

Building a More Drought-Resilient Urban Forest Ecosystem

An aerial photograph of a city skyline, likely Chicago, featuring numerous skyscrapers and buildings. The sky is blue with scattered white clouds. A semi-transparent white rectangular box is overlaid on the lower portion of the image, containing text. The bottom of the image shows a dense area of green trees, representing an urban forest.

Lindsay Darling, PhD—Chicago Region Trees Initiative
M. Ross Alexander, PhD—Argonne National Laboratory

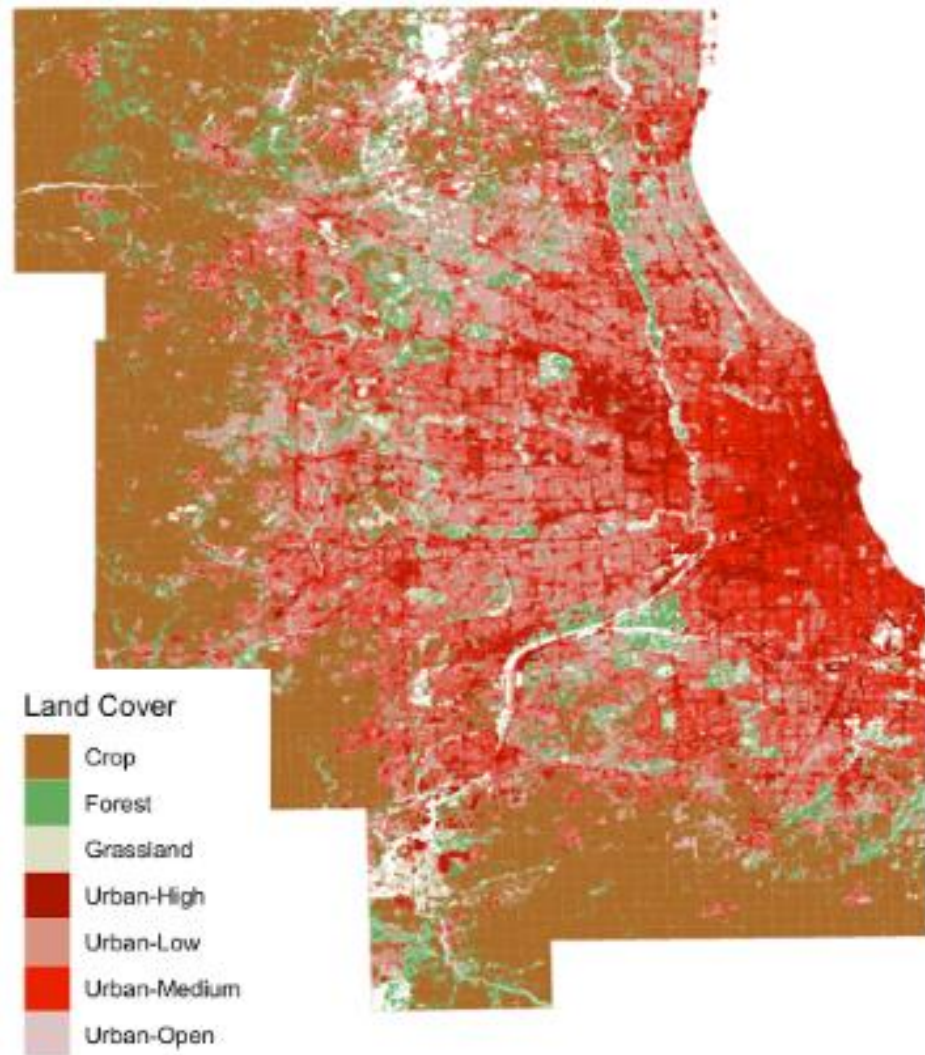
Urban systems

- Tough place to be a tree



Urban systems

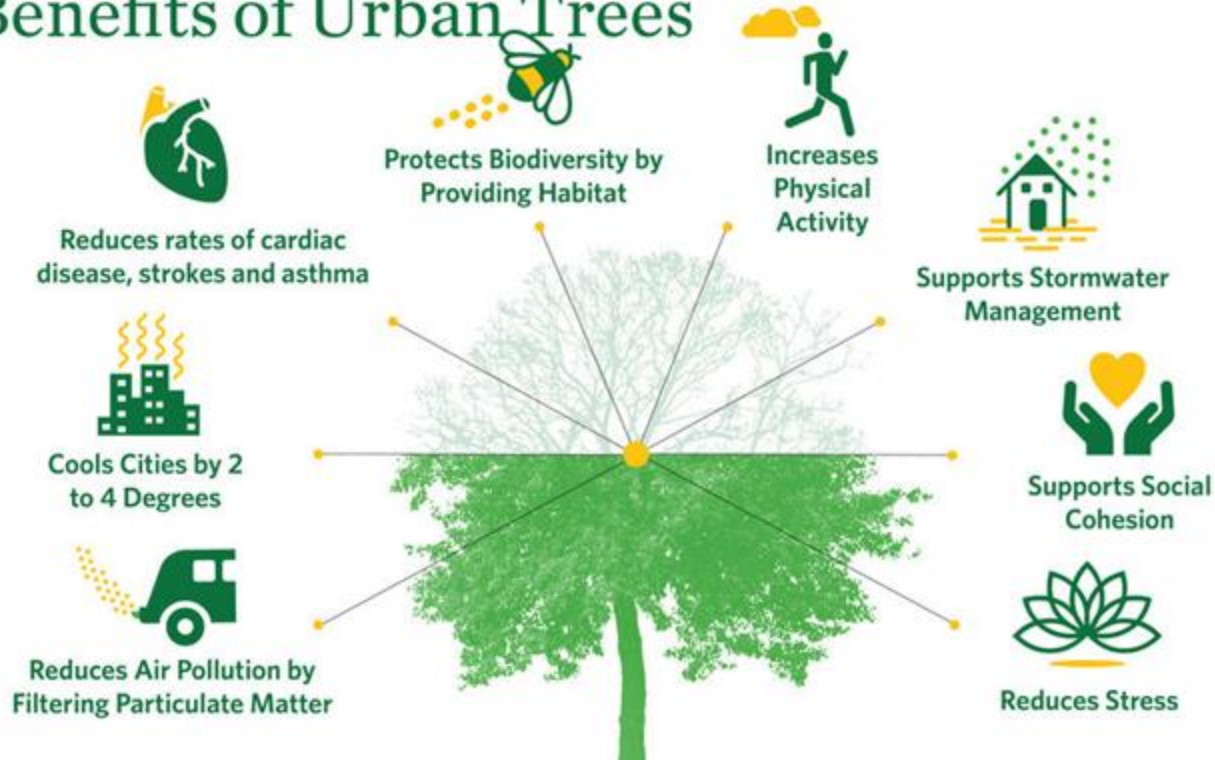
- Tough place to be a tree
- Highly heterogeneous



Urban systems

- Tough place to be a tree
- Highly heterogeneous
- Hugely important to quality of life

Benefits of Urban Trees



Urban forest benefits: physical health

- Improve air quality and reduce asthma rates
- Improved birth outcomes
- Increase exercise rates
- Reduce incidences of heart disease
- Reduce obesity rates

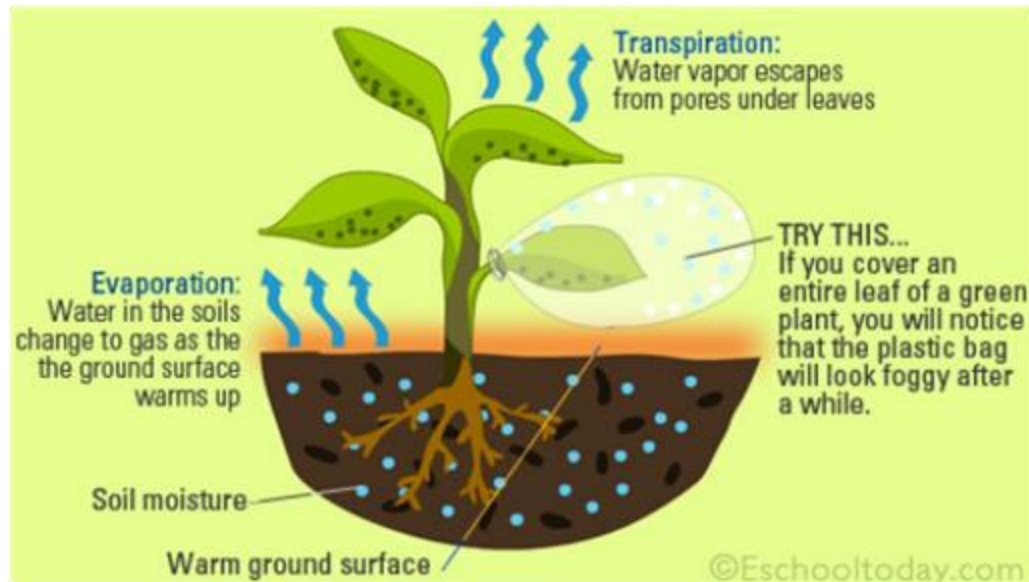


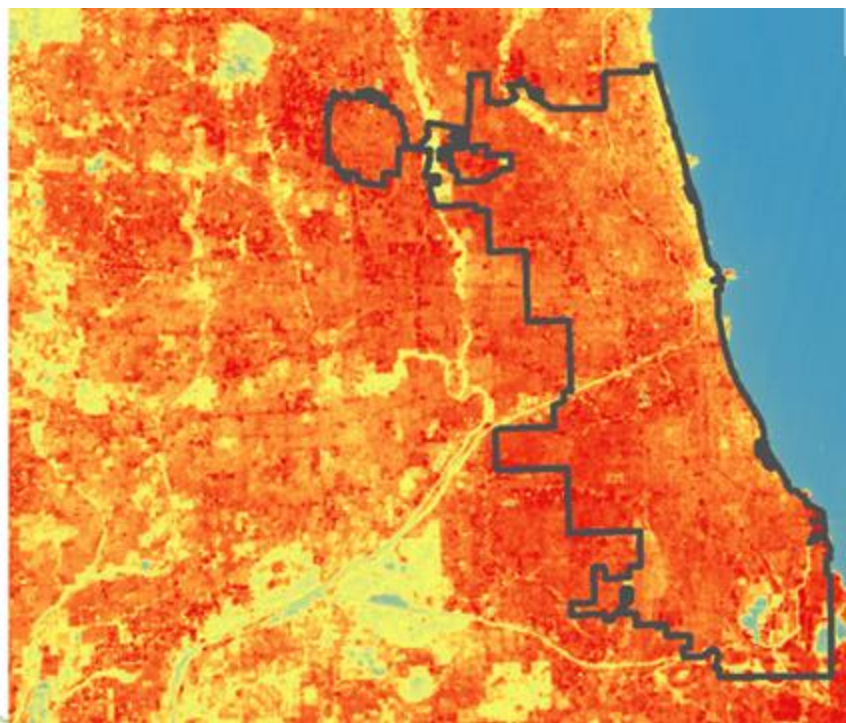
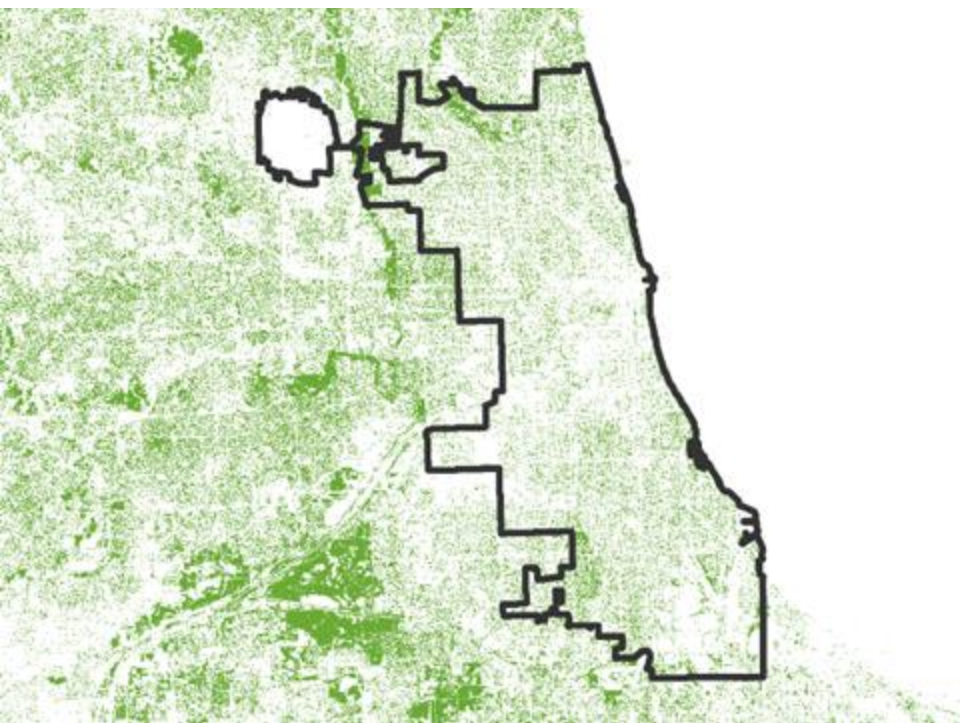
Urban forest benefits: mental health

- Improve impulse control
- Restore focus and increases ability to pay attention
- Reduce stress



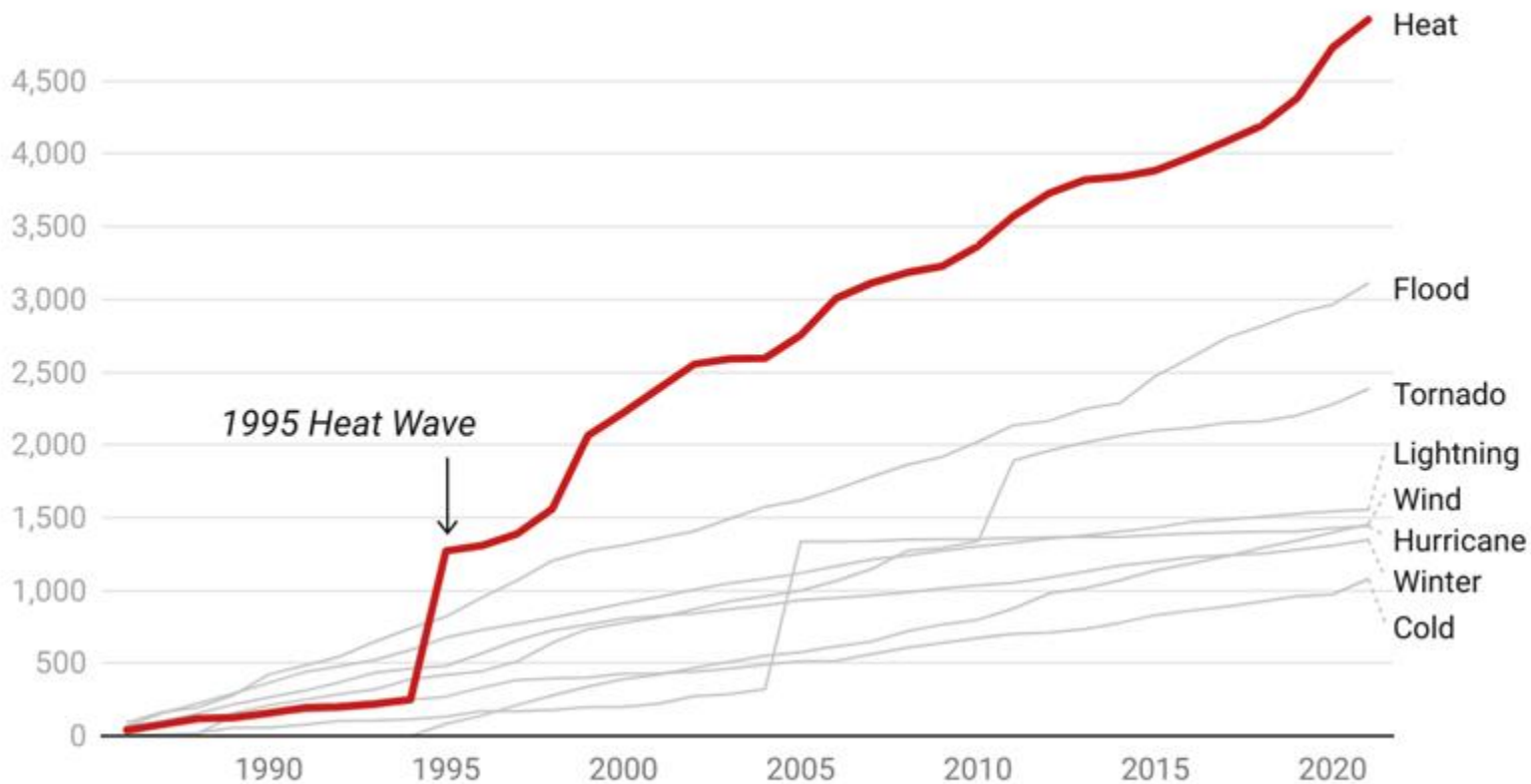
Urban forest benefits: lower temperatures





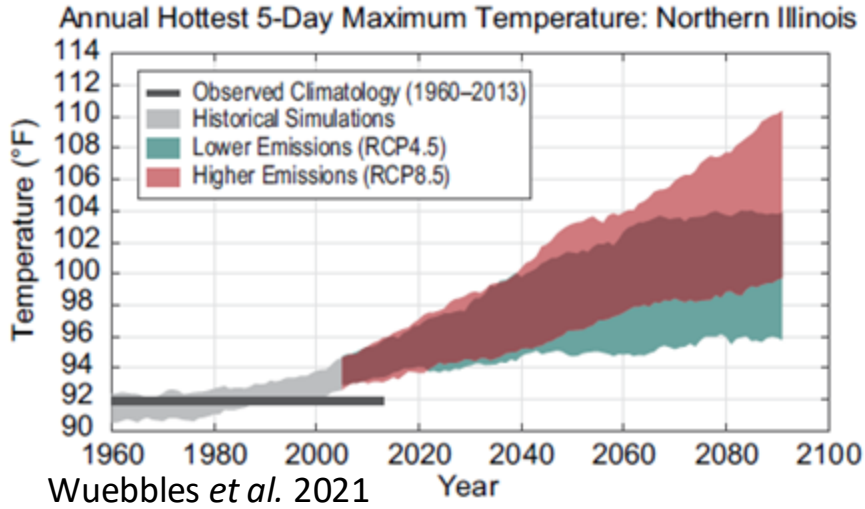
Heat events are the #1 weather related cause of mortality in the US

Date Range: 1986-2021

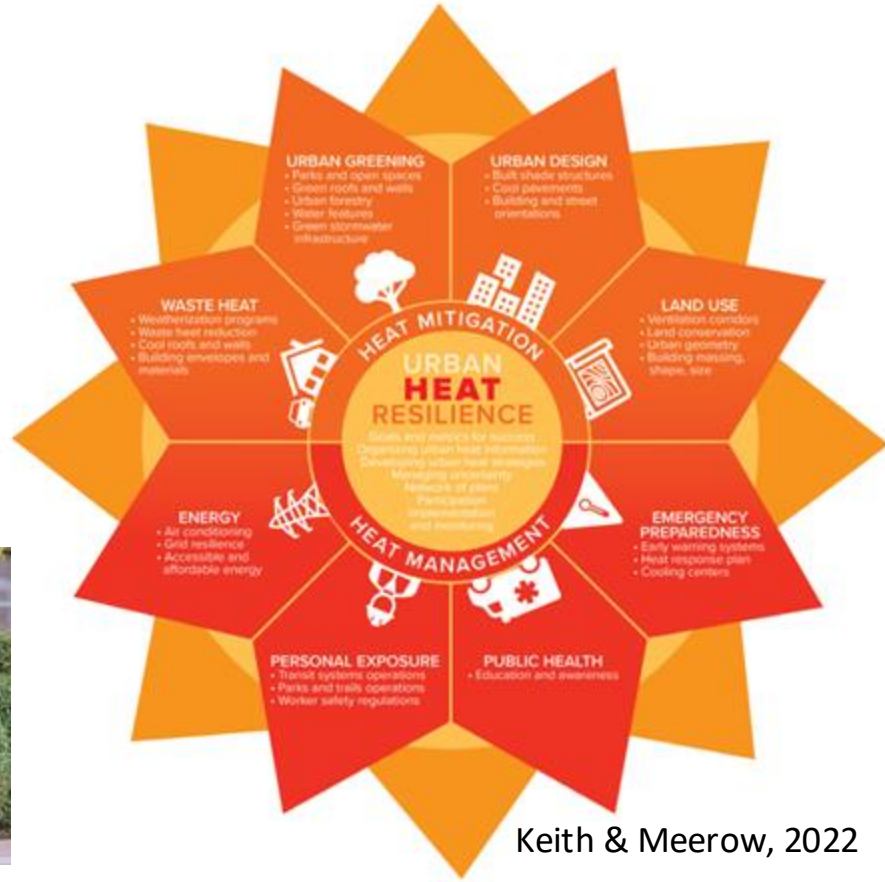


Source: National Weather Service • Created with Datawrapper

Hazards: Extreme Heat



5-day average high temperature in northern Illinois projected between 95° and 103°F by 2050



Healthy trees provide more ecosystem services





Project Team



Research: Dr. Christy Rollinson, Dr. Luke McCormack, Dr. Jake Miesbauer, Brendon Reidy, Abby Tumino, Marvin Lo

Plant Clinic: Spencer Campbell



Zach Wirtz, Dr. Lindsay Darling, (Lydia Scott)



Dr. Trent Ford



Dr. M. Ross Alexander

Unfunded Collaborators
(Recent Grad Students)



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Dr. Renata Poulton
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Dr. Ayo Deas

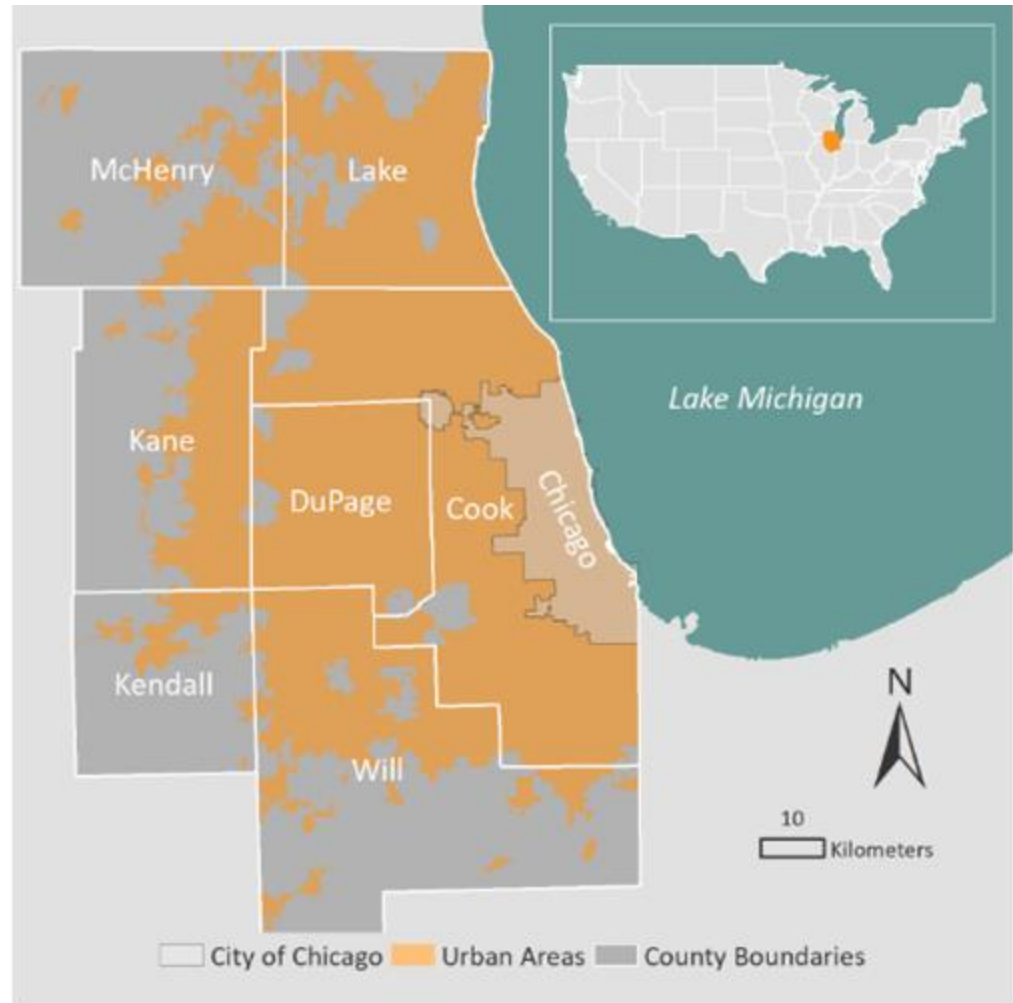
Project Objectives

1. **Assess drought triggers and resilience** in trees & plants across the Chicago metropolitan region
1. **Develop recommendations and action strategies** to reduce impacts of drought on trees and plants in the Chicago region
1. Improve long-term adaptation strategies to **maintain ecosystem services** during current and future drought.



Focal Area

- 7-county Chicago region
 - 8.9 million people
 - 304 municipalities
- City of Chicago
 - Third largest US city
 - 2.7 million people
- Lots of variation in socio-demographics, land use, and ecosystem types





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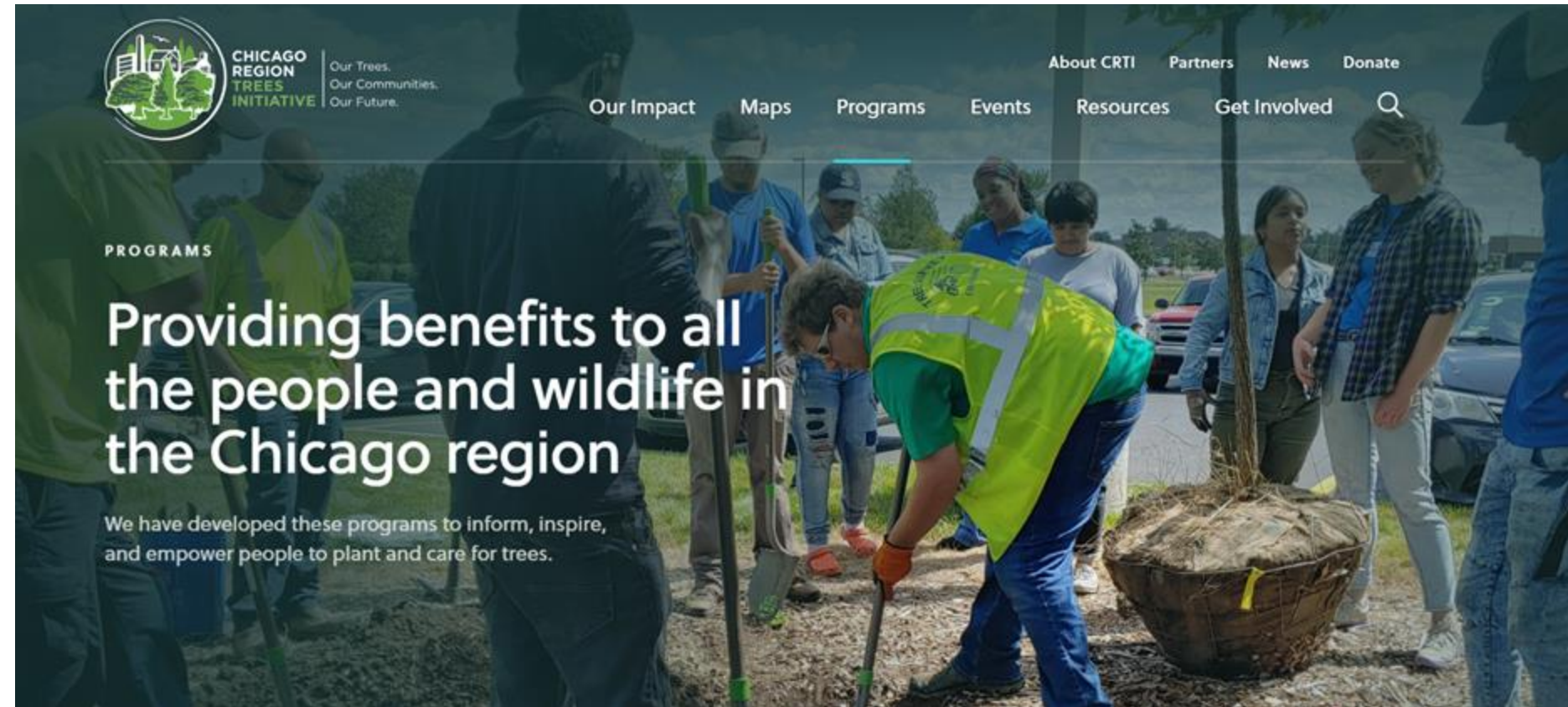
[Get Involved](#)



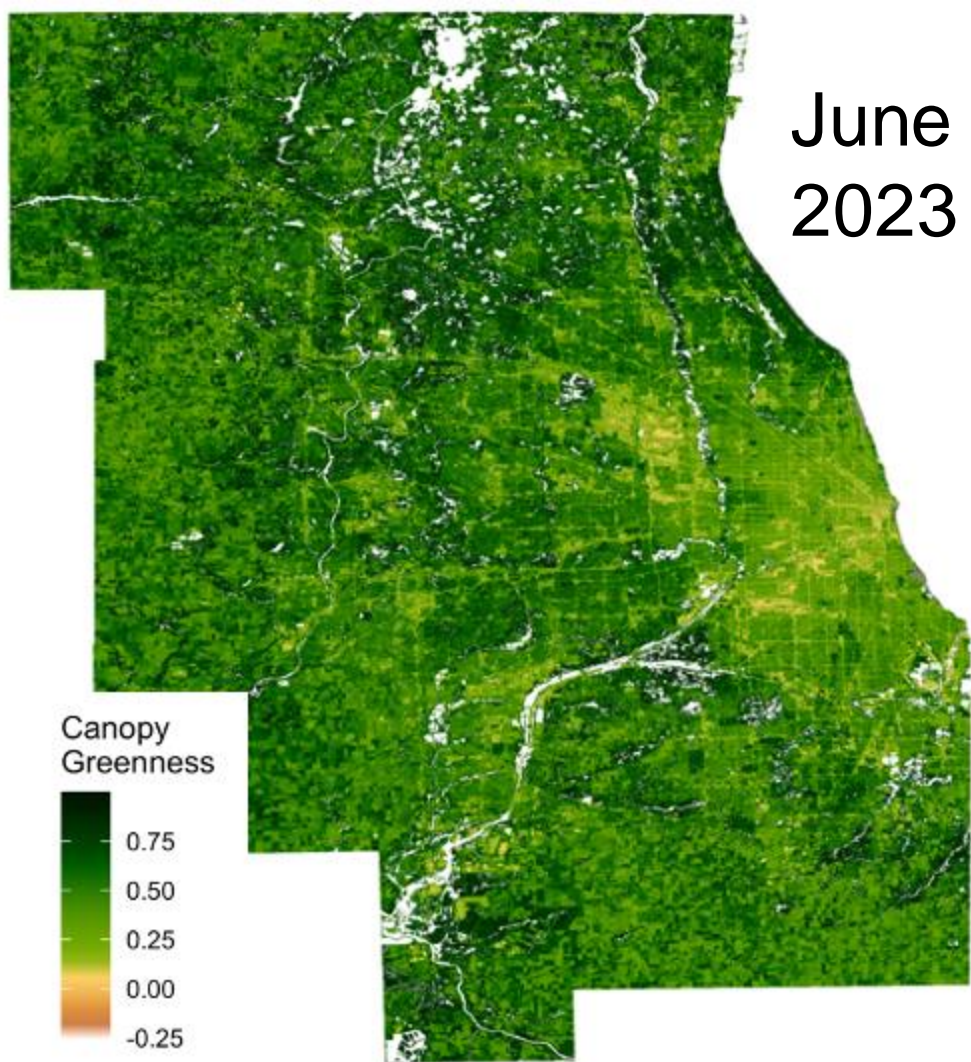
PROGRAMS

Providing benefits to all the people and wildlife in the Chicago region

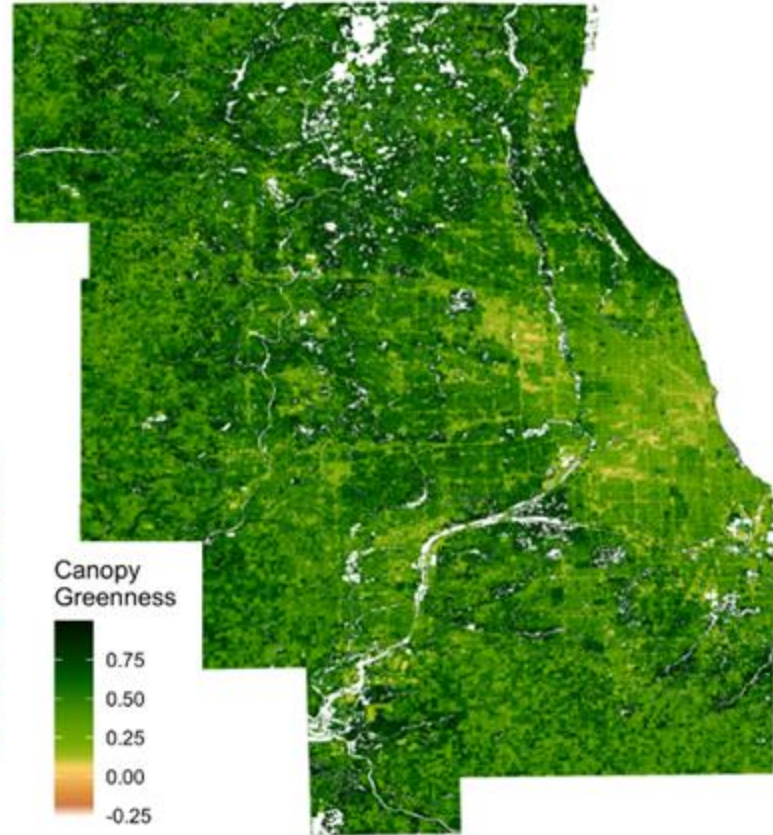
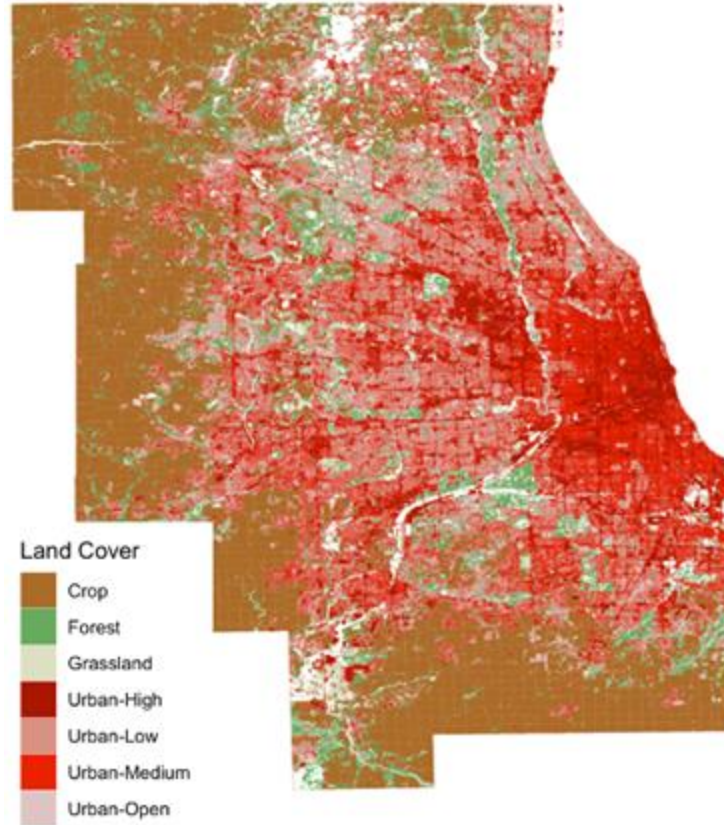
We have developed these programs to inform, inspire,
and empower people to plant and care for trees.



Using greenness
(NDVI) to describe
current conditions
and change

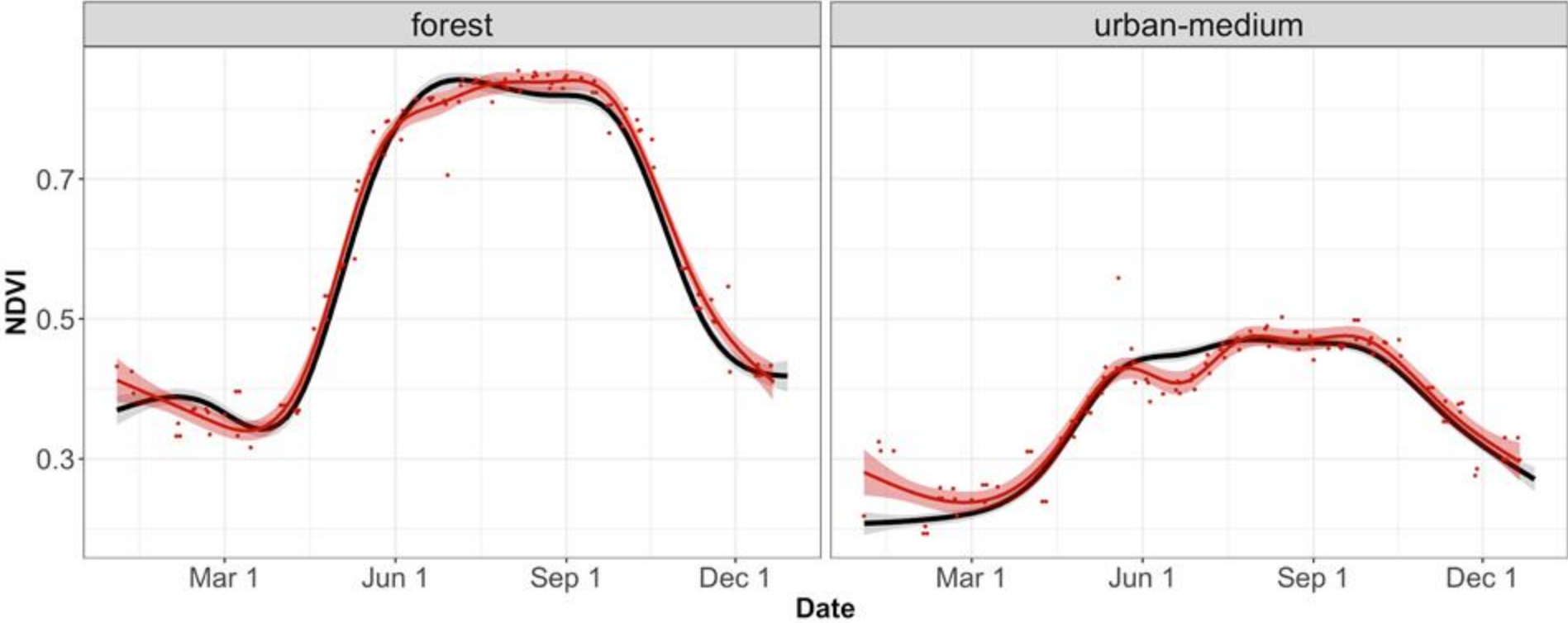


Variation in greenness = Landcover + weather (simplified version)

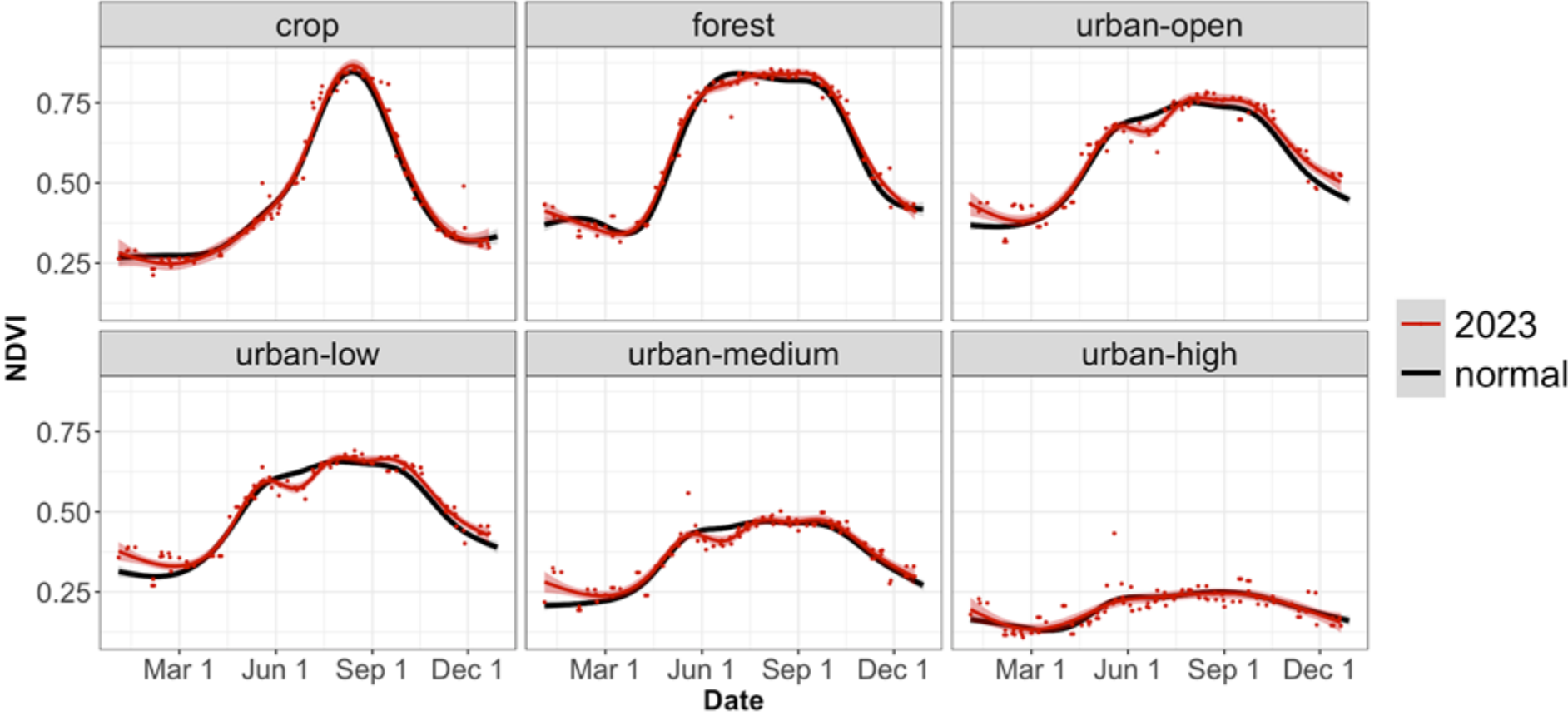


Landcovers vary in greenness & drought responses

— 2023 — normal

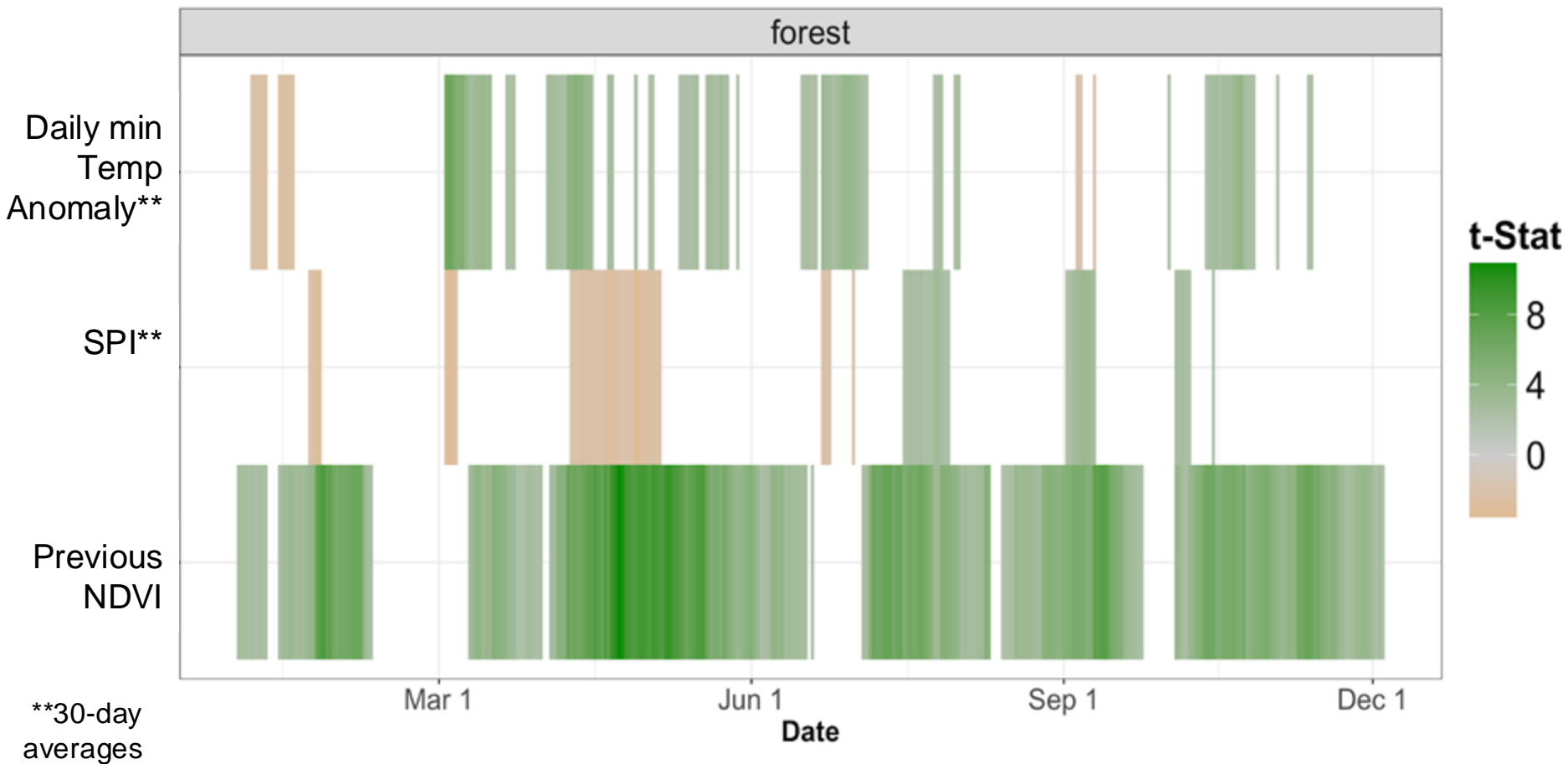


Landcovers vary in greenness & drought responses

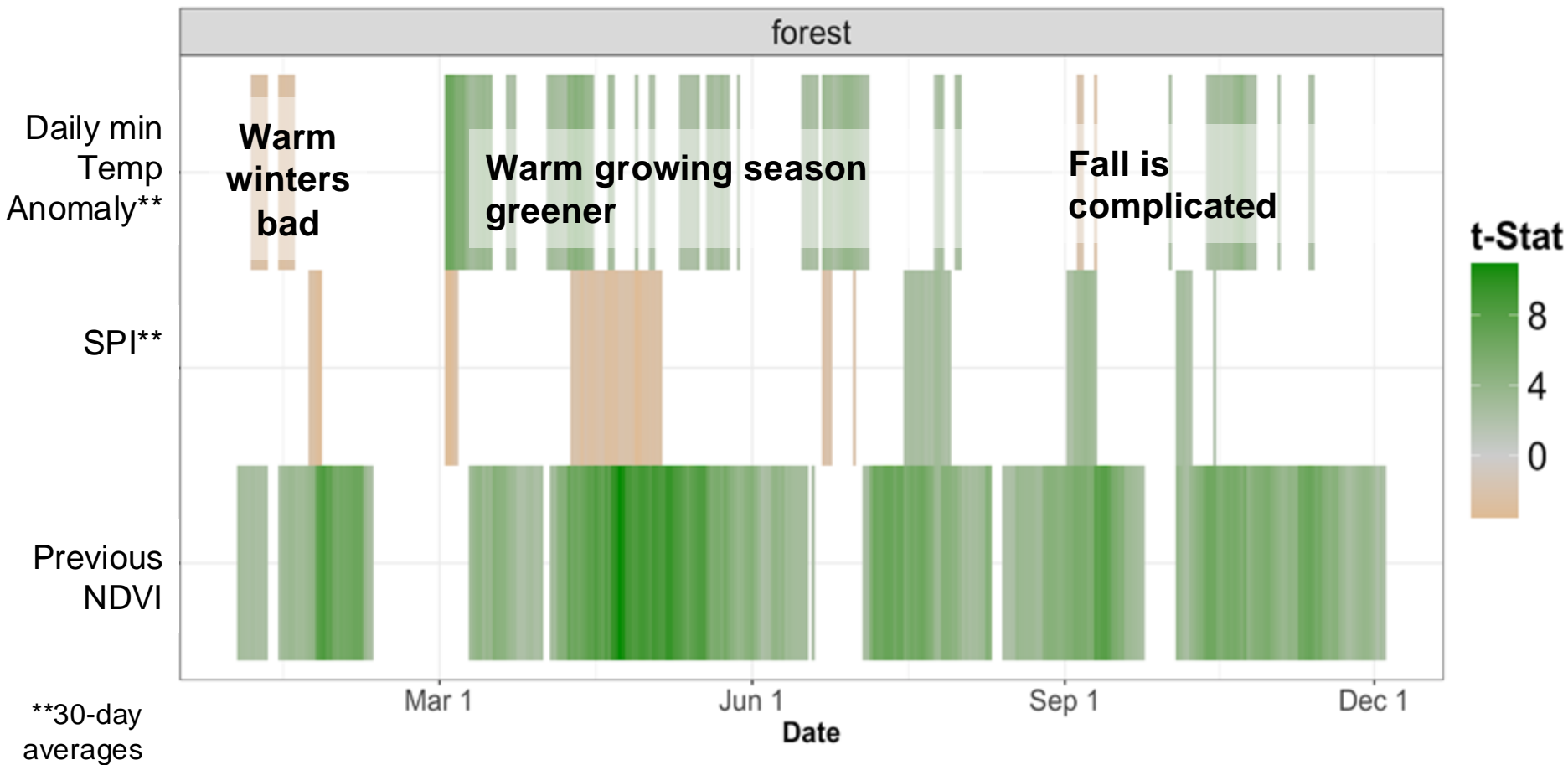




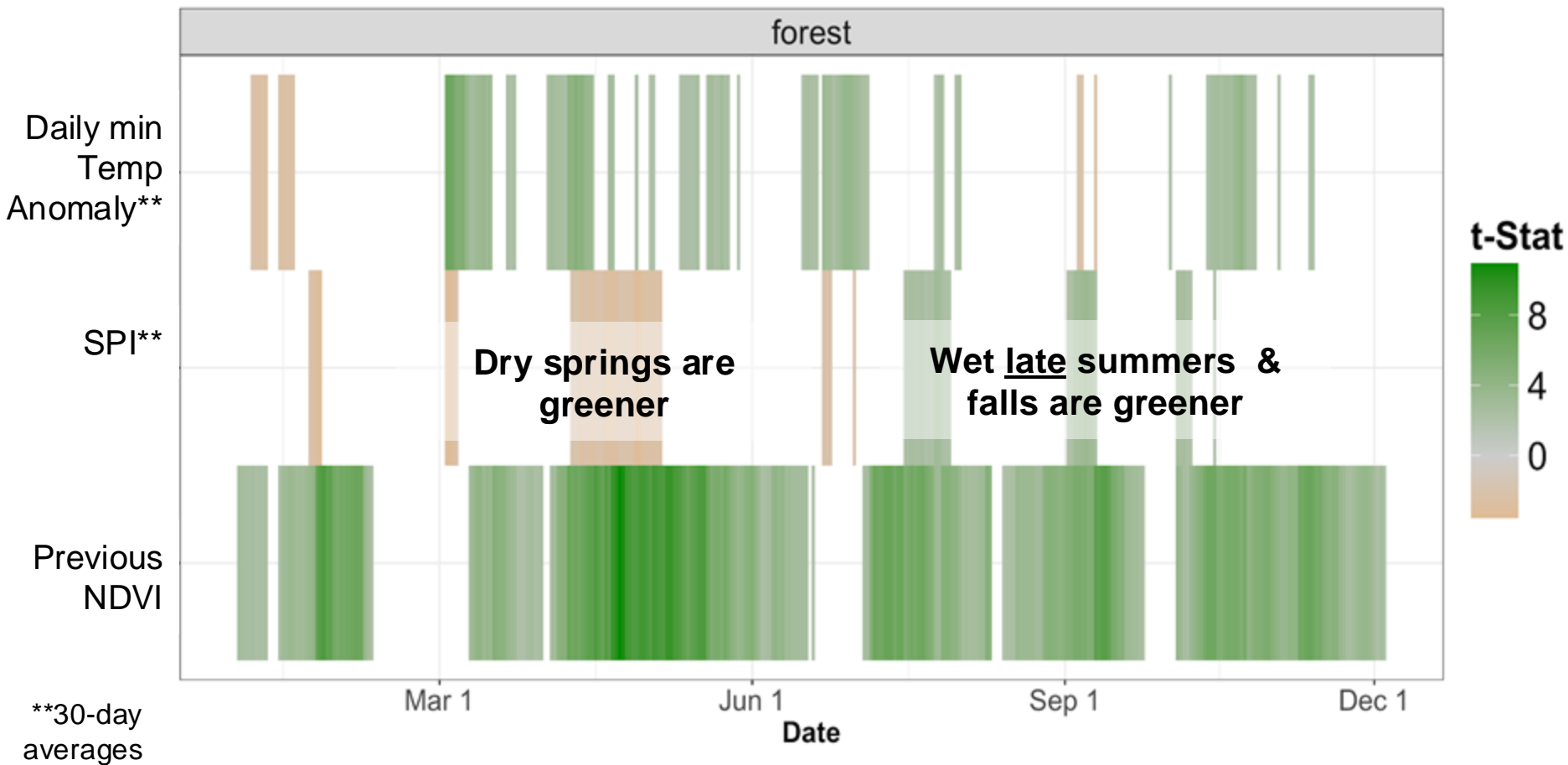
Weather effects on greenness vary over the season



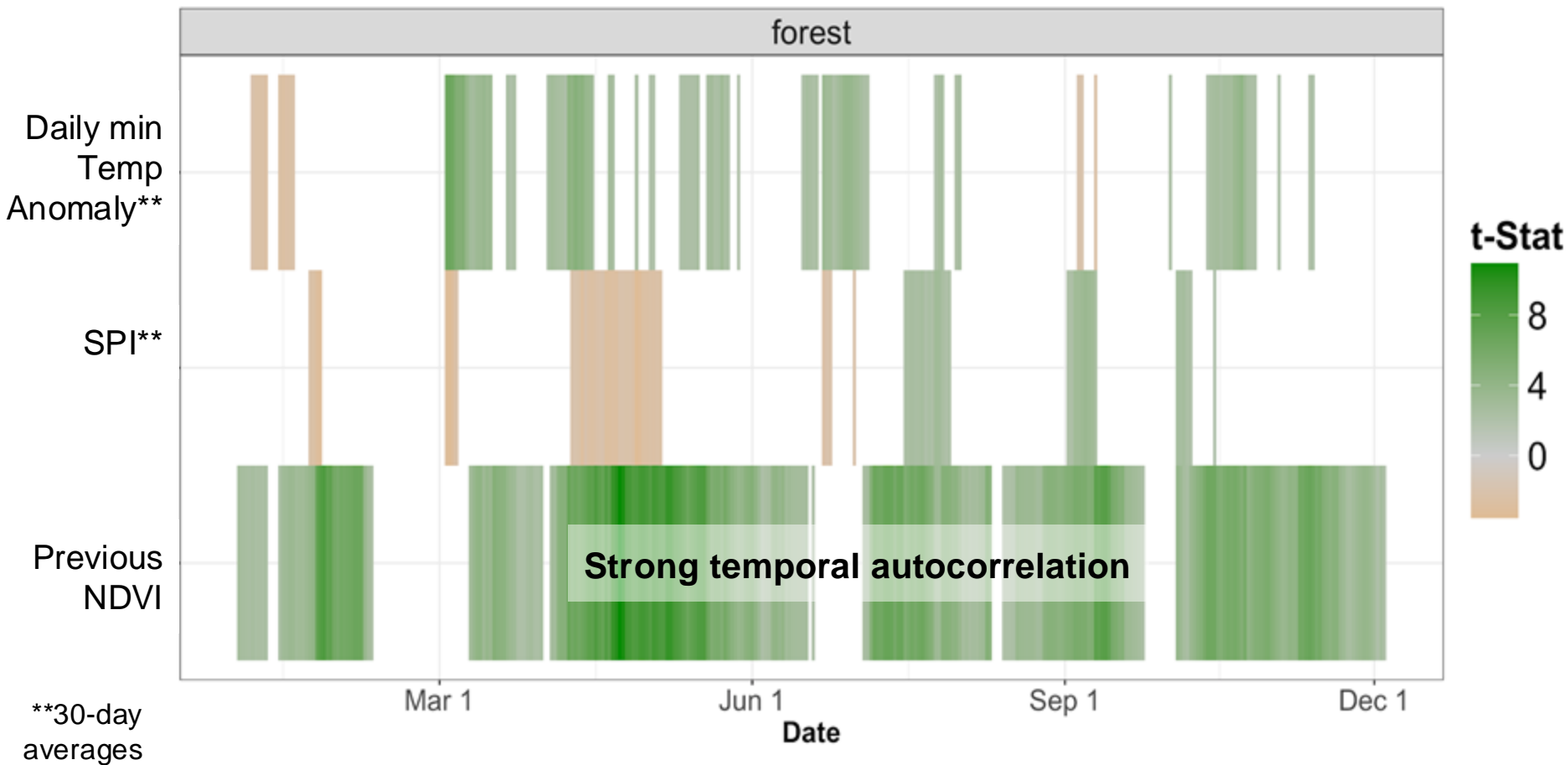
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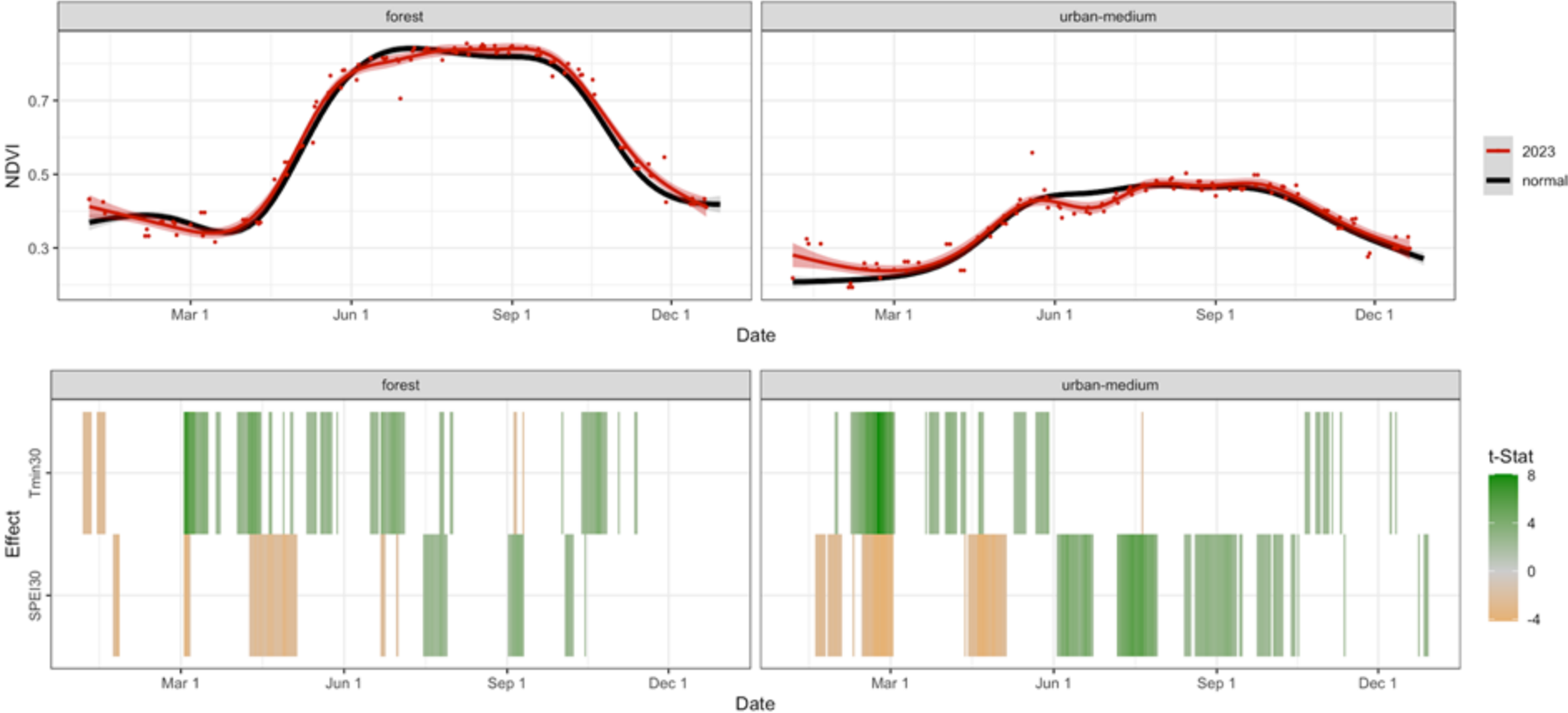
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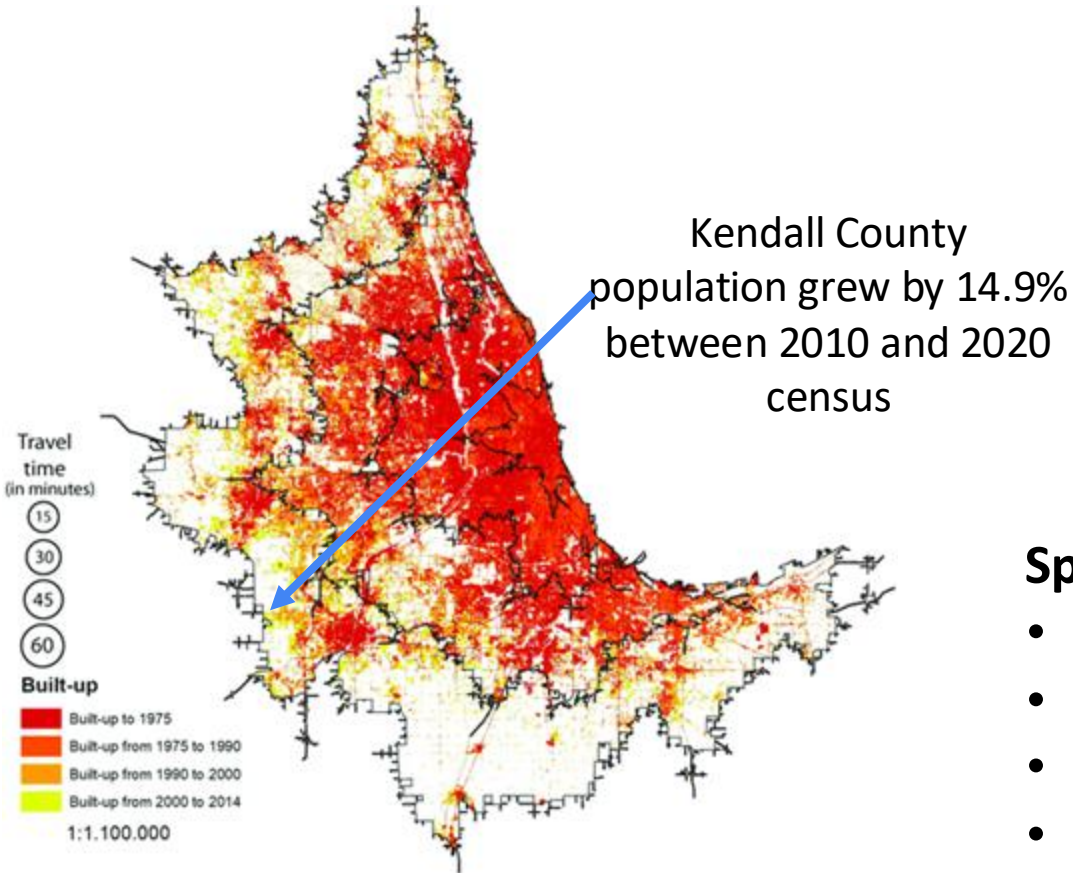
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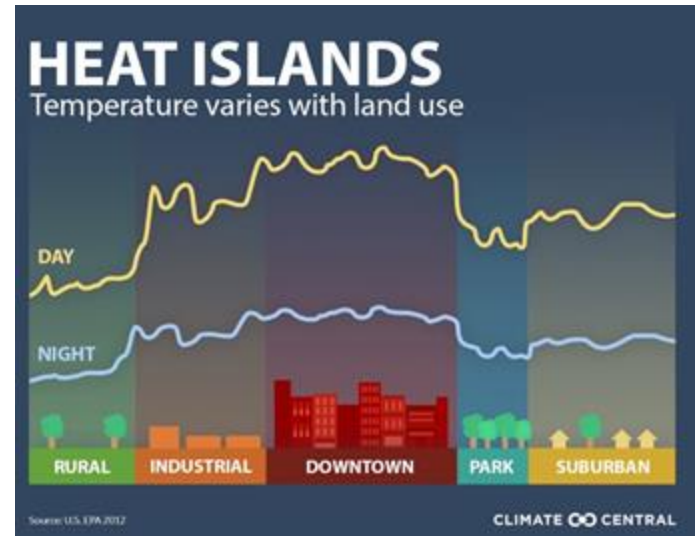
Climate effects vary by landcover class.



Heat & Development Patterns



Gerten *et al.* 2019



Sprawl Development

- Exacerbates urban heat effects
- Prioritizes car-based transit
- Increases risk of social isolation
- Not just an urban problem



NbS for Community Resilience Opportunities



Analyze variability across growing season and environmental conditions for ecosystem services.



Think about how drought impacts affect different components of the human landscape.



Leverage partnerships to integrate this work into management plans.



Seek resources to support multi-agency working groups to identify and action existing resources (funds and data).

Acknowledgements



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co-Is: Luke McCormack, Jake Miesbauer, Lydia Scott
Collaborators: Lindsay Darling, Zach Wirtz, Spencer
Campbell, Julie Janoski, Brendon Reidy, Abby Tumino, Ayo
Deas, Ren Poulton Kamakura***

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Drought impacts vary across landcover types.

