

Active Indiana municipal urban forestry programs: How are they addressing sustainability and/or environmental change?

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Intro – Lit Rev - Urban forest sustainability & climate change

- Environmental changes that will affect urban forest (IPCC 2014)
 - temperature increases
 - precipitation patterns changes
 - more frequent & intense storms
- Suitability of tree species for future climate conditions may be different than for current conditions (USFS 2014)
- Sustainable UF mgmt tactics planning for environmental change (Brandt et al. 2016)
 - increasing species & age/structure diversity
 - increasing canopy cover & connectivity
 - monitoring inventoried trees for overall forest health

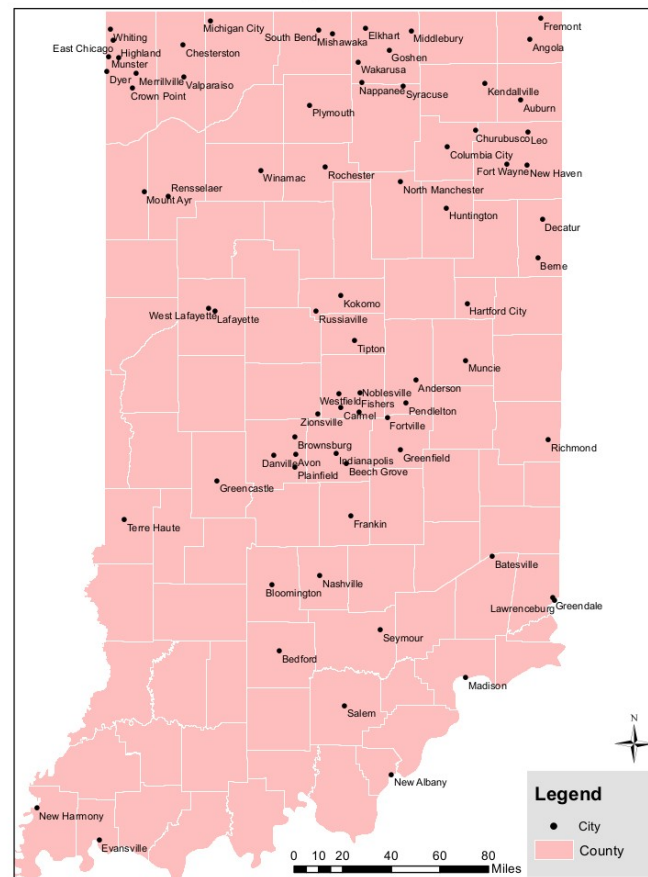
Research Questions

1. Which Indiana communities have active municipal urban forestry programs and what are the programs doing?
2. Which active Indiana municipal urban forestry programs are planning, implementing and monitoring to ensure environmental sustainability and/or in reaction to or anticipation of environmental change?

Data sources and resulting municipal UF programs

- Began with lists of current (64) and former (22) Tree City USA programs (86 total)
- Combined with DNR CUF Forestry grants list (167 grants for 82 communities)
- Results were a list of 74 active municipal Indiana UF programs - Tree City USA (64) and otherwise active - significant planting/inventory/programs/etc (10)

Active Indiana Municipal Urban Forestry Programs



Website Search Methods – 74 Active UF Programs

- City websites reviewed to determine levels of urban forest program activity and planning for sustainability and/or environmental change
 - Urban Forestry program pages
 - City and urban forest planning documents
 - City websites for sustainability/environmental change planning and UF planning
- Professional credentials of forestry staff (Indiana Arborist Association & Indiana Municipal Forester Directory)
- Website search resulted in 45 municipalities and 53 documents, which we then performed a keyword search on

Keyword Methodology

- Keyword list developed from:
 - research-suggested tactics to maintain forest health
 - ecosystem services
 - terms related to environmental change and/or sustainability.
- Documents – city and urban forestry reports/plans, tree ordinances, etc. (53 total for 45 cities)
- Text-based search function applied to each document (Table 1)

Table 1. List of keywords and brief explanation used in search:

Climate- specifically in context of climate change, does not include phrases like “Climate Zone” unless in the context of changing climate zones due to environmental change

Sustainable- as applied to the urban forest, not to sustainable budgets

Diversity- of tree species population

Tree structure- in context of pruning and maintenance and possibly used as a resistance strategy to disturbances caused by climate change (i.e. intense storms and icing events)

Forest structure- population structure (age/size) of trees in urban forest

Disturbance- in reference to weather events associated with climate change

Pest (invasive)-in reference to planning for anticipated threats to urban forest

Strategic- in reference to planning for the urban forest

Implement- in reference to discussing how plan will be acted upon

Action- in reference to what will be done in accordance with the urban forest plan, excludes phrases in ordinances referring to legal action for tree damage

Green infrastructure- in reference to the urban forest

Heat island- in reference to ecosystem services of urban trees

Monitor- as applied to the tree population

Stormwater- in reference to ecosystem services of urban trees

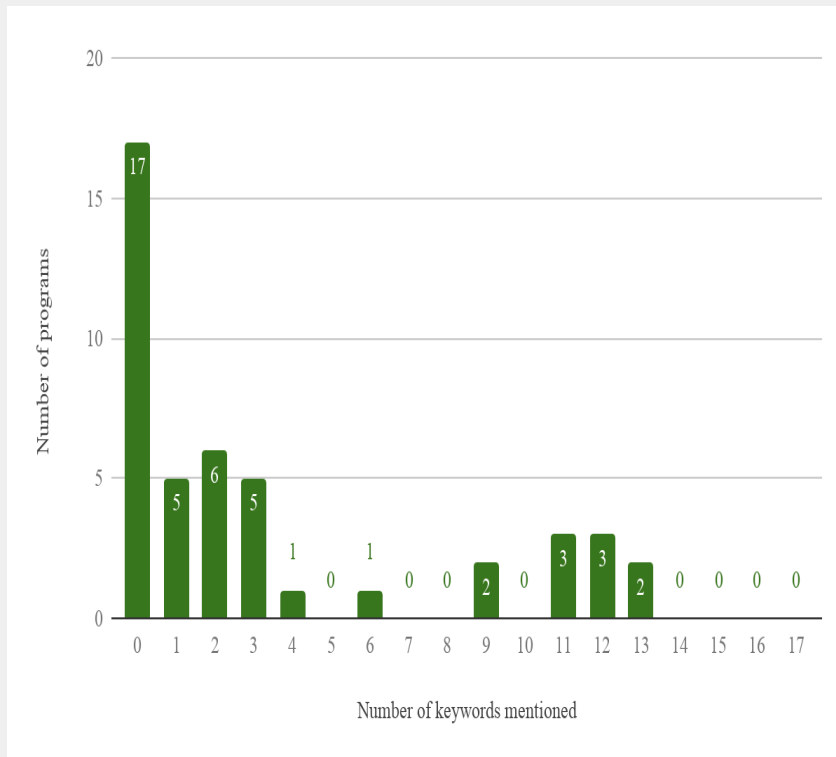
Mitigation- climate change mitigation; stormwater mitigation is included here since increases in intense storms are associated with climate change in many areas

Adaptation- to climate change effects

Transition- of the urban forest population to one expected to be successful in future climate conditions

Keyword Usage Frequency

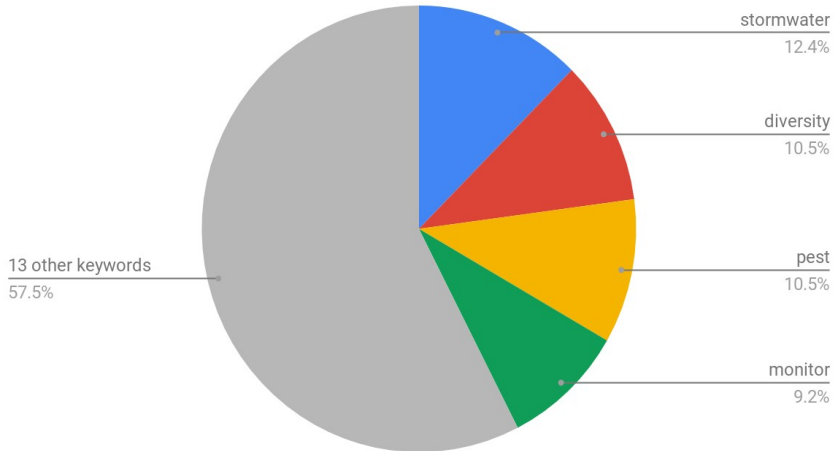
- 11/45 used >5 keywords, indicating a higher degree of planning for sustainability and/or environmental change
- Higher keyword usage related to those having a consultant perform a tree/canopy inventory and prepare a report/plan



Most important Sus/EC keywords

- Stormwater (42%, 19/45)- trees to mitigate
- Diversity (36%, 16/45)- increase species
- Pest (Invasive) (36%, 16/45)- resistance/resilience
- Monitor (31%, 14/45)- of forest or for pests

Keyword proportion of usage by word



KEYWORD	# CITIES	% CITIES	# TIMES USED
climate	7	16%	1-6
sustainable	11	24%	1-7
diversity	16	36%	1-46
structure (tree)	13	29%	1-16
structure (UF)	11	24%	1-5
disturbance	5	11%	1
pest (invasive)	16	36%	1-33
strategic	8	18%	1-12
implementation	11	24%	1-24
action	13	29%	1-15
green infrastructure	4	9%	1-4
heat island	1	2%	1
monitor	14	31%	1-12
stormwater	19	42%	1-48
mitigation (stormwater)	3	7%	1-4
adaptation	0	0%	0
transition	1	2%	1

Conclusions about active UF programs

Leading **reports/plans** include

- ties to city sustainability plans
- language indicating need to plan for urban forest resilience
- specific strategies including:
 - increasing species and structure diversity
 - increasing canopy cover or forest connectivity

Leading Indiana **programs** are

- conducting georeferenced inventories that can be updated as trees are planted or removed
- considering ecosystem services of the UF in sustainability planning
- carefully considering planting lists for forest resilience (species diversity & native, non-invasive spp)

Next Steps

- Are UF programs updating recommended species lists to plan for future climate conditions?
- City-developed UF plans?
- Interviews of active program leaders to assess in-process planning and potential planning ideas (clustering of programs)
- Exploring local connections between municipal programs, universities/college & urban greening non-profits

