Greenbelt
Essex County's Land Trust

Diversify Your Data:
New Perspectives in Conservation Planning

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Greenbelt
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About Greenbelt

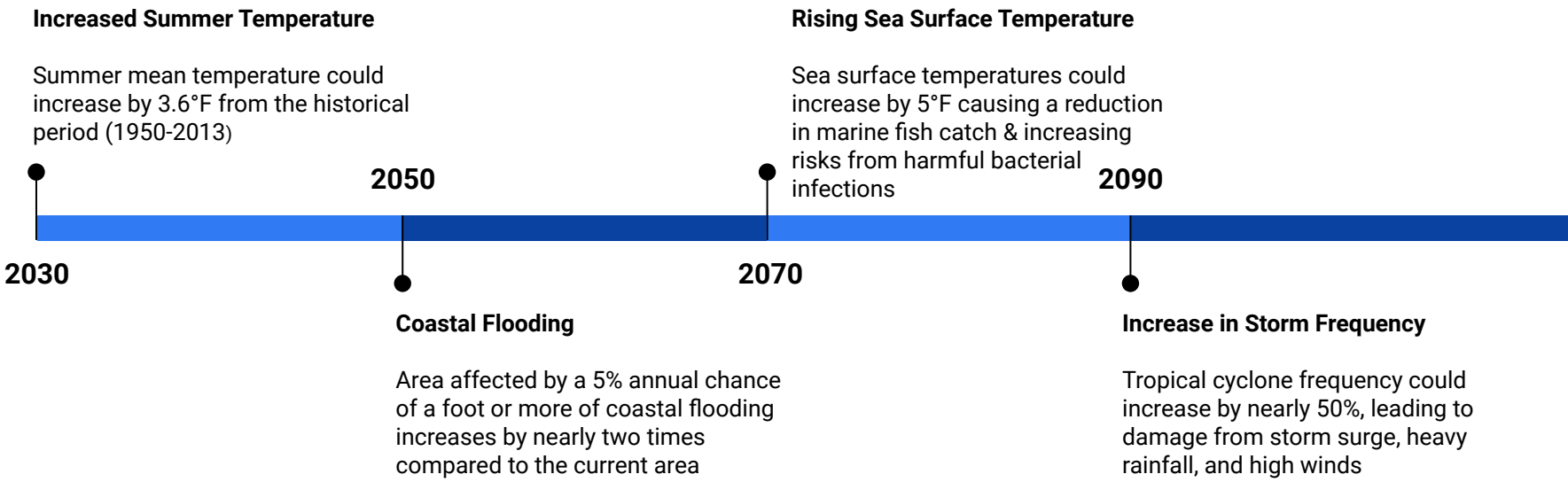
- Serve the 34 cities and towns of Essex County
- In 63 years we've protected over 21,000 acres and opened more than 50 public properties
- Protect land for habitat, agriculture, climate resilience and scenic value


Why is this important?

Local Climate Impacts

North & South Shore Climate Impacts Timeline:

2022 Massachusetts Climate Change Assessment Volume III - Regional Reports



Local Climate Impacts

- Higher-than average rates of sea level rise measured in the Northeast have led to a 100%–200% increase in high tide flooding
- Will experience a net loss of 63% of saltmarsh by 2100
- Air quality degradation:
    - Increase in ground-level ozone formation
    - Less rain events = reduction in flushing particulate matter
    - Increase in wildfires
- Decrease in agricultural productivity in crop yields
- More severe and long-lasting heatwaves

Drinking Water

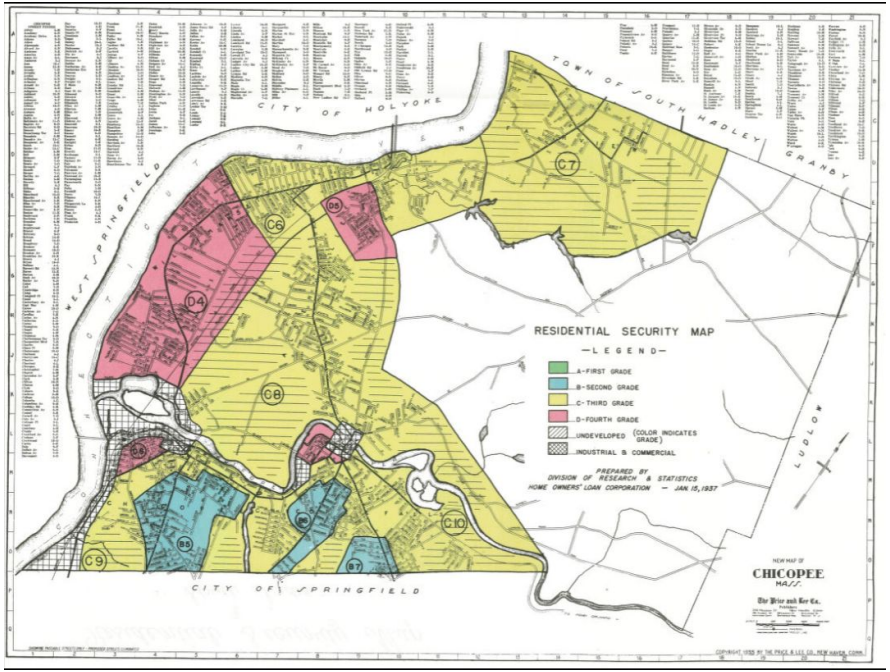
- 77% of drinking water originates from surface water sources (streams, ponds, reservoirs, etc.)
- As population increases, the demand for water increases
- Impacted by climate change:
    - Heavy spring downpours = increase water pollution
    - Dry summers = strain on water supply
    - Extreme heat flooding = increase in harmful algae blooms

Diversity, Equity, Inclusion & Justice

- Vulnerable groups: low-income, communities of color, limited English speaking communities, low educational attainment, ages 65 & older

- EJ communities are more vulnerable to:
  - Flooding
  - Urban Heat
  - Air pollution

- Historically do not have access to open space



[Mapping Inequality Collection]

Norman B. Leventhal Map & Education Center

Diversity, Equity, Inclusion & Justice

Check the Stats

[EPA Climate Change & Social Vulnerability In The United States - Report 2021]

40%	Black & African American individuals	More likely to live in areas with the highest projected increases in mortality rates due to extreme heat.
25%	Low income or individuals with no high school diploma	More likely to live in areas with the highest projected losses of labor hours due to increase in high-temperature days with a 2°C of global warming.
23%	Asian Individuals	More likely to live in coastal areas with the highest projected traffic delays from climate-driven high-tide flooding.
15%	Socially vulnerable groups	Most likely to live in areas with the highest percentage of land projected to be inundated due to sea level rise.
15%	Socially vulnerable groups	More likely to live in areas with the highest projected increases in childhood asthma diagnosis due to air pollution

Municipal Vulnerability Plans
Flooding

Winthrop

- Winthrop is subjected to three types of flooding: coastal, inland/ riverine, and urban. FEMA flood maps indicate that **45% of the town is within the 1% annual chance flood (known as 100 year storm)**.

New Bedford

- **New Bedford has experienced more than 10 inches of relative sea level rise**… led to more localized flooding during high tides as well as greater flooding due to storm surges…

Essex

- The Town of Essex Vulnerability Assessment…found that approximately **27% of the town is vulnerable to coastal inundation**. **That number climbs to 30% in 2070**.

Municipal Vulnerability Plans
Heat & Vulnerable Communities

Worcester

- Extreme heat/ drought has an impact on community facilities and residents, especially vulnerable populations. City experienced this in 2016, causing a temporary shortage of available drinking water supply and resulting in the purchase of additional water from the Massachusetts Water Resources Authority (MWRA), **costing the city over $3 million**.

- (The) city has a large and growing population of residents living at or below the poverty line and residents who are foreign-born….**Vulnerable populations also face heightened health risks from exposure to climate hazards** (such as extreme heat or cold), disruptions to utility services, and the burden of increased heating and cooling cost.

Holyoke

Heat events are an existing and future concern for multiple reasons.

- Much of the downtown area is paved, resulting in heat island effects.
- There is little shading in the downtown area.
- The orientation of the City does not allow for substantial cooling

Municipal Vulnerability Plans
Drinking Water

Ipswich

- Town has faced significant impacts from the persistent low flow and irregular precipitation conditions; …**drinking water supply is extremely vulnerable to drought**.

- Massachusetts Drought of 2016, the most extreme drought conditions were in the northeast region, including the Ipswich and Parker watersheds. The Town of Ipswich declared an “Emergency” (Stage 5) drought, and MassDEP issued a Declaration of State of Water Supply Emergency to limit all non-essential water usage in the Town and allow for pumping of water sources in excess of permitted levels

Lynnfield

- The Lynnfield Center Water District (LCWD) is **currently impacted by water quality issues** (e.g., iron and manganese) **and water quantity issues** (i.e., increased demands)

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Benefits of Land Conservation

Municipal Perspectives

"There have been studies that show protecting the watershed is more cost effective than upgrading your treatment process. So the cleaner you can keep your watershed and the more you can keep it in its natural state, the less your treatment plant has to work."

-Bob Ward, DPW Director, City of Haverhill

"Having easy access to the best climate change data is highly important to inform effective open space planning, and to ensure that concerns such as flood vulnerability (both present and future) and heat mitigation on all populations are incorporated into decision making. A lot of municipal permitting is discretionary, through special permits that can be conditioned and negotiated. To have good data that illustrates both current and future public benefits, or current and future vulnerabilities, is critical for good planning decisions."

- Kristen Grubbs, Assistant Planner, Town of Newbury

Municipal Perspectives

"Amesbury is a town of hills, valleys, and lots of water. Climate resilience has already become a big issue with us. Prioritization mapping has helped us prioritize and de-prioritize efforts based on mapped impacts and values as projected through a few lenses."

-Jonathan Sherwood, Chair, Amesbury Open Space Committee

"A developer sought to build a large multifamily project on a 21-acre parcel that was enrolled in the Ch. 61 program. When depicted on a map populated with environmental resources, it immediately became apparent to me that the Town needed to act on the Right of First Refusal. Seeing the parcel in context with contours, vegetation, drinking water well locations, other publicly held land and existing trails, it jumps off the page and says 'please don't build here!'

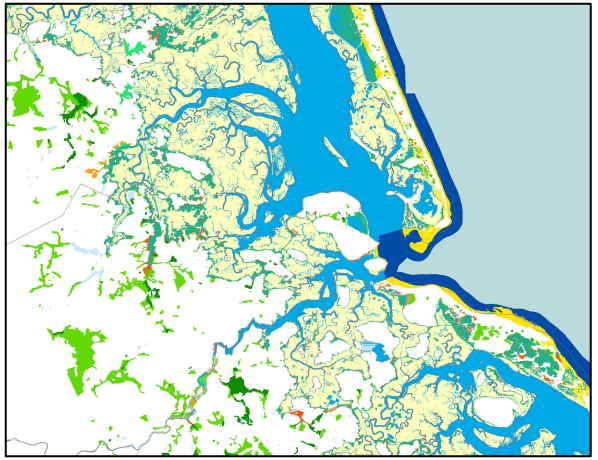
Moving ahead, the continued use of accurate mapping datasets that depict wetlands, well field locations, and other existing features will help the Town and its partners create a protected, yet open to the public, incredible passive recreation area."

-Emilie Cademartori, Lynnfield Planning Director

Climate Data

Sea Level Affecting Marshes Model (SLAMM)

- Marshes are in danger of drowning if sea level rises faster than a marsh can accumulate sediment/organize matter to build elevation.
- Simulates the impact of sea level rise on wetlands & shorelines for 2030, 2050, 2070, 2100.
- Sea level rise scenarios: 0.8ft, 2.3ft, 4.5ft, 7.1ft
- Marsh migration data available on ArcGIS online
- CZM SLAMM Viewer explores the distribution of coastal wetlands in response to sea level rise



Adapted SLAMM Wetland Classes

Salt or Brackish Marsh

- Regularly Flooded Marsh *(Low Marsh)*
- Irregularly Flooded Marsh *(High Marsh)*
- Transitional Marsh or Scrub-Shrub *(Marsh Border)*

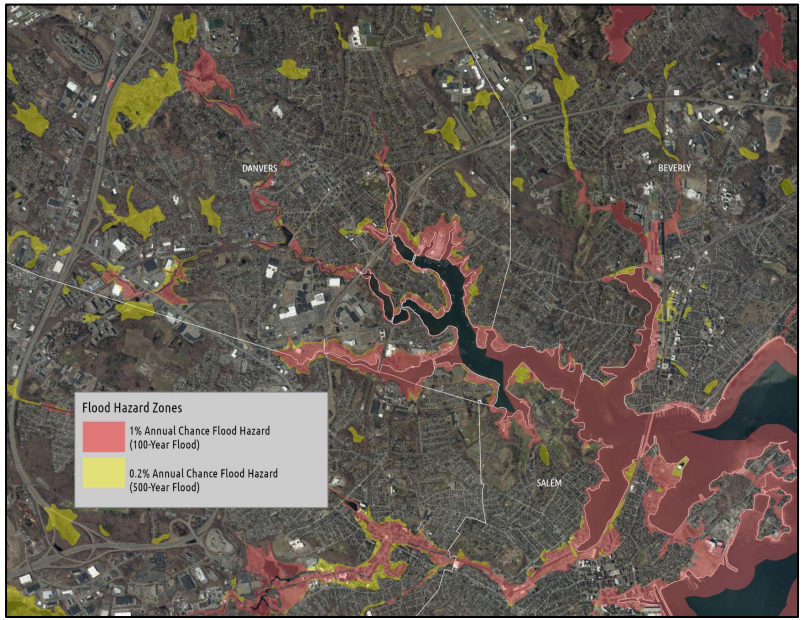
Freshwater Marsh or Swamp

- Tidal Fresh Marsh
- Tidal Swamp
- Inland Fresh Marsh
- Nontidal Swamp

Other Wetlands and Open Water Habitats

- Rocky Intertidal Shore
- Tidal Flat or Estuarine Beach
- Ocean Beach
- Ocean Flat
- Inland Open Water
- Estuarine or Riverine Tidal Open Water
- Open Ocean

FEMA National Flood Hazard Layer

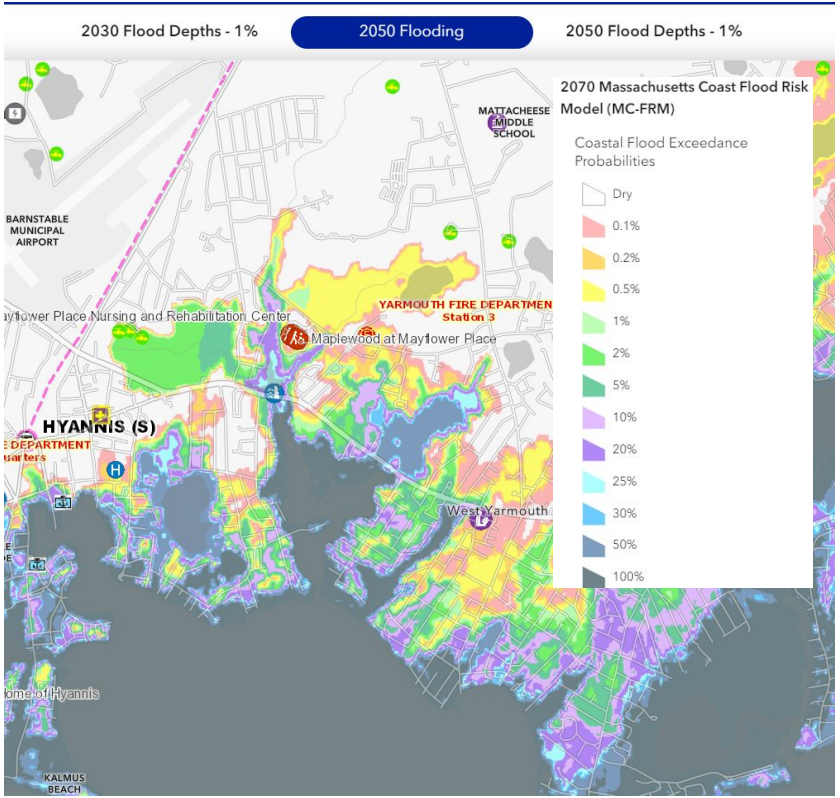


FEMA National Flood Hazard Download (MassGIS)

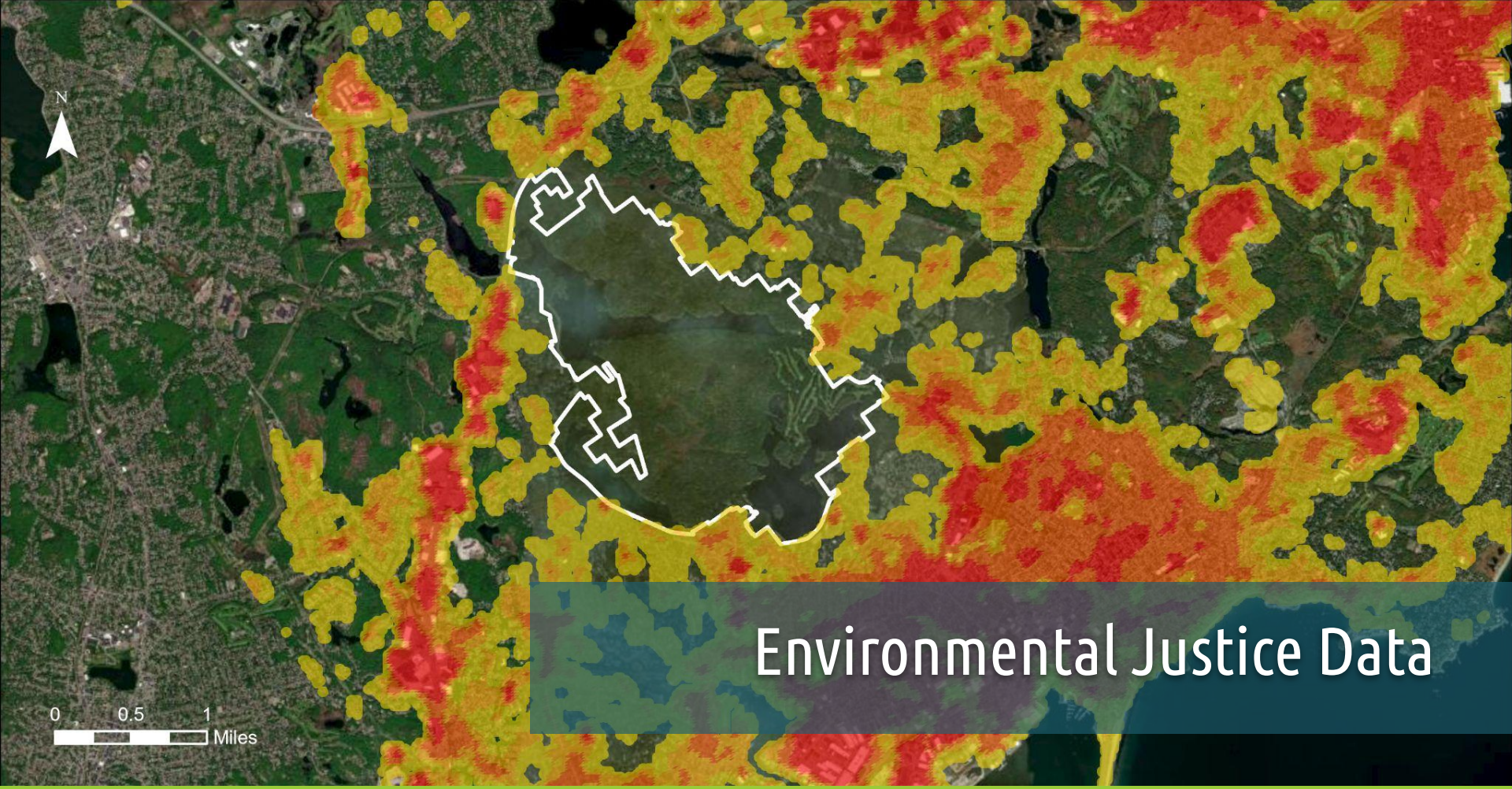
- Information from the Flood Insurance Rate Map (FIRM) databases and Letters of Map Revision (LOMR)
- The National Flood Insurance Program (NFIP) uses for floodplain management
- 1% annual chance flood event (100-year flood)
- 0.2% annual chance flood event (500-year flood)
- FEMA's National Flood Hazard Layer (NFHL) Viewer

Massachusetts Coastal Flood Risk Model (MC-FRM)

- Created by Woods Hole Group
- Models flooding from sea level rise & storms under different scenarios: 2030, 2050, & 2070
- Considers physical processes during storms such as waves, wind, overtopping, and storm-surge
- Flooding scenario - Full range of annual coastal flood exceedance probabilities from 0.1% (1,000-year storm) to 100% (1-year storm)
- Flood depth scenarios - show the relative depth of water above land during a coastal flooding event with a 1% annual coastal flood exceedance probability



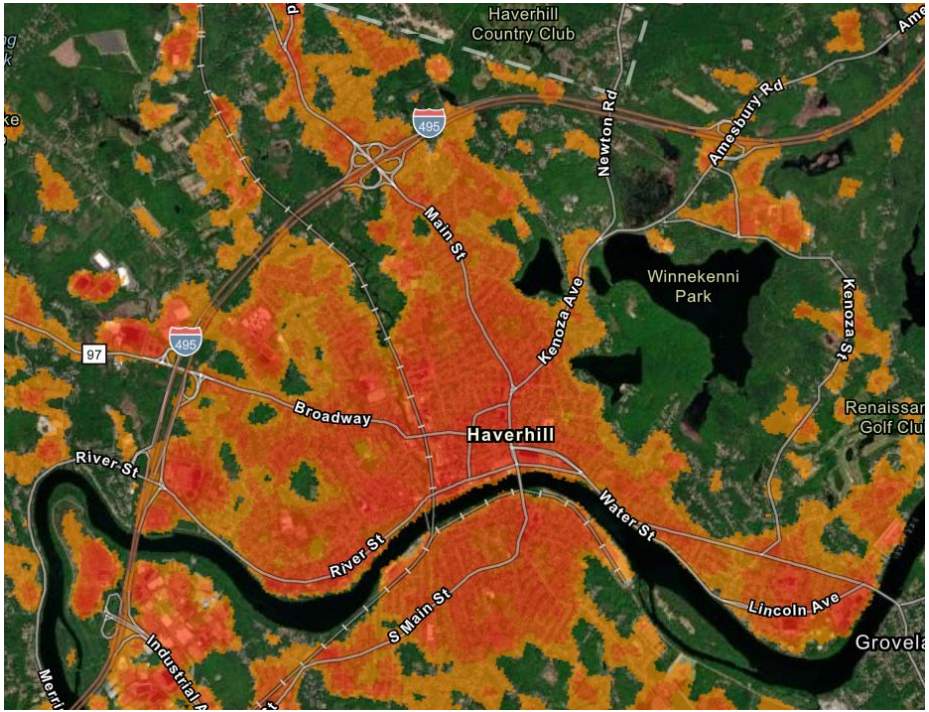
[MC-FRM Data Viewer]



Environmental Justice Data

Trust for Public Land Urban Heat Severity

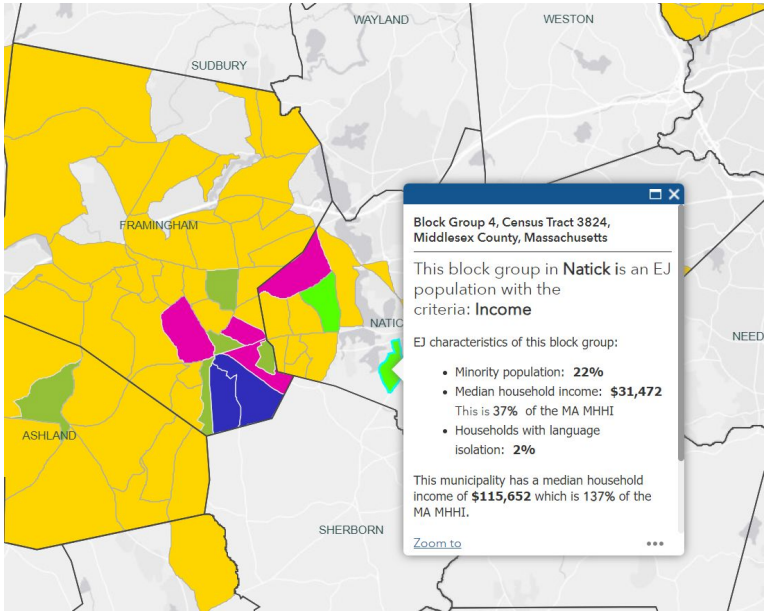
- 30-meter raster of heat severity for every city in the United States
- Derived from Landsat 8 imagery ground-level thermal sensor (band 10)
- Areas within cities that are hotter than the average temperature for the entire city
- Will be updated yearly by TPL



2021 TPL Heat Data - (AGOL)

Massachusetts Environmental Justice Data

- Developed by the Executive Office of Energy & Environmental Affairs (EEA)
- Communities that are subjected to a disproportionate burden of environmental hazards
- From the 2020 U.S Census- Criteria for an EJ Block:
  1. Annual median household income is not more than 65% of the statewide annual median
  2. Minorities comprise 40% or more of the population
  3. 25% or more of households lack English language proficiency
  4. Minorities comprise 25% or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median

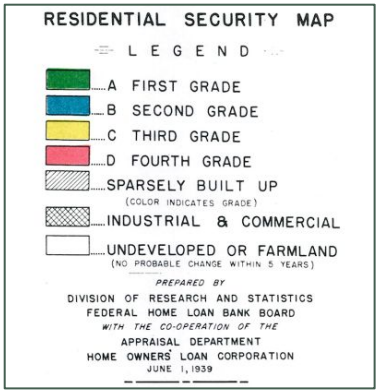


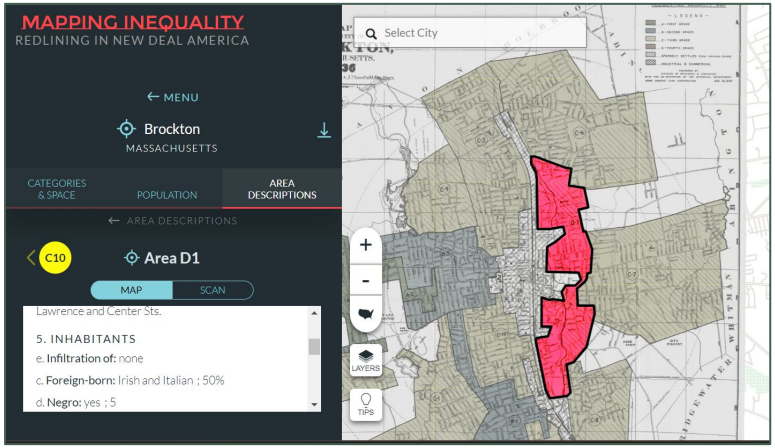
EJ Data Viewer

University of Richmond Redlining Data

- Digitized Home Owners Loan Corporation (HOLC) maps from 1935-1940
- Grades for each residential neighborhoods that reflect their “mortgage security”
- Grade A = minimal risk for banks and mortgage lenders (often wealthy and white neighborhoods)
- Grade D = hazardous and high risk (often low income and diverse neighborhoods)

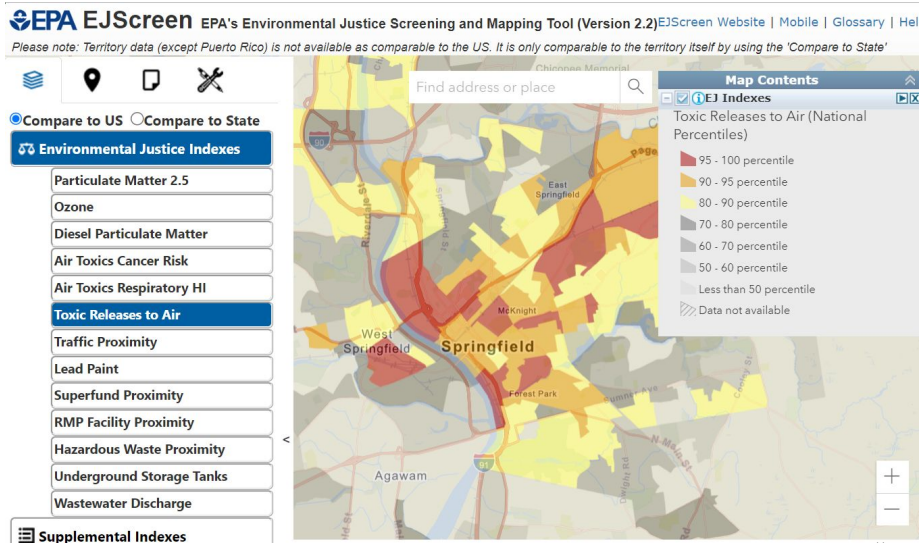
[Redlining Data Viewer]





EPA EJ Screen

- Combines environmental & demographic socioeconomic data
- Includes multiple datasets related to air quality (Particulate Matter 2.5, Air Toxics Cancer Risk, etc.)
- Socioeconomic Indicators -
  - Demographic index
  - People of Color
  - Low Income
  - Unemployment Rate
  - Limited English Speaking
  - Less than High School Education
  - Under Age of 5
  - Over Age of 64

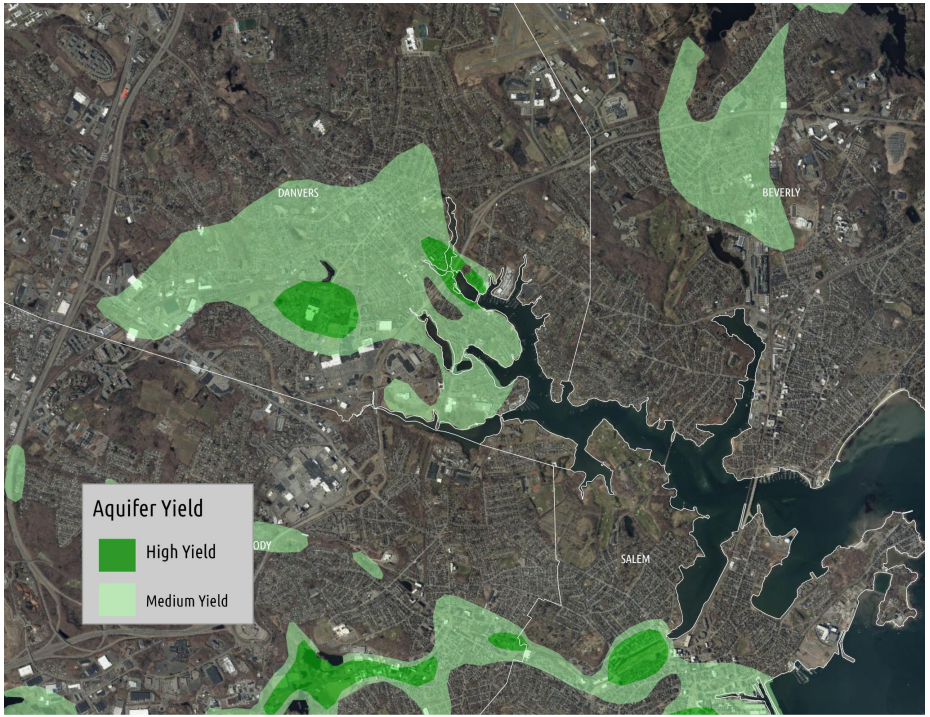


[EJ Screen Data Viewer]

Drinking Water Data

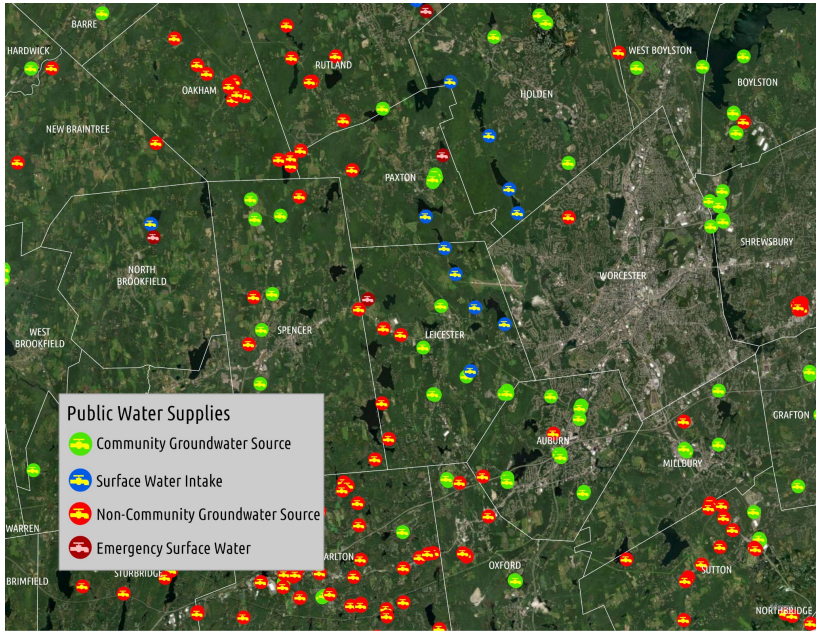
Aquifers

- Groundwater is contained in formations known as aquifers.
- MassGIS' Aquifer data contains the boundary location of major aquifers
- Based on USGS 1:48,000 hydraulic atlas series for Massachusetts
- Data distinguishes between the aquifer's water yield



[MassMapper data viewer]

Public Water Supplies

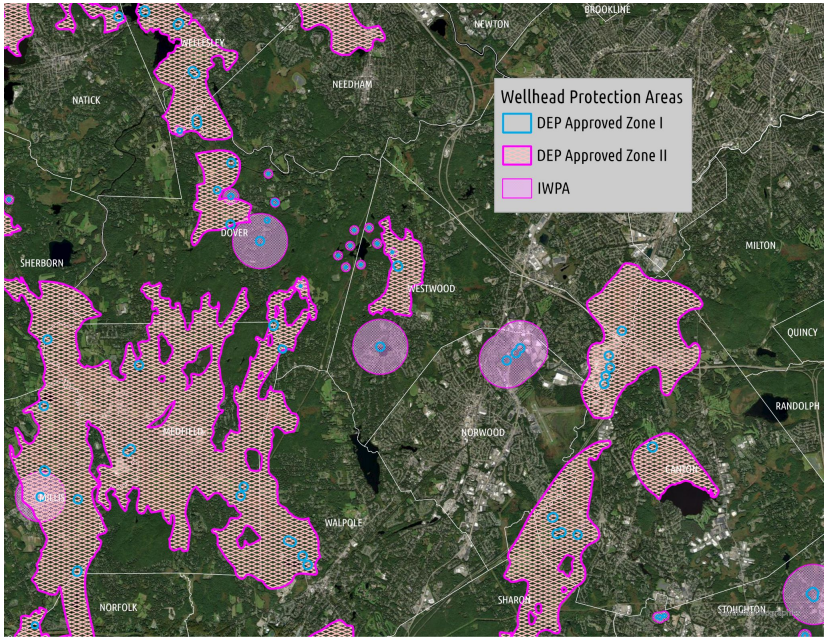


[MassMapper data viewer]

- Locations of public community surface & groundwater and public non-community supply sources
- Based on DEP's Water Quality Testing System (WQTS) database
- Use in association with:
  - DEP Approved Wellhead Protection Areas (Zone II)
  - Interim Wellhead Protection Areas (IWPA)
  - Surface Water Supply Protection Areas (Zone A, B, C)
  - Surface Water Supply Watersheds

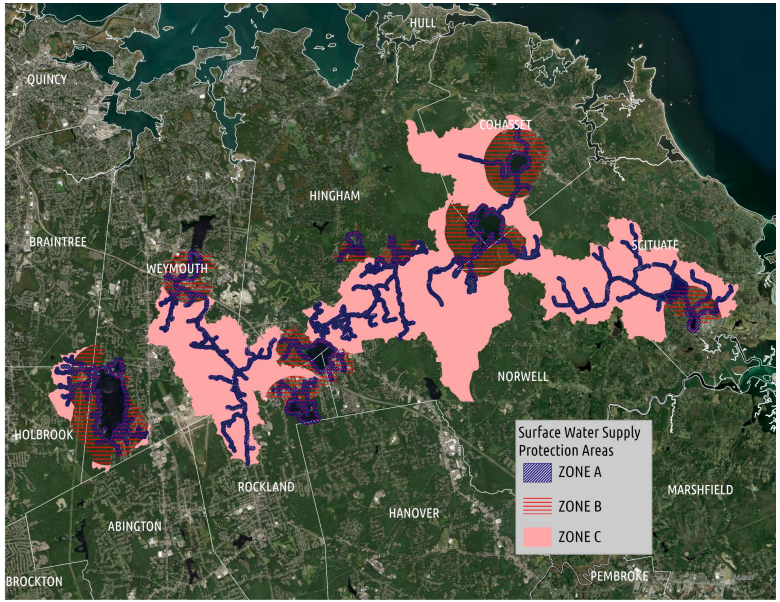
Wellhead Protection Areas

- Important for protecting recharge areas around public water supply (PWS) groundwater sources
- Zone I - Protective radius around public water supply well or wellfield
- Zone II - Area of an aquifer that contributes to a well under the most severe pumping & recharge conditions
- Interim Wellhead Protection Areas (IWPA) - protected recharge area for PWS groundwater sources when there is an absence of Zone II



[MassMapper data viewer]

Surface Water Supply Protection

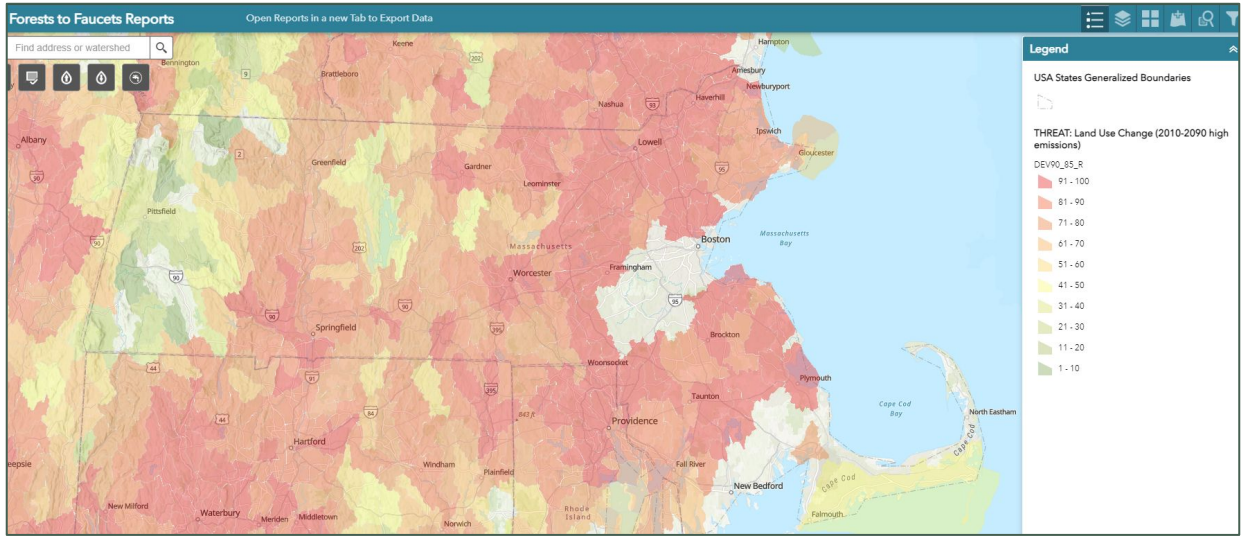


[MassMapper data viewer]

- Surface Water Protection zones delineated in the Massachusetts Drinking Water Regulations (310 CMR 22.00)

- Zone A -
  - land between the surface water source and upper boundary of the bank
  - land within 400ft lateral distance from upper boundary of the bank of Class A surface water source
  - land within 200ft lateral distance from the upper boundary of the bank of a tributary or associated surface water body
- Zone B -
  - land area within 1 ½ mile of upper boundary of the bank of Class A surface water source or edge of watershed
- Zone C -
  - land area not designated in Zone A or B, but within the watershed of Class A surface water source

Forests to Faucets (F2F) non-regulatory



- Developed by the Forest Service
- Watersheds most important to surface drinking water
- Important Watersheds to Surface Drinking Water (IMP) Index
  - IMP = Water Supply x Water Demand

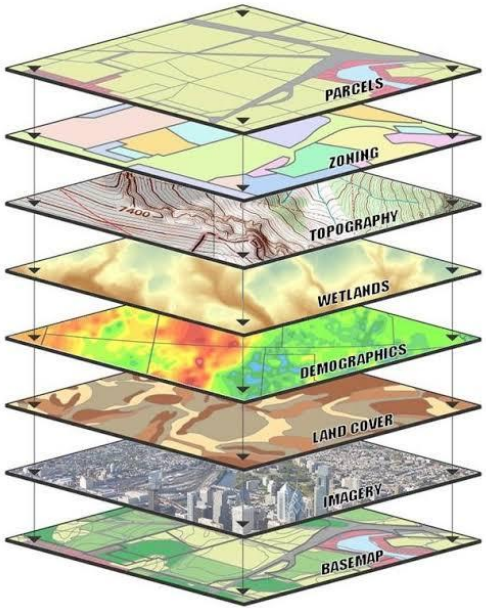
F2F Data Viewer

- Ability to Produce Clean Water (APCW) Index
  - APCW = (% natural cover + % ag land + % impervious cover + % riparian natural cover) x mean annual water yield
- Watershed threatened by:
  - Insect & Disease
  - Wildfire
  - Future Land Use Change
  - Future Decrease in Water Yield

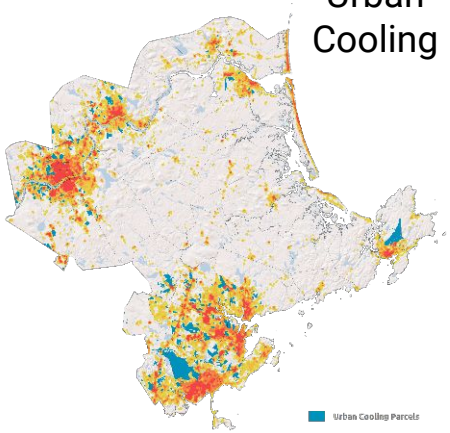

Q&A

How do we use this data?

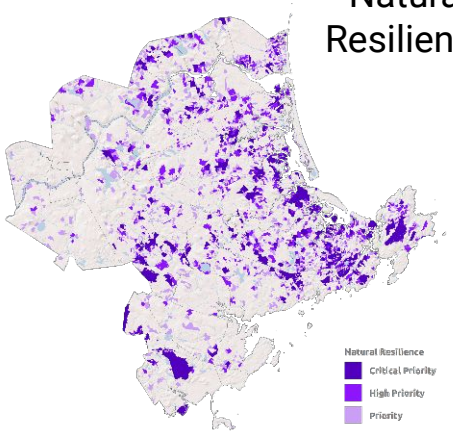
- Project Review
- Parcel Prioritization
- Project Funding
- Public Outreach



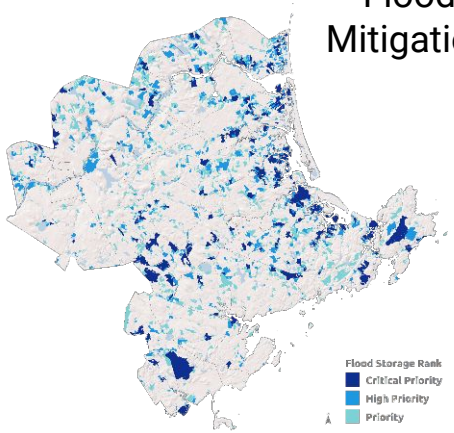
Urban Cooling



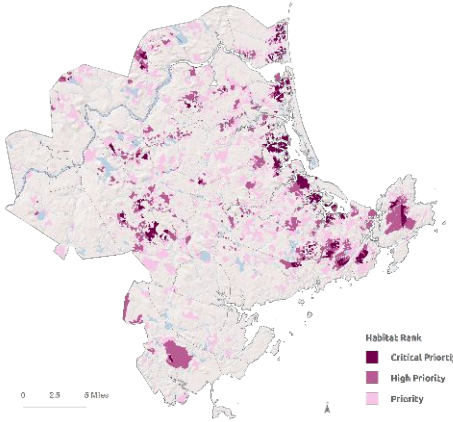
Natural Resilience



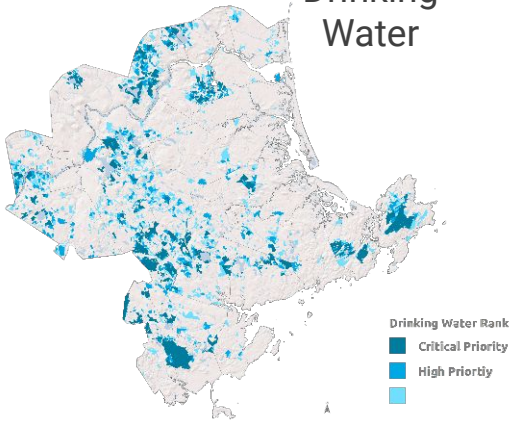
Flood Mitigation



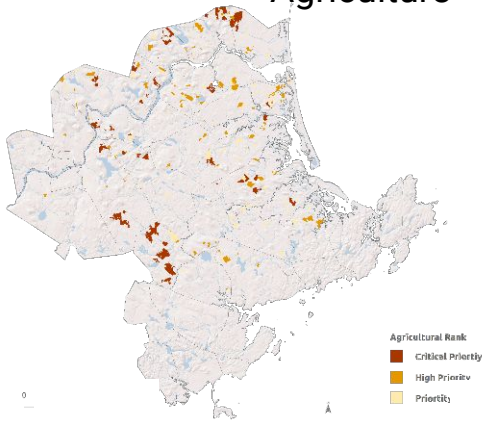
Habitat



Drinking Water



Agriculture



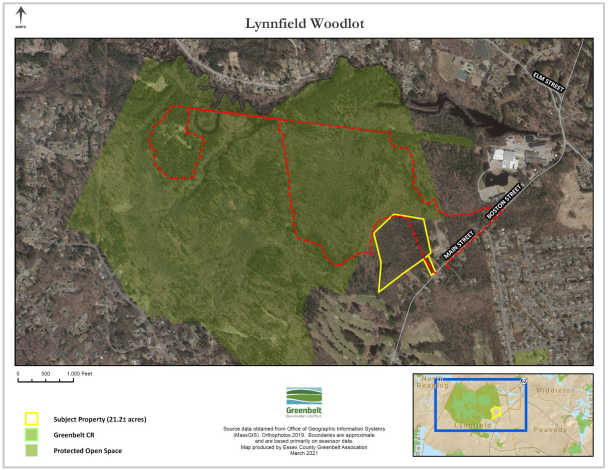
[2019 Prioritization Report]

Lynnfield Woodlot

Lynnfield Woodlot

Why is it important to preserve?

- Drinking Water
- Natural Resilience
- Habitat
- Flood Protection
- Trails / Connectivity

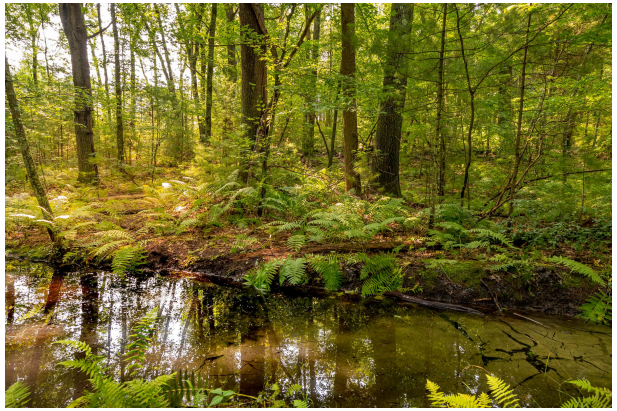


Lynnfield Woodlot

High Natural Resource Values Attract Funding

- State Drinking Water Supply Grant
- Community Preservation Act
- Municipal Vulnerability Planning program
- State's LAND grant program
- Etc.

Purchase Price:	$2,710,000
<u>Funding Sources</u>:	
MVP Action Grant:	$1,638,750
Lynnfield Con Com:	$200,000
ARPA:	$571,250
Greenbelt:	$300,000



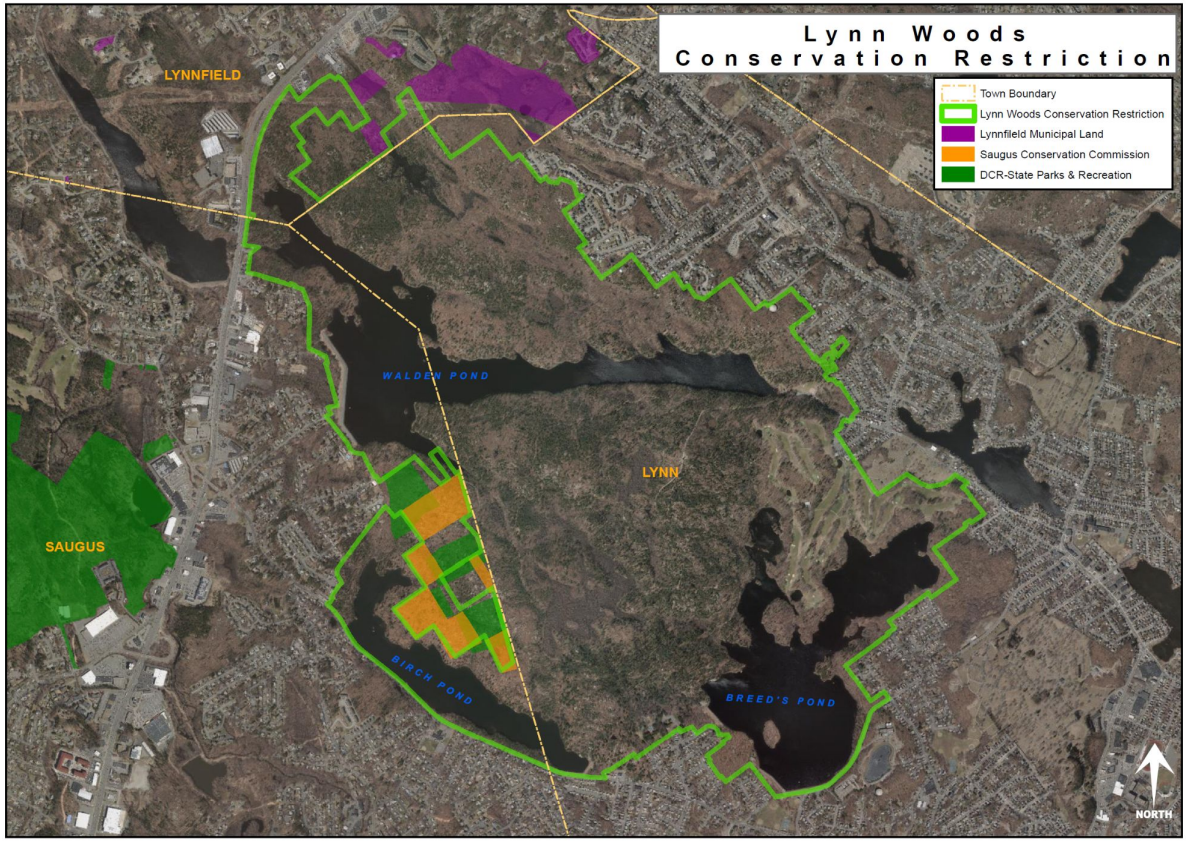
Lynnfield Woodlot

A conservation acquisition partnership:
Lynnfield Center Water District
Town of Lynnfield
Ipswich River Watershed Association
Greenbelt

“Now a Greenbelt property known as Lynnfield Woodlot and subject to a conservation restriction held by the Town of Lynnfield, this parcel will provide public access to over 600 acres of protected water supply land within the Ipswich River Watershed. ”

-Emilie Cademartori, Lynnfield Planning Director

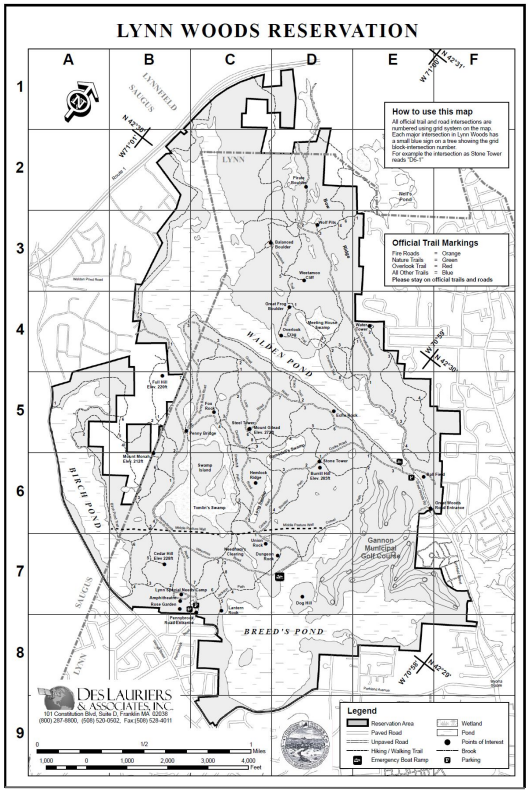
Lynn Woods

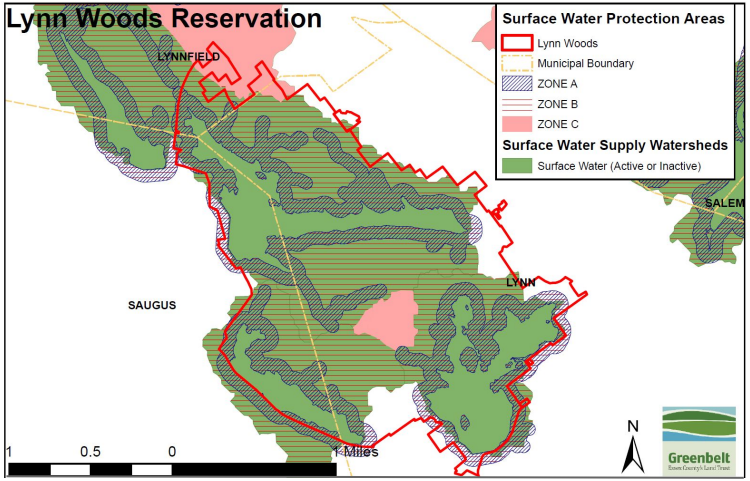

Lynn Woods
Conservation Restriction
Town Boundary
Lynn Woods Conservation Restriction
Lynnfield Municipal Land
Saugus Conservation Commission
DCR-State Parks & Recreation
LYNNFIELD
WALDEN POND
LYNN
SAUGUS
BIRCH POND
BREED'S POND
NORTH
0
0.5
1 Miles
Map for illustrative purposes only. Boundaries are approximate and based on most currently-available assessor's data. 2019 Orthophotos;1:5,000. All data other than Greenbelt properties from MassGIS and DCR. Map by Greenbelt, dated 8.24.23

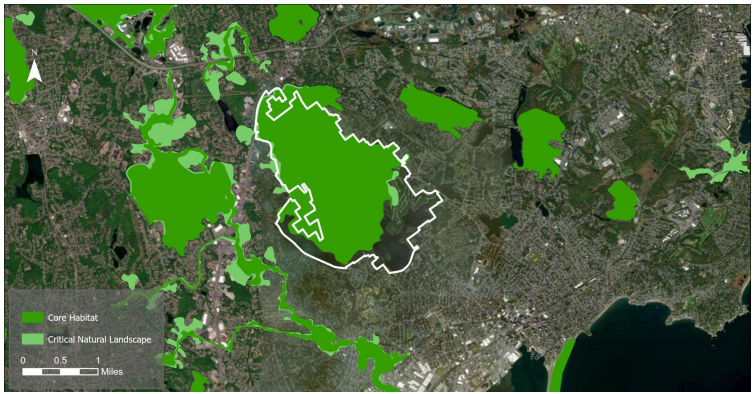
Lynn Woods

Why is it important to preserve?

- Drinking Water
- Habitat
- Flood Protection
- Trails / Connectivity
- Urban Cooling





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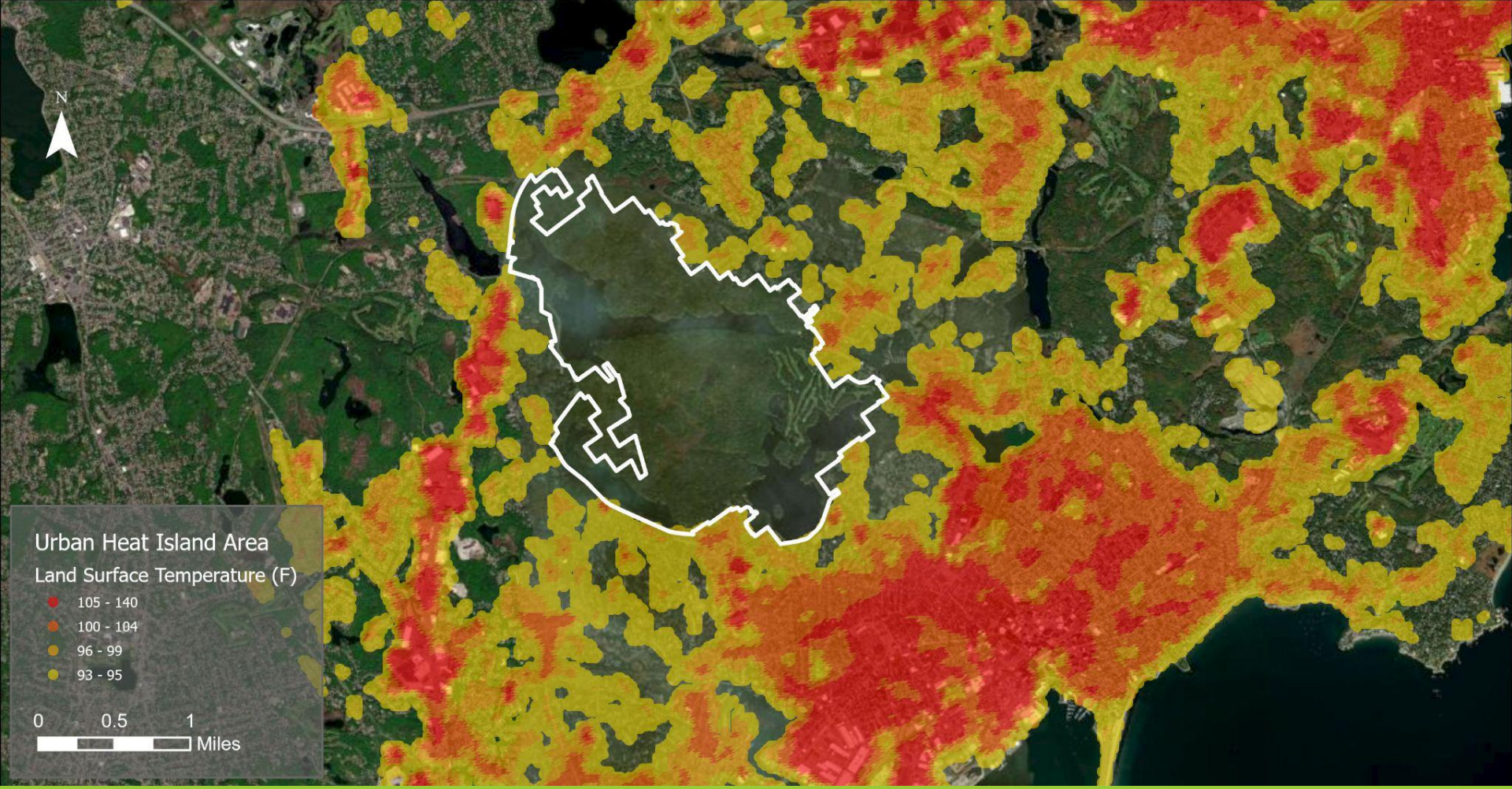
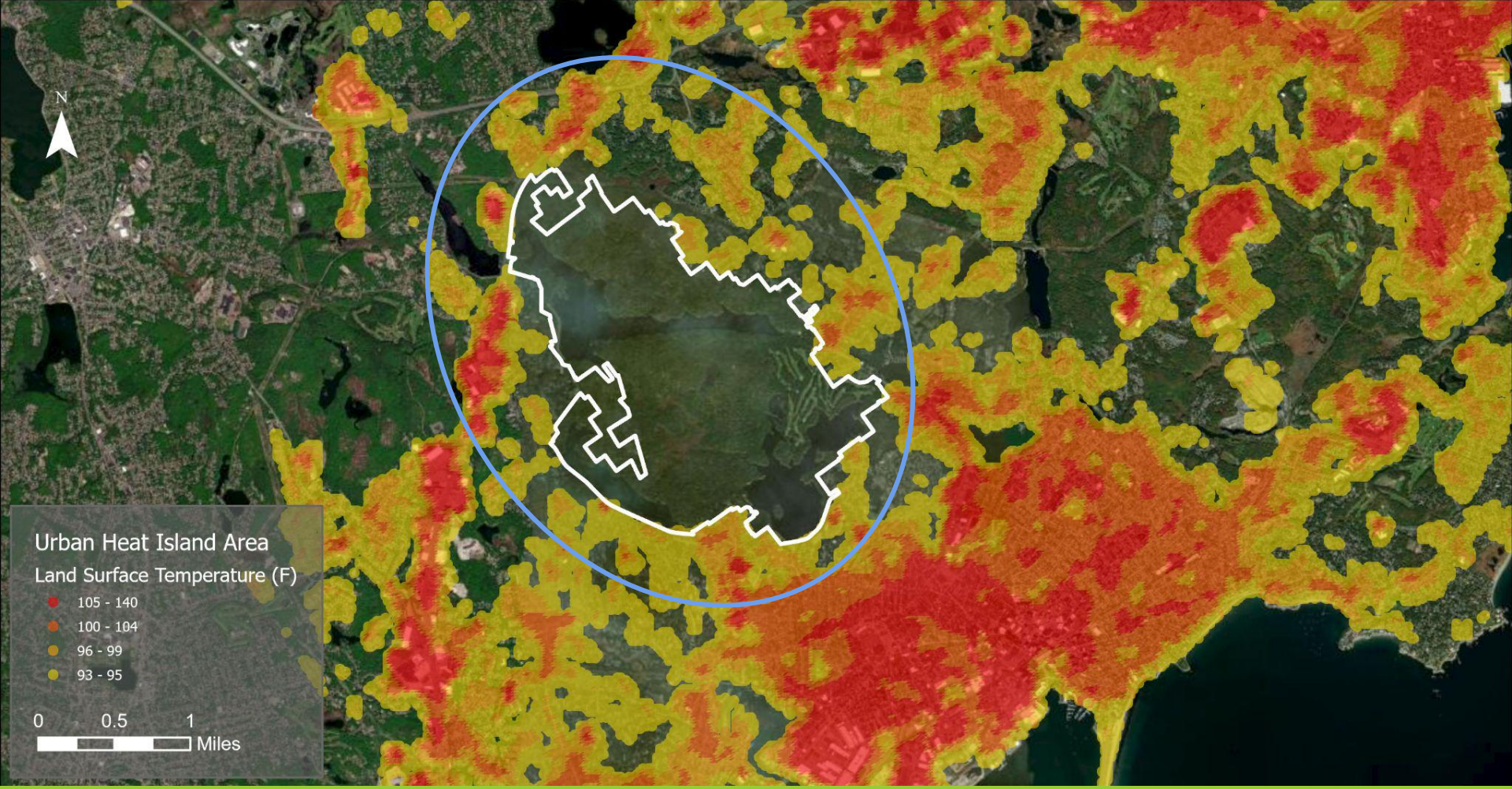
Miles


N
Urban Heat Island Area
Land Surface Temperature (F)
105 - 140
100 - 104
96 - 99
93 - 95
0
0.5
1
Miles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Urban Heat Island Area
Land Surface Temperature (F)
105 - 140
100 - 104
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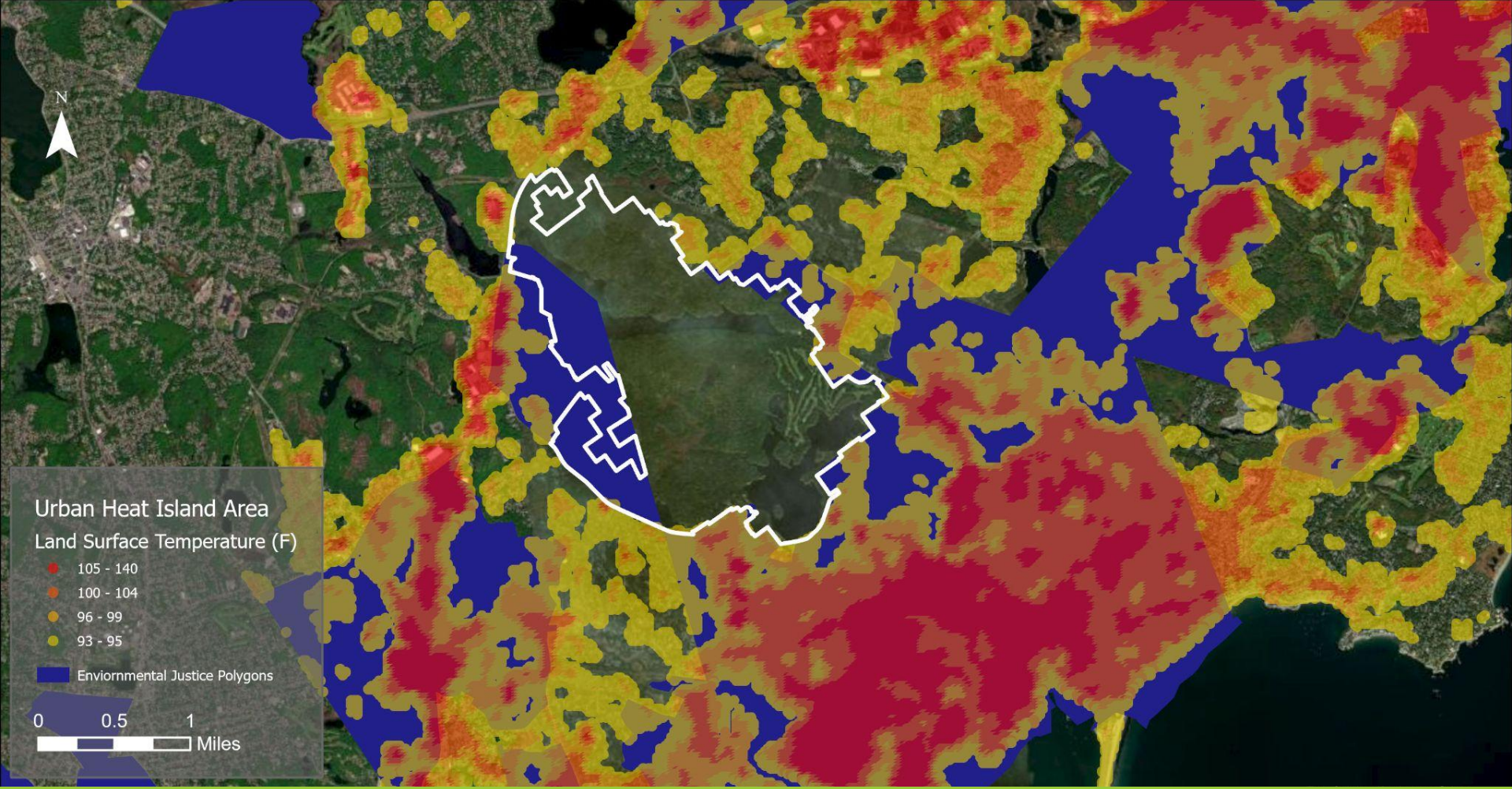
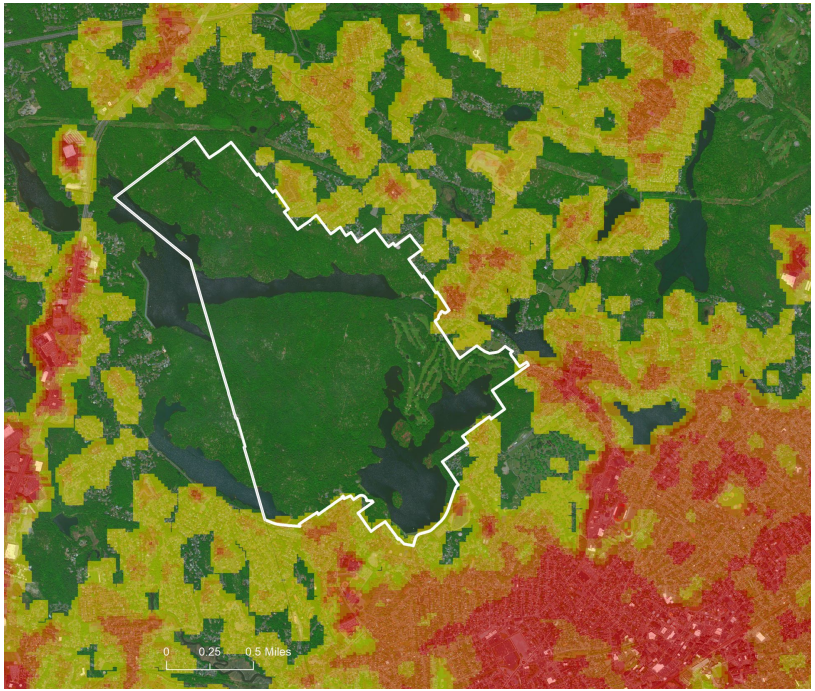
0
0.5
1
Miles


N
Enviornmental Justice Polygons
0
0.5
1
Miles


N
Urban Heat Island Area
Land Surface Temperature (F)
105 - 140
100 - 104
96 - 99
93 - 95
Enviornmental Justice Polygons
0
0.5
1
Miles

Lynn Woods

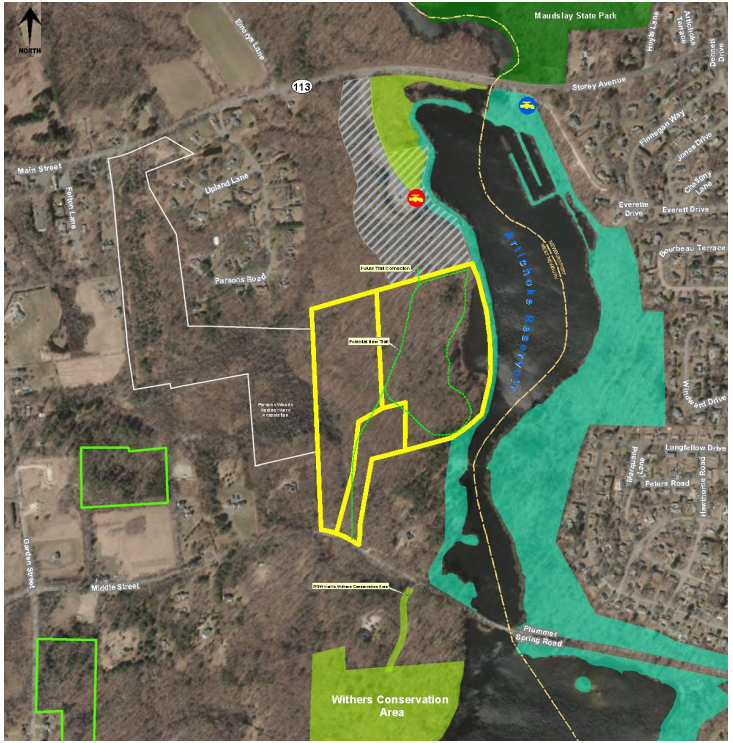
As Kate Bowditch, President of Greenbelt notes: "In addition to all the benefits of its trails and water supplies, **Lynn Woods is nature's air conditioner for the neighborhoods of Lynn**…and its permanent protection will mean those benefits will be there for future generations, who may need Lynn Woods even more than we do now"



Lynn Woods

A conservation partnership:
City of Lynn
Friends of Lynn Woods
Dept. of Conservation & Recreation
Greenbelt

Artichoke River Woods, West Newbury



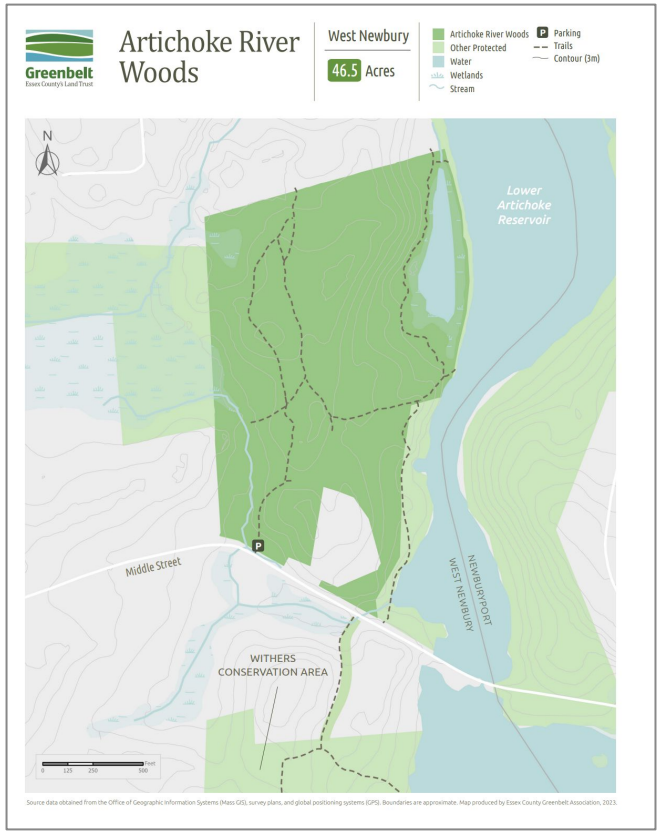
Artichoke River Woods (38 acres +/-)
Community Groundwater Source
Surface Water Intake
West Newbury Municipal Land
W. Newbury Water Well Easement
Newburyport Municipal Land
DCR-State Parks & Recreation
Greenbelt Property

Artichoke River Woods
38 +/- acres

0 500 1,000 Feet

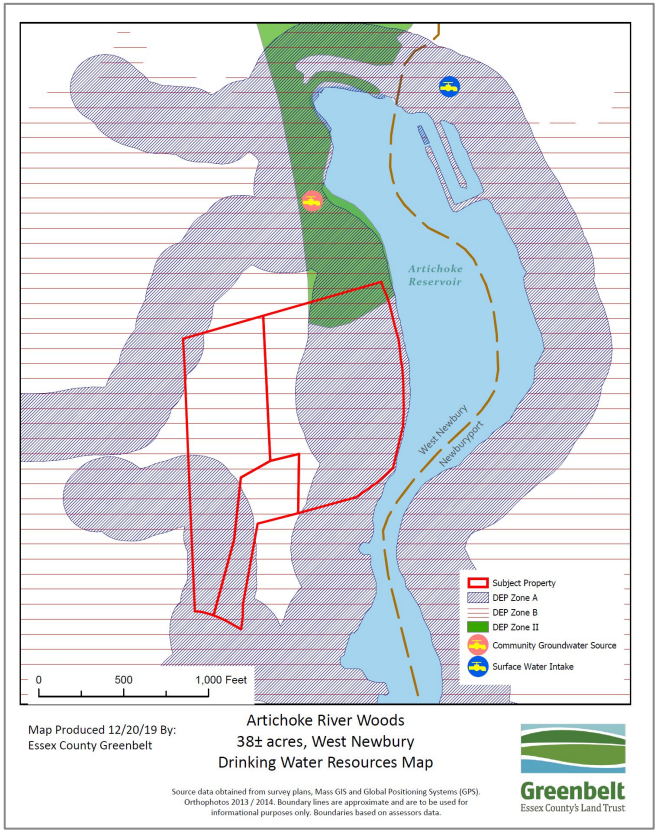
Map for illustrative purposes only. Boundaries are approximate and based on most currently-available assessor's data. 2013 Orthophotos;1:5,000. All data other than Greenbelt properties from MassGIS. Map by Greenbelt, dated 1-6-20

Artichoke River Woods, West Newbury

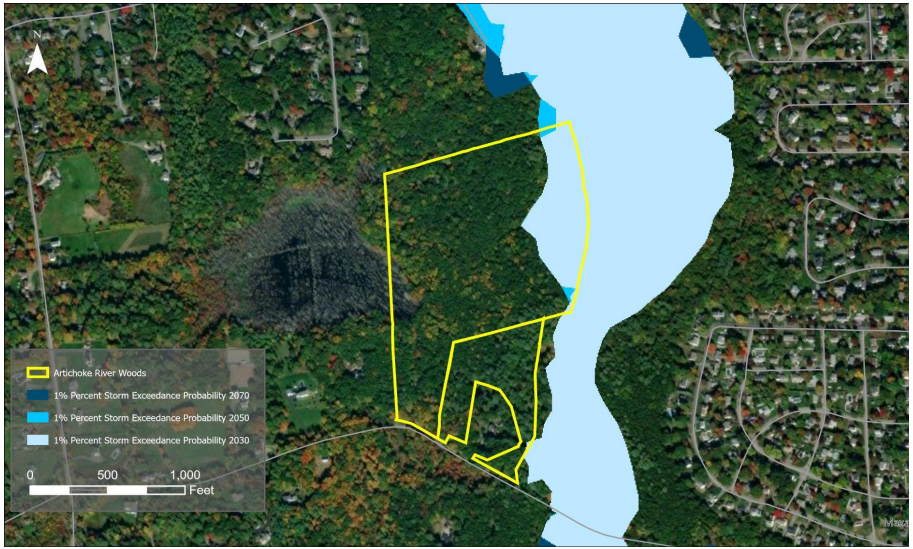


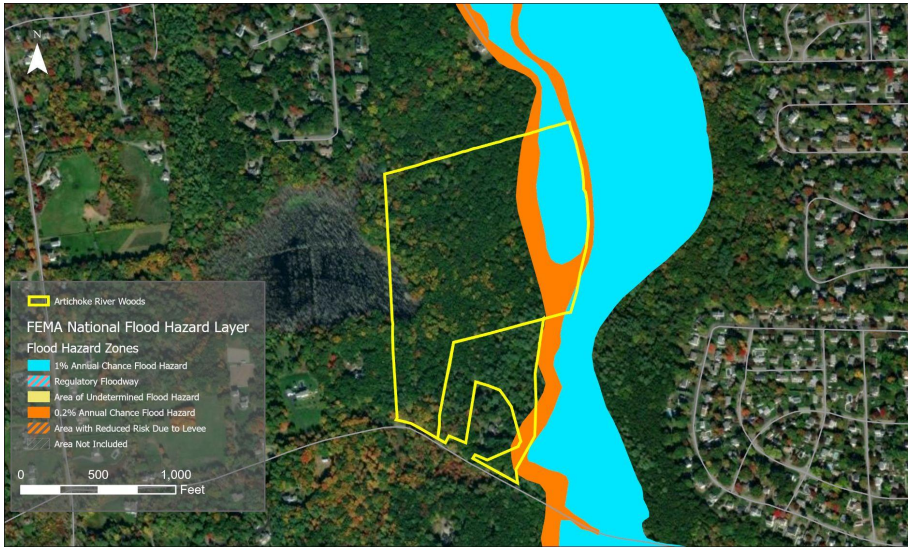
Why is this important to preserve?

- Drinking Water
- Flood Protection
- Natural Resilience
- Trails / Connectivity



Artichoke River Woods, West Newbury





Artichoke River Woods, West Newbury

High Natural Resource Values Attract Funding

- State Drinking Water Supply Grant
- Community Preservation Act
- Municipal Vulnerability Planning program
- State's LAND grant program

Purchase Price:	$985,000
Transaction Costs:	$30,000
Parking & Signs:	$7,500
TOTAL:	$1,022,500

<u>Funding Sources</u>:

Drinking Water Supply Grant:	$300,000
Newburyport CPA:	$225,000
W. Newbury CPA:	$175,000
DCR:	$175,000
Greenbelt:	$147,500

Beaver dam and pond on Artichoke River Woods

Artichoke River Woods, West Newbury

A conservation acquisition partnership:

City of Newburyport
Town of West Newbury
Dept. of Conservation & Recreation
Division of Conservation Services
Greenbelt

Summary

Using climate, EJ, and drinking water data:

- Broadens the appeal of land conservation
- Can help accomplish more equitable conservation outcomes
- Attracts project funding

Greenbelt
Essex County's Land Trust

Thank you! Questions?

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