Urban Forests: Interactions Between Human Decision-Making, Climate, and Landscape Function

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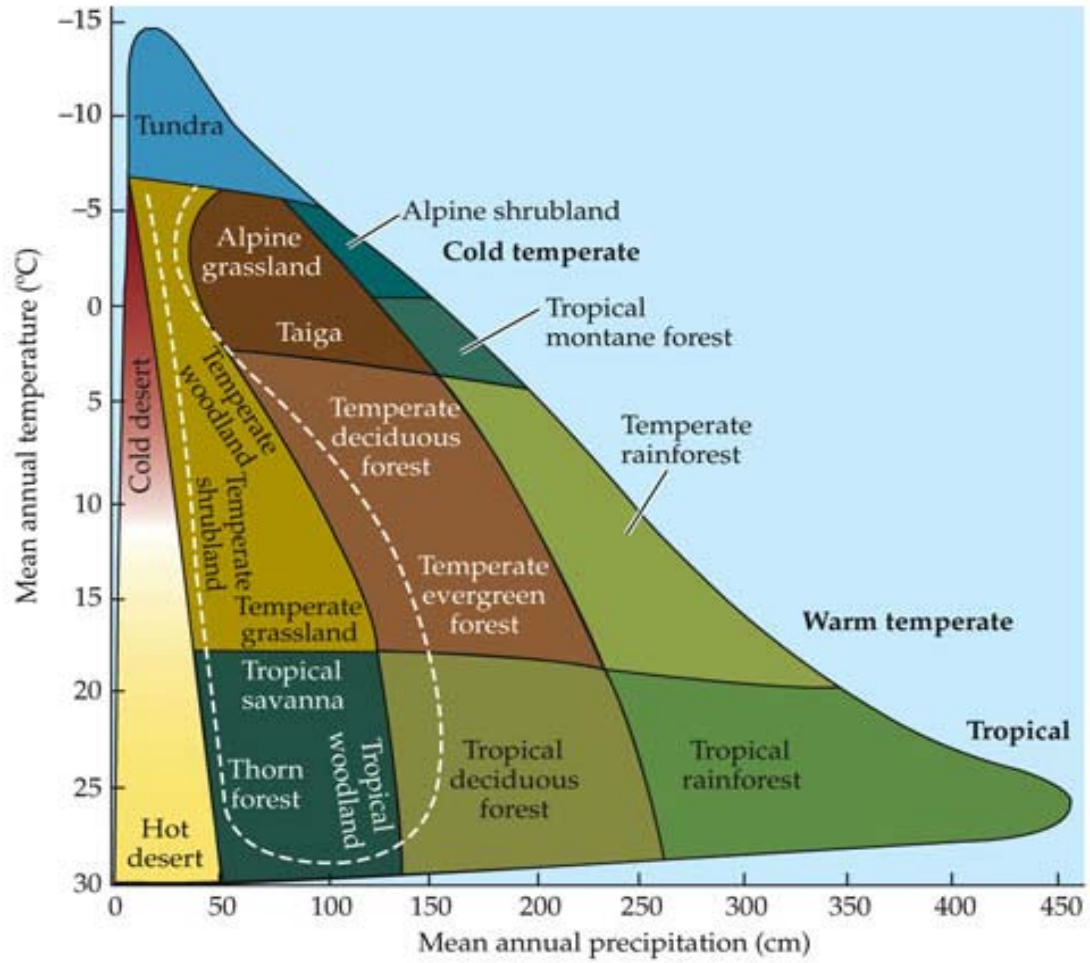
Broadly, climate exerts significant control over vegetation distribution and function



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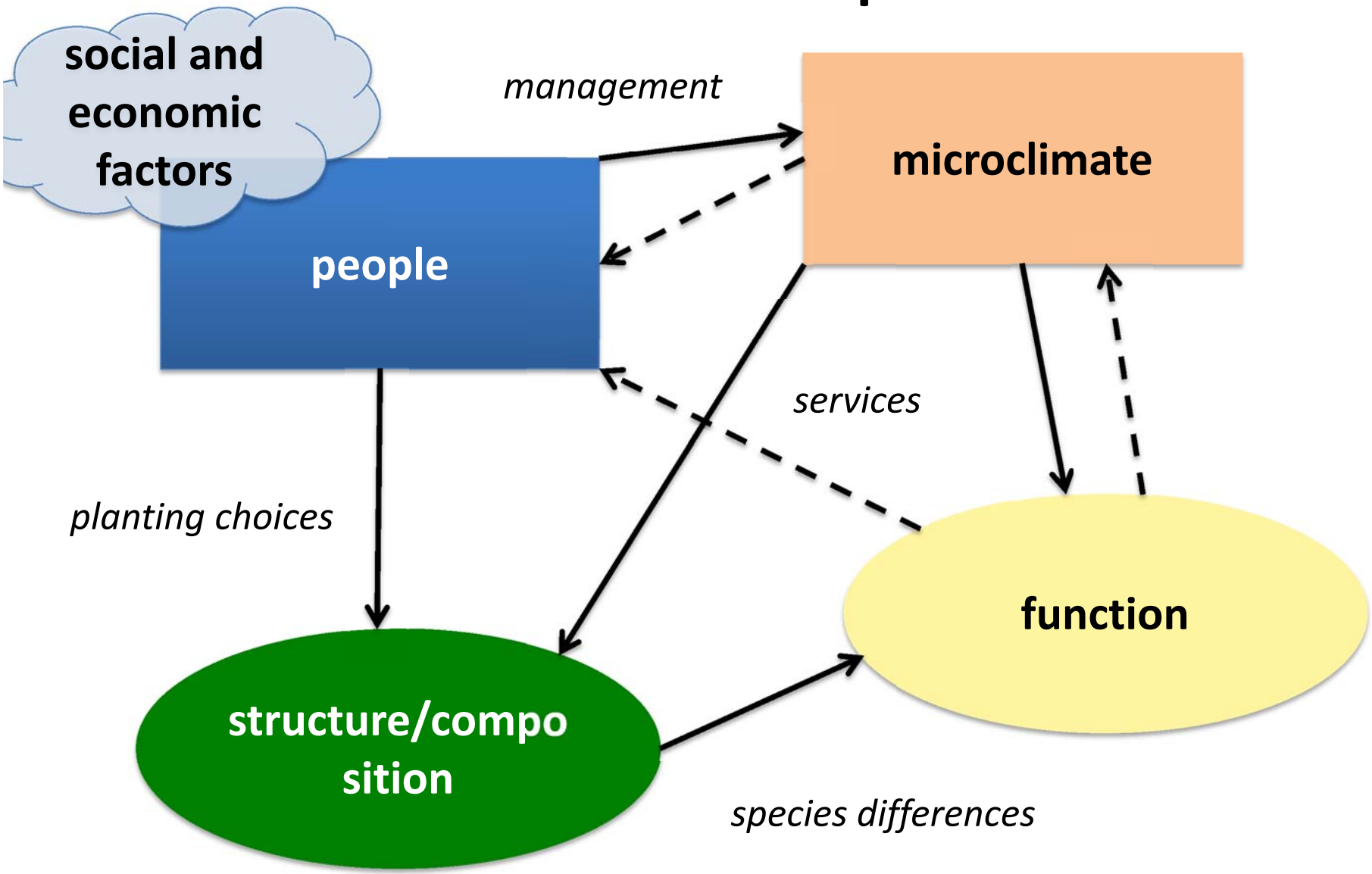
urban ecosystems are buffered from climate pressures

What city is this?

http://www.urbanhomogenization.org/

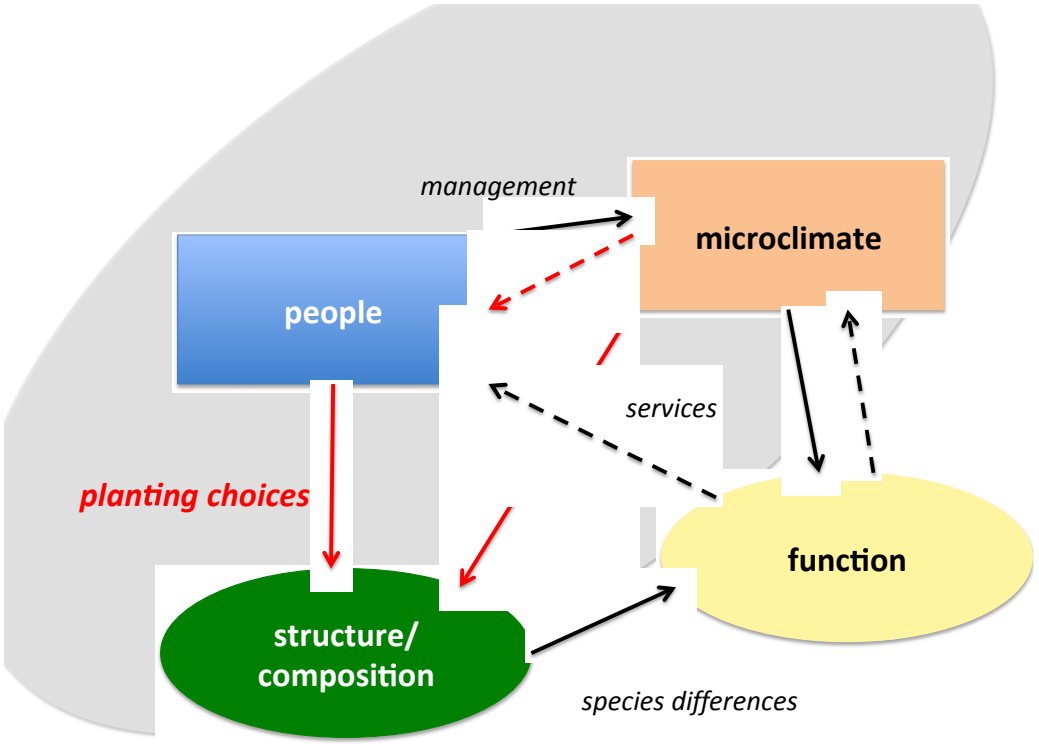
How do human and climate drivers shape urban landscapes?



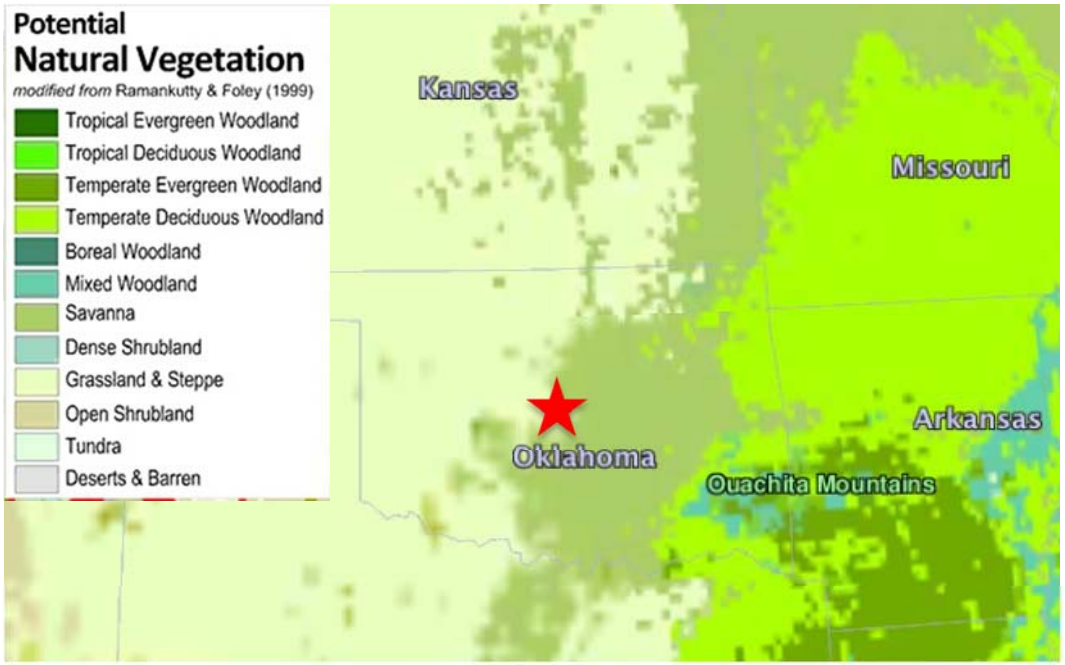
Overview of talk

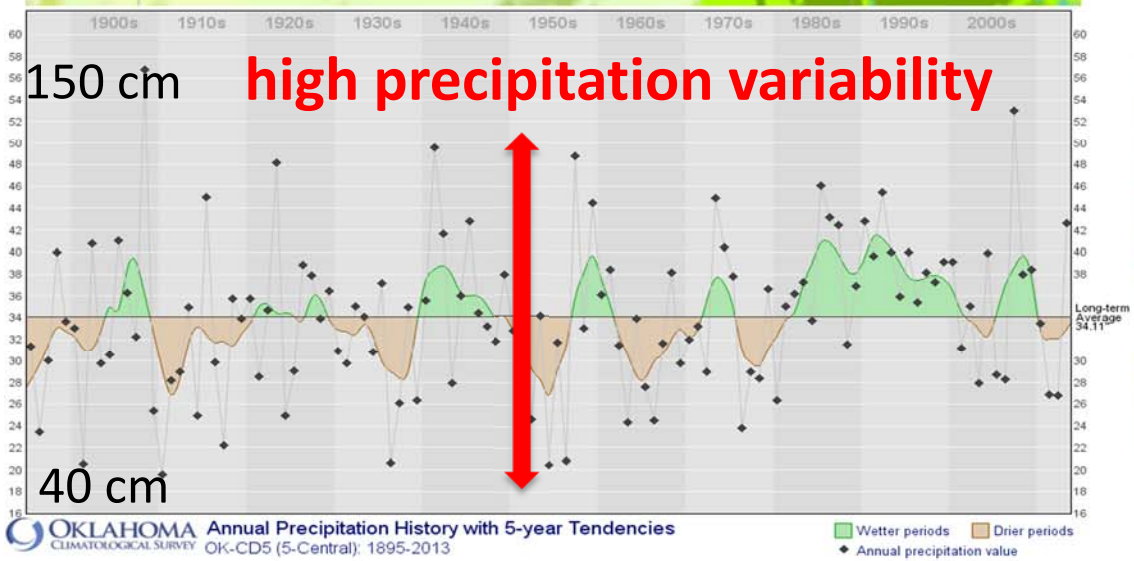
- **Determine relative importance of human versus climate factors on urban forest condition**

- **Detect climate signals on urban vegetation and planting trends**



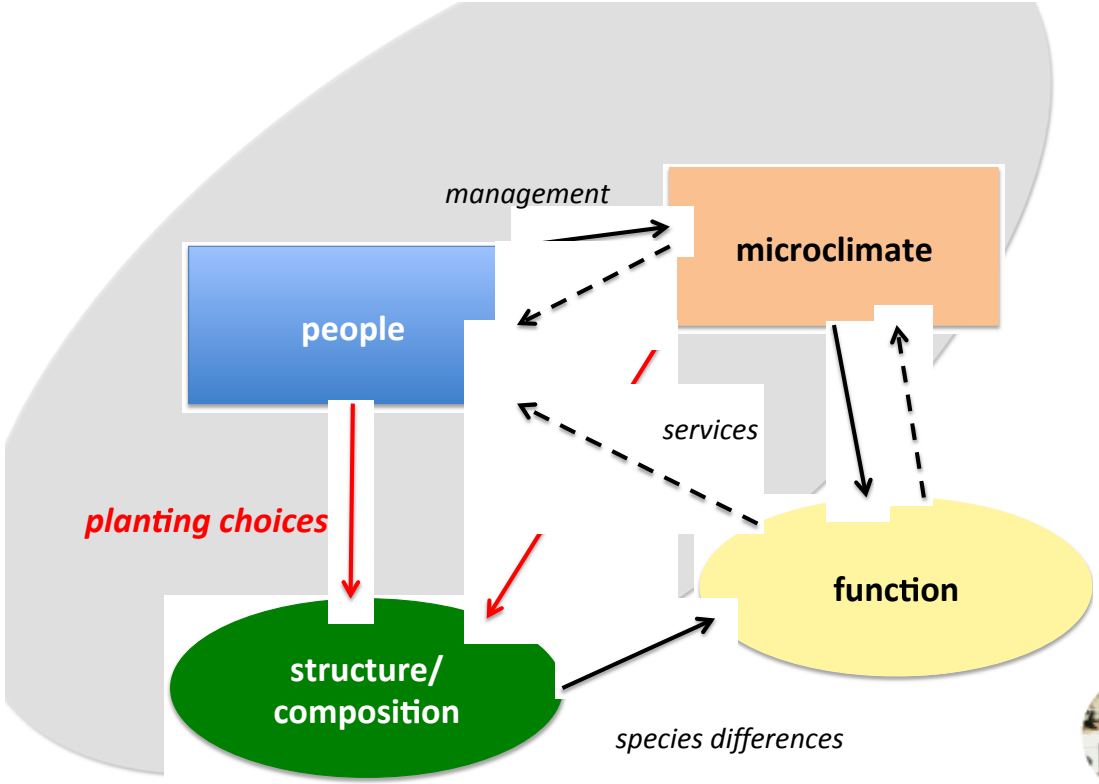
Ecological context





Determine relative importance of human versus climate factors on urban forest condition

- What is the prevalence of human caused vs. natural sources of tree damage?
- What factors are associated with poor urban tree health?



Jonathan Daniel Giddens
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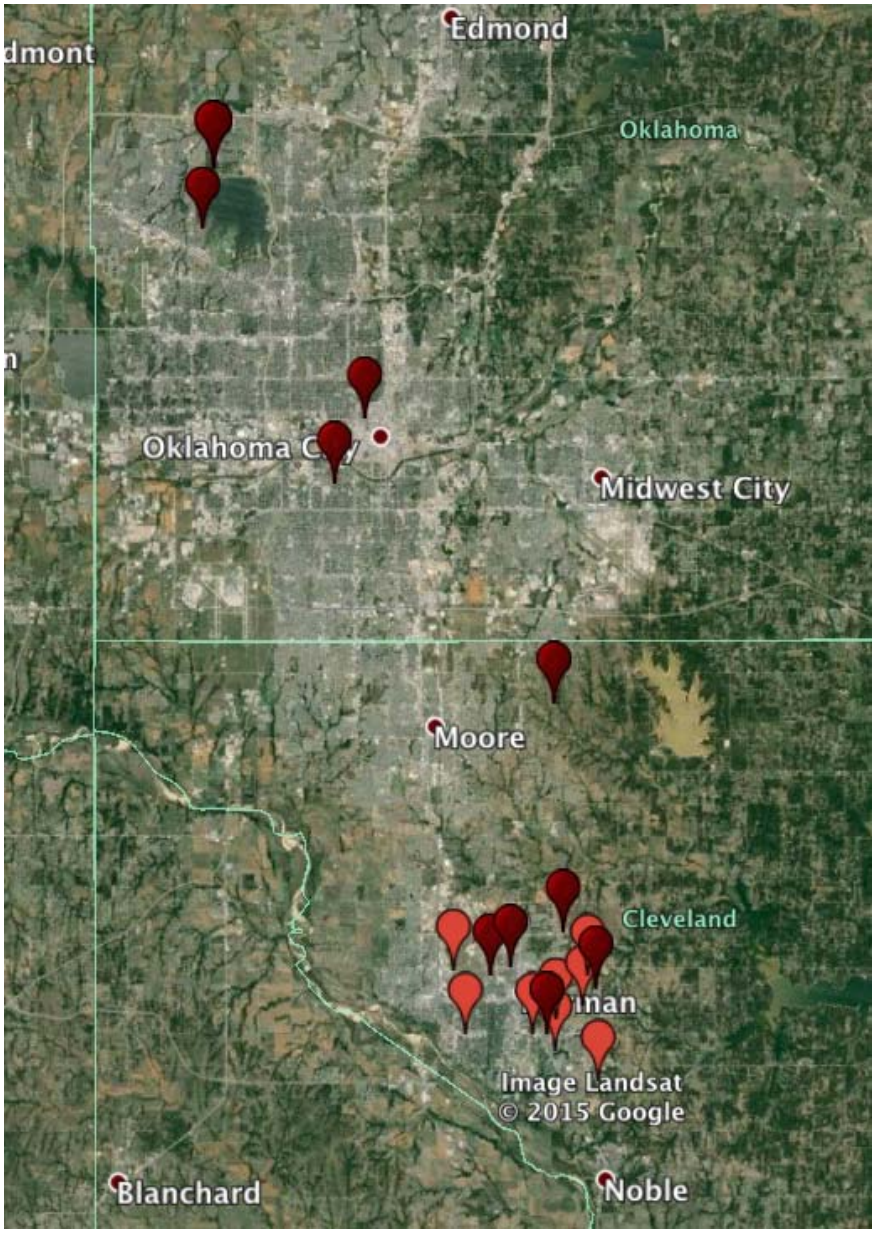
Approach: tree condition

17 public locations

656 trees

ground based surveying



Assessing tree condition

excellent
(0-1 minor)

good
(2-3 minor)

fair
(1-2 mod)

poor
(1 major)

Tree Insect/Disease

1	Elm Leaf Beetle
3	Webworms
5	Borers
6	Galls
7	Mistletoe

Tree Structural/Cultural

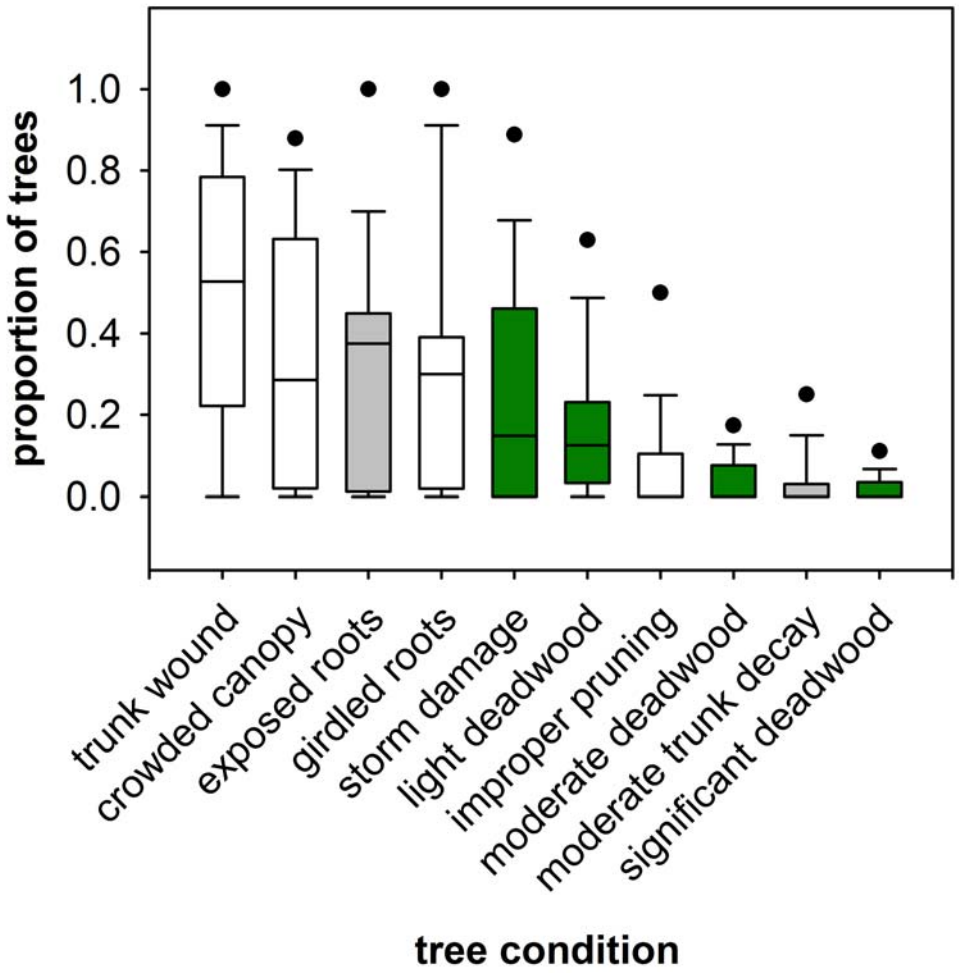
13	Light Deadwood (<30% Canopy Dead)
14	Improper Pruning (stubs evident)
15	Partial, unbalanced or crowded canopy
16	Storm Damage
17	Trunk Wound (lawnmower or weedeater)
18	Topped or Dehorned
19	Mod. Deadwood (30-60% Canopy Dead)
20	Shallow or exposed roots
21	Moderate Trunk Decay
22	Significant Trunk Decay or Hollow
24	Sign. Deadwood (>60% Canopy Dead)
25	Chlorosis or Nutrient Deficiency
27	Girdling Roots

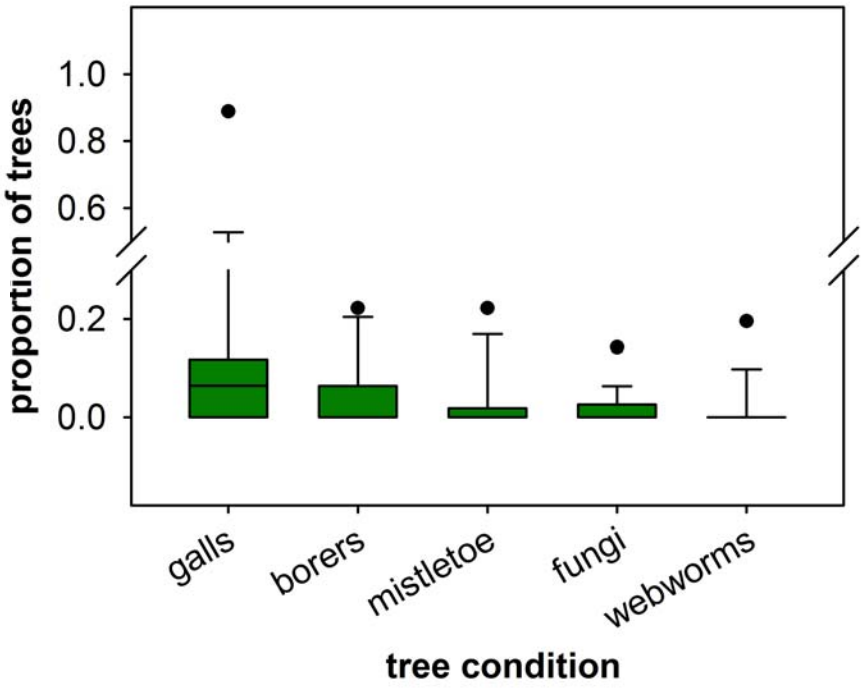
CITY OF NORMAN, OKLAHOMA

TREE INVENTORY AND ASSESSMENT

PREPARED BY:

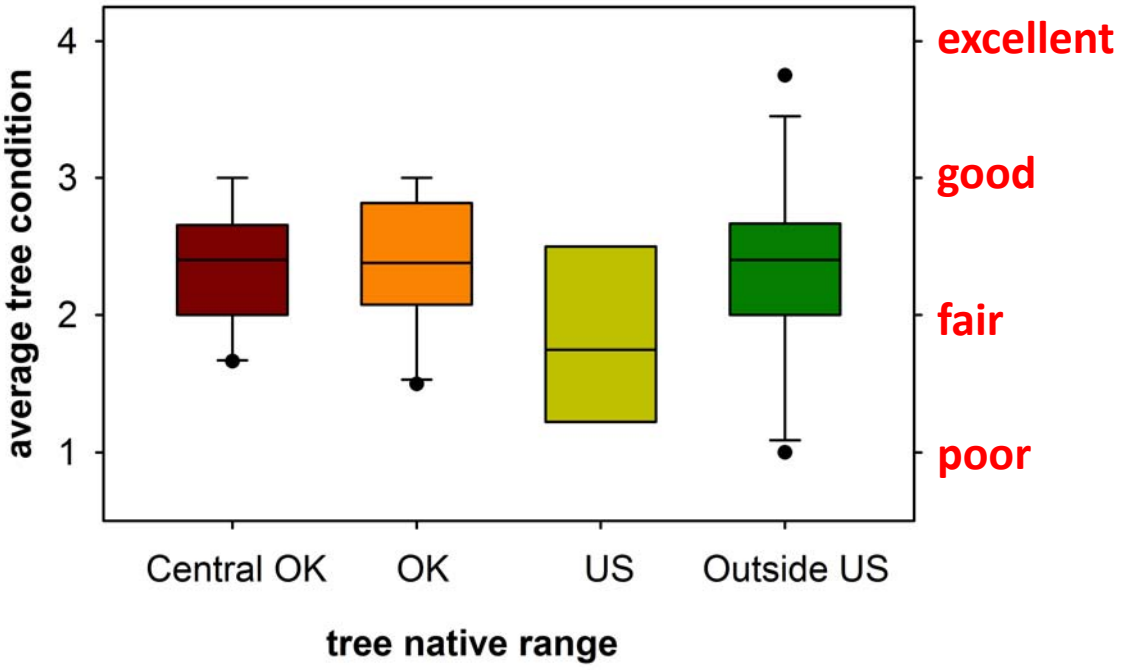
Dr. Thomas Hennessey, Ph.D.





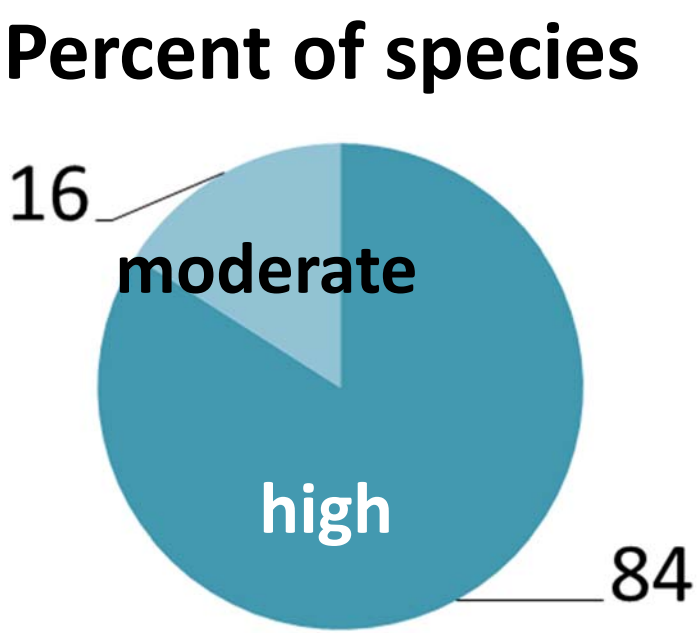
human induced damages are much more common than natural damages

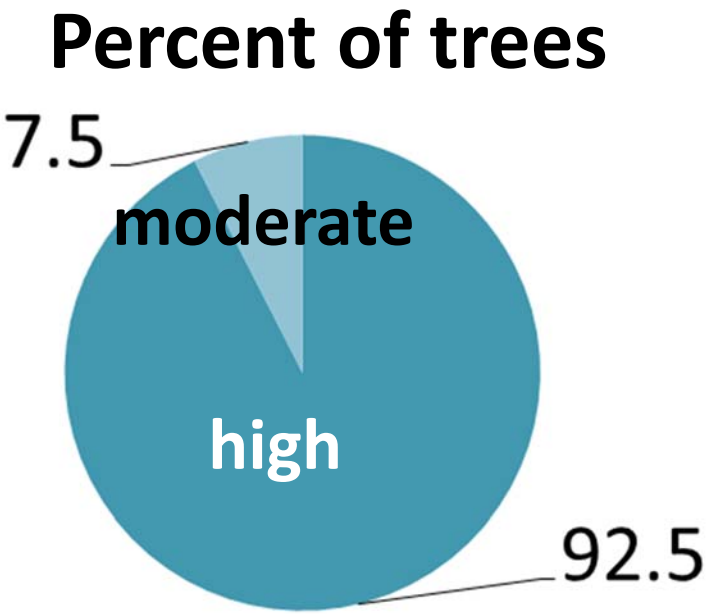
Are native trees in better condition?



native trees are not healthier than non-natives

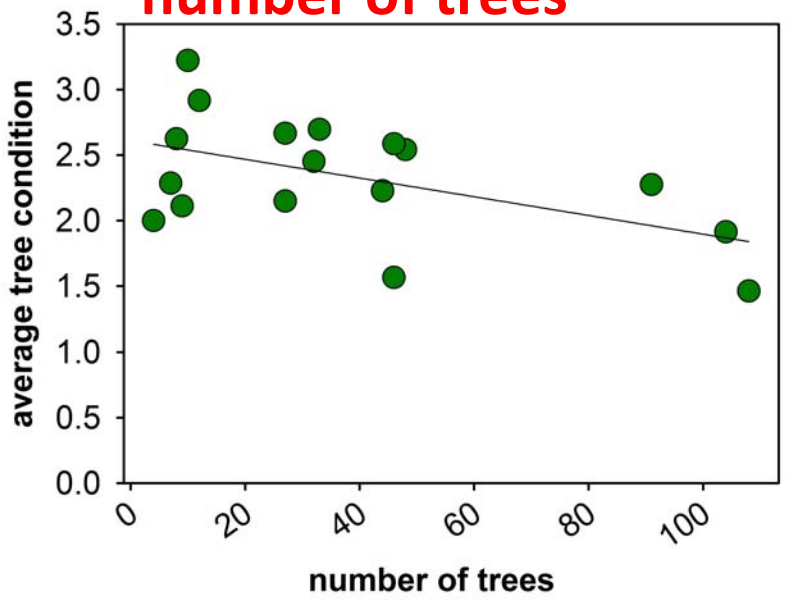
This may be because most trees are highly drought tolerant





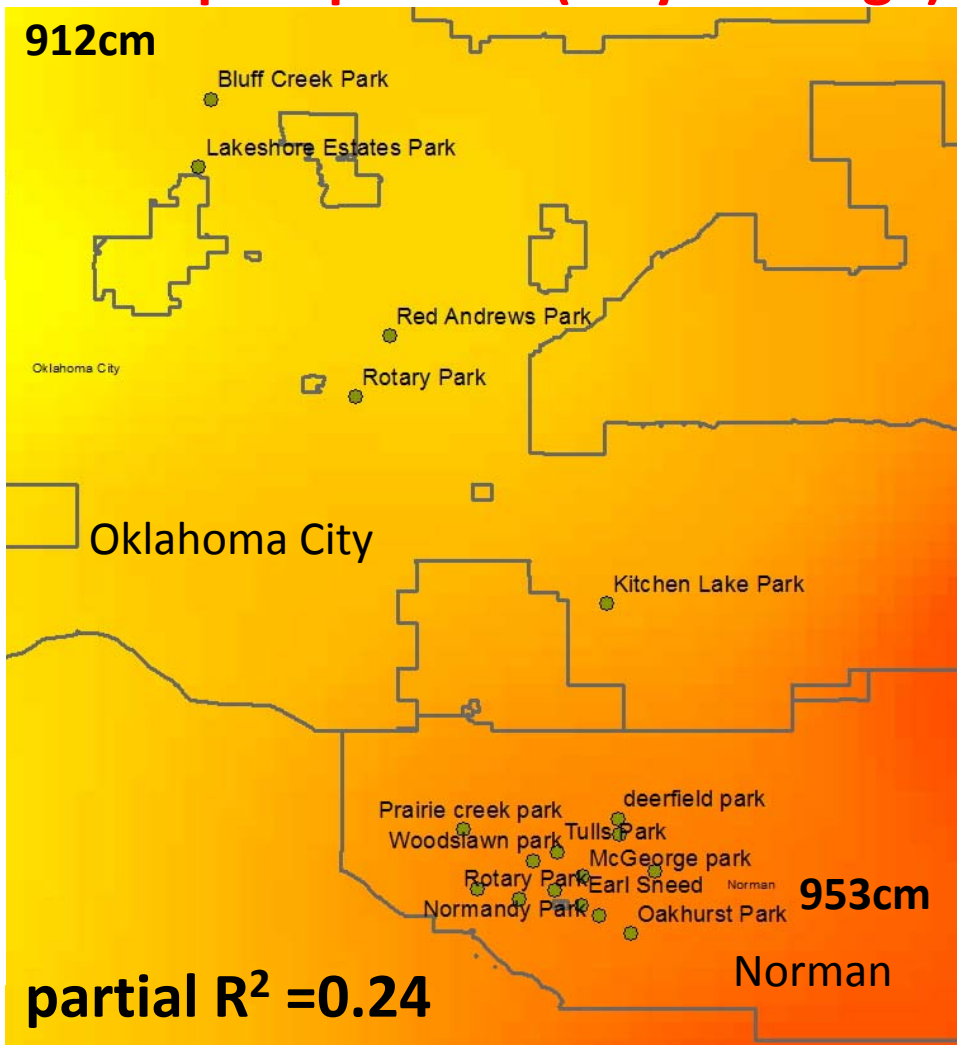
How does tree condition vary spatially?

number of trees



partial R^2 =0.22

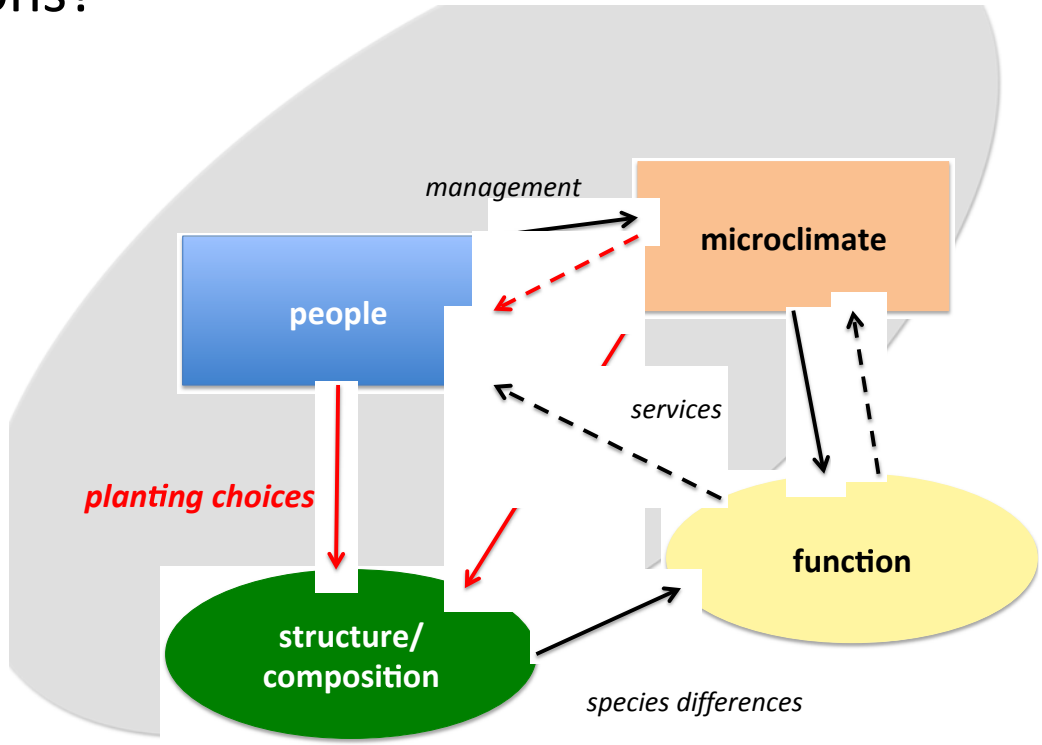
Annual precipitation (30 yr average)



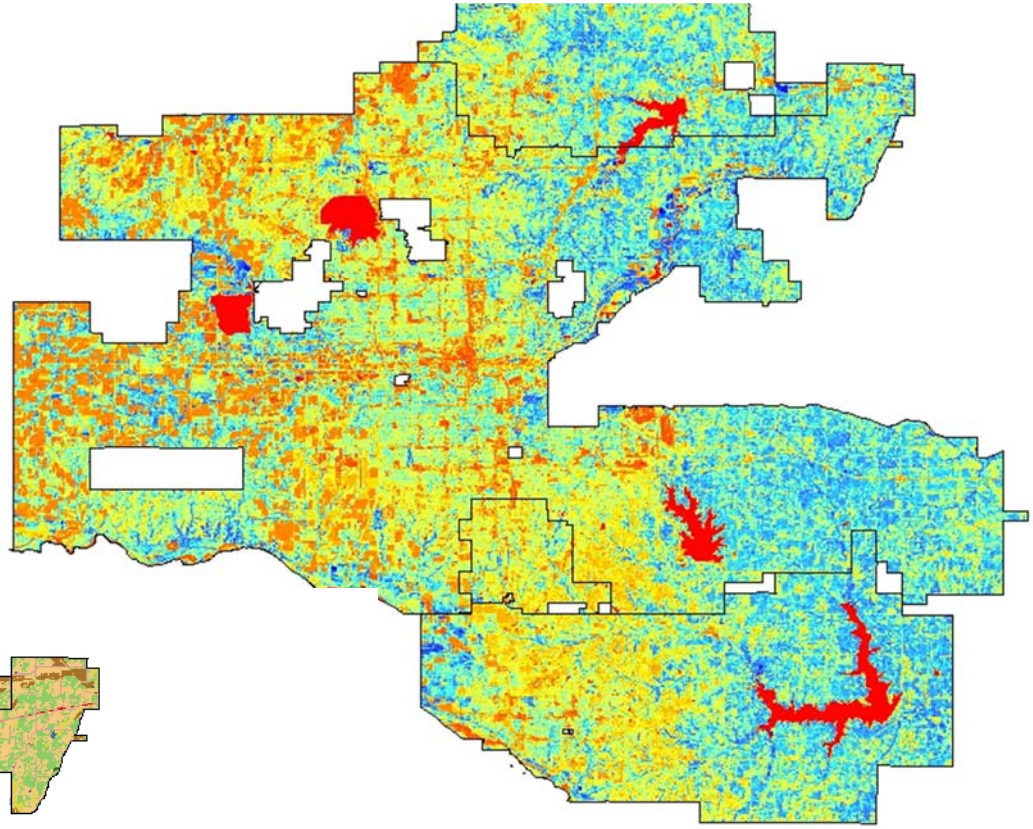
Detect climate signals on urban vegetation and planting trends

How much does drought impact urban forest cover and composition?

- What are the direct climate effects?
- Is there feedback from these events to human landscape decisions?

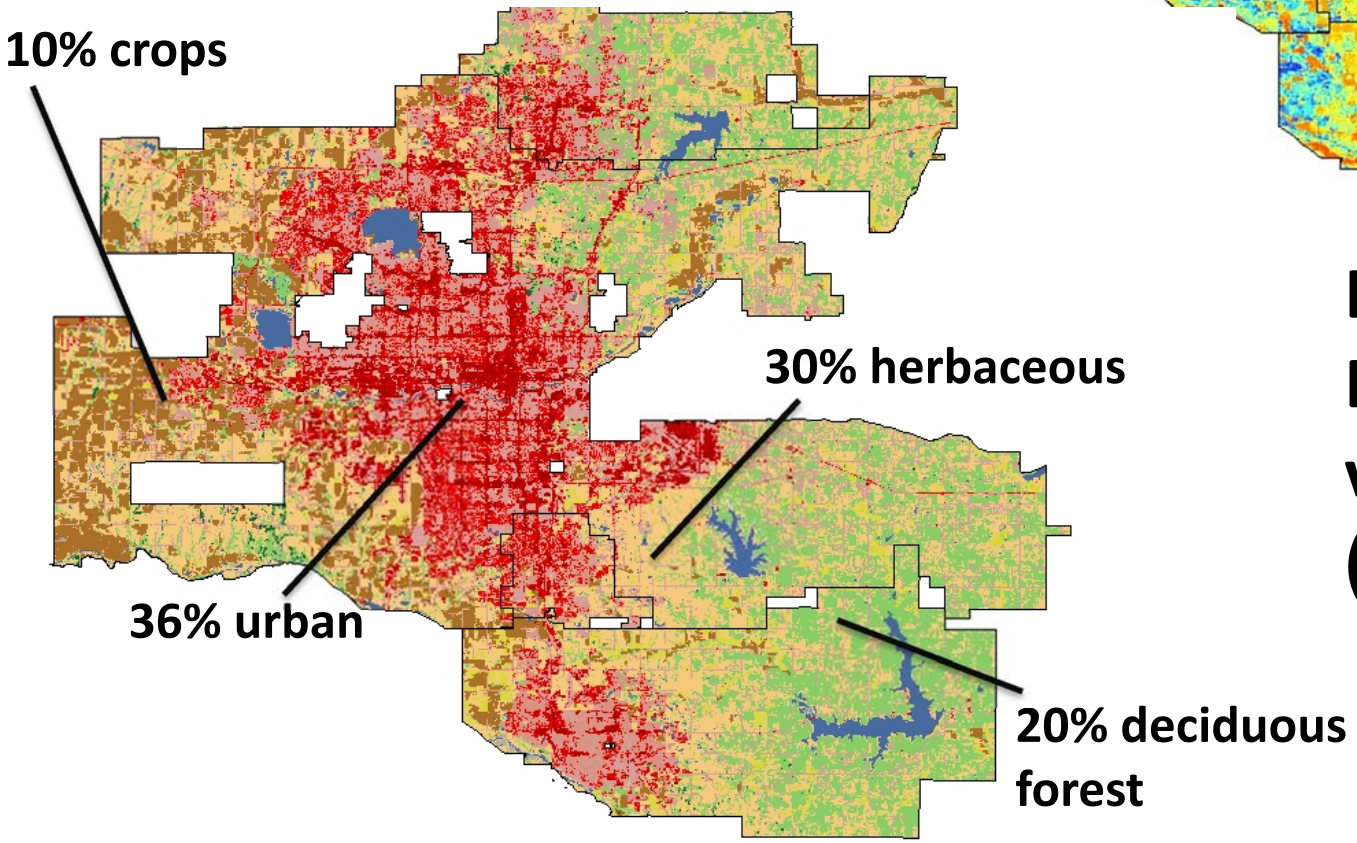


Approach



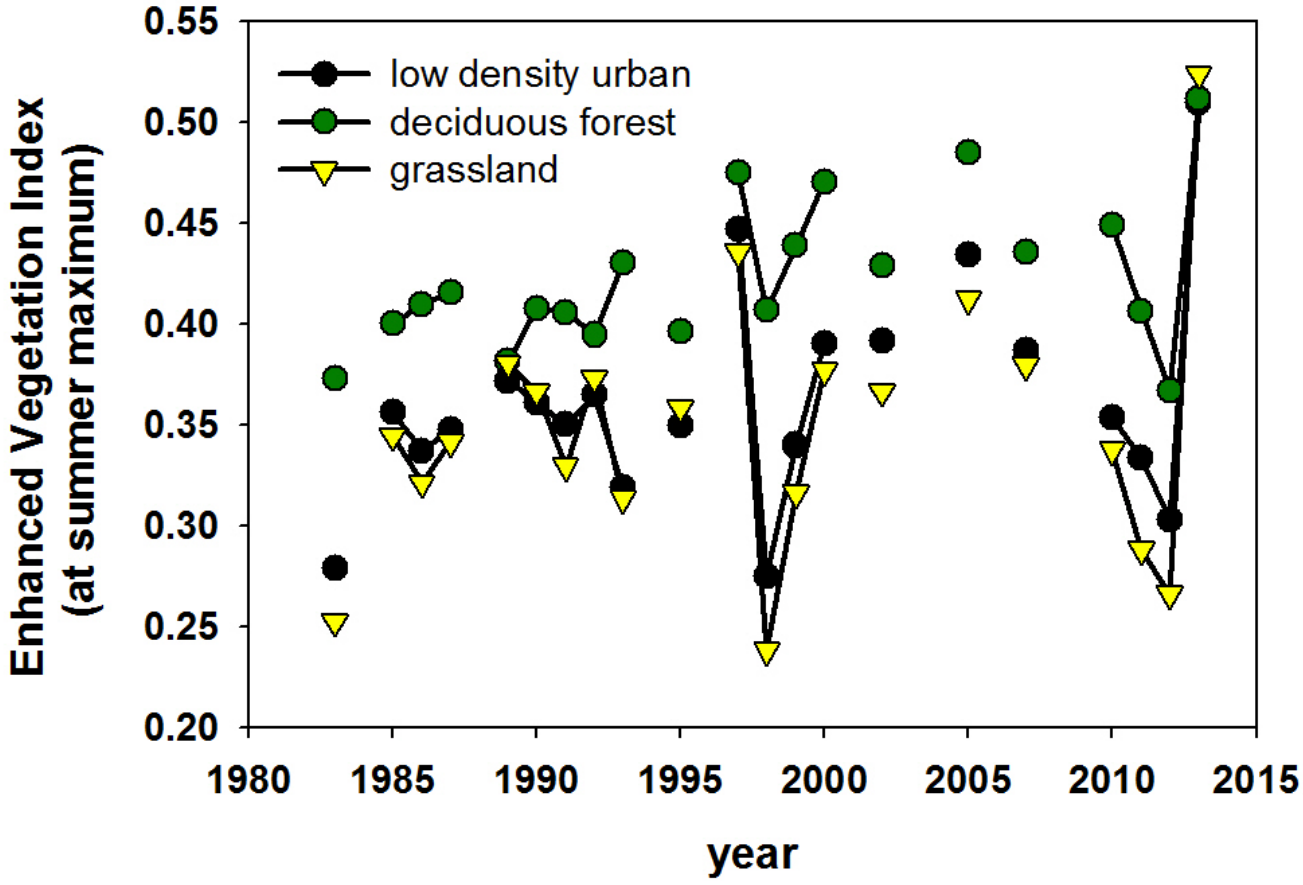
Landsat 30m Enhanced vegetation index (EVI)

2011 land cover (NLCD)



What does the urban ecosystem look like?
greenness in managed and natural ecotypes

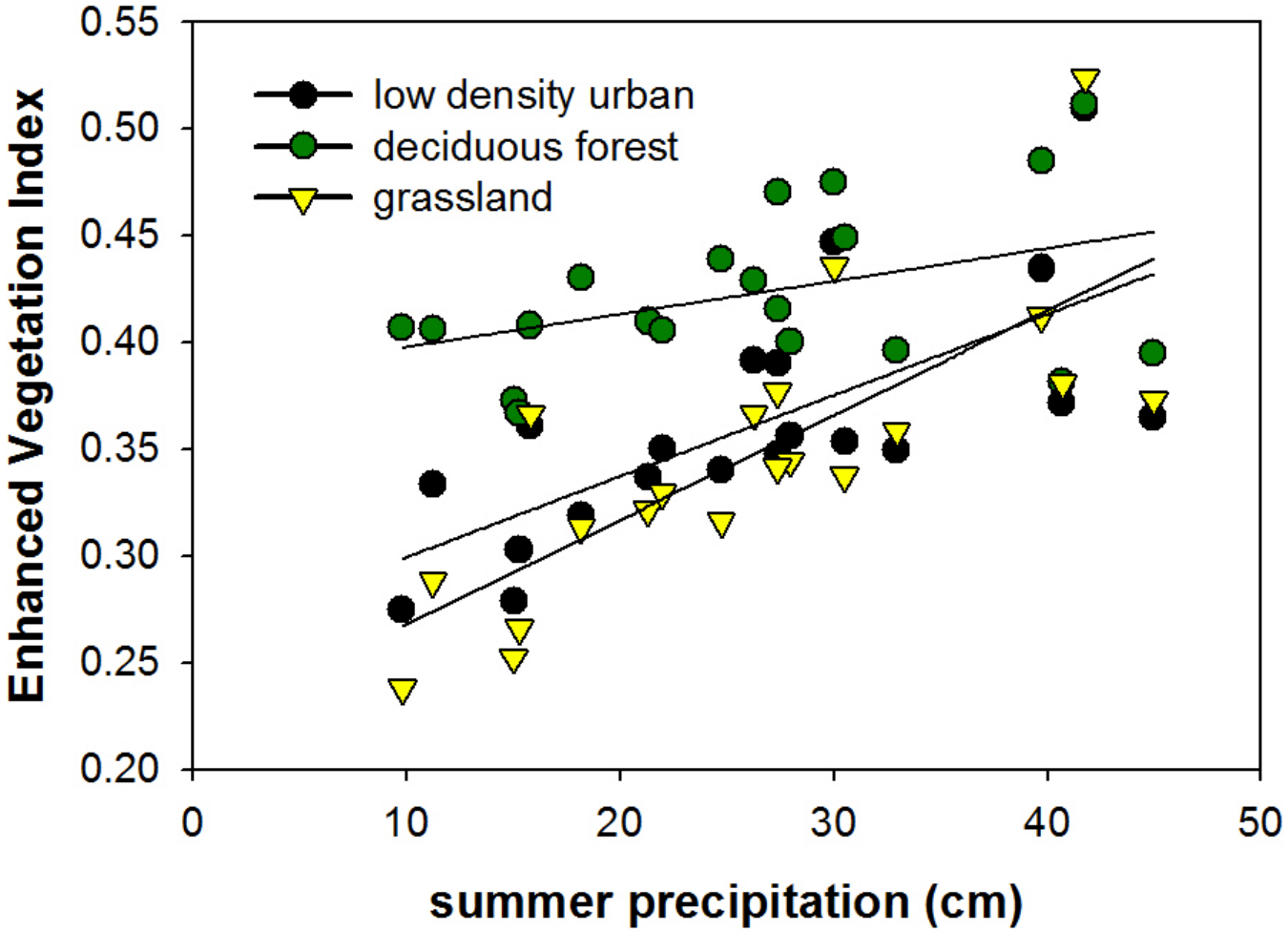
urban has similar greenness to grasslands



temporal variation but no directional changes

sensitivity to precipitation

urban and grasslands are more sensitive to precipitation than forest



urban is not *less* sensitive

Conclusions

- Most urban trees in OKC metro are in good to fair condition
- Around half of trees have trunk wounds; crowded canopies, root damage and storm damage are common
- Tree health does not vary by native status

Results suggest that human stressors, rather than species selection, is the biggest factor

Conclusions

- At the city scale, urban vegetation shows sensitivity to dry conditions

- Although tree mortality is observed during drought, health is more commonly impacted by human stressors than weather

Concluding thoughts

How much does the native environment of a city effect its resiliency to climate stressors?

What are the legacy of extreme climate events on urban landscapes?

- direct climate effects vs. human responses to events?
- How long do the effects last?

What cues are people responding to in their environment?

- What are the thresholds for decision making?
- Do people actually respond to loss of ecosystem services?

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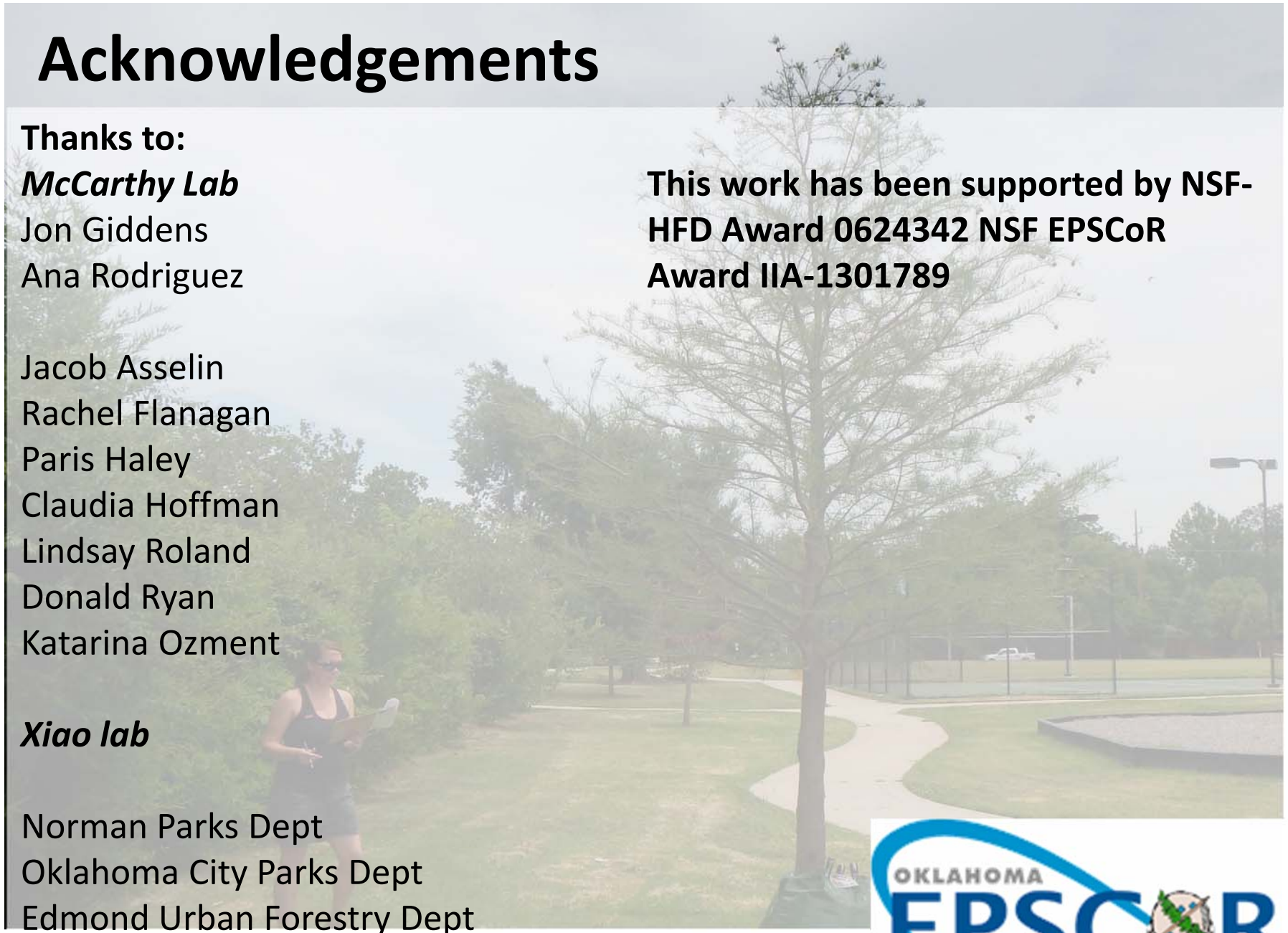

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