Neighborhood & Nonprofit Urban Forestry:
Results of a 5-City Study

Bloomington Urban Forestry Research Group at CIPEC

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Take-Home Message

The **ecological and social outcomes of tree planting differ by city,** yet residents involved in tree-planting activities in 4 study cities (Atlanta, Detroit, Indianapolis, Philadelphia) **report positive outcomes,** particularly **beautification** of the neighborhood. Nonprofit **mission statements are changing** to reflect greater accountability to funders and donors; some organizations are beginning to incorporate social outcomes into their mission statements, yet others are becoming more focused on the number of trees planted. Ultimately, **the social outcomes of tree planting matter,** but how much and what these outcomes are **may differ across neighborhoods *even within a single city*.** Next steps of our research include diving deeper into neighborhood-specific results.

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Summary

Trees in urban areas provide ecological, economic, and social benefits to urban residents. Urban communities may plant trees with the intent of increasing these benefits. Few studies have examined **the success of urban trees in the ecological and social context** in which they are planted and grow. And even fewer have considered potential **social benefits to community groups** who partake in tree planting. This presentation discusses preliminary results of a **5-city study** of urban nonprofit tree-planting programs. We gathered extensive data about tree planting projects occurring in neighborhoods between 2009 and 2011 in cooperation with 5 nonprofit member organizations of the United-States-based **Alliance for Community Trees: Trees Atlanta** (Atlanta, Georgia), **The Greening of Detroit** (Detroit, Michigan), **Keep Indianapolis Beautiful** (Indianapolis, Indiana), **Pennsylvania Horticultural Society** (Philadelphia, Pennsylvania), and **Forest ReLeaf of Missouri** (St. Louis, Missouri). This study collected information about the planted trees and their growing environment using the **Planted Tree Re-Inventory Protocol** and about maintenance practices and other community dynamics gathered through **interviews and surveys** of residents in neighborhoods in which trees were planted. By using a **unique multi-city dataset** that combines information on planted trees, nonprofit programs, individual planting projects, land use, and neighborhoods and neighborhood residents, this research starts to answer two questions:

1) **What factors influence the survival of recently-planted urban trees?** and,

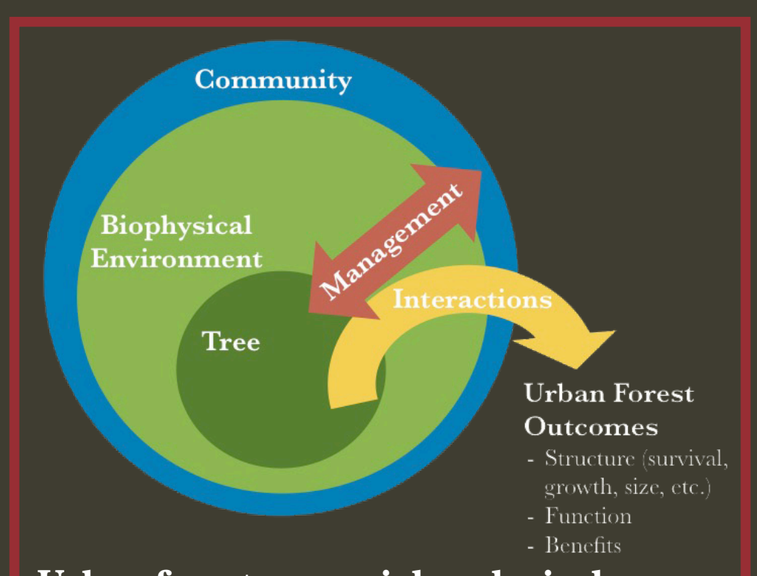
2) **What are the social outcomes of participation in neighborhood and nonprofit tree planting?**

Background

Neighborhoods and urban forests are best understood as **social-ecological systems** (SESs).

- SESs are systems of **inseparable** human and natural elements, including the **biophysical environment,** the nearby **community** of **people,** and **institutions** (*i.e.,* **management** practices) used by people as they interact with their environment.
- The elements of an SES **interact** to produce **outcomes** ***(figure at right).***

We can study which elements of SESs produce the most **desirable outcomes** by gathering **data** about the community, environment, and management practices.



Urban forests as social-ecological systems.

Because trees in cities produce many **benefits** to the community and to the environment ***(table at left),*** **municipal governments** and **non-profit organizations** working in cities have begun **planting trees** in neighborhoods in order to **improve the urban quality-of-life.**

Benefits of Urban Trees	
Stormwater management	Property value increase
Air pollution mitigation	Increased retail sales
Carbon sequestration/storage	Improved mental health and stress management
Energy savings	Lower crime rates
Decreased urban heat island	Recreational opportunities
Aesthetic beauty	

Study Sites

The **Bloomington Urban Forestry Research Group** (BUFRG; *the authors*) at Indiana University recruited 5 partner nonprofit tree-planting and urban-greening organizations in 5 United States cities ***(map at right),*** all member organizations of the national nonprofit organization **Alliance for Community Trees.** Tree-planting organizations must have:

- Had an **active tree-planting program** between **2009** and **2011,** through which they plant trees with community groups; and,
- Kept **detailed records** of the **locations** of all planted trees, as well as data from planting (**packaging type, species, size,** *etc.*).

Methods

We used **mixed methods research** that combined tools from the fields of **forest ecology,** environmental science, public policy/**public affairs,** anthropology/ethnography, **sociology,** geographic information science, **econometrics,** and more. Our goal was to gather information about **trees,** the **environment,** and **people** that allow us to make conclusions about **neighborhoods as a social-ecological system.**

- Neighborhood selection:
  - **"Neighborhood"** = Census **block group**
  - 25 randomly-selected **tree-planting neighborhoods,** where large (20+ trees) projects occurred 2009-2011
    - 25 matching **comparison neighborhoods** with similar **physical** (canopy cover) and **demographic** (*e.g.,* income, % white residents) characteristics
- Data on **people:**
  - **Semi-structured interviews** with neighborhood leaders, tree-planting project leaders, nonprofit employees
  - **Household survey** ***(left)*** of all tree-planting project participants randomly-selected neighborhood residents
- Data on **trees:**
  - **Planted Tree Re-Inventory Protocol** ***(above right)*** developed by BUFRG
  - Researchers trained **citizen scientists** (high schoolers, master gardener retirees, local tree stewards, *etc.*) to use Protocol to collect data on trees planted in tree-planting neighborhoods

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The following is a survey about your neighborhood and the environment.
We would greatly appreciate your participation in this survey.

The confidentiality of all respondents will be maintained in this research.

Section 1: This section asks about your experiences in the neighborhood where you live now. We define "neighborhood" as the people and places around where you live. It is where you might perform routine tasks, such as shopping, going to the park, or visiting with neighbors. It may include religious institutions, schools, or local businesses.

1 In what year did you first live in *this city?* ☐

2 In what year did you first live in *this neighborhood?* ☐

3 On the whole, do you like or dislike this neighborhood as a place to live?
- a. I like it alot ☐
- b. I like it ☐
- c. I neither like nor dislike it ☐
- d. I dislike it ☐
- e. I dislike it alot ☐

4 Please indicate whether you think the neighborhood has gotten better, stayed about the same, or gotten worse ***over the past five years*** (even if you have not lived here the entire time).
- a. It has gotten better. ☐
- b. It has stayed the same. ☐
- c. It has gotten worse. ☐

5 Please indicate whether you agree or disagree with each of the following statements.

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
a. This is a close-knit neighborhood.	☐	☐	☐	☐	☐
b. People in this neighborhood generally don't get along with each other.	☐	☐	☐	☐	☐
c. People in this neighborhood don't share the same values.	☐	☐	☐	☐	☐
d. People around here are willing to help their neighbors.	☐	☐	☐	☐	☐
e. If there is a problem around here, the neighbors get together to deal with it.	☐	☐	☐	☐	☐
f. People in this neighborhood can be trusted.	☐	☐	☐	☐	☐
g. There are many opportunities to meet neighbors and work on solving community problems.	☐	☐	☐	☐	☐
h. Residents informally manage neighborhood affairs more than through a formal process.	☐	☐	☐	☐	☐

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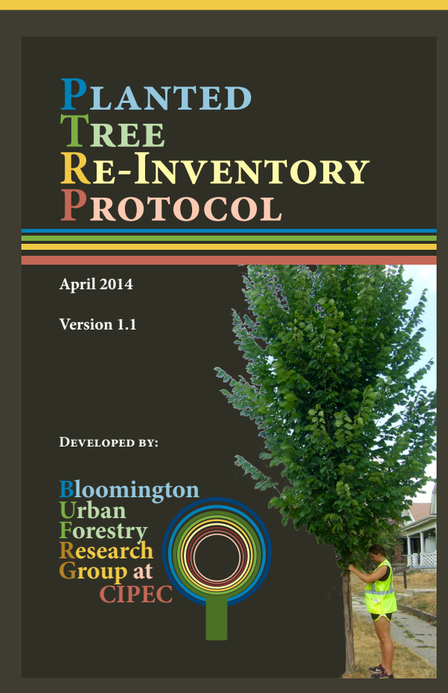


Results

Nonprofits

- Most organizations have been planting trees for **over 20 years.**
- **Variation** in tree-planting **program** characteristics (***table below***).

Nonprofit interview results - Organization and tree-planting program characteristics.

	Atlanta	Detroit	Indy	Philly	St. Louis
Organization **established** in...	1985	1989	1976	1827	1993
Tree planting since...	**1985**	**1989**	**2005**	**1991**	**1993**
Overall mission change over time?	No	Yes	Yes	No	No
Mission of tree-planting program change over time?	No	*More* numeric (#s of trees)	*Less* numeric, *more* social	Expanded geographically	Expanded types of communities
Other **big changes** in recent past?	No	Yes - mission, organizational	Yes - staffing	Yes - Staffing	No
Training program for lead volunteers?	Tree Keepers	Citizen Foresters	No	Tree Tenders	Tree Keepers
Applicants submit **plan for tree care?**	**Sometimes**	**No**	**Yes**	**No**	**Yes**

Trees

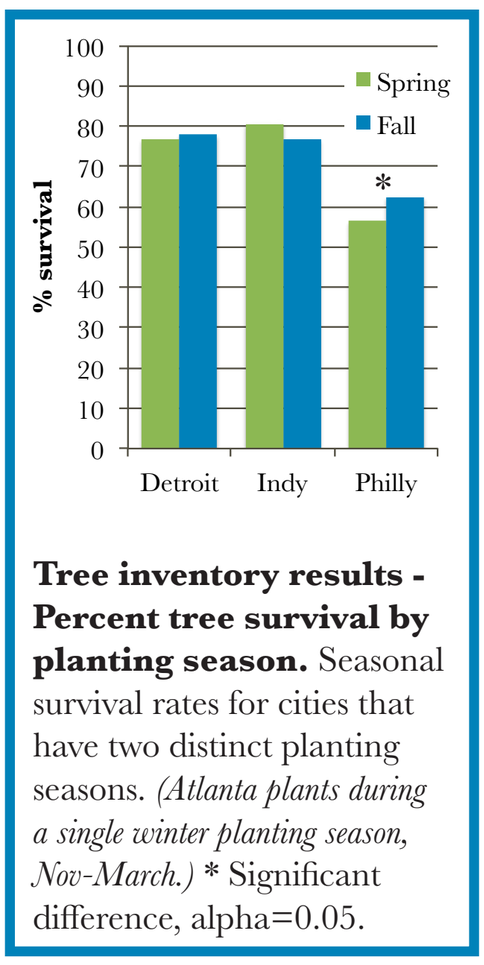
- Tree **survival rates** in each study city ranged from **just below 60%** in Philadelphia **to about 85%** in Indianapolis and St. Louis (***table at right***).
- Survival was **highest for fall planted trees** in Philadelphia, but there was no difference for Detroit or Indianapolis (***graph bottom left***)
- Significantly **lower survival rates** for trees planted in **more recent years** (*results not shown*).

Tree re-inventory results - City-specific cumulative and annual tree survival.
* The precise number of trees planted in St. Louis between 2009 and 2011 is unavailable.
** This number is an approximated cumulative survival rate; it reflects the percent of trees that remained alive of those trees that were able to be located during re-inventory, and likely overestimates the true survival rate.

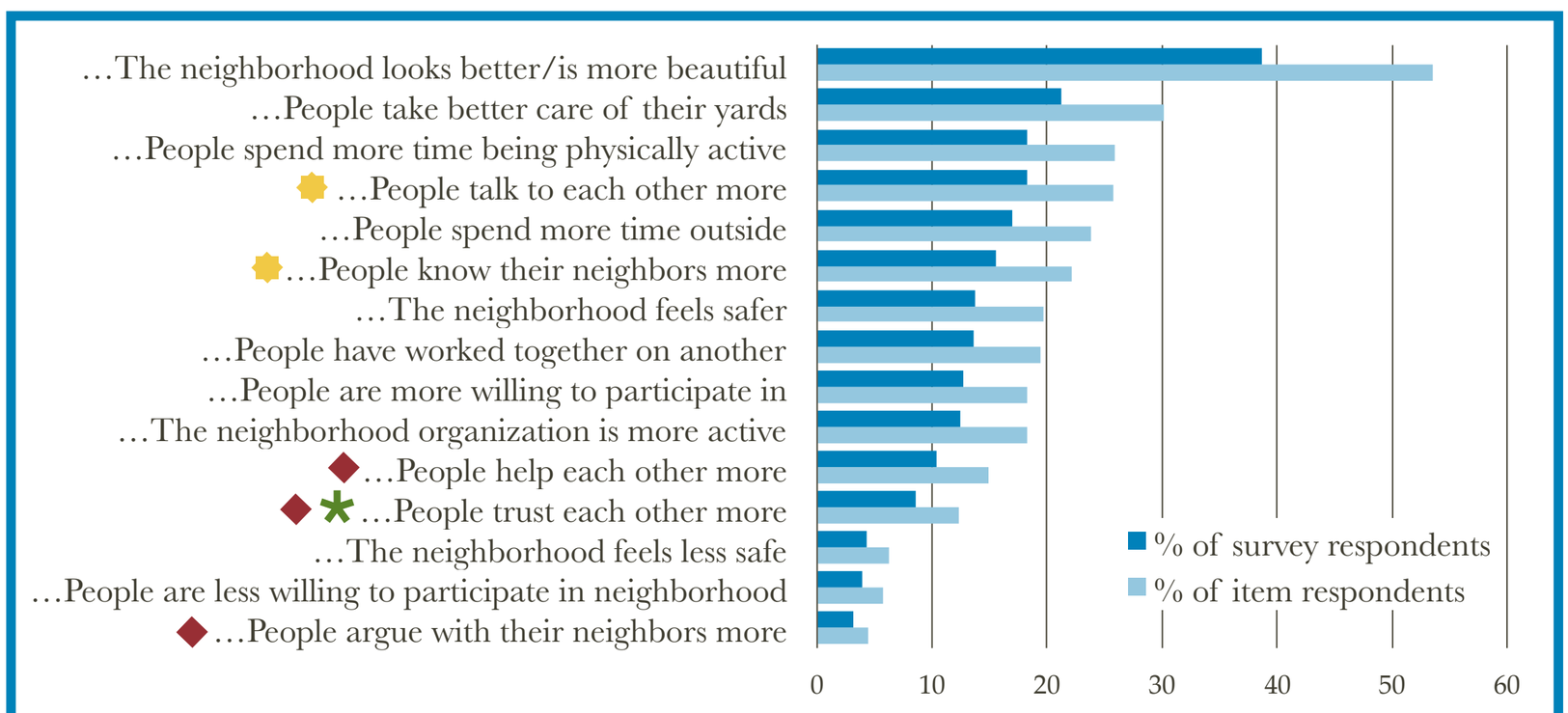
	Atlanta	Detroit	Indy	Philly	St. Louis
# tree **planted** 2009-2011	21,349	7,040	18,238	7,012	Not available*
# trees **re-inventoried** in 2014 (%)	577 (2.7%)	1,241 (17.9%)	1,076 (6.0%)	1,742 (25%)	101 (n/a)
Cumulative survival rate of re-inventoried trees	**82%**	**80%**	**85%**	**59%**	**86%****
Annual survival rate of re-inventoried trees	93%	93%	93%	87%	n/a

Neighborhoods

- Neighborhood residents **report some changes** in the neighborhood **as a result of** tree planting (***graph bottom right***). **Beautification improvements** most commonly reported.
- Significantly **higher neighborhood ties and trust for tree-planting neighborhoods,** but no difference cohesion (*results not shown*).
  - *However,* once we control for neighborhood demographics, **no significant differences in neighborhood capacity** indices (neighborhood ties, social cohesion, trust) are observed (*pooled, all-city ordered logit results not shown*).
  - Separate models for each city show that in Atlanta, **neighborhood ties and community cohesion are higher in Atlanta** (*results not shown*).



Tree inventory results - Percent tree survival by planting season. Seasonal survival rates for cities that have two distinct planting seasons. *(Atlanta plants during a single winter planting season, Nov-March.)* * Significant difference, alpha=0.05.



Household survey results - Reported outcomes of tree planting. Residents in planting neighborhoods were asked whether they noticed any of the above **changes in their neighborhood** that they thought were a **result of tree planting.** The graph shows the proportion of responding residents in planting neighborhoods who noted they had noticed the neighborhood change. ***Light blue*** indicates the percentage of "yes" responses out of all responses to the survey item. ***Darker blue*** indicates the percentage of "yes" responses out of all residents who responded to the survey (including those who left the item blank).
Neighborhood ties measure **Community cohesion** measure **Trust** measure

Preliminary Synthesis - A Tale of Two Cities

Preliminary conclusions from this project indicate both **statistical and substantive differences in the way nonprofits approach tree planting** in neighborhoods. **Comparing cities** with high and low tree survival rates can help us understand the **key differences driving social and ecological success.**

Low Tree Survival in Philadelphia

Why?
- Only use **bare root** planting stork
- Plant **more trees in spring** than other cities
  - Spring planting = **lower survival** rates
- More **constrained** growing space
  - **~80%** of trees planted in a **tree pit,** constrained on 4 sides
- More varied **geographic extent** of plantings?

Possible **social factors:**
- No nonprofit employees present at time of tree planting

Other biophysical, social differences between Philly & other cities?
Air pollution, etc....

Adaptive Management in Indianapolis

- Nonprofits **adapt**...
- Previous **experience with researchers**
  - Solicitation of resarchers to collect data
  - Provided **information to inform changes** in practices
- Planting packaging changes
  - No longer plant **ball & burlap trees** that had **low survival**
  - **Avg. survival rates** for container, root bag trees
- **40%** of trees planted in **tree lawn - avg. width 6 m**
- **Fewer** trees planted in **spring**
- Change in **mission** towards **social**
  - **People** outcomes (not just tree outcomes)