



# Stormwater Regulations and Better Site Design (Chapter 2 and 3)

# **Chapter 2 – Strategies for Local Governments**

# **Chapter 3 - Conservation Principles and Neighborhood Site Design for Low Impact Development**

## **Conservation**

What are the top 6 reasons that LID stormwater practices are not implemented on development projects?

High/Uncertain Cost

Maintenance Concerns

No Clear Guidelines

Site Constraints

Lack of Education/Experience

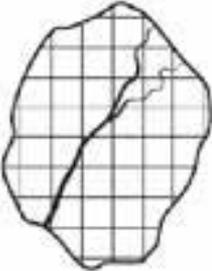
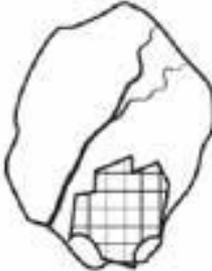
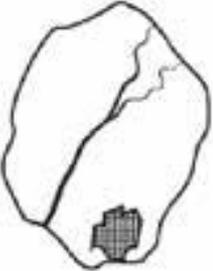
Lack of Political Will

What is Greg's #1 reason LID stormwater practices are not implemented on development projects?

It's Not Required!

# Barriers to Implementation

## 1. Zoning Rules

| Scenario A  | Scenario B  | Scenario C  |
|---|---|---|
|                              |                                |                              |
| <p>1 unit per acre</p> <p><b>Site: 20% impervious cover</b></p> <p><b>Watershed: 20% impervious cover</b></p> | <p>4 units per acre</p> <p><b>Site: 38% impervious cover</b></p> <p><b>Watershed: 9.5% impervious cover</b></p> | <p>8 units per acre</p> <p><b>Site: 65% impervious cover</b></p> <p><b>Watershed: 8.1% impervious cover</b></p> |

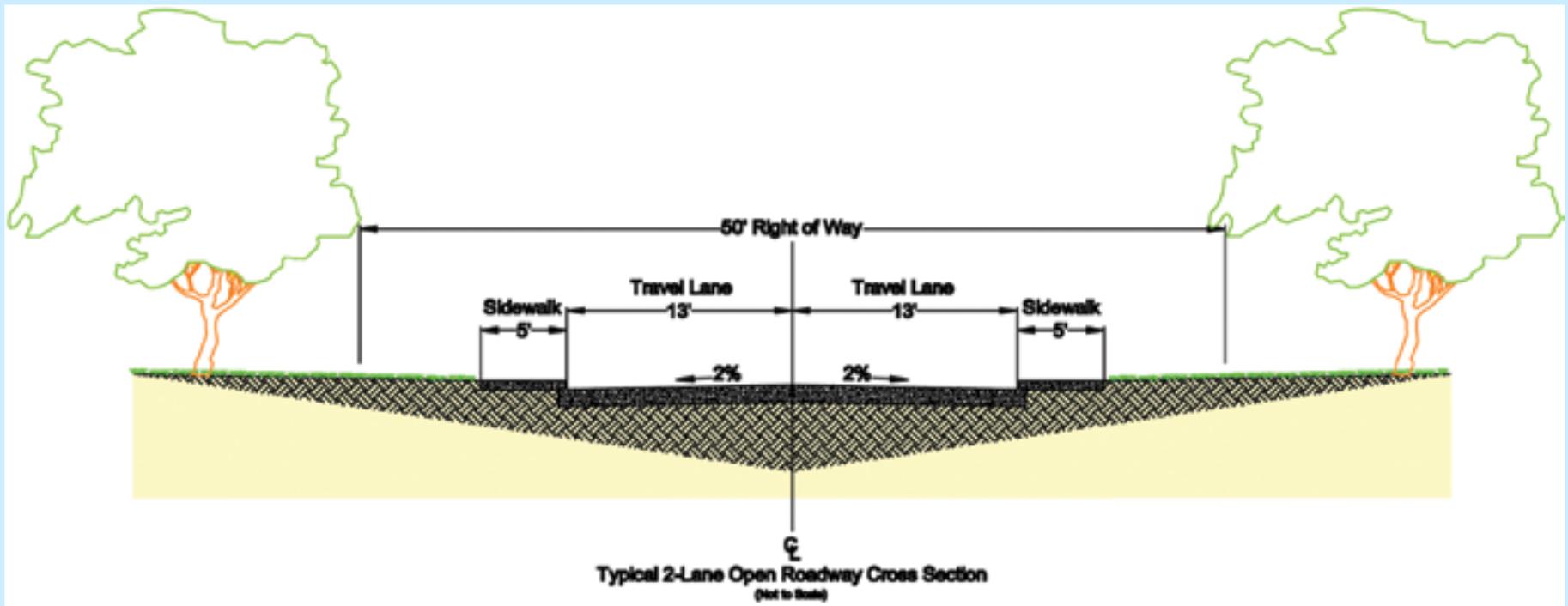
# Barriers to Implementation

## 2. Grading and Other Permits



# Barriers to Implementation

## 3. Standard Design Approaches and Regulations



# Managing and Promoting LID

**Require It!**



**STATE OF SOUTH CAROLINA  
NPDES GENERAL PERMIT  
FOR  
STORM WATER DISCHARGES  
FROM  
REGULATED SMALL MUNICIPAL  
SEPARATE STORM SEWER SYSTEMS (SMS4)**

# Managing and Promoting LID

**Require It!**

| Table 2.2-4. Unique Stormwater Volume Control Requirements                        |  |
|---|--|
| Municipality  | Stormwater Volume Control  |
| Beaufort County<br><i>(Including the City of Beaufort and Town of Port Royal)</i> | All stormwater from the 95 <sup>th</sup> percentile storm (1.94 inches) must be retained on site   |
| Town of Bluffton  | In areas of Hydrologic Soil Groups A&B, the development shall control and infiltrate the first one inch of stormwater runoff from the entire development or maintain the pre-development hydrology for the Water Quality Design Storm Event (95th percentile storm = 1.95 inches), whichever is greater                    |
| Horry County  | Three Options:<br>1. Redevelopment projects must achieve a 10% reduction in runoff volume (from pre-redevelopment levels)<br>2. Reduce impervious cover on the site by at least 20%<br>3. Reduce the post-development peak discharge rates by 20% for the 10- and 25-year, 24-hour storms                                  |
| Jasper County   | The 85 <sup>th</sup> percentile storm (1.2 inches) must be retained on site  |
| City of Myrtle Beach  | As a minimum, the first inch of rainfall from each storm over the developed portion of the site shall be retained on site  |
| City of North Myrtle Beach  | Minimum storage volume shall be provided to retain on-site the first inch of runoff generated by any storm event over the developed or redeveloped portion of the site   |
| Town of Hilton Head   | The first flush runoff (0.5 to 1.0 inch) from paved streets and parking areas shall be filtered through vegetation, grass, gravel, sand or other filter mediums to remove oil, grease, gasoline, particulates and organic matter is required before the runoff leaves the site or enters any natural or manmade waterbody. |
| Town of Surfside Beach  | As a minimum, adequate storage volume shall be provided to retain on-site the first inch of runoff generated by any storm event over the developed or redeveloped portion of the site.   |

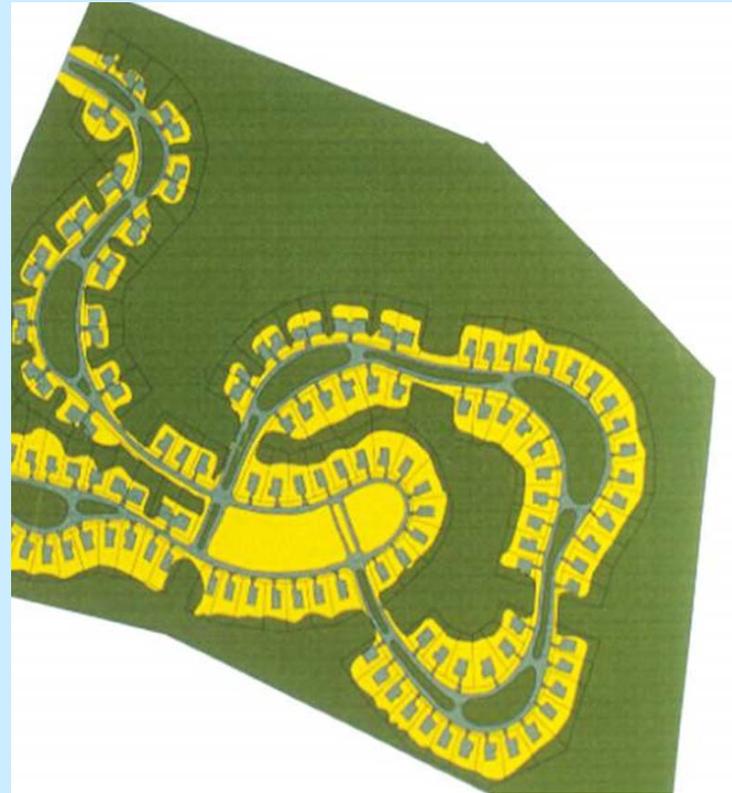
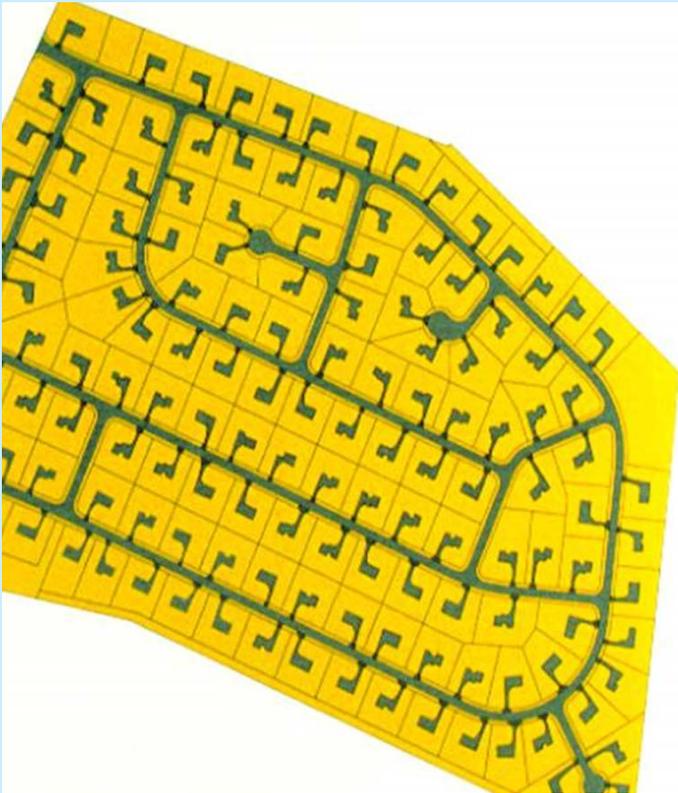
# Managing and Promoting LID

## Require It!

| Municipality      | Requirement   |
|-------------------|---|
| Beaufort County   | <ul style="list-style-type: none"><li>◆ Established 10% effective imperviousness threshold for development or redevelopment</li><li>◆ Pollutants (phosphorus, nitrogen, and bacteria) are specifically targeted for control; treatment achieved by 10% effective imperviousness (N&amp;P) and 5% effective imperviousness (FC)</li><li>◆ River protection buffer of 50 feet</li><li>◆ Detention and retention ponds shall be designed with relatively flat side slopes along the shoreline, and with meandering shorelines where possible to increase the length of shoreline, thus offering more space for the growth of littoral vegetation for pollution control purposes</li><li>◆ No new stormwater discharge shall be permitted onto any beaches/shorelines</li></ul> |
| Charleston County | Zoning and Land Development Regulations Ordinance establishes limits on building density, buffer & setback requirements, parking lot islands, tree protection, planting species selection, and screening requirements for ponds   |
| Georgetown County | When wet ponds are employed, retention/planting of littoral vegetation, particularly native wetland plants selected for nutrient and contaminant uptake capacity, shall be included   |

# Managing and Promoting LID

## Higher Density Allowances



# Managing and Promoting LID

## Redevelopment Incentives



# Managing and Promoting LID

**Faster Permit Approval/Reduced  
Fees/Stormwater Credits**



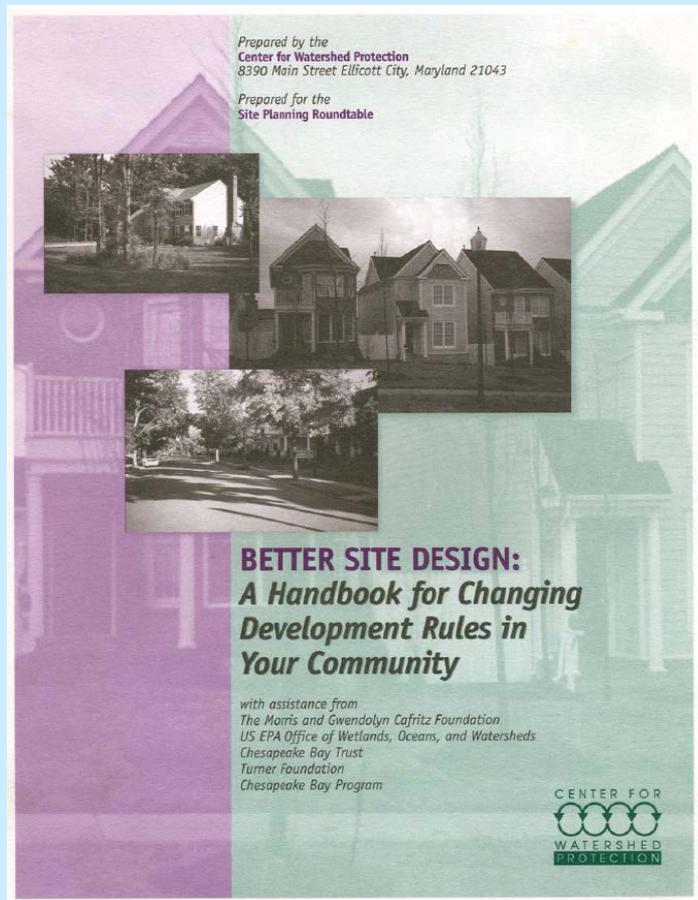
# Managing and Promoting LID

## Conservation of Natural Areas

- **Preserve and Maintain Open Space**
- **Protect Critical Resources: Existing Soils, Vegetation, and Wetlands**
- **Promote Buffers**
- **Protect and Promote Tree Canopy**

# Managing and Promoting LID

## Encourage Better Site Design



- ▶ Development projects can be planned and designed to reduce their impact on coastal aquatic and terrestrial resources, particularly when an effort is made to protect and **conserve natural areas**, **reduce impervious cover**, and **integrate stormwater management** with site design.

# #1 Reduce Residential Street Width

Design residential streets for **minimum pavement width needed** to:

- support travel lanes
- on-street parking
- emergency, maintenance, & service vehicle access
- based on traffic volume



2.2.2

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



# #2 Reduce Residential Street Length

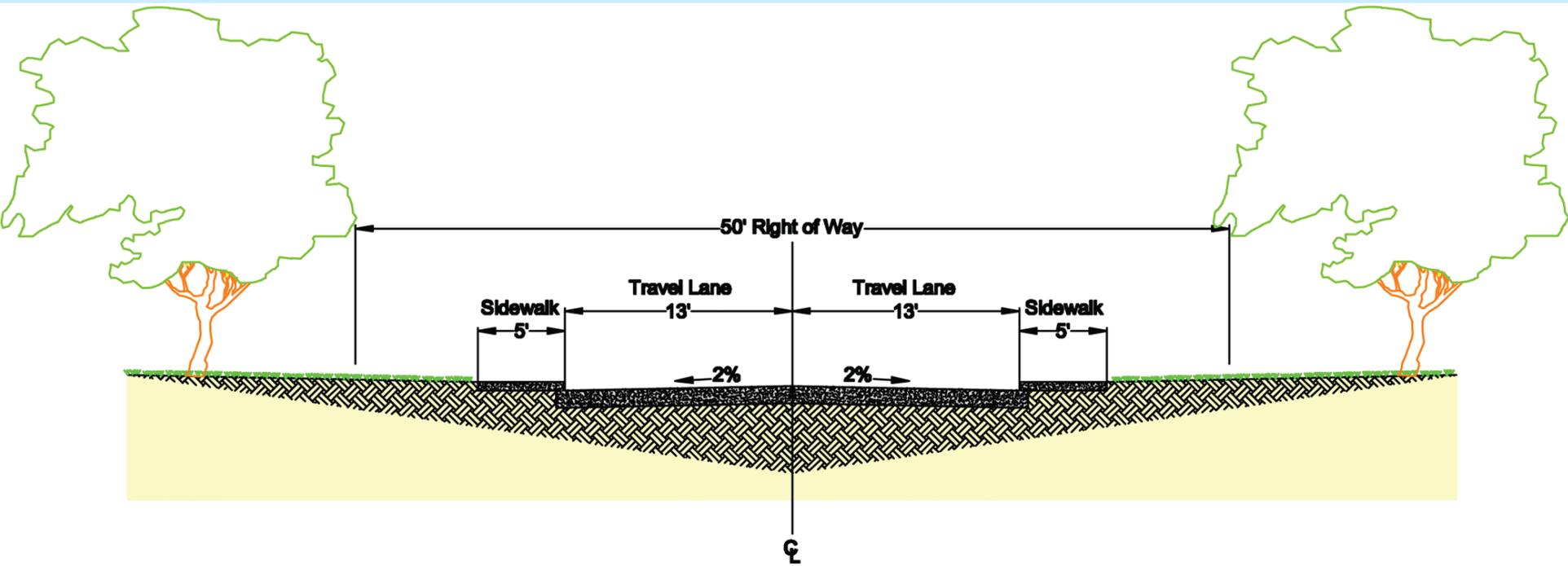
**Reduce the total length** of residential streets by examining alternative layouts that increase the number of homes served per unit length.



# #3 Reduce Residential ROW Widths

- Residential street **right-of-way** widths should be the minimum to accommodate
  - the travel-way
  - sidewalk
  - open channels
- Utilities and storm drains should be located **within the pavement section** of the right-of-way.





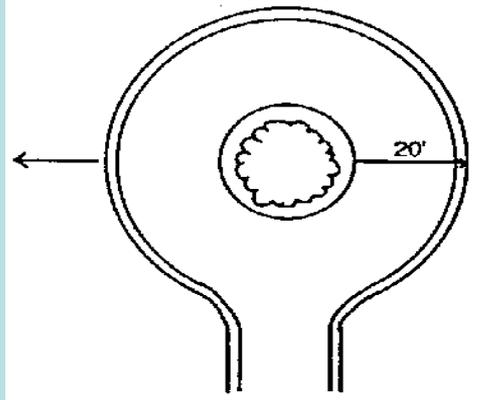
**Typical 2-Lane Open Roadway Cross Section**  
(Not to Scale)

# #4 Minimize Cul-de-Sacs

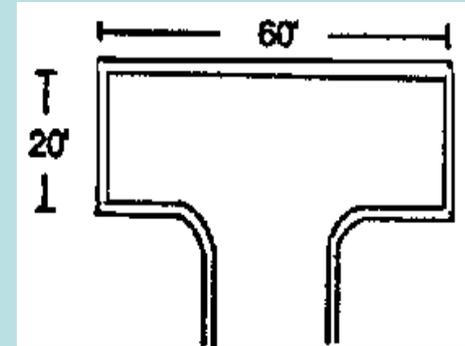
- Minimize # of residential street cul-de-sacs
- Incorporate **landscaped areas** to **reduce impervious cover**
- Minimum radius needed for emergency/maintenance vehicles
- Consider alternative turnarounds



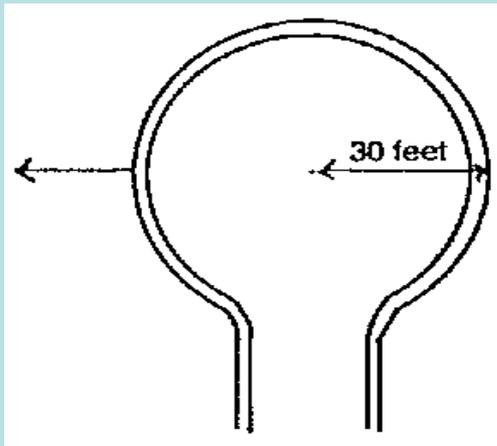
# Alternative Turnaround Options



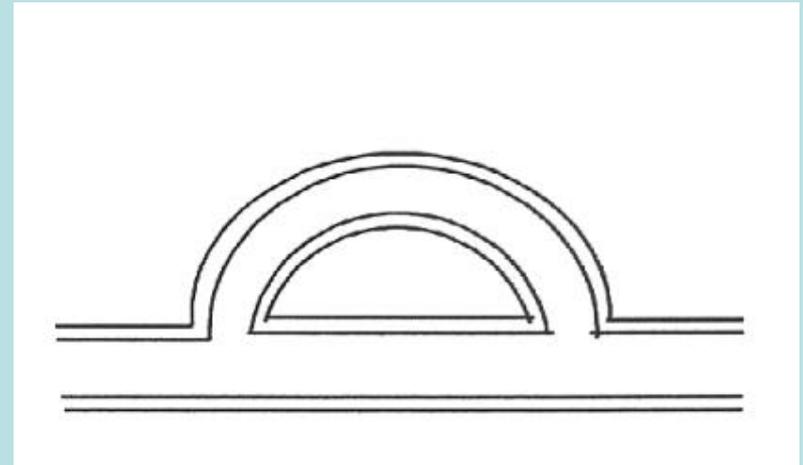
**40 FT CUL-DE-SAC  
W/ ISLAND**



**T-SHAPED  
TURNAROUND**



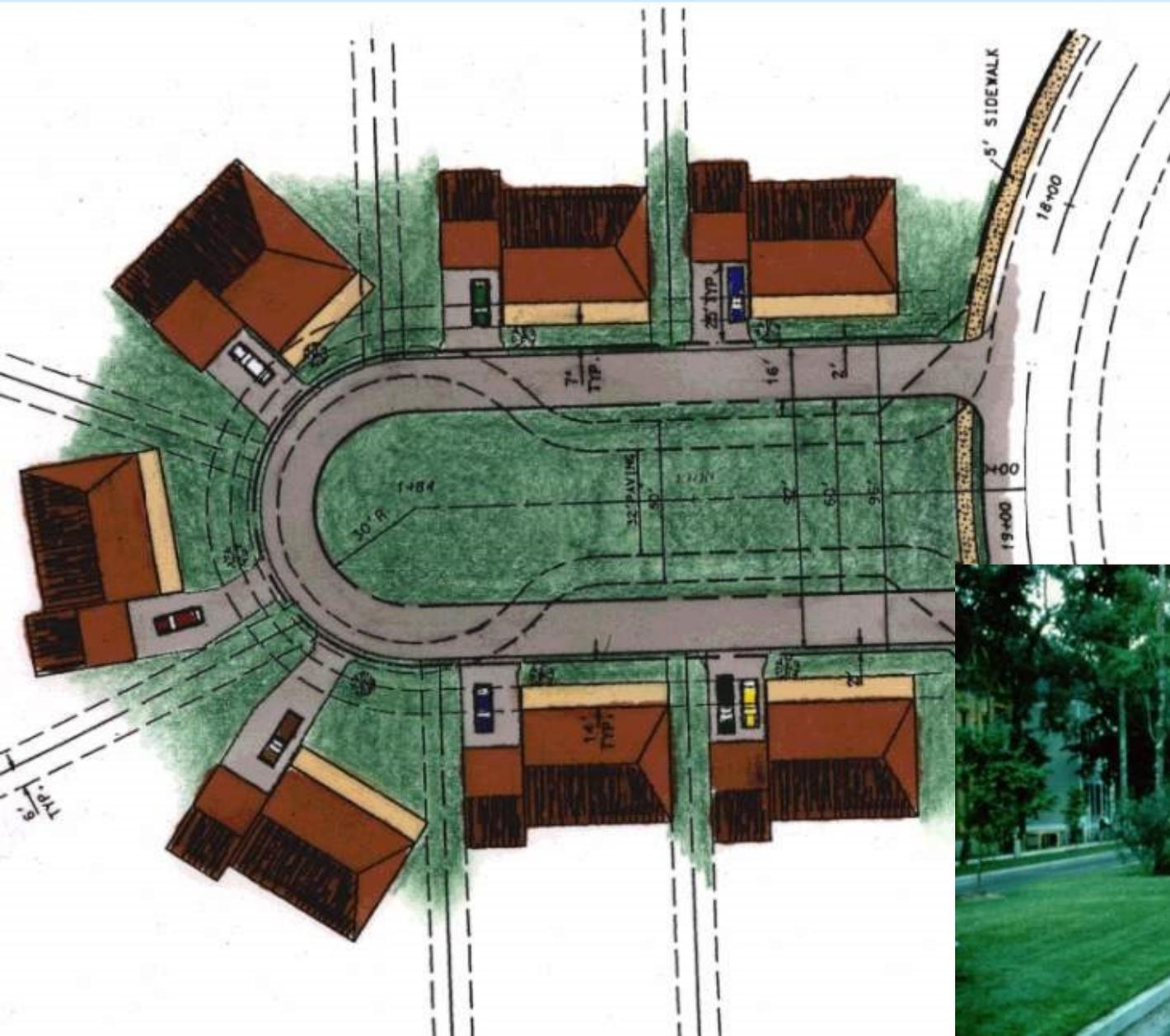
**30 FT RADIUS  
CUL-DE-SAC**



**LOOP ROAD**



# Alternative Cul-de-sac - Loop Road



# #6 Lower Parking Ratios

Required parking ratios should be enforced as **both a maximum and a minimum** in order to curb excess parking lot area.



# #7 Reduce Parking Ratios for Mass Transit or Shared Parking

Parking codes should be revised to **lower parking requirements** where:

- mass transit is available
- shared parking is enforceable





6.15.2000

# #8 Reduce Parking Lot Imperviousness

Reduce parking lot imperviousness by:

- Providing **compact** car spaces
- Minimizing stall **dimensions**
- Incorporating **efficient** parking lanes



**Small Car  
Only**

# #9 Structured Parking

Provide meaningful **incentives** to encourage structured & shared parking to make it more economically viable.



# #10 Vegetated Open Channels

Allow for drainage via grass channels, instead of curb and gutter.



# #11 Open Space Design Options

Advocate open space development that:

- Incorporates smaller lot sizes
- Minimizes total impervious area
- Conserves natural areas
- Provides community space
- Promotes watershed protection



An aerial photograph showing a residential development. The area is characterized by a mix of greenery and buildings. A winding road or path is visible, and the overall layout suggests a more integrated approach to development. The text 'Open Space Development' is overlaid in a white box with a blue border in the upper left quadrant.

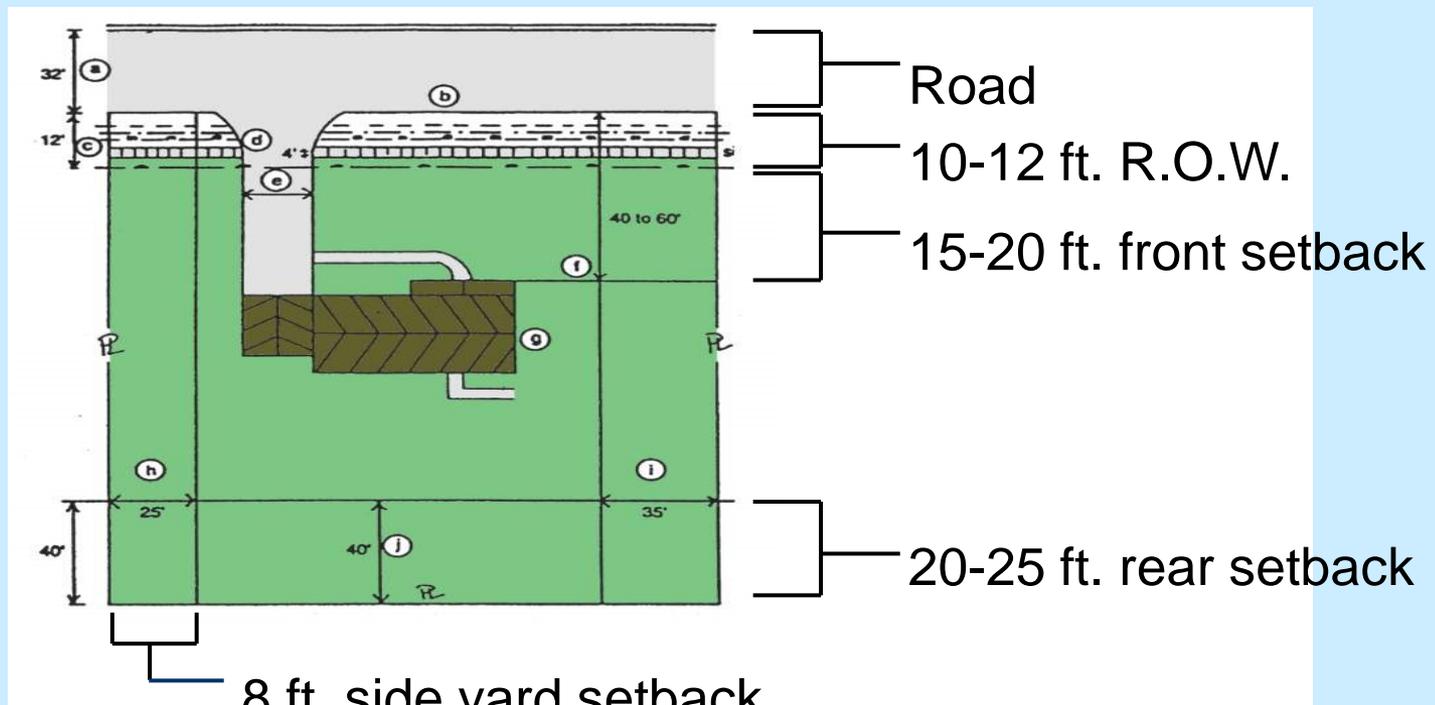
**Open Space Development**

**Conventional Development**

*Photo courtesy of Randall Aren*

# #12 Relax Setbacks & Frontages

- To reduce total road length in the community
  - Relax **side yard setbacks**
  - Allow narrower **frontages**
- Relax **front setbacks** to minimize driveway lengths



# #13 More Flexible Sidewalk Standards

Promote more flexible design standards for residential subdivision sidewalks

Where practical:

- Consider locating sidewalks on only **one side of the street**
- Provide **common walkways** linking pedestrian areas



# #14 Alternative and Shared Driveways

Reduce imperviousness by:

- promoting **alternative driveway surfaces**
- promoting **shared driveways** that connect two or more homes together







**Utilize Pervious  
Materials**

# #15 Specify Management of Open Space

- Clearly specify **how** community open space will be managed
- Designate a **sustainable legal entity** responsible for managing natural & recreational open space.

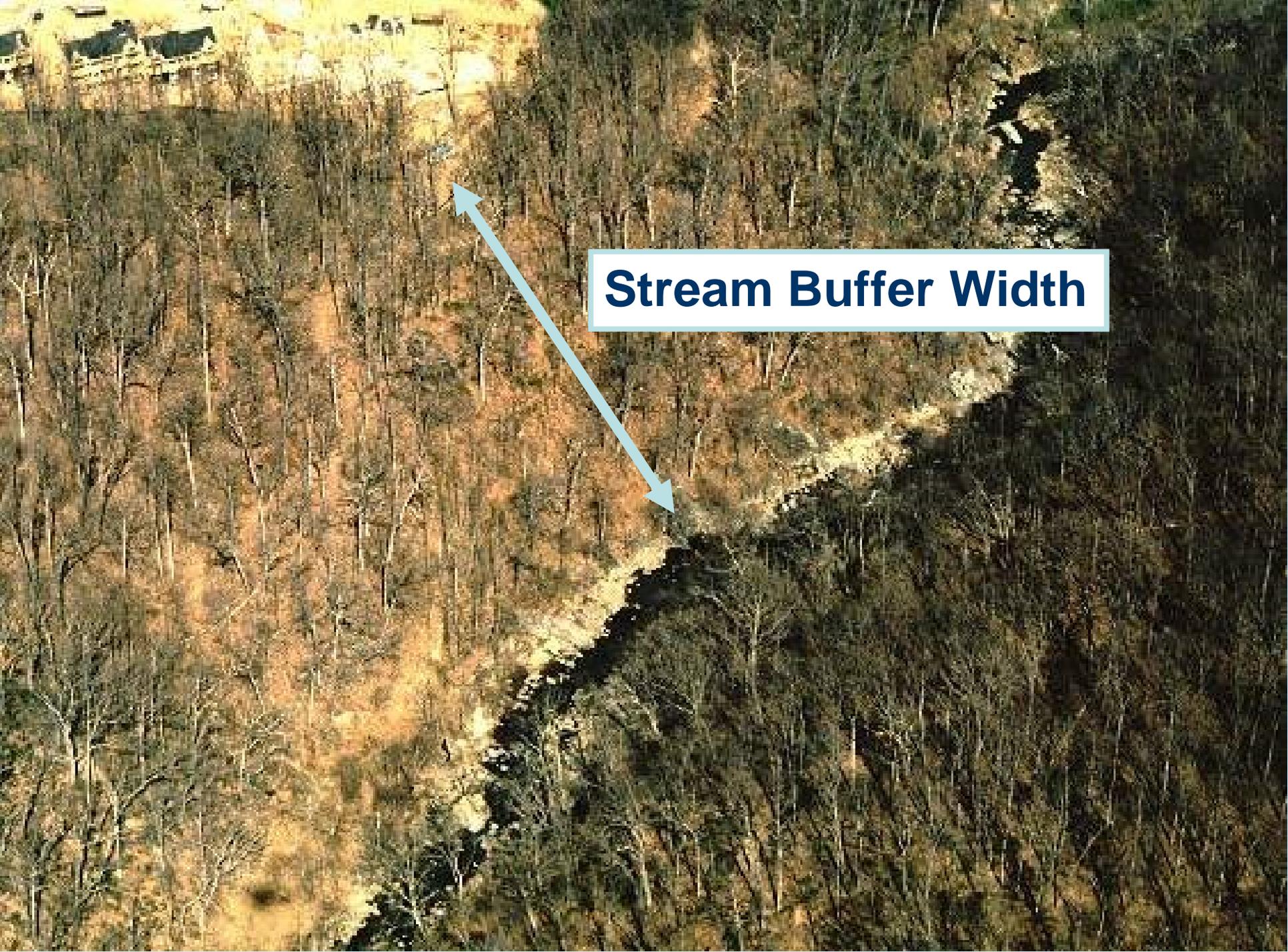


# #17 Aquatic Buffers

Create a variable width buffer system along all **waterways** that also encompasses critical environmental features

- floodplains
- steep slopes
- freshwater wetlands



An aerial photograph of a stream flowing through a forest. The stream is visible as a dark, winding path. A blue double-headed arrow is drawn across the image, extending from the stream towards the surrounding forest. A white rectangular box with a blue border is positioned in the center of the image, containing the text "Stream Buffer Width" in bold blue font. The forest is dense, with trees showing varying shades of green and brown, suggesting a mix of species or seasonal changes. The stream appears to be a small, clear waterway.

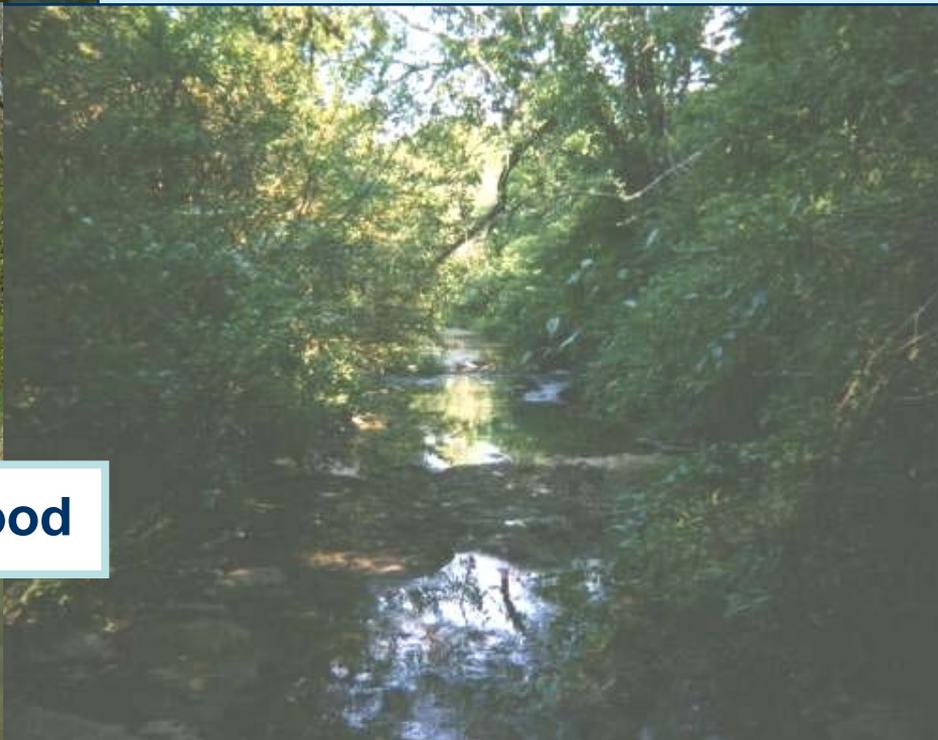
**Stream Buffer Width**



**Not So Good**



**Good**

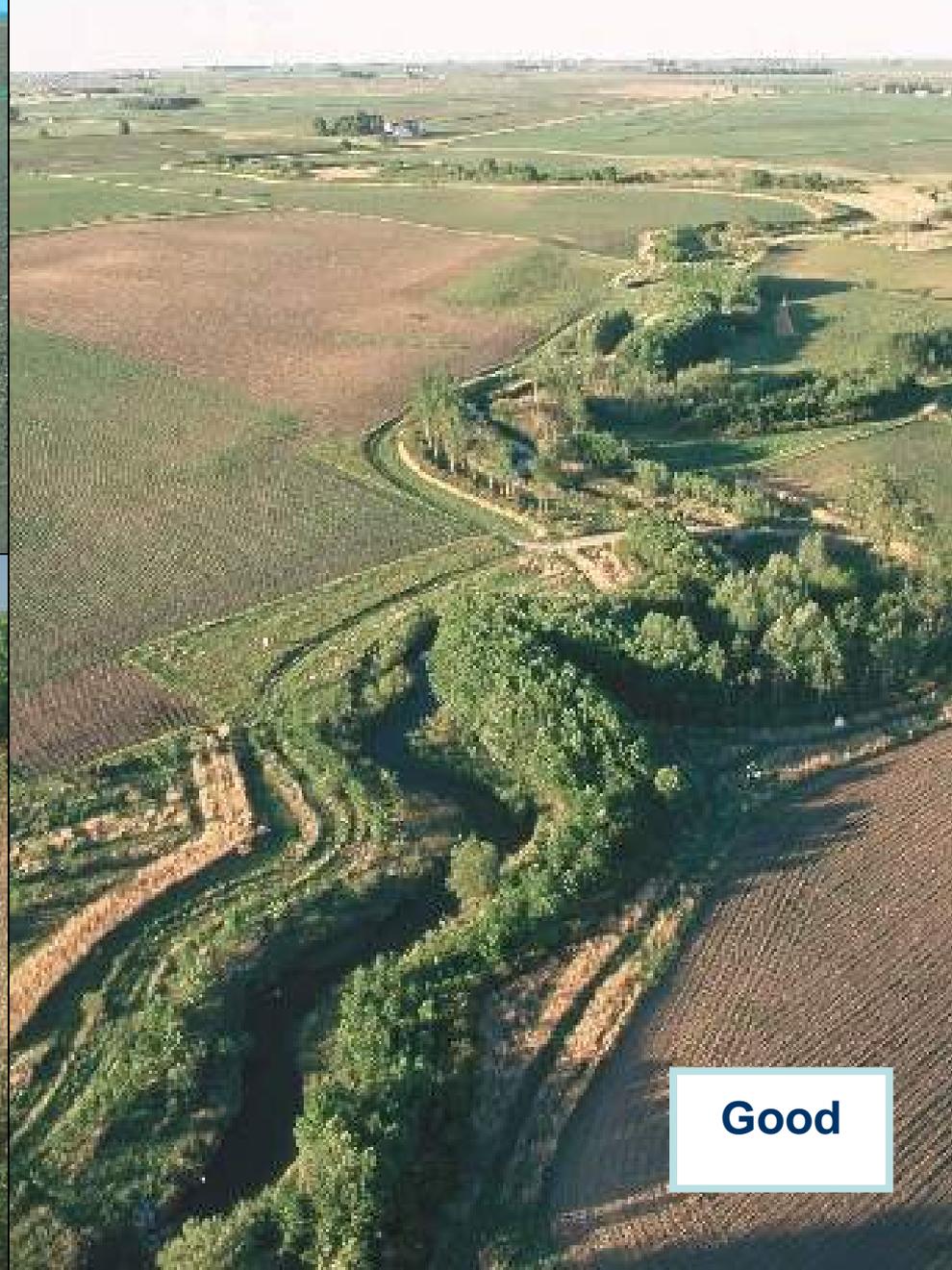


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**Not So Good**



*NCRS Photo Gallery,  
2000*



**Good**



**Good**

# #18 Maintain Buffers Over Time

Riparian stream buffers should be preserved or restored with native vegetation that can be maintained through **all stages of development**:

- Delineation – field marking
- Plan review – site plan, sediment control, utilities, etc.
- Construction – LOD fencing
- Occupancy – attractive signage



**WARWICK TOWNSHIP**  
**RIPIARIAN PARK**  
**PARK HOURS: DAWN TO DUSK**  
THIS PARK FACILITY WAS MADE POSSIBLE THRU THE EFFORTS AND DEDICATION OF:  
WARWICK TOWNSHIP, SITE SCAPING, ORIGINAL CHAPTER OF FIRST MENNONITE SPORTSMAN ASSOCIATION, LANCASTER COLONY COMMUNITY PARK, TRAVEL, KENNEDY GLASS, ST. BIRKBEITH, LANDSCAPE, INC., WHITE OAK COFF, SHAWNEE CONSTRUCTION, ZICK LANDSCAPING, LANCASTER WADY BIK CORP.

**WARWICK TOWNSHIP**  
**MUNICIPAL BUILDING**  
←

**HESS MENNONITE CHURCH**

# #19 Minimize Clearing of Native Vegetation

Clearing and grading of native vegetation should be limited to the **minimum** needed to:

- build lots
- allow access
- provide fire protection

A fixed portion of community open space should be managed as **green space** in a **consolidated** manner



**Cleared Site**

**Vegetation Preserved**



*Photo courtesy of Randall Aren*



## FOREST RETENTION AREA

MACHINERY, DUMPING, OR STORAGE  
OF ANY MATERIALS PROHIBITED  
VIOLATORS ARE SUBJECT TO FINES  
AS IMPOSED BY THE MARYLAND  
FOREST CONSERVATION ACT OF 1981

*Trees For Your Future.*



# #20 Conserve Trees & Native Vegetation

- Conserve trees at each site by
  - additional planting
  - clustering tree areas
  - promoting the use of native plants
- Promote natural vegetation in managing
  - community open space
  - street rights-of-way
  - parking lot islands
  - other landscaped areas
- \*Forest Conservation Act

The trees in this landscaped median were preserved during development, which reduced the amount of clearing during road construction





Trees to be preserved are marked with yellow ribbon at this development site

Narrow road.

Sidewalk rules

Driveway size

Frontage and Side yard setbacks

Shared driveways

Cul de sac size

Density/Lot size

Other creative ideas.