Pollinator Habitat Initiative Field and Drone Survey

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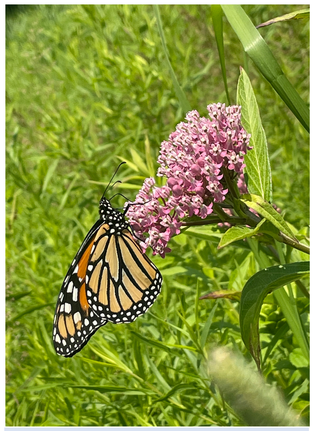

Image 1: Monarch butterfly (*Danaus plexippus*) on swamp milkweed (*Asclepias Incarnata*)

Introduction

- Monarch butterfly (*Danaus plexippus*) populations are in decline, primarily due to loss of milkweed habitat.
- The Greater Cincinnati Pollinator Habitat Initiative is researching best methods for restoring milkweed at sites across the region.
- Milkweed population sampling evaluates success of restoration efforts.
- Drone surveys may provide more efficient method of population sampling versus field surveys.
- Data from 2019 and 2020 showed drone methods adequately mimicked field survey methods when entire sites were sampled.
- In 2021, we sought to refine the methods by making sampling more efficient with the use of random quadrat sampling. We then tested this by comparing drone and field quadrat sampling methods.
- We hypothesized that there would be no difference in milkweed stem counts between the field and drone quadrate survey methods.

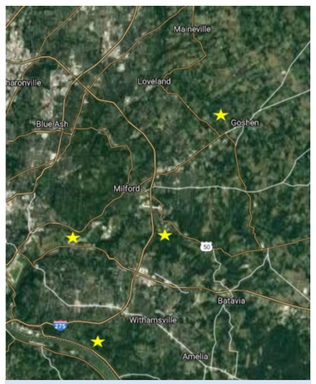

Image 2: The four study locations of the 2021 sampled sites.

Objective

To determine if drone quadrat survey methods are as effective as field quadrat surveying methods.

Methods

- 5 sites at 4 locations were sampled in 2021 (see Image 2 above).
- FIELD: Sampled 50 randomly selected 1m * 0.5m quadrats in the field at each of the 5 sites.
  - All common milkweed (*Asclepias syriaca)* stems were counted in each quadrat.
- DRONE: Using GIS, the same 50 quadrats (lat/long) were marked on drone images of each site.
  - All common milkweed stems were counted in each quadrat on the images in GIS by two observers and averaged.
- STATS: The drone and field counts of each quadrat were compared using Spearman correlation analysis to determine if the two methods resulted in similar stem counts.
  - Normality was checked and data was not normally distributed.

Results

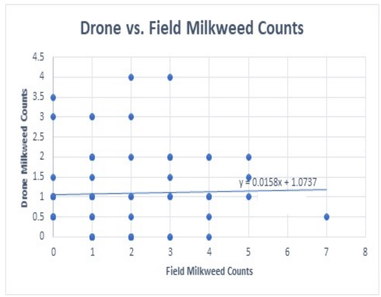

Fig. 1: No correlation between drone and field milkweed counts

Descriptive Statistics					
	Mean	Std. Error	Skewness	Kurtosis	Shapiro-Wilk
Drone	1.1029	0.12508	1.018	0.604	0.874
Field	1.8529	0.18771	0.900	.628	0.897

Table 1: Skewness, Kurtosis, and Shapiro-Wilk

Correlations

			Drone	Field
Spearman's rho	Drone	Correlation Coefficient	1.000	.034
		Sig. (2-tailed)	.	.784
		N	68	68
	Field	Correlation Coefficient	.034	1.000
		Sig. (2-tailed)	.784	.
		N	68	68

Table 2: Correlation coefficients between drone and field survey methods p= 0.784

Histogram: field survey

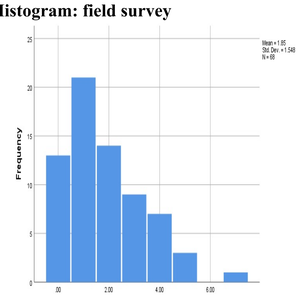

Fig. 2: Distribution frequency of milkweed stems counted in field survey

Histogram: drone survey

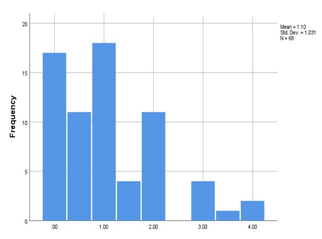

Fig 3. Distribution frequency of milkweed stems counted in drone survey

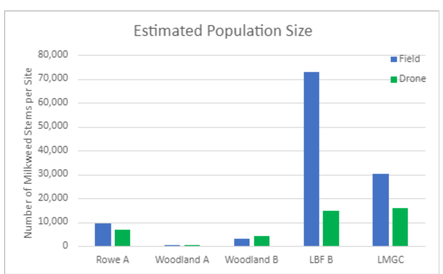

Fig. 4: Milkweed population size estimates from drone and field surveys

Discussion

- The data collected in the summer of 2021 showed that there was no correlation between the field survey method and the drone survey method.
- Comparing the survey methods relied heavily on our ability to sample the exact same quadrats (lat/long) on the drone images and in the field; we determined that a more precise GPS is needed for future work. The GPS used for this data collection was not accurate enough to ensure the quadrats were in the exact same location.
- We also learned that the random quadrat method resulted in a high number of quadrats with no milkweed stems being sampled, making it more difficult to compare the two methods. In the future, we will select quadrat locations that have milkweed stems.

Image 3: Garmin Handheld GPS used in the experiment

Future Research

We anticipate repeating the experiment this fall using a high accuracy GPS in the field, in order to assure that the field and drone quadrats are identical. In addition, we will intentionally select quadrats that have milkweed present to compare the field and drone quadrats.

Acknowledgements

We would like to thank both Dr. Robertson and Dr. Hopfensperger for providing the materials, the direction, and most importantly their time, which was needed over the summer to complete this research. Funding provided by the Duke Energy Foundation.

Image 4: A common milkweed stem included in the field survey.

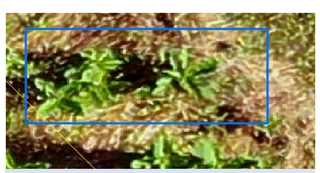

Image 5: A common milkweed stem included in the drone image survey