Distributed Management of Stormwater Solids as a Nutrient Reduction Strategy

A. R. Rubin, Professor Emeritus

NCSU BAE

Presentation to Lower Neuse Basin Association

May 2021

Overview

- Why consider distributed stormwater management infrastructure in Tar-Pamlico Basin
- What are basin inserts and what is Trash Guard (TG)
- Examples of selected benefits
- Results
- O and M

Why Distributed Management for SW Solids

- Removes pollutants close to source
- Targets specific areas where trash, solids or nutrients are an issue
- Allows potential beneficial use for solids in yard and leaf compost programs
- Optimum performance requires periodic maintenance
- Cost effective
    - Lower cost per pound of pollutant removed

Why consider distributed approach to stormwater management

- Distributed approach traps pollutants at or near their source
- Historically the Tar-Pamlico Basin and the Neuse Basin have been listed on state 303d list and TMDL's have been established for N and P
- NCAC 02B .0703 and .0730 contain criteria for nutrient management (.0730 specific to Tar-Pamlico Basin)
- 10 March 2021, NCEMC item reiterated integrating NPDES and Stormwater programs
- 29 October 2019 memo established nutrient reduction credits available through stormwater management (Culpepper, 2019)

2019 Culpepper Memorandum

- Storm Drain Cleaning is defined as the practice of periodic removal of gross solids and associated material from storm drain catch basins.
- To determine the nutrient removal credit, the weight of material collected is converted to a representative weight of nitrogen and phosphorus removed from the system.
- RC = W x CF
  - RC is reduction credit, W is weight of solids removed, CF is conversion factor
  - W is the weight of solids removed from a basin
  - CF_n is for nitrogen and is 0.023 pounds of N per 1000 pounds removed
  - CF_p is for phosphorus and is 0.002 pounds of P per 1000 pounds removed

Source: nutrient reduction practices and crediting, DWR

Basin management and inserts

- Stormwater solids refers to combined material collected from unaltered catch basins or catch basins with a gross solids collection device installed. These devices are designed to alter catch basins to store more material than unaltered catch basins.
- Basin inserts refer to the devices deliberately installed as part of a distributed storm basin management effort

Trash Guard is a locally manufactured basin insert

- Screen
  - Initially
- Filter
  - As solids accumulate

Impacts

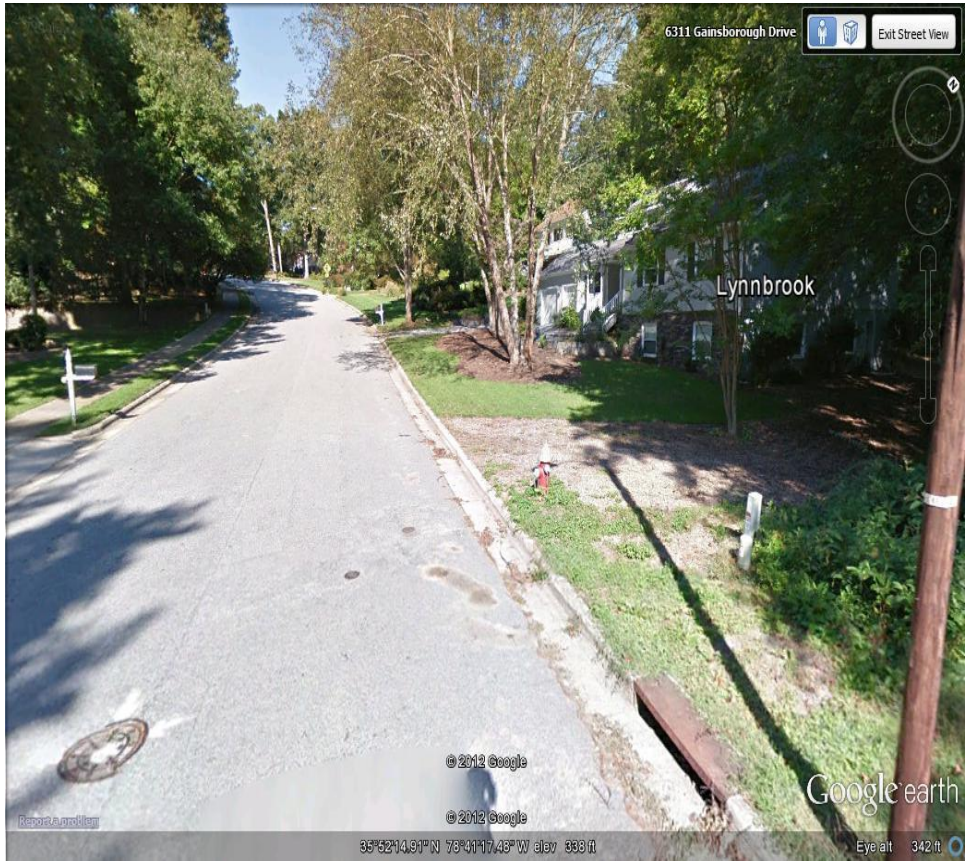
- Visual, litter removal
- Organic Matter
- Chemical (nutrients)
- Sediment and regulated metals

Impacts

- Visual (trash)
- Organic Matter
- Chemical (nutrients)
- Sediment and regulated metals

Success Story - Gainsborough Dr.

- 2 acre drainage area
- Enters catch-basin at base of hill
- Significant vegetation
- Drainage directly into creek



Vac-All
20 minutes to set up and remove
1000 pounds of SW solids

Gainsborough Dr

‘05-’08: 3000 lb Solids
‘09: Vac-Al (1000 est)
Winter ‘11: 1000 lb solids removed
Spring 2012: 1000 VacAll (est)

Table 2, Average Concentration in Solids and Mass as Pound Constituent per 1000 Pounds Solids

Solids Removed, Gainsborough Dr, Mar 2011

	1	2	3	AVERAGE
TOC (lb/K-Lb)	211	150	444	268 lb/K - Lb
TN (lb/K Lb	12	9	24	15 lb/K-Lb
P (Lb/K-Lb)	1.5	1.7	2.2	1.8 lb/K-Lb

Solids and Nutrients Removed, 2012 VacAll Demo

Site	TN	IN	NH3	NO3	P	K	Zn	Cu	Pb	CD	C
Ave	5123	214	121	85	535	683	86.3	26	8.2	0.5	105330
Mass	5.123	0.21	0.12	0.085	0.53	0.68	0.09	0.03	0.01	0.001	105.3

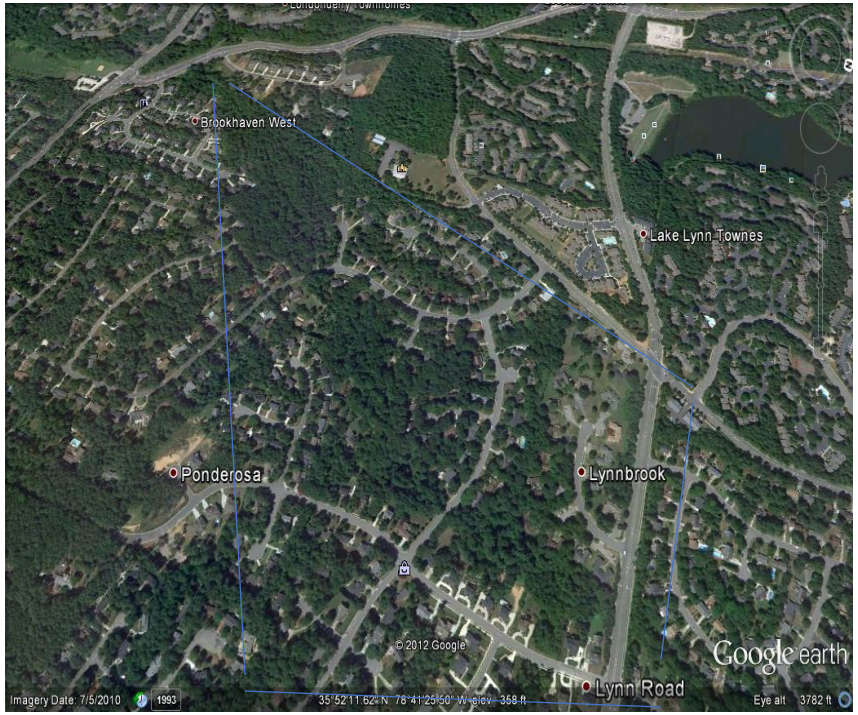
Immediate drainage area

- 2 basins in immediate area

3rd Order Stream to Snipe Creek

- 70 plus basins
- 50 in similar landscape
- Potential catchment significant
- Pollutant removal significant (as lb/yr)
  - 50,000 pounds organics
  - 750 pounds of N
  - 90 pounds of P

  - Vac-All requires 20 minutes per basin per year



Thank you

- A. R. Rubin
- NCSU-BAE
- Rubin@ncsu.edu