 gal

Mix #3: 9.75 gal

Mix #4: 11 gal

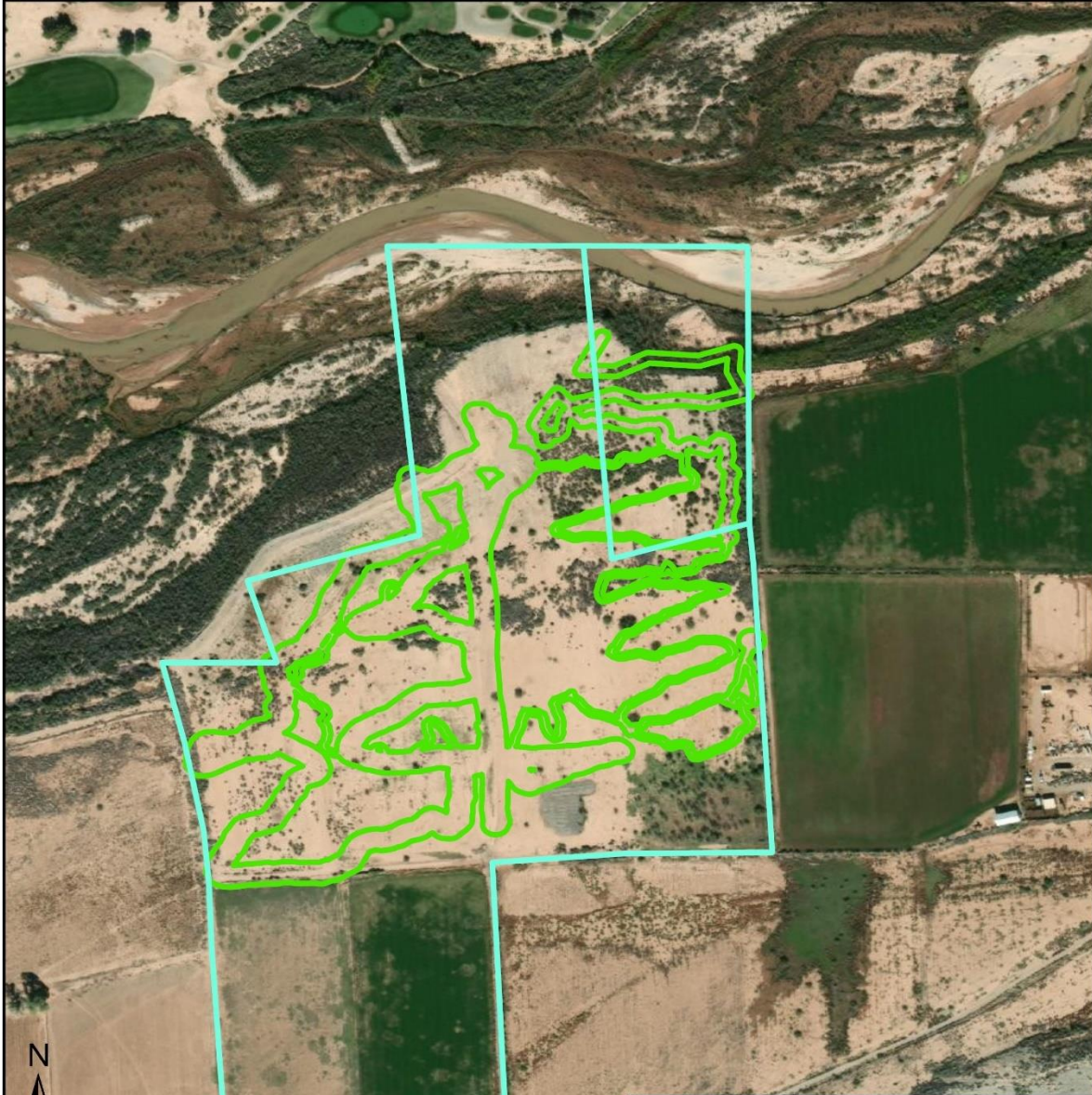
Accomplishments

Species	Total Surveyed Acres	Infested Acres	Gross Infested Acres Treated	Treated Acres
<i>Alhagi maurorum</i>	14.96	0.84	4.76	0.7
<i>Lepidium latifolium</i>	7.37	0.08	0.57	0.08
<i>Tamarix aphylla</i>	2.6	0.12	0.14	0.12
<i>Tamarix ramosissima</i> Salt cedar	27.7	0.69	6.9	0.69
<i>Washingtonia filifera</i>	4.8	0.0005	0.017	0.0005





Bunkerville East Parcels 2020 Survey

Lake Mead IPMT
National Park Service
U.S. Department of the Interior



Legend

-  Parcel Boundary
-  Weed Survey 14 acres

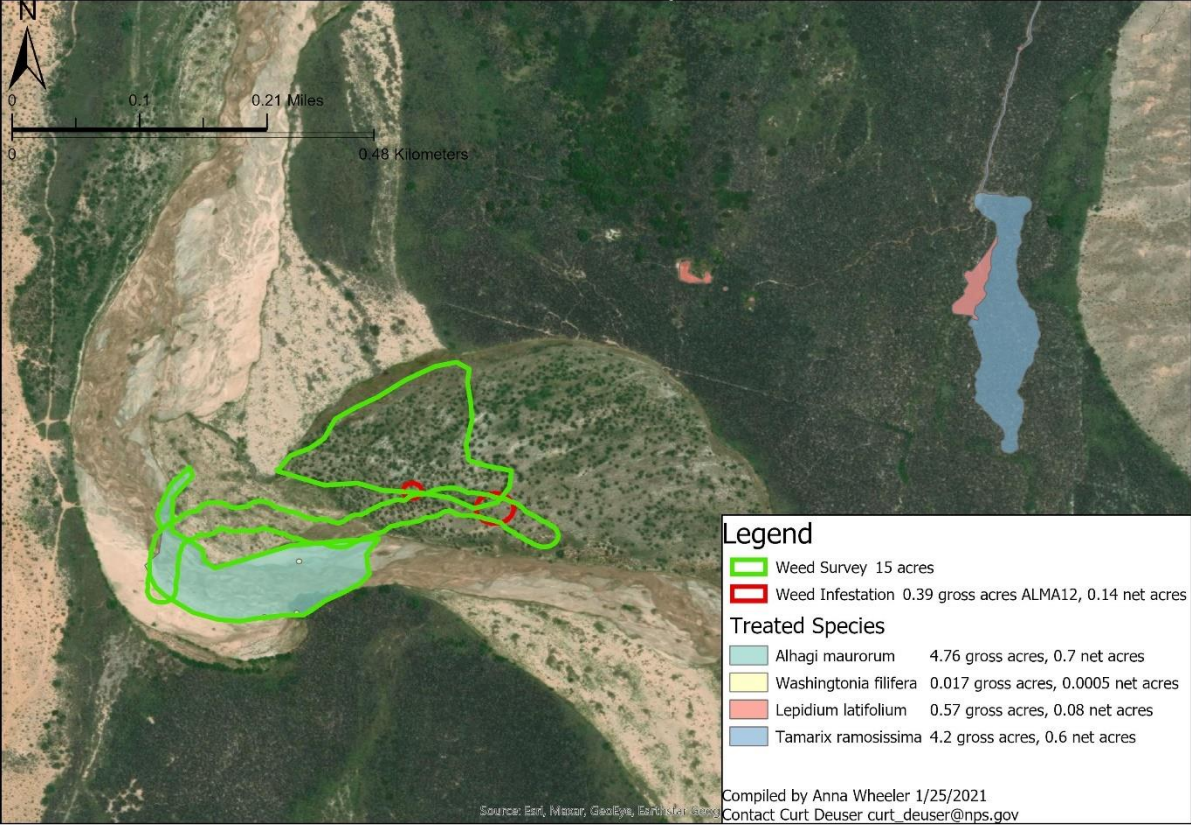
Compiled by Anna Wheeler 1/25/2021
Contact Curt Deuser curt_deuser@nps.gov

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES



Lower Mormon Mesa 2020 Treatments and Survey

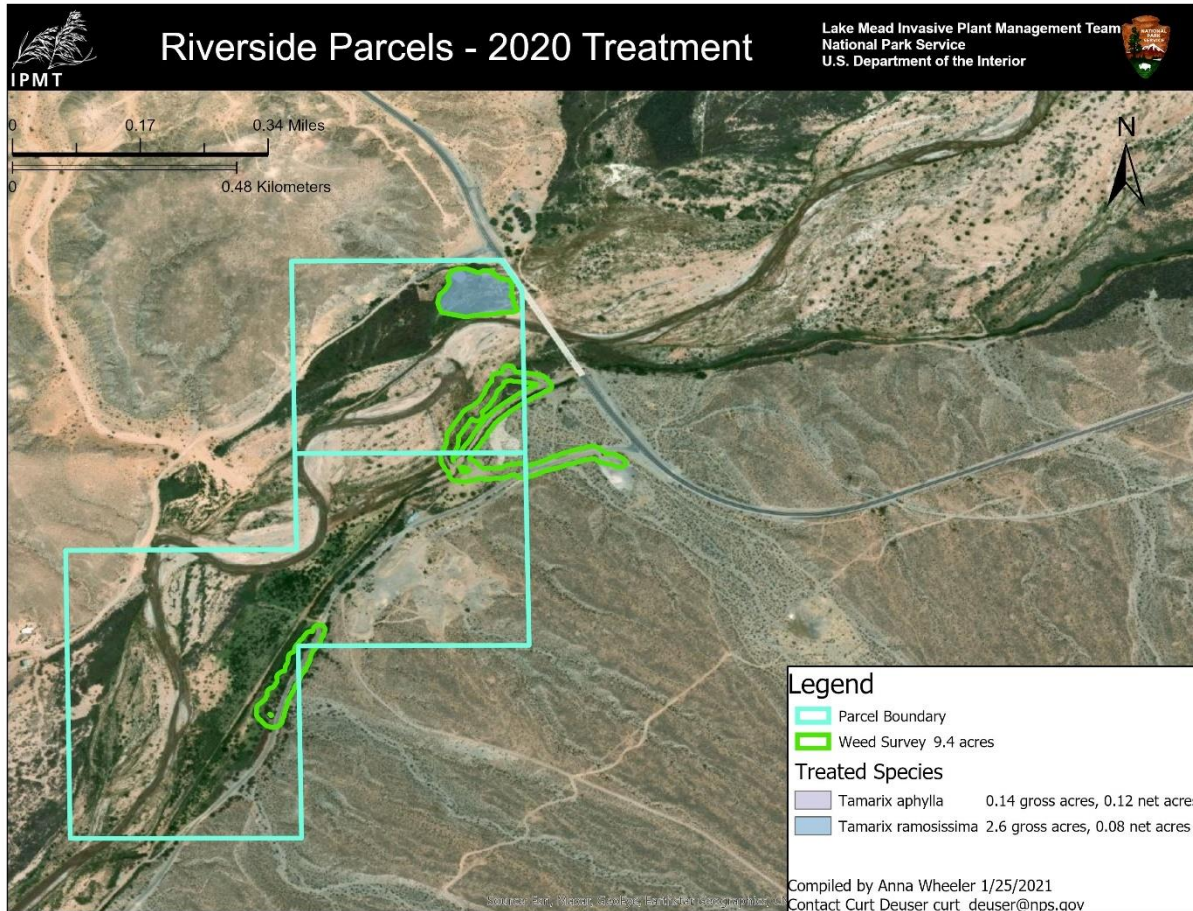
Lake Mead Invasive Plant Management Team
National Park Service
U.S. Department of the Interior



Legend

- Weed Survey 15 acres
 - Weed Infestation 0.39 gross acres ALMA12, 0.14 net acres
- Treated Species**
- Alhagi maurorum 4.76 gross acres, 0.7 net acres
 - Washingtonia filifera 0.017 gross acres, 0.0005 net acres
 - Lepidium latifolium 0.57 gross acres, 0.08 net acres
 - Tamarix ramosissima 4.2 gross acres, 0.6 net acres

Compiled by Anna Wheeler 1/25/2021
Contact Curt Deuser curt_deuser@nps.gov



Evaluation and Discussion of Results:

Tamarisk (*Tamarix ramosissima*) is the most common weed species occurring in all of the Virgin River Units. Although much less widespread and limited in distribution there are other high priority Nevada State listed Noxious Weeds present within some of the units including malta starthistle (*Centaurea melitensis*), tall whitetop (*Lepidium latifolium*), camelthorn (*Alhagi maurorum*) and athel tamarisk (*Tamarix aphylla*). Several athel tamarisk tree recruitment was observed at the Riverside Unit that was most likely established from seed from the large athel trees located within the property. This is considered rare and athel trees have been controlled throughout the Lake Mead NRA several miles downstream. This is considered a high priority for control so initial treatment of the large athel trees in the unit was implemented using the frill cut method. Post treatment monitoring of these athel trees was conducted in January 2021 and was about 50% effective with partially live and dead branches. A second treatment will be necessary in the future. The tall whitetop treatments in the Mormon Mesa Units were effective and will take continued monitoring and treatment vigilance. Tall whitetop is not widespread on the Virgin River however there are obscure populations in the understory of some of the old

tamarisk trees in this vicinity. The 3-4 acre tamarisk mastication site on the Mormon Mesa Unit did have some tall whitetop establishing along the western edge of the unit but was treated with herbicide and should also be monitored and re-treated as necessary. Camelthorn is only found in the lower portions of the river and was detected in the southwest portion of the Mormon Mesa Unit on the lower terrace near the river channel intermixed with native riparian plants such as willow, cottonwood, screwbean mesquite, arrowweed and baccharis. However a flood event occurred in 2019 that deposited a lot of sediment in this area covering up most of the plants. In 2020 most of the native trees have survived and recolonized dominance of the site however camelthorn was observed in lower amounts and should be monitored and treated in the future as necessary. The NPS IPMT has partnered with the BLM for several years to control camelthorn adjacent this unit and successes have been made. Camelthorn is very important to control because its distribution is very limited and is the only area known to occur in Southern Nevada. Malta Starthistle is found in some of the Units from Riverside up to the Bunkerville Units. This is an annual plant that can be a nuisance and produces dried thorns after it senesces. Malta Starthistle is a seed bank plant species that varies in production from year to year based on weather and site disturbance. It is important to continue to control this species to reduce its populations and keep it from becoming dominate. With control efforts Malta Starthistle should be reduced and less competitive as perennial shrubs become established. It benefits from ground disturbance activities and possibly from excessive cattle grazing. Sahara mustard (*Brassica tournefortii*), this is another state listed Noxious weed that is a widespread common problem in Clark County, however it is found in only limited amounts on the County Riparian Units. Small populations were observed and treated on the western portion of the Riverside Unit. Tamarisk treatments were conducted on resprouts at the masticated sites in the Riverside and Mormon Mesa Units. These sites are recovering well with native shrubs including arrowweed and quailbush. Tamarisk control has also occurred at the Bunkerville West and Muddy River Unit F sites.

Some excellent native plant recovery has occurred at the 5 small tamarisk removal clearings (A/B/C/D/E) at the Virgin River Mormon Mesa Unit. The tamarisk was controlled using the cut stump method in 2014(?) and some native tree cuttings were planted (cottonwood and willow). These sites have recovered with a variety of native wetland and riparian plant species with great diversity. Aquatic species that have established naturally include *Juncus acutus* and *Anemopsis californica*. Goodings willow and *Salix exigua* have formed dense thickets that have surface water/marsh type habitats under the canopy. These sites appear to be excellent southwestern willow flycatcher nesting habitat. Tall whitetop (*Lepidium latifolium*) has established in a couple of these sites but treatment has been successful. Minor amounts of tamarisk has also invaded but treatments should continue. Some good native plant recovery is also occurring at the Mormon Mesa Unit within the 4 acre tamarisk mastication site with mostly

quail bush establishing naturally. All of the tamarisk resprouts in this mastication site were basal sprayed which has allowed for native plant recovery.

Another additional accomplishment included the collection of salt grass (*Distichlis spicata*) for growing out in the NPS Lake Mead NRA (Song Dog) native plant nursery to be outplanted at the future Muddy River Units restoration projects. This project is a tribute and benefit of partnerships since we ended up facilitating the salvage of these wild growing salt grass plugs from the Clark County Wetlands Park and Nature Preserve's future construction site. In January 2021 we collected 20 tray container bins totaling approximately 92 square feet of salt grass by digging up with hand tools, hoes, pulaskis, fire tools and shovels into trays then to wheelbarrows and then loaded on back of pick up trucks and taken to the plant nursery for growing out and eventual transplanting on the Muddy River. The salt grass will be separated by root wads and transferred into grow out flat containers at the nursery and some of it is being planted outside in the coppice yard that can be irrigated.

We also want to report on successes at some of the Muddy River Riparian Units. There has been a dramatic recovery of desirable native plants from natural recovery and our transplanting and seeding of native species back in April of 2016 in Unit A and B. This native species establishment has also attributed to the reduction of weeds by competition with desirable perennial plant cover increasing. Excellent survival of the 156 native trees and shrubs has occurred with minimal supplemental watering due to the expertise of the IPMT's planting techniques, watering and maintenance activities on site. Many of these trees have grown over 10 feet tall and are providing desirable habitat for birds and other wildlife species. In the spring of 2016 we conducted native revegetation and seeding within Units A, B and seeding within Unit D. We transplanted native trees using deep hole planting of long stem nursery grown stock provided by the National Park Service Native Plant Nursery at Lake Mead National Recreation Area. All plant material was originally collected from the southern Nevada area. This long stem deep planting method was developed by the USDA NRCS Plant Materials Center in Los Lunas, New Mexico and described by David R. Dreesen and Gregory A. Fenchel in a 2014 Rangelands publication produced by the Society for Range Management. 156 one gallon container trees and shrubs were planted on March 28, 2016. Refer to previous Muddy River project report. The purpose of the revegetation was to provide a desirable plant community to reduce and eventually out-compete the amount of weeds on site. However recent funding has been obtained to conduct a larger restoration project including large scale earth moving and re-contouring of the floodplain in the near future, unfortunately all of the transplanted trees from 2016 will be destroyed from these earth moving activities. However the end result should be the creation of a more hydric vegetation community capable of supporting an excellent riparian habitat that is more intact with the floodplain.

Previous weed treatments on the Muddy River Units were effective at greatly reducing the amount of high priority state Noxious weed species presence throughout the properties such as Russian knapweed (*Acroptilon repens*), Malta starthistle (*Centaurea melitensis*), puncture vine (*Tribulus terrestris*) and Johnson grass (*Sorghum halepense*) in addition to persistent high priority nuisance species that can inhibit long term site restoration such as fivehook bassia (*Bassia hyssopifolia*), Australian saltbush (*Atriplex semibaccata*) and field bindweed (*Convolvulus arvensis*).

Conclusions and Recommendations:

Continuation of this project is important to maintain successes and to keep the sites free from Noxious weeds and other high priority weed species that alter site restoration potential or any other nuisance species determined to be controlled by the County Project Manager. The Bureau of Land Management (BLM) manages most of the adjacent lands along the Muddy and Virgin River Units and has continued tamarisk control and other weed species control followed by some active revegetation along the streambanks and floodplains so vegetation management within the County properties has high potential for success. Russian knapweed within the Muddy River County properties has been virtually eradicated and also controlled to maintenance levels on adjacent BLM lands which are also being treated through an agreement with our team. Camelthorn and tall whitetop should continue to be controlled on the Virgin River Units to keep this plant from becoming further established. This way weeds will have less potential to move across boundaries since adjacent properties have the same weed control objectives.

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. Tamarisk resprouts after equipment mastication should continue to be the priority. The Bunkerville West site would be a good area to conduct selective tamarisk control such as basal spray and cut stump of some of the larger thickets. This site has good potential for successful revegetation using a variety of riparian plant species due to the amount of water and moist soil on the site. I recommend fence repair and further fencing some of the perimeter of this unit to keep cattle out of the site so it can be restored. There are currently large mature stands of tamarisk in Unit H on the Muddy River which could be controlled and Unit F could be a good place to transplant mesquite, desert willow, catclaw trees, sacatone and salt grass in the future now that the tamarisk has been controlled. In Unit F there is also a large amount of dense dead exotic invasive annual brome grass (red brome and cheatgrass) that established in years past and has created dried chaff. This could be a good place to consider brome grass chemical control treatments to reduce this population and subsequent hazard wildfire fuels. The remaining tamarisk piles in Unit F can be evaluated further to either let degrade on site or

consider mastication prior to revegetation. The tamarisk leaf beetle, (*Diorhabda* spp) has been widely established on both Muddy and Virgin Rivers since approximately 2010 or 2011. Periodic beetle caused defoliations has occurred in the summers with variable amounts of defoliation and presence of the beetle. 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. However much of the tamarisk along the Virgin River from Arizona to Lake Mead over the last decade or more has been greatly reduced and replaced by native plant communities such as willow in wet areas and screwbean mesquite, qualibush, arrowweed and seep willow (personal observation by Curt Deuser). This is a result of a combination of events including major flooding in 2005 and 2010, wildfires in the 1990's and 2000's, active tamarisk control by the BLM and the arrival of the tamarix beetle in 2010 to the system. Most of the monotypic "old growth" tamarisk located along the high terraces of the lower Virgin River are partially dead (estimated 75% reduction in live tamarisk leaf cover ocular estimates) due to beetle predation. Lots of opportunity exists for natural native plant and active plant recovery. 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 Riparian Units include ground crews using the cut stump method or the foliar herbicide application method, or tree extraction or mastication with heavy equipment. Selective low volume basal spray is recommended for many of the County Units on the Virgin River. This method can be very effective since most of the tamarisk is intermixed with native plant species and can be done with no ground disturbance. Either triclopyr or imazapyr based herbicides could be used with these methods.

The southernmost Muddy River Reserve Units, F, G, H and I 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. 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.

Supporting Project Report Photos:



Photos above of Muddy River Unit F Tamarisk control cut stump project December 2020 and January 2021



Salt grass salvage from Clark County Wetlands Park and Nature Preserve for future Muddy River Riparian Restoration projects taken to Lake Mead NRA Nursery (January/February 2021).



Successful tree planting project at Muddy River Unit A/B from April 2016. Honey mesquite and catclaw trees have grown approximately 10 feet tall photo taken (November 30, 2020).



Anna Wheeler and Andy Pigg from NPS treating tall whitetop at the Virgin River Mormon Mesa Unit in October 2019. Notice the amount of native wetland and riparian plant species colonizing the site after tamarisk removal from circa 2012. This site should make good southwestern willow flycatcher habitat due to marshy surface water and abundant moist soil under dense forests of willow trees.



The photos above show populations of tall whitetop in the basal rosette stage at the Mormon Mesa Virgin River Unit and Andy Pigg from NPS treating these plants. This noxious weed is not widespread or common along the Virgin River, however it is found in this area in the understory of dense thickets of tamarisk. Most of the tamarisk in this unit is partially dead from the bio control leaf beetle. It is very important to control these populations of tall whitetop since it could take over the area after the tamarisk has died.



The photos above show the Athel tamarisk tree (*Tamarix aphylla*) which is an evergreen and is a much larger tree than its deciduous cousin which is much more widespread. The photos on the right are of a young athel trees that are establishing on the flood plain at the Riverside Unit. Its likely that these saplings were a result of seed spread from the mature large Athel tree below the bridge. These trees were controlled during this project and follow up will be needed.

Acknowledgements:

Report prepared by the Lake Mead Invasive Plant Management Team (LAKE IPMT). Project reporting, maps and data management production by Anna Wheeler, LAKE IPMT. Report analysis and recommendations prepared by Curt Deuser. Thanks to the field work completed by Andy Pigg and Darrin Gobble and many other individuals from the LAKE IPMT. Also thanks to James Holland for plant identification and verification.

This work was supported by the Clark County Desert Conservation Program and funded by Section 10, as project #2017-NPS-1720A, to further implement or develop the Clark County Multiple Species Habitat Conservation Plan.

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