Land Use as the First BMP

Julie Tasillo
Watershed Analyst
Center for Watershed Protection

MAFSM Conference
October 25, 2007
Linthicum, MD

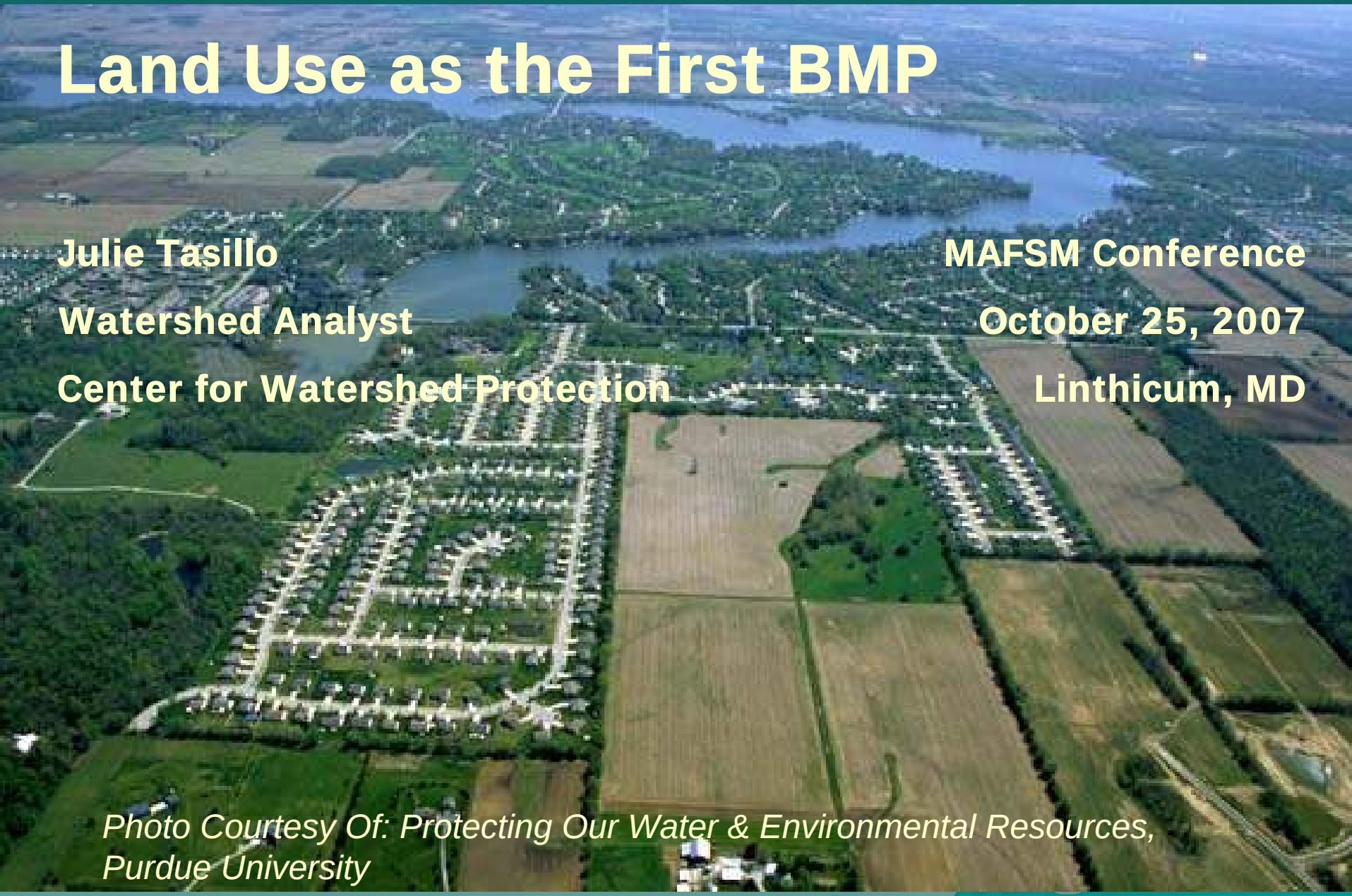


Photo Courtesy Of: Protecting Our Water & Environmental Resources, Purdue University

About the Center for Watershed Protection

- Non-profit 501(c)3, non-advocacy organization
- Work with watershed groups, local, state, and federal governments
- Provide tools communities need to protect streams, lakes, and rivers
- 17 staff in Ellicott City, MD

www.cwp.org

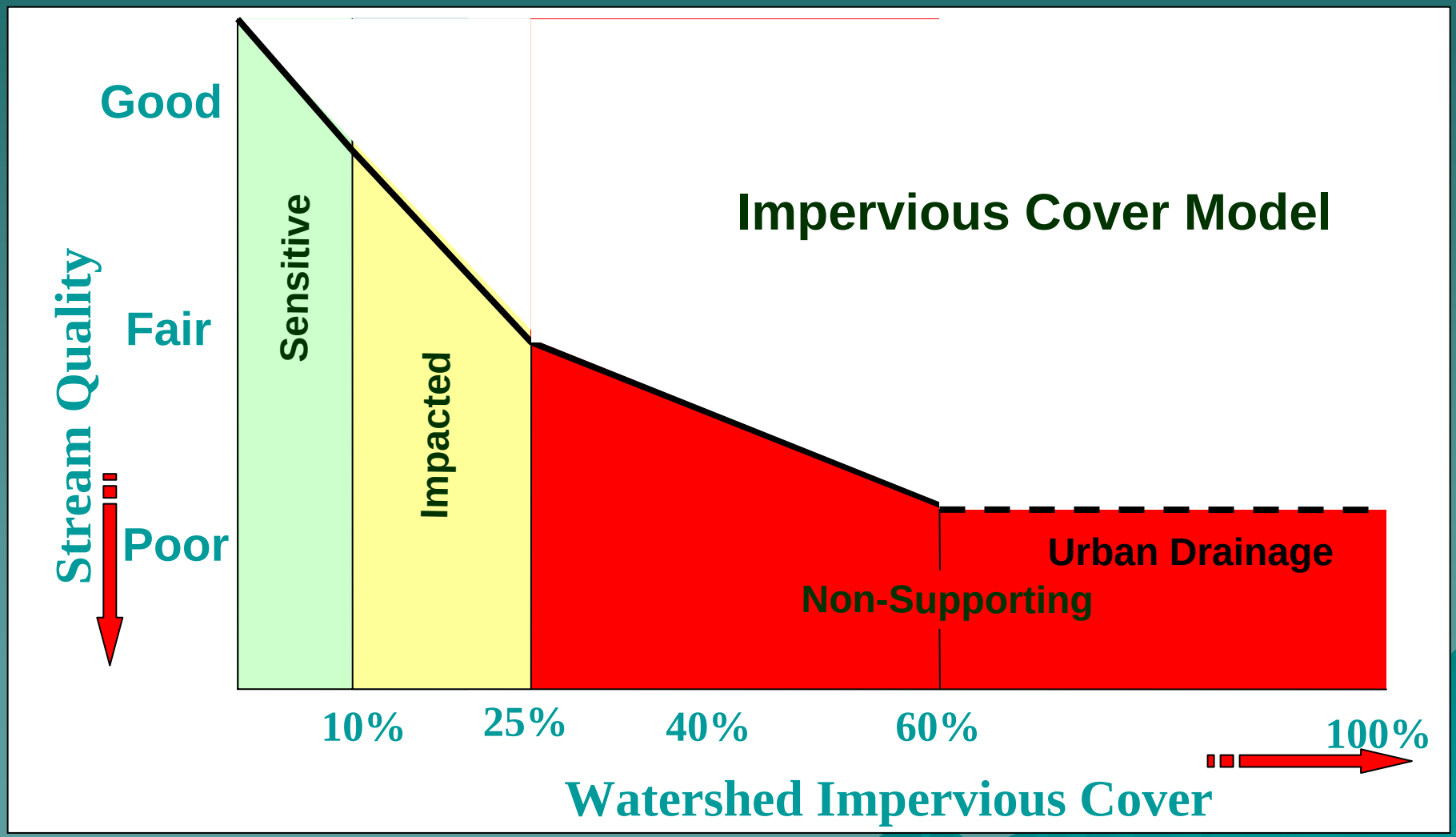
www.stormwatercenter.net

CENTER FOR WATERSHED PROTECTION

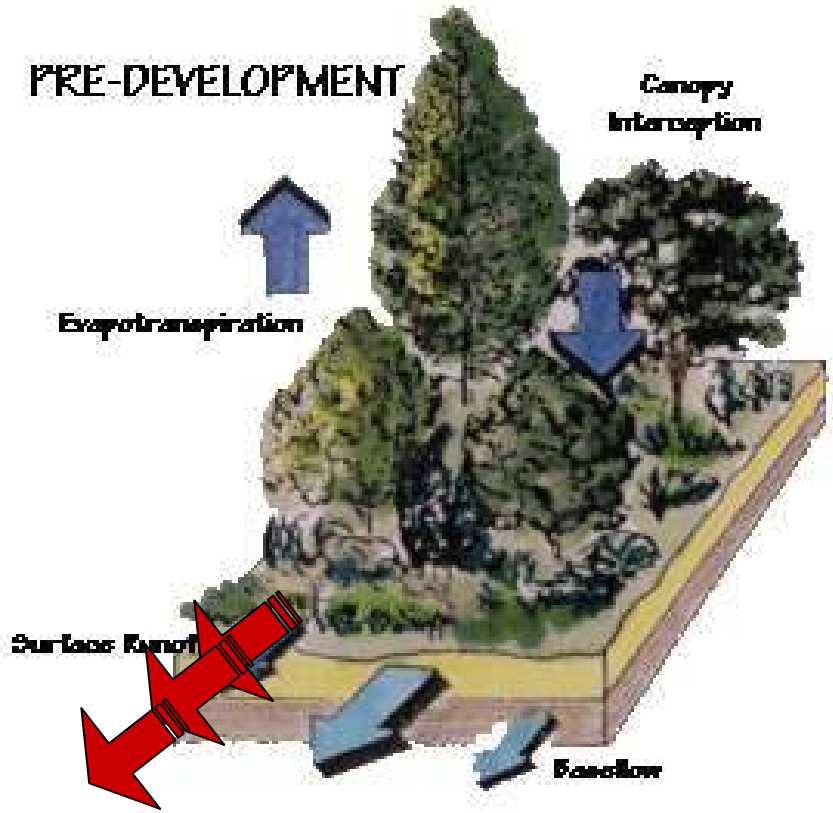
Presentation Overview

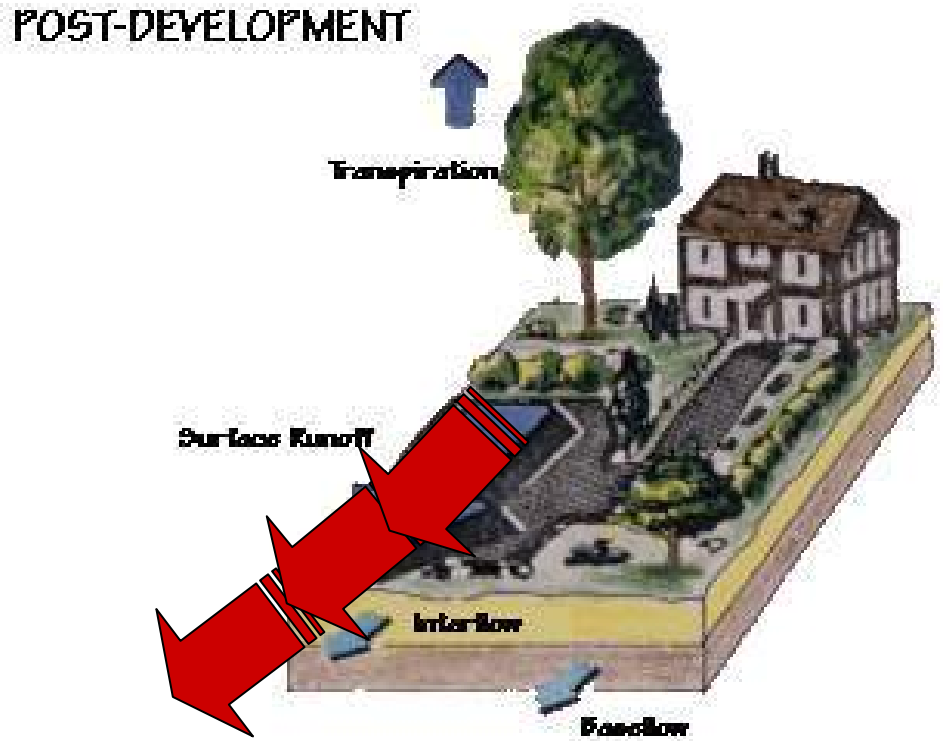
- Why Impervious Cover Matters?
- Relationship between Landuse and Impervious cover
- Drivers of Impervious cover
- Better Site Design

Relationship Between Impervious Cover & Water Quality



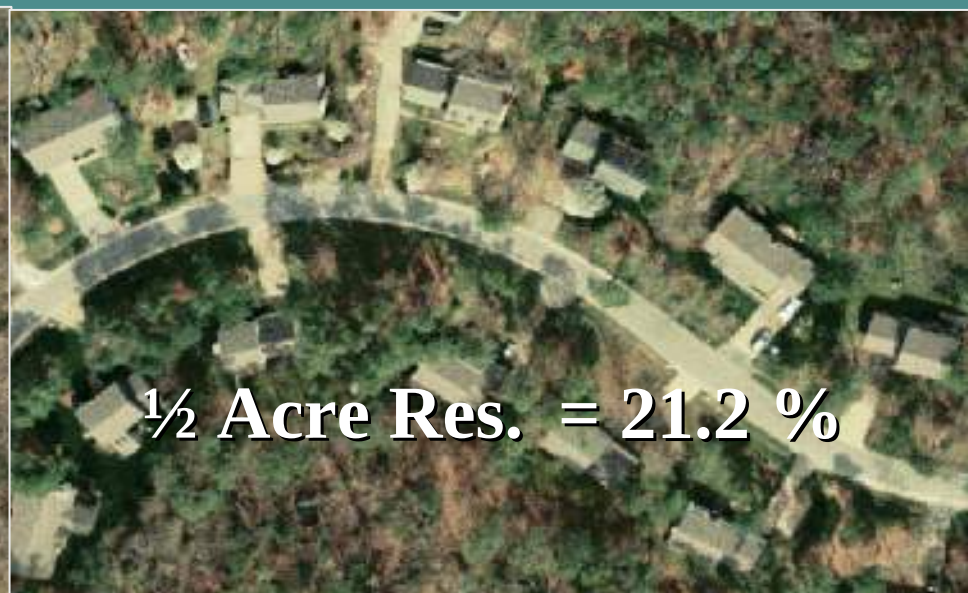
Changes in Surface Runoff



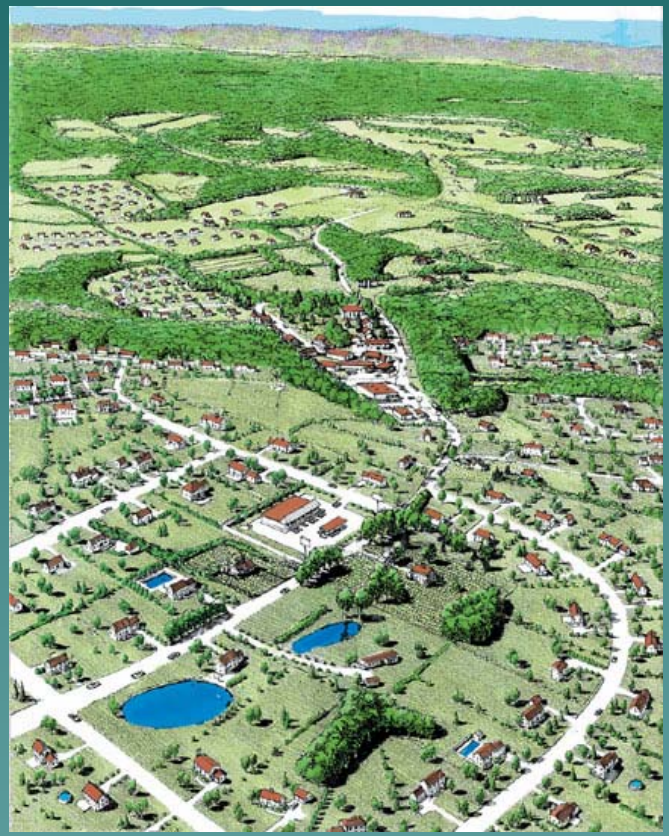


Impervious Cover Land Use Relationships

Data from 4 Suburban Counties (CWP, 2001)



Trends in Development

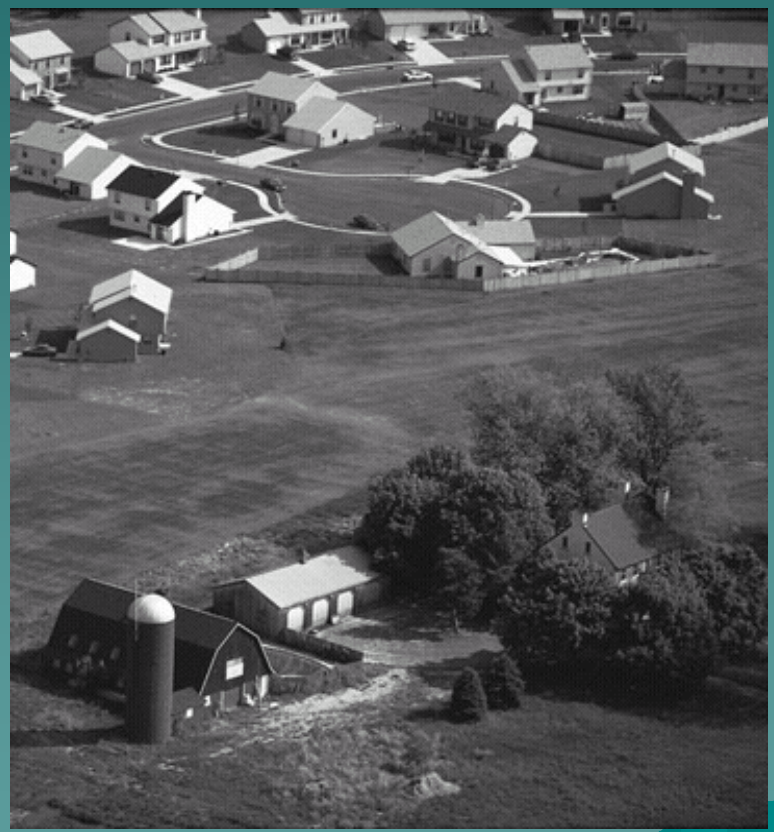


Current development trends are characterized by low-density housing, farmland conversion, and dependence on cars, which:

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

Development patterns

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



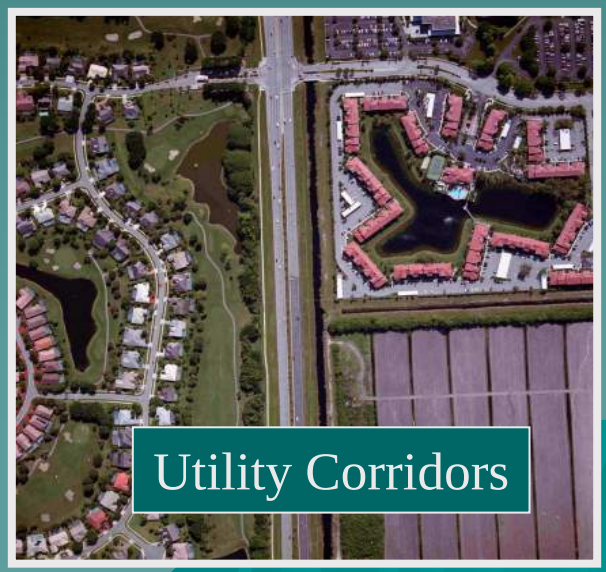
Drivers of Impervious Cover: Zoning

- Zoning Regulates
  - Separate Uses
  - Parking MINIMUMS
  - Setbacks
  - Height

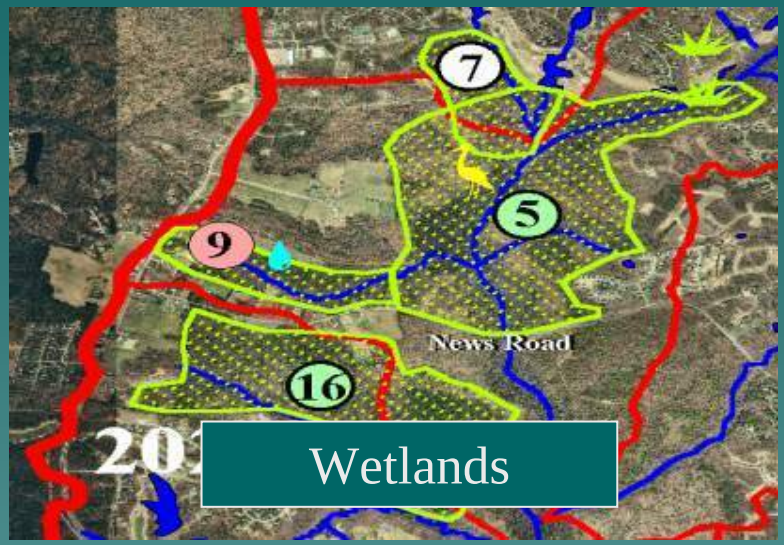
Spread-Out Development **=**

More Impervious & More Runoff

Development Should Be Targeted to Some Areas. . .



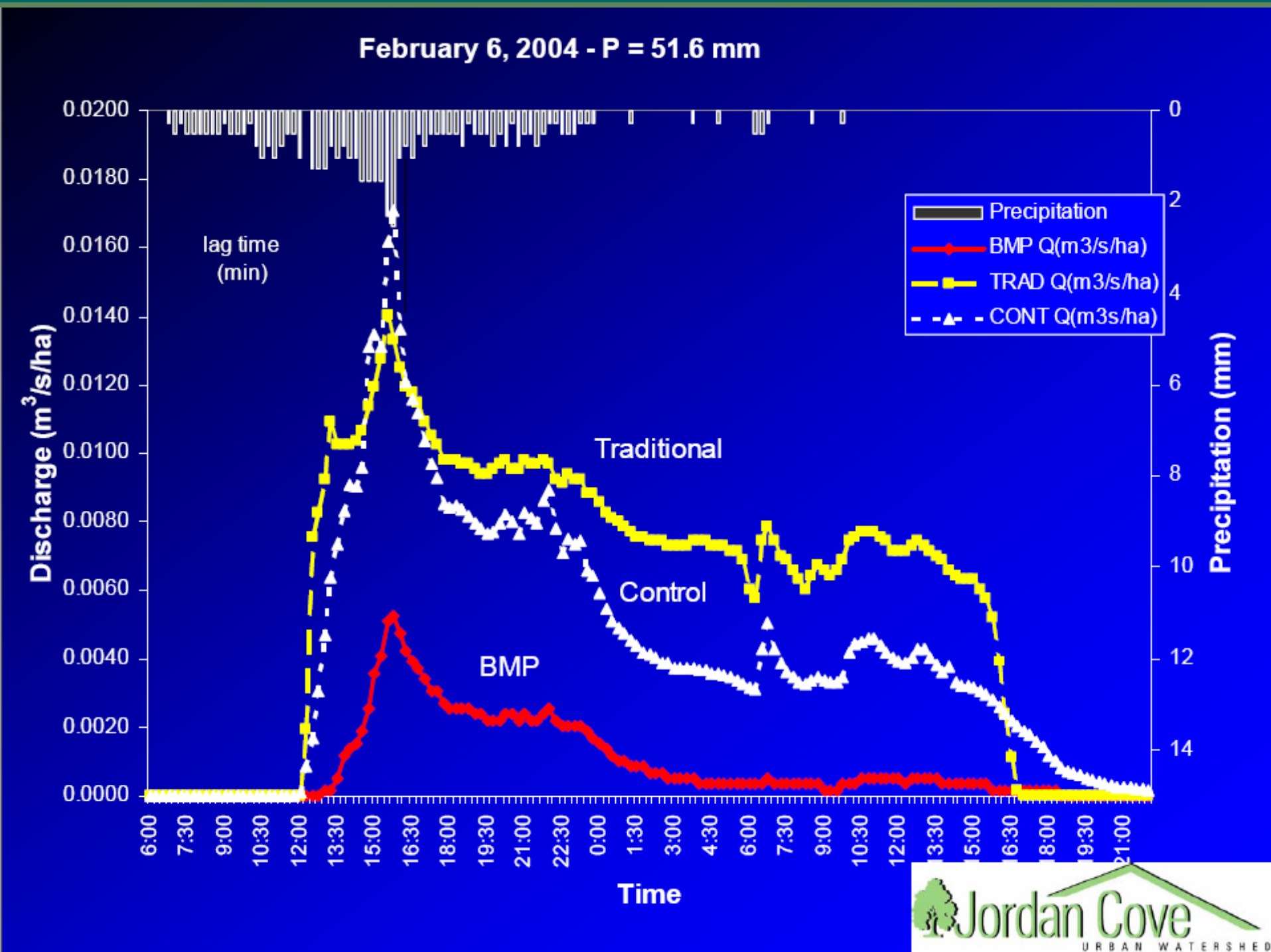
. . .And Avoided in Others




Jordan Cove, CT
Grassed Swale
Jordan Cove


Jordan Cove
URBAN WATERSHED


Bioretention cul-de-sac
Jordan Cove


February 6, 2004 - P = 51.6 mm
Discharge (m3/s/ha)
Precipitation (mm)
Time
lag time (min)
Traditional
Control
BMP
Precipitation
BMP Q(m3/s/ha)
TRAD Q(m3/s/ha)
CONT Q(m3s/ha)
0.0200
0.0180
0.0160
0.0140
0.0120
0.0100
0.0080
0.0060
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7:30
9:00
10:30
12:00
13:30
15:00
16:30
18:00
19:30
21:00
Jordan Cove
URBAN WATERSHED

More Barriers

Jordan Cove Waivers

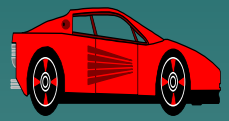
- Reduce road width
- Elimination of curb and gutter
- Alternative pavement surface
- One-way cul-de-sac
- Depressed island in cul-de-sac
- Zero lot line setback
- Shared driveways
- Reduced front setback
- Swales in ROW
- Elimination of sidewalks

What is Better Site Design?

- Approach to residential & commercial site design that seeks to:
  - Reduce the amount of impervious cover
  - Reduce the volume & rate of stormwater runoff
  - Use pervious areas for more effective stormwater treatment
  - Increase the natural lands set aside for conservation
  - Achieve a marketable, cost-effective product

22 Model Development Principles

Four Categories of Development:

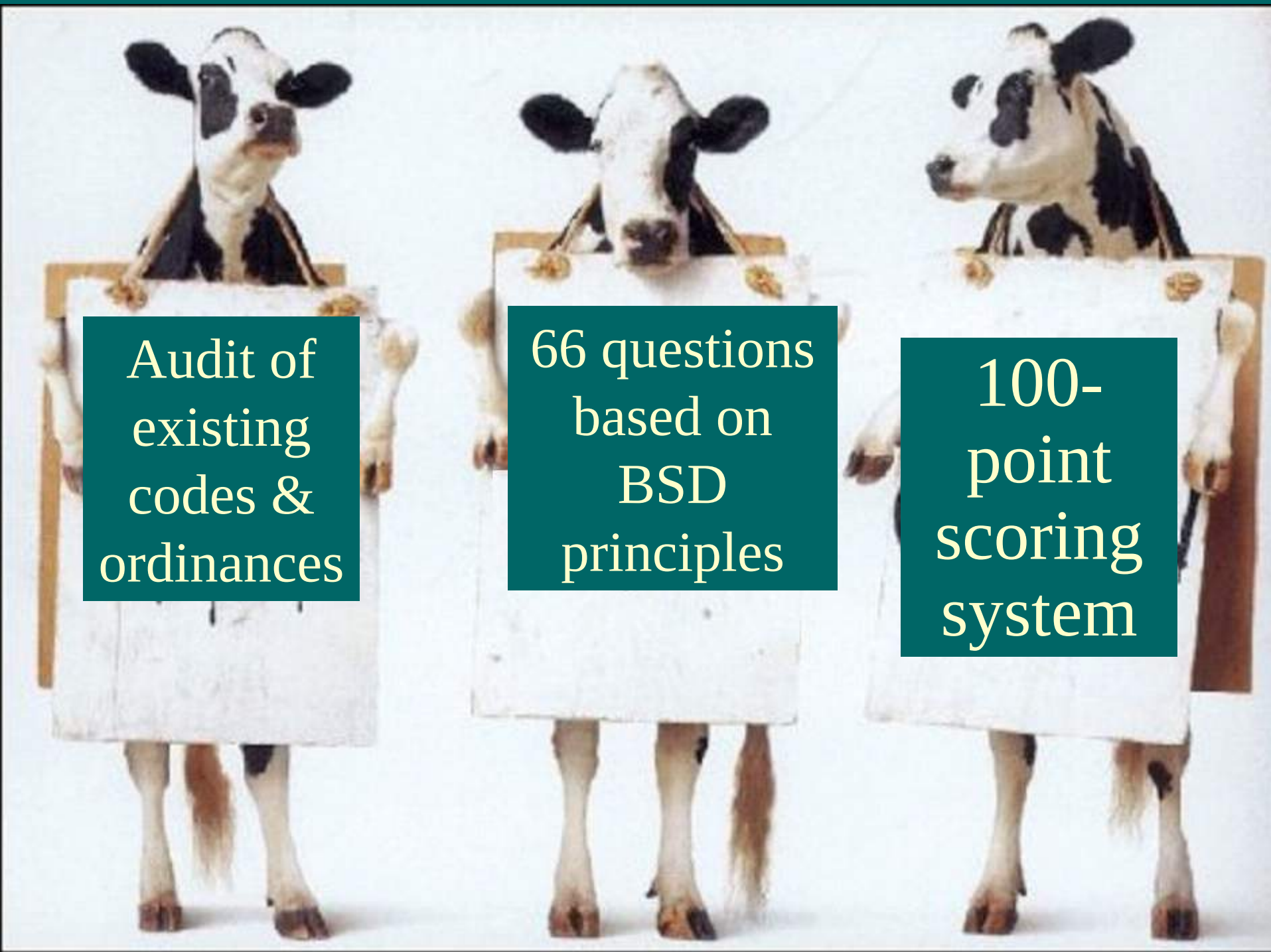


Residential Streets & Parking Lots

Lot Development

Conservation of Natural Areas

Stormwater Management


Audit of existing codes & ordinances
66 questions based on BSD principles
100-point scoring system

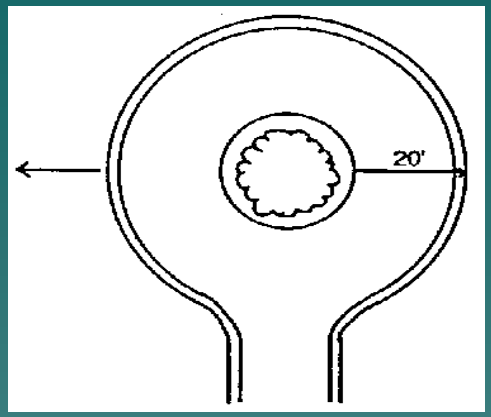
Street Width

Driveways

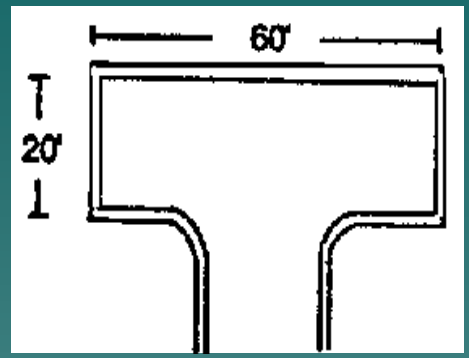
Utilize Pervious Materials

Cul-de-Sac Radius and Alternatives

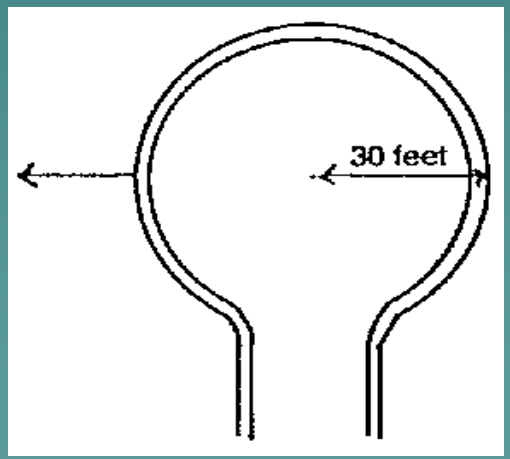
Alternative Turnaround Options



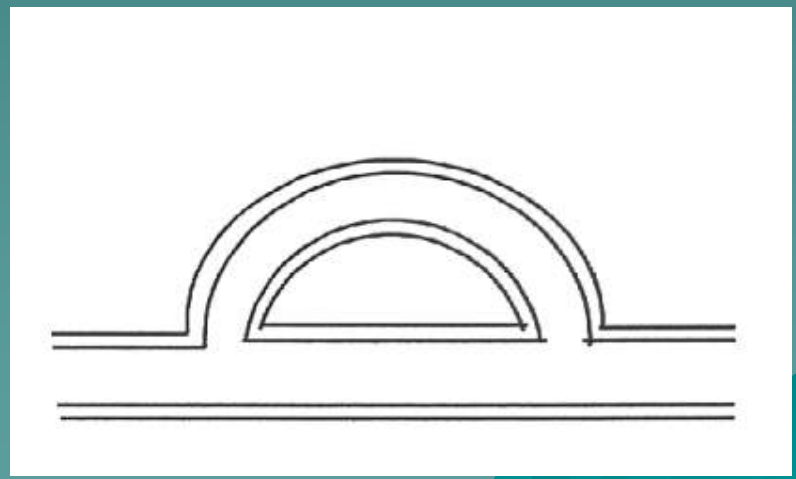
40 FT CUL-DE-SAC W/ ISLAND



T-SHAPED TURNAROUND



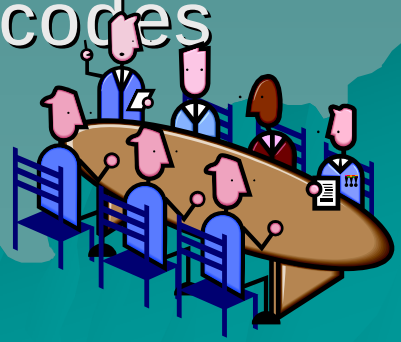
30 FT RADIUS CUL-DE-SAC



LOOP ROAD

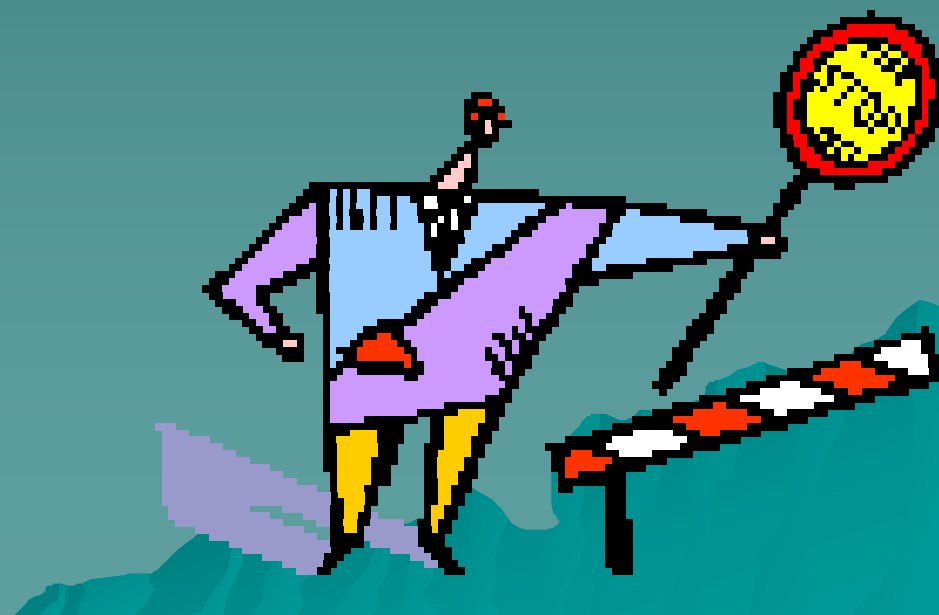
The COW is the Beginning -Site Planning Roundtable-

- Group of “stakeholders” representing development, government, civic, environmental, and the business community:
  - Identify codes & ordinances that act to prohibit or impede better site design
  - Devise a set of recommendations for the jurisdiction to reform or update codes



Common Barriers

- Change is Bad
- Misperceptions
  - Costs
  - Safety concerns
  - Mosquitoes
  - Marketability
- Maintenance
- Property Rights
- Liability
- Mindsets



Lessons Learned

- Political Climate should be right
- Must have a Local Advocate to help drive the process & see through to implementation
- Give people many opportunities for Input/Output
- Understand Limitations of the process
- Neutral Party should facilitate process
- Use Local Examples

Resources

Better Site Design

http://www.cwp.org/builders_for_bay.htm

Jordan Cove

http://www.cag.uconn.edu/nrme/jordancove/

Smart Growth

http://www.epa.gov/smartgrowth/

Questions?

Cul-de-Sac Radius and Alternatives

Land Use Planner

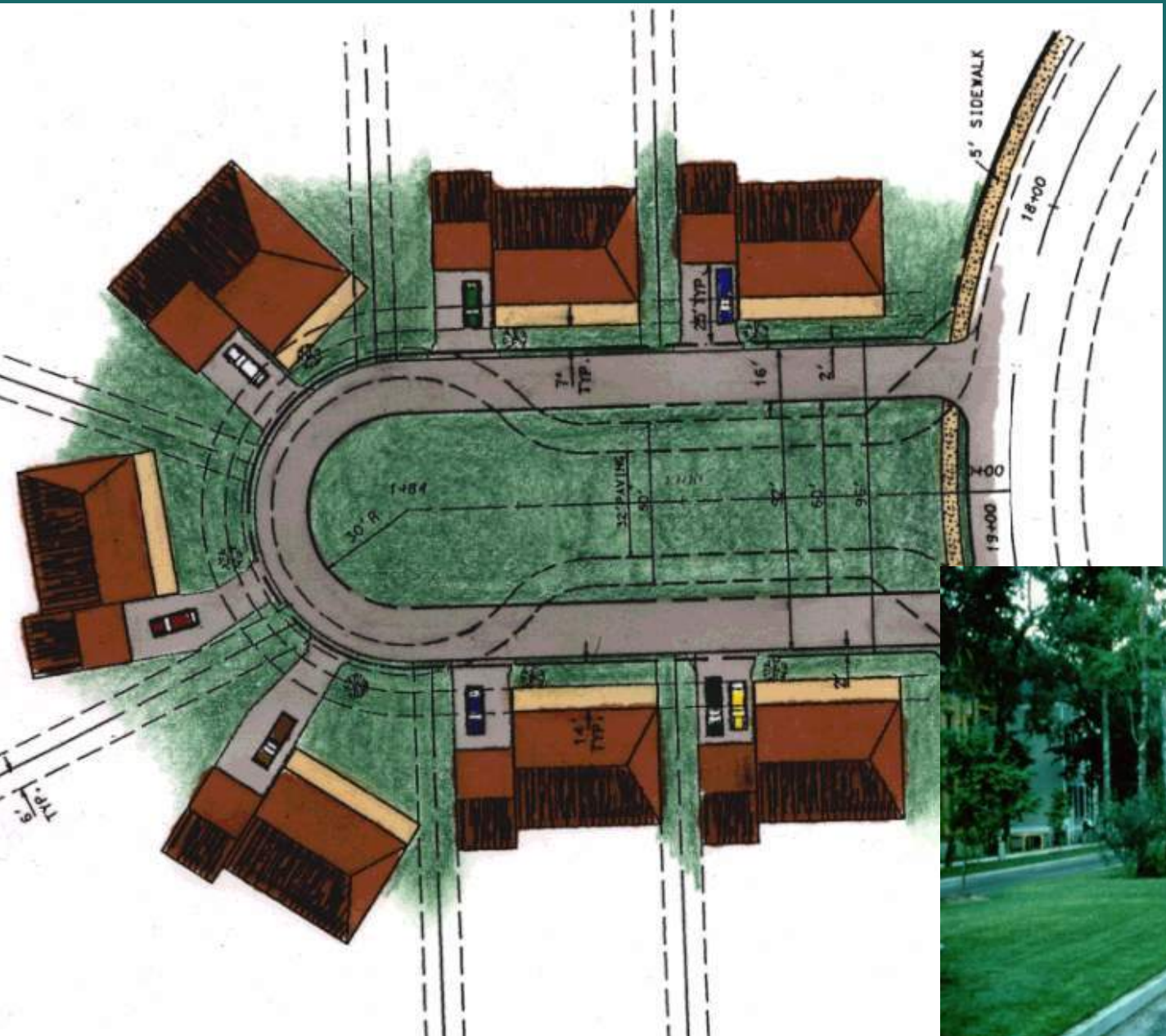
Construction

Battle Impervious Surfaces!

Use Better Site Design Principles!

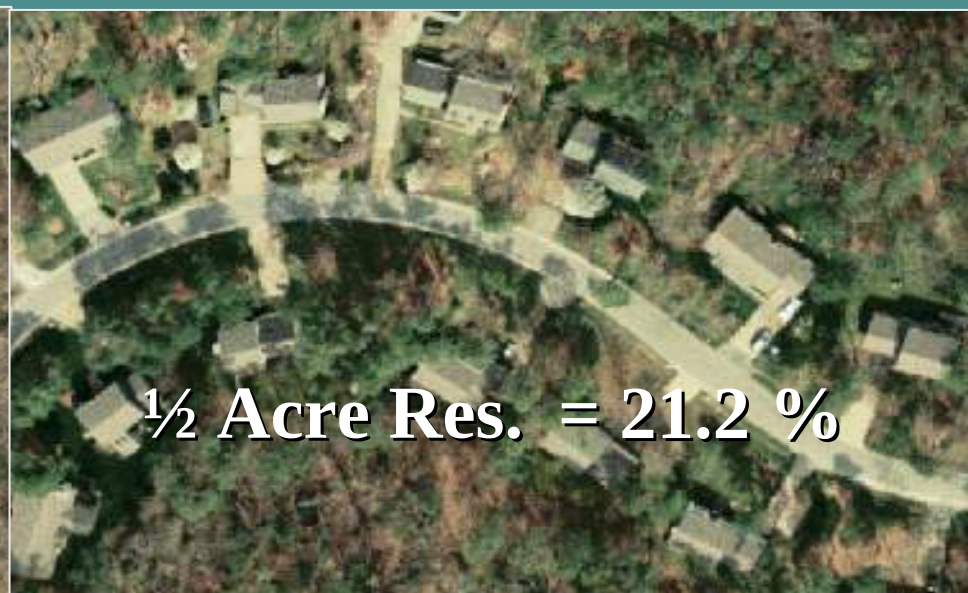
Tame Irate Citizens!

Alternative Cul-de-sac - Loop Road



Impervious Cover Land Use Relationships

Data from 4 Suburban Counties (CWP, 2001)

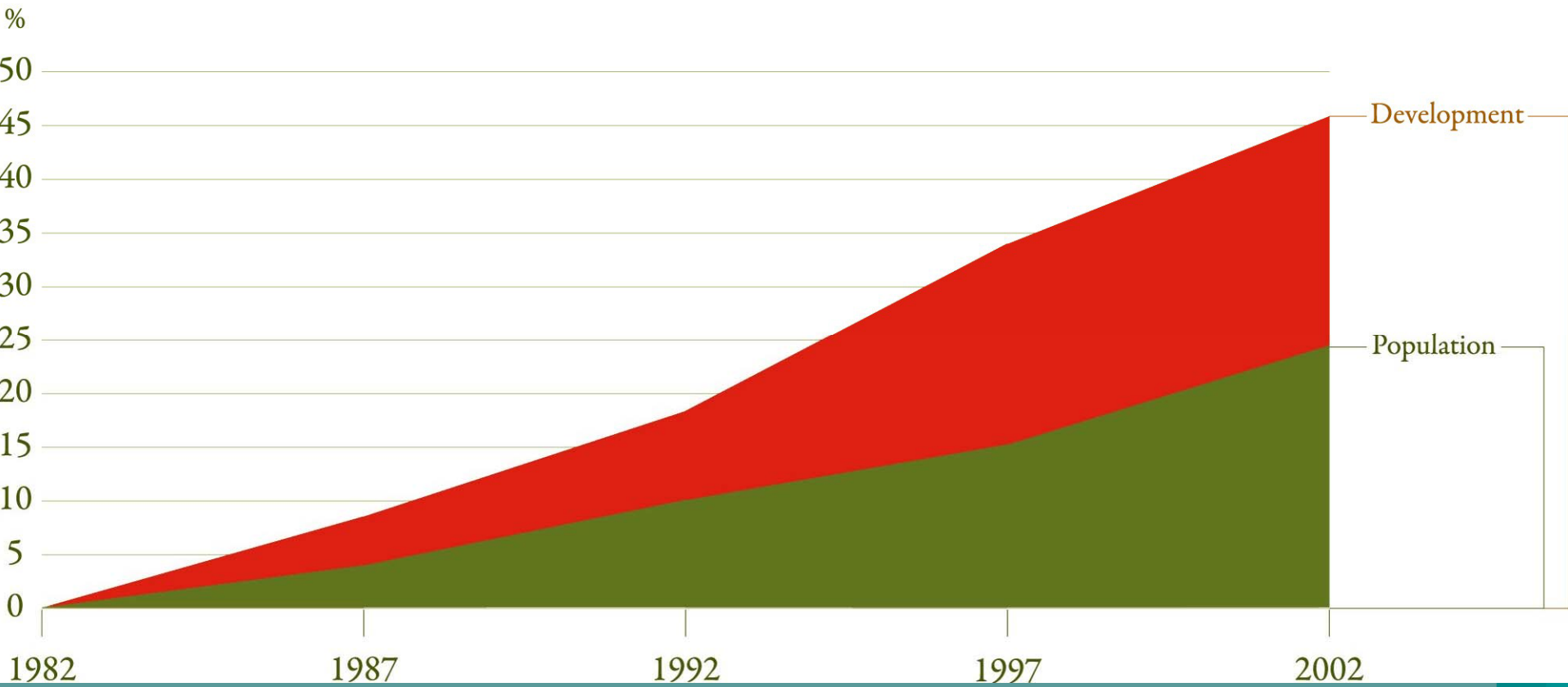


Low Variability within Zoning Category

Light Industrial = 53.4 %

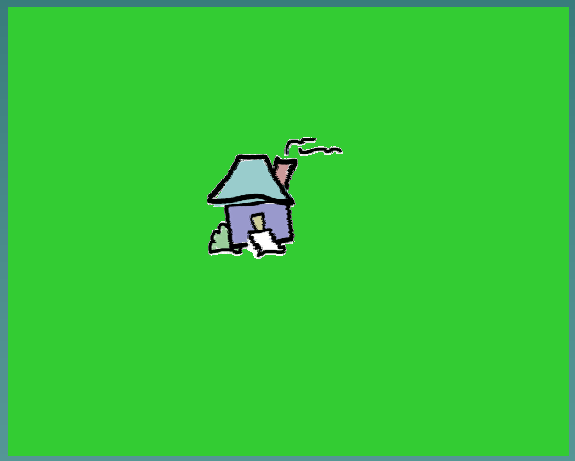
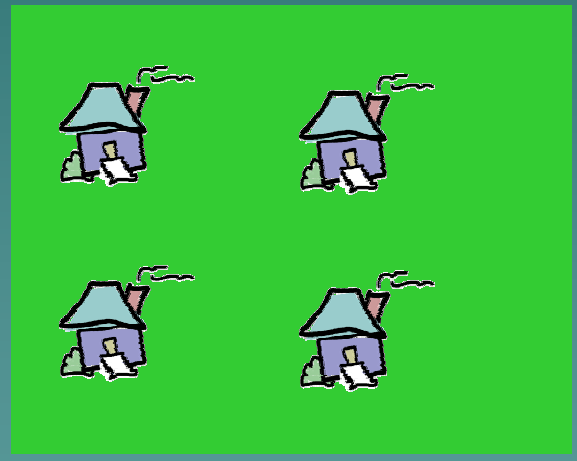
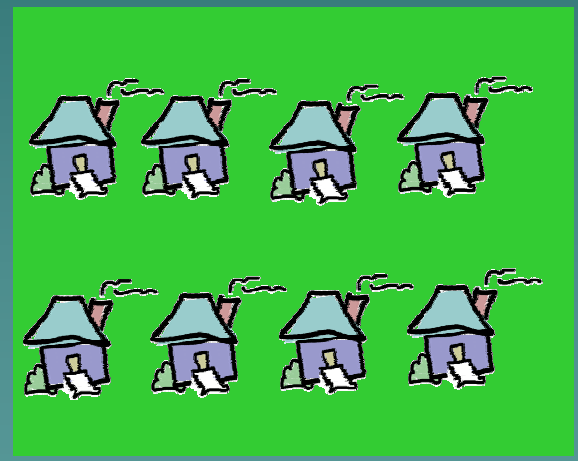
Commercial = 72.2 %

Land Development and Population Growth in the US, 1982-2002



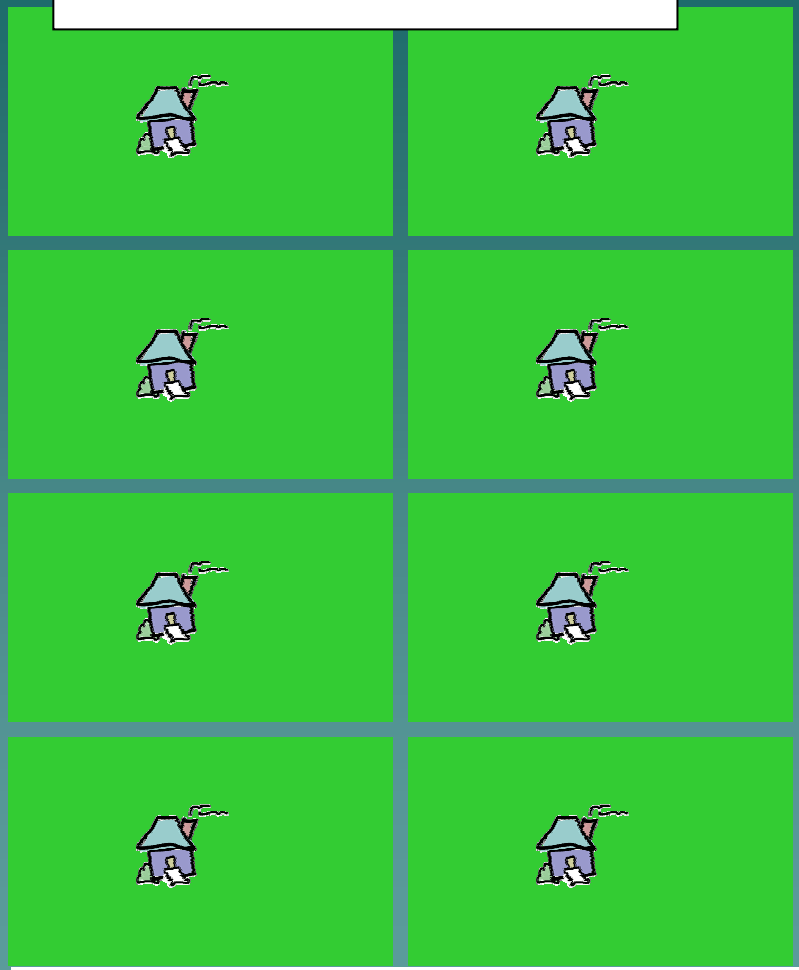
It's how and where we are growing that are driving our significantly increasing rate of land consumption, not domestic population growth.

EPA Research on Smart Growth & Water

Scenario A: ***1 unit/acre***	***Scenario B:*** ***4 units/acre***	***Scenario C:*** ***8 units/acre***
		
Impervious cover = 20% Runoff/acre = 18,700 ft^3/yr Runoff/unit = 18,700 ft^3/yr	Impervious cover = 38% Runoff/acre = 24,800 ft^3/yr Runoff/unit = 6,200 ft^3/yr	Impervious cover = 65% Runoff/acre = 39,600 ft^3/yr Runoff/unit = 4,950 ft^3/yr

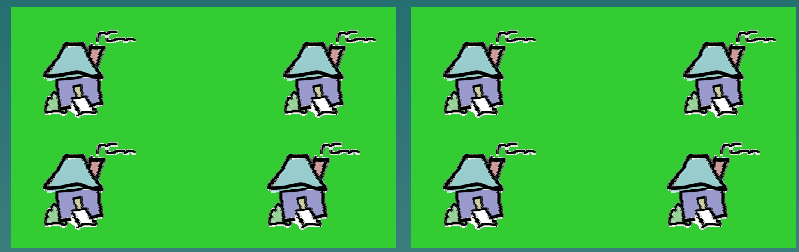
Accommodating the same number of houses (8) at varying densities

Scenario A: 1 unit/acre



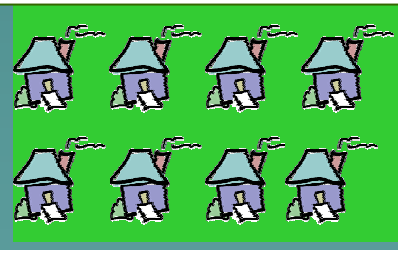
Impervious cover = 20%
Total runoff = 149,600 ft³/yr
Runoff/house = 18,700 ft³/yr

Scenario B: 4 units/acre



Impervious cover = 38%
Total runoff = 49,600 ft³/yr
Runoff/house = 6,200 ft³/yr

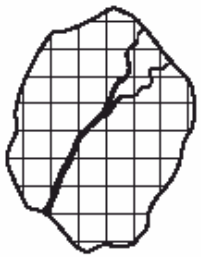
Scenario C: 8 units/acre



Impervious cover = 65%
Total runoff = 39,600 ft³/yr
Runoff/house = 4,950 ft³/yr

And at the watershed level…

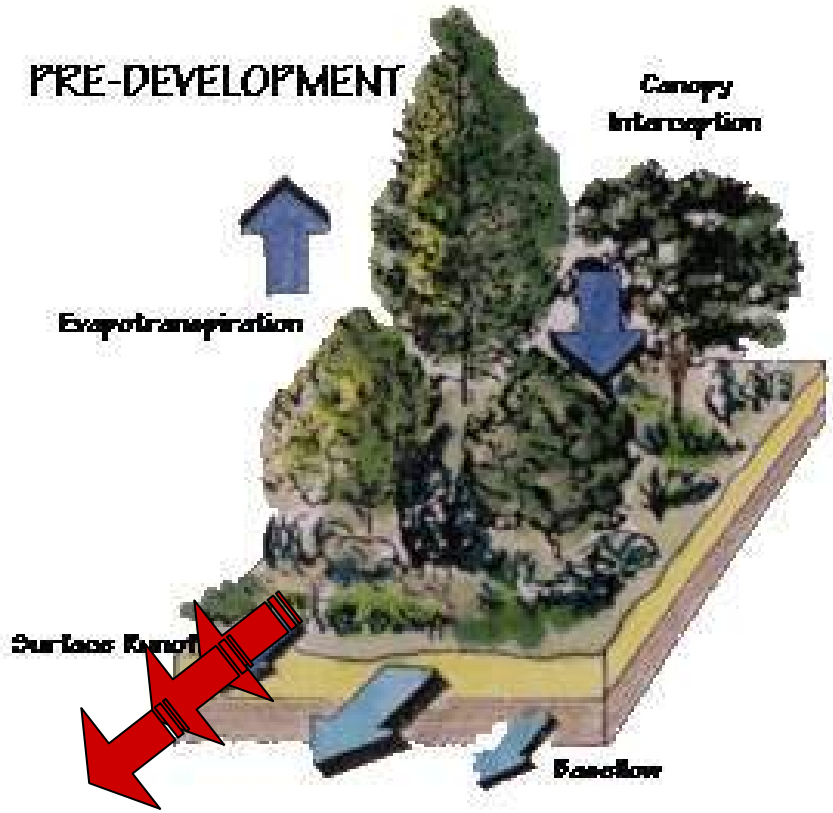
Accommodating 10,000 units on a 10,000 acre watershed at different densities

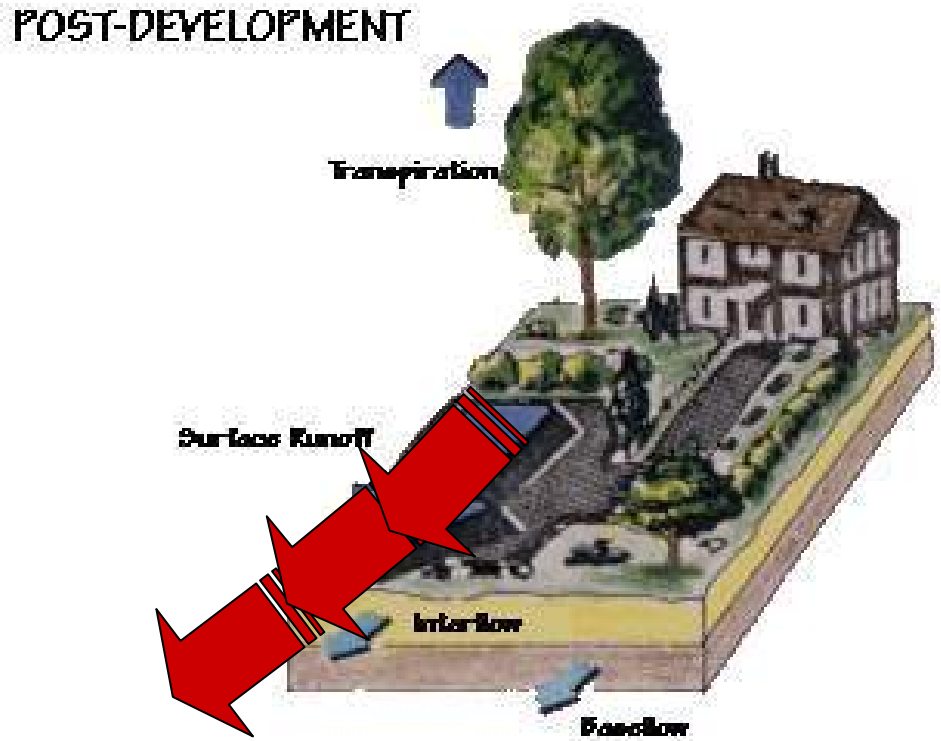
Scenario A	Scenario B	Scenario C
		
10,000 houses built on 10,000 acres produce:	10,000 houses built on 2,500 acres produce:	10,000 houses built on 1,250 acres produce:
10,000 acres x 1 house x 18,700 ft^3/yr of runoff =	2,500 acres x 4 houses x 6,200 ft^3/yr of runoff =	1,250 acres x 8 houses x 4,950 ft^3/yr of runoff =
187 million ft^3/yr of stormwater runoff	**62 million ft^3/yr of stormwater runoff**	**49.5 million ft^3/yr of stormwater runoff**
Site: 20% impervious cover	**Site: 38% impervious cover**	**Site: 65% impervious cover**
Watershed: 20% impervious cover	**Watershed: 9.5% impervious cover**	**Watershed: 8.1% impervious cover**

The lower density scenario creates more runoff and consumes 2/3 more land than the higher density scenario.

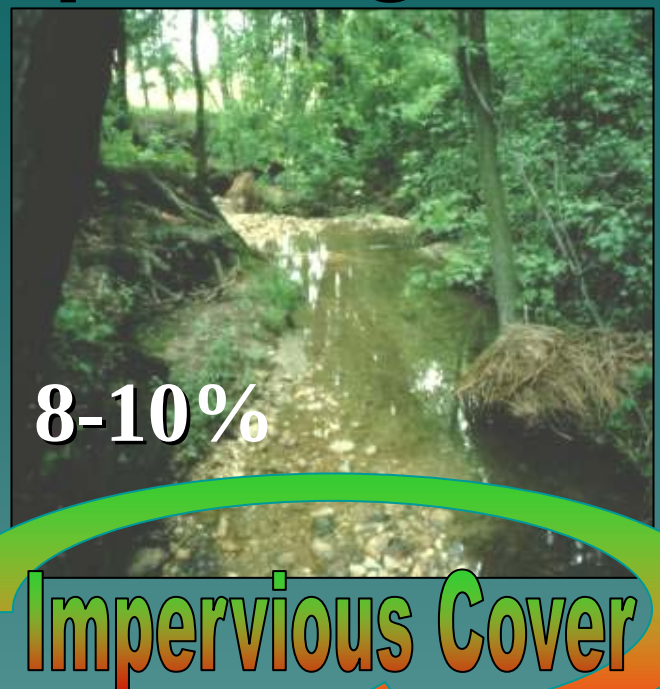
Watershed Scale – Smart Growth

Changes in Surface Runoff

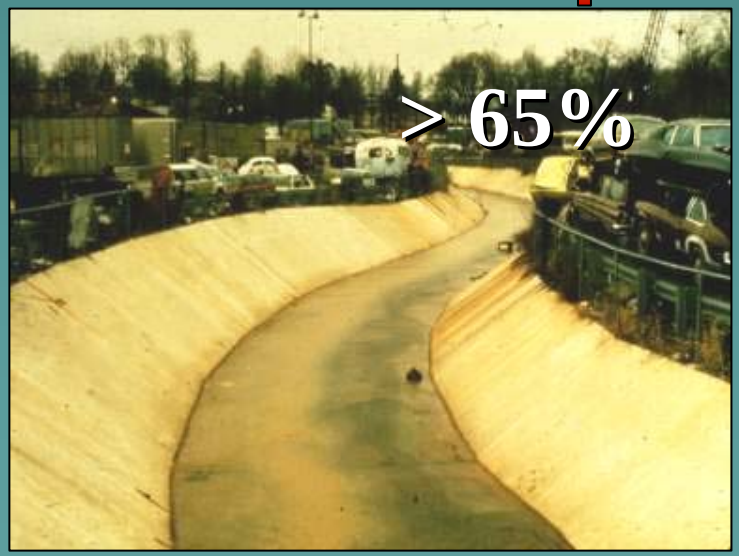




Geomorphological Impacts



Impervious Cover



What's In A Name?

~~Better Site Design?~~
~~Low Impact Development?~~
~~Conservation Design?~~

Green Infrastructure!!!!!
Damn it!

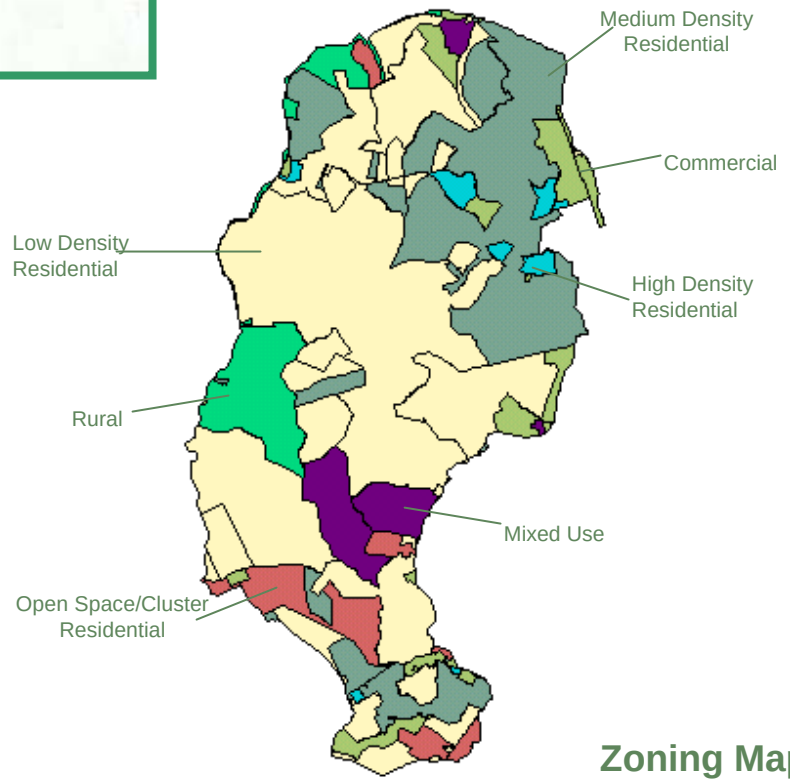
D[illegible]e

conserve natural areas and reduce **stormwater runoff** in comparison to traditional development.

Site Plan

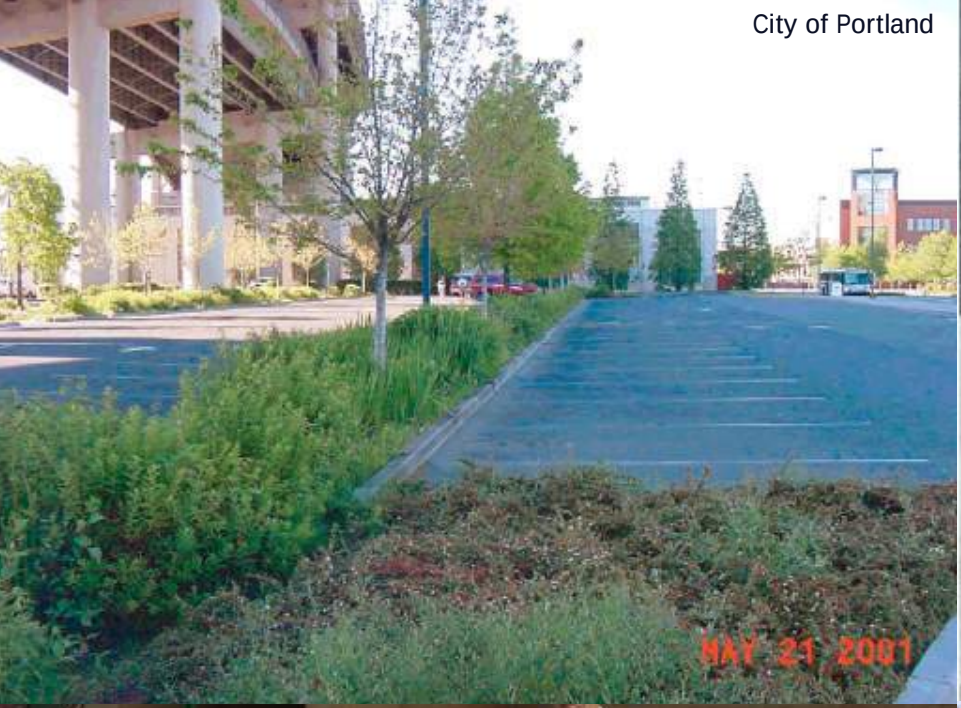
Better Site Design principles address **how** development occurs

Better Site Design principles do not address **where** development occurs



Zoning Map

Parking Lot Imperviousness


City of Portland
MAY 21 2001


Source: City of Portland, OR


OYOTA
ACK TAYLOR'S
ALEXANDRI

Natural Areas Conservation

Open Space Design

Case Study
Chapel Run
Conventional Development

Total size of site: 96 acres
Total number of lots: 142
Average size of lots: 1/2 acre
Percent undisturbed: 0%
Percent impervious: 29%

Delaware Dept. of Natural Resources and Environmental Control

Environmental Management Center
Brandywine Conservancy

Case Study
Chapel Run
Conservation Design
Parkway Alternative

Total size of site: 96 acres
Total number of lots: 142
Average size of lots: 1/4 acre
Percent undisturbed: 59.6%
Percent impervious: 14.9%

Delaware Dept. of Natural Resources and Environmental Control
Environmental Management Center
Brandywine Conservancy

Cost Comparison: Chapel Run

- Conventional Development $2,460,200
- Conservation Design-Parkway $888,735

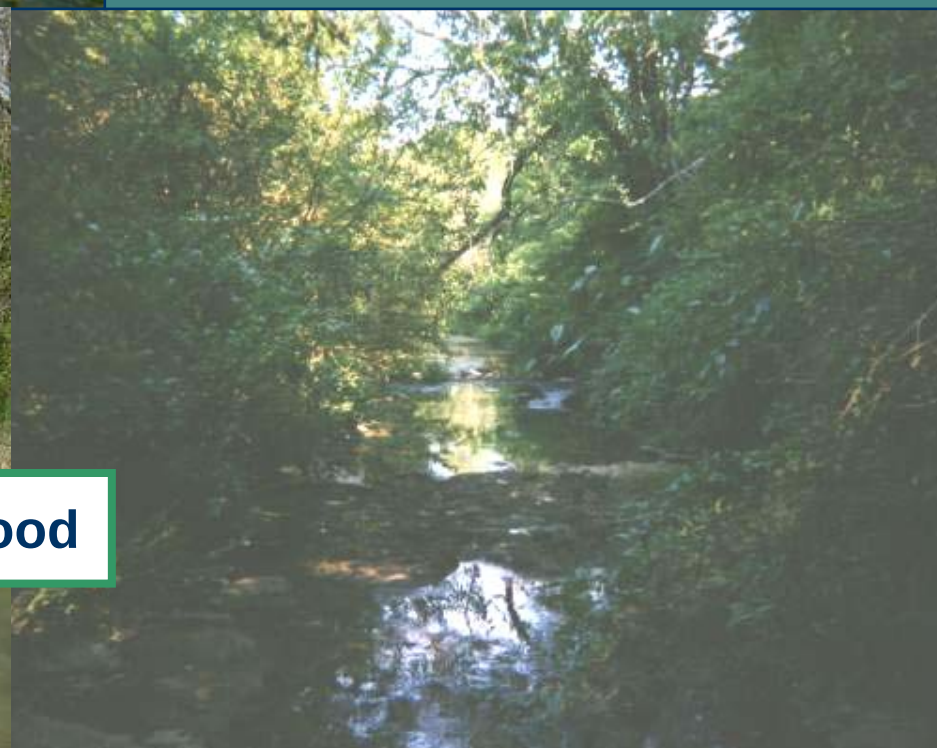
Changing Cost Perceptions: Conservation Development

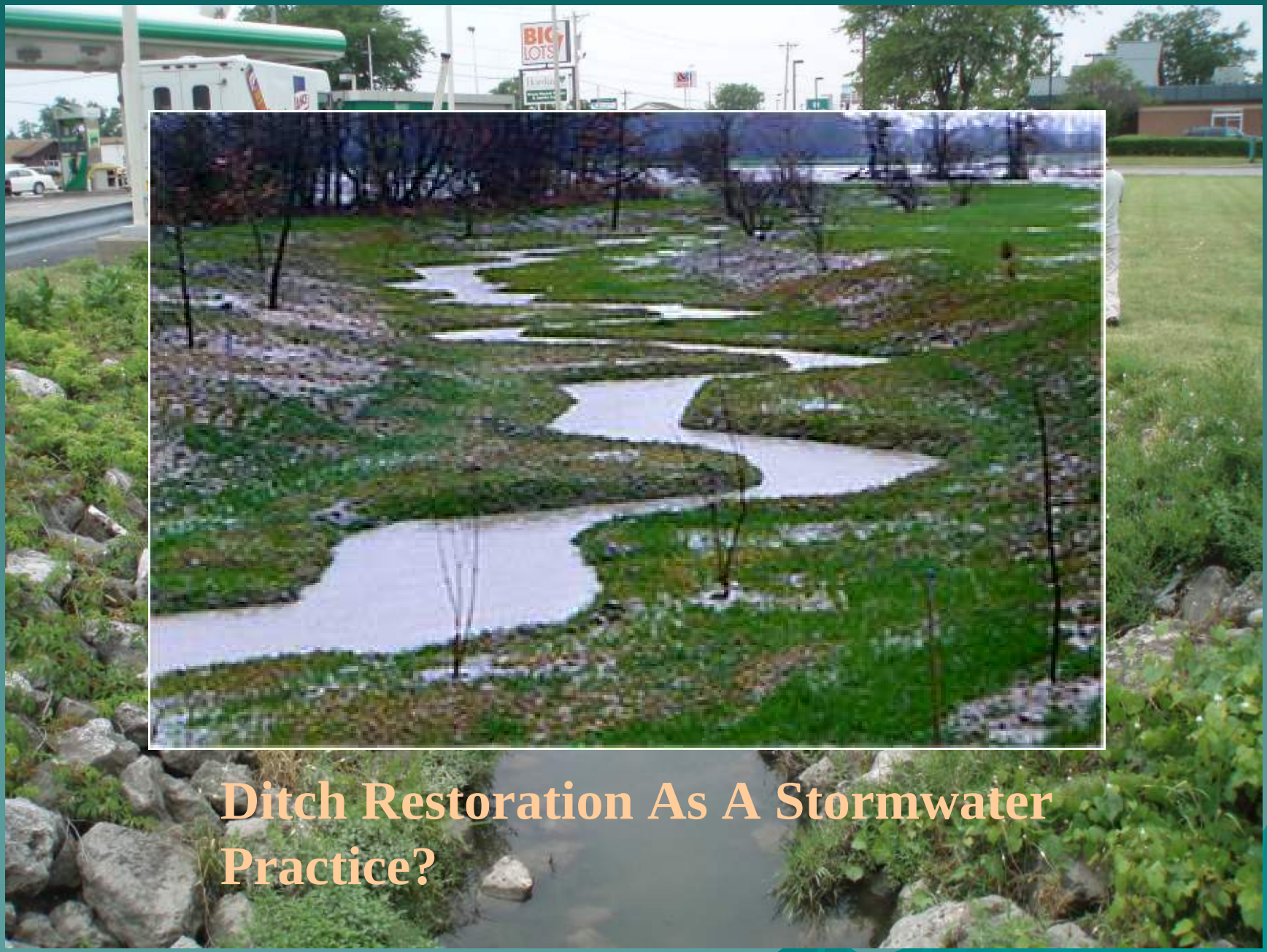
- BSD cost savings are from
  - Reduced grading during site preparation,
  - Stormwater management savings,
  - Reduced site paving
- 2 BSD techniques that most influence cost are:
  - Clustered site design
  - Naturalized stormwater management systems

Stream/Ditch Buffers

Not So Good

Good





Ditch Restoration As A Stormwater Practice?

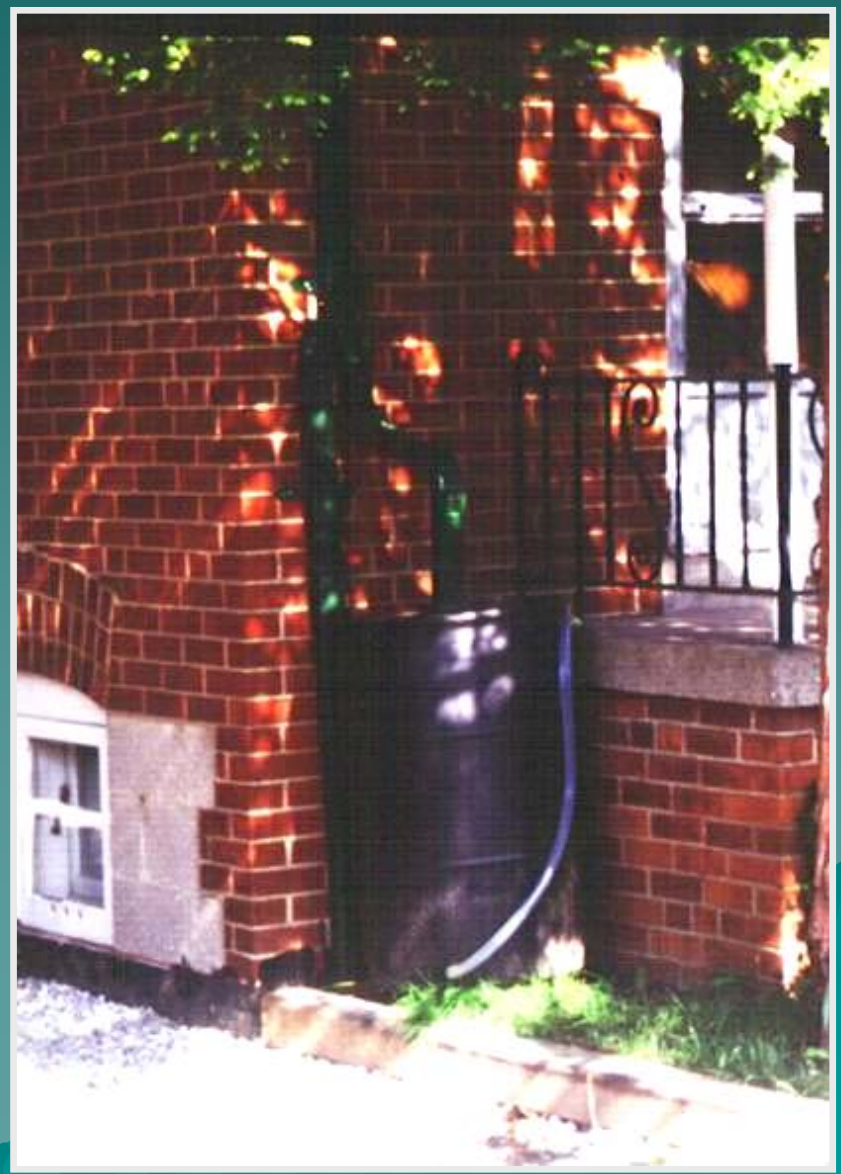
Clearing and Grading

Stormwater Treatment

Vegetated Open Channels

Parking Lot Runoff

Rooftop Runoff

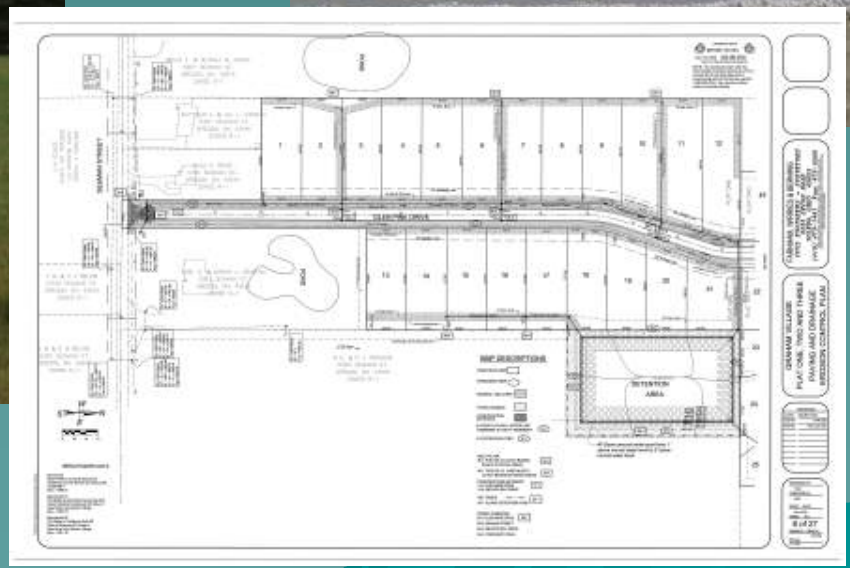


Rooftop Runoff

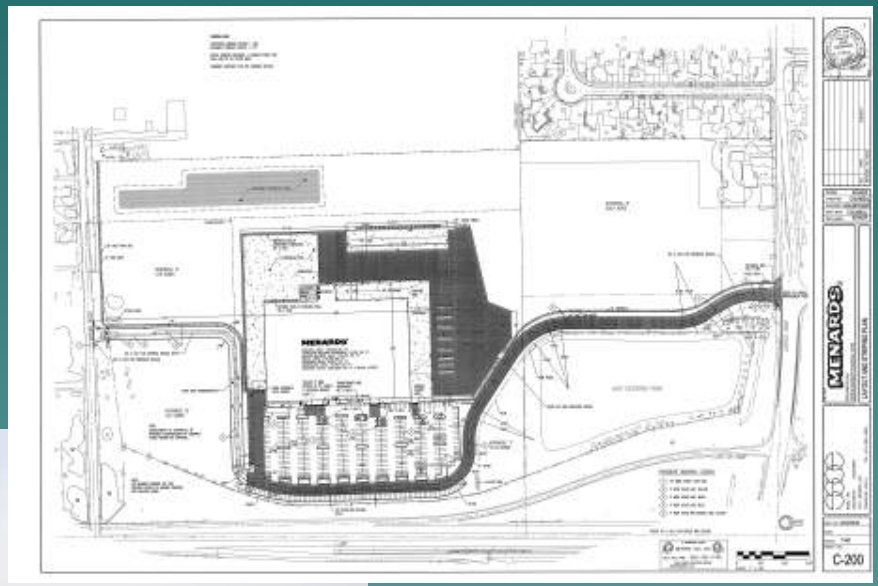
Rain Gardens & Rain Barrels

Parking Lot Ratio

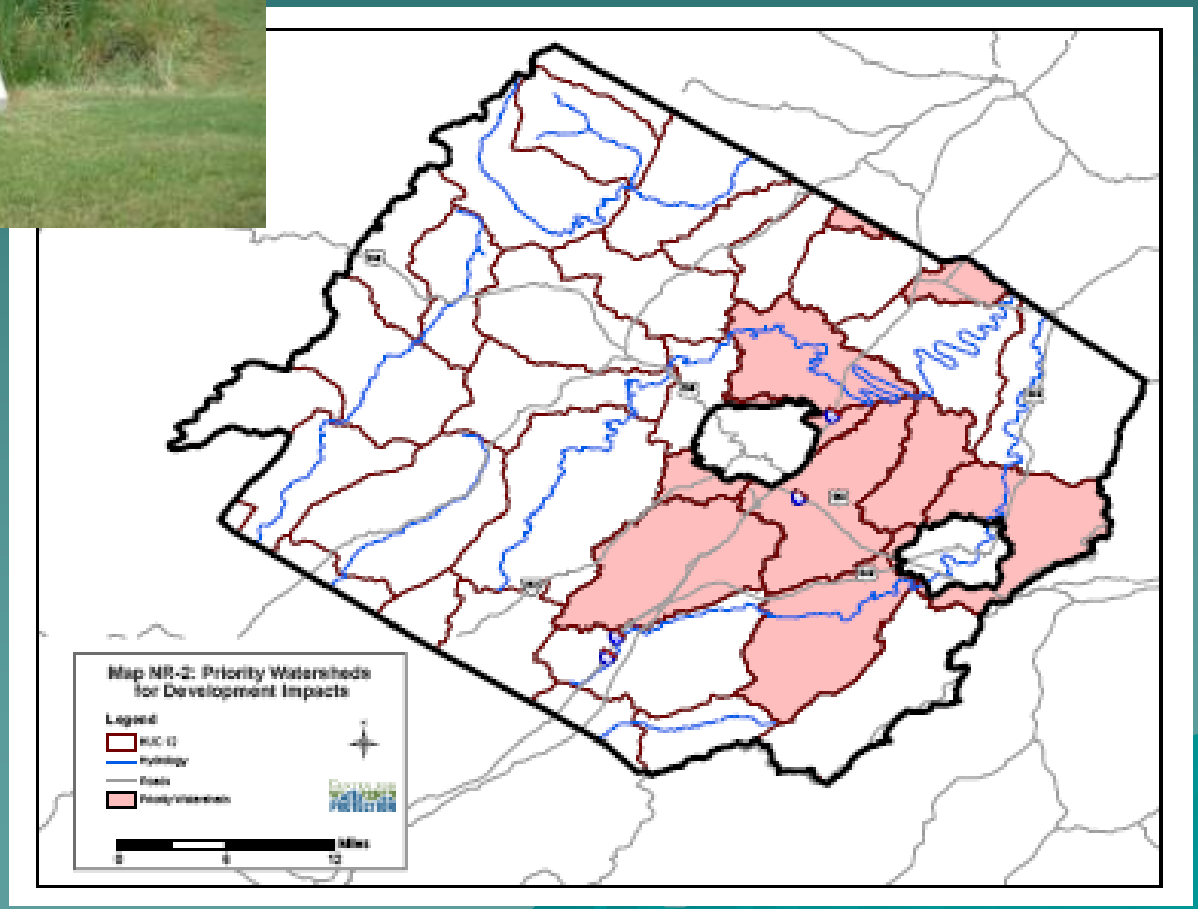
Site 1: Residential Graham Village



Site 2: Menards



Why Should Stormwater Managers Care. . .



. . .What the Comprehensive Plan says?

Land Use As the First BMP!

GOAL: Comprehensive Plan & Stormwater Program Should Send the Same Signal

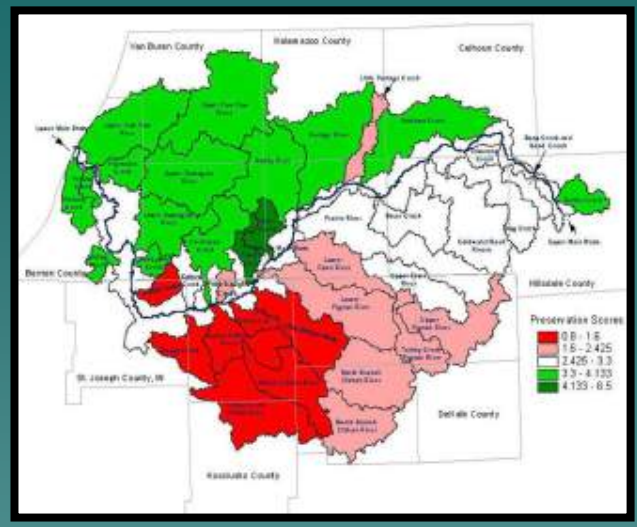
Linking Stormwater & Land Use

- Work With Land Use Planners
  - Comprehensive Plans
- Evaluate Existing Codes
  - Zoning
  - Subdivision
  - Utility
- Use Watersheds for Integrated Planning
- Smart Growth Resources at www.epa.gov/smartgrowth

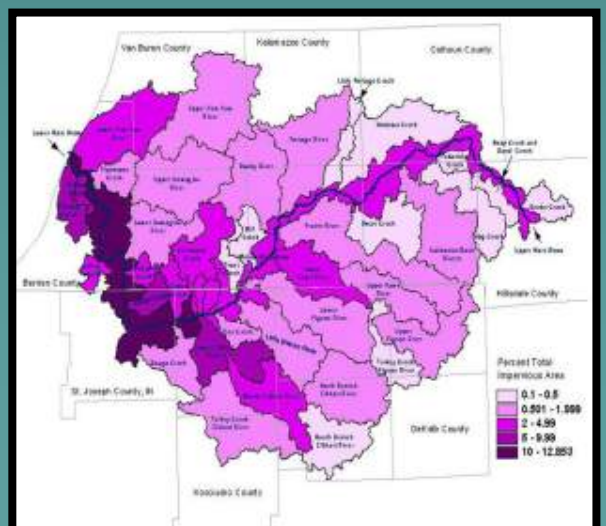
Watersheds As Organizing Units

Subwatershed map

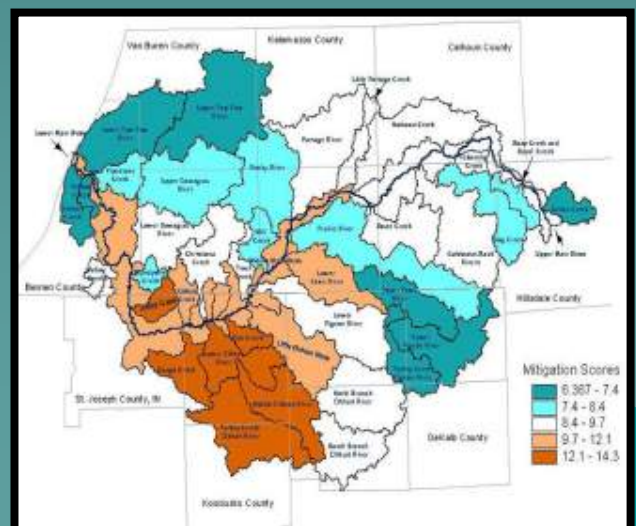
What to Preserve Map



Impervious Cover



Mitigation Scores



St Joseph River
Watershed Assn


This private road is just wide enough to support travel lanes, on-street parking and emergency access

Examples of Narrower ROW Widths

Source	ROW Width	Pavement Width & Purpose
Portland, OR	35’ 40’	20’ residential street 26’ residential street
Montgomery County, MD	20’ 44’ 46 – 60’	16’ residential alley 20’ residential street 26’ residential street
ASCE, 1990 (Recommendations)	24 – 26’ 42 – 46’	22 – 24’ residential alley 26’ residential street

Encouraging Development Where We DO Want It. . .

- **Infill & Redevelopment Incentives**
- **Flexible Setbacks & Lot Coverage**
- **Redevelopment Stormwater Criteria**
- **Fee-in-Lieu Program for Watershed Projects**
- **Utility Planning**

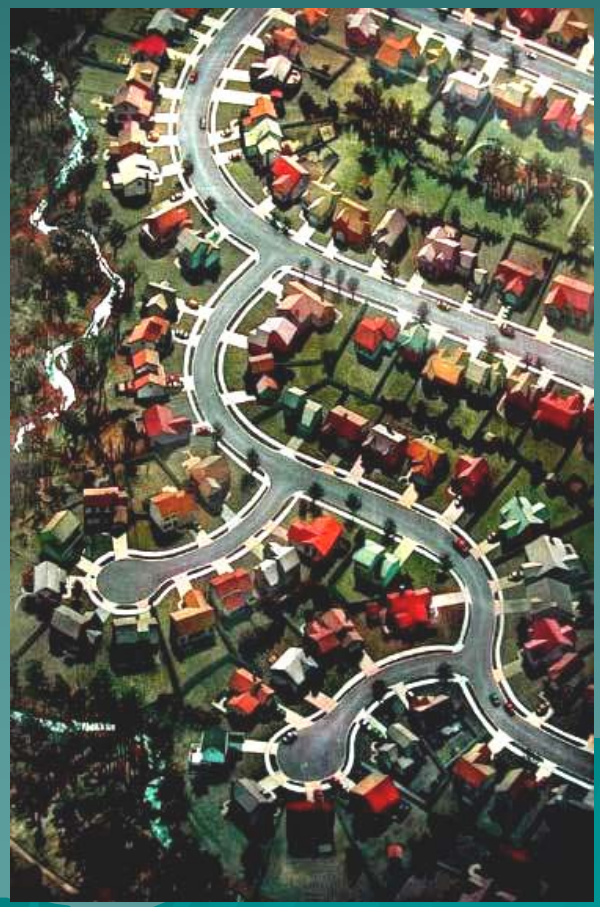
Discouraging The Wrong Type of Development Where We DON'T Want It. . .

- **Overlay Zoning**
- **Performance Standards**
- **Special Stormwater Criteria (Buffers, Infiltration)**
- **Conservation Easements**
- **Utility Restrictions**

Why Impervious Cover Matters At Different Scales

Watershed/Community

Site



Impervious Cover/Water Quality: Watershed/Community Scale

- Focus Development Footprint from New Growth
- Encourage Redevelopment
- Protect Natural Resources
- SMART GROWTH

Reduce Impervious Cover at Site Scale

- Reduce Impervious Cover Through Site Design
- Disconnect Impervious Cover
- Protect Site Open Space/Natural Areas
- Low Impact Development/ Better Site Design