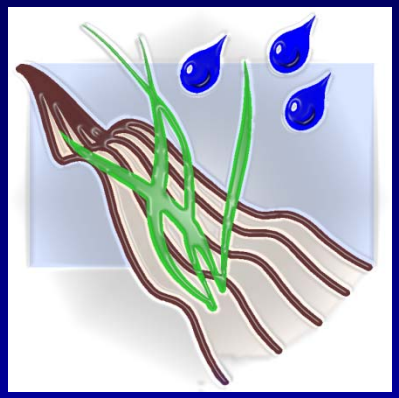


Revisions to the Delaware Sediment & Stormwater Regulations

RPv "Rewind"

Regulatory Advisory Committee Meeting

April 6, 2016

Kent County Administration Building


September 15, 2003
+
+
+
15
SEP
2003
-
-
-


WE
R DONE
BUY
US
OUT
9/15/03
12 NOOBS
HOMEOWNER
1 PM
HOMELESS


GLENVILLE, DE
SAYS
BUY US OUT!

"In the past four years NCC has been affected by three storm systems: Tropical Storm Henri (September 15, 2003), Tropical Storm Isabel (September 18, 2003) and Tropical Depression Jeanne (September 28, 2004). Tropical Storm Henri caused widespread damage to the community of Glenville spurring the largest housing purchase by State and County governments in Delaware's history due to storm damage: 171 homes were purchased just 8 months after the storm struck. Tropical Depression Jeanne spawned the first tornado New Castle County had seen in 15 years, ripping trees from the ground and severely damaging residential and business structures. Jeanne also initiated a buyout of the Newkirk Estates and Glendale communities. All in all, State and County governments spent over $34 million in two years to rectify storm damage."

Executive Order Number Sixty-Two
Establishing A Task Force On Surface Water Management

WHEREAS, in recent years, several areas of the State have been subject to chronic flooding and drainage problems; and

WHEREAS, such flooding and related problems can threaten the health, safety and welfare of our State's citizens, can damage private property, and can impose substantial costs on State and local governments, in the form of emergency response activities, property damage and infrastructure improvements; and

WHEREAS, it is appropriate to coordinate efforts within the State to ensure the best use of resources in enhancing flood prevention and control efforts and to develop a comprehensive strategy to address drainage and stormwater management issues.

NOW, THEREFORE, I, RUTH ANN MINNER, by virtue of the authority vested in me as the Governor of the State of Delaware, do hereby declare and order as follows:

1. The Task Force on Surface Water Management is created. Members of the Task Force shall include representatives of State and local governments and persons with special expertise on the issues of drainage, flood control and water management. Members of the Task Force shall be appointed by the Governor and serve at the Governor's pleasure.

2. The Task Force is directed to:

   a. Develop a statewide surface water management strategy to integrate drainage, flood control and stormwater management;

   b. Explore potential costs and funding sources for implementing a statewide surface water management strategy;

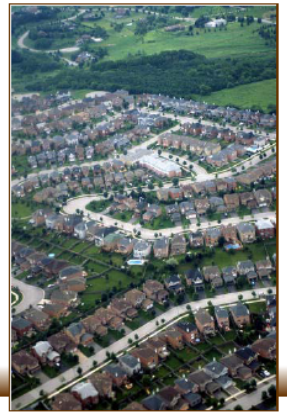
   c. Recommend appropriate changes to State or local laws, regulations and policies as appropriate;

   d. Recommend a statewide organizational structure to coordinate surface water management strategies and to respond to citizen, community and county needs;

   e. Integrate surface water management polices with federal and State clean water requirements; and

   f. Recommend strategies to preserve and enhance aquifer recharge, community, local government and State open space use and implement green infrastructure policies and goals, where applicable.

3. The Task Force is directed to submit its recommendations to me not later than April 1, 2005.



Governor Minner's Task Force on Surface Water Management

April 1, 2005

A report in response to Executive Order No. 62

Background

"The current stormwater regulations do not adequately address volume management of stormwater. This program deficiency has been recently addressed by surrounding states with new program requirements. **Increased emphasis on recharge and infiltration of stormwater** where technically and environmentally feasible, has to be endorsed by changes to the existing body of law."

Task Force on Surface Water Management

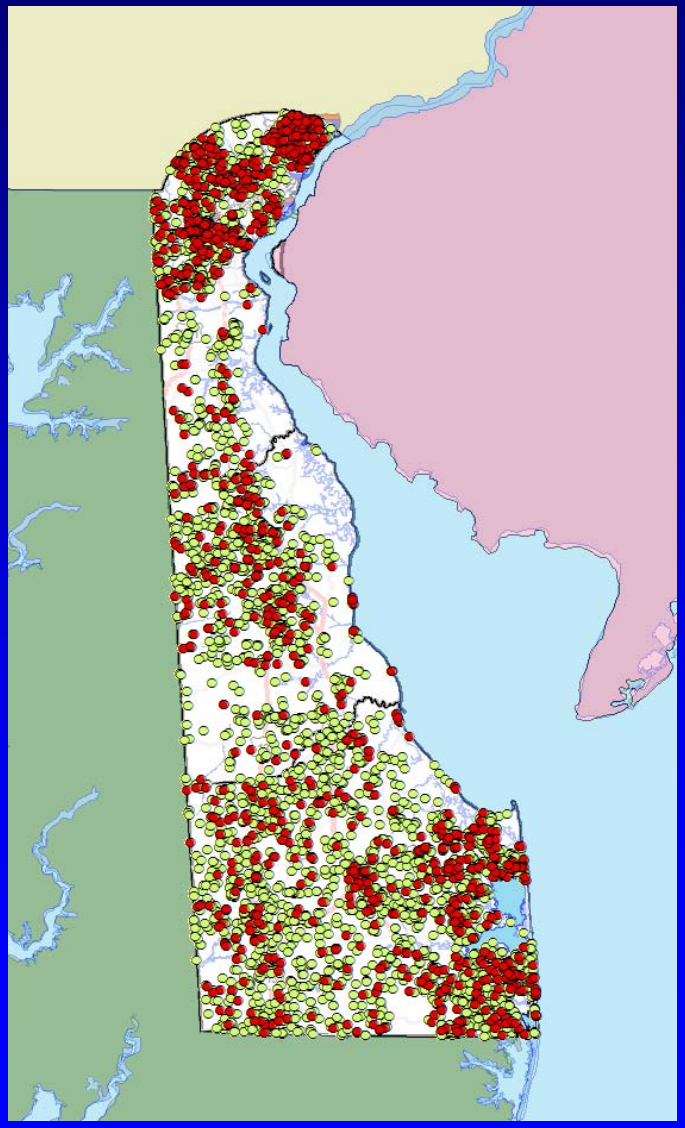
- Specific Recommendations for Drainage & Stormwater Section

Recommendation #2 (approved 3/17/05)

A central response unit coordinated by DNREC in conjunction with county or municipal utilities should be created for handling public calls related to drainage, stormwater, and flood control. A new process and response procedure for addressing **citizen complaints** related to stormwater facilities and flooding needs to be established. Citizens should be provided with a single point of contact.

Drainage & SW Assistance “Hotline”

Drainage & SW Assistance Database



- System went live August, 2007
- Over 7,500 complaints logged into system to date
- Avg. 800 complaints/yr

Recommendation #9 (approved 3/17/05)

"Design and engineering standards at the State level should be strengthened through a revision to the Sediment and Stormwater Regulations. **Minimum standards should address volume management**, conveyance adequacy, pollutant loadings, floodplain management, strict standards for operation and maintenance of structures and management areas."

Recommendation #25 (approved 3/24/05)

Aquifer recharge should be considered as part of the design, construction, operation, and maintenance of stormwater facilities.

Recharge of surface water in developed areas with impervious surfaces will result in reduction of overland runoff (surface water volume reduction), improved surface and ground-water quality, and increased base flows of streams.

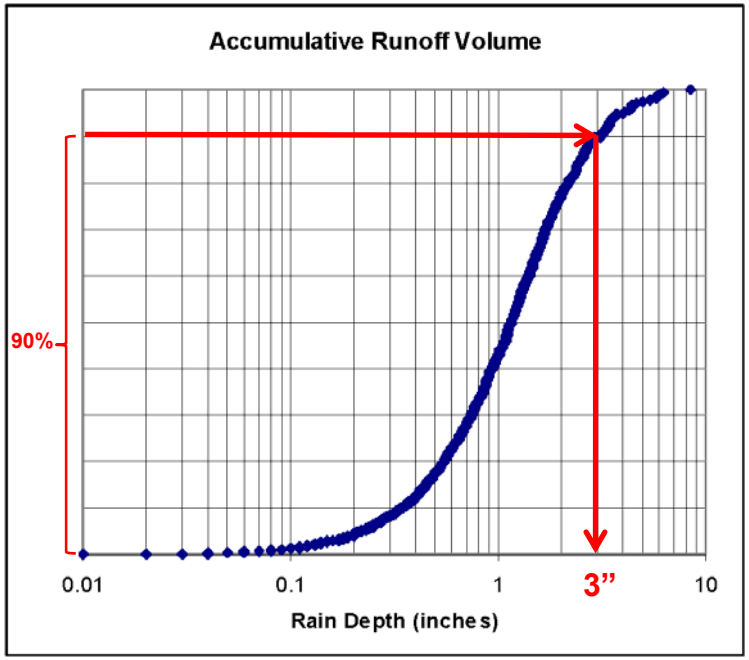
History of Reg Revisions

- Task Force Report – April 2005
- RAC first meeting – October 2007
- Tech Sub first meeting – February 2008

Problems w/old regs

- Pitt study; 90th percentile runoff event
- Pizzuto study
- Streams as main TSS source
  - USGS report

Pitt's Accumulative Runoff Curve *(2004)*



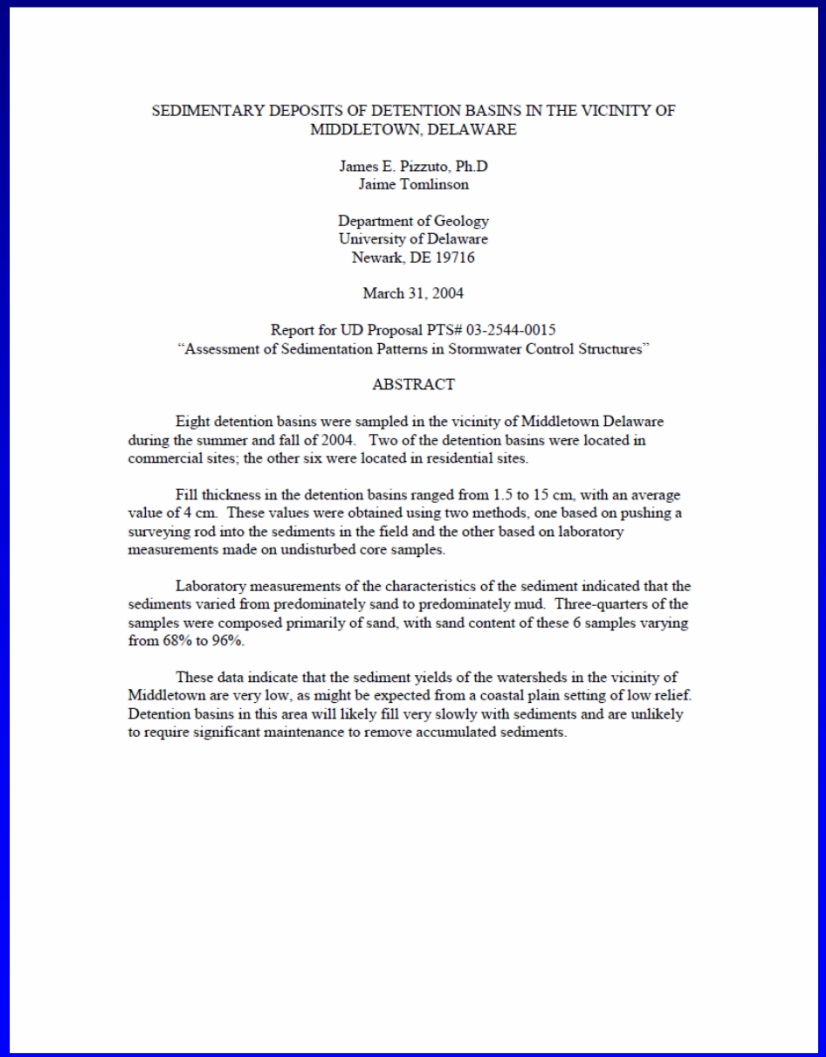
Plot showing accumulative runoff (100% full scale) against rain depth (Baltimore rains and typical medium density residential areas with silty soils).

- Based on WinSLAMM modeling of med. density residential site with silty soils using BWI rainfall
- Most of annual runoff associated with rainfall > 1"

90th Percentile Runoff Event = ~3"

Source: Pitt & Voorhees (2004)

UD Sedimentation Study *(2004)*



SEDIMENTARY DEPOSITS OF DETENTION BASINS IN THE VICINITY OF MIDDLETOWN, DELAWARE

James E. Pizzuto, Ph.D
Jaime Tomlinson

Department of Geology
University of Delaware
Newark, DE 19716

March 31, 2004

Report for UD Proposal PTS# 03-2544-0015
"Assessment of Sedimentation Patterns in Stormwater Control Structures"

ABSTRACT

Eight detention basins were sampled in the vicinity of Middletown Delaware during the summer and fall of 2004. Two of the detention basins were located in commercial sites; the other six were located in residential sites.

Fill thickness in the detention basins ranged from 1.5 to 15 cm, with an average value of 4 cm. These values were obtained using two methods, one based on pushing a surveying rod into the sediments in the field and the other based on laboratory measurements made on undisturbed core samples.

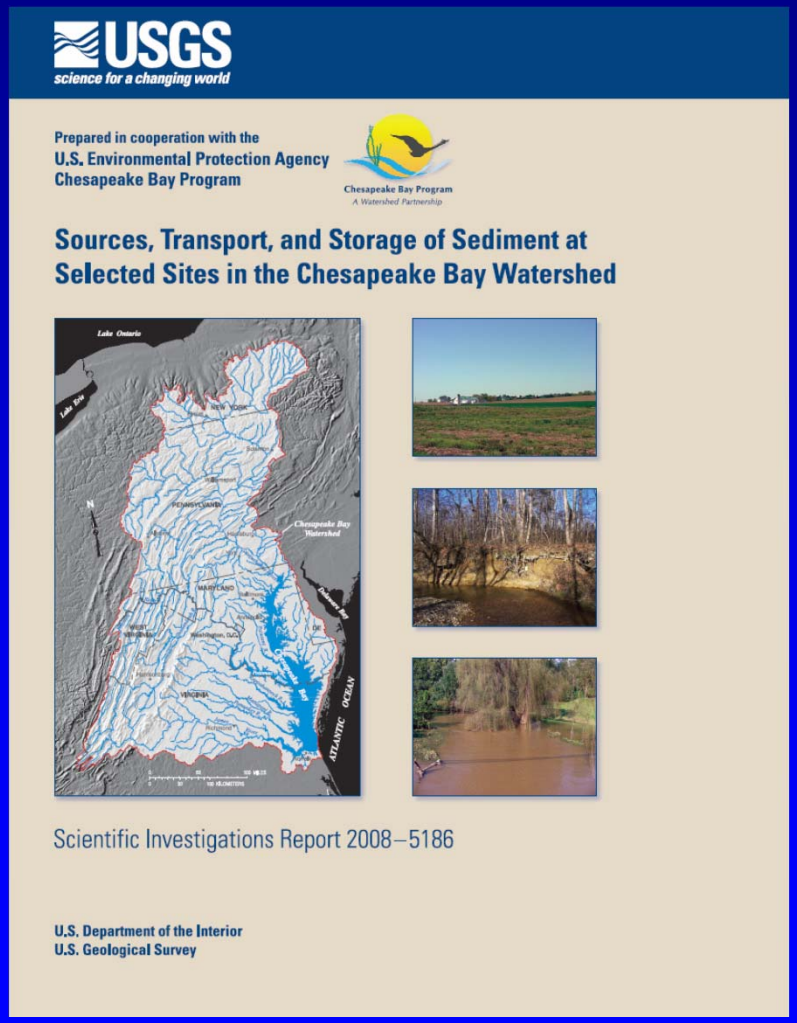
Laboratory measurements of the characteristics of the sediment indicated that the sediments varied from predominately sand to predominately mud. Three-quarters of the samples were composed primarily of sand, with sand content of these 6 samples varying from 68% to 96%.

These data indicate that the sediment yields of the watersheds in the vicinity of Middletown are very low, as might be expected from a coastal plain setting of low relief. Detention basins in this area will likely fill very slowly with sediments and are unlikely to require significant maintenance to remove accumulated sediments.

- 8 SWM detention basins in Middletown, DE
- "The data indicate that the thickness of sediment fill in the detention basins is remarkably small."

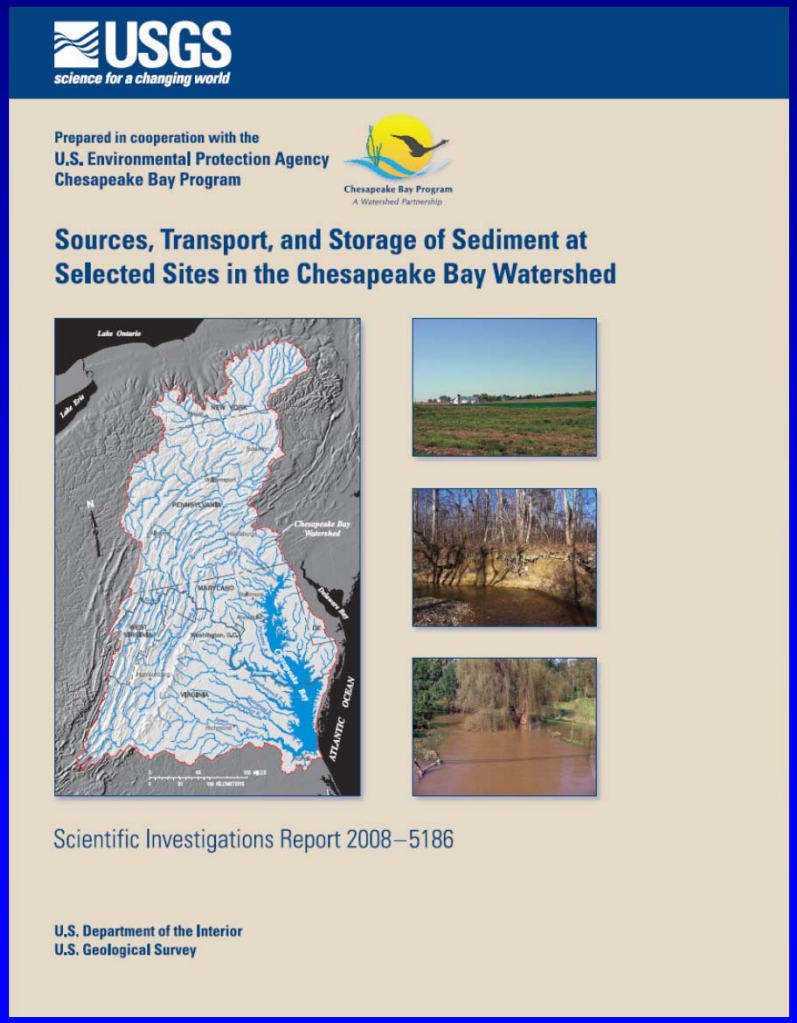

United States • DE • New Castle Co. • Middletown

USGS Chesapeake Bay Sediment Study *(2008)*



- Little Consestoga Creek WS (Piedmont MD)
- Mixed Land Use (Ag, Urban)
- Major Sediment Sources
  - Cropland (37%)
  - **Streambanks (63%)**

USGS Chesapeake Bay Sediment Study *(2008)*



- Mattawan Creek WS (Coastal Plain MD)
- Mixed Land Use (Forest, Ag, Urban)
- Major Sediment Sources
  - Cropland (17%)
  - Construction (25%)
  - Forest (29%)
  - **Streambanks (30%)**

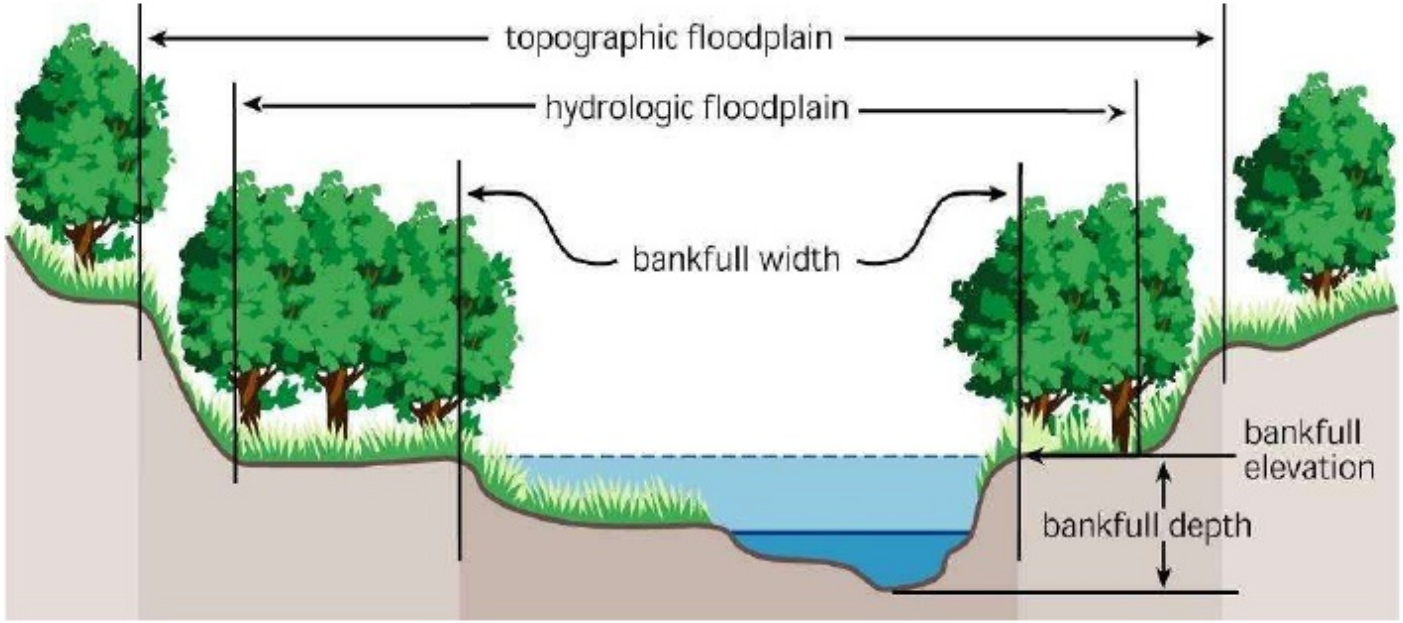
Significance of bankfull discharge

- USFW reports; Piedmont/Coastal Plain
- D. Smith Study

Bankfull Discharge

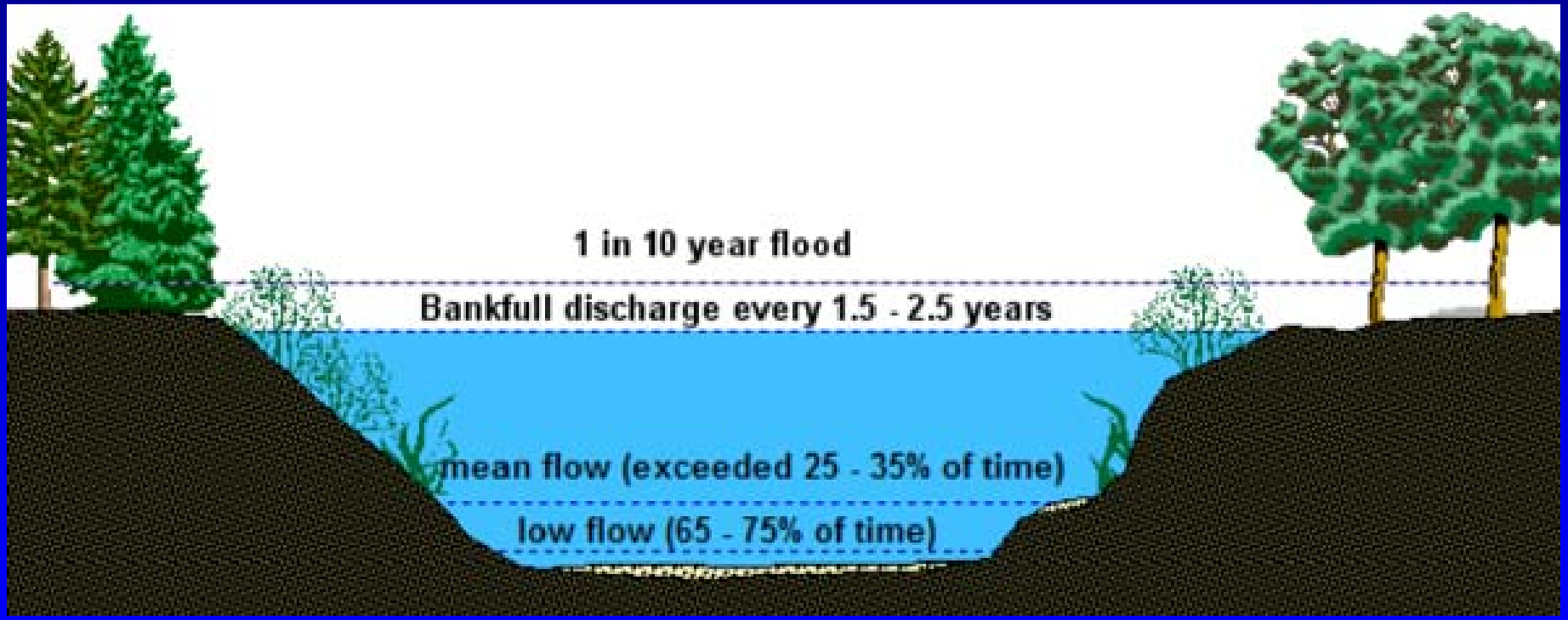
Bankfull Stage

"corresponds to the discharge at which channel maintenance is the most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work results in the average morphologic characteristics" *(Dunne and Leopold, 1978)*

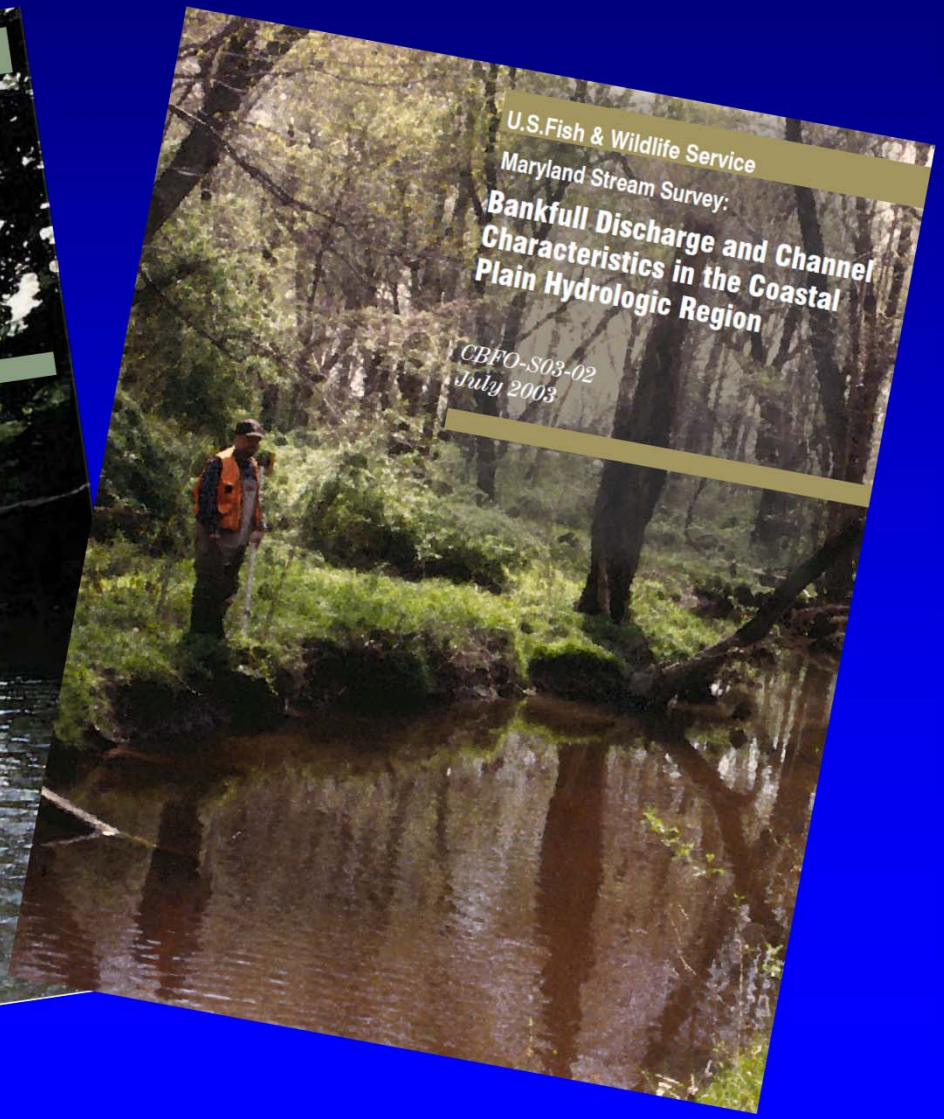


Stream Corridor Restoration: Principles, Processes, and Practices. 1998. Federal Interagency Stream Restoration Working Group.

Bankfull Discharge



USFW Bankfull Discharge Studies *(2002 & 2003)*



USFW Bankfull Discharge Studies *(Piedmont MD)*

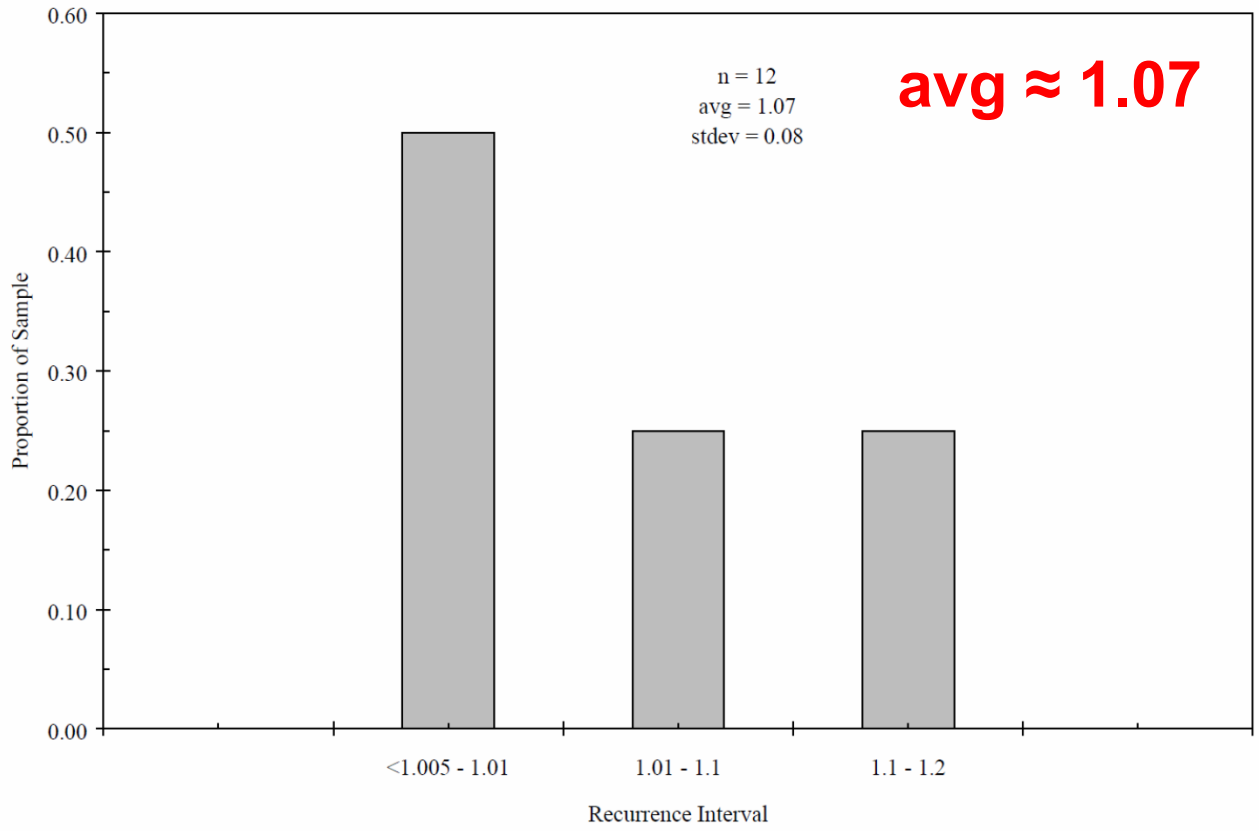


Figure 15. Recurrence intervals for field-observed active channel or inner berm.

USFW Bankfull Discharge Studies *(Coastal Plain MD & DE)*

Table 3. Coastal Plain survey sites - Rosgen stream classification delineative values.

USGS Gage Site	Entrenchment Ratio	Width/Depth Ratio	Sinuosity	Water Surface Slope	Meander Width Ratio	D_{50} (mm)	Particle	Rosgen Stream Type
Beaverdam Branch at Houston, DE	23.5	10.4	1.1	0.0007	37	0.27	medium sand	E5
Choptank River near Greensboro, MD	10.4	24.7	1.3	0.0003	14	0.41	medium sand	C5c-
Faulkner Branch at Federalsburg, MD	19.6	9.8	1.3	0.0023	12	0.64	coarse sand	E5
Glebe Branch at Valley Lee, MD	6.5	10.3	1.1	0.0100	21	6.93	fine gravel	C4
Gravel Run at Beulah, MD	22.5	9.6	1.1	0.0014	22	0.14	fine sand	E5
Mattawoman Creek near Pomonkey, MD	36.5	11.5	1.4	0.0014	44	13.21	medium gravel	C4
Mill Creek near Skipton, MD	8.1	26.5	1.2	0.0013	9	0.33	medium sand	C5
Murderkill River near Felton, DE	29.9	14.6	1.3	0.0004	7	1.00	very coarse sand	C5c-
Nanticoke River near Bridgeville, DE	48.3	13.6	1.2	0.0004	4	0.32	medium sand	C5c-
Nassawango Creek near Snow Hill, MD	23.6	11.9	1.5	0.0003	11	0.67	coarse sand	E5
Sallie Harris Creek near Carmichael, MD	14.0	5.9	1.2	0.0002	30	0.19	fine sand	E5
St. Clements Creek near Clements, MD	18.3	9.8	1.1	0.0010	13	0.26	medium sand	E5
St. Mary's River at Great Mills, MD	2.9	12.4	1.4	0.0014	30	13.11	medium gravel	C4
Western Branch at Upper Marlboro, MD	3.2	11.9	1.2	0.0002	17	0.25	medium sand	C5c-

USFW Bankfull Discharge Studies *(Coastal Plain MD & DE)*

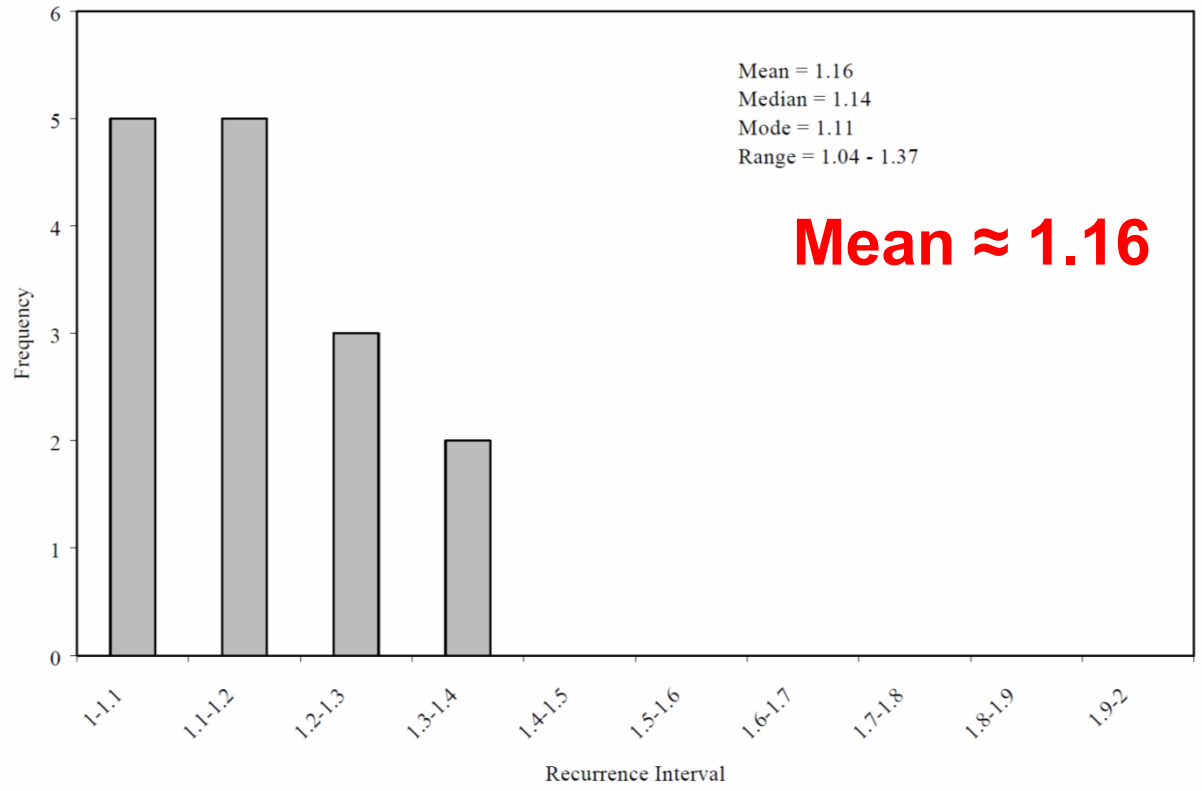
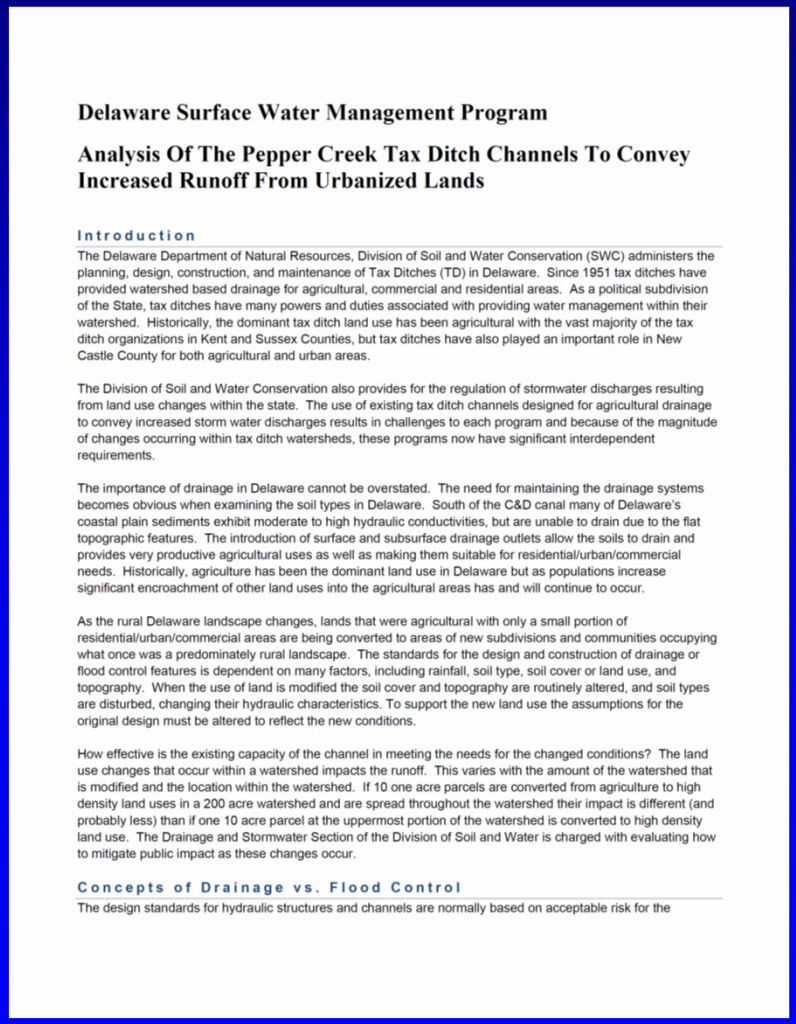


Figure 11. Frequency of recurrence interval for field-estimated bankfull discharge.

Ayers Study – Pepper Creek TD *(D. Smith, 2008)*



Delaware Surface Water Management Program

Analysis Of The Pepper Creek Tax Ditch Channels To Convey Increased Runoff From Urbanized Lands

Introduction

The Delaware Department of Natural Resources, Division of Soil and Water Conservation (SWC) administers the planning, design, construction, and maintenance of Tax Ditches (TD) in Delaware. Since 1951 tax ditches have provided watershed based drainage for agricultural, commercial and residential areas. As a political subdivision of the State, tax ditches have many powers and duties associated with providing water management within their watershed. Historically, the dominant tax ditch land use has been agricultural with the vast majority of the tax ditch organizations in Kent and Sussex Counties, but tax ditches have also played an important role in New Castle County for both agricultural and urban areas.

The Division of Soil and Water Conservation also provides for the regulation of stormwater discharges resulting from land use changes within the state. The use of existing tax ditch channels designed for agricultural drainage to convey increased storm water discharges results in challenges to each program and because of the magnitude of changes occurring within tax ditch watersheds, these programs now have significant interdependent requirements.

The importance of drainage in Delaware cannot be overstated. The need for maintaining the drainage systems becomes obvious when examining the soil types in Delaware. South of the C&D canal many of Delaware's coastal plain sediments exhibit moderate to high hydraulic conductivities, but are unable to drain due to the flat topographic features. The introduction of surface and subsurface drainage outlets allow the soils to drain and provides very productive agricultural uses as well as making them suitable for residential/urban/commercial needs. Historically, agriculture has been the dominant land use in Delaware but as populations increase significant encroachment of other land uses into the agricultural areas has and will continue to occur.

As the rural Delaware landscape changes, lands that were agricultural with only a small portion of residential/urban/commercial areas are being converted to areas of new subdivisions and communities occupying what once was a predominately rural landscape. The standards for the design and construction of drainage or flood control features is dependent on many factors, including rainfall, soil type, soil cover or land use, and topography. When the use of land is modified the soil cover and topography are routinely altered, and soil types are disturbed, changing their hydraulic characteristics. To support the new land use the assumptions for the original design must be altered to reflect the new conditions.

How effective is the existing capacity of the channel in meeting the needs for the changed conditions? The land use changes that occur within a watershed impacts the runoff. This varies with the amount of the watershed that is modified and the location within the watershed. If 10 one acre parcels are converted from agriculture to high density land uses in a 200 acre watershed and are spread throughout the watershed their impact is different (and probably less) than if one 10 acre parcel at the uppermost portion of the watershed is converted to high density land use. The Drainage and Stormwater Section of the Division of Soil and Water is charged with evaluating how to mitigate public impact as these changes occur.

Concepts of Drainage vs. Flood Control

The design standards for hydraulic structures and channels are normally based on acceptable risk for the

- "It appears that the Pepper Creek Tax Ditch channels have a bank full capacity near the **1-year peak flows**"

Ayers Study – Pepper Creek TD *(D. Smith, 2009)*

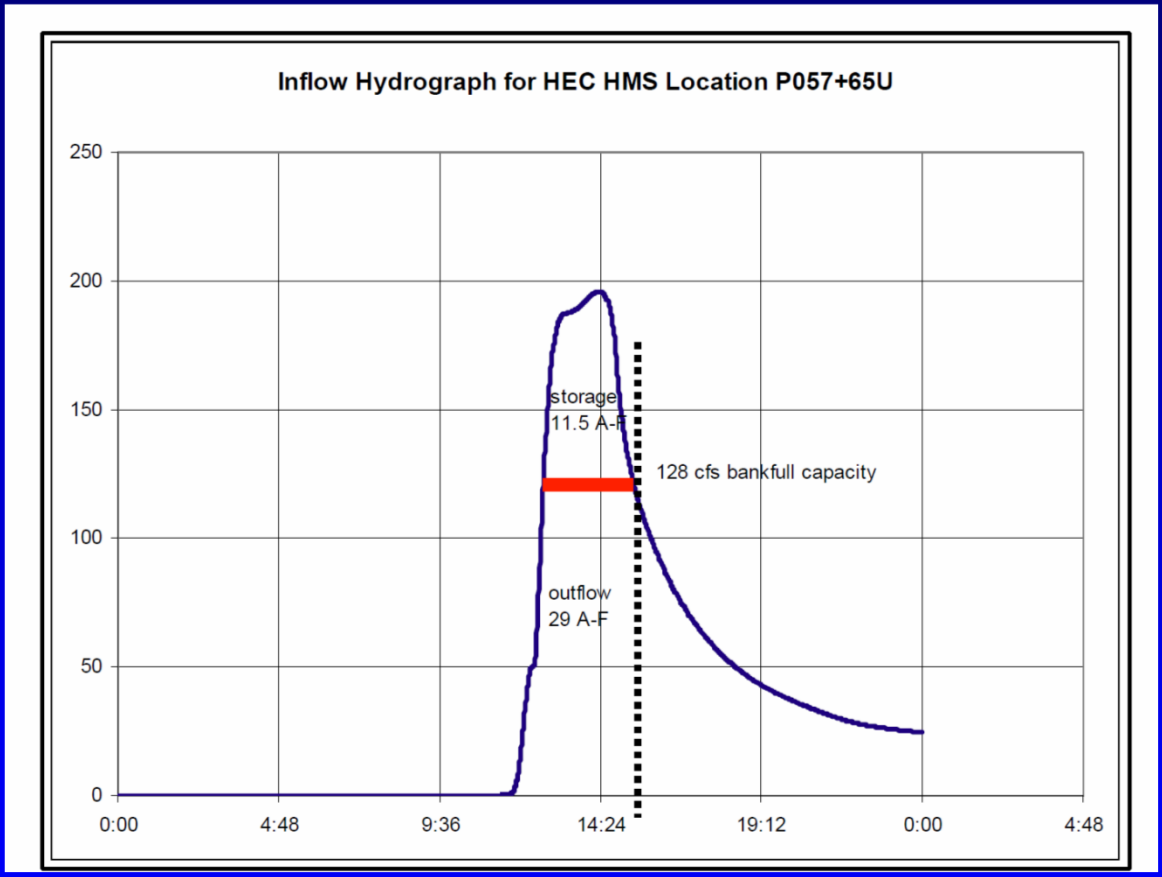
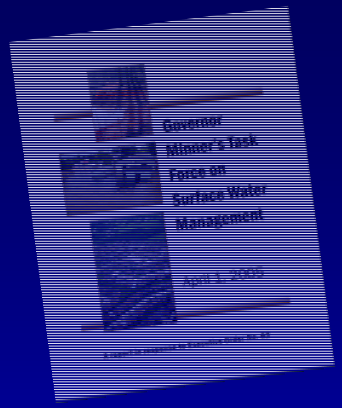


Fig. 4 – Inflow hydrograph showing the minimum **1-year storm** runoff volume that would have to be stored to prevent exceeding the bank full capacity of the channel at location P057+65U, **Pepper Creek upstream of Prong 13**.

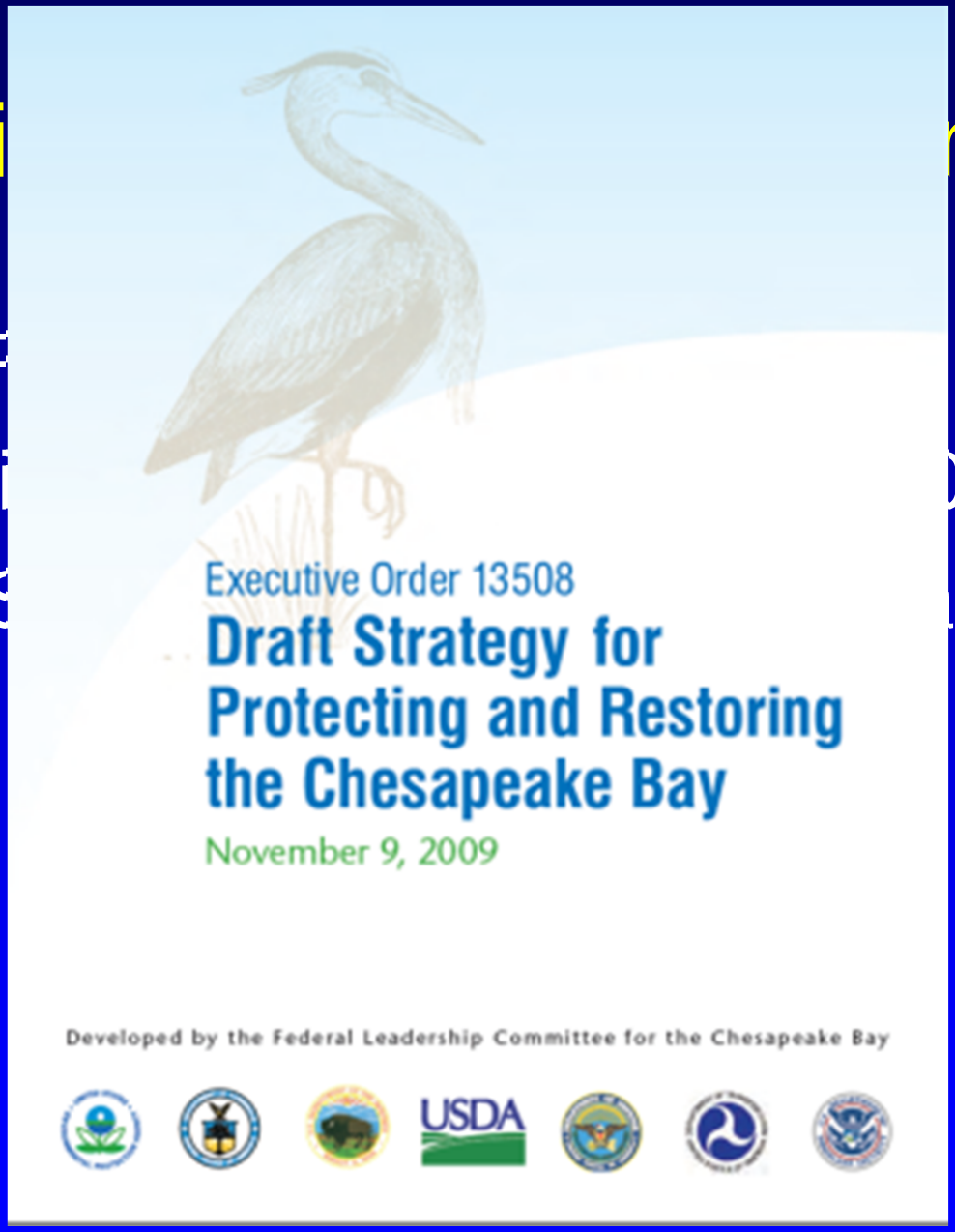
Tie-in w/TMDLs

- CB TMDL Executive Order
- Pollutant load reduction vs RR analysis



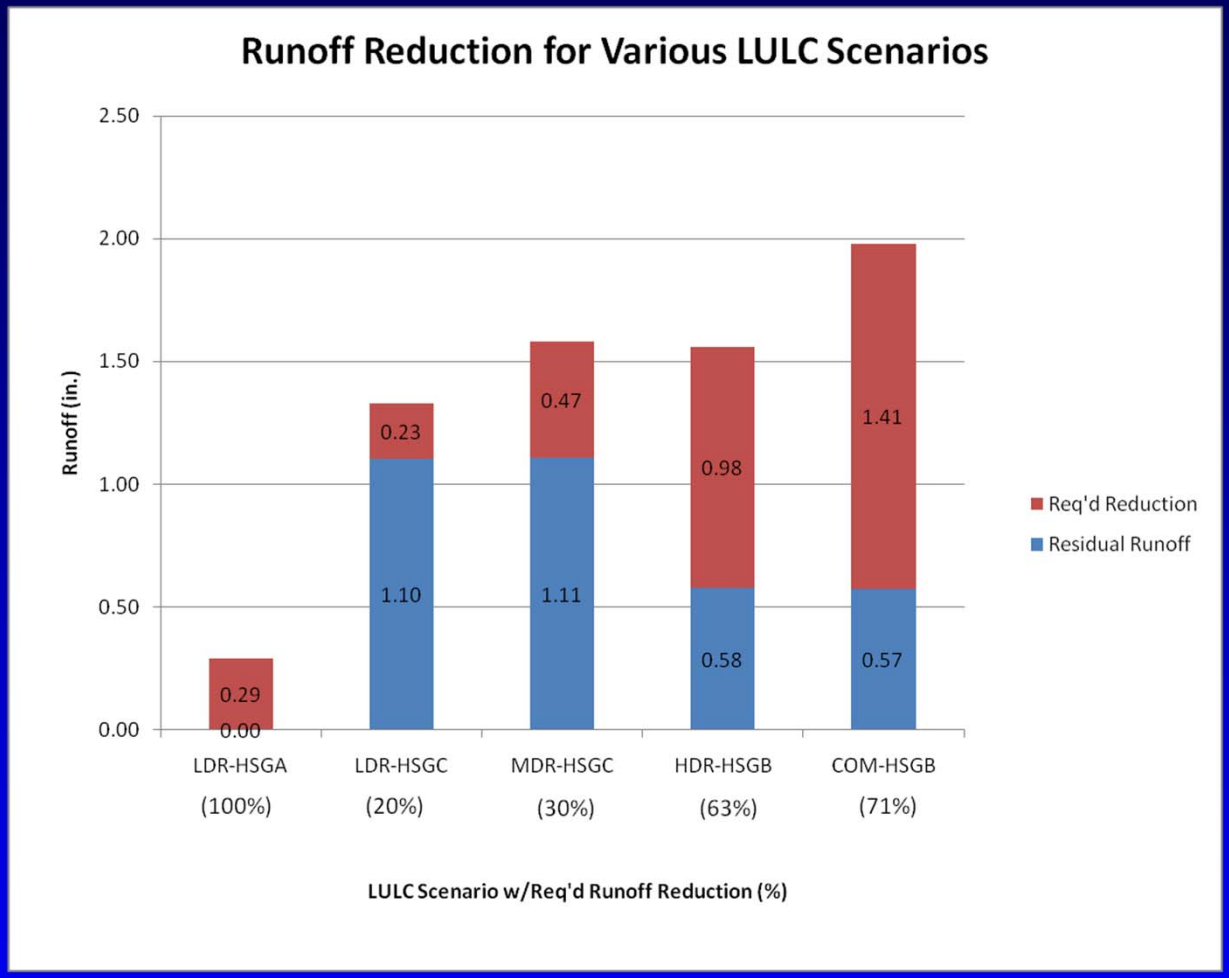
Hi ns

- Task F
- RAC fi 07
- Tech S ry 2008



Total Maximum Daily Load

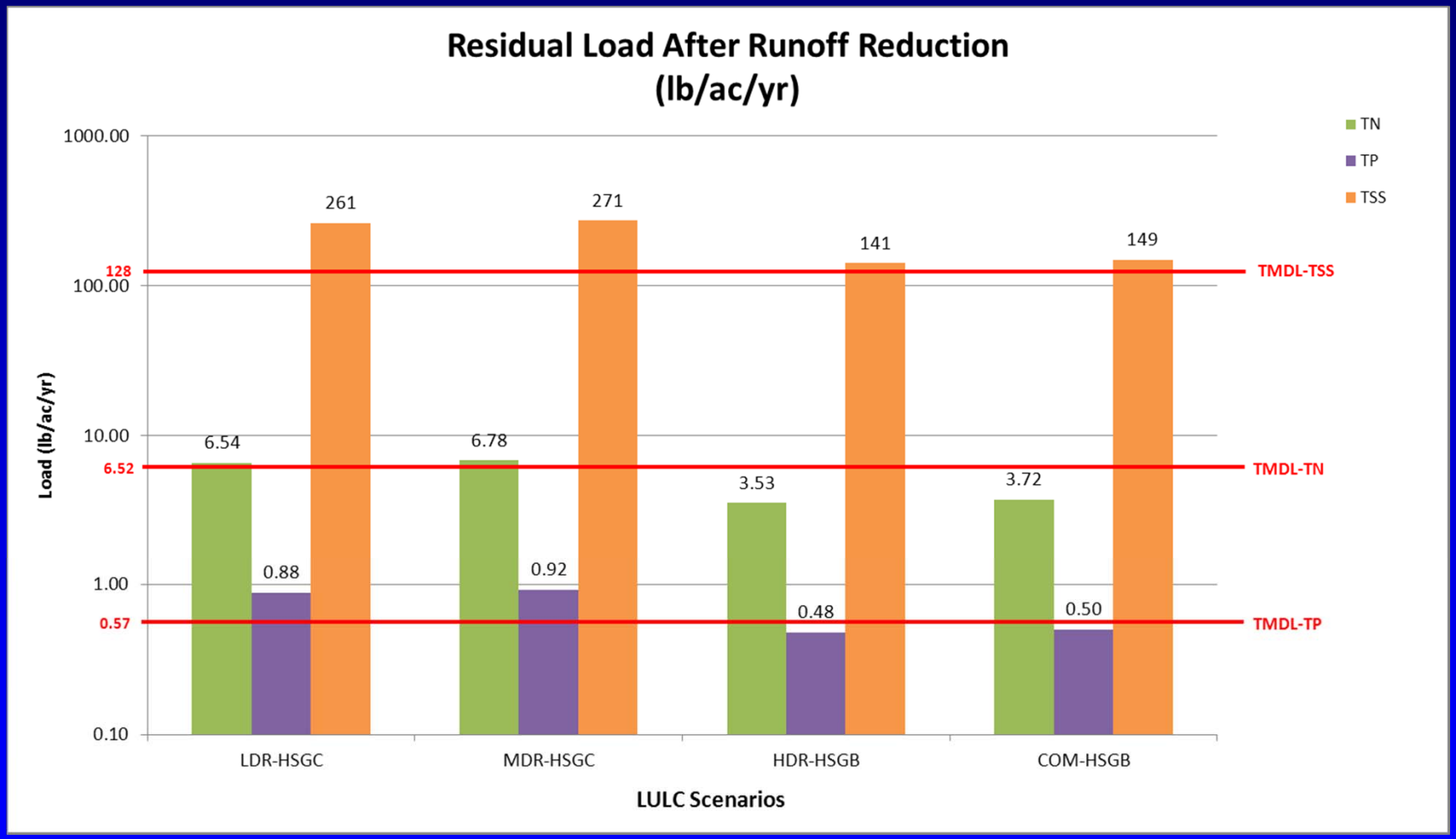
- *(def)* – the total pollutant loading that a waterbody can receive and still meet water quality standards
- For stormwater runoff, typically measured as an **annual load**



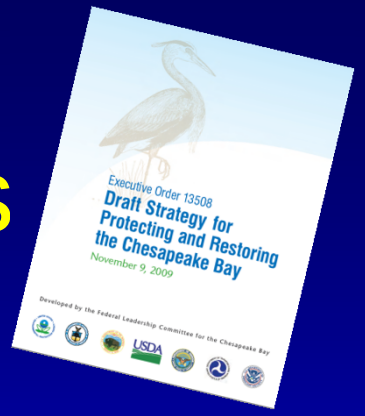
Key

LDR-HSGA: Low Density Residential, 20% Imp., HSG A
LDR-HSGC: Low Density Residential, 20% Imp., HSG C
MDR-HSGC: Medium Density Residential, 40% Imp., HSG C
HDR-HSGB: High Density Residential, 60% Imp., HSG B
COM-HSGB: Commercial, 80% Imp., HSG B

w/Minimum Runoff Reduction



History of Reg Revisions



- Task Force Report – April 2005
- RAC first meeting – October 2007
- Tech Sub first meeting – February 2008
- Chesapeake Bay TMDL – November 2009

Theory vs. Reality

- Local evidence of hydrologic impacts
  - NCCD photos
  - Tax ditch photos

“Reality Check”

Evidence of Hydrologic Impacts

Evidence of Hydrologic Impacts

Evidence of Hydrologic Impacts

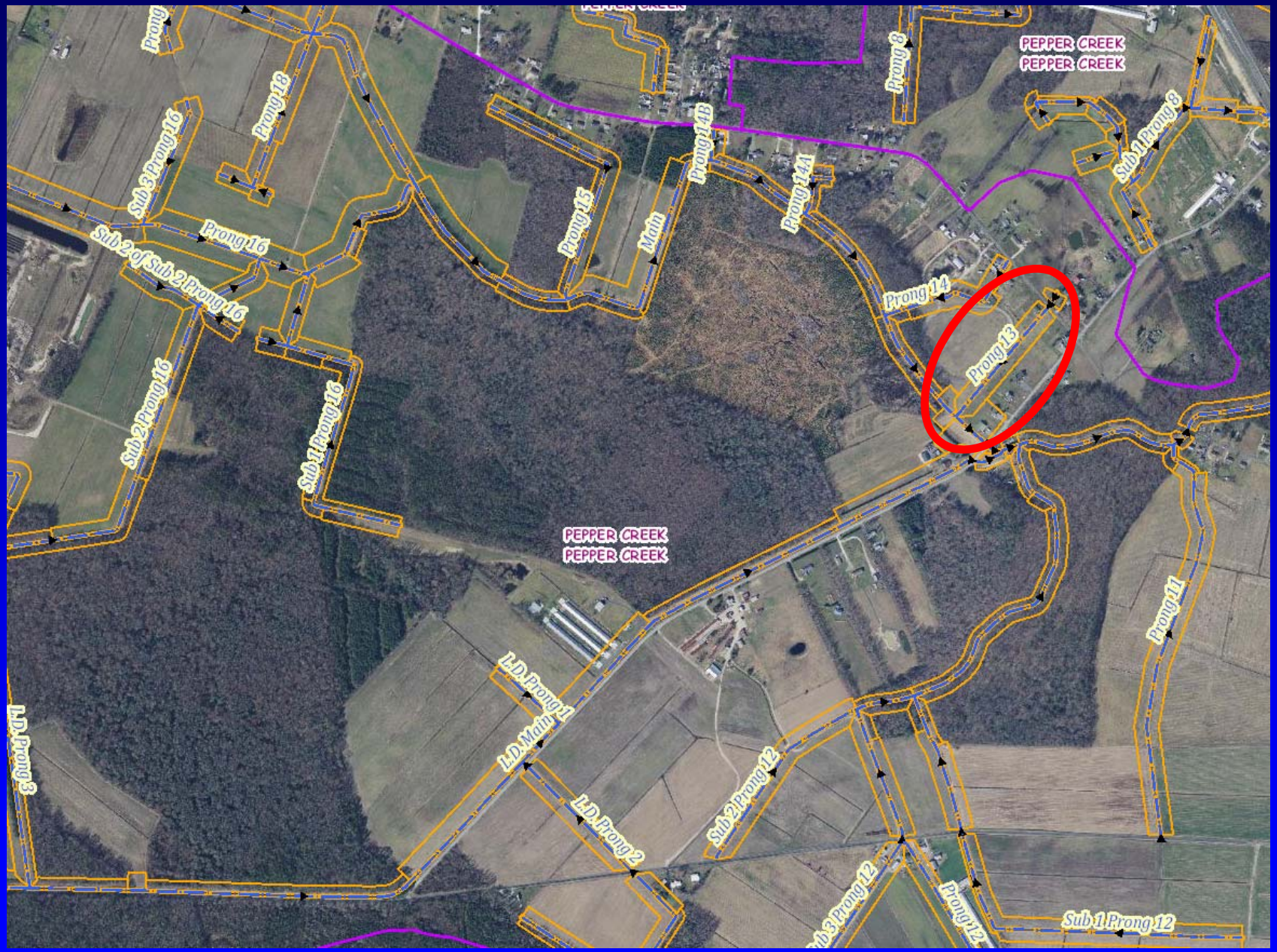
Evidence of Hydrologic Impacts

Pepper Creek

- Historic aerial photos at Prong 13
- Complaints database image
- Streetview image upstream/downstream conveyance channel

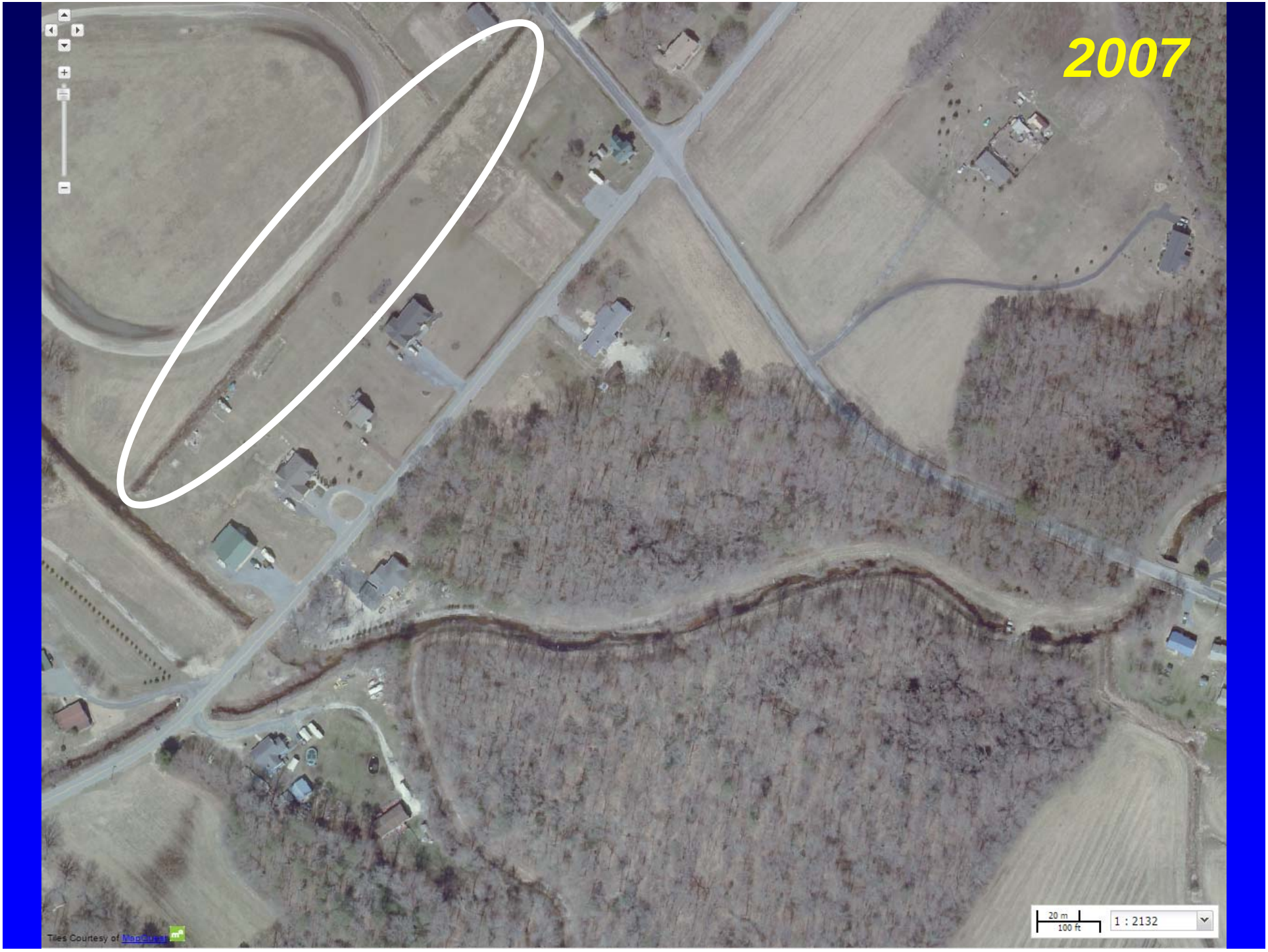
Pepper Creek TD
“Virtual Tour”

Dagsboro →


PEPPER CREEK
PEPPER CREEK
Prong 8
Sub 1 Prong 8
Prong 14B
Prong 14A
Prong 15
Main
Prong 18
Sub 3 Prong 16
Prong 16
Sub 2 of Sub 2 Prong 16
Sub 2 Prong 16
Sub 1 Prong 16
Prong 14
Prong 13
PEPPER CREEK
PEPPER CREEK
Prong 11
L.D. Prong 1
L.D. Main
L.D. Prong 3
L.D. Prong 2
Sub 2 Prong 12
Sub 3 Prong 12
Prong 12
Sub 1 Prong 12


1937
20 m
100 ft
1 : 2132
Tiles Courtesy of MapQuest


1992
20 m
100 ft
1 : 2132
Tiles Courtesy of MapQuest

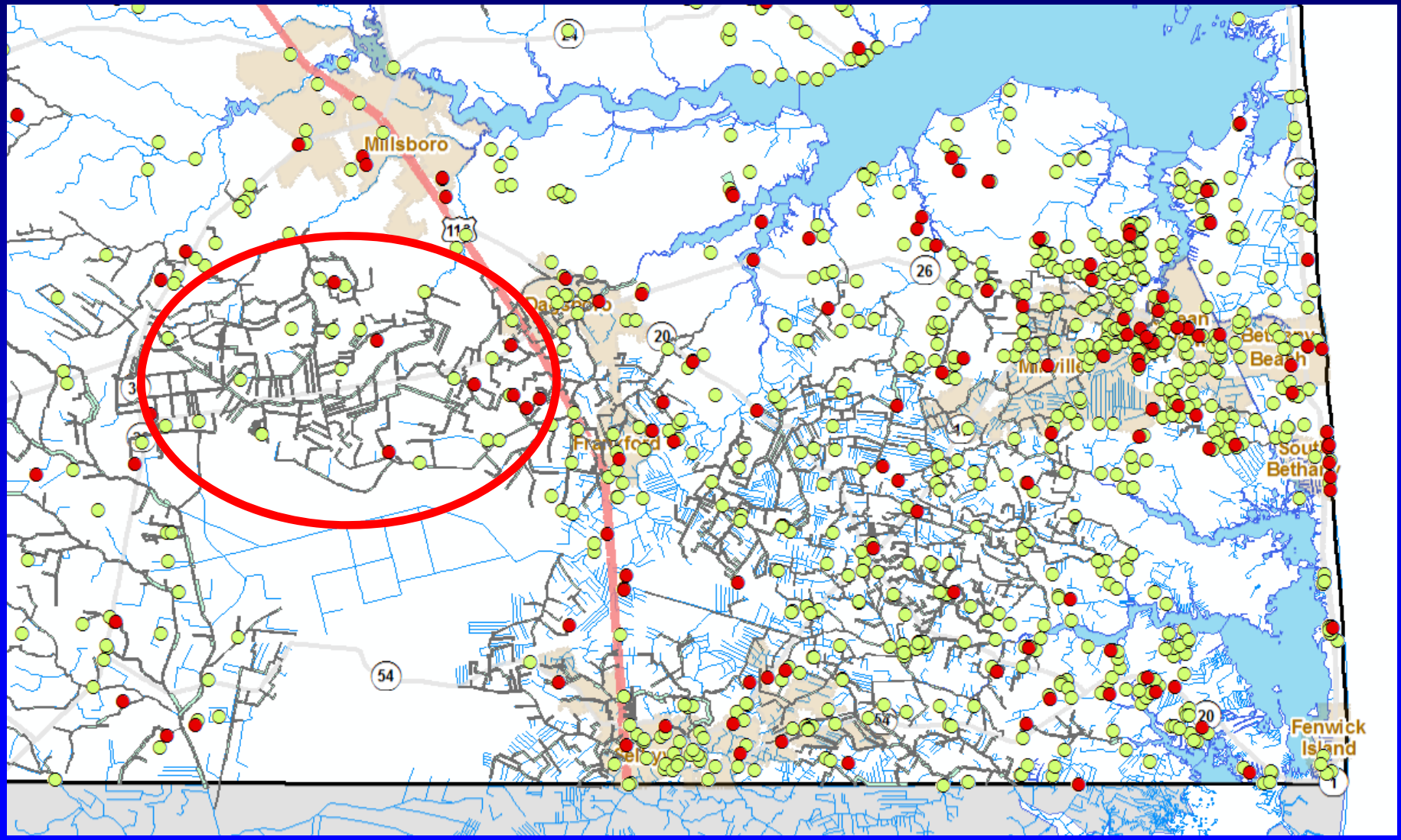

2007
20 m
100 ft
1 : 2132
Tiles Courtesy of MapQuest

Virtual Tour of Pepper Creek TD

“The Future”

- Complaints database stats
- Complaints database image of Ocean View area

Drainage & SW Assistance Database



Return Period vs. Exceedance Probability

- 100-YR = 1% Prob.
- 10-YR = 10% Prob.
- **1-YR = 99.9% Prob.**

RPv Goals

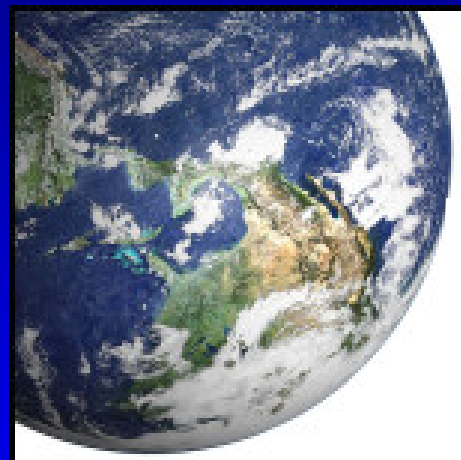
RPv Goals


12 NOOBZ
HOME OWNER
9/15/03 1 PM
HOMELESS
WE
R DONE
BUY
US
OUT


MILL
GLENVILLE, DE
SAYS
BUY US OUT!

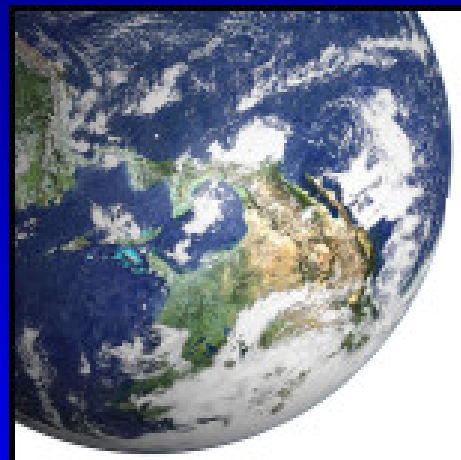
RPv Goals

RPv Goals



It's the HYDROLOGY!!!

QUESTIONS???



It's the

HYDROLOGY!!!