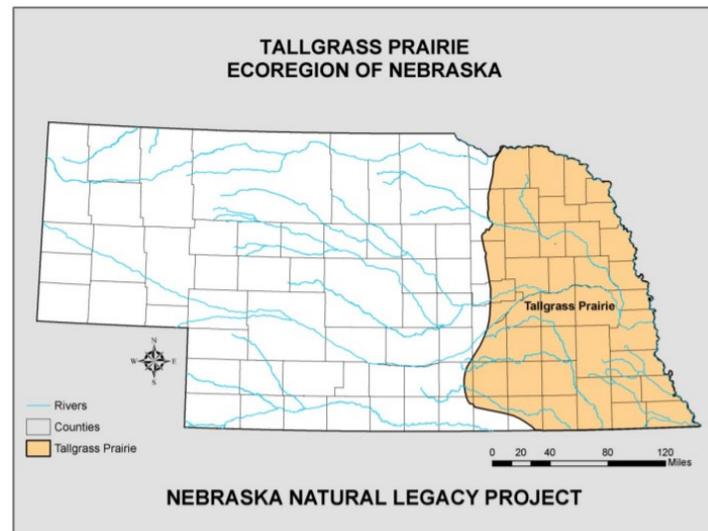


## Regal Fritillary and Monarch Abundance Estimates with Floral, Habitat, and Management Assessments

**Background:** The purpose of the project is to collect data in order to calculate an abundance estimate, study behavior, and nectaring preferences, and conduct floral resource assessments on habitats within the range of the Regal Fritillary (*Argynnis idalia*) and monarch butterfly (*Danaus plexippus*) in eastern Nebraska. The U.S. Fish and Wildlife Service has been petitioned to list the Regal Fritillary under the Endangered Species Act in 2022. Current data on the distribution and population size are needed in order for the Service to be able to accurately assess the status of the Regal Fritillary on eastern Nebraska grasslands. Data on monarchs will also be collected to assist with their listing decision.

### **Objectives:**

1. Determine the abundance estimate for regal fritillaries and monarch butterflies properties in the eastern tallgrass prairie ecoregion of Nebraska.
2. Determine whether abundance correlates to habitat variables on survey sites.
3. Determine whether abundance relates to floral richness.



### **Study Areas:**

The focal area for this survey is the Tallgrass Prairie Ecoregion. A list of available sites will be provided by NGPC. As of 2021, the survey is expanding to include some sites through all of Nebraska. Western sites are more flexible and can be chosen at least in part by the surveyor.

*The following methods are adapted from those used by Dr. Ray Moranz of the Xerces Society/ Oklahoma State University and were modified in order to accomplish project objectives.*

### **Survey Methods:**

#### **Sampling Window:**

Each site should be surveyed at least twice from June 15 to August 15. These surveys should be at least 2 weeks apart, ideally 3-4 weeks apart. Note: Surveyors are more likely to find Regal Fritillaries from later in June to the end of July. Blooming Narrow-leaved Coneflower (*Echinacea angustifolia*) can be an indicator of Regal Fritillary activity. Surveyors should also practice their distance estimation within two weeks of surveying to ensure accuracy.

### **Weather and Time Constraints:**

All of these factors will need to be noted on the data sheet. Weather conditions are recorded, including the temperature, estimated percent cloud cover, and wind speed (using the Beaufort scale) at the beginning of the survey.

1. Surveys must be conducted when the air temperature exceeds 55°F.
2. Wind is ≤12 mph (19 kph) (Beaufort Scale Leaves and small twigs constantly moving, light flags extended, smoke rises at about 70 degrees).
3. <30% cloud cover if <80°F. Cloud cover is tolerable if >80°F.
4. The survey should start between 0900–1600 hours unless the temperature is >80°F, then surveys may begin between 0800-1800 hours.

### **1. Butterfly Surveys:**

1. On each site, a 200-m long transect will be traversed. This should take approximately 5-10 minutes. Do not walk too slowly.
2. Transects will be randomly placed on the property.
3. The transects will be marked using GPS coordinates at the start and endpoints. While the transects are labeled as “Start Point” and “End Point”, these were generated randomly. Surveyors can start at either point and should avoid walking too close to the transect before starting the survey. Walk the shortest distance possible between these two points. If you would need to detour by more than 5 meters to get through or around an obstacle, the transect should, in this order:
  - a. Be cut short if the transect is over 100 meters long. The new end point should be recorded. Include the reason for cutting the transect short in the notes section (deep water, dense vegetation, etc.). **See paragraph 2 of Figure 4 (page 5) for veg and habitat plot instructions.**
  - b. Switch the start and end points to see if the transect can be longer than 100 meters from the other direction. Circle “Reversed” and then record the correct new end coordinates. Include the reason for cutting the transect short in the notes section (deep water, dense vegetation, etc.). **See paragraph 2 of Figure 4 (page 5) for veg and habitat plot instructions.**
  - c. Be excluded if the transect is less than 100 meters long. This will remove the site from the study and new sites can be provided. Include the reason for excluding the transect in the notes section (deep water, dense vegetation, etc.).
4. The surveyor must record the site, weather and training information at the top of the data sheet.
5. The surveyor must estimate the distance to where the butterfly was detected (see Fig. 1).
6. The surveyor must estimate the angle between the detection line and the transect (see Fig. 2).
7. Regal Fritillary and Monarch butterflies will have the following data points collected about them (do not leave the transect to do so):
  - a. Distance to where the butterfly was first detected.
  - b. Angle between the line to the location of first detection and the transect.
  - c. Behavior- basking, flying, mating, and/or nectaring, etc.
    - i. If nectaring, note the species of forb on which it was nectaring whenever possible.
  - d. Sex if possible.
8. After a butterfly transect is completed, the surveyor should turn around and periodically stop to conduct the Floral (2m<sup>2</sup> plots) and Habitat Assessment (100m<sup>2</sup> plots) on the way back to the start of the transect (detailed instructions on page 4).
9. If at any point a regal fritillary and monarch is seen on the property, circle the appropriate word on the bottom of the front side of that data sheet. This includes the time walking to and from your vehicle and the survey itself.

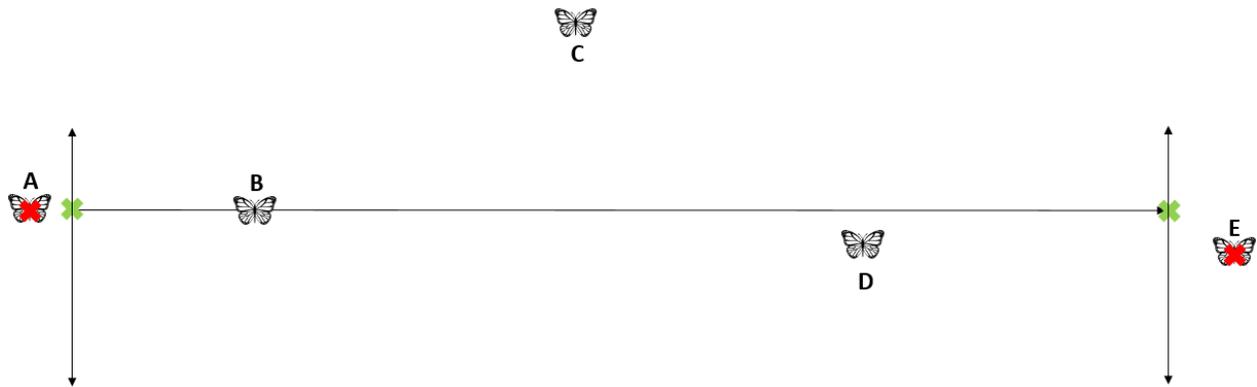


Figure 1

An example of a butterfly transect. The line between the green Xs is the transect. The area between the vertical lines are the area of the survey, extending as far as butterflies can be seen. This is only a forward facing survey. Do not record any butterflies seen behind you.

- Do not include Butterfly A because it is before the start of the survey. Never record any butterfly that is seen behind the surveyor. This is an exclusively forward-facing survey.
- Be sure to record Butterfly B as it is on the transect.
- Include Butterfly C if seen, even though it is far away.
- Include Butterfly D.
- Do not include Butterfly E because it is beyond the end of the transect. If it is detected before the observer reaches the end of the transect, the observer must decide if it falls within the transect. This could mean the observer excludes it once they reach the end and determine the butterfly was in fact past the end of the transect.

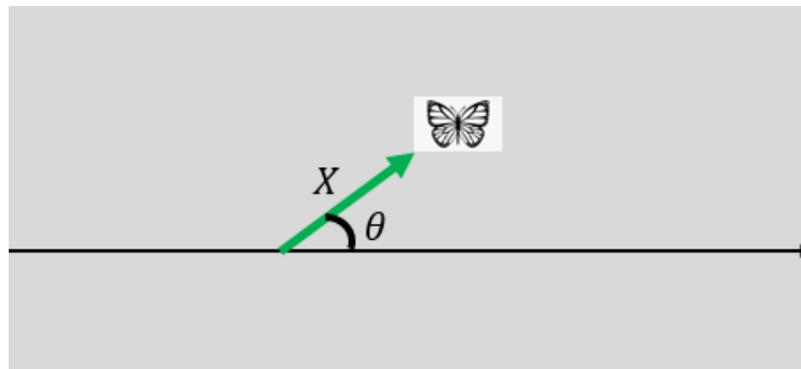


Figure 2

From the point the observer **first sees** the butterfly, record the angle in degrees ( $\theta$ ), distance in meters ( $X$ ) to where the butterfly was first seen, sex, behavior, and the flower the butterfly is nectaring on if the butterfly is nectaring. Do not leave the transect to collect any of this information.

## 2-4. Floral, Habitat, and Management/Landscape Assessments

Once the surveyor reaches the endpoint for the butterfly survey, they will then conduct the floral and habitat assessments on the way back to the original start point. **See paragraph 2 of Figure 4 (page 5) for veg and habitat plot instructions if the transect is cut short.**

1. From the end of the butterfly transect, walk approximately 5 meters from the floral and habitat assessment transect starting point (end of the butterfly transect).
2. Throw the plot rope farther down the transect. There should be no intended target, just keep the rope close to the transect.
3. Expand the plot rope into a 2m<sup>2</sup> plot as seen below.
4. Survey all of the actively flowering plants in the plot.
  - a. If the plant is already listed on the data sheet, fill in the appropriate bubble.
  - b. Write in the rest of the plants that have blooms (i.e., actively flowering, butterfly can eat it) that were not pre-listed, and fill in the appropriate bubble.
  - c. Be sure to include unknown plants. Take pictures of unknown plants and submit them with the data. Name the plants according to the picture number or date and time number: ex. Unknown Sunflower 1234 or Blue Flowers 6-30-9:42. **Check the photos in the field** to make sure they are high enough quality to ID later. If you are uncertain, take the photos.
5. Complete condition surveys from the center of the vegetation plot (Fig. 3).
  - a. To create a 100m<sup>2</sup> plot, estimate 5m in each direction from the center point.
  - b. For each plot, fill in the vegetation and ground cover bubbles for the appropriate percentage cover within the 100m<sup>2</sup> plot. It will likely be helpful to take a quick lap around the 100m<sup>2</sup> plot to get a full understanding of these variables. Each row should have a bubble filled in for each plot.
  - c. Fill in the appropriate management/landscape variables if there is evidence of those practices anywhere within the 100m<sup>2</sup> plot. If those practices are only observed outside of the 100m<sup>2</sup> plot, do not include them. If other land use variables are observed that are not on the sheet, mark "Other" and write in the variable on the given line. If no variables are present leave all bubbles blank.
6. Walk to the point approximately 50m from the floral and habitat assessment transect starting point (end of the butterfly transect).
7. Randomly pick left or right and walk approximately 5 meters perpendicular to the transect.
8. Throw the plot rope farther out from the transect. There should be no intended target other than perpendicular to the transect and a similar strength throw to the previous. Then repeat steps 4-6.
9. Return to the transect, and walk to the point approximately 95m from the floral and habitat assessment transect starting point (end of the butterfly transect).
10. Repeat steps 3–6.
11. Walk to the point approximately 150m from the floral and habitat assessment transect starting point (end of the butterfly transect).
12. Pick the opposite direction from the first off-transect plot (Plot 2) and walk approximately 5 meters perpendicular to the transect.
13. Throw the plot rope farther out from the transect. There should be no intended target other than perpendicular to the transect and a similar strength throw to the previous. Then repeat steps 4-6.
14. Return to the transect, and walk to the point approximately 185m from the floral and habitat assessment transect starting point (end of the butterfly transect).
15. Repeat steps 3–6.
16. If any species of milkweed is found anywhere at this site (even outside of the transect or on the walk back to the vehicle), circle "Yes" at the bottom of the 2<sup>nd</sup> page of the data sheet. If none were found, circle "No".

\*\*\*\*\* **Do not forget to mark if a regal fritillary and/or monarch was** \*\*\*\*\*  
\*\*\*\*\* **seen at any point on the property on the front of the data sheet.** \*\*\*\*\*

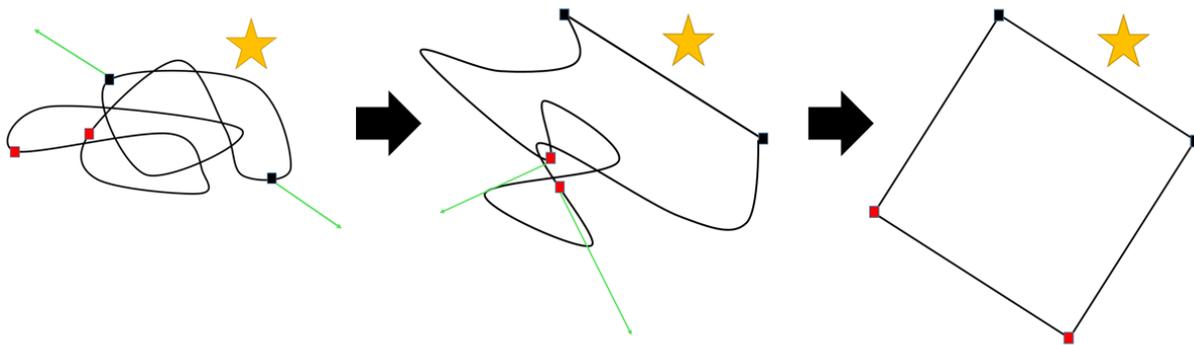
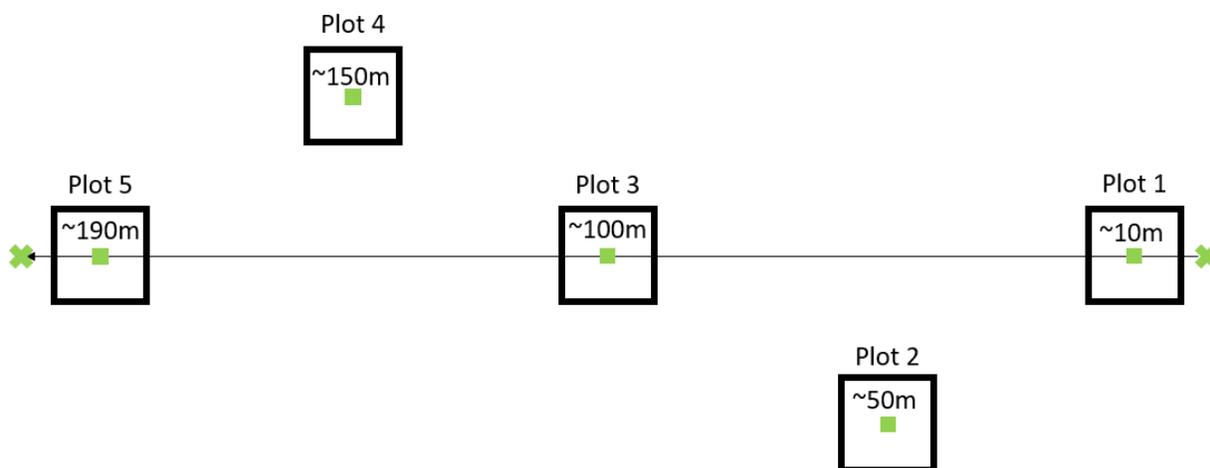


Figure 3

The star is the surveyor. The left shape is how the plot rope might look after being thrown. Then expand the black marks directly away from each other. This creates a shape like the center shape with a single straight edge. Expand the red marked corners away from the surveyor to form a square like the one on the right. Stakes can be helpful to make sure corners are tight.



This is an example of a vegetation and habitat assessment. Three of the plots (first, middle, and end) should fall on the original butterfly transect (black arrow) and one each should be on either side of the transect. The centers of the plots should fall approximately 10m, 50m, 100m, 150m, and 190m from the original start of the butterfly transect. Plots may be turned differently depending on how the plot rope falls.

**If the transect is cut short**, follow the general procedure outlined on page 4. Plot 1 should still start near the end of the butterfly transect. Shorten or lengthen the space in between the plots to get 3 to 5 plots placed roughly equidistant from each other. Recommendations for the number of plots compared to transect length are 3 for transects under 120m, 4 for transects 120m-180m, and 5 for transects over 180m.

## **Datasheet Explanation/Clarification**

### **Site Information**

Site Name and #: The name and number of the site you were given by the NGPC survey organizer

Observer Name: The name of the person walking the transect

Observer Email: The email of the person walking the transect

Survey Date: Date of the survey

Attended Training: If you have ever attended the training (the video counts), mark Yes. If not, mark No

Biologist or Volunteer: Do you have a degree in wildlife or related field and are typically paid to do surveys?

Yes = biologist. No = volunteer

Given Point Used: Did you use the points given to you by the NGPC survey organizer? Yes-Given: Started at given "start" to given "end," Yes Reversed: Started at given "end" to given "start," No-Adjusted: used at least 1 different point from what was given. Write in ALL points used, No-excluded: could not find a transect of at least 100 meters and did not survey

Start Lat: Write in the new starting latitude if the given GPS points were not used

Start Long: Write in the new starting longitude if the given GPS points were not used

End Lat: Write in the new ending latitude if the given GPS points were not used

End Long: Write in the new ending longitude if the given GPS points were not used

Wind (MPH): Wind speed in miles per hour at the start time of the butterfly survey

Temp (F): Temperature in Fahrenheit at the start time of the butterfly survey

% Clouds: Percent cloud cover at the start time of the butterfly survey

Last Estimation Practice Date: The date you last practiced estimating distances and got <10% incorrect twice in a row

Circle Visit Number This Year: How many times has the site been surveyed this summer

Butterfly Walk Start Time: The time you leave from the start point looking for butterflies along the transect. This does not include any time walking to the start point

Butterfly Walk End Time: The time you arrive at the end point after looking for butterflies along the transect. This does not include any time doing vegetation or landscape surveys

### **Butterfly Information**

Species Detected: Monarch or Regal Fritillary

Sex: Male, Female, or Unknown

Behavioral Activity: Write in whatever the butterfly is doing when you saw it

Nectaring species (if available): Write in the plant it is drinking from. Leave blank if the butterfly is not drinking

Detection Distance in Meters: Distance in meters to the butterfly when you saw it

Detection Angle ( $\theta$ ): Angle to the butterfly when you saw it based on the transect line/end point

Notes: Any extra information you think is important to share not captured on this sheet

Habitat Assessment: This section is all based on total cover. The plants do not need to be rooted in the quadrat to be counted. They only need to overhang the transect. Each row should have a bubble filled in.

Woody Veg >2m: Likely trees but could be large shrubs with woody bark

Woody Veg < 2m: Likely young trees or shrubs

Blooming Forbs: Actively flowering species. Think "if a butterfly can drink it now"

Non-blooming Forbs: Flowering plants that are not currently blooming. Think "if a butterfly can drink it at some point, but not now"

Grasses: Grasses, rushes, sedges, reeds, etc.

Bare Ground: Dirt, rocks, soil, cement, etc. larger than a quarter with no covering directly on top.

Litter/Duff: Dead grass, leaves, fallen tree, cow pies

Water: Lake, puddle, stream

Management/Landscape Assessment: Old evidence still counts, so you still record things like a dried-up cow patty or a burned tree. If you see the evidence in the plot, you record it for this section.

Hay/Mow: Haying, mowing, shorter veg. caused by humans, like the shorter grass in between the tire marks of a two track

Grazing: Either native or domestic, tracks, cow pies, signs of herbivory

Burning: Ash, charred trees

Till/Ag: crops, tilled land, intentionally broken soil

Herbicide: yellowing or brown plants, likely around agriculture

Insecticide: dead and dying insects, likely around agriculture

Cement: Concrete, buildings, large impermeable human made structure

Other: Other variables not listed above. If you think it is noteworthy, please record it





**2. Floral Assessment**

Site Number and Date \_\_\_\_\_

Circle Yes or No at the bottom of the page if milkweeds were seen at any point during your visit. This includes the floral assessment and the walk to and from the vehicle. Record the species of all actively flowering plants found within the vegetation plots, even unknowns. Take pictures of unknown plants and submit them with the data so they can be matched and identified during data entry. Name the plants according to the picture number: ex. Unknown Sunflower 1234 or Unknown Blue Flowers 5678.

Species	Plot Number					Species	Plot Number				
	1	2	3	4	5		1	2	3	4	5
Black Medic	0	0	0	0	0		0	0	0	0	0
Black Eyed Susan	0	0	0	0	0		0	0	0	0	0
Common Milkweed	0	0	0	0	0		0	0	0	0	0
Daisy Fleabane	0	0	0	0	0		0	0	0	0	0
Hoary Vervain	0	0	0	0	0		0	0	0	0	0
Leadplant	0	0	0	0	0		0	0	0	0	0
Native Thistle	0	0	0	0	0		0	0	0	0	0
Plains Coreopsis	0	0	0	0	0		0	0	0	0	0
Prairie Ironweed	0	0	0	0	0		0	0	0	0	0
Purple Prairie Clover	0	0	0	0	0		0	0	0	0	0
Red Clover	0	0	0	0	0		0	0	0	0	0
Western Yarrow	0	0	0	0	0		0	0	0	0	0
Yellow Sweet-Clover	0	0	0	0	0		0	0	0	0	0

**3. Habitat Assessment**

Fill in appropriate cover class bubble for each strata type for each 100m<sup>2</sup> plot centered on the vegetation plot. Each row should have a bubble filled in.

0 = Absent; 1 = <10%; 2 = 11%-40%; 3 = 41%-75%; 4 = >76%

Plot 1					Plot 2					Plot 3							
	0	1	2	3	4		0	1	2	3	4		0	1	2	3	4
Woody Veg > 2m	0	0	0	0	0	Woody Veg > 2m	0	0	0	0	0	Woody Veg > 2m	0	0	0	0	0
Woody Veg < 2m	0	0	0	0	0	Woody Veg < 2m	0	0	0	0	0	Woody Veg < 2m	0	0	0	0	0
Blooming Forbs	0	0	0	0	0	Blooming Forbs	0	0	0	0	0	Blooming Forbs	0	0	0	0	0
Non-blooming Forbs	0	0	0	0	0	Non-blooming Forbs	0	0	0	0	0	Non-blooming Forbs	0	0	0	0	0
Grasses	0	0	0	0	0	Grasses	0	0	0	0	0	Grasses	0	0	0	0	0
Bare Ground	0	0	0	0	0	Bare Ground	0	0	0	0	0	Bare Ground	0	0	0	0	0
Litter/Duff	0	0	0	0	0	Litter/Duff	0	0	0	0	0	Litter/Duff	0	0	0	0	0
Water	0	0	0	0	0	Water	0	0	0	0	0	Water	0	0	0	0	0

Plot 4					Plot 5						
	0	1	2	3	4		0	1	2	3	4
Woody Veg > 2m	0	0	0	0	0	Woody Veg > 2m	0	0	0	0	0
Woody Veg < 2m	0	0	0	0	0	Woody Veg < 2m	0	0	0	0	0
Blooming Forbs	0	0	0	0	0	Blooming Forbs	0	0	0	0	0
Non-blooming Forbs	0	0	0	0	0	Non-blooming Forbs	0	0	0	0	0
Grasses	0	0	0	0	0	Grasses	0	0	0	0	0
Bare Ground	0	0	0	0	0	Bare Ground	0	0	0	0	0
Litter/Duff	0	0	0	0	0	Litter/Duff	0	0	0	0	0
Water	0	0	0	0	0	Water	0	0	0	0	0

**4. Management/Landscape Assessment**

Fill in the appropriate bubble(s) if the disturbance is observed within the 100m<sup>2</sup> plot. If "other," write in the disturbance on the adjacent line. Leave blank if none present.

Plot	1	2	3	4	5	Plot	1	2	3	4	5	Plot	1	2	3	4	5
Hay/Mow	0	0	0	0	0	Grazing	0	0	0	0	0	Burning	0	0	0	0	0
Till/Ag	0	0	0	0	0	Herbicide	0	0	0	0	0	Insecticide	0	0	0	0	0
Cement	0	0	0	0	0	Other	0	0	0	0	0	Other	0	0	0	0	0

Milkweed Seen On Property: Yes No

