

Appendices

to Urban Monarch Conservation Guidebook

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Appendix A

Social science research online survey text (English)

This survey was developed by The Field Museum’s social science staff and used in Chicago, Kansas City, Austin, and Minneapolis/St. Paul. What follows is the Chicago version of the survey; each city’s survey was customized to their locality (this changed milkweed species lists and contact information at the end of the survey, for example).

These surveys were hosted online via [SurveyMonkey](#). Other platforms are available, but be sure to pick one with the option to use contingency questions (also known as “skip logic”). This survey’s skip logic is noted throughout in *[bracketed text]*. Page breaks are indicated with gray lines.

To encourage participation from those who did not have time to take the whole survey, we made answering many questions optional. Those questions that were required are noted in **bold**.

Some multiple choice questions can have only one answer, while others may have multiple answer to a single question. Those that allow multiple answers list the options with square bullets, while those that allow only one answer have round bullets.

Introduction

A Monarch’s View of the City Survey: Chicago

1

Partners in multiple US cities are collecting information on a range of practices that benefit pollinators, with a focus on the Monarch butterfly. This survey concerns practices in and around Chicago (the Chicago Wilderness Region).

The responses you provide here will be used to inform Monarch butterfly conservation priorities and practices in urban and suburban areas. Your contact information will not be used for purposes other than this survey. If you prefer, you may choose to answer the survey anonymously, by not providing contact information at the end of the survey.

If you have questions or comments about this survey or this project overall, please contact our team at monarchs@fieldmuseum.org.

Thank you for your interest in the project, and for your time!

[Participe en la encuesta del Museo Field \(En Español\)](#) *[links to Spanish language version]*

Part 1: Monarch conservation

2

We'd like to start by asking you about Monarch butterfly conservation activities. This is work that you do, as an individual or as part of an organization, professionally or on a volunteer basis, to protect Monarch butterflies. This may include creating monarch habitat, as well as less "direct" efforts, such as studying monarchs or spreading awareness of monarch conservation issues. Even if you would not describe your work as monarch conservation, we are still interested in learning about your environmental practices, and will ask about these practices later in this survey.

1. Which of the following applies to you, and how would you like to proceed?

- I am part of an effort directly aimed at monarch conservation, and will answer the questions in this section. *[Proceed to page 3]*
 - I am not, at present, part of an effort that is directly aimed at monarch conservation, so I will skip to the next section. *[Skip to page 6]*
-

3

2. Are you involved in Monarch conservation as part of a group/organization, or as an individual?

- Individual
- Group/organization (please provide group name) _____

3. Does your monarch conservation effort have a name? If so, please provide it here. _____

4. If you are involved in monarch conservation as part of an organization, please share your organization's mission statement here.

5. Please briefly explain how your monarch conservation effort fits (or does not fit) to the overall mission of your organization.

6. What is/are the source(s) of information you use for your monarch conservation effort? You may list up to five.

- Source 1 _____
- Source 2 _____
- Source 3 _____
- Source 4 _____
- Source 5 _____

7. What is/are the source(s) of funding for your monarch conservation effort, if you are comfortable sharing them? You may list up to five. (You may enter "self" or "N/A" if your work is self-funded or unpaid.)

- Source 1 _____
- Source 2 _____
- Source 3 _____
- Source 4 _____
- Source 5 _____

8. Do you, or does your organization, work independently or collaborate with outside partners on your monarch conservation?

- I/we work independently [*Skip to page 5*]
- I/we work independently but am/are interested in connecting with potential partners [*Skip to page 5*]
- I/we work with outside partners [*Proceed to page 4*]

4

9. With whom do you collaborate on monarch conservation? Please list up to five names of outside partners here, if you are comfortable sharing them.

- Partner 1 _____
- Partner 2 _____
- Partner 3 _____
- Partner 4 _____
- Partner 5 _____

5

10. Why have you become involved in monarch conservation? Please list up to five reasons/motivations you have - one reason per box.

- Reason 1 _____
 - Reason 2 _____
 - Reason 3 _____
 - Reason 4 _____
 - Reason 5 _____
-

11. How do you measure success in your monarch conservation effort? Please list up to five metrics you use - one metric per box.

- Metric 1 _____
- Metric 2 _____
- Metric 3 _____
- Metric 4 _____
- Metric 5 _____

12. What challenges or barriers have you encountered in your monarch conservation effort? Please list up to five challenges - one challenge per box.

- Challenge 1 _____
- Challenge 2 _____
- Challenge 3 _____
- Challenge 4 _____
- Challenge 5 _____

13. What have been the key benefits or positive outcomes of your monarch conservation effort? Please list up to five benefits you've seen - one benefit per box.

- Benefit 1 _____
- Benefit 2 _____
- Benefit 3 _____
- Benefit 4 _____
- Benefit 5 _____

Thank you! Next, we'll ask about a range of environmental practices that are relevant to the success of pollinators. You will have the option to skip the sections that do not apply to you.

Planting & managing land

Part 2: Planting and managing land

6

In this section, we'd like to ask you some questions about putting plants in the ground. The questions in this section have to do with plantable open space on land that you manage in some way - in other words, non-forest space where you grow plants or could grow plants. It may be plantable space on public or shared land, or land that you own (including your backyard at home), or land that you manage that is owned by someone else.

14. Which of the following applies to you, and how would you like to proceed?

- I manage plantable open space on one or multiple sites, and would be willing to discuss this work over the phone or in person with a project researcher. *[Skip to page 13]*
- I manage plantable open space on one or multiple sites, and I prefer to continue the survey and answer questions about these sites one by one. (May enter info for up to 3 sites) *[Proceed to page 7]*
- I do not manage any kind of plantable open space, so I'll skip to the next section of the survey. *[Skip to page 8]*

15. On what kind of site do you manage plantable open space?

(If you manage multiple sites, enter information for only one site in this section. You will have the option to add additional sites afterward.)

- Open space: Conservation area
- Open space: Other open green space (park, golf course, cemetery, etc.)
- Open space: Vacant lot
- Open space: Farm
- Residential: Space owned or managed by my household alone
- Residential: Common open space in a residential development
- Public-facing institution: Corporate or medical
- Public-facing institution: Commercial
- Public-facing institution: Community or cultural (government, schools, churches, community centers, museums, etc.)
- Industrial: less than 100,000 sq. ft. in area
- Industrial: greater than 100,000 sq. ft. in area
- Right-of-way, roads, rails, utilities, or landfill
- Parking, airport, or wastewater treatment
- Other (please specify) _____

16. What is the total area of plantable open space on this site?

- 1-10 sq. meters (1-107 sq. ft.) - the size of a small garden
- 11-100 sq. meters (108-1076 sq. ft.) - up to the size of half a tennis court
- 101-1,000 sq. meters (1077-10,764 sq. ft.) - up to the size of a baseball diamond infield
- 1,001-10,000 sq. meters (2.5 acres) - up to the size of 2 football fields
- 10,000+ sq. meters (2.5+ acres) - large fields and bigger

17. Where is this site located?

Site/property name (if applicable) _____

Address _____

Address 2 _____

City/Town _____

State/Province _____

ZIP/Postal Code _____

18. How was this site established?

- It grew naturally
- It was established by humans prior to my ownership or monitoring
- I established it

19. About how much of the total plantable open space on this site is made up of native plants?

- None
- 1 to 25 percent
- 26 to 50 percent
- 51 to 75 percent
- 76 to 100 percent

20. How much milkweed is there at this site?

- None
- 1-10 plants

- 11-50 plants
- 51-100 plants
- 101-500 plants
- 501-1000 plants
- 1001+ plants
- Not sure if milkweed is present

21. Please select all that apply to the area where milkweed is present.

- N/A - No milkweed present
- My milkweed is visible to the public (for example, milkweed in your front yard).
- There is signage related to milkweed and/or Monarch butterflies.
- This site is used to educate people about milkweed and/or Monarch butterflies.

22. Which species of native milkweed are present on this site? Please select all that apply.

- Swamp milkweed (*A. incarnata*)
- Common milkweed (*A. syriaca*)
- Butterfly milkweed (*A. tuberosa*)
- Whorled milkweed (*A. verticillata*)
- Poke milkweed (*A. exaltata*)
- Tropical milkweed (*A. curassavica*)
- Other (please specify) _____

[We recommend listing the five most common species for your area, plus tropical milkweed and an "other" option. If possible, include photos of each species.]

23. Are there flowering plants that have nectar at this site? If so, how many different species of nectar plants are there?

- No flowering nectar plants present
- Non-native flowering nectar plants present
- Native flowering nectar plants - 1-2 different species present
- Native flowering nectar plants - 3-6 different species present
- Native flowering nectar plants - 7+ different species present
- Flowering nectar plants but unsure if native
- Not sure

24. In the next five years, which of the following would you be willing and able to do? Please select all that apply.

- Convert some/more of the plantable open space of this site to native plants
- Convert some/more of the plantable open space of this site to native milkweed
- Convert some/more of the plantable open space of this site to flowering nectar plants
- None of the above
- Not sure

25. Is there another site that you manage with plantable open space that you would like to tell us about?

- Yes, I'll enter info about another site.
- No, I'll go on to the next section.

[Repeat this page two to four times to allow for those who manage multiple sites.]

Part 3: Selling plants and designing landscapes

8

In this section, we'd like to ask you about plants that you sell and/or landscape designs or plans that you create for others. In other words, we are asking about goods and/or services you provide as a vendor to others who own or manage plantable open space.

47. Do you sell plants, design landscapes, and/or plan restorations?

- I sell plants and/or plan/design landscapes, and will answer this set of questions about this work. *[Proceed to page 9]*
 - I do not sell plants or plan/design landscapes, so I will skip to the next section. *[Skip to page 10]*
-

9

48. Who are your clients/customers? Please select all that apply.

- Individual homeowners
- Businesses/organizations/institutions
- Land managers (public)
- Land managers (private)
- Other (please specify)

49. Which land use type(s) does your business serve? In other words, which kind(s) of sites are your customers/clients coming from? Please select all that apply.

- Open space: Conservation area
 - Open space: Other open green space (park, golf course, cemetery, etc.)
 - Open space: Vacant lot
 - Open space: Farm
 - Residential: Space owned or managed by my household alone
 - Residential: Common open space in a residential development
 - Public-facing institution: Corporate or medical
 - Public-facing institution: Commercial
 - Public-facing institution: Community or cultural (government, schools, churches, community centers, museums, etc.)
 - Industrial: less than 100,000 sq. ft. in area
 - Industrial: greater than 100,000 sq. ft. in area
 - Right-of-way, roads, rails, utilities, or landfill
 - Parking, airport, or wastewater treatment
 - Other (please specify) _____
-

50. How much do you tend to sell of the following? / How much do you tend to plan landscapes with the following?

| | None | A little | Some | A lot |
|--------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Native plants in general | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Milkweed | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

51. Which species of milkweed is/are present in your designs/plans? Please select all that apply.

- Swamp milkweed (*A. incarnata*)
- Common milkweed (*A. syriaca*)
- Butterfly milkweed (*A. tuberosa*)
- Whorled milkweed (*A. verticillata*)
- Poke milkweed (*A. exaltata*)
- Tropical milkweed (*A. curassavica*)
- Other (please specify) _____

[We recommend listing the five most common species for your area, plus tropical milkweed and an "other" option. If possible, include photos of each species.]

Educating public & promoting green practices

Part 4: Educating the public and promoting green practices **10**

In this section, we'd like to ask you about efforts you're involved in that educate people about the natural environment and/or promote environmentally friendly practices. This work does not necessarily have to be directly related to Monarch butterflies or pollinators.

52. Which of the following applies to you, and how would you like to proceed?

- I am involved in an organized effort to educate people about the natural environment and/or promote environmentally friendly practices, and will answer the questions in this section. *[Proceed to page 11]*
- I am not involved in an organized effort to educate people about the natural environment and/or promote environmentally friendly practices, so I will skip to the next section. *[Skip to page 12]*

11

53. Whom does your organization target/serve? Please enter up to three groups.

- Constituent group 1 _____
- Constituent group 2 _____
- Constituent group 3 _____

54. What methods of education/promotion does your group use? Please select all that apply.

- Workshops
- Formal lesson plans
- Volunteer work days
- Print materials
- Visual art
- Email newsletters
- Social media
- News media
- Word of mouth
- Other (please specify)

55. Which of the methods you selected above are most effective and essential to your work? Please rank them in order of effectiveness, with the most effective first.

- Workshops _____
- Formal lesson plans _____
- Volunteer work days _____
- Print materials _____
- Visual art _____
- Email newsletters _____
- Social media _____
- News media _____
- Word of mouth _____
- Other (please specify) _____

56. Do you educate people about or promote practices related to the following? Please select all that apply.

- Pollinators
- Monarch butterflies
- None of the above

Studying & monitoring
natural environment

Part 5: Studying and monitoring the natural environment

12

In this section, we'd like to ask you about research you do on the natural environment. This work could involve studying or monitoring wildlife or plants formally or informally, in the lab or in the field.

57. Which of the following applies to you, and how would you like to proceed?

- I study and/or monitor some aspect of the natural environment, and will answer the questions in this section.
- I do not study and/or monitor the natural environment, so I will skip to the final section.

58. In what capacity or capacities do you collect data on the natural environment? Please select all that apply.

- Citizen scientist
- Student researcher
- Professional scientist
- School group
- Other (please specify)

59. Which of the following applies to you?

- I collect data on pollinators.
- I collect data on Monarch butterflies.
- I do not currently collect data on pollinators, but I am interested in doing so in the future.
- I do not currently collect data on monarchs, but I am interested in doing so in the future.
- None of the above

[All leaving this page skip to page 14]

Contact information for interview

13

Thanks for your interest in speaking with us! Please enter your contact information below and preferred method of contact, and a researcher from The Field Museum will contact you about setting up a time to talk.

60. Contact information

Name _____
Organization (if applicable) _____
Address _____
City/Town _____
State/Province _____
ZIP/Postal Code _____
Website URL _____
Email Address _____
Phone Number _____

61. Preferred method of contact:

- Phone
- Email
- No preference

We will be in touch soon. If you have questions about the project in the mean time, more information is available on The Field Museum's website. To get in touch with the project team, please write to us at monarchs@fieldmuseum.org.

Thank you!

Almost done!

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62. Do you have any additional comments? If so, please share them here.

63. How did you hear about this survey?

64. May we contact you in the future for additional information? Please select all that apply.

- Yes, I am willing to be contacted for follow-up information in the future.
- Yes, I have data and/or contact lists I am willing to share, and am willing to be contacted about this.
- No, I do not wish to be contacted about this in the future.

65. Contact information

Name _____
Organization (if applicable) _____
Address _____
City/Town _____
State/Province _____
ZIP/Postal Code _____
Website URL _____
Email Address _____
Phone Number _____

End

Thank you!

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We greatly appreciate your contribution to our understanding of Monarch conservation related practices in urban and suburban areas.

We welcome your questions and comments regarding this survey and the overall project. For more information on our project, please visit The Field Museum's website. To get in touch with the project team, please write to us at monarchs@fieldmuseum.org.

Appendix B

Social science interview guide

Participants may not be asked all of the questions that follow. What is asked will depend on each participant's work, area of expertise, and/or relevance to the project. Sub-questions are prompts to elicit fuller responses, but may not always be needed. Questions may be asked in a different order or skipped if covered by the respondent in a previous answer. It is up to the researcher to customize the interview to each participant.

i. [Introductions]

ii. [Description of project]

iii. [Privacy and confidentiality practices, and how information will be used]

iv. [Request permission to record if appropriate - emphasize that recording is for accuracy]

General

1. You were identified as a relevant contact because [their relevance to project]. Is that a good description?
 - a. Is there any other relevant project, site or activity you're involved in?
2. *[If being interviewed about their organization's work]* Can you tell me about your organization and its mission?

Monarch conservation work

3. Can you give us an overview of your monarch program?
 - a. What is the goal of the program?
 - b. How long have you been doing this work?
 - c. How did it start? / How did you become interested in monarchs?
4. How has your monarch program been going?
 - a. What benefits or positive outcomes have you seen?
 - b. How do you measure the success of your program?
 - c. What challenges have you had?
 - d. What have you learned? / Any advice or recommendations?
5. What resources do you use to do monarch conservation?
 - a. Where do you get information?
 - b. How do you fund this effort?
 - c. Do you work with partners? If so, whom do you work with?

Planting and managing land

6. Can you tell us about the site(s) where you plant things, or manage land?
 - a. What kind of open space do you plant on?
 - Open space: Conservation area
 - Open space: Other open green space (park, golf course, cemetery, etc.)
 - Open space: Vacant lot
 - Open space: Farm

- Residential: Space owned or managed by my household alone
- Residential: Common open space in a residential development
- Public-facing institution: Corporate or medical
- Public-facing institution: Commercial
- Public-facing institution: Community or cultural (government, schools, churches, community centers, museums, etc.)
- Industrial: less than 100,000 sq. ft. in area
- Industrial: greater than 100,000 sq. ft. in area
- Right-of-way, roads, rails, utilities, or landfill
- Parking, airport, or wastewater treatment

Other (please specify) _____

- b. What is its total area of plantable open space?
- c. Where is this site?
- d. How was this site established?

7. What is the makeup of the plants on the site?

- a. How much of the total plantable open space on this site is made up of...
 - i. Native plants?
 - ii. Milkweed? (Which species?)
 - iii. Flowering nectar plants?

8. What are your plans for the site going forward (the next five or so years)?

- a. Would you be willing to convert more of the site to...
 - i. Native plants?
 - ii. Milkweed? (Which species?)
 - iii. Flowering nectar plants?

Selling plants and designing landscapes

9. Can you tell me about your business? What kind of goods and/or services do you provide?

10. Who are your clients or customers?

- a. What kinds of sites are your customers planting on?
 - Open space: Conservation area
 - Open space: Other open green space (park, golf course, cemetery, etc.)
 - Open space: Vacant lot
 - Open space: Farm
 - Residential: Space owned or managed by my household alone
 - Residential: Common open space in a residential development
 - Public-facing institution: Corporate or medical
 - Public-facing institution: Commercial
 - Public-facing institution: Community or cultural (government, schools, churches, community centers, museums, etc.)
 - Industrial: less than 100,000 sq. ft. in area
 - Industrial: greater than 100,000 sq. ft. in area
 - Right-of-way, roads, rails, utilities, or landfill
 - Parking, airport, or wastewater treatment
 - Other (please specify) _____

b. What is the scale of the sites your customers are planting on?

11. How frequently do you sell or use...

- a. Native plants?
- b. Milkweed? (Which species?)
- c. Flowering nectar plants?

Educating the public and promoting green practices

- 12. Can you tell us about your initiative? What is your mission or goal?
- 13. Whom does your organization target?
- 14. What methods of education or promotion does your group use?
- 15. Which methods are the most effective or essential to your work?
- 16. Would you be interested in incorporating monarchs or other pollinators into your programs? Why or why not?

Studying and monitoring the natural environment

- 17. In what capacity or capacities do you collect data on natural environment?
- 18. What species is/are your focus?
- 19. Would you be interested in studying or monitoring monarchs or other pollinators? Why or why not?
- 20. Do you collect data on pollinators/monarch butterflies?
- 21. Why do you collect data on the species that you do?
- 22. What have you found? Any interesting observations?

Wrap-up

- 23. Is there anyone you would recommend we contact about this study?
- 24. *[If they manage multiple sites, collect data on monarchs, or have other data they seem comfortable sharing, make arrangements for them to share it in a way that is convenient for them.]*
- 25. Do you have any questions for me?

Thank you very much for your time! Your thoughts will help inform ongoing monarch conservation efforts.

Appendix C

Measuring milkweed densities and existing habitat across metropolitan areas

In order to understand the capacity cities have for increasing the amount of monarch butterfly habitat available for breeding and migrating adult butterflies, a “baseline” of how much habitat and milkweed is present in metropolitan areas must be established. To estimate the baseline, data is collected in two ways: sampling natural areas known to have milkweed and sampling random locations across the landscape.

First, sampling from known natural areas establishes an average milkweed density number that can be applied across all natural area sites, including open space conservation and open space non-conservation land use classes. Not only are natural areas important for monarchs, but they are also places where residents learn about native plants and native landscaping.

The percent habitat in natural areas is determined by calculating the area of digitized milkweed habitat in proportion to the total plantable space on the entire site. Milkweed density is the total estimated stem count over the same area. When possible, a distinction should be made between natural areas in municipal parks with a primarily recreational mandate and natural areas with a primarily conservation mandate. The full sampling protocol for measuring milkweed density in natural areas can be found in Appendix 6.

A baseline for milkweed density can also be calculated using randomized sampling across the metropolitan area from the more densely populated areas to less populated areas.

Sampling points are located every four to five miles across “metro-transect” lines that span across the entire metropolitan area. Figure 1 illustrates an example of metro-transect lines in the Chicago metropolitan area.

By visiting sampling areas along metro transects, data on habitat and milkweed can be collected across all consolidated land-use types. Typically these field visits take anywhere from 15 minutes to a maximum of two hours for each sampling area. This approach gathers the data that will be needed to determine milkweed densities and the proportion of greenspace typically allocated as gardens and habitat. Ultimately, these numbers are used to populate the model used for the monarch conservation planning tools.

Differences may exist along the transect lines between some land-use categories in more populated areas compared with less populated areas. US census blocks can be used to partition the metropolitan area into zones corresponding to high, medium and low population densities used for more advanced modeling techniques.

Appendix D

Notes on land use types

| Type | Notes |
|--|--|
| Open space: conservation | Natural areas and any other public or private land that is managed primarily for conservation. |
| Open space: non-conservation | Public and private land that is not managed primarily for recreation: parks, trails, cemeteries, golf courses, etc. |
| Vacant lots | Vacant residential, commercial, and others, usually without intact buildings (in some cities, vacant land with buildings is included in this type). |
| Agricultural | Parcels that are predominantly used for commercial crops. In some cities this includes land used for livestock or pastureland or undeveloped land with development potential. |
| Residential: single | Land that is controlled by individuals/households. Includes detached, attached, mobile homes, and can include small farm holdings in some cities. The curb strip can be included in this category or broken out into the minor roads category. |
| Residential: common space and multi-family | Land that is a shared space controlled by development owner or resident group such as a homeowners' or condo association. This category may include stormwater retention basins adjacent to residential developments. |
| Corporate and medical | Corporate campuses and smaller office complexes and medical facilities. These are larger tracts of land with in-house or professional management. This category may include stormwater retention basins adjacent to commercial developments. |
| Commercial | Shopping malls, retail centers, single large-site retail centers, urban mix, and hotel/motel. This category may include stormwater retention basins adjacent to commercial developments. |
| Community and cultural | These are places where people congregate for civic, cultural, or educational purposes: schools, places of worship, entertainment venues, government agencies, and other public-facing social institutions. |
| Industrial: small | Industrial land with smaller buildings. This category is meant to capture industrial parks and mixed industrial lands. This type captures smaller tracts sometimes shared between many companies. |
| Industrial: large | Large industrial parcels and resource extraction. This tends to capture large tracts with controlled by a single company. |
| Major rights of way and landfill | Major rights of way include those for utilities, rail lines, major roads, and landfills. |
| Lower opportunity rights of way | Includes waste treatment, parking, aircraft transportation, and other less plantable rights of way. |
| Other: low opportunity | Reserve this category for unclassified land, parcels with low to no plantable space and parcels controlled by landowners that are less accessible. |
| Minor roads | This category is reserved for the curb strip. |
| Water | If the land use is well drawn this will include only water and zero plantable space. |

Crosswalking: the land use consolidation process

The Urban Monarch Conservation Tools are organized around 16 categories of consolidated land use. These consolidated categories were designed to combine similar types of land use and land uses that share engagement strategies. As more cities were added to the project, each city's divergent land use was crosswalked into the 16 consolidated categories. When crosswalking data from a new city into the consolidated land use types, it is important to remember that the goal is to combine land use with similar engagement strategies and scales. Consult with experts and the table on the previous page to find the defining characteristic for each land use type. In some cities, the land use data provided by the regional planning agency will not be detailed enough to fill all 16 categories. In that case, some can be left blank.

Data issues

Land use data are obtained from a regional planning agency and often cover the full extent of the planning agency boundary. Sometimes, however, mapped land use coverage may not include the entire area that is in the regional planning agency boundary. If this is the case, the analysis will be limited to the extent of the land use coverage. Additionally, each regional planning agency will have differences in the types of land use types they include. This can have implications for monarch habitat. For example, sometimes datasets do not include vacant lots, or vacant lots may be combined with agriculture. There can also be challenges with land use classification not distinguishing between major rights-of-way, highways, and local roads. Road rights-of-way have the potential to provide a substantial amount of habitat for the monarch population; being able to distinguish between residential rights-of-way and larger highway rights-of-way enables the different users to target habitat in the land use type with which they work. Using a separate roads dataset, land use rights-of-way were categorized based on their location from the more detailed roads data.

Appendix E

Milkweed sampling protocols

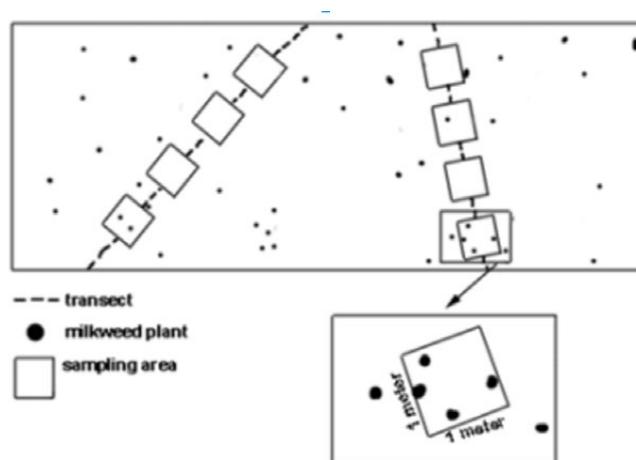
Sampling of milkweed density will occur continuously throughout the summer. Each site, such as a conservation park or recreation park, is to be visited once. Before starting a program to sample milkweed across natural areas, users will need to talk to local experts in order to understand the kind of natural areas data that is available in their city. This protocol will focus on sampling naturalized areas within larger parkland sites. Some cities, like Chicago, will distinguish between conservation and recreation focused natural areas and some cities will lump all undeveloped land into one category. This protocol is designed to assess milkweed density at sites that are likely to have milkweed present. Using aerial imagery and input from local experts users should prescreen sites to identify those likely to provide milkweed habitat. Once the sampling team is at a site they need to assess whether comprehensive monitoring or transects is the best method to sample milkweed density. This decision will be based both on the extent of the natural areas within a site and the distribution of milkweed patches. The rules below are designed to help guide that decision.

Counts

Sites that are less than five acres:

1. For sites under five acres, take two random 200 meter walks. If you spot more than five plants, treat it as a five to ten acre site. If you do not, continue to Step 2.
2. Count the stems of all species of milkweed in the site and record the total number of each species on the datasheet after identification. If it becomes too arduous to count all the stems then users should revert to transects.
3. Identify, by sight, the five most dominant species of blooming plants. Work with your team to determine a more accurate methodology, if desired.

Transects



Sampling transects. Note that the sampling plots will be farther apart than shown here.

Sites that are five to ten acres:

1. Create four transects that will contain 25 subplots each, totaling 100 subplots per site. Designating transect locations could be done in the lab, or in the field. Each subplot is 1 m² quadrat that can be brought out into the field site.
2. Throw a pencil in the air at the start of each transect to determine the direction of that transect. The directionality is determined by the point of the pencil. The first transect should start approximately 100m from the entrance of the site. The second transect should be established in the middle of the site. The third transect should begin at a habitat feature (if there is one). For example, if there is a pond in your site, establish the transect at the edge of the pond, with the direction of the transect facing away from the pond. This will eliminate bias of going around the edge of the pond. If a habitat feature is not present, create a transect using your discretion. The fourth and final transect should start from an edge away from the entrance. These transects can be designated before entering the field or at the site.
3. Take an established number of paces between each subplot for each acre of the site. For example, take 5 paces between subplots for a 5 acre site and 10 paces between each subplot for a 10 acre site.

It is important to keep the placement of each quadrat consistent. For example, if you choose to place the quadrat on the left side of your left foot, continue to use the same placement for all the subplots in all transects at that site. In total, you should sample 100m² subplots per site.

4. In each of the 100 subplots, identify and count all of the stems for each milkweed species.
5. Record the abundance of all blooming plant species in each quadrat. Assess the five dominating plant species on the datasheets after sampling all 100 quadrats.
6. Record all monarch eggs and monarch caterpillars by instar (1-5) found in each quadrat for specific locations only. These locations will be chosen by each team.

Sites that are 10 to 100 acres:

1. Create 8 transects that are set up in a similar way to the ones described above (steps 1-7). In total you should sample 200m² subplots.
2. Do your best to have transects that are spread across the site to eliminate bias in sampling. For example, if a site is fairly heterogeneous, be sure to stratify or arrange the transects you establish at the site to capture this variability. For a site that is homogeneous, a random sampling approach will be adequate.

Sites that are over 100 acres

1. Sample in one day or less following the guidelines similar to the ones listed above. Add additional transects with subplots where deemed necessary.

Sampling form

Site Name and Area _____

County, City, State: _____

Date: _____ Start Time: _____ End Time: _____

Observers: _____

Total Milkweed Stems: _____

Five dominating species: _____

| Sub-plot | Milkweed species & abundance | Blooming species & abundance | Sub-plot | Milkweed species & abundance | Blooming species & abundance | Sub-plot | Milkweed species & abundance | Blooming species & abundance | Sub-plot | Milkweed species & abundance | Blooming species & abundance |
|----------|------------------------------|------------------------------|----------|------------------------------|------------------------------|----------|------------------------------|------------------------------|----------|------------------------------|------------------------------|
| 1 | | | 2 | | | 3 | | | 4 | | |
| 5 | | | 6 | | | 7 | | | 8 | | |
| 9 | | | 10 | | | 11 | | | 12 | | |
| 13 | | | 14 | | | 15 | | | 16 | | |
| 17 | | | 18 | | | 19 | | | 20 | | |
| 21 | | | 22 | | | 23 | | | 24 | | |
| 25 | | | 26 | | | 27 | | | 28 | | |
| 29 | | | 30 | | | 31 | | | 32 | | |
| 33 | | | 34 | | | 35 | | | 36 | | |
| 37 | | | 38 | | | 39 | | | 40 | | |
| 41 | | | 42 | | | 43 | | | 44 | | |
| 45 | | | 46 | | | 47 | | | 48 | | |
| 49 | | | 50 | | | 51 | | | 52 | | |
| 53 | | | 54 | | | 55 | | | 56 | | |
| 57 | | | 58 | | | 59 | | | 60 | | |
| 61 | | | 62 | | | 63 | | | 64 | | |

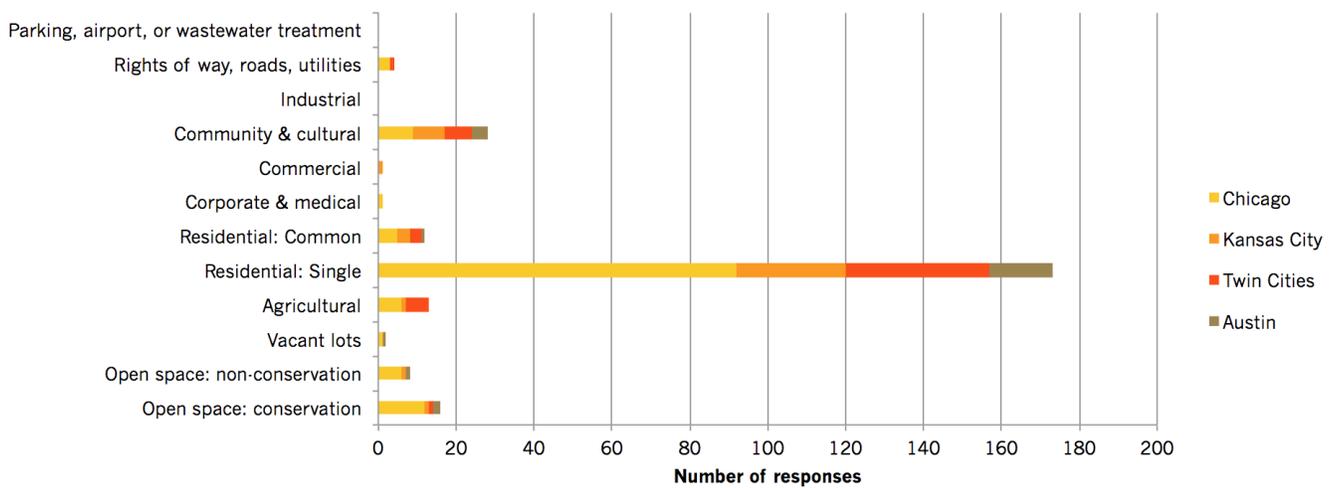
| | | | | | | | | | | | |
|----|--|--|----|--|--|----|--|--|-----|--|--|
| 65 | | | 66 | | | 67 | | | 68 | | |
| 69 | | | 70 | | | 71 | | | 72 | | |
| 73 | | | 74 | | | 75 | | | 76 | | |
| 77 | | | 78 | | | 79 | | | 80 | | |
| 81 | | | 82 | | | 83 | | | 84 | | |
| 85 | | | 86 | | | 87 | | | 88 | | |
| 89 | | | 90 | | | 91 | | | 92 | | |
| 93 | | | 94 | | | 95 | | | 96 | | |
| 97 | | | 98 | | | 99 | | | 100 | | |

Appendix F

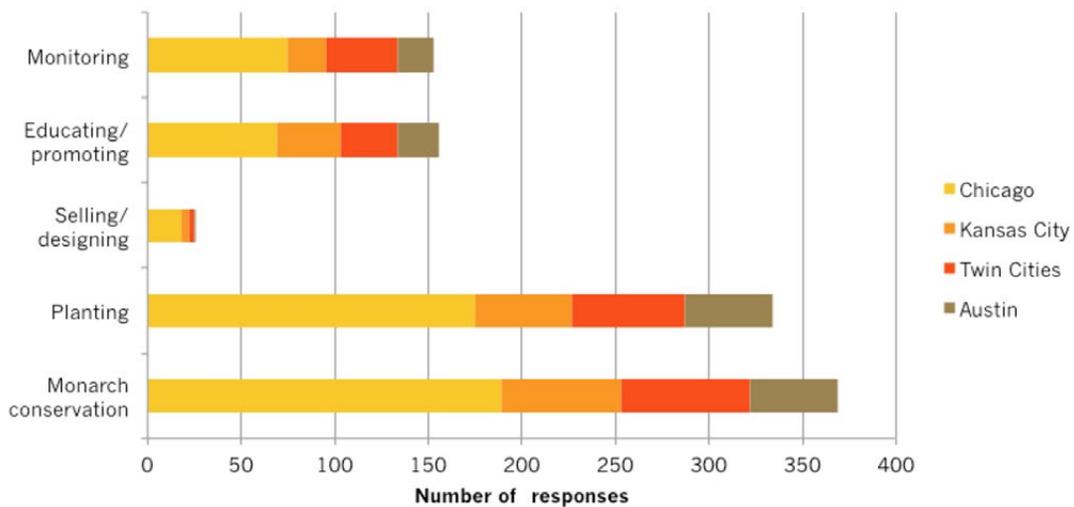
2016 research results summary for four pilot cities

Social survey comparison: selected results

Survey responses by land use type



Survey responses by conservation practices



Ecological research results: Chicago

A variety of both governmental and non-governmental organizations in Chicago have invested in conserving open space and natural areas throughout the region. These urban open spaces act as homes to the many species that live in the city, as well as resting spots for the number of migrating species that travel through the region. One of those migrating species that has the potential to benefit from these urban open spaces is the monarch butterfly.

With the current baseline of 18.5 million milkweed stems in Chicago, milkweeds in open space conservation lands comprise almost 70% of that total. With this in mind it is no surprise that the continued retention and management of these lands will be imperative for future monarch conservation.

| Land Use class | Milkweed Density | Plantable Space (ac) | Total Milkweed by Land Use |
|---|-------------------|----------------------|----------------------------|
| Agriculture (1) | 1.39 | 792,785 | 1,101,972 |
| Residential Single Family and Mobile Home Parks (2) | 0.91 | 262,546 | 238,917 |
| Residential Development Common Space and Multifamily (3) | 6.89 | 33,979 | 234,117 |
| Office complexes, Campus, Medical Facilities and associate retention basins (4) | 1.15 | 10,568 | 12,153 |
| Commercial (5) | 0.5 | 12,075 | 6,038 |
| Community Institutions (6) | 1.02 | 35,947 | 36,666 |
| Open Space Conservation (7) | 103.9 | 125,550 | 13,044,608 |
| Open Space Non-conservation (8) | 44.5 | 68,821 | 3,062,527 |
| Small Industrial (9) | 14.92 | 9,818 | 146,482 |
| Large Industrial (10) ¹ | 14.92 | 16,061 | 239,629 |
| Minor ROW (11) | 5.86 | 61,449 | 360,093 |
| Major ROW/Landfill (12) | 1.5 | 48,309 | 72,464 |
| Less Plantable ROW (13) | 0.96 | 17,926 | 17,209 |
| Vacant Land without intact building / undeveloped (14) | 2.18 | 67,426 | 146,989 |
| Low Opportunity (15) | 0.1 | 6,012 | 601 |
| Water(16) | 0 | 955 | 0 |
| Total Baseline Milkweed | 18,720,465 | | |

Ecological research results: Kansas City

After analyzing data gathered by the Kansas City field techs, it was determined that Kansas City has approximately 2 million milkweed stems. We believe this amount of milkweed is low for Kansas City for a number of reasons. Most obviously is that field techs did not encounter milkweed as much as we had expected. This may be due to the timing of the sampling done or it may have had something to do with Kansas City having the most agricultural land of all the four cities. This made sampling along metro transects difficult as much of the land encountered was agricultural. Since Kansas City has the most agricultural land, it is important for conservation groups to reach out and build partnerships with the farming community.

With their extensive partnerships, position along the I-35 flyway and continued on-the-ground efforts, Kansas City is set to play a role in the conservation of the Monarch Butterfly.

| Land Use class | Milkweed Density | Plantable Space (ac) | Total Milkweed by Land Use |
|---|------------------|----------------------|----------------------------|
| Agriculture (1) | 1.48 | 1,210,385 | 1,791,370 |
| Residential Single Family and Mobile Home Parks (2) | 0.01 | 169,364 | 1,694 |
| Residential Development Common Space and Multifamily (3) | 0 | 8,349 | 0 |
| Office complexes, Campus, Medical Facilities and associate retention basins (4) | 0.24 | 2,064 | 495 |
| Commercial (5) | 0 | 9,189 | 0 |
| Community Institutions (6) | 0 | 29,079 | 0 |
| Open Space Conservation (7) | 2.06 | 32,651 | 67,261 |
| Open Space Non-conservation (8) | 1.46 | 28,769 | 42,002 |
| Small Industrial (9) | 3.03 | 17,441 | 52,846 |
| Large Industrial (10)^1 | 3.03 | 35 | 106 |
| Minor ROW (11) | 1.24 | 42,789 | 53,058 |
| Major ROW/Landfill (12) | 1.81 | 10,008 | 18,114 |
| Less Plantable ROW (13) | NA | 0 | NA |
| Vacant Land without intact building / undeveloped (14) | 5.13 | 3,850 | 19,751 |
| Low Opportunity (15) | NA | 0 | NA |
| Water(16) | 0 | 305 | 0 |
| Total Baseline Milkweed | 2,046,697 | | |

Ecological research results: Twin Cities

Metro transect sampling was not conducted in the Twin Cities, but instead two targeted land use types (open space areas and vacant lots) were surveyed for milkweed densities. Additionally, monarch productivity was assessed on those sites to align with research interests of the project partners. In addition to open space sampling they also conducted residential block assessments, where information such as number of milkweed and native and non-native forbs was collected. In the 44 residential blocks that were assessed, the survey team encountered just over 1500 milkweed plants. This resulted in residential land having on average 30 milkweed stems per acre, significantly higher than any of the other cities.

It was determined that 7 counties that represent the extent of Twin Cities planning agency has approximately 13 million milkweed stems.

| Land Use class | Milkweed Density | Plantable Space (ac) | Total Milkweed by Land Use |
|---|-------------------|----------------------|----------------------------|
| Agriculture (1) | 1.39 | 518,925 | 721,306 |
| Residential Single Family and Mobile Home Parks (2) | 29.95 | 134,167 | 4,018,303 |
| Residential Development Common Space and Multifamily (3) | 6.89 | 3,239 | 22,316 |
| Office complexes, Campus, Medical Facilities and associate retention basins (4) | 1.15 | 1,233 | 1,418 |
| Commercial (5) | 0.5 | 4,086 | 2,043 |
| Community Institutions (6) | 1.02 | 14,104 | 14,386 |
| Open Space Conservation (7) | 103.9 | 51,196 | 5,319,236 |
| Open Space Non-conservation (8) | 44.5 | 46,969 | 2,090,135 |
| Small Industrial (9) | 14.92 | 998 | 14,888 |
| Large Industrial (10) ¹ | 14.92 | 10,792 | 161,014 |
| Minor ROW (11) | 5.859 | 24,607 | 144,170 |
| Major ROW/Landfill (12) | 1.504 | 29,776 | 44,783 |
| Less Plantable ROW (13) | 0.964 | 3,493 | 3,367 |
| Vacant Land without intact building / undeveloped (14) | 2.178 | 226,971 | 494,342 |
| Low Opportunity (15) | 0.1 | 0 | 0 |
| Water(16) | 0 | 10,362 | 0 |
| Total Baseline Milkweed | 13,051,707 | | |

Ecological research results: Austin

Austin posed a number challenges, both in the form of limited data availability as well as in the ecology of the region. Austin has a regional planning agency which includes Travis, Williamson, Bastrop, Caldwell, and Hays counties; however their land use data only extended to the Austin metro region. This led to only being able to use transect data that fell within the metro region, which resulted in the lower than average total milkweed.

It was determined that the metro area of Austin has approximately 2.5 million milkweed stems.

| Land Use class | Milkweed Density | Plantable Space (ac) | Total Milkweed by Land Use |
|---|------------------|----------------------|----------------------------|
| Agriculture (1) | 0.02 | 52,290 | 1,046 |
| Residential Single Family and Mobile Home Parks (2) | 0.6 | 44,517 | 26,710 |
| Residential Development Common Space and Multifamily (3) | 1.84 | 9,350 | 17,204 |
| Office complexes, Campus, Medical Facilities and associate retention basins (4) | 0 | 3,296 | 0 |
| Commercial (5) | 0 | 3,271 | 0 |
| Community Institutions (6) | 0 | 4,671 | 0 |
| Open Space Conservation (7) | 127 | 11,874 | 1,508,055 |
| Open Space Non-conservation (8) | 107.34 | 9,159 | 983,127 |
| Small Industrial (9) | 0 | 4,209 | 0 |
| Large Industrial (10)^1 | 0 | 4,591 | 0 |
| Minor ROW (11) | 1.58 | 11,602 | 18,332 |
| Major ROW/Landfill (12) | 0.22 | 5,428 | 1,194 |
| Less Plantable ROW (13) | 0 | 3,304 | 0 |
| Vacant Land without intact building / undeveloped (14) | 0.07 | 20,131 | 1,409 |
| Low Opportunity (15) | NA | 0 | NA |
| Water(16) | 0 | 0 | 0 |
| Total Baseline Milkweed | 2,557,077 | | |