

Summit CWMA

Garlic Mustard Control and Riparian Habitat Program

Contract 2022-002 | 2023 BIL FINAL REPORT



Prepared September 2023

Prepared for

BIL Program

Division of Plant Industry and Conservation
Utah Department of Agriculture and Food
350 North Redwood Road
Salt Lake City, UT

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01 | PROJECT BACKGROUND



Garlic mustard flowering, second year plants

The Summit CWMA BLI Garlic Mustard Control and Riparian Habitat Program focuses on the control and containment of garlic mustard (*Alliaria petiolata*) along highly invaded

riparian corridors within

Summit County. Garlic mustard is a category 1B Utah State Noxious Weed and known to aggressively invade woodland understory and crowd out native species. Due to its preference for moderate to full shade and moist habitats, it readily invades riparian habitats and benefits from stream/river mediated seed movement. Garlic mustard has a negative impact on native plants and wooded ecosystems through competition and allelopathy, affecting soil health, wildlife grazing, native butterfly reproduction, and wildfire. This species alters natural soil microbial communities to facilitate its own growth which reduces the soil fungal communities that native plants rely on for establishment and accessing soil water during drought. These soil microbial community impacts and the indirect impact these impacts to the soil microbial community can have on trees is especially

concerning within this project area due to extensive areas of wildland urban interface where wildfire would threaten thousands of homes.

Monitoring efforts funded by the Utah State Invasive Species Mitigation grants between 2013-22 have allowed us to identify hundreds of acres of garlic mustard, but additional monitoring of adjacent lands are necessary to determine the full extent. Regarding riparian habitats within Summit County, additional inventory/monitoring is most needed upstream and downstream from known populations. Our 2023 goal was to inventory 100 additional acres .

02 | TREATMENT AND DATA COLLECTION

Inventory of areas previously not mapped for garlic mustard is accomplished through grid walks when possible or serpentine paths. All garlic mustard populations are mapped using a GIS based App called Field Maps (previously Arc Collector). ArcGIS Field Maps is used to record treatment actions and herbicide rates along with percent cover (or absence) of noxious weed, dominant growth stage, control method, contractor or partner that applied treatment, number of bags of target noxious weeds pulled from a site, and notes. Sites previously mapped are then monitored for status and control effect.

Control methods include weeding, mulching, herbicide application, and revegetation. For large dense



While the majority of garlic mustard remains on the west side of the county, new populations were found in Oakley and outside of Wanship. Left and Center: pre-weeding of a single population at Stevens Grove Park in Oakley, Right: post-weeding.

populations, we hand weed first-year plants as often as logistically feasible to thin the flowering canopy and then apply herbicide to the remaining rosettes. Hand weeding is also used for small populations, particularly those in more remote areas and those within 2 feet of open water.

begin to address this issue, we mechanically thinned select areas, particularly where there seems to be garlic mustard invasion fronts and where garlic mustard is growing up to the edge of moving water. Removal is applied to improve habitat quality and gain better access for ongoing garlic mustard control.

Garlic Mustard Games

Because hand weeding is expensive and finding crews to do the work is challenging, the Summit CWMA and Ecology Bridge created a community wide garlic mustard removal competition in 2020.

The Summit CWMA Garlic Mustard Games (GMG) combines our knowledge of garlic mustard control with community volunteer events to reduce herbicide use on public and private land while successfully controlling garlic mustard and triggering recovery of natural habitats

Official garlic mustard weeding event locations are selected by proximity to waterways, trails, and popular recreation areas. These sites are considered at high risk of further garlic mustard spread. Additionally, participants weeded independently and reported their pounds of mustard using our Survey 123 App that tracks competition statistics on a public dashboard.

Participants of the Garlic Mustard Games form teams and compete by pulling garlic mustard at our events and on their own to win prizes throughout the season and be invited to an end of season food truck party. A large dump trailer is placed in a couple key locations throughout the competition for participants and contractors to dispose of bags of garlic mustard. Banners were made to hang on the dump trailer to increase advertising and volunteer participation

In areas controlled for greater than five years, percent



Hikers and bikers participated on their own time to pull garlic mustard for the Garlic Mustard Games.

In well established garlic mustard populations percent cover is commonly close to 100% in both the upper canopy of second year flowering plants and the lower canopy of first year rosettes. Herbicide applications onto these densities are only partially effective because herbicide is unable to penetrate through the second year plant canopy to the rosettes and complete coverage of the second year plant canopy also is unlikely. This leaves some second year plants alive and fails to impact rosettes. Rapid hand weeding to open the second year canopy followed by herbicide application allows for near complete control of both garlic mustard canopy layers and more rapid long-term reduction of garlic mustard populations.

Due to years of fire suppression, some of the riparian corridors have become overgrown and dense, dead woody vegetation limits access to effectively control garlic mustard and is reducing habitat quality overall. To



Ecology Bridge staff loading the dump trailer for the final landfill run of the season.

cover of garlic mustard is reducing, and some sites are suitable for revegetation. Seeding trials we have conducted in similar habitats in 2020-22 have shown

amendments can increase establishment rates and

03 | RESULTS

survival of seeded grasses. Because we anticipate having to control small amounts of garlic mustard in these areas for at least 10 years, we use native grass seed mixes (base of blue wild rye, slender wheat grass and fescues) so herbicide can be used on the garlic mustard without impacting the seeded species.

A total of 1,035 acres were inventoried for new populations of garlic mustard or monitored for current status to plan treatment. In addition, to acres monitored prior to treatment, contractors assessed population status of additional populations prior to treatment. 83 acres of garlic mustard populations were treated of which 21 were hand pulled and 66 were treated with herbicide.

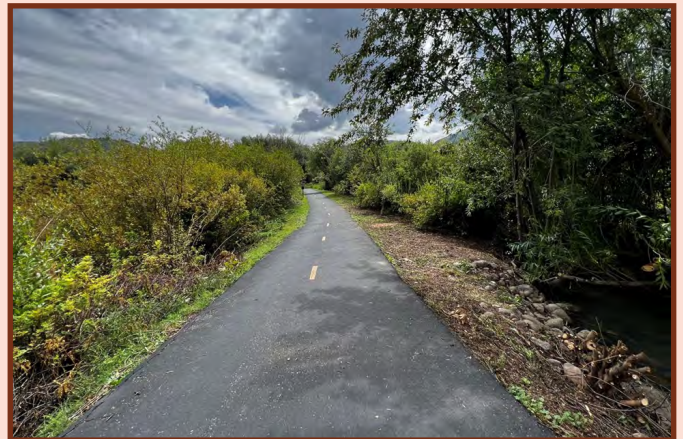
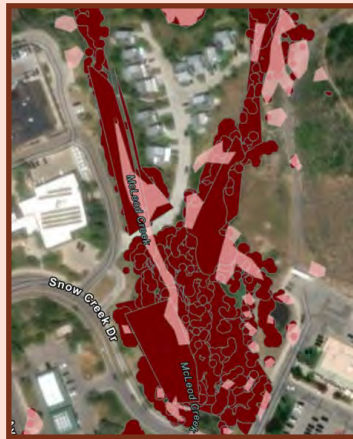
McLeod Creek 2023 Riparian Vegetation Thinning Program

Garlic Mustard treatment occurred for over 15 years but populations within overgrown and dead riparian vegetation prevented effective control.

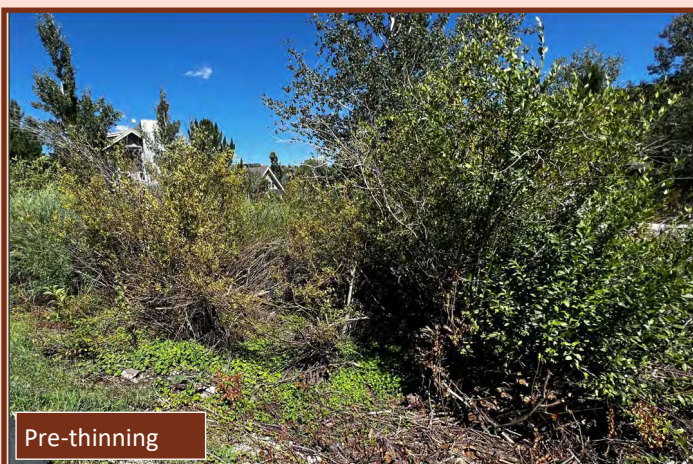
3,200 Lbs. dead /overgrown woody vegetation removed

.25 acres now accessible to wildlife and treatment crews

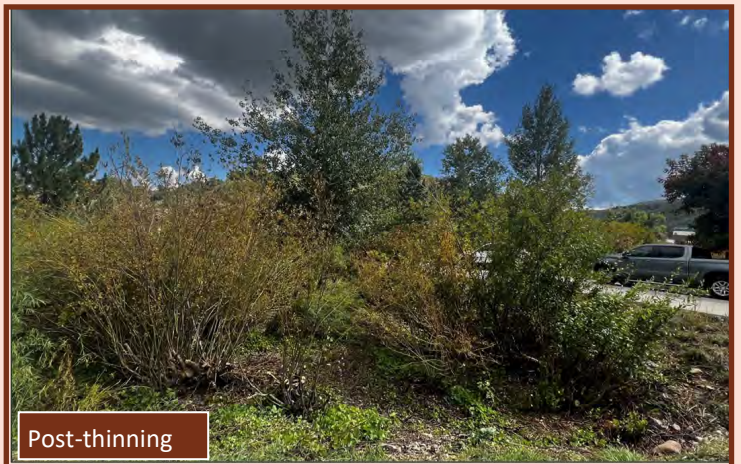
Fire and flood risk reduced



Left: Polygons in maroon are the historic distribution of garlic mustard and pink polygons the current distribution. Right: The McLeod Creek trail showing a recently thinned section on the right of the trail and the overgrown riparian habitat on the left of the trail prior to treatment.



Pre-thinning



Post-thinning

Thinning of 0.25 acres allowed for herbicide treatment of garlic mustard along McLeod Creek that we could not previously access, This increased access was crucial to moving forward on over 10 years of control

efforts with a goal of eradication of garlic mustard from large sections of McLeod Creek. Now these populations will not act as a seed source to adjacent areas.

3 EVENTS

13 VOLUNTEERS

68 HOURS OF VOLUNTEER TIME



Summit Park HOA Dumpster Day Garlic Mustard Games drop off regularly brings in hundreds of pounds of garlic mustard helping to prevent the species from expanding into the Salt Lake Watershed and into the Toll Canyon Creek corridor.

GMG included three weed-pull events with prizes and opportunity drawings, and a food truck party for overall winners—the individuals and teams that pulled the most garlic mustard over the course of the summer

04 | CHALLENGES IN 2023

The record breaking winter and wet spring delayed access to many riparian areas due to high water levels. These conditions also delayed germination and growth of garlic mustard. Then an early summer hot spell caused plants to quickly flower and go to seed resulting in a drastically reduced control season for second year plants. With such a short season for the second year plants, volunteers had only just begun weeding for the

Project Partners

Thank you so much to our partners and sponsors for their contribution to this program.

Government Partners

- Summit County
 - Dave Bingham, Dan Pena, Jessica Kirby
- Oakley City
 - Tom Smart
- Park City Municipal Corporation
 - Logan Jones
- Snyderville Basin Special Recreation District
 - Matt Benge
- United States Forest Service BIL Grant
- Utah Department of Agriculture and Food
 - Brittany Duncan

Local Business/Sponsors Partners

- Arcade
- Copper Moose Farms
- Dakine
- Deer Valley Resort
- Ecology Bridge
- Ground Solutions
- Kate's Bars
- Park City Equipment Rental
- Park City Film Institute
- Savory Kitchen

Non-Profit & Academic Partners

- Park City Film Institute
- Swaner EcoPreserve
 - Rhea Cone
- Utah Department of Agriculture and Food
 - Brittany Duncun
- Utah State University Extension
 - Elizabeth Cohen

HOA Partners

- Crescent Ridge HOA
 - Carla Maupin
- Hidden Cove HOA
 - Erin Ferguson
- Moose Hollow HOA
 - Allyson and Ryan Dickey
- North Shore HOA and Ranch Place HOA
 - Brenda Lake
- Pinebrook HOA
 - Stephan Herrera
- Southshore HOA
 - Insa Riepen
- Sun Peak HOA
 - Tereasa Wharton
- Summit Park HOA
 - Mike Quinoines

Garlic Mustard Games when plants started to develop seed and the Garlic Mustard Games had to be ended six weeks early to prevent volunteers from accidentally spreading seed while pulling plants.

The late start of the season also led to challenges with getting herbicide contractors on the ground. To ensure work for their staff in the spring, many took on extra work at lower elevations and then were finishing that work and unavailable when we needed them to start. In order to address this challenge, we brought on a contractor we work with in Sundance Canyon for other noxious weed programs. This increased our contractor pool to 6 companies getting the work done just in time.

05 | CONCLUSIONS

Treatment is reducing garlic mustard density and containing populations where treatment has been consistent for greater than five years. The wet season did release the seedbank in areas we had previously seen declines and eradication which made it seem as though progress was lost; however, these rosettes represent older seedbanks and as long as we are able to

treat them prior to seed set, we are gaining ground on long-term decline and eradication.

Our goal for 2023 was to inventory 100 acres, hand pull 10 ac, treat 68 ac with herbicide, thin 3 ac of overgrown and dead riparian vegetation and revegetate 3 acres. We far exceeded our goal for inventory and treated 9 more acres and reseeded one more acre than we planned. The incredible amount of dead wood that had accumulated along McLeod Creek, prevented us from thinning as many acres as hoped however, we have some additional funds to continue this work.

Due to the distribution of garlic mustard in Summit County, this project requires long-term planning and prioritization of containment when necessary and control/population reduction where possible. Each year new populations are found as we are able to access and inventory new areas. Our goal remains to find the edge of the invasion along the outer boundary of the known garlic mustard populations and due to numerous vectors of spread, that boundary has not been identified confidently in most directions. That said, we are



For some communities, the Garlic Mustard Games has become an anticipated family event. Teams of kids from age 6 and up not only have claimed ownership of the games but act as prize selection consultants. Who better knows how to get kids involved than the kids themselves.

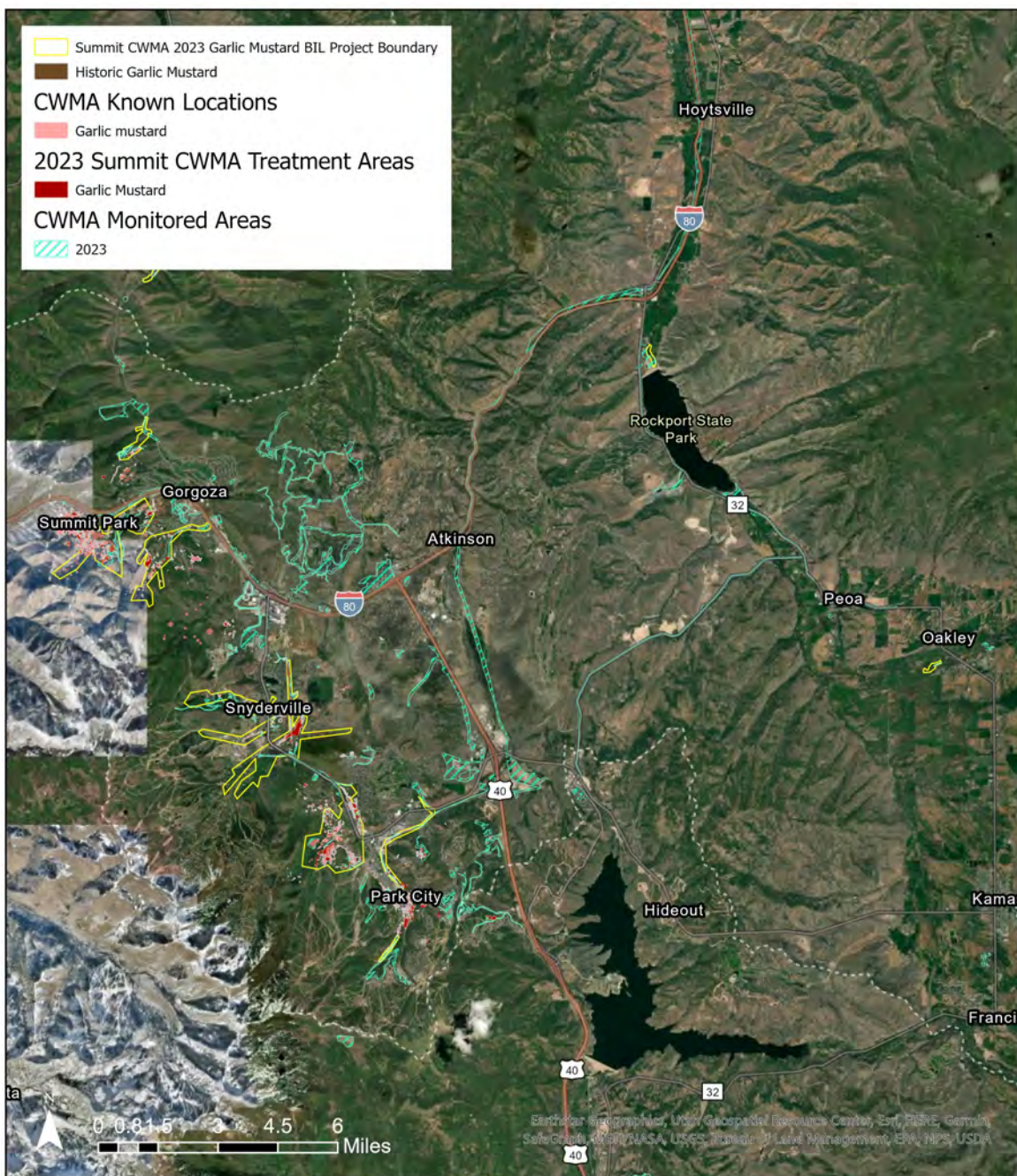
confident we have identified the boundary in the Summit Park area that abuts the Salt Lake Watershed and edges of the more northern portions of the project area where the habitat is less suitable for garlic mustard. Areas that are heavily wooded and commonly used by wild game continue to be the areas needing more inventory, particularly riparian areas and wetlands where garlic mustard can flourish and wild game frequent for access to water.

We are also seeing the edges of populations consistently

controlled receding leaving smaller and less dense populations. We think this can be attributed to the long history of control and also an increased awareness in the community about garlic mustard that has resulted in more volunteer aid and control in residential properties reducing seed sources for our open spaces.

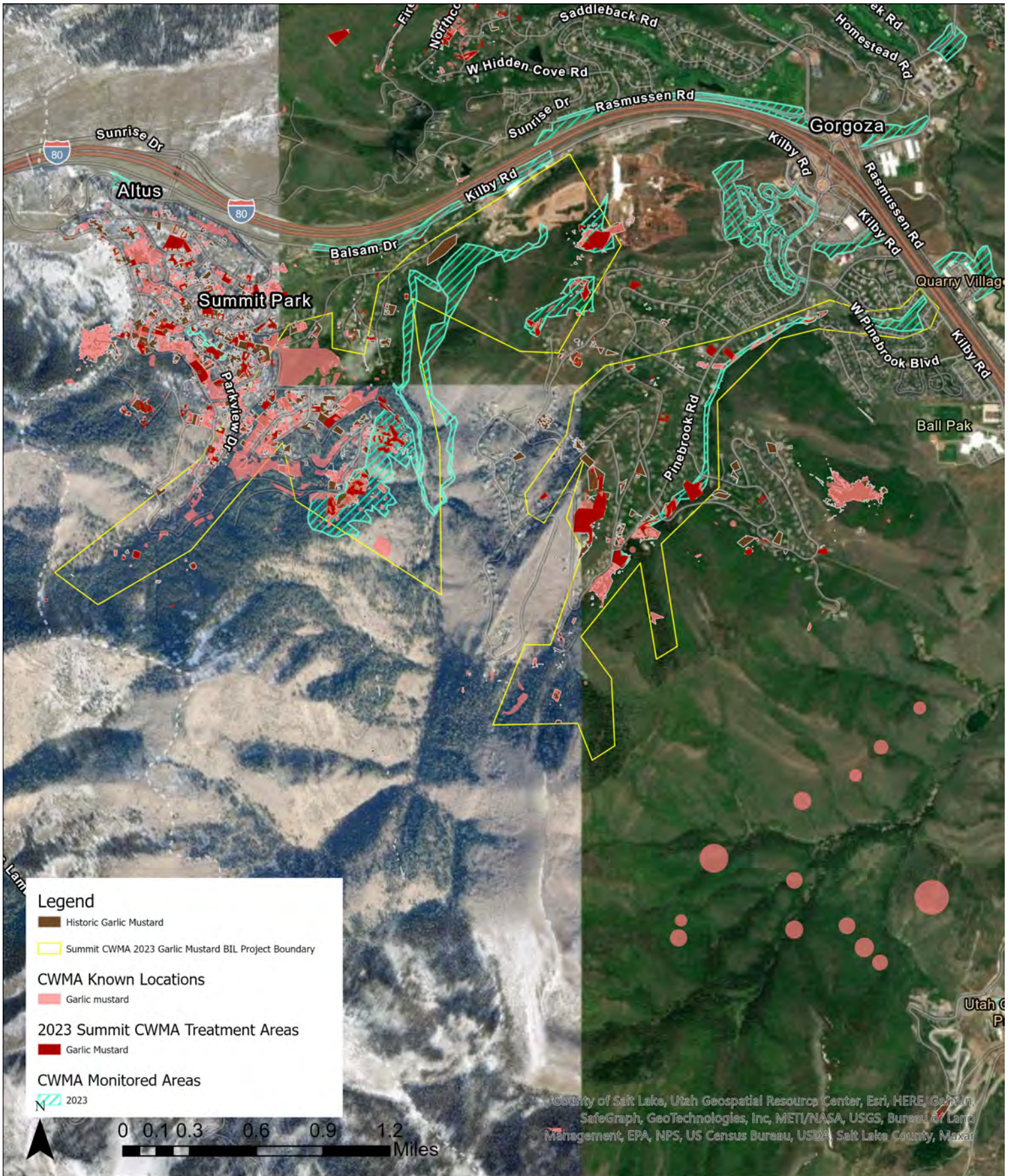
We will continue our outreach efforts along with control actions with the hope that in time we will have this noxious weed contained and reduced in Summit County preventing further spread to other counties in Utah.

06 | MAPS



Summit CWMA - 2023 BIL Garlic Mustard Control and Riparian Habitat Program Grant - Project Area

Prepared: September 15, 2023. Sara Jo Dickens, PhD, Ecology Bridge LLC



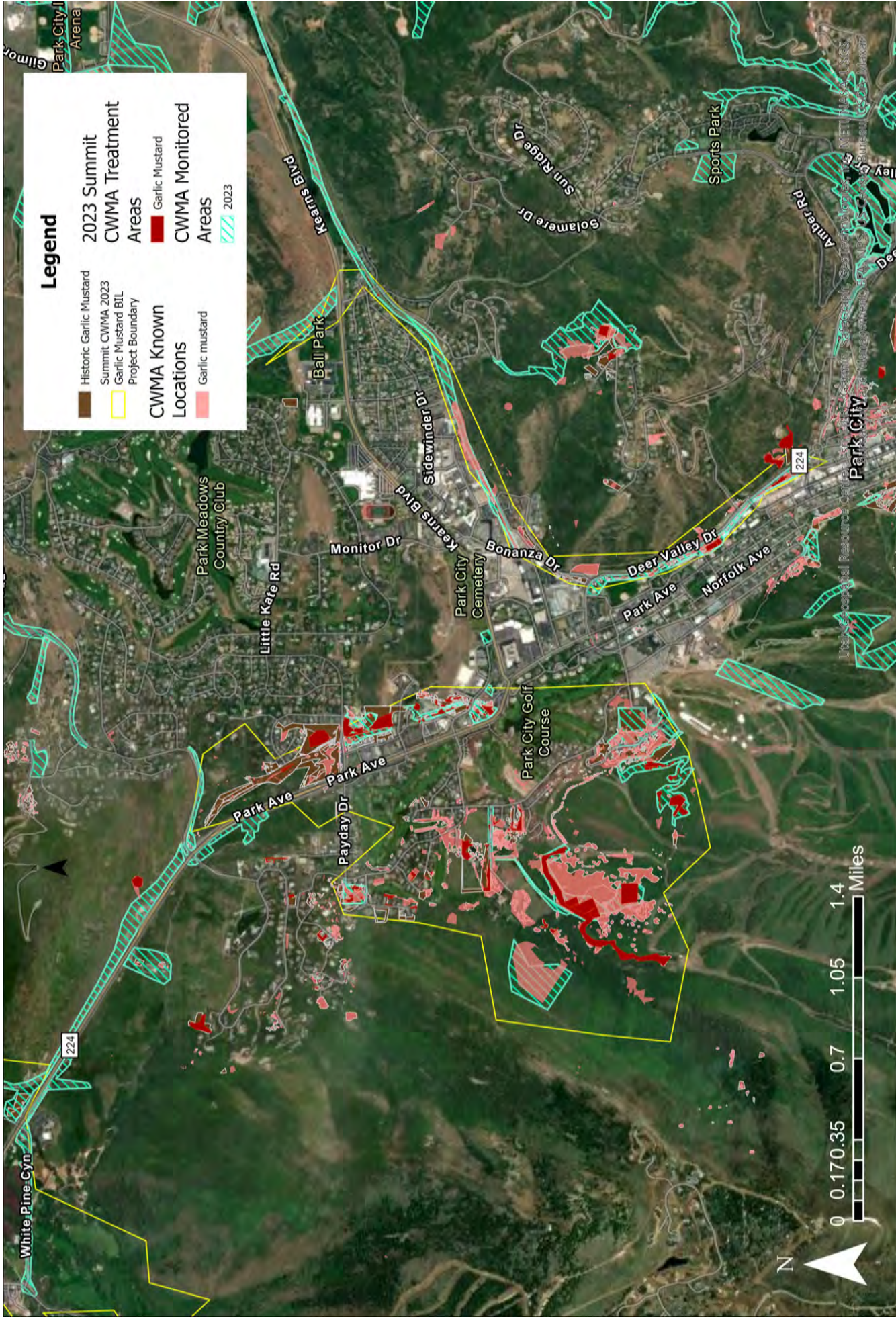
**Summit CWMA - 2023 BIL Garlic Mustard Control and Riparian Habitat Program Grant
Summit Park and Pinebrook Area**

Map Created: 9/15/2023
By Sara Jo Dickens, PhD



Summit CWMA - 2023 BIL Garlic Mustard Control and Riparian Habitat Program Grant Snyderville Basin Area

Map Created: 9/15/2023
By Sara Jo Dickens, PhD



Legend

Historic Garlic Mustard	2023 Summit CWMA Treatment Areas
Summit CWMA 2023 Garlic Mustard BIL Project Boundary	Garlic Mustard
CWMA Known Locations	CWMA Monitored Areas
Garlic mustard	2023

**Summit CWMA - 2023 BIL Garlic Mustard Control and Riparian Habitat Program Grant
Park City Area**

Map Created: 9/15/2023
By Sara Jo Dickens, PhD

07 | FINANCIAL SUMMARY

The project was awarded \$29,000 and was matched through \$13,788 in partner in-kind matches and \$22,78 in state Invasive Species Mitigation Grants.

Summit CWMA 2023 Garlic Mustard and Riparian Habitat BLI Grant Budget			
Line Item	Description	Budget	Expensed
Seed	Native grass seed blend from Pawnee Butte Seed	\$930.00	\$930.00
Soil Amendment	1:5 Biochar and Compost Blend	\$1,300.00	\$1,300.00
Banners for GMG Games at Dump Trailer	Banners to hang on the dump trailer parked in public locations for Garlic Mustard Games participants, residents and contractors to dispose of garlic mustard.	\$560.00	\$557.00
Dump Trailer	2 month rental fee for Garlic Mustard Disposal and transport of	\$2,500.00	\$2,500.00
Herbicide Contractors	Herbicide contractors for spot spraying	\$9,005.00	\$9,258.00
Mechanical control Contractors	Contractors for hand removal of garlic mustard	\$3,000.00	\$3,000.00
Inventory and Monitoring Contractors	Contractors to inventory and map new populations and monitor weed control effect	\$4,255.00	\$4,255.00
Mechanical Thinning Contractors	Contractors to thin overgrown and dead willow	\$6,000.00	\$6,000.00
Herbicide	2,4D	\$250.00	0
Administrative costs	Fiscal administration and project management 50/50 split	\$1,200.00	\$1,200.00
Basin Recreation	Ground Solutions herbicide application in Toll Canyon	Match	\$1,200.00
Park City Municipal Corporation	Staff Labor and mechanical removal contractors	Match	\$4,300.00
Park City Municipal Corporation	Park City Municipal Corporation - cost of chipping dead woody materials removed during vegetation thinning	Match	\$1,000.00
Snyderville Basin Special Recreation District	Staff Labor	Match	\$3,300.00
Vail Resorts	Staff Labor	Match	\$250.00
Park City Garden and Nursery	Staff Labor	Match	\$115.00
Volunteers	Garlic Mustard Games Volunteer Labor Hours	Match	\$3,623.00
ISM Grant - Low Elevation GM 2022-23	Herbicide Treatment	Match	\$13,495.00
ISM Grant - High Elevation GM 2023-24	Mechanical Removal, GIS Specialist, Inventory and Mapping, Outreach, Equipment Rental, Seed	Match	\$9,243.09
Total BIL			\$29,000.00
Total In-Kind	Partner and Volunteer In-Kind Match		\$13,788.00
Total State Match	State Grant Funds		\$22,738.09
Project Total			\$65,526.09