NATIONAL PARK SERVICE

Riparian Reserves Vegetation Management 2026 Final Report

Clark County DCP Project Number 2021-NPS-2010E



Cover Photo Caption: Kolbeinn Wesen treating California fan palm (*Washingtonia filifera*) at Muddy River Riparian Reserve Parcel B. Photo Credit: Ouen Moore/NPS/January 2026.

Final Project Report

Project Title: Riparian Reserves Vegetation Management

Project Number: 2021-NPS-2010E

Deliverable: D04

Executive Summary:

Clark County, NV and the National Park Service Lake Mead Invasive Plant Management Team (LAKE IPMT) committed to a 1-year partnership agreement beginning in mid-November 2025 until October 2026 to inventory non-native invasive vegetation, conduct weed control treatments and restoration activities on the Clark County Desert Conservation Program (DCP) Riparian Reserve Parcels on the 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 acquired DCP properties along the Virgin River and Muddy 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 included targeted species listed in the agreement.

Project Deliverables and Milestones are reported on a quarterly and annual basis during the project. Information has been exchanged and vegetation management work has been accomplished on the ground to meet current site objectives. Similar weed management and restoration activities have been simultaneously occurring by the BLM and other adjacent land managers within the corridor. This collaborative effort will help ensure long-term vegetation management success not only within the Clark County Virgin and Muddy River Properties but throughout the river corridor. The work conducted on this project is consistent with the goals of the Virgin River Coalition.

This work was supported by the Clark County Desert Conservation Program and funded by Section 10, as project #2021-NPS-2101E, 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 landowners 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 ocular surveys by using a grid type pattern to ensure thorough coverage. In some cases, dense stands of vegetation such as tamarisk and quail bush inhibited walking directly through while conducting surveys.

Non-native plant surveys were conducted on foot during the fall/winter of 2025/2026, spring/early summer of 2026. Non-native annual and perennial plant species were documented during surveys and geospatially recorded using handheld 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. Many weeds were treated using spot foliar herbicide method applied with backpack sprayers equipped with adjustable nozzles. The cut-stump method and low-volume basal spray method were used on tamarisk. The Mormon Mesa tamarisk mastication sites were treated with heavy equipment by a separate partner/contractor and then we applied low-volume basal spray to the tamarisk resprouts approximately 9-12 months following the initial removal. The ideal height of tamarisk resprouts after initial mastication is at least 3 feet to7 feet tall so usually a full growing season is necessary before conducting the

application. California fan palms were treated by one of three methods: foliar spot treatment, cut-stump method, and/or drill and fill method.

Results:

For last year's project results please refer to the following tables, data summaries and maps. These results represent work conducted from primarily from winter of 2025 to spring of 2026.

IPMT
Invasive Plant
Management Team
Lake Mead

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Riverside
Date(s): 12/5/2025
Treatment Method(s): Chemical foliar spot treatment.
Note(s): Inventoried infestations remaining were senescent and untreatable at time of site visit.

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Alhagi maurorum Camelthorn	5.0	1.651

Herbicide Use

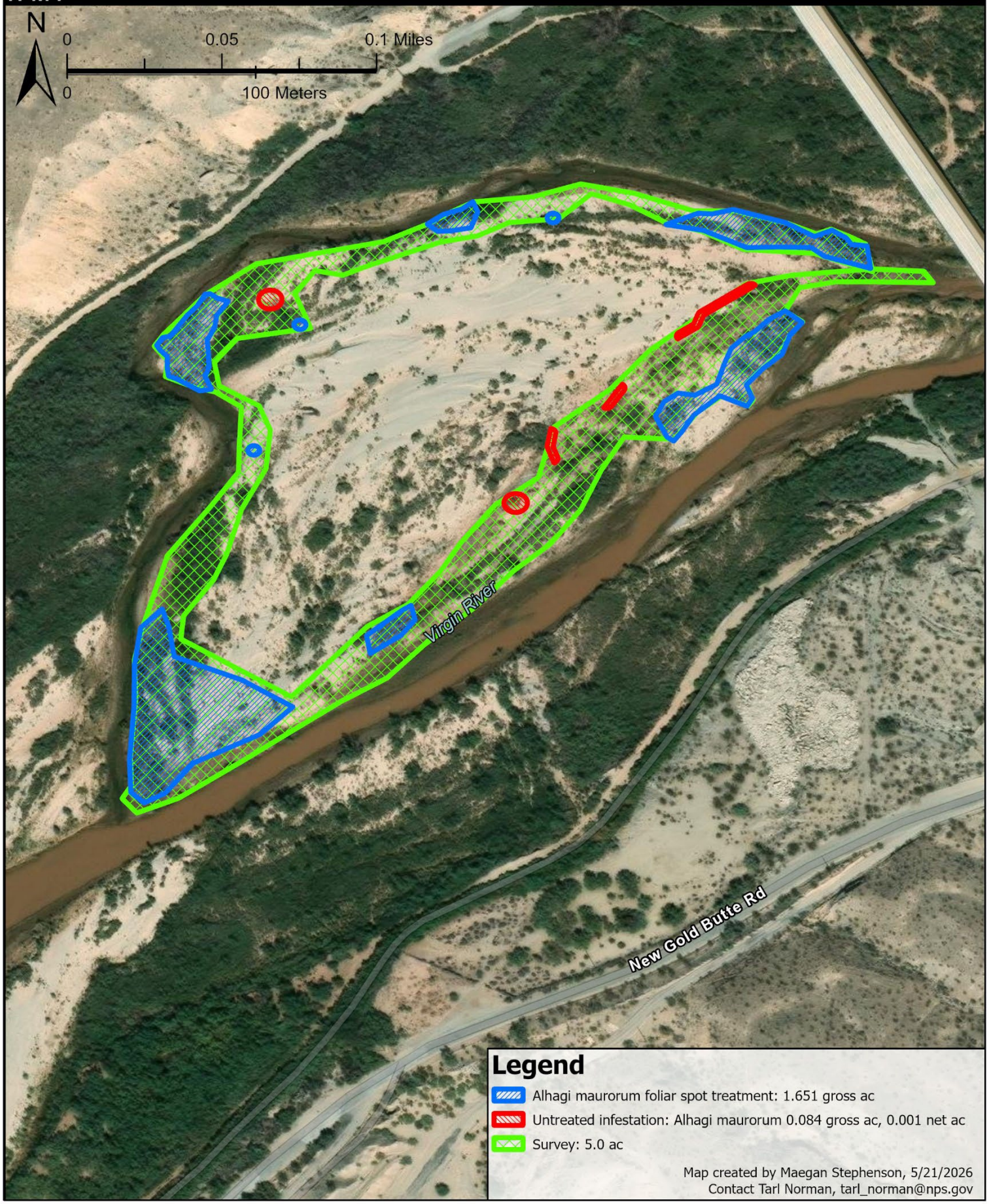
Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Habitat	10.24 fl oz	1%	0.25% Activator 90	8 gallons
Garlon 3A	10.24 fl oz	1%		

These definitions are based on the 2019 NISIMS Fields and Domains guide. Please refer to https://irma.nps.gov/DataStore/DownloadFile/617128 for more information. These definitions can also be found on the back of this report. Compiled by Maegan Stephenson. For questions, please contact Tarl Norman at tarl_norman@nps.gov or (702) 283-2194.

Clark County Riparian Reserve
Riverside, 12/5/2025

IPMT

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Legend

- Alhagi maurorum foliar spot treatment: 1.651 gross ac
- Untreated infestation: Alhagi maurorum 0.084 gross ac, 0.001 net ac
- Survey: 5.0 ac

Map created by Maegan Stephenson, 5/21/2026
Contact Tarl Norman, tarl_norman@nps.gov

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Bunkerville East
Date(s): 2/26/2026 and 4/7-8/2026
Treatment Method(s): Chemical foliar spot treatment on a variety of weeds via backpack sprayers. A variety of herbicide mixes used.
Note(s): Please see geodatabase for polygon specifics.

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Brassica tournefortii Sahara mustard	44.06	16.25
Centaurea melitensis Malta starthistle		
Convolvulus arvensis Field bindweed		
Malcolmia africana African mustard		
Malva neglecta Common mallow		
Polypogon monspeliensis Annual rabbit's-foot grass		
Salsola sp. Russian thistle		
Sisymbrium irio London rocket		
Sonchus asper Prickly sow-thistle		

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix	Grossed Infested Acres Treated
Roundup Pro Concentrate	5.12 fl oz	1%	1% Alligare 90	4 gallons	1.49
Milestone	0.17 fl oz	0.2 fl oz/gal	1% Alligare 90	111 fl oz	1.15
Roundup Custom	17.28 fl oz	2%	0.5% Kinetic	6.75 gallons	13.56
Polaris	8.64 fl oz	1%			
Roundup Custom	2.56 fl oz	2%	0.5% Kinetic	1 gallon	0.03

Invasive Plant Chemical Treatment Report

Partner: **Clark County**
Location: **Bunkerville East**
Date(s): **4/7/2026**
Treatment Method(s): **Chemical foliar spot treatment via tank sprayer.**

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Tamarix ramosissima Salt cedar	44.06	0.61

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Roundup Custom	109.44 fl oz	2%	0.5% Kinetic	42.75 gallons
Polaris	54.72 fl oz	1%		

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Invasive Plant Manual Treatment Report

Partner: Clark County
Location: Bunkerville East
Date(s): 2/26/2026 and 4/7/2026
Treatment Method(s): Hand-pulling.

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Bassia hyssopifolia Fivehook bassia	44.06	0.0144	0.0001	0.0001
Centaurea melitensis Malta starthistle				
Sisymbrium irio London rocket				

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Invasive Plant Survey Report

Partner: **Clark County**
Location: **Bunkerville East**
Date(s): **1/20/2026 and 4/7-8/2026**
Survey Method(s): **Inventoried infestations while working in the area. Sahara mustard and London rocket senescent phenology at time of survey. Salt cedar is in a wet area and needs cut/stump treatment.**

Accomplishments

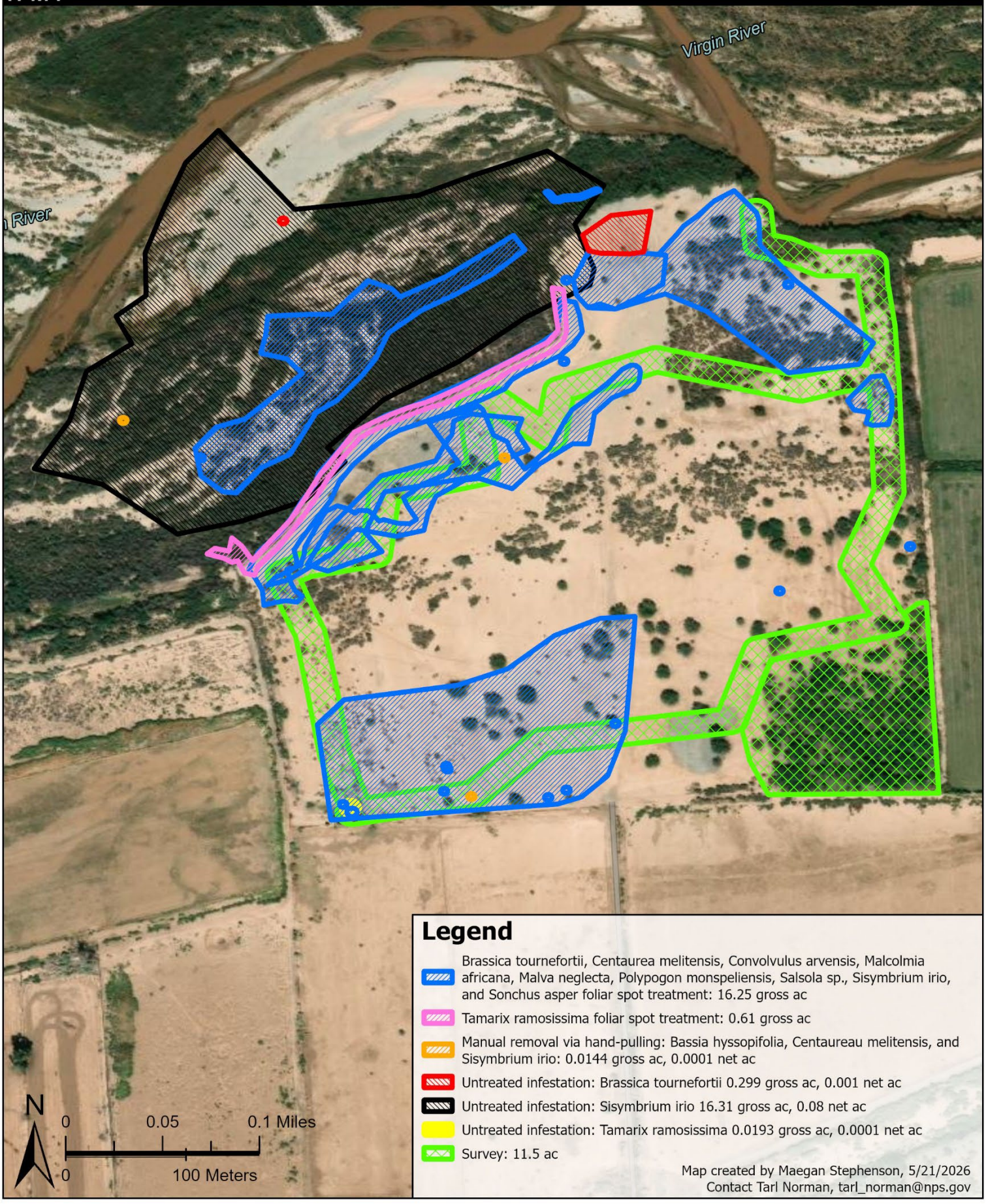
Species	Total Surveyed Acres	Gross Infested Acres	Infested Acres	Treated Acres
Brassica tournefortii Sahara mustard	44.06	0.299	0.001	Not treated
Sisymbrium irio London rocket		16.31	0.08	Not treated
Tamarix ramosissima Salt cedar		0.0193	0.0001	Not treated

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Clark County Riparian Reserve
Bunkerville East
1/20/2026, 2/26/2026, and 4/7-8/2026

IPMT

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U.S. Department of the Interior



Legend

- Brassica tournefortii, Centaurea melitensis, Convolvulus arvensis, Malcolmia africana, Malva neglecta, Polypogon monspeliensis, Salsola sp., Sisymbrium irio, and Sonchus asper foliar spot treatment: 16.25 gross ac
- Tamarix ramosissima foliar spot treatment: 0.61 gross ac
- Manual removal via hand-pulling: Bassia hyssopifolia, Centaureau melitensis, and Sisymbrium irio: 0.0144 gross ac, 0.0001 net ac
- Untreated infestation: Brassica tournefortii 0.299 gross ac, 0.001 net ac
- Untreated infestation: Sisymbrium irio 16.31 gross ac, 0.08 net ac
- Untreated infestation: Tamarix ramosissima 0.0193 gross ac, 0.0001 net ac
- Survey: 11.5 ac

Map created by Maegan Stephenson, 5/21/2026
Contact Tarl Norman, tarl_norman@nps.gov

Invasive Plant Chemical Treatment Report

Partner: **Clark County**
Location: **Bunkerville West**
Date(s): **3/30/2026, 4/2/2026, 4/6/2026, 4/8-10/2026, and 4/14/2026**
Treatment Method(s): **Chemical foliar spot treatment on a variety of weeds via backpack sprayers.**
Note(s): **Please see geodatabase for polygon specifics.**

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Bassia scoparia Kochia	56.8	4.3
Centaurea melitensis Malta starthistle		
Lactuca serriola Prickly lettuce		
Lepidium latifolium Tall whitetop		
Malva neglecta Common mallow		
Melilotus sp. Sweetclover		
Polygonum aviculare Common knotgrass		
Salsola sp. Russian thistle		
Sisymbrium irio London rocket		
Solanum elaeagnifolium Silverleaf nightshade		
Sonchus asper Prickly sow-thistle		

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Roundup Custom	58.95 fl oz	2%	1% Alligare 90 or 0.5% Kinetic	23 gallons + 4 fl oz
Polaris	29.47 fl oz	1%		

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Bunkerville West
Date(s): 4/2/2026, 4/10/2026, and 4/14/2026
Treatment Method(s): Chemical cut/stump treatment using 2 different herbicides.
Note(s): Please see geodatabase for polygon specifics.

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Tamarix ramosissima Salt cedar	56.8	1.7

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix	Grossed Infested Acres Treated
Garlon 4 Ultra	3.2 fl oz	20%	80% JLB Oil Plus Improved	16 fl oz	0.064
Polaris	0.625 fl oz	10 fl oz/gal	n/a	8 fl oz	1.694

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Invasive Plant Manual Treatment Report

Partner: **Clark County**
Location: **Bunkerville West**
Date(s): **2/26/2026 and 4/8/2026**
Treatment Method(s): **Hand-pulling.**

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Brassica tournefortii Sahara mustard	56.8	0.01235	0.00006	0.00006
Centaurea melitensis Malta starthistle		0.00482	0.00002	0.00002

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Invasive Plant Survey Report

Partner: Clark County
Location: Bunkerville West
Date(s): 2/26/2026
Survey Method(s): Inventoried infestations while working in the area.
Note(s): Remaining salt cedar contains both mature and juvenile phenology. Cut/stump and basal bark treatments are recommended.

Accomplishments

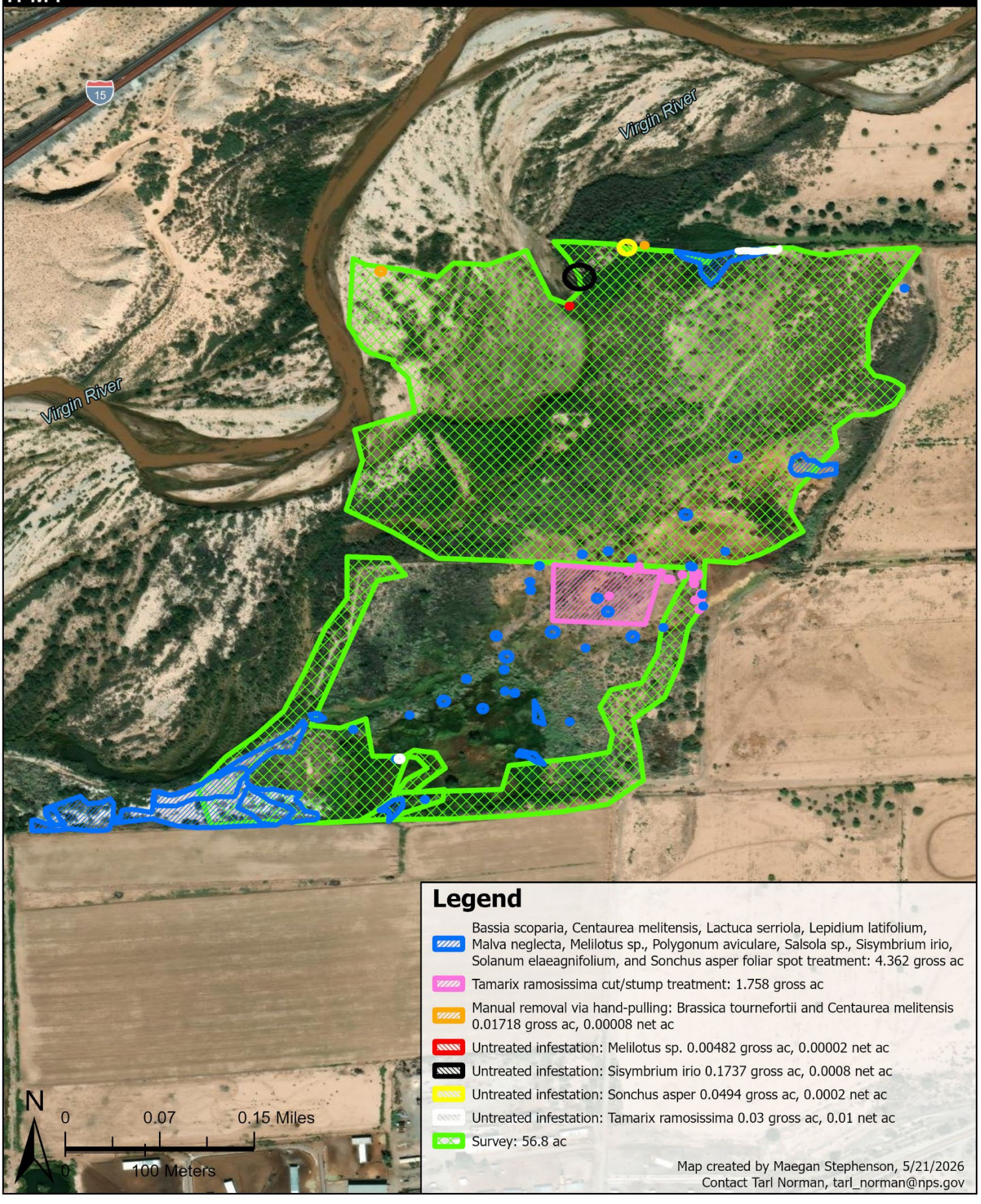
Species	Total Surveyed Acres	Gross Infested Acres	Infested Acres	Treated Acres
Melilotus sp. Sweet clover	56.8	0.00482	0.00002	Not treated
Sisymbrium irio London rocket		0.1737	0.0008	Not treated
Sonchus asper Prickly sow-thistle		0.0494	0.0002	Not treated
Tamarix ramosissima Salt cedar		0.03	0.01	Not treated

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Clark County Riparian Reserve
Bunkerville West
2/26/2026, 4/2, 6, 8-10, and 14/2026, and 3/30/2026

IPMT

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



Legend

- Bassia scoparia, Centaurea melitensis, Lactuca serriola, Lepidium latifolium, Malva neglecta, Melilotus sp., Polygonum aviculare, Salsola sp., Sisymbrium irio, Solanum elaeagnifolium, and Sonchus asper foliar spot treatment: 4.362 gross ac
- Tamarix ramosissima cut/stump treatment: 1.758 gross ac
- Manual removal via hand-pulling: Brassica tournefortii and Centaurea melitensis 0.01718 gross ac, 0.00008 net ac
- Untreated infestation: Melilotus sp. 0.00482 gross ac, 0.00002 net ac
- Untreated infestation: Sisymbrium irio 0.1737 gross ac, 0.0008 net ac
- Untreated infestation: Sonchus asper 0.0494 gross ac, 0.0002 net ac
- Untreated infestation: Tamarix ramosissima 0.03 gross ac, 0.01 net ac
- Survey: 56.8 ac

Map created by Maegan Stephenson, 5/21/2026
Contact Tarl Norman, tarl_norman@nps.gov

IPMT
Invasive Plant
Management Team
Lake Mead

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Virgin River Mastication Site
Date(s): 12/6-7/2025, 3/16/2026, and 3/25/2026
Treatment Method(s): Chemical cut/stump treatment OR basal bark treatment, dependent on phenology of species and/or proximity to water.
Note(s): Cut/stump treatment using Habitat. Basal bark treatment using Garlon 4 Ultra.

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Tamarix ramosissima Salt cedar	8.704	0.816

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix	Gross Infested Acres Treated
Garlon 4 Ultra	79.68 fl oz	20.75%	79.25% JLB Oil Plus Improved	3 gallons	0.493
Habitat	5 fl oz	10 fl oz/gal	n/a	64 fl oz	0.323

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Virgin River Mastication Site
Date(s): 12/6/2025, 3/14-16/2026, and 4/8/2026
Treatment Method(s): Chemical foliar spot treatment using a variety of different herbicide mixes. Please see geodatabase for polygon specifics.

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Lepidium latifolium Tall whitetop	8.704	6.275

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix	Gross Infested Acres Treated
Habitat	3.2 fl oz	1%	0.25% Activator 90	2.5 gallons	0.096
Garlon 3A	3.2 fl oz	1%			
Polaris	2.56 fl oz	1%	0.5% Kinetic	2 gallons	0.146
Roundup Custom	5.12 fl oz	2%			
Rodeo	58.88 fl oz	2%	0.5% Activator 90	23 gallons	2.715
Habitat	29.44 fl oz	1%			
Roundup Custom	66.56 fl oz	2%	0.5% Activator 90	26 gallons	3.316
Habitat	33.28 fl oz	1%			

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Invasive Plant Manual Treatment Report

Partner: **Clark County**
Location: **Virgin River Mastication Site**
Date(s): **12/7/2025**
Treatment Method(s): **Lopping and hand-pulling.**

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Tamarix ramosissima Salt cedar	8.704	0.225	0.006	0.006

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Invasive Plant Survey Report

Partner: **Clark County**
Location: **Virgin River Mastication Site**
Date(s): **12/6/2025 and 3/14/2026**
Survey Method(s): **Inventoried infestations while working in the area.**

Accomplishments

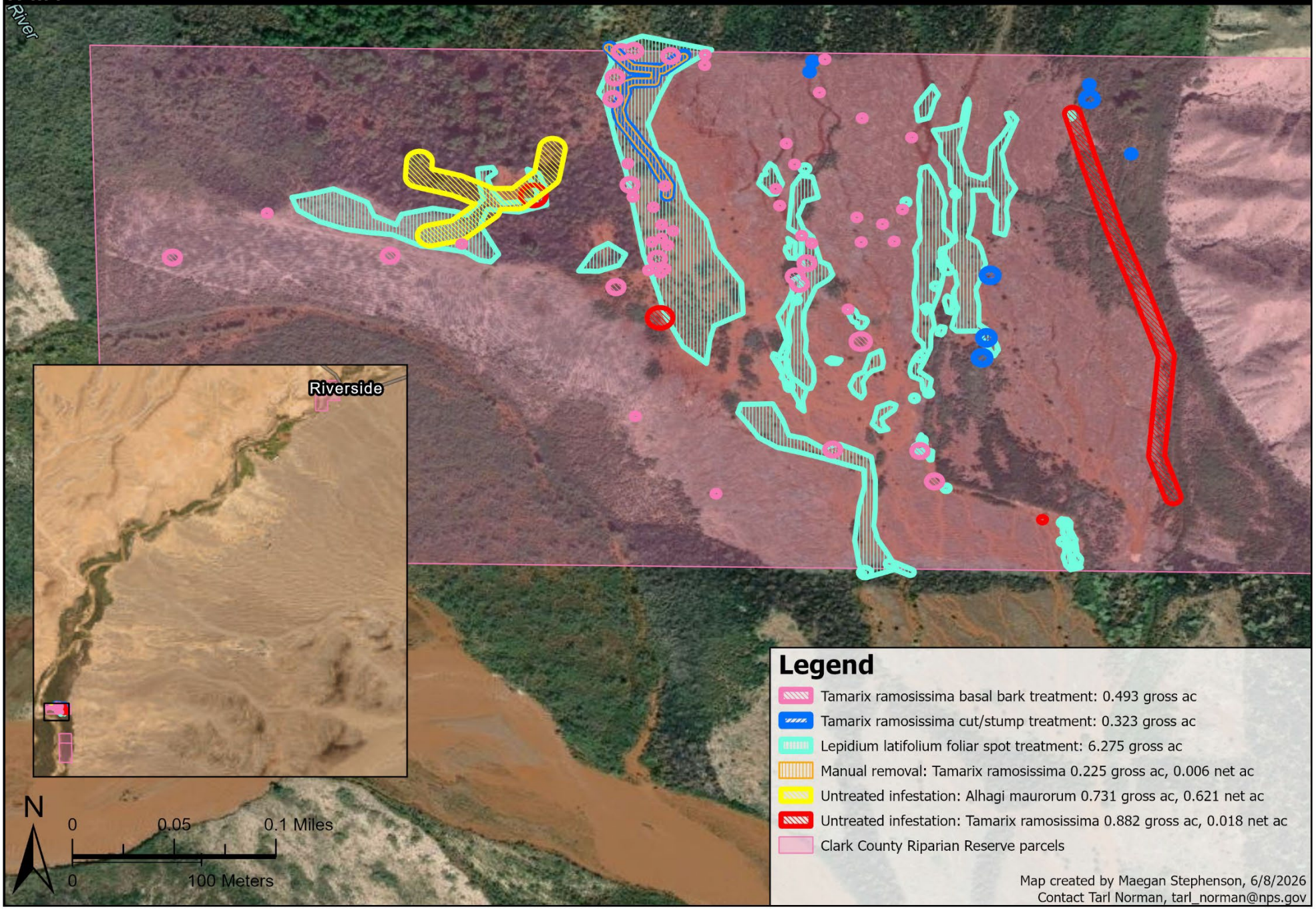
Species	Total Surveyed Acres	Gross Infested Acres	Infested Acres	Treated Acres
Alhagi maurorum Camelthorn	8.704	0.731	0.621	Not treated
Tamarix ramosissima Salt cedar		0.882	0.018	Not treated

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Clark County Riparian Reserve
Virgin River Mastication Site, Winter FY26

IPMT

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



Legend

- Tamarix ramosissima basal bark treatment: 0.493 gross ac
- Tamarix ramosissima cut/stump treatment: 0.323 gross ac
- Lepidium latifolium foliar spot treatment: 6.275 gross ac
- Manual removal: Tamarix ramosissima 0.225 gross ac, 0.006 net ac
- Untreated infestation: Alhagi maurorum 0.731 gross ac, 0.621 net ac
- Untreated infestation: Tamarix ramosissima 0.882 gross ac, 0.018 net ac
- Clark County Riparian Reserve parcels

Map created by Maegan Stephenson, 6/8/2026
Contact Tarl Norman, tarl_norman@nps.gov

IPMT
Invasive Plant
Management Team
Lake Mead

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Muddy River Riparian Reserve
Date(s): 1/14-15/2026
Treatment Method(s): Chemical basal bark treatment.
Note(s): Please see geodatabase for polygon specifics.

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Tamarix ramosissima Salt cedar	35.5	25.4

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Garlon 4 Ultra	6.17 gallons	20.75%	79.25% JLB Oil Plus Improved	29.75 gallons

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Muddy River Riparian Reserve
Date(s): 1/15-19/2026 and 3/26/2026
Treatment Method(s): Chemical cut/stump treatment using a variety of different herbicide mixes.
Note(s): Please see geodatabase for polygon specifics.

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Tamarix ramosissima Salt cedar	35.5	0.704
Washingtonia filifera California fan palm		

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix	Gross Infested Acres Treated (breakdown)
Rodeo	10 fl oz	50%	n/a	20 fl oz	0.064
Habitat	1.56 fl oz	10 fl oz/gal			
Habitat	3.125 fl oz	10 fl oz/gal	n/a	40 fl oz	0.060
Garlon 4 Ultra	36.8 fl oz	20.75%	79.25% JLB Oil Plus Improved	177.8 fl oz	0.579

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Muddy River Riparian Reserve
Date(s): 1/15-17/2026, 1/19/2026, 2/25/2026, and 3/26/2026
Treatment Method(s): Chemical foliar spot treatment using a variety of different herbicide mixes.
Note(s): Please see geodatabase for polygon specifics.

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Brassica tournefortii Sahara mustard	35.5	2.5
Malcolmia africana African mustard		
Sisymbrium irio London rocket		
Washingtonia filifera California fan palm		

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix	Gross Infested Acres Treated (breakdown)
Rodeo	4.4 fl oz	5%	n/a	88 fl oz	0.046
Habitat	0.88 fl oz	1%			
Rodeo	5.12 fl oz	1%	0.75% Alligare 90	4 gallons	0.473
Roundup Pro Concentrate	33.28 fl oz	1%	0.75% Alligare 90 or 1% Alligare 90	26 gallons	1.82
Roundup Pro Concentrate	2.24 fl oz	1%	0.5% Alligare 90	1.75 gallons	0.136
Polaris	2.24 fl oz	1%			
Roundup Custom	6.4 floz	5%	0.5% Activator 90	1 gallon	0.029
Habitat	1.28 fl oz	1%			

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Muddy River Riparian Reserve
Date(s): 1/16-17/2026
Treatment Method(s): Chemical drill/fill treatment.
Note(s): Please see geodatabase for polygon specifics.

Accomplishments

Species Treated	Total Surveyed Acres	Gross Infested Acres Treated
Washingtonia filifera California fan palm	35.5	0.399

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Rodeo	93.6 fl oz	50%	n/a	187.2 fl oz
Habitat	14.6 fl oz	10 fl oz/gal		

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Invasive Plant Survey Report

Partner: Clark County
Location: Muddy River Riparian Reserve
Date(s): 1/17/2026, 1/19/2026, and 3/26/2026
Survey Method(s): Inventoried infestations while working in the area. Some of the remaining work is difficult to access. Please see geodatabase for polygon specifics.

Accomplishments

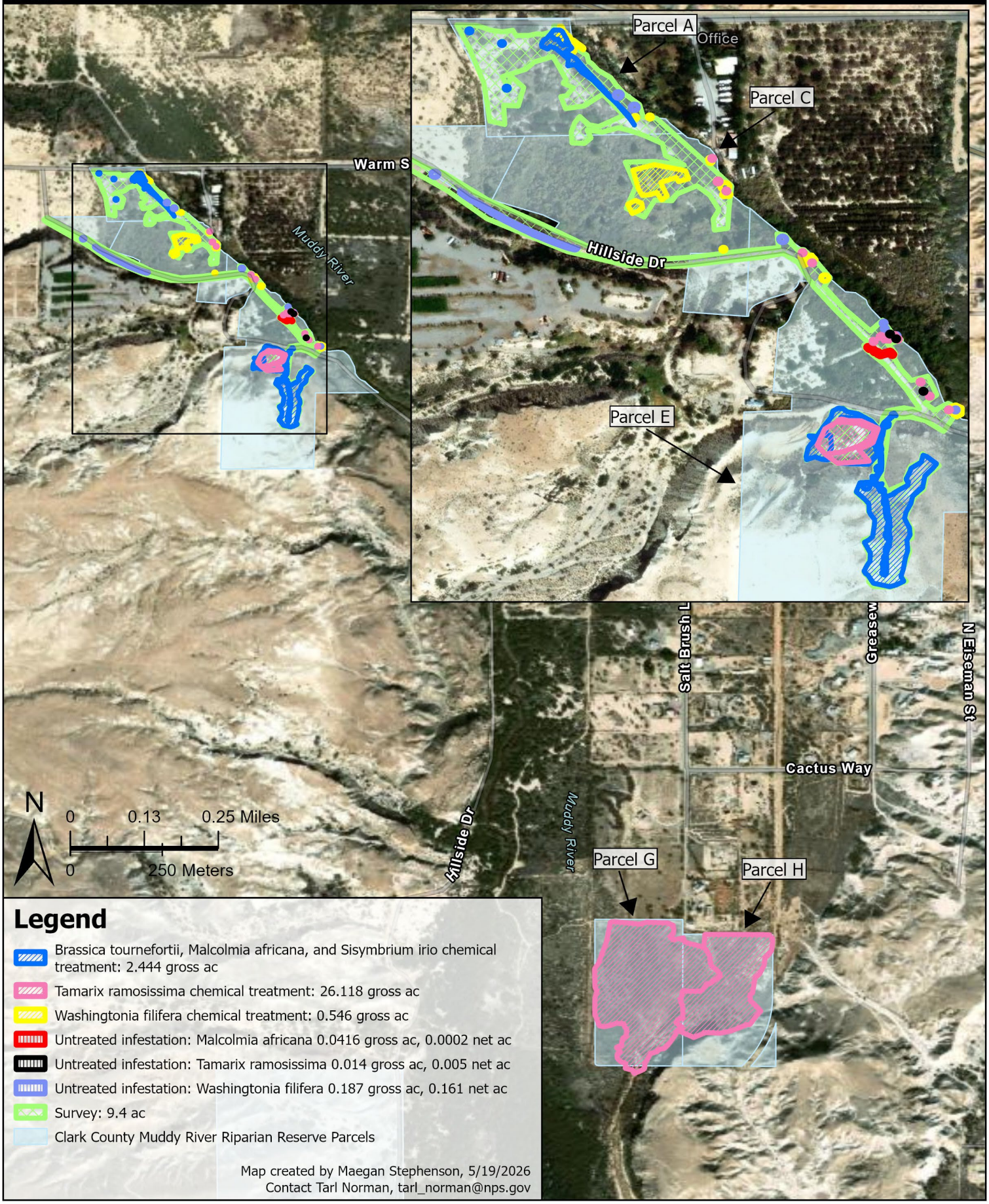
Species	Total Surveyed Acres	Gross Infested Acres	Infested Acres	Treated Acres
Malcolmia africana African mustard	35.5	0.0416	0.0002	Not treated
Tamarix ramosissima Salt cedar		0.014	0.005	
Washingtonia filifera California fan palm		0.187	0.161	

These definitions are based on the 2019 NISIMS Fields and Domains guide. Please refer to https://irma.nps.gov/DataStore/DownloadFile/617128 for more information. These definitions can also be found on the back of this report. Compiled by Maegan Stephenson. For questions, please contact Tarl Norman at tarl_norman@nps.gov or (702) 283-2194.

Clark County, Muddy River Riparian Reserve, Winter FY26

IPMT

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



Legend

- Brassica tournefortii, Malcolmia africana, and Sisymbrium irio chemical treatment: 2.444 gross ac
- Tamarix ramosissima chemical treatment: 26.118 gross ac
- Washingtonia filifera chemical treatment: 0.546 gross ac
- Untreated infestation: Malcolmia africana 0.0416 gross ac, 0.0002 net ac
- Untreated infestation: Tamarix ramosissima 0.014 gross ac, 0.005 net ac
- Untreated infestation: Washingtonia filifera 0.187 gross ac, 0.161 net ac
- Survey: 9.4 ac
- Clark County Muddy River Riparian Reserve Parcels

Map created by Maegan Stephenson, 5/19/2026
Contact Tarl Norman, tarl_norman@nps.gov

Acreage Definitions

Surveyed Area
Any area covered during 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 accounting for estimated percent cover.

Gross Infested Area Treated
Gross infested area treated is the gross acreage of treatment. Gross acreage is defined as the general perimeter of the treatment. Gross infested areas treated contain the target species treated and the spaces between populations or individuals. A gross infested area treated is calculated by adding up the total gross acreage of all mapped treatment areas without accounting for estimated percent cover.

Infested Area
The estimated acreage that the weed species occupies derived from gross infested acres and estimated percent cover.

Treated Area
Treated area is the net acreage of treatment area, calculated as: [ChemicalComponentPy.GrossAcres]*[ChemicalComponentPy.EST_CVR_RT] / 100 (if no calibration rate exists) or Total Mix Volume / Calibration Rate (if calibration rate exists).

All 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.

Evaluation and Discussion of Results:

Virgin River Units

Tamarisk (*Tamarix ramosissima*) is the most common weed species occurring in all 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*).

RIVERSIDE: Camelthorn was detected and treated in the Riverside Unit. This site has not had a substantial infestation of camelthorn and will need to be monitored and treated to prevent any further spread. The NPS IPMT has partnered with the BLM for several years to control camelthorn adjacent to this unit and control efforts have been successful. 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 dominant. No Malta starthistle was detected in the Riverside unit this spring, however, Malta starthistle was detected and treated in relatively new mastication sites on BLM land upstream of the Riverside Bridge. 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 in the past, but no Sahara mustard was detected in the winter of 2025-2026. Past tamarisk treatments were conducted on resprouts at the masticated site in the Riverside Unit. This site has been recovering well with native shrubs including arrowweed and quailbush. However, there are mature tamarisk trees that are still on the site that could be treated. These tamarisk have been considered a lower priority, but treatment of these tamarisk would further enhance the recovery of the site. These tamarisk would be cut-stumped and treated with herbicide. Several large, mature athel tamarisk trees have been treated at the Riverside Unit in the past. The trees are mostly dead, but some live portions may still be present. No new treatments occurred during this time period but monitoring the site will continue to evaluate success and any future treatments. Surveys for camelthorn, athel tamarisk and tamarisk should continue into future years at the Riverside parcel.

BUNKERVILLE EAST: There were a variety of winter and spring annual noxious and invasive plant species that were treated within the Bunkerville East Parcel. Malta starthistle (*Centaurea melitensis*), Sahara mustard (*Brassica tournefortii*), field bindweed (*Convolvulus arvensis*), African mustard (*Malcolmia africana*), common mallow (*Malva neglecta*), Annual rabbitsfoot grass (*Polypogon monspeliensis*), Russian thistle (*Salsola* sp.), London rocket (*Sisymbrium irio*), prickly sowthistle (*Sonchus asper*) and fivehook bassia (*Bassia hyssopifolia*) were all detected on the site. Most populations were treated either by herbicide or hand removal. Some infestations, such as the Sahara mustard were senesced and not treatable. Even though late fall and winter precipitation events produced abundant weed growth throughout the region, this site was infested rather lightly compared to what it could have been.

Several large stands of mature tamarisk have been present on the Bunkerville East site for some time. Clark County masticated these old-growth tamarisk stands with equipment in November 2025. This is a more efficient and cost-effective treatment for this type of tamarisk. A number of native plants such as honey mesquite and wolfberry were left untouched and will contribute to the recovery and restoration of the site. The contractor was not able to masticate some old-growth tamarisk that was closely aligned along some raised berms. A foliar treatment of this remaining tamarisk was completed using a truck-mounted tank sprayer. This was a more efficient treatment of tamarisk rather than cutting using chainsaws. Further monitoring of this treatment will be done to ensure complete control. The active ingredient in the herbicide used was imazapyr, which typically kills the plant slowly over time. No further action or disturbance of these plants should occur for the next year or so to ensure that herbicide has been fully translocated to the roots. The newly masticated sites will be monitored for the anticipated regrowth of tamarisk sprouts starting later in the winter of 2027. The intent is to allow for the new growth to get tall enough to treat using the low-volume basal bark method of herbicide application.

The Bunkerville East site includes some fallow, leveled agriculture fields that are no longer in production (approximately 20 acres). It will be a challenge and somewhat unreasonable to keep these fields weed free since they are not being cultivated. The winter/spring of 2026 saw a variety of noxious and nuisance plant species emerge on the site. Due to the proximity to the river these fields will likely eventually convert to a high terrace, off-river site consisting of quailbush and honey mesquite and other shrubs and grasses over the next decade or more. In the meantime, they will be consistently occupied by various annual nuisance weeds depending on amount and timing of precipitation. These fields were included in the parcel purchase due to not being divided from the riparian parcels closer to the river. One alternative could be to consider putting these fields back to into production to grow desirable native plants for seed increasing that could be harvested and used for restoration purposes elsewhere in the region. A native plant propagation proposal has been developed by the Southern Nevada Restoration

Team (SNRT) and submitted for competition to the Southern Nevada Public Lands Management Act (SNPLMA) funding in fall of 2025 as a conservation initiative project. The project has been selected and awarded funding. This County parcel is included as a potential site to grow out native plants for seed increase and production.

BUNKERVILLE WEST: There were a variety of winter and spring annual noxious and invasive plant species that were treated within the Bunkerville West Parcel. Malta starthistle (*Centaurea melitensis*), Sahara mustard (*Brassica tournefortii*), tall whitetop (*Lepidium latifolium*), common mallow (*Malva neglecta*), common knotgrass (*Polygonum aviculare*), Russian thistle (*Salsola* sp.), London rocket (*Sisymbrium irio*), prickly sowthistle (*Sonchus asper*), prickly lettuce (*Lactuca serriola*), silverleaf nightshade (*Solanum elaeagnifolium*), sweetclover (*Melilotus* sp.) and kochia (*Bassia scoparia*) were all detected on the site. Most populations were treated either by herbicide or hand removal. Even though late fall and winter precipitation events produced abundant weed growth throughout the region, this site was infested rather lightly compared to what it could have been.

There were some areas within the Bunkerville West unit that had some tamarisk control in drier areas and a few wetter areas. All of the work was completed in the northeast corner of Parcel J. The tamarisk was controlled using the cut-stump method. This is an area that has reasonably good native plant cover and the removal of the tamarisk will likely lead to promoting more native plant growth, especially with the combination of relatively shallow groundwater with some surface water. Tamarisk control will likely continue in this area and adjacent areas as well.

Bunkerville West along the river floodplain riparian areas is in “good shape” and dominated by native plant species including coyote willow, seep willow (*Baccharis* sp.), native arrowweed, screwbean mesquite and various rushes and sedges with some minimal tamarisk mixed in. Scattered Goodding’s willow and cottonwood trees can also be found along the 5–10-year floodplain. These areas along the river are difficult to access on foot and require some river crossings which can be challenging depending on the river levels. However, opportunities in the future may exist to periodically survey these areas for potential early detection of weeds, but it is less likely since the native species are well intact. It appears that the tamarisk leaf beetle biological control has reduced the overall establishment and competitive advantage that the tamarisk used to have before the beetle became established throughout the river corridor. The most important areas to invest in future tamarisk control have been the remaining dense, old-growth stands of tamarisk that have not been wiped out from previous flooding or wildfires over the last 30 years. Tamarisk mastication followed by herbicide treatments, combined with secondary weed control along with passive and active restoration with desirable native plant species will continue the trend of native plant dominance along the river. Clark County

masticated these old-growth tamarisk stands with equipment in November 2025. This is a more efficient and cost-effective treatment for this type of tamarisk. A number of native plants such as honey mesquite (among others) were left untouched and will contribute to the recovery and restoration of the site. The mastication did not treat all of the tamarisk plants. There were some smaller groups and scattered individual plants that were left. Some were adjacent to native plants and likely avoided because of their proximity. These remaining tamarisk plants will be treated using the cut-stump method within the next year or two. The newly masticated sites will be monitored for the anticipated regrowth of tamarisk sprouts starting later in the winter of 2027. The intent is to allow for the new growth to get tall enough to treat using the low-volume basal bark method of herbicide application.

MORMON MESA SITES: The tall whitetop treatments in the Mormon Mesa units have been effective and will take continued monitoring and treatment vigilance. Most of the populations of tall whitetop are typically located in the linear wet areas that frequently have surface water and/or consistently moist soils. Tall whitetop is not widespread on the Virgin River, however, there are obscure populations in the understory of some of the mature tamarisk trees in this vicinity. The 38-acre tamarisk mastication site on the Mormon Mesa units did stimulate a resurgence of tall whitetop along some wetter drainages and stream channels within the mastication areas. These tall whitetop infestations were treated in the late fall of 2021, spring of 2022 and fall of 2023 and spring of 2025 and should be monitored and re-treated as necessary. Treatments for tall whitetop were completed in the early winter of 2025 and late winter/early spring of 2026.

Camelthorn is only found in the lower portions of the river and was detected in a portion of the Mormon Mesa unit. The population was not treated since it was discovered too late for an effective herbicide treatment. This was due in part to the federal government shutdown for all of October and part of November of 2025. However, camelthorn was observed in lower amounts and should be monitored and treated in the future as necessary.

The effort for controlling tamarisk has diminished some because of the effectiveness of past treatments. The crew has noted fewer plants on these sites which is indicative of effective treatments by reducing on-site seed sources. Some of the linear wet areas continue to have young tamarisk emerge because of the presence of surface water and/or moist soils that promote ideal conditions for tamarisk seedling establishment. Nearby mature, old-growth tamarisk that is either on County land or on adjacent BLM or Nevada state land will continue to produce seeds that will contribute to this issue. One concern regarding native plant recovery of these Mormon Mesa mastication sites continues to be the amount of trespass cattle utilizing the areas, which are foraging on plants (including some tall whitetop) and causing soil disturbance and trampling in many of the wet soil areas and stream channels. Past

revegetation efforts have helped to recover these sites, but more revegetation efforts may be needed. The County has employed a variety of methods to discourage unwanted, on-site herbivory. This will likely continue to be a problem into the future.

Camelthorn and tall whitetop should continue to be controlled on the Virgin River Units to keep this plant from becoming further established. This will prevent weeds from moving across boundaries since adjacent properties have the same weed control objectives. The Bureau of Land Management (BLM) manages most of the adjacent lands along the 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.

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 ideal timing of the tamarisk resprouts treatment after the initial treatments during year two or three is in the late fall or early winter prior to leaf drop so you can determine what is dead from alive. 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 have 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, quailbush, 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 mesquite trees, quailbush and alkali sacaton 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 bark application 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.

MUDDY RIVER UNITS: 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 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. 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 (*Rhaponticum* [formerly *Acroptilon*] *repens)*, Malta starthistle (*Centaurea melitensis*), puncturevine (*Tribulus terrestris*) and Johnsongrass (*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*). Russian knapweed within the Muddy River County properties has been virtually eradicated and controlled to maintenance levels on adjacent BLM lands which are also being treated through an agreement with our team. Although Russian knapweed continues to persist on adjacent BLM lands, efforts will continue into the future to minimize and control this population. A number of annual and perennial species listed above will likely continue to reinvade previously treated areas and efforts should continue to control them.

Most of the work for this timeframe primarily focused on these areas:

- Parcel A and B for California fan palm and tamarisk control along with some winter annual mustards (Sahara mustard and London rocket) that emerged;
- Parcel E for tamarisk control within the dry “pond” area;
- Parcel E for African mustard and a little bit of California fan palm control along the river;
- Parcel G and H for treatment of tamarisk resprouts from 2022 mastication efforts.

Parcels A and B: In 2022 Muddy River Units A and B were planned to be bulldozed and reconstructed into a lower elevation which would allow the river to flood into the site creating enhanced wetlands and riparian areas however this has been cancelled or postponed due to administrative contracting issues with the County. It will continue to be important to conduct weed control in these two units since our efforts were lessoned in 2021-2022 due to impending construction. California fan palm and tamarisk were controlled in Units A and B in April of 2025 and in January, February and March of 2026. Palms were located on the riverbank directly across from private land that also has palms. Future efforts should include controlling any young palms that emerge in this area. Even with the control of palms in this area that will reduce the presence of palms on County land, the private landowner across the river has no

interest in controlling palms on their land because it enhances recreational use of that private land. With this in mind, there will be continuous propagule pressure from this uncontrolled population from across the river. Periodic monitoring and control of small palms will be necessary for the foreseeable future to prevent invading palms from reestablishing. Parcel B had a number of various age-classes of palm trees that were controlled. There was more palm work completed in Parcel B than Parcel A. There were a variety of methods used to control these palms: foliar herbicide application of smaller-sized palms; cut-stump for smaller- to medium-sized palms and drill-and-fill for larger palms. A variety of winter annuals emerged in Muddy River Parcels A, B and E in the late fall of 2025 and early winter of 2026. These species consisted of mustards such as Sahara mustard (*Brassica tournefortii*), African mustard (*Malcolmia africana*) and London rocket (*Sisymbrium irio*). There was flush of Sahara mustard and London rocket, mostly within Parcel A, that was treated. These infestations mostly occurred in areas that were relatively open with little to no vegetative cover. Scattered individual tamarisk plants were controlled in Parcel B that were mostly next to the river.

The Muddy River Riparian Units A and B continues a dramatic recovery of desirable native plants from natural recovery and our transplanting and seeding of native species back in April of 2016. 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 likely providing desirable habitat for birds and other wildlife species. The purpose of the revegetation was to provide a desirable plant community to reduce and eventually out-compete the number of weeds on site. Continued pressure on old-growth

Parcel C: No control work was done in Parcel C. Only roadside surveys were completed.

Parcel D: No control work was done in Parcel D. Only roadside surveys were completed.

Parcel E: Tamarisk was treated using the cut-stump method in the dry "pond" area of Parcel E. The area should recover well as there was native *Atriplex* species also growing there. An infestation of African mustard that was scattered on the two-track road going up the hill and the surrounding higher ground was treated using herbicide. African mustard has been noted in other Muddy River parcels and can be an issue in years that experience increased winter precipitation. A number of mature California palm trees were controlled using the drill-and-fill method. This is where the trunk of the palm tree is prepared for drilling using a gas-powered drill with a 24-inch bit. Six to nine holes are distributed evenly around the trunk, and the herbicide is placed in the holes. This control method will kill the palm tree slowly over time, usually several weeks, and drooping fronds will eventually indicate the effectiveness of the

treatment. Any wildlife that is using the palms will have sufficient time to relocate and utilize other suitable habitat in the area. Scattered individual tamarisk plants that were adjacent to the river were also treated in Parcel E.

Parcel F: No work was completed in Parcel F. The road that accesses this parcel has been washed out from past flooding events and access has been limited. However, the road has since been repaired by the BLM, and the expectation is to evaluate this parcel for future invasive plant work. This site has been not been as impacted by invasive plants as other neighboring Muddy River parcels likely because of fewer disturbances.

Parcels G and H: These sites were previously masticated for mature stands of tamarisk in 2022. The sites were treated for tamarisk resprouts that were anywhere from 6-10 feet tall in January 2026. Tamarisk resprouts were treated using the low-volume basal bark treatment method with the herbicide active ingredient, triclopyr (Garlon 4 Ultra), and vegetable oil carrier, Improved JLB Oil Plus. Both parcels were completed in two days so there wasn't a large amount of tamarisk to treat.

The native shrub community in Parcels G, H and I are dominated by *Suaeda torreyana* (sea-blite) and *Atriplex lentiformis* (quailbush) and include both screwbean and honey mesquites. Native perennial bunchgrass such as alkali sacaton grass (*Sporobolus airoides*) is also present in scattered patches as well. These species have recovered positively and are well-established in the masticated sites. Evidence of the mastication is being covered up as native plants are successfully establishing and emerging through scattered masticated debris piles. Follow-up monitoring of the site and subsequent retreatments for tamarisk should continue in subsequent years.

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 to restore the hydrologic processes. alkali sacaton 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 sacaton is highly drought tolerant yet often found near marshes and where ground water is not deeper than three feet from the surface. Alkali sacaton is present in Reserve Unit H and G in a few isolated pockets, yet remnants of a much larger distribution are 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.

Parcel I: No control work or survey work was completed in Parcel I.

Supporting Project Report Photos:



Photo Caption: Photos above and below depict Bunkerville East mastication sites of salt cedar (*Tamarix ramosissima*) along the Virgin River. Photo credit: Tarl Norman/NPS/January 2026.





Photo Caption: Tyler Jack treating tamarisk in Bunkerville East mastication site. Photo Credit: Ouen Moore/NPS/April 2026.



Photo Caption: Above photo – Tyler Jack and Alex Demers completing foliar treatments of tamarisk in Bunkerville East. Photo credit: NPS/April 2026. Below photo – Tyler Jack and Alex Demers completing foliar treatments of tamarisk in Bunkerville East. Photo Credit: Quen Moore/NPS/April 2026







Photo Caption:

Top Photo: African mustard (*Malcolmia africana*) treated along an old two-track road near High Spring (seasonally dry pond) within Muddy River Parcel E. Photo Credit: Ouen Moore/NPS/ February 2026.

Bottom Photo: African mustard (*Malcolmia africana*) flowers and seed pod formation within Muddy River Parcel E. Photo Credit: Ouen Moore/NPS/February 2026.





Photo Captions:

Top Photo: California fan palm (*Washingtonia filifera)* treated with herbicide in Muddy River Riparian Reserve Parcel A. Photo Credit: Ouen Moore/NPS/January 2026.

Bottom Photo: Tyler Jack and Kole Wesen treating California fan palm (*Washingtonia filifera)* with the drill-and-fill method on Muddy River Reserve Parcel B. Photo Credit: Ouen Moore/NPS/January 2026.



Photo Captions (Above): Kole Wesen treating Sahara mustard in Muddy River Parcel A. Photo Credit: Ouen Moore/NPS/April 2026. Below Photo: Overall view of Parcel E. Photo Credit: Ouen Moore/NPS





Photo Caption (above and below): Crew member Alex Demers treating rabbitsfoot grass at Bunkerville East parcel. Photo Credit: Ouen Moore/NPS/May 2026.





Photo Caption (above): Tamarisk treated with the low-volume basal bark treatment method in Muddy River Parcel H. Photo Credit: Ouen Moore/NPS/January 2026. Photo Caption (below): Native *Suaeda* in Muddy River Parcel G. Photo Credit: Ouen Moore/NPS/January 2026





Photo Caption: Above - Bunkerville East winter annuals London rocket (*Sisymbrium irio*) and storksbill (*Erodium cicutarium*). Below – James Roberts manually removing Malta starthistle (*Centaurea melitensis*) around native mesquite along with herbicide-treated plants. Photo Credit: Ouen Moore/NPS/February 2026.





Photo Caption: Above and below – California fan palm control, before and after. Muddy River Parcel A. Photo Credit: Ouen Moore/NPS/January 2026.





Above and below – Before and after tamarisk treatments in pond in Muddy River Reserve Parcel E. Photo Credit: Ouen Moore/NPS/January 2026







Photo Captions:

Top Photo: Ouen Moore cutting tamarisk in the pond in Muddy River Reserve Parcel E. Photo Credit: Wesley Scott/NPS/January 2026.
Bottom Photo: Wesley Scott treating tamarisk in the pond in Muddy River Reserve Parcel E. Photo Credit: Ouen Moore/NPS/January 2026

Acknowledgements:

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