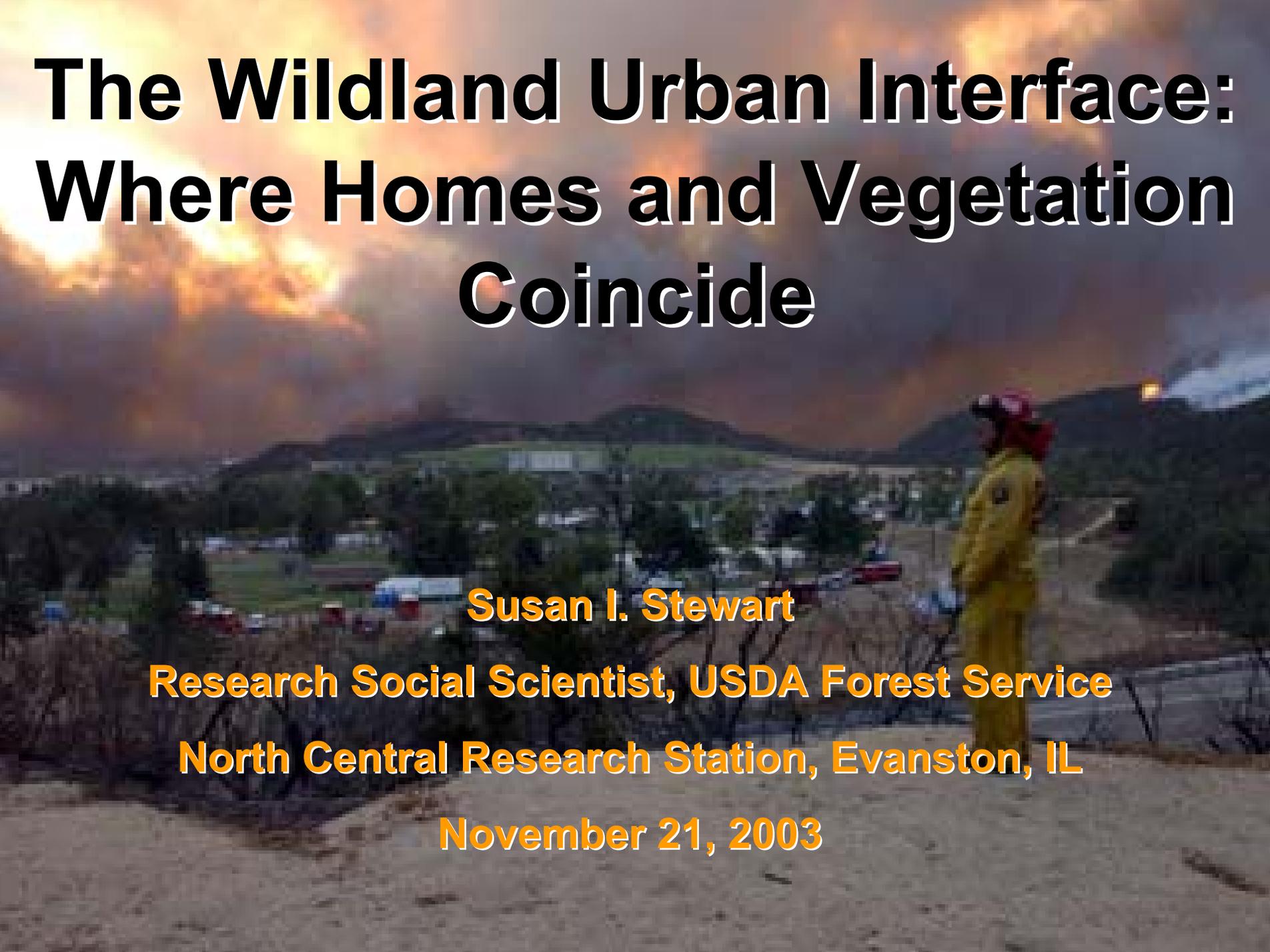


# **The Wildland Urban Interface: Where Homes and Vegetation Coincide**



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**November 21, 2003**

# Why locate the WUI?

- Fire risk reduction targets communities, lands in the WUI:

- “Priorities [for fuels treatment] are first within the wildland-urban interface ....”

National Fire Plan Interagency MOU for Development of a Collaborative Fuels Treatment Program.

- “Oregon SB 360 will apply to lands classified as ‘forestland-urban interface’ ...”



- A valuable tool for state & national strategic planning

# The WUI Definition

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- ...where structures and other human development **meet** or **intermingle** with undeveloped wildland

**Interface** WUI is where housing **meets** vegetation

**Intermix** WUI is where housing and vegetation **intermingle**

# The WUI Definition

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- **Interface** areas
  - have more than 6 houses per km<sup>2</sup> (1 house per 40 acres),
  - have less than 50% vegetation, and
  - are within 2.4 km (1.5 miles) of an area >5 km<sup>2</sup> (1,325 acres) that is more than 75% vegetated

# The WUI Definition

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- **Intermix** areas
  - have more than 6 housing units per km<sup>2</sup> (1 house per 40 acres), and
  - have more than 50% vegetation
- **Interface + Intermix = WUI**
- Based on Federal Register definition

# The WUI is a Transition Zone



- From urban (or suburban) to wildland
- From structural fuels to vegetative fuels
- From structure protection to wildland fire management

# Mapping the WUI



- Mapping units are US Census blocks
- Housing data from 2000 US Census
- Vegetation data from 1992/93 USGS National Land Cover Data (30 m resolution)

# Mapping the WUI



- Our data is easily integrated in a GIS platform with data on fuels, ignitions, fire perimeters, etc.
- We can identify and characterize communities in the interface

# Wildland Urban Interface 2000



## WUI

 intermix and interface

## Non-WUI Vegetated

 very low density housing  
 no housing

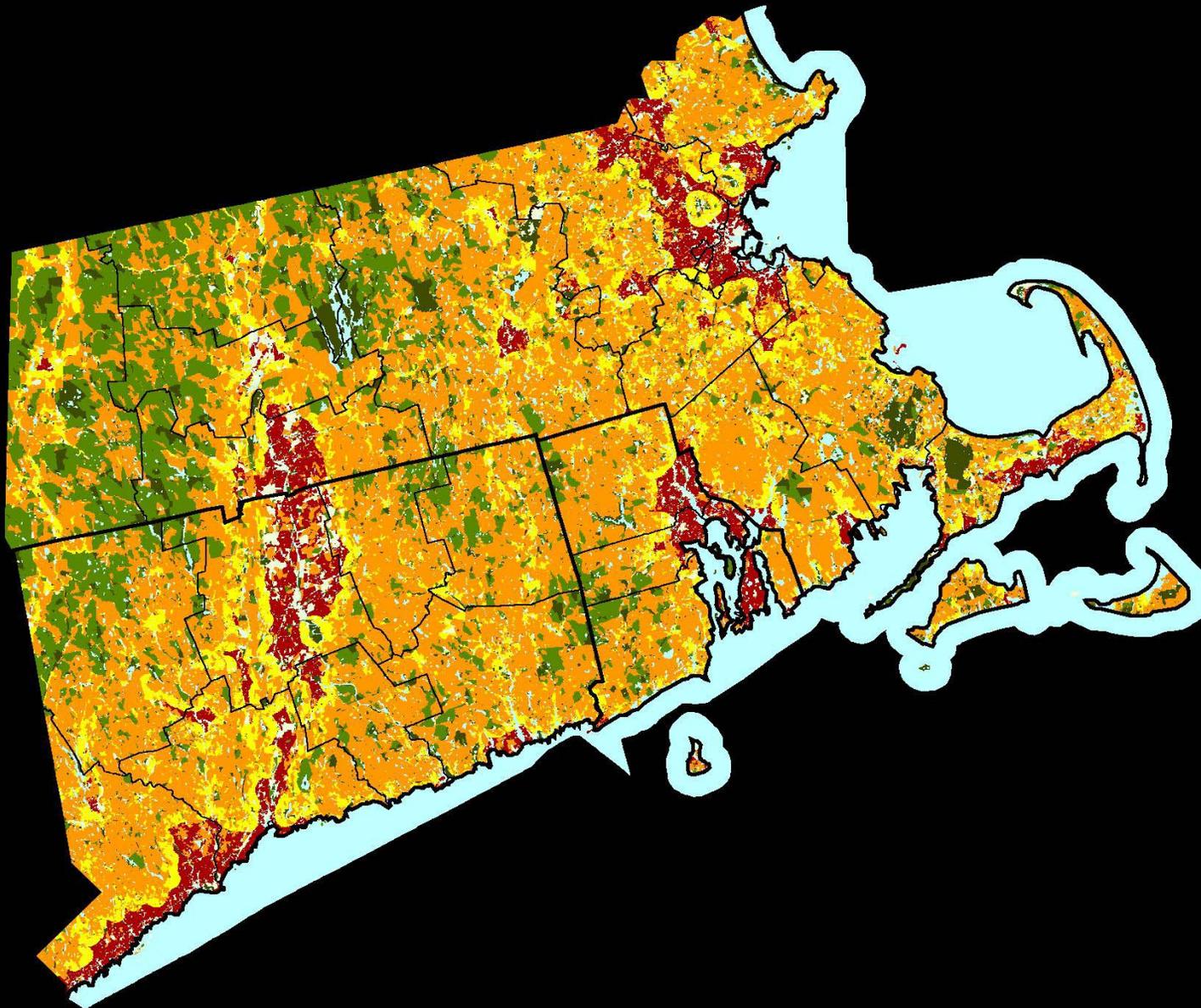
## Non-vegetated or agriculture

 medium and high density housing  
 low and very low density housing

 water

# Southern New England

## Wildland Urban Interface 2000



### WUI

- intermix
- interface

### Non-WUI Vegetated

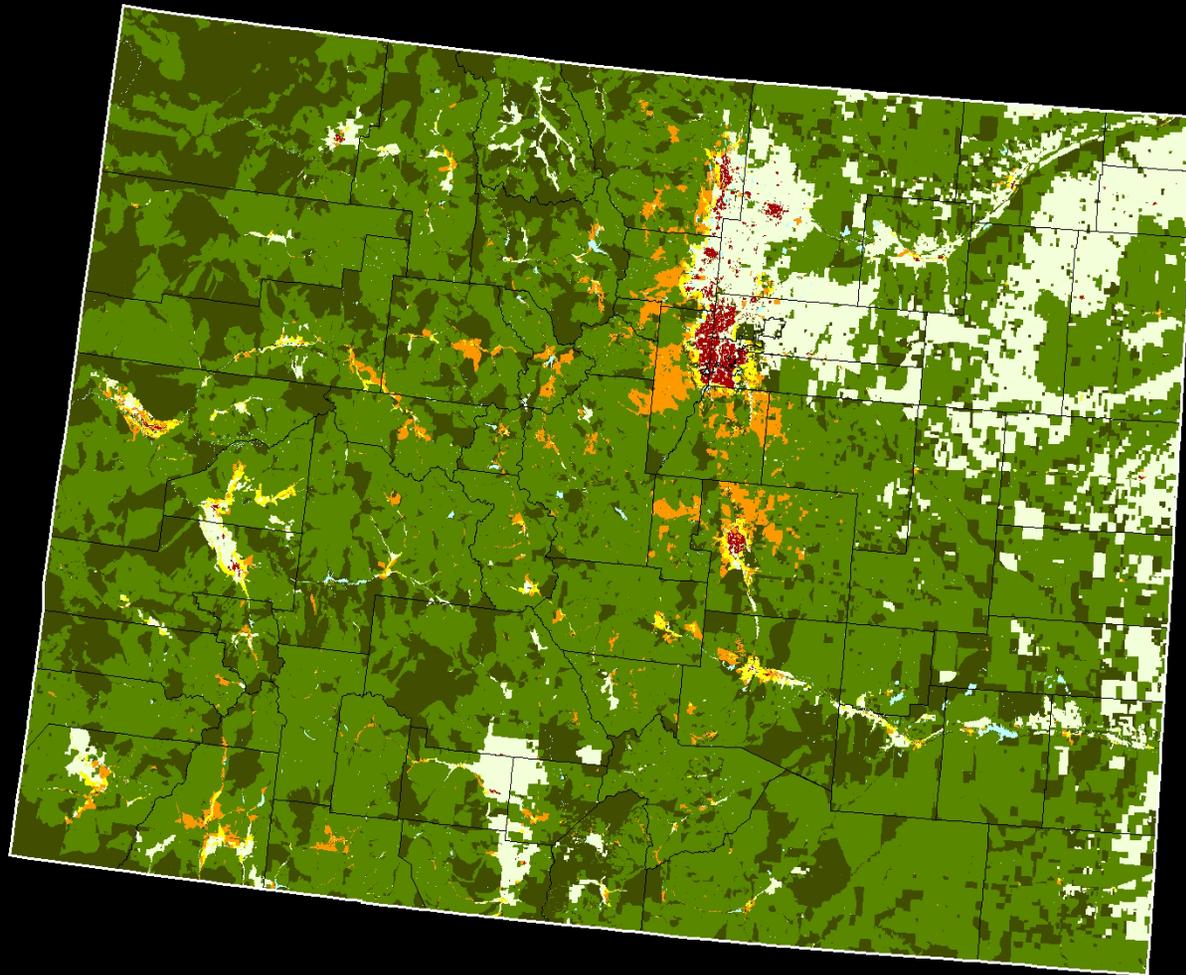
- very low density housing
- no housing

### Non-vegetated or agriculture

- medium and high density housing
- low and very low density housing
- water

# Colorado

## Wildland Urban Interface 2000



### WUI

-  intermix
-  interface

### Non-WUI Vegetated

-  very low density housing
-  no housing

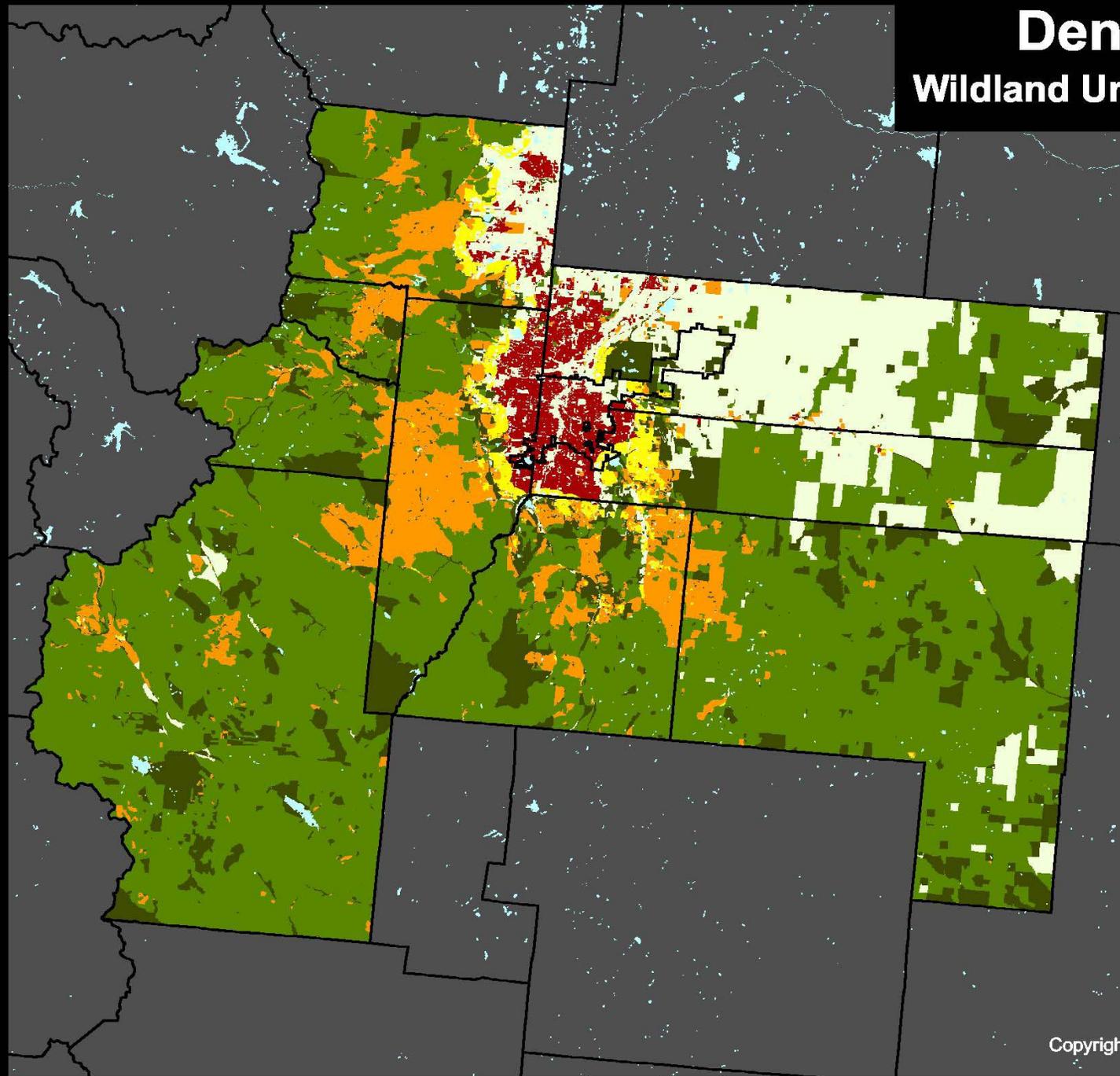
### Non-vegetated or agriculture

-  medium and high density housing
-  low and very low density housing

-  water

# Denver Area

## Wildland Urban Interface 2000



### WUI

- intermix
- interface

### Non-WUI Vegetated

- very low density housing
- no housing

### Non-vegetated or agriculture

- medium and high density housing
- low and very low density housing
- water



# 37% (42 million) U.S. homes are in the WUI



**Missouri Ozarks**



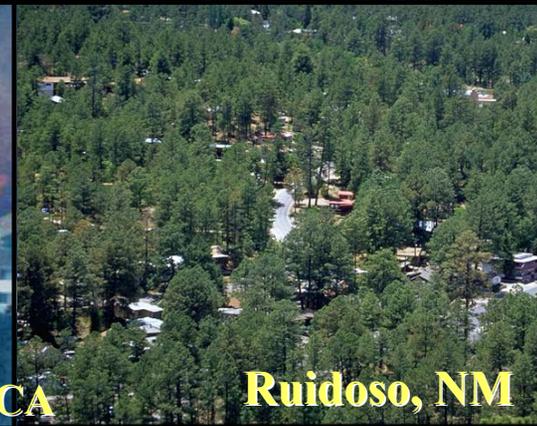
**Bend, OR**



**Port Charlotte, FL**



**Oakland Hills, CA**



**Ruidoso, NM**



**Northern Minnesota**

# 2000 US WUI Analysis

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## National Summary Statistics

- **WUI land area across the U.S.**
  - 9.3% of land area is WUI
  - 708,705 km<sup>2</sup>
- **WUI homes across the U.S.**
  - 36.7% of homes are in the WUI
  - 42,297,763 homes

# Mapping the October 2003 California Wildfires



- Fire perimeters obtained from the interagency geoMAC website  
<http://www.geomac.gov>
- Additional information from CalMAST  
<http://jicfire.calmast.org/index.html>





Smoke from Fire

**Piru**  
63,991 Acres  
90% Contained  
8 Structures Destroyed

**Verdale**  
8,650 Acres  
100% Contained  
1 Structure Destroyed

**Grand Prix**  
59,448 Acres  
100% Contained  
196 Structures Destroyed

**Old**  
91,281 Acres  
100% Contained  
1,003 Structures Destroyed

**Padua**  
10,446 Acres  
(Final)

**Simi**  
108,204 Acres  
100% Contained  
300 Structures Destroyed

**Mountain**  
10,331 Acres  
100% Contained  
61 Structures Destroyed

**Roblar 2**  
8,592 Acres  
100% Contained

**Paradise**  
56,700 Acres  
100% Contained  
415 Structures Destroyed

**California Fires**  
11/12/03 0900

**Dark Red= Current Fire Perimeters.**

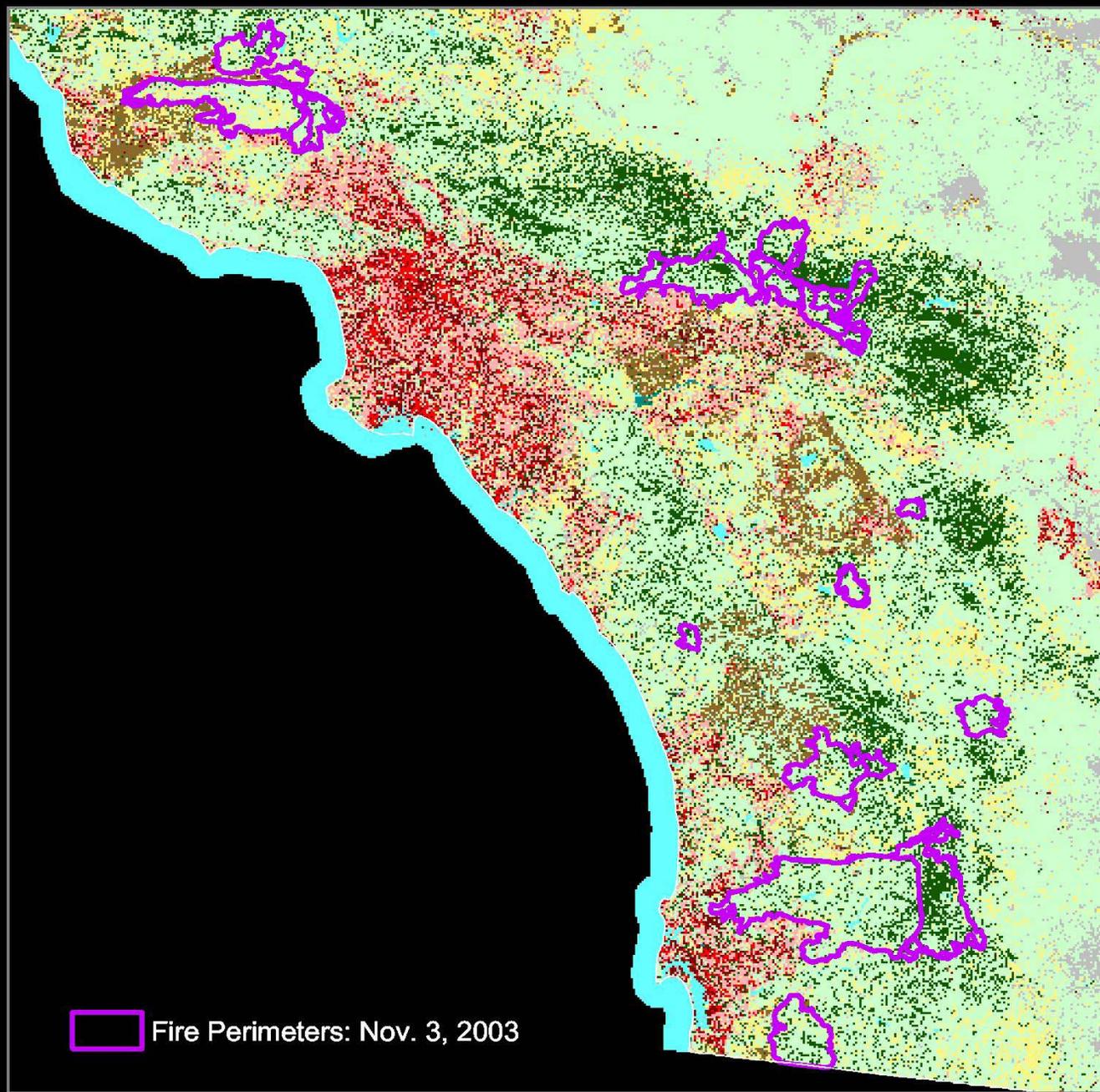
**MODIS Terra Imagery**  
Courtesy USFS, NASA,  
University of Maryland  
(Image date: 10/28/03)

**Cedar**  
273,246 Acres  
100% Contained  
2,820 Structures Destroyed

Uncontrolled Fire Edge

**Otay**  
45,971 Acres  
100% Contained

# Southern California Fire Perimeters and Land Cover: NLCD 1992-1993



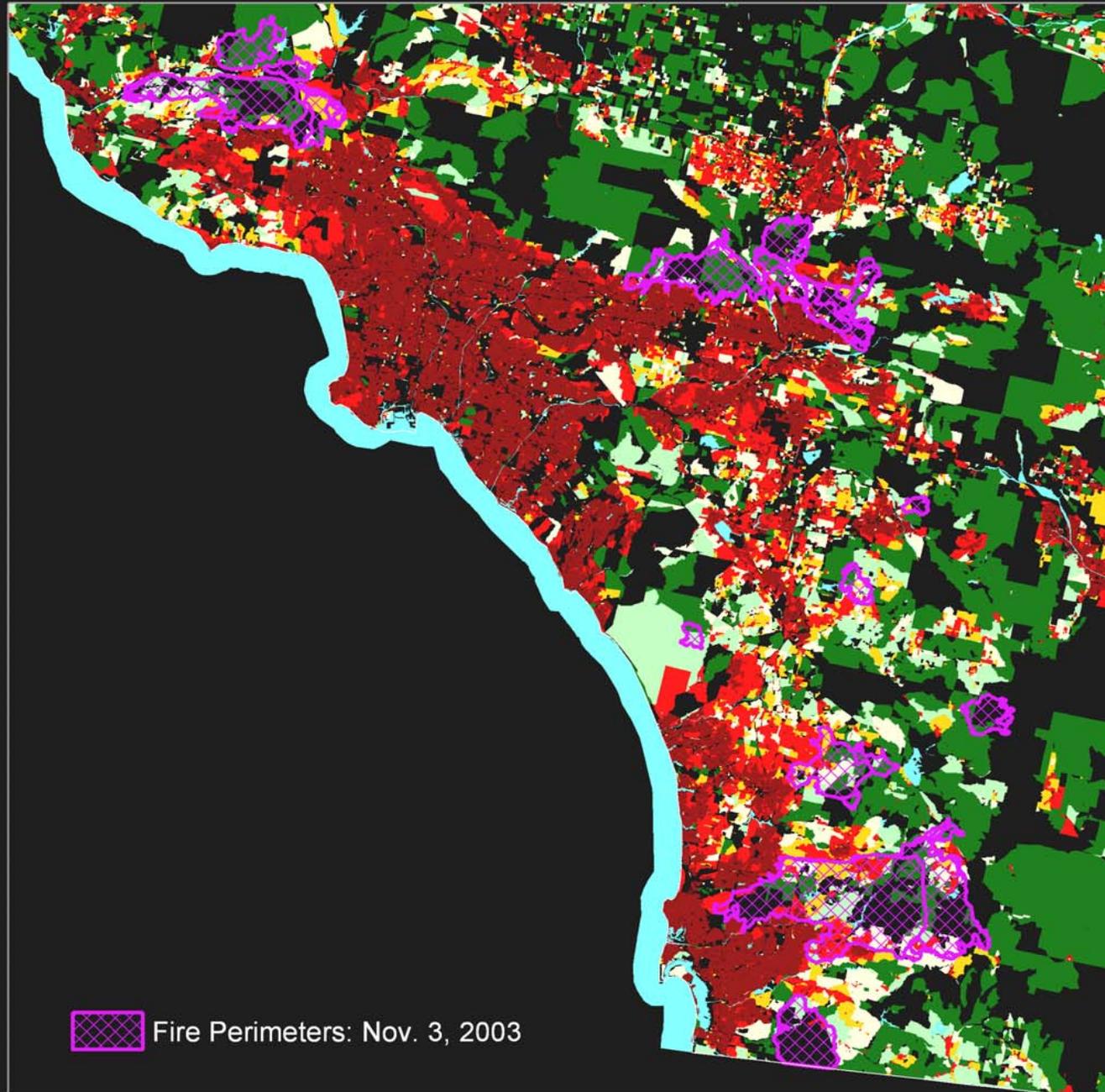
## Landcover Type

- Low Intensity Residential
- High Intensity Residential
- Commercial/Industrial
- Barren/Transitional
- Forest
- Shrubland
- Croplands/Cultivated
- Grasslands/Herbaceous
- Wetlands
- Water

Fire Perimeters: Nov. 3, 2003

0 10 20 40 60 80  
Kilometers

# Southern California Fire Perimeters and Housing Density: Census Block 2000



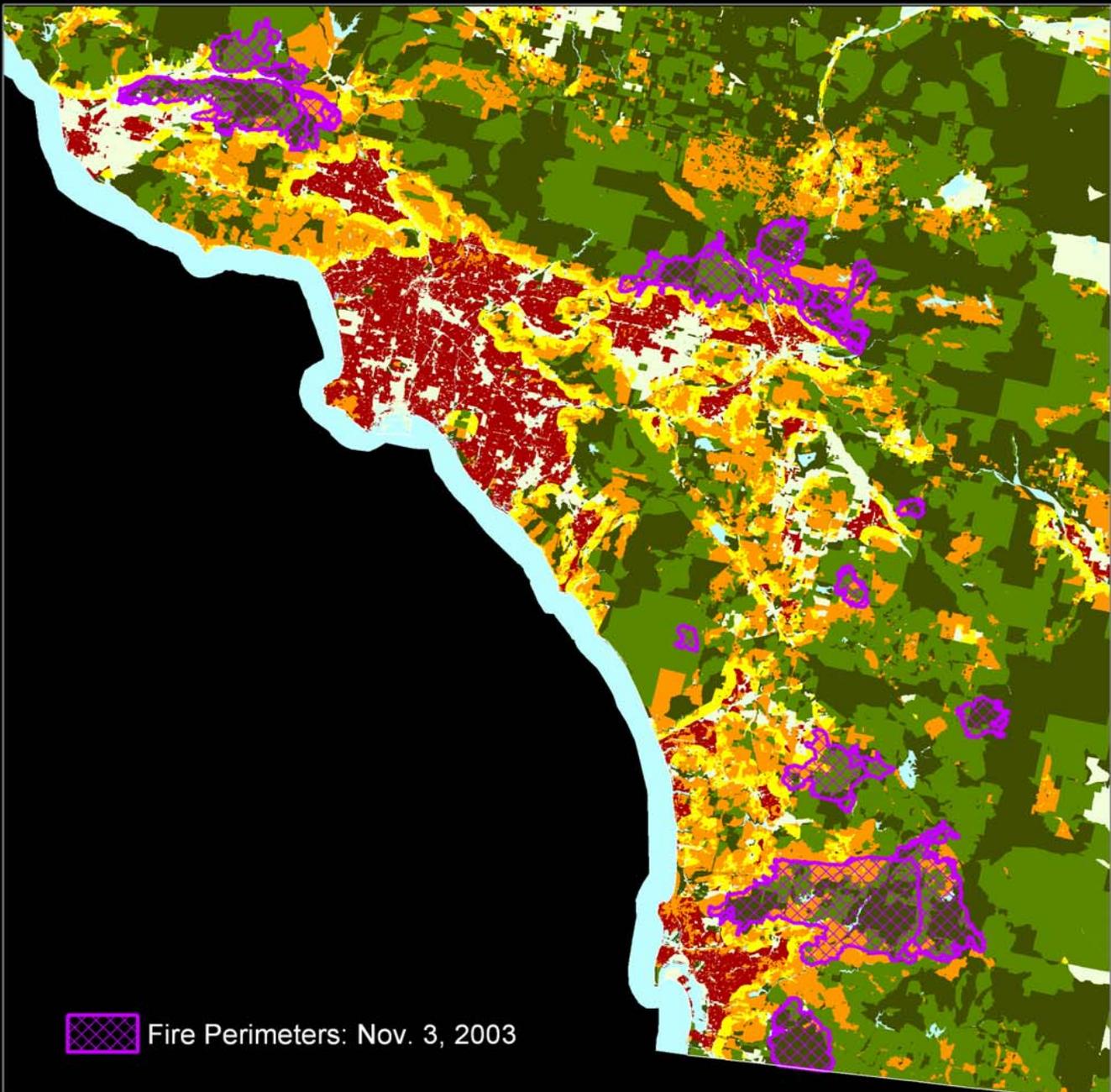
## Housing Units per Km<sup>2</sup>



 Fire Perimeters: Nov. 3, 2003



# Southern California Fire Perimeters and the Wildland Urban Interface



## WUI

intermix

interface

## Non-WUI Vegetated

very low density housing

no housing

## Non-vegetated or agriculture

high and medium density housing

low and very low density housing

water

Fire Perimeters: Nov. 3, 2003



# California Fire Map Summary

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- LA, SD area on map is just over 49,000 km<sup>2</sup>
  - 20% is WUI
- Fire perimeters together cover 2,753 km<sup>2</sup>
  - 19% is WUI
- Houses in area mapped number over 6 M
  - 40% are in the WUI
- Fire perimeters include nearly 33,000 homes
  - 94% are in the WUI

# Housing Density Maps

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- Foundation for WUI maps
- Developed by UW Madison team
- Custom geography creates stable sub-county boundaries over past 60 yrs
- Backcasting method uses Census question “year structure built.”
- Decadal county totals used to correct for missing housing units

# Data Processing

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- Mapping pre-1990 housing units below county level requires spatial data analysis...
- ...And boundary reconciliation: between 1990 and 2000, **60%** of all block boundaries were altered by Census Bureau
- All maps use Albers projection
- Geospatial information processed using ArcInfo and ArcGIS 8.2 (ESRI 2002).

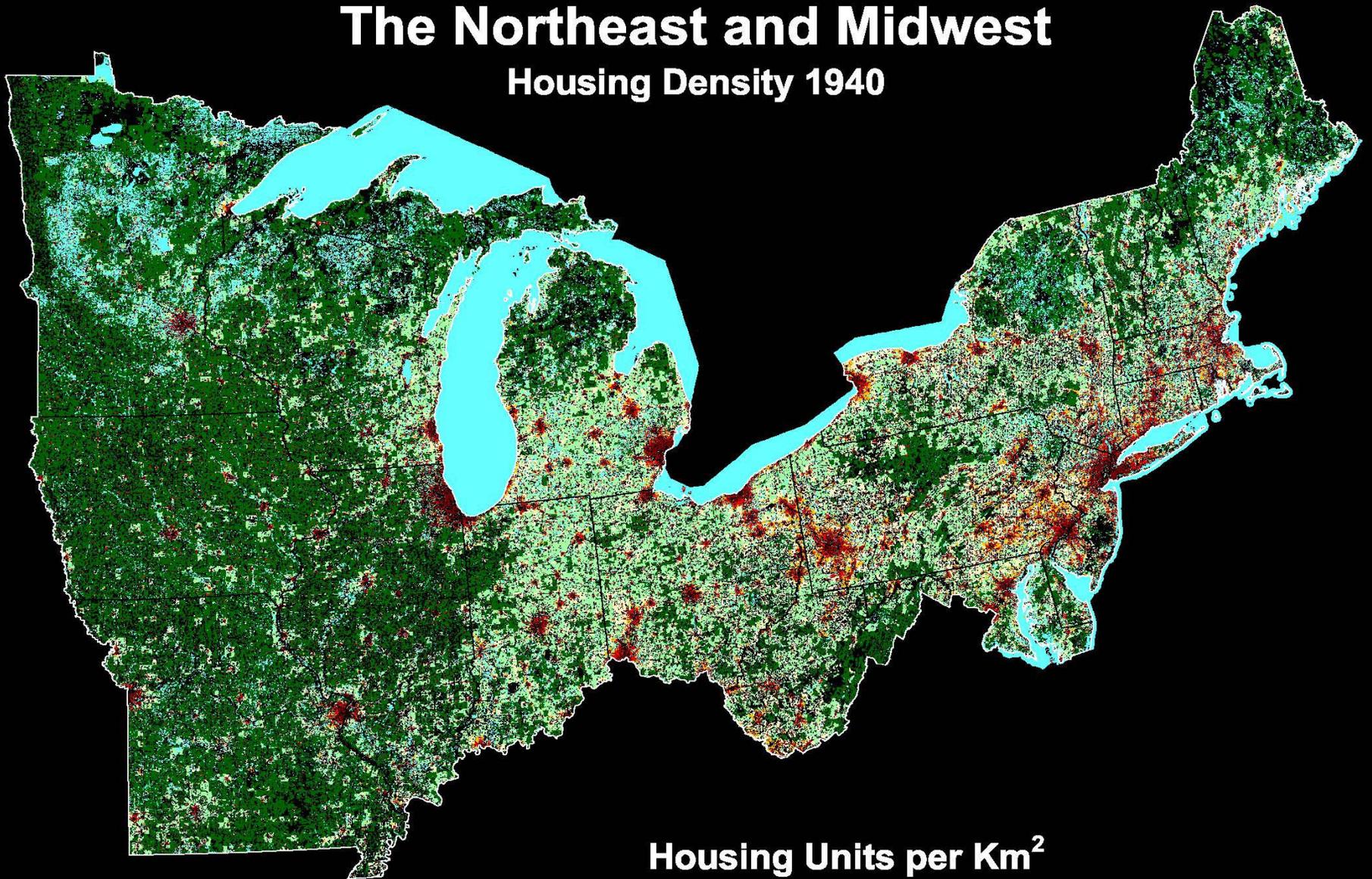
# Housing Density Maps

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- Categories used here highlight lower density than most maps
- Low density growth usually indicates the leading edge of development
- Lowest density growth most often affects *forests and agricultural lands*
- Both land *use* and land *cover* are altered

# The Northeast and Midwest

## Housing Density 1940

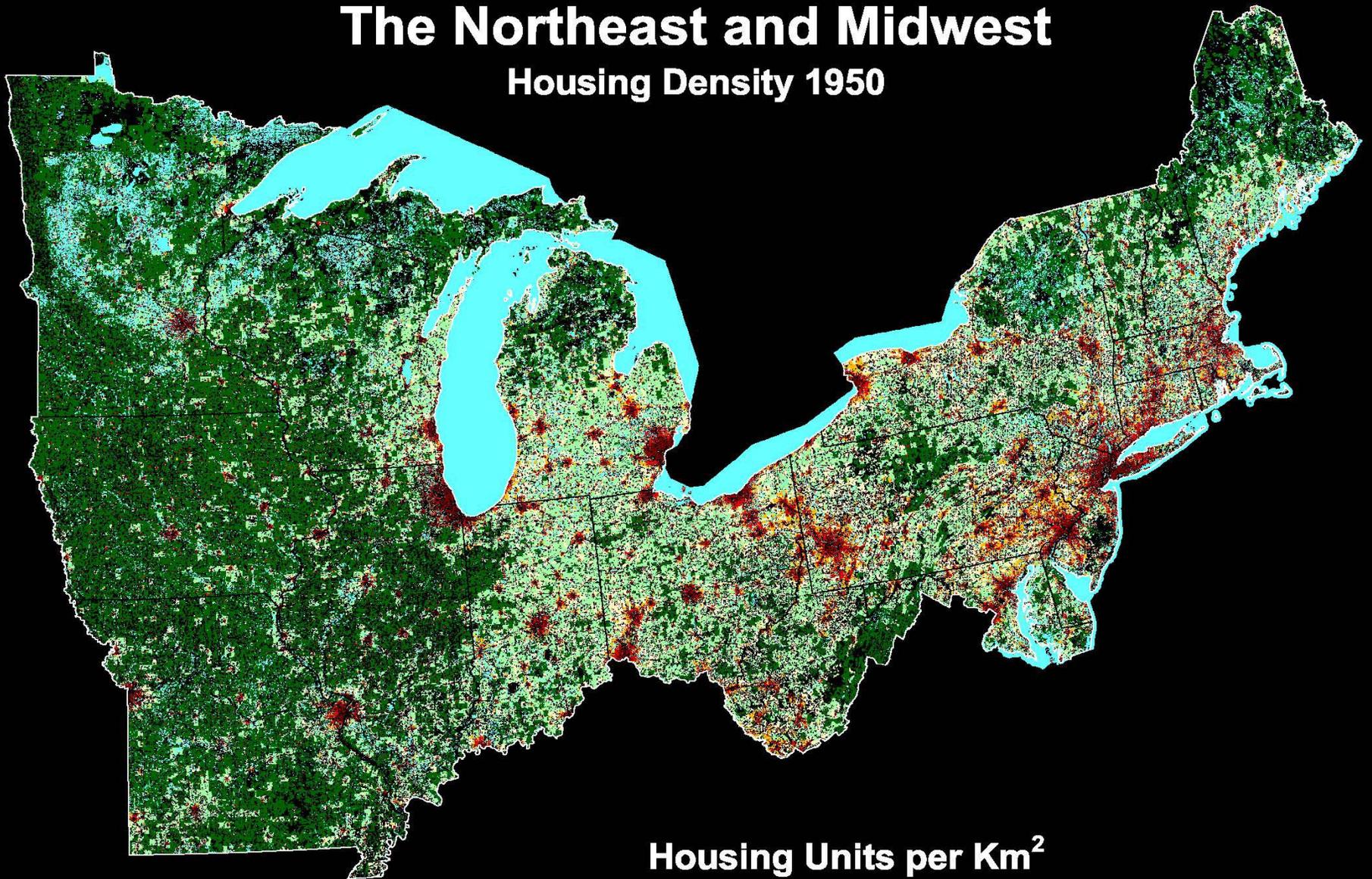


### Housing Units per Km<sup>2</sup>



# The Northeast and Midwest

## Housing Density 1950

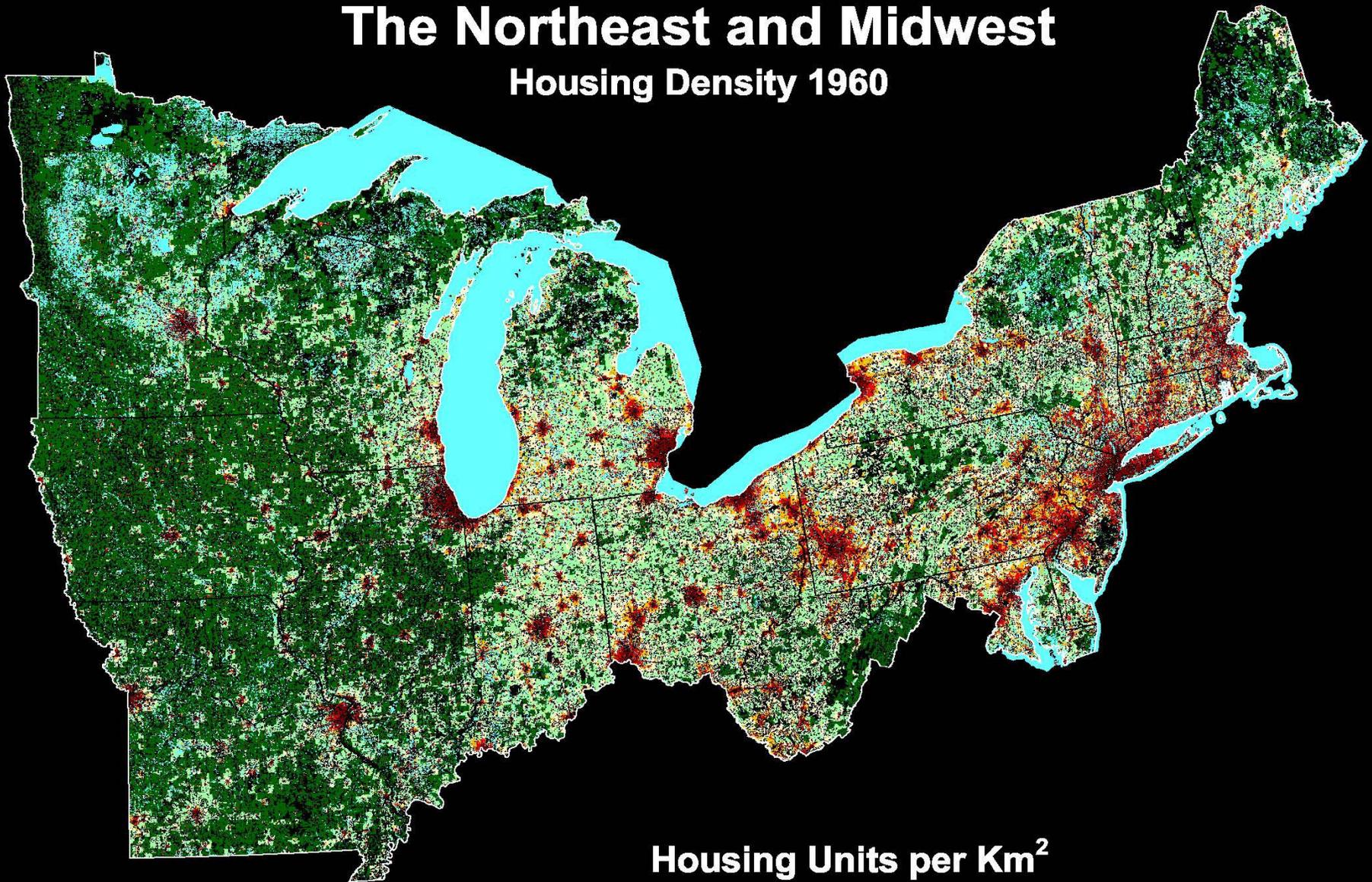


### Housing Units per Km<sup>2</sup>



# The Northeast and Midwest

## Housing Density 1960

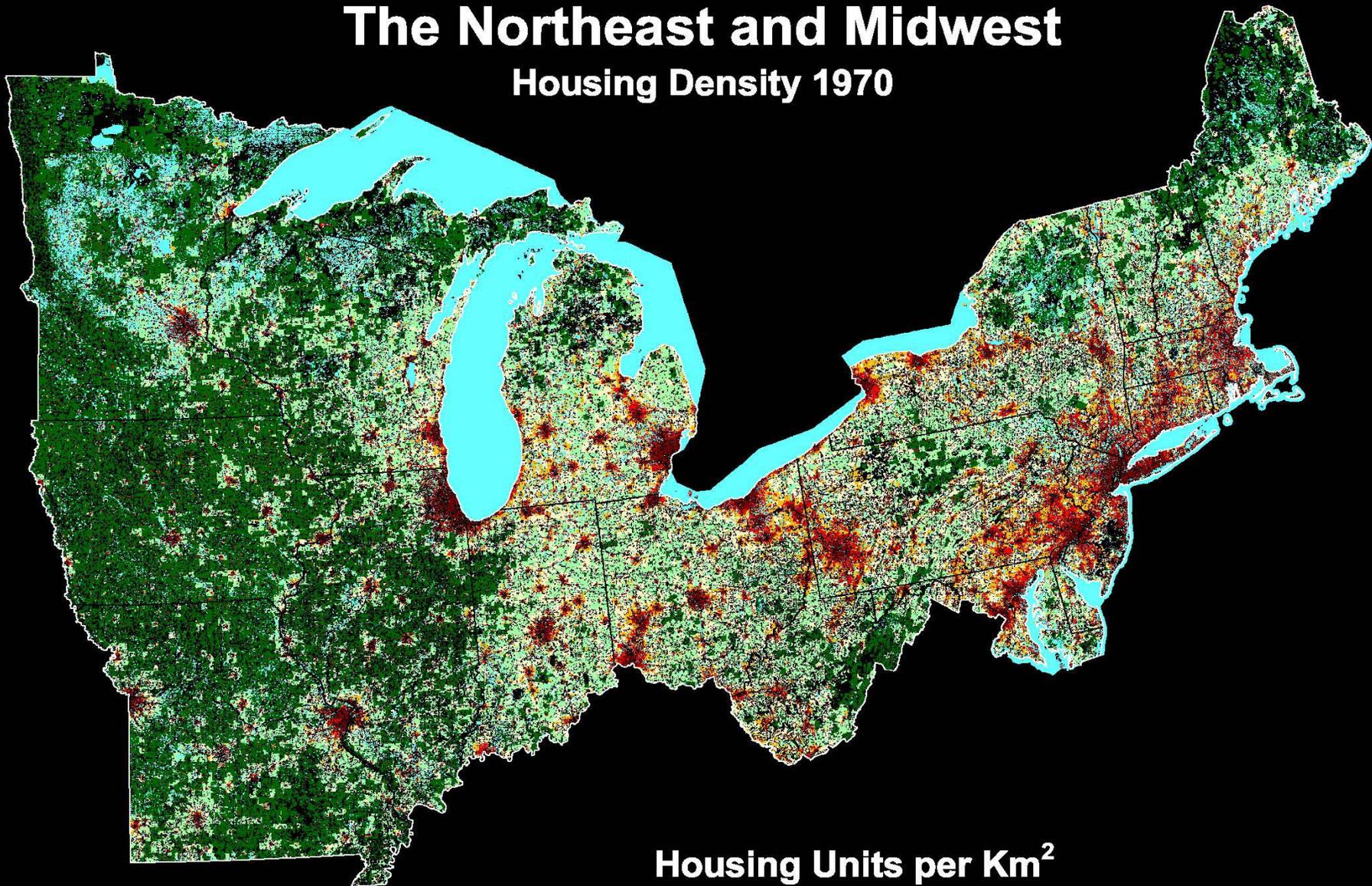


### Housing Units per Km<sup>2</sup>



# The Northeast and Midwest

## Housing Density 1970

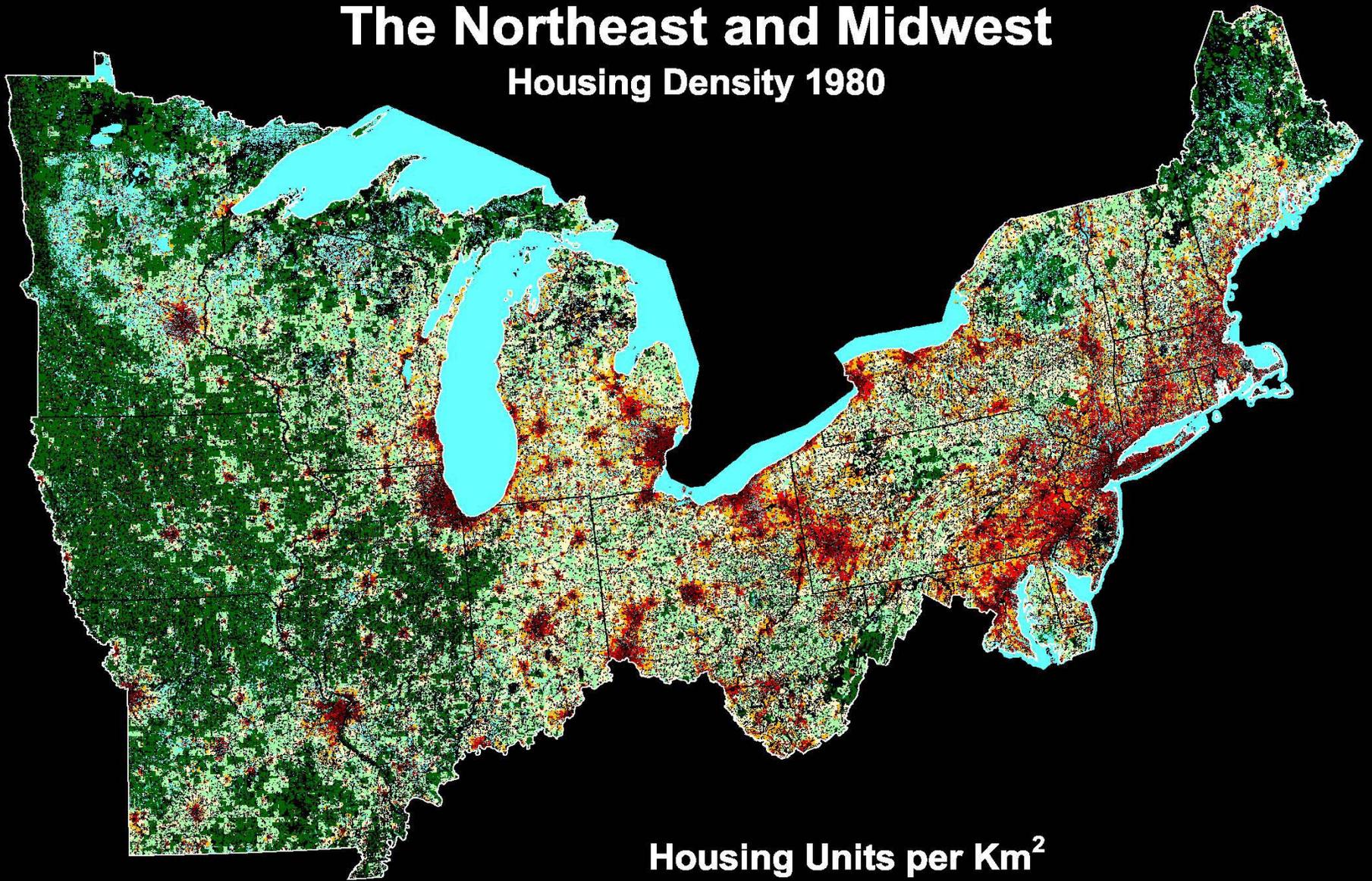


### Housing Units per Km<sup>2</sup>



# The Northeast and Midwest

## Housing Density 1980

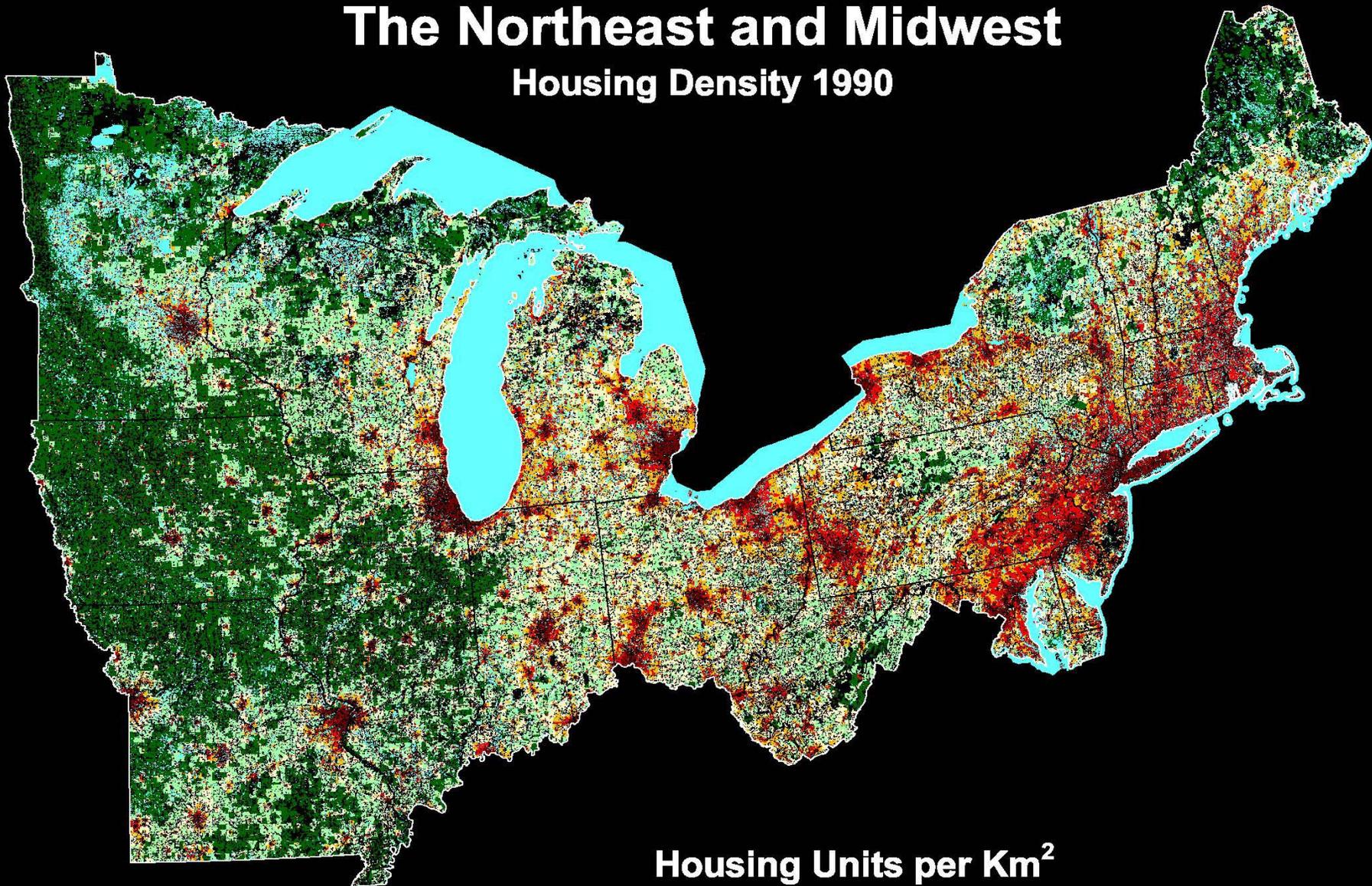


### Housing Units per Km<sup>2</sup>

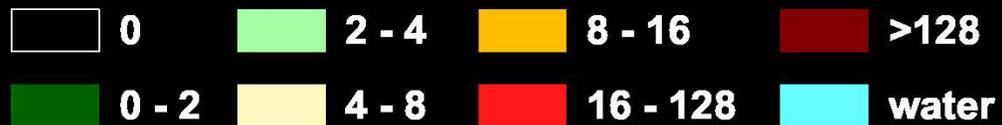


# The Northeast and Midwest

## Housing Density 1990

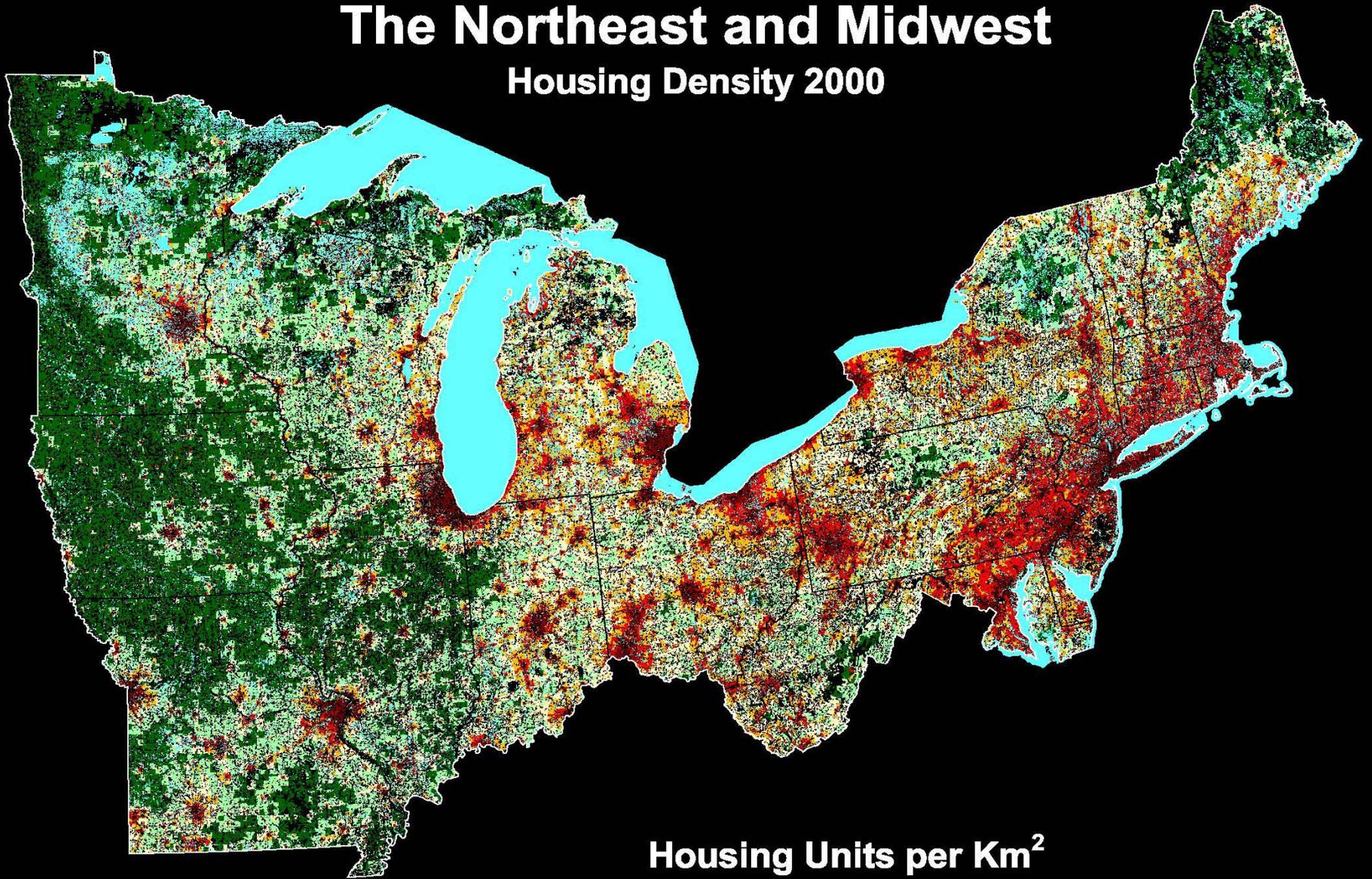


### Housing Units per Km<sup>2</sup>



# The Northeast and Midwest

## Housing Density 2000

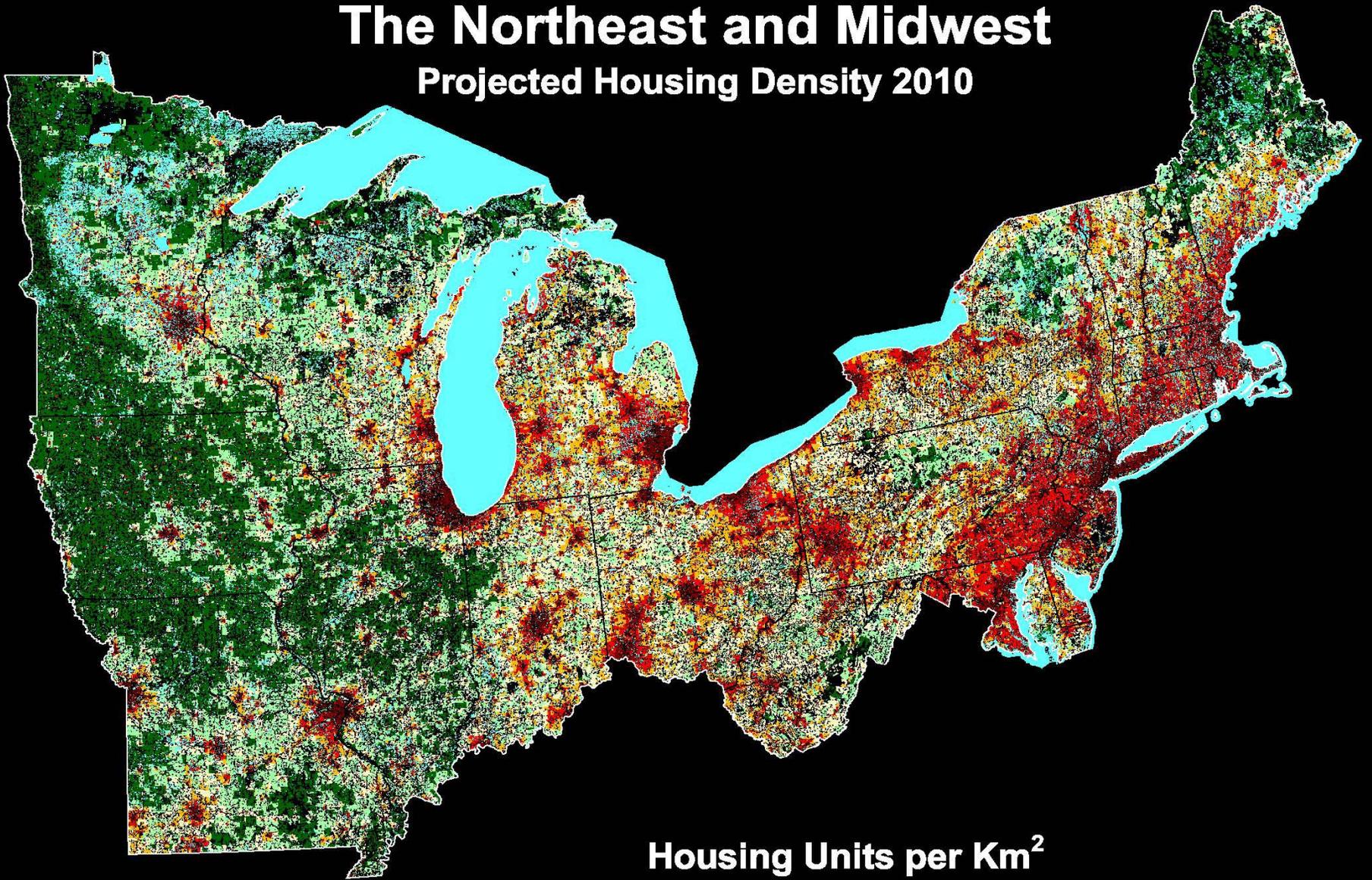


### Housing Units per Km<sup>2</sup>



# The Northeast and Midwest

## Projected Housing Density 2010



Housing Units per Km<sup>2</sup>



0



2 - 4



8 - 16



>128



0 - 2



4 - 8



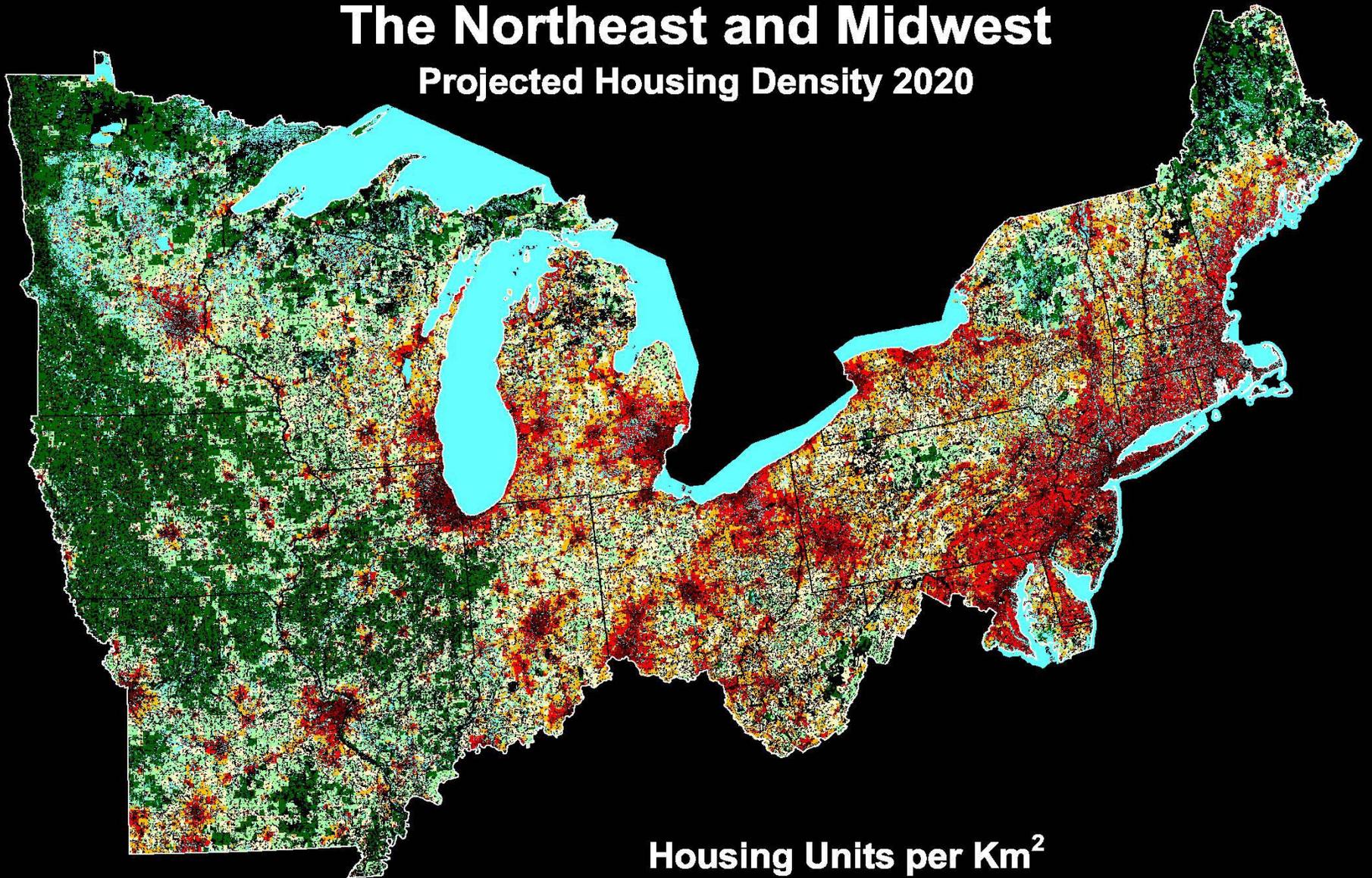
16 - 128



water

# The Northeast and Midwest

## Projected Housing Density 2020

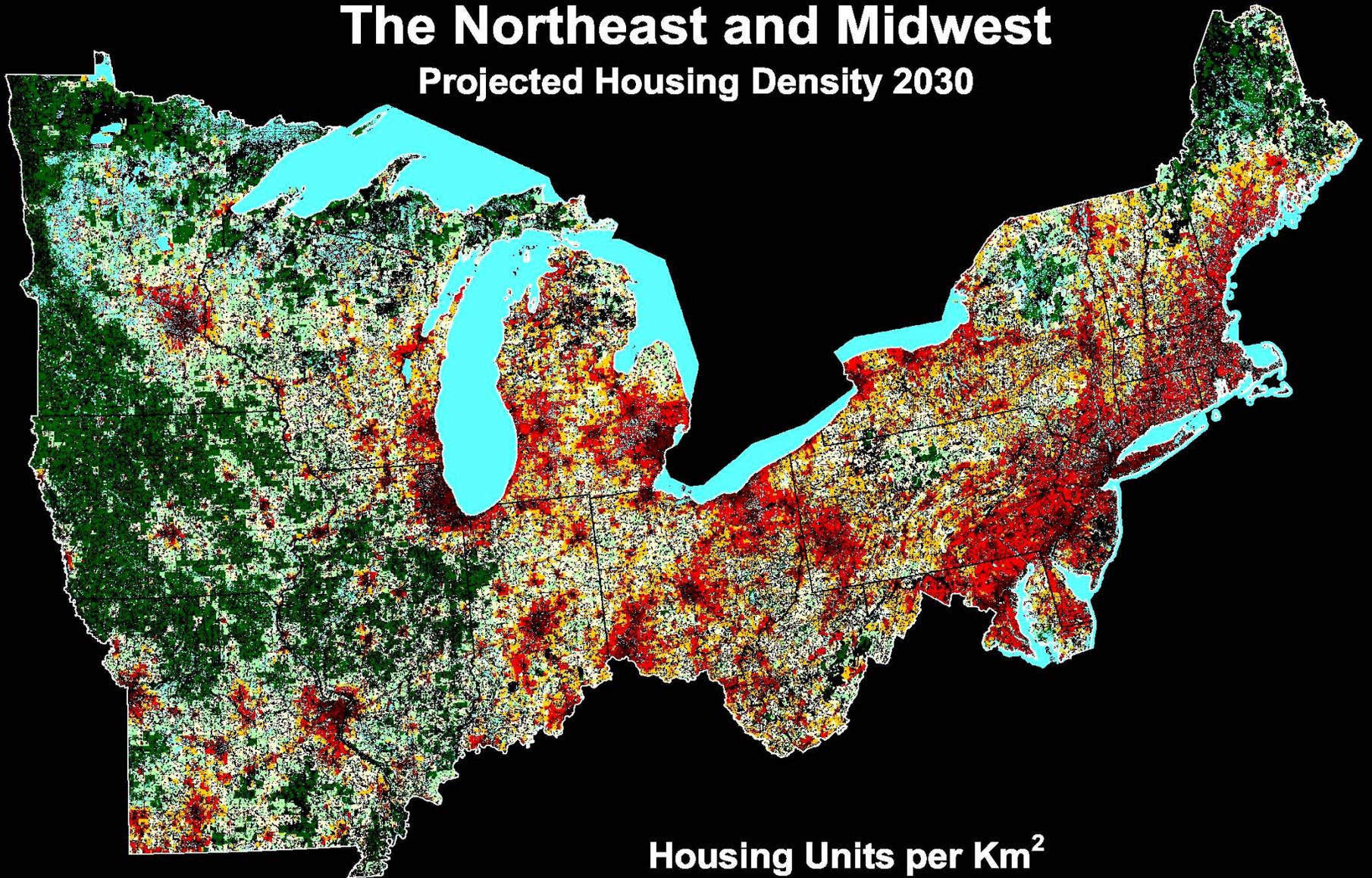


### Housing Units per Km<sup>2</sup>



# The Northeast and Midwest

## Projected Housing Density 2030



### Housing Units per Km<sup>2</sup>



# Housing density data supports additional research

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- Patterns of landscape change
- Effects of housing density change on forest productivity and fragmentation
- Mapping the wildland-urban interface

For more detail on housing density maps and methods, see our web show at <http://www.ncrs.fs.fed.us/IntegratedPrograms/lc/pop/hd/title.htm>

# Conclusions



- WUI maps provide an important strategic planning and management tool
- Housing data developed for use in a GIS has a wide range of basic and applied research applications

***Project Scientists***

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University of Wisconsin-Madison

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