Lespedeza cuneata and _Asclepias verticillata_ detection by dogs on Neal Smith National Wildlife Refuge, Prairie City, Iowa

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Prepared for
Friends of the Prairie Learning Center, The Garden Club of America Partners for Plants, and US Fish & Wildlife Service

by

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Wicket gets her ball for finding a small patch of whorled milkweed. Finding the short plant among the taller prairie plants is an impressive display and a video of Lily finding a small patch can be viewed here: Https://youtu.be/ATkQUu_CkRo

Summary:

Working Dogs for Conservation deployed two handlers and three dogs to the Neal Smith National Wildlife Refuge (NSNWR), Prairie City, Iowa, for the detection of wild growing invasive *Lespedeza cuneata* from 21 May to 2 June 2015. Dogs, Wicket and Lily, had previously detected Lespedeza at Neal Smith National Wildlife Refuge (Wicket in 2010, 2011, and 2014 and Lily in 2011 and 2014). This was the first year of deployment for dog, Busco. In addition, this year the returning dogs—Lily and Wicket—were trained to the scent of whorled milkweed (*Asclepias verticillata*), and once adequately familiar with the scent were able to simultaneously search the units for milkweed in the interest of determining how widely it's distributed across NSNWR. Teams searched for Lespedeza over 144 km within 10 management units, and found Lespedeza in seven units (North Middle, PLC, Highpoint, Thorn Valley, Orbweaver, Bison South, and Basswood) for a total of 39 plant locations (either single plants or patches). Simultaneously, milkweed searches were conducted on over 83 km in six units (North Middle, PLC, Orbweaver, Bison North, Swallowtail, and Basswood) and whorled milkweed was found to be widespread across all units, with teams locating 378 milkweed locations (either single plants or patches).

Notable accomplishments of the 2015 season:

- To our knowledge, this is the first-ever deployment of dogs finding invasive and native plants during simultaneous searches anywhere in the world
- We determined that NSNWR has an abundant population of whorled milkweed, throughout the units (and not primarily along edges, which was previously suspected given that's where it's easiest for people to see the short plant)
- After four years of Lespedeza searches, the seed-harvested area in North Middle remains free from Lespedeza
- The patches of Lespedeza previously located in the units appear to be getting smaller in size, and the overall number of locations is staying small

Lespedeza Training:

Returning dogs, Wicket and Lily, were refreshed with the scent of Lespedeza for one and three days, respectively, before beginning searches. First-year dog, Busco, trained for six days prior to commencing searches. The dogs were deemed ready when they were independently alerting to the presence of growing Lespedeza (including single plants, small, and large patches), at "typical" detection distances of several meters up to approximately 25 meters.

Naturally occurring Lespedeza were located in PLC and Highpoint units which we used for training plants. We placed clipped stems of the plants in a line-up of jars on pavement, to introduce/refresh the dogs to the scent of lespedeza in a simplistic, plant-barren environment (see Figure 1). The returning dogs were then immediately placed in PLC and Highpoint areas to complete their refresher training on undisturbed naturally occurring plants. For the new dog, clippings were then removed from jars and placed among prairie plants. Whole Lespedeza were dug up and placed in pots, which we could move around within prairie units. From there, training progressed to un-clipped growing plants with some leaves pinched or crushed, to coax more scent to be released. Finally, undisturbed naturally occurring plants were used. Because the returning dogs were able to begin Lespedeza searches quickly, as they found plants those units were used as additional training sites for the new dog.

Given this was the fourth year of work with Lespedeza, and we've trained five dogs to this target, we have now perfected the training and were able to get Busco field-ready in just six days of training.

Whorled milkweed training:

In order to rapidly prepare Busco for deployment, we elected to train her only to Lespedeza, and trained the veteran dogs to the additional milkweed scent.

Milkweed training for Lily and Wicket used the same process as the Lespedeza training. In addition, given its slight stature, single milkweed stems were dug up and place din seedling pots (Figure 2) so dogs could be given repeated exposure to these isolated plants.

Lily and Wicket began Lespedeza deployment, and then after the morning's Lespedeza search, trained to milkweed. If a handler spotted milkweed while searching, she would conduct and opportunistic training session. After six days of training to milkweed, both dogs began independently targeting milkweed during Lespedeza searches.

Deployment:
Both Lespedeza and milkweed searches were unequivocal successes in the dogs' ability to find the plants. Thirty-nine Lespedeza locations were noted, which is almost 10-times fewer than the number of milkweed located (378 locations). The dogs readily alerted to either plant, even-though the milkweed scent was far more abundant. Both plants were detectable at distances up to approximately 25m (see Figure 3 for a one-minute video of Lily finding a milkweed plant in Basswood unit).

The handlers maintained a methodical search pattern across the area which consisted primarily of parallel lines at 20 to 30 meters spacing, running perpendicular to the wind direction. The handler carried a GPS which was continually logging the search track every 20 seconds. Dogs searched off-leash but within close range of the handler, while quartering to the left and right of the search line being maintained by the handler. Areas with reed canary grass, dense brome, unburned sections, or where the bison were loitering were not searched.

Transect spacing is such that it allows for finding many patches, if they exist, while maximizing the ability to cover large amounts of area in relatively short time period. Search lines were typically 20-30m apart, which falls within the maximum observed range of detection distances for the dogs locating both Lespedeza and milkweed. However, because dogs often find plants at less than maximum distance, it should be expected that not all plants were located. By observing where patches were found and given the clumped nature of Lespedeza, it's vital that follow up sprayers search the patch area very thoroughly for all plants. The handler spent a brief amount of time assessing the patch, and did not exhaustively locate every plant in the patch. See Appendix for maps of searched areas, and locations of Lespedeza and milkweed. Detailed GPS location information and information on patch size have been shared with Karen Viste-Sparkman previously.

At the point at which Lily and Wicket began independently locating milkweed during searches, we started counting those search kilometers as both Lespedeza and milkweed searches. Busco continued to perform only Lespedeza searches. This resulted in 83.4 km of milkweed searches, and 144.2 of lespedeza searches (i.e. 144.2 km were searched for lespedeza and 83.4 km of those searches were also searching for milkweed, See Table 1). Seven management units contained Lespedeza (North Middle, PLC, Highpoint, Thorn Valley, Orbweaver, Bison South, and Basswood), and no Lespedeza were found in three other units (Southeast, Swallowtail, and the northwestern portion of Bison North). Milkweed plants were noted throughout the six units where the dogs searched for them (Bison North, North Middle, PLC, Swallowtail, Orbweaver, and Basswood).

Table 1. Survey results summary

Date	area	dist (km)	milkweed	lespedeza
5/21-5/30	Highpoint	10.9	2*	5
5/23-5/28	Thorn Valley	9.4	1*	11
5/24	Bison South	10.9	n/a*	1
5/27-5/30	Orbweaver	12.7	32	10
5/26	Southeast	5.9	n/a*	0
5/27-5/28	Basswood	14.2	14	1
5/28-5/30	PLC	18.1	72	2
5/31-6/1	North Middle	36.6	131	9
6/2	Swallowtail	11.4	65	0
5/31-6/2	Bison North	14.1	59	0
5/28	Ant Mound	n/a*	2*	0
Total Search		**144.2 km**	**378**	**39**
Total Lespedeza ONLY search		**60.8 km**		
Total Milkweed + Lespedeza Search		**83.4 km**		

*Areas which were not systematically searched for milkweed. If milkweed were located, it was opportunistically found by handlers while walking through area, or by a dog who was working in a contiguous unit and happened to smell a nearby milkweed in the adjacent unit

Milkweed plants were exceedingly abundant, occurring at a rate of one plant or patch every 220 m. When the dogs found a plant, the handler would mark a GPS location, record dog behavior and plant information on a data sheet, place a pin flag, and briefly play with the dog (Figure 4). This procedure minimally takes 60-120 seconds, and with 378 locations that resulted in 6-12 hours was spent in this procedure. The rate for searching for Lespedeza only was 2.2km/hour, while the rate of searching for Lespedeza combined with milkweed was 1.6km/hour. We anticipated some slowing of the searches by adding an additional target, and the extra effort required was made possible by the GCA Partners for Plants support.

It's a very happy occasion for the dogs to locate so many desirable plants, but from a logistical standpoint, milkweed is almost too successful of a target as it converts significant time to processing and away from searching. Therefore, recommended options for future deployment are:

1. Make no changes and know that by knowing an additional, common, target the searches will take approximately 30% longer to accomplish.
2. Send one intern into the field with each dog team to perform data collection, thus allowing the team to rapidly move from plant-to-plant and speed searching.
3. Determine if additional coverage for whorled milkweed is needed. We have demonstrated that the plant is widespread across the refuge and it's possible to "extinguish" a trained odor from a dog's repertoire so that even experienced dogs could learn to ignore milkweed and return to searching for lesser common plants.
4. Maintain a mix of dogs trained only to milkweed, with those who know additional targets. This essentially broadens each team's transect spacing to double the usual distance, while alternating transect lines between Lespedeza-only and Lespedeza-milkweed searches. This would provide comprehensive Lespedeza coverage, with coarser milkweed coverage yet still allowing us to establish if milkweed is throughout the unit or contained in just a few areas. See Figure 5.

Conclusion:

2015 was a highly successful season for Lespedeza and milkweed detection, made possible by the continued support of Friends of the Prairie Learning Center, new support of The Garden Club of America Partners for Plants, and our ongoing relationship with US Fish & Wildlife Service personnel at Neal Smith National Wildlife Refuge.

Because eradication is a patient, long-term process, we hope that we will be able to continue working together on Lespedeza, as well as new targets of interest on the Refuge.

Figure 1. Training starts with plant clippings in jars, placed on pavement, so that the dog can experience the target odor without distraction of other plant odor.

Figure 2. By digging up single stems of whorled milkweed and placing them in greenhouse seedling pots, we could carry them with us and place frequently--either isolated on pavement, or nestled in other vegetation--to provide ample training encounters.

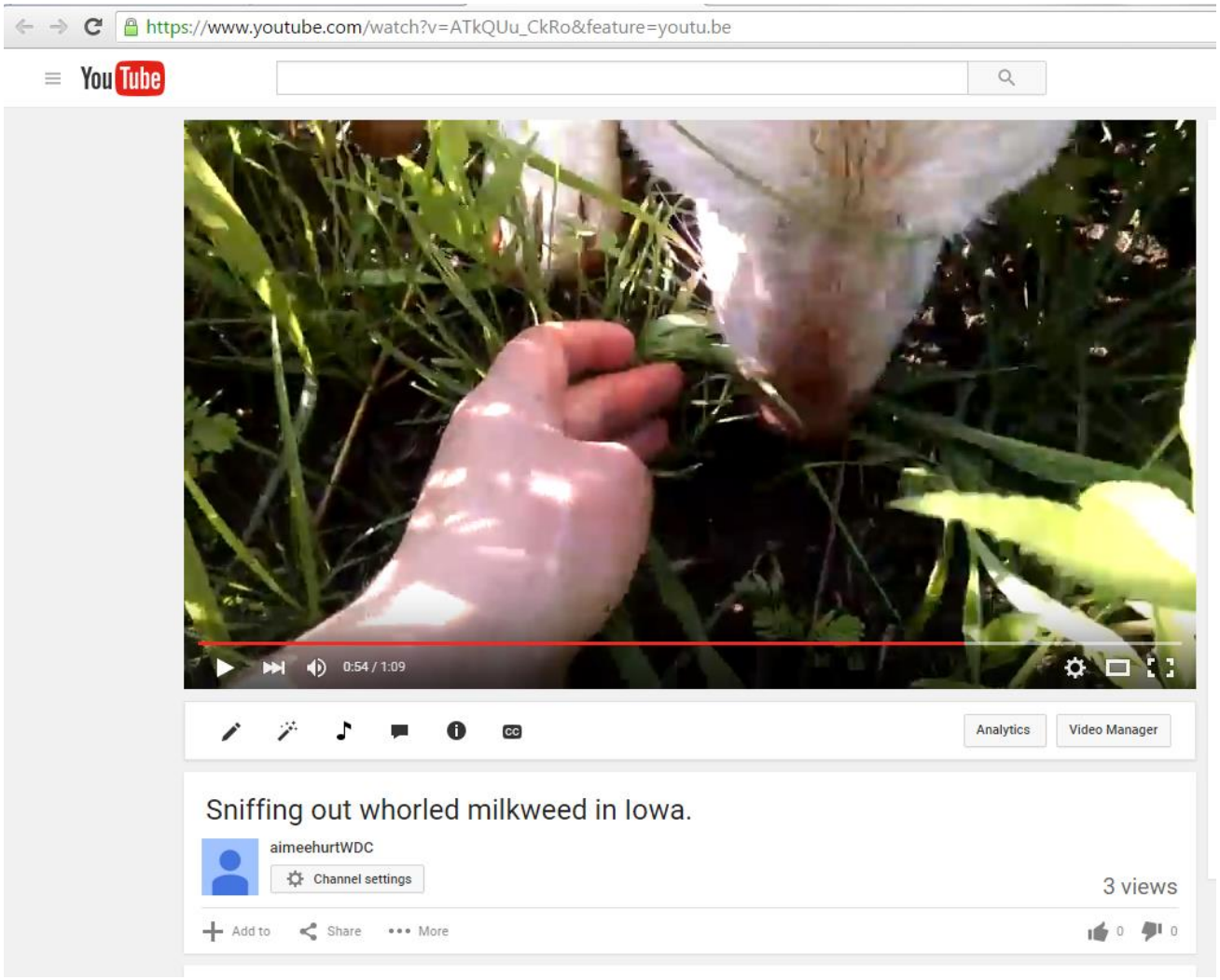


Figure 3. Go to this link to see a 1-minute video of Lily finding a milkweed during a deployment. Https://youtu.be/ATkQUu_CkRo. Note, as soon as the video starts she is "on-scent".

Figure 4. When a plant is found, there's a 1-2 minute process of playing with the dog, marking GPS point, recording data on paper, and placing pin flags.

Figure 5. This is an example of having one dog who knows the more numerous target (milkweed) alternating transect lines with a dog who knows only the rarer target (Lespedeza). This allows a thorough search of the rarer target, while still establishing the overall trend of the common target in the area. Pink line is track of Lespedeza-milkweed search, blue line is Lespedeza-only. Blue stars are milkweed locations, no Lespedeza were found in this plot.

Appendix

Key:

Pink: Track of Lespedeza-plus-milkweed searches

Blue: Track of Lespedeza-only searches (handler noted milkweed if seen, even though dog wasn't searching for it)

Blue star: milkweed location (single or patch)

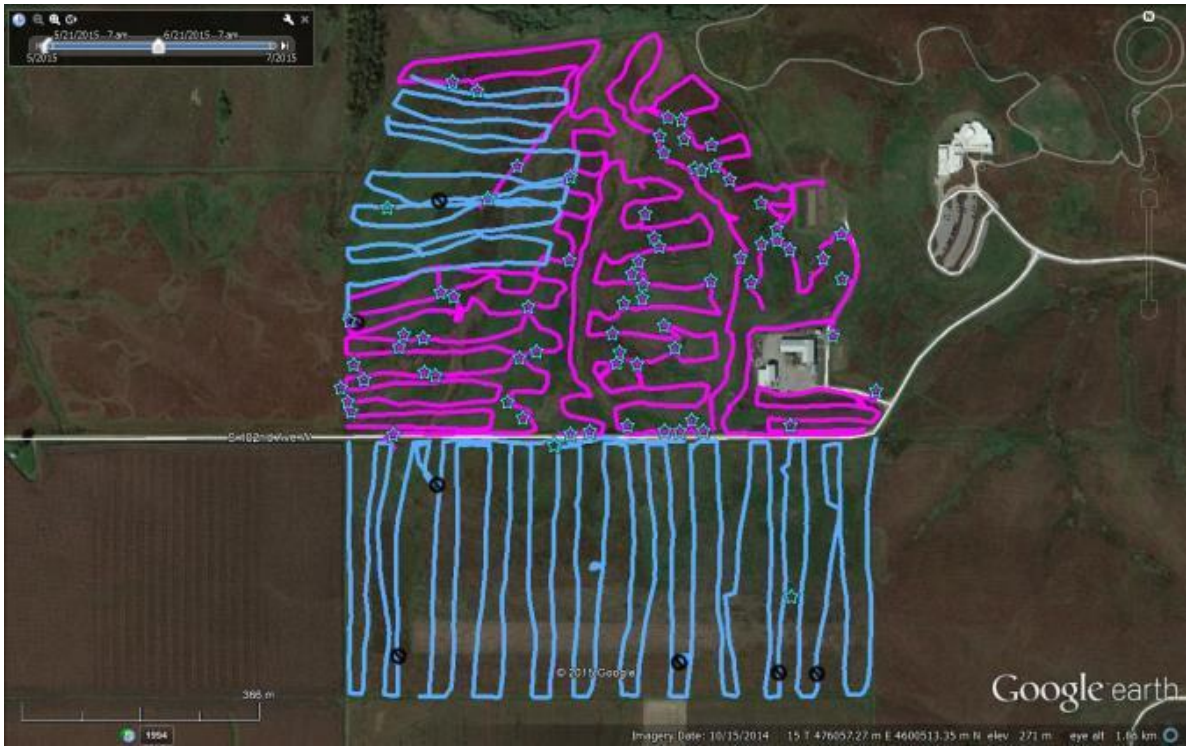
Black noid: Lespedeza location (single or patch)

North Middle: 131 milkweed, 9 Lespedeza

Bison North: 59 milkweed (incomplete coverage due to bison loitering)

Swallowtail: 65 milkweed

PLC: 72 milkweed, 2 Lespedeza and Highpoint: 2 milkweed, 5 Lespedeza



Orbweaver: 32 milkweed, 10 Lespedeza

Basswood: 14 milkweed, 1 Lespedeza. No plants found in Southeast. Also note two opportunistic milkweeds found in Ant Mound during Basswood search

Thorn Valley: 1 milkweed, 11 Lespedeza

Bison South: 1 Lespedeza