Placing a Value on Trees

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URBAN NATURAL RESOURCES INSTITUTE

Providing Science to Promote Urban & Community Natural Resources Stewardship

URBAN FORESTS
- composition
- effects

MANAGEMENT
- community-based
- improved approaches

UNRI RESOURCES
- ask a question
- collaborators/partners
- unri contacts
- other unri resources

LEARNING
- web-based
- other tools

UNRI
- about the institute
- our vision
- our goals

WHAT WE DO

The Urban Natural Resources Institute (UNRI) is a science-based source for information and answers to questions on urban natural resources stewardship.

>> Learn more

PUBLIC AWARENESS

A goal of the Institute is to strengthen public awareness of activities related to urban natural resources research and management.

>> Learn more

COLLABORATORS

The Institute consists of Forest Service scientists, conducting science-based research on urban natural resource issues across the country.

>> Learn more

HOW CAN WE HELP YOU?

The Institute's scientific resources are available to you. Ask a question of our researchers and we will work to get you the latest answers and solutions.

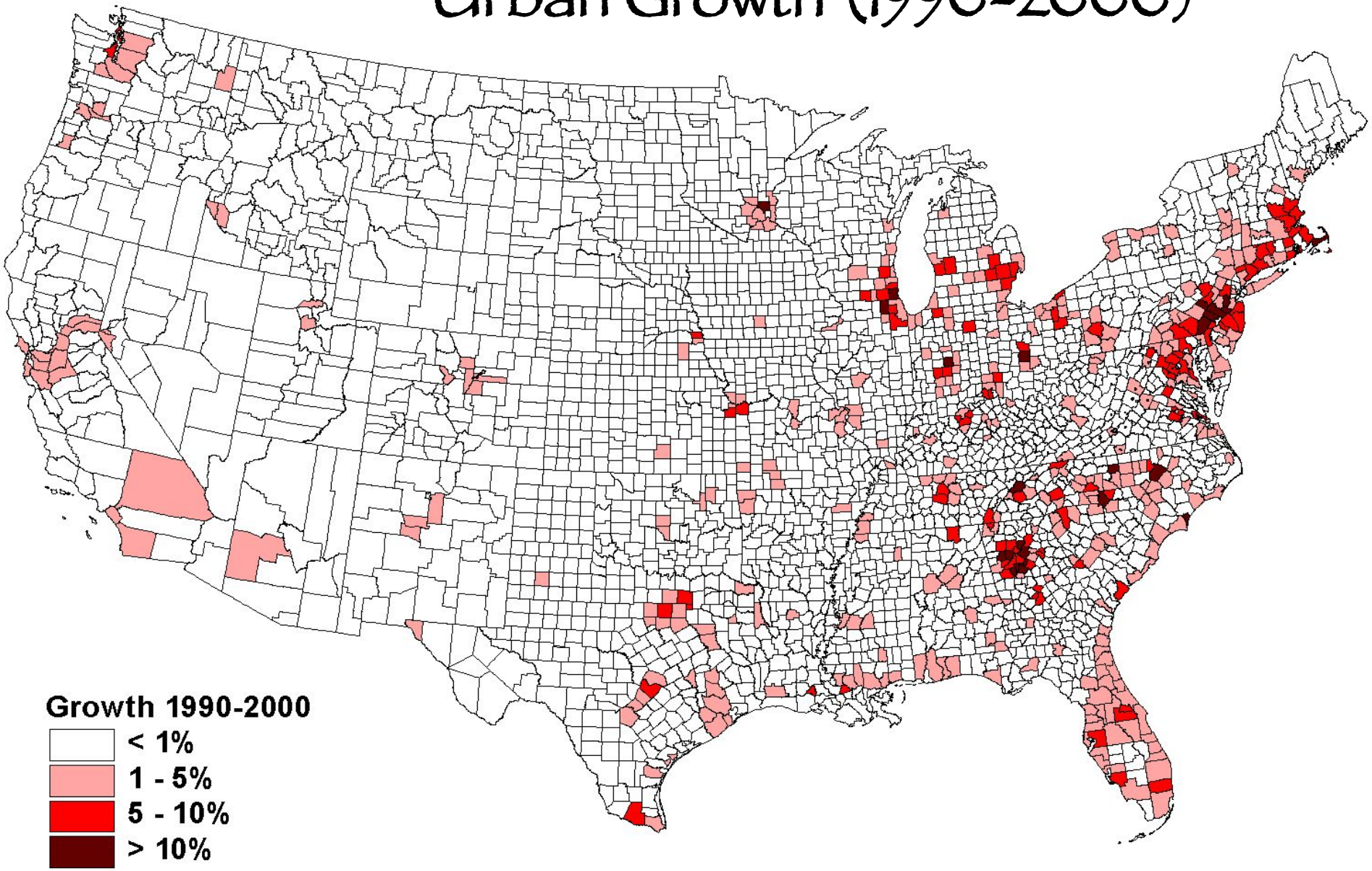
>> Learn more

www.unri.org

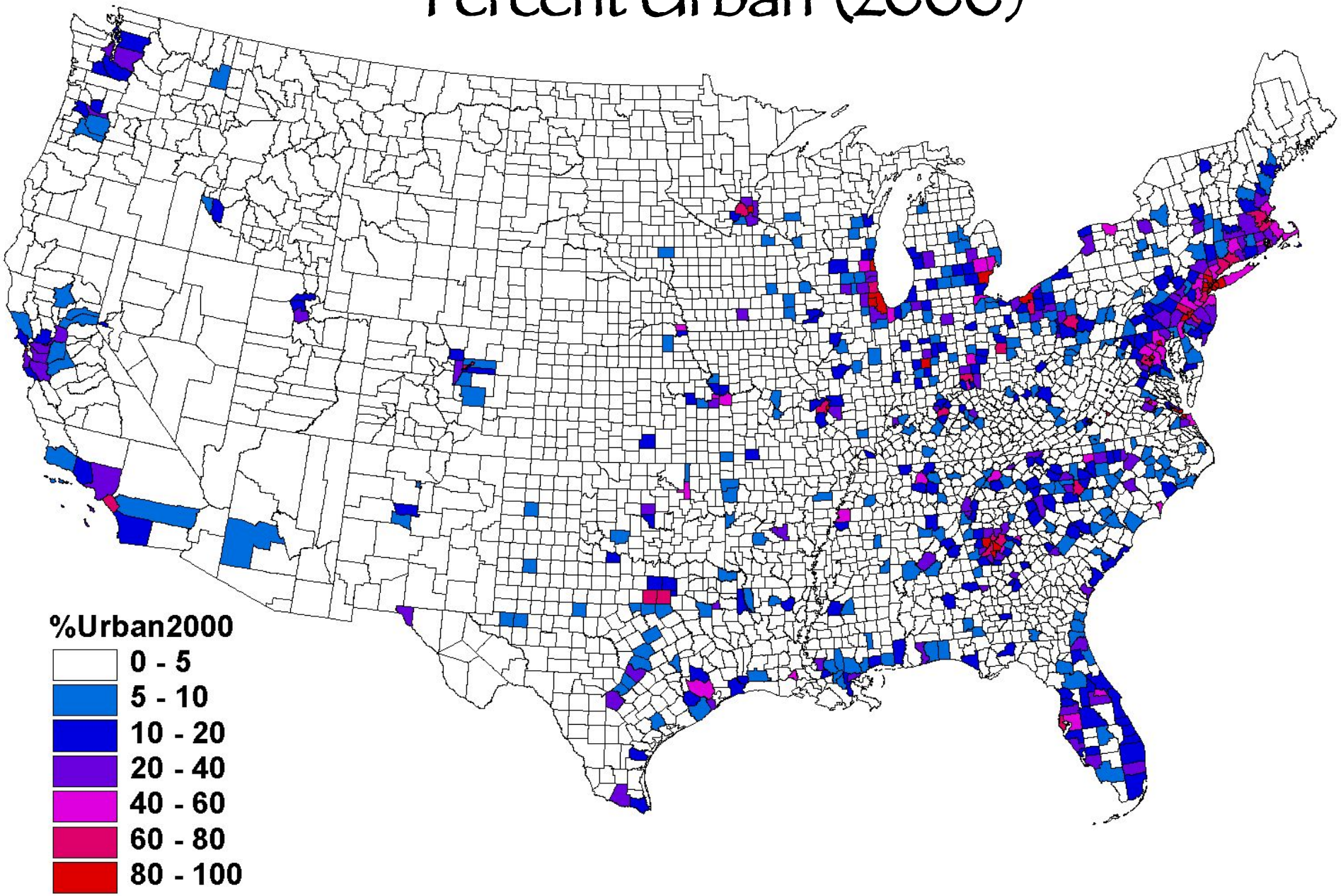
Some Key Points

- Benefits of Trees Are Variable
- We Can Calculate Benefits of Trees
- We Don't Need to Be Scientists
- Benefits are Very Often Overlooked
- Make it Part or Your Annual Planning

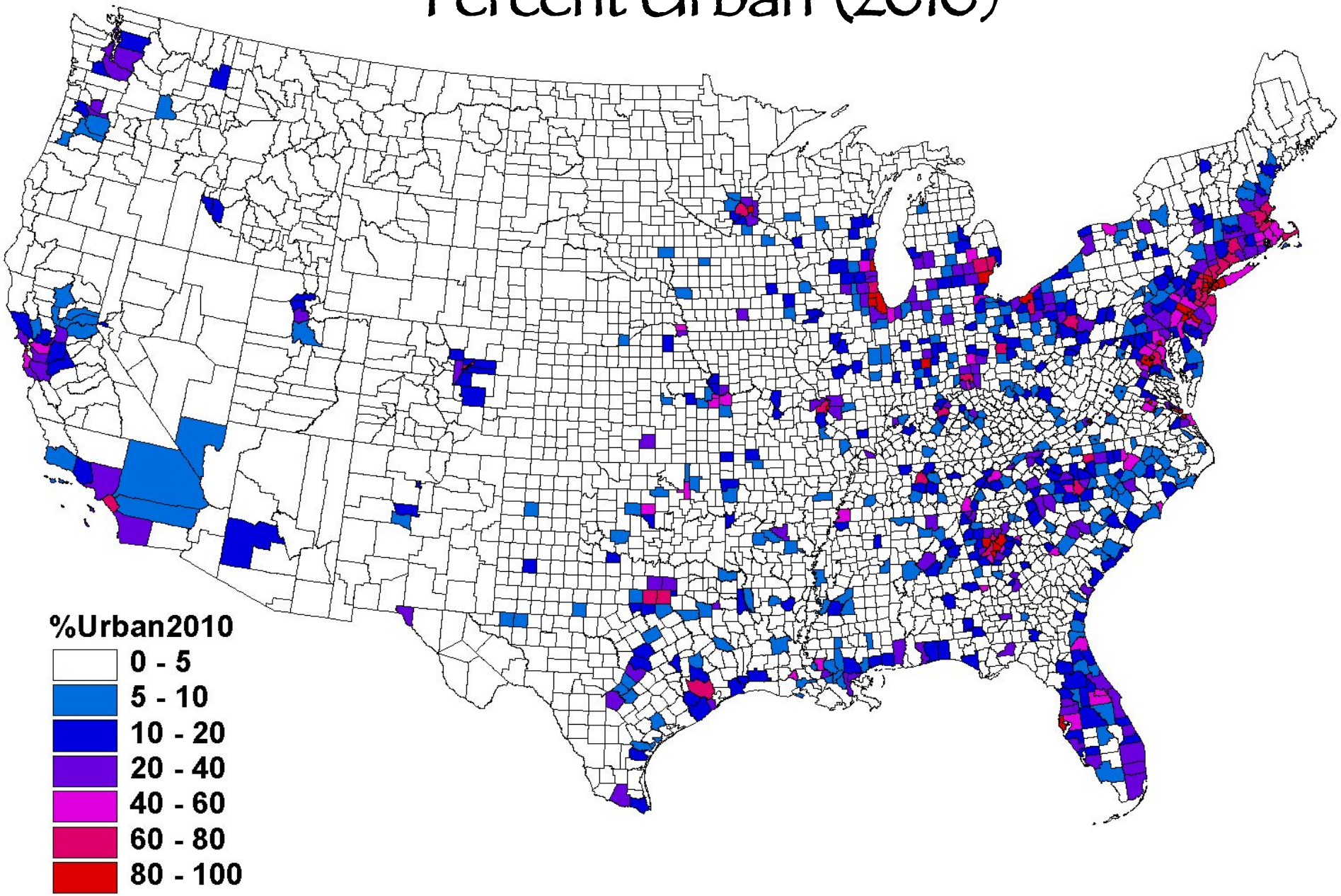
Urban Growth (1990-2000)



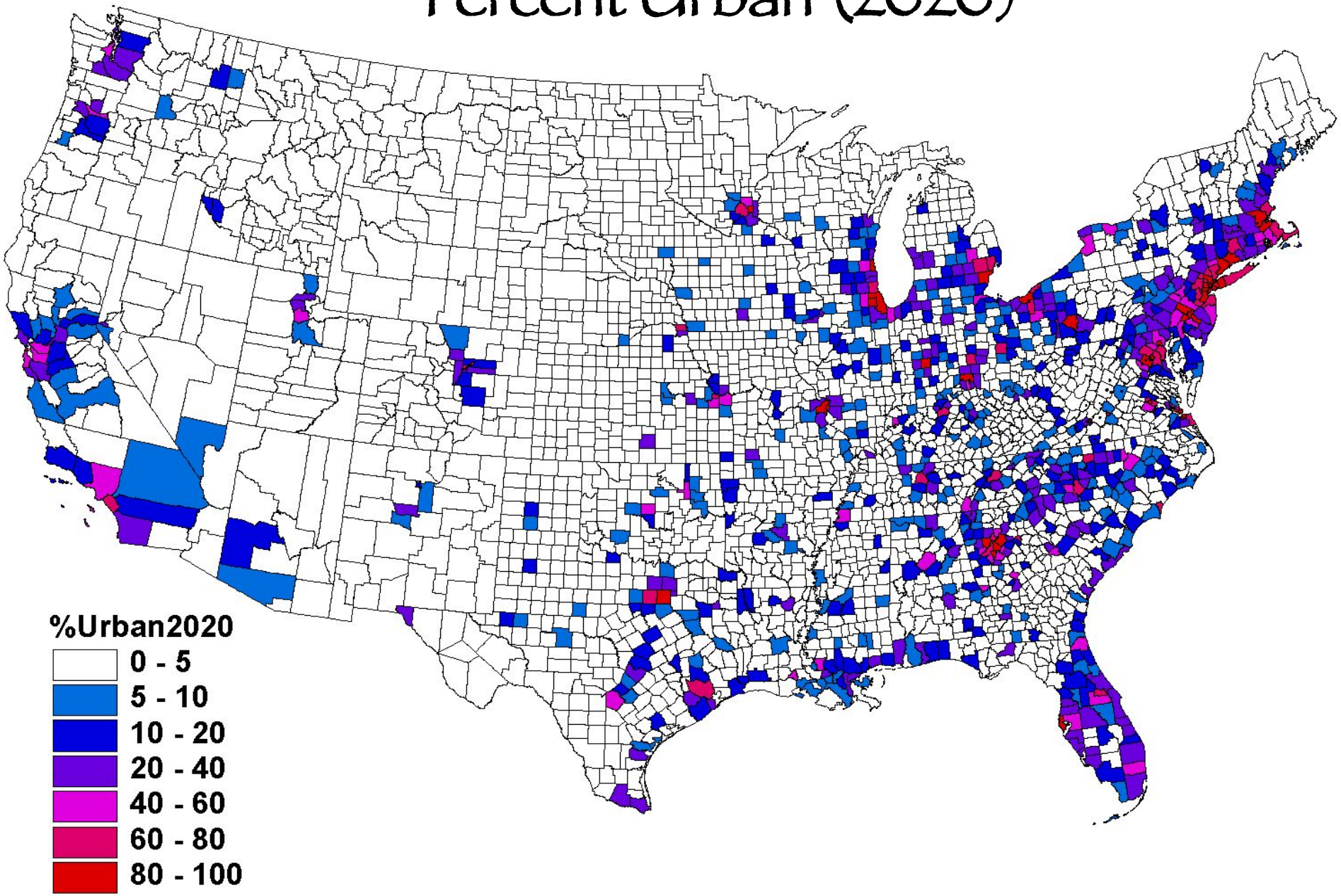
Percent Urban (2000)



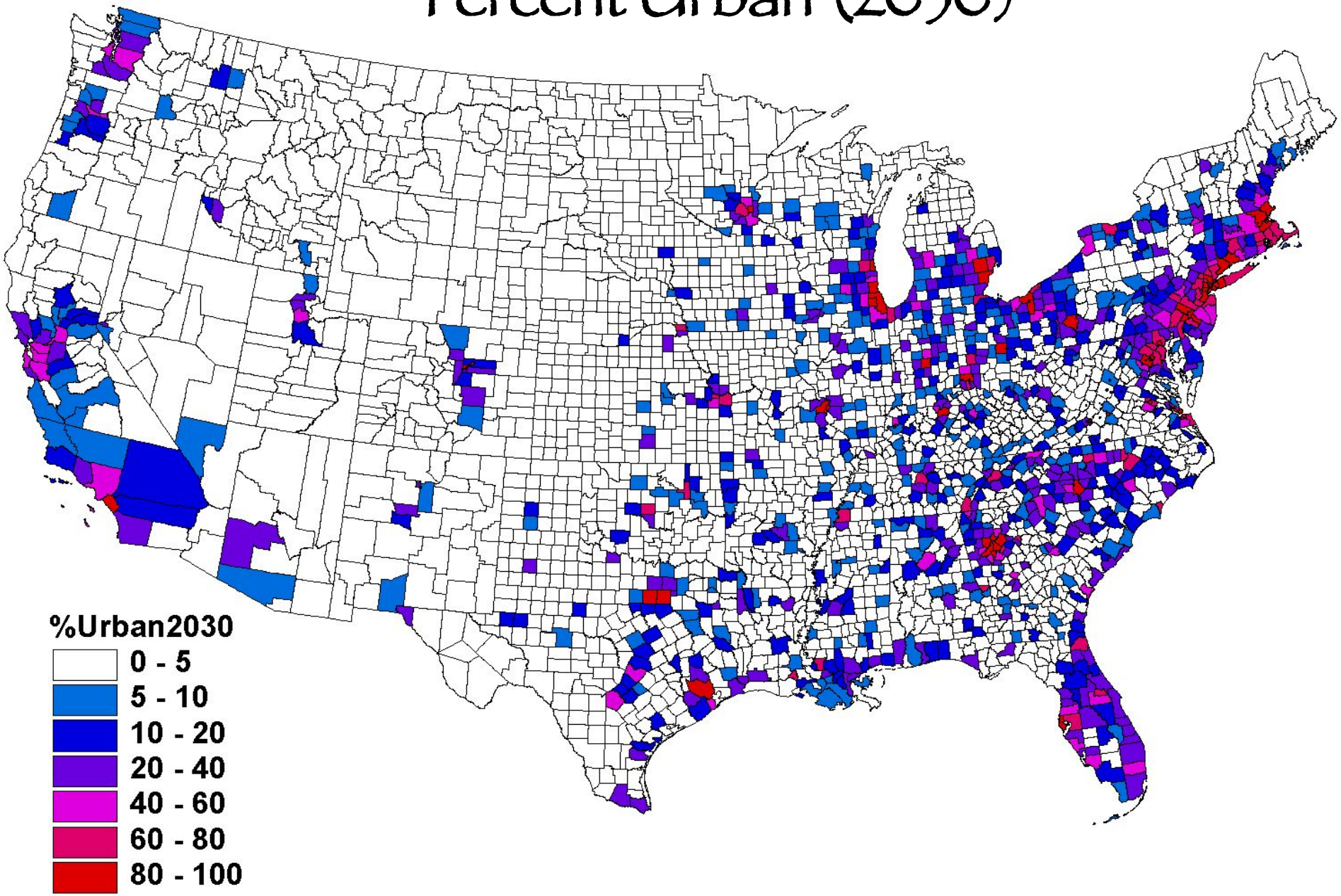
Percent Urban (2010)



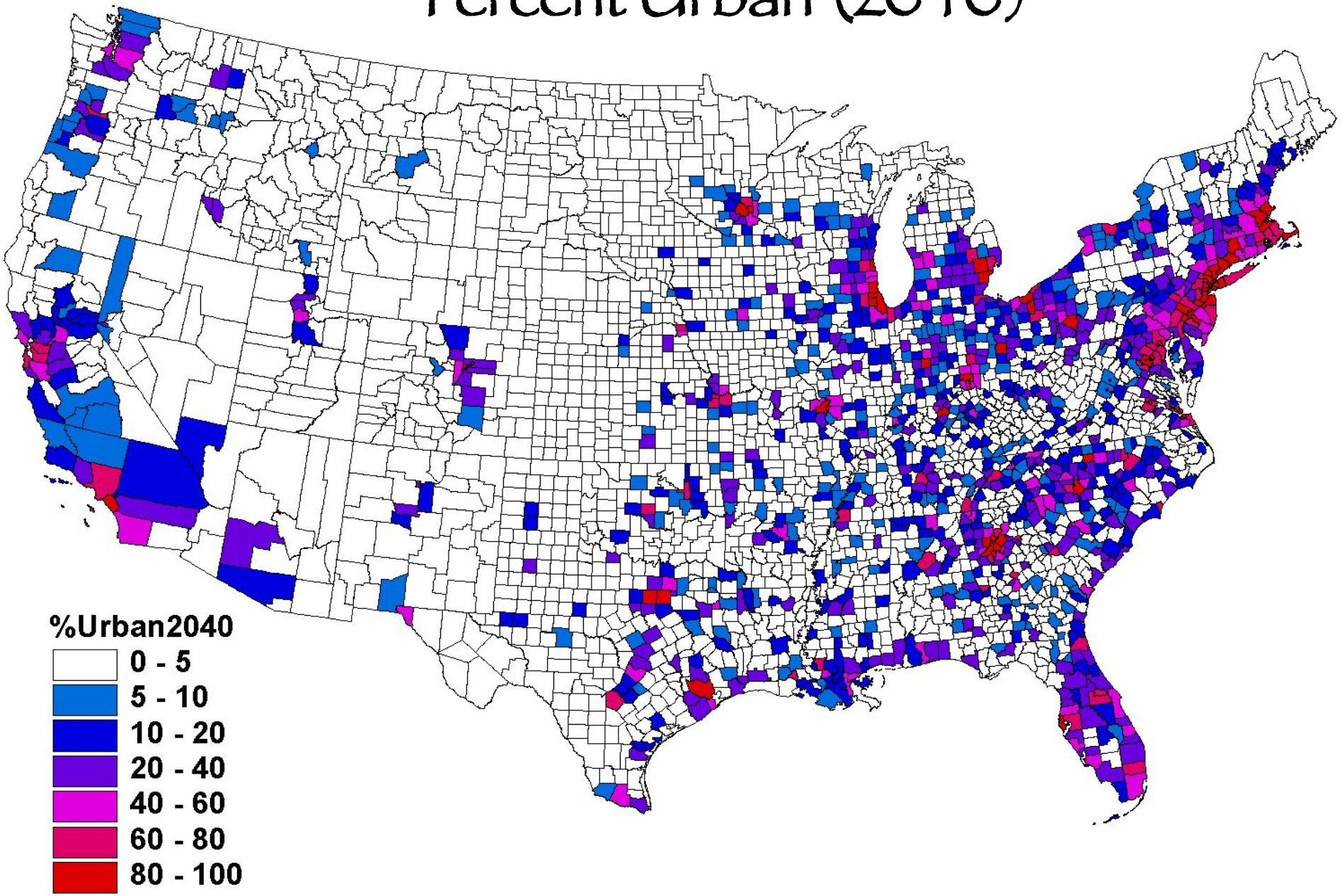
Percent Urban (2020)



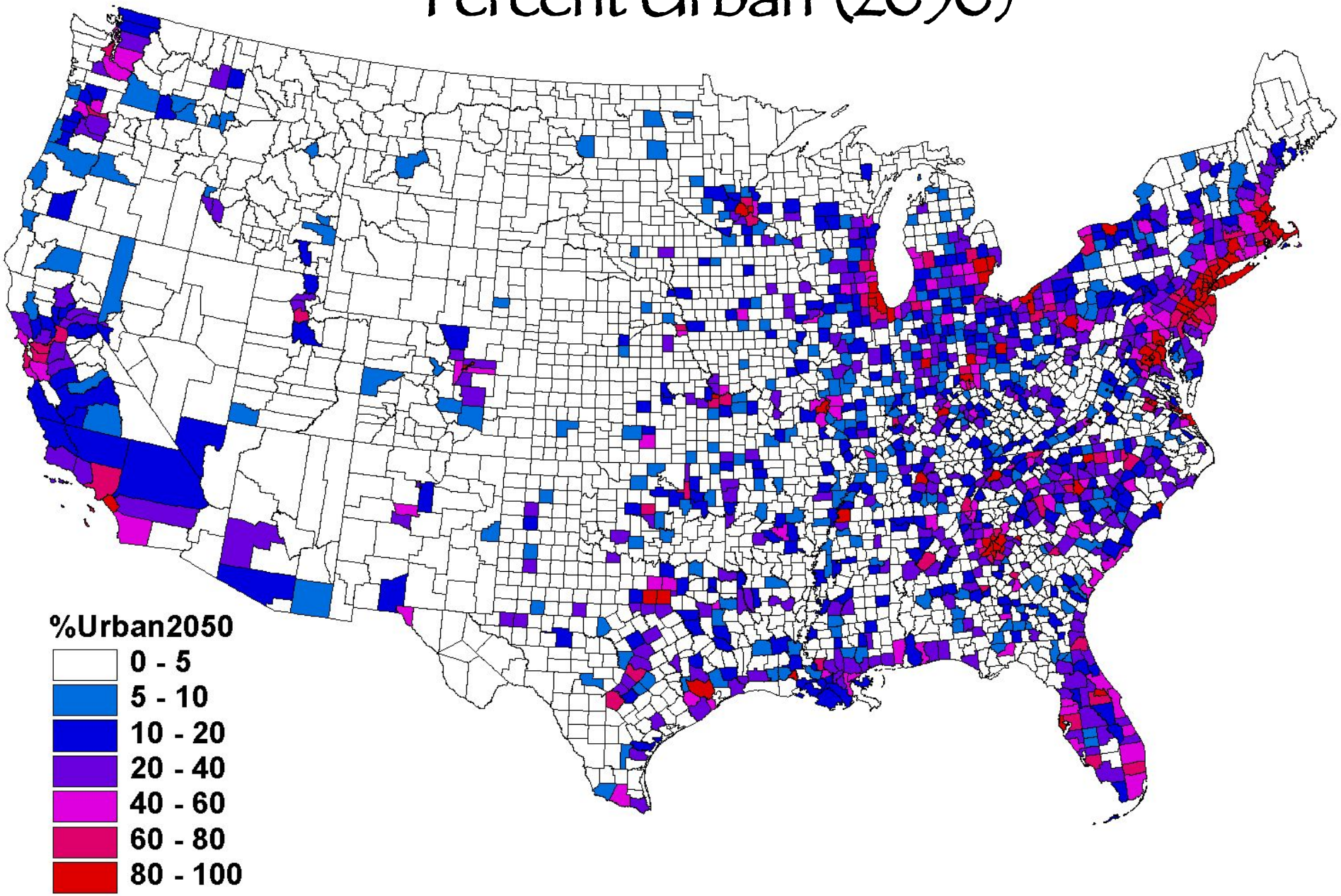
Percent Urban (2030)



Percent Urban (2040)



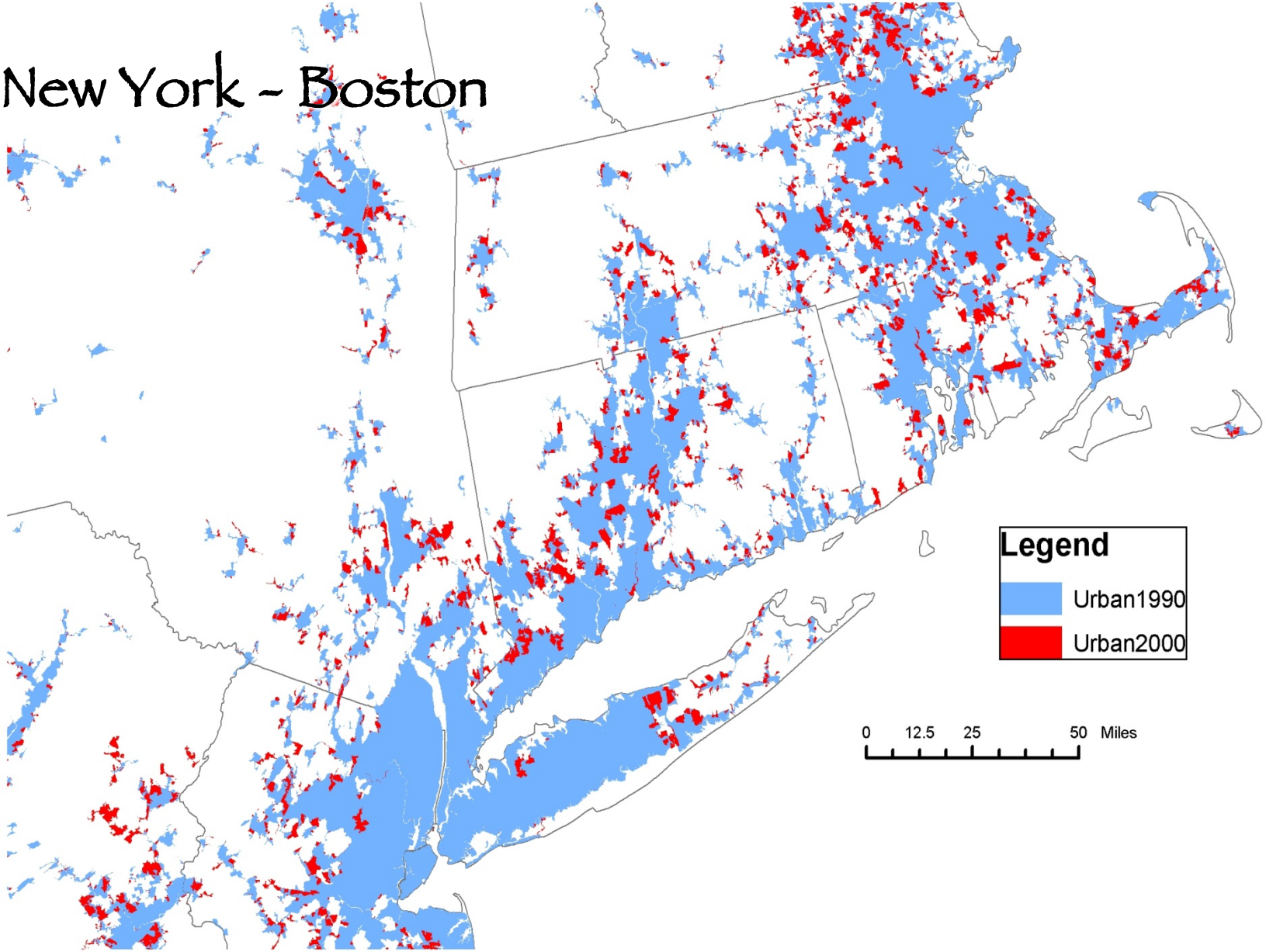
Percent Urban (2050)



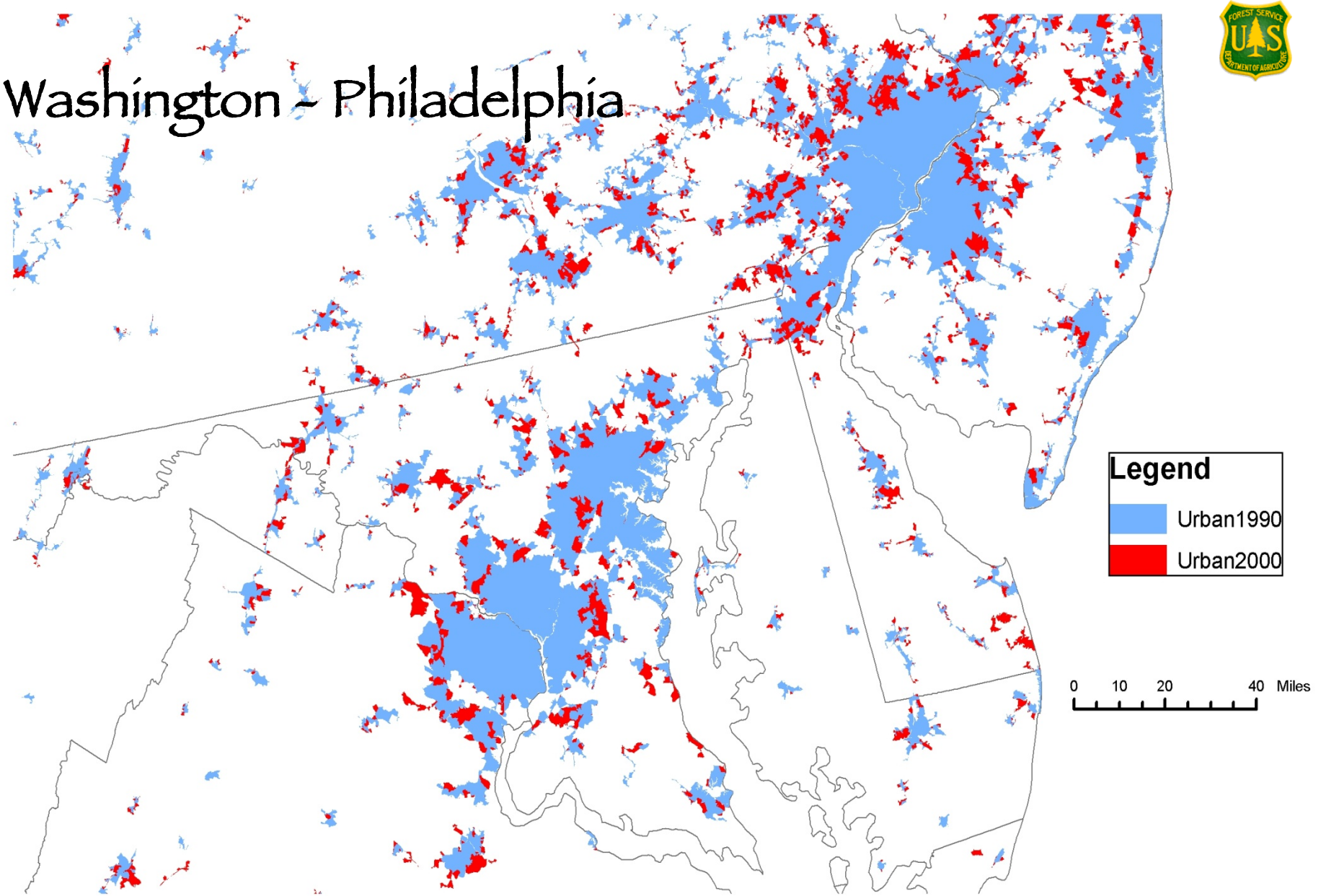
Urban Land (1990-2000)

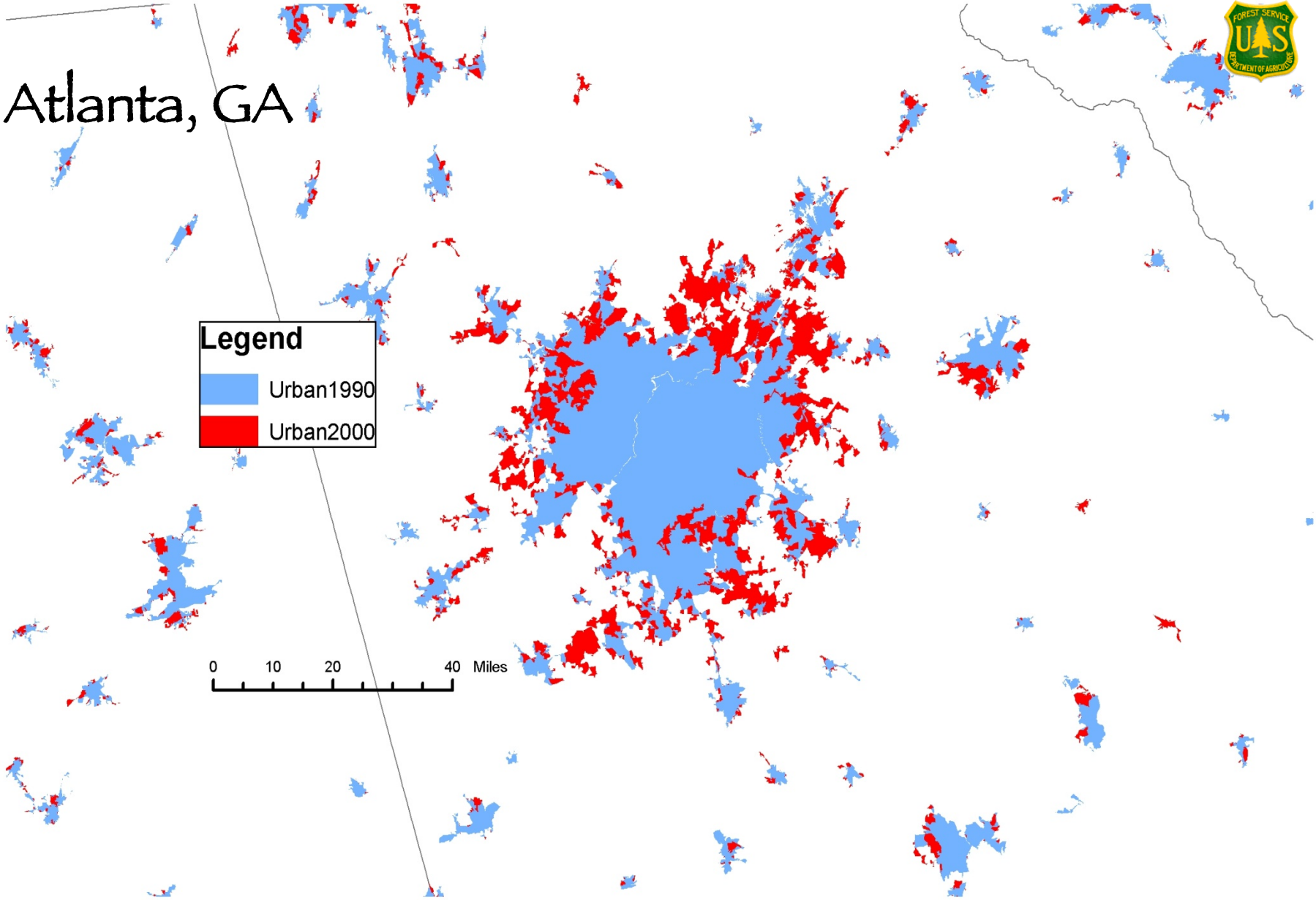
State	Urban (1990)		Urban (2000)		Growth (1990-2000)		Urban Area Rank (2000)
	(km^2)	(%)	(km^2)	(%)	(km^2)	(%)	
RI	862	30.2	1,026	35.9	164	5.7	2
NJ	6,280	31.2	7,304	36.2	1,024	5.1	1
CT	3,947	30.6	4,591	35.5	643	5.0	3
MA	6,218	29.2	7,273	34.2	1,055	5.0	4
DE	572	10.9	787	15.0	215	4.1	6
MD	3,873	14.3	4,680	17.3	807	3.0	5
FL	12,518	8.3	16,260	10.8	3,742	2.5	7
NC	6,573	5.0	9,219	7.1	2,645	2.0	11
PA	8,803	7.5	11,048	9.4	2,245	1.9	9
GA	6,888	4.5	9,700	6.4	2,812	1.8	13
US48	194,908	2.5	239,742	3.1	44,833	0.6	na
US50	196,164	2.1	241,336	2.6	45,173	0.5	na

New York - Boston

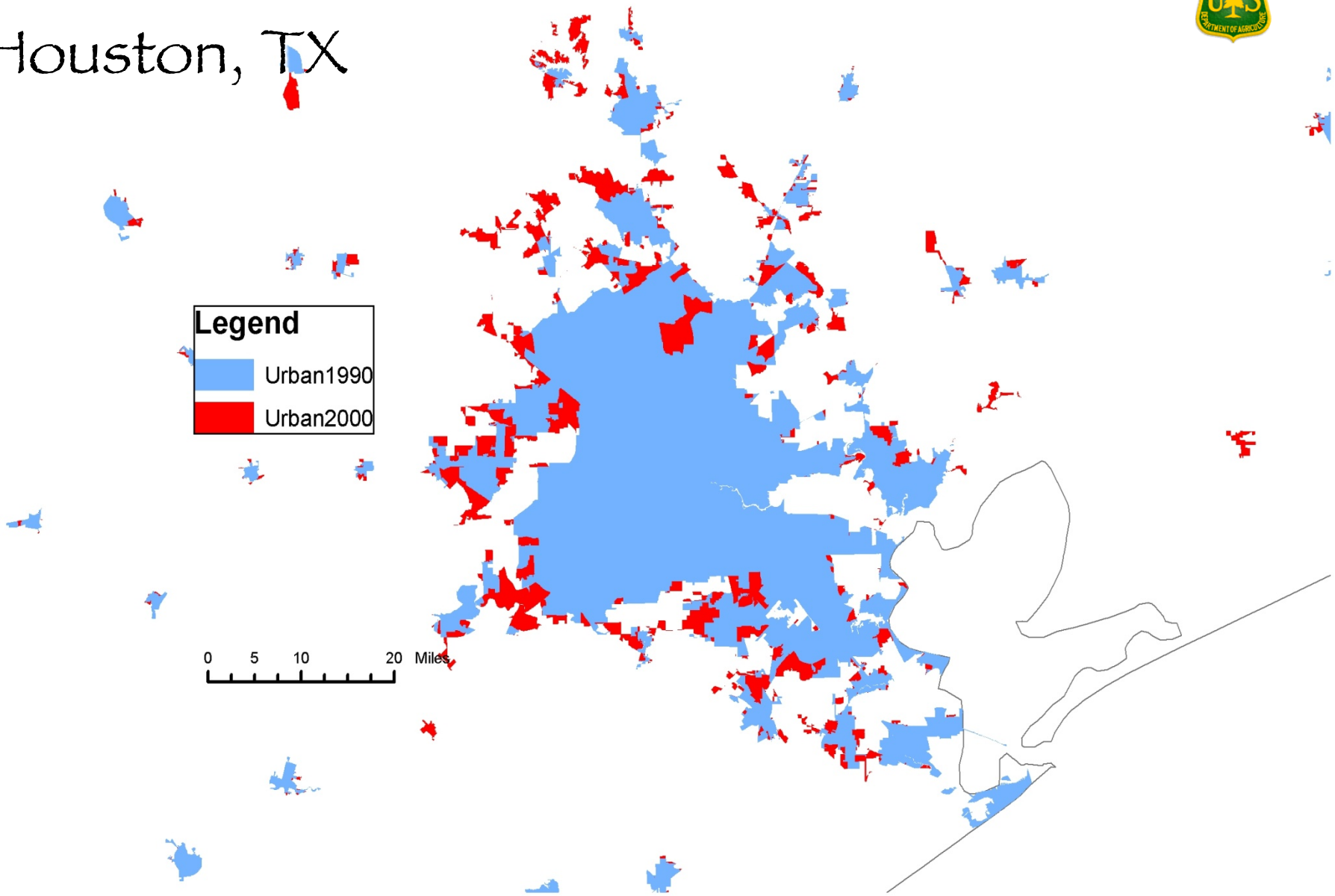


Washington ~ Philadelphia

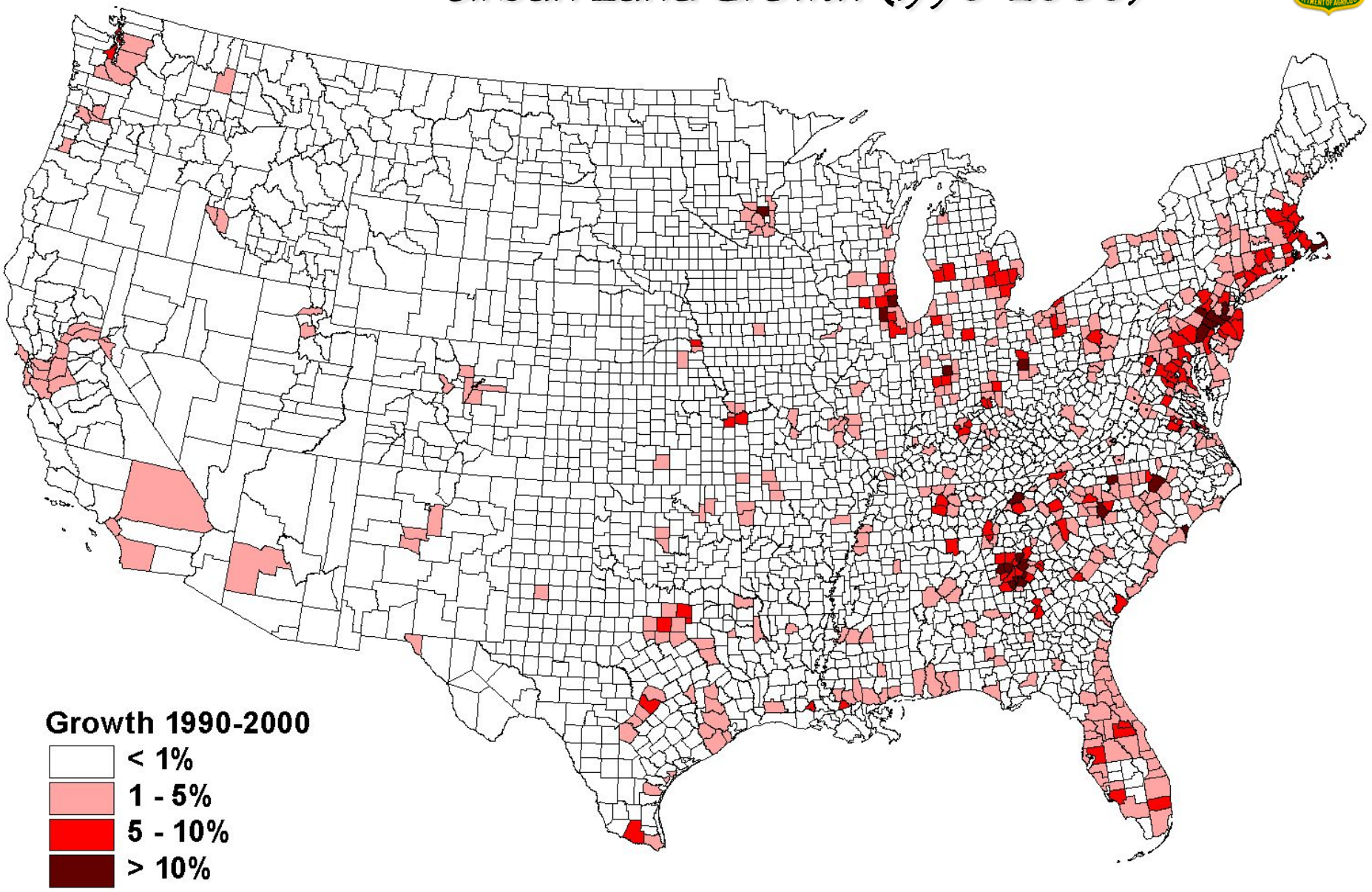



Atlanta, GA
Legend
Urban1990
Urban2000
0
10
20
40
Miles

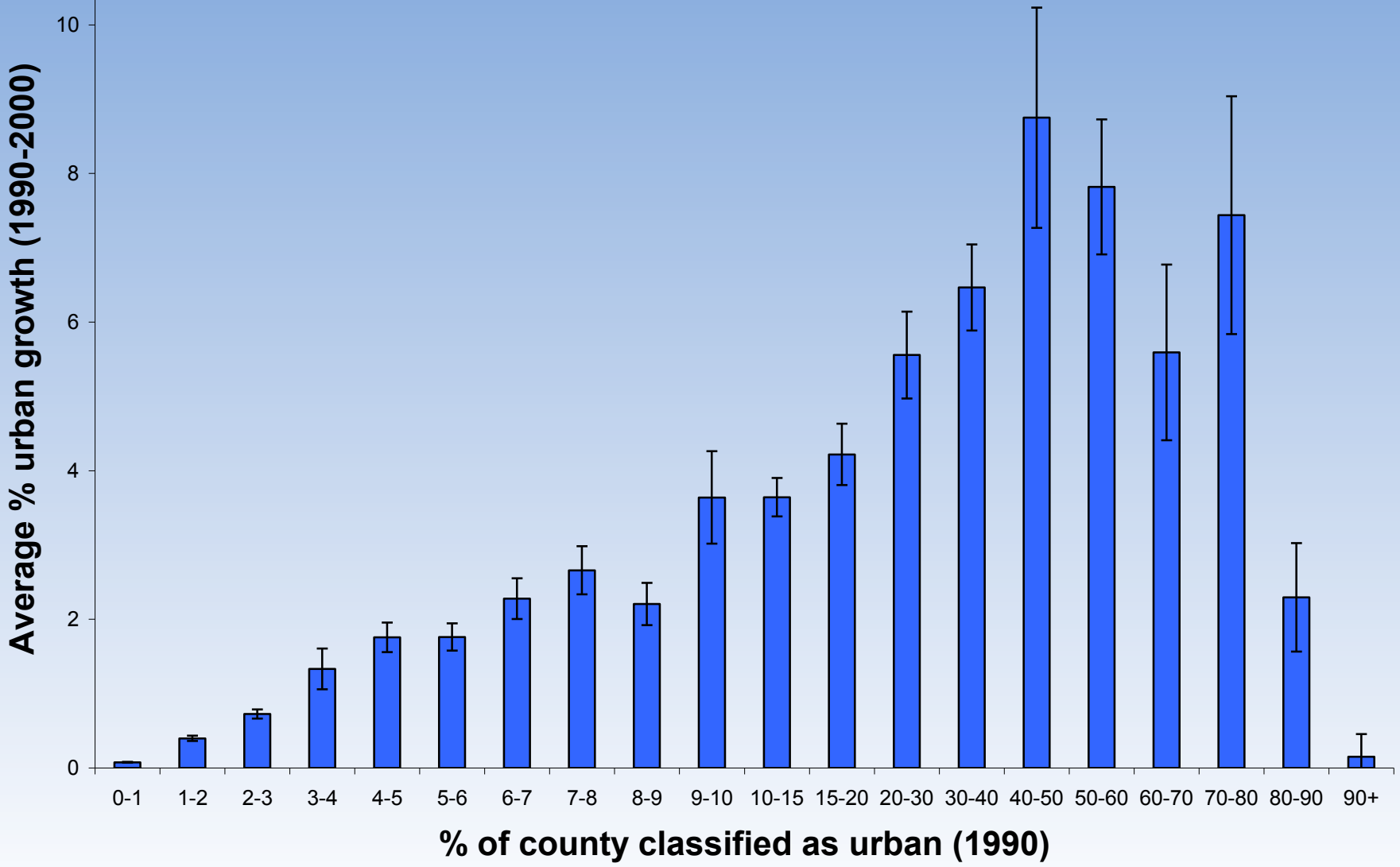
Houston, TX



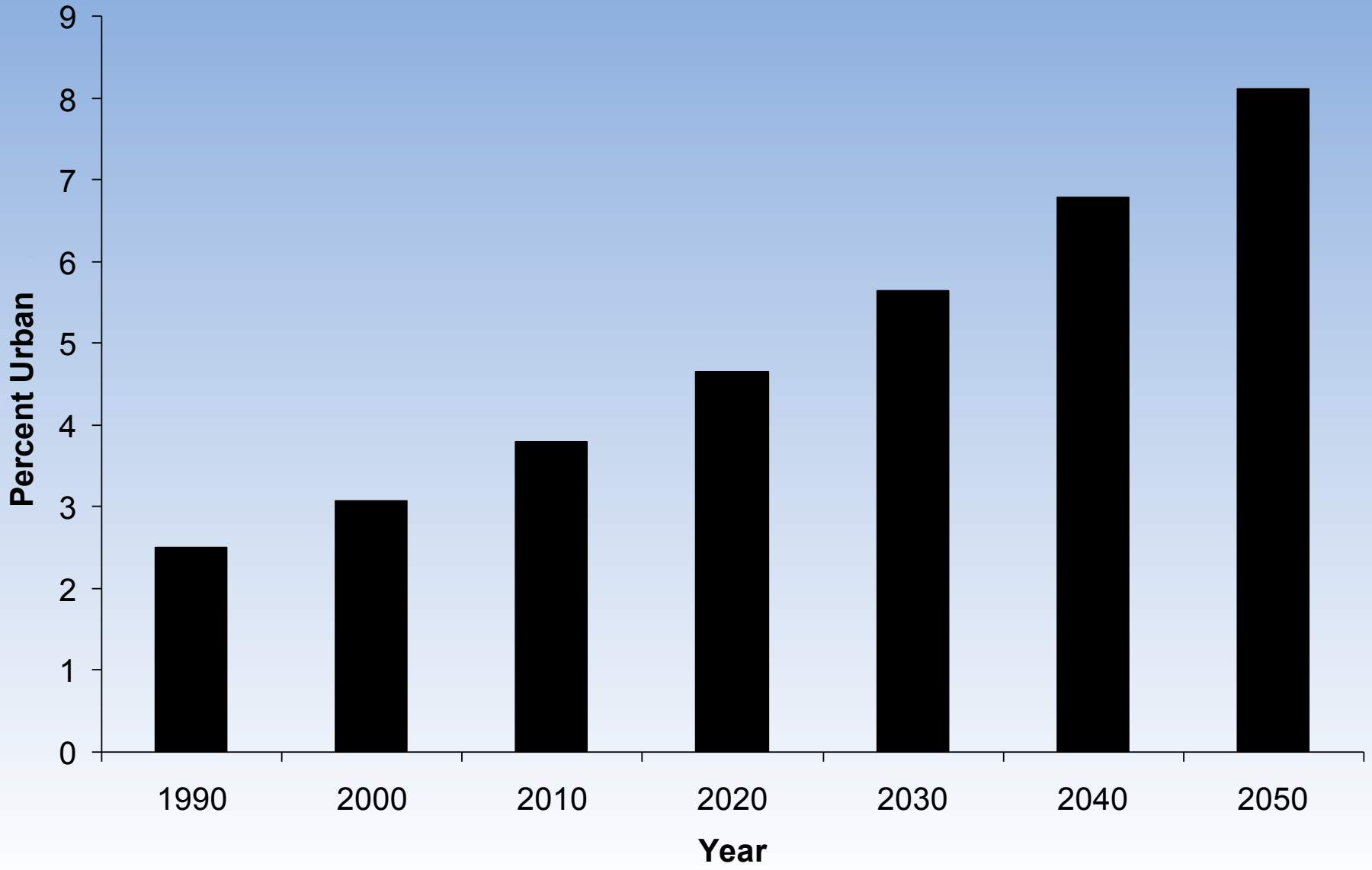
Urban Land Growth (1990-2000)



National average percent increase in urban land within counties (1990-2000) by percent urban land in 1990



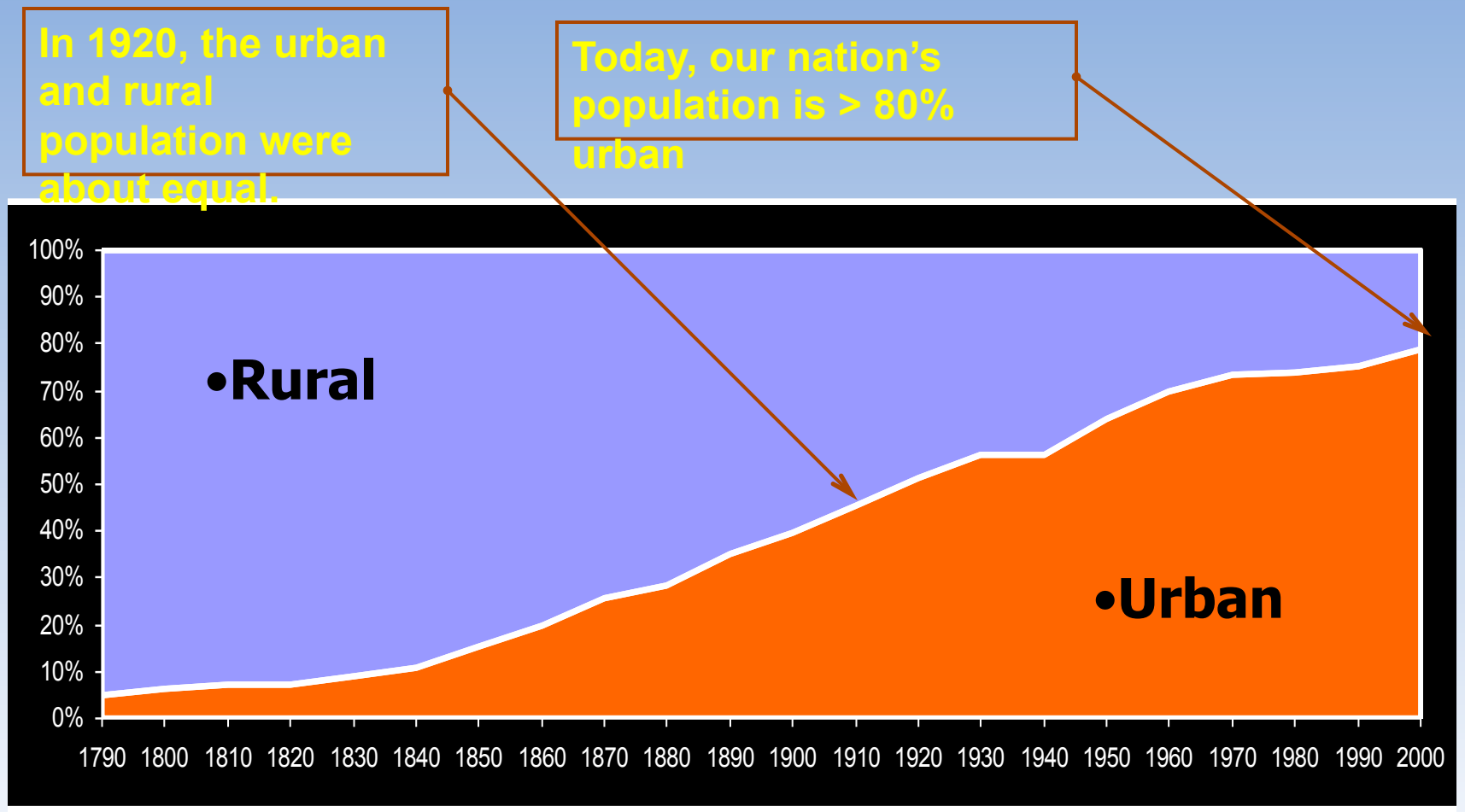
Percent Urban (lower 48 states)



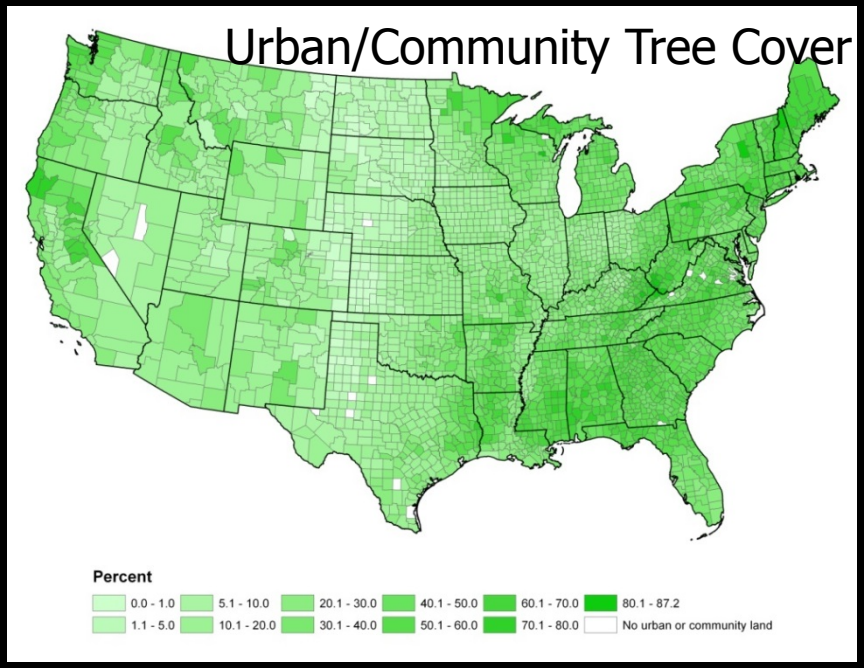
Urban Growth (lower 48 states)

- 1990 – 2000: about the area of Vermont and New Hampshire combined
- 2000 – 2050: larger than Montana

- US Urban and Rural Population Mix (1790–2000)

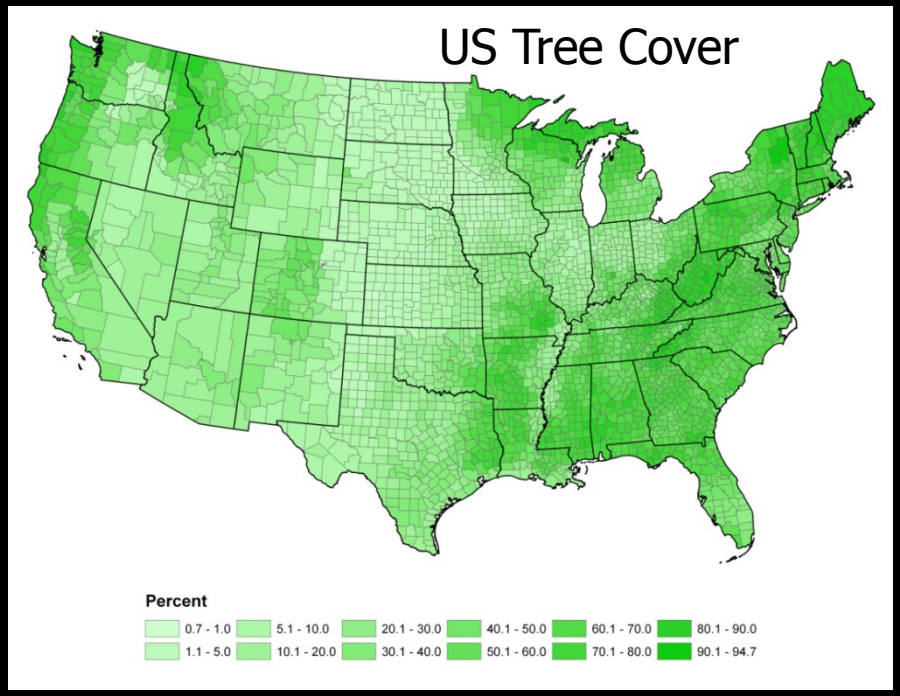


Tree Cover - Nationally



- Region and population density influence tree cover

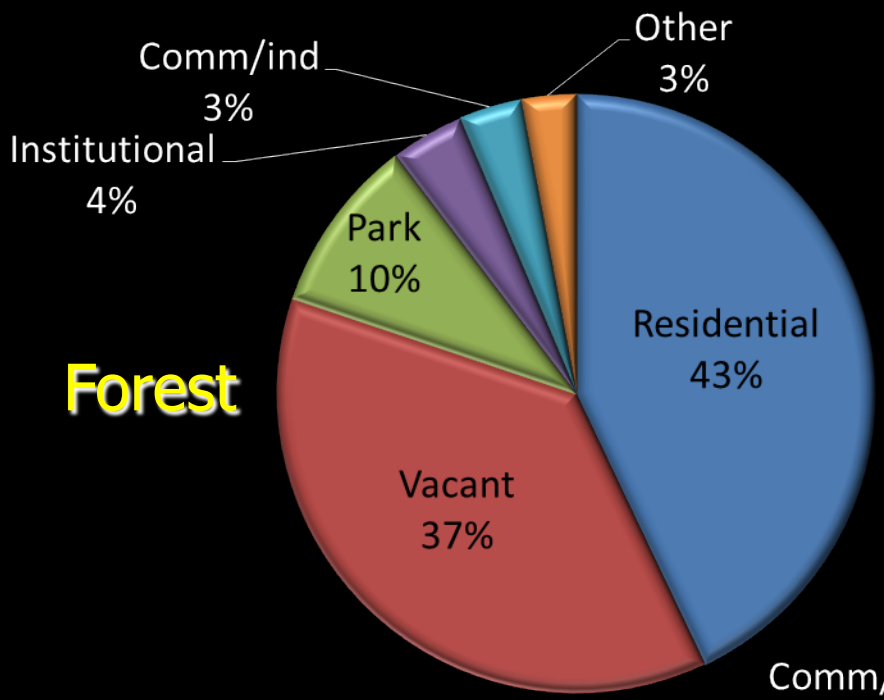
- Average US tree cover = 34.2%

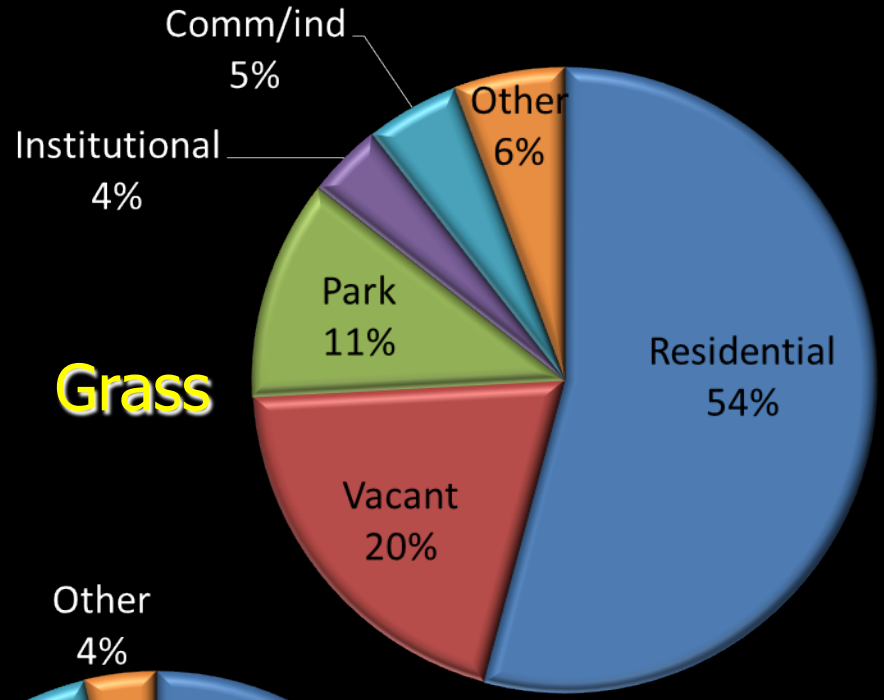


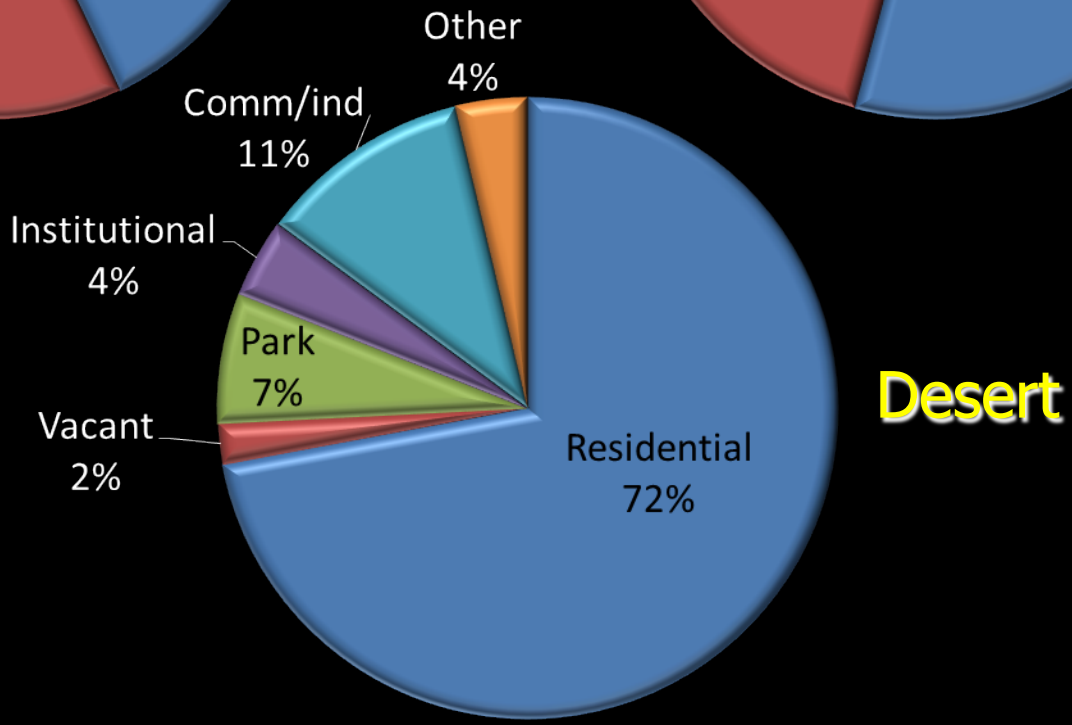
- Urban/comm. tree cover = 35.1%
- Rural tree cover = 34.1%

- Urban/comm. imp. cover = 17.5%
- Rural impervious cover = 1.5%

Percent of Total Tree Cover in Cities by Land Use







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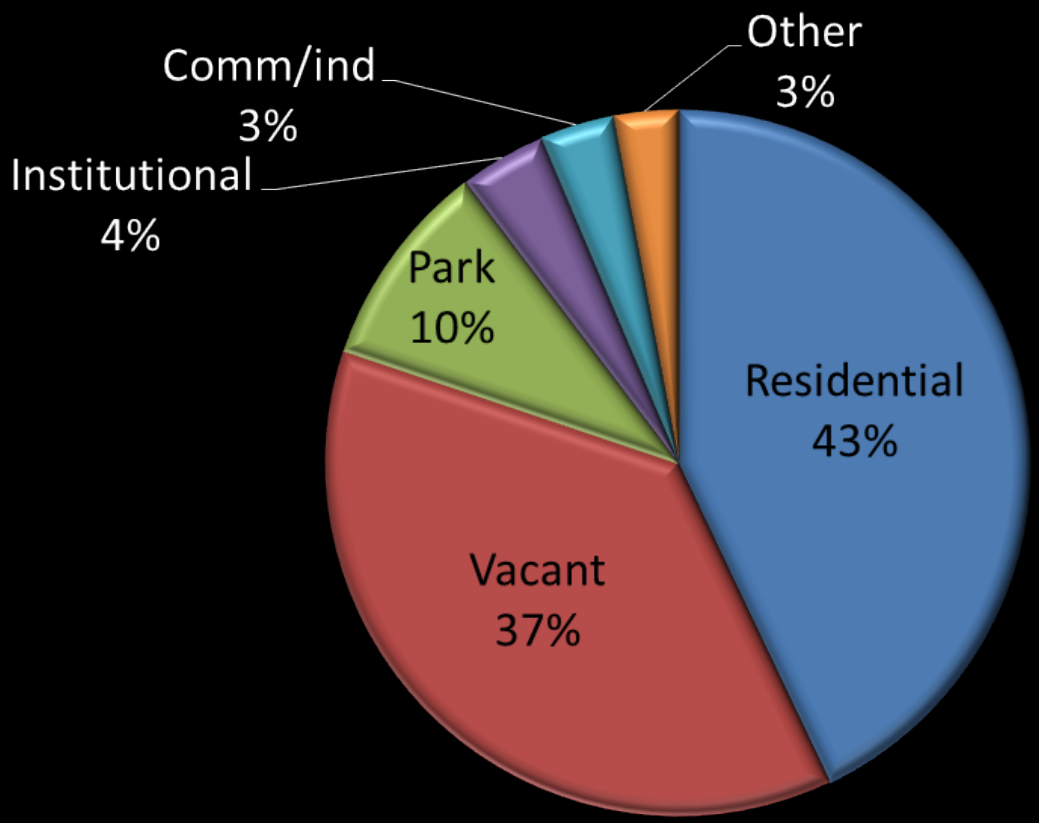
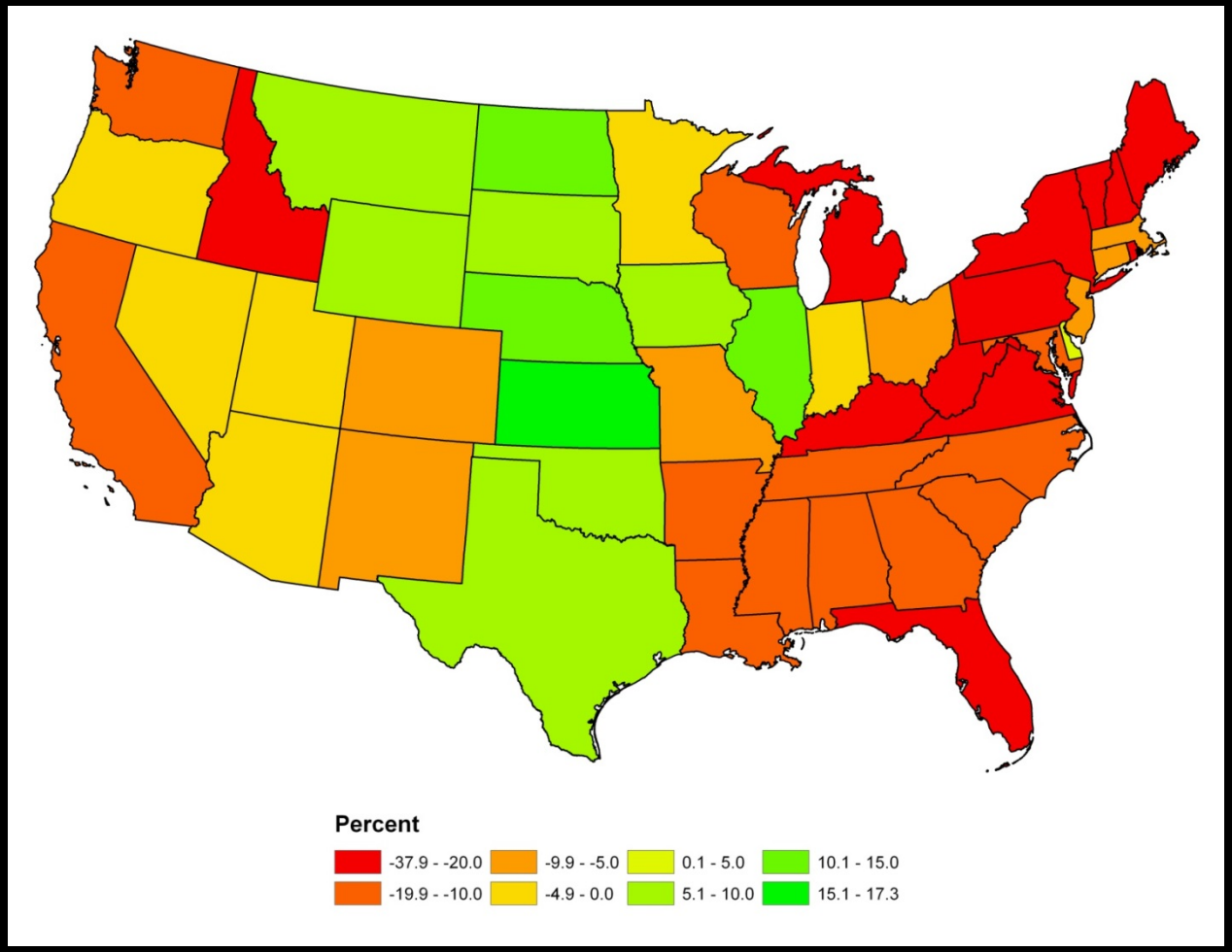


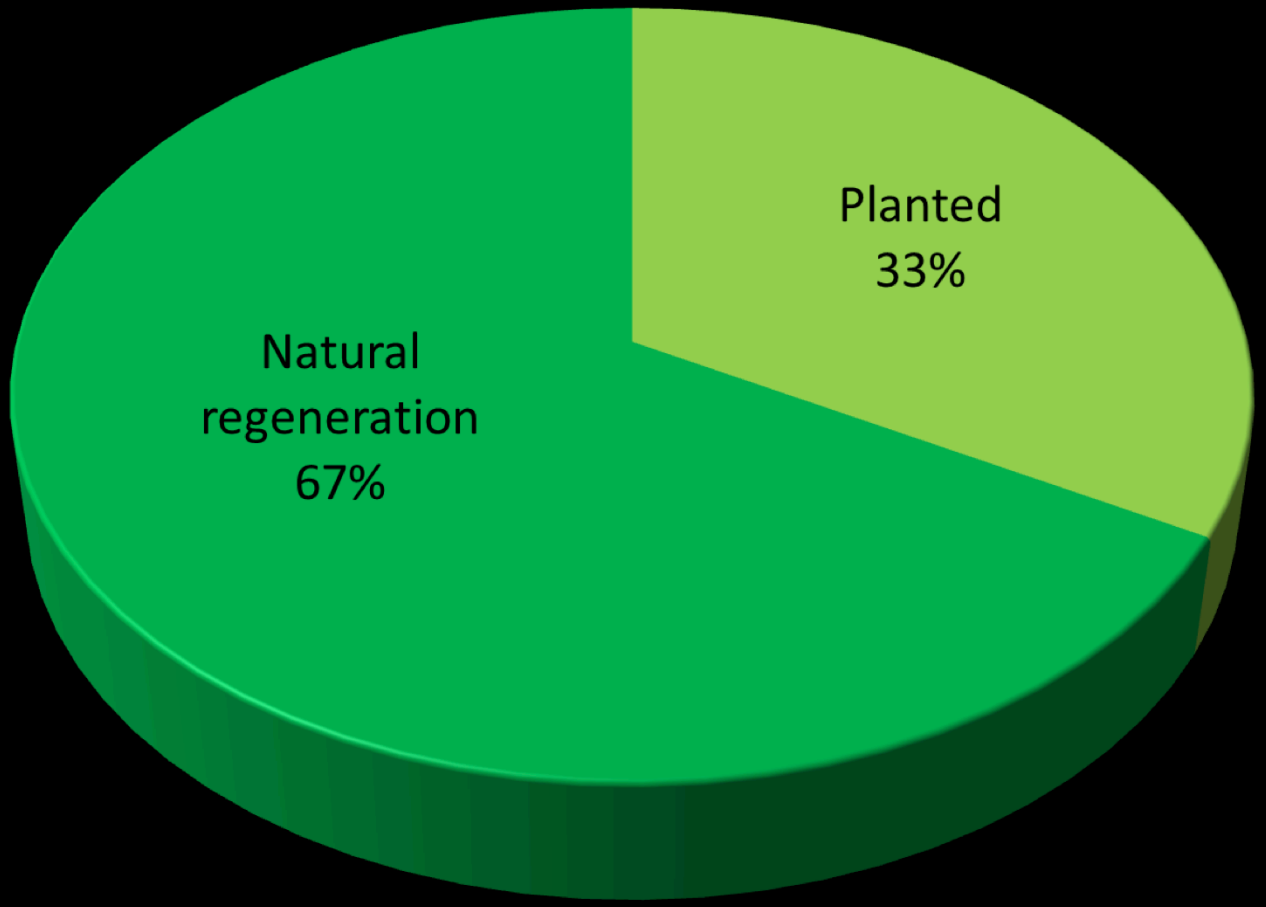
Tree Cover – Urban vs Rural

- Difference in Tree Cover between Urban / Community Land and Rural Land



Nature and Humans - Locally

- What percent of trees in cities are planted?



Planting varies by city population density and region

City	%Planted	SE
Los Angeles, CA	89.0	1.2
Mississauga, Ont.	57.7	2.0
Toronto, Ont.	45.9	1.0
Chicago, IL	45.0	1.2
Markham, Ont.	33.7	1.4
Ajax, Ont.	30.0	1.1
London, Ont.	29.0	0.9
Richmond Hill, Ont.	27.4	1.0
Vaughan, Ont.	25.9	1.1
Brampton, Ont.	19.9	1.2
Pickering, Ont.	18.4	0.7
Syracuse, NY[a]	12.8	1.3
Hartford, CT	11.1	1.1
Baltimore, MD[a]	7.3	2.1

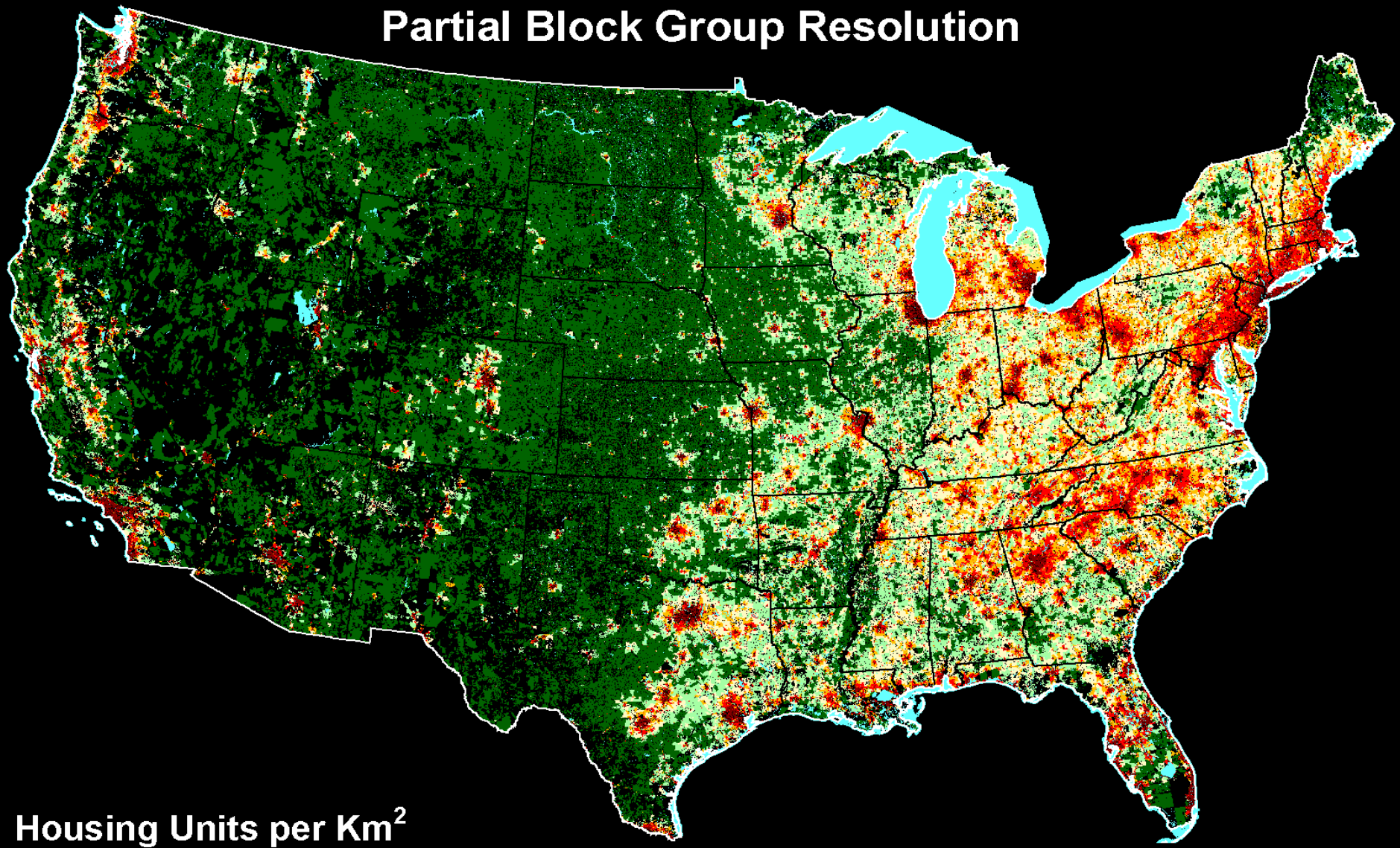
Percent planting varies by land use

Land use	% Planted	SE
Residential	74.8	0.5
Commercial/Industrial	61.2	1.8
Institutional	19.7	1.5
Utilities/Transportation	15.1	1.5
Other	13.8	1.4
Park/Cemetery/Golf	10.7	0.5
Open Space/Vacant	7.1	0.3
Agriculture	2.0	0.5
Wetland/Water	0.8	0.8

SE= standard error.

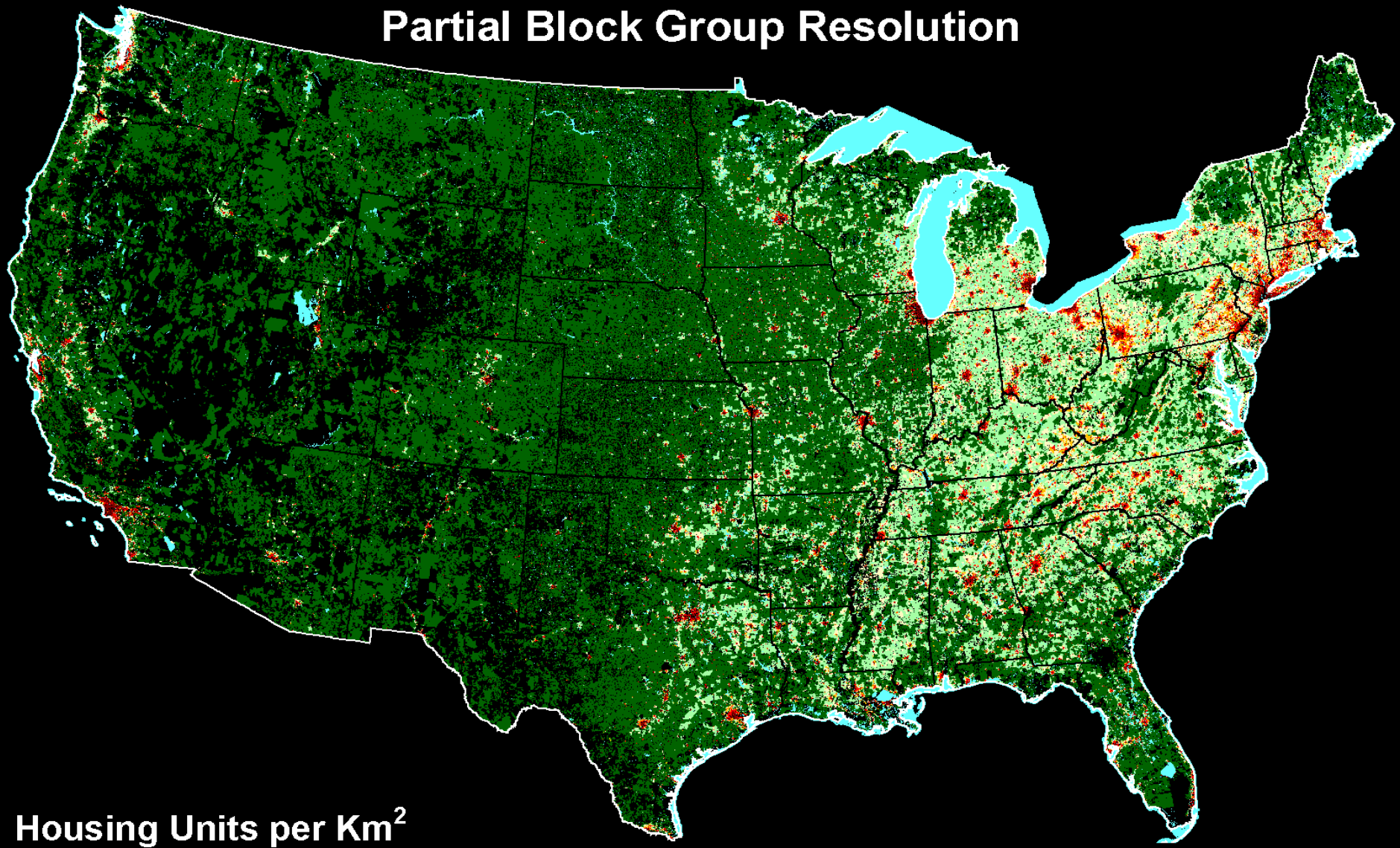
Housing Density 2000

Partial Block Group Resolution



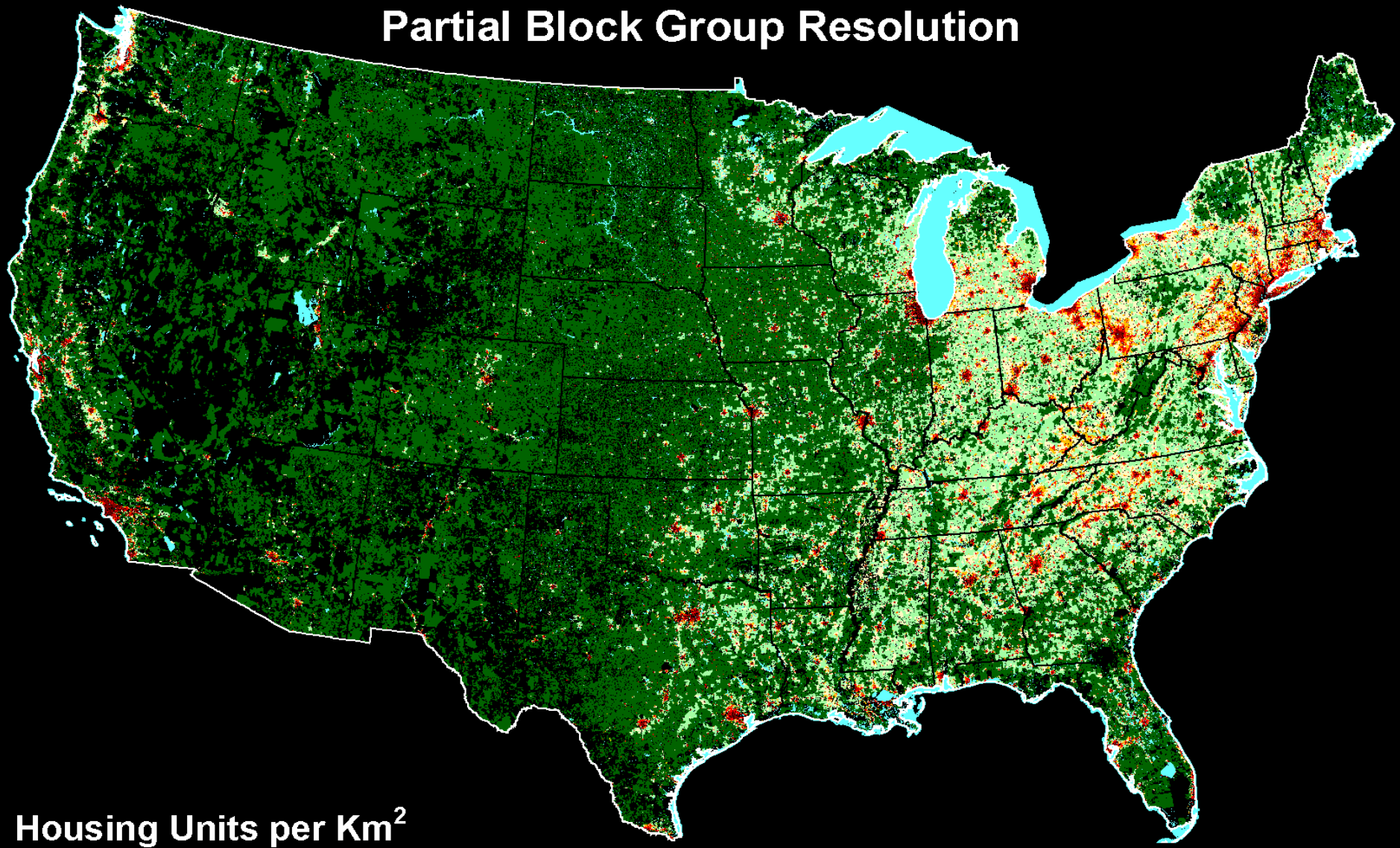
Housing Density 1940

Partial Block Group Resolution



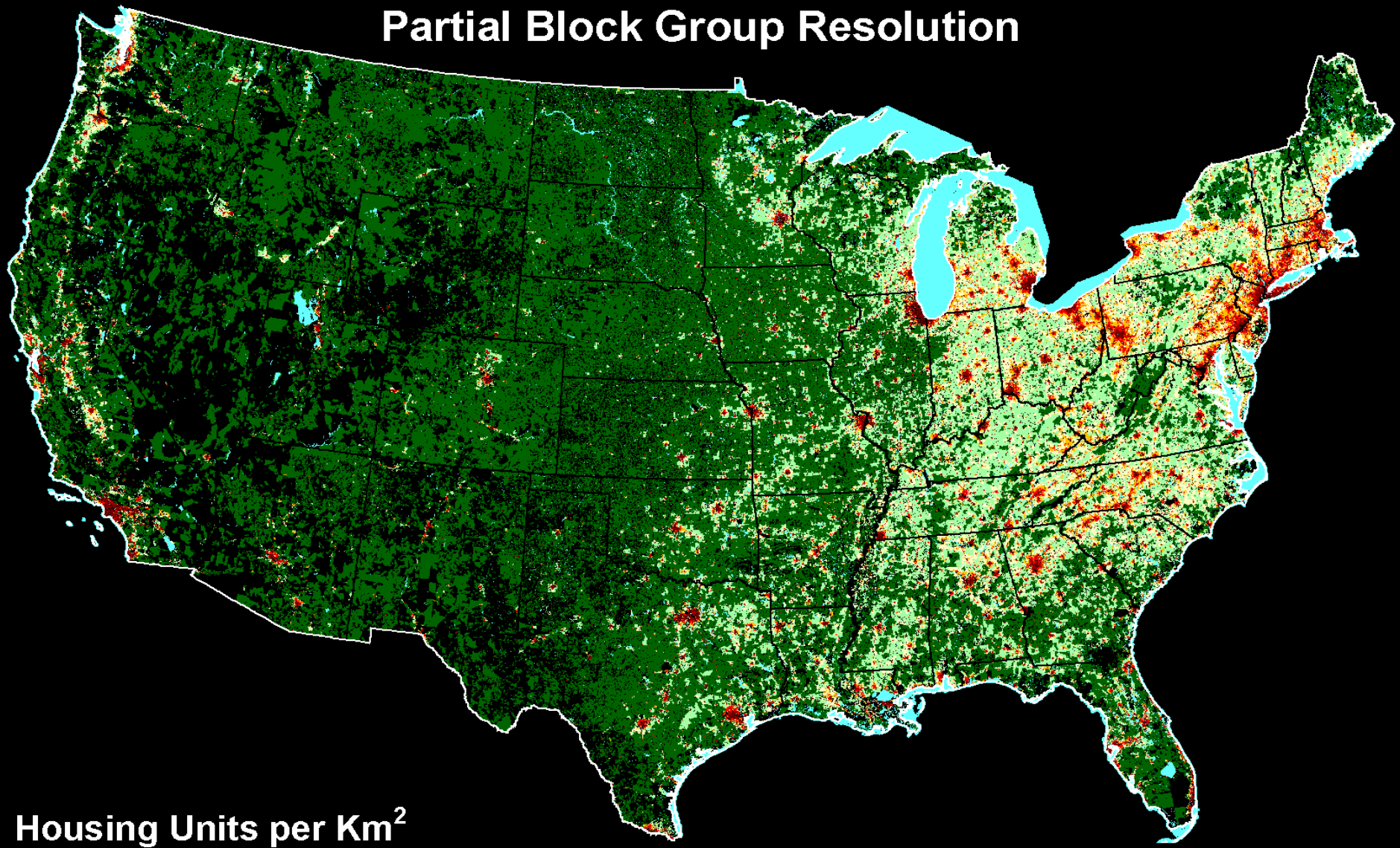
Housing Density 1950

Partial Block Group Resolution



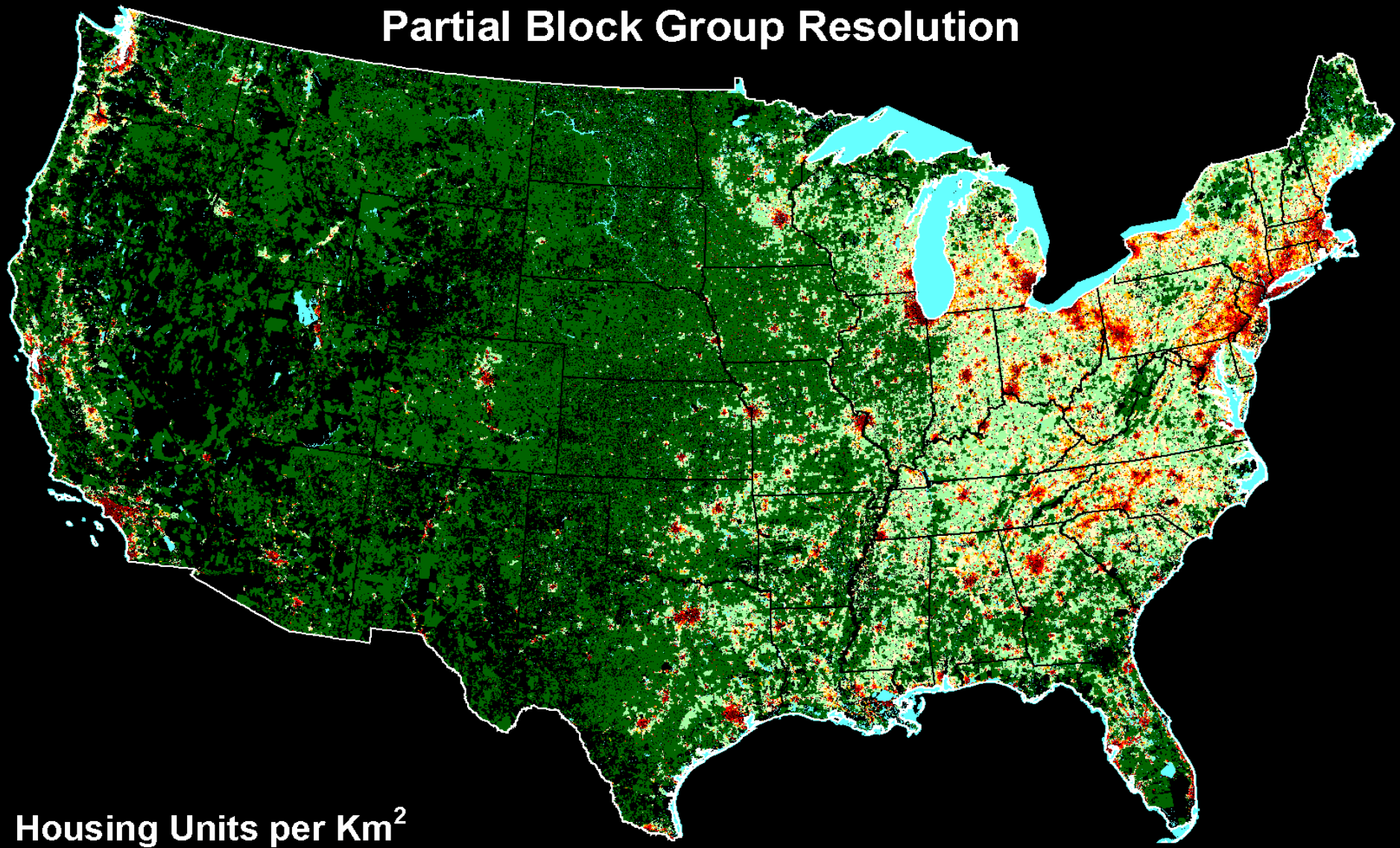
Housing Density 1960

Partial Block Group Resolution



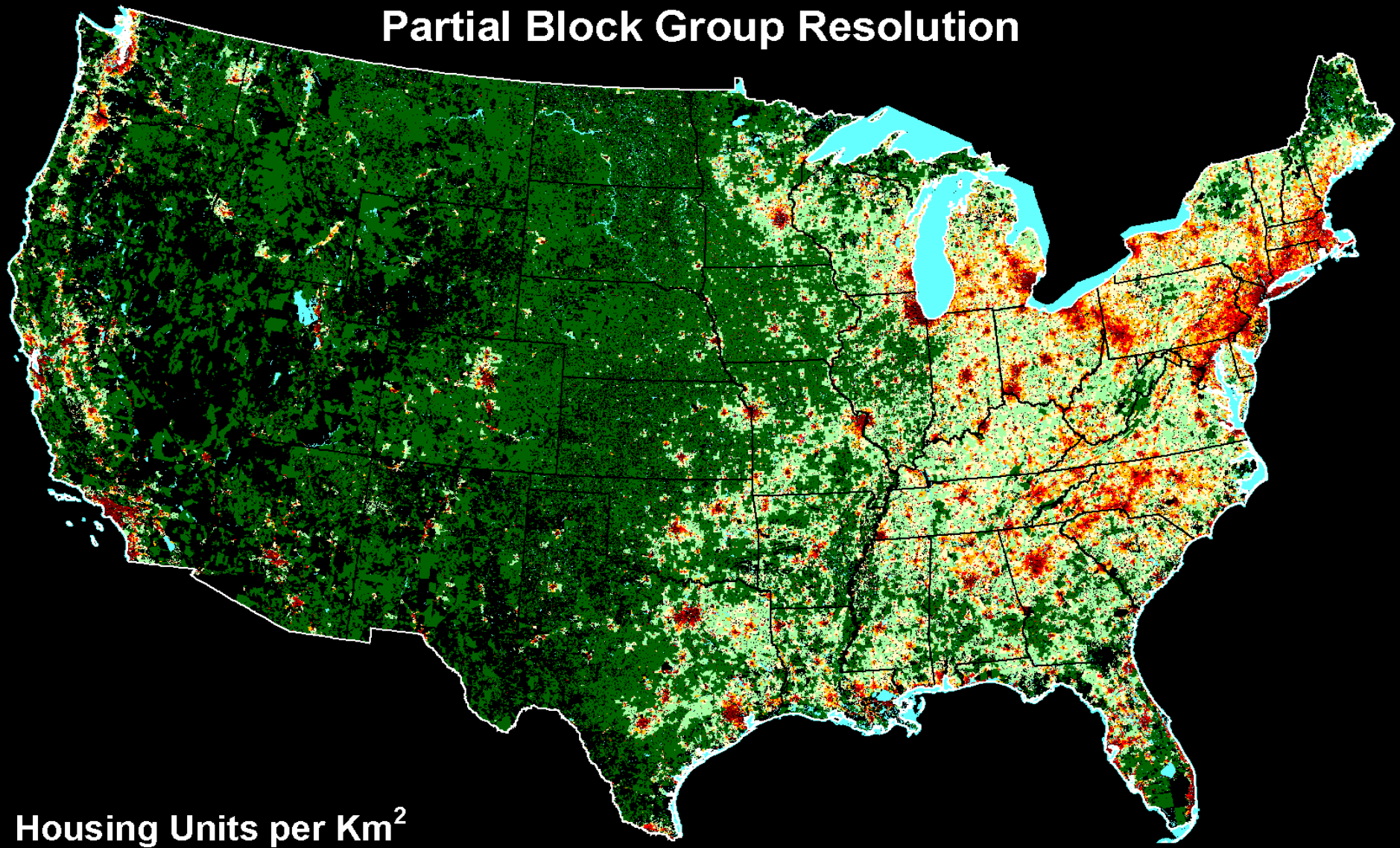
Housing Density 1970

Partial Block Group Resolution



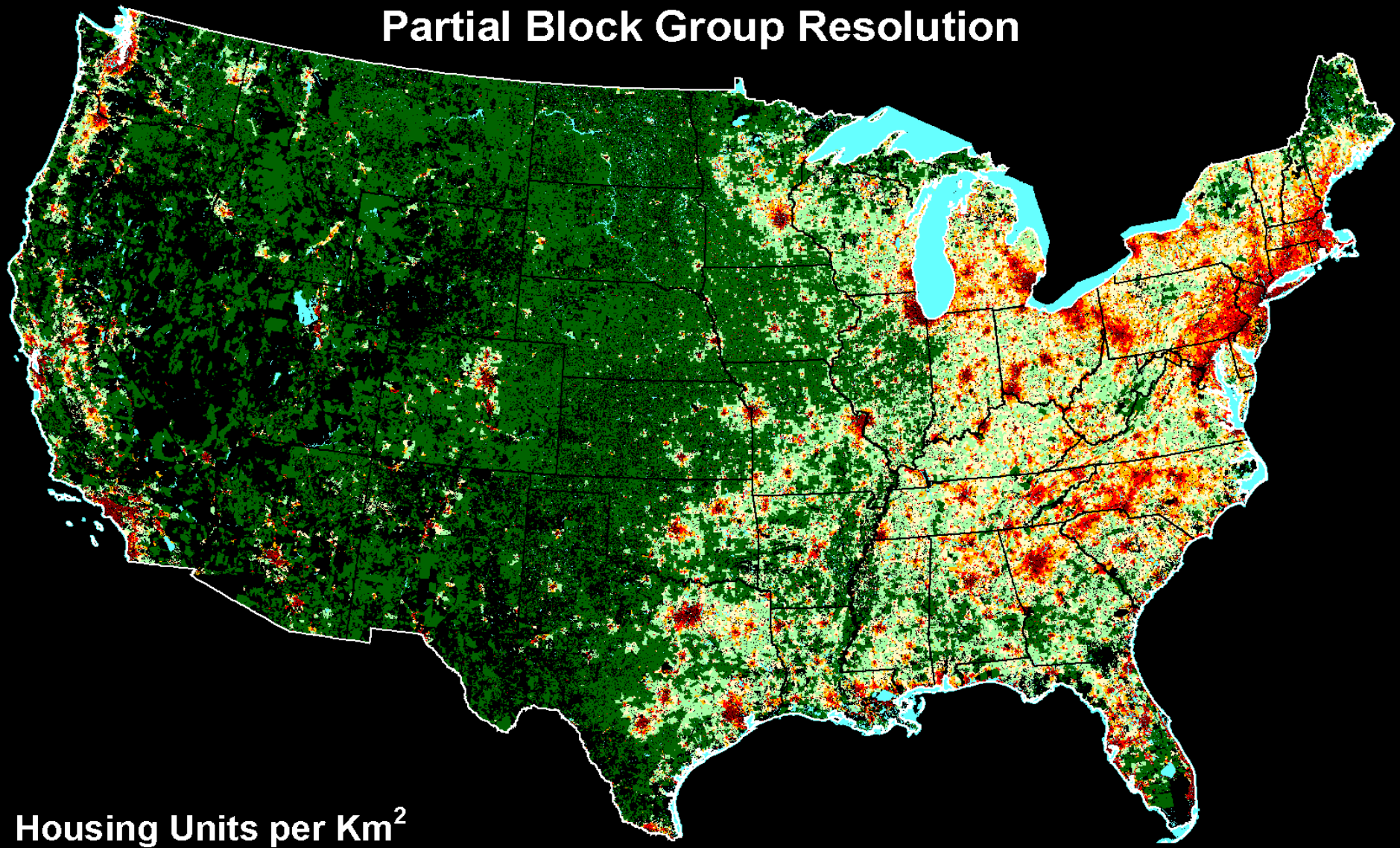
Housing Density 1980

Partial Block Group Resolution



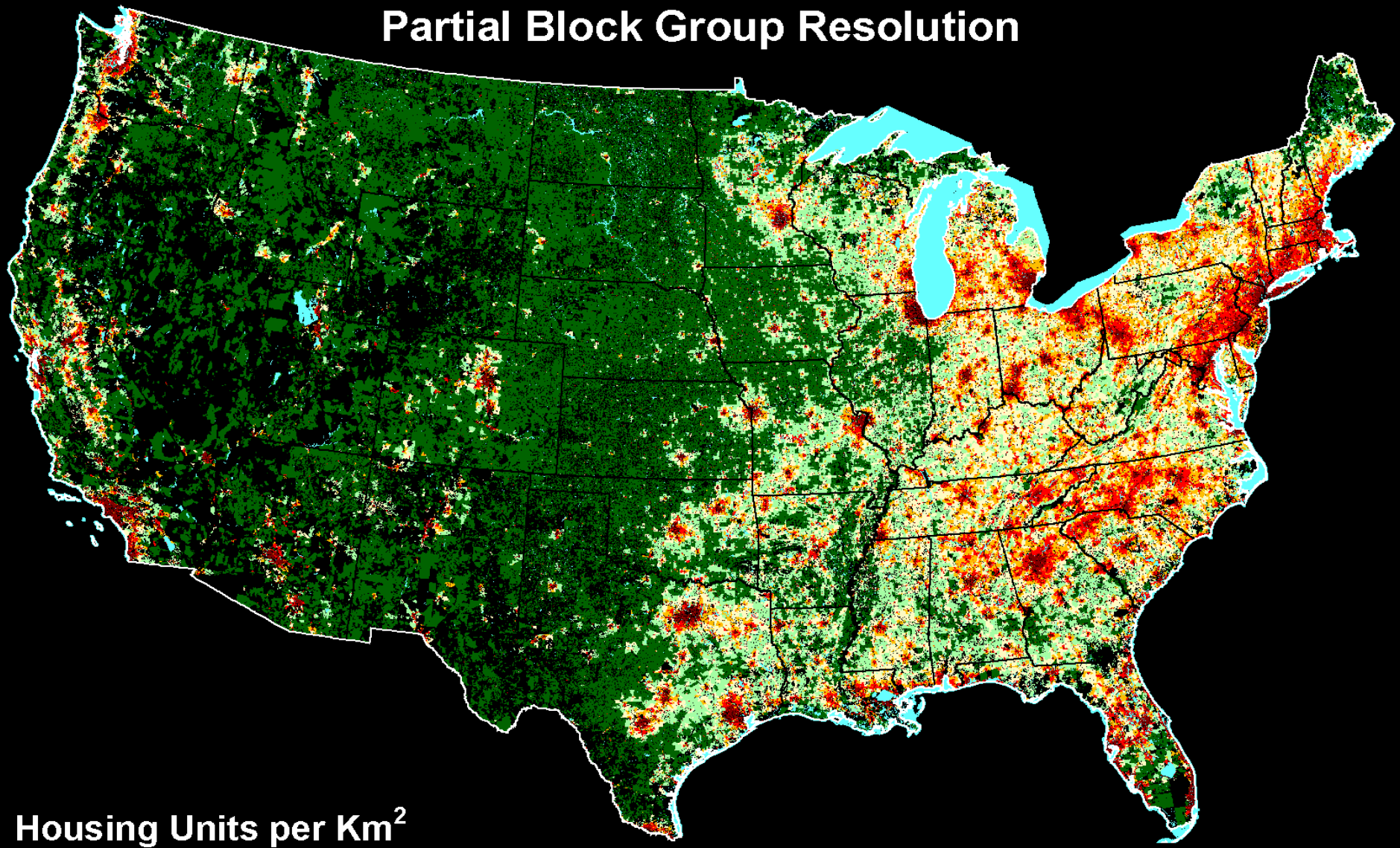
Housing Density 1990

Partial Block Group Resolution



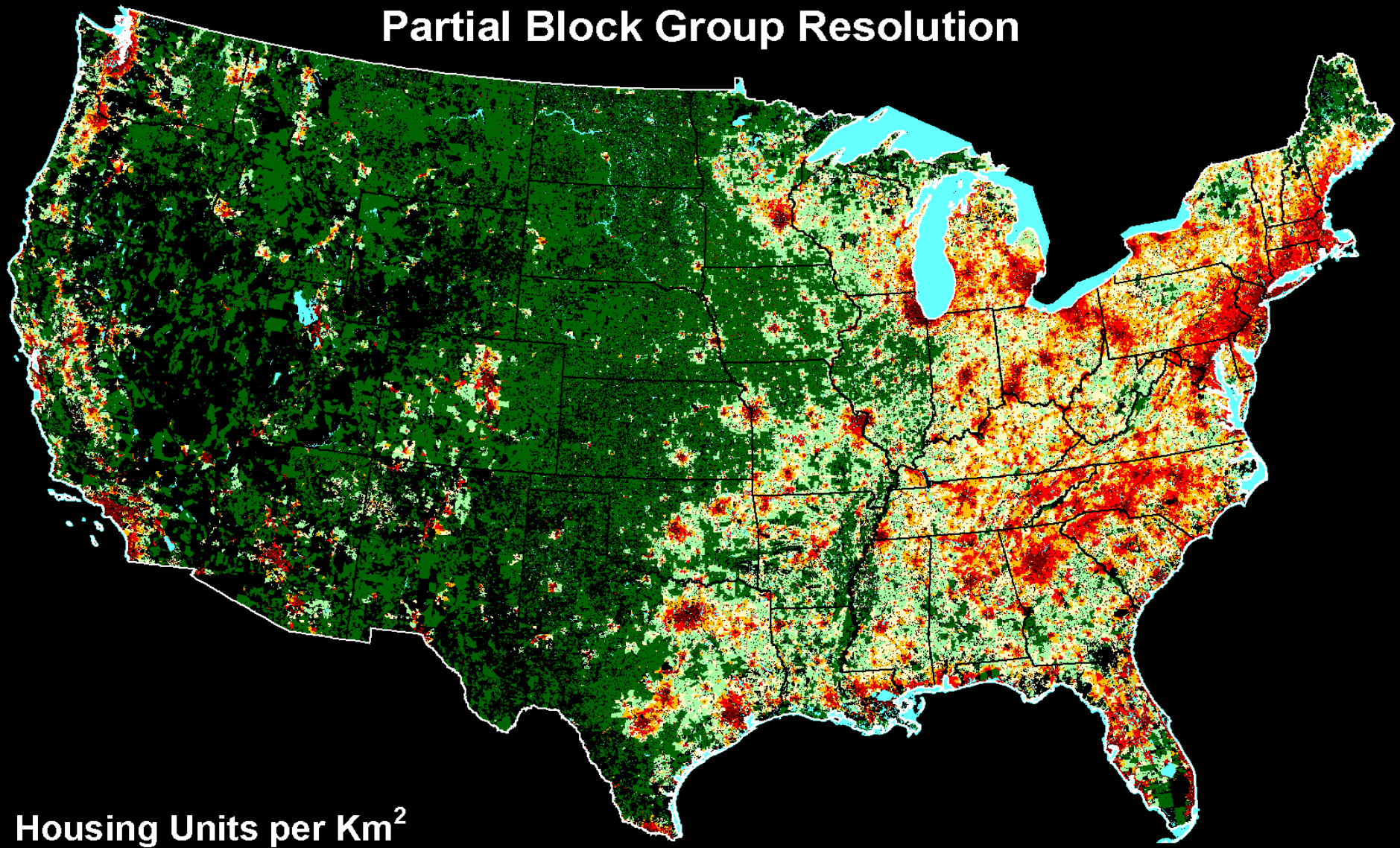
Housing Density 2000

Partial Block Group Resolution



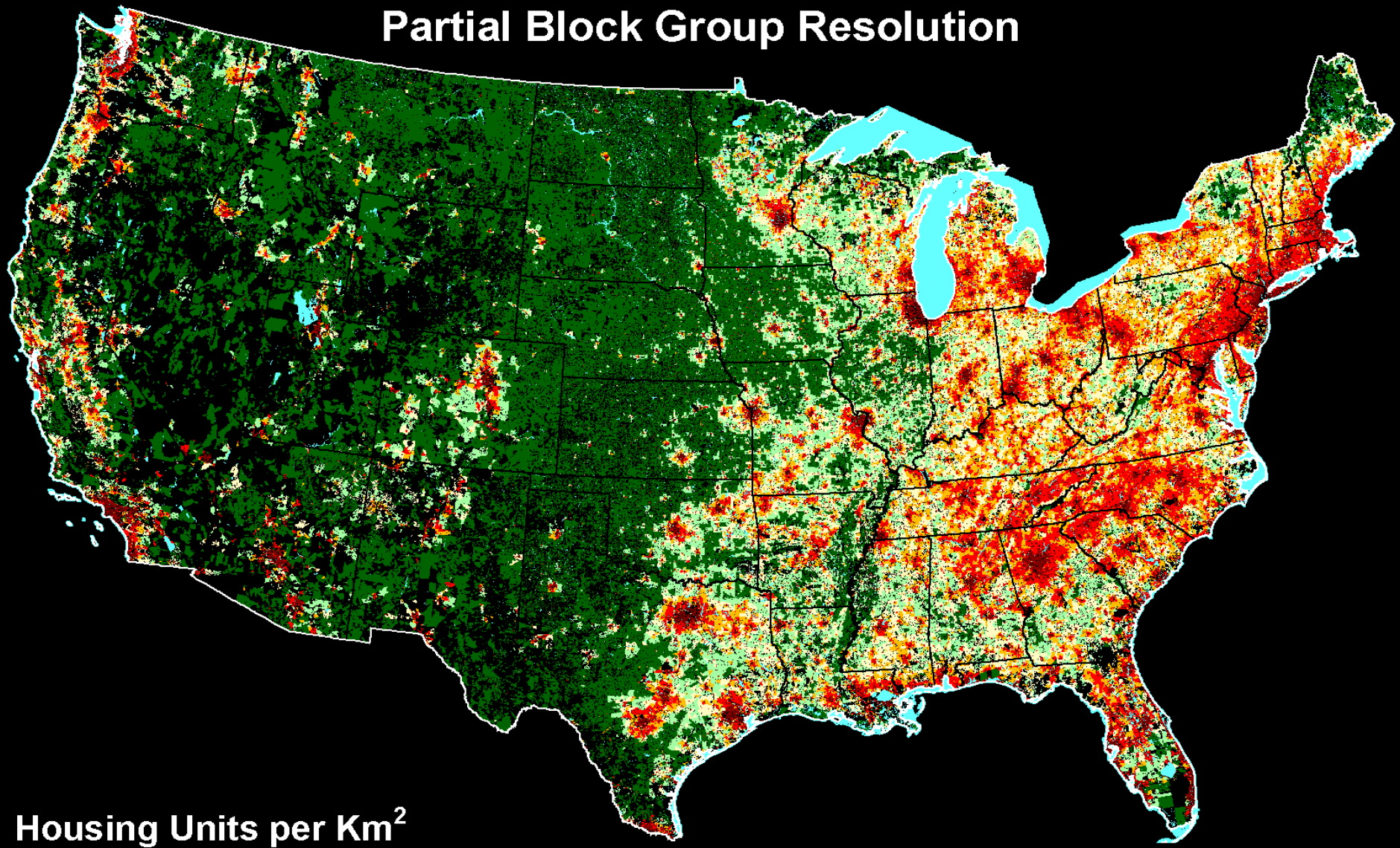
Projected Housing Density 2010

Partial Block Group Resolution



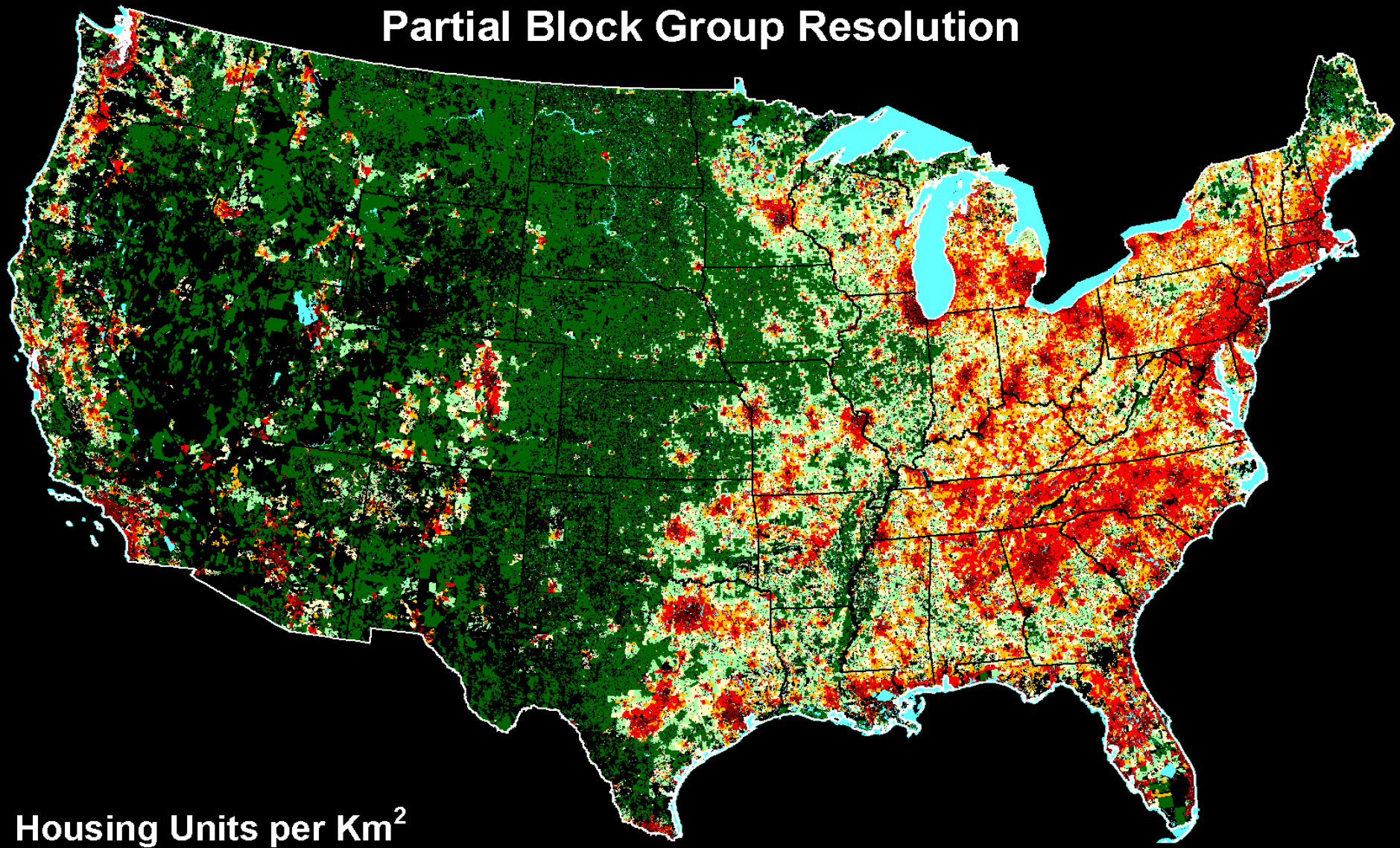
Projected Housing Density 2020

Partial Block Group Resolution



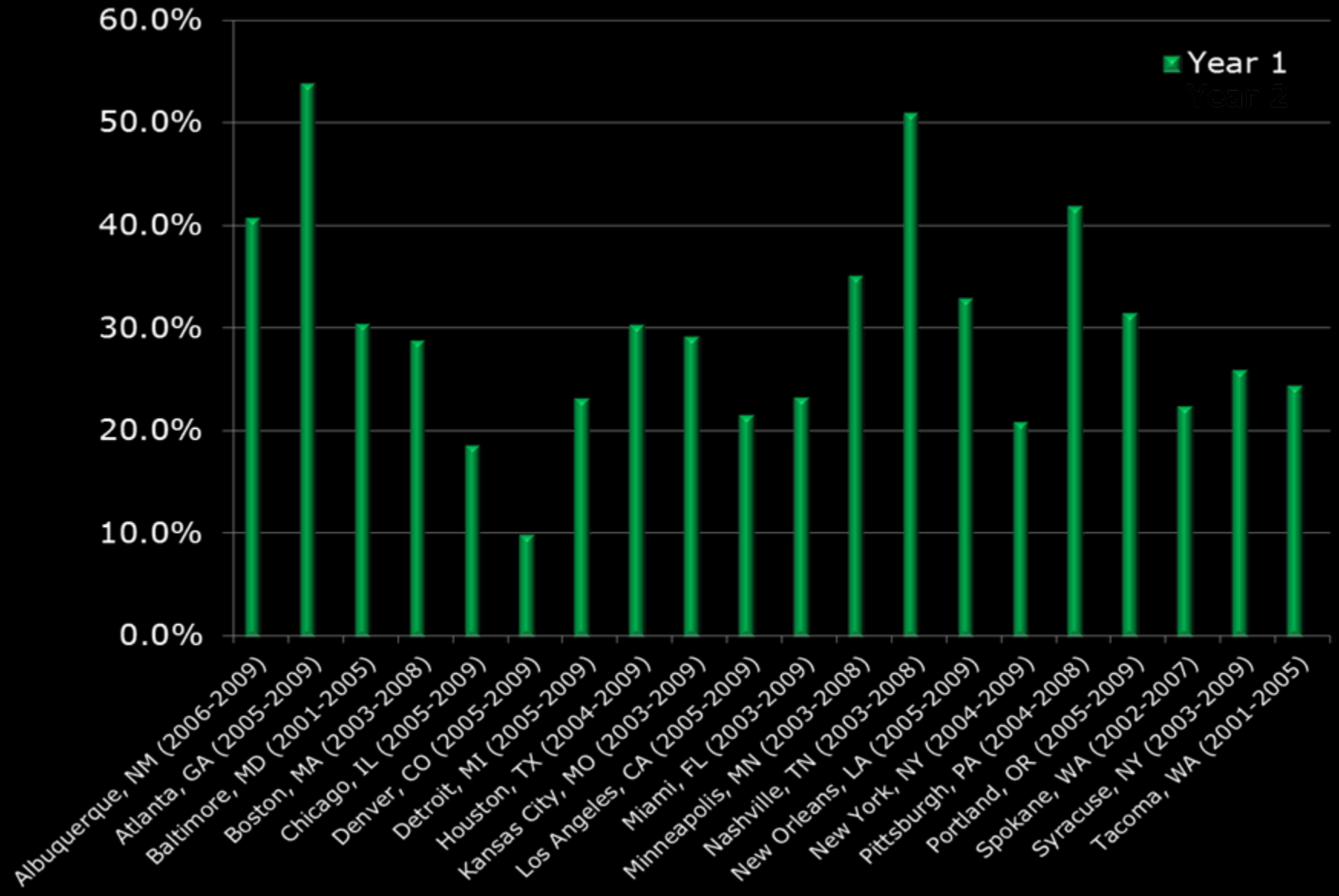
Projected Housing Density 2030

Partial Block Group Resolution

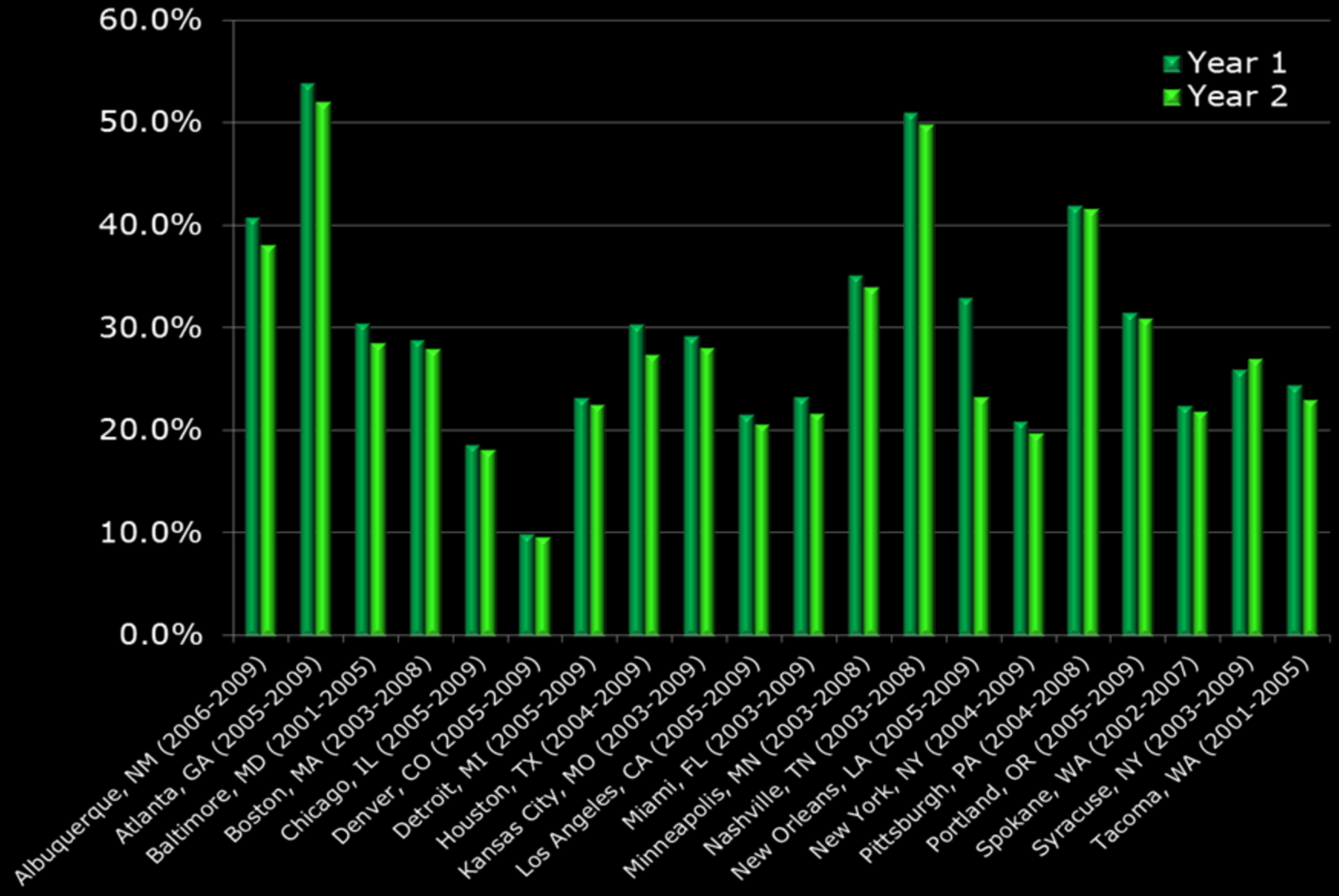


In Addition to Expanding, Cities are Changing

Tree Cover Change



Tree Cover Change



US Urban Forest Statistics

- Acres of urban (2010) = 68 million
- Percent tree cover (urban) = 35%
- Estimated number of urban trees = 4.9 billion*
- Carbon storage = $50.5 billion
- Carbon sequestration = $2 billion /yr
- Pollution removal = $5.7 billion / yr*
- Energy conservation = $4.4 billion / yr*
- Avoided emissions = $1.7 billion / yr*

* unpublished


:Looking at Environmental Benefits
Structure ⇨ Function ⇨ Value

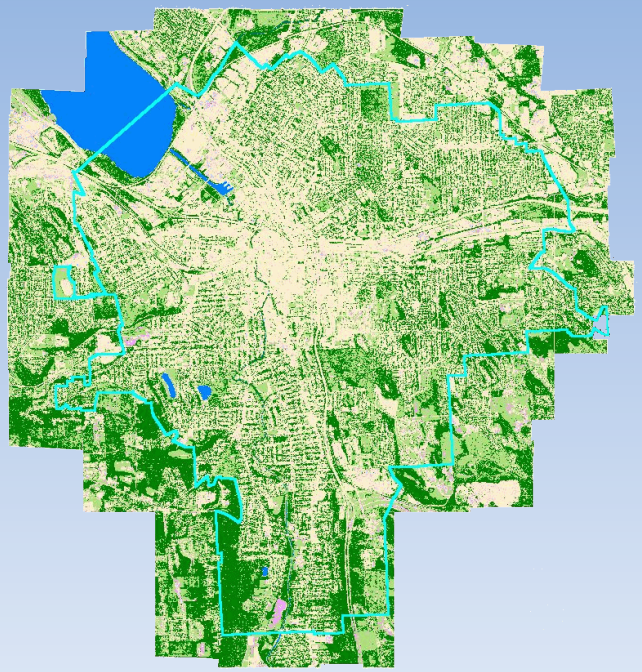

Management
Needs


Structure


Function


Tucson Electric Power Company
08-17-89 SEP
09-18-89 032
09-19-89
29.53
340 XH 0129090
YOUR ELECTRIC USE
KWH PER DAY
KWH PER DAY
KWH PER DAY
Value

Assessing Urban Forests



- Top-down
- Bottom-up

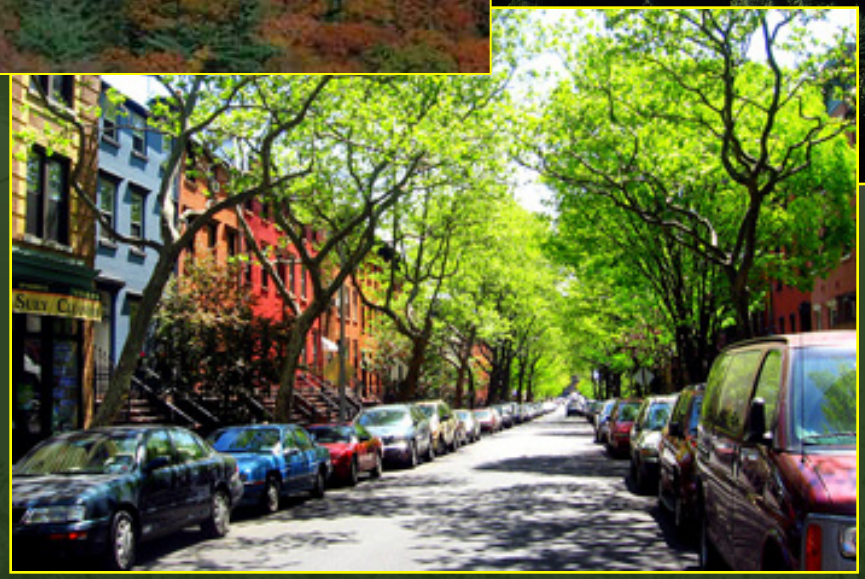
Assessing Urban Forests

- Top-down
  - Produces good cover estimates
  - Can detail and map tree and other cover locations
- Bottom-up
  - Provides detailed management information
    - No. trees, spp. composition, tree sizes and health, tree locations, risk information…
  - Provides better means to assess and project ecosystem services and values
    - Air pollution removal, carbon storage…

PLANTING THE SEEDS OF SUCCESS.

Trees in Our City: Benefits and Values

PLANTING THE SEEDS OF SUCCESS.

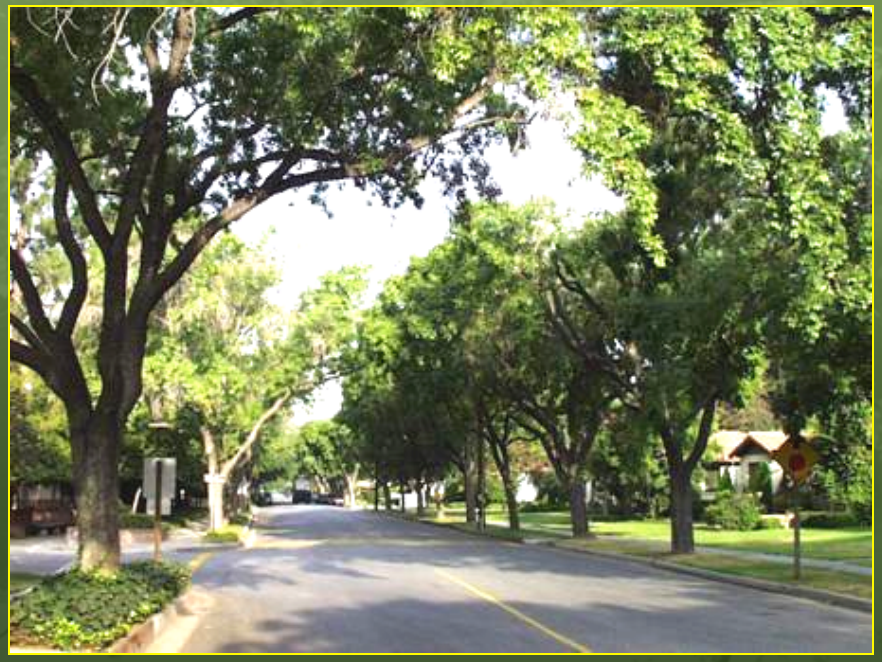


PLANTING THE SEEDS OF SUCCESS.

Trees. Worth Our Time. Worth Our Resources.

- Part of community infrastructure
- Vital to community health
- Community legacy
- Positive impact on business and tax base
- Wise investment of community dollars

Trees. Vital to Community Health.



- Tree-filled neighborhoods:
  - Lower levels of domestic violence
  - Are safer and more sociable
- Tree-filled landscapes reduce stress
- Trees decrease need for medication and speed recovery times

Trees. Important to Human Health.

- 100 trees remove five tons of CO_2/year
- 100 trees remove about 1000 lbs of pollutants per year, including:
  - 400 lbs of ozone
  - 300 lbs of particulates

Trees Save the Environment.

- 100 mature trees catch about
  100,000 gallons of rainwater
  per year…
  - Less $ for stormwater control
  - Cleaner water

Trees. A Savings for Homeowners.

- Save up to 30% of annual air conditioning costs
- Save 10-25% of winter heating costs

Trees Sell Houses. (At higher prices.)

- Each large front yard tree adds
  1% to sales price
- Large specimen trees can add
  10%, or more, to property values.

Trees Mean Better Business.

In tree-lined commercial districts…

- More frequent shopping
- Longer shopping trips
- Shoppers spend more for parking
- Shoppers spend 12% more for goods

Trees Pay Us Back.

100 Trees Over 40 Years...

Benefits = $225,000

- Energy
- Air Quality
- Runoff
- Real Estate

Costs = $82,000

- Planting - Pruning
- Removal/Disposal
- Irrigation
- Sidewalk Repair
- Litter
- Legal - Admin

Pay Off: $140,000

The Bottom Line

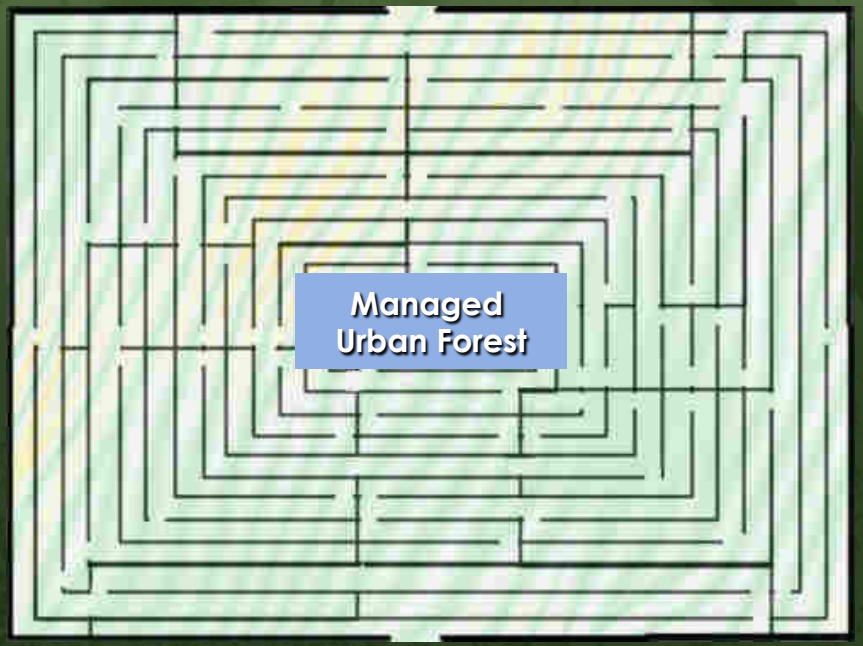
- Quality of life depends on tree benefits
- Benefits depend on healthy trees
- Healthy trees require quality care
- Quality care depends on each of us

So, Now We Know Trees Have Value…

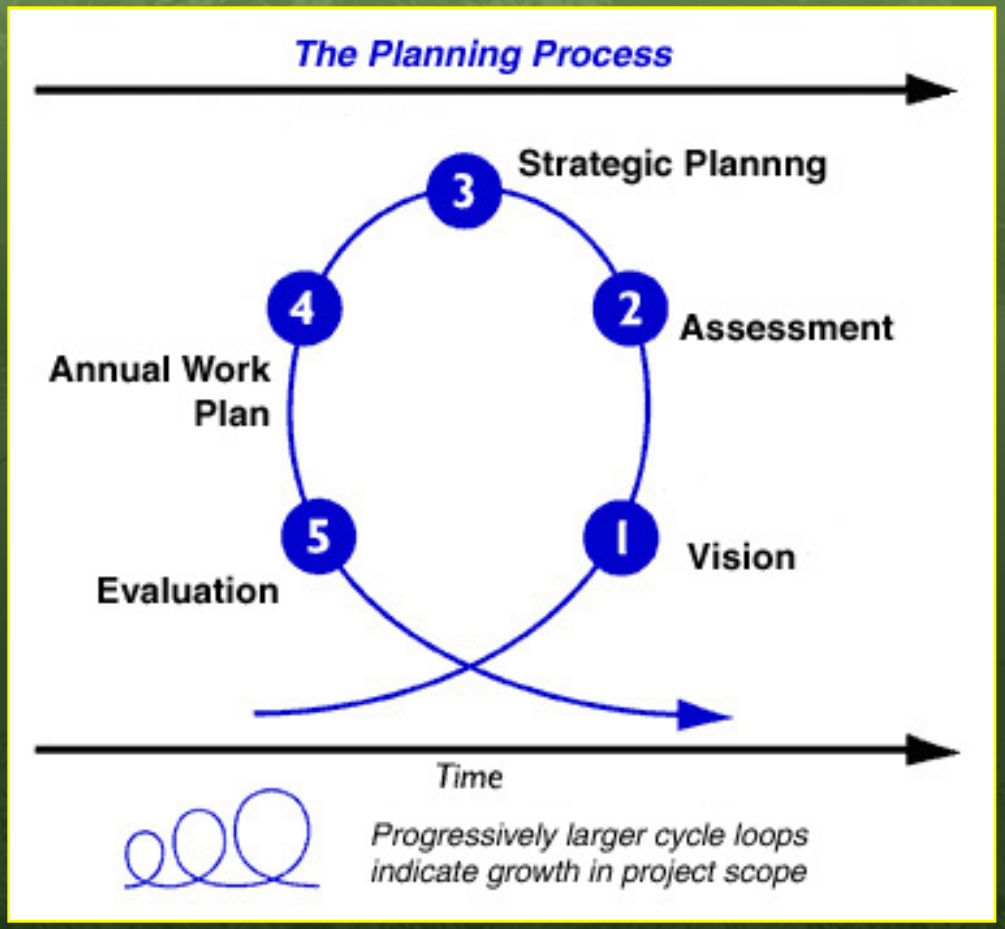
Where do we go from here?

Managing the Urban Forest

- Methods are variable
- Individual opportunities
- Common concepts
- Shifting priorities
- Planning Guidelines



The Planning Process



Planning Steps

- Step 1: Vision
- Step 2: Assessment
- Step 3: Strategic Planning
- Step 4: Annual Work Plan
- Step 5: Evaluation

Results in a Successful and Sustainable Program

Planning Steps

- Step 1: Vision
  - Where You Want to Go
  - Includes Strategic Goal
  - May be a Mission Statement

Step 1: Vision
Step 2: Assessment
Step 3: Strategic Planning
Step 4: Annual Work Plan
Step 5: Evaluation

Planning Steps

- Step 2: Assessment
  - What We Have - The Inventory
  - Sample or Complete Type
  - Identifies and Quantifies the Resource

Step 1: Vision
Step 2: Assessment
Step 3: Strategic Planning
Step 4: Annual Work Plan
Step 5: Evaluation

Planning Steps

- Step 3: Strategic Planning
  - How to Close the Gap
  - Steps to Take
  - Prioritization of Efforts
  - Budgeting - Time & Resources

Step 1: Vision
Step 2: Assessment
Step 3: Strategic Planning
Step 4: Annual Work Plan
Step 5: Evaluation

Planning Steps

- Step 4: Annual Work Plan
  - Getting the Job Done
  - Tasks & Activities
  - Includes Partnerships, Education, Management and Planting
  - Budgeting - Staff and Resources

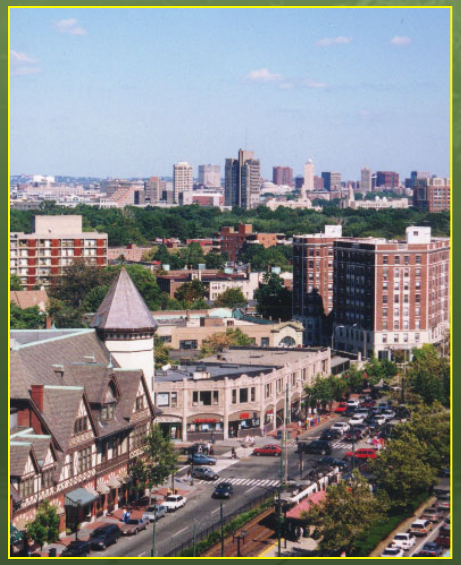
Step 1: Vision
Step 2: Assessment
Step 3: Strategic Planning
Step 4: Annual Work Plan
Step 5: Evaluation

Planning Steps

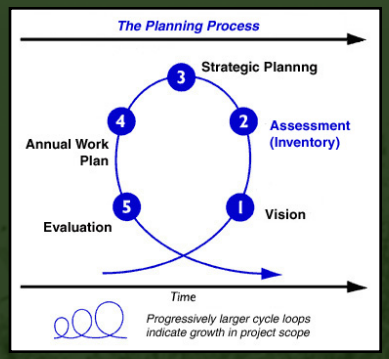
- Step 5: Evaluation
  - Did it get Done?
  - How Did You Do?
  - Justification for Increases - Funding, Staffing & Support
  - Important Step, but Often Not Completed

Step 1: Vision
Step 2: Assessment
Step 3: Strategic Planning
Step 4: Annual Work Plan
Step 5: Evaluation

Key Component - Assessment



Providing a Baseline



- Step 1: Vision
- Step 2: Assessment
- Step 3: Strategic Planning
- Step 4: Annual Work Plan
- Step 5: Evaluation

Projected Budget Estimates

Based on Inventory Data

Crown Cleaning - 500 trees @ $100 each	$50,000
Crown Lifting - 300 trees @ $55 each	$16,500
Crown Reduction - 120 trees @ $95 each	$11,400
Removal - 20 trees @ $400 each	$8,000
Stumps - 45 stumps @ $175 each	$7,875
Vacant planting sites 125 @ $350 each	$43,750
TOTAL	$137,525

Long Term Projected Cost of Maintenance

Total Estimated Costs $137,525

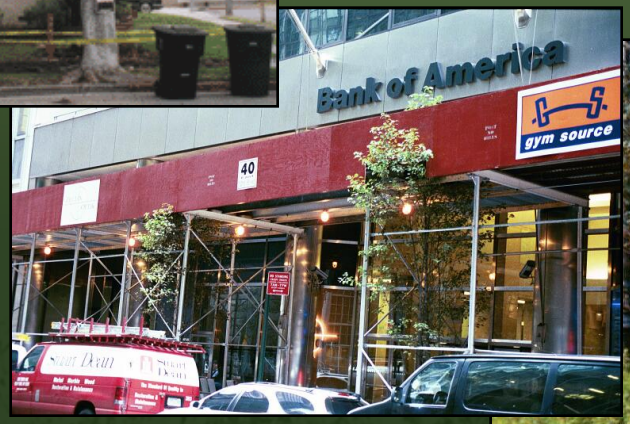
- Year One $ 40,000
- Year Two $ 45,000
- Year Three $ 52,525

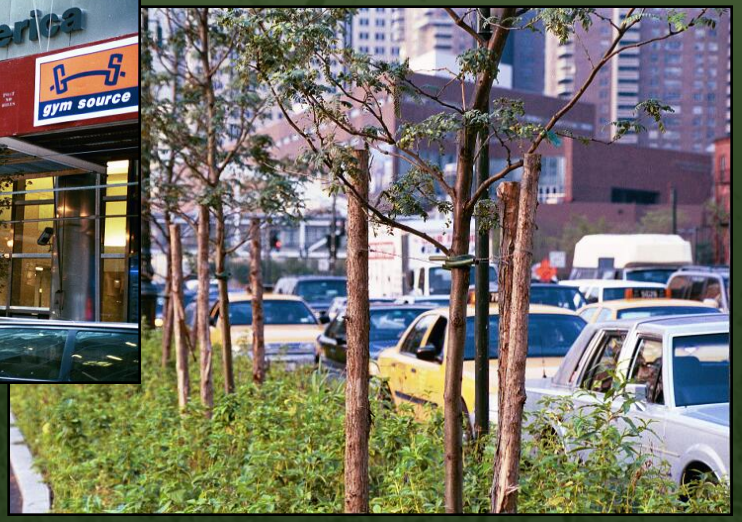
Valuation

- Psychological and Aesthetic Values
- Social Values
- Historic Values
- Environmental Values
- Monetary Values
- Economics and Decision Making

Fiscal Valuation

- Size
- Species
- Condition
- Location





Valuation


THIS TREE
PAYS US
BACK
$9,006
IN POTENTIAL
LIFETIME BENEFITS
for more information, visit
www.heartlandtreealliance.org

Valuation

Tree Facts

Serving Size: 27 in DBH (68.6 cm)
Species: Red Maple, ***Acer rubrum***

Amount Per Serving

Carbon sequestered 222 lbs	avoided 466 lbs
	% Annual Value*
Total Carbon 690 lbs	
O3 $4.24	
VOC(Volatile Organic Compounds) $ 1.57	
NO2(Deposited) $ 1.83	
NO2(Avoided) $ 6.06	
SO2(Deposited) $ 0.54	
SO2(Avoided) $ 2.37	
PM10(Deposited) $3.83	
PM10(Avoided) $ 0. 71	
Conserved Kilowatt/hours 155 KwH	
Reduced oil/natural gas consumption 56 therm(s)	
Stormwater intercepted 3,472 gallons	

Property value increase $168.00	Natural Gas $79.09
Storm water $27.77	Electricity $21.76

*It should be noted that trees themselves emit biogenic volatile organic compounds (BVOCs) which can contribute to ground-level ozone production. This may negate the positive impact the tree has on ozone mitigation for some high emitting species (e.g. Willow Oak or Eucalyptus). However, the summation of the tree's environmental benefits always trumps this negative.

Source

USDA Forest Service's i-Tree Software Suite v4.0

i-Tree Tools CC BY-SA

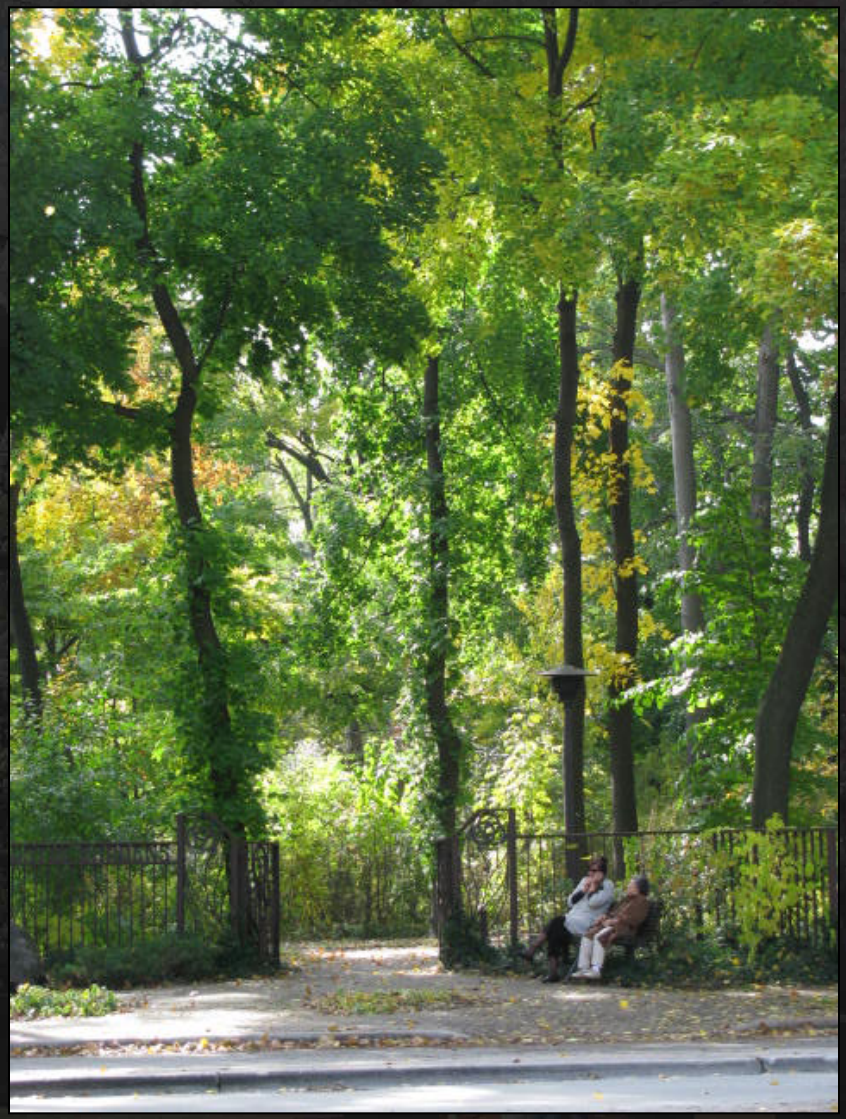
42000 06200

- Bottom-up

i-Tree Tools Version 5

Focus for today…

- i-Tree Background
- Ground Based Assessment Tools
- Aerial Based Assessment Tools

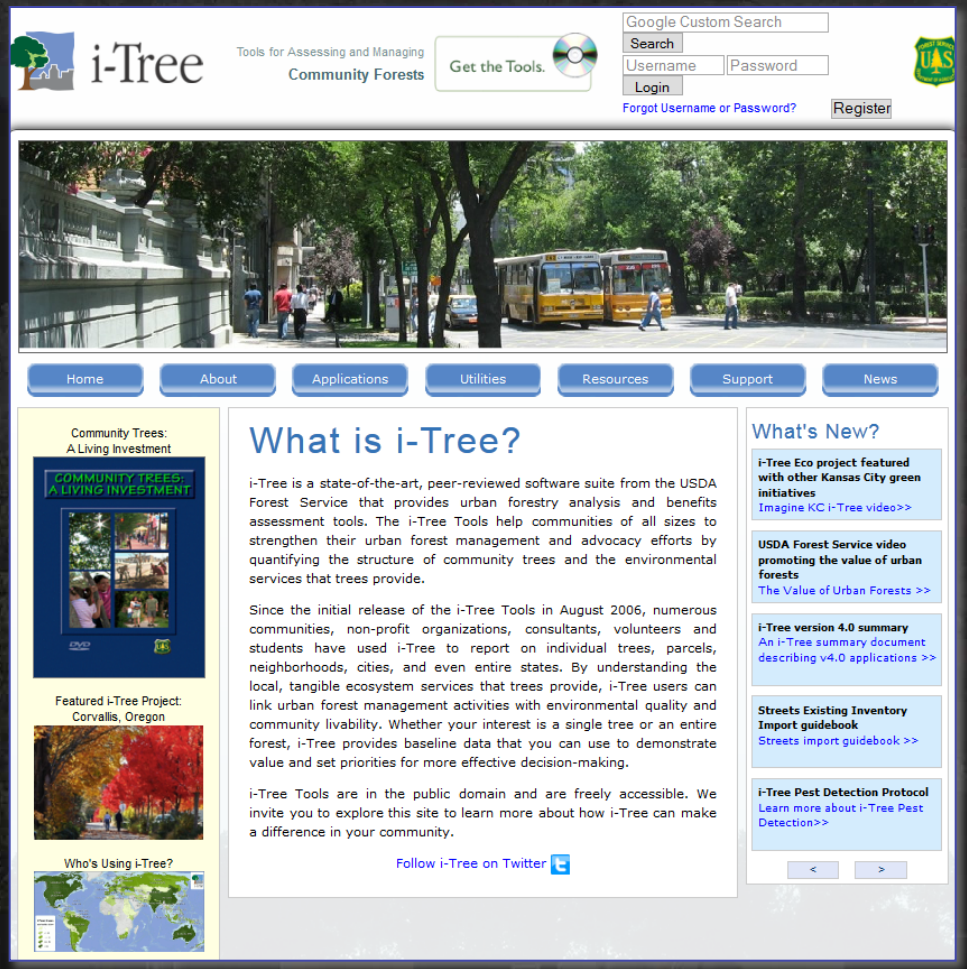


i-Tree…

"Putting USFS Urban Forest science into the hands of users"

- Credible, USDA FS peer-reviewed tools
- Public Domain Software
- Accessible
- Continuously improved

www.itreetools.org



Benefit Based Approach

i-Tree Tools

Comprehensive
Value

Environmental
Services

- **Since its release in 2006, over 12,600 copies have been distributed in over 100 countries. An additional 10,000 unique users of i-Tree web tools were added in since 2011.**

•What is i-Tree?

- **Core programs—bottom-up approach**

•All or any trees

•Street trees

•Individual trees

Minneapolis Street Tree Assessment

- $6.8 million in energy savings
- $9.1 million in reduced storm water runoff
- $1 million improvements to air quality
- $7.1 million increase in property value

Milwaukee i-Tree Eco Assessment

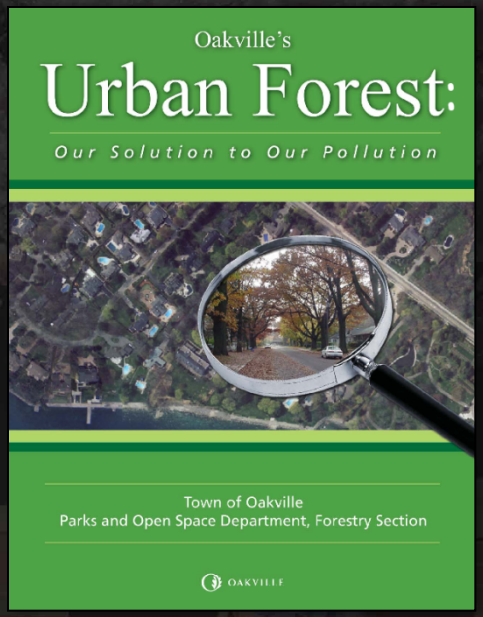
EAB Structural Impacts:

- 17.4% Canopy Loss
- $221 Million structural damage (citywide)

EAB Functional Impacts:

- $243,785 less pollutant removal
- $138,000 less energy savings (cooling costs)
- $2.6 million reduction in storm water benefits (1996 study)

i-Tree: Demonstrating Tree Value



i-Tree : Key Tools

<- Field Data ->

Web

Web

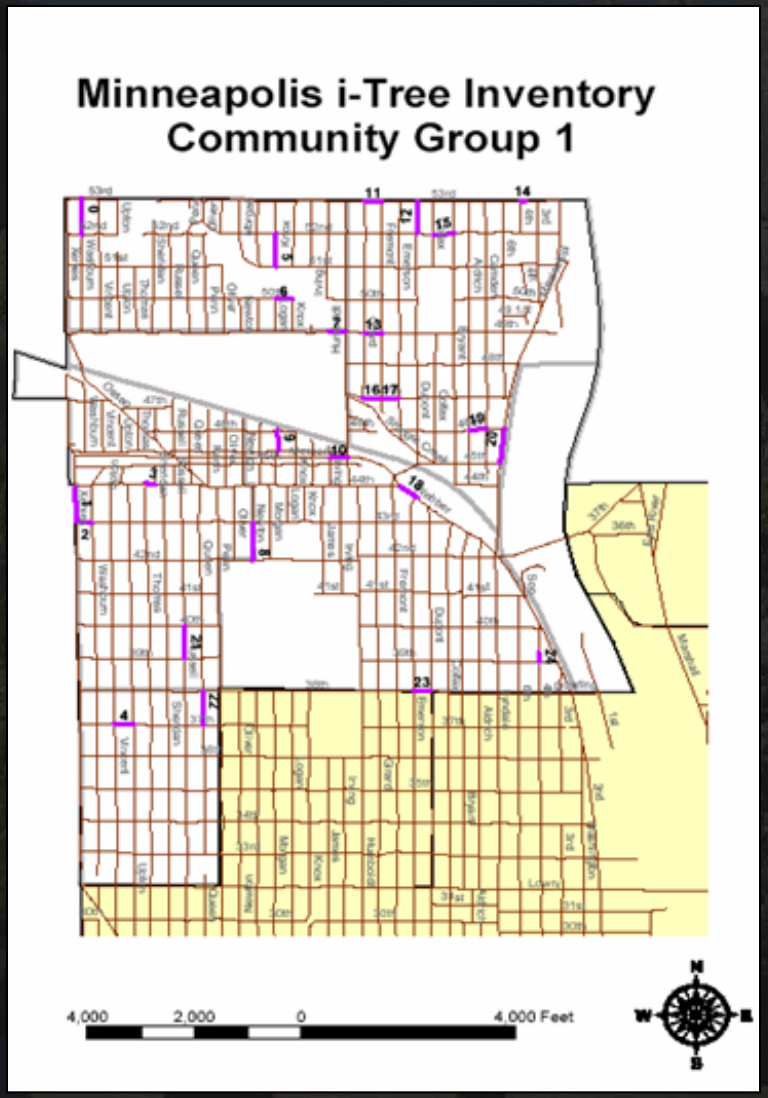
Desktop

Assessing Street Tree Populations

Streets assesses:

- Structure
- Function
  - Energy
  - Air pollution
  - Stormwater
  - Carbon
  - Aesthetic Value *
- Cost Benefit Ratio *
- Management needs *
- Pest Detection Module

i-Tree Streets



i-Tree Eco

Structure

- Number of Trees, species distribution, canopy cover, etc.

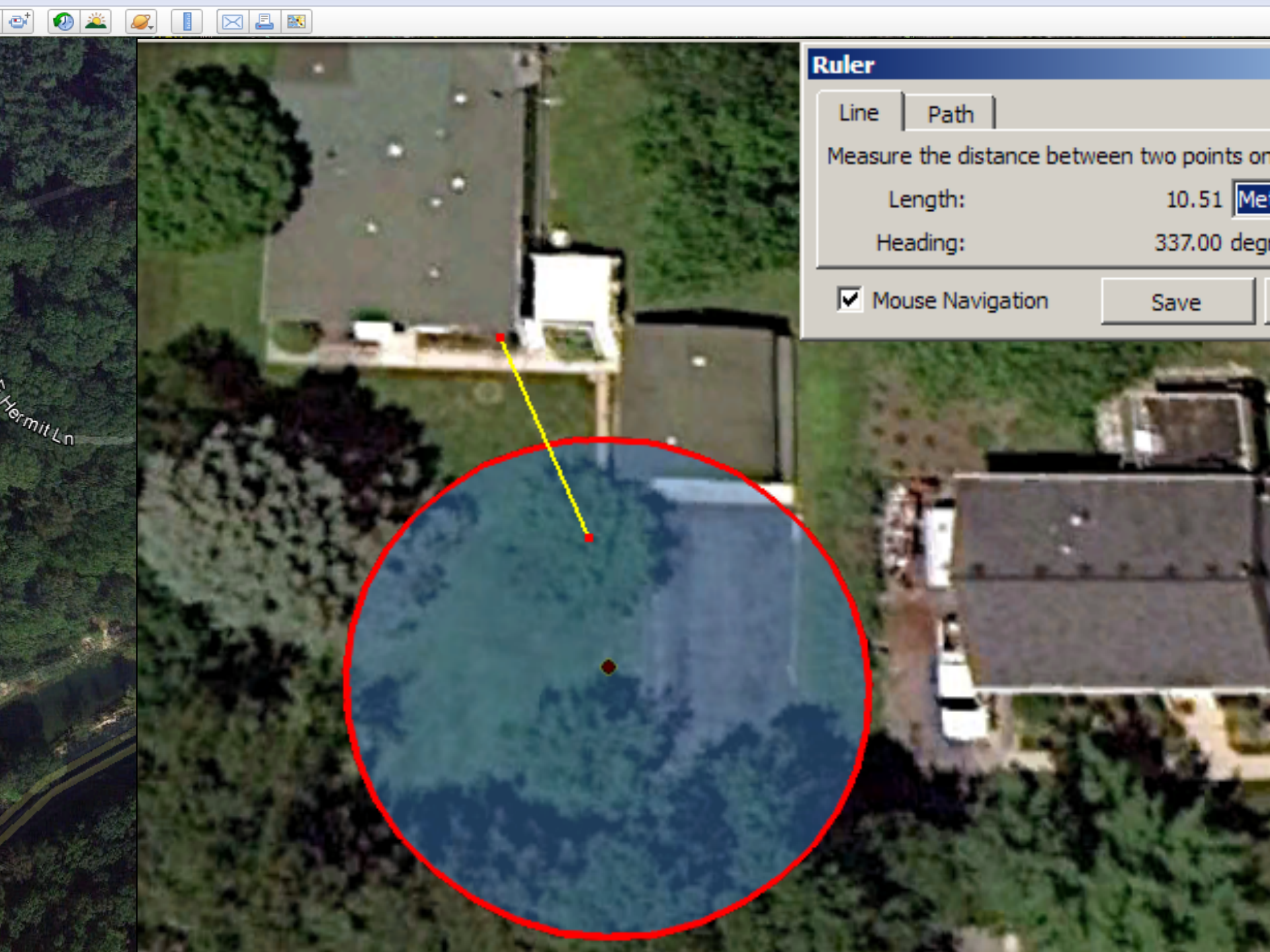
Functions / Ecosystem Services

- Energy use
- Air pollution
- Carbon
- Biogenic VOC emissions
- Rainfall interception

Management needs

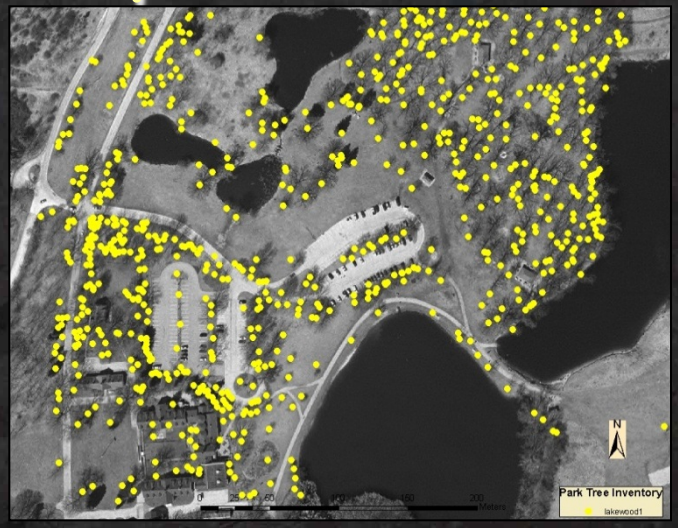
- Pest risk
- Tree health
- Exotic/invasive spp.

$ Value


Ruler
Line
Path
Measure the distance between two points on
Length:
10.51
Heading:
337.00 deg
Mouse Navigation
Save
Hermit Ln

Eco Inventory Option

- Structural analysis
- Carbon sequestration & storage
- Structural tree value
- Annual pollution removal & value
- Energy effects & stormwater interception available in v5

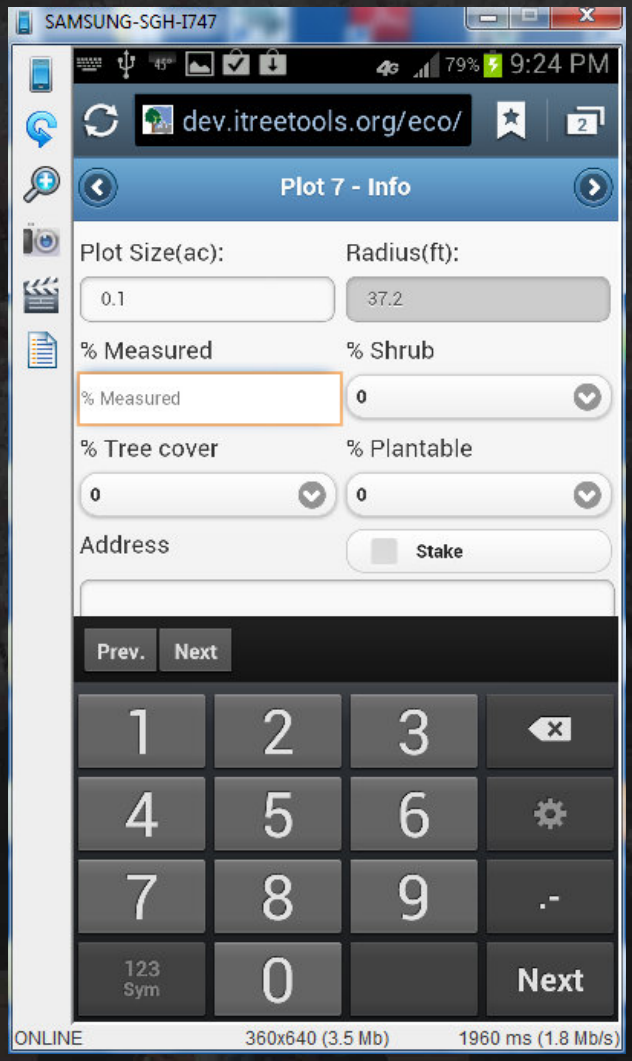


i-Tree Eco v5 Updates

- Human health impacts & values (e.g., reduced sick days, asthma cases, mortality, etc.)
- Rainfall interception modeling
- Pest detection & risk evaluation
- Google Maps-based sample plot generator

Eco v5 Updates

- Web-based data collection system for mobile devices
- New pollution model, including PM 2.5 & VOC estimates
- Expansion to Canada & Australia



Human Health Impacts and Values

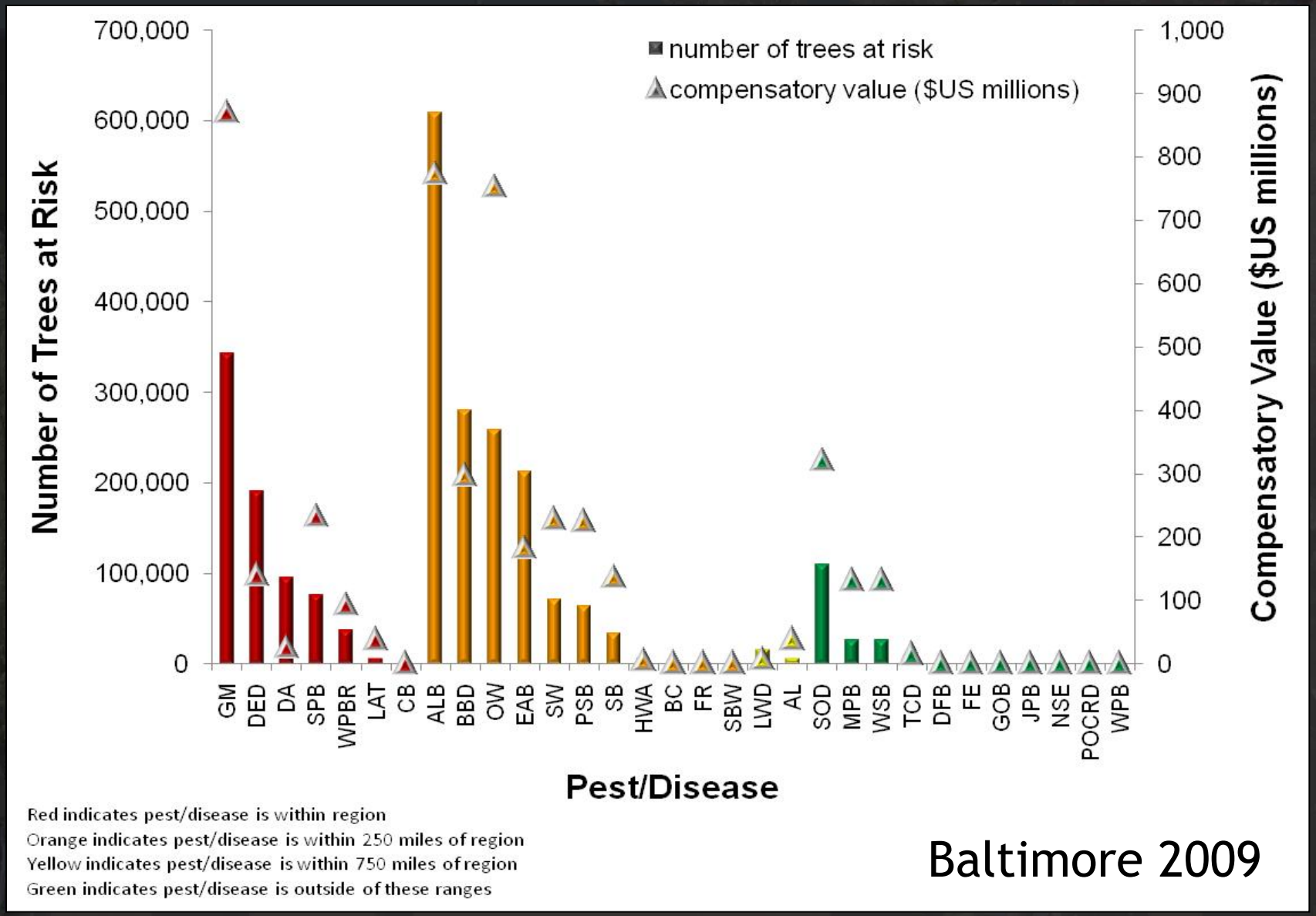
- Link to EPA BenMAP program
- Estimates health impacts and values due to tree effects on air quality via pollution removal

Health Effects	O_3	NO_2	SO_2	$PM_{2.5}$
Acute Bronchitis				✓
Acute Myocardial Infarction				✓
Acute Respiratory Symptoms	✓	✓	✓	✓
Asthma Exacerbation		✓	✓	✓
Chronic Bronchitis				✓
Emergency Room Visits	✓	✓	✓	✓
Hospital Admissions	✓	✓	✓	✓
Lower Respiratory Symptoms				✓
Mortality	✓			✓
School Loss Days	✓			
Upper Respiratory Symptoms				✓
Work Loss Days				✓

Human Health Impacts – PM2.5 removal New York City

	No.	Value
Acute Bronchitis	4.5	$398
Acute Myocardial Infarction	1.4	$129,347
Acute Respiratory Symptoms	2,931	$287,280
Asthma Exacerbation	1,919	$156,020
Chronic Bronchitis	2.4	$681,773
Emergency Room Visits	8	$3,326
Hospital Admissions, Cardiovascular	1.2	$46,150
Hospital Admissions, Respiratory	0.7	$22,684
Lower Respiratory Symptoms	55.7	$2,892
Mortality	7.6	$58,708,876
Upper Respiratory Symptoms	45	$2,019
Work Loss Days	504	$92,089
Total	na	$60,132,856

Trees at Risk to Insects and Diseases

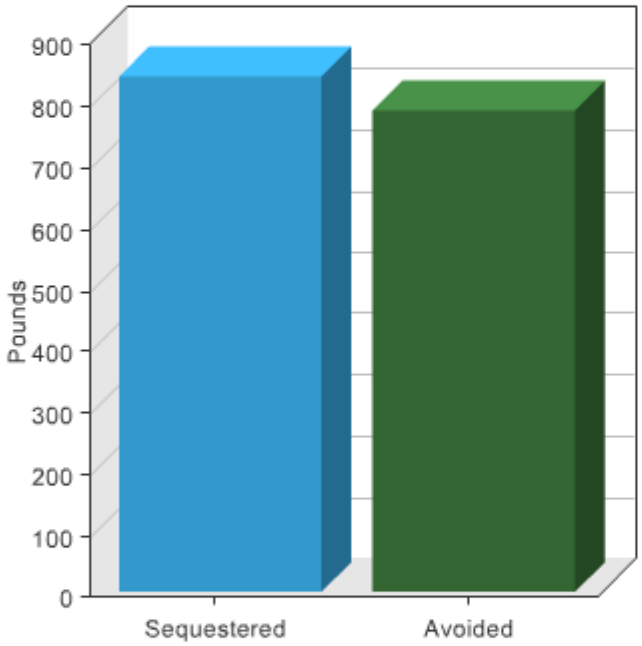


Red indicates pest/disease is within region
Orange indicates pest/disease is within 250 miles of region
Yellow indicates pest/disease is within 750 miles of region
Green indicates pest/disease is outside of these ranges

Baltimore 2009

i-Tree Design

- Parcel level analysis of individual or multiple trees
- General public use
- Web accessible by all



This year your 36 inch American elm tree will reduce atmospheric carbon dioxide by 1,631 pounds.

How significant is this number? Most car owners of an "average" car (mid-sized sedan) drive 12,000 miles generating about 11,000 pounds of CO_2 every year. A flight from New York to Los Angeles adds 1,400 pounds of CO_2 per passenger.

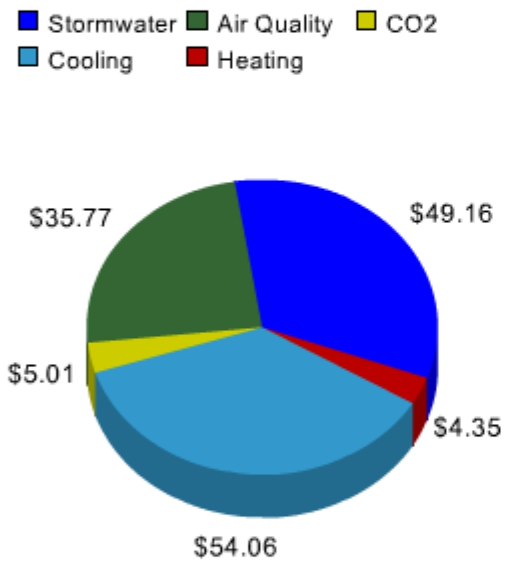
Trees can have an impact by reducing atmospheric carbon in two primary ways (see figure at left):

- They sequester ("lock up") CO_2 in their roots, trunks, stems and leaves while they grow, and in wood products after they are harvested.
- Trees near buildings can reduce heating and air conditioning demands, thereby reducing emissions associated with power production.

Combating climate change will take a worldwide, multifaceted approach, but by planting a tree in a strategic location, driving fewer miles, or replacing business trips with conference calls, it's easy to see how we can each reduce our individual carbon "footprints."

For more information see the USDA Forest Service's Community Tree Guide series.

i-Tree Design *Beta* 1614 N Newcastle Ave, Chicago, IL 60707, USA



Breakdown of your tree's benefits

Click on one of the tabs above for more detail

This 36 inch American elm provides overall benefits of: $148 every year.

While some functional benefits of trees are well documented, others are difficult to quantify (e.g., human social and communal health). Trees' specific geography, climate, and interactions with humans and infrastructure is highly variable and makes precise calculations that much more difficult. Given these complexities, the results presented here should be considered initial approximations to better understand the environmental and economic value associated with trees and their placement.

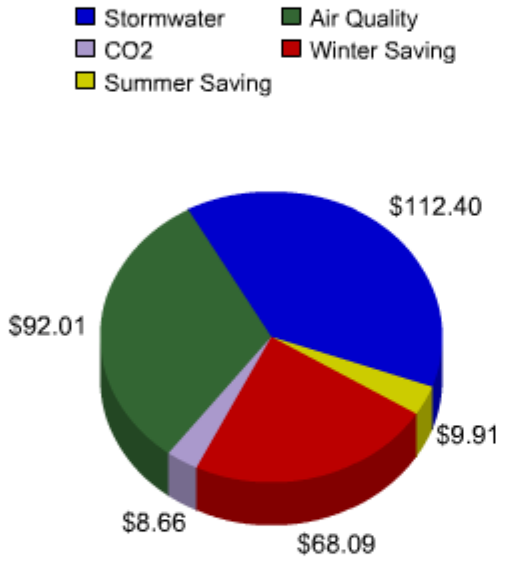
Benefits of trees do not account for the costs associated with trees' long-term care and maintenance.

If this tree is cared for and grows to 41 inches, it will provide $163 in annual benefits.

American elm
Ulmus americana

Overall Benefit | Storm Water | Energy | Air Quality | CO2 | About Model

Current Year | Future Year 15



Breakdown of your tree's benefits

Click on one of the tabs above for more detail

In 15 years, your selected trees will provide overall benefits of: $291.06

.

While some functional benefits of trees are well documented, others are difficult to quantify (e.g., human social and communal health). Trees' specific geography, climate, and interactions with humans and infrastructure is highly variable and makes precise calculations that much more difficult. Given these complexities, the results presented here should be considered initial approximations to better understand the environmental and economic value associated with trees and their placement.

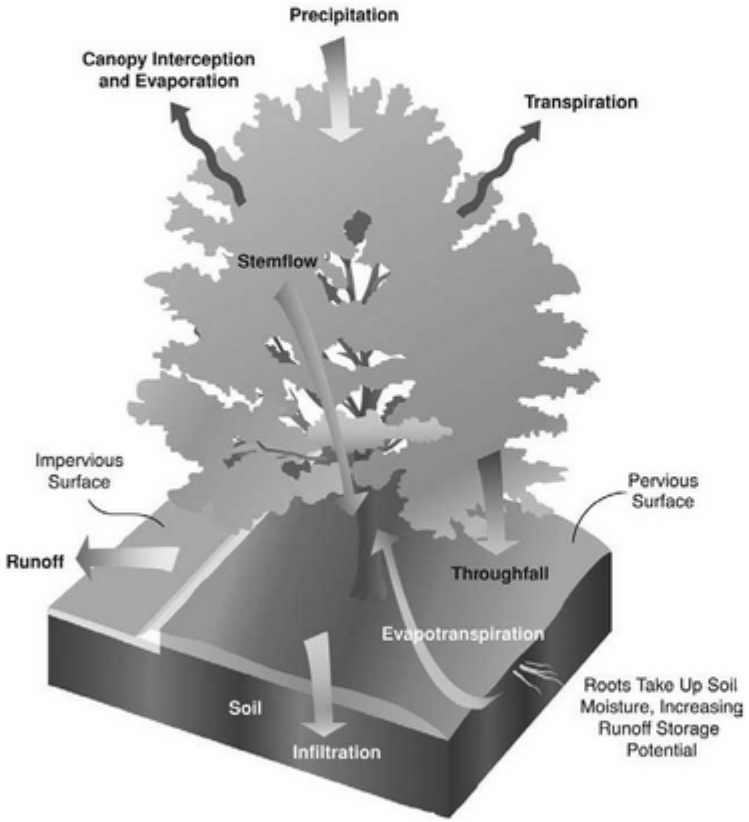
Benefits of trees do not account for the costs associated with trees' long-term care and maintenance.

Next Tree (Silver maple, 11 inches)


ENERGY-SAVING TREES
presented by: arborday.org
Arbor Day Foundation
About
Get Started
Utility Partners
Register Your Utility Company
FAQ
Online Tutorial
Step 2: Map Your House
Step: 1 2
1. Draw Outline of House
Watch Video Tutorial
2. Pick Your Tree
Crapemyrtle, Common
3. Place Your Tree
4. See Your Savings
Estimate My Savings »
9100 Swenson Ln, Austin, TX 78748, USA
Map
Satellite
Google

Model Tree Planting Projects

Photo courtesy of Gene Hyde



In 25 years, your selected trees will intercept 49517.60 gallons of stormwater.

Urban stormwater runoff (or "non-point source pollution") washes chemicals (oil, gasoline, salts, etc.) and litter from surfaces such as roadways and parking lots into streams, wetlands, rivers and oceans. The more impervious the surface (e.g., concrete, asphalt, rooftops), the more quickly pollutants are washed into our community waterways. Drinking water, aquatic life and the health of our entire ecosystem can be adversely affected by this process.

Trees act as mini-reservoirs, controlling runoff at the source. Trees reduce runoff by:

- Intercepting and holding rain on leaves, branches and bark
- Increasing infiltration and storage of rainwater through the tree's root system
- Reducing soil erosion by slowing rainfall before it strikes the soil

For more information see the USDA Forest Service's Community Tree Guide series.

i-Tree Canopy

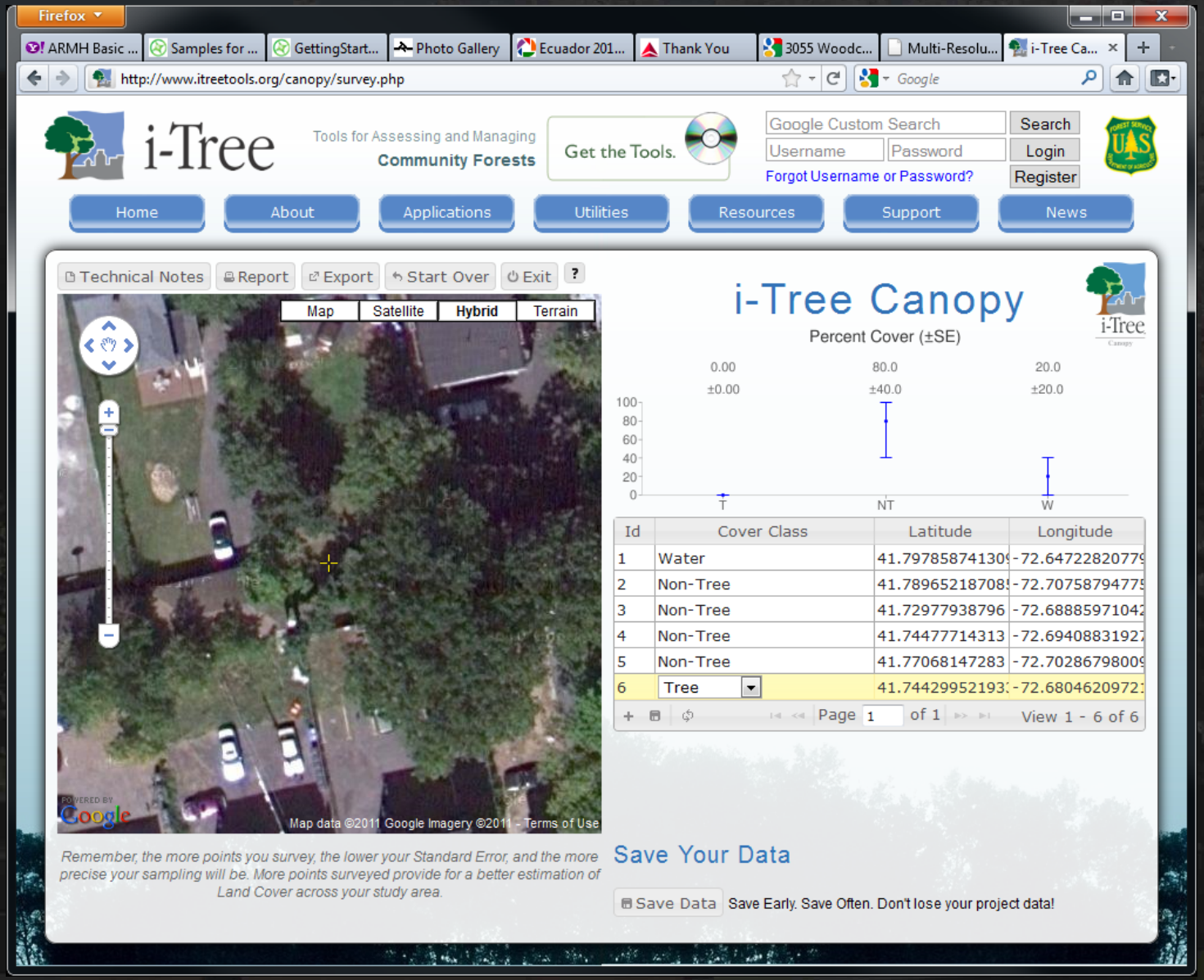
Main Screen

- *Web App*
- *No Login*
- *Required*

1.Define area

2.Configure survey

3.Assess points

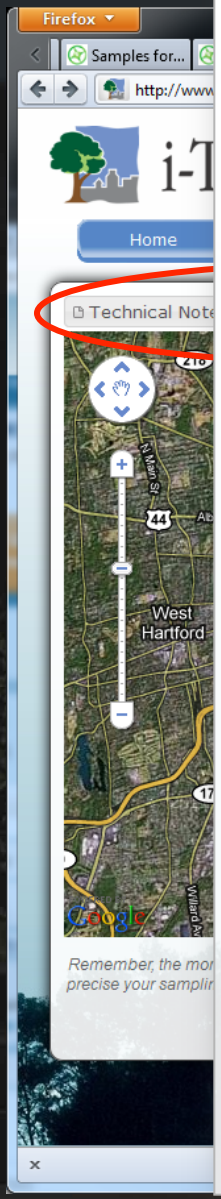


Output

Report

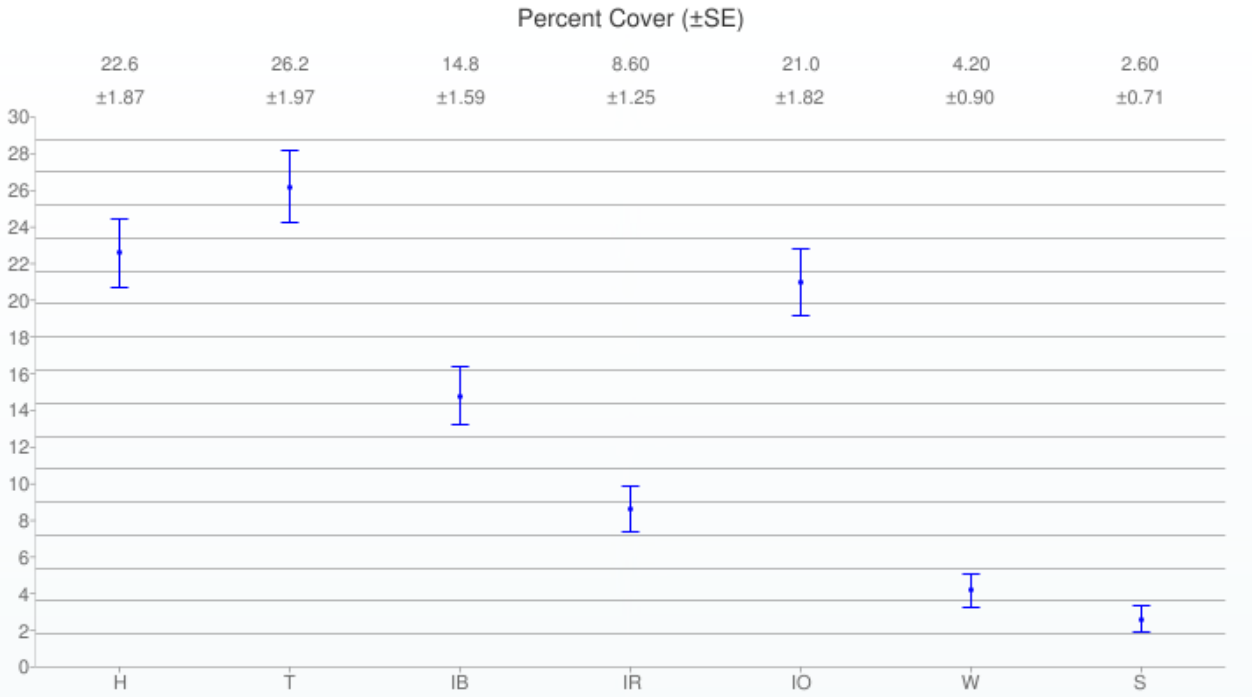
Export

Save Project



i-Tree Canopy

Cover Report



Cover Class	Description	Abbr.	% Cover
Grass/Herbaceous		H	22.6 ±1.87
Tree/Shrub		T	26.2 ±1.97
Impervious Buildings		IB	14.8 ±1.59
Impervious Road		IR	8.60 ±1.25
Impervious Other		IO	21.0 ±1.82
Water		W	4.20 ±0.90
Soil/Bare Ground		S	2.60 ±0.71

About i-Tree Canopy

The concept and prototype of this program were developed by David J. Nowak, Jeffery T. Walton and Eric J. Greenfield (USDA Forest Service). The current version of this program was developed and adapted to i-Tree by David Ellingsworth, Mike Binkley, and Scott Maco (The Davey Tree Expert Company).

Limitations of i-Tree Canopy

The accuracy of the analysis depends upon the ability of the user to correctly classify each point into its correct class. As the number of points increase, the precision of the estimate will increase as the standard error of the estimate will decrease. If too few points are classified, the standard error will be

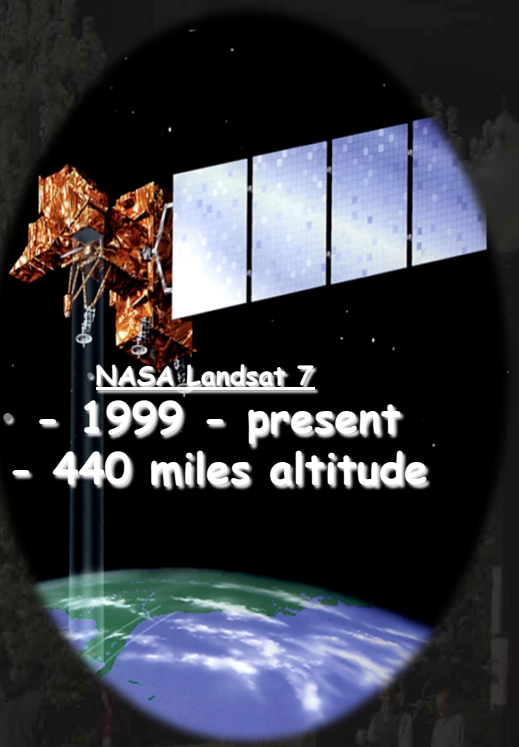
Aerial Based Assessment Tools

- NLCD National Land Cover Dataset (i-Tree Vue)

- UTC Urban Tree Canopy Analysis – high resolution imagery

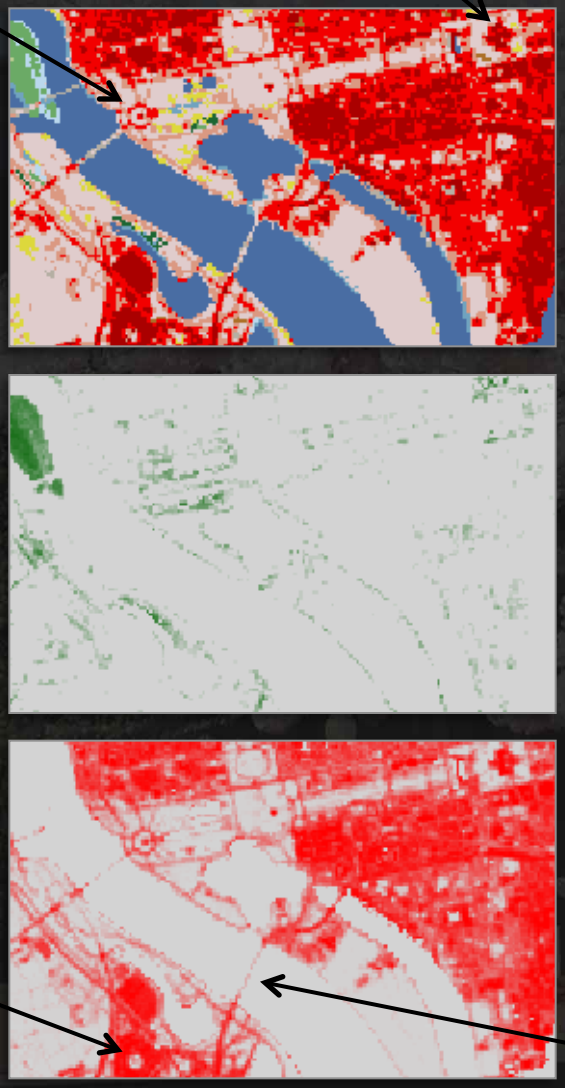
- Photo-interpretation
- (i-Tree Canopy)

i-Tree
Vue



NASA Landsat 7
- 1999 - present
- 440 miles altitude

MRLC



Land Cover
- 29 classes:
  - Developed/Urban
  - Forested
  - Wetland
  - Agriculture

Tree Canopy
- 0 - 100%

Impervious Cover
- Pavement
- Buildings
- 0 - 100%

i-Tree

i-Tree Vue

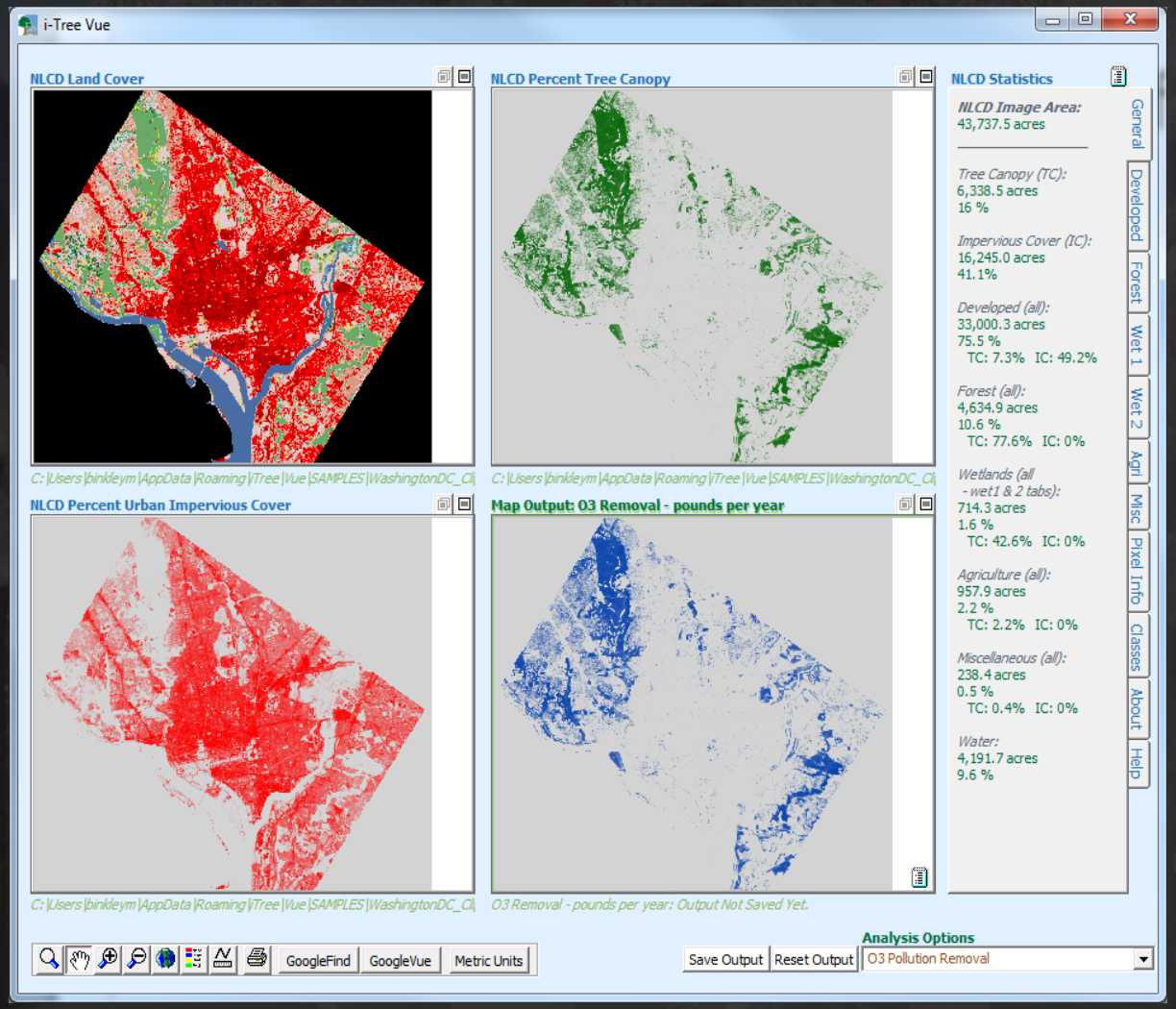
NASA Landsat

+ MRLC NLCD

+ USFS Research

+ i-Tree Development

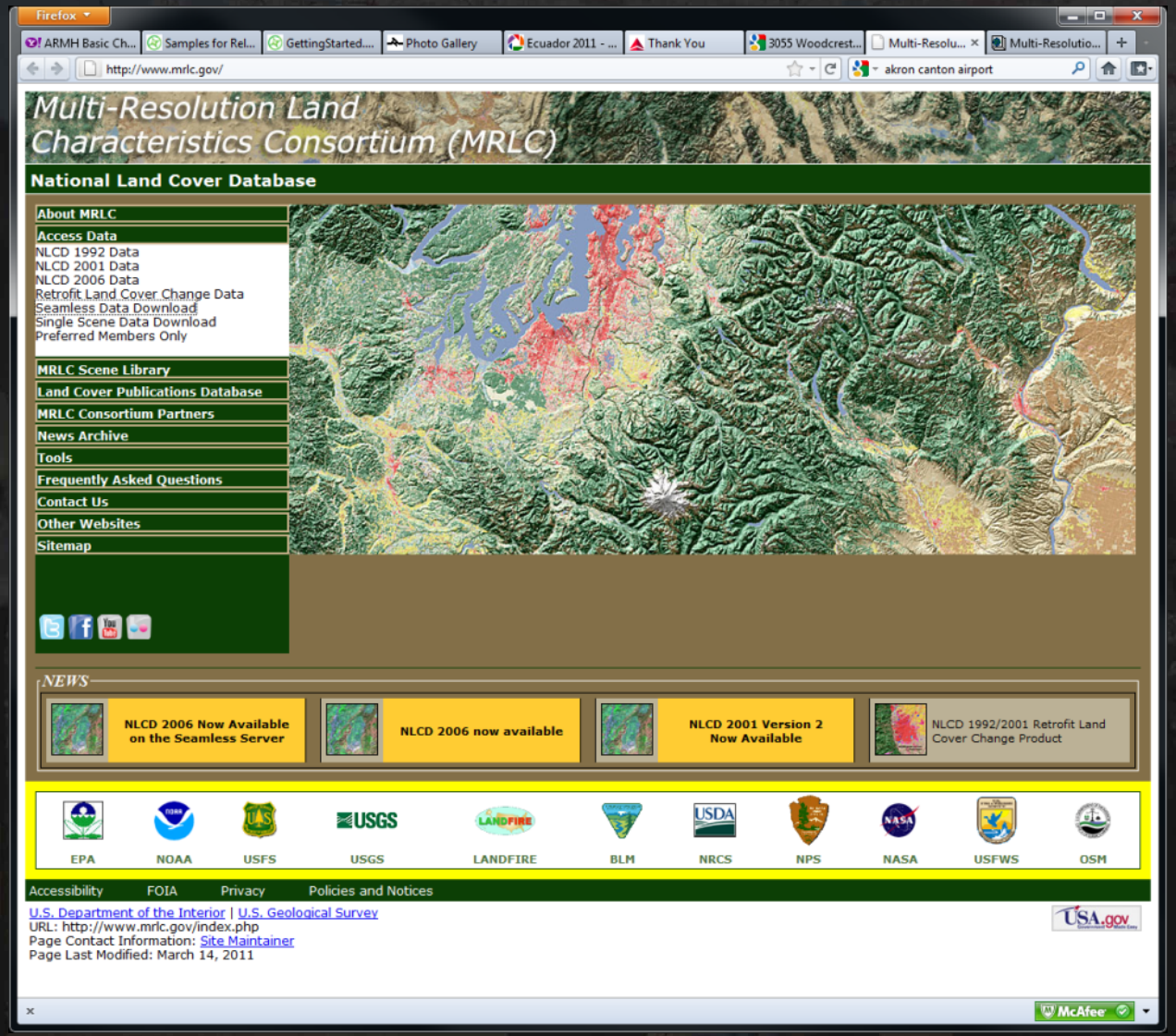
Urban Forest Estimates



i-Tree Vue: Obtaining Data

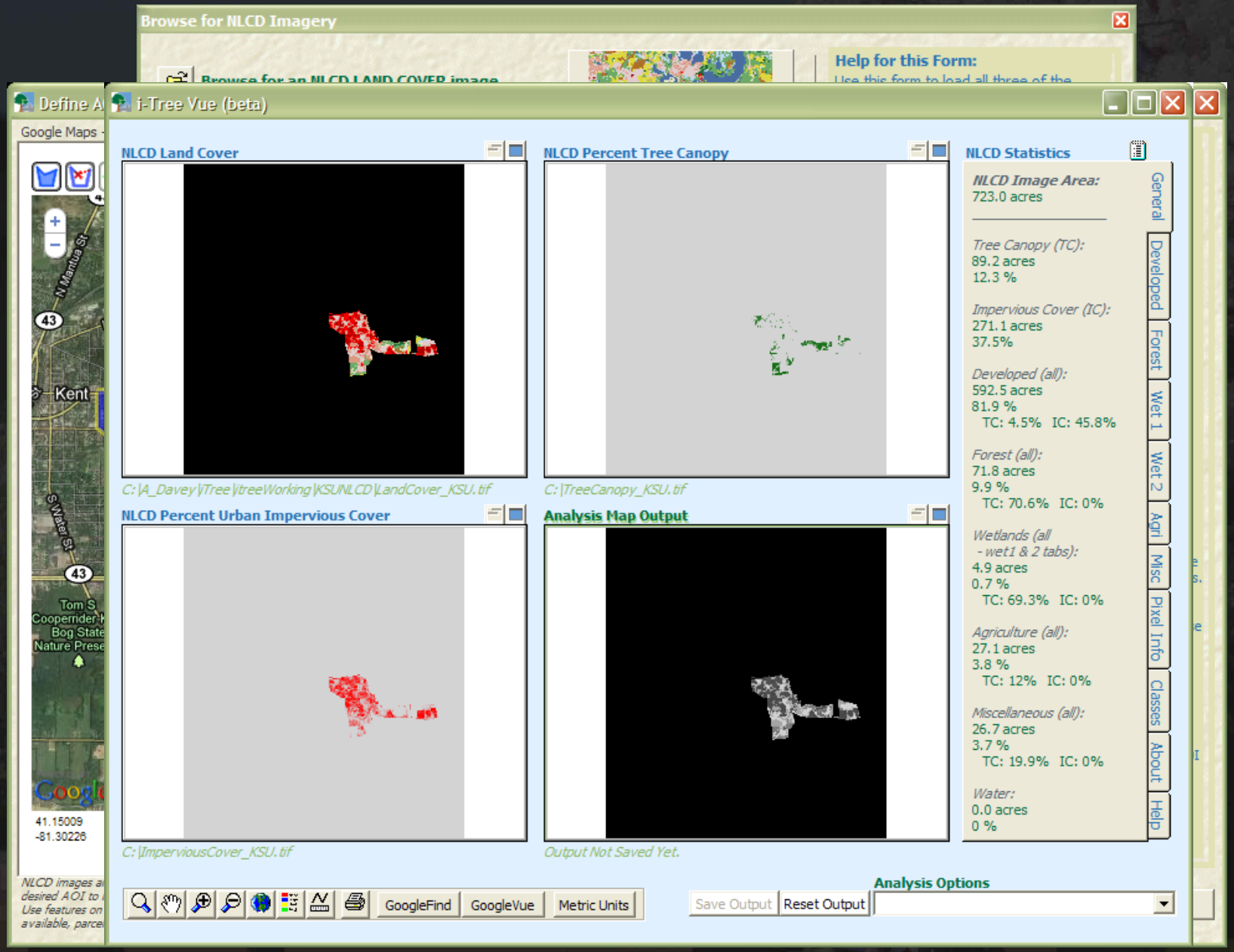
Free!
Nationwide!
Easy to Download!

www.mrlc.gov

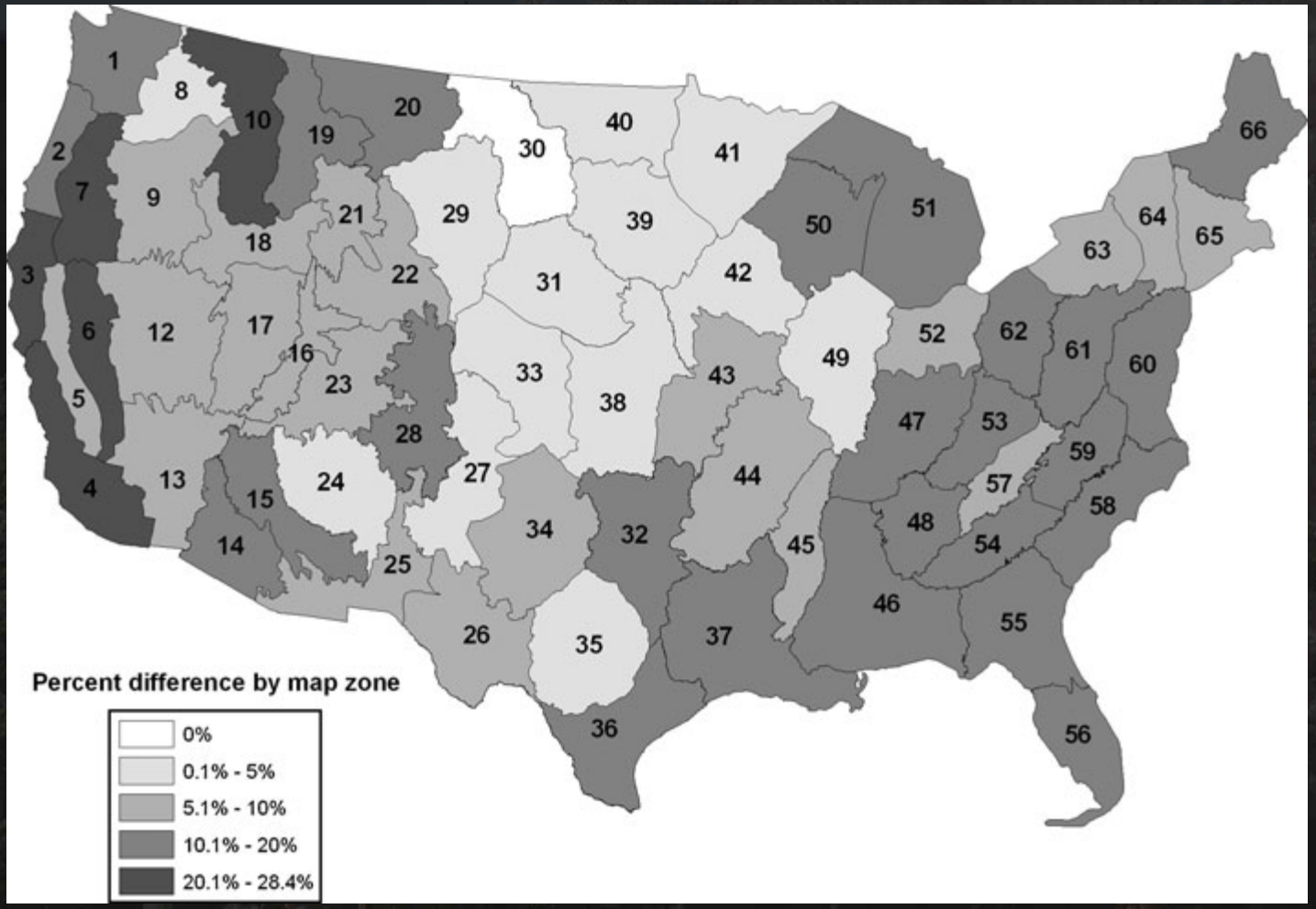


Startup:

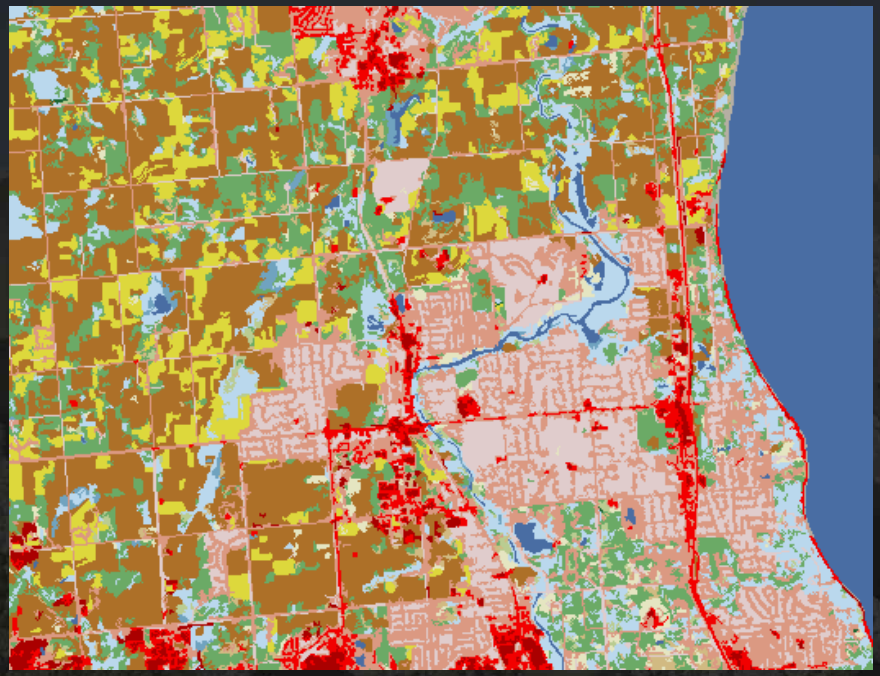
Load
&
Clip
Imagery



i-Tree Vue Canopy & Impervious Adjustments



Differences in tree canopy cover estimates between photo-interpreted values and NLCD 2001 by mapping Zone. (Nowak & Greenfield, 2010)



i-Tree Vue Canopy & Impervious Adjustments

i-Tree Vue - Report

Tree Canopy Ecosytem Services Benefits

Executive Summary of Estimates

More than just beauty and shade, trees work for us all every day to clean the air we breathe.

Date: 12/18/2012 9:22:20 PM

i-Tree Vue

Executive Summary

Full Report

LAND COVER

	Area		Impervious		Tree Canopy	
	acres	%	acres	%	acres	%
Entire Area	**12,622.5**	**100**	**1,764.5**	**14.3**	**3,985.9**	**32.4**
Developed, All Classes	7,334.1	58.1	1,760.0	24.0	1,700.6	23.2
Forested, All Classes	2,174.8	17.2	2.7	0.1	1,405.6	64.6
Wetlands, All Classes	932.9	7.4	0.5	0.1	644.4	69.1
Agriculture, All Classes	1,768.0	14	1.4	0.1	221.5	12.5
Miscellaneous, All Classes	105.0	0.8	0.0	0.0	13.8	13.2
Water	307.6	2.4	n/a	n/a	n/a	n/a

CARBON DIOXIDE

	Annual Sequestration *CO2 stored each year*		Total Storage *total accumulated CO2*	
	short tons	$	short tons	$
Entire Area	**19,555.4**	**379,873.7**	**593,180.0**	**11,522,837.0**
Developed, All Classes	8,343.4	162,074.8	253,082.8	4,916,268.1
Forested, All Classes	6,895.9	133,956.9	209,176.1	4,063,357.8
Wetlands, All Classes	3,161.7	61,417.2	95,904.1	1,862,987.7
Agriculture, All Classes	1,086.5	21,105.6	32,956.7	640,201.9
Miscellaneous, All Classes	67.9	1,319.4	2,060.3	40,021.5

AIR POLLUTION

	TOTAL *all pollutants*		CO *Carbon Monoxide*		NO2 *Nitrogen Dioxide*		O3 *Ozone*		SO2 *Sulfur Dioxide*		PM10 *Particulate Matter <10 microns*	
	total pounds	total $	pounds	$	pounds	$	pounds	$	pounds	$	pounds	$
Entire Area	**220,065.1**	**967,641.4**	**3,634.4**	**2,635.8**	**39,423.7**	**201,302.1**	**107,951.4**	**551,213.1**	**10,619.6**	**13,275.1**	**58,436.0**	**199,215.3**
Developed, All Classes	93,891.8	412,848.4	1,550.6	1,124.6	16,820.3	85,886.4	46,058.0	235,177.4	4,530.9	5,663.9	24,932.0	84,996.1
Forested, All Classes	77,602.7	341,224.4	1,281.6	929.5	13,902.2	70,986.2	38,067.5	194,377.1	3,744.8	4,681.3	20,606.6	70,250.3
Wetlands, All Classes	35,579.6	156,446.2	587.6	426.1	6,373.9	32,546.1	17,453.4	89,119.0	1,716.9	2,146.3	9,447.8	32,208.7
Agriculture, All Classes	12,226.7	53,761.6	201.9	146.4	2,190.4	11,184.2	5,997.7	30,625.1	590.0	737.6	3,246.7	11,068.3
Miscellaneous, All Classes	764.3	3,360.9	12.6	9.2	136.9	699.2	374.9	1,914.5	36.9	46.1	203.0	691.9

Estimates generated with i-Tree Vue for Trees only. For more information, visit www.itreetools.org.

Expand All | Save | Print | Close

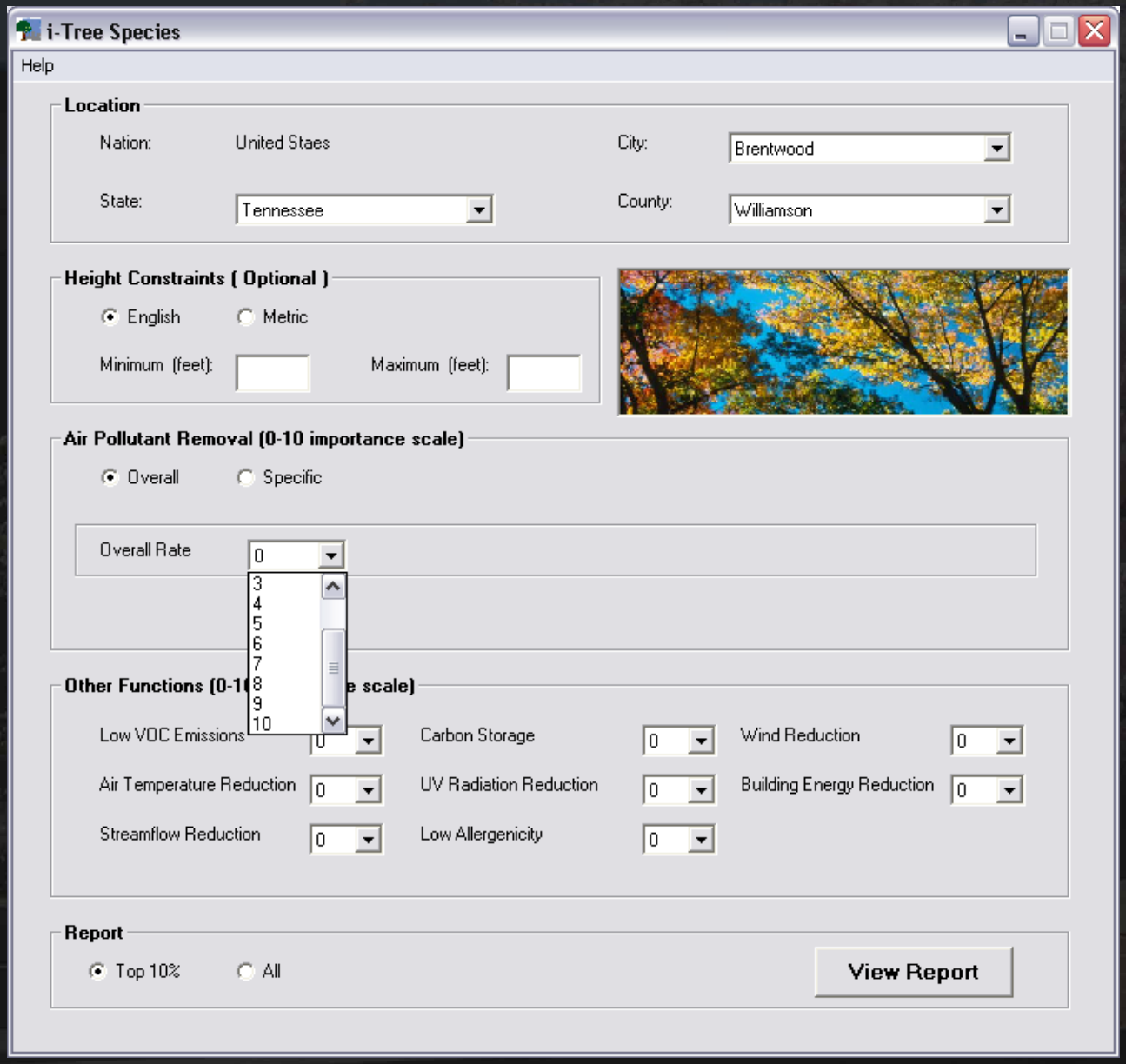
NLCD Statistics Report

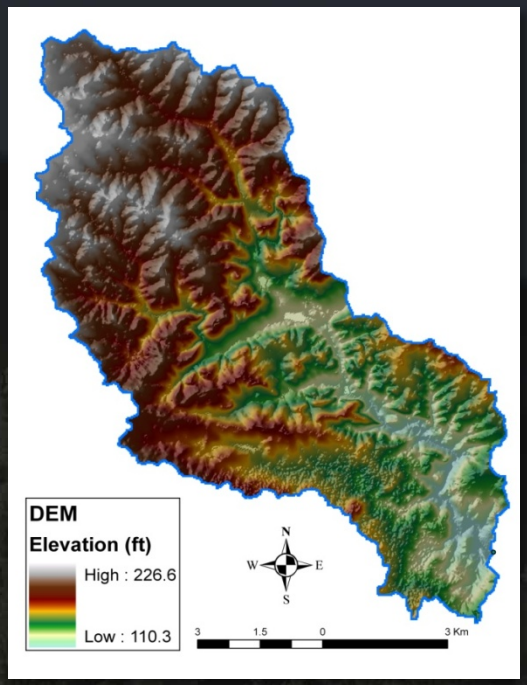
i-Tree™
Species

- Easily determine best species for desired tree benefits

i-Tree

i-Tree Species

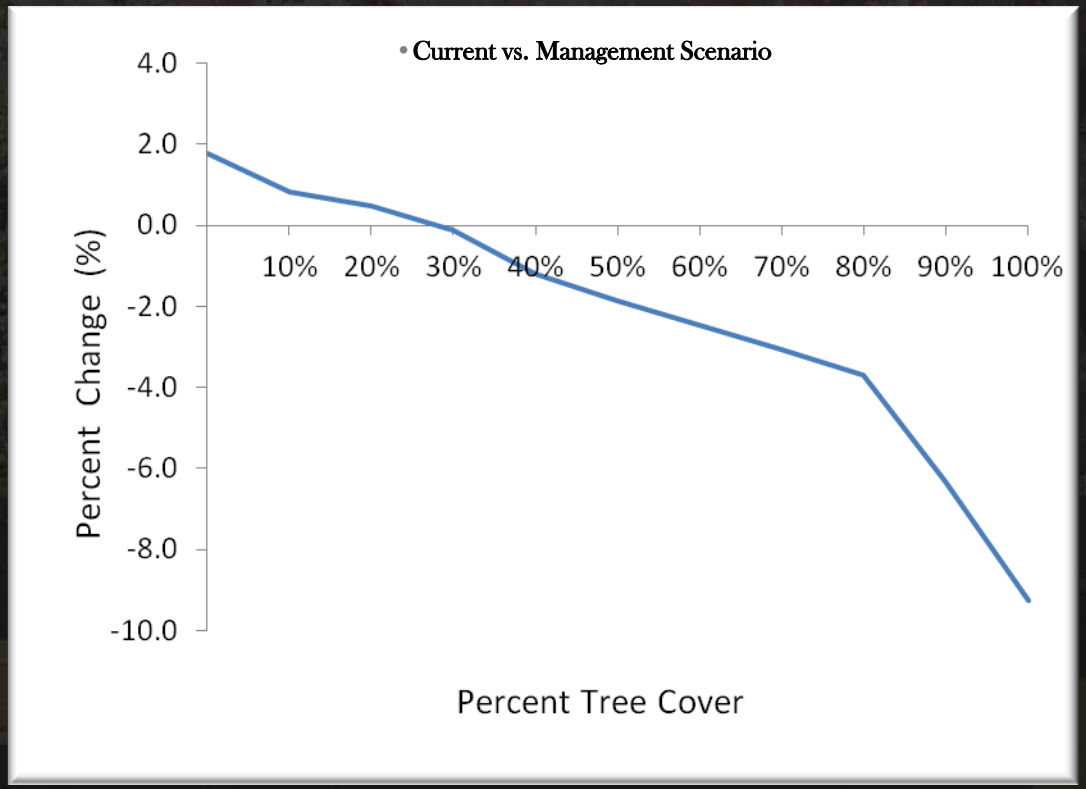




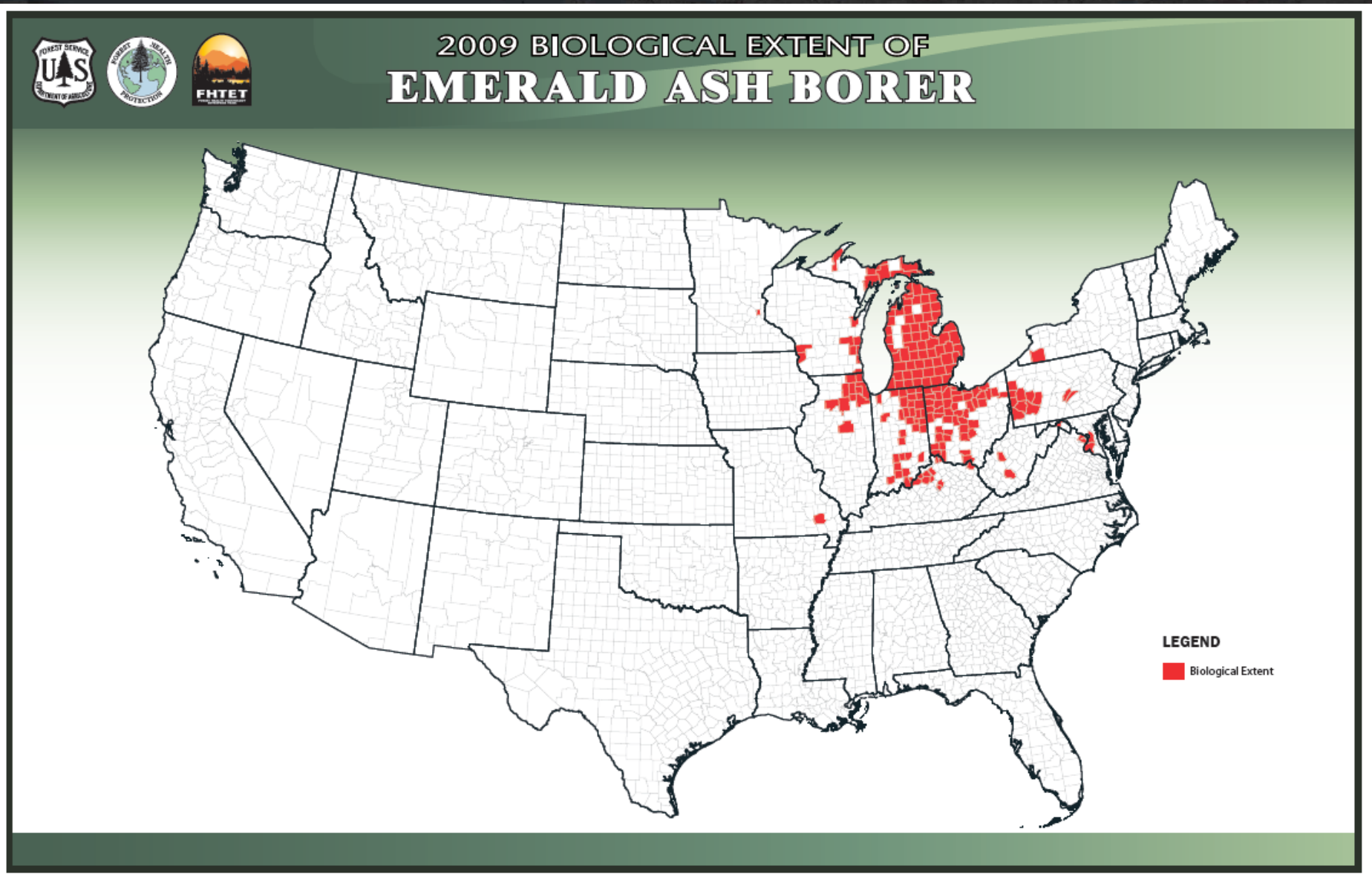
- Gwynns Falls Watershed, Baltimore

i-Tree
•Hydro

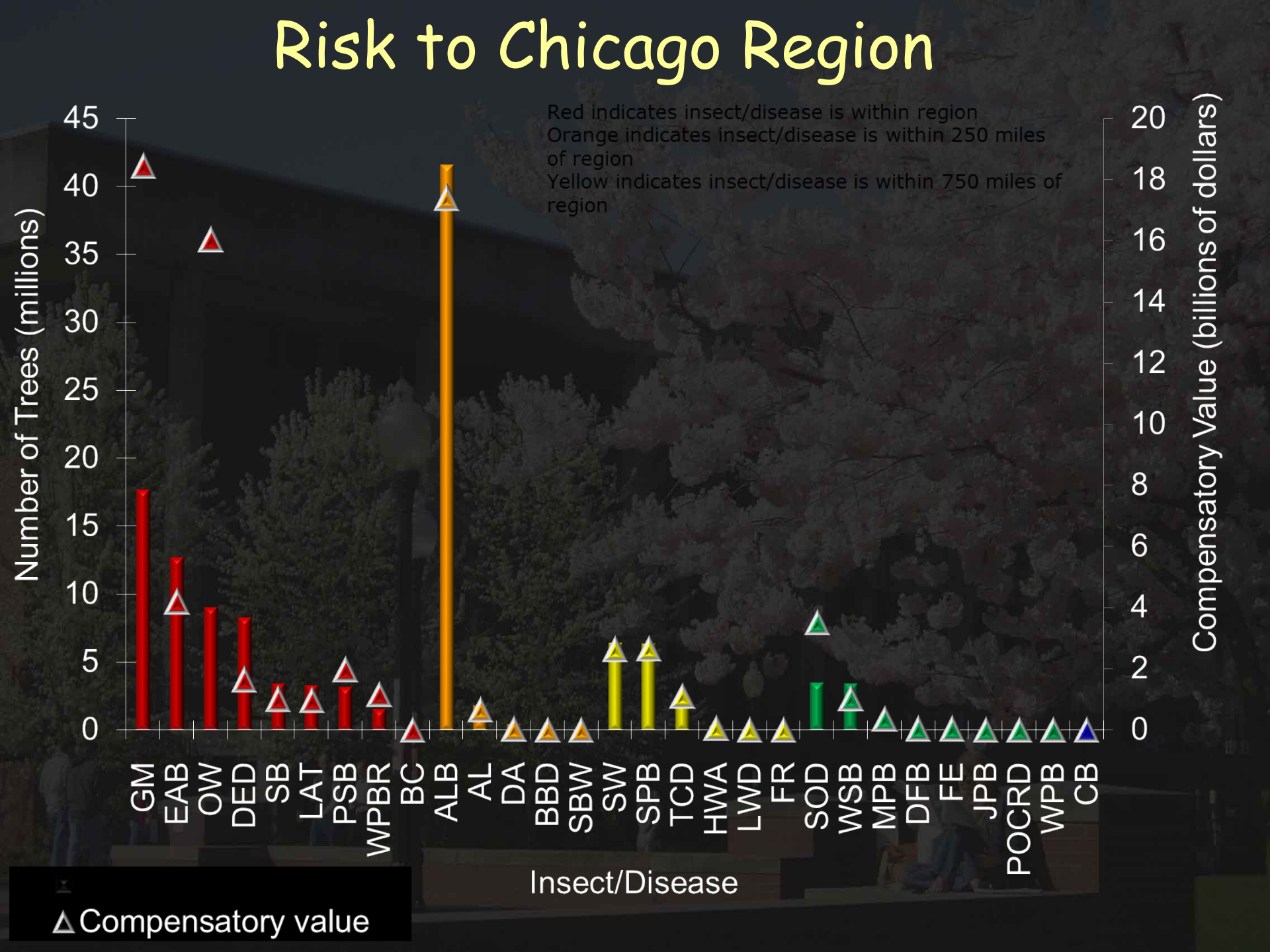
- **Quantifies effects of:**
  - Tree cover
  - Impervious cover
- **on:**
  - Hourly stream flow
  - Water quality



i-Tree: What's new in Version 5.0 (2012)?



Risk to Chicago Region



Reducing Risk

			Pest																														
Spp. Risk	Risk weight	Common Name	ALB	EAB	OW	LAT	PSB	WPBR	BC	GM	SB	AL	DA	BBD	SBW	LWD	SW	SPB	HWA	FR	SOD	WSB	TCD	MPB	DFB	FE	JPB	POCRD	WPB	DED	CB
1	14	Willow spp	1			1				2		2																			
1	14	Quaking aspen	1			1				2		2																			
1	14	Peachleaf willow	1			1				2		2																			
1	14	Pussy willow	1			1				2		2																			
1	14	Black willow	1			1				2		2																			
1	14	Weeping willow	1			1				2		2																			
1	14	Narrowleaf willow	1			1				2		2																			
1	13	Norway spruce					1				2						4	4				4		4							
1	12	Eastern white pine					1	1									4	4													
1	11	River birch	1			1				2																					
1	11	Paper birch	1			1				2																					
1	11	Gray birch	1			1				2																					
1	10	Scotch pine					1										4	4				4		4							
1	9	Douglas fir					1										4					4			4	4					
1	8	Green ash	1	1																											
1	8	Northern red oak			1					2											4										
1	8	Austrian pine					1										4	4													
1	8	Pin oak			1					2											4										

•Invasive Tree Species

- Trees on Maryland Invasive Species List within Baltimore

Species	% of Population	No. Trees
Tree of heaven	5.6	138,000
Norway maple	0.7	17,700
Callery pear	0.7	17,200
Total	7.0	172,900

•Human Health Impacts and Values

- Link to EPA BenMAP program
- Estimates health impacts and values due to tree effects on air quality via pollution removal

Health Effects	O_3	NO_2	SO_2	$PM_{2.5}$
Acute Bronchitis				✓
Acute Myocardial Infarction				✓
Acute Respiratory Symptoms	✓	✓	✓	✓
Asthma Exacerbation		✓	✓	✓
Chronic Bronchitis				✓
Emergency Room Visits	✓	✓	✓	✓
Hospital Admissions	✓	✓	✓	✓
Lower Respiratory Symptoms				✓
Mortality	✓			✓
School Loss Days	✓			
Upper Respiratory Symptoms				✓
Work Loss Days				✓

Some Key Points

- Benefits of Trees Are Variable
- We Can Calculate Benefits of Trees
- We Don't Need to Be Scientists
- Benefits are Very Often Overlooked
- Make it Part or Your Annual Planning


Find this presentation online
http://www.unri.org/research-documents/
Northern
RESEARCH STATION
USDA Forest Service

Placing a Value on Trees

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