Summit CWMA High Elevation Garlic Mustard Control Program

January 2025

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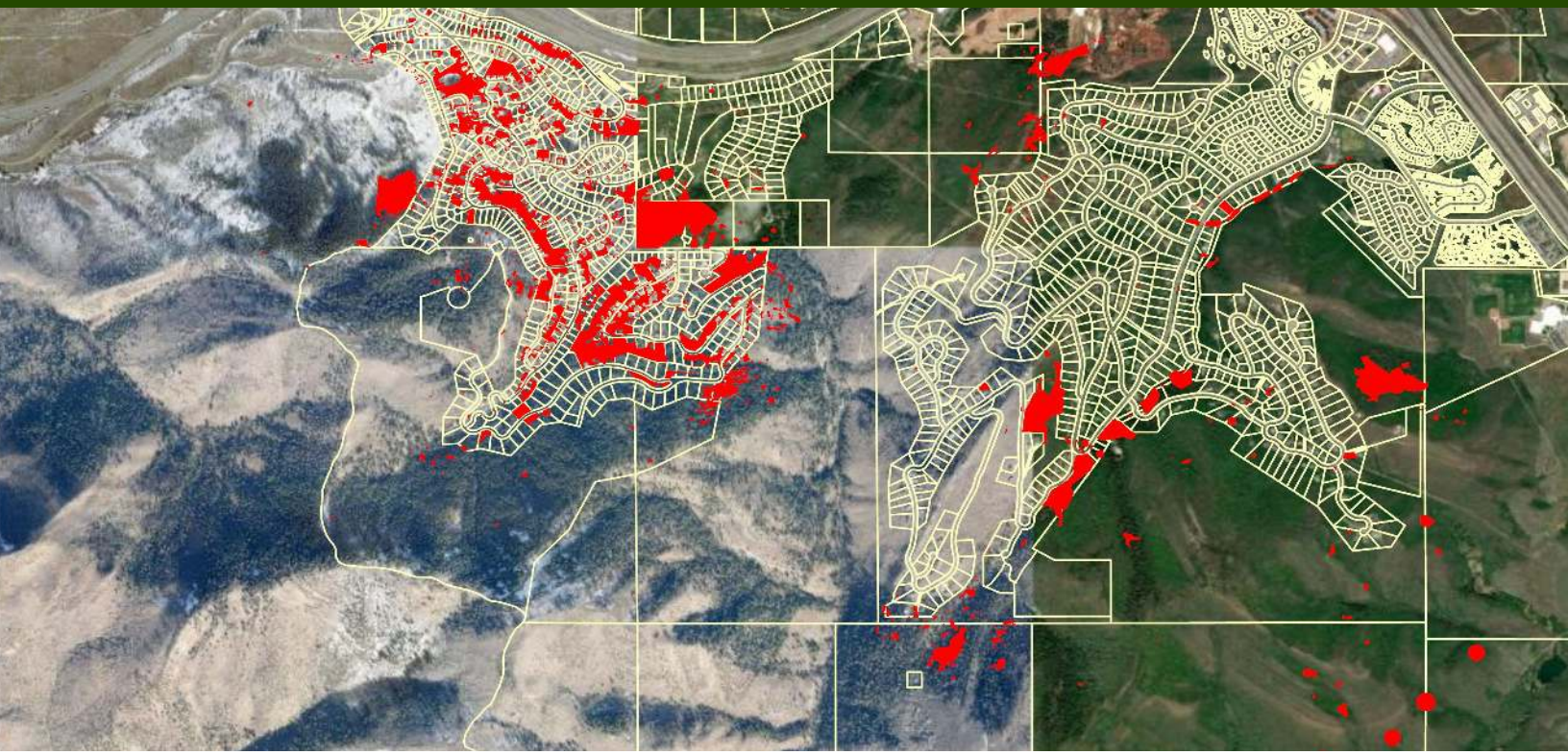
Ecology Bridge LLC



PROJECT DESCRIPTION

The focus of the High Elevation Garlic Mustard Control Program is the removal of the Class 1B state-listed noxious weed, garlic mustard (*Alliaria petiolate*). The ultimate goal of the program is the restoration of natural ecosystems for the protection of forest, shrublands and tributaries to the rivers of the Weber River and Salt Lake County Watersheds.

The High Elevation Garlic Mustard Control Project Area encompasses private and public lands where many residential and ski resort properties border locally and federally owned public open space. Proximity to vast wildlands makes early detection and rapid response (EDRR) of noxious weeds critical to the protection of watershed and wildlife habitat quality. Such wildland-urban interface (WUI) areas are challenging environments for noxious weed control due, in part, to the thousands of small (.2-1 ac) privately owned lots lining the forest edge. To effectively control garlic mustard, substantial outreach and partnerships are essential.

TREATMENT AND DATA COLLECTION

This integrated weed management program includes outreach, hand weeding, mulching, herbicide, vegetation thinning (to gain better access to weed populations), and revegetation.

ArcGIS Field Maps is used to map new garlic mustard populations (and other priority noxious weeds), and record treatment actions and herbicide rates. The app collects percent cover, dominant growth stage of the weed species, control method used (with herbicide rates) and the contractor or partner that applied treatment. The app is also used to record areas monitored and facilitate efficient use of herbicide crews.

Revegetation is applied at sites where the noxious weeds have been reduced to around 20% or less. Methods are site-dependent and are determined based on ecological conditions, current plant community, target community, and site accessibility.

Due to garlic mustard's affinity for moist, wooded habitat,

many areas of riparian habitat are invaded. Some of the areas are so overgrown due to long-term fire suppression and lack of vegetation management that crews struggle to access the garlic mustard to treat it. Thinning this overgrowth is used to increase accessibility.

Since much of the garlic mustard in Summit County is on private land and its distribution so vast, outreach and education are critical to effective control. The Summit CWMA partners with the Summit County Weed Department annually to hold weed identification and control trainings. Additionally, the CWMA hosts volunteer events and maintains a collection of factsheets and noxious weed resources for Summit County residents. The Summit CWMA uses a number of outreach methods and programs to increase community awareness and engagement in noxious weed control efforts.

Garlic Mustard Games

- A summer long series of community weed pull events.
- Incentivizes residents and visitors to participate in garlic mustard control.
- Increases hand-weeding of high-priority garlic mustard populations and reduces herbicide use in sensitive habitats.
- Educates community members and visitors about noxious weed impacts and treatment.
- Trail side garlic mustard pull stations with garlic mustard signage help to drive participation.
- Celebrates volunteers through opportunity drawings and an annual food truck party for top volunteers.

Garlic Mustard Games volunteers at Glenwood Cemetery and Crescent Ridge HOA.

TREATMENT METHODS

Inventory/Monitoring and Mapping

Inventory/monitoring is used to locate new noxious weed populations, evaluate their growth, assess treatment success, and identify retreatment needs. Mapping allows the CWMA to maintain a record of noxious weed populations' status and distribution, and record treatment and monitoring actions over time. All mapping is done using ArcGIS Field Maps. Data is updated in EDDMaps to the extent possible given our resources.

Manual Control

Hand weeding allows for rapid treatment of backcountry patches, reduces overall herbicide use, and facilitates complete herbicide coverage of plants .

Dense Patches: Flowering plants are weeded to thin the second-year garlic mustard canopy and allow more complete herbicide coverage of remaining second-year and first-year plants.

Small and Backcountry Patches: Both flowering and rosette stages are weeded.

Herbicide Treatment

Three herbicides are typically used; environmental conditions, land use, and applicator are considered when selecting one. Herbicide rates are also tailored for particular locations and sensitive individuals or resources.

2, 4-D (Amine): 64oz/ac, MSM 60: 1.5oz/ac or Aquaneet: 2qt/ac

Vegetation Thinning

Riparian and other areas of dense shrub growth are thinned of dead or laterally growing, unhealthy vegetation to increase accessibility for weed control crews. This work is generally accomplished with hand tools and small chainsaws. When possible, the wood is chipped and reused on site.

Revegetation

Seed mixes consist primarily of native bunch grasses; wildflowers are included when appropriate. In aspen forest, oak woodland, and dry shrubland, compost and biochar are often applied pre-seeding to enhance soil moisture retention for germinating plants.

Noxious Weed Ambassador Program

- Incentivizes and celebrates self-motivated volunteers that remove all species of noxious weeds from local open space.
- Station signage shows photos of common noxious weeds and describes the best control methods (in English and Spanish).
- QR code on the station signs allow volunteers to enter into a biweekly prize drawing.
- CWMA and its partners pick up bags and track the pounds of weeds pulled to share progress with the community via social media.

Noxious Weed Ambassador Program signs and volunteer station tool box at McLeod Creek. Residents of the adjacent HOA regularly help control musk thistle, houndstongue and garlic mustard at this location.

Hounds Against Houndstongue

- Provides information about houndstongue, emphasizing how easily it spreads via clothing and pets.
- Incentivizes participants to collect houndstongue seeds by hand and/or pull them off of their dogs post-hike with a prize for the human-hound pair that collects the most seed.
- Additionally, participants guess how many houndstongue seeds are in a jar to win a basket of dog-related prizes.

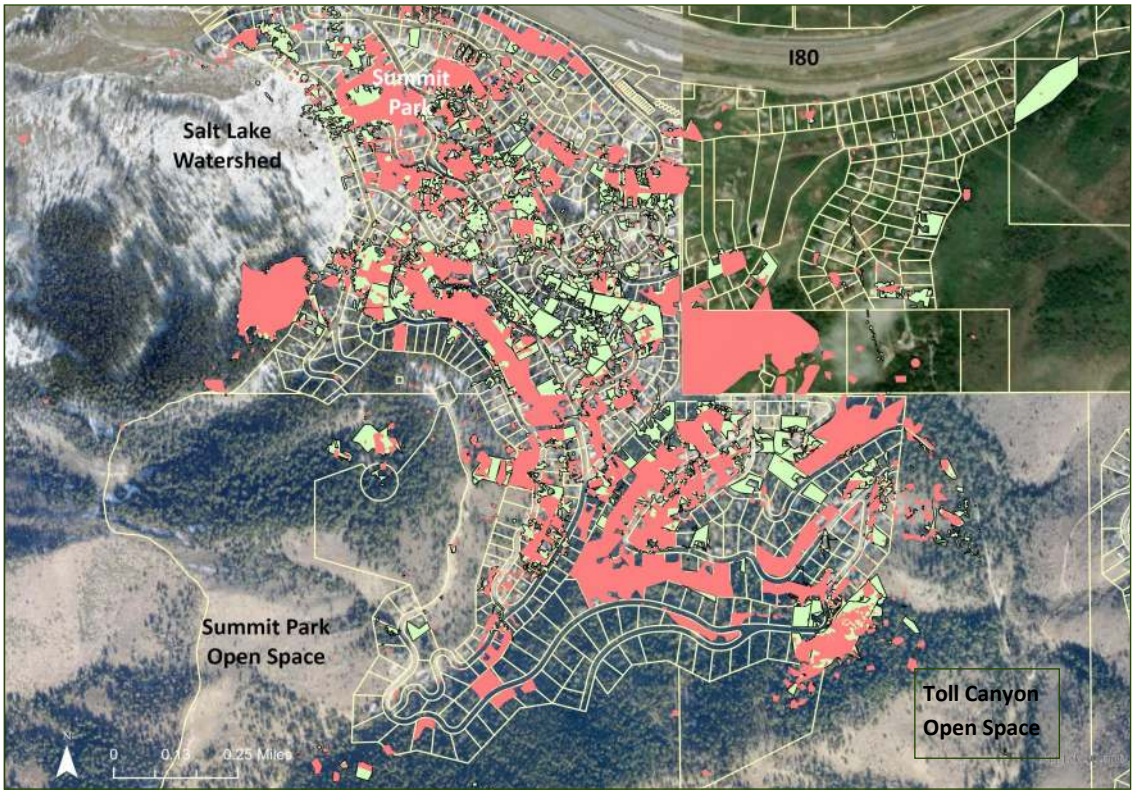
TREATMENT RESULTS

In 2024, 91 acres were inventoried and 301 acres monitored for the status of previously mapped populations of garlic mustard. Inventory priorities included portions of the Ontario Trail System, Iron Man Trail, the Iron Mountain community, portions of the Canyons Resort stream corridor, Sun Peak HOA Open Space, Utah Olympic Park (UOP) trails, Pinebrook Perimeter Trail, Ecker Hill trails, Toll Canyon, upper Summit Park Open Space, boundaries of the Armstrong population, the Spiro Trail and the new Seldom Seen Trail, and the Park City Garden and Nursery along its section of creek. We were unable to inventory much of the populations at Canyons Resort, Ecker Hill, Iron Man Trail and the Iron Mountain community, however, the remaining priority areas were inventoried. In addition to the areas initially targeted, we also inventoried portions of Discovery Ridge.

Monitoring priorities included: portions of Toll Canyon, Pinebrook Creek Trail, PRI Trail Systems, Sun Peak Creek Trail, Rotary Park, Treasure Hill, Crescent Ridge and the Poison Creek Trail. All of these targets were monitored and garlic mustard population data updated except for the Treasure Hill populations where approximately half the populations were revisited. New populations were discovered during monitoring of Treasure Hill, Sun Peak HOA and Pinebrook that appear to be associated with recent fire mitigation activities.

The garlic mustard populations in Summit Park and Timberline communities remain the largest combined population on private property in Summit County.

Volunteer prize baskets all donated by local businesses.



Summit Park and Timberline communities and the adjacent Summit Park and Toll Canyon Open Space. Pink polygons are current garlic mustard populations and lime green polygons are historic locations that ate now considered eradicated, but regularly monitored for reinvasion.

This may have more to do with the higher rates of participation in the mapping and control efforts by Summit Park and Timberline residents allowing us to better understand the extent of garlic mustard. Further mapping in areas such as Pinebrook, Enclave HOA and Old Town Park City would likely show equal levels of garlic mustard invasion on private lands, but these residents have had much lower participation rates in the CWMA programs. Garlic mustard populations on public and private property in Summit Park and Toll Canyon continue to decline where consistently treated.

Sun Peak HOA Creek area. *Pink polygons are current garlic mustard populations and white are historic locations now eradicated.*

Additionally, garlic mustard spread from residential areas to open space remains limited. The majority of garlic mustard in Summit Park continues to be on residential properties. Where an invasion line between the open space/Salt Lake Watershed and residential parcels has been established, maintaining this line is a high priority of this project as is the control of the remaining garlic mustard populations. Summit Park residents continue to be our most active participants in garlic mustard control, particularly on their own property. That said, an increase in second homes and nightly rentals in the community is resulting in an increase in the number of properties where control is not occurring.

In the Pinebrook HOA, garlic mustard along the main creek is declining in population size and density overall, however recent fire mitigation treatments have resulted in one new large population. In addition, garlic mustard along the HOAs perimeter trail system adjacent public lands have increased in size. Some populations have more than doubled in the last three years likely because the trails are steeper and harder to access for control. It is difficult to motivate volunteers to carry bags of weeds that distance and up the steep hills of these trails. Access to private properties in Pinebrook remains more limited than in Summit Park; consequently, the extent of

Sun Peak HOA Creek area. *Pink polygons are current garlic mustard populations and white are historic locations now eradicated.*

invasion within residential parcels of the Pinebrook HOA is less understood.

The garlic mustard populations of PRI below the Utah Olympic Park do not appear to have expanded and the majority of these populations are declining in percent cover of garlic mustard.

The nearby Sun Peak HOA has had substantial decline in the garlic mustard population in the main creek, however significant increases have occurred in the forest open space where fire mitigation treatments have recently occurred. This increase is also occurring in the neighboring Enclave HOA following fuels reduction work. Resident participation remains low in the Sun Peak HOA and is completely lacking in the Enclave HOA. The Sun Peak HOA is now under new management so the CWMA is in the process of bringing the new manager on board.

The Armstrong population remains the largest continuous garlic mustard population mapped on public open space in Summit County. This population is now mapped at 161 acres (15 of which is in the Crescent Ridge HOA and 40 acres in adjacent private properties), however the number and size of patches with declining percent cover increased substantially within the largest and primary sub populations. The greatest decline in extent has occurred along the lower Armstrong trail, the

Armstrong populations just off the Armstrong trail. While the population as a whole remains large, there are pocket of garlic mustard free or nearly free areas, particularly where garlic mustard games events have focused and areas USU Extension has been testing herbicide rates and combinations for garlic mustard control. Left: 2020, Right: 2024

ranches, a couple homes north of the main sub population and the areas surrounding the Crescent Ridge HOA (including the Glenwood Cemetery where Garlic Mustard Games have been held for four years).

The Iron Mountain community and Crescent Ridge Condominiums continue to have dense populations of garlic mustard. These residential populations are adjacent and down slope from the large Armstrong garlic mustard population. While the Crescent Ridge garlic mustard population has pockets of reduced percent cover, the majority remains dense. The Thaynes Canyon and Iron Mountain communities continue to have low participation rates in our programs and control efforts.

A total of 66 acres were treated in 2024 (42 ac hand weeded and 22 ac treated with herbicide). The significant increase in hand weeded acres is due to two things. First, the window in which herbicide treatment would be effective for garlic mustard control was especially short this season making it impossible to get contractors to many locations in time. Garlic mustard bolted, flowered and developed seed pods in a matter of three weeks at many locations. Once the seed pods were developed, treatment shifted to hand removal until plants fully senesced. At senescence, no further treatment was applied in order to minimize seed spread. Secondly, volunteer participation continues to increase through the Garlic Mustard Games resulting in an increasing number of acres hand weeded by volunteers. These volunteer efforts were crucial to our success, particularly in sensitive habitat such as along streams and creeks.

As always, the Toll Canyon Open Space and the Summit Park Open Space garlic mustard populations were treated. The Pinebrook Creek, Armstrong, Dawns, and Spiro trails were hand weeded as well as the most northern portion of the perimeter trails of Pinebrook. All populations in the PRI trail system near the Olympic Park, the trails of the Sun Peak HOA Creek, and Rotary Park were treated with a combination of hand weeding and herbicide treatment. The Prospector Trailhead area and the single garlic mustard population known on Bonanza Flat, along with several residential properties were treated with herbicide again in 2024. The boundary was assessed for spread, but no spread was observed.

PROJECT PARTNERS

We would like to thank all of our partners and sponsors for their contribution to this program. Thanks to the Utah Department of Agriculture and Food for funding this project.

Primary CWMA Member Partners

Ecology Bridge: Sara Jo Dickens
Summit County: Dave Bingham and Dan Pena
Snyderville Basin Special Recreation District: Maddie Nelson
Park City Municipal Corporation: Logan Jones, Hannah Halsted, David Jenkins, Adam Smath
Deer Valley Resort: Laura Sexton and Paul Hedman
Pinebrook HOA: Don Brown and Stephan Herrera
Summit Park HOA: Mike Quinones
Sun Peak HOA: Bill Riley
Utah Olympic Park: Jamey Kimball
Utah State University Extension: Elizabeth Cohen
Woodward Park: Tom Butz

Additional Partners

Vail Resorts: Nick Dana, Brett Johnson
Mountain Trails Foundation: Rick Fournier
Recycle Utah: Carolyn Wawra
Park City Rotary Club: Insa Riepen, Brooke Ahlberg, and Rob Ahping

Contractors

Ecology Bridge: Sara Jo Dickens
EcoLawn: Rob AhPing
EcoSolutions: Kelly Creamer
Greenleaf: Buck Bailey
Ground Solutions: Sterling Graham
Providia Management Group: Scott Pratt

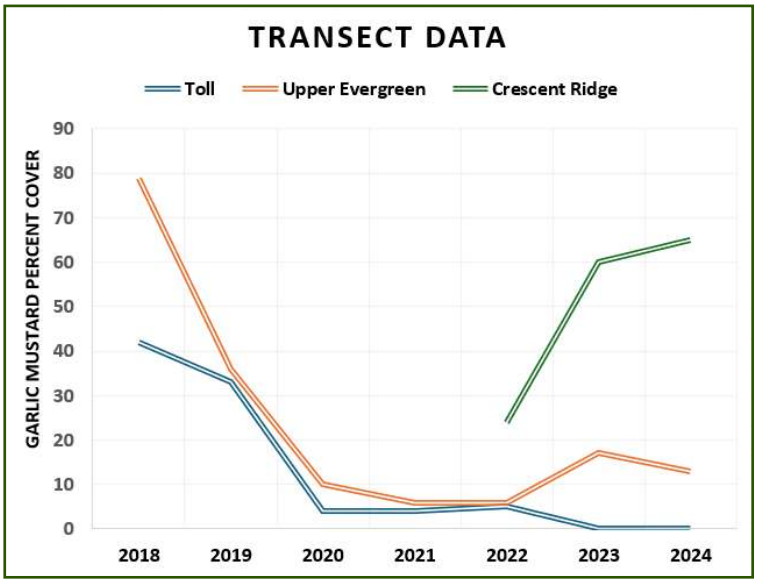
Additional Sponsors

Arcade Belts
Dakine
Kate's Real Food
Oleus
Fjallraven
Swaner Preserve and EcoCenter
Park City Film
Savoury Kitchen

Revegetation

Areas previously seeded in fall of 2020 (including Toll Canyon, Summit Park Open Space, Pinebrook Creek Trail, Poison Creek, and Prospector Trail) continue to support the establishment of seeded grasses. Two acres were seeded within the High Elevation Garlic Mustard Control Project area in 2024. Soil amendments were not used for these seedings as seeding trials conducted over the last 5 years indicate that seed availability, rather than soil quality, is likely the most significant factor in native plant community recovery in most of our invaded evergreen and aspen forest habitats. Those habitats where the use of compost or a compost + biochar blend would substantially increase native grass establishment generally are not showing the reduction of garlic mustard percent cover that the forested sites are. This reduced control success in these drier oak/maple shrublands generally has to do with shorter control windows resulting in inconsistent control year to year, whereas, the forest garlic mustard populations hold flower longer giving a longer window for treatment.

We will monitor these sites, and if any show poor native plant establishment, we may apply soil amendments and reseed in the future.



Percent cover of garlic mustard at the three transect locations within the High Elevation Garlic Mustard project area.

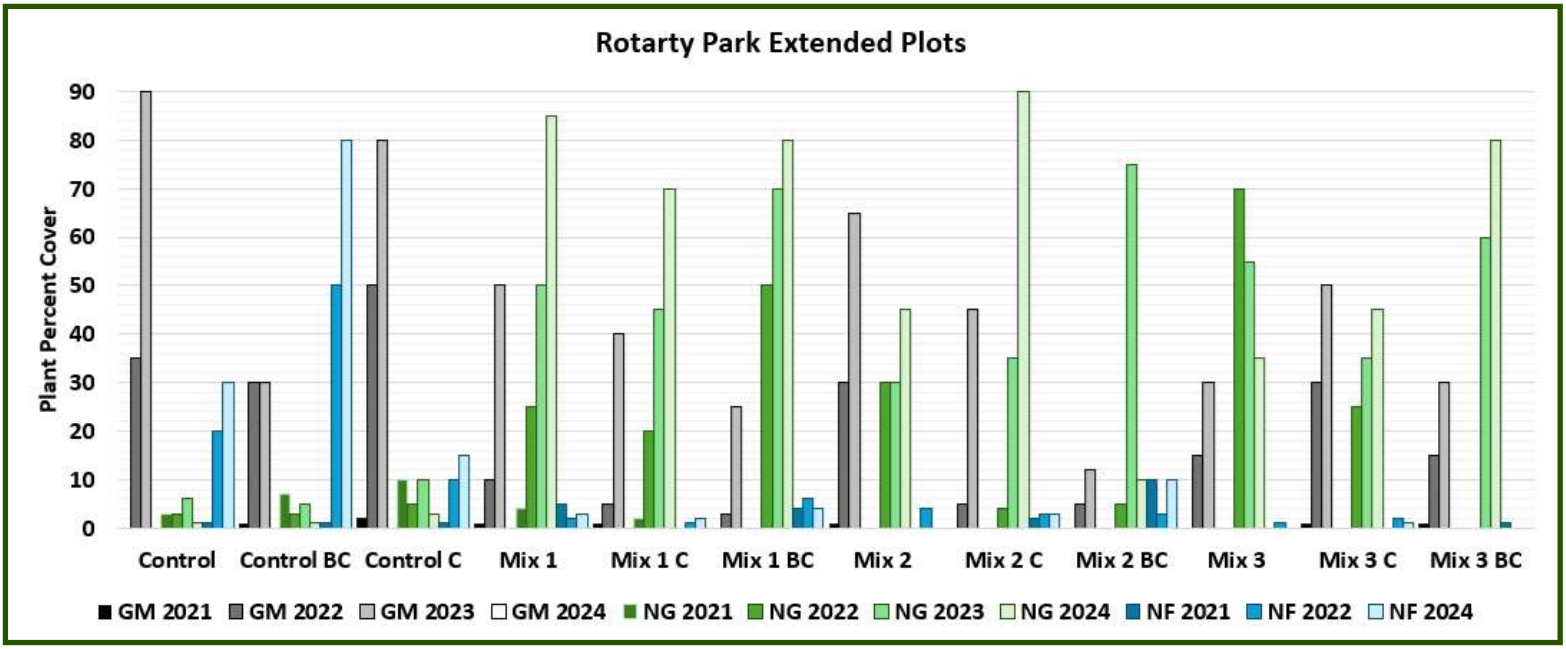
Transects

By 2020, the 570 Upper Evergreen site (Summit Park) had reached less than 10 percent cover of garlic mustard; in 2021, that coverage dropped to near zero. However, due to two years of perfect growing conditions, in 2023 percent cover increased to 17 percent and in 2024, 13 percent cover. Flowering plants accounted for the majority of the increase and these were hand weeded.

In 2024, the Toll Canyon transect remained nearly free of garlic mustard and native plant species are now dominant.

The Crescent Ridge HOA transect was at 24 percent cover in 2022 and has steadily increased to 65

Above: Toll Canyon transect in 2019 looking upslope. The barer portion in the middle consists of short garlic mustard plants. Left: Transect in 2024 looking upslope. The areas of garlic mustard are now filled in with native plants replacing garlic mustard.



Seeding trial plots established in 2021. Control plots received no seed all other plots received broadcast seeding of the corresponding seed mix, C - compost amendment, B = biochar amendment.

percent cover by 2024. This is a large site that has received varied treatment. The transect is located towards the western end of the population where treatment has been far less consistent than it has at the eastern side of the populations which is closer to the edge of the manicured lawns. In this eastern portion of the population, percent cover is closer to 25-40 percent with pockets of 10 percent cover. The CWMA had been working with the HOA to implement hand weeding through volunteer programs and a resident had been applying herbicide. That resident no longer volunteer's for the HOA so herbicide application has not occurred in the last two years.

Garlic Mustard - DuraCor Trials

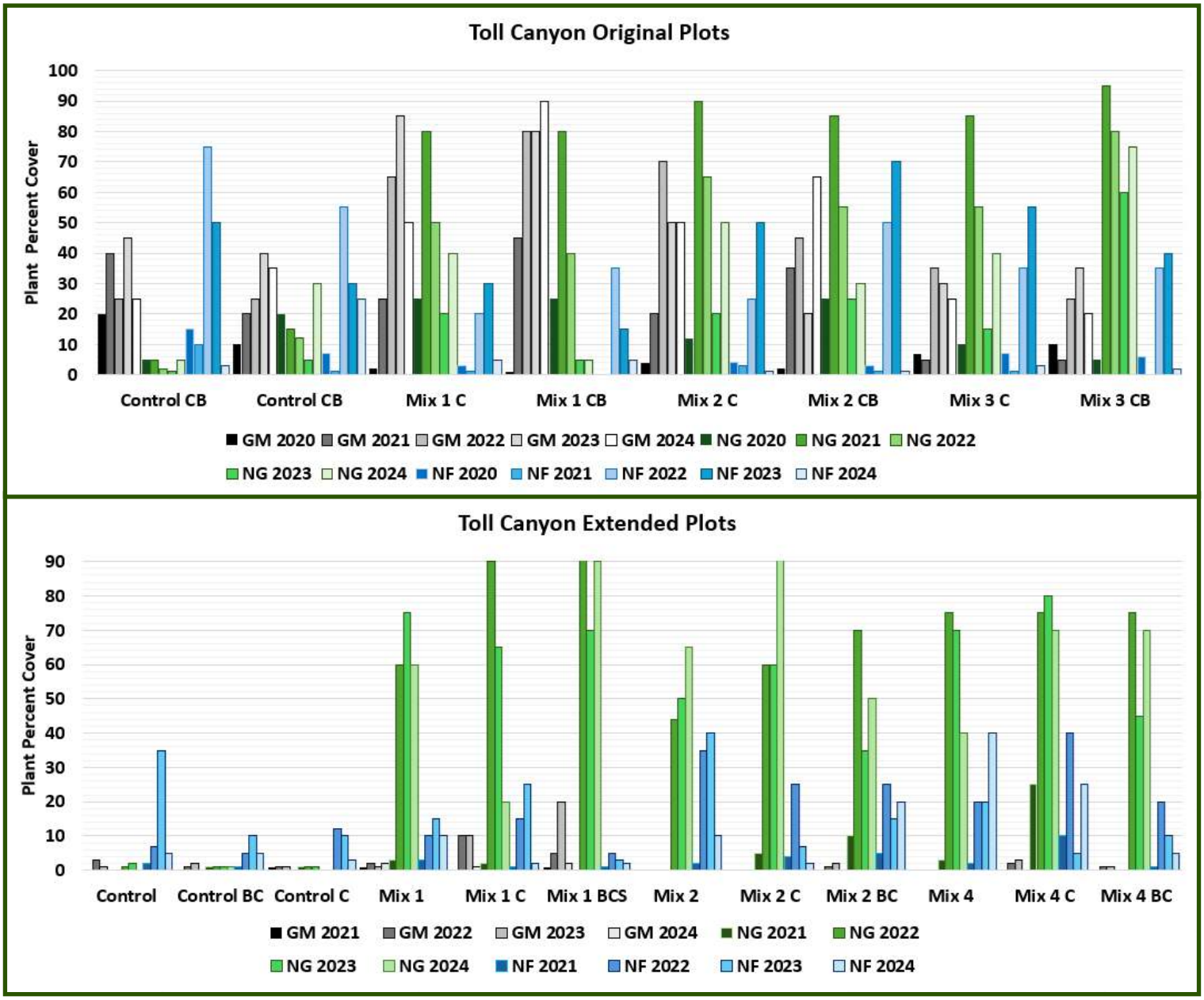
Herbicide trial plots were established in 2020 to test how long control would last and whether we could reduce overall herbicide use from 2-3 treatments a year for three years with 2,4D and Dicamba to one treatment every 3 years with DuraCor. The DuraCor nearly wiped out the garlic mustard year one, however by year two or three all plots, including the control (no treatment) plots, showed the same level garlic mustard cover indicating DuraCor does effectively control garlic mustard, however control will only last up to two years. of reduction. This concludes the DuraCor trial, plots will be removed in 2025.

Garlic Mustard - Seeding Trials

This will be the final year of reporting on the seeding trials in Toll Canyon and Rotary Park. The most useful results taken from this project were that, for native grasses, seed limitation was one of the primary drivers of low native grass reestablishment, but that seeding at high rates with native grass mixes can inhibit reestablishment of forbs. For this reason, seeding rates should be very low when using native grass seed in forest, particularly conifer forests. Additionally, soil amendments may be more helpful for reestablishment of native forb, but results varied. Some variation in both grass and forb response is likely due to annual variation in precipitation. All plots will be removed in 2025.

Rotary Park

Only the expanded seeding trial plots were monitored in 2024. The original trial plots had been flooded. Seed mix one with and without soil amendment continues to perform better or similar to the other mixes in conjunction with soil amendments. Seed mix two performed better with the biochar + compost in 2023, but by 2024, compost outperformed the biochar + compost. Over time, seed mix three has had reduced percent cover with seeding alone and the biochar + compost amendment substantially increased percent cover. For increasing native grass cover in this aspen forest, seed



All treatments received seeding with the corresponding seed mix except the control plots that did not receive seeding. B = biochar, C = compost, S = seeding. Top graph shows garlic mustard and plant functional group percent cover in pots over time in the original seed trials and the bottom graph shows the same results for the additional round of seeding trials that incorporated a full control and seeding with no soil amendments for the Toll Canyon site.

mix alone appears to be the most effective both in grass establishment and cost. However, native forbs do not appear to be increasing in the plots with higher native grass suggesting a low seeding rate would be advised to reduce competitive exclusion of native forbs by native grasses. Native forbs did the best under no seeding with the application of biochar + compost.

Toll Canyon

Both the original and the expanded seeding trial plots were monitored in 2024. Similar to the Rotary Park data, all control plots which did not receive seeding had very low native grass cover. Unlike the Rotary Park plots, native forbs in the Toll Canyon trials did not appear to be as hindered by native grass establishment. Additionally, the presence of garlic mustard did not appear to impact native grass or native forb establishment.

In the original plots, the addition of biochar + compost increased grass cover when using seed mix 3. The use of compost may have aided in grass establishment but

HIGH ELEVATION GARLIC MUSTARD ISM GRANT 2024 QUICK SUMMARY

12 Years
of funding Garlic Mustard Mapping and Control

Fiscal Agent
Summit County

Project Manager
Ecology Bridge

$65,000
ISM Grant FY 2025

9 Years
Using spring and fall treatments

7 Years
Thinning with weeding pre-herbicide

4rd ANNUAL GARLIC MUSTARD GAMES

91 ac INVENTORIED

301 ac MONITORED

42 ac HAND WEEDING (65% Treated Acres)

22 ac HERBICIDE (35% Treated Acres)

103 VOLUNTEERS

8 EVENTS

13,000 POUNDS

** Includes High and Low Elevation Program areas

REVEGETATION
2 Acres Reseeded

RESEARCH
2 Transect
3 Research Projects

since this round of trials lacked a seeded only treatment for each seed mix, it is not certain that compost was impacting establishment. This was addressed with the expanded plots which included the control treatments and seed only treatment for each mix. Garlic mustard percent cover has increased since the start of this trial due to a lack of control over this time. Herbicide applicators avoided the plots in order to prevent impacting the trials.

The expanded trial pots indicate that biochar + compost addition substantially increased grass cover in mix 1 and compost without biochar actually caused reduced grass cover except with mix 3. Regardless of the soil amendments, the results in 2024 agree with previous years in that revegetation in these forest are likely more seed limited than nutrient limited or inhibited by garlic mustard allelopathic soil legacy.

Organic Herbicide Trial

In 2024, the CWMA partnered with USU Extension and Ecology Bridge to conduct an organic herbicide trial. In the Summit CWMA project area, sensitivity around the use of herbicide is common and can prevent the use of herbicide on private lands. This trial is in response to information requests to USU Extension and the CWMA regarding the effectiveness of organic herbicides in controlling noxious weeds. Many of the organic products are not developed to address noxious weeds specifically so tests assessing effectiveness are lacking.

The trial tested 3 organic herbicides and the most commonly used synthetic herbicide for garlic mustard (WeedMaster), musk thistle and Canada thistle

Organic herbicide trial plots testing organic vs synthetic herbicide control of Canada thistle in Round Valley, Park City.

(Milestone for both thistles). Organic herbicides were sprayed three times with each treatment spaced 2-3 weeks apart as described by labels. The organic herbicides were selected such that differing active ingredients were represented. This included the following organic herbicides: Captain Jack's Dead Weed Brew (Caprylic Acid 2.62%, Capric Acid 2.17%), Weed Pharm (Acetic Acid 20%) and Firehawk™ Bioherbicide (Nonanoic Acid 2.8%).The synthetics were used according to their labels with treatment twice in the season, one early summer and one in the fall.

Initial results suggest that Weed Pharm and Firehawk may be effective on Musk thistle, but these organic herbicides do not perform as well as WeedMaster plus Milestone. Initially, all three of the organic herbicides reduced Canada thistle with Weed Pharm causing the greatest reduction, however, Canada thistle started to recover over time indicating that more applications would be needed, which may exceed the safety standards of their use. As was the case with musk thistle, the WeedMaster plus Milestone performed nearly twice as well as organics.

Garlic mustard, on the other hand, was reduced to near zero percent cover by all four herbicides. The organic herbicides reduced cover more rapidly than the synthetic, WeedMaster, but garlic mustard had some recovery in plots treated with organics. This recovery was minimal. Seed pods were desiccated or failed to fully develop using all four treatments.

At this early stage of this trial, it appears that some alternative herbicides can effectively reduce musk thistle and garlic mustard. Canada thistle appears to recover from herbicide impacts except with the use of WeedMaster plus Milestone. This is encouraging for use of alternative herbicides in residential properties by landowners and landscapers. Application of these alternative herbicides remains logistically infeasible given the difficulty of reaching all weed populations once in a season.

Interesting Plant Growth In 2024

Deformed flowering shoots formed after plants had already seeded, plants prolifically or minimally reflowered long after seed pods had formed and sometimes even after some pods had dropped seed. Plants covered in mites were far more common in 2024.

Upper Left to right: deformed flowering stalk, Upper Right: extensive mite infestation of flowering stalk, Lower Right: establishment of additional flowering stalks after plant had developed a few pods and stopped growth, Lower Left: reflowering post seed pod formation and death of upper stalk.

OUTREACH

Summit CWMA outreach is achieved through regular social media posts, appearances on the local radio station (KPCW), articles in local papers (Park Record), partnerships with local government and HOAs, and community volunteer programs.

A collection of factsheets are made available on the website and a growing number of these resources either are or include Spanish translations. A current partnership with the Park City Library and a grant from the Park City Rotary Club is translation of training videos to post on the CWMA website.

HOA Outreach Program

Many of our partner HOA open spaces are adjacent to or contain waterways and trails that lead to public open space. Consequently, treatment of these areas is extremely important for reducing garlic mustard invasion of public open space. Our HOA partnership program aids in the success of the CWMA by increasing the reach of resident outreach and volunteer recruitment

Garlic Mustard Games

Team Allison
2024
GMG Champ

Garlic Mustard Games events were held throughout Park City and the Snyderville Basin. In 2024, the Garlic Mustard Games program succeeded in removing over 13,000 pounds of garlic mustard (this total includes pounds pulled in both garlic mustard management areas). In all, 103 volunteers on 26 different teams participated.

Advertising on local radio, in local papers, on HOA websites, on Summit CWMA and partner social media, and through direct outreach to local interest groups generated large numbers of volunteers and many opportunities to educate residents about garlic mustard and other noxious weeds.

HOA Partners	Event Locations
Bear Hollow	Pinebrook Creek
Summit Park	Summit Park
Pinebrook Master	Rotary Park
Sun Peak	Crescent Ridge/ Glenwild Cemetery
Thayne's Canyon	Armstrong Trail
Crescent Ridge	

Hounds Against Houndstongue

The goal of Hounds Against Houndstongue is to teach hikers how easily houndstongue seeds attach to dog fur and spread to new locations. In 2024, the event was held at the base of PC Hill in Park City. A total of 76,700 houndstongue seeds were collected.

Noxious Weed Ambassador Program

Volunteers of the county-wide Ambassador Program pulled a total of 972 pounds of weeds which were collected across all Summit CWMA Control Program areas. Musk thistle, houndstongue and common burdock were the most commonly pulled noxious weeds through this program. This year the program ran from May- October.

CONTRIBUTORS TO SUCCESS

Multiple factors increased our ability to respond to weather, use time and money efficiently, collect high quality data, and share information across jurisdictions. The following is a list of the project components we found most effective.

A shared Summit CWMA map on the ArcGIS Field Maps allows for real-time mapping of new weed populations and treatment, and aids communication with all partners and contractors.

Local Government and Weed Department Support: Partnering with our county and municipal weed departments allows us to obtain grant funding, acquire herbicide for partners at affordable rates, incorporate noxious weed trainings, and treat priority weed populations on private lands when CWMA or county staff discovers them.

Consistent Partners and Treatment:

Communicating with and directing treatment is increasingly more efficient with consistent partners. As an understanding of treatment needs as well as policy requirements is already in place, treatment goes forward without interruption.

Outreach Communication:

Volunteer events and programs, along with radio, newspaper, fliers and social media continue to increase resident awareness and action.

CONCLUSIONS

Containment of garlic mustard populations and reduced population densities have been achieved where treatment has been applied consistently. New populations of garlic mustard continue to be discovered in open space and in residential areas. With continued, consecutive treatment, garlic mustard can be contained and, in some areas, may even be eradicated; however, ensuring private property owners control and monitor their properties for long enough to make progress is an ongoing challenge.

The Garlic Mustard Games continues to grow in popularity and participation. In 2024, volunteer participation remained high.

FUTURE TREATMENT PLANS

As we continue to find new garlic mustard populations, strategic use of resources and annual funds is increasingly important. In 2025, we will continue to use Arc Field Maps to map weeds, treatments and inventory. Due to the Summit CWMA's new status as a non-profit, the CWMA has qualified for Non-profit discounted licenses to ESRI software (maker of Arc Pro and Arc FieldMaps). All data will be transferred to this new license from the contractors license. This will also allow for more crew logins to better track data collection.

Treatment will continue to include manual and mechanical control, restoration and outreach. To further facilitate control efforts in overgrown areas, we will continue thinning overgrown vegetation and debris that prevents crews from accessing and controlling garlic mustard. Priorities in 2025 will be public open space and private lands adjacent to open space or major vectors of spread. Residential property owners will be asked to take on full responsibility for control unless they are within the above priority areas.

Outreach will become increasingly important as residents take on their own control responsibilities. Specific programs and resources we hope to add this year include recording and Spanish translation of our weed trainings and these sections to be made available on the CWMA website and distributed with assistance from the Park City Library Spanish Resources Program

and new opportunities to present for HOA boards and members to increase resident compliance.

FINANCIALS

In 2024, the Summit CWMA was awarded $65,000 for the 2024 state fiscal year (July 1, 2024-June 30, 2025). Additionally, $32,977.48 was carried over from the 2023 state fiscal year grant. This totaled $97,977.48 going into the 2024 season. $68,102.17 was spent in 2024, leaving $29,875.32 to be applied to work conducted spring of 2025. This grant was matched through partner in-kind donations. The total match was $55,926.89.

ISM Grant funded expenses for the 2024 growing season.

Line Item	Description	Expensed
Expensed January 1 - June 30, 2024		
Chemical	10 one gal bottles of WeedMaster	$300.00
Arc GIS Data/Mapping	Management of GIS databases, Updating Arc Field Maps, Updating Survey 123	$1,790.80
Outreach	Materials and labor for outreach programs including weed trainings	$1,609.23
Inventory/Monitoring	Inventory of new areas to map previously unknown populations and addition of EDDMaps data, Work with KPCW to get more residents to participate and report so we can map new locations.	$5,464.24
Mechanical Removal	Hand removal of 2nd year garlic mustard plants, Pinebrook, Toll Canyon, Summit Park, Rotary Park, Poison Creek	$13,501.54
Herbicide Treatment	Herbicide treatment of garlic mustard at Prospect Trail, Summit Park, Sun Peak HOA, Pinebrook	$3,195.70
Administration	Fiscal Agent Fees	$4,000.00
Administration	Project management, budgeting, partner correspondence, reporting	$3,115.97
Expensed July 1 -December 30. 2024		
Restoration - Grass Seed	Native grass seed mix and individual wildflower species seed: Longspur Lupine, Common Yarrow, Blue Prairie Flax	$2,683.00
Equipment - Rental	Dump Trailer	$1,827.83
Outreach Labor and Supplies	Partial labor costs for community weed pull volunteer/outreach programs: Garlic Mustard Games, Noxious Weed Ambassador Program, and Hounds Against Houndstongue program, Outreach materials: website additions, signage, weed identification trifold	$1,602.79
Monitoring	Contractors to monitor current populations, past restorations and Update EDDMaps data using ArcGIS data or directly in field.	$9,903.04
Mechanical Removal	Hand weeding first year plants	$14,611.50
Herbicide Treatment	Contractors to treat with 2,4D (150ac)	$564.20
Arc GIS Data/Mapping	Updating and maintaining GIS data	$161.28
Administration	Fiscal Agent Fees	$3,200.00
Administration	Project management, budgeting, partner correspondence, reporting	$571.05
Total ISM		**$68,102.17**

Grant and partner matches for the ISM Grant for the 2024 growing season.

Funding Source	Descriptions	Match Value
Deer Valley Resort	Downhill Mountain Bike Passes - GMG prizes	$206.11
Ecology Bridge	Additional administration, outreach and treatment costs - donated	$2,750.00
Park City Municipal Corporation	Manual control of garlic mustard, musk thistle. Dyers woad and Dalmatian Toadflax	$12,700.00
	Inventory and mapping	$7,075.00
Snyderville Basin Special Rec Dist.	Contractor: Manual control of garlic mustard, musk thistle. Dyers woad and Dalmatian Toadflax	$5,538.10
	Staff Hours: Garlic mustard and houndstongue	$6,831.00
	Volunteer hours: controlling garlic mustard	$267.68
	Inventory and mapping	$1,800.00
	Herbicide treatment: Garlic Mustard, Houndstongue, Thistle, Dyers Woad	$11,268.00
	Day passes to recreation center - GMG prizes	$30.00
Summit Co Noxious Weed Division	Labor for garlic mustard control	$2,000.00
	15 county books and 10 USU books donated	$125.00
	Presenting at the weed trainings	$300.00
Volunteer Hours	Treatment by volunteers	$3,104.00
Misc. Businesses	Volunteer program prizes and food donated by several businesses	$1932.00
Total		**$55,926.89**

HIGH ELEVATION GARLIC MUSTARD CONTROL PROGRAM: 4 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, thousands of acres of garlic mustard have been treated. The Summit CWMA partners with the Summit County Weed Department to hold two free noxious weed trainings annually, and, as of 2023, the CWMA runs three volunteer programs to incentivize community participation in weed control: the Garlic Mustard Games, the Noxious Weed Ambassador Program, and Hounds Against Houndstongue.

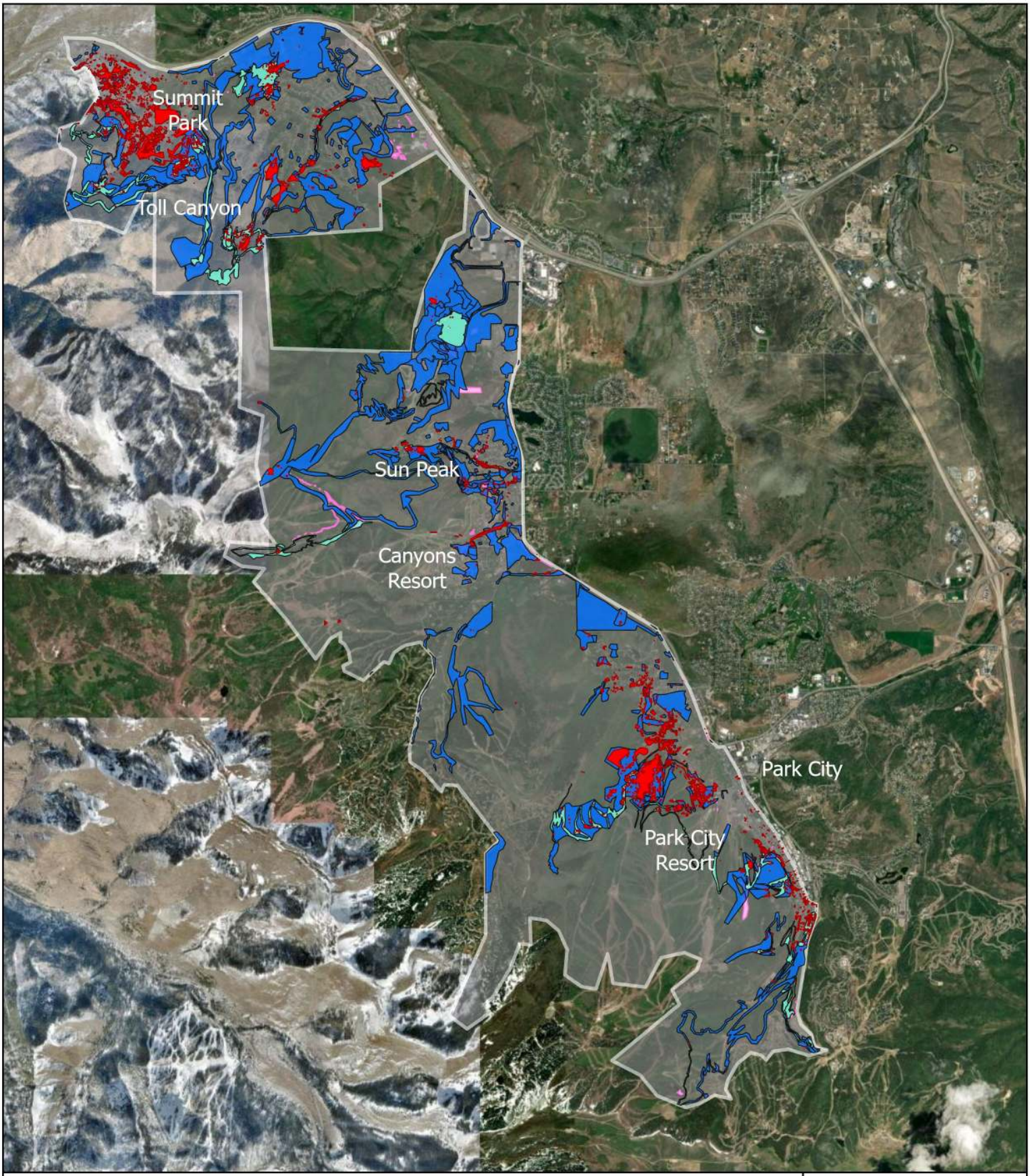
2023	**INVENTORED** 287 Acres	**MONITORED** 4 sites	• DuraCor Trials • Toll Canyon Seed Trials • Toll Canyon and Upper Evergreen Dr Transects
	CONTROLED 90 Acres	**SEEDED** 41 acres	• Summit Park Open Space - No Worries Trail, Parkview Dr trailhead
	THINNED .12 Acres	New - Thinning of overgrown riparian vegetation in the Canyons Village to increase access to garlic mustard populations that have previously gone untreated because crews could not physically reach them.	
	OUTREACH	• 1 KPCW appearance, 1 Park Record article • New - Noxious Weed Ambassador Program including a Spanish translation • New - Hounds Against Houndstongue Event	

2024	**INVENTORIED** 91 Acres	**MONITORED** 301 Acres, 4 sites	• Toll Canyon Seed Trials, DuraCor Trials, Organic herbicide trials • Toll Canyon and Upper Evergreen Dr Transects
	CONTROLED 64 Acres	**SEEDED** 2	• 2 maintained acres
	THINNED 0 Acres	None	
	OUTREACH	• 2 KPCW appearances, 1 Park Record article • All 3 volunteer programs • Created noxious weed identification and treatment trifold (English & Spanish)	

2025	**INVENTORY GOAL -** 270 Acres	**MONITORING GOAL**	• New: Organic herbicide trials - Armstrong and Park City Nursery • 3 sites: Toll Canyon, Upper Evergreen Dr, thinning site Transects
	CONTROL GOAL - 5060Acres	**RESTORATION GOAL**	• 6 maintained acres
	THINNING GOAL - .1 Acres		
		• Translate and add a Spanish translation of weed training to the website	

2026	**INVENTORY GOAL -** 250 Acres	**MONITORING GOAL**	• 3 sites: Toll Canyon, Upper Evergreen Dr, thinning site Transects
	CONTROL GOAL - 100 Acres	**RESTORATION GOAL**	• 1 new acres, 4 maintained acres
	THINNING GOAL - .1 Acres		

2027	**INVENTORY GOAL -** 250 Acres	**MONITORING GOAL**	• 2 sites: Toll Canyon and Upper Evergreen Dr Transects
	CONTROL GOAL - 150 Acres	**RESTORATION GOAL**	• 2 new acres, 5 maintained acres
	THINNING GOAL - .1 Acres	Canyons Village	



High Elevation Garlic Mustard
2024 ISM Grant Treatment

0 0.4 0.8 1.7 2.5 Miles

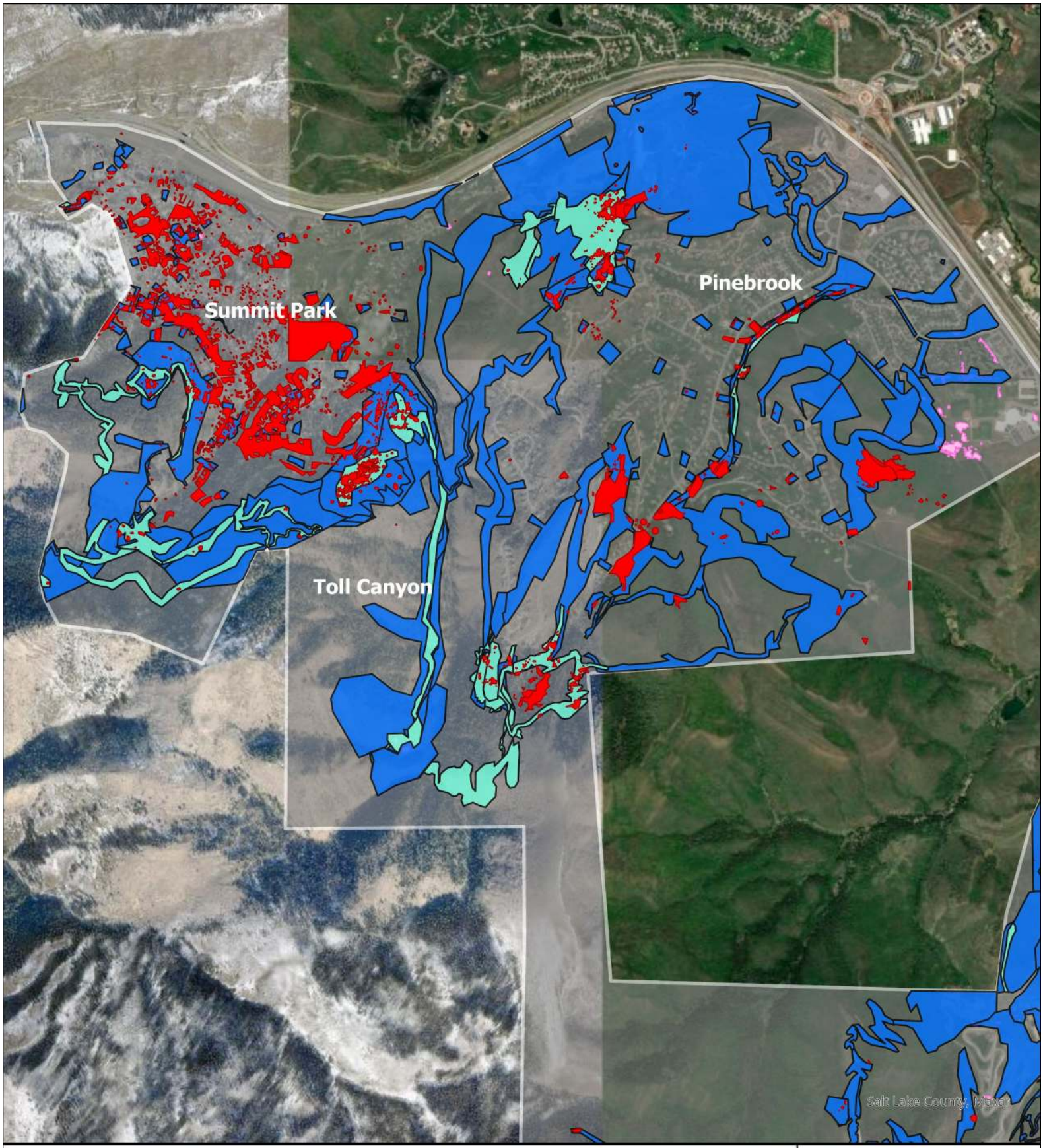
N

SUMMIT CWMA

High Elevevation GM Management Area
- High Elevevation GM Management Area
- 2024 Garlisc Mustard Treatment
- Garlic mustard

Inventoried and Monitored
- 2024
- Prior Years

Prepared: February 12, 2025
Sara Jo Dickens, PhD,
Ecology Bridge LLC
jo@ecologybridge.com



High Elevation Garlic Mustard
2024 ISM Grant Treatment:
Summit Park and Pinebrook Area

0 0.1 0.3 0.6 0.9 Miles

N

SUMMIT CWMA

High Elevevation GM Management Area
- High Elevevation GM Management Area
- 2024 Garlisc Mustard Treatment
- Garlic mustard

Inventoried and Monitored
- 2024
- Prior Years

Prepared: February 12, 2025
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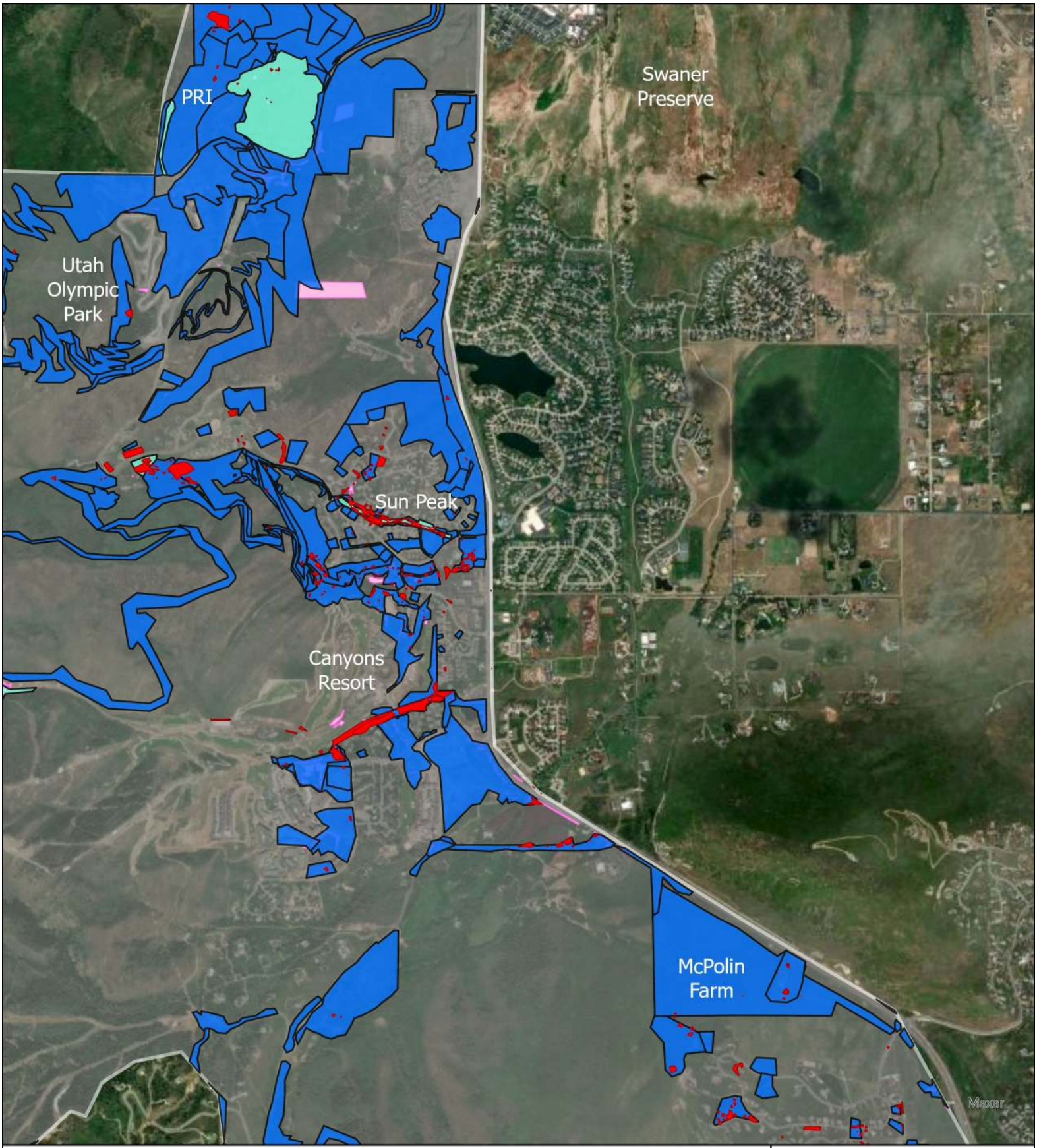

High Elevation Garlic Mustard
2024 ISM Grant Treatment:
Snyderville Basin Area

0 0.1 0.3 0.5 0.8 Miles

N

High Elevegation GM Management Area
High Elevegation GM Management Area
2024 Garlisc Mustard Treatment
Garlic mustard

Inventoried and Monitored
2024
Prior Years

SUMMIT CWMA

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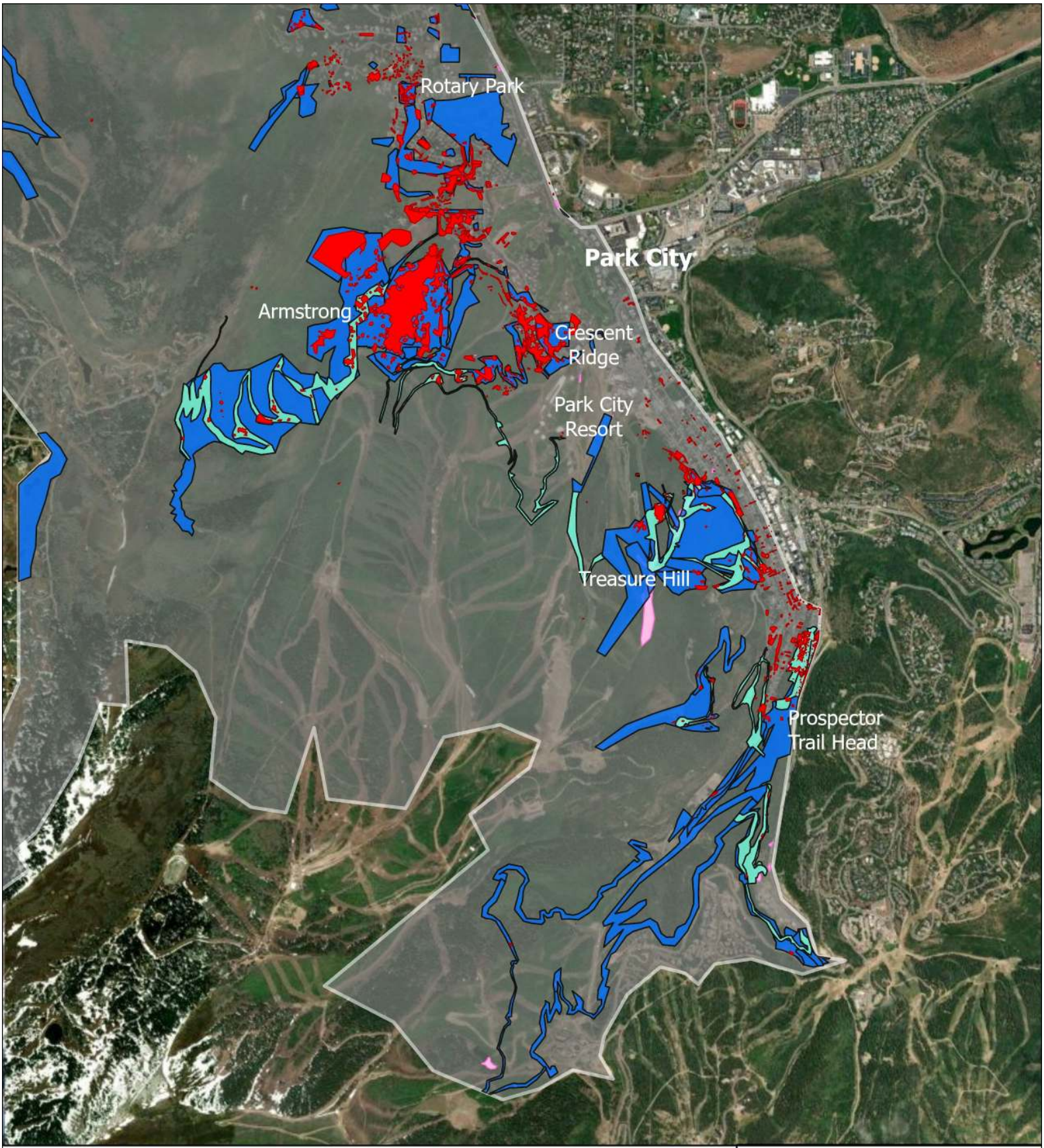

High Elevation Garlic Mustard 2024 ISM Grant Treatment: Park City Area

0 0.1 0.3 0.6 0.9 Miles

N

High Elevevation GM Management Area
High Elevevation GM Management Area
2024 Garlisc Mustard Treatment
Garlic mustard

Inventoried and Monitored
2024
Prior Years

SUMMIT CWMA

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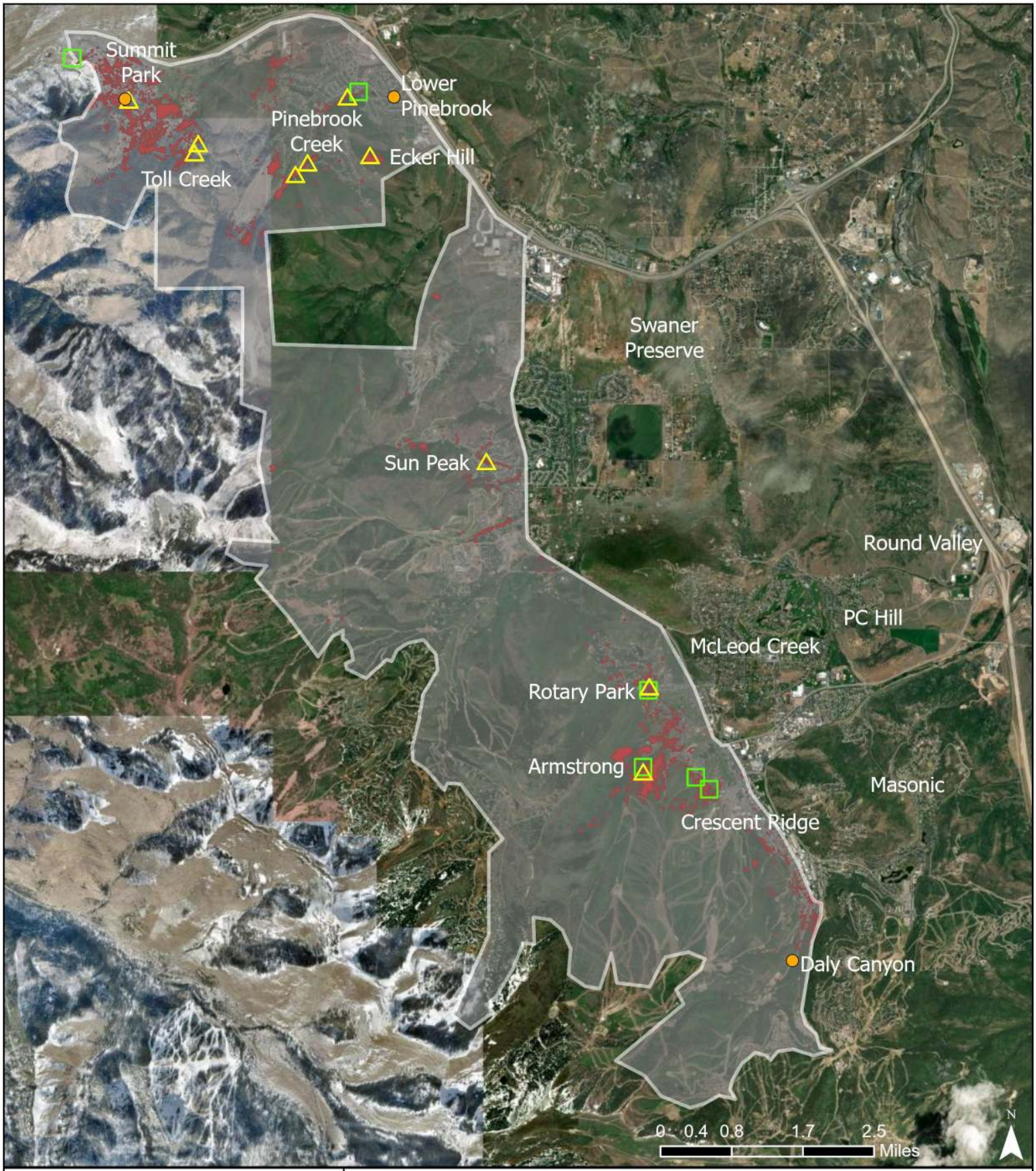

High Elevation Garlic Mustard 2024 Programs and Research

Prepared: February 12, 2025
Sara Jo Dickens, PhD,
Ecology Bridge LLC
jo@ecologybridge.com

Research / Program Type
- DuraCore Trial
- Organic Herbicide Trial
- Seeding Trial
- Transect
- Noxious Weed Ambasador Stations

Garlic Mustard Games Locations
- Event
- Volunteer Station

High Elevation GM Management Area
- High Elevation GM Management Area
- Garlic mustard

Seeding Trial Seed Mix Compositions

Common Species Name	*Latin Name*	Seed Mix 1	Seed Mix 2	Seed Mix 3	Seed Mix 4
Alpine Bluegrass	*Poa alpine*	20			
Arizona Fescue	*Festuca arizonica*			5	10
Big/Sandberg Bluegrass	*Poa secunda*			9	10
Blue Wildrye	*Elymus glaucus*		20	14	30
Fringed Brome	*Bromus ciliates*	20			
Mountain Brome	*Bromus marginatus*	10	10	20	25
Prairie Junegrass	*Koeleria macrantha*		20	5	
Rocky Mountain Fescue	*Festuca saximontana*	20			
Slender Wheatgrass	*Elymus trachycaulus*	10	10	20	25
Spike Tricetum	*Trisetum spicatum*		20		
Streambank Wheatgrass	*Elymus lanceolatus*	20		20	
Tufted Hairgrass	*Deschampsia cespitosa*		20	5	