

# Chicagoland Urban Foresters' Response to Climate Change, Drought, and Flooding



## ABSTRACT

The purpose of this research is to determine whether or not urban foresters within the Chicagoland area are responding to climate change, and if so, what are they doing to mitigate or adapt to climate change. This research specifically looks to analyze what best management practices, as defined in Clark et al. (1997), urban foresters within the Chicagoland area are implementing, and how they might be responding to drought and flooding.

A survey was designed and distributed to 492 urban foresters within the entire state of Illinois and Northwest Indiana in collaboration with the Community Trees Program of the Morton Arboretum in Lisle, IL. Out of the 70 responses, only one was not within the greater Chicagoland area. Of the survey responses to the question, "Does climate change affect the survival and well-being of the urban forest?" 81% strongly agreed, agreed, or somewhat agreed that climate change impacts the urban forest.



Figure 1: Approaches to managing climate change impacts on ecosystems and people. Source: Derby Lewis et al. 2014

## BACKGROUND

Urban centers are particularly susceptible to the effects of climate change. Urban areas experience the urban heat island effect, which makes urban centers hotter than their more rural counterparts. Industry and commercial business create excess heat that contributes the overall temperature of a city. The urban heat island effect is exacerbated by climate change and can lead to unhealthy atmospheric conditions from pollution, and associated exacerbated flooding and drought from lack of permeable surfaces (Clark et al. 1997).

The City of Chicago and the surrounding Chicagoland area is responsible for the production of an estimated 103 million metric tons of greenhouse gases per year (Hayhoe 2008). The creation and maintenance of urban forests are a beneficial and economically viable approach. "Urban forestry is the art, science, and technology of managing trees, forests, and natural systems in and around cities, suburbs, and towns for the health and well-being of all people" (Kusnierz et al. 2010). Urban forests within the continental United States sequester about 700 million tons of carbon (Nowak et al. 2002).

Although urban forests provide innumerable benefits to cities and urban centers, they can still be negatively impacted by climate change themselves. In the Midwest, climate change is predicted to account for hotter, drier summers and longer, milder winters. Research regarding urban forest practitioner response to climate change is limited.

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## PRELIMINARY RESULTS

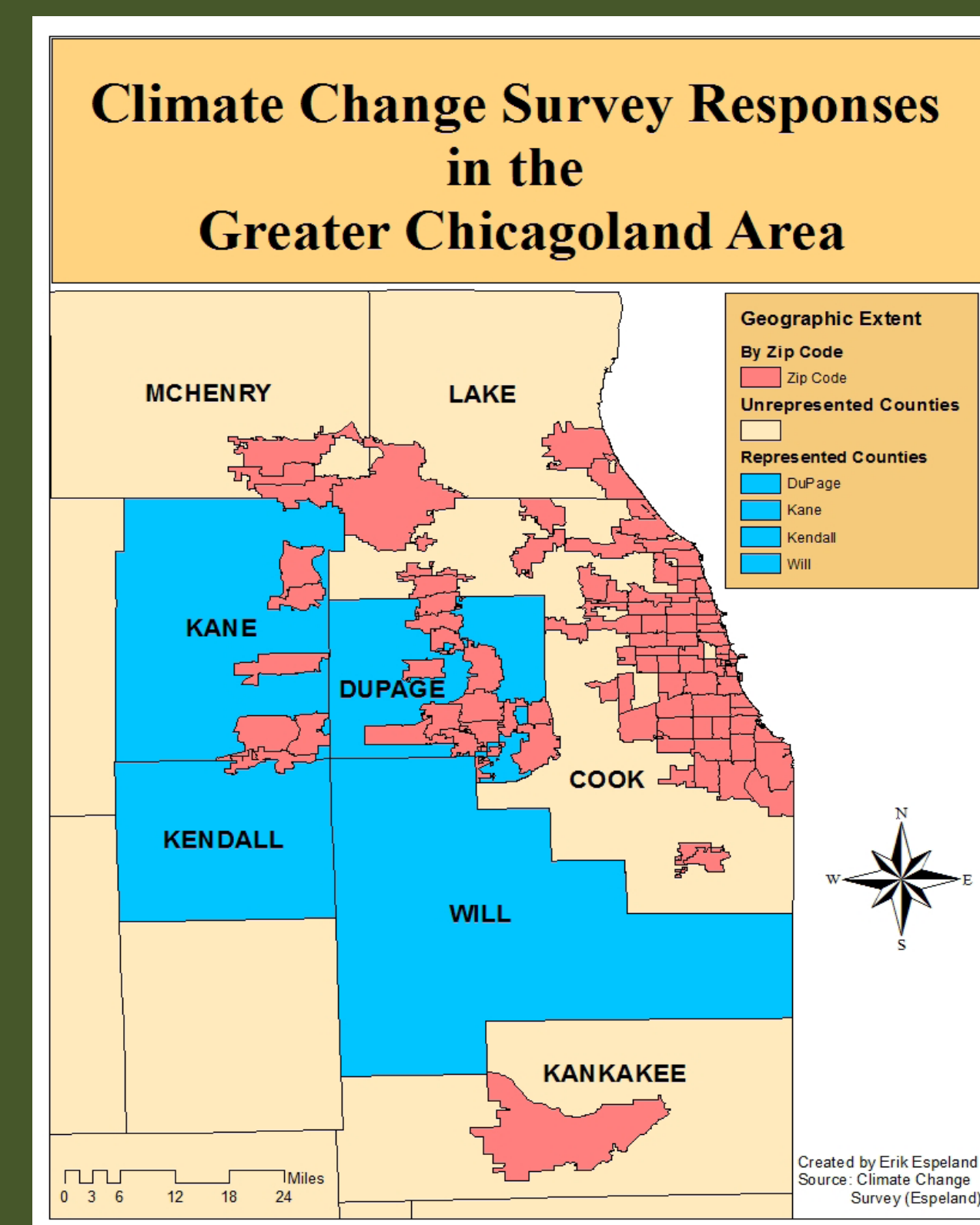


Figure 2: Geographic extent of survey respondents

- Urban forester survey responses were almost entirely from the target study area despite being distributed to the entire state of Illinois
- Responses from other parts of the state were appreciated, but may not be used for the current research project
- Survey responses from urban foresters throughout the Chicagoland area may show trends or differences in management practices by urban foresters experiencing the same weather patterns and effects of climate change
- Mapping of responses allows for multiple overlays in order to see trends in management practices, climate change knowledge, and flood/drought responses

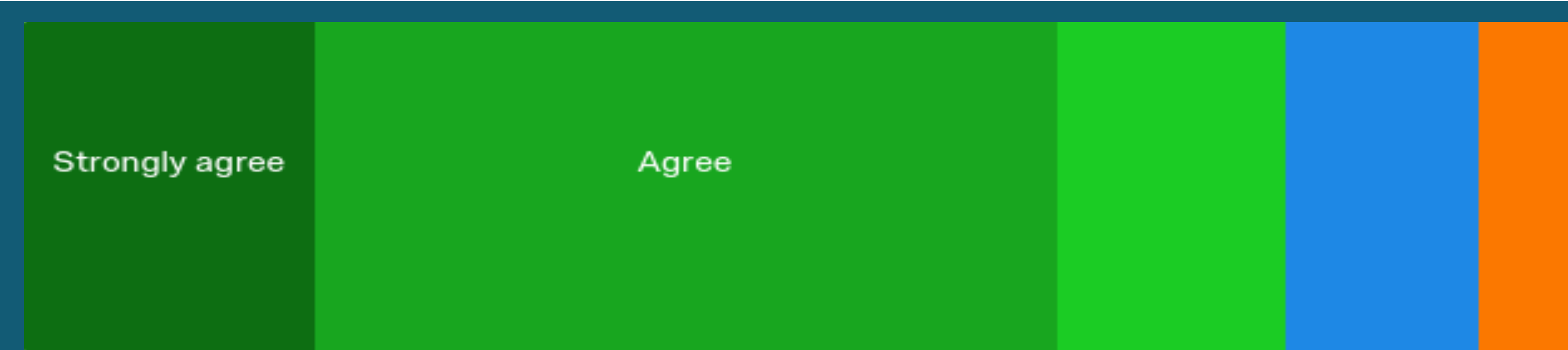


Figure 3: Urban foresters' response to the statement, "Climate change affects the survival and well-being of the urban forest."

- Urban foresters generally agree that climate change impacts the urban forest negatively
- Half of urban foresters are not doing anything to mitigate the effects of climate change on their managed urban forest
- 43% of respondents reported having changed the species of trees they planted to mitigate the effects of drought

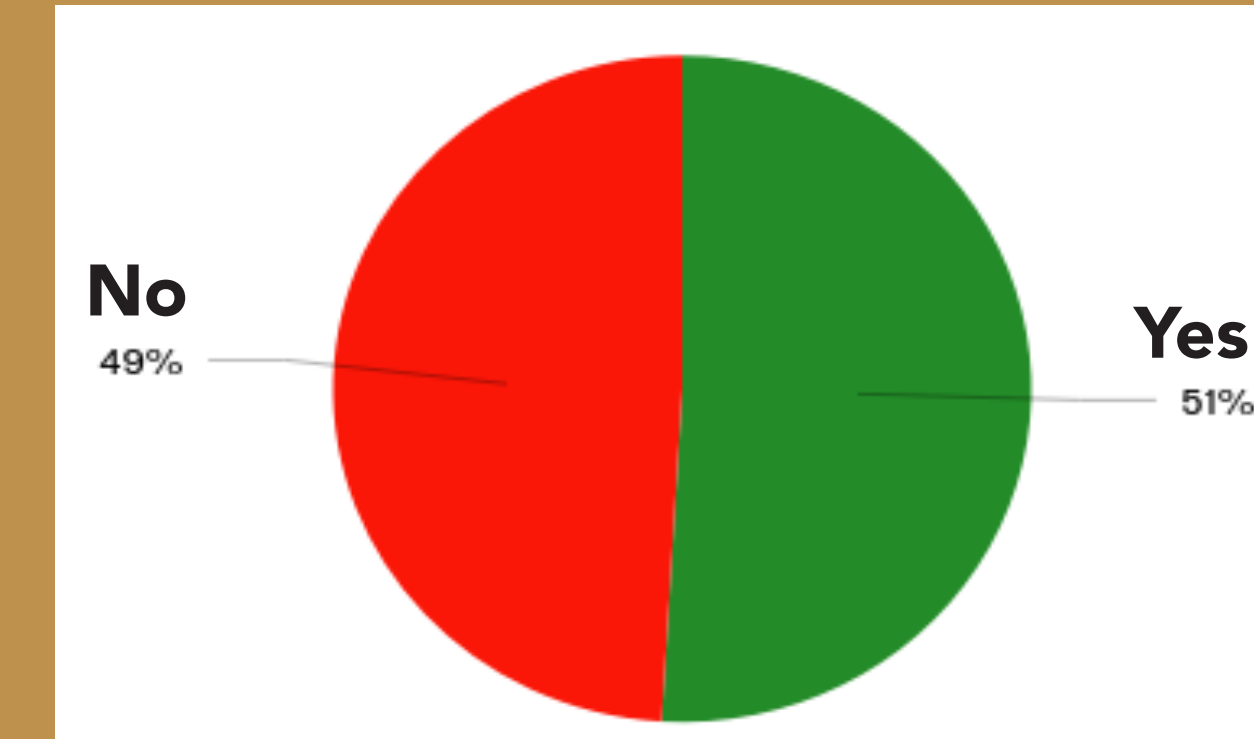


Figure 4: Urban forester response to "Has drought affected the planting of street trees within the past 5 years?"

## REFERENCES

- Clark, J. S., et al (2015) The impacts of increasing drought on forest dynamics, structure, and biodiversity in the United States. *Global Change Biology*, (2016), 1-15.
- Kusnierz, E. M., Dwyer, J. (2010) The Role of Our Urban Forest in the Chicago Metropolitan Region's Future. *The Morton Arboretum*, 4-39.
- Derby Lewis, A., Moseley, R. K., Hall, K. R., Hellmann, J. J. (2014) Conservation of Urban Biodiversity Under Climate Change: Climate-Informed Management for Chicago Green Spaces. *Handbook of Climate Change Adaptation*, 5.
- Environmental Protection Agency (2016) "Climate Change: Basic Information." "Climate Impacts in the Midwest." EPA.gov. United States Environmental Protection Agency, 23 Feb. 2016. Web. 18 Mar. 2016.
- Clark, J. R., Matheny, N. P., Cross, G., Wake, V. (1997) A model of urban forest sustainability. *Journal of Arboriculture*, 23 (1), 19-29.

## METHODOLOGY

### 1. Create Survey

- Challenge
  - Asking urban foresters about their response to climate change without allowing them to have any bias in answering these questions
- Solution
  - Ask urban foresters about their response to more frequent drought and flooding, the most apparent effects of climate change on the Midwest
  - Urban foresters would be filling out the survey without bias because to someone that does not know about climate change, responding to a flood or drought may just be another day on the job
- Detail/Access
  - Survey needed to gather as much data as possible without being too difficult or lengthy to fill out
- Question Sources
  - Clark et al. (1997) Best management practices for a sustainable urban forest
  - Yale climate survey

### 2. Survey Administration

- Community Trees Program (The Morton Arboretum)
  - Email list with 492 municipal urban foresters throughout Illinois
  - Goal: Help communities, public and private landowners, land managers, tree professionals, and groups interested in trees to effectively manage and care for our urban and community forest.
- Recruitment email sent 3 times over the course of 3 weeks
  - Survey open 9/26 – 11/1
  - The Tailored Design Method (Dillman 2014)

### 3. Data Analysis

- All analysis is currently done in Qualtrics online platform
- Future cross-tab analysis will be done in Excel

## NEXT STEPS

- Cross tab analysis of responses: In order to determine if urban foresters know that they are responding to climate change induced drought or flooding, individual responses must be compared. An urban forester may be responding to drought, but could be unaware that drought is a symptom of climate change.
- Add the last of the response data to the survey response map
- Overlay different sets of data on map to see check for any geographic patterns in management practices and response to climate change induced drought and flooding