Residential Vegetation Changes and Associated Multi-scalar Drivers in Central Arizona-Phoenix, 2017-2021

Qinnan Zhu[1], Kelli L. Larson[2]

[1]School of Geographical Sciences and Urban Planning, Arizona State University, Tempe, AZ;
[2]School of Geographical Sciences and Urban Planning, School of Sustainability, Arizona State University, Tempe, AZ.

Background

- Historically, mesic lawns have led to increasing environmental concerns, including high water demands and excessive inputs of fertilizers and pesticides.
- Promotion of water conservation in the arid southwestern U.S. is shifting residential landscapes toward climate-adapted xeric yards, which in Phoenix typically include gravel groundcover and low water-use vegetation.
- Wildlife-friendly gardening—i.e., planting trees and native plants to provide habitat for birds, pollinators, and other wildlife—is gaining popularity among residents.
- Residential yards that reduce water demands and other inputs while also providing habitat for wildlife provide more sustainable alternatives to traditional lawns.

However, only a few studies have explicitly investigated **parcel-scale vegetation change** in residential contexts, and the **extent of different vegetation changes and associated drivers** are still unclear.

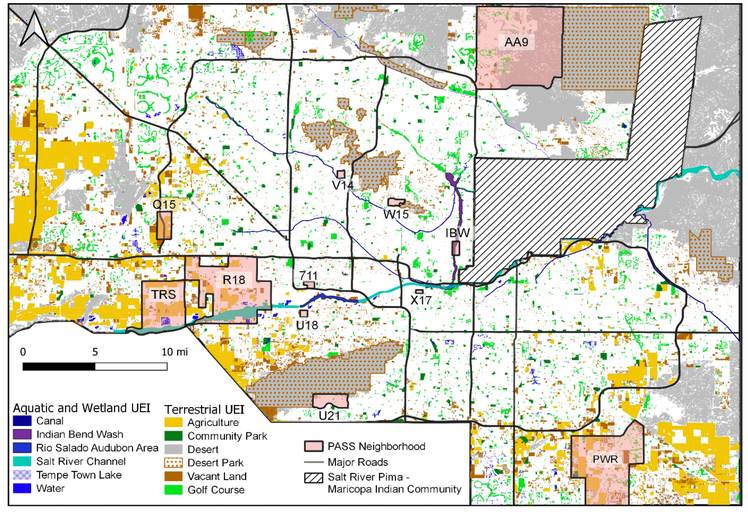
Research Questions

- When considering **urban greening**: to what extent have residents made different types of vegetation changes in their yards, including *trees and desert plants*, over the past five years?
- How are *different attitudinal, institutional, and structural drivers* associated with changes of different vegetation in the recent past?

Data Collection in Study Neighborhoods

This study focuses on data from 2021 Phoenix Area Social Surveys (PASS). We also present a time-series analysis based on the survey in 2017.

12 surveyed neighborhoods from PASS 2017 and 2021: Metropolitan Phoenix , AZ



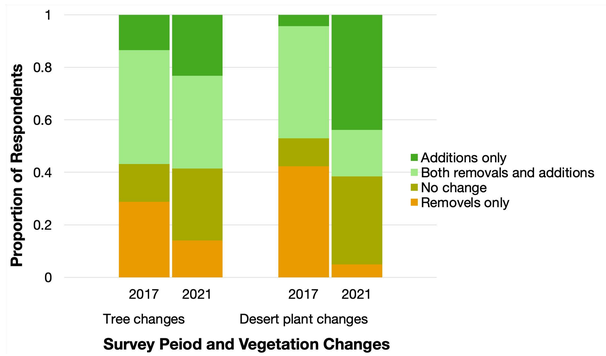
Acknowledgement: This study is fund by 2020 Central Arizona-Phoenix Long-Term Ecological Research Program (CAP LTER) grad grant. CAP LTER is supported by the National Science Foundation under grant number DEB-1832016.

Results

➢ Vegetation Changes (Trends of Urban Greening) in Single-family Parcels Surveyed in 2017 and 2021

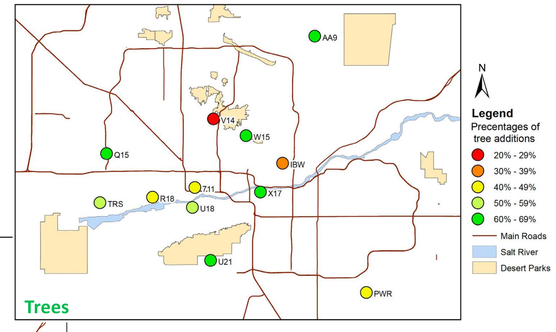
Note: survey participants were asked about changes "over the past 5 years."

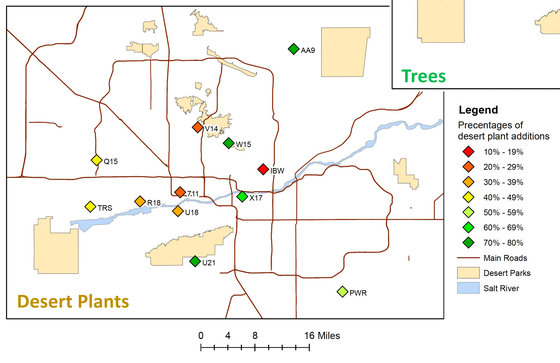
- The portion of respondents only planting trees increased in 2021, while the percentage of tree removals decreased.
- The percentage of respondents only adding desert plants also increased 10-fold compared to 2017 period.
- Results suggest a **potential net increase** of **trees and desert plants**.



➢ Urban Greening in 12 PASS Neighborhoods (2021): Percentage of Respondents who Added Trees and Desert Plants

- Percentages of respondents planting trees vary from 29% (V14) to 67% (X17).
- **Wealth neighborhoods close to desert preserves** (e.g., W15, AA9, U21) have higher percentage of respondents adding trees..





- Percentages of respondents adding desert plants vary from 18% (IBW) to **80%** (W15).
- Neighborhoods with a higher percentage of tree additions are likely to have higher percentage of desert plant additions as well.

➢ Binary Regressions: drivers of residents' additions of trees and desert plants in 2021

	Trees Addition (R^2 = 0.233)		Desert Plant Addition (R^2 = 0.246)	
Independent Variables	*Beta*	*SE*	*Beta*	*SE*
Attitudinal: Environmental Worldviews				
Ecological worldviews	-0.19	0.15	-0.09	0.15
Desert attitudes	0.06	0.15	**0.32***	0.16
Attitudinal: Yard Priorities				
Look beautiful	**0.54*****	0.16	**0.32***	0.16
Provide shading/cooling	0.18	0.15	0.11	0.16
Support wildlife	0.02	0.17	**0.33***	0.16
Conserve water	0.06	0.18	0.06	0.18
Require low maintenance	**-0.39***	0.17	-0.14	0.17
Institutional				
Presence of HOA^	-0.57	0.37	-0.66	0.35
Neighborhoods form Phoenix^	**-0.80***	0.33	-0.41	0.34
Structural: Environmental/Parcel				
Lot size	0.39	0.22	-0.05	0.13
Proximity to desert preserve^	-0.02	0.36	-0.68	0.37
Structural: Social/Demographics				
Age of respondent	**-0.63*****	0.19	0.19	0.20
Years in the current address	0.08	0.17	**-0.41***	0.19
Gender (Male)^	-0.50	0.30	0.00	0.30
Race (White)^	-0.67	0.42	-0.46	0.42
Income 2020	-0.15	0.19	0.14	0.19
Education level	0.08	0.17	-0.06	0.18
Home ownership^	**-1.47***	0.64	-0.71	0.57

^ Binary variables. Independent variables excluding binary variables were standardized as Z-scores
significant at p<0.05*, p<0.01 levels**, p<0.001 levels***.

- Aesthetics is a crucial landscaping priority which motivates residents to add both trees and desert plants.
- Younger tenants not prioritizing yard maintenance are more likely to plant trees, while newcomers who have positive desert attitudes and value wildlife tend to add desert plants.
- Residents from neighborhoods outside the city of Phoenix have higher likelihood of planting trees.

Conclusions

- Reported vegetation changes in residential yards in metro Phoenix show **a sustainable trend** of increasing trees and desert plantings.
- The percentages of respondents who added trees and desert **plants vary from different surveyed neighborhoods**.
- Different **attitudinal** (environmental worldviews and yard priorities), **institutional, and social structural drivers** affect residents' decisions to adopt desired urban greening in residential landscapes.