CITYgreen

What is it?

How does it work?

CITYgreen

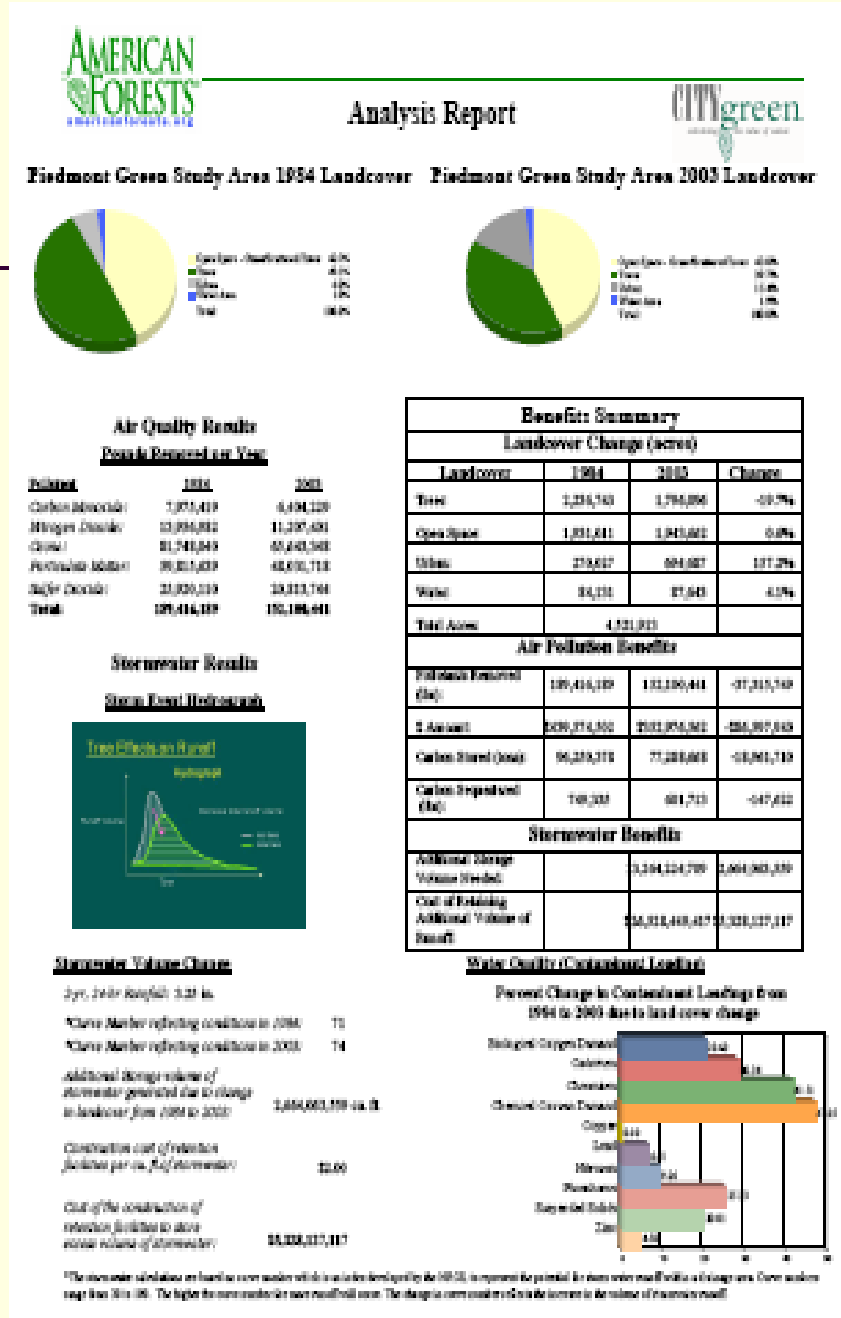
- Developed by American Forests
- Software module for ArcGIS software
- Initially released in 1996.

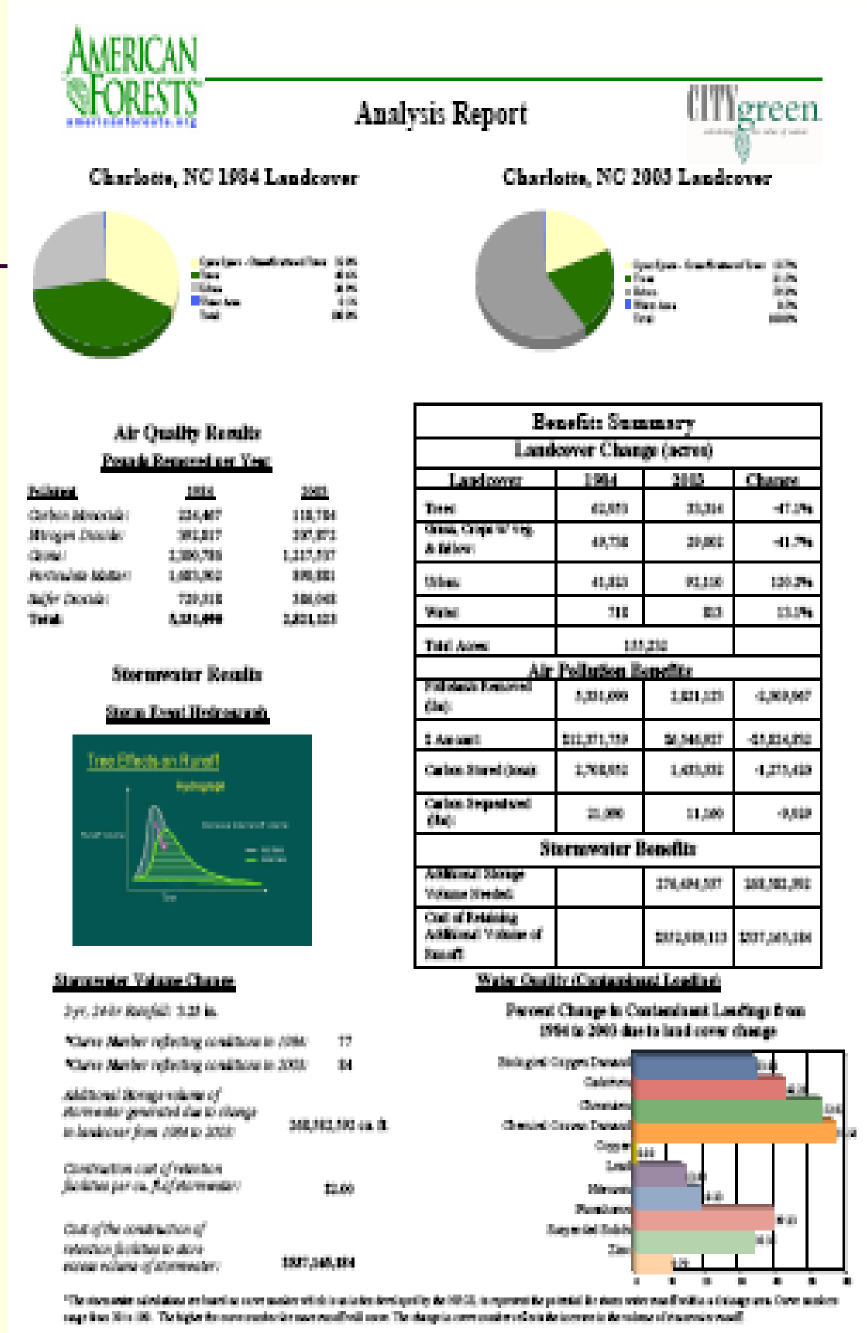
What does it do?

- CITYgreen calculates dollar benefits based on your specific site conditions.
- CITYgreen analyzes:
  - Stormwater Runoff
  - Air Quality
  - Summer Energy Savings
  - Carbon Storage and Avoidance
  - Tree Growth

How does it work?

- High-resolution multispectral satellite imagery.
- Landcover type classification.
  - Tree canopy
  - Impervious surface
  - Grass
  - Water
  - Etc.
- CITYgreen uses classification information to calculate data.


AMERICAN FORESTS
Analysis Report
CITYgreen
Piedmont Green Study Area 1984 Landcover
Piedmont Green Study Area 2003 Landcover
Air Quality Results
Pounds Removed per Year
Benefits Summary
Landcover Change (acres)
Landcover
1984
2003
Change
Trees
Open Space
Urban
Water
Total Acres
Air Pollution Benefits
Stormwater Results
Storm Event Hydrograph
Tree Effects on Runoff
Carbon Stored (tons)
Stormwater Benefits
Stormwater Volume Change
Water Quality (Contaminant Loading)
Percent Change in Contaminant Loadings from 1984 to 2003 due to land cover change



AMERICAN FORESTS

Analysis Report

CITYgreen

Charlotte, NC 1984 Landcover

Charlotte, NC 2003 Landcover

Air Quality Results

Pounds Removed per Year

Benefits Summary

Landcover Change (acres)			
Landcover	1984	2003	Change
Trees	[illegible]	[illegible]	[illegible]
Grass, Crops w/ Veg. & fallow	[illegible]	[illegible]	[illegible]
Urban	[illegible]	[illegible]	[illegible]
Water	[illegible]	[illegible]	[illegible]
Total Acres	[illegible]		
Air Pollution Benefits			
Pollutants Removed (lbs)	[illegible]	[illegible]	[illegible]
$ Amount	[illegible]	[illegible]	[illegible]
Carbon Stored (tons)	[illegible]	[illegible]	[illegible]
Carbon Sequestered (lbs)	[illegible]	[illegible]	[illegible]
Stormwater Benefits			
Additional Storage Volume Needed		[illegible]	[illegible]
Cost of Retaining Additional Volume of Runoff		[illegible]	[illegible]

Stormwater Results

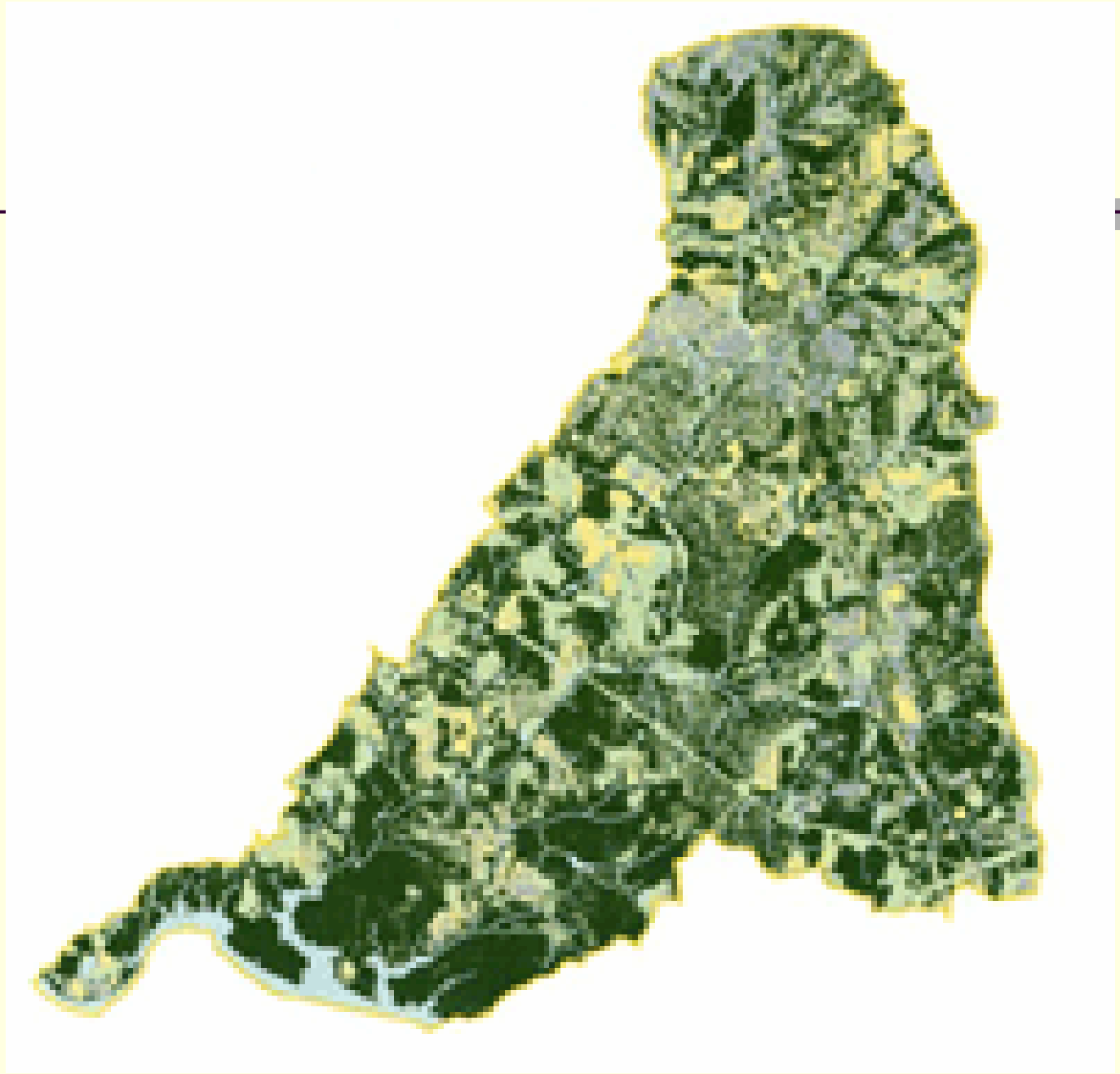
Storm Event Hydrograph

Tree Effects on Runoff

Stormwater Volume Change

Water Quality (Contaminant Loading)

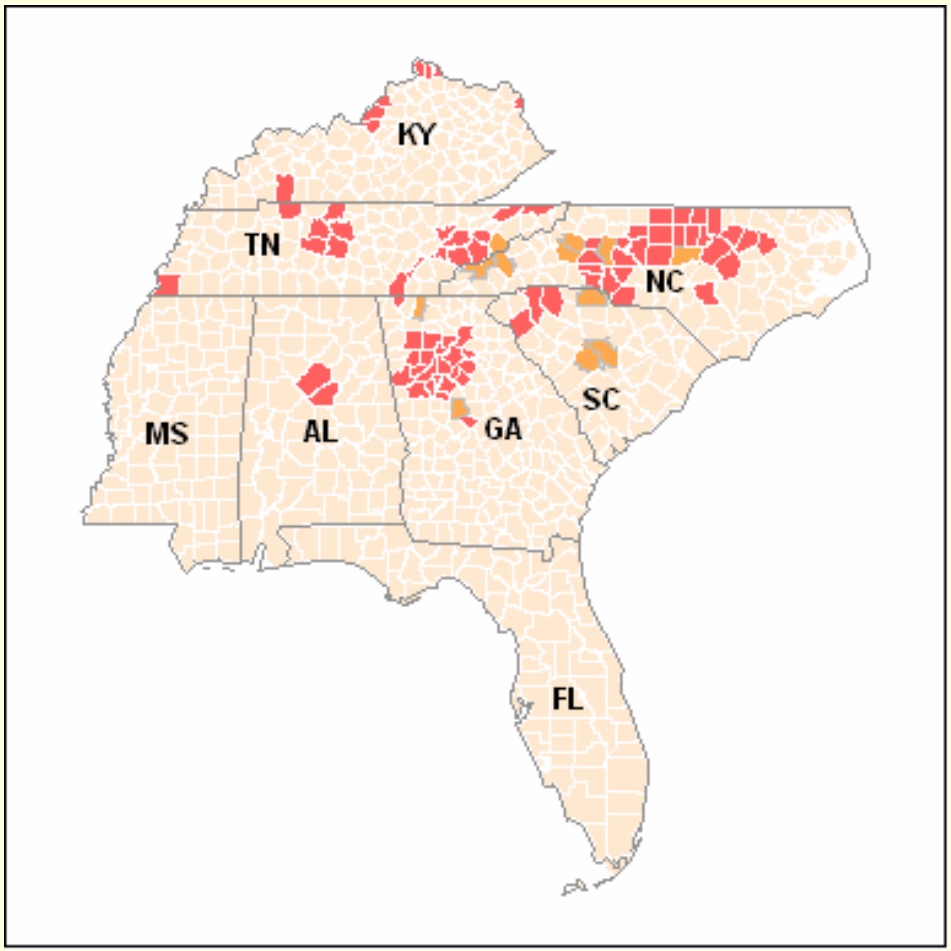
Percent Change in Contaminant Loading from 1984 to 2003 due to land cover change

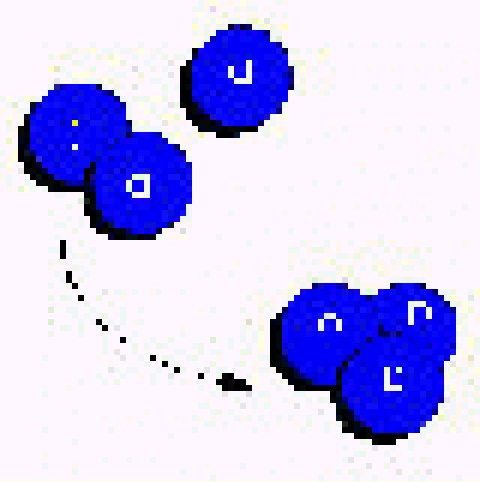


Cost Analysis Related to Local Air and Water Issues

How **CityGreen** can provide a baseline for local decision-making in the future

Triad Operating Under an EAC for Ozone (EAC = Early Action Compact)





- “Bad” Ozone is produced in the lower atmosphere on hot days when nitrogen oxides (NOx) and volatile organic compounds (VOCs) react with oxygen in the presence of sunlight.
- This photochemical reaction creates Ozone.

Southern Oxidant's Study

(NCSU – updated 9/05)

- "AQM11. …….. ***Thus, destruction of trees in urban and suburban areas increased total VOC emissions*****.** *Conversely, urban planning and construction practices that modulate the intensity of urban heat islands (for example, through placement of "green spaces" within the urban core of cities and use of high-reflectivity building materials) aided in ozone pollution abatement by decreasing air temperatures in urban and suburban areas (Cardelino and Chameides, 1990; Meagher et al., 1998)."*

- http://www.ncsu.edu/sos/pubs/SOSNYCU.pdf

NOx Reduction Estimates

- Study Area = urban park @ 523 acres
  http://www.co.hunterdon.nj.us/planning/Woodland/Chapter01/1to5.pdf
- FC = 410 sq. miles (x 640 acres/sq.mile) = 262,400 acres
  - NOx reduction (523 acres @ 9lbs/day)
  - 4,515 lbs NOx per day in FC x 365 days
  - 1,647,975 lbs/year (823 tons) – at similar density

Every 1% reduction in tree cover is roughly equivalent to an extra 8.2 Tons of NOx emissions in FC

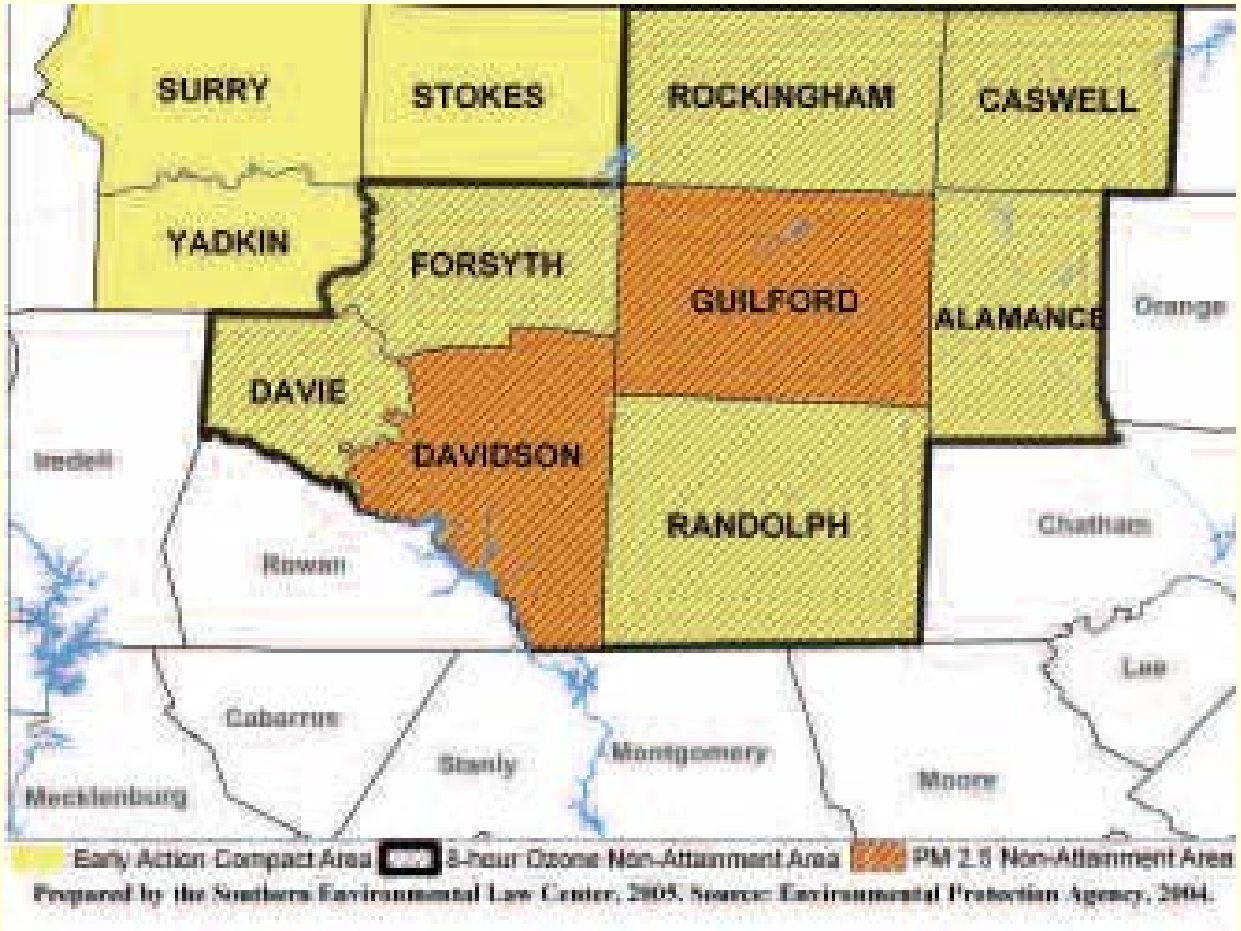
Industry's Cost for NOx Control (in an attainment or EAC area)

- New Company X – Best Available Control Technology (BACT) for NOx = Selective Catalytic Reduction (SCR).
- Cost/ton/year = $2000 - $10,000
- Every 1% tree cover loss ~= 8.2 tons/year
- @$6000/ton/year = $49,200/yr worth of AQ service compared to the Industrial permittees.

If FC became non-attainment for Ozone.

- If (when?) FC becomes non-attainment – then - LAER (Lowest Achievable Emission Rate)
- Eg. Catalytic Oxidation/Absorption @ $6145 - $48,663 cost/ton/year
- @ $48,663 /ton/yr x 8.2 tons (per 1% tree loss) = $399,680/ yr AQ service compared to Industrial and/or mobile source Community (and citizens)
- + offsets
- CityGreen may provide options – eg. Commit to increased % tree coverage

Triad is approaching non-attainment for Fine Particulate Matter



PM Reduction Estimates

- 48 lbs particulate / 523 acres
- 4390 tons yr / FC
- Every 1% reduction in tree cover is roughly equivalent to an extra 43.9 tons of particulate matter available to be monitored in FC
- Atlanta and other areas are using CityGreen along with TO as implementation strategies to achieve attainment.

Stormwater Control

- **TMDL** (Total Maximum Daily Load) –LID growth techniques can facilitate TMDL development and the long-term implementation of TMDL load allocations and wasteload allocations by better controlling stormwater discharges, reducing the quantity and peak flow of stormwater, and retaining more land in open space and buffers. Moreover, allocations for future growth provide a mechanism to evaluate the patterns of development that will protect water quality and those that will not.

- ***Linking Stormwater Fees to the Size of Impervious Surfaces.*** Local systems could assess fees based on the amount of impervious surface on a property and provide discounts for properties where stormwater is managed effectively on site.
- Phase II – Post Construction – LID could be used as a tool to eliminate costly maintenance issues and make the property more cost-friendly to consumers. Any lot that is part of a bigger project exceeding one acre will require post-construction BMPs.

CityGreen – useful down to the acre level for site planning

Summary

- CityGreen can be a valuable resource to future action strategies to avoid draconian EPA measures for non-attainment areas.
- CityGreen can benefit local planning and strategy initiatives to meet CWA requirements (TMDLs, etc.)
- CityGreen can be used by Developers to offset traditional infrastructure costs.
- It would be in invaluable tool for future assessment of current planning initiatives.
- It would give elected officials necessary data to make more informed planning decisions in FC
- Concern – staffing and resources; usefulness is in future evaluations.