

**U.S. EPA  
Collaborative Science  
and Technology  
Network for  
Sustainability (CNS)  
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**Lynn Richards  
US EPA  
Office of Policy, Economics,  
and Innovation  
Smart Growth Program**

# Regions are growing...

- The US Census estimates that our population will grow by 50 million people by 2020.

Where and how will these people live?



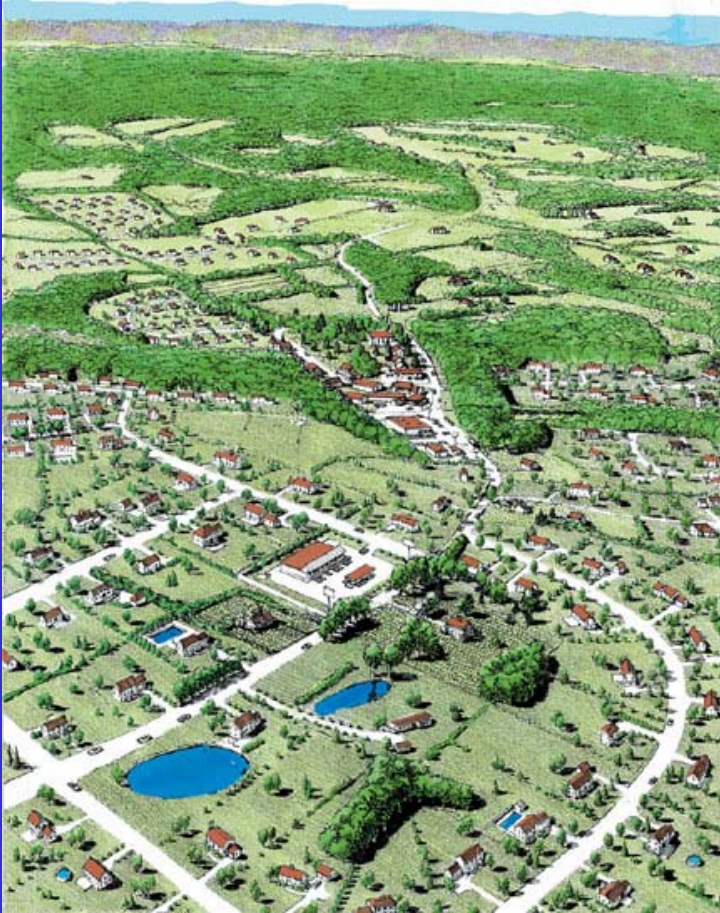
# Development patterns

- 80% of residential development occurs on urban fringe or beyond
- 94% of that development on 1 acre or more





# Trend Development

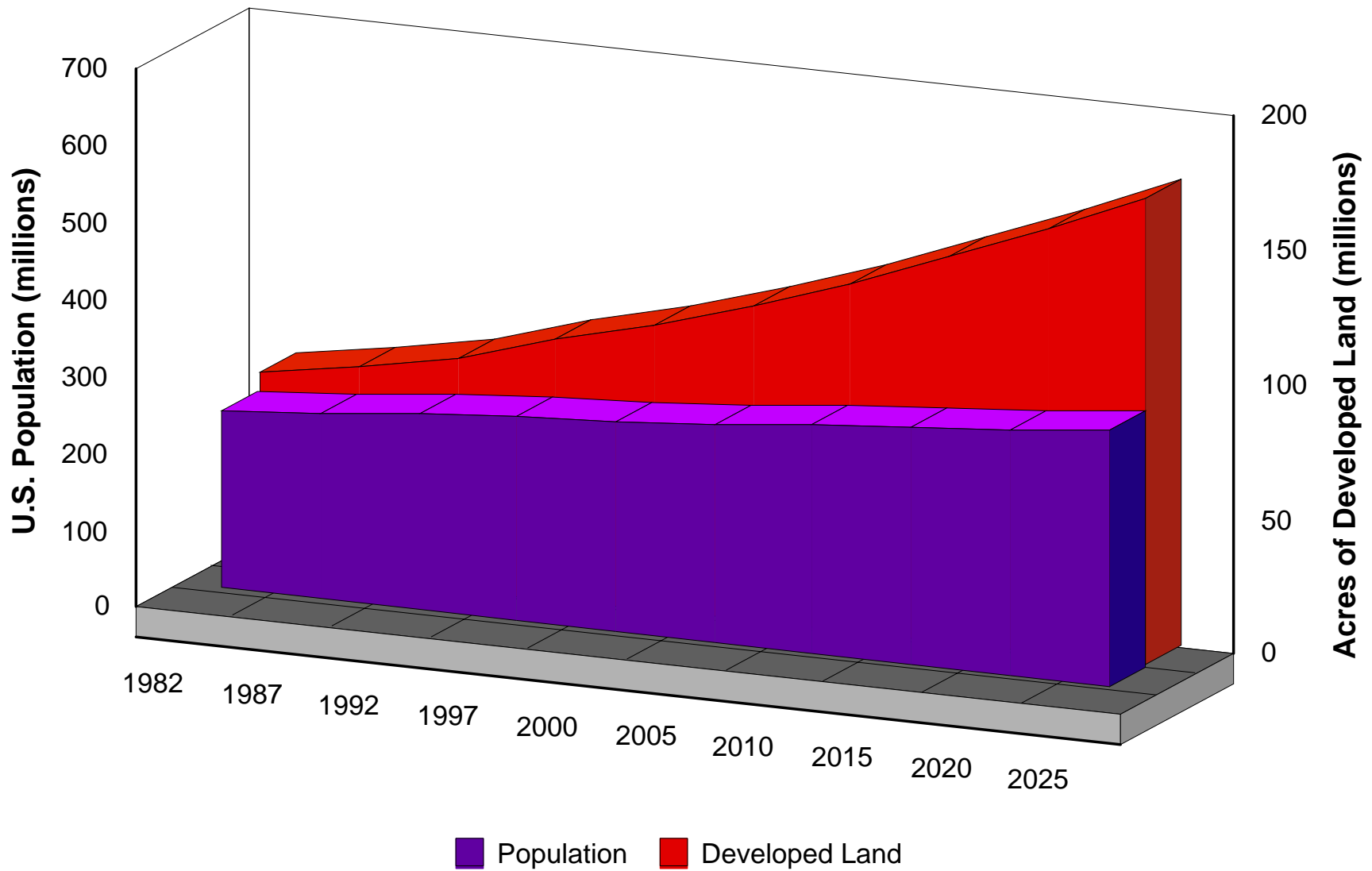


Current development trends are characterized by low-density housing, farmland conversion, and dependence on autos, which:

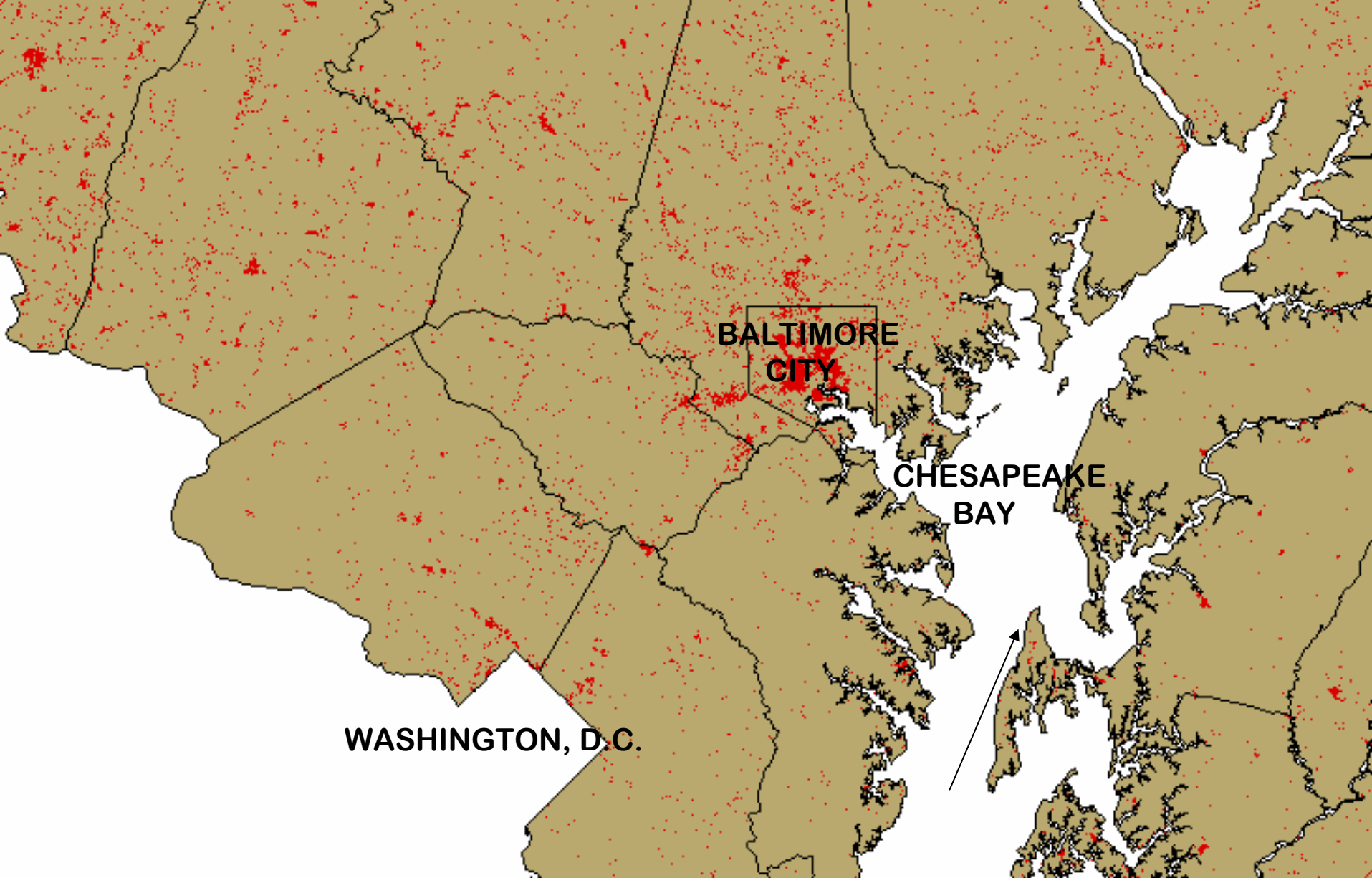
- Consumes land at a faster rate
- Transforms farmland
- Separates houses from stores, businesses, and other land uses
- Increases time spent in cars

# Rate of Land Development vs. Rate of Population Growth

Rate of Land



It's how and where we are growing that are driving our significantly increasing rate of land consumption, not domestic population growth.

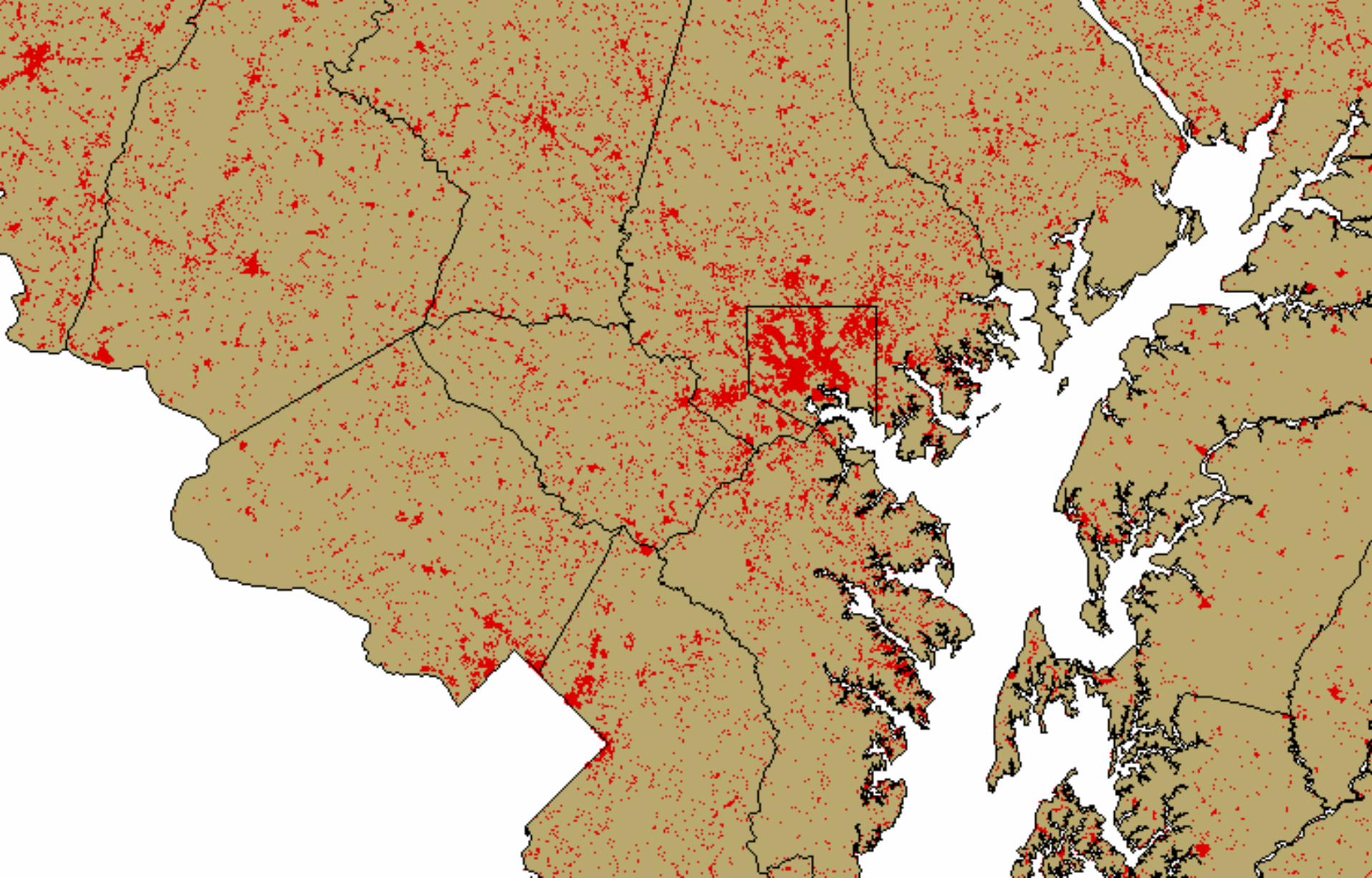


BALTIMORE  
CITY

CHESAPEAKE  
BAY

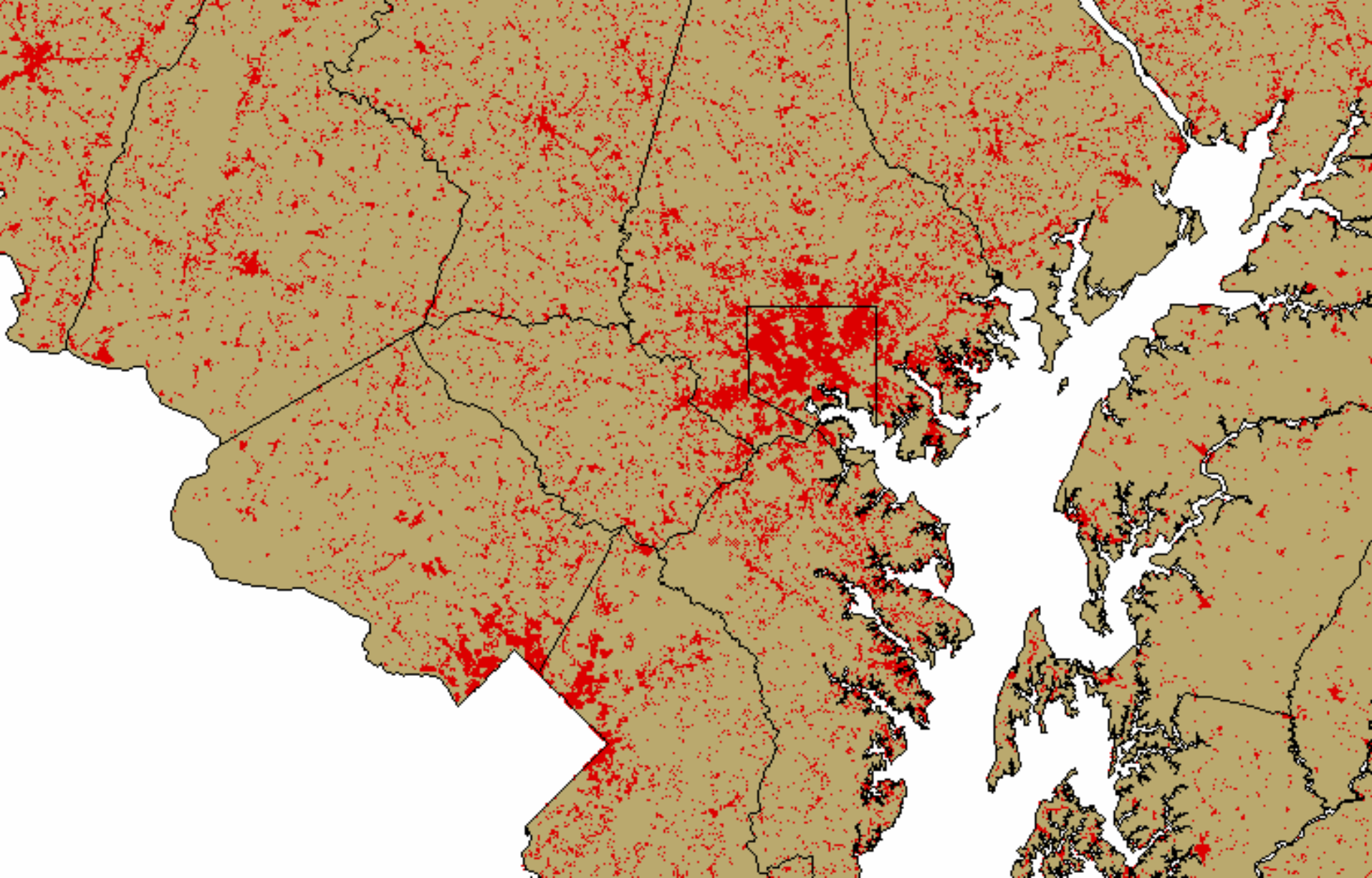
WASHINGTON, D.C.

Development Patterns Before  
1900



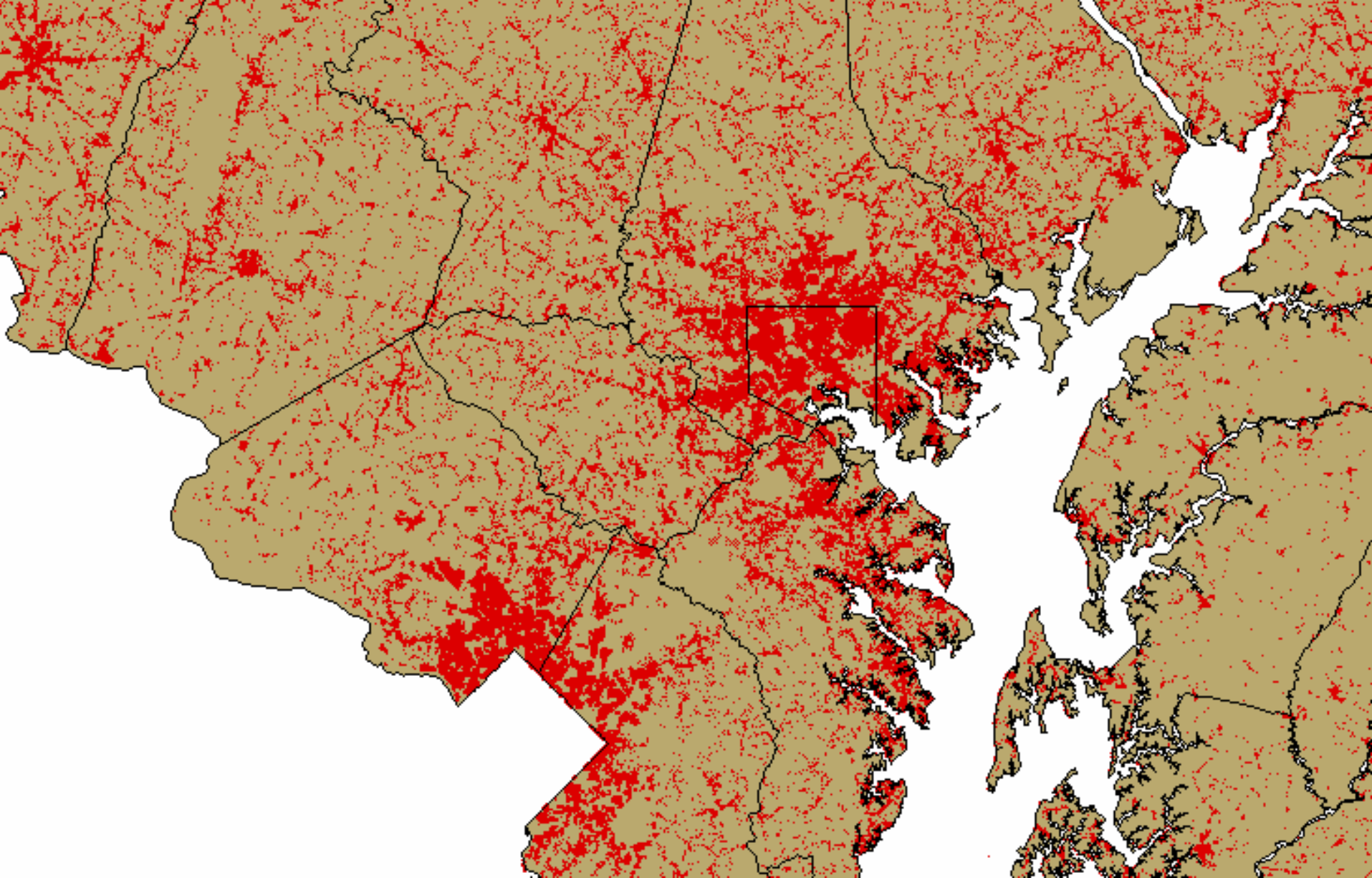
Development Patterns up to  
**1920**



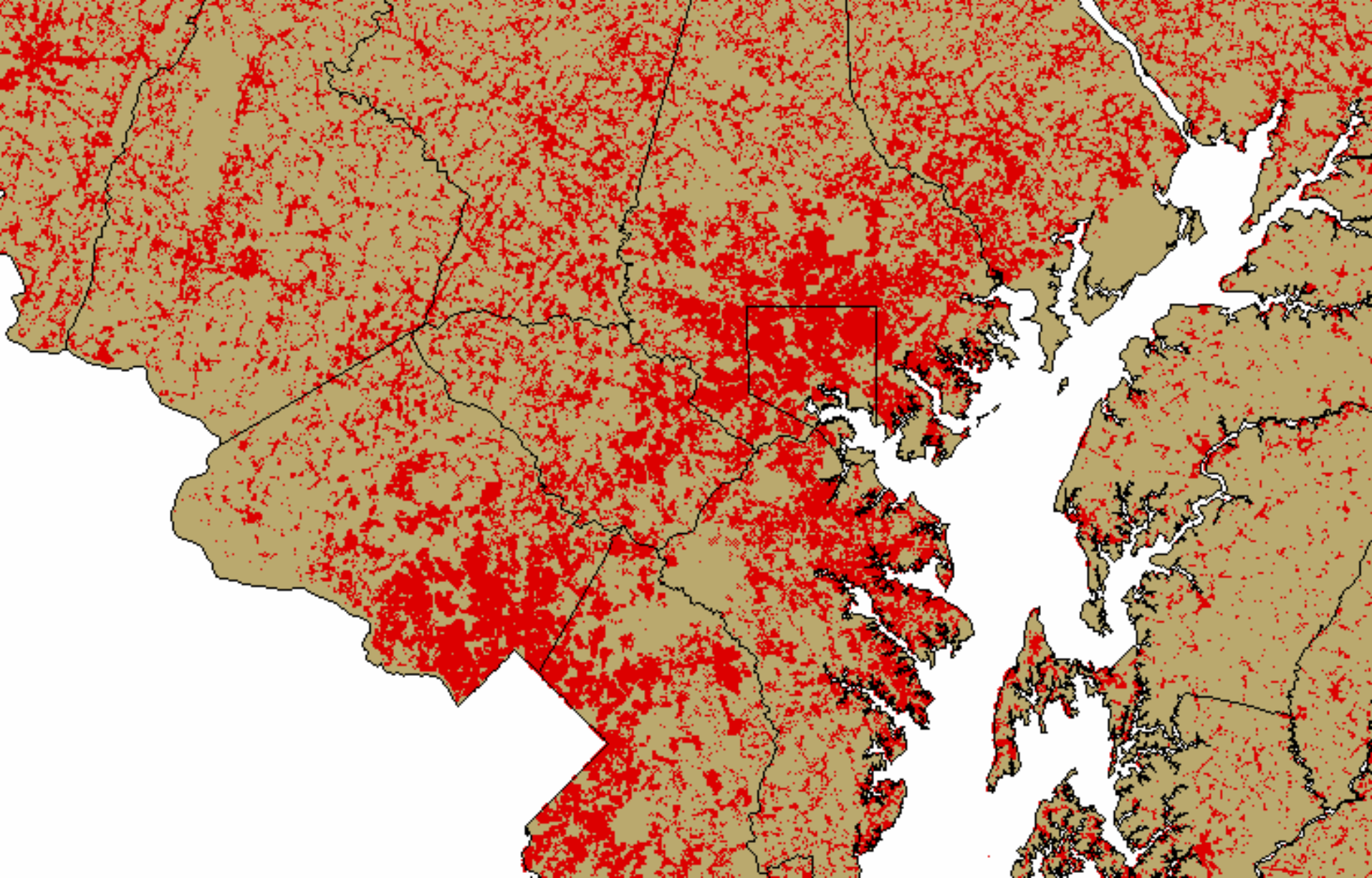


Development Patterns up to  
**1940**



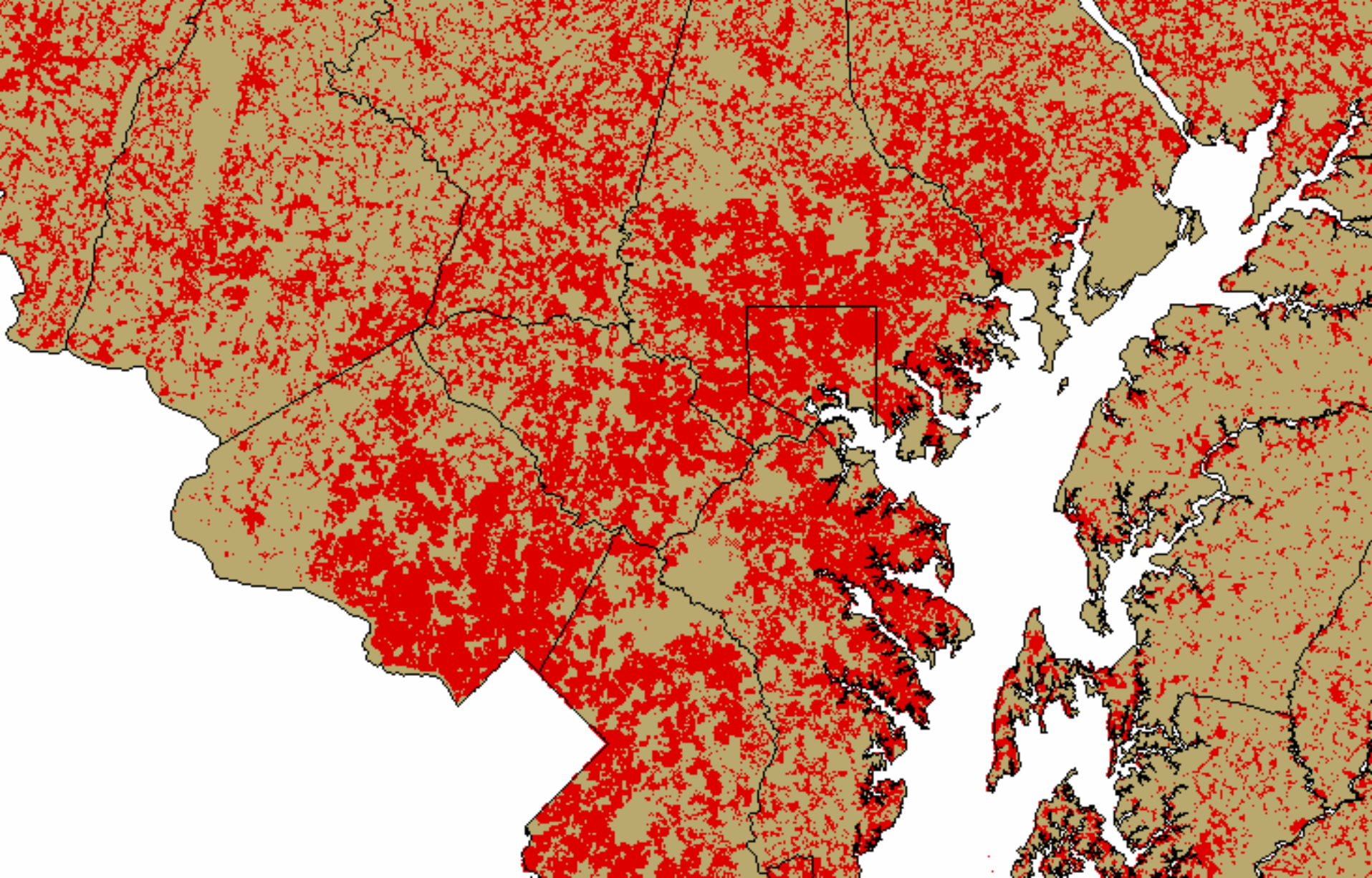


Development Patterns up to  
**1960**



Development Patterns up to  
**1980**



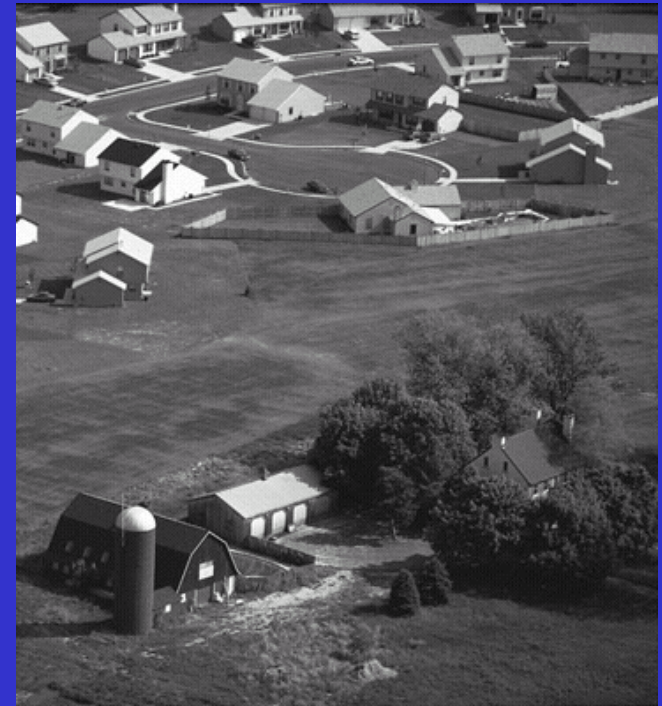


Development Patterns through  
2000



# Trend Development Impacts the Environment

- Increased air emissions from more driving
- Decreased habitat
- Increased wetlands loss
- Decreased water quality
- Increased stormwater runoff
- Increased land consumption
- Increased vacant properties



# What is smart growth?



**Smart growth is development that revitalizes neighborhoods, protects farmland and open space, keeps housing affordable, and provides more transportation choices.**

**It is development that is good for the environment, community, and economy.**



# Smart Growth Principles

- Mix land uses
- Take advantage of compact building design
- Create a range of housing opportunities and choices
- Create walkable neighborhoods
- Foster distinctive, attractive communities with a strong sense of place
- Preserve open space, farmland, natural beauty, and critical environmental areas
- Strengthen and direct development towards existing communities
- Provide a variety of transportation choices
- Make development decisions predictable, fair, and cost-effective
- Encourage community and stakeholder collaboration in development decisions



# Arlington, VA-- Smart growth at the corridor level



Smart growth encourages development around transit stations

# Should We Treat This Strip Mall Like a Forest?





# Which is better for Watershed Water Quality?



Low Density

OR



Higher Density



# Water Quality and Land Use

Regardless of development densities, in order to ensure adequate water quality:

- Preserve large, continuous areas of open space;
- Preserve sensitive ecological areas
- Minimize overall land disturbance and impervious surface associated with development



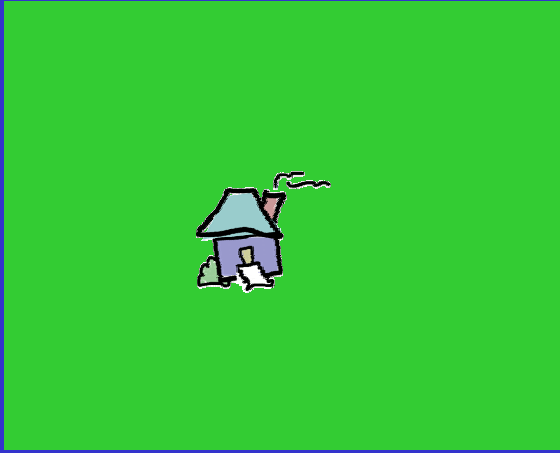
# Water Quality & Smart Growth

- Density and imperviousness are not equivalent
- Lawns do not equal undisturbed land, such as forests or meadows
- Low-density developments have more impervious infrastructure
- Growth is coming to the region-- limiting density on a site doesn't eliminate that growth



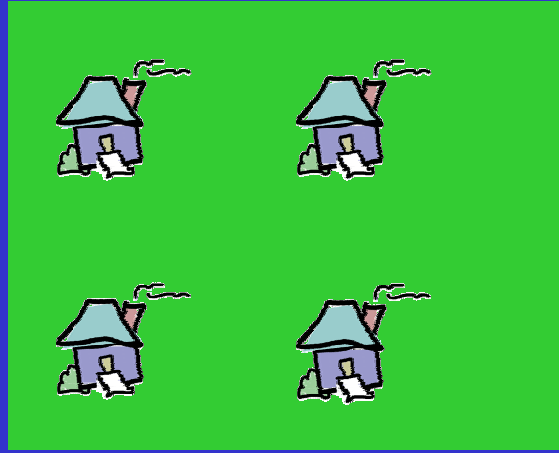
# EPA Research on Smart Growth & Water

*Scenario A:*  
*1 unit/acre*



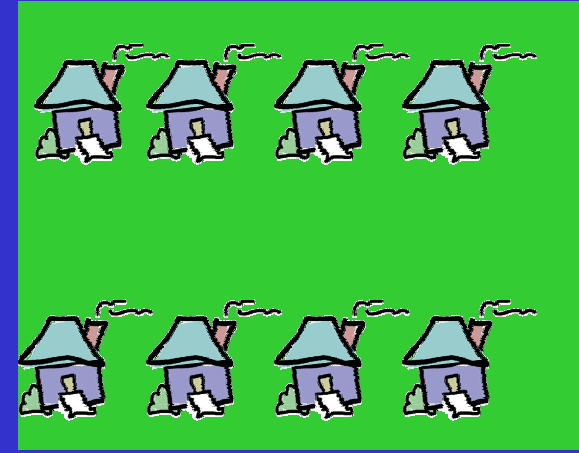
Impervious cover = 20%  
Runoff/acre = 18,700 ft<sup>3</sup>/yr  
Runoff/unit = 18,700 ft<sup>3</sup>/yr

*Scenario B:*  
*4 units/acre*



Impervious cover = 38%  
Runoff/acre = 24,800 ft<sup>3</sup>/yr  
Runoff/unit = 6,200 ft<sup>3</sup>/yr

*Scenario C:*  
*8 units/acre*

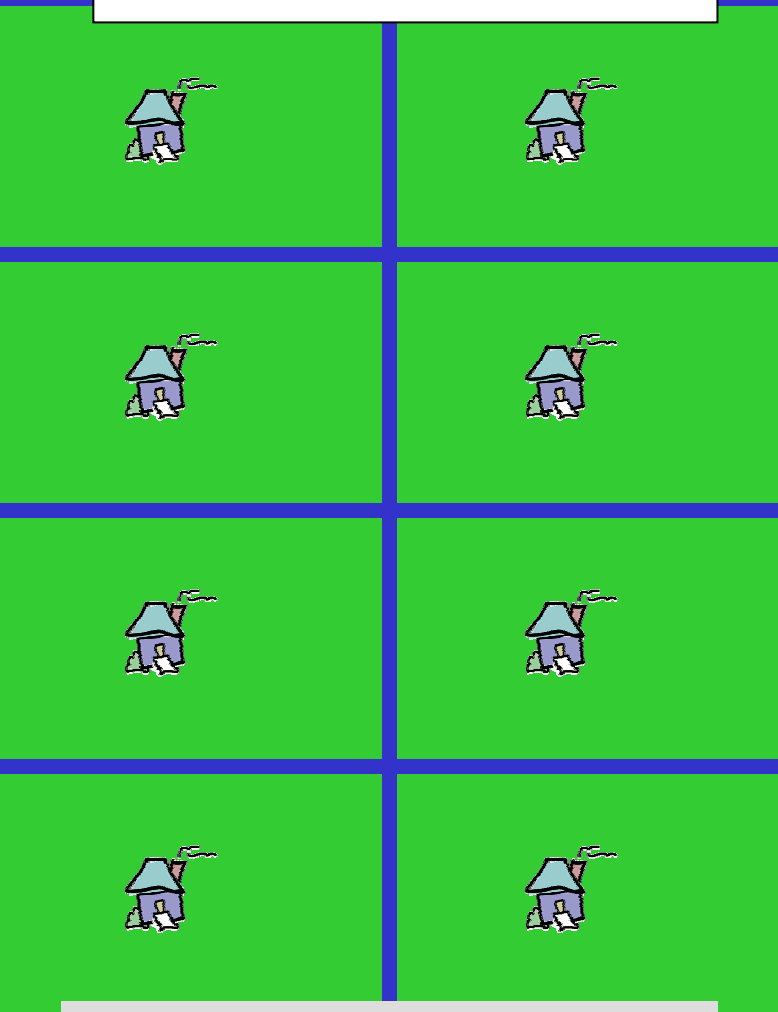


Impervious cover = 65%  
Runoff/acre = 39,600 ft<sup>3</sup>/yr  
Runoff/unit = 4,950 ft<sup>3</sup>/yr



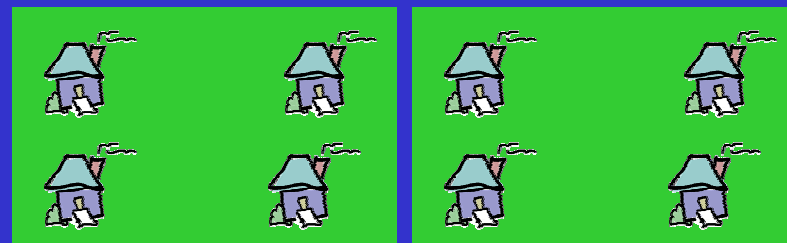
# Accommodating the same number of houses (8) at varying densities

## Scenario A: 1 unit/acre



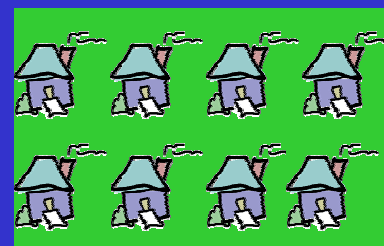
Impervious cover = **20%**  
Total runoff = **149,600 ft<sup>3</sup>/yr**  
Runoff/house = **18,700 ft<sup>3</sup>/yr**

## Scenario B: 4 units/acre



Impervious cover = **38%**  
Total runoff = **49,600 ft<sup>3</sup>/yr**  
Runoff/house = **6,200 ft<sup>3</sup>/yr**

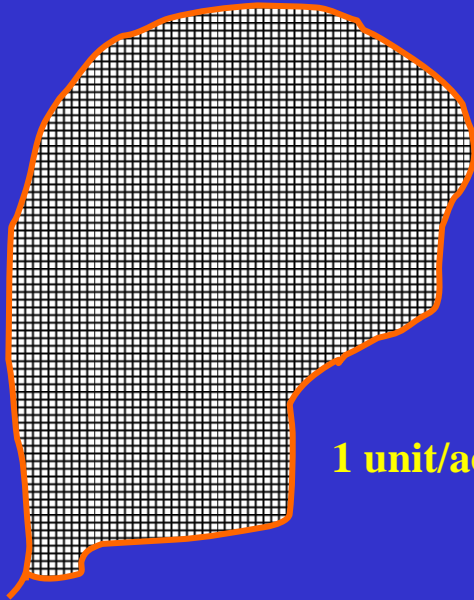
## Scenario C: 8 units/acre



Impervious cover = **65%**  
Total runoff = **39,600 ft<sup>3</sup>/yr**  
Runoff/house = **4,950 ft<sup>3</sup>/yr**

# EPA Research on SG and Water

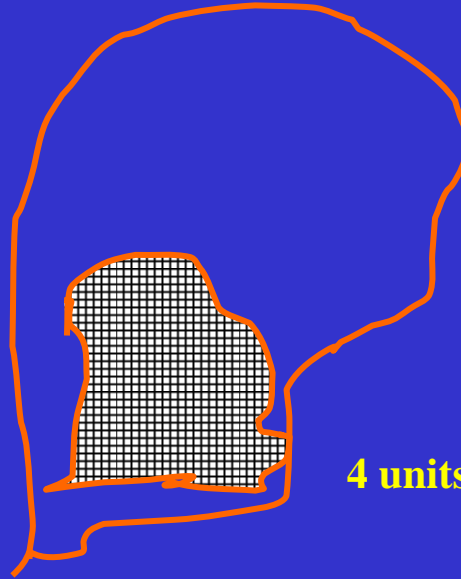
Accommodating 10,000 units on a 10,000 acre watershed at different densities



1 unit/acre

10,000 houses on  
10,000 acres produce  
187 million ft<sup>3</sup>/yr  
stormwater runoff

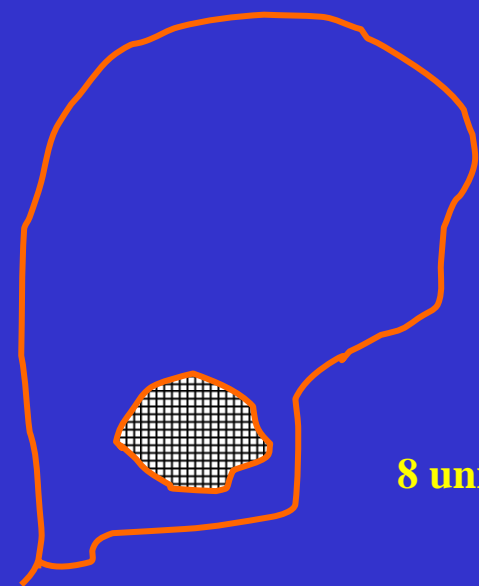
Site: 20% impervious  
Watershed: 20%  
impervious



4 units/acre

10,000 houses on 2,500  
acres produce  
62 million ft<sup>3</sup>/yr  
stormwater runoff

Site: 38% impervious  
Watershed: 9.5%  
impervious



8 units/acre

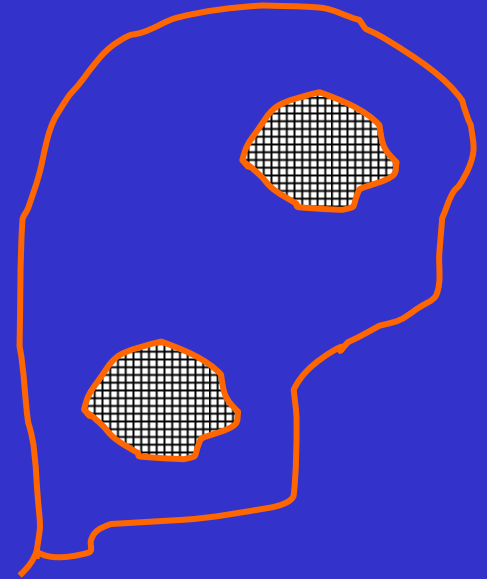
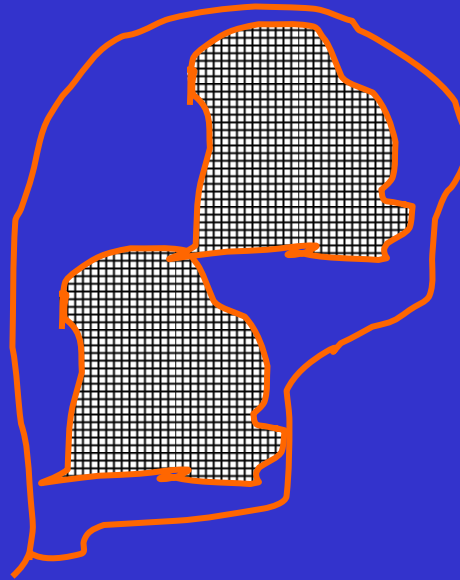
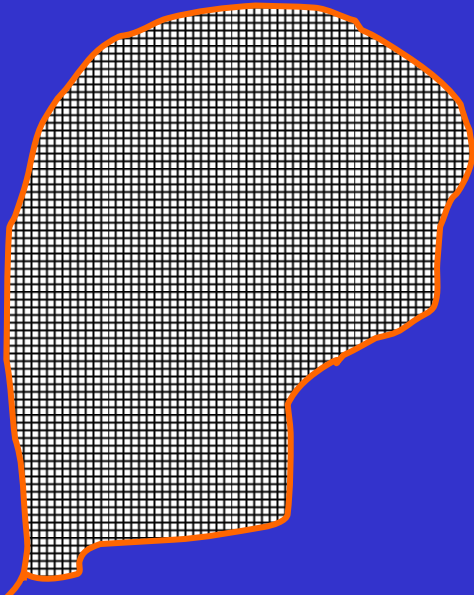
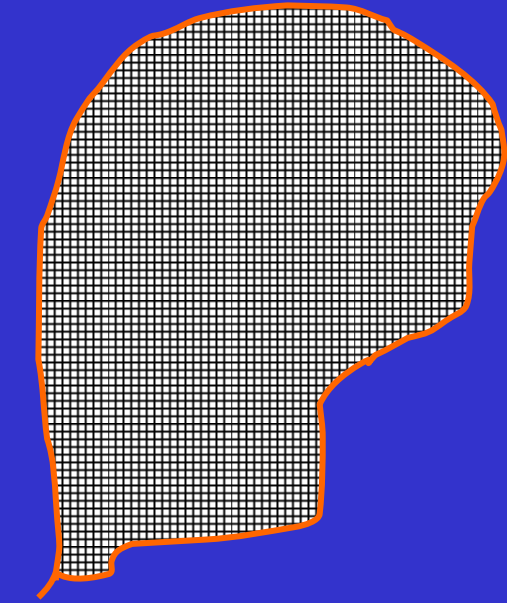
10,000 houses on 1,250  
acres produce  
49.5 million ft<sup>3</sup>/yr  
stormwater runoff

Site: : 65% impervious  
Watershed: 8.1%  
impervious

**The lower density scenario creates more run-off and consumes 2/3 more land than the higher density scenario.**

In 20 years, they have doubled their populations...

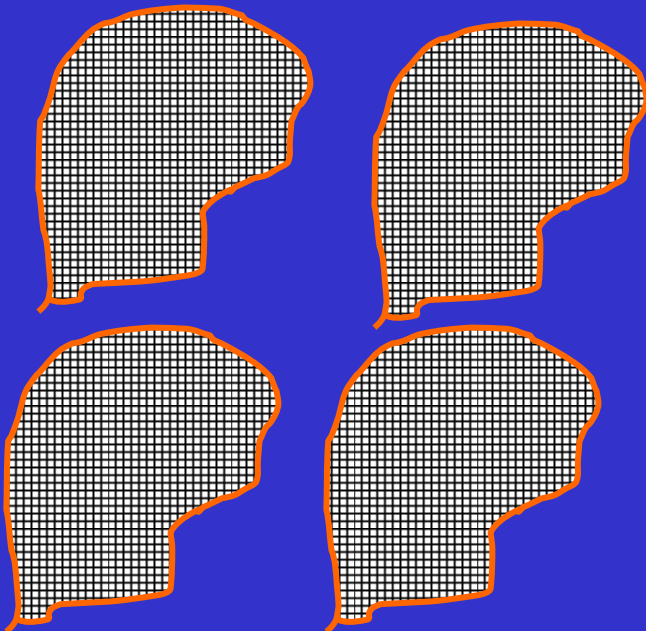
So by **2020**, they might look like...



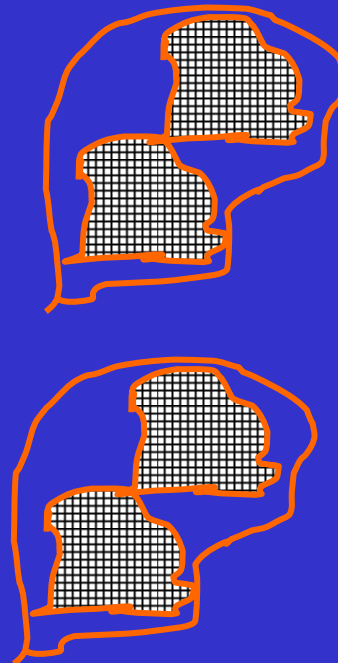
In another 20 years, they have doubled their populations, again...

So by **2040**, they might look like...

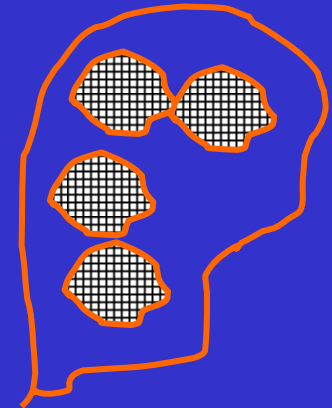
**4** watersheds totally built out



**2** watersheds partially totally built out



**1** watershed partially totally built out





# Working Together: Density and Site-Design Strategies

- Complementary approaches for reducing total environmental impact
- Smart growth site design techniques prevent pollution
- Site-design strategies-- treats and stores remaining stormwater and pollutants on site

**Result? Maximum benefit for communities addressing growth and water quality concerns**

# For example...

- Emeryville, CA is redeveloping many industrial sites to increase densities and to treat runoff.
- Portland, OR created "Green Streets," design guidelines for managing the nexus between roads and water



**These site level approaches enhance the community's sense of place**

# Redeveloping a dead mall

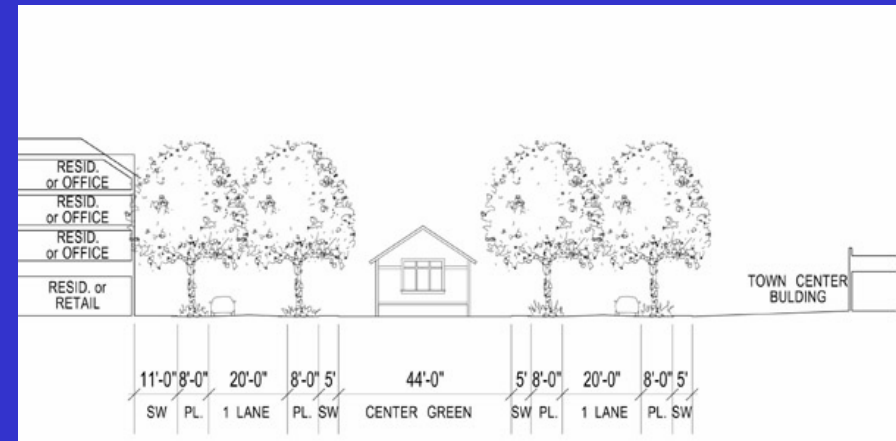
- Abandoned mall in Mizner Park, FL
- 29 acres
- 100% IC
- Value: \$26.8 million
- Redeveloped into:
  - 272 apartments
  - 103K sq ft office
  - 156K sq ft retail
  - decreased IC by 15%
- Value: \$68 million





# And in Salishan, Washington...

- Currently a public housing project with 855 units
- Redesigned as a mixed use development with 1200 units, including market rate housing, local retail, senior housing facility, daycare
- Narrower streets, some streets replaced with walkways
- Site plan will restore 65 % of the land to forest and pervious landscape
- Remaining streets bordered by rain gardens



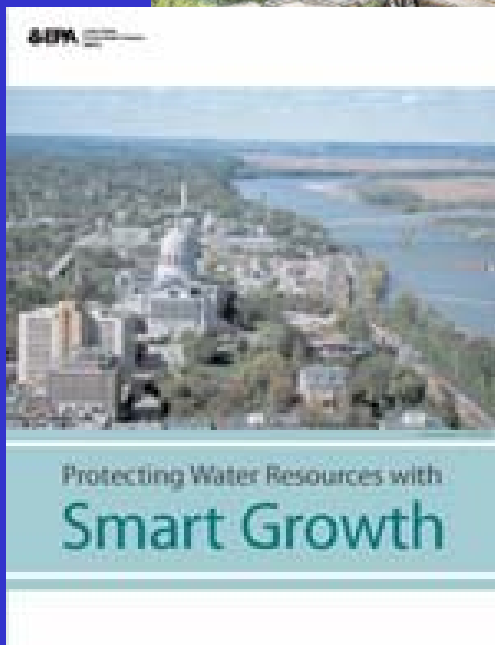
# Some successful community strategies



- **“Getting to Smart Growth”** *Volumes 1 and 2* catalogue 200 specific policies for implementing the 10 SG principles.

## Getting to Smart Growth II:

100 MORE POLICIES FOR IMPLEMENTATION



- **Protecting Water Resources with Smart Growth** catalogue 75 policies that simultaneously address growth and water quality



# Thank You

- My information

- richards.lynn@epa.gov
- 202-566-2858

- Resources

- EPA's smart growth information:  
[www.epa.gov/smartgrowth](http://www.epa.gov/smartgrowth)
- EPA OWOW's smart growth water training:  
<http://www.epa.gov/watertrain/smartgrowth/>
- Smart Growth Network: [www.smartgrowth.org](http://www.smartgrowth.org)
- International City/County Management Association (ICMA) [www.icma.org](http://www.icma.org)
- Local Government Commission [www.lgc.org](http://www.lgc.org)