Mapping the Steans Center's Partnered Community Based Organizations (CBO's)
Steans Center

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GEO 242

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Project summary

During the winter quarter of 2013 we partnered with DePaul's Irwin W. Steans Center for our Geographic Information Systems II: Community GIS group project. The purpose of this project was to work with a community-based organization (CBO) to address one of the organization's geographic data visualization needs using our knowledge of GIS. This project gave us the opportunity to work on a real-world scenario to use some of the specific skills we learned in GEO 242. To fulfill the geographic information needs of the organization, we worked directly with a staff member from the Steans Center by following the best practice steps of project management; project needs assessment, spatial database design, data collection, and spatial analysis. The initial goal our partnership was to produce a set of maps which would help visualize the locations, and key attributes of service-learning sites that DePaul students served at in 2012. Due to time and data constraints, the final set of maps do not contain information about the key attributes of service-learning sites; instead they show the locations of the Steans Center's CBOs on neighborhood and regional scales. The final set of maps helps users see the distribution of the organizations, and give them an idea of to what extent the Steans Center has a presence in each region of the Chicagoland area.

The Steans Center partnered with our group because they were interested having a set of maps made that could be used internally within their organization to analyze their service-learning program, and externally by DePaul students to help prospective service-learning students get an idea of the where the service-learning opportunities are located and help them select a service site. The program the Steans Center provides is intended to give students experiences that will help develop them into socially-conscious citizens. Students are placed at non-profits and community based organizations in the Chicagoland area, to participate in internships, research, scholarships, and community-based student employment.

Initially we intended to map qualitative attributes--if DePaul students have had a positive or negative experience serving at the site, the number of students who served at each site, or the average income of a site's census tract--of the service-learning sites the Steans Center. This type of analysis would be valuable information for the Steans Center to highlight what parts of their program that are working well, and what aspects of the program they would like to change. Unfortunately, the Steans Center staff was not able to compile a complete data set of both the locations, and key attributes of its partnered community based organizations (CBOs) as they had hoped they would be able to at the beginning of the project. Instead, the final data set we were provided only contained the locations of the CBOs instead of the locations and the key attributes. Due to this, we could produced a smaller set of maps that only show locations of the CBOs. The final set of maps we produced can still be used by both of the intended group—internally by Steans Center, and externally by prospective service-learning students—but they do not provide as much detail as was initially hoped for because less data is conveyed through them.

In total we created 14 different maps, and two pie charts. Thirteen of the maps show the locations of the CBOs at different scales ranging from the entire Chicagoland area down to

regional groupings of neighborhoods in the city, and two of the maps show the total number of organizations per region using graduated symbols. The charts show what percentage of the organizations fall into each region. Aside from conveying useful information, the maps and charts serve as a good starting point for future work mapping the CBOs key attributes, in order to fulfill all geographic information needs of the Steans Center. Future maps could move beyond just giving data about the locations and the key attributes of the CBOs, by adding data layers containing demographic and economic data for each region. These additional overlays could enable the Steans Center to analyze their service-learning program to an even higher level.

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Introduction

For this project we have partnered with DePaul University's Irwin W. Steans Center for Community-based service-learning. DePaul University is founded on the Vincentian mission, which advocates community service. The Steans Center falls in line with this mission, as it provides opportunities for DePaul students to participate in community-based service-learning courses. Our goal is to bring synergy for the Steans Center between all of their affiliated service organizations. By using Geographic Information Systems (GIS), we plan to map out the locations and concentrations of various organizations associated with the Steans Center, separated by a set of regions that are determined by our client. This will be utilized by the Steans Center by having a distinct visualization of their outreach, as well as helping future service-learning students determine which organization will be the best fit for their volunteering hours.

We accomplished our goal by listening attentively to how the Steans Center wanted their data represented. In order to make maps based on their needs, we needed to inquire as to which organizations will be addressed along with certain attributes for each location such as: address, neighborhood, number of locations per region. Since the Steans Center granted us a lot of creative freedom with regard to designing maps, we had to have a keen eye for displaying the data in a visually stimulating and effective way. The set of maps display the locations of service-learning sites to quickly allow the users to see the neighborhoods or regions where they are located, as well as the quantity of locations per region. The maps will be used by the Steans Center to internally to assess their programs' outreach by displaying areas with many organization, and areas with fewer organizations. The maps will additionally be used by others to see the extent of the geographic area that the Steans Center associates with, as well as to help students make decisions about where they would like to serve.

As a result of this project, we produced a multitude of maps to the Steans Center. These maps included point symbol maps of organization locations, as well as graduated symbol maps that display the Steans Center's partnered organizations across Chicago and Chicagoland. These maps are divided into regions: six Chicago neighborhood regions (North Neighborhoods, Northwest Neighborhoods, West Neighborhoods, Loop Neighborhoods, Southwest Neighborhoods, and South Neighborhoods) as well as four Chicagoland Suburb regions (North Suburbs, West Suburbs, Southwest Suburbs, and South Suburbs).

The following report provides specific information about our project process. The Needs Assessment describes the need for service-learning mapping not just for the Steans Center, but in a larger context. Systems Requirements define the necessary data and GIS processing requirements to answer our need-to-know questions related to the goal of this project. The Data Acquisition elaborates upon all data sets used, including their functionality for this project. The Data Analysis and Visualization compiles all of the types of informational products created in this project, as well as the specific GIS functions necessary to create them. These informational products, and our assessment of them, are included in the Results. Finally, the Summary, Conclusions, and Recommendations provide a final overview and assessment of the project.

Needs Assessment

When we had first met with Sergio at the Steans Center, there was a lot of ambiguity as to our role in assisting them with GIS. We knew that the Steans Center had a very large outreach to many different CBOs in the Chicagoland area, and that they helped place students around the city to assist those CBOs and fulfill service-learning hours. Researching how others scholars have used GIS to assist organizations gave us a little more direction for this project. In literature, there are examples of GIS being used by social scientists to analyze neighborhoods and communities. GIS is used in community development, and mapping of community assets (Luke, 2005); the successfulness of a service-learning program is based on how well students engage in the community needs, and to what degree the programs enhance students' academic learning and civic responsibility (Grey 2008, Shumer 1997). Mapping attributes of the CBOs that are related to the key factors for success would help to evaluate CBO efficacy.

For this project, we deciphered the needs of the Steans Center, and figured out what questions we were going to try and answer:
- Where are the organizations located across Chicagoland?
- Where are the organizations located throughout specific Chicago neighborhood and suburb regions?
- How do the number of organizations compare between regions?

By addressing the needs of the Steans Center we narrowed down our task. We knew that we would need to be able to place each of the CBO locations on a map, based on their address and name. This additionally required forming regions from the Chicago neighborhood shapefile, and creating suburban regions based on the specifications of the Steans Center. The needs of the Steans Center set up the basis of our entire project, and ultimately gave the Steans Center a visualisation of their outreach throughout the Chicagoland area.

References

Gray, M. J. (2000) Assessing Service-Learning: Results from a Survey of "Learn and Serve America, Higher Education". *Change.* 32 (2): 30-39.

Luke, D. A. (2005). Getting the big picture in community science: Methods that capture context. *American Journal of Community Psychology,* 35. 185–200.

Shumer, R. (1997). What research tells us about designing service learning programs. *NASSP Bulletin,* 81. 18-26

This section defines the system requirements necessary to answer the aforementioned need-to-know questions: (1) where are the organizations located across Chicagoland; (2) where are the organizations located throughout specific Chicago neighborhood and suburb regions; and (3) how do the number of organizations compare between regions. The systems requirements include both data requirements, and processing requirements. The data requirements are described using an entity-relationship diagram (ERD). This ERD describes the attributes and relationships of entities necessary to answer our need-to-know questions. Processing requirements are the specific GIS functions needed to carry out designing our information products.

Data Requirements

All of our need-to-know questions can be answered using one, complex ERD (Chen Model):
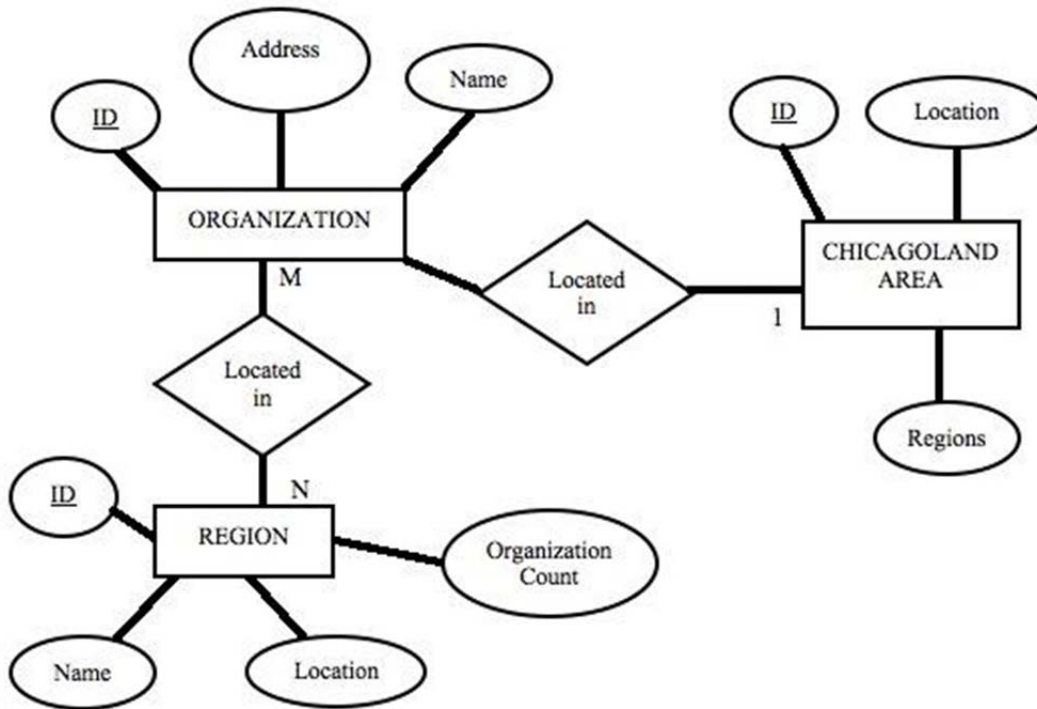
Processing Requirements

1. To determine where the organizations are located across Chicagoland, and throughout specific neighborhood and suburb regions:

- Data transfer: organization ID's, names, and addresses
- Geocoding: organization locations
- Miscellaneous data manipulation: dividing Chicago neighborhoods and suburbs into

regions/polygons

2. To determine how the organization count by region compares across regions:
   ● Data transfer: organization ID's, names, and addresses; Chicago neighborhood shapefiles
   ● Geocoding: organization locations
   ● Miscellaneous data manipulation: dividing Chicago neighborhoods and suburbs into regions/polygons
   ● Spatial join: regions to organization locations
   ● Thematic mapping: using graduated symbol mapping to display number of organizations per region

<div align="center">Data Acquisition</div>

       This section documents our experiences acquiring data for this project. Our data is defined in a data dictionary by name, source, processing steps, spatial object type, attributes, and format. Then, our data is assessed for fitness for use, by its resolution, accuracy, completion, consistency, currency, and limitations. Finally, we describe the data that we were unable to acquire that could benefit this project, as well as how this influenced our project's objectives.

Data Dictionary

Data Set Name: Community-Based Organizations (CBO) Locations

       File Name: CBOs

       Description: Data on the CBOs that are partnered with the Steans Center, including the ID, name, street address, city and state names, and zip code for each.

       Source of the Data: DePaul's Steans Center

       Processing Steps: 1) Formatting the data to meet the needs of ArcMap
                                 2) Geocoding CBO addresses, and displaying them as vector data

       Spatial Object Type: Point

Attributes:	ID	CBO identification number
	Name	CBO name
	Address	CBO street address
	City	CBO city
	State	CBO state
	Zip code	CBO postal code

       Data Format: Shapefile

Data Set Name: Chicago Neighborhood Boundaries

       File Name: Neighborhoods 2012

       Description: Chicago neighborhood boundaries, developed by the Office of Tourism.

       Source of the Data: City of Chicago Data Portal, URL:
                                 https://data.cityofchicago.org/d/9wp7-iasj

Processing Steps: None

Spatial Object Type: Polygon

Attributes: ID   Neighborhood identification number
               Shape   Spatial object type
               Primary Neighborhood   Primary neighborhood name
               Secondary Neighborhood   Secondary neighborhood name
               Shape Area   Area of neighborhood polygon
               Shape Length   Length of neighborhood polygon

Data Format: Shapefile

Data Set Name: Chicagoland Region Boundaries
        File Name: Regions

        Description: Chicagoland region boundaries, as created specifically for this project.

        Source of the Data: Louis Baggetto, Peter Dittrich, and Kathryn Rico

        Processing Steps: 1) Develop six inner-city region boundaries based on Chicago
                                  Neighborhood Boundaries.
                               2) Develop four suburban region boundaries.

        Spatial Object Type: Polygon

        Attributes: ID   Region identification number
                       Name   Region name

        Data Format: Shapefile

Fitness for Use
Data Set Name: Community-Based Organizations (CBO) Locations
        The data provided has attribute and positional accuracy. Some attribute values (CBO names, addresses, and zip codes) are missing/incomplete. Additionally, some attribute values did not have a consistent format that is compatible with ArcMap. Issues in attribute consistency are due to duplication instances/rows or multi-valued address attributes. The data is current, as of 2012, however, it does not contain all existing CBOs in partnership with the Steans Center; it

only contains roughly 65% of all existing CBOs. This limits the data, as well as its incompleteness and inconsistencies, which were either corrected, or the instances in question were omitted.

Data Set Name: Chicago Neighborhood Boundaries

This data set, developed by the City of Chicago Office of Tourism, is accurate, complete, and consistent. Based on 2012 Chicago neighborhood boundaries, this shapefile is current. This data is limited only by its lack of inclusion of Suburban boundaries, but this was circumvented by our development of the Chicago Region Boundaries data set.

Data Set Name: Chicago Region Boundaries

This data set is accurate and current. However, as it was developed largely by our team members and based partially on the Chicago Neighborhood Boundaries data set, there are some issues with spatial consistency. There are measurement errors attributed to some slivers, as well as misplaced lines, which will be edited as the project continues. Additionally, the neighborhood polygons lack in attribute completeness—they are missing values for neighborhood names.

Data Acquisition Constraints

Over the course of this project, the number of different map themes has decreased, due to the limited dataset provided to us by the Steans Center. Originally, we intended to produce a set of maps that showed the locations of the Steans Center's partnered CBOs, in addition to other maps that would display the key attributes about the organizations. These key attributes included the number of DePaul students that served at each site, the number of hours DePaul students spent at each organization, and a categorical set of maps that indicate the type of work each CBO engages. We had to abandon the maps that were going to display the CBO key attributes, because the Steans Center was not able to compile the necessary data in time for us to produce those maps within the project's timeframe. Our project would have included more maps if we had been provided with all of the originally intended, but instead our project was limited to a smaller scope.

This limitation in data acquisition not only reduces the number and types of informational products we could have produced, but also limits the ways in which this project can aid the Steans Center in its service-learning outreach efforts. While displaying the vast number of CBOs does depict an abundance of service-learning to any audience, it neglects to describe just how many service-learning hours are provided by DePaul students, or how many students are involved at these CBOs. Additionally, it neglects to demonstrate the form of service-learning each CBO engages in. While the products of our project can help illustrate how widespread the Steans Center's efforts are, it does not exemplify the manpower that aids in these efforts.

Fortunately, the data needed to create these additional maps will be collected and organized in the coming months by the Steans Center, and the project will be continued again by some of our team members.

Data Analysis and Visualization

This section describes the informational products that will be created as a result of this project. The specific processing steps--operations and data layers-- required to create these informational products will be define, and illustrated using process diagrams. Furthermore, each informational product will be assessed as to how it helps meet project goals and objectives, how well it conveys information to an audience, and how it meets the six parameters of cartographic design (map projection, map symbols, map types, data classification, normalization, and map elements).

Information Products

The content of our maps represents the distribution of service-learning organizations affiliated with DePaul's Steans Center across the Chicagoland area. We broke up the Chicagoland area into ten regions: six regions of Chicago neighborhoods (North Neighborhoods, Northwest Neighborhoods, West Neighborhoods, Loop Neighborhoods, Southwest Neighborhoods, and South Neighborhoods), and four regions of the suburbs (North Suburbs, West Suburbs, Southwest Suburbs, South Suburbs). The neighborhood regions are divided by designated Chicago neighborhoods, while the suburban regions are divided according to Chicago boundaries and highway routes. Our first set of maps are point symbols maps that show CBO locations. These are multiple maps, as they display the organization locations as specific points across the entire Chicagoland area, across specifically the Chicago neighborhood regions, and for each of the ten regions. This satisfies our first two need-to-know questions: (1) where are the organizations located across Chicagoland; and (2) where are the organizations located throughout specific Chicago neighborhood and suburb regions. To answer our third need-to-know question-- how do the number of organizations compare between regions-- we will create two graduated symbol maps (one for the entire Chicagoland area, and one specifically for the Chicagoland neighborhood regions). This will compress all of the organizations to one single point per region, and varies the circumference of these points based of the count of organization locations.

These maps will be useful to both students and instructors. For anyone who looks at our maps, they will be able to observe the hundreds of CBOs spread across the Chicagoland area. This could help the students choose where they can spend their service-learning hours, and allow Steans Center faculty to determine where they have a strong concentration of service-learning locations, and where there needs to be more focus on perpetuating service-learning.
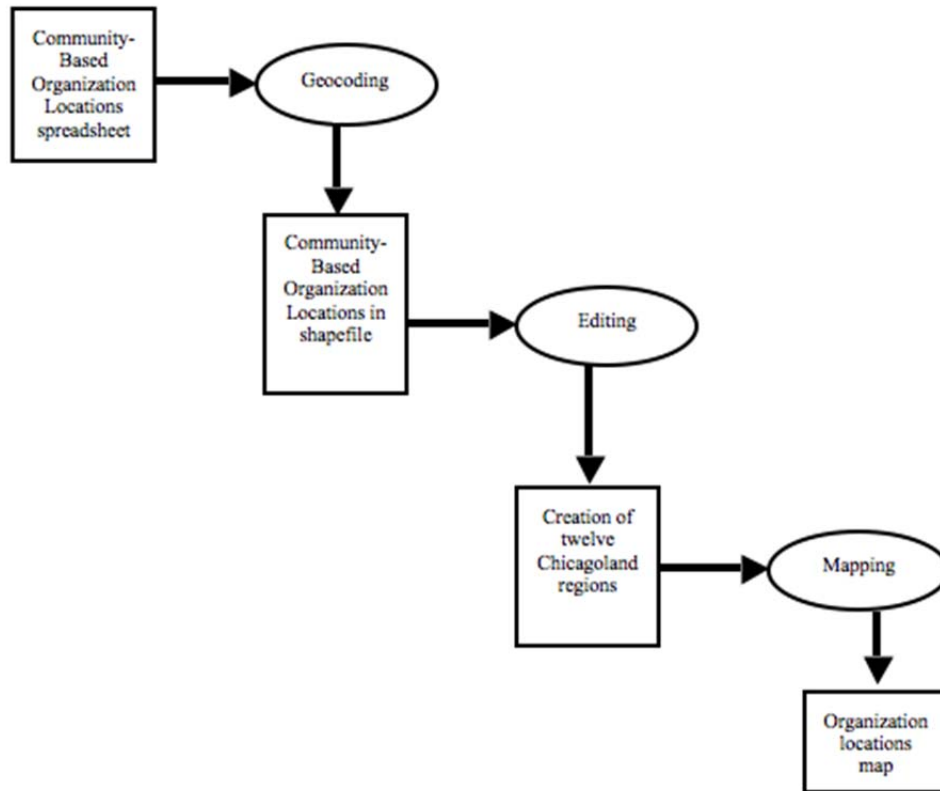
Data Products

To develop the set of maps that display the organization locations, the following GIS operations will be used:

1   Geocoding to convert spreadsheet to spatial data shapefile based on street address
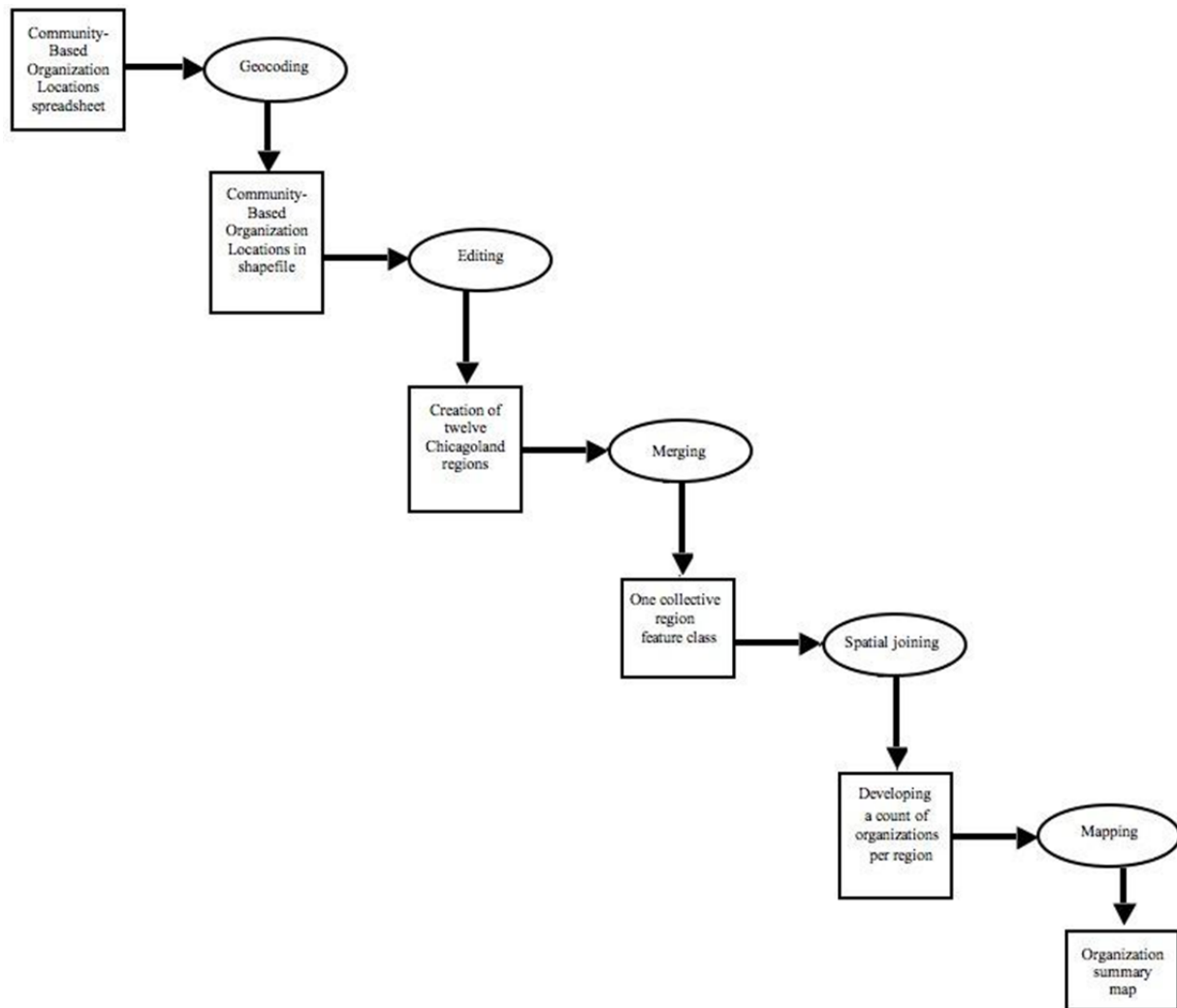2   Editing to convert neighborhood shapefile data into Chicago regions shapefiles, and

create suburban region shapefiles
3   Mapping to produce a map of the organization locations for each region individually, and for the regions collectively

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┌──────────────┐
│ Community-   │
│   Based      │         ╭──────────╮
│ Organization │────────▶│ Geocoding│
│  Locations   │         ╰──────────╯
│ spreadsheet  │              │
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                 ┌──────────────┐
                 │ Community-   │
                 │   Based      │        ╭──────────╮
                 │ Organization │───────▶│ Editing  │
                 │ Locations in │        ╰──────────╯
                 │  shapefile   │             │
                 └──────────────┘             ▼
                              ┌──────────────┐
                              │ Creation of  │
                              │   twelve     │        ╭──────────╮
                              │ Chicagoland  │───────▶│ Mapping  │
                              │   regions    │        ╰──────────╯
                              └──────────────┘             │
                                                           ▼
                                             ┌──────────────┐
                                             │ Organization │
                                             │  locations   │
                                             │     map      │
                                             └──────────────┘
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To develop the set of maps that display the organization locations as one summation point per region, the following GIS operations will be used:

1   Geocoding to convert spreadsheet to spatial data shapefile based on street address
2   Editing to convert neighborhood shapefile data into Chicago regions shapefiles, and create suburban region shapefiles
3   Merging to combine the region shapefiles into one collective feature class
4   Spatially joining the regions to the geocoded organization locations to combine their count
5   Mapping to produce a graduated symbol map of the count of organization location per region

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┌──────────────┐
│ Community-    │
│ Based         │      ╭──────────╮
│ Organization  │─────▶│ Geocoding │
│ Locations     │      ╰──────────╯
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              │ Community-    │
              │ Based         │      ╭─────────╮
              │ Organization  │─────▶│ Editing  │
              │ Locations in  │      ╰─────────╯
              │ shapefile     │           │
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                          │ Creation of   │
                          │ twelve        │      ╭──────────╮
                          │ Chicagoland   │─────▶│ Merging   │
                          │ regions       │      ╰──────────╯
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                                                   │ Developing    │
                                                   │ a count of    │      ╭─────────╮
                                                   │ organizations │─────▶│ Mapping  │
                                                   │ per region    │      ╰─────────╯
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                                                               ┌──────────────┐
                                                               │ Organization  │
                                                               │ summary       │
                                                               │ map           │
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Data Visualization

To show the locations of the community-based organizations across the Chicagoland area, across the Chicago neighborhood regions, and for each region specifically, we will produce a total of twelve maps. For all of these maps, the State Plane Coordinate System, IL East zone, is the map projection used. As these maps are not intended to show any other attributes of the organizations besides location, they are point symbol maps. Thus, these maps do not require data classification or normalization. The maps will utilize a street basemap; this basemap is second to the CBO locations in terms of visual hierarchy because it provides more geographical and urban context to the organization locations. The regions shapefiles serve as third highest on the visual hierarchy as they break the overall area into smaller geographic scales for easier visual usability. Additionally, a title, map legend, graticle, and scale bar will be used as supportive map elements with the lowest visual importance (as they describe the data sets, but do not present unique data themselves). These map elements, as well as the simplicity of the maps, will ensure their usability across their intended audience.

To show a quantitative comparison of organization locations by region, we will be

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developing two graduated symbol maps—one for the entire Chicagoland region, and one for just the Chicago neighborhoods region. These will both utilize the State Plane Coordinate System 12E as the map projection. As graduated symbol maps, the same symbol of unique sizes will be applied to each class, with a natural breaks data classification. Normalization will not be needed. These maps will not utilize a descriptive basemap, as the most important data present is the comparative count of organizations per region. As such, the graduated symbols serve highest in terms of visual hierarchy, the regions shapefiles serve second highest, and the basemaps serve third highest in terms of visual hierarchy. As with the previous set of maps, the title, map legend, and scale bar will be used as supportive map elements, holding the lowest place in terms of visual hierarchy.

Results

Most of our project analysis stems from the maps that display the distribution of the CBOs across the Chicagoland area. There is high discrepancy in the concentrations of the CBOs between the regions; some regions have low concentrations while others have very high concentrations. The majority of the CBOs are located within the Chicago city limits. The following maps demonstrate this:
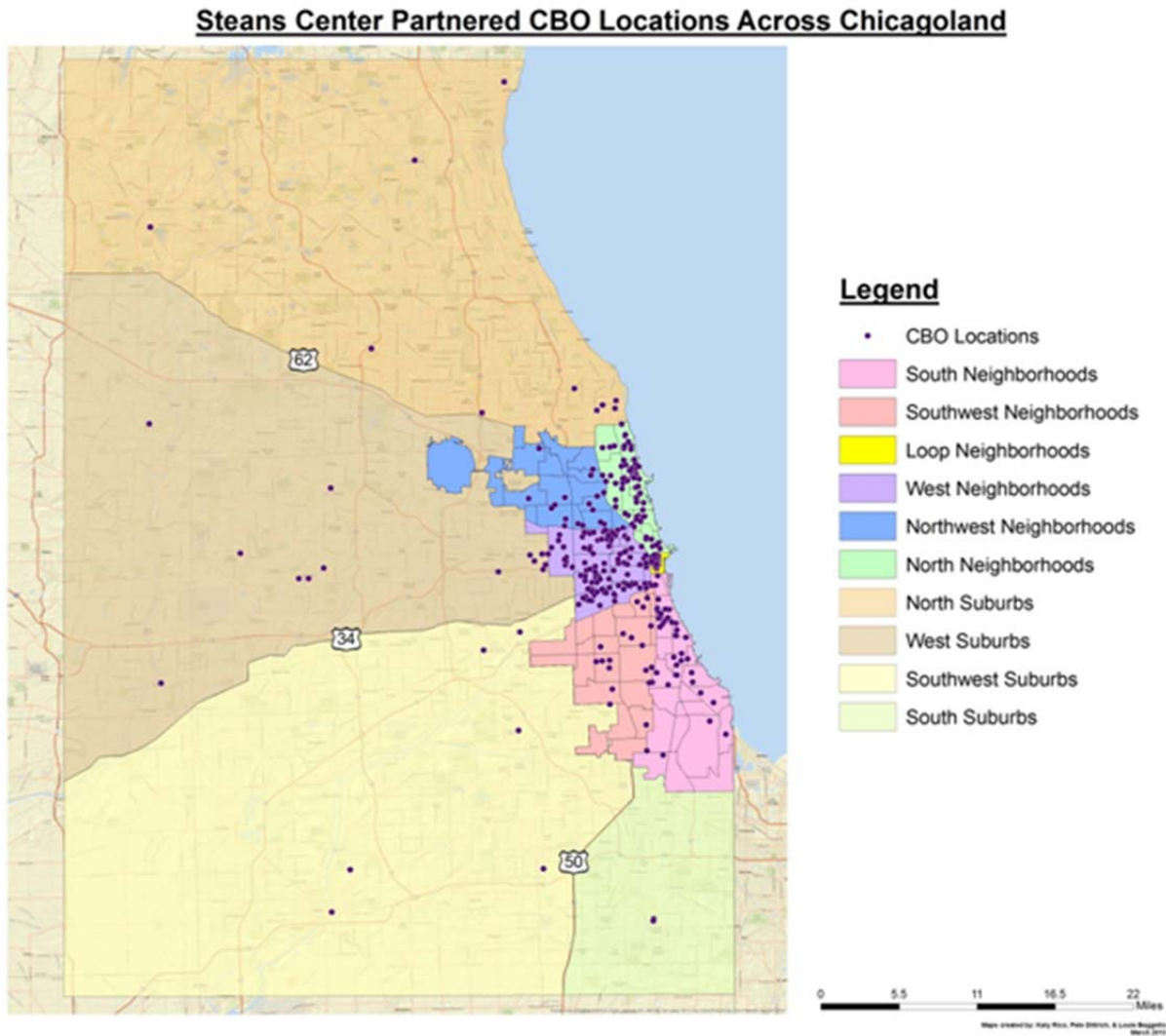
Steans Center Partnered CBO Locations Across Chicagoland

Steans Center Partnered CBO Count Per Region for Chicagoland

Legend

CBO Count

- · 2 - 7
- • 8 - 14
- ● 15 - 21
- ● 22 - 47
- ● 48 - 142

South Neighborhoods
Southwest Neighborhoods
Loop Neighborhoods
West Neighborhoods
Northwest Neighborhoods
North Neighborhoods
North Suburbs
West Suburbs
Southwest Suburbs
South Suburbs

0   5.5   11   16.5   22
Miles

Steans Center Partnered CBO Locations Across Chicago

Legend

- • CBO Locations
- South Neighborhoods
- Southwest Neighborhoods
- Loop Neighborhoods
- West Neighborhoods
- Northwest Neighborhoods
- North Neighborhoods

0   2   4   6   8 Miles

Maps created by: Katy Rico, Pete Dittrich, & Louis Baggetto
March 2013

Steans Center Partnered CBO Count Per Region for Chicago

Maps created by: Katy Rico, Pete Dittrich, & Louis Baggetto
March 2013
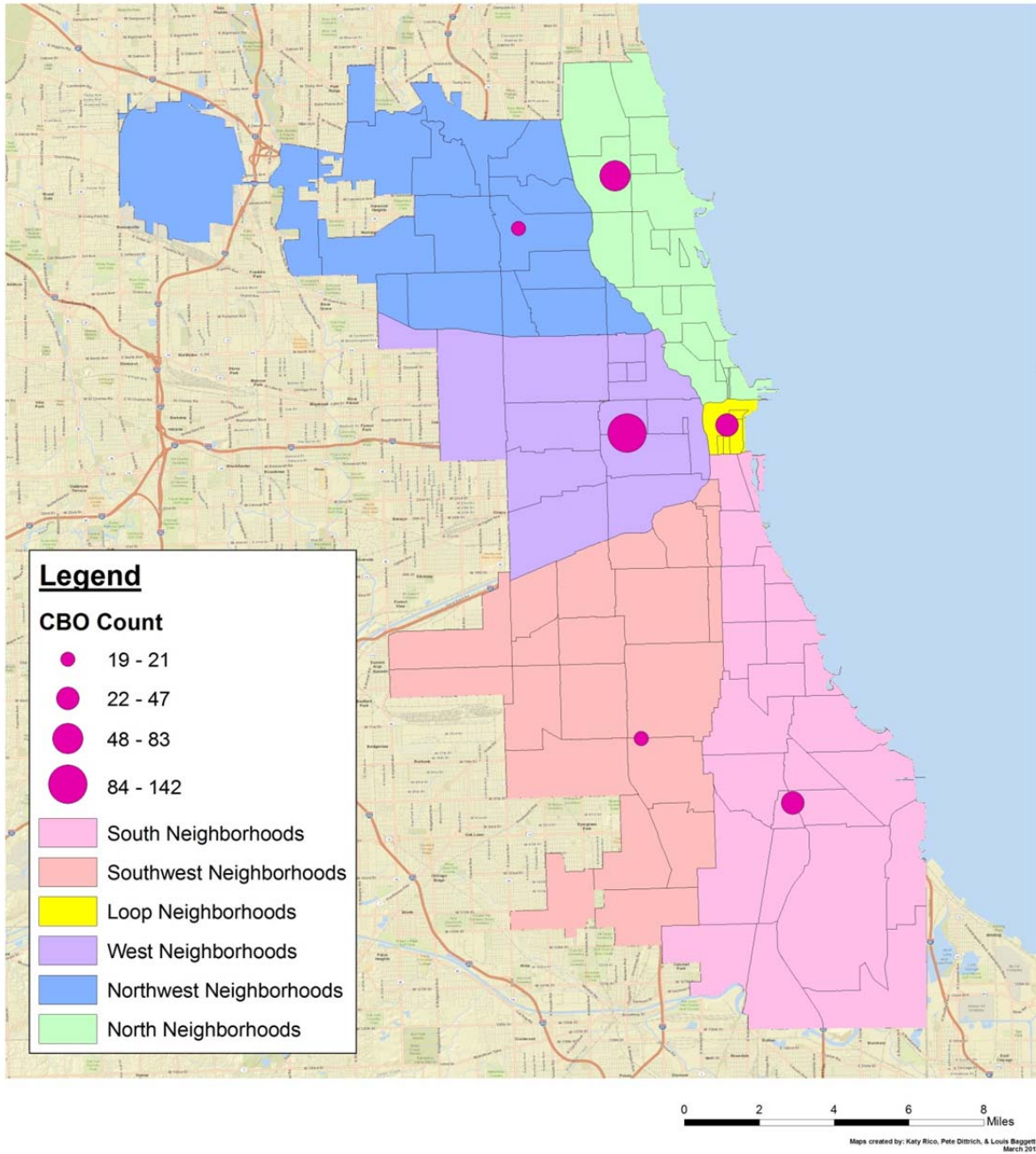
Additionally, the following pie charts demonstrate the breakdown of CBOs across all regions, and just the Chicago neighborhood regions:

CBO Locations

- West Suburbs (14) 0.04
- Southwest Suburbs (7) 0.02
- South Suburbs (2) 0.01
- North Suburbs (10) 0.03
- Loop (46) 0.12
- South Neighborhood (47) 0.12
- Southwest Neighborhoods (19) 0.05
- North Neighborhoods (83) 0.21
- West Neighborhoods (142) 0.36
- Northwest Neighborhoods (21) 0.05
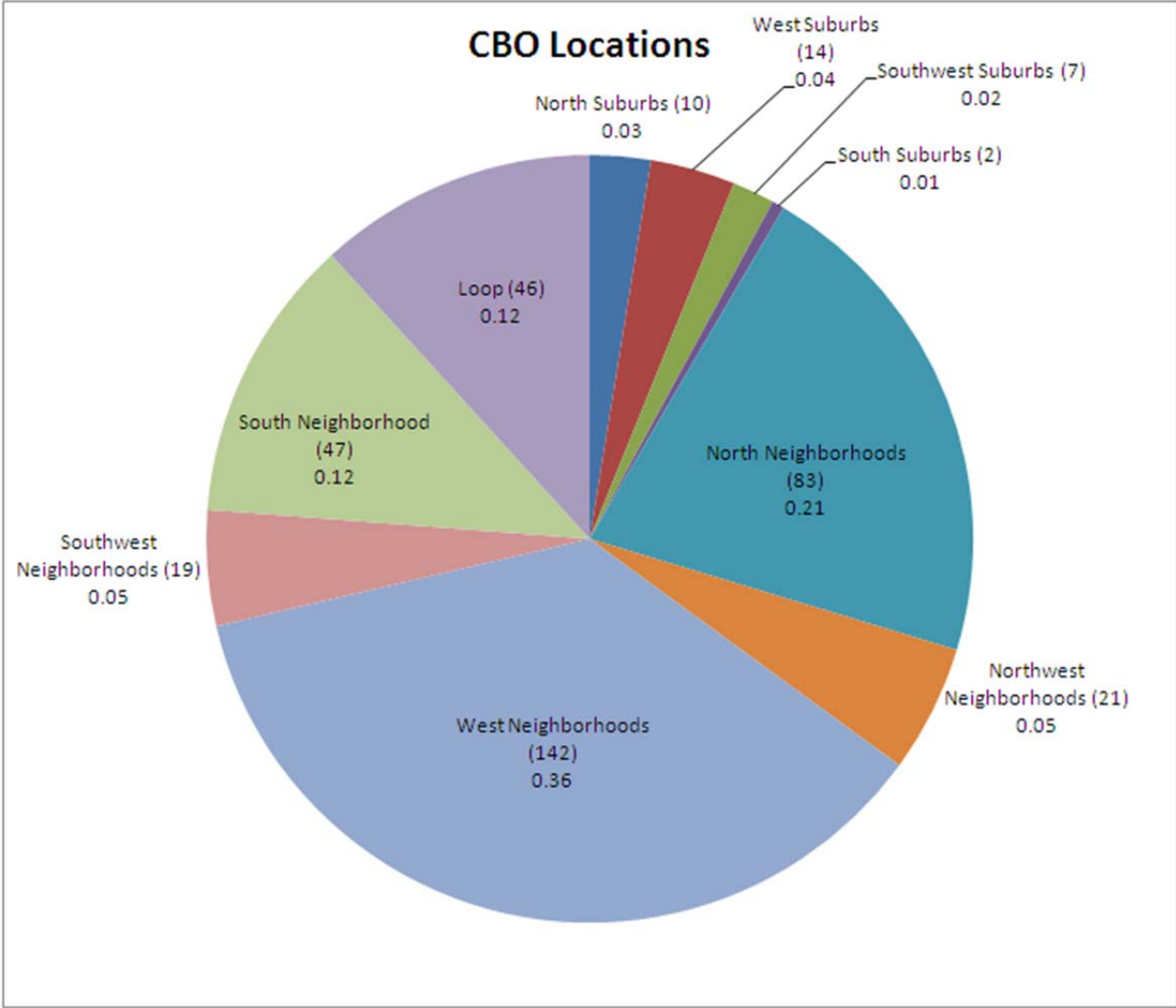
CBO Locations in Chicago

North Neighborhoods (83) 23%

Northwest Neighborhoods (21) 6%

West Neighborhoods (142) 40%

Southwest Neighborhoods (19) 5%

South Neighborhood (47) 13%

Loop (46) 13%
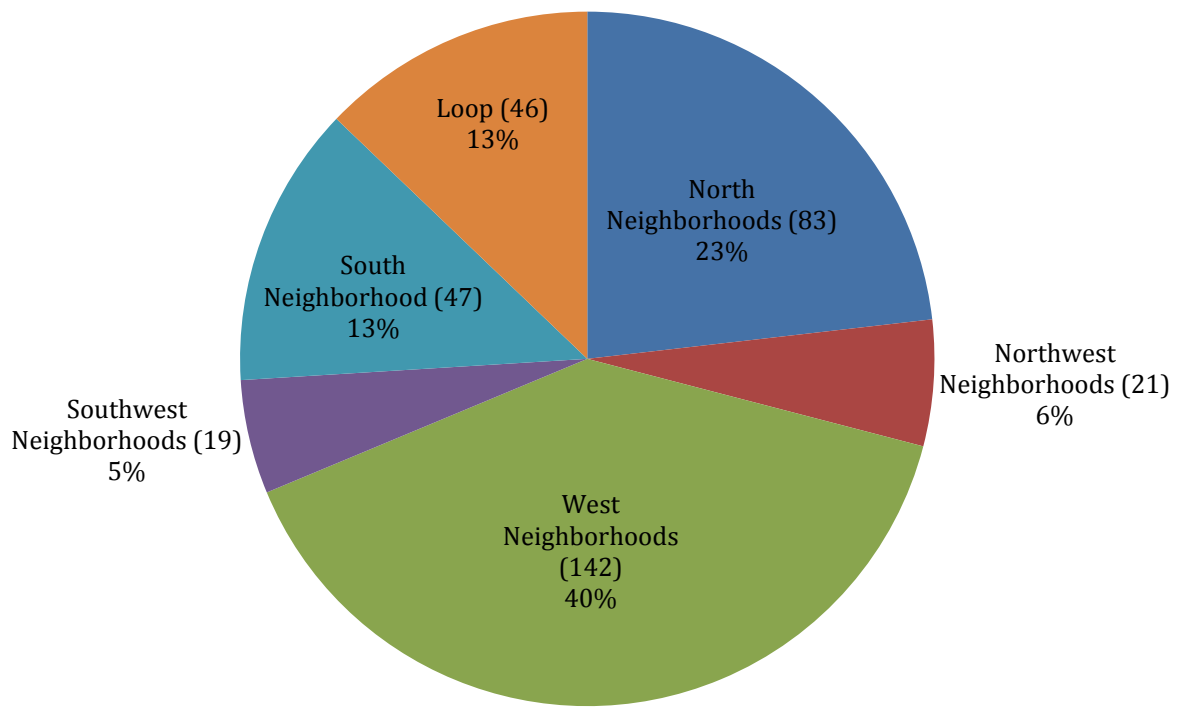
It is not surprising that the majority of the organizations are located in the city. This phenomenon is most likely a result of proximity. Service-learning sites located near the DePaul Campus are easier for DePaul students to commute to, therefore making them more attractive sites for student to serve. The city also has a greater population density than the suburbs, which translates into a greater density of CBOs.

In addition to the maps that show the locations of the CBOs across the entire Chicagoland area, we made ten maps at larger scales centered on each of the regions we defined. While we cannot draw any meaningful conclusions about the data we mapped from them, they will be a great help to the Steans Center. From these maps users can identify the locations of specific CBOs based on the street basemap that underlies the dots representing CBO locations. These maps will be especially useful tools for prospective service-learning students as they think about where they would like to serve. These ten maps are included as follows:

Steans Center Partnered CBO Locations Across the North Suburbs
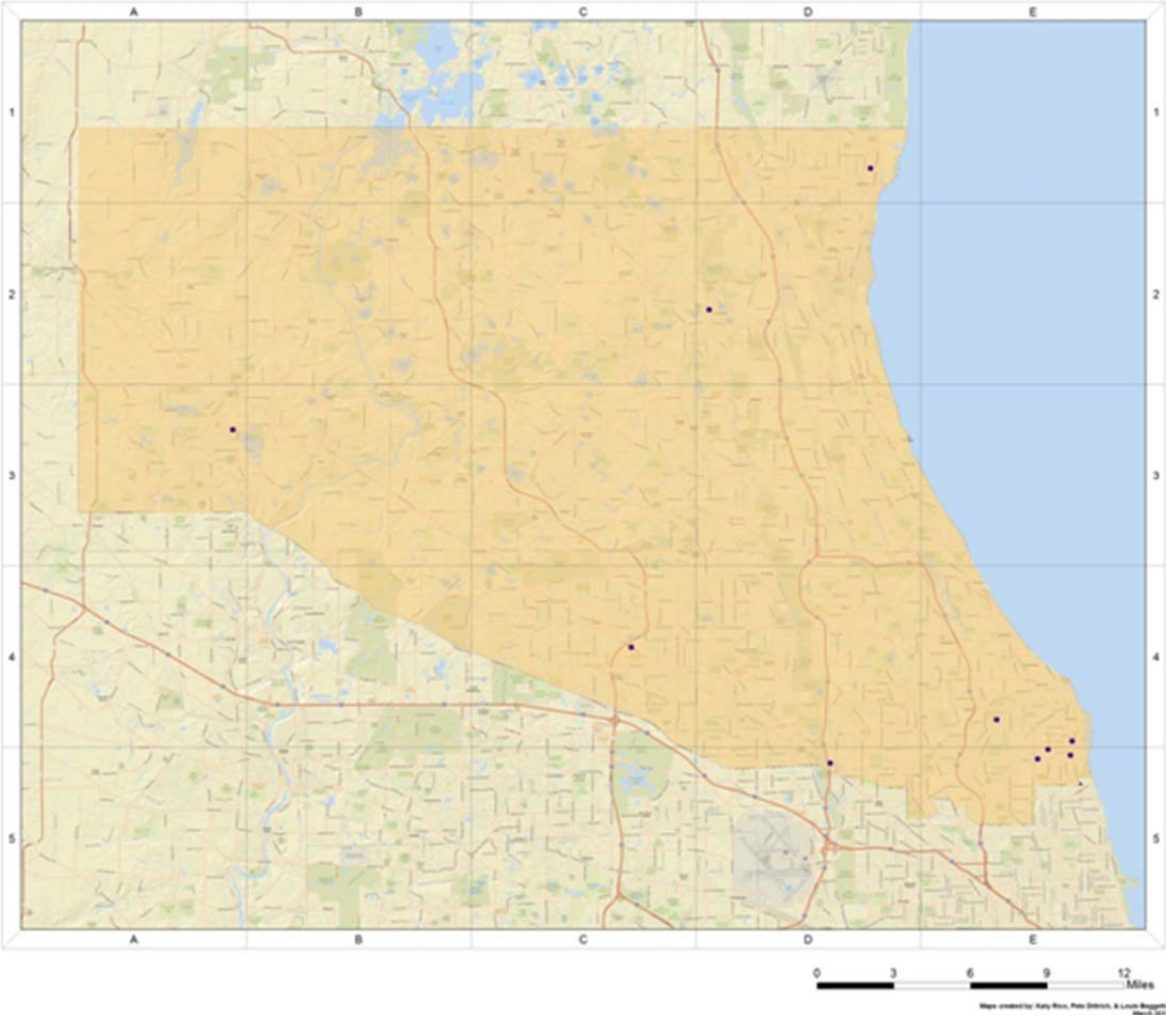
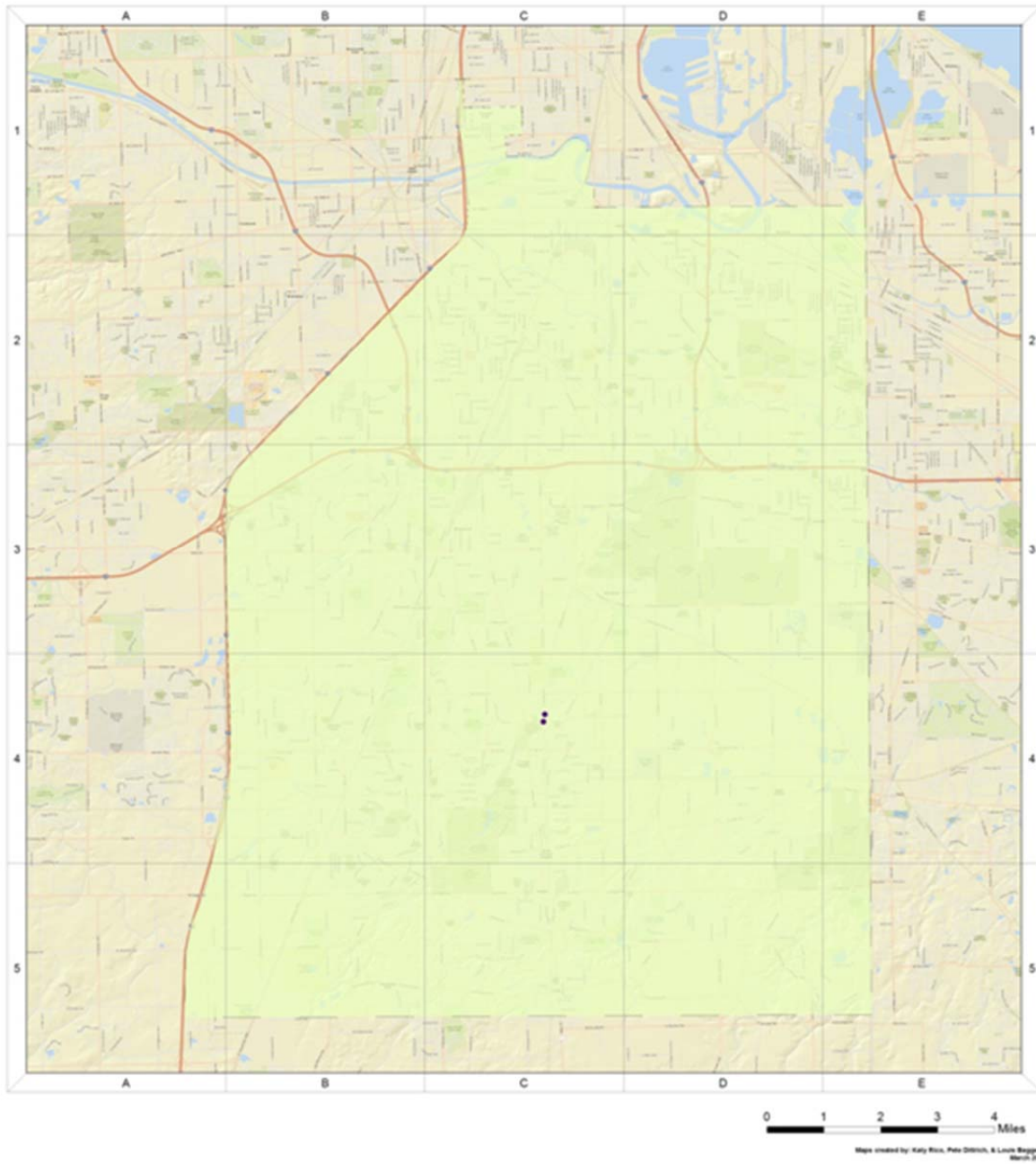## Steans Center Partnered CBO Locations Across the West Suburbs
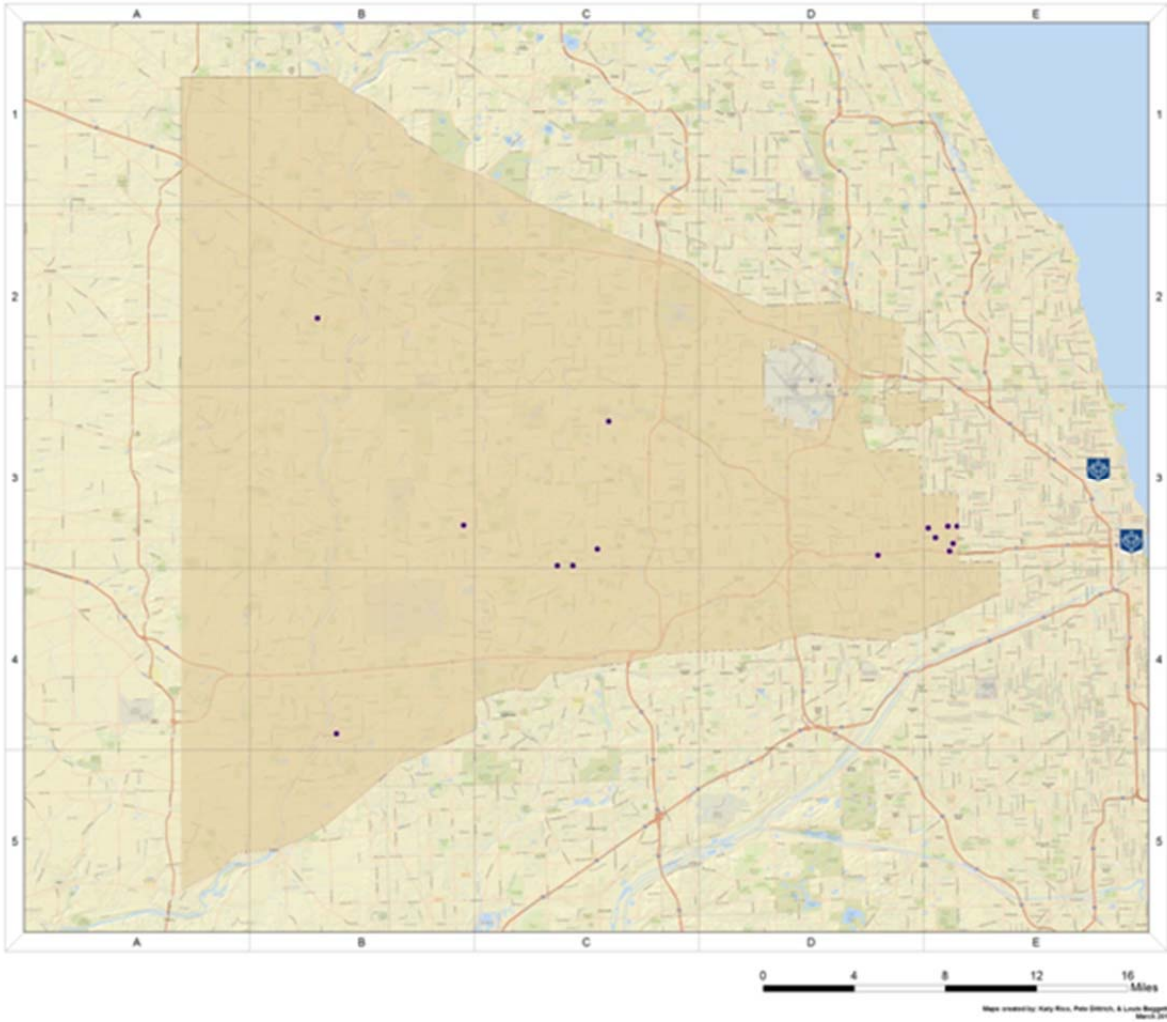
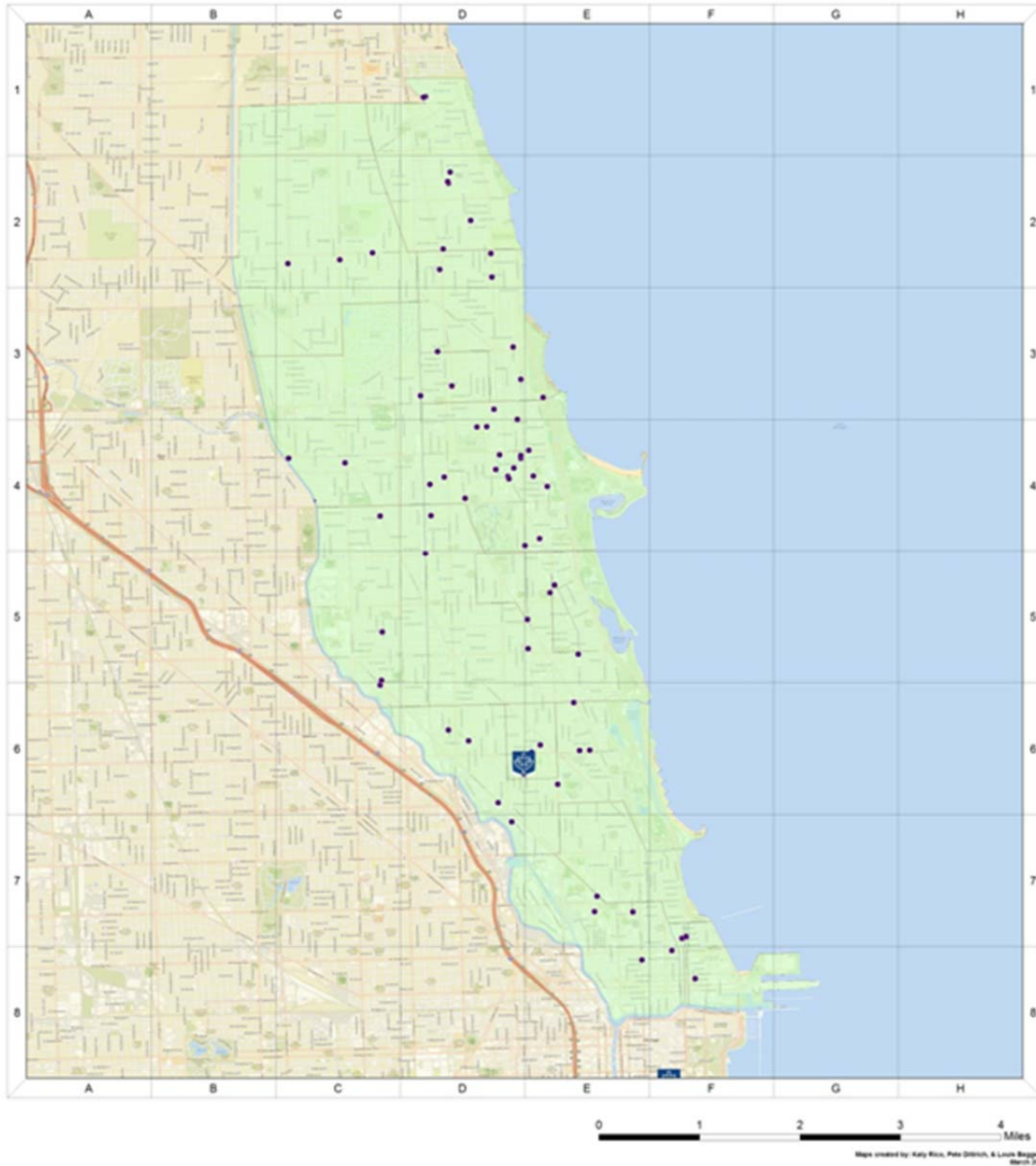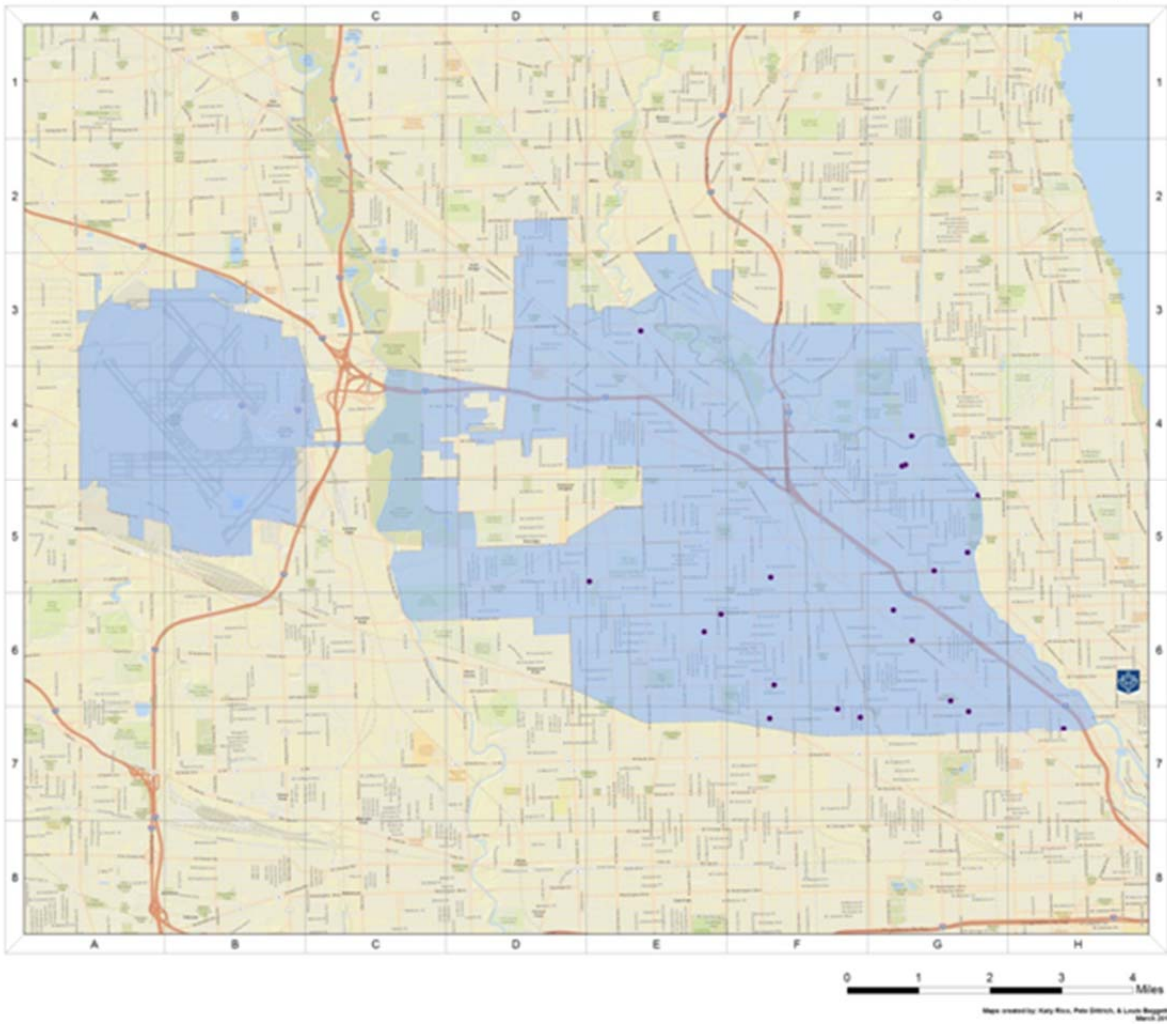**Steans Center Partnered CBO Locations Across the Southwest Suburbs**
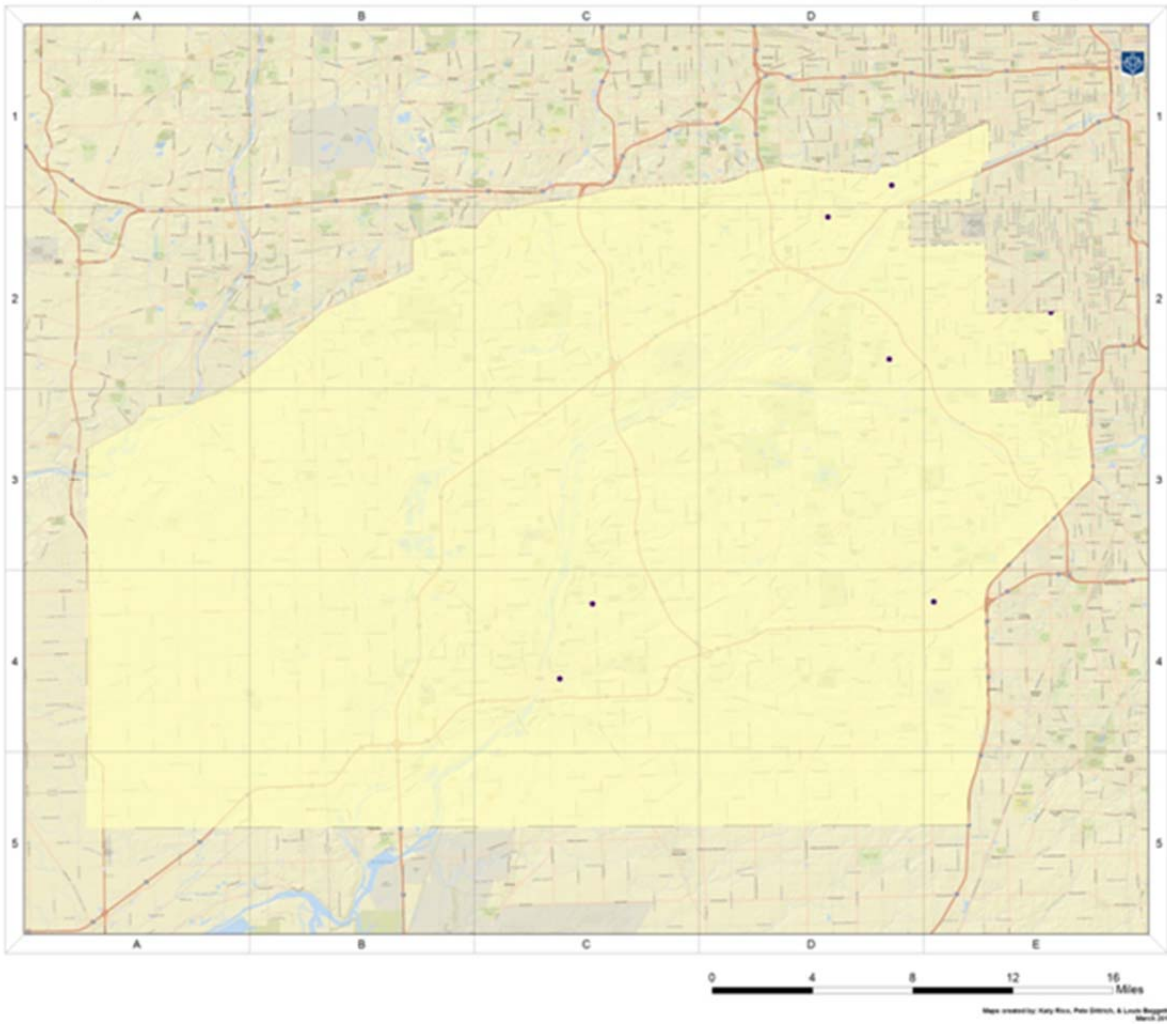
Steans Center Partnered CBO Locations Across the South Suburbs

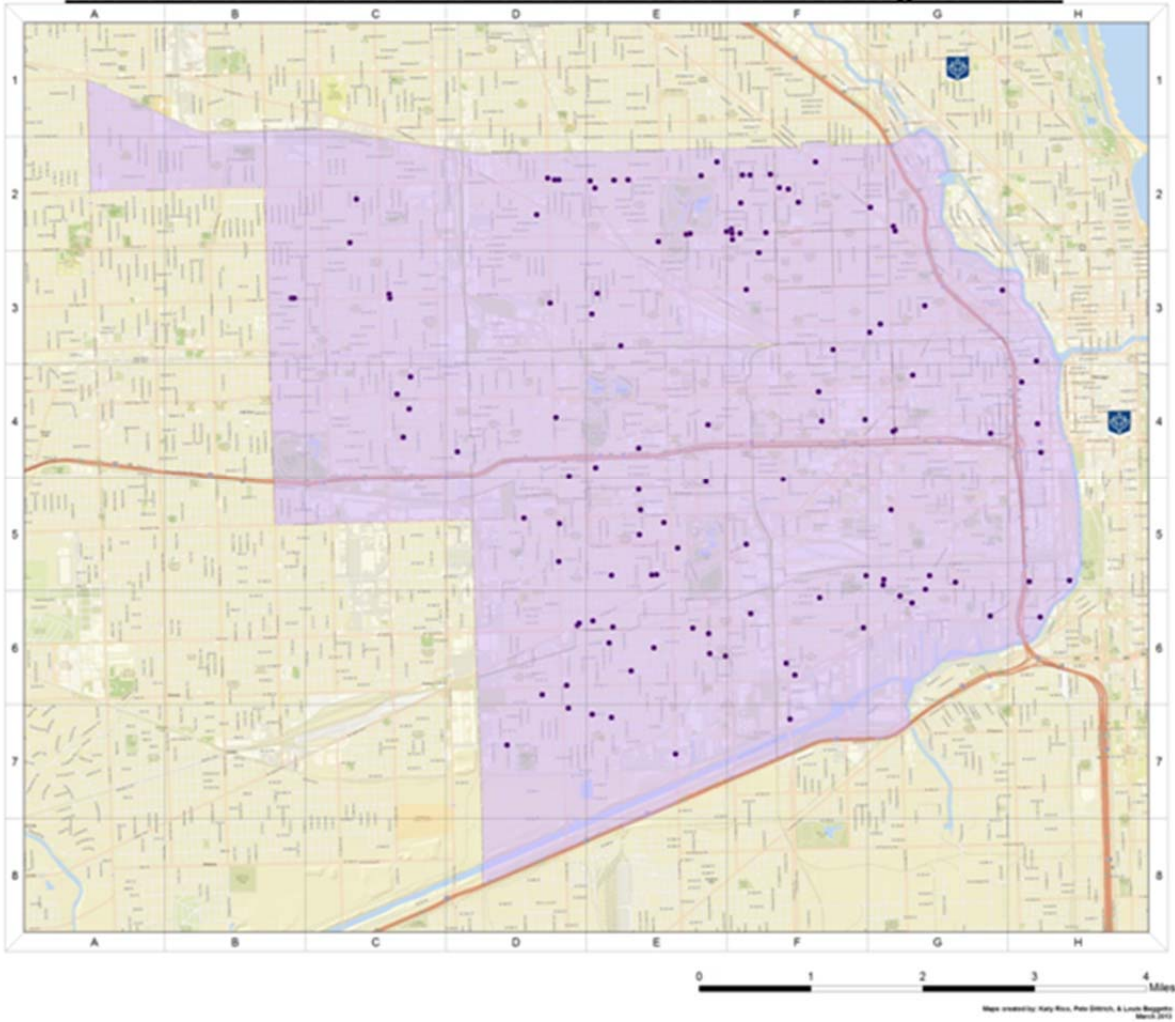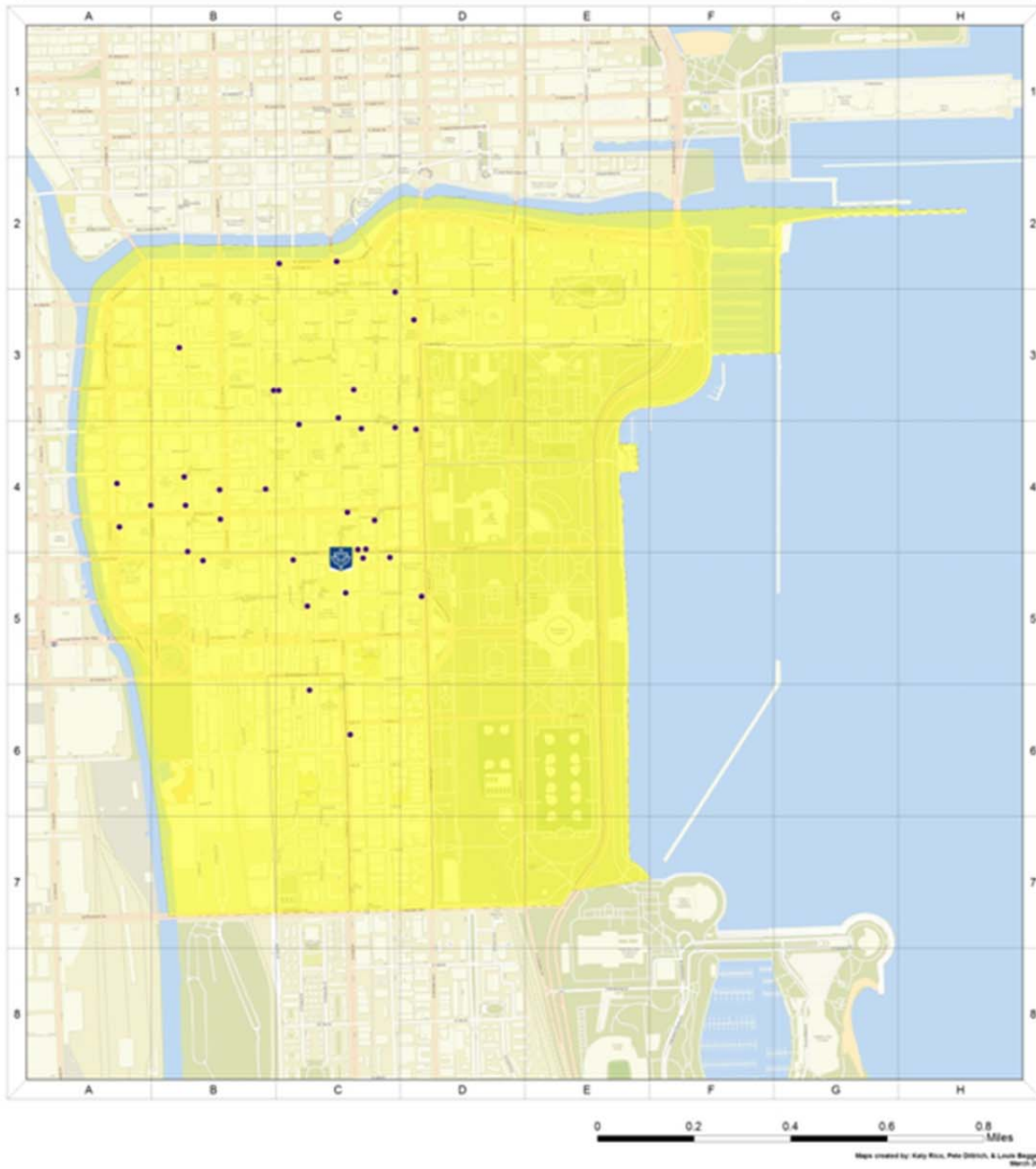# Steans Center Partnered CBO Locations Across the North Neighborhoods

Maps created by: Katy Rico, Pete Dittrich, & Louis Beggetto
March 2013

Steans Center Partnered CBO Locations Across the Northwest Neighborhoods

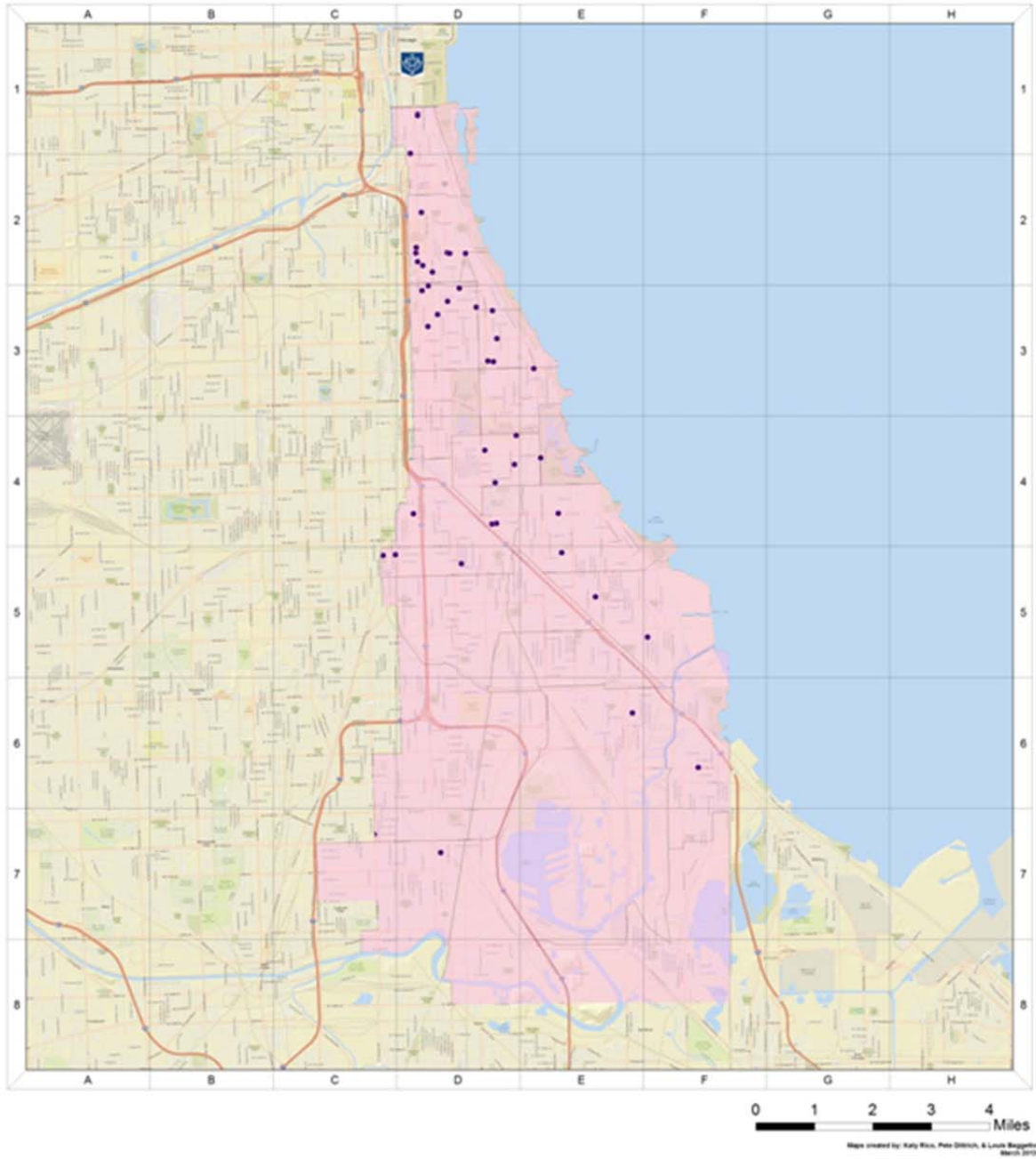# Steans Center Partnered CBO Locations Across the West Neighborhoods

Steans Center Partnered CBO Locations Across the Loop Neighborhoods

Steans Center Partnered CBO Locations Across the Southwest Neighborhoods

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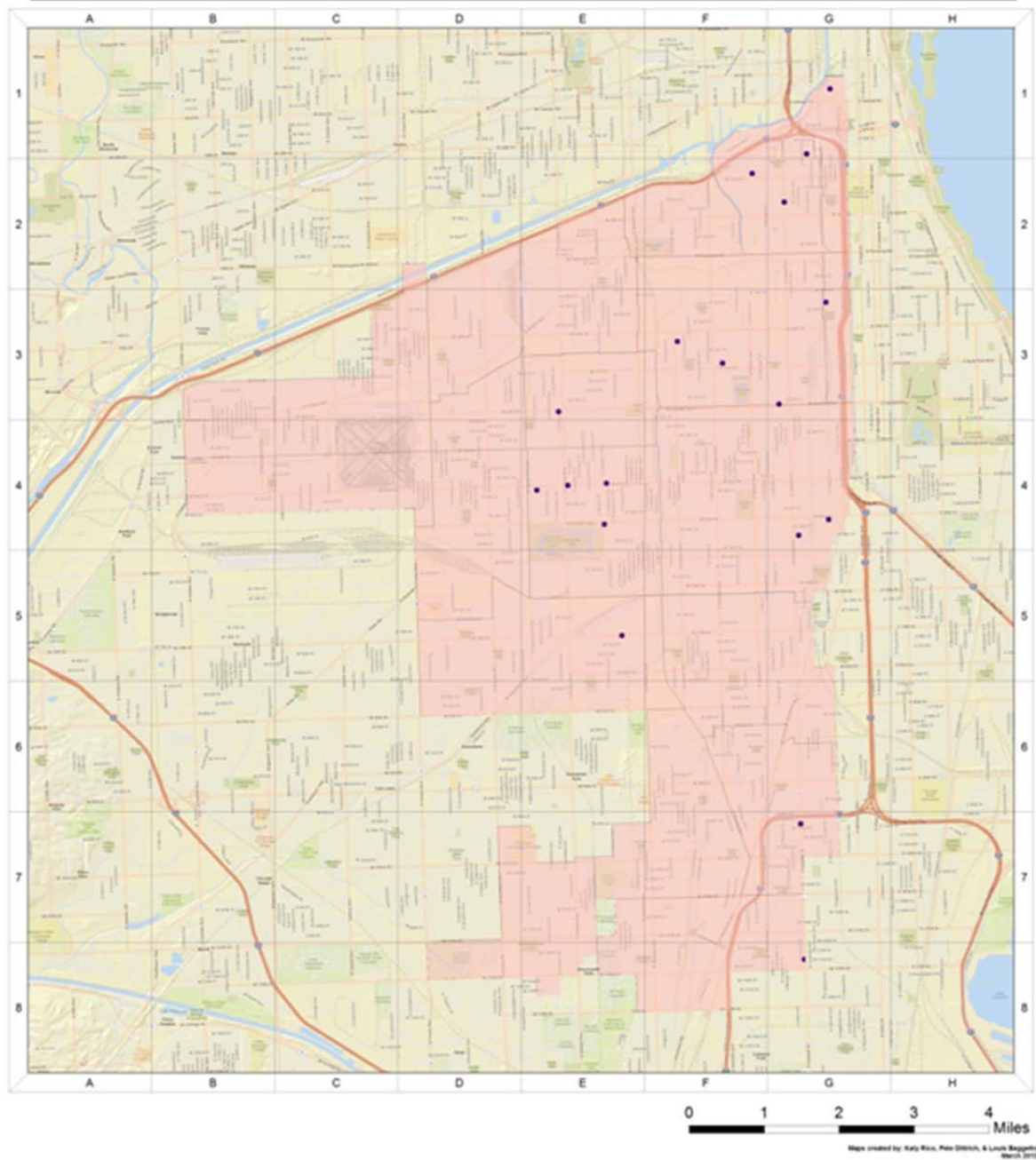
Steans Center Partnered CBO Locations Across the South Neighborhoods

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Summary, Conclusions, and Recommendations

In summation, we are very pleased with the overall functionality and quality of our work. The content of our maps represents the distribution of service-learning organizations affiliated with DePaul's Steans Center across the Chicagoland area. We broke up the Chicagoland area into ten regions—six regions of Chicago neighborhoods, and four regions of the suburbs. The neighborhood regions are divided by designated Chicago neighborhoods, while the suburban regions are divided according to Chicago boundaries and highway routes. Our first set of maps shows each organization location. These are multiple maps, as they display the organization locations as specific points across the entire Chicagoland area, across specifically the Chicago neighborhood regions, and for each of the ten regions. This satisfies our first two need-to-know questions. To answer our third need-to-know questions, we created two graduated symbol maps (one for the entire Chicagoland area, and one specifically for the Chicagoland neighborhood regions). This compressed all of the organizations to one single point per region, and varies the circumference of these points based of the count of organization locations.

Over the course of this project, the number of different map themes has decreased, due to the limited dataset provided to us by the Steans Center. Our initial aspirations to produce maps which would represent key attributes of the CBOs, service-learning hours, and students approval of the CBOs were eventually removed. The data required to create these maps was never provided, and both the Steans Center and our group felt it too large of a task to undertake in the allotted time.

Even though we were unable to represent all of the information we had initially intended for, these maps will be useful to both students and instructors. For anyone who looks at our maps, they will be able to observe the hundreds of CBOs spread across the Chicagoland area. This could help the students choose where they can spend their service-learning hours, and allow Steans Center faculty to determine where they have a strong concentration of service-learning locations, and where there needs to be more focus on perpetuating service-learning.

Although we were unable to complete all of what we intended during the course of the class, many of our group members felt that this project was enriching, and will continue to assist the Steans Center in the summer of 2013. By that time, a variety of attributes for each CBO will be obtained, and our project can be completed.

Contacts/ Data Suppliers

1. Sergio Elahi, Steans Center
   Academic and Community Development Program Coordinator
   - Provided the Steans Center CBO Organization names and locations
2. Office of Tourism, City of Chicago (Data Portal)
   - Provided the Chicago Neighborhoods Shapefile