



# Whose woods are these?

## Forest patch distribution, ownership, and land use history throughout the Mid-Atlantic

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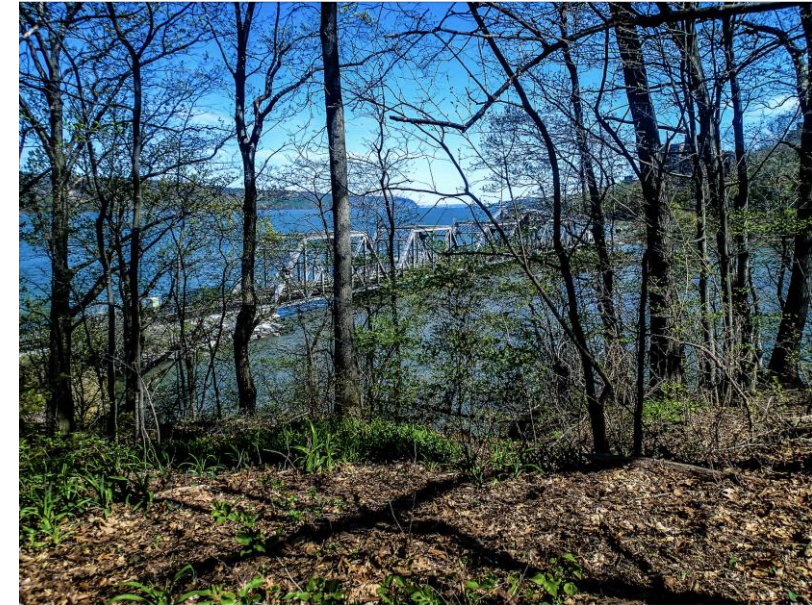
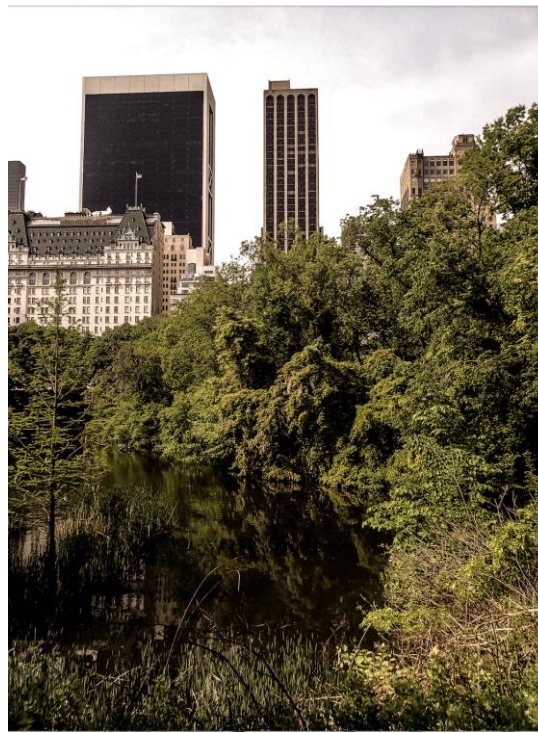
January 7, 2026  
Chesapeake Bay Program  
Forestry Workgroup





# Presentation Goals

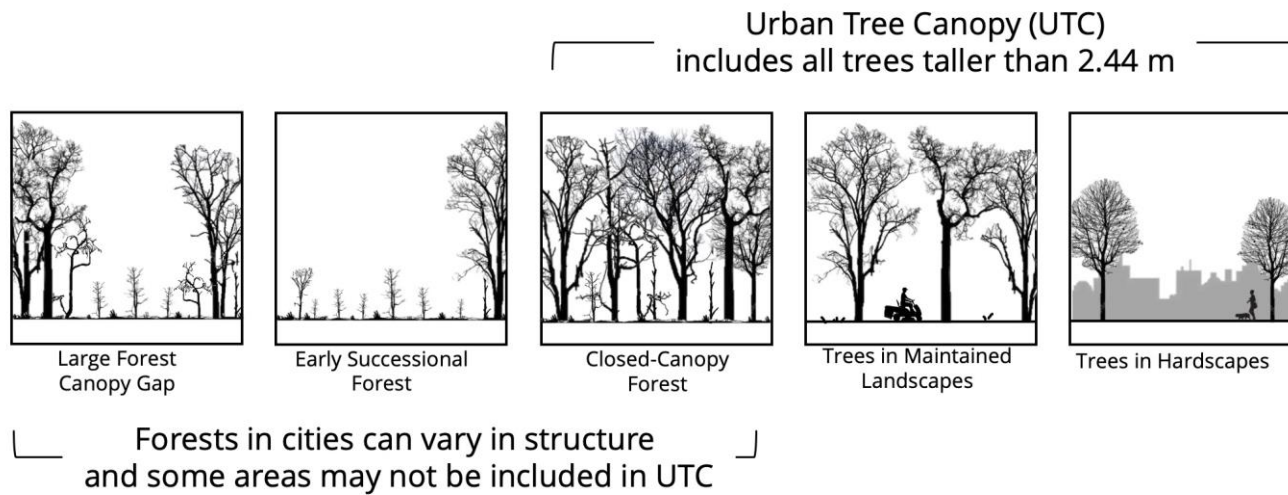
- Overview **methods for forest patch mapping**
- **Results on patch size and ownership**
  - Urban to rural setting, Baltimore County and City, MD
  - New York, NY; Philadelphia, PA; and Baltimore, MD
- Introduce **online tool – forest patch viewer**



## Research Goals

Map those areas  
with forest  
ecosystem  
processes and  
recruitment

**Image credit: Max R.  
Piana**



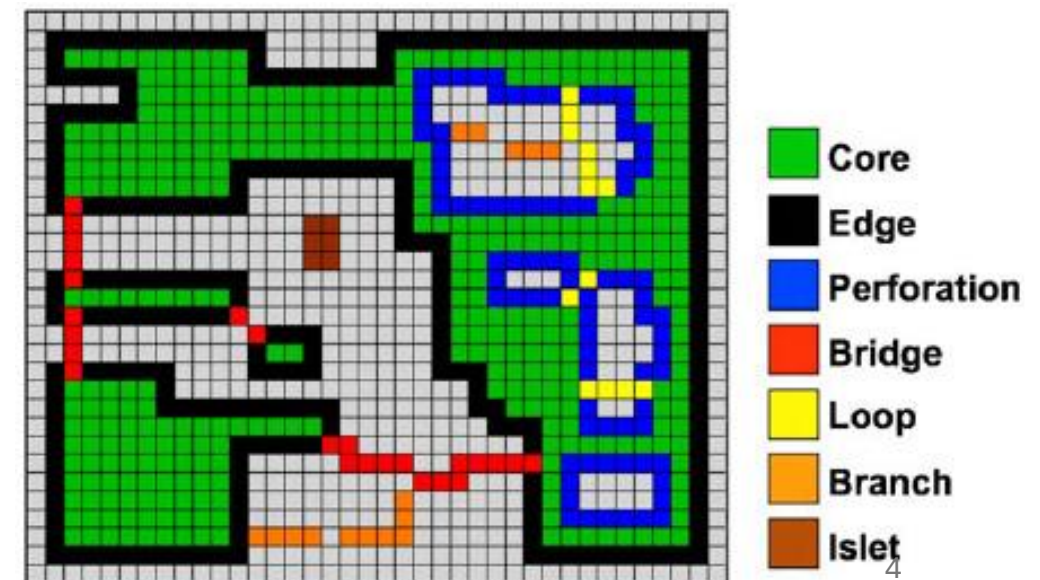
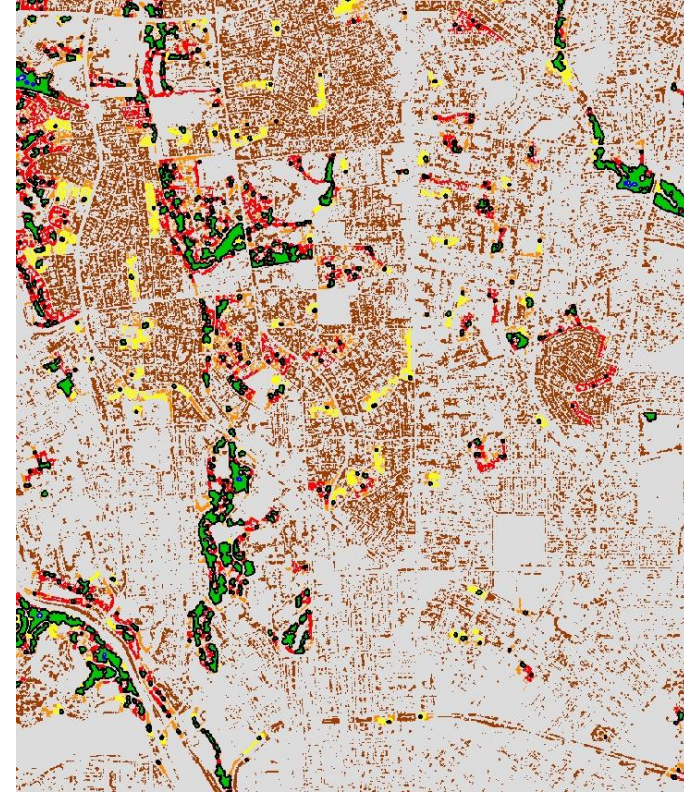


# Methods - morphological spatial pattern analysis (MSPA)

## Create data on forest patches

- high resolution land cover data (2013), streets and buildings removed, with MSPA tool Guidos Toolbox
- edge width set to 15 meters

Baker, M., Yesilonis, I., Templeton, L., Shobe, B., Bos, J., Sonti, N. F., & Lautar, K. (2025). Distributed urban forest patch sampling detects edge effects and woodland condition for monitoring and management. *Ecosphere*, 16(3), e70236. <https://doi.org/10.1002/ecs2.70236>





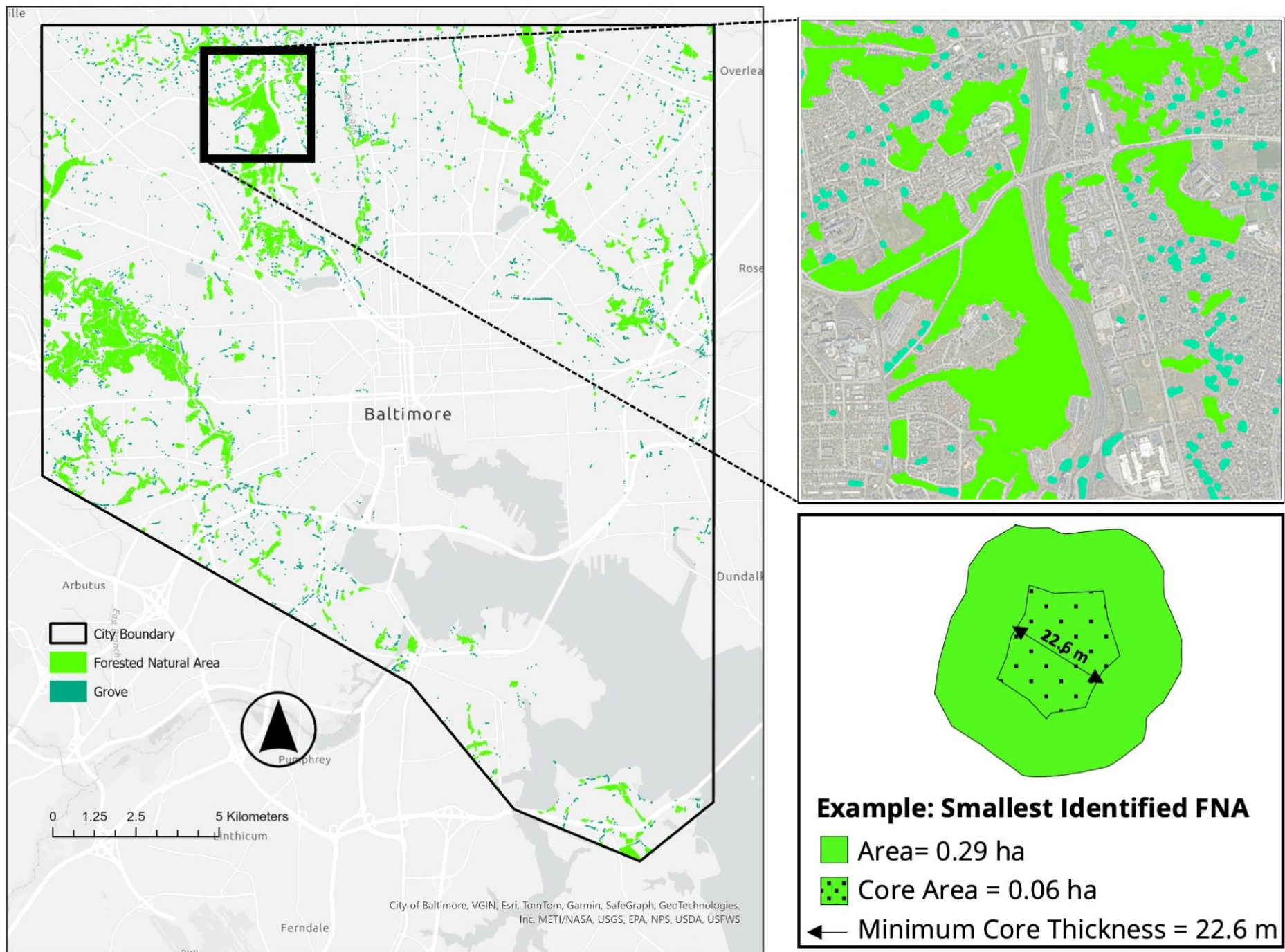


Image credit:  
Max R. Piana

# Forest patches from rural to urban areas

Number and area of forest patches

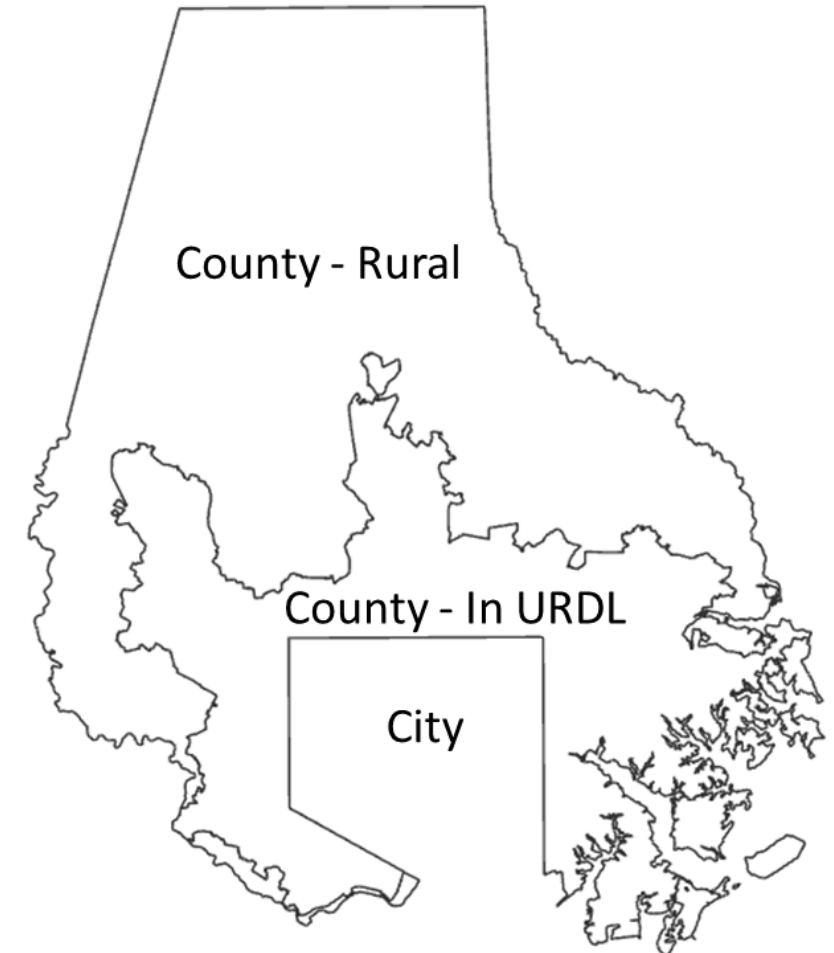
Ownership and land use, parcel data

## Ownership:

- Public – Federal, State, Municipal
- Private – Commercial, Institutions, Residential

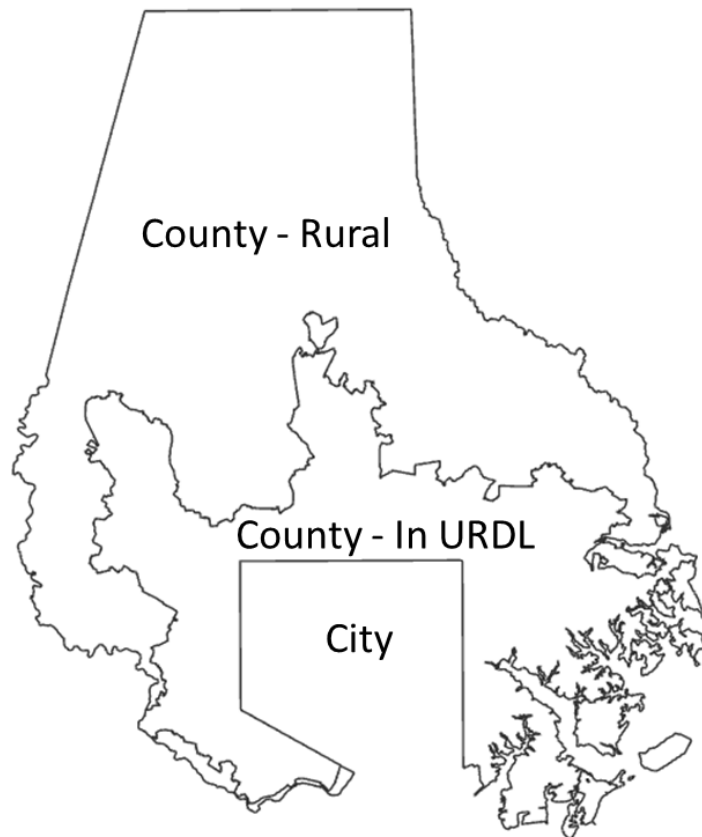
## Land Use:

- School, other institution, transportation
- Park & recreation
- Residential
- Agriculture





**Over 20,000 forest patches mapped across Baltimore City and County, totaling 581.9 km<sup>2</sup> (32.6% of total area area).**



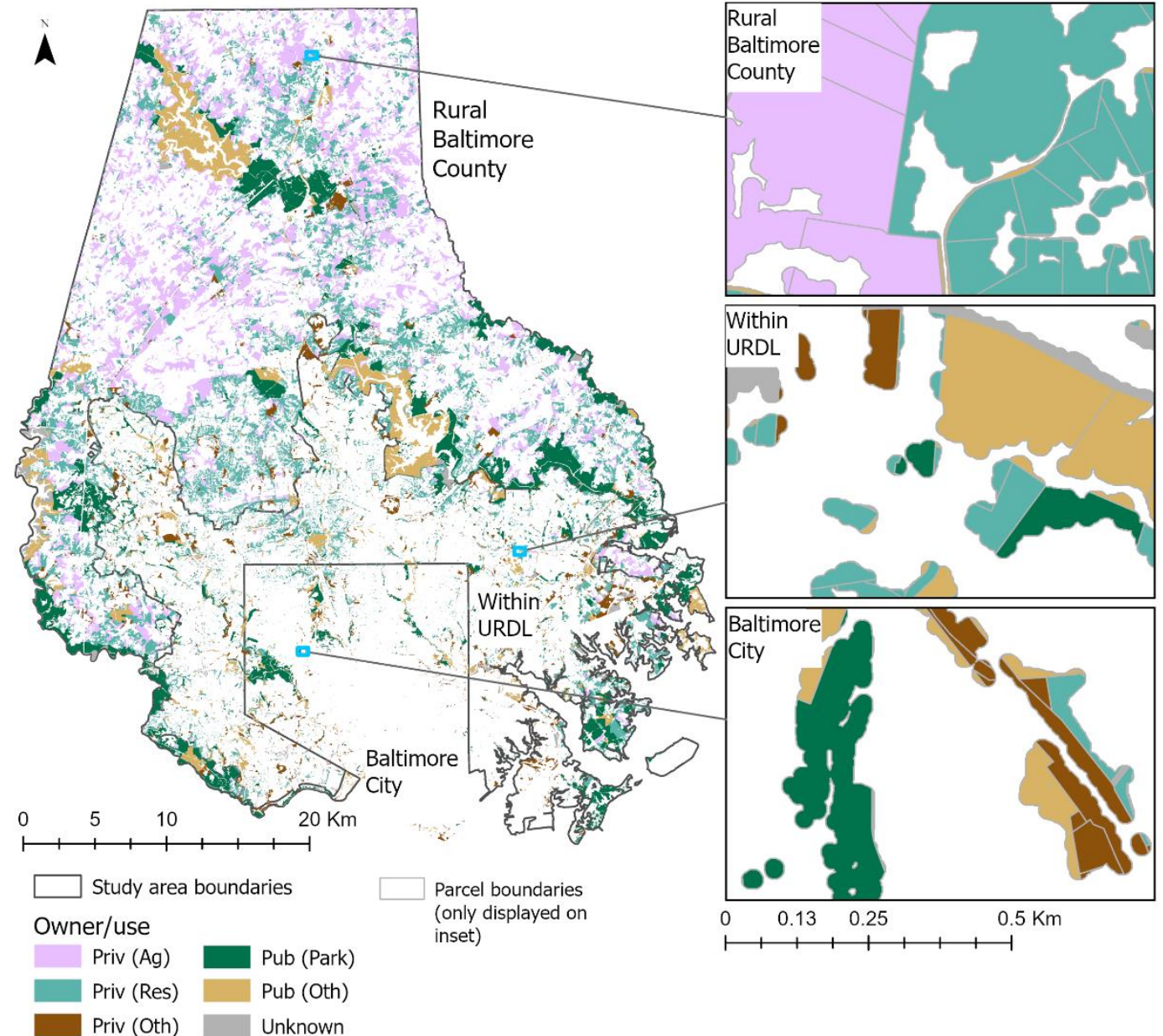
- **Baltimore City: 9.7% forest cover;** median patch size ~2,100 m<sup>2</sup>.
- **Suburban (inside URDL): 17.9% forest cover;** median patch size ~2,300 m<sup>2</sup>.
- **Rural (outside URDL): 44.7% forest cover;** median patch size ~2,600 m<sup>2</sup>

# Forest Patch Ownership and Land use

**Urban** - Forest mostly **publicly owned (55%)**, **concentrated in parks** (e.g., Gwynns Falls/Leakin Park).

**Suburban:** Forest primarily **private residential (39%)**, with some public parkland.

**Rural:** Forest dominated by **private agricultural lands (34%)** and **private residential (31%)**, plus public lands near reservoirs.





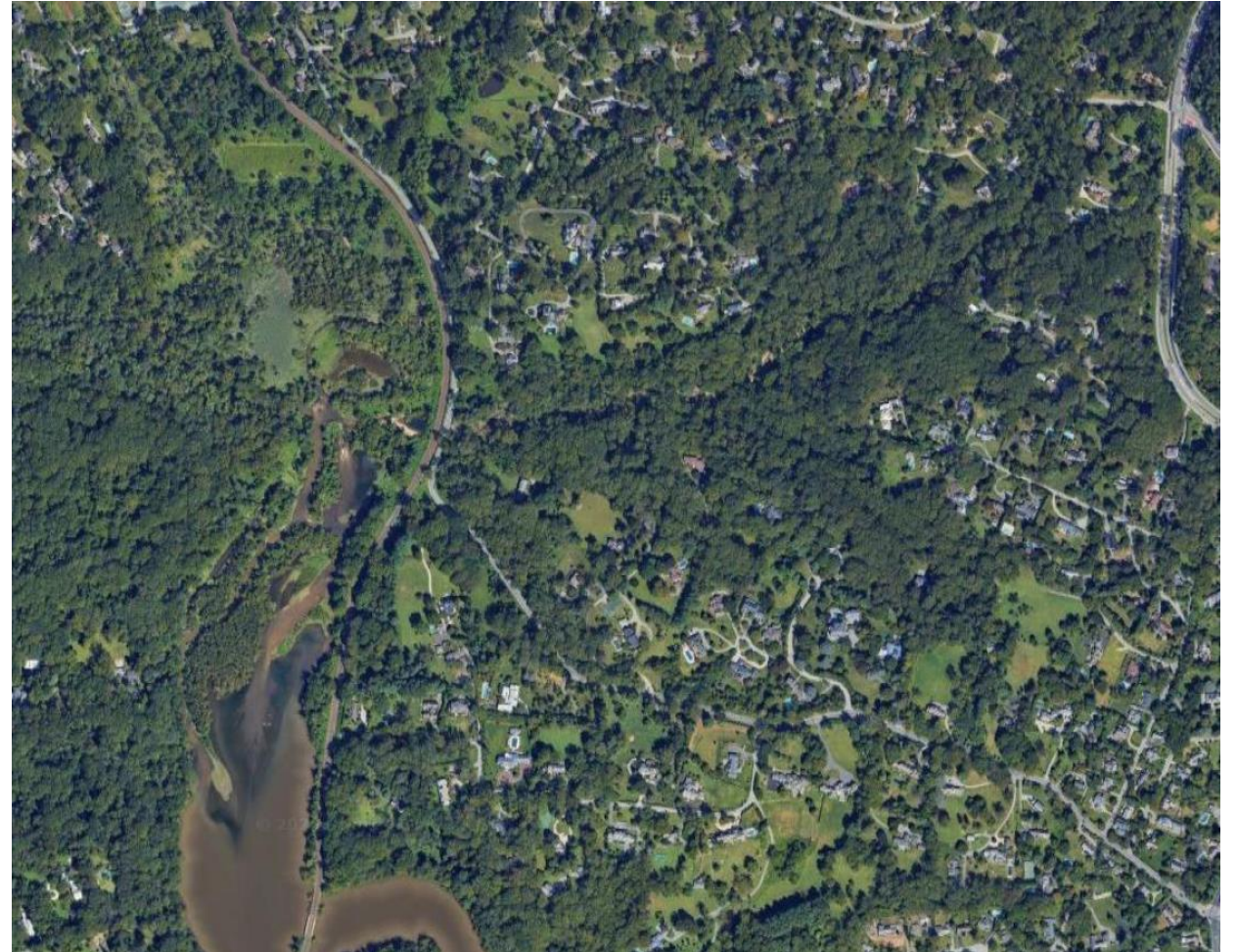
# Amount and ownership in suburban areas is notable

Area within URDL makes up one-third of Baltimore County's total area & 90% of the county's population, ~¾ million people.

- **17.9% of land area is in forest**
- **Highest patch density (14.6 patches/km<sup>2</sup>), despite intense development.**
- **Mostly private residential ownership and use**

Mockrin, M. H., Baker, M. E., Katoski, M., Sonti, N. F., & Holland, M. B. (2025). Legacies of urbanization and suburbanization on forest patch distribution, ownership, and use: Insights from Baltimore, Maryland. *Urban Forestry & Urban Greening*, 107, 128778.

<https://doi.org/10.1016/j.ufug.2025.128778>



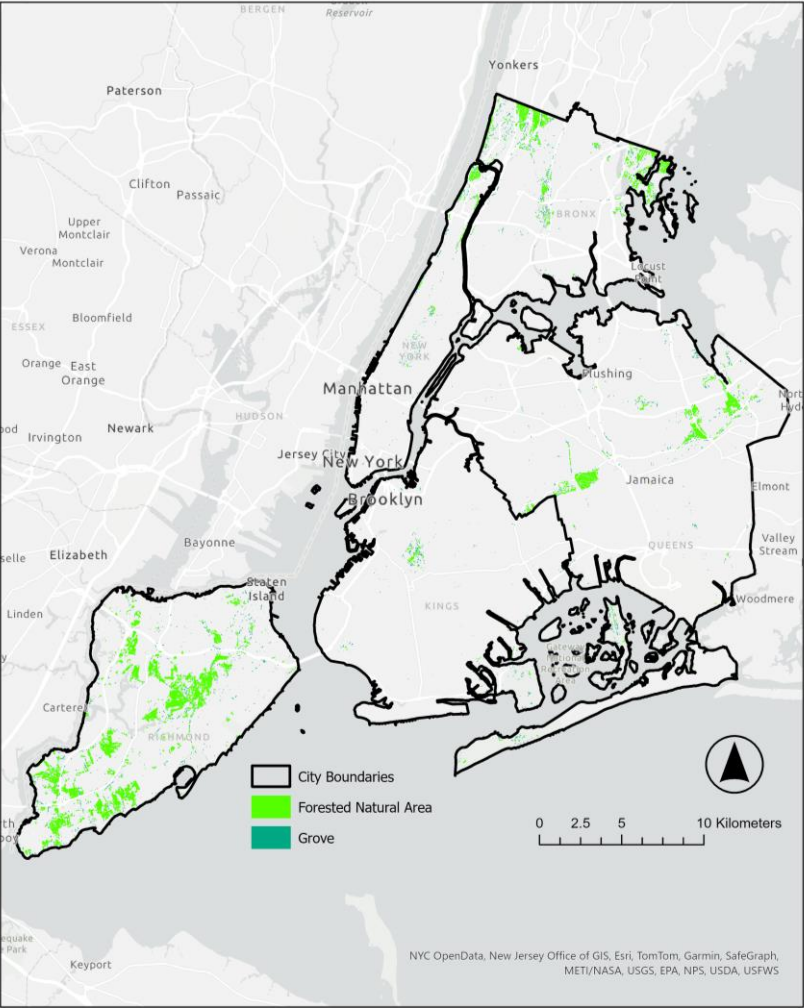


# Urban Forest Patch Viewer: Conserving Forests in Cities

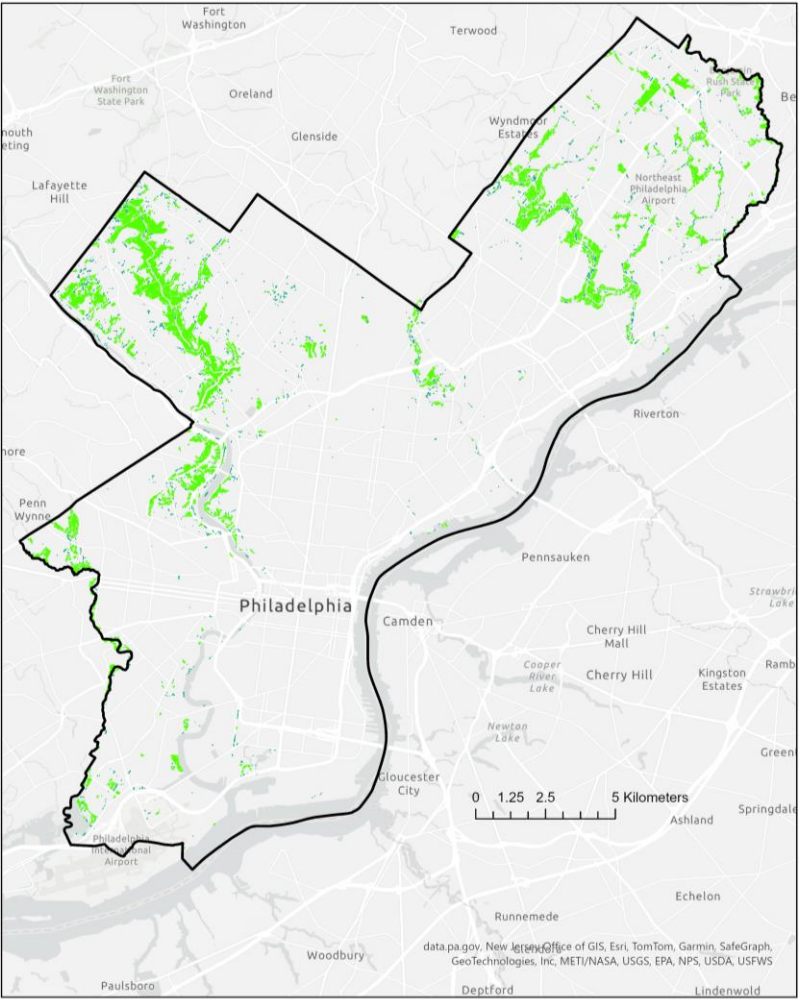




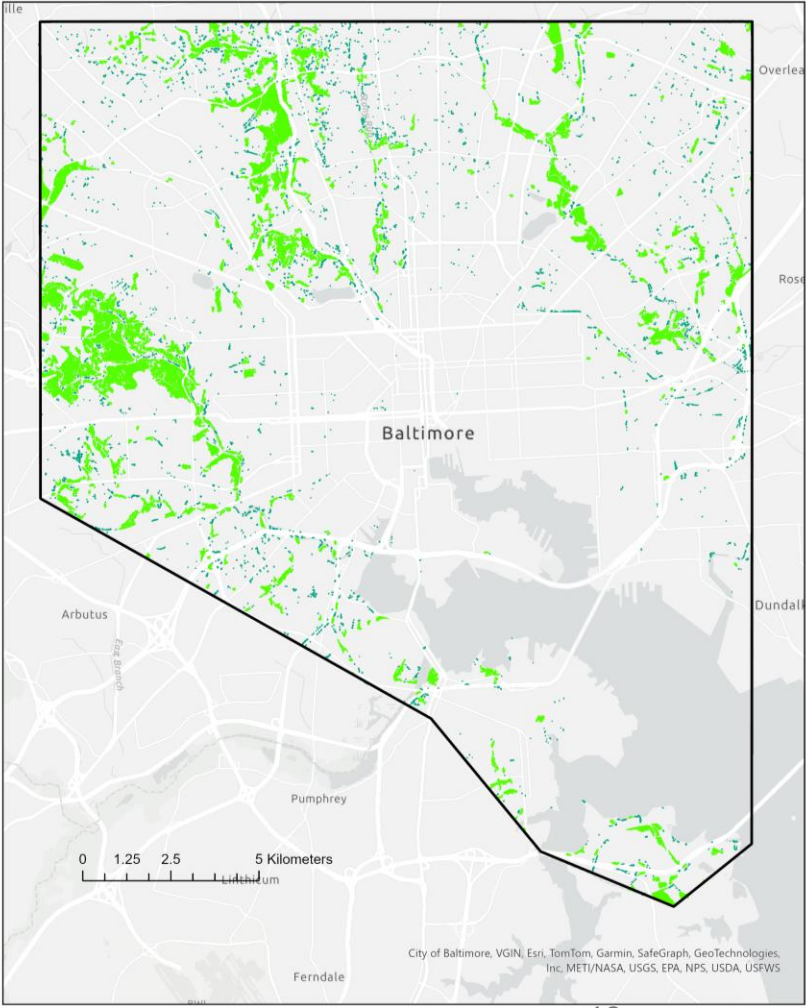
**New York City:**  
**22% UTC**  
**3.9% Forest Patch Cover**



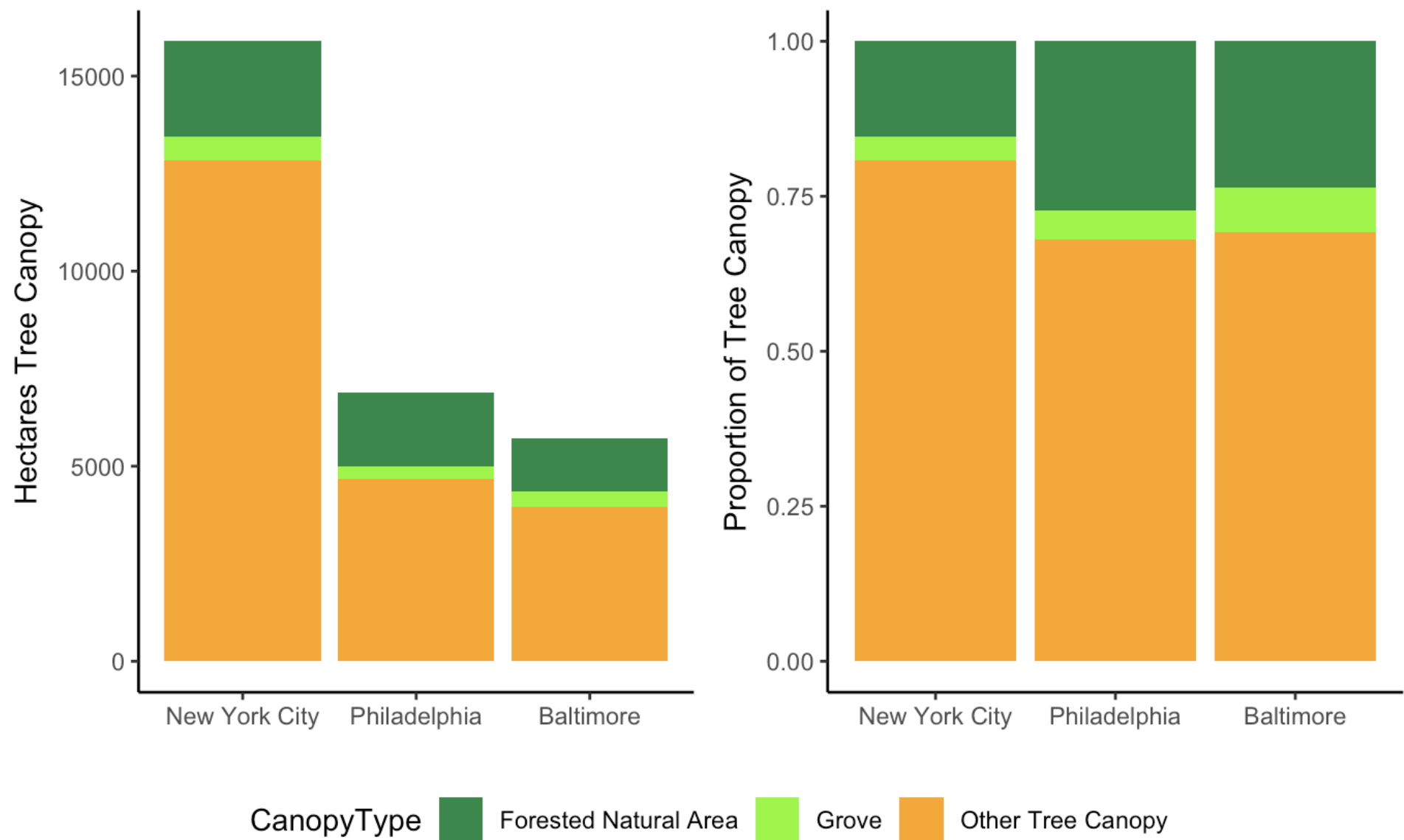
**Philadelphia:**  
**20% UTC**  
**6.3% Forest Patch Cover**



**Baltimore:**  
**28% UTC**  
**8.4% Forest Patch Cover**



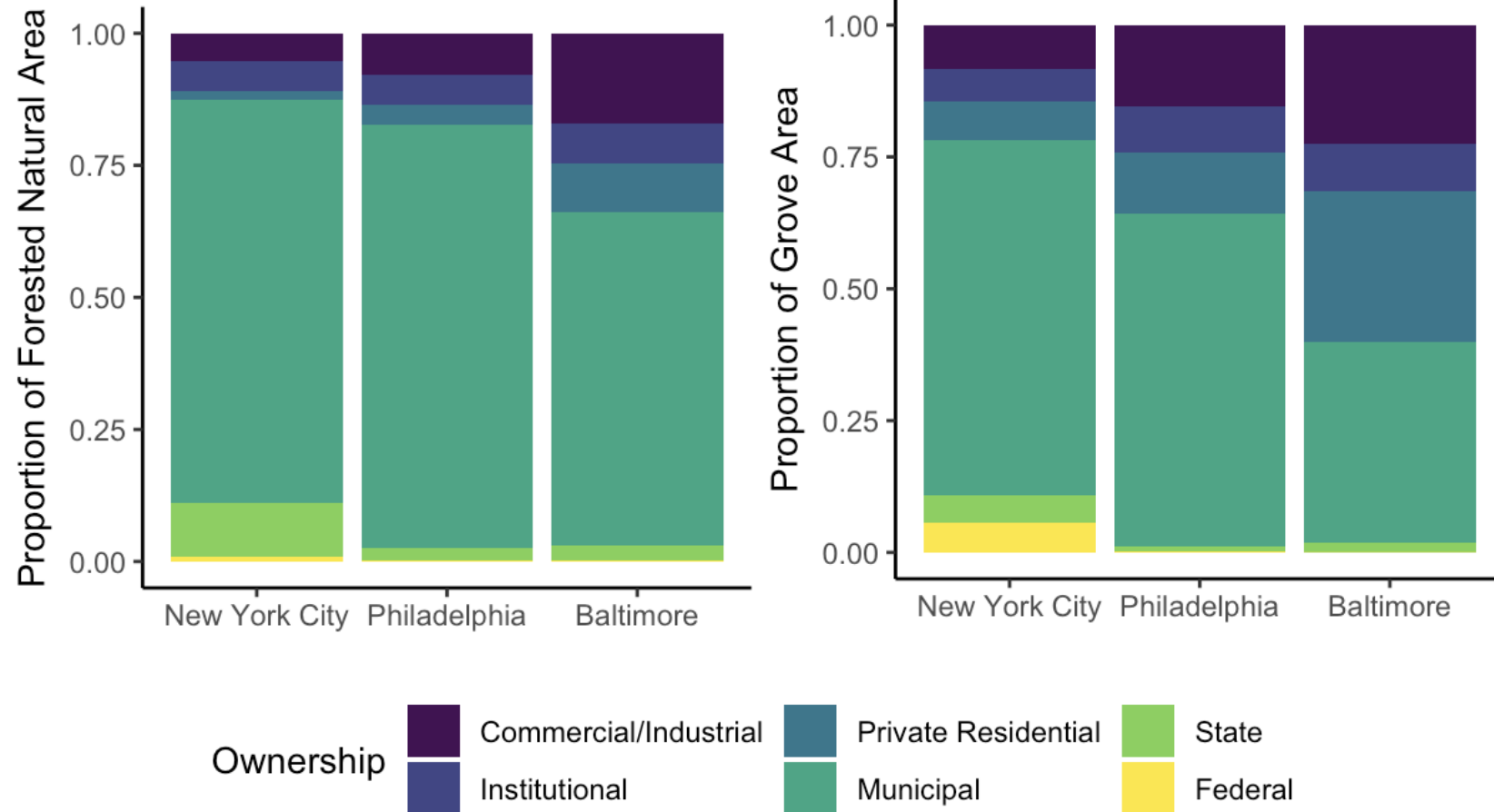
# Mapping Forest Patch Canopy





# Mapping Forest Patch Ownership

- Policy implications
  - Conservation priorities
  - Legal preservation challenges across parcels
- Management implications
  - Forest connectivity across parcels and ownerships
  - Landowner outreach / extension activities



1927 Aerial Imagery

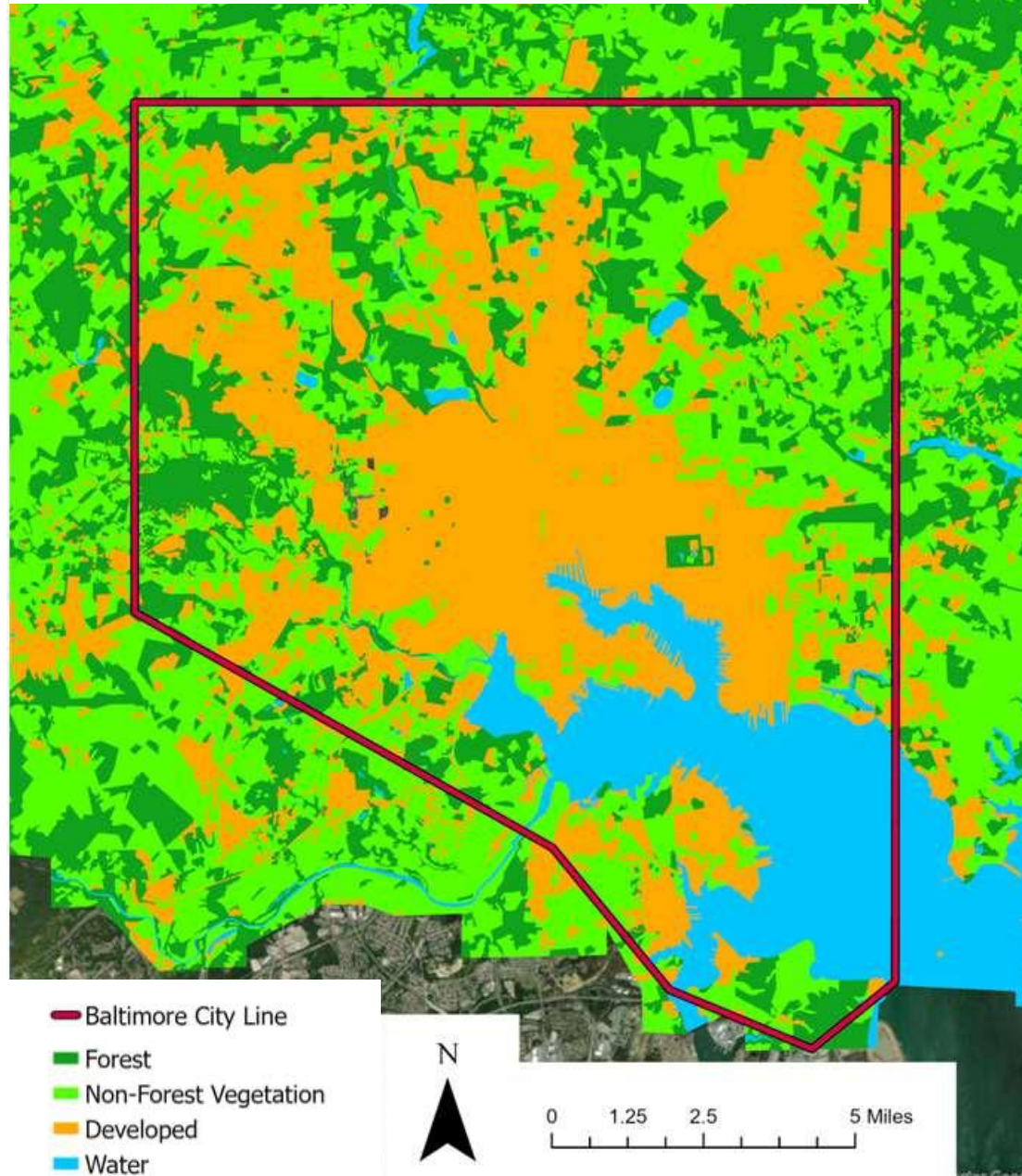


1953 Aerial Imagery

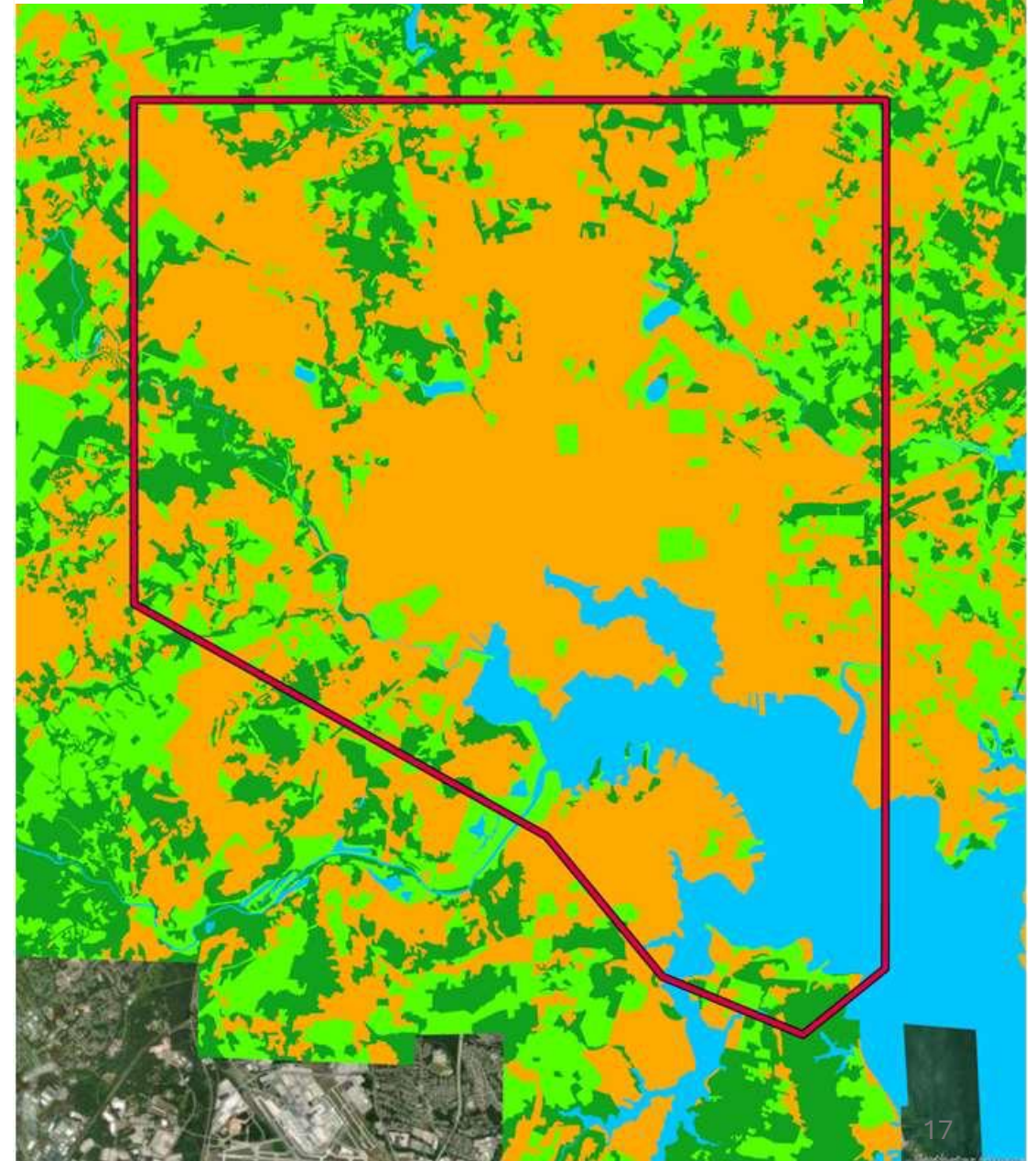




# 1927 Land Cover Classification

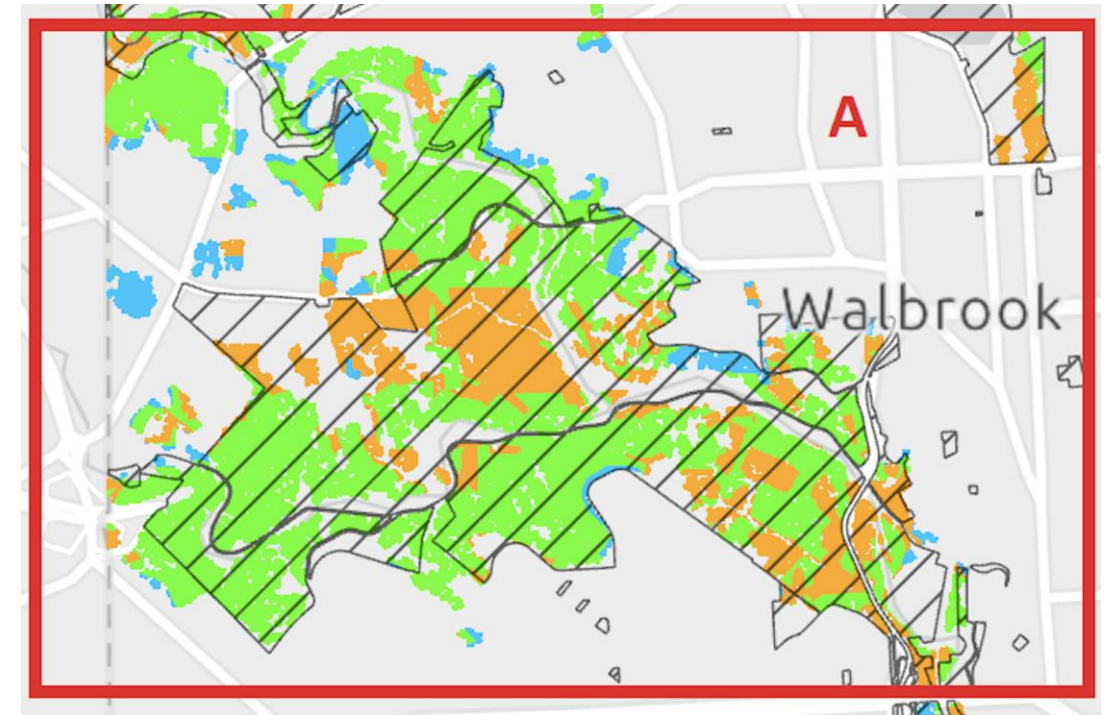
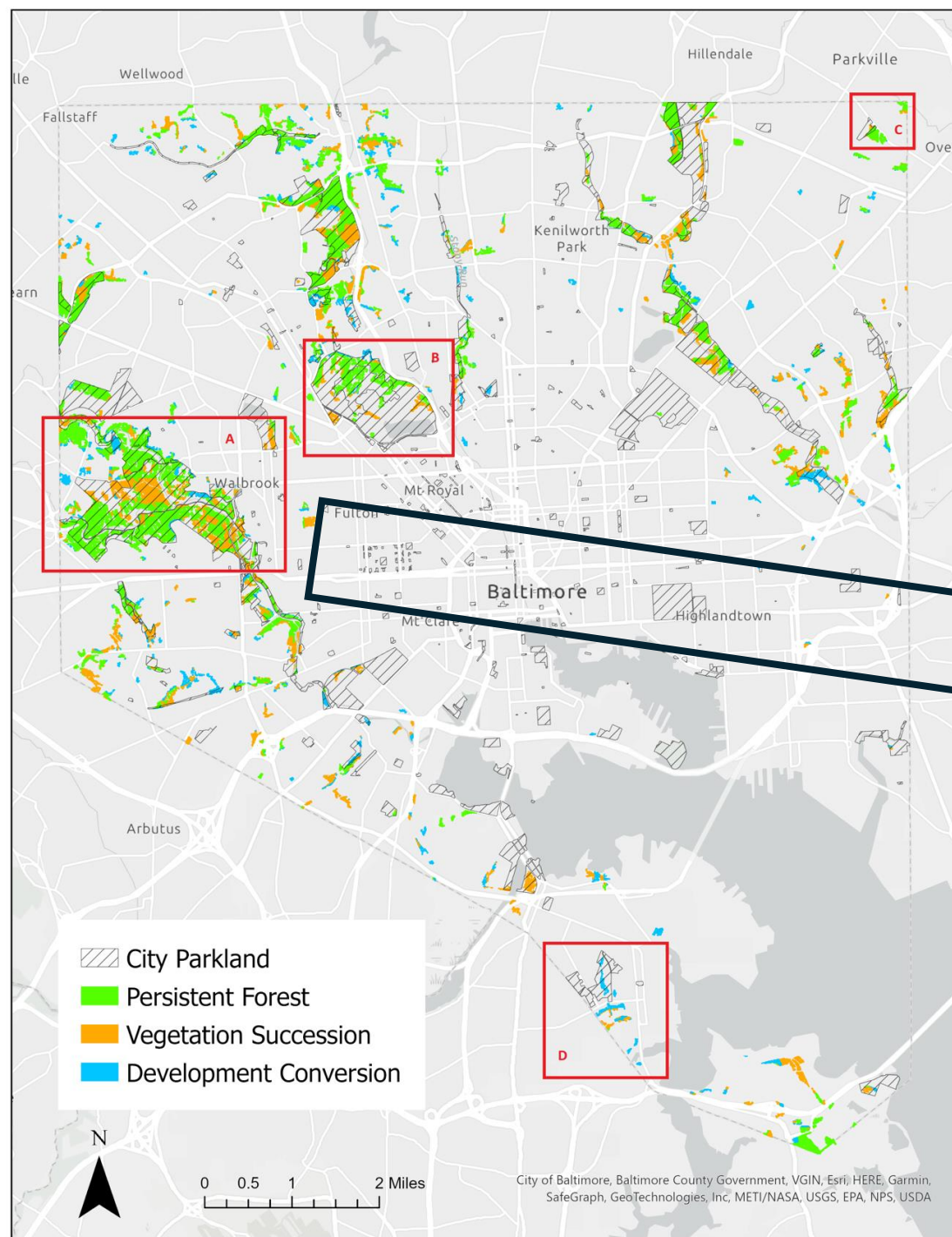


# 1953 Land Cover Classification





# Gwynns Falls – Leakin Park







# The Urban Forest Patch Viewer

[Home Page](#)[New York City](#)[Philadelphia](#)[Baltimore](#)[Washington, D.C.](#)

Sources: Esri, USGS, data.pa.gov, Delaware FirstMap, New Jersey Office of GIS, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS | USDA Forest Service Northern Research Station | USDA Forest Service, Northern Research Station

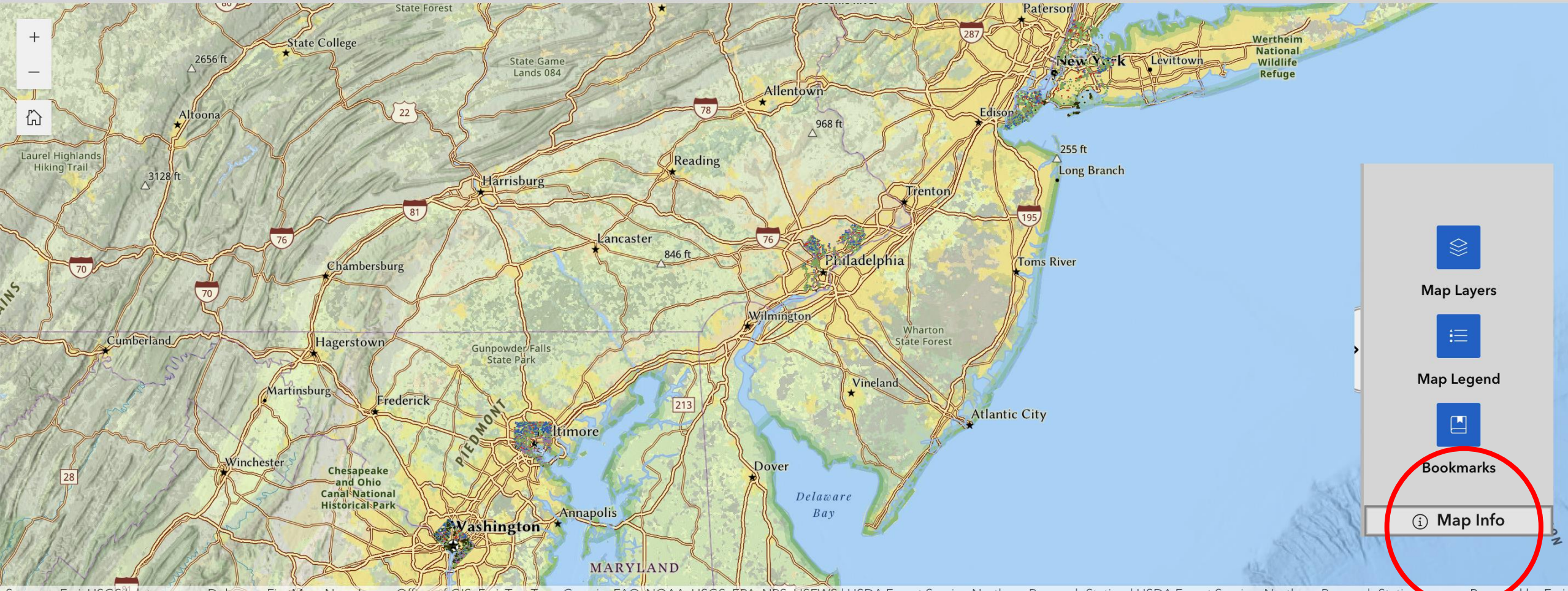
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# The Urban Forest Patch Viewer

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# Welcome to the Urban Forest Patch Viewer!

## Using This Web Application

Click on a city name at the top of the screen to view map layers, and summary data tables for that city. You can turn layers on and off within each city and can change the transparency of each layer. You may also view a swipe screen within each city. Be sure that all layers are on before selecting which layer to view with the swipe tool. Click on "Details" buttons within each layer for metadata about how each layer was created.

## Layer Descriptions

The Urban Forest Patch Viewer displays three map layers providing slightly different information on urban forest patches. The forest patch ownership layer is visible by default. The forest patches layer provides an indication of size, with groves being the smallest type of patch. The forest patches and the core and edge forest layers can be viewed by checking the box next to the layer in the **Map Layers** tool. View the item details in the map layer tool for [more information on these layers](#).

## Web Application Information

### Citation:

Sonti, N.; Baker, M. 2023. Urban forest patch viewer app. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station. <https://experience.arcgis.com/experience/e9801ba79ba0487c8a027390da49fbea> (15 September 2023).

### Project Contact:

[Nancy Sonti](#), Research Ecologist at [nancy.f.sonti@usda.gov](mailto:nancy.f.sonti@usda.gov).

**Last Update:** 26 February 2024

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# The Urban Forest Patch Viewer

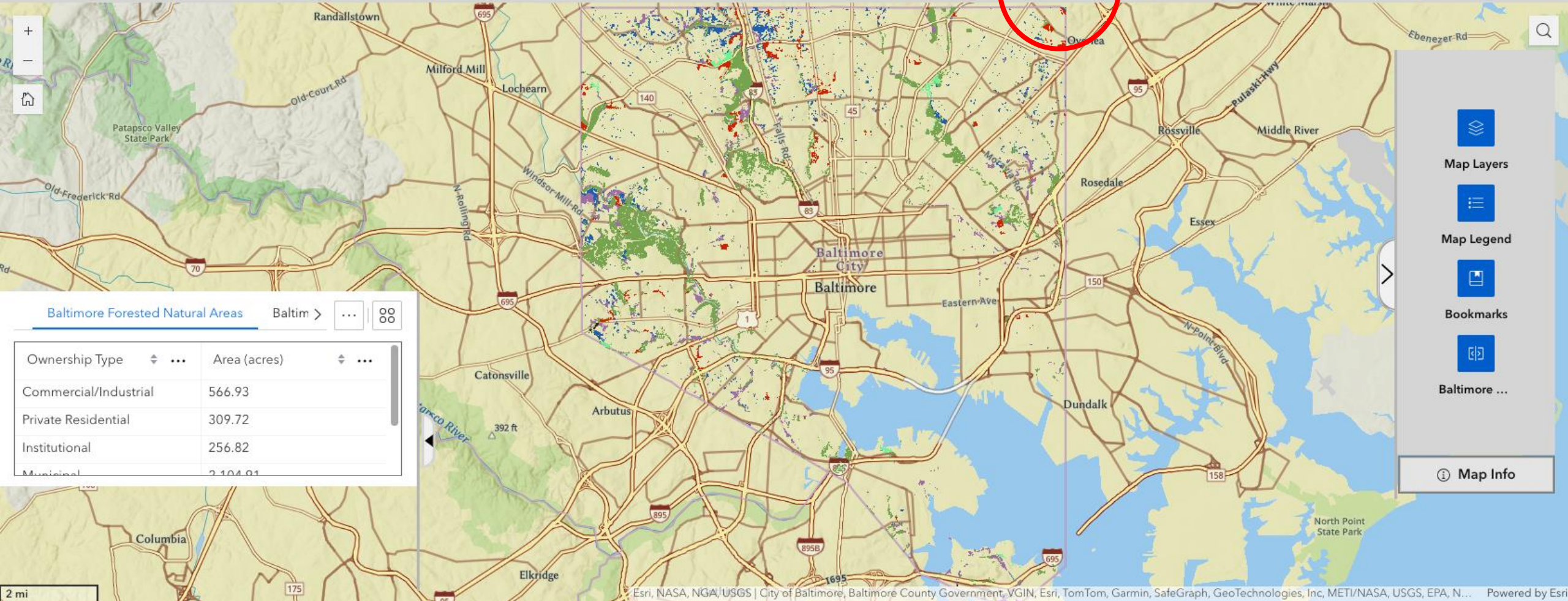
Home Page

New York City

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Map Layers



Map Legend



Bookmarks



Baltimore ...

Map Info





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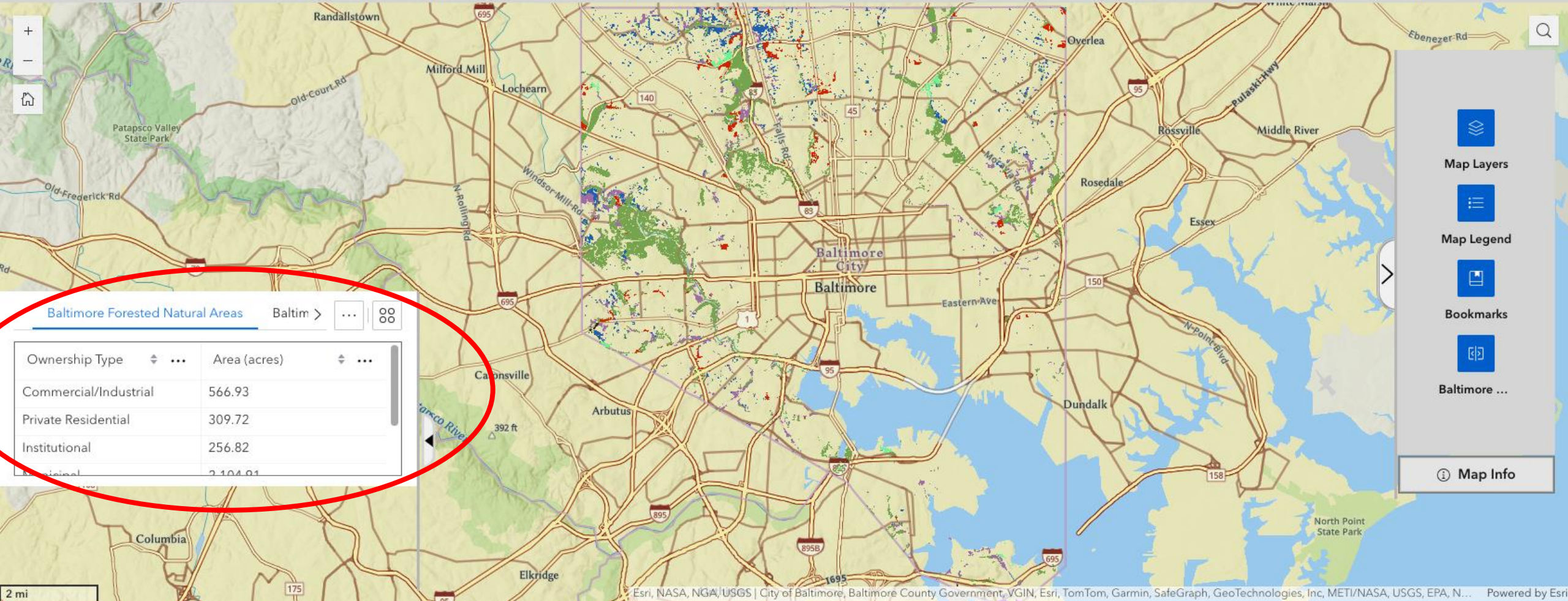
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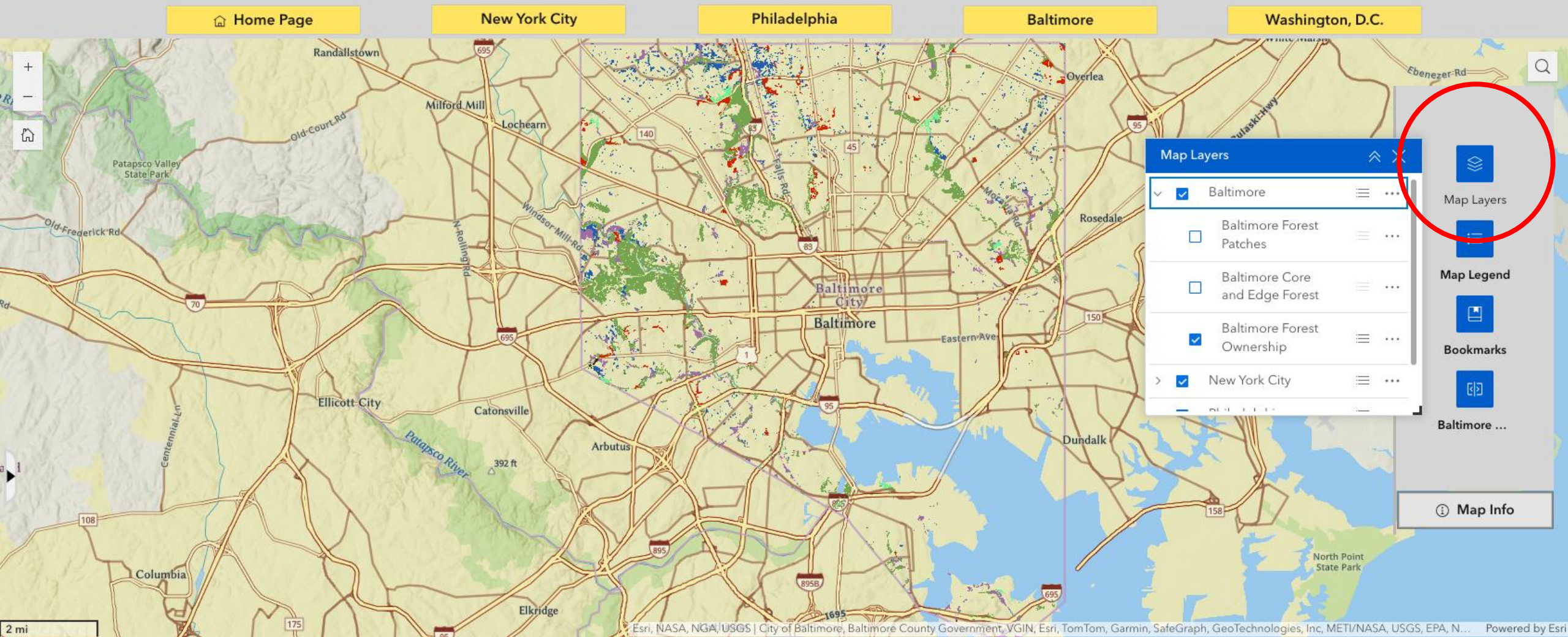
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# The Urban Forest Patch Viewer







# The Urban Forest Patch Viewer

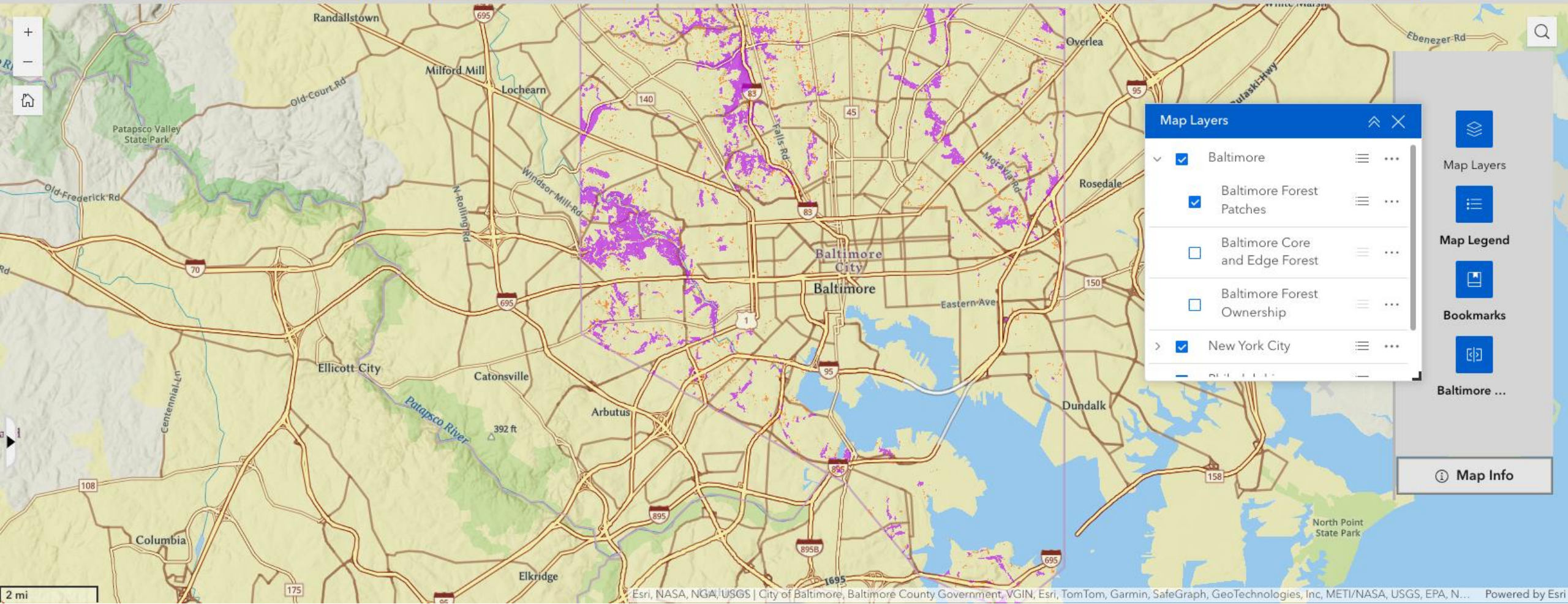
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Esri, NASA, NGA, USGS | City of Baltimore, Baltimore County Government, VGIN, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, N... Powered by Esri





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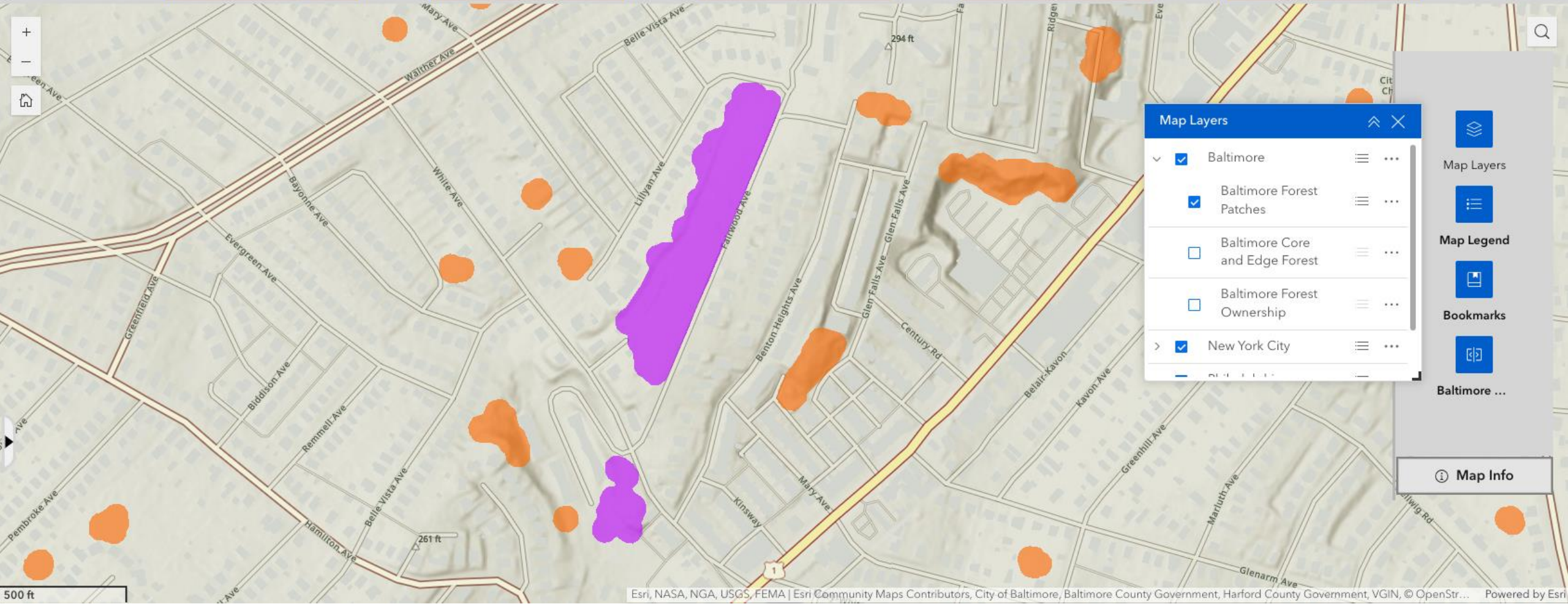
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Map Layers

<input checked="" type="checkbox"/>	Baltimore	≡	⋮
<input checked="" type="checkbox"/>	Baltimore Forest Patches	≡	⋮
<input type="checkbox"/>	Baltimore Core and Edge Forest	≡	⋮
<input type="checkbox"/>	Baltimore Forest Ownership	≡	⋮
<input checked="" type="checkbox"/>	New York City	≡	⋮

Map Layers

Map Legend

Bookmarks

Baltimore ...

Map Info





# The Urban Forest Patch Viewer

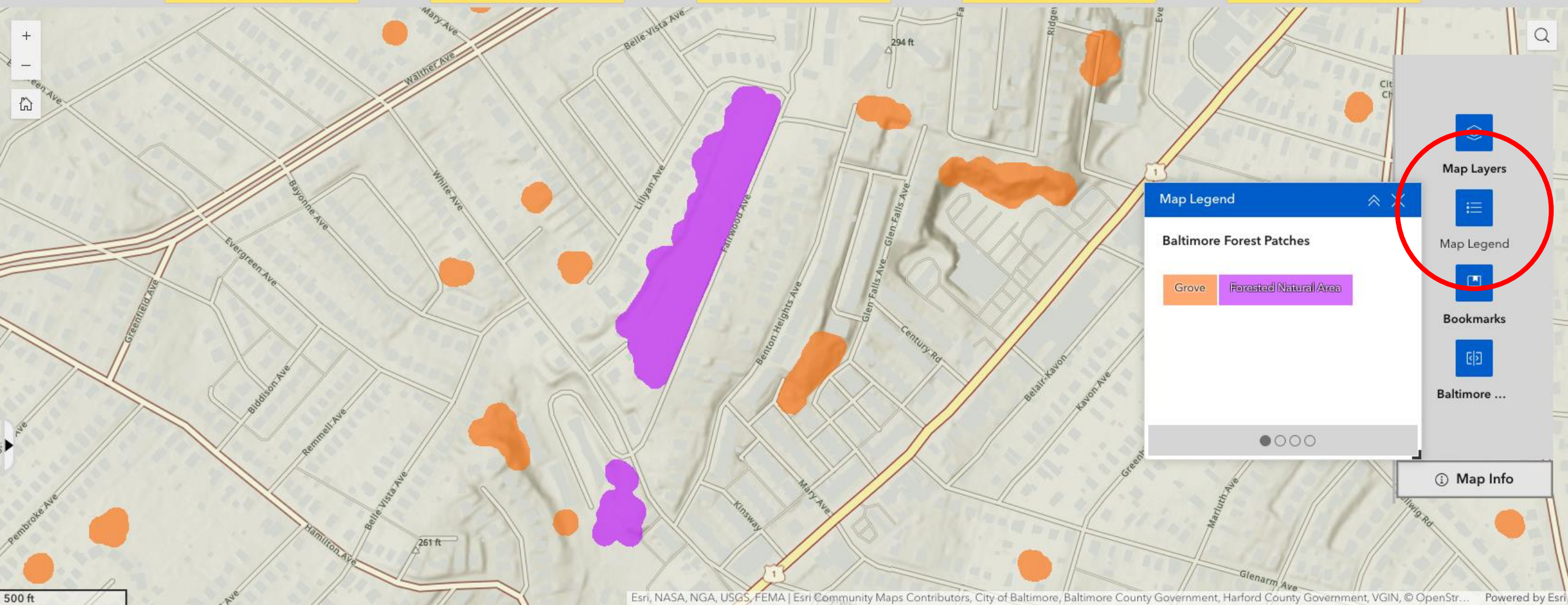
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Map Legend

Baltimore Forest Patches

Grove

Forested Natural Area

Map Layers

Map Legend

Bookmarks

Baltimore ...

Map Info





# The Urban Forest Patch Viewer

Home Page

New York City

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Map Layers

☒

Baltimore

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Baltimore Forest Patches

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Baltimore Core and Edge Forest

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Baltimore Forest Ownership

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New York City

Map Layers

Map Legend

Bookmarks

Baltimore ...

Map Info





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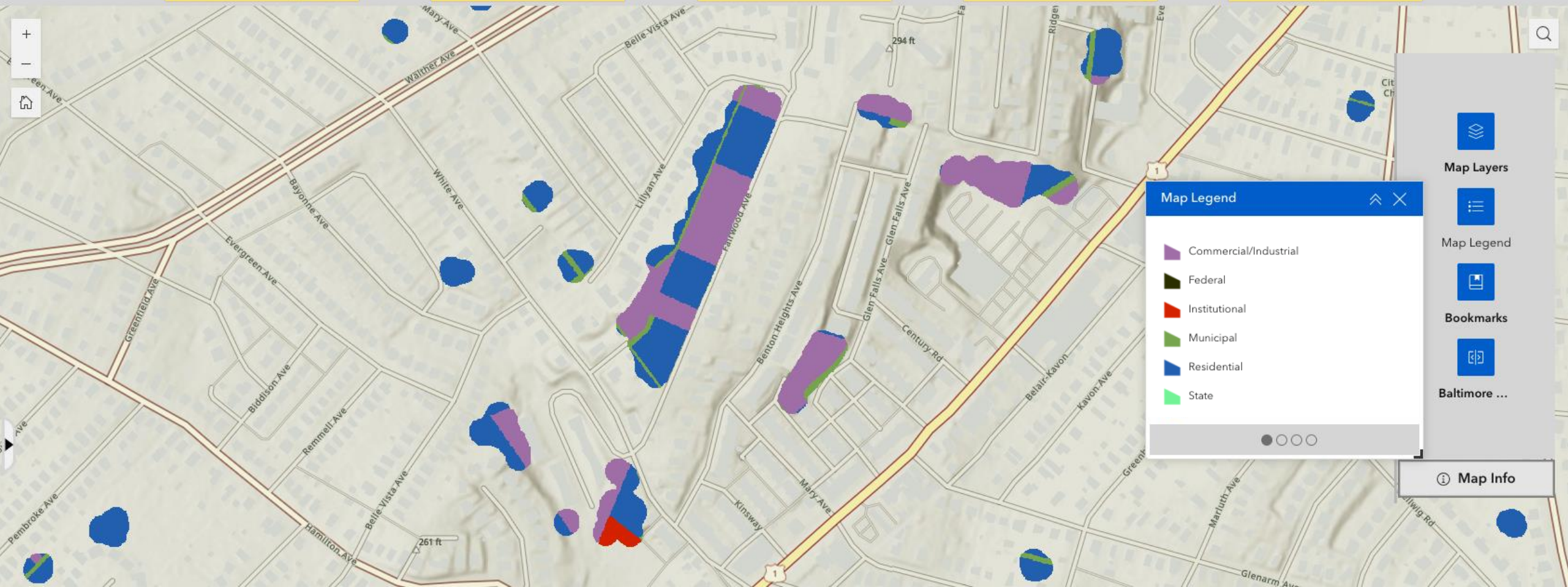
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## Map Legend

- Commercial/Industrial
- Federal
- Institutional
- Municipal
- Residential
- State



Map Layers



Map Legend



Bookmarks



Baltimore ...

Map Info





# The Urban Forest Patch Viewer

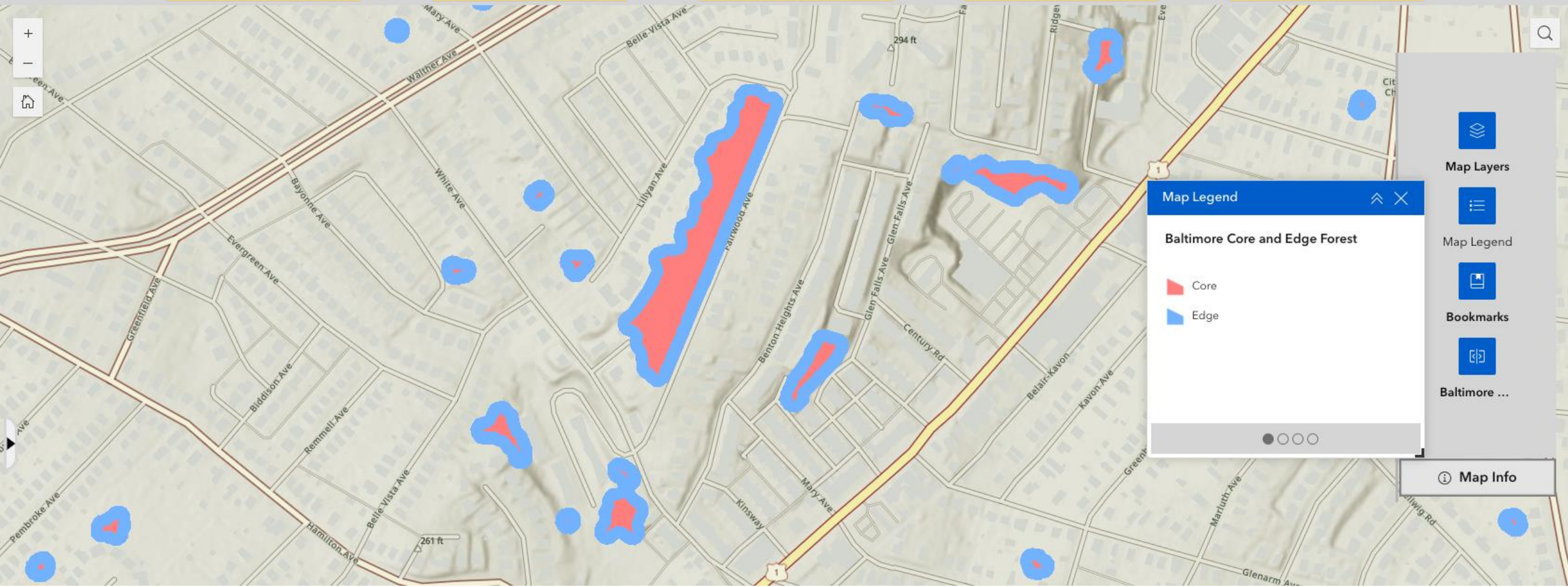
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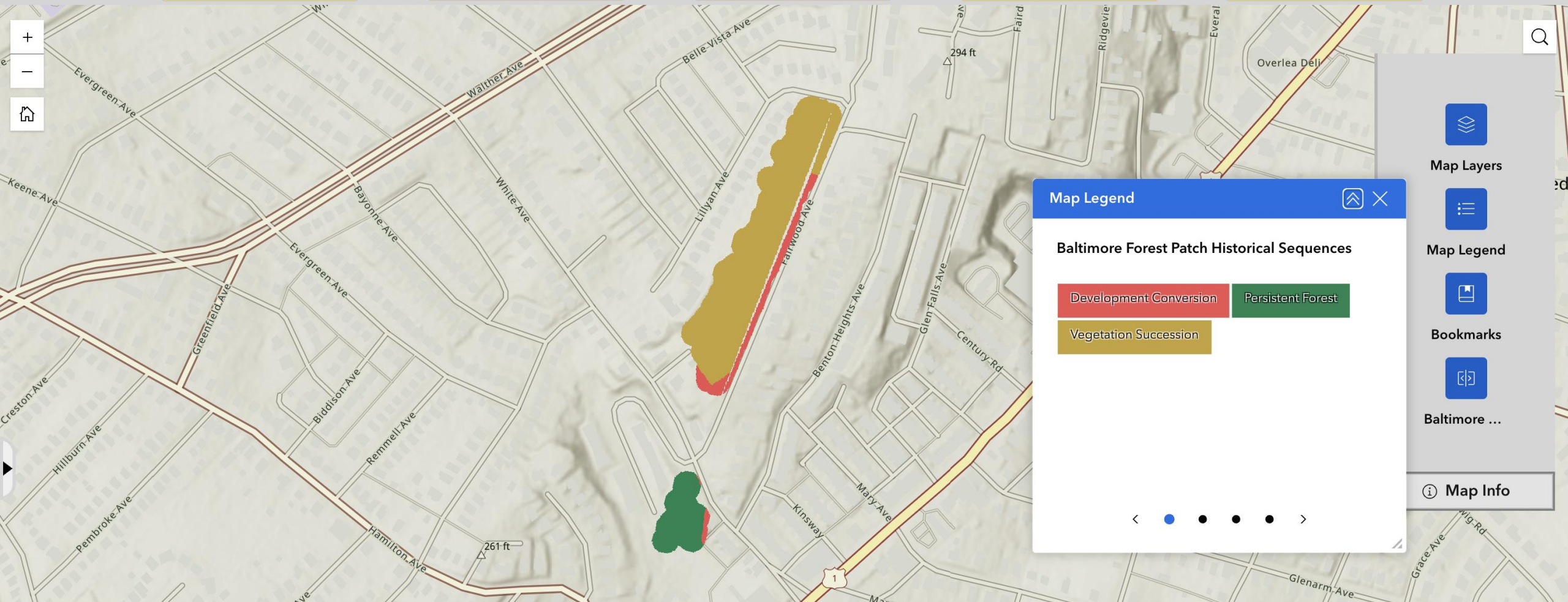
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## Map Legend

### Baltimore Forest Patch Historical Sequences

- Development Conversion
- Persistent Forest
- Vegetation Succession

Map Layers

Map Legend

Bookmarks

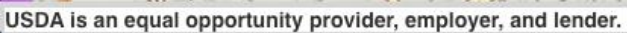
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Map Info





Washington, D.C.





# Baltimore's Forest Patches



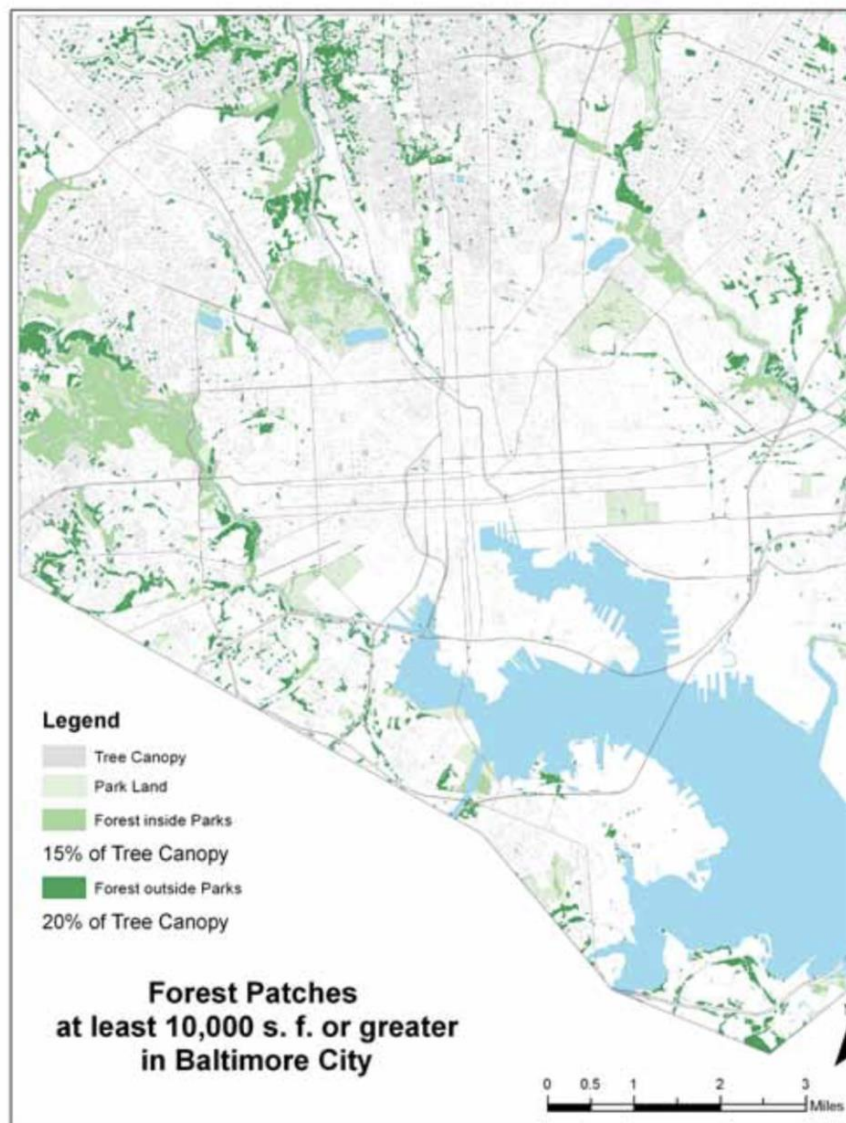


# Mapping Baltimore's Forest Patches



**BALTIMORE'S FOREST PATCHES:  
EMERALD ASSETS FOR ECOSYSTEM  
SERVICES**

Miriam Avins  
Baltimore Green Space  
June 2013





# THANK YOU

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