NATIONAL PARK SERVICE

Riparian Reserves Vegetation Management 2024 Annual Report

Clark County DCP Project Number 2019-NPS-1910C

Cover Photo Caption: Tobias Verville, NPS IPMT Staff, treating Russian thistle at the Clark County Muddy River Riparian Reserve Unit A. (NPS)

Annual Project Report

Project Title: Riparian Reserves Vegetation Management 2024

Project Number: 2019-NPS-1910C

Deliverable: D18

Executive Summary:

Clark County, NV and the National Park Service Lake Mead Invasive Plant Management Team (LAKE IPMT) entered into approximately 2-year partnership agreement beginning in mid-July 2023 until mid-July 2024 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, bi-annual, 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 #2019-NPS-1910C, 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. 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 of 2023 through the spring 2024. 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.

Results:

For last year's project results please refer to the following tables, data summaries and maps. These results represent work conducted primarily from fall 2023 to spring 2024. For previous results from fall 2022 through spring 2023 refer to Deliverable 11 (Annual Report).

IPMT
Invasive Plant
Management Team
Lake Mead

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Muddy River Reserve
Date(s): 10/16-17/2023
Treatment Method(s): Chemical foliar spot treatment using 0.2 fl oz/gal Milestone via backpack sprayer.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Acroptilon repens Russian knapweed	7.7	0.039	0.033	0.033

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Milestone	0.3 fl oz	0.2 fl oz/gal	0.25% Activator 90	1.5 gallons

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) 281-8120.

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Muddy River Reserve
Date(s): 10/16-17/2023
Treatment Method(s): Chemical foliar spot treatment using 1% Roundup Pro Concentrate and 1 fl oz/gal Weedar 64 via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Atriplex semibaccata Australian saltbush	7.7	0.01	0.00005	0.00005
Bassia hyssopifolia Five-hook bassia	7.7	1.75	0.05	0.05
Centaurea melitensis Malta starthistle	7.7	0.01	0.00007	0.00007
Malcolmia africana African mustard	7.7	0.01	0.00005	0.00005
Salsola spp. Russian thistle	7.7	2.46	0.86	0.86

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Roundup Pro Concentrate	34.56 fl oz	1%	0.25% Activator 90 or 0.25% RRSI	27 gallons
Weedar 64	27 fl oz	1 fl oz/gal		

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Muddy River Reserve
Date(s): 10/10/2023
Treatment Method(s): Chemical foliar spot treatment using 1 fl oz/gal Weedmaster and 1% Roundup Pro Concentrate via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Salsola spp. Russian thistle	7.7	1.48	0.22	0.22
Tribulus terrestris Puncturevine	7.7	1.48	0.01	0.01

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Weedmaster	20.5 fl oz	1 fl oz/gal	0.25% RRSI	20.5 gallons
Roundup Pro Concentrate	26.24 fl oz	1%		

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Invasive Plant Survey Report

Partner: **Clark County**
Location: **Muddy River Reserve**
Date(s): **10/16-17/2023**
Survey Method(s): **Weed survey on foot and from a vehicle along roads.**

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres	Infested Acres	Treated Acres
Bassia hyssopifolia Five-hook bassia	7.7	0.427	0.002	Not treated
Malcolmia africana African mustard	7.7	0.0097	0.0001	Not treated
Salsola spp. Russian thistle	7.7	0.43	0.002	Not treated
Tamarix ramosissima Saltcedar	7.7	0.0048	0.00002	Not treated

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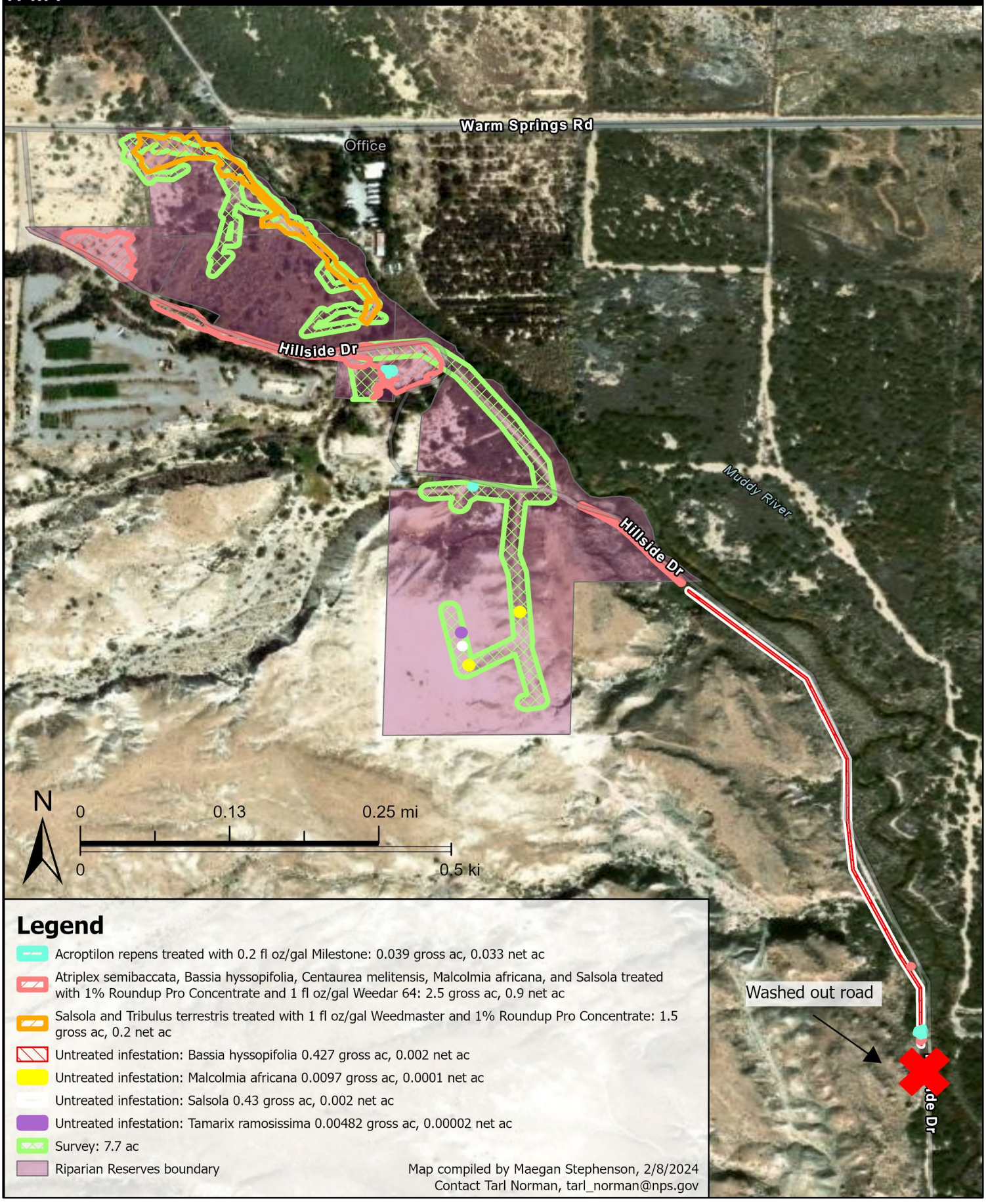
Clark County: Muddy River Reserve
10/10/2023 and 10/16-17/2023

IPMT

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



Legend

- Acroptilon repens treated with 0.2 fl oz/gal Milestone: 0.039 gross ac, 0.033 net ac
- Atriplex semibaccata, Bassia hyssopifolia, Centaurea melitensis, Malcolmia africana, and Salsola treated with 1% Roundup Pro Concentrate and 1 fl oz/gal Weedar 64: 2.5 gross ac, 0.9 net ac
- Salsola and Tribulus terrestris treated with 1 fl oz/gal Weedmaster and 1% Roundup Pro Concentrate: 1.5 gross ac, 0.2 net ac
- Untreated infestation: Bassia hyssopifolia 0.427 gross ac, 0.002 net ac
- Untreated infestation: Malcolmia africana 0.0097 gross ac, 0.0001 net ac
- Untreated infestation: Salsola 0.43 gross ac, 0.002 net ac
- Untreated infestation: Tamarix ramosissima 0.00482 gross ac, 0.00002 net ac
- Survey: 7.7 ac
- Riparian Reserves boundary

Map compiled by Maegan Stephenson, 2/8/2024
Contact Tarl Norman, tarl_norman@nps.gov

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Bunkerville West
Date(s): 10/19/2023
Treatment Method(s): Chemical foliar spot treatment using 1% Roundup Pro Concentrate and 1 fl oz/gal Weedar 64 via backpack sprayer.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Atriplex semibaccata Australian saltbush	0.216	0.216	0.03	0.03
Atriplex suberecta Sprawling saltbush	0.216	0.216	0.1	0.1
Bassia hyssopifolia Five-hook bassia	0.216	0.216	0.006	0.006
Salsola spp. Russian thistle	0.216	0.216	0.03	0.03

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Roundup Pro Concentrate	5.12 fl oz	1%	0.25% Activator 90	4 gallons
Weedar 64	4 fl oz	1 fl oz/gal		

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Invasive Plant Chemical Treatment Report

Partner: **Clark County**
Location: **Bunkerville West**
Date(s): **10/24-25/2023**
Treatment Method(s): **Chemical foliar spot treatment using 1 fl oz/gal Weedmaster and 1% Roundup Pro Concentrate via backpack sprayers.**

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Atriplex semibaccata Australian saltbush	0.76	0.76	0.114	0.114
Bassia hyssopifolia Five-hook bassia	0.76	0.76	0.07	0.07
Salsola spp. Russian thistle	0.76	0.76	0.06	0.06

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Weedmaster	12 fl oz	1 fl oz/gal	0.25% RRSI	12 gallons
Roundup Pro Concentrate	15.36 fl oz	1%		

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Invasive Plant Manual Treatment Report

Partner: **Clark County**
Location: **Bunkerville West**
Date(s): **10/19/2023**
Treatment Method(s): **Manual treatment via hand-pulling.**

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Tribulus terrestris Puncturevine	0.005	0.005	0.00002	0.00002

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Invasive Plant Survey Report

Partner: **Clark County**
Location: **Bunkerville West**
Date(s): **10/19/2023**
Survey Method(s): **Surveyed area for infestations on foot.**

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres	Infested Acres	Treated Acres
Bassia hyssopifolia Five-hook bassia	4.2	4.2	1.6	Not treated
Lepidium latifolium Perennial pepperweed	0.007	0.007	0.0002	Not treated
Salsola spp. Russian thistle	4.2	4.2	0.02	Not treated
Solanum elaeagnifolium Silverleaf nightshade	0.005	0.005	0.00002	Not treated
Tamarix ramosissima Salt cedar	0.03	0.03	0.001	Not treated

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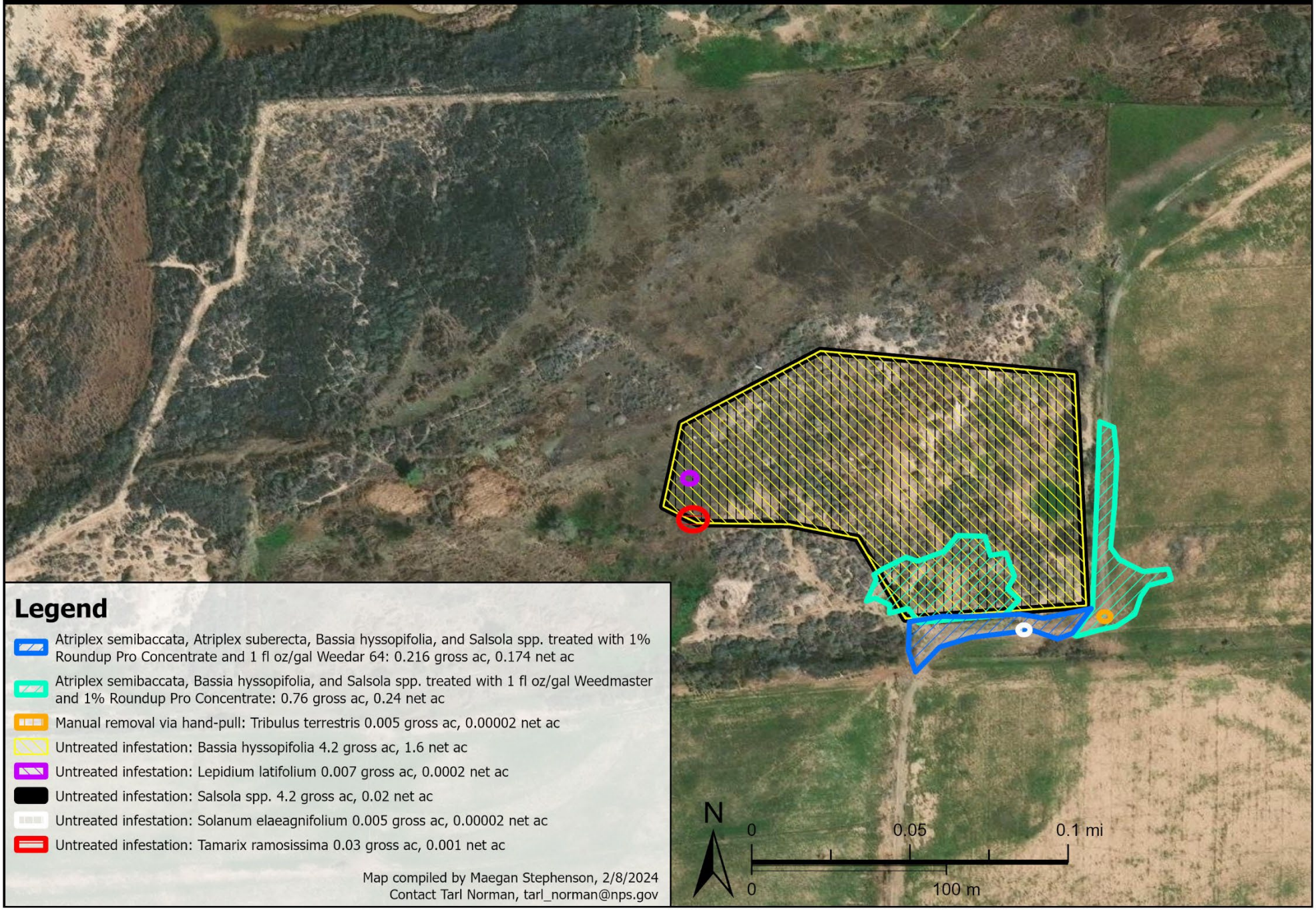
Clark County: Bunkerville West
10/19/2023 and 10/24-25/2023

IPMT

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



Legend

- Atriplex semibaccata, Atriplex suberecta, Bassia hyssopifolia, and Salsola spp. treated with 1% Roundup Pro Concentrate and 1 fl oz/gal Weedar 64: 0.216 gross ac, 0.174 net ac
- Atriplex semibaccata, Bassia hyssopifolia, and Salsola spp. treated with 1 fl oz/gal Weedmaster and 1% Roundup Pro Concentrate: 0.76 gross ac, 0.24 net ac
- Manual removal via hand-pull: Tribulus terrestris 0.005 gross ac, 0.00002 net ac
- Untreated infestation: Bassia hyssopifolia 4.2 gross ac, 1.6 net ac
- Untreated infestation: Lepidium latifolium 0.007 gross ac, 0.0002 net ac
- Untreated infestation: Salsola spp. 4.2 gross ac, 0.02 net ac
- Untreated infestation: Solanum elaeagnifolium 0.005 gross ac, 0.00002 net ac
- Untreated infestation: Tamarix ramosissima 0.03 gross ac, 0.001 net ac

Map compiled by Maegan Stephenson, 2/8/2024
Contact Tarl Norman, tarl_norman@nps.gov

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Bunkerville East
Date(s): 10/18/2023
Treatment Method(s): Chemical foliar spot treatment using 1% Roundup Pro Concentrate and 1 fl oz/gal Weedar 64 via backpack sprayer.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Atriplex semibaccata Australian saltbush	1.52	0.005	0.00002	0.00002
Brassica tournefortii Sahara mustard	1.52	0.932	0.005	0.005
Centaurea melitensis Malta starthistle	1.52	1.39	0.07	0.07
Malcolmia africana Africana mustard	1.52	0.942	0.005	0.005
Salsola spp. Russian thistle	1.52	1.496	0.007	0.007

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Roundup Pro Concentrate	7.68 fl oz	1%	0.25% Activator 90	6 gallons
Weedar 64	6 fl oz	1 fl oz/gal		

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Bunkerville East
Date(s): 10/31/2023
Treatment Method(s): Chemical foliar spot treatment using 1% Roundup Pro Concentrate and 1 fl oz/gal Weedmaster via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Brassica tournefortii Sahara mustard	1.28	1.28	0.01	0.01
Centaurea melitensis Malta starthistle	1.28	1.28	0.01	0.01
Salsola spp. Russian thistle	1.28	1.28	0.48	0.48

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Roundup Pro Concentrate	10.24 fl oz	1%	0.25% RRSI	8 gallons
Weedmaster	8 fl oz	1 fl oz/gal		

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Invasive Plant Survey Report

Partner: Clark County
Location: Bunkerville East
Date(s): 10/17-18/2023
Survey Method(s): Surveyed for infestations on foot.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres	Infested Acres	Treated Acres
Atriplex semibaccata Australian saltbush	13.4	5.1	0.2	Not treated
Atriplex suberecta Sprawling saltbush	13.4	5.1	0.2	Not treated
Brassica tournefortii Sahara mustard	10.4	2.1	0.01	Not treated
Centaurea melitensis Malta starthistle	8.454	0.154	0.004	Not treated
Salsola spp. Russian thistle	10.4	2.1	1.3	Not treated
Tamarix ramosissima Salt cedar	12.1	3.8	2.4	Not treated
Tribulus terrestris Punctureveine	8.314	0.014	0.0001	Not treated

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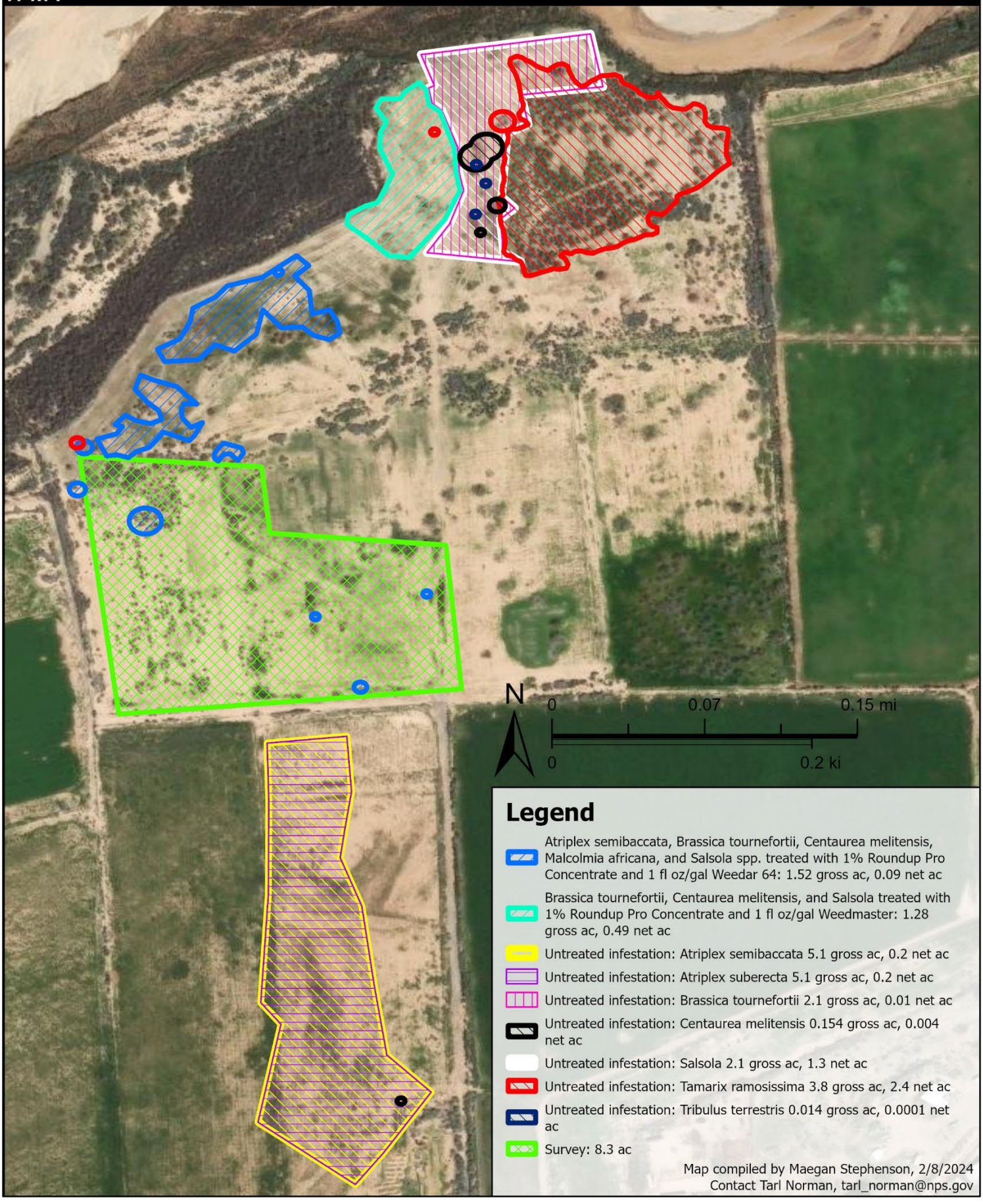
Clark County: Bunkerville East
10/17-18/2023 and 10/31/2023

IPMT

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



Legend

- Atriplex semibaccata, Brassica tournefortii, Centaurea melitensis, Malcolmia africana, and Salsola spp. treated with 1% Roundup Pro Concentrate and 1 fl oz/gal Weedar 64: 1.52 gross ac, 0.09 net ac
- Brassica tournefortii, Centaurea melitensis, and Salsola treated with 1% Roundup Pro Concentrate and 1 fl oz/gal Weedmaster: 1.28 gross ac, 0.49 net ac
- Untreated infestation: Atriplex semibaccata 5.1 gross ac, 0.2 net ac
- Untreated infestation: Atriplex suberecta 5.1 gross ac, 0.2 net ac
- Untreated infestation: Brassica tournefortii 2.1 gross ac, 0.01 net ac
- Untreated infestation: Centaurea melitensis 0.154 gross ac, 0.004 net ac
- Untreated infestation: Salsola 2.1 gross ac, 1.3 net ac
- Untreated infestation: Tamarix ramosissima 3.8 gross ac, 2.4 net ac
- Untreated infestation: Tribulus terrestris 0.014 gross ac, 0.0001 net ac
- Survey: 8.3 ac

Map compiled by Maegan Stephenson, 2/8/2024
Contact Tarl Norman, tarl_norman@nps.gov

IPMT
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Lake Mead

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Virgin River Mastication Site
Date(s): 11/28/2023
Treatment Method(s): Chemical foliar spot treatment using 1% Polaris and 1% Garlon 3A via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Lepidium latifolium Tall whitetop	1.54	0.16	0.01	0.01

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Polaris	0.68 fl oz	1%	0.25% Kinetic	0.5 gallons
Garlon 3A	0.68 fl oz	1%		

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Virgin River Mastication Site
Date(s): 11/28/2023
Treatment Method(s): Chemical foliar spot treatment using 2% Roundup Custom via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Lepidium latifolium Tall whitetop	1.449	0.069	0.0003	0.0003

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Roundup Custom	0.64 fl oz	2%	0.25% Kinetic	0.25 gallons

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Virgin River Mastication Site
Date(s): 12/10-11/2023
Treatment Method(s): Chemical foliar spot treatment using 1% Garlon 3A via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Tamarix ramosissima Salt cedar	9.18	7.8	0.039	0.039

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Garlon 3A	12.8 fl oz	1%	0.25% Kinetic	10 gallons

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Virgin River Mastication Site
Date(s): 12/8-10/2023
Treatment Method(s): Chemical basal bark treatment using 20.75% Garlon 4 Ultra via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Tamarix ramosissima Salt cedar	43.38	42.0	0.45	0.45

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Garlon 4 Ultra	18.156 gallons	20.75%	79.25% JLB Oil Plus Improved	87.5 gallons

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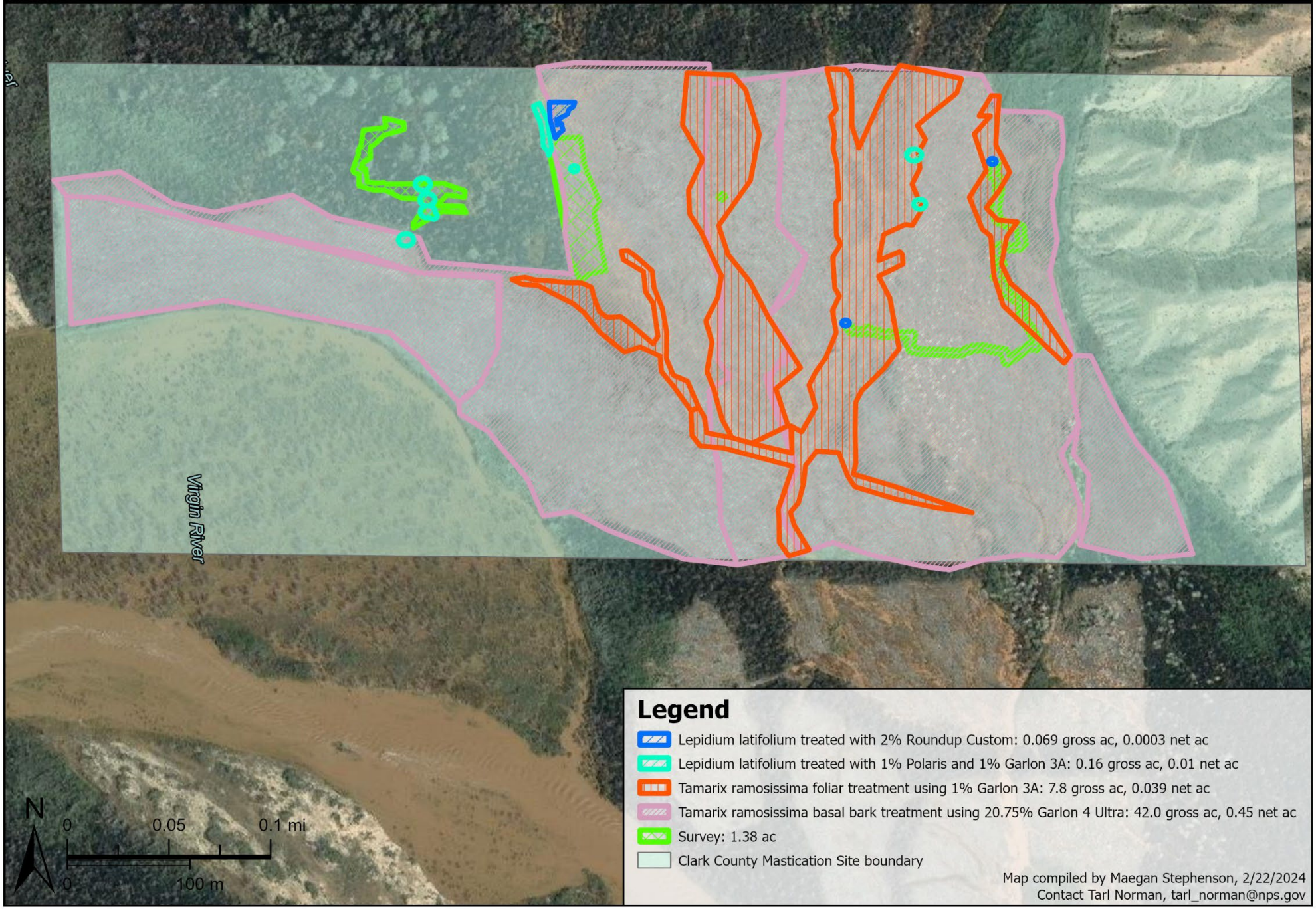
Clark County: Mastication Site
Nov and Dec 2023

IPMT

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



Legend

- Lepidium latifolium treated with 2% Roundup Custom: 0.069 gross ac, 0.0003 net ac
- Lepidium latifolium treated with 1% Polaris and 1% Garlon 3A: 0.16 gross ac, 0.01 net ac
- Tamarix ramosissima foliar treatment using 1% Garlon 3A: 7.8 gross ac, 0.039 net ac
- Tamarix ramosissima basal bark treatment using 20.75% Garlon 4 Ultra: 42.0 gross ac, 0.45 net ac
- Survey: 1.38 ac
- Clark County Mastication Site boundary

Map compiled by Maegan Stephenson, 2/22/2024
Contact Tarl Norman, tarl_norman@nps.gov

IPMT
Invasive Plant
Management Team
Lake Mead

Invasive Plant Survey Report

Partner: Clark County
Location: Riverside
Date(s): 12/11/2023
Survey Method(s): Surveyed area on foot.

Accomplishments

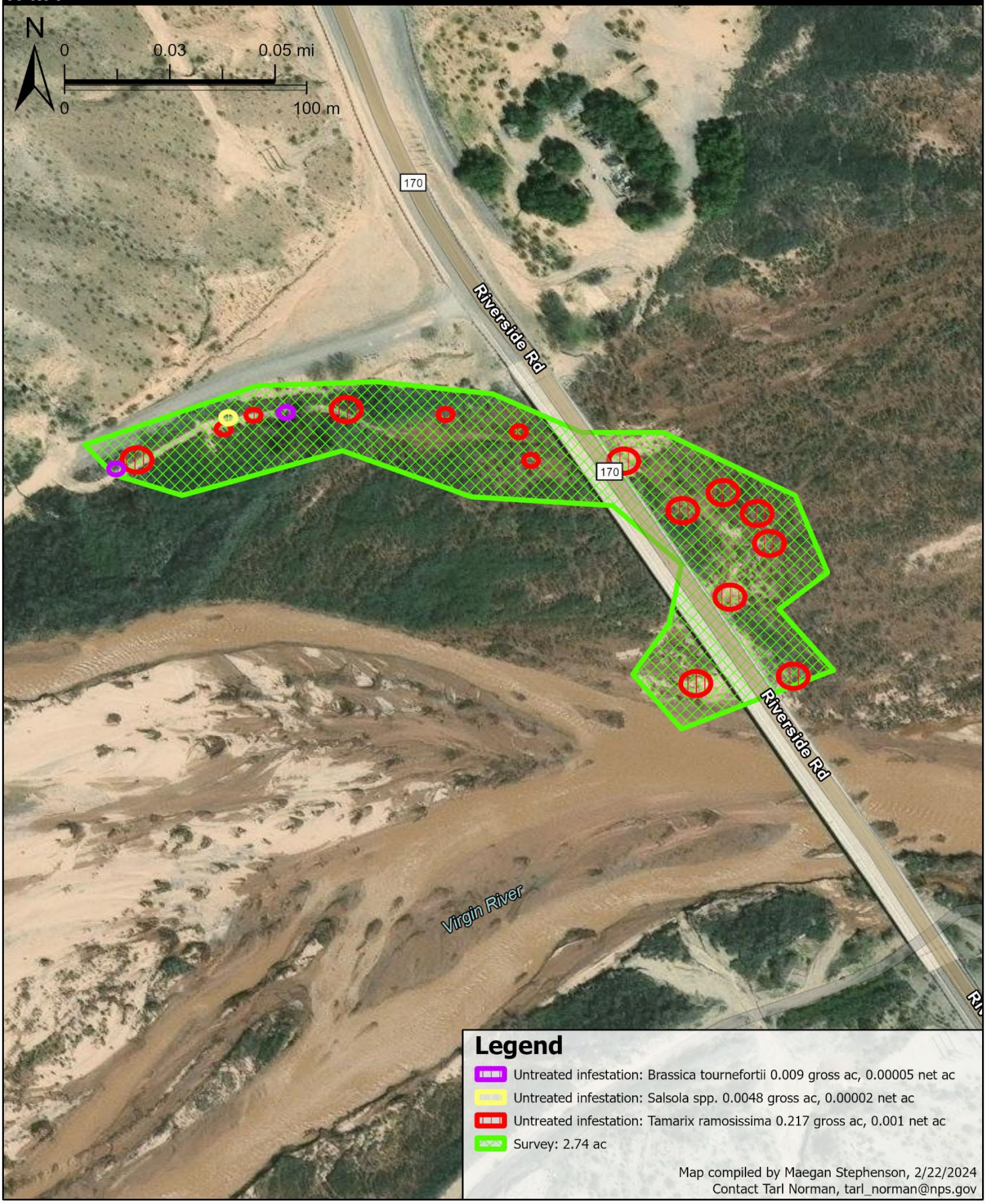
Species	Total Surveyed Acres	Gross Infested Acres	Infested Acres	Treated Acres
Brassica tournefortii Sahara mustard	2.74	0.009	0.00005	Not treated
Salsola spp. Russian thistle	2.74	0.0048	0.00002	Not treated
Tamarix ramosissima Salt cedar	2.74	0.217	0.001	Not treated

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) 281-8120.

Clark County: Riverside
12/11/2023

IPMT

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



Legend

- Untreated infestation: Brassica tournefortii 0.009 gross ac, 0.00005 net ac
- Untreated infestation: Salsola spp. 0.0048 gross ac, 0.00002 net ac
- Untreated infestation: Tamarix ramosissima 0.217 gross ac, 0.001 net ac
- Survey: 2.74 ac

Map compiled by Maegan Stephenson, 2/22/2024
Contact Tarl Norman, tarl_norman@nps.gov

IPMT
Invasive Plant
Management Team
Lake Mead

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Bunkerville West
Date(s): 1/4-8/2024, 1/17-20/2024, 1/22/2024, and 1/30/2024
Treatment Method(s): Chemical cut/stump treatment using 20.75% Garlon 4 Ultra via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Tamarix ramosissima Salt cedar	10.8	10.8	0.49	0.49

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Garlon 4 Ultra	3.18 gallons	20.75%	79.25% JLB Oil Plus Improved	15.328 gallons

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) 281-8120.

Invasive Plant Chemical Treatment Report

Partner: **Clark County**
Location: **Bunkerville West**
Date(s): **1/4-8/2024, 1/17-18/2024, and 1/20/2024**
Treatment Method(s): **Chemical basal bark treatment using 20.75% Garlon 4 Ultra via backpack sprayers.**

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Tamarix ramosissima Salt cedar	31.7	31.7	3.8	3.8

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Garlon 4 Ultra	9.7 gallons	20.75%	79.25% JLB Oil Plus Improved	46.75 gallons

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Bunkerville West
Date(s): 1/18/2024
Treatment Method(s): Chemical cut/stump treatment using 75% Roundup Custom via hand sprayer.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Elaeagnus angustifolia Russian olive	0.0048	0.0048	0.0001	0.0001

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Roundup Custom	4.5 fl oz	75%	0.5% Induce	6 fl oz

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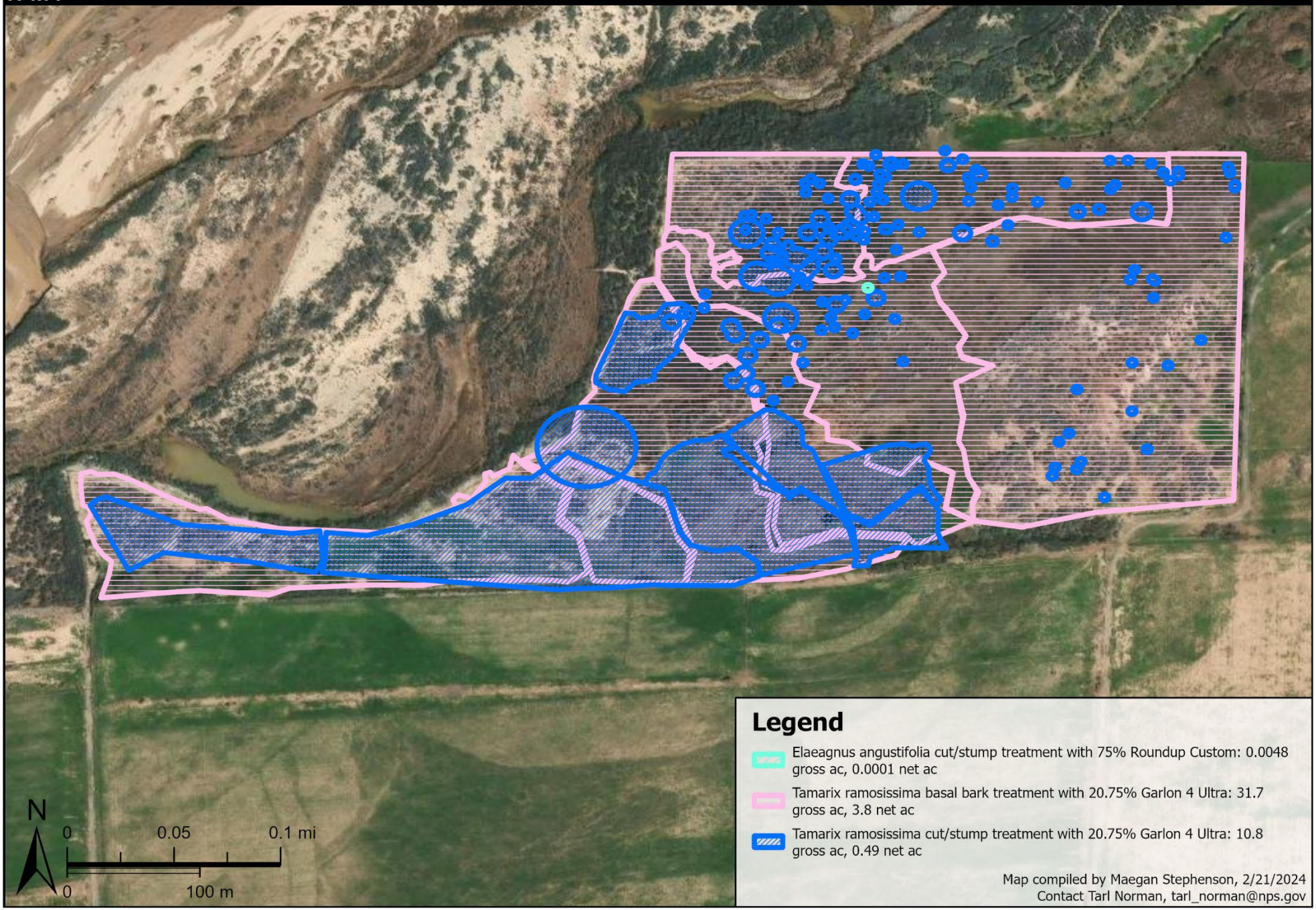
Clark County: Bunkerville West
1/4-8/2024, 1/17-20/2024, 1/22/2024 and 1/30/2024

IPMT

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



Legend

- Elaeagnus angustifolia cut/stump treatment with 75% Roundup Custom: 0.0048 gross ac, 0.0001 net ac
- Tamarix ramosissima basal bark treatment with 20.75% Garlon 4 Ultra: 31.7 gross ac, 3.8 net ac
- Tamarix ramosissima cut/stump treatment with 20.75% Garlon 4 Ultra: 10.8 gross ac, 0.49 net ac

Map compiled by Maegan Stephenson, 2/21/2024
Contact Tarl Norman, tarl_norman@nps.gov

IPMT
Invasive Plant
Management Team
Lake Mead

Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Bunkerville East
Date(s): 1/30-31/2024 and 2/1/2024
Treatment Method(s): Chemical foliar spot treatment using 1 fl oz/gal Weedmaster and 1% Roundup Custom via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Centaurea melitensis Malta starthistle	32.95	26.8	0.134	0.134
Brassia tournefortii Sahara mustard	32.95	26.7	0.133	0.133

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Weedmaster	13.5 fl oz	1 fl oz/gal	0.5% Induce	13.5 gallons
Roundup Custom	17.28 fl oz	1%		

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Invasive Plant Manual Treatment Report

Partner: **Clark County**
Location: **Bunkerville East**
Date(s): **1/21/2024**
Treatment Method(s): **Manual removal via hoeing. Rain during the day – did not use herbicide.**

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Brassia tournefortii Sahara mustard	24.01	17.86	0.09	0.09

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) 281-8120.

Invasive Plant Survey Report

Partner: **Clark County**
Location: **Bunkerville East**
Date(s): **1/7/2024**
Survey Method(s): **Surveyed area for weed infestation. Russian thistle reported senescent at the time of survey.**

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres	Infested Acres	Treated Acres
Salsola spp. Russian thistle	6.15	2.57	0.01	Not treated
Tamarix ramosissima Salt cedar	6.15	0.19	0.01	Not treated

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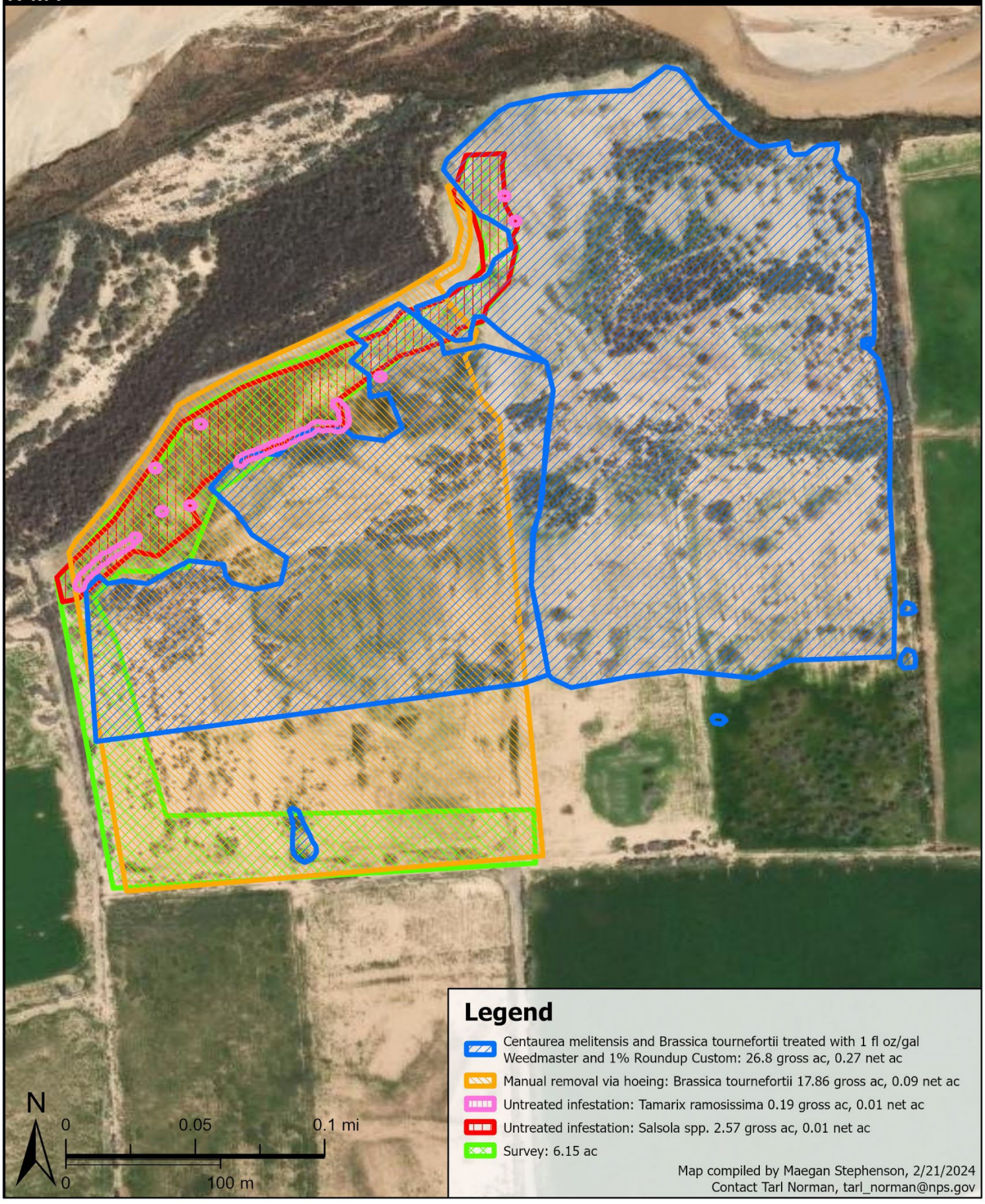
Clark County: Bunkerville East
1/7/2024, 1/21/2024, and 1/31-2/1/2024

IPMT

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



Legend

- Centaurea melitensis and Brassica tournefortii treated with 1 fl oz/gal Weedmaster and 1% Roundup Custom: 26.8 gross ac, 0.27 net ac
- Manual removal via hoeing: Brassica tournefortii 17.86 gross ac, 0.09 net ac
- Untreated infestation: Tamarix ramosissima 0.19 gross ac, 0.01 net ac
- Untreated infestation: Salsola spp. 2.57 gross ac, 0.01 net ac
- Survey: 6.15 ac

Map compiled by Maegan Stephenson, 2/21/2024
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): 5/15-16/2024 and 5/20-21/2024
Treatment Method(s): Chemical foliar spot treatment using 1% Roundup Pro Concentrate + 1 fl oz/gal Weedmaster via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Atriplex semibaccata Australian saltbush	5.82	2.01	0.03	0.03
Bassia hyssopifolia Five-hook bassia	5.82	5.57	0.21	0.21
Centaurea melitensis Malta starthistle	5.82	1.58	0.01	0.01
Convolvulus arvensis Field bindweed	5.82	0.94	0.004	0.004
Salsola spp. Russian thistle	5.82	5.57	0.09	0.09

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Roundup Pro Concentrate	27.712 fl oz	1%	0.25% Activator 90 or 0.25% RRSI	21.65 gallons
Weedmaster	21.65 fl oz	1 fl oz/gal		

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Muddy River Riparian Reserve
Date(s): 5/16/2024
Treatment Method(s): Chemical foliar spot treatment using 0.2 fl oz/gal Milestone + 0.5 fl oz/gal Transline via backpack sprayer.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Acroptilon repens Russian knapweed	0.23	0.0048	0.0001	0.0001

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Milestone	0.03 fl oz	0.2 fl oz/gal	0.25% Activator 90	0.15 gallons
Transline	0.075 fl oz	0.5 fl oz/gal		

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Invasive Plant Chemical Treatment Report

Partner: Clark County
Location: Muddy River Riparian Reserve
Date(s): 5/21-22/2024
Treatment Method(s): Chemical basal bark treatment using 20.75% Garlon 4 Ultra via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Tamarix ramosissima Salt cedar	3.07	2.844	0.08002	0.08002

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Garlon 4 Ultra	2.62 gallons	20.75%	79.25% JLB Oil Plus Improved	12.625 gallons

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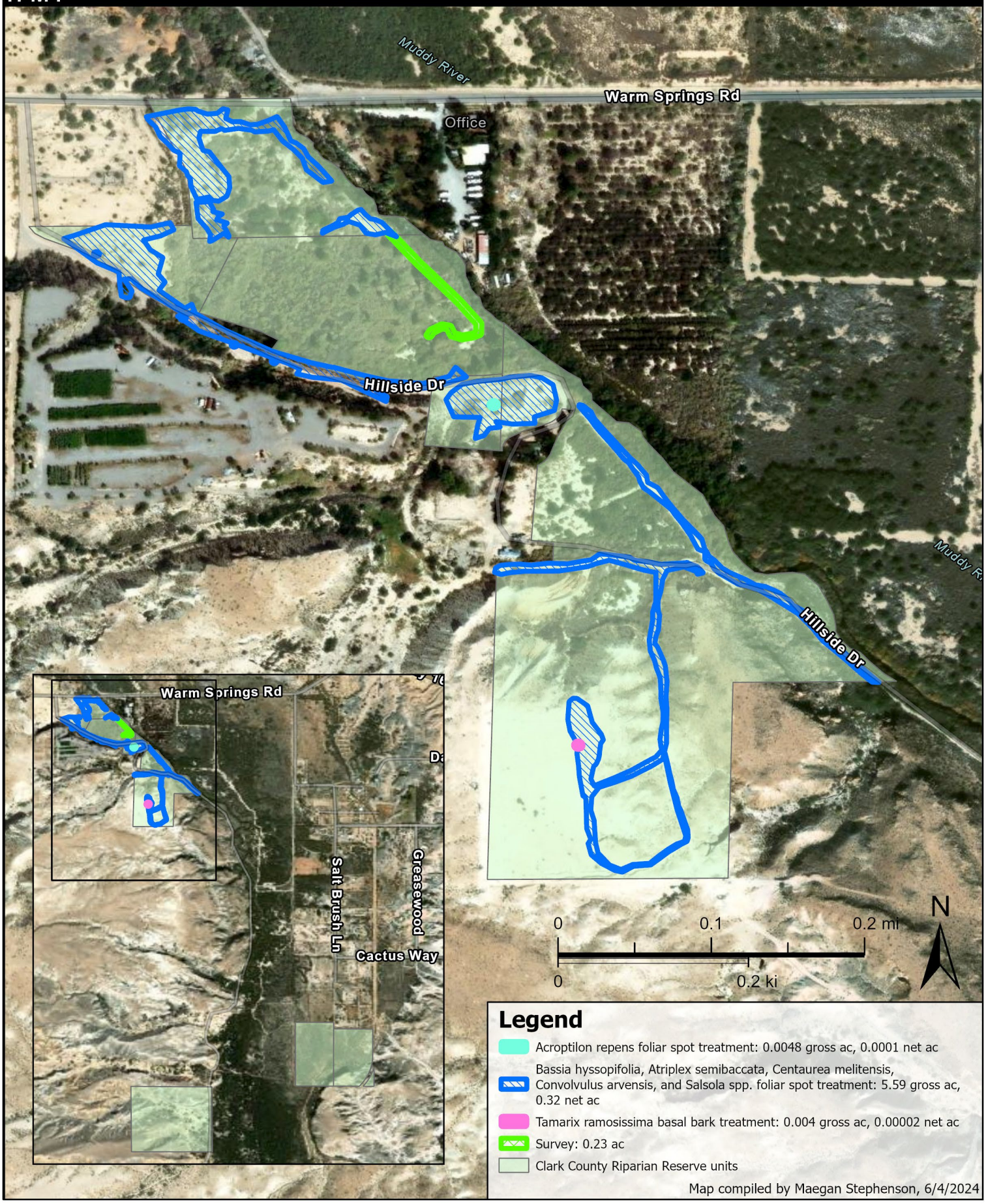
Clark County: Muddy River Riparian Reserve
5/15-16/2024 and 5/20-21/2024

IPMT

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



Legend

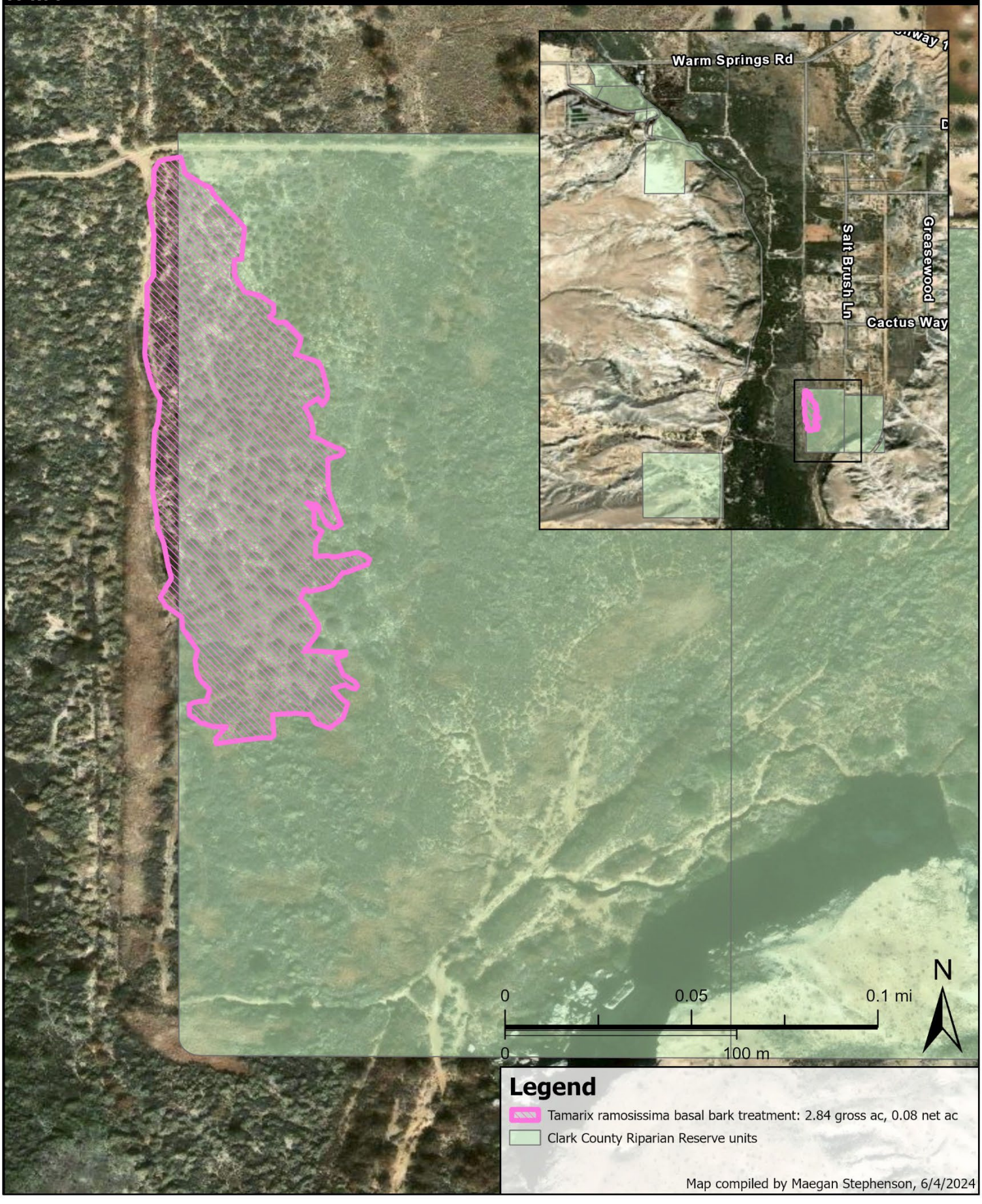
- Acroptilon repens foliar spot treatment: 0.0048 gross ac, 0.0001 net ac
- Bassia hyssopifolia, Atriplex semibaccata, Centaurea melitensis, Convolvulus arvensis, and Salsola spp. foliar spot treatment: 5.59 gross ac, 0.32 net ac
- Tamarix ramosissima basal bark treatment: 0.004 gross ac, 0.00002 net ac
- Survey: 0.23 ac
- Clark County Riparian Reserve units

Map compiled by Maegan Stephenson, 6/4/2024

Clark County: Muddy River Riparian Reserve
5/22/2024

IPMT

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



Legend

- Tamarix ramosissima basal bark treatment: 2.84 gross ac, 0.08 net ac
- Clark County Riparian Reserve units

Map compiled by Maegan Stephenson, 6/4/2024

IPMT
Invasive Plant
Management Team
Lake Mead

Invasive Plant Chemical Treatment Report

Partner: Clark County Riparian Reserve
Location: Bunkerville West
Date(s): 5/22-23/2024 and 5/28/2024
Treatment Method(s): Chemical foliar spot treatment using 1% Polaris + 1% Garlon 3A via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Convolvulus arvensis Field bindweed	5.8	0.014	0.0001	0.0001
Lepidium latifolium Tall whitetop	5.8	1.34	0.02	0.02

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Polaris	24.96 fl oz	1%	0.25% Kinetic	19.5 gallons
Garlon 3A	24.96 fl oz	1%		

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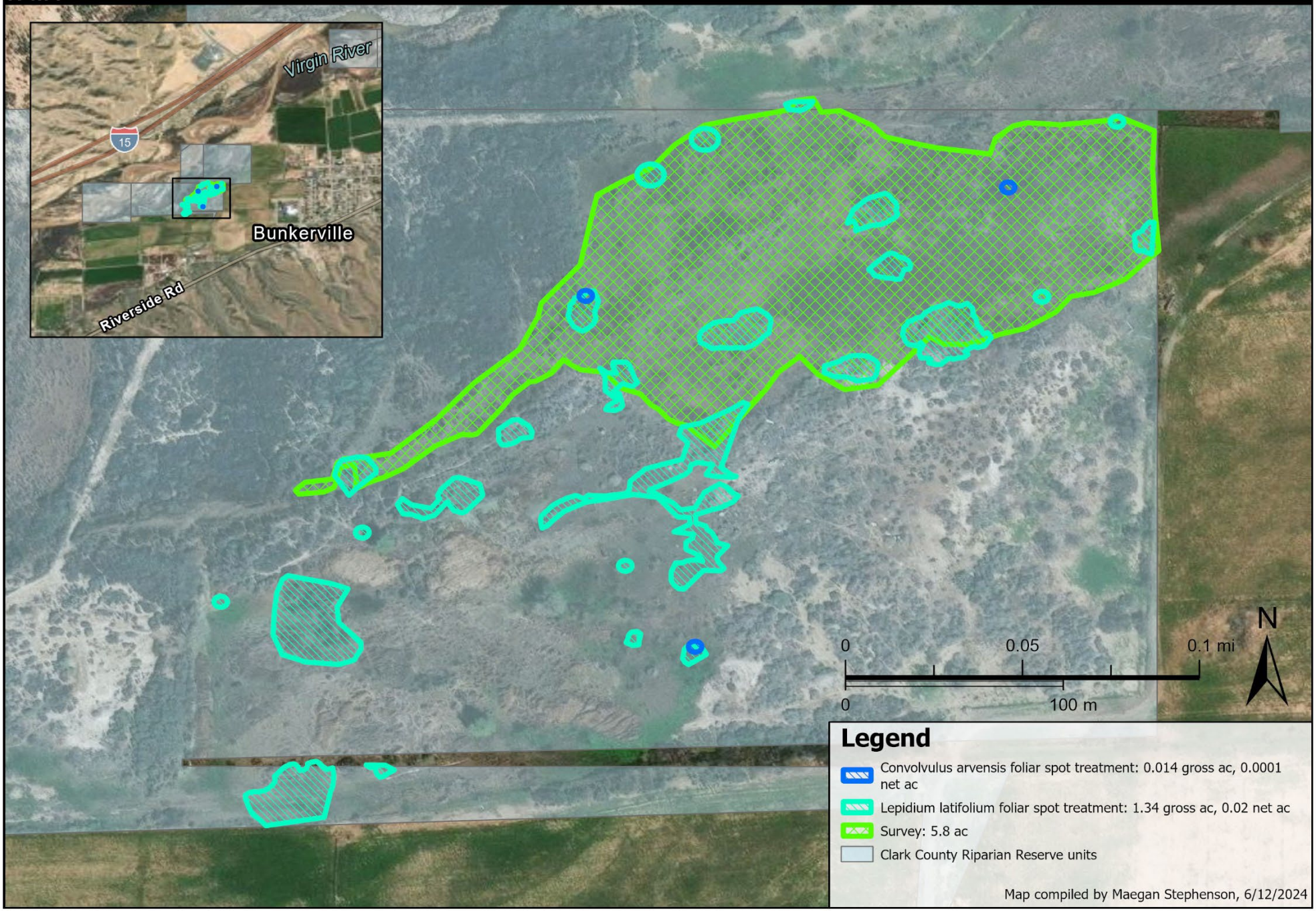
Clark County: Bunkerville West
5/22-23/2024 and 5/28/2024

IPMT

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



Map compiled by Maegan Stephenson, 6/12/2024

Invasive Plant Chemical Treatment Report

Partner: Clark County Riparian Reserve
Location: Bunkerville East
Date(s): 5/28/2024
Treatment Method(s): Chemical foliar spot treatment using 1% Polaris via backpack sprayers.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres Treated	Infested Acres	Treated Acres
Salsola spp. Russian thistle	13.89	1.62	0.008	0.008

Herbicide Use

Herbicide	Amount	Mix Rate	Surfactant	Total Mix
Polaris	10.24 fl oz	1%	0.25% Kinetic	8 gallons

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) 281-8120.

Invasive Plant Survey Report

Partner: Clark County Riparian Reserve
Location: Bunkerville East
Date(s): 5/28/2024
Survey Method(s): Mapped infestations while working in the area.
Notes: Malta starthistle was senescent at the time of mapping. Suggest an earlier visit to site next year for optimal herbicide treatment window of this species.

Accomplishments

Species	Total Surveyed Acres	Gross Infested Acres	Infested Acres	Treated Acres
Centaurea melitensis Malta starthistle	13.76	0.651	0.008	Not treated
Convolvulus arvensis Field bindweed	13.76	0.048	0.0004	Not treated
Salsola spp. Russian thistle	13.76	12.14	0.06	Not treated

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) 281-8120.

Clark County: Bunkerville East
5/28/2024

IPMT

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National Park Service
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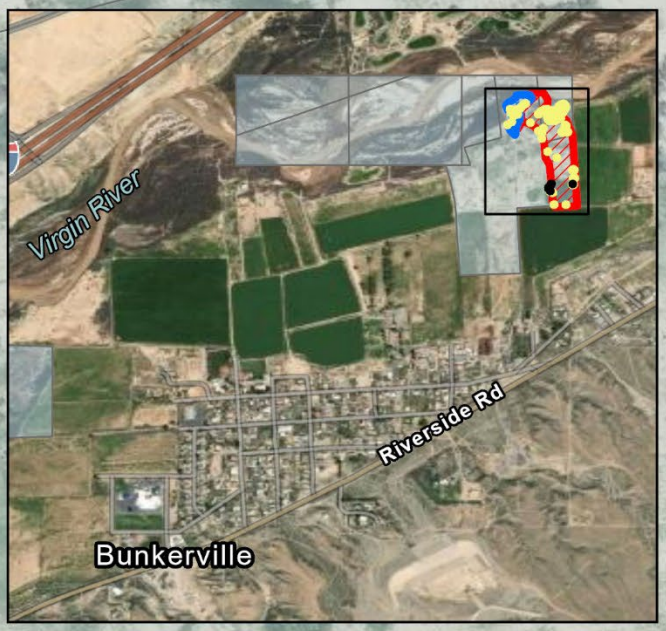

N

0 0.05 0.1 mi

0 100 m

Legend

- Salsola spp. foliar spot treatment: 1.620 gross ac, 0.008 net ac
- Untreated infestation: Centaurea melitensis 0.651 gross ac, 0.008 net ac
- Untreated infestation: Convolvulus arvensis 0.048 gross ac, 0.0004 net ac
- Untreated infestation: Salsola spp. 12.14 gross ac, 0.06 net ac
- Clark County Riparian Reserve units

Map compiled by Maegan Stephenson, 6/12/2024

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.

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:

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*). Several athel tamarisk tree recruitments were 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. 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 38-acre tamarisk mastication site on the Mormon Mesa Unit 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 should 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 dominant. 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. 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. The low volume basal spray treatments following the mastication were successful from the winter 2021/22 and follow up retreatments occurred in during the winter of 2022/23. Tamarisk control also occurred at the Bunkerville

West and Muddy River Unit F sites, by using the basal spray method on small diameter trees and resprouts from previous cut stump treatments. Substantial cut-stump treatments of tamarisk were conducted at the Bunkerville West to isolated tamarisk patches growing in marshy areas.

Some good native plant recovery is also occurring at the Mormon Mesa Unit within the older 4-acre tamarisk mastication site with mostly quail bush establishing naturally. All the tamarisk resprouts in this mastication site were basal sprayed which has allowed for some native plant recovery. However the biggest concern regarding native plant recovery of these Mormon Mesa mastication sites is the amount of trespass cattle utilizing the areas, which are eating lots of plants (including some tall whitetop) and causing soil disturbance and trampling in many of the wet soil areas and stream channels.

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.

The Riverside Unit adjacent to the bridge crossing on the Virgin River was only surveyed in late 2023 with a small amount of tamarisk, Sahara mustard, and Russian thistle detected. Monitoring of the large athel tamarisk below the west side of the bridge will continue to ensure control and eventually 100% mortality. Most of the tree is dead but monitoring and further treatment may be necessary eventually obtain 100% mortality. The tree consists of large multiple trunks at the base growing at many angles. The current plan is to leave the tree standing dead on site and could be considered a wildlife snag. A few more smaller athel trees have been treated within the unit which is of high priority since athel tamarix is an early detection rapid response species that we don't want to spread further throughout the river. This is the only site we've have observed athel tamarix establishment along the entire river corridor. We also want to note that heavy equipment on the east side of the river in this unit has removed a lot of vegetation and soil has been disturbed and berms have been created sometime in the winter of 2023. This has happened along the edge of the river just below the bridge in an apparent effort to possible divert or change the direction of the river flow? These areas should be monitored since heavy equipment disturbance can facilitate weed establishment.

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 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 ideal timing of the tamarisk resprout treatments after the initial treatments during year two or three is in the late fall or early winter prior to leaf drop so you can decipher what is dead from alive. The Virgin River Bunkerville West and East Units have some dense old growth tamarisk that would be good areas to conduct future mastication. The 11-acre parcel located on the northwest side of the river adjacent to the golf course also consists of dense old tamarisk that should be considered for mastication and should recover well with native species potential. This would be a good place to coordinate with the Virgin River Coalition since it has easier access to the town of Mesquite and could serve as a good place to host volunteers and highlight restoration efforts for educational and public awareness purposes. These sites have good potential for successful natural revegetation 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, 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 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.

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.

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. I believe these most recently were used to grow alfalfa. Due to the proximity to the river these fields will likely eventually convert to a high terrace off river site consisting of quail bush 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 is being developed and requested by the Southern Nevada Restoration Team (SNRT) and submitted for competition to the Southern Nevada Public Lands Management Act (SNPLMA) funding in fall of 2023 as a conservation initiative project if it is prioritized by the federal agencies. This County parcel is included as a potential site to grow out native plants for seed increase and production.

Bunkerville West and East Sites along the river floodplain riparian areas are in “good shape” and dominated by native plant species including coyote willow, seep willow baccharis, native arrow-weed, screwbean mesquite and various rushes and sedges with some minimal tamarisk mixed in. Scattered goodings 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. I think the tamarisk leaf beetle biological control has reduced the overall establishment and competitive advantage that the tamarisk used to have before the beetle established throughout the river corridor. The most

important areas to invest in future tamarisk control are the remaining dense old growth thick stands of tamarisk that have not been wiped out from previous flooding or wildfires over the last 30 years. Tamarisk mastication follow 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.

Also want to note that most all the Virgin River Riparian units contained a variety of ages classes and sizes of what appeared to be healthy screwbean mesquite trees. This is important to note because over the last couple of decades there has been widespread die-off of many screwbean mesquite trees throughout the regional area of its range. I personally observed many screwbean mesquite trees within the Virgin River suffering die back in circa 2009 or so. There are many remnant large dead screwbean mesquite trees remaining at the Bunkerville West Unit has evidence of this phenomenon. It has been historically unknown what is causing the die back and up until the last 3 years I have not been aware of any investigation into what was causing the die off. I believe it is some unknown pathogen causing the disease. However, a Screwbean Mesquite working group was established approximately 3 years ago led by The Nature Conservancy that is assisting with coordinating the investigation and monitoring of this phenomenon. Early investigation has discovered a “sooty canker’ disease that may be causing the die back. More will be discovered about this mysterious die back in the coming years. However, whatever is affecting the screwbean many of them are re-establishing throughout the Virgin River corridor and it is currently one of the most common woody perennial trees on the floodplain. Its possible whatever is causing the problem it may be something the screwbean has evolved with over its existence because it appears to be rebounding in many areas over the last decade or so but some areas like Ash Meadows NWR are experiencing more recent intense die-back that other areas have sustained over 20 years ago indicating that it is migrating throughout its range.

Supporting Project Report Photos:

Photo Caption: Atriplex semibaccata (Australian saltbush) in Muddy River Riparian Unit A. October 2023.

Photo Caption: Bassia hyssopifolia (Five-hook bassia) in Muddy River Riparian Units A/B. October 2023.

Photo Caption: Thick Salsola spp. (Russian thistle) on the west side of Muddy River Riparian Unit A. October 2023.

Photo Caption: Centaurea melitensis (Malta starthistle) chaff in Muddy River Riparian Unit C. October 2023.

Photo Caption: Salsola spp. (Russian thistle) field inside Muddy River Riparian Units D/E. This population was chemically treated after the photo was taken. October 2023.

Photo Caption: Acroptilon repens (Russian knapweed) rosettes at Muddy River Riparian Unit E – inside the fence at Perkins Pond. Treated after the photo was taken. October 2023.

Photo Caption: Acroptilon repens (Russian knapweed) at Muddy River Riparian Unit D with herbicide treatment. October 2023.

Photo Caption: Acroptilon repens (Russian knapweed) mostly dead after October 2023 treatment. Retreatment of remaining plants shown sprayed. May 2024.

Photo Caption: Concaved road wash out enroute to Muddy River Riparian Unit F. Location: 114.6869940 W, 36.6999397 N. October 2023.

Photo Caption: Weeds along the perimeter of the fence at Clark County Bunkerville West unit. October 2023.

Photo Caption: Salsola spp. (Russian thistle) and Bassia hyssopifolia (five-hook bassia) crowding the pedestrian entrance at Clark County Bunkerville West unit. October 2023.

Photo Caption: Bassia hyssopifolia (Five-hook bassia) thick in Clark County Bunkervile West unit. October 2023.

Photo Caption: Lepidium latifolium (Perennial pepperweed) in the marsh area of Clark County Bunkerville West unit. October 2023.

Photo Caption: Atriplex suberecta (sprawling saltbush)on the ground at Clark County Bunkverille West unit. Treatment occurred after the photo was taken. October 2023.

Photo Caption: Atriplex suberecta (sprawling saltbush) close up. October 2023.

Photo Caption: Solanum elaeagnifolium (Silverleaf nightshade) and Salsola spp. (Russian thistle) at Clark County Bunkerville West unit. October 2023.

Photo Caption: Solanum elaeagnifolium (Silverleaf nightshade). October 2023.

Photo Caption: Centaurea melitensis (Malta starthistle) rosettes beneath last year's chaff at Muddy River Riparian Bunkerville East unit. October 2023.

Photo Caption: Centaurea melitensis (Malta starthistle) rosettes treated at Muddy River Riparian Bunkerville East unit. Hundreds of rosettes coming up in the west northwest section of Bunkerville East. October 2023.

Photo Caption: Atriplex semibacatta (left) and Atriplex suberecta (right) in the southern field of Muddy River Riparian Bunkerville East unit. October 2023.

Photo Caption: Atriplex semibaccata (bottom) and Atriplex suberecta (top) close up comparison. October 2023.

Photo Caption: View of Atriplex's (in red circles) found at Bunkerville East southern fallow old agriculture field. October 2023.

Photo Caption: View of Atriplex's (in red circle) found at Bunkerville East southern fallow old agriculture field. October 2023.

Photo Caption: Basal barking Tamarix ramosissima sprouts in Clark County Virgin River Mastication site. December 2023.

Photo Caption: Treatment of Salsola spp. in Clark County Muddy River Riparian Unit A. May 2024.

Photo Caption: Post-treatment of Salsola spp. in Clark County Muddy River Riparian Unit A. August 2024.

Photo Caption: Treatment of Bassia hyssopifolia along the fenceline of Clark County Muddy River Riparian Unit B. May 2024.

Photo Caption: Post-treatment of Bassia hyssopifolia along the fenceline of Clark County Muddy River Riparian Unit B. August 2024.

Acknowledgements:

Report prepared by the Lake Mead Invasive Plant Management Team (LAKE IPMT). Project reporting, maps and data management production by Maegan Stephenson, LAKE IPMT. Report analysis and recommendations prepared by Tarl Norman and Curt Deuser. Thanks to the field work completed by Corbin Gentzler, Tyler Jack, Jacob Pope, James Roberts, Stephanie Sonnenberg, Wesley Scott, Maegan Stephenson, Riley Gronemeyer, Joshua Vogel, Tobias Verville, Caleb Dankle, and other individuals from the LAKE IPMT.

This work was supported by the Clark County Desert Conservation Program and funded by Section 10, as project #2019-NPS-1910C, to further implement or develop the Clark County Multiple Species Habitat Conservation Plan.

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