



### Linking Land Use and Water Quality

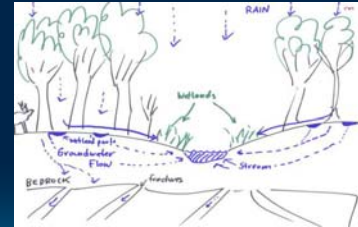
### Implementing a Comprehensive Green Infrastructure Approach

Lynn Richards

U.S. Environmental Protection Agency  
Office of Sustainable Communities

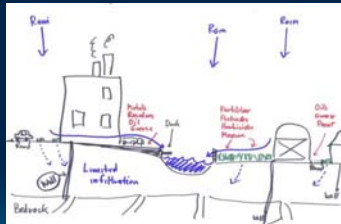
### Nature's System ...

Nature has an elegant system for taking the water from the sky, and soaking it into the ground or having trees and other plants use it.



### Interrupted

But, when we place houses, shops, office buildings, roads, parking lots and other "impervious surfaces" on the ground, the natural system is interrupted and runoff is created.



### When we go from this...



### And develop the landscape...



### We create lots of impervious surface...



And we create runoff problems



Polluting Streams and Wreaking Economic Havoc



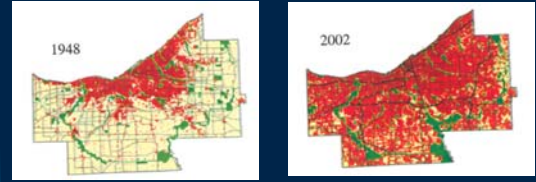
## How To Accommodate Growth & Protect Water Resources

- 100 Million More Of Us By 2043
- 70 Million New Housing Units
- Huge Increase In Impervious Cover
- Communities Leading Way With New Approaches

- Key Element of Water Resource Protection:  
**Focus on Land Development and Impervious Cover**



## Expansion with little population growth



U.S. Census 1950  
1,389,582 pop.

U.S. Census 2002  
1,393,978 pop.

Source: Cuyahoga Co Land Use Maps – Cuyahoga County, Ohio, Planning Commission

## To best protect water quality

### Preserve, Recycle, Reduce, Reuse

- **Preserve:** Protect and enhance natural features, such as undisturbed forests, meadows, wetlands, and other natural areas.
- **Recycle:** Recycle land by directing development to already degraded land, e.g., parking lots, vacant buildings, abandoned malls.
- **Reduce:** Reduce land consumption and development footprint by using land efficiently
- **Reuse:** Capture and reuse stormwater by directing it back into the into the ground through infiltration, evapotranspiration, or reuse.

## Preserve Critical Land Areas

- Preserve large, continuous areas of open space;
- Preserve sensitive ecological areas



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## Recycle land: direct development to already degraded areas



## Why Redevelopment?

- A George Washington University study (2002) found that for every brownfield acre that is redeveloped, 4.5 acres of open space are preserved.
- Baltimore, MD has completed 30 brownfields projects throughout the city, creating or retaining more than 3,000 jobs and attracting more than \$300 million in new investment
- In the late 1970s, El Dorado, AZ downtown vacancy rate was 65%. To revitalize the city, El Dorado preserved the city's historic business district to create a sense of place and improve the local economy. The pedestrian-friendly downtown has created 566 new jobs and 87 new businesses, and the town's \$20M investment generated an additional \$90M in private investment.

## Redeveloping a dead mall: Mizner Park

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



Communities can enjoy a reduction in runoff by taking advantage of vacant or underused properties.

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## Reduce land consumption:

Which is better for watershed water quality?



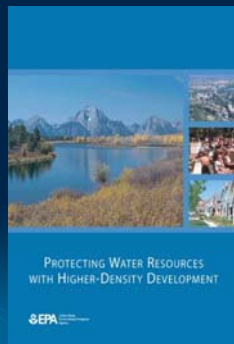
Low Density



Higher Density

## EPA Research

- Higher density can be more protective of water resources because:
  - Lower density development requires significant roads, retail, parking lots, office buildings to support it
  - Low density development can have considerably compacted soil
  - Growth is coming to a region– spreading it out doesn't make it go away, it just spreads it out



## And its just not density– its mixing land uses



Single use development consumes more land and generates more pavement



Housing like this...



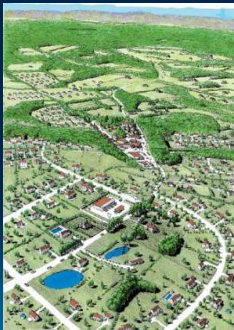
...is, by design, served by retail and roads like this

Compact development can save money  
Billions of dollars, nationally

	Water & Sewer Laterals Required	Water & Sewer Costs (billions)	Road Lane Miles Required	Road Land Miles Costs (billions)
Sprawl Growth Scenario	45,866,594	\$189.8	2,044,179	\$927.0
Compact Growth Scenario	41,245,294	\$177.2	1,855,874	\$817.3
Savings	4,621,303	\$12.6 (10.1%)	188,305	\$109.7 (6.6%)

Sprawl Costs: Economic Impacts of Unchecked Development, Robert W. Burchell, Anthony Downs, Barbara McCain and Sahar Mukherji, Island Press, 2005

...and continue to save money...



➢ NJ study shows that by 2020, a smart growth plan produces savings over the business-as-usual plan:

- Local governments cut annual fiscal deficit by nearly 40%
- **\$870 million** less in local road infrastructure costs
- **\$1.45 BILLION** less statewide in sewer and other infrastructure

The Costs and Benefits of Alternative Growth Patterns (NJ) 2000

Compact development as an economic driver

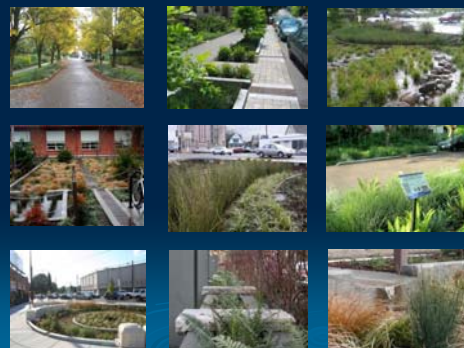
- Chelmsford, Massachusetts, found that their traditional town center generates 25 percent additional tax revenues per square foot than their conventional strip land.
- Sacramento calculated that a smart-growth infrastructure scenario would save \$9.4 billion when compared to conventional development.
  - Savings come from reduced transportation infrastructure, water infrastructure, and flood control and utilities – the equivalent of saving about \$18,000 for each housing unit or 2,500 square feet of office or commercial space
- After Lakewood, CO, a suburb of Denver, redeveloped a series of grey fields, the town saw a \$2 million increase in property taxes in 2005 – a 500% increase from 2002

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Reuse: Direct stormwater back into the ground



## Reuse: Direct stormwater back into the ground

- Use site-design strategies-- treats and stores remaining stormwater and pollutants on site—use it as a community amenity!

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

To reduce stormwater runoff, Highlands Garden Village in Colorado used smaller lot sizes and native landscaping



## What about here? Covington, KY



BEFORE: Madison Avenue and 15<sup>th</sup>



AFTER: Madison Avenue with Stormwater Swale

Drawn by: Kevin Perry

## What about here?



BEFORE: Madison Avenue and Convention Center



AFTER: Madison Avenue with Stormwater Swale

Drawn by: Kevin Perry

## What about here?



BEFORE: Residential Street



AFTER: Residential Street with Curb Extensions

Drawn by: Kevin Perry

## What about here?



BEFORE: Madison Avenue and Convention Center



AFTER: Madison Avenue with Stormwater Planters

Drawn by: Kevin Perry

## Economic Benefits

- Meeting multiple community needs
  - Calming traffic
  - Creating a safer pedestrian environment
  - Creating a more distinctive community
- Cost Savings
  - EPA study shows 15-80% cost savings on stormwater infrastructure
  - City of Portland estimates is can save \$63 million in capital costs
  - Philadelphia's triple bottom line study for CSO controls highlights the cost return of investing in green infrastructure



## Other benefits...

- Green Building
  - Green infrastructure is one way that allows smart growth approaches to include the building
- Green jobs
  - Huge potential to create new industries and jobs: designing, installing, maintaining
- Transportation
  - Retrofitting and design streets to better manage stormwater



## Comments and Questions?



## Thank You

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## It's The Impervious Cover!

- How Communities Handle Land Development Is Critical
- "Grey" Engineered Infrastructure Solutions Can Be Costly...And Ineffective
- Blending New Approaches To Address Runoff Before It's A Problem
  - Compact development + Infill
  - Smart streets
  - Efficient parking
  - Natural resource protection
  - Green infrastructure



## WHY GIVE A HOOT ABOUT STORMWATER AND WATER QUALITY?

1. Stream impairment—water supply, recreational use, fish and wildlife habitat
  - 44% of streams impaired
2. Sewer Overflows
  - 23-75,000 overflows annually
  - 3-10 billion gallons of sewage released
3. EPA Regulations—must adopt stormwater management plans to reduce contamination
  - Reduce discharge to maximum extent practicable
  - 6 required BMPs
4. Cost Savings and Economic Development



## ...And cost more to serve

### Water and Sewer Service Costs

Estimated costs of water and sewer services based on identical water consumption

Lot Size	Proximity	Annual Water and Sewer Service Costs
.25 acre	Near Service Center	\$143
1 acre	Near Service Center	\$272
1 acre	Distant from Service Center	\$388

Speir, Cameron, and Kurt Stephenson. 2002. "Does Sprawl Cost Us All? Isolating the Effects of Housing Patterns on Public Water and Sewer Costs." Journal of the American Planning Association 68(1): 56-70.

## Costs of Deteriorating Infrastructure: Leaks<sup>36</sup>

- Aging pipes result in between 6% and 25% of drinking water being lost through leaks and breaks.
- In 1995, an estimated 25.4 billion gallons of water leaked per day across the country.



Sources: Environmental Health Perspective, US Geological Survey, Kansas Water Office



## Slide 43

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**E3** This slide is a little confusing. Do leaks relate to low-density development?  
EPA, 5/11/2011