



Wake County Stormwater Management Task Force Meeting #3

May 18, 2006

Cary • Fuquay-Varina • Garner • Holly Springs • Knightdale •
Morrisville • Raleigh • Rolesville • Wake County • Wake Forest •
Wendell • Zebulon • Apex • Cary • Fuquay-Varina • Garner • Holly
Springs • Knightdale • Morrisville • Raleigh • Rolesville • Wake County •
Wake Forest • Wendell • Zebulon • Apex • Cary • Fuquay-Varina • Garner



Stormwater Perspectives

Proposed Activities:

- Meeting #2 Follow-Up
- Stormwater Levels of Service
- Task Force Survey Results

Meeting 3

May 18, 2006

Expected Outcome:

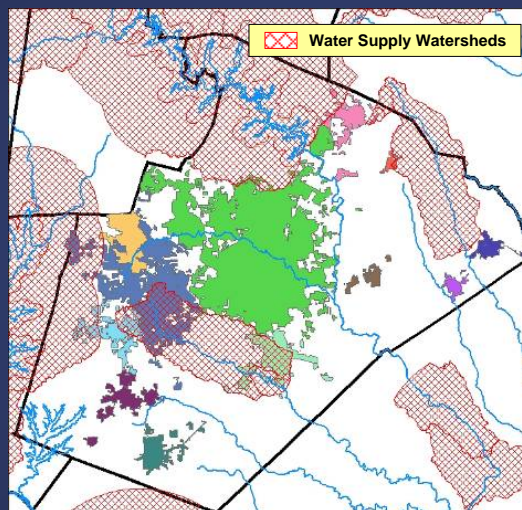
- Task Force understanding of stormwater levels of service

Meeting Agenda

- Dinner and Welcome
 - Kenn Gardner, Wake County
 - Work Plan Review
- **Follow-Up Session – Impervious Surface**
- What is Level of Service?
- Perceptions for Stormwater Service

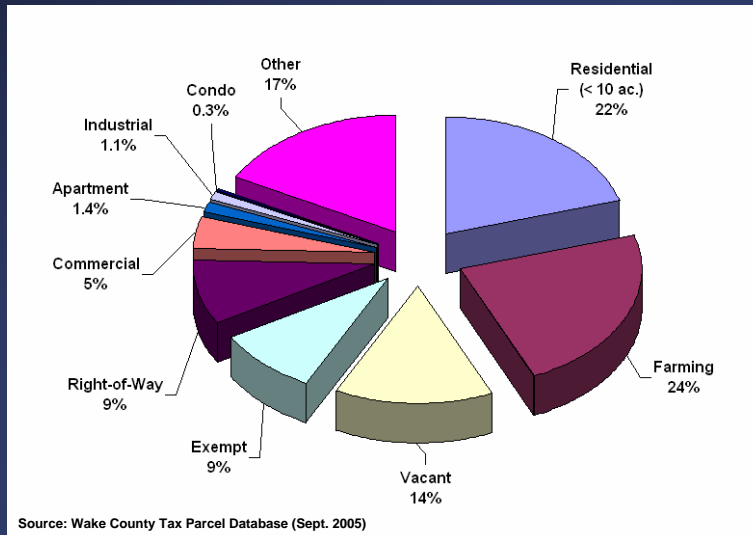
Wake County Land Area

- Total Area
 - 856 sq. mi.
- WSW Area
 - 249 sq. mi.
- Net Area
 - 607 sq. mi.
- Net Area (w/o ROW)
 - 553 sq. mi.



Wake County Land Area Breakdown

Note: Only includes area outside WSW and outside public right-of-way



Estimating Impervious Areas for Three Major Land Use Categories

- **Single-Family Residential**
 - All parcels less than 1.5 acres
 - Apply typical area for rooftops and driveways
- **Non-Residential**
 - All parcels with Wake County land class of commercial, industrial, apartment, condos
 - Apply 80% average percent impervious to all
- **Roads**
 - Estimate length of primary and secondary roads (approximately 4,500 miles)
 - Apply assumed width of 40' for primary roads and 24' for secondary roads

Typical Single-Family Residential Property



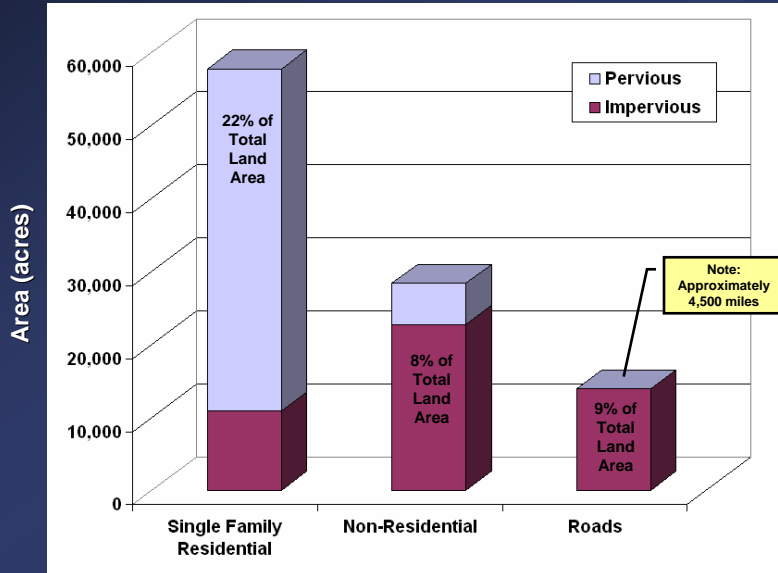
Typical Non-Residential Property



- Assume a weighted average of 80% impervious for commercial, industrial, apartment/condos, schools

Location: Celebration at Six Forks

Comparison of Impervious Areas for Major Land Use Categories

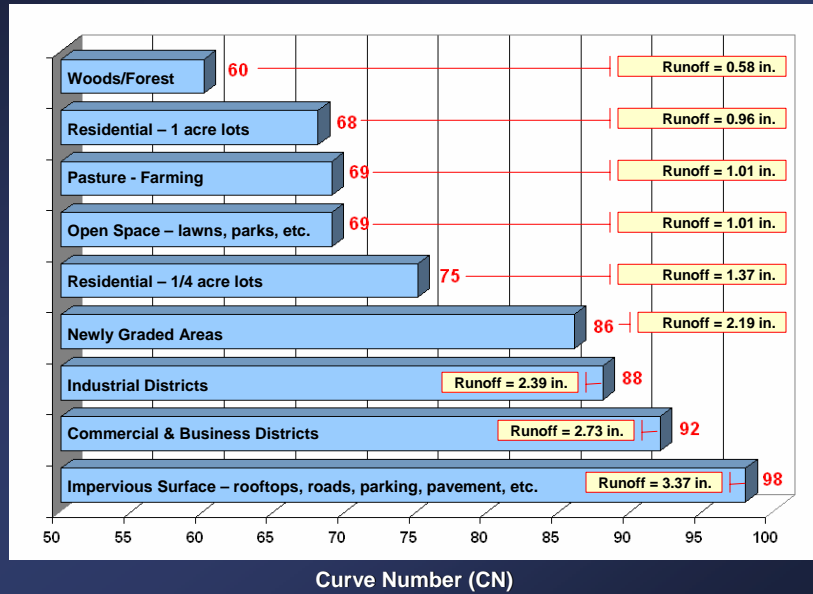


Runoff Characteristics of Various Land Uses

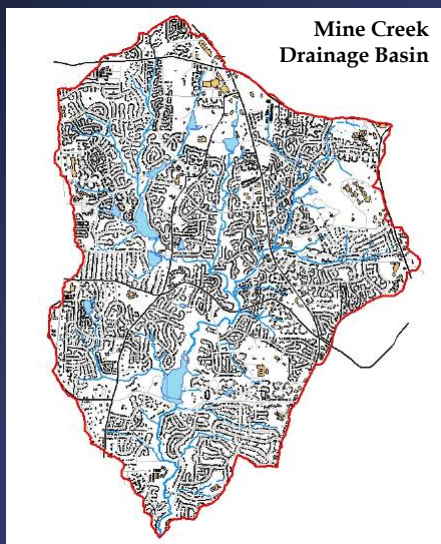
- Major factors in determining runoff for various land uses
 - Soil type, land cover, condition, moisture level
- Common engineering practice uses Soil Conservation Service Runoff Curve Numbers (CN) to describe land use conditions

Impact of CN Values on Rainfall Runoff

Note: Assume 2-yr Design Storm Rainfall = 3.6 inches & Type B Soil



Mine Creek Case Study: Impact of Development on Runoff



Land Use Data & Assumptions

- Pre-Developed Condition is Ag-Pasture (i.e. farm)
- Developed/Build-Out condition is represented by table below:

Land Use Type	% of Total
Single Family Residential	69%
Non-Residential	21%
Roads	10%

Note: Table represents breakdown of developed area only. Remaining portion of watershed is undeveloped

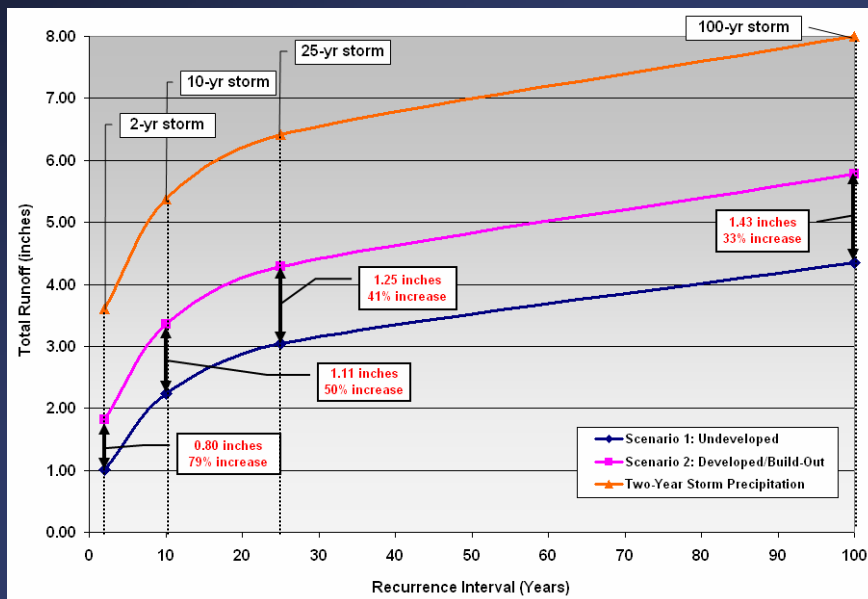
Mine Creek Case Study Results

Note: Based on 2-yr storm (P=3.6 in.)

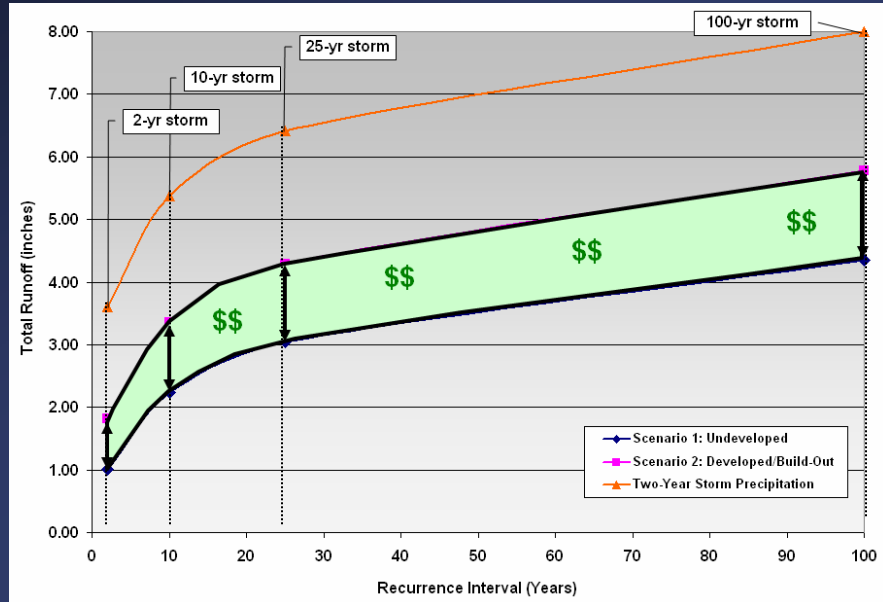
- For Pre-Developed Condition
 - 1.02 inches of total rainfall (P = 3.6 in.) converted to runoff
- For Developed/Build-Out Condition
 - 1.81 inches of total rainfall (P = 3.6 in.) converted to runoff
- Percent Increase in Total Runoff (inches)
 - 79 percent increase in rainfall converted to runoff

Our “natural stormwater system” must convey at build-out 79 percent more runoff than it was “designed” to convey

Change in Runoff for Various Design Storms

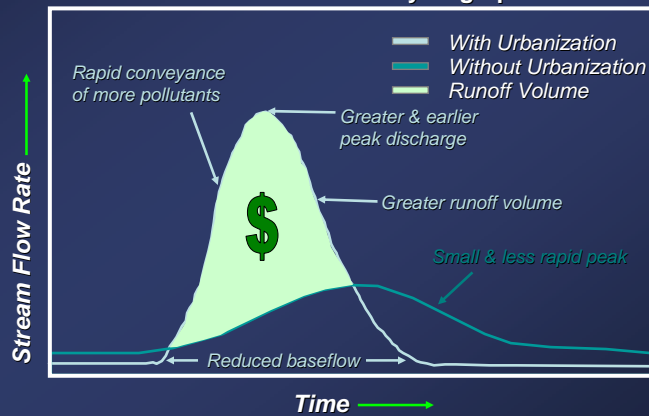


Difference Between Runoff Curves is Increased Volume in System



Adding Impervious Surfaces Increases Demands On The Stormwater System

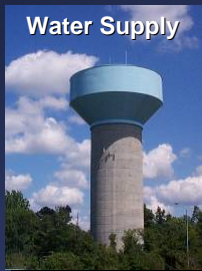
Stormwater Runoff Hydrograph



Meeting Agenda

- Dinner and Welcome
 - Kenn Gardner, Wake County
- Follow-Up Session - Impervious Surface
- **What is Level of Service?**
- Perceptions for Stormwater Service

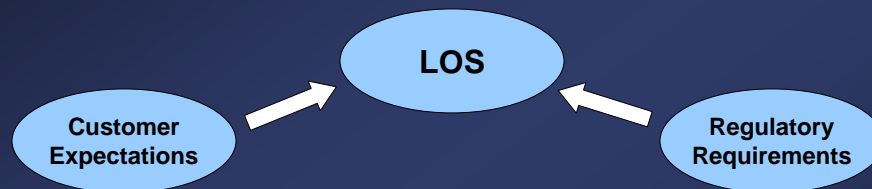
How is Level of Service Defined for Other Infrastructure?



The Stormwater System

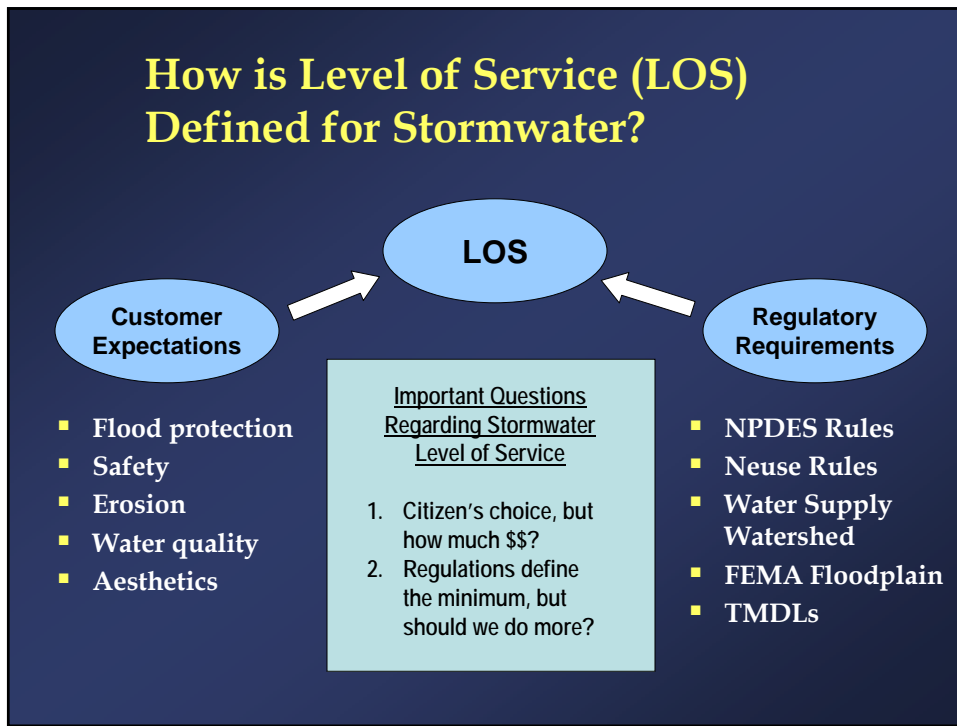


How is Level of Service (LOS) Defined?

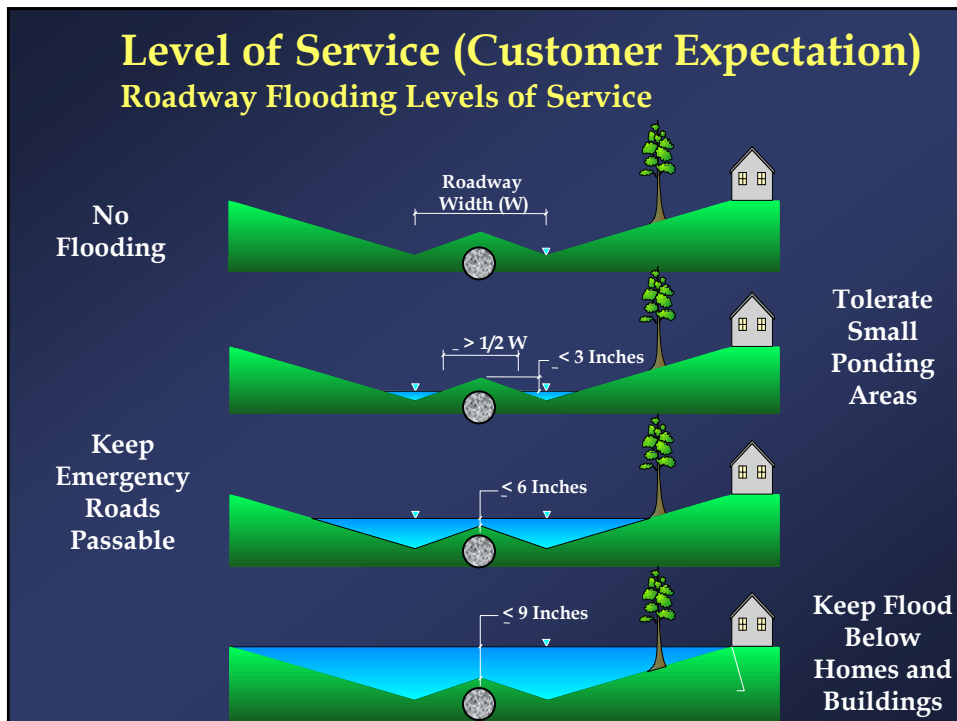


- Technically Feasible and Reliable
- Maintainable
- Socially and Politically Acceptable
- Environmentally Acceptable
- Economically Viable
- Financially Feasible

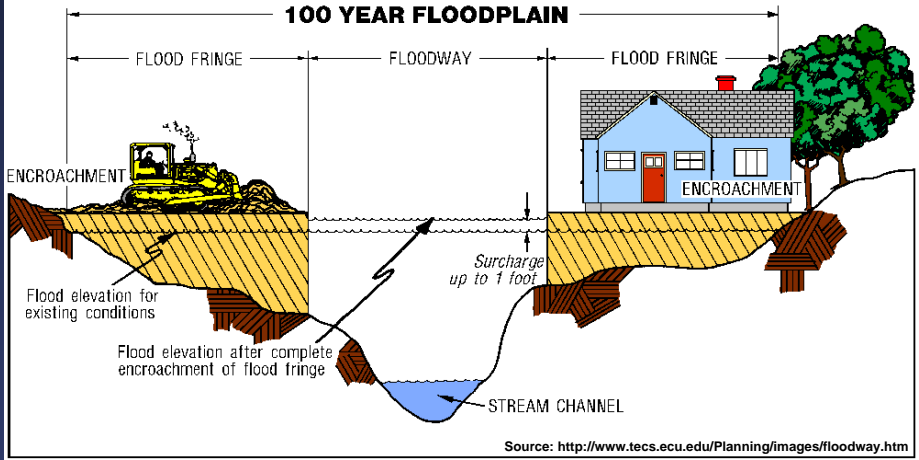
How is Level of Service (LOS) Defined for Stormwater?



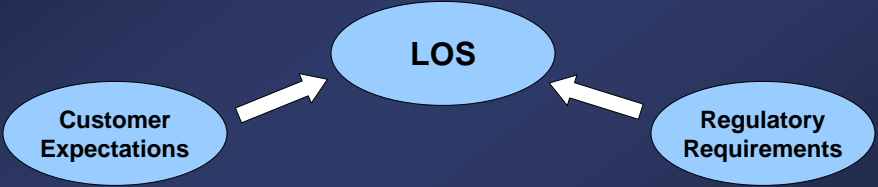
Level of Service (Customer Expectation) Roadway Flooding Levels of Service



Level of Service (Regulatory Requirement) Floodplain Management



Level Of Service (LOS) Is The Perspective By Which We Measure And Compare Expectations And Their Cost



Meeting Agenda

- Dinner and Welcome
 - Kenn Gardner, Wake County
- Follow-Up Session - Impervious Surface
- What is Level of Service?
- **Perceptions for Stormwater Service**

Task Force Survey Results Stormwater System Performance

- How well does the storm drainage system generally work in your area?
 - Works perfectly, no problems - 3%
 - Seems to work OK in most storms - 53%
 - Occasionally backs up water, creates potentially dangerous or nuisance flooding - 42%



Task Force Survey Results System Maintenance

- How would you generally rate the maintenance of the storm drainage system within your area?
 - Very clean and very well maintained - 3%
 - Adequately maintained in most cases - 50%
 - Needs more frequent maintenance - 39%



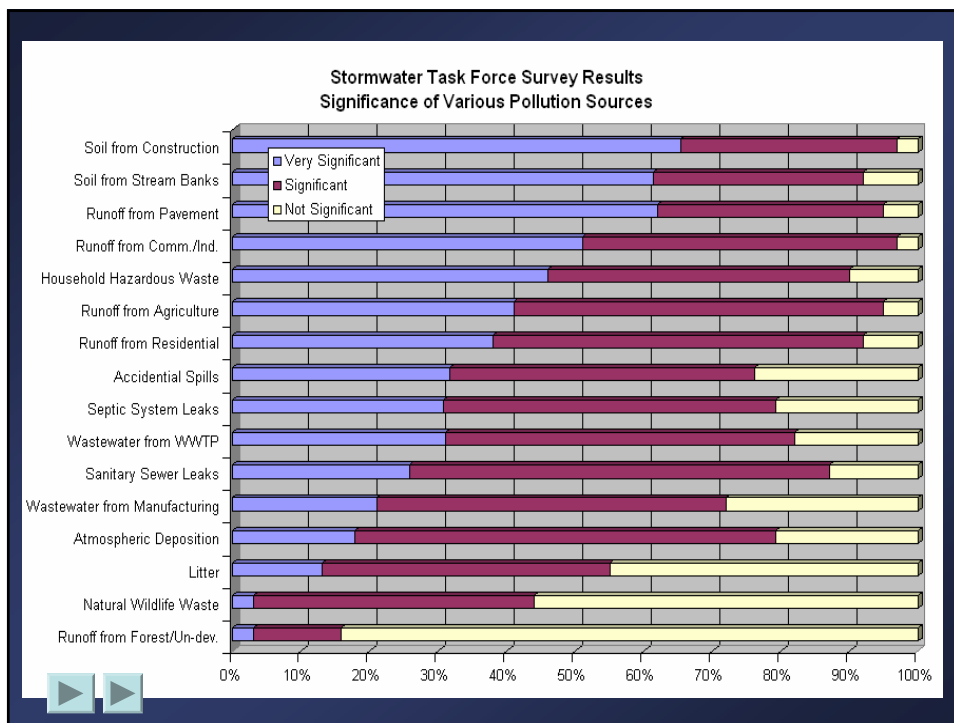
Task Force Survey Results Sedimentation and Erosion Control

- How well are erosion and sedimentation controlled during construction?
 - Always well protected - 0%
 - Usually well protected - 34%
 - Sometimes unprotected - 50%
 - Frequently unprotected - 24%



Task Force Survey Results Household Good Housekeeping

- What do you do with grass clippings?
 - Leave in Yard - 50%
 - Mulch or compost them - 33%
 - Dispose in ditch or storm drain - 2%
- How often fertilize lawn? (of 78% that do)
 - Once per year - 41%
 - 2 - 3 times per year - 53%
 - Monthly - 6%
- How do you dispose of oil ? (18% change their own)
 - Recycle center - 90%
 - Pour down the storm drain - 10%

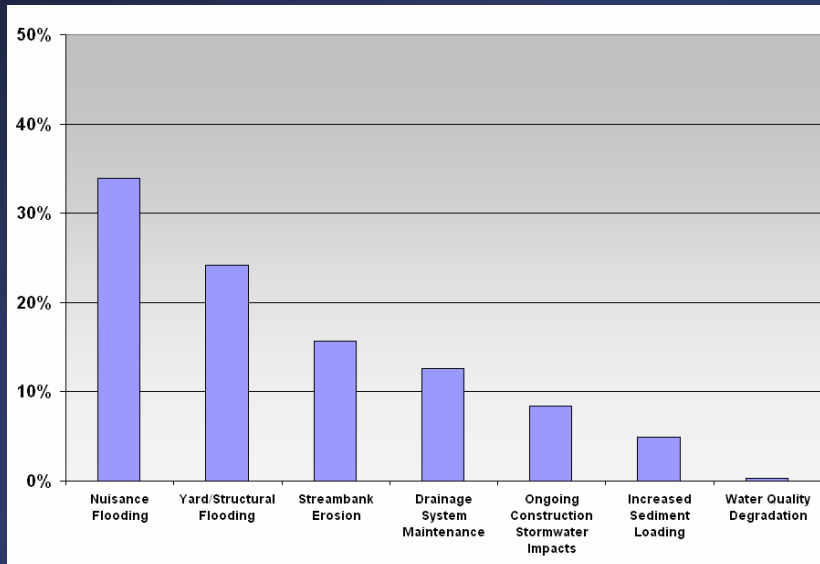


Task Force Survey Results Top Five Sources of Pollution in Wake County

1. Runoff from Parking Lots and Streets
2. Runoff from Construction Sites and Disturbed Land
3. Runoff from Residential Development
4. Runoff from Commercial and Industrial Development
5. Soil Eroding from Unstable Stream Banks

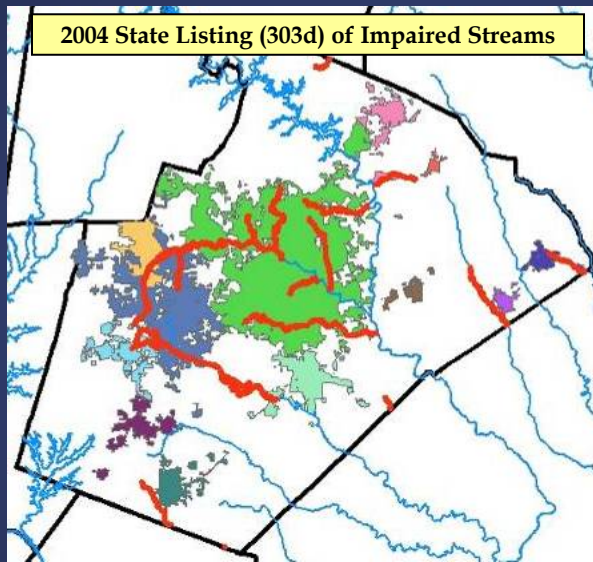
Notable Mention: Runoff from Farms and Ag Ops

Breakdown of Typical Stormwater Complaints for Local Governments



The State Agrees that Stream Condition and Water Quality is an Issue in Wake County

- 93 miles of Wake County streams designated as "impaired"
- 47% of all streams were monitored; 28% of those streams were impaired
- Most common source of impairment is "urban runoff /storm sewers"



Relative Contribution of Various Sources of Sediment in Urban Watershed (WA State)

(Nelson and Booth, 2002)

Source	Sediment Load (pounds/acre/year)
Medium Density Residential	287
Paved Roads	448
Commercial Development	718
Agriculture	varies
Streambank Erosion	varies
Construction Sites/Disturbed Areas	798

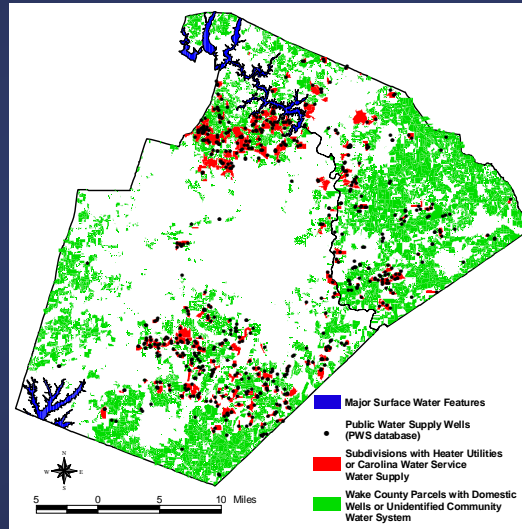
- 27 acres disturbed per day = 15.4 square miles per year (1.8% of Wake County)
- 3,275 miles* of streams in Wake County (* based on source of data)

Studies generally point to streambank erosion as the primary source of sediment in urbanizing watersheds



Water Quality Impacts due to Failing Septic Tanks – 2003 Field Study Results

- 55,000 on-site systems (est.)
- 33,000 installed between 1982 – 2001, 310 surveyed
- 9.7% observed to have “wet season hydraulic failure” (5,500 est. countywide)



On-Site Septic System Survey – Key Correlations to Likelihood of Failure

No Correlation	Correlation
<ul style="list-style-type: none"> ■ Age, type of system ■ Source of water supply ■ Amount of water usage ■ Use of garbage disposals, dishwashers, additives, irrigation systems ■ Location in county (various soil types, geologic features) ■ Number of non-adult residents 	<ul style="list-style-type: none"> ■ Site maintenance and landscaping of drain field ■ Number of adult residents ■ Frequency of septic tank pumping ■ Availability of education materials and permit

Task Force Survey Results **75% of Survey Respondents Said "Yes" to These Statements**

- Beneficial to regularly sample and test water quality
- Support enhanced stormwater controls
- Natural environment adds to quality of life
- Current programs are inadequate
- Willing to pay for services to improve stormwater management

Discussion Session

- What information and data do you need to enhance your understanding of current levels of service related to stormwater management?

Issues

Stormwater Perspectives

Expected Outcome:

- Task Force understanding of existing and future stormwater needs from various perspectives

Meeting 4

June 2006

**Thank You For Your
Time And Interest!**



CDM