

**ISM Garlic Mustard**  
**2018 Manual Control and Monitoring Report**  
**November 27, 2018**



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# ISM Garlic Mustard Ecology Bridge LLC. 2018 Manual Control and Monitoring Report

## Manual Control and Monitoring Location Summary

Ecology Bridge provided manual control and monitoring during the months of May-October of 2018 in the Salt Lake Watershed, Summit Park, Pinebrook, Jeremy Ranch, Snyderville Basin and Park City. The majority of the work was conducted late May through August. Nine and a half acres within sixty two residential, private parcels were manually controlled, and four and a half acres of 9 publicly owned or open space parcels were manually controlled. Seven new transects were established in Summit Park and Park City. See Appendix Maps for monitoring and weeding locations.

Table 1. Summary of the number of parcels and acres treated manually and monitored in the three focus areas of Park City, Snyderville Basin and Summit Park, as well as the sub areas of Snyderville Basin Special Recreation District (SBRD) Open Space, Pinebrook and Jeremy Ranch within the Snyderville Basin focus area and the sub-areas of Salt Lake Watershed, SBRD Open Space and Summit Park neighborhood within the Summit Park focus area.

|                          | <b>Number of Sites Monitored</b> | <b>Number Of Parcels Weeded</b> | <b>Number of Population/Patches Weeded</b> | <b>Total Acres Weeded</b> |
|--------------------------|----------------------------------|---------------------------------|--|---------------------------|
| <b>Park City</b>         | <b>59</b>                        | <b>3</b>                        | <b>6</b>                                   | <b>1.93</b>               |
| <b>Snyderville Basin</b> | <b>44</b>                        | <b>14</b>                       | <b>18</b>                                  | <b>1.48</b>               |
| <i>SBSRD Open Space</i>  | <i>7</i>                         | <i>3</i>                        | <i>12</i>                                  | <i>0.79</i>               |
| <i>Pinebrook</i>         | <i>7</i>                         | <i>1</i>                        | <i>1</i>                                   | <i>0.09</i>               |
| <i>JeremyRanch</i>       | <i>30</i>                        | <i>10</i>                       | <i>5</i>                                   | <i>0.60</i>               |
| <b>Summit Park Area</b>  | <b>116</b>                       | <b>54</b>                       | <b>73</b>                                  | <b>10.62</b>              |
| <i>Salt Lake</i>         | <i>11</i>                        | <i>2</i>                        | <i>2</i>                                   | <i>0.07</i>               |
| <i>SBSRD Open Space</i>  | <i>40</i>                        | <i>2</i>                        | <i>39</i>                                  | <i>1.65</i>               |
| <i>Summit Park</i>       | <i>65</i>                        | <i>50</i>                       | <i>32</i>                                  | <i>8.90</i>               |
| <b>Total</b>             | <b>219</b>                       | <b>71</b>                       | <b>97</b>                                  | <b>14.02</b>              |

## Data Collection Methods

GIS point data of each population/patch observed while applying manual control and monitoring was collected using Survey 123 on an iPhone 8. In addition, a Garmin Montana 610t with 5 meter accuracy was used to mark boundaries of larger populations, transect locations and as a back up to enable data correction of Survey 123 data if accuracy of the iPhone was low. Mid season, a Bad Elf Pro was used to increase iPhone accuracy to 1-3 meters.

## Challenges

- Timing treatments remains a challenge. Because manual control is not weather dependant, treatment could be applied nearly any day, however, a crew of one was not sufficient to treat as many sites as the budget would allow while second year plants were in flower or before seed maturity.
- Communication between the manual control/monitoring crew and herbicide crew's could have been better to ensure sites with transects were treated with herbicide after weeding and prevent manual control crews from weeding sites where the herbicide crew had already treated. There was some use of a shared KMZ in Google Earth, but this use was inconsistent.
- Some residents were frustrated that we did not get to their property and waited to treat their garlic mustard until it was too late. Because we did not have up to date maps we could not keep residents informed as to when their properties may be treated or if the property was treated. Additionally, it appears some residents feel the County is responsible for the control of weeds and are not taking responsibility for their noxious weeds.
- Spring treatment success was inconsistent. This could have been due to issues with timing due to weather delays, possible incomplete chemical coverage or too low of a herbicide rate.

### Things that went well

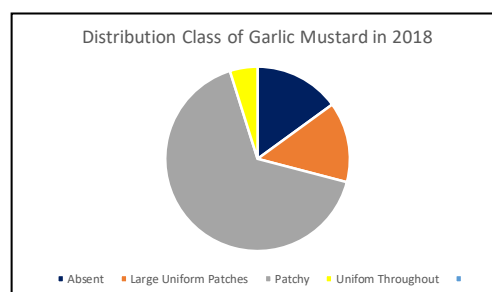
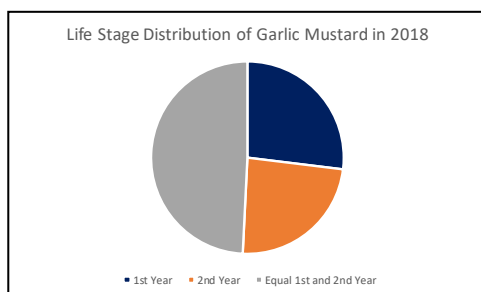
- Emailing the consent links increased participation rates and using Survey 123 the way Jessica Kirby did produced a map of the consenting sites that contractors could use as a shapefile or KMZ in the field to ensure they were within consenting property boundaries.
- Communication between partners and manual control/monitoring crew allowed us to get to areas that became a priority for our partners due to reports of new populations. Communication between the manual control/monitoring crew and herbicide crew allowed us to get the herbicide crew to new population as they were found.
- Use of KMZ's shared between the control crews allow for communicating new priority locations for control without having to have crews meet up with each other.

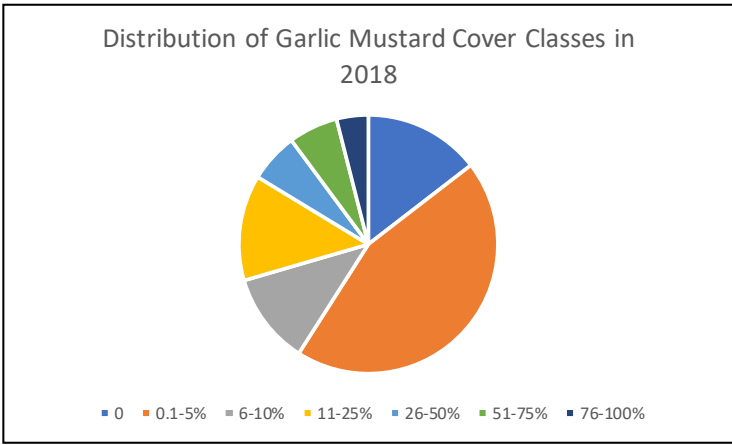
### Observations of what we can do better/ different next year

- It appears that some residents are not making efforts to take on more of the responsibility of noxious weed control on their property and are instead completely relying on the ISM grant. Given the increase in acres identified this year on open space, and the grant is funded by public grants, publicly accessible and partner owned lands should be the priority. This will mean that many residential parcels will not get treated and those that do need to be prioritized by proximity to open space and public/partner lands.
- Increase effectiveness and incentivize private land owners to aid in garlic mustard control, we may want to require that private land owners hand pull flowering/second year plants in order to be eligible for herbicide application. It will also need to be made clear that hand pulling their garlic mustard does not ensure the ISM grant funding crews will treat their property but will move them up in the priority list of areas to treat following completion of public and partner lands.
- Hire more weed contractors or ensure contractors have enough staff to conduct the manual control in May and early June.
- Increase communication between weeding crews and herbicide crews so herbicide is applied to sites after weeding is completed and any monitoring data collected.
- Use real-time technology to map where treatments have been applied. This would reduce the need for communication between control crews and allow partners to see what areas of their properties have been treated in the case that they need to bring in additional crews to ensure treatment occurs within the appropriate growth stages. This would also allow the project manager to report project status throughout the season if the public requests information.
- Increase the standardization of data collection. Ask control crews to provide an estimate of area within the parcel or property that is invaded and the approximate percent cover (or cover class) of garlic mustard within the patch/population. While this is subjective, it would allow for analysis of general trends at each site that is treated.
- Increase herbicide rates by 50%.

### Data Analysis Summary

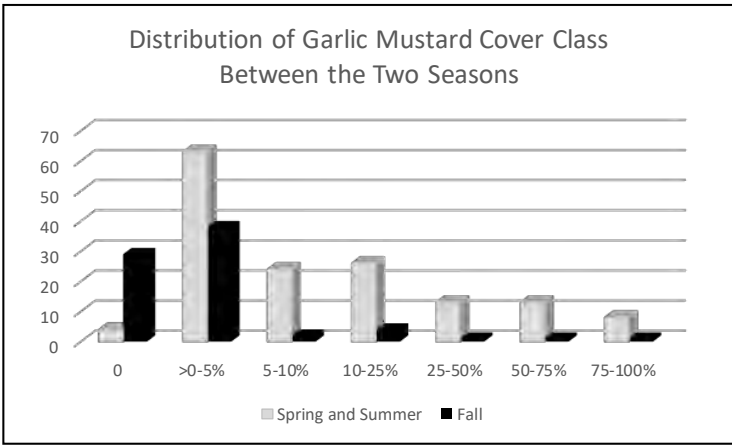
Monitoring data from 2018 were summarized and analyzed with treatment history to look for general patterns in garlic mustard distribution and treatment effects. Almost half of the sites monitored had a fairly equal amount of first and second year plants and the remaining half of the sites were fairly evenly split between being dominated by first or second year plants. Most populations were patchy in nature though there were sites where larger uniform patches were present.



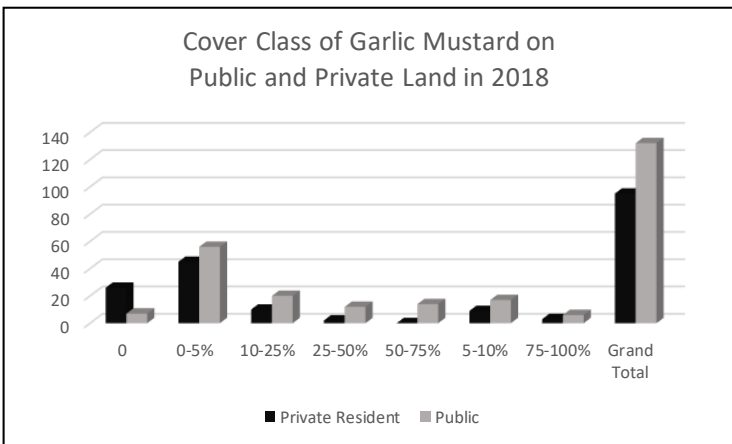


Garlic mustard percent cover was between 1% and 10% in the majority of sites monitored, however, there are 18 sites with greater than 50% cover. The most notable locations were in the Armstrong Trail area and Masonic Trail in Park City, areas of Toll Canyon and Residential parcels in Summit Park .

The distribution of sites among cover classes differed between spring/summer and fall seasons with the spring/summer season having more sites with greater percent cover than in the fall. This is to be expected given that both first and second year plants would be present in spring and summer and would be at peak growth. Fall populations would be limited to first year rosettes and given the dry growing season and early snowfall in September, the typical fall flush of germination did not occur.



A comparison of public and private lands show a similar overall distribution of cover classes, however, the private lands appear to have had a greater number of sites that were free of garlic mustard. This result is misleading in that monitoring in the fall focused on identifying private parcels for chemical and manual treatment which lead to a skewed number of private parcels being monitored in the fall when cover was low and fall germination did not occur.

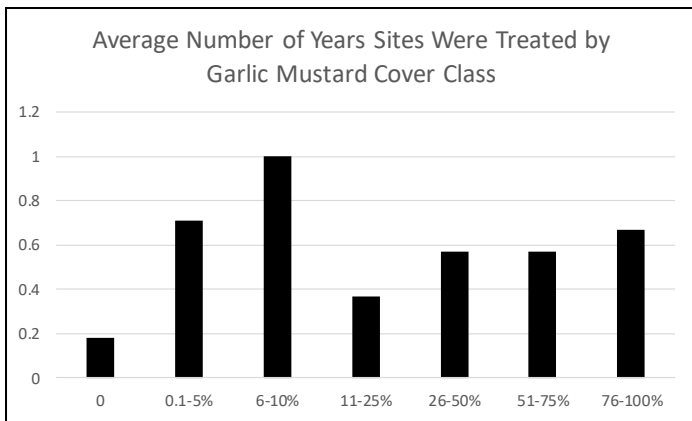
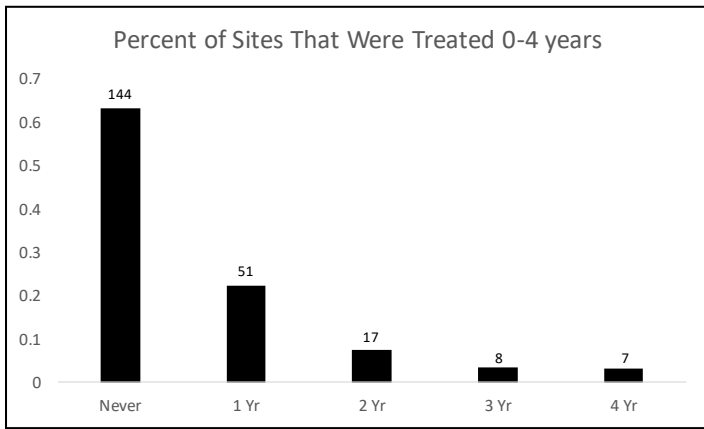


Garlic Mustard in Toll Canyon.



Pre (left) and Post (right) volunteer weed pull event in the Pinebrook open space.





Data Analysis Summary Continued:

The majority (144 sites) of sites monitored this season were new locations not previously treated. Only 7 sites had been treated four years between 2014 and 2018. No clear pattern was observed between the cover class category and the number of years a site had been treated. This is likely because no sites were consecutively treated year after year for the past 5 years and only a few had treatment multiple years in a row. Any year that treatment was not continued would have allowed garlic mustard from the seedbank to produce seed and re-establish the cover levels that were present prior to earlier treatments. While the limited data collected this year does not reflect reductions in garlic mustard with increasing years of treatment, discussions with land owners and weed crews indicate that they have seen significant reductions in garlic mustard on their sites. This was primarily true for those who have had two or more years of treatment in the past three years. Because we do not have pretreatment data for most of the areas that have been treated multiple years, it is difficult to determine the degree of success. Additionally, many of the properties are adjacent properties where garlic mustard is not being controlled and therefore garlic mustard is reinvading from the edges .

Data collected this season will allow for site comparisons next year when transects and cover class data are collected again in the same

Table 2. Pre and post treatment garlic mustard percent cover along transects. Percent was determined by measuring the the length of the transect invaded divided by the total transect length time 100.

| Transect Number | Transect Site                                | Pre Weeding Percent of | Post Weeding Percent of | Pre herbicide Percent of Transect | Post Herbicide Percent of Transect            |
|-----------------|--|------------------------|-------------------------|-----------------------------------|---|
| 1               | Toll Canyon Below Matterhorn (70ft transect) | 42                     | 19                      | Not Sprayed                       | Not Sprayed                                   |
| 2               | Paradise - 225 Paradise Road (60ft transect) | 0                      | 0                       | 99                                | 0   |
| 3               | Upper Evergreen Dr (100ft transect)          | 79                     | 41                      | Not Sprayed                       | Not Sprayed                                   |
| 4               | 570 Upper Evergreen Dr (80ft transect)       | 37                     | 17                      | Not Sprayed                       | Not Sprayed                                   |
| 5               | 660 Parkview Dr (90ft transect)              | 80                     | 66                      | Not Sprayed                       | Not Sprayed                                   |
| 6               | Armstrong Trail (70ft transect)              | Not Weeded             | Not Weeded              | 67                                | Sprayed in fall, then it snowed               |
| 7               | Masonic Trail                                | 87                     | 75                      | 100                               | Leave litter in Fall made transect unreadable |

Within season data comparisons along transects pre and post treatment show reduction in cover ranging from 10–40% for transects where second year plants were weeded as a pre-treatment for herbicide application. Unfortunately only one of the sites that was pre-treated with weeding was treated by herbicide due to weather and timing complications and that transect was too buried in leaf litter in the fall to sample. In cases where the percent cover reduction was low following weeding, there was an equal layer of rosettes under the second year plants. Three sites were treated with herbicide two of which could not be resampled due to leaves or snow fall, and the one that was resampled could not be completed due to the presence of dogs. However, a quick site walk through showed percent cover had been reduced by 95% or more. This particular site had experienced construction the year before and the back fill around the house had become invaded last year. So the site has a limited seedbank.

Overall, data is inconclusive due to the limited data available regarding percent cover prior to this season. Data Collected in 2018 will aid in analysis in the future is comparable data continues to be collected in the sites monitored and treated this year.

## Example Pre- and Post Weeding Sites Photos



Salt Lake Watershed—Summit Park Area



Willow Creek—Snyderville Basin



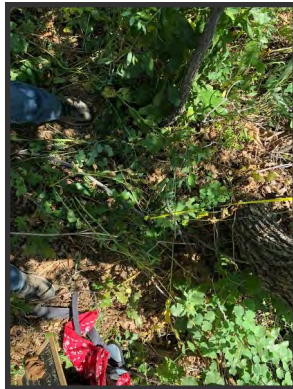
Summit Park

# Transect Photos

## Transect 1: Toll Canyon



Pre -Weeding 0 ft



Post -Weeding 0 ft



Pre -Weeding 40 ft



Post -Weeding 40 ft



Pre -Weeding 10 ft



Post -Weeding 10 ft



Pre -Weeding 50 ft



Post -Weeding 50m ft



Pre -Weeding 20 ft



Post -Weeding 20 ft



Pre -Weeding 60 ft



Post -Weeding 60 ft



Pre -Weeding 30 ft



Post -Weeding 30 ft



Pre -Weeding 70 ft



Post -Weeding 70 ft

# Transect Photos

## Transect 2: 225 Paradise Road

Herbicide was applied 2 days prior to collecting transect data but had not taken full effect so transect was read as if all plants were healthy. I was unable to access the property long enough in the fall to run a transect due to dogs, however a quick site walk showed less than 5% cover of garlic mustard.



Pre -Weeding 0 ft



Pre -Weeding 40 ft



Pre -Weeding 10 ft



Pre -Weeding 50 ft



Pre -Weeding 20 ft



Pre -Weeding 60 ft



Pre -Weeding 30 ft



# Transect Photos

## Transect 3: 550 Upper Evergreen Dr



Pre -Weeding 0 ft



Post -Weeding 0 ft



Pre -Weeding 40 ft



Post -Weeding 40 ft



Pre -Weeding 10 ft



Post -Weeding 10 ft



Pre -Weeding 50 ft



Post -Weeding 50 ft



Pre -Weeding 20 ft



Post -Weeding 20 ft



Pre -Weeding 60 ft



Post -Weeding 60 ft



Pre -Weeding 30 ft



Post -Weeding 30 ft



Pre -Weeding 70 ft



Post -Weeding 70 ft

# Transect Photos

## Transect 3: 550 Upper Evergreen Dr continued



Pre -Weeding 80 ft



Post -Weeding 80 ft



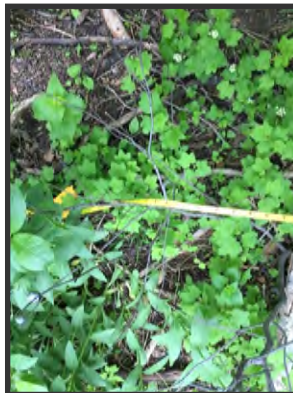
Pre -Weeding 90 ft



Post -Weeding 90 ft



Pre -Weeding 100 ft



Post -Weeding 100 ft

# Transect Photos

## Transect 4: 570 Upper Evergreen Dr



Pre -Weeding 0 ft



Post -Weeding 0 ft



Pre -Weeding 40 ft



Post -Weeding 40 ft



Pre -Weeding 10 ft



Post -Weeding 10 ft



Pre -Weeding 50 ft



Post -Weeding 50 ft



Pre -Weeding 20 ft



Post -Weeding 20 ft



Pre -Weeding 60 ft



Post -Weeding 60 ft



Pre -Weeding 30 ft



Post -Weeding 30 ft



Pre -Weeding 70 ft



Post -Weeding 70 ft

# Transect Photos

## Transect 5: 660 Parkview Dr



Pre -Weeding 0 ft



Post -Weeding 0 ft



Pre -Weeding 40 ft



Post -Weeding 40 ft



Pre -Weeding 10 ft



Post -Weeding 10 ft



Pre -Weeding 50 ft



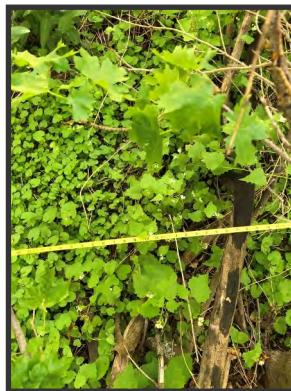
Post -Weeding 50 ft



Pre -Weeding 20 ft



Post -Weeding 20 ft



Pre -Weeding 60 ft



Post -Weeding 60 ft



Pre -Weeding 30ft



Post -Weeding 30 ft



Pre -Weeding 70 ft



Post -Weeding 70 ft

# Transect Photos

## Transect 5: 660 Parkview Dr continued



Pre -Weeding 80 ft



Post -Weeding 80 ft



Pre -Weeding 90 ft



Post -Weeding 90 ft

# Transect Photos

## Transect 6: Armstrong Trail



Pre -Weeding 0 ft



Pre -Herbicide 40 ft



Pre -Herbicide 10 ft



Pre -Herbicide 50 ft



Pre -Herbicide 20 ft



Pre -Herbicide 60 ft



Pre -Herbicide 30 ft



Pre -Herbicide 70ft

The Armstrong Trail was sampled late fall. The main population was not fully surveyed until fall and snow fell prior to being able to sample a transect. After the snow melted, a transect was established and sampled. The data associated with this transect is an under estimation of garlic mustard cover due to heavy leaf litter and the and all the second year plants had dies. It is likely this was nearly 100% cover at the peak of the season. Snow fell again within days of the herbicide treatment so no post treatment monitoring was able to be completed.

# Transect Photos

## Transect 7: Masonic Trail Area



Pre -Weeding 0 ft



Post -Weeding 0 ft



Pre -Weeding 40 ft



Post -Weeding 40ft



Pre -Weeding 10 ft



Post -Weeding 10ft



Pre -Weeding 50 ft



Post -Weeding 50ft



Pre -Weeding 20 ft



Post -Weeding 20 ft



Pre -Weeding 60 ft



Post -Weeding 60ft



Pre -Weeding 30 ft



Post -Weeding 30 ft



Pre -Weeding 70 ft



Post -Weeding 70 ft

# Transect Photos

## Transect 7: Masonic Trail Area



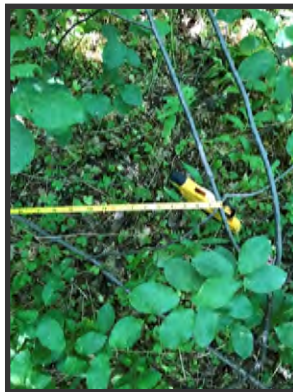
Pre -Weeding 80 ft



Post -Weeding 80 ft



Pre -Weeding 90 ft



Post -Weeding 90 ft



Condition of plants 4 days post herbicide treatment.