2025 Weed Biological Control Monitoring, Upper Missouri Watershed Alliance (UMOWA), Cascade and Lewis & Clark Counties, MT

Trip Dates: July 8, 2025

Author: Carol Randall, Retired USFS Forest Entomologist and Weed Biological Control Specialist (cbrandall@ucdavis.edu)

Unit: Upper Missouri Watershed Alliance, UMOWA.

Local Contact: Sherry Meador, smeador@umowa.org, UMOWA Board Chairman

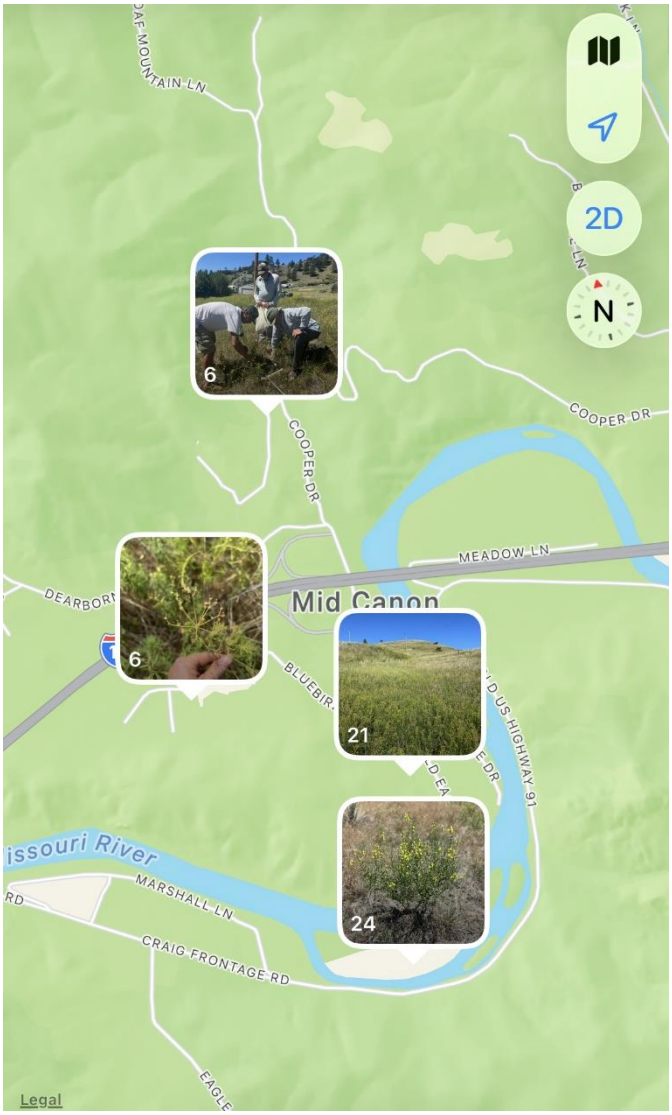
Others Present: Sherry Meador, Jay Erickson, John Kowalski, and Joe Kierkfeldt- UMOWA Board

Keywords: Standardized Impact Monitoring Protocol (SIMP); leafy spurge, *Euphorbia virgata*; Upper Missouri Watershed Alliance (UMOWA), Upper Missouri River; Cascade Co, MT; Lewis and Clark Co, MT.

On July 8, 2025, I, Carol Randall-retired Forest Service (FS) Forest Health Protection Entomologist, traveled to Craig, MT and met with Sherry Meador, Board Chairman of the Upper Missouri Watershed Alliance (UMOWA), Jay Erickson- UMOWA Board Vice Chair, John Kowalski- UMOWA Board Member, and Joe Kierkfeldt- UMOWA Board Member to remeasure UMOWA Standardized Impact Monitoring Protocol (SIMP; Appendix 1) plots established in 2024. UMOWA's SIMP plots are used to evaluate noxious weed treatments along the Upper Missouri River.

After leaving Craig, we continued to the three SIMP sites established in 2024, Yetter, Blue Jay Way, and Eagle Island (Figure 1) (Randall 2024) where leafy spurge biological control agents, including two species of flea beetles (*Aphthona nigriscutus* and *A. lacertosa*) and the red-headed stem borer (*Oberea erythrocephala*) had been released.

Figure 1: Locations of leafy spurge (*Euphorbia virgata*) biological control monitoring sites for the Upper Missouri Watershed Alliance (UMOWA), from top to bottom: Yetter LS SIMP, Blue Jay SIMP, and Eagle Island SIMP, 7/8/2025.



The northern most site was Yetter (Appendix 2). The vegetation monitoring data from the ten 1/8th meter^2 Daubenmire frame samples SIMP monitoring transect (Figure 2) had a range percent cover of leafy spurge from 15-50% with a mean of 24%; other weed cover ranged from 0-20% with a mean of 5.5% cover (mostly cheatgrass (*Bromus tectorum*)). Forbs/ shrubs cover ranged from 0-10% with a mean of 4% cover; desirable grasses accounted for between 5- 30% with a mean of 13% cover; bare ground (including rock) accounted for between 0-5% with a mean of 2.5% cover; litter accounted for between 40-65% with a mean of 50% cover; and no moss cover was observed. The height of the tallest leafy spurge plants in the sample ranged from 40-90 cm with a mean of 62.2 cm; the density of leafy spurge in the Daubenmire frames averaged 114 stems per meter^2

Leafy spurge flea beetle biological control agents were released at Yetter in 2024 a week prior to establishing the SIMP plot, so we did not disturb the recently released adult flea beetles with sweep netting. In 2025, (Appendix 2) we conducted six sets of sweeps and found between 40 and 100 *Aphthona nigriscutus* flea beetles per set. We also found *Aphthona flava* flea beetles in 3 sweep sets, but only a few. *Aphthona flava* likely moved into the area from earlier biological control releases as it was not included in the 2024 flea beetle release. We did not find red headed stem borers (*Oberea erythrocephala*)while sweeping.

Figure 2: Yetter leafy spurge SIMP site, 7/8/2025.

The middle monitoring site (Figure 1) was near Blue Jay Way where leafy spurge biological control agents were released over the past few years. We remeasured the SIMP plot installed in 2024 (Appendix 3). We found that across the 20-meter transect the average percent cover of leafy spurge in ten 1/8th meter^2 Daubenmire frame samples ranged from 10-55% with a mean of 30%; other weed cover ranged from 5-15% with a mean of 7.5% cover (mostly cheatgrass). There was no forbs/ shrubs cover; desirable grasses ranged from 0-10% with a mean of 4.5% cover; there was no bare ground; litter accounted for between 25-75% with a mean of 47.5% cover; and moss accounted for between 5-20% with a mean of 11% cover. The height of the tallest leafy spurge plants in the sample ranged from 35-59 cm with a mean of 48.5 cm; the density of leafy spurge in the Daubenmire frames averaged ~200 stems per meter^2.

We used sweep nets to monitor leafy spurge biological control agents at the Blue Jay Way site. We conducted six sets of 10 sweeps, and found between 100-175 *Aphthona nigriscutus*; we did not see any *Aphthona lacertosa* in 2025- and very few in 2024; 2-5 *Aphthona flava*; and we found red headed leafy spurge stem borers in 2 of the 6 sets of sweeps- 3 in one set and 1 in the other (Appendix 3).

Figure 3 Blue Jay Way Leafy Spurge SIMP site, remeasured 7/8/2025.

The southernmost monitoring site was on Eagle Island (Figure 4) where leafy spurge biological control agents were released over the past few years. We remeasured the SIMP Plot installed in 2024 (Appendix 4). We found in 2025 that across the 20-meter transect the average percent cover of leafy spurge in ten 1/8th meter^2 Daubenmire frame samples ranged from 0-25% with a mean of 11%; other weed cover ranged from 10-50% with a mean of 24.5% cover (mostly cheatgrass and houndstongue). Forbs/ shrubs cover ranged from 0-20% with a mean of 4.5% cover; desirable grass ranged from 0-5% with a mean of 1.5% cover; bare ground (including rock) accounted for between 0-15% with a mean of 5.5% cover; litter accounted for between 30-80% with a mean of 53% cover; and there was no moss cover sampled. The height of the tallest leafy spurge plants in the sample ranged from 12-65 cm with a mean of 45.6 cm; the density of leafy spurge in the Daubenmire frames averaged ~46 stems per meter^2.

Figure 4 Eagle Island SIMP monitoring transect, 7/8/2025.

We conducted six sets of 10 sweeps and found between 10-30 (average of 23) *Aphthona nigriscutus*; we found one red headed leafy spurge stem borer in 1 of the 6 sets of sweeps, and we found one *Aphthona flava* in one set of sweeps (Appendix 4).

UMOWA Biological Control Monitoring Summary: 2024 – 2025

Vegetative Cover Data

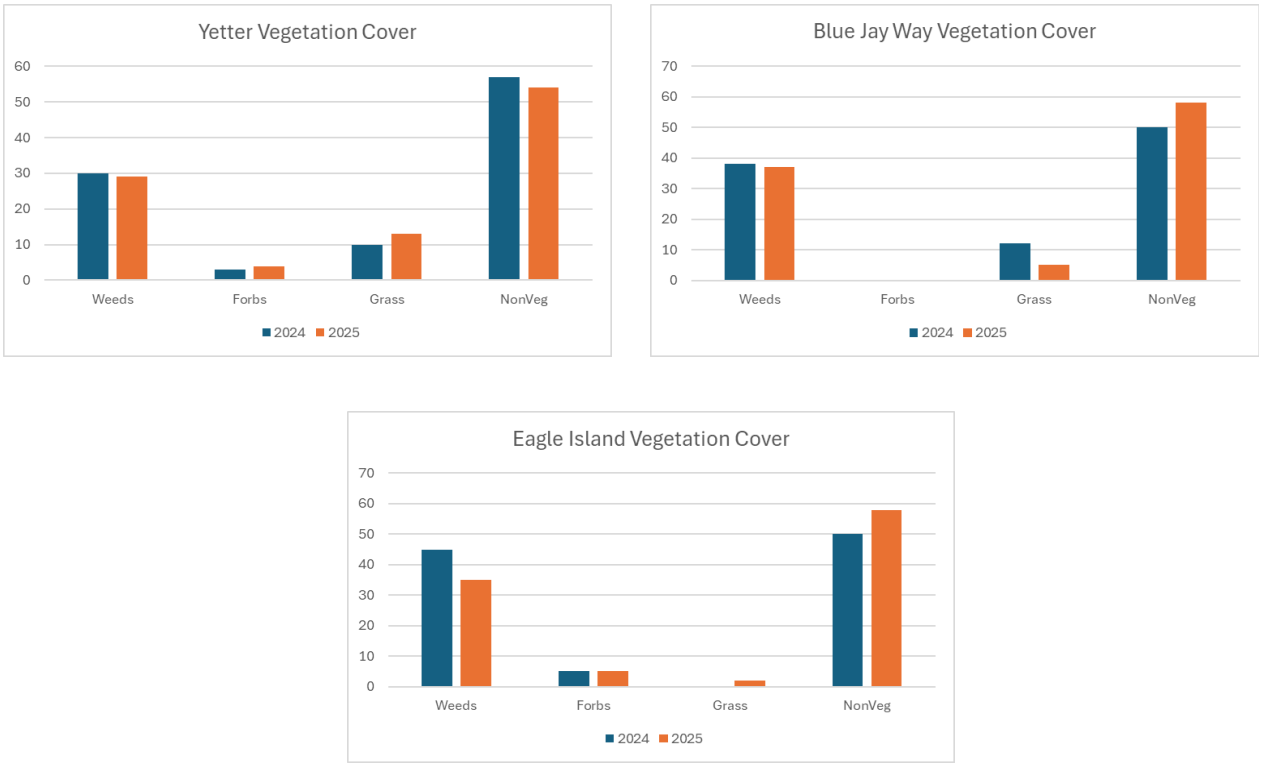
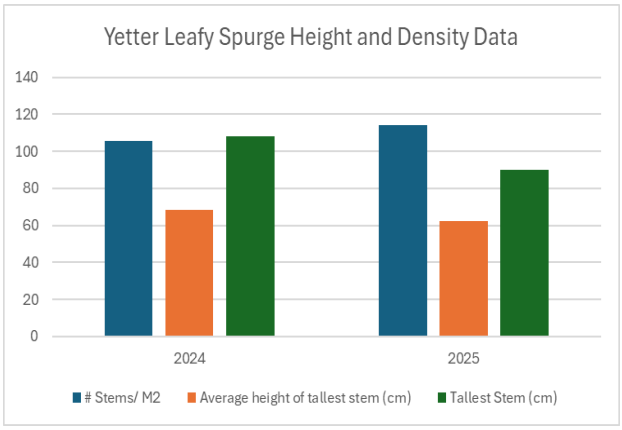


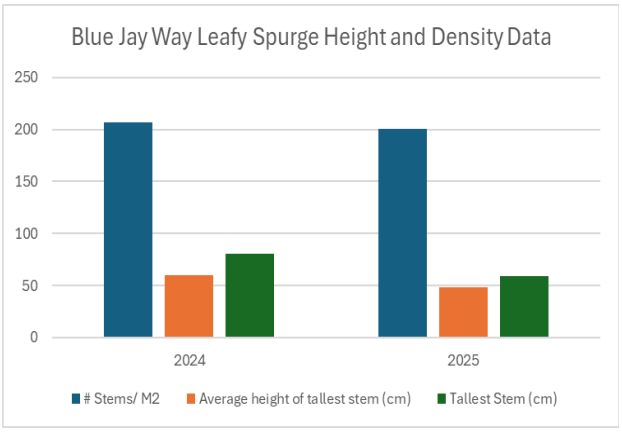
Figure 5: Vegetation cover data for 2024 and 2025 from the three Upper Missouri Watershed Alliance (UMOWA) leafy spurge biological control Standardized Impact Monitoring Protocol (SIMP) plots.

Changes in vegetative cover resulting from biological control activity take time to manifest so regular monitoring, such as annual SIMP monitoring, allows land managers to demonstrate changes through time. We now have two years of vegetation cover data from the three UMOWA plots, and significant trends are not yet apparent (Figure 5).

Leafy Spurge Height and Density Data

The height and density of leafy spurge is highly influenced by annual weather conditions, and between year variability can be high. There are differences in leafy spurge density and height between 2024 and 2025 at all three SIMP sites (Figure 6), but it will take more than two years of data to identify trends.





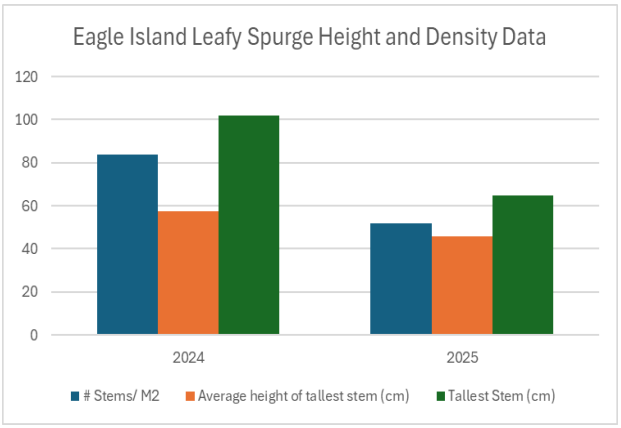


Figure 6: Leafy spurge density and height data for 2024 and 2025 from the three Upper Missouri Watershed Alliance (UMOWA) leafy spurge biological control Standardized Impact Monitoring Protocol (SIMP) plots.

Biological Control Agent Data

Leafy spurge biological control agents have been released throughout Cascade and Lewis and Clark Counties, however the biological control agents have not become uniformly distributed throughout leafy spurge infestations. Research shows that when biological control agents are missing or occur at low levels in a leafy purge patch, additional releases can be helpful.

At the Yetter SIMP plot no biological control agent monitoring was conducted when the plot was established in 2024.

Based on the data (Figure 7) *Aphthona nigriscutus* is the most abundant leafy spurge biological control agent at all 3 sites with smaller populations of other *Aphthona* flea beetle species and an occasional red-headed leafy spurge stem borer (*Oberea erythrocephala*) also found.

Site	Year	Average APNI	Average APLA	Average APFL	Average OBER
Eagle Island	2024	50	0	0	<1
	2025	22	0	<1	0
Blue Jay	2024	168	1	1	<1
	2025	124	0	3	<1
Yetter	2024				
	2025	63	0	<1	0

Figure 7: Leafy spurge biological control agent and average abundance data for 2024 and 2025 from the three Upper Missouri Watershed Alliance (UMOWA) leafy spurge biological control Standardized Impact Monitoring Protocol (SIMP) plots. APNI *Aphthona nigriscutus*; APLA *Aphthona lacertosa*; APFL *Aphthona flava*, OBER *Oberea erythrocephala*.

With the establishment of three SIMP plots, UMOWA has begun the important task of monitoring current conditions and putting a monitoring protocol in place which, if repeated annually, will enable UMOWA to detect changes in vegetation that will inform and help guide future management actions that ensure desirable vegetative communities are not displaced by invasive and noxious weeds along the Upper Missouri River.

References:

Randall, C. 2024. 2024 Weed Biological Control and Island Monitoring, Upper Missouri Watershed Alliance (UMOWA), Cascade and Lewis & Clark Counties, MT. Forest Health Protection Weed Biological Control Functional Assistance Trip MFO-TR.

Appendix 1

Standardized Impact Monitoring Protocol (SIMP) for Biological Control of Invasive Plants

Sampling Design

The Standardized Impact Monitoring Protocol (SIMP) is based upon a permanent 20 meter vegetation sampling transect randomly placed in a suitable (at least ½ hectare) infestation of the target invasive plant (target weed). Annual vegetation sampling is conducted to characterize the plant community and the abundance and vigor of the target weed.

Biological control agent populations are sampled along six transects using sweep nets or timed counts. Transects are randomly placed through the target weed infestation. Either a series of ten "sweeps" are conducted along each transect; the number of biological control agents in the net after ten sweeps are counted and recorded. Alternatively six three-minute times count of adult biological control agents are conducted; one 3-minute observation along each of the six transects.

Necessary Supplies

1) 25 x 50 cm Daubenmire frame made from PVC (preferred) or rebar,
2) 20 m (or longer) tape measure for the transect and smaller tape measure for target weed height,
3) 10 permanent markers (road whiskers) and nails,
4) Post or piece of rebar to permanently mark the starting point of the transect (1/2 to 2 meters in length),
5) Global Positioning System (GPS) to record plot location coordinates,
6) For sweep net sampling: sweep net, plastic tub to sort contents of sweep nets, and an aspirator to collect biological control agents from sweeps to be counted.
7) For Timed Counts: a stop watch.

Vegetation Monitoring

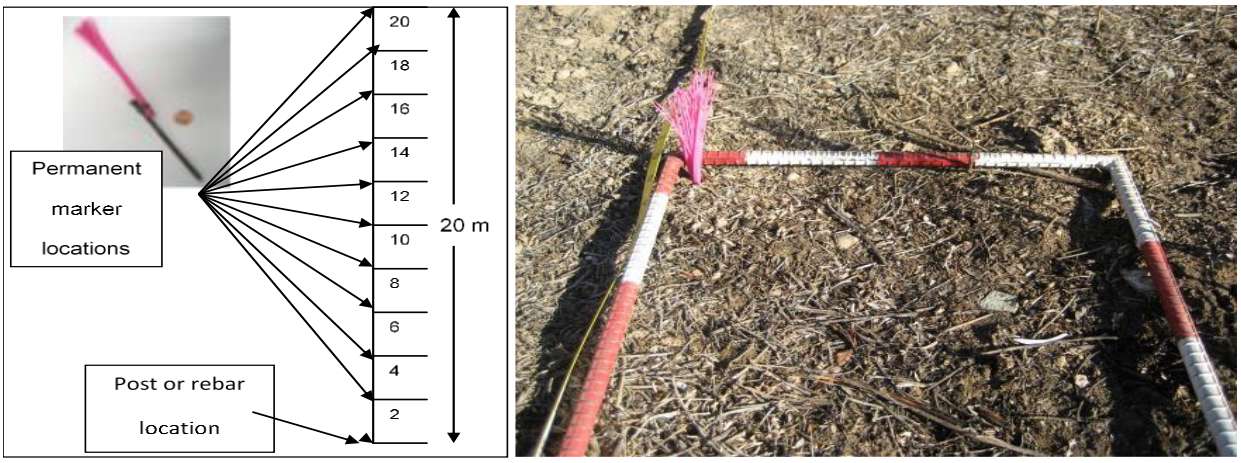


Figure 4: Standardized Impact Monitoring Protocol (SIMP) transect design and monumentation: Left: schematic of the layout of the monitoring transect, Right: photo showing placement of Daubenmire frame along 20 meter transect and placement of the permanent marker.

*Installation of Vegetation Monitoring Transect

A 20 meter measuring tape is randomly placed within the target weed infestation. A rebar post is used to mark the starting point of the 20 meter transect. Permanent markers (road whiskers) are placed every two meters along the length of the 20 meter tape for a total of 10 markers (Figure 2).

*Conducting Vegetation Monitoring

The Daubenmire frame was placed parallel to the vegetation monitoring transect on the 50 cm side with the permanent marker in the upper left corner for each of the 10 permanent markers (Figure 3). With the frame in position, estimates were made of percent cover of the target weed, other weeds, forbs, grasses, bare ground, litter, and moss within the frame to the nearest 5%. When trace amounts of a particular class occurred, it was marked as 5% and the coverage of other classes were adjusted so that total percent cover of all classes was 100% per state guidelines.

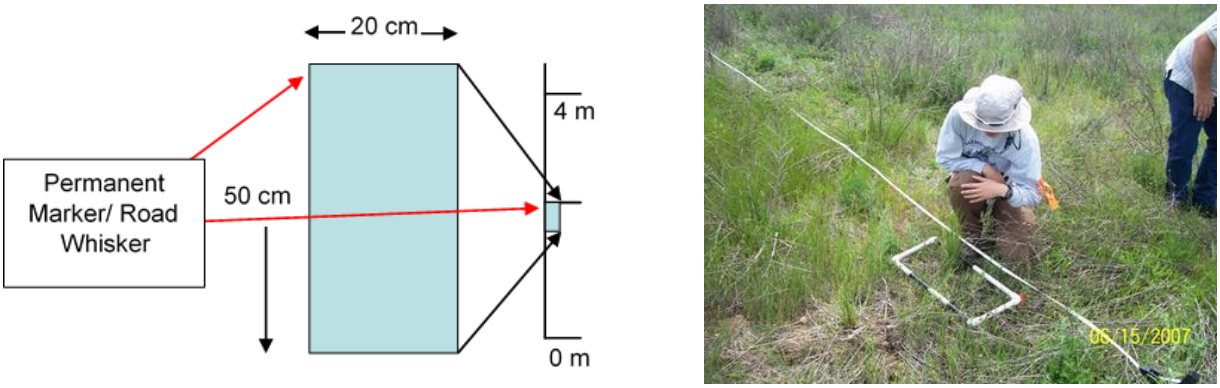


Figure 5: How to position the Daubenmire frame along the 20 meter monitoring transect for the Standardized Impact Monitoring Protocol (SIMP) biological control monitoring program.

***Remeasuring Existing Statewide Biological Control Monitoring Plots**

GPS coordinates recorded during plot establishment are entered into a Global Positioning Unit (GPS) and used to relocate the plot. Once at the plot, a 20 meter (or longer) tape is attached to the post marking the start of the vegetation monitoring transect (Figure 2). The 20 meter (or longer) tape is extended along the road whiskers installed at the time of plot establishment. If road whiskers are missing, they are replaced at the proper distance from the starting stake. Once the tape is extended and all road whiskers accounted for, vegetation monitoring occurs per the description below "Conducting Vegetation Monitoring."

Once vegetation monitoring is complete, six three-minute observations or six 10-sweep transects are made to count adult biocontrol agents. All data is noted on a data sheet, and a picture is taken of the plot including the plot stake and unique features of the landscape.

The number of target weed stems occurring within the Daubenmire frame are counted and the height of the tallest target weed stem are measured.

Biocontrol Agent Monitoring

Sweep Net Method: Six sweeping transects are randomly located in the target weed infestation avoiding the permanent vegetation monitoring transect. At the end of 10 sweeps, the contents of the sweep net are emptied into a plastic basin or tub and an aspirator is used to aspirate and count adult biocontrol agents. The number of biocontrol agent adults collected is recorded per transect sampled.

Timed Count Method: Six transects are randomly located in the target weed infestation avoiding the permanent vegetation monitoring transect. The observer then walks along a transect for a total of three minutes, counting all adult biological control agents observed. At the end of the three minute observation, the number of biocontrol adults observed is recorded on the datasheet, and the observer moves to another transect and repeats the three-minute observation.

Appendix 2: **Standardized Impact Monitoring Protocol (SIMP)**

General Information:

Observer(s): Carol Randall/ Jay Erickson/ John Kowalski/Joe Kierkfeldt/Sherry Meador		Date: 7/8/2025	Landowner: PVLA
Permanent site? Y	Site name: Yetter LS		Weed: Leafy Spurge
Biocontrol agent: Aphthona beetles/ Oberea		Insect Stage: adults	
Lat/Long: N 47.13899	W 111.89016	UTMDatum:	UTM E:
		UTM Year :	UTM N:

Weed Infestation:

Size in acres: 1 acre	Picture taken? Y		If Y, picture direction: 20 degrees N

Vegetation cover (all in %, rows add to 100%):

Frame	Target weed%	Other weed%	Forb/shrub %	Grass%	Bare ground %	Litter%	Moss%	Total%
1	50	0	5	5	0	40	0	100
2	30	20	0	5	0	45	0	100
3	25	10	5	10	0	45	0	100
4	25	5	10	10	5	45	0	100
5	20	5	10	10	0	55	0	100
6	20	5	5	10	5	55	0	100
7	25	0	0	25	5	45	0	100
8	15	0	0	10	5	65	0	100
9	15	0	0	30	0	55	0	100
10	15	10	5	15	5	50	0	100

Target weed size/density:

Frame	Number of stems	Height of tallest stem (cm)
1	18	90
2	22	51
3	18	51
4	16	80
5	11	87
6	9	55
7	17	59
8	9	55
9	13	55
10	10	40

Biological control agent:

Count #	# insects seen during 3 minute count
1	40 APNI 2 APFL
2	70 APNI
3	100 APNI 1 APFL
4	60 APNI
5	60 APNI 1 APFL
6	50 APNI

Notes: other weeds Cheat grass, misc. mustards- shrub=snowberry

Appendix 3 **Standardized Impact Monitoring Protocol (SIMP)**

General Information:

Observer(s): Carol Randall/ Jay Erickson/ John Kowalski/Joe Kierkfeldt		Date: 7/8/2025	Landowner: PVLA
Permanent site? Y	Site name: Blue Jay Rd LS (Landell)		Weed: Leafy Spurge
Biocontrol agent: Aphthona spp/ Oberea		Insect Stage: Adult	
Lat/Long: N 47.12898	W 111.89634	UTM Datum:	UTM E:
		UTM Year :	UTM N:

Weed Infestation:

Size in acres: 5	Picture taken?	Y	If Y, picture direction: 170 degree S

Vegetation cover (all in %, rows add to 100%):

Frame	Target weed%	Other weed%	Forb/shrub %	Grass%	Bare ground %	Litter%	Moss%	Total%
1	10	5	0	5	0	75	5	100
2	30	15	0	5	5	50	5	100
3	55	10	0	5	0	25	5	100
4	25	10	0	5	0	45	15	100
5	25	5	0	10	0	40	20	100
6	20	10	0	5	0	50	15	100
7	20	5	0	0	0	55	20	100
8	45	5	0	5	0	30	15	100
9	35	5	0	0	0	55	5	100
10	35	5	0	5	0	50	5	100

Target weed size/density:

Frame	Number of stems	Height of tallest stem (cm)
1	10	52
2	35	51
3	30	59
4	28	45
5	26	47
6	21	45
7	18	51
8	35	50
9	26	50
10	22	35

Biological control agent:

Count #	# insects seen during 3 minute count
1	150 APNI/ 2 APFL
2	175 APNI/ 5 APLA
3	100 APNI/ 5 APFL
4	3 OBER 100 APNI 2 APFL
5	120 APNI/ 1 OBER/ 3 APFL
6	100 APNI

Appendix 4 **Standardized Impact Monitoring Protocol (SIMP)**

General Information:

Observer(s): Carol Randall/ Jay Erickson/ John Kowalski/Joe Kierkfeldt/Sherry Meador		Date: 7/8/2025	Landowner: PVLA
Permanent site? Y	Site name: Eagle Island LS		Weed: Leafy Spurge
Biocontrol agent: Aphthona beetles		Insect Stage: adults	
Lat/Long: N 47.12109	W 111.88825	UTM Datum:	UTM E:
		UTM Year :	UTM N:

Weed Infestation:

Size in acres: 3 acres	Picture taken? Y		If Y, picture direction: 343 degrees N

Vegetation cover (all in %, rows add to 100%):

Frame	Target weed%	Other weed%	Forb/shrub %	Grass%	Bare ground %	Litter%	Moss%	Total%
1	0	50	0	0	15	35	0	100
2	5	10	20	0	10	55	0	100
3	10	15	10	0	15	50	0	100
4	10	35	0	0	0	55	0	100
5	25	15	15	0	0	45	0	100
6	15	20	0	0	0	65	0	100
7	15	40	0	0	5	40	5	100
8	25	35	0	5	5	30	0	100
9	5	10	0	5	0	80	0	100
10	0	15	0	5	5	75	0	100

Target weed size/density:

Frame	Number of stems	Height of tallest stem (cm)
1	0	
2	2	12
3	8	35
4	8	58
5	15	65
6	8	65
7	11	55
8	12	50
9	1	25
10	0	

Biological control agent:

Count #	# insects seen during 3 minute count
1	30 APNI 1 OBER
2	20 APNI
3	20 APNI, 1 APFL
4	10 APNI
5	20 APNI
6	30 APNI

Notes: Other weeds include houndstongue and cheatgrass, shrub = snowberry