



# **SUMMIT CWMA FINAL REPORT 2022**

**EDRR Low Elevation  
Garlic Mustard Control  
In Summit County**

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## 01 PROJECT BACKGROUND

The Low Elevation Garlic Mustard ISM Weed Control program in Summit County is funded through the Utah Department of Agriculture and Food - Invasive Species Mitigation Fund, and Summit CWMA partner matching funds and in-kind donations. The project focuses on the Class 1B state noxious weed, garlic mustard (*Alliaria petiolate*) with the Class 1B noxious weed, Common St Johnswort (*Hypericum perforatum*) as a secondary target.

The program area was selected based on over 11 years of garlic mustard control data in Western Summit County. Much of the land is privately owned so outreach and active control efforts on private land is crucial.

The project focus is garlic mustard and Common St Johnswort removal and restoration of natural ecosystems for the protection of watersheds and water ways. The program additionally works to protect and enhance pollinator and wildlife habitat through outreach and suitable revegetation projects.

# \$85,000

ISM Grant Funds Awarded 2022 FY

Fiscal Agent: Summit County,

Project Manager: Ecology Bridge

## 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 and Common St Johnswort populations are mapped using a GIS based App called Field Map (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 monitored for status and control effect both target species.

Because mechanical control is labor intensive and costly, a combination of contractors, partner staff and volunteers is used. All chemical work is completed by licensed staff and commercial contractors.

# 10

Years ISM Grant Funded Garlic Mustard Control

8 years spring + fall treatments

5 years weeding remote locations

5 years thinning thick populations

2 years Garlic Mustard Games

## GENERAL CONTROL METHODS IN 2022

Manual/Mechanical Control



Two approaches enable us to reduce overall herbicide use while also getting better results than with herbicide alone.

- Dense Patches: Weed flowering plants to thin the mustard canopy to prepare for herbicide - more complete herbicide coverage using less herbicide.
- Small and Backcountry Patches: Weeding of flowering and rosette stages.

Herbicide Treatment



Herbicides are chosen based on species treated, environmental condition and land use. Herbicide rates are tailored for sites, species and locations and sensitive resources.

- 2,4-D (Amine): 64oz/ac plus MSM 60: 1.5oz/ac
- Aquaneet: 2qt/ac
- Escourt XP (partner contractors)

Cultural Control



Revegetation is used to introduce competition and when herbicide is not an option and manual methods to laborous, garlic mustard is burried to prevent germination while the seedbank ages and dies off.

- Revegetation: Native grass seeding
- Mulch: mulching in shaded residential areas

## 03 OUTREACH



### 2022 CONTRACTORS

#### INVENTORY/MONITORING

Ecology Bridge

#### MECHANICAL CONTROL

Ecology Bridge

Ground Solutions

Providia Management Group (PMG)

#### HERBICIDE

Ground Solutions

Green Leaf

EcoLawn

PMG

### Garlic Mustard Games

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.

GMG includes multiple 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.

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.

### HOA Partnership Program

In Summit County, many of the HOAs own open space and/or are adjacent to some form of public open space. Summit CWMA works to engage these HOAs to both educate residents and also prevent/control noxious weeds in open space to reduce spread to public lands. This is the fourth year we have partnered with local HOAs to assist with member outreach and obtain access to HOA open space.

The Ranch Place, Northshore, Jeremy Ranch, Hidden Cove, South Shore, The Oaks, and Solamere HOAs assist in advertising the program to their residents. In addition to advertising the program, the Moose Hollow HOA signs their open space up for treatment annually and assists in running a GMG event so residents participate and provide in-kind labor match.

# 4,934

Pounds of Garlic Mustard Pulled

5 weed pull events

25 volunteers

50 hours of volunteer time

1,422 lbs pulled by volunteers, 3,512 lbs by contractors

# 8

HOA Partners

4 years partnering with HOAs

27 Residents reached through HOA communications

3 HOA participants in Garlic Mustard Games

# 04

## TREATMENT RESULTS

A wet 2021 fall and 2022 spring led to high levels of germination and germination in areas garlic mustard has not been present for several years. Due to labor shortages, we were unable to treat as many areas as hoped prior to seed set.

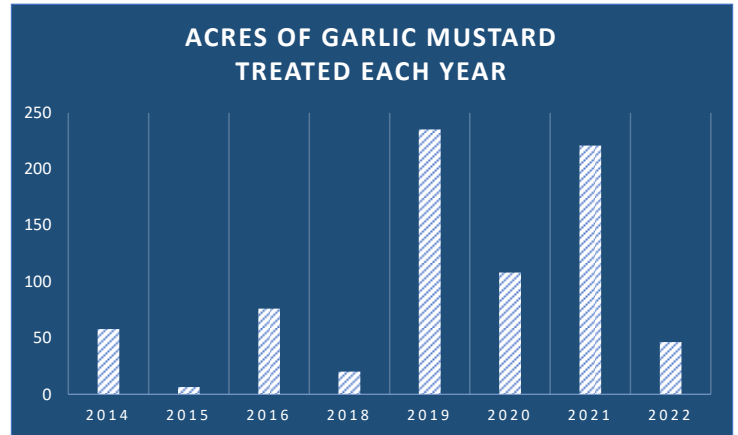
As in previous years, inventory efforts identified additional garlic mustard populations but no new Common St Johnswort was found. A 2022 goal was to inventory the edges of known garlic mustard populations at Moose Hollow, East Canyon Creek State Park, and Masonic Trail. East Canyon Creek State Park populations appear to be stable, while significant areas of new garlic mustard populations were mapped and Moose Hollow and the Masonic Trail.

Small patches of garlic mustard were manually controlled, while larger populations thinned with weeding where possible and then treated with herbicide. Due to multiple germinations of garlic mustard, several sites were treated twice July through November and some three times. Common St Johnswort was hand pulled where soils were loose (<1 ac) and treated with herbicide elsewhere.

To reestablish a competitive native community in areas previously invaded by garlic mustard, 2.23 acres were reseeded with native bunchgrass.

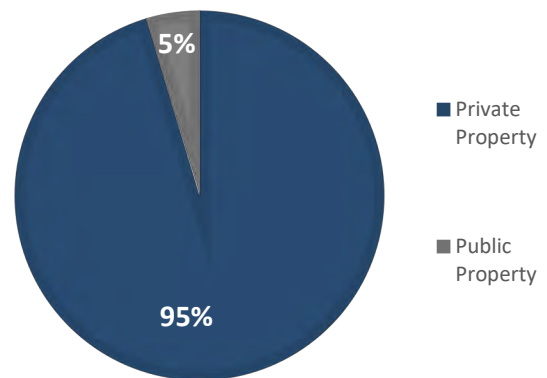
The ArcGIS Collector App continues to increase efficiency in management of control crews by allowing assignment of treatment work digitally and real time crew monitoring. However, some contractors still

struggle to accurately map control areas; accordingly, regular monitoring of the data and follow up with crews regarding data is necessary.



The number of acres treated varies annually due to variation in garlic mustard germination rates, labor availability and funding. In 2022, labor shortages limited control efforts.

### DISTRIBUTION OF TREATMENT ACRES



## 46.39

### Acres of Garlic Mustard Treated

- 12.17 Inventoried
- 18.29 Weeded
- 28.10 Treated With Herbicide
- 2.23 Revegetated

**Masonic Trail: Control Assessment Transects**



Pre-weeding 2018



Post-weeding 2018



2019

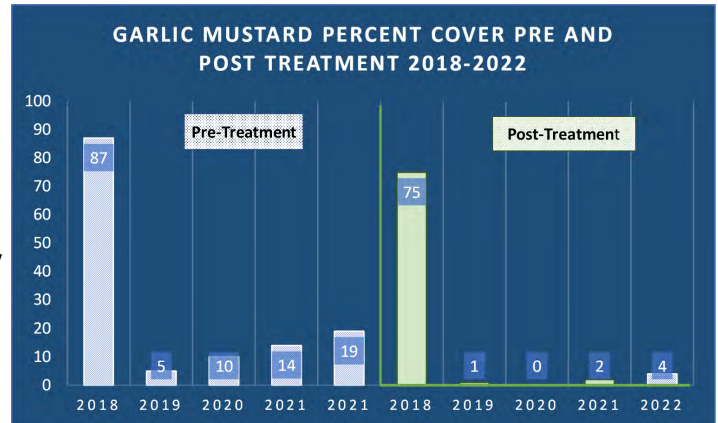


2021



2022

Garlic mustard at the Masonic Trail site was first treated in 2018. Since then, percent cover of garlic mustard has remained below 19% (70% less than original cover). A minor increase in seedlings was observed again in 2022 and a single herbicide treatment knocked it back. Inventory of the edges of this population led to discovery of additional dense populations downslope.

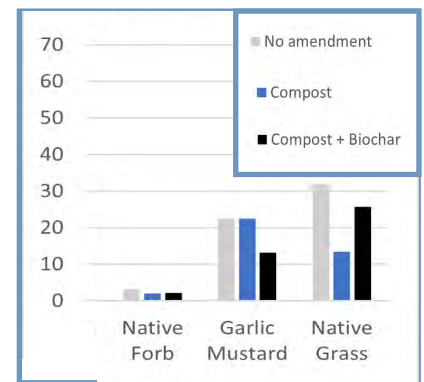


**Masonic Trail: Seeding Trials**

The Summit CWMA was awarded funding from the Utah Weed Control Association for revegetation seed mix, soil amendments and biochar trials for shady garlic mustard treatment sites. Shady sites had been difficult to revegetate due to the lack of an effective seed mix and possible soil legacy effects of garlic mustard allelopathy. However, the seeding trials remain relatively high in native bunchgrass cover with two species, blue wild rye (*Elymus glaucus*) and wheatgrass (*Elymus trachycaulus*) being dominant. In the fall of 2021, native forbs were seeded into 50% of each plot. Common yarrow (*Achillea millefolium*) and mountain lupine (*Lupinus argenteus*) were frequently observed with yarrow being the dominant forb. Interestingly, maple seedlings were also present in relatively high cover. An additional set of plots was established fall of 2021 to further test the value of soil amendment applications for seeding.

Within the original test plots, Seed Mix #1 and #2 were most successful; differences between the two mixes are negligible. In the expanded plots, Seed Mix #4 performed best overall, especially with no soil amendments. However, Seed Mix #1 performed better than Seed Mix #4 when compost and biochar were applied. Slender wheat grass clearly dominated across all plots with a wild rye component that varied but with no obvious pattern associated with treatments.

Native forb cover averaged 22-28%. Adding compost and biochar increased forb coverage by only a 6% in the original plots and made a negligible difference in native forb cover in the expanded plots. In addition, maple seedlings from the natural seedbank had 10-15% cover across the site.



Percent Cover by plant group and treatment in 2022

## Virginia Mine :

### Common St Johnswort Control and Revegetation

**Description:** Common St Johnswort dominated the site on the lower slopes, while the upper slopes had a mixture of garlic mustard, Dyer's woad and Dalmatian toadflax. Three years of control had significantly reduced noxious weed populations, particularly the Common St Johnswort; however, native vegetation was not recovering. On steeper slopes, seeding was followed by installation of erosion matting to prevent soil erosion and hold seed in place until plants could grow and stabilize the slope. The tops of slopes and more gradual slopes were treated with a compost/biochar soil amendment then seeded with native grass mixes created for drier hillsides and high mountain elevations.

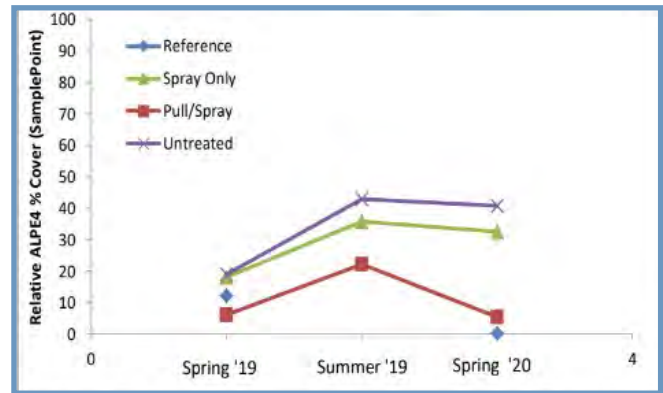
**Current Results:** Grasses are established in patchy distribution with greater establishment on less steep slopes where soil amendment was used. The use of amendments appears to be crucial in these mining-contaminated soils. Low grass establishment on steeper slopes may reflect contaminated soil issues. If funding allows, in 2023, additional seeding would use soil amendments to prepare the site prior to seeding.

*Left: During Restoration in 2020 and Right: 2023 midsummer*



### UDAF Monitoring

Britany Duncan of UDAF has been tracking transects at the Copper Moose Farms to track treatment success under the differing treatment methods. As of 2020 reports suggest thinning garlic mustard with weeding prior to herbicide treatment is more effective than spraying alone. Transects were not monitored in 2022 and are scheduled to be monitored 2023?



*Average relative percent cover of garlic mustard by treatment and year from ground cover plots.*

## 06 Challenges in 2022










Inconsistent participation of individual landowners continues to be a challenge. Each time a property goes two or more years without treatment, we see recovery of garlic mustard populations. In 2023, we hope to do targeted outreach to residents with parcels at public space boundaries to assess containment of garlic mustard within residential lands and where it has escaped. We will also target long treated parcels to maintain the progress made in previous years.

Some contractors continue to be inconsistent with the use of the ArcGIS App. This reduced the efficiency of communication and slowed planning of contractor assignments. We will continue to work with supervisors to increase data entry on site before moving to the next treatment assignment.

Exceptionally late fall rains and snow led to heavy garlic mustard germination late in the 2021 season. That plus a wet spring released garlic mustard at rates not seen in years and in areas that garlic mustard has been removed from or was never present before. This flush resulted in cover of flowering plants in 2022 that were difficult to keep up with. Along with labor shortages, this pulse year put previous success at risk.

## 07 Contributors to Success

The following is a list of the project components we found most effective.

-  Increasing the number of contractors > Timelier treatment
-  Survey 123 for electronic collection of consent forms for treatment
-  Advertising on the Summit CWMA and Summit County websites
-  Use of the Arc Field Maps > Coordinates contractors and makes data available to partners
-  Partnering with HOAs > Increases success of outreach programs and number of resident participants
-  Consistent partners and treatment
-  Pre-treatment monitoring/survey > Increases herbicide crew efficiency
-  Post treatment monitoring > Assess treatment effects and new growth
-  Local government and weed department support



## 08 Future Treatment Plans

### Inventory

In 2023, a primary goal will be to continue inventorying the edge of the Moose Hollow and Masonic Trail garlic mustard populations. We also plan to inventory the East Canyon Creek State Park areas near known garlic mustard and the associated boy scout camping site.

### Monitoring

As in previous years, we will continue monitoring the previous restorations, trials and transects including the treatment transects at the Masonic Trail, the two seeding trials at Masonic Trail as well as the Virginia Mine revegetation post Common St Johnswort control. In addition, we plan to reassess the distribution of garlic mustard at the Copper Moose Farm where control has been consistent since the start of the program and garlic mustard is declining.

### Outreach

The Summit CWMA website was completed in February of 2022 and has enabled the CWMA to more effectively educate the public and recruit volunteers and program participants. The event calendar will be the most important element which we can use to keep volunteers in the loop throughout the season. Several events are in the planning stages for 2023 and residents are following with excitement to compete in the GMG events again.

To increase contractor effectiveness, we will continue to hold the weed identification training we have provided partners in previous years. In 2023 there will be two trainings, April and June, to enable us to reach year-round staff that will begin in May and the seasonal staff that often do not start until June.

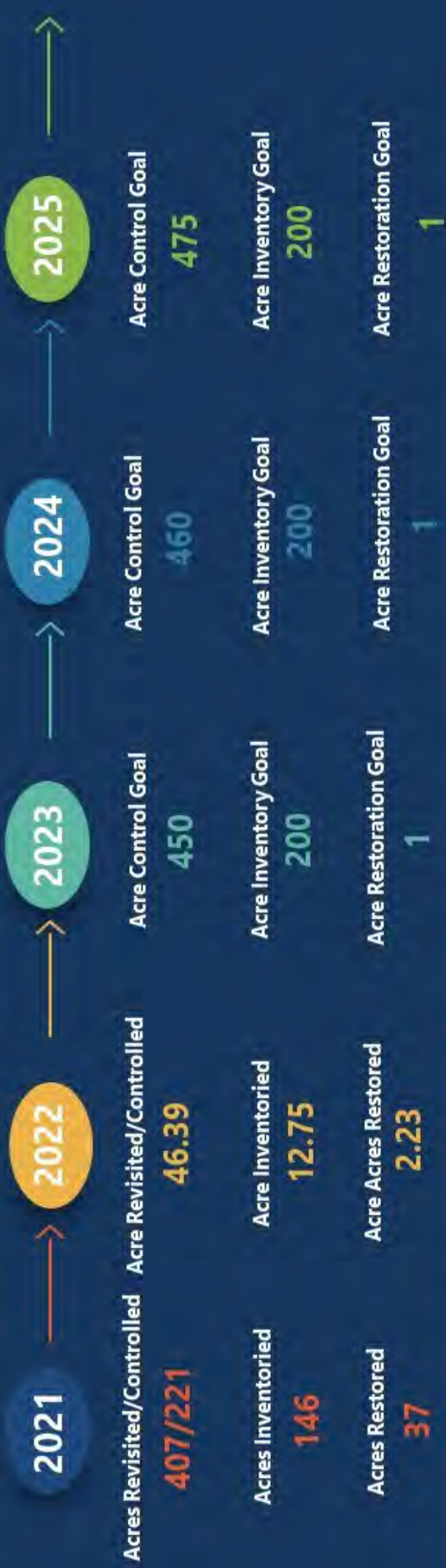
The Garlic Mustard Games will be held again in 2023 for which we have 6 community weed pull events planned, beginning in May and continuing through July or August. These events are critical to minimize contractor costs for mechanical removal by incentivizing residents and using good-hearted competition between community groups.

In addition, we will continue compiling a list of respectable weed control contractors and landscape crews that can assist residents with weed control. This list is on the Summit CWMA website.

## 09 Five Year Plan

### Summit CWMA Low Elevation Garlic Mustard Control Program 5-Year Plan

Garlic Mustard control began in 2010 as a partnership between the Summit CWMA, Salt Lake County and the Salt Lake Watershed. Garlic mustard has been treated using hand weeding, mulching, herbicide and restoration. Since the program began, over 1804 acres have been inventoried and 44 acres revegetated/restored. Each year we anticipate needing to control more acres as more populations are found during monitoring, but we also anticipate the treatment efforts can be reduced in areas that have been treated for more than 10 years allowing us to continue to treat a similar number of acres with less effort.



- ✓ Treatment, restoration and monitoring for new populations.
- ✓ Monitor 1 transect at the Masonic Trail to track control success and the UWSA funded seeding trials.

- ✓ Treatment, restoration and monitoring for new populations.
- ✓ Monitor 1 transect at the Masonic Trail and the UWSA funded seeding trials.
- ✓ Implemented 3 Garlic Mustard Games Events

- ✓ Continue monitoring Masonic transect and seeding trials. Continue to monitor restoration progress.
- ✓ Establish Transects
  - o Ketyly
  - o Mcleod Creek
  - o Moose Hollow HOA

- ✓ Continue monitoring the all 4 transect sites and seeding trials. Continue to monitor restoration progress.
- ✓ Establish 2 Restorations

- ✓ Continue monitoring the all 4 transect sites and seeding trials. Continue to monitor restoration progress.
- ✓ Establish 2 Restorations



## 09 Project Partners

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Thank you so much to our partners and sponsors for their contribution to this program. Thanks to the Utah Department of Agriculture and Food for funding this project. Thanks to the following partners and contractors for their participation:

### Government Partners

**Summit County**

Dave Bingham, Dan Pena, Jessica Kirby

**Park City Municipal Corporation**

Logan Jones

**Snyderville Basin Special Recreation District**

Matt Bengé

**Utah Department of Agriculture and Food**

Brittany Duncan

### Non-Profit & Academic Partners

**Park City Community Foundation**

Diego Zegarra

**Swaner Preserve & EcoCenter**

Nell Larson, Rhea Cone

**Utah Department of Agriculture and Food**

Brittany Duncan

**Utah State University Extension**

Elizabeth Cohen

**Utah Weed Supervisors Association**

Jerry Caldwell, Amber Mendenhall

### Local Business Partners

**Copper Moose Farms**

Ben Smaha

**Deer Valley Resort**

Laura Sexton and Paul Hedman

**Ecology Bridge**

Sara Jo Dickens, Betsy Hochman

**Woodward Park City**

Tom Butz

**Dakine and Arcade**

Judd Salvis

**Kate's Bars****Backcountry.com**

### HOA Partners

**Hidden Cove HOA**

Erin Ferfuson

**Jeremy Ranch HOA**

Tom Spencer

**Moose Hollow HOA**

Allyson and Ryan Dickey

**North Shore HOA and Ranch Place HOA**

Brenda Lake

**Southshore HOA**

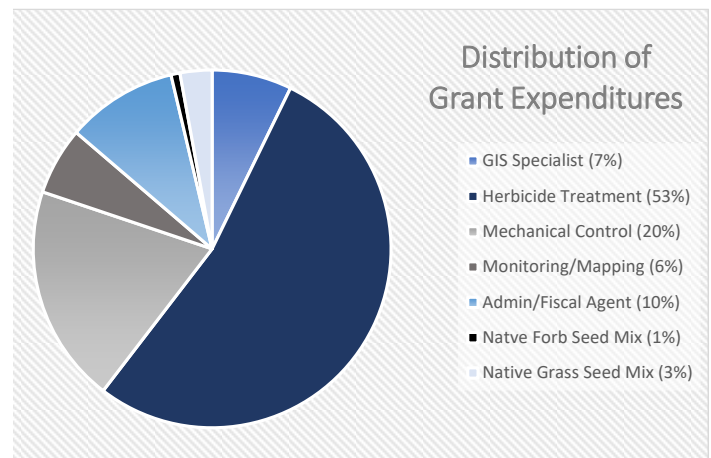
Insa Riepen

**The Oaks and Solamere HOAs**

Tom Mohor

## 11 Financial Summary

The project was awarded \$85,000 for July 1, 2021 to June 30, 2022. The Proposed budget allowed for \$8,500 to be spent on administrative costs (fiscal agent and project management). The remaining line item allotment and expenditure is defined in the table below. Summit County has continued to provide assistance with contacting residents with properties needing assistance, donating space for training, providing fiscal agent services and providing the Summit County weed book. USU Extension continues to provide their noxious weed book assist with outreach events. Many of the remaining partners provide in-kind matches via in-house labor and materials. In 2022, 50 volunteer hours were donated by the public via the Garlic Mustard Games and other independent hand weeding. Additionally, Deer Valley, Woodward Park City, Ecology Bridge, Dakine, Arcade, Kate's Bars, and Backcountry donated incentive items to raffle at GMG events. Overall, the grant funds were matched at 27% by in-kind donations.

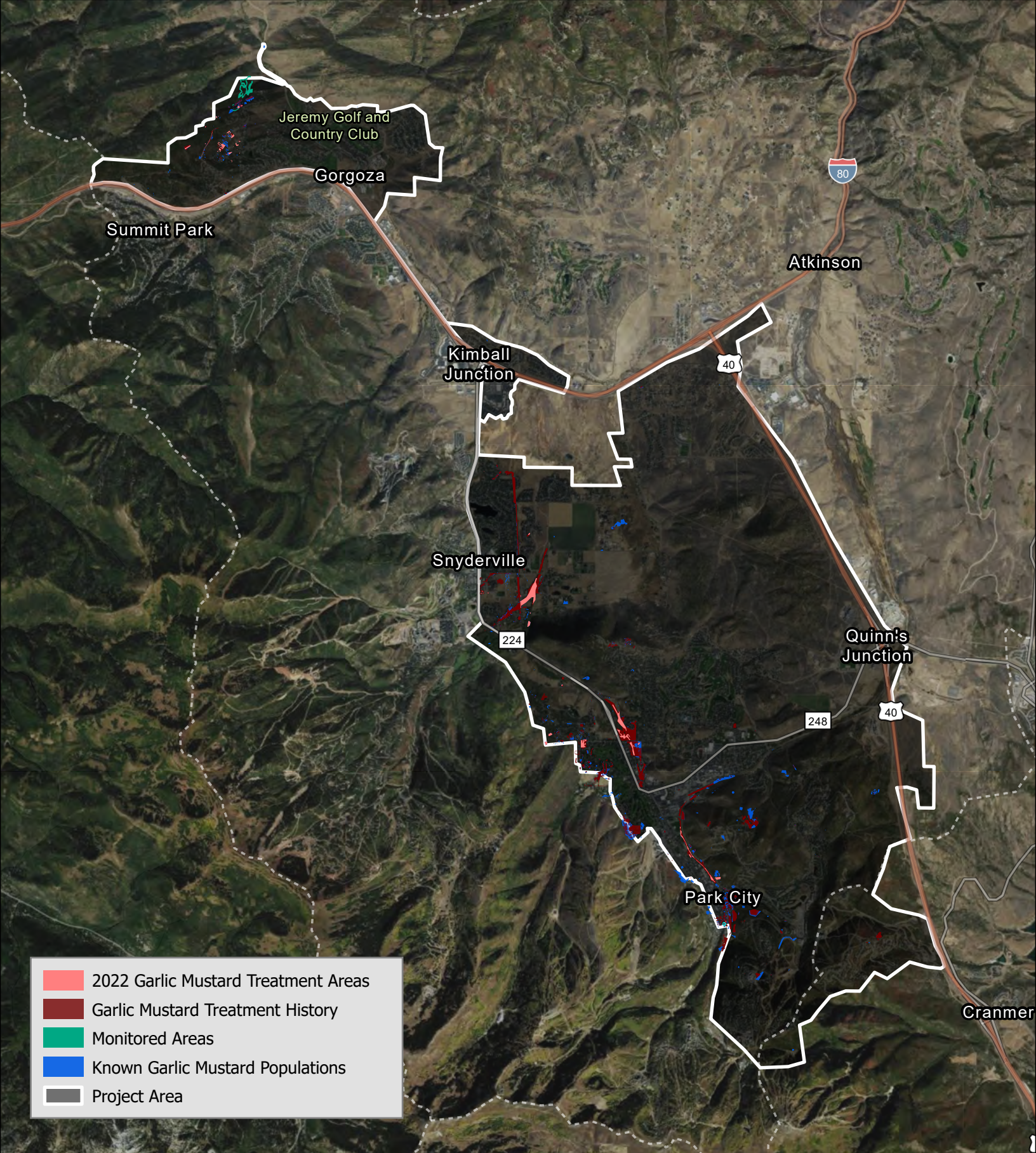


Grant Line Item	Description	Total Expense	Funding Source
Administrative Costs	Fiscal Agent and Project Management	\$ 8,500.00	ISM
GIS Specialist	Maintenance of GIS programs, apps and data	\$ 2,532.00	ISM
Herbicide Contractors	Herbicide Application	\$ 41,754.34	ISM
Mechanical Control Contractors	Hand removal	\$ 15,524.80	ISM
Monitoring/Mapping Contractor	Inventory of new and monitoring known populations	\$ 9,802.66	ISM
Herbicide	Weed Master	\$ 285.00	ISM
Native Forb Seed Mix	Native Forb Seed Mix	\$ 688.00	ISM
Native Grass Seed Mix	Native Grass Seed Mix	\$ 2,442.00	ISM
Labor	Garlic mustard mapping and control	\$ 15,553.75	In-Kind Match
Contractors	Garlic mustard and Common St Johnswort mapping and control	\$ 2,925.00	In-Kind Match
Equipment	Trucks, ATV, Spray Rigs, Backpack Sprayers, GPS	\$ 6,159.00	In-Kind Match
Herbicide	Escort and Weedmaster	\$ 2,182.75	In-Kind Match
Volunteer Incentives	Items for Garlic Mustard Games Drawings	\$ 1,935.00	In-Kind Match
Volunteer Hours	Volunteer manual control	\$ 1,150.00	In-Kind Match
<b>ISM Funded Total</b>		<b>\$ 81,528.80</b>	
<b>In-Kind Match Total</b>		<b>\$ 29,905.50</b>	
<b>Program Total</b>		<b>\$ 111,434.30</b>	

## 12 Conclusions

Treatment is reducing garlic mustard density and containing populations where treatment has been consistent over the last eight years. Several new, large populations in open space and some residential areas were found and many were treated. Given the extensive invasion in residential areas, accountability mechanisms are needed to motivate land owners to address their

garlic mustard. The new Summit CWMA website plus the Garlic Mustard Games is increasing awareness and participation in garlic mustard removal, but the extent of invasion necessitates even greater involvement. We anticipate 2023 will again be a big garlic mustard year and are working with local interest and recreational groups to increase volunteer participation.

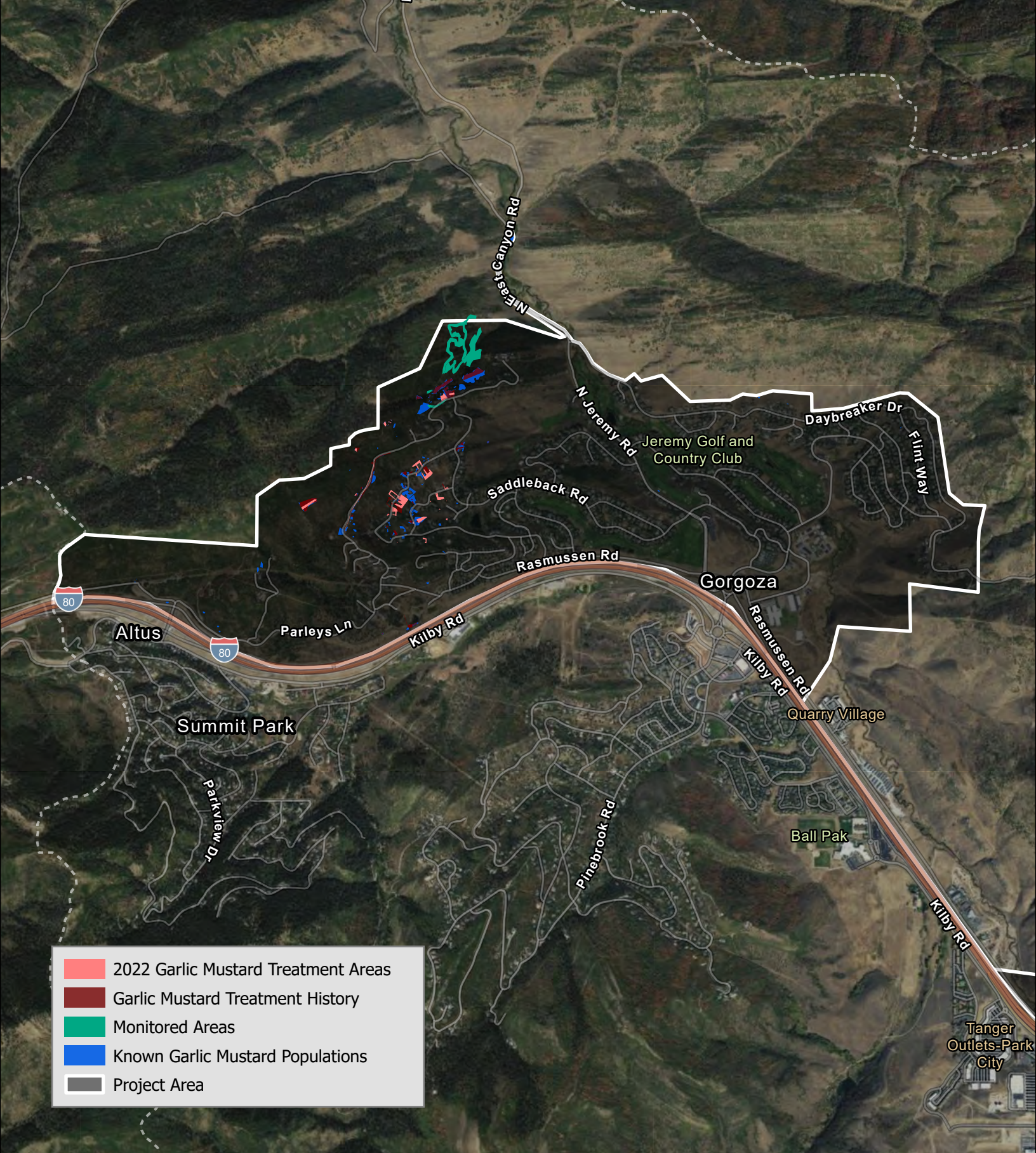


## Summit CWMA Low Elevation Garlic Mustard Control ISM Program 2021 Report

Treatment areas, treatment history, monitored areas, and known populations of garlic mustard for the full 2022 low elevation garlic mustard project area. Known populations data are cumulations of data since 2018.

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 3/3/2023

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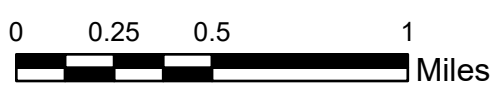


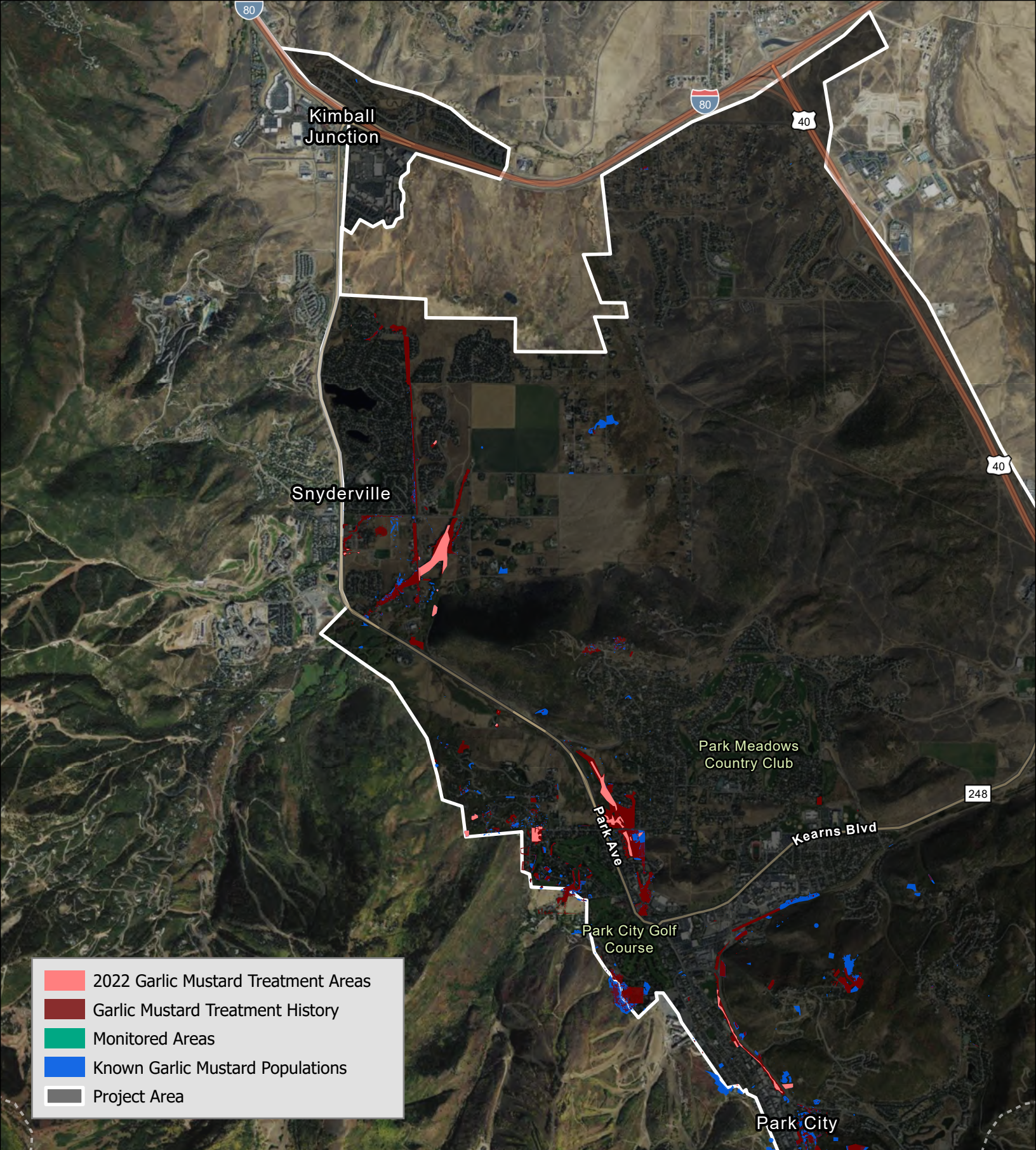
## Summit CWMA Low Elevation Garlic Mustard Control ISM Program 2021 Report

Treatment areas, treatment history, monitored areas, and known populations of garlic mustard in the Jeremy Ranch portion of the project area. Known populations data are cumulations of data since 2018.



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3/3/2023





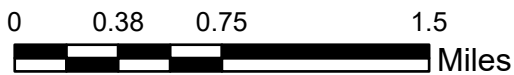
- 2022 Garlic Mustard Treatment Areas
- Garlic Mustard Treatment History
- Monitored Areas
- Known Garlic Mustard Populations
- Project Area

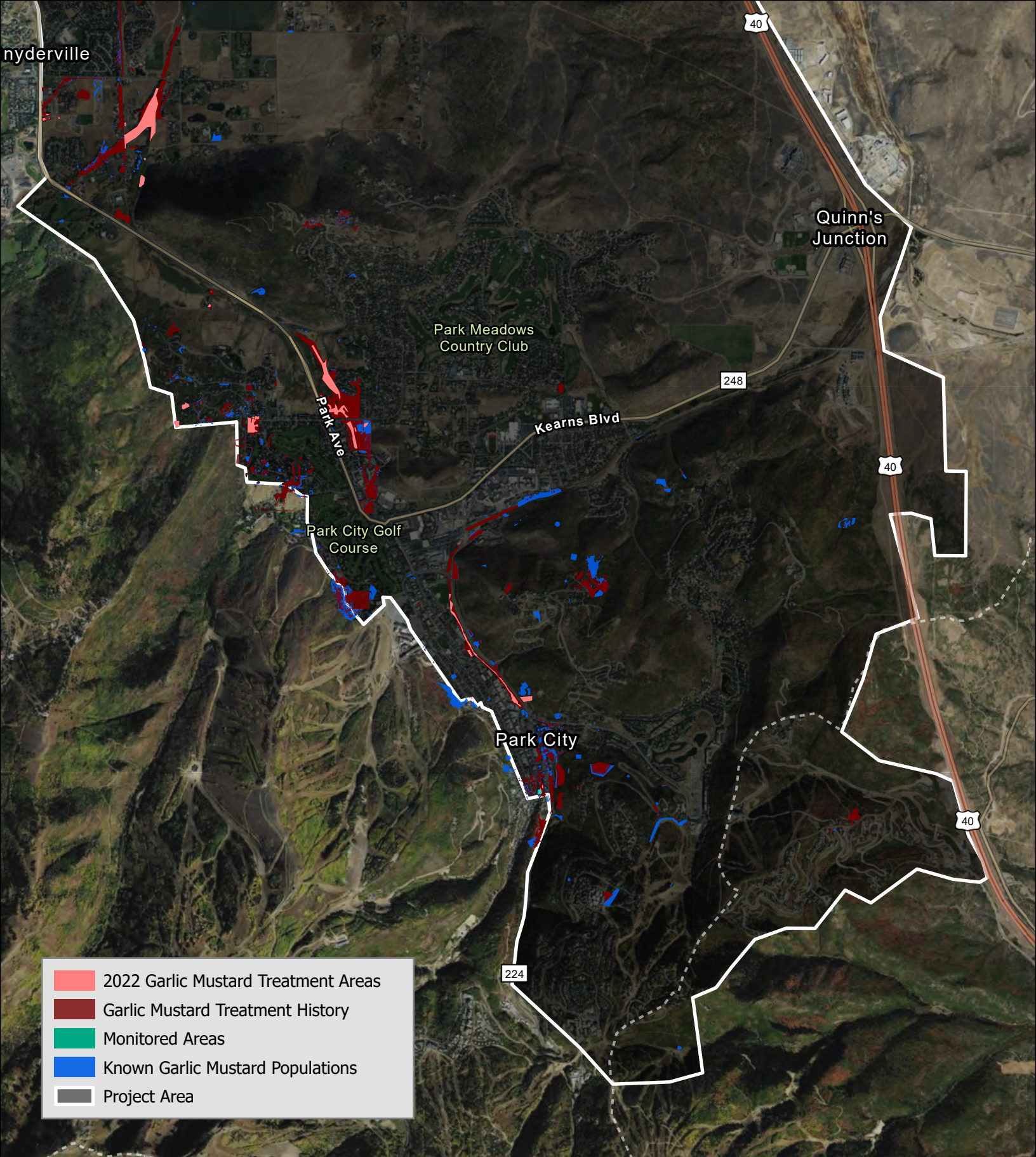
## Summit CWMA Low Elevation Garlic Mustard Control ISM Program 2021 Report

Treatment areas, treatment history, monitored areas, and known populations of garlic mustard in the Snyderville Basin. Known populations data are cumulations of data since 2018.



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## Summit CWMA Low Elevation Garlic Mustard Control ISM Program 2021 Report

Treatment areas, treatment history, monitored areas, and known populations of garlic mustard in and around Park City proper. Known populations data are cumulations of data since 2018.



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3/3/2023

