Washington County Maltese Star-thistle ISM Monitoring EDRR 2020 Year 1

Introduction

Malta star-thistle (*Centaurea melitensis*) is a high priority, Class 1A Early Detection Rapid Response (EDRR) species.[1] For EDRR species, it is our goal at the Utah Department of Agriculture and Food (UDAF), to get map, monitor, treat, and eradicate the infestation as quickly as possible. In 2003, two EddMapS points were uploaded near Motoqua. In 2018, we (UDAF) asked Washington County to re-verify these points. The plants were difficult to find, and they were not able to verify at that time. On April 9, 2020, Brad Winder, the Washington County Weed Supervisor, found about 6-7 acres of plants near La Verkin that he thought could either be yellow star-thistle or Malta star-thistle. He marked the points in EddMapS and communicated this with the Utah Weed Supervisor's Association and UDAF. On April 28, 2020, Corey Ransom, Associate Professor in Weed Science at Utah State University, went out to the site and confirmed that the plant was indeed Malta star-thistle. After the plant was identified, a huge group effort was put together to contain this species. Washington County worked with the Utah Weed Supervisor's Association and USU Extension to get funding in order to begin treatment at La Verkin. Several agencies and volunteer groups came together to help with applying for grants, identifying and locating more plant populations, and spraying. Here at UDAF, we helped facilitate the identification of the plant, assisted in the grant application process, and map and monitored on June 9th-12th as part of our EDRR monitoring protocol. This report is a summary of the first year of monitoring prior to treatment.

Location

We spent time with Brad Winder and Ben Scow, from USU Extension, in different areas of Washington County to verify and map Malta star-thistle. The plant was typically on road sides. We verified populations on the shoulder and in the median of I-15 near the 20 mile mark (Fig. 2). We verified and mapped a population on SR-9 near the Hurricane Walmart (Fig. 2). One population was particularly concerning because it is close to Zion National Park in Springdale (Fig. 2). In 2020, Brad Winder and Ben Scow were able to find the 2003 Motoqua points (Fig. 2). We also re-visited the Motoqua points and found that the plants were yellow star-thistle (*Centaurea solstitialis*) and not Malta star-thistle, but this site will be monitored to ensure it doesn't spread further. We ended up establishing our first round of detailed monitoring at a larger population near La Verkin off of a part of SR-9 known as the La Verkin Twist (Fig. 1). This property is owned by SITLA and currently serves as habitat for wildlife and a recreational site. Off-roading and camping occur nearby, and there is a shooting range

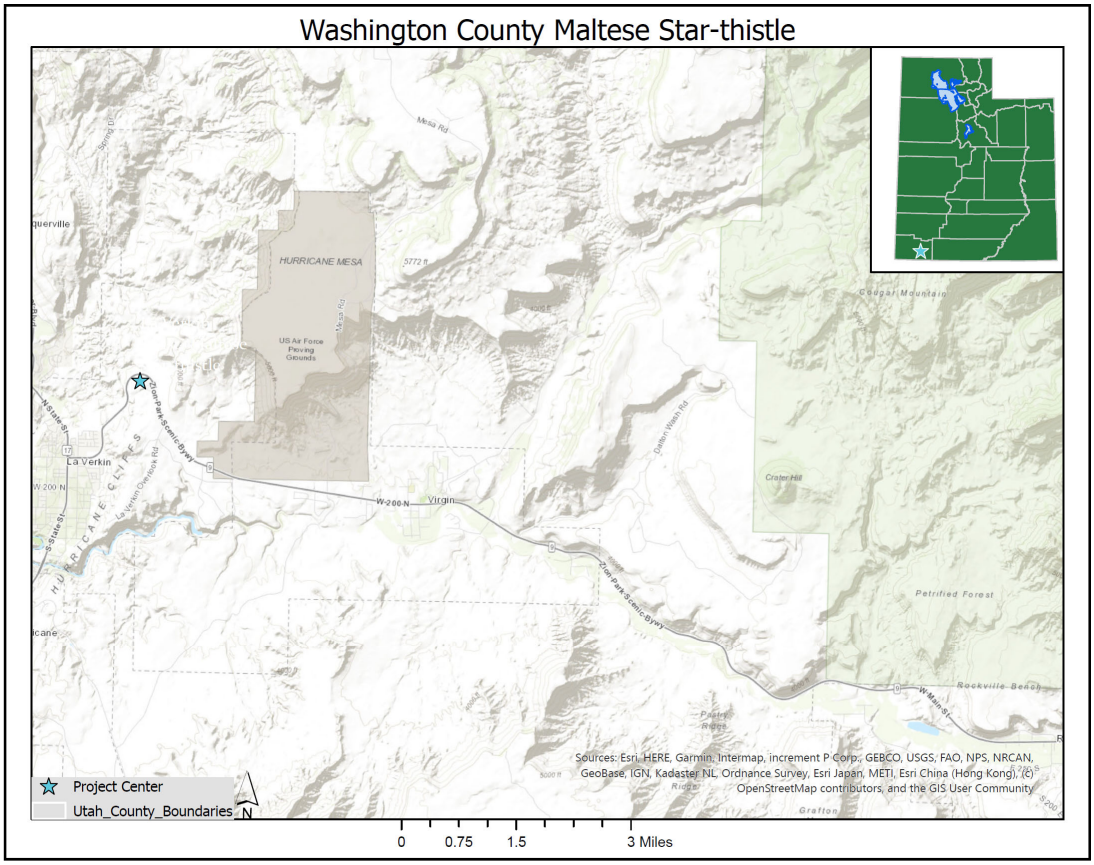


Fig. 1. A zoomed out view of the project location with the project center displayed.

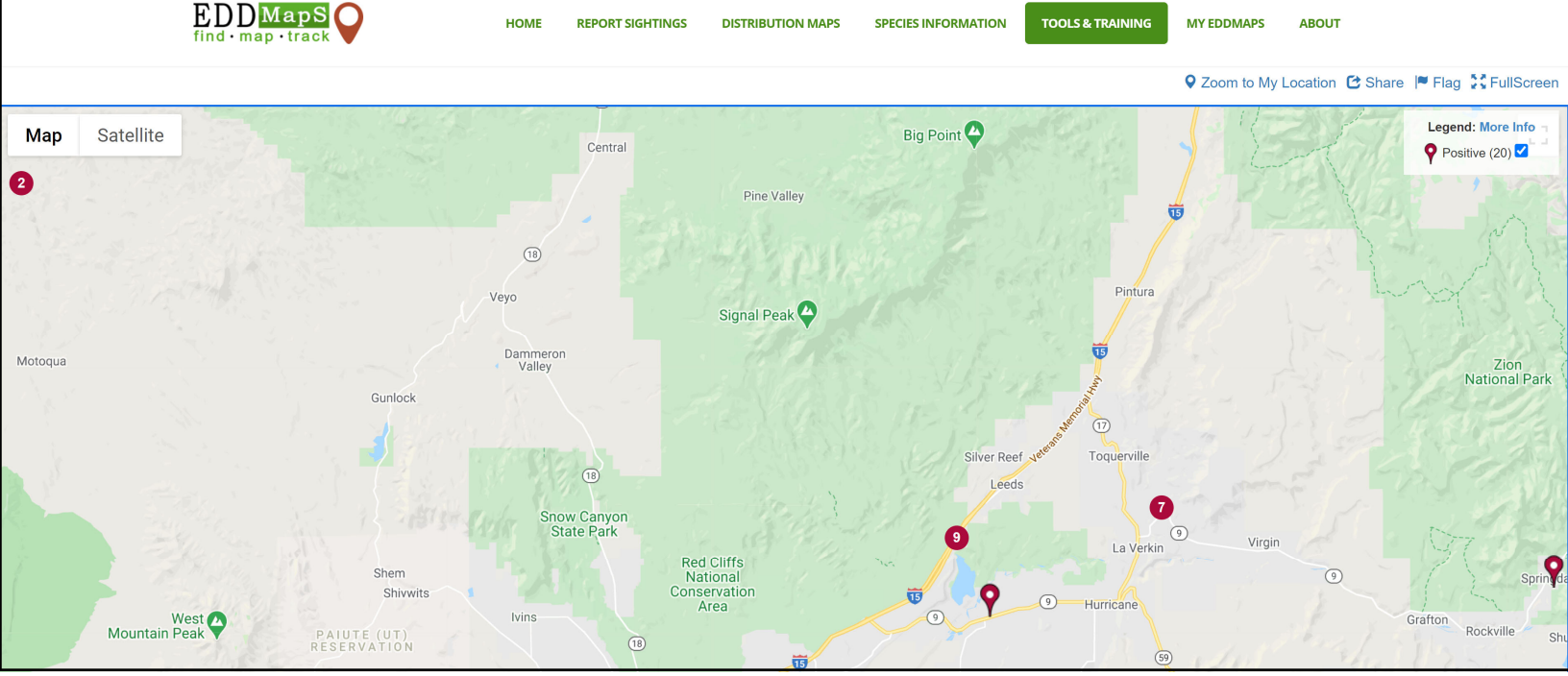


Fig. 2. This is a map from EddMapS displaying the positive Malta star-thistle points and the yellow star-thistle points near Motoqua.

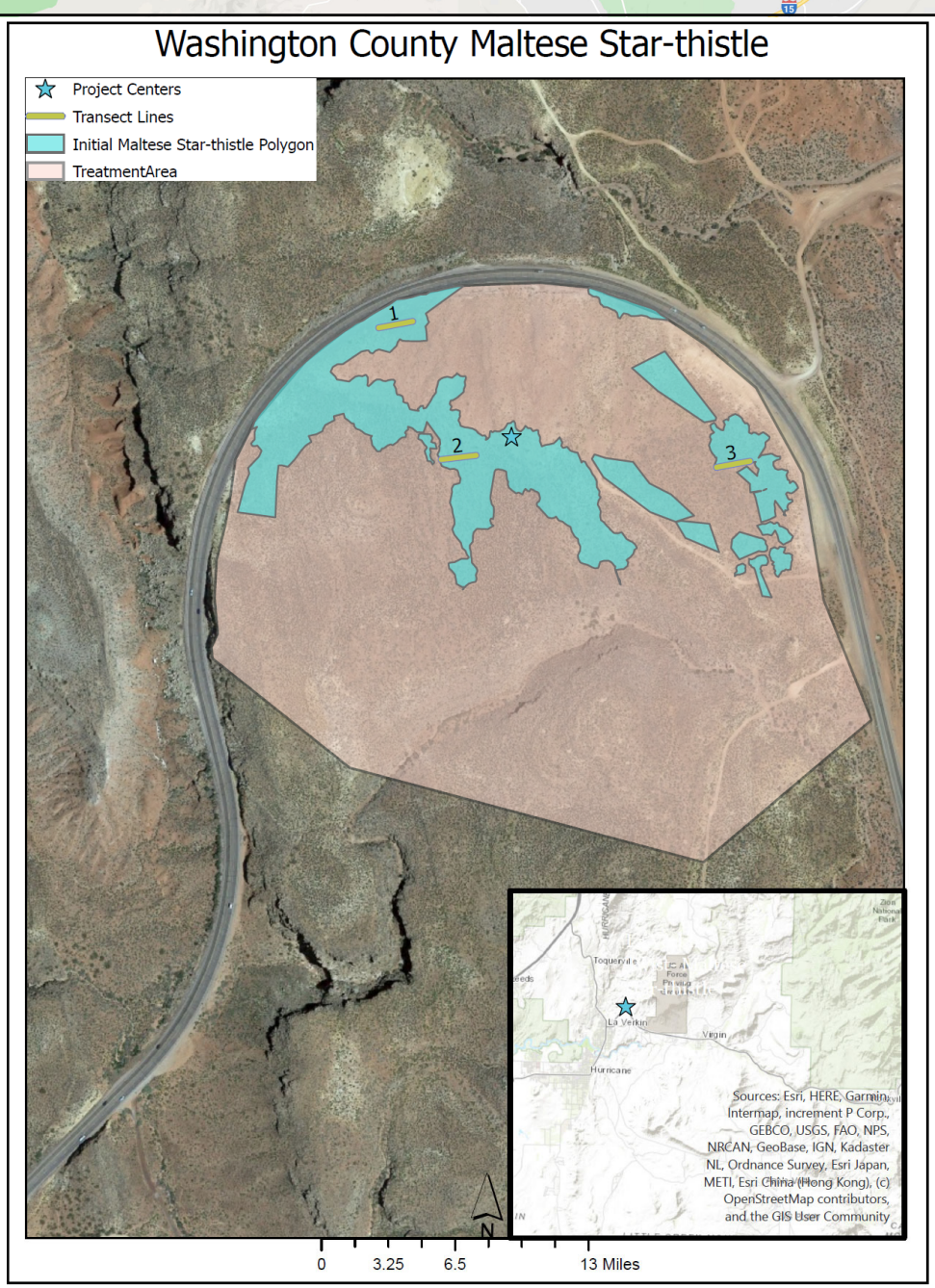
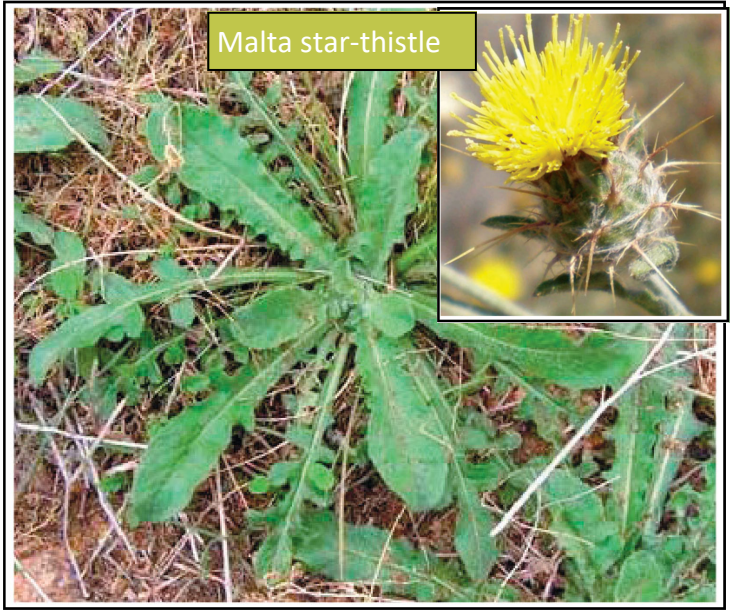


Fig. 3. This map displays the initial population polygons, the transect locations, and the larger treated area.

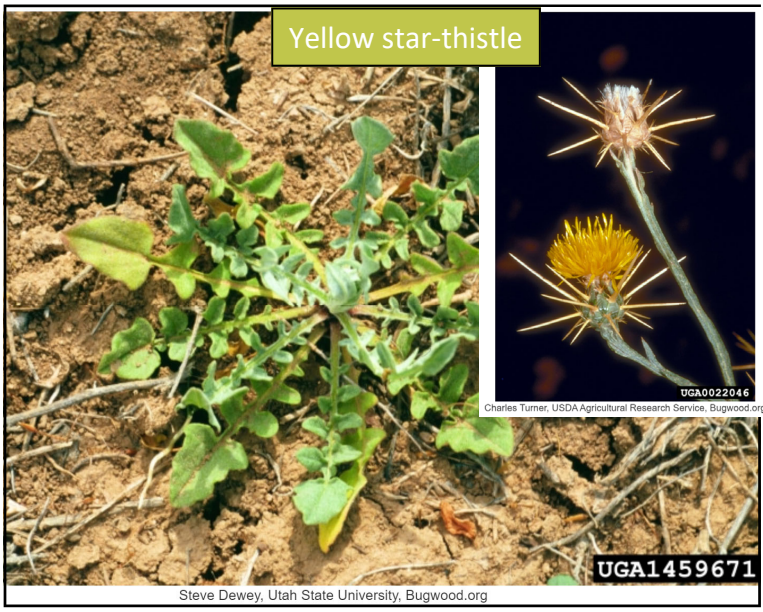
and military proving grounds across the freeway. Therefore, there are a lot of vectors for spreading this plant, and disturbance occurring, which increasing sites to spread too. After our (UDAF's) trip down to this site, Brad Winder found an additional 80-90 acres of Malta star-thistle on BLM land North of the La Verkin Twist near the shooting range (Fig. 2). Although the primary project is at La Verkin Twist, controlling Malta star-thistle is very important on a larger scale because it is an EDRR species and it is close to spreading into nearby National parks and National Conservation Areas. With time and increased funding, this project should be able to identify and control more Malta star-thistle populations through-

Invasiveness of Noxious Weeds on Site

Again, the primary target weed is Malta star-thistle, a Class 1A EDRR species.[1] It is an annual and reproduces through seeds that typically live about 4 years but can live up to 10. These seeds can grow to plants very rapidly to outcompete other plants for many resources.[2,3] Potential problems caused by Malta star-thistle can include competition with native plants, harming animals or people through its spines, and increasing soil erosion.[2,4] This species is new to the state and is a high priority for immediate control and eradication if possible.



Photos from US Forest Service "Field Guide from Managing Malta Starthistle in Southwest"



Yellow star-thistle flower photo from https://www.eddmaps.org/species/subject.cfm?sub=4390 and rosette from https://www.eddmaps.org/species/subject.cfm?sub=4390

Yellow star-thistle is listed in Utah as a Class 2 Control species that is often confused with Malta starthistle (Table 1).[1] It is a winter annual that reproduces through seeds.[5] Yellow star-thistle is problematic because it causes "chewing disease" in horses;[6] it grows in dense stands that outcompetes other beneficial plants;[7] it can cause injury to humans, livestock, and wild animals, and it can decrease soil moisture.[7] Yellow star-thistle was the plant that actually occurred at the original Malta star-thistles 2003 EddMapS points near Motoqua.

Species	Height	Rosette/ foliage	Spines
Malta star-thistle	1-3 ft.	Covered in white hairs, leaves deeply lobed at base and smooth at top	< 1/2 inch, purple to brown at base
Yellow star-thistle	4 in. to 5 ft.	Leaves deeply lobed; covered in hairs; stems winged	1-2 inches, all white to yellow

Table 1. This table shows the some key differences between Malta and yellow star-thistles.[2,4,5]

Johnsongrass (*Sorghum halepense*) was found on the La Verkin Twist site near transect 1 (Fig. 2). It is listed as a Class 3 Containment weed in Utah.[1] This grass reproduces through both seeds and rhizomes and easily hybridizes with other *Sorghum* species.[8] Johnsongrass causes problems because it is allelopathic and carries diseases that outcompete other plants especially agricultural crops.[8] It can also be toxic to cattle in certain growth stages.[9]

Photo courtesy of Washington County Weed Department.

Treatment

When treating Malta star-thistle, one working paper recommends treating it similar to yellow star-thistle when it comes to herbicide.[3] Recommendations for most herbicides are to treat the growing rosettes of Malta and Yellow star-thistle in the spring or fall. They still can be treated once they bolt with most herbicides but in higher concentrations. Plants should be treated before they begin to flower. One working paper suggests that post-emergent broadleaf herbicides would work best for Malta star-thistle and minimize effects on grasses.[2] Another paper for yellow star-thistle suggests that also using a long residual pre-emergent can be good for suppressing germination for these high seed producing plants.[7]

Malta star-thistle at the La Verkin Twist site was sprayed with herbicide by Washington County and an additional crew of 5-8 volunteers from multiple agencies and nonprofit organizations. The spray dates were July 1st, 8th, and 15th early in the day to avoid the afternoon heat. Spraying in July is past the recommended timeframe for both DuraCor® and Esplanade. However, the drought conditions slowed the growth of Malta starthistle, and along with residual herbicide impacts, the treatment should still be beneficial. A total of 102 man hours was spent to carefully spot spray about 14 acres. The herbicides mix was DuraCor® (16 oz./acre), Esplanade (6 oz./acre), MSO surfactant (16 oz./acre), and Spray Indicator Blue (8 oz./acre). This year most plants did not grow beyond a rosette due to the heat. Therefore, they ended up spraying last year's skeletons and any green rosettes they could find. They also attempted to spray the populations growing on I-15, but it was dry enough that the plants didn't grow this year. Even though the treatment was late in the season, pre-emergent aspect of Esplanade should prevent growth next year and hopefully decrease the annual grasses. Since there will be more time to plan next year, spraying in the spring and/or fall would likely be

Photos courtesy of Washington County Weed Department

Monitoring Methods

For monitoring this project, we began by focusing on mapping. We double checked the known locations and, in some cases, the area around the known locations. As we found populations, we marked them in EddMapS. At La Verkin Twist, we began with trying to map all populations and do a complete population count. As we did this, we realized the population was much larger than we had originally thought. We did a very rough polygon around the populations at the site. Then we installed 3, 100 ft., transects and took several different measurements along the transects. The ground cover photos were analyzed using SamplePoint, and Excel was used to create means and confidence intervals.

Monitoring methods:

-Creating a species list
-Taking Landscape photos
-Taking ground cover photos
- Measuring noxious weed cover using the line intercept method
-Counting plant density (1 m. x 100 ft. belt)
-Measuring percent cover using Line Point Intercept method

Goals

The actual cover of live Malta star-thistle was very low due to the drought conditions, and the cover of last year's dead stems was much higher. Typically, with EDRR species, the goal is complete eradication, but as much larger populations are found, the project manager is concerned that complete eradication would not be possible within 5 years. Therefore, we determined that the five year goal would be to maintain a low average cover of 3.3%. The goal and current cover data is based off of the line intercept measurements.

Goal:

≤3.3% cover of Malta star-thistle

Current Average Cover:

3.3% cover of Malta star-thistle

Results

Our first priority for monitoring the EDRR species was to verify and map as many of the populations as we had time for. Again we found that the Motoqua EddMapS points were actually yellow star-thistle and not Malta. The rest of the populations were indeed Malta star-thistle and usually much larger than was originally thought (Fig. 2). Fig. 3 displays a rough initial polygon around the populations at this site. However, we kept discovering plants spaced far apart making an accurate polygon very difficult. Because the population was so large and spaced out, we went back to our standard monitoring protocols. In this section, we will discuss the target weed, other plants occurring at the site, ground cover, and precipitation.

Malta star-thistle

The transects were spread over the hill with a range of cover from high at transect 1 to low at transect 3 (Fig. 4, Table 8). Live Malta star-thistle very small averaging at 3.3% (Table 8). Malta star-thistle was still in the early life stage of small rosettes growing under last year's dead skeletons. If these plants grew to full size, the percent cover would have been much greater. The cover of last year's dead skeletons was much higher at 17.6% average cover (Table 8). This indicates that 2019 was likely a higher water year.

For density (the number of plants/m^2), we only counted live plants. Again, the density ranged from high to medium to low like the cover (Fig. 5). The density averaged at 8.1 plants/m^2 of mainly rosettes (Table. 8). Thus, even though the cover was low there were still a good population of plants. Thus, treatment was still vital.

Other Plant Cover

Other non-noxious plant cover is high with an average of 90.7%, but this cover is dominated by annual grasses, particularly cheatgrass (*Bromus tectorum*) and red brome (*Bromus rubens*) (Fig. 6, Table 4). Both of these species are early, rapid germinators, increase the rates of fire at a site, and can outcompete other more beneficial species.[10,11] Luckily, the pre-emergent, Esplanade, help control these species.[10,11] Purple three-awn was the only native grass with a large cover at transect 1 (22%), but very little to no cover on the other transects (Table 4). This could be a great candidate for seeding in the future if needed. Shrub cover averaged 18% cover and all were natives (Fig. 6, Table 5). It is important to protect these native plants as the project moves

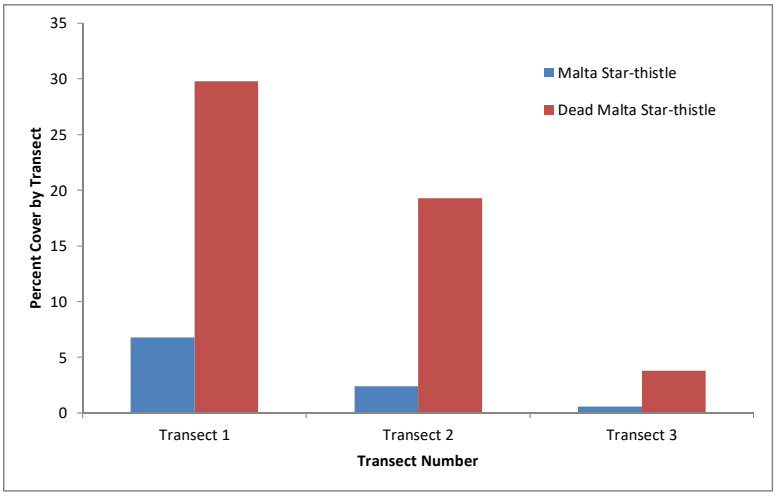


Fig. 4. This graph displays the mean percent cover of Malta star-thistle and dead Malta star-thistle by transect from the line intercept data.

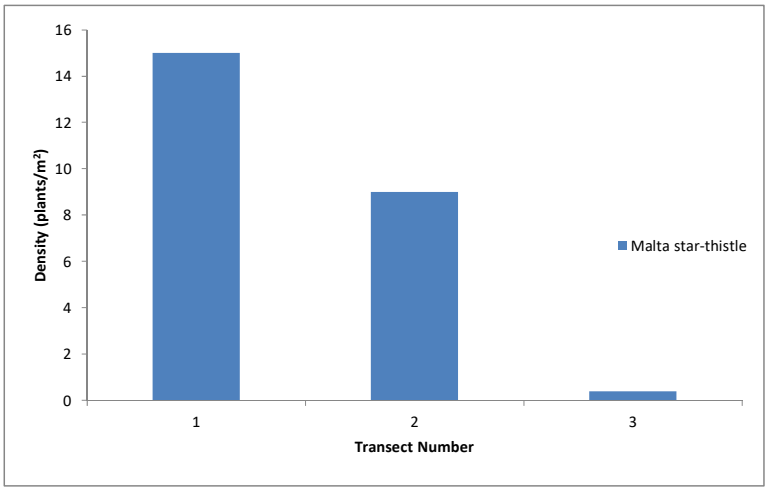


Fig. 5. This graph displays the density of Malta star-thistle plants per meter squared by transect from the line intercept data.

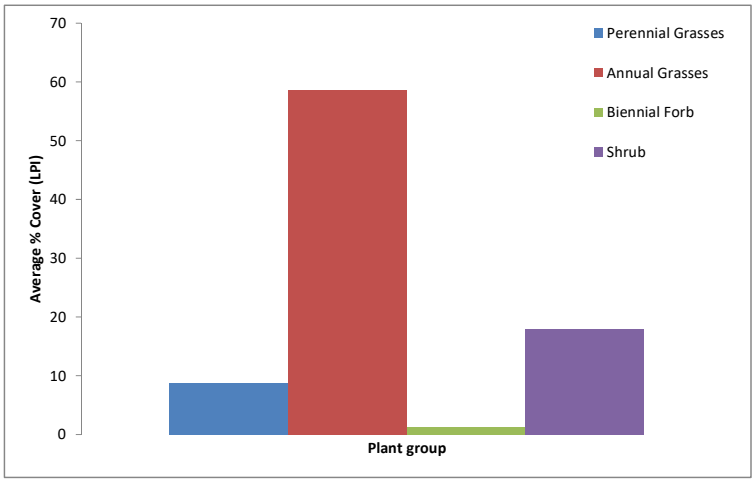


Fig. 6. This graph displays the average percent cover of different plant groups from the Line Point intercept data.

forward. Forb cover was incredibly low with a cover of 1.3% on average (Fig. 6, Table 4). Low annual forb cover could be due to the high temperatures and summertime monitoring, but more perennial forbs should still be occurring.

The overall the number of plant species (species richness) was good at 15 species and the biodiversity (distribution of these species) was moderate at 1.8 (Tables 6 and 7). However, the primary plant cover is derived from weedy annual grasses (Table 5). The most native plants (forbs especially) are only occurring in low to trace amounts (Table 5). If native plants do not return in the future, seeding or planting of beneficial plants may be needed. This will minimize soil erosion and invasion of noxious weeds.[12] However, Esplanade recommends waiting at least 8 months after spraying to plant.[13] Also, the highest rate of Esplanade application (7 oz./acre) can inhibit germination for years.[13] This project used 6oz.acre, so planting plugs rather than seeding may be more effective.

Ground Cover

The ground cover photo analysis displays a relative cover and includes only the most upper canopy cover. In general, large amounts of bare ground leads to increased rates of erosion and invasion of noxious weeds. Currently, this site only has an average of 9% cover of bare ground/soil (Fig. 7, Table 9). This site is more rocky with an average cover of 7% rock and 9% gravel. Some plants can establish in these more rocky habitats. Maintaining lower bare ground levels is essential but difficult with herbicide treatments. If bare ground levels increase and native plants are not returning, this site may need to be revegetated with beneficial plants to prevent future problems. Investigating ways to increase biological soil crusts may be beneficial as well in this habitat.

Precipitation

2019 was a big precipitation year (Fig. 8), which is probably why we found all of the dead Malta skeletons on site. Precipitation in 2020 was a much drier year with low precipitation values (Fig. 8). The decrease in precipitation is likely why we did not see many full grown Malta star-thistle plants this year. Precipitation in future years will likely drive the success controlling Malta star-thistle and the growth other beneficial plants.

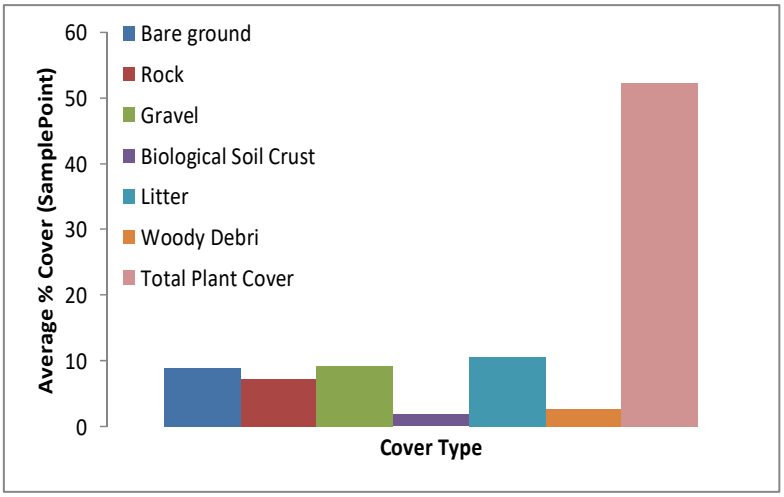


Fig 7. This graph displays the relative average percent cover over the whole site. Data is from the ground cover photo analysis.

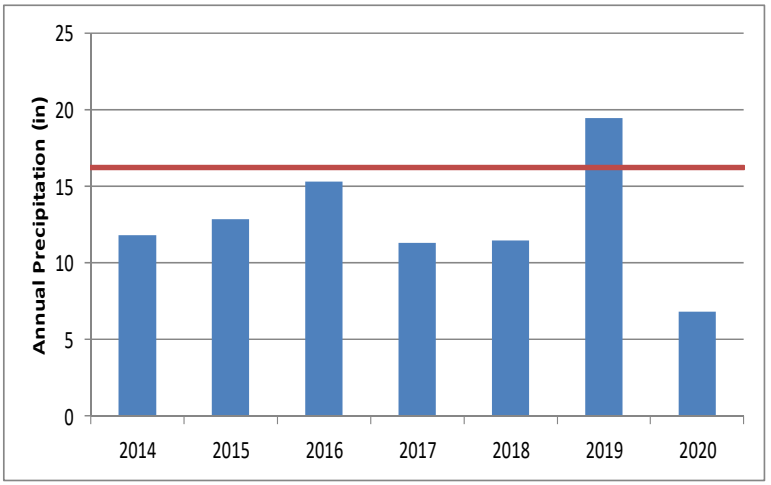


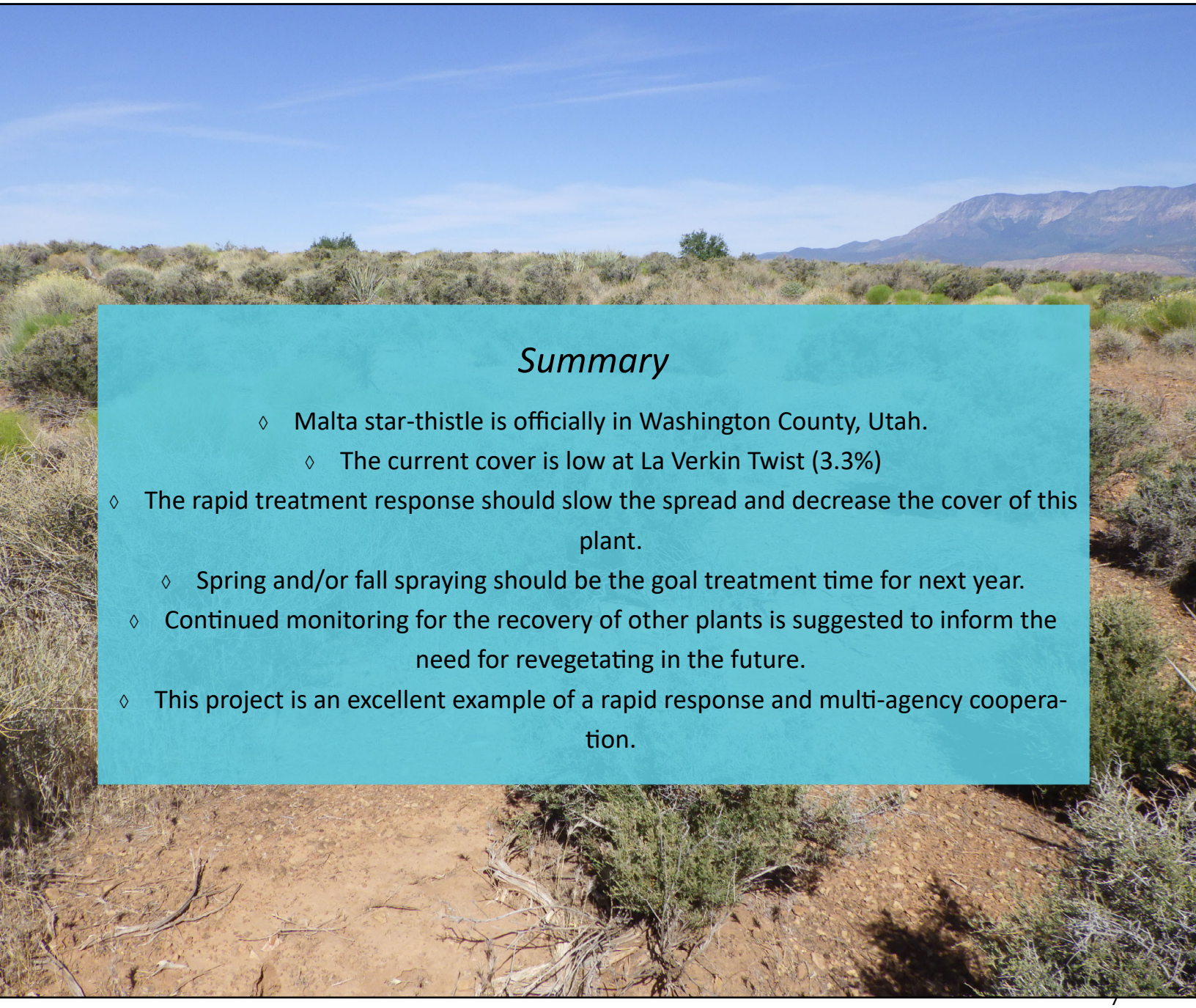
Fig 8. This graph displays the annual precipitation. The red line represents the 30 year average. The data is from the Physical Science Laboratory (http://www.prism.oregonstate.edu/documents/PRISM_datasets.pdf),Utah Division 2, Dixie.

A view of the rocky ground, a dead Malta skeleton, and some red brome

Conclusion

Malta star-thistle is an EDRR species that has been found and verified in Washington County. Brad Winder did an excellent job of questioning a plant species and requesting verification. Corey Ransom from USU was able to verify the plant in Southern Utah within 19 days. After verification, UDAF responded with monitoring within 42 days (about 1.5 months). In 2 months after verification (64 days), Brad Winder and the Utah Weed Supervisor Association were able to put together funding, a plan, supplies, and a volunteer crew to begin spraying Malta star-thistle. Not only was this a huge find, but also a great example of coordination between multiple agencies to respond rapidly to this new invader.

The current average percent cover of Malta star-thistle was low at 3.3%. The treatment, although quickly put into place after the plant was discovered, was administered a little later in the season then is recommend. Residual effects should still prove to be beneficial. New and larger populations have been discovered elsewhere. Therefore, controlling and hopefully eradicating this species will need to continue to be a huge multiagency effort. Also, as time and treatments occur, the sites should be evaluated for the need to revegetate to prevent future noxious weeds from entering the system, increasing overall ecosystem health, and minimize erosion.



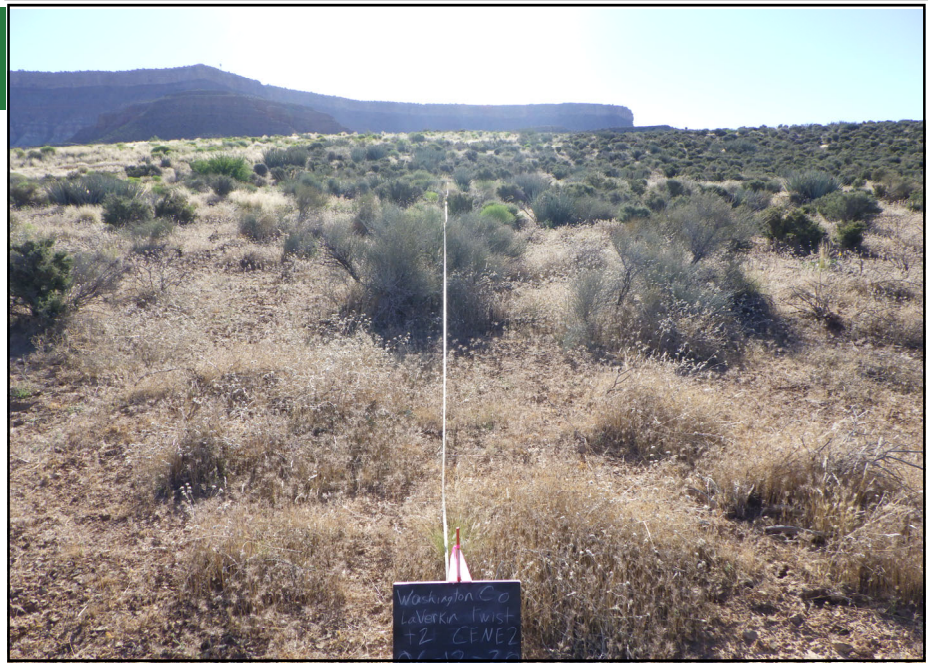
Summary

- Malta star-thistle is officially in Washington County, Utah.
- The current cover is low at La Verkin Twist (3.3%)
- The rapid treatment response should slow the spread and decrease the cover of this plant.
- Spring and/or fall spraying should be the goal treatment time for next year.
- Continued monitoring for the recovery of other plants is suggested to inform the need for revegetating in the future.
- This project is an excellent example of a rapid response and multi-agency cooperation.

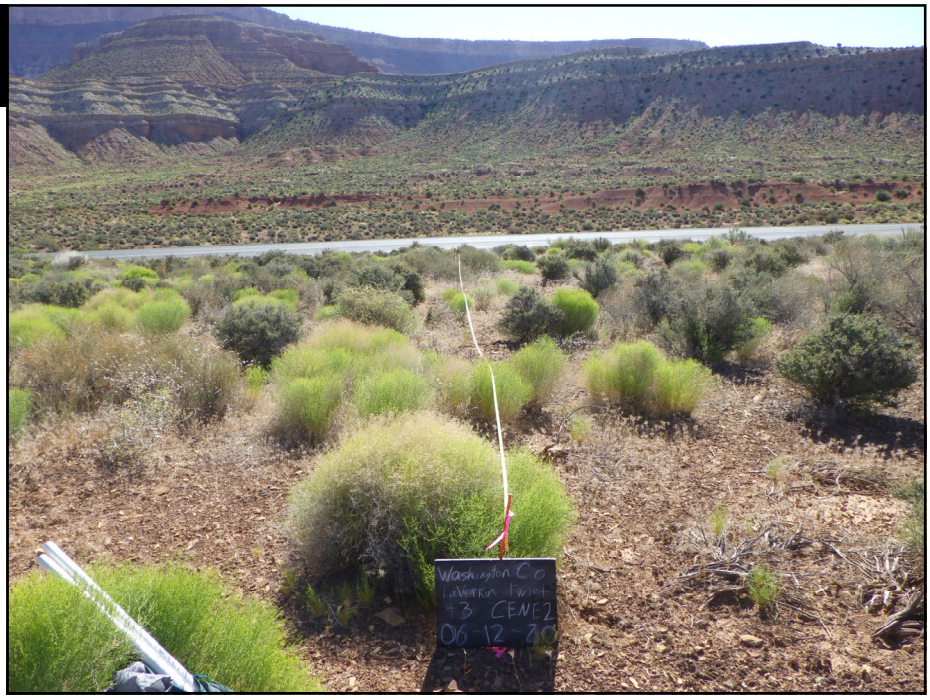
Landscape Photos-06/12/20

Transect 1

Transect 2



Transect 3



Tables and Graphs

Native Plants

Plant Type	Annual (A)/ Biennial (B)/ Perennial (P)	Code	*Scientific Name*	Common Name
Forb	A/B/P	BAPL3	*Baileya pleniradiata*	woolly desert marigold
Forb		CALOC	*Calochortus sp.*	mariposa lily
Forb	A/B/P	DEPI	*Descurainia pinnata*	western tansymustard
Forb	P	SPAM2	*Sphaeralcea ambigua*	desert globemallow
Forb	P	STPA4	*Stephanomeria pauciflora*	brownplume wirelettuce
Grass	A/P	ARPU9	*Aristida purpurea*	purple threeawn
Shrub	P	CORA	*Coleogyne ramosissima*	blackbrush
Shrub	P	ENRE	*Encelia resinifera*	sticky brittlebush
Shrub	P	EPVI	*Ephedra viridis*	Mormon tea
Shrub	P	GUSA2	*Gutierrezia sarothrae*	broom snakeweed
Shrub	P	MIMU	*Mirabilis multiflora*	Colorado four o'clock
Shrub	P	RHTR	*Rhus trilobata*	skunkbush sumac
Shrub	P	SAVE4	*Sarcobatus vermiculatus*	greasewood
Shrub	P	YUCCA	*Yucca sp.*	yucca


Purple threeawn

Table 2. This table contains a list of all the native plants that were found on site by plant type, life span, USDA plant code, scientific name, and common name.


Yucca


blackbrush


Woolly desert marigold


Mormon tea

Other Plants

Plant Type	Introduced (I)/ Native (N)/ Noxious (Nx)	Annual (A)/ Biennial (B)/ Perennial (P)	Code	*Scientific Name*	Common Name
Forb	Nx	A/B	CEME2	*Centaurea melitensis*	Malta star-thistle
Forb	I	A/B	ERCI6	*Erodium cicutarium*	redstem stork's bill
Forb	I	A/B	LASE	*Lactuca serriola*	prickly lettuce
Forb	I	A/B	SIAL2	*Sisymbrium altissimum*	tall tumblemustard
Forb	I	A/B	TRDU	*Tragopogon dubius*	yellow salsify
Grass	I	A	AVFA	*Avena fatua*	wild oat
Grass	I	A	BRRU2	*Bromus rubens*	red brome
Grass	I	A	BRTE	*Bromus tectorum*	cheatgrass
Grass	Nx	I	SOHA	*Sorghum halepense*	Johnsongrass

Table 3. This table contains a list all of plants that were found on site that could be introduced, native, and/or state listed noxious. The plants are organized by plant type, origin, life span, USDA plant code, scientific name, and common name. Noxious weeds are highlighted in red. Problem weeds are highlighted in orange.

Percent Cover by Species (LPI)					
Scientific Name	Common Name	Transect 1	Transect 2	Transect 3	average
Aristida purpurea	purple threeawn	22	4	0	8.7
Baileya pleniradiata	woolly desert marigold	0	2	0	0.7
Bromus rubens	red brome	0	40	38	26
Bromus tectorum	cheatgrass	70	18	10	32.7
Coleogyne ramosissima	blackbrush	0	0	6	2
Centaurea melitensis	Maltese star-thistle	4	0	0	1.3
Encelia resinifera	sticky brittlebush	6	2	10	6
Ephedra viridis	mormon tea	0	8	12	6.7
Gutierrezia sarothrae	broom snakeweed	0	0	8	2.7
Sarcobatus vermiculatus	greasewood	0	2	0	0.7
Tragopogon dubius	yellow salsify	2	0	0	0.7
	moss	0	8	4	4

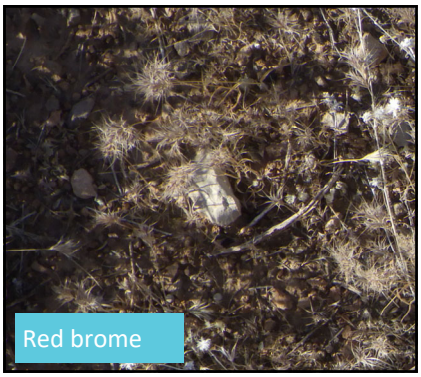


Table 4. This table contains a the percent cover by transect and average percent cover of plant species from the analysis of the Line Point intercept data. Noxious weeds are highlighted in red.

Percent Cover (LPI)				
Plant group	T1	T2	T3	Average
Perennial Grasses	22	4	0	8.7
Annual Grasses	70	58	48	58.7
Biennial Forb	2	2	0	1.3
Shrub	6	12	36	18
Plant Origin				
Natives	28	18	36	27.3
Introduced	72	58	48	59.3

Tables 5. This table shows the plant groups cover by transect and average percent cover from the analysis of the Line Point Intercept data.

Species Richness	
Transect #	# of Species
1	17
2	16
3	11
Average	14.7

Table 6. This table displays the number of different plant species found at each transect and averaged for the whole site.

Biodiversity	
Levels	Shannon's Index
Low	<1.5
Medium	1.5-2.5
High	>2.5
Current	1.8

Table 7. This table displays different ranges for ranking Shannon's Biodiversity index. In the last row, the current biodiversity index is displayed.

Malta star-thistle Measurements			
Transect Num.	Density (plants/m^2)	Live % Cover (LI)	Dead % Cover (LI)
1	15	6.8	29.8
2	9	2.4	19.3
3	0.4	0.6	3.8
Average	8.1	3.3	17.6

Tables 8. This table shows different measurements of Malta star-thistle including density, liver percent cover and last years dead stem % cover. These are displayed by transect and average for the whole site.

Percent Ground Cover (Sample Point)				
Cover Type	T1	T2	T3	average
Soil	7	11.4	8.3	8.9
Rock	2	3.3	16.1	7.1
Gravel	0	19.4	8.1	9.2
Biological Soil Crust	0	3.3	2	1.8
Litter	10.3	10.3	11.1	10.6
Woody Debri	0	2.2	5.6	2.6
Dead Malta Star-thistle	7	5.8	4.5	5.7
Total Plant Cover	73.4	41.7	42	52.3

Tables 9. This table shows the Relative average percent cover by transect and averaged for the site of different types of ground cover. Data is from the SamplePoint analysis of the ground cover photos.

References

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