Illicit Discharge Detection & Elimination

Water Quality Advisory Group

Lori Lilly

Watershed Ecologist/Planner

Center for Watershed Protection

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Center for Watershed Protection

National non-profit 501(c)3, non-advocacy organization
Mission: to protect, restore, and enhance our streams, rivers, lakes, wetlands, and bays.

Provides technical assistance and tools to watershed groups, local, state, and federal governments
20 staff in MD, VA, & NY

www.cwp.org
www.forestsforwatersheds.org
www.cbstp.org
www.awsps.org

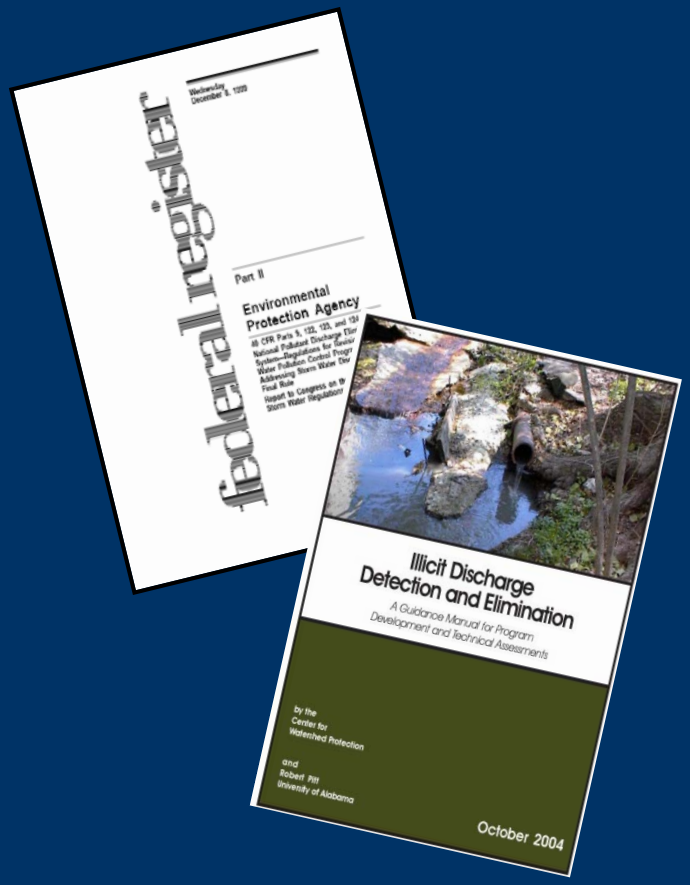
What is an Illicit Discharge?

- A discharge to an MS4 that is not composed entirely of storm water except permitted discharges and fire fighting related discharges
  40 CFR 122.26(b)(2)

- Unique frequency, composition & mode of entry
- Interaction of the sewage disposal system & the storm drain system
- Produced from “generating sites”

Regulatory Context

- Illicit discharges are regulated under Phase II MS4 permits as one of the six Minimum Measures
- Communities must develop a means for regulating illicit discharges, a plan to address them, education strategies and measurable goals



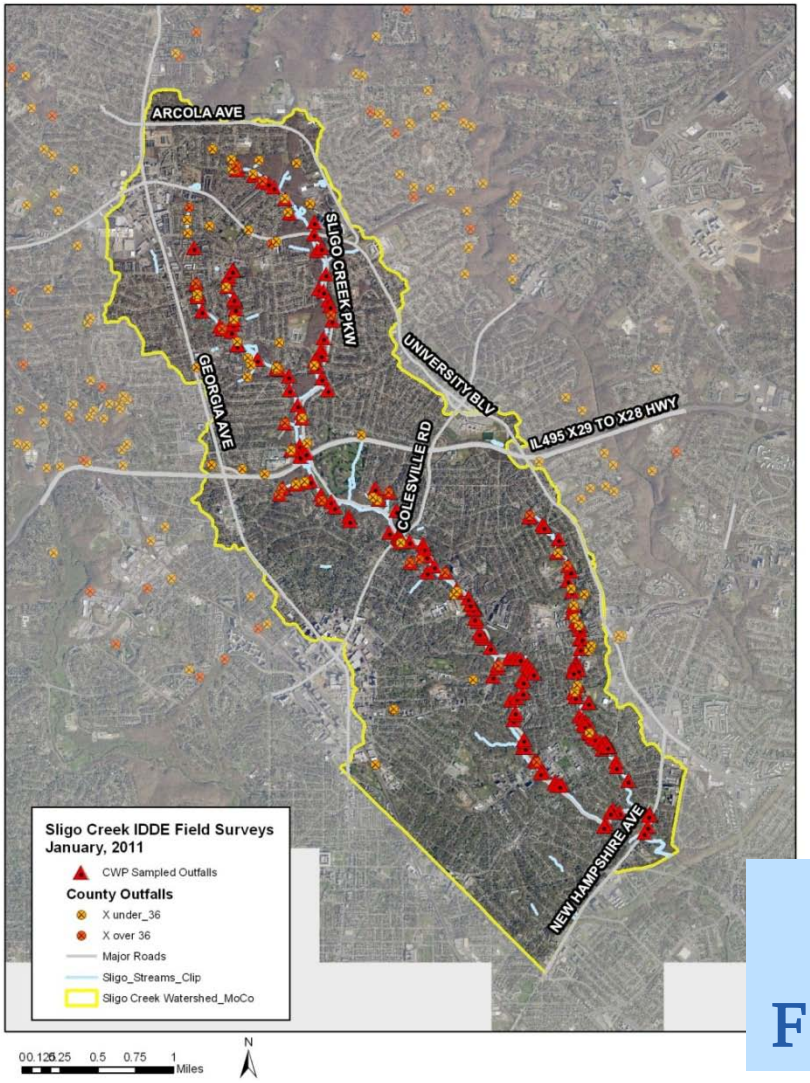
Sources of Illicit Discharges (Reported in Phase I Communities)

- Illegal dumping practices (95%)
- Broken sanitary sewer line (81%)
- Cross-connections (71%)
- Connection of floor drains to storm sewer (62%)
- Sanitary sewer overflows (52%)
- Inflow / infiltration (48%)
- Straight pipe sewer discharge (38%)
- Failing septic systems (33%)
- Improper RV waste disposal (33%)
- Pump station failure (14%)

Sewage Discharges

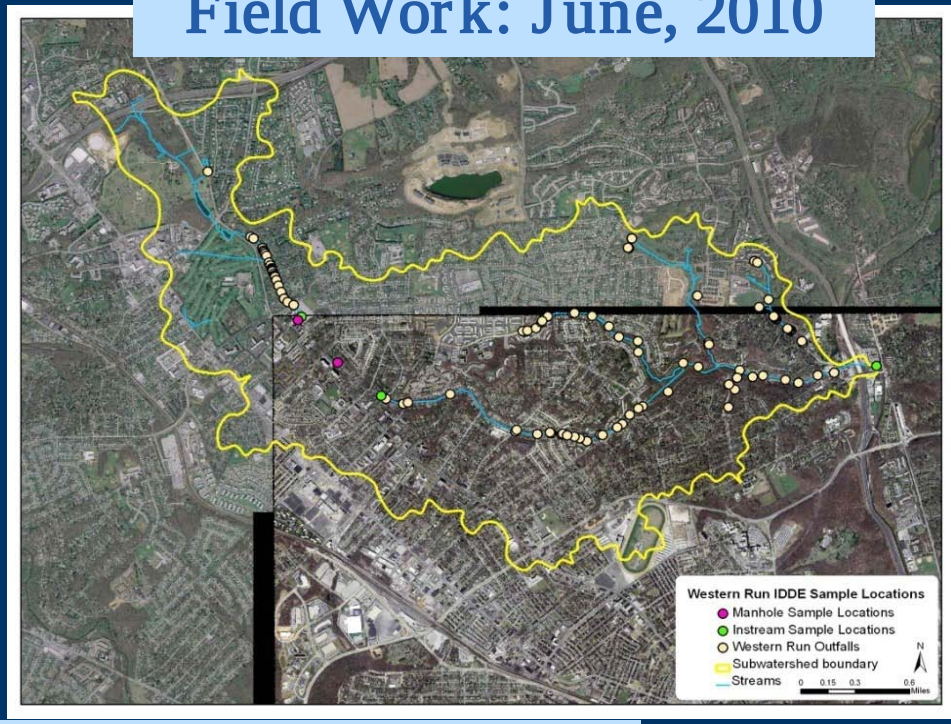
- In urban areas, these may be a bigger problem than previously realized
- Baltimore has spent millions on wet weather repairs to address SSOs – the repairs have had little effect on dry weather water quality (CWP 2011)
- Kaushel et al (2011) found that sewage was the predominant source of nitrogen load during baseflow, even after repairs to the wastewater system were complete

Watershed-scale Studies



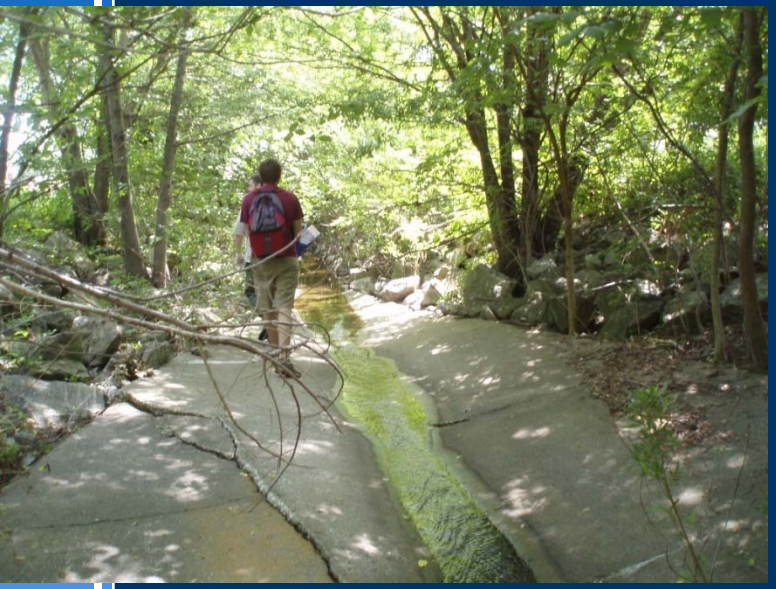
Western Run (5.4 sq mi)

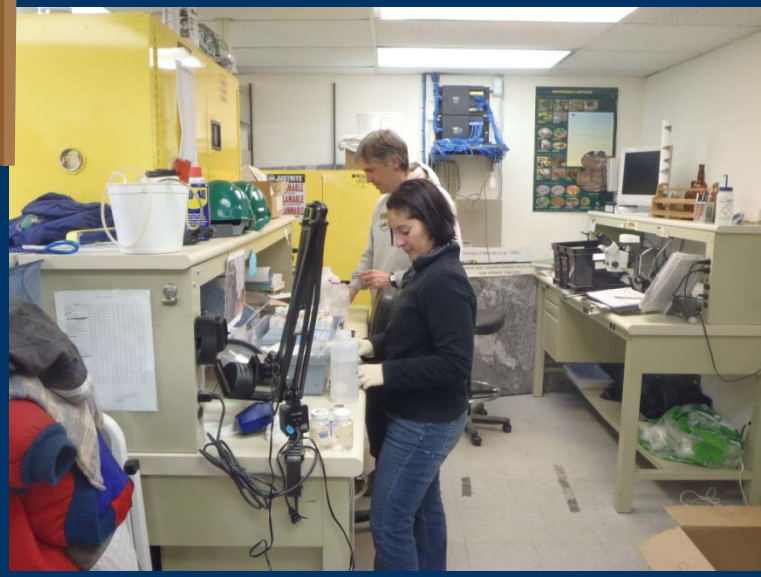
Field Work: June, 2010



Sligo Creek (9.6 sq mi)

Field work: January, 2011



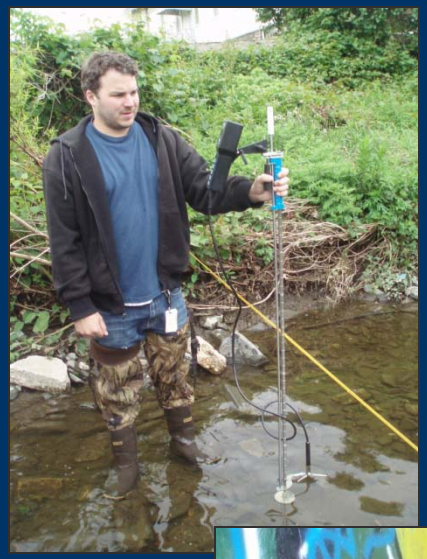


Outfall Reconnaissance Inventory (ORI) Qualitative Assessment

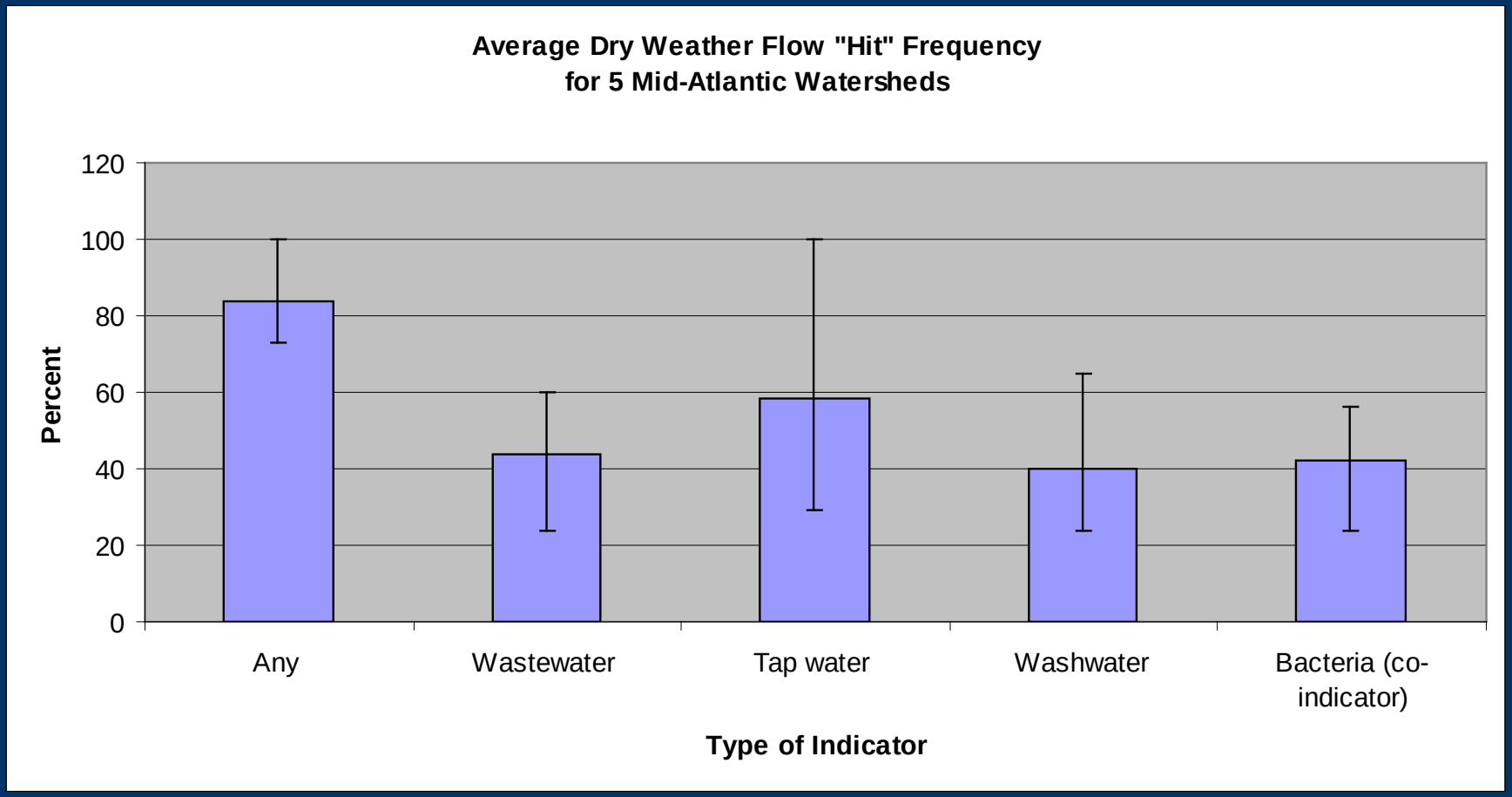
- Outfall Damage
- Deposits/Stains
- Abnormal Vegetation
- Poor Pool Quality
- Pipe Benthic Growth

Outfall Reconnaissance Inventory (ORI) Quantitative Assessment

	Parameters Analyzed
In the field	Ammonia
Sample 1	Fluoride
	Anionic Surfactants
	Potassium
Sample 2	Total Nitrogen
	Total Phosphorus
Sample 3	E. coli and Total coliform



Recent studies: 27-40% of outfalls have dry weather flow



Sligo Field Work Summary

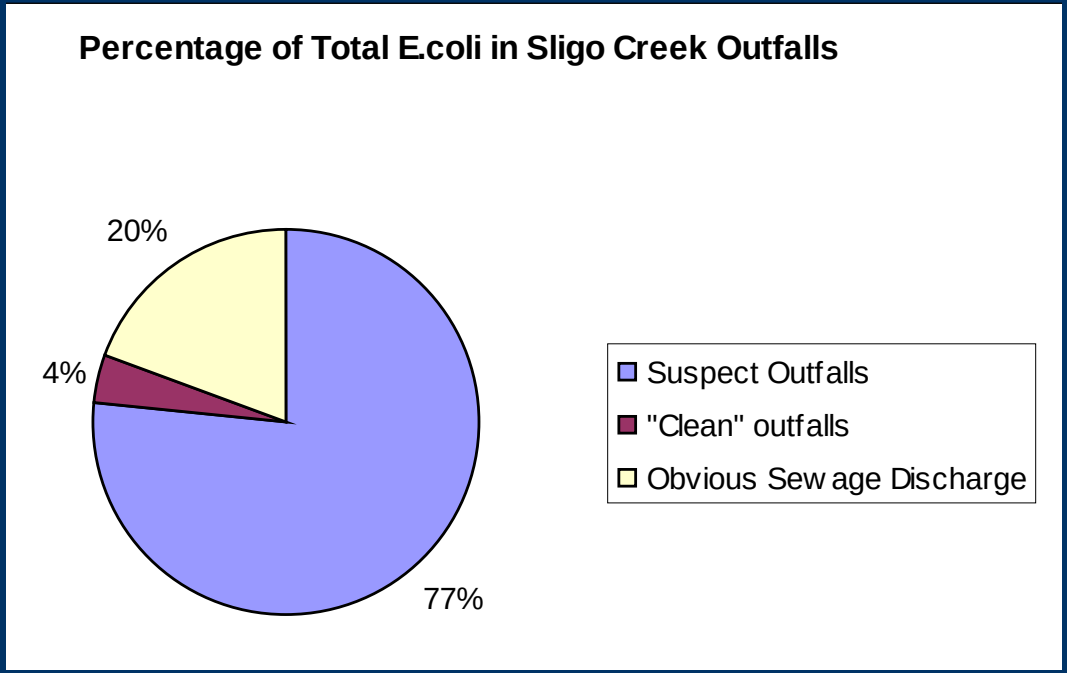
- Four days in the field throughout January, 2011
- 10 miles walked in Sligo Creek in Montgomery County
- 213 outfalls assessed
- 4 In-stream measurements
- 14 volunteers contributed 114 hours over field sampling period

Sligo Outfall Summary

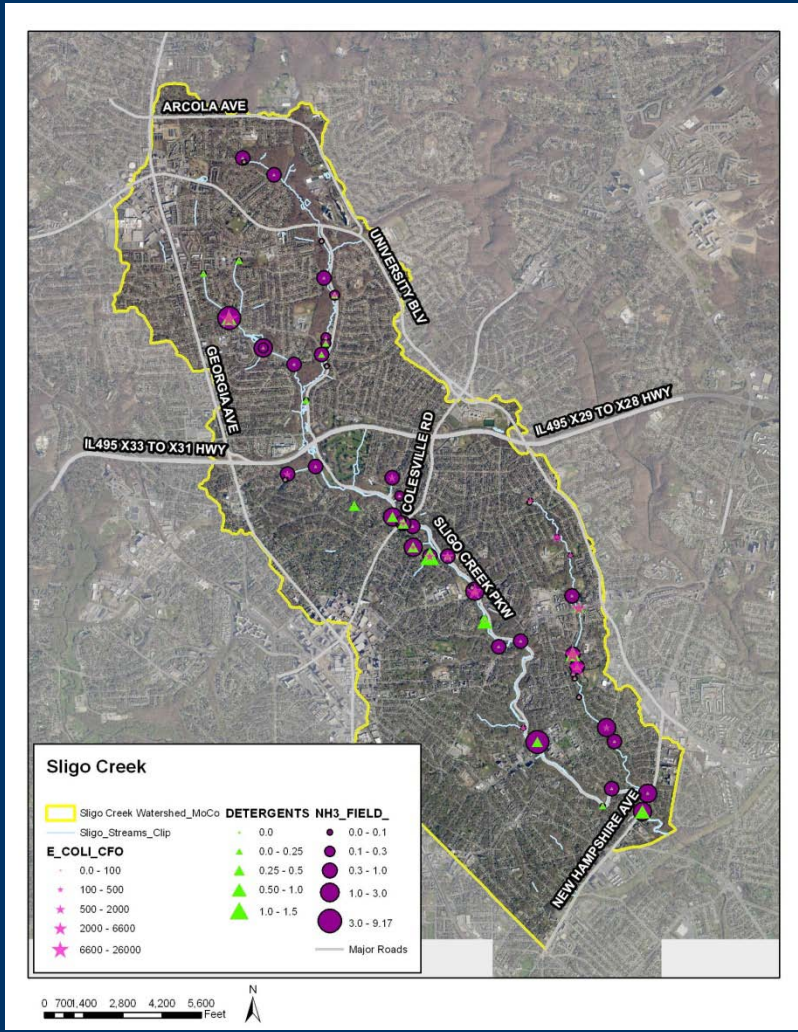
- Flowing outfalls: 58/213 (27%)
- Mapped outfalls: 45/213 (21%)
- Overall hits for flowing outfalls: ~80%
- Field hits for ammonia (>0.1 mg/l): 35/58 (60%)
- Hits for fluoride (>0.25 mg/l): 17/58 (29%)
- Hits for detergents (>0.25 mg/l): 24/58 (41%)
- Storm drain investigations: 23

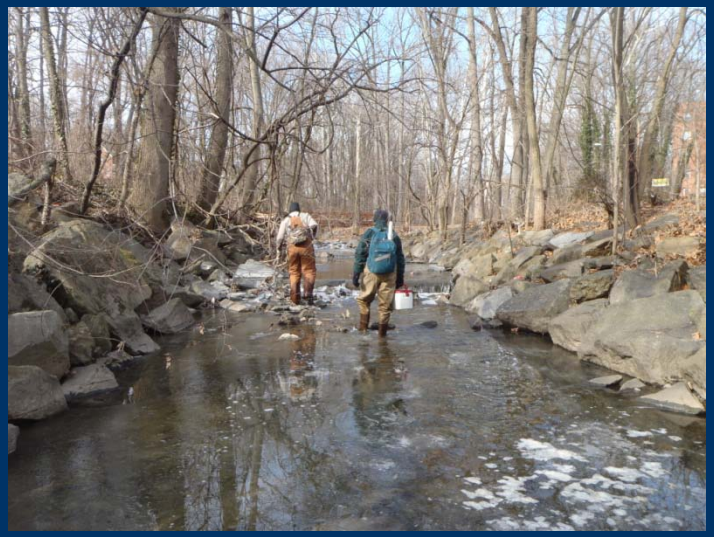
Bacteria

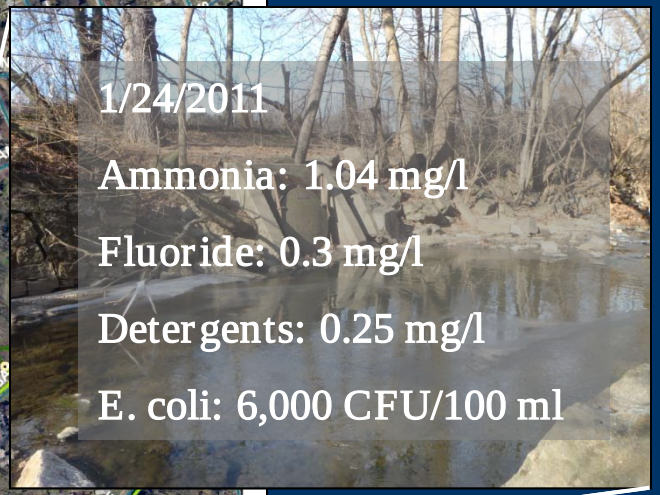
- Outfalls with E. coli above EPA threshold for contact recreation (235 CFU/100ml): 14/58 (24%); range – up to 26,000 CFU/100ml
- Outfalls with total coliform >10,000 CFU/100ml: 5/58 (8.6%); range – up to 30,000 CFU/100ml



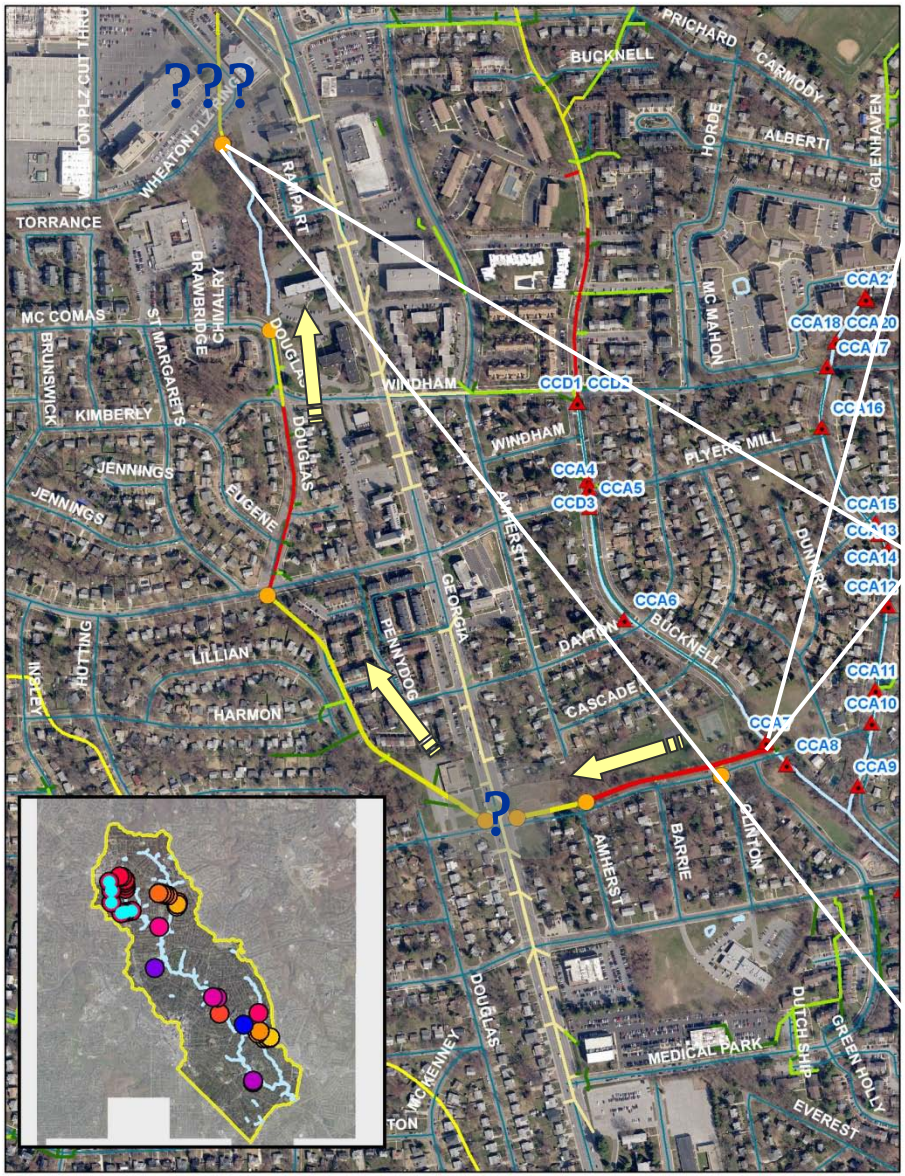
Storm Drain Investigations







- Four site visits to this outfall
- Dye testing in school and video inspection revealed no connections
- Two sources of flow identified from Mansfield and between Mansfield and Dale on Wayne
- TN – 6.9 lb/day; TP – 0.16 lb/day
- Cumulative load as of 6/11/2012 = 3,489 lbs + ? TN & 88 + ? Lbs TP
- 132 million gallons + ?


???
?
WHEATON PLZ CUT THRU
WHEATON PLAZA
TORRANCE
MC COMAS
BRUNSWICK
KIMBERLY
ST MARGARETS
DRAWBRIDGE
CHIVALRY
JENNINGS
JENNINGS
EUGENE
DOUGLAS
DOUGLAS
RAMPART
WINDHAM
WINDHAM
BUCKNELL
PRICHARD
CARMODY
ALBERTI
GLENHAVEN
HORNE
MC MAHON
FLYERS MILL
DUNNER
AMHERST
GEORGIA
PENNYDOG
DAYTON
BUCKNELL
CASCADE
LILLIAN
HARMON
HUTTING
INSLEY
BARRIE
CLINTON
MEDICAL PARK
DUTCH SHIP
GREEN HOLLY
EVEREST
MC KENNEY
CCD1
CCD2
CCD3
CCD4
CCA5
CCA6
CCA7
CCA8
CCA9
CCA10
CCA11
CCA12
CCA13
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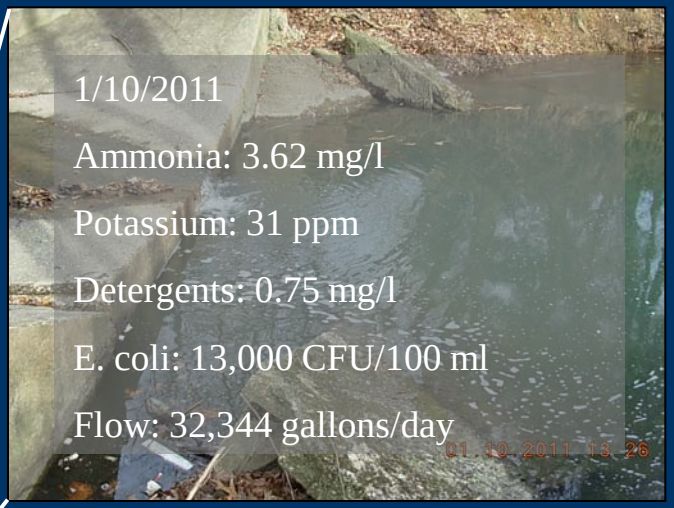
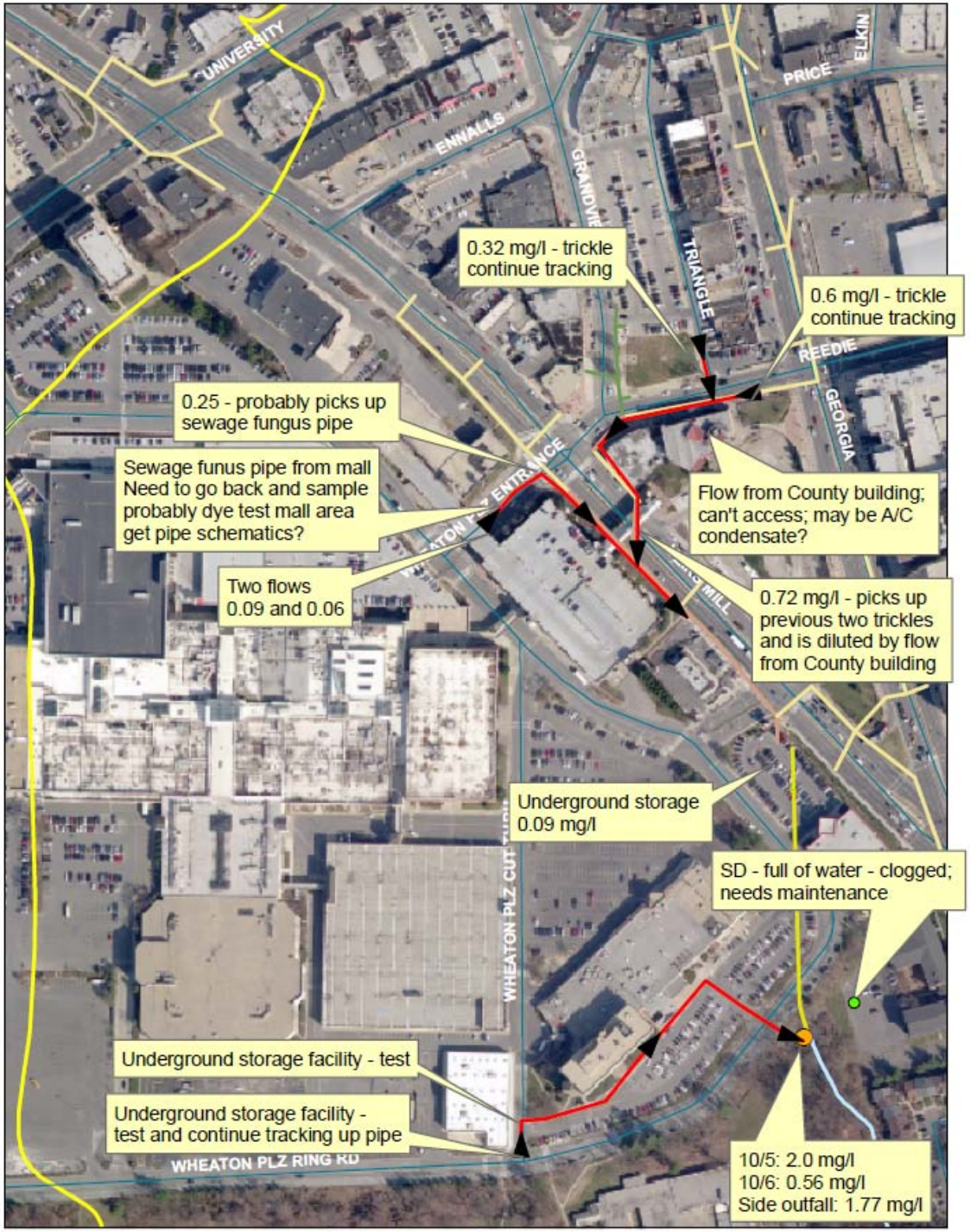
CCA20


1/10/2011
Ammonia: 3.62 mg/l
Potassium: 31 ppm
Detergents: 0.75 mg/l
E. coli: 13,000 CFU/100 ml
Flow: 32,344 gallons/day



Original total nitrogen load:

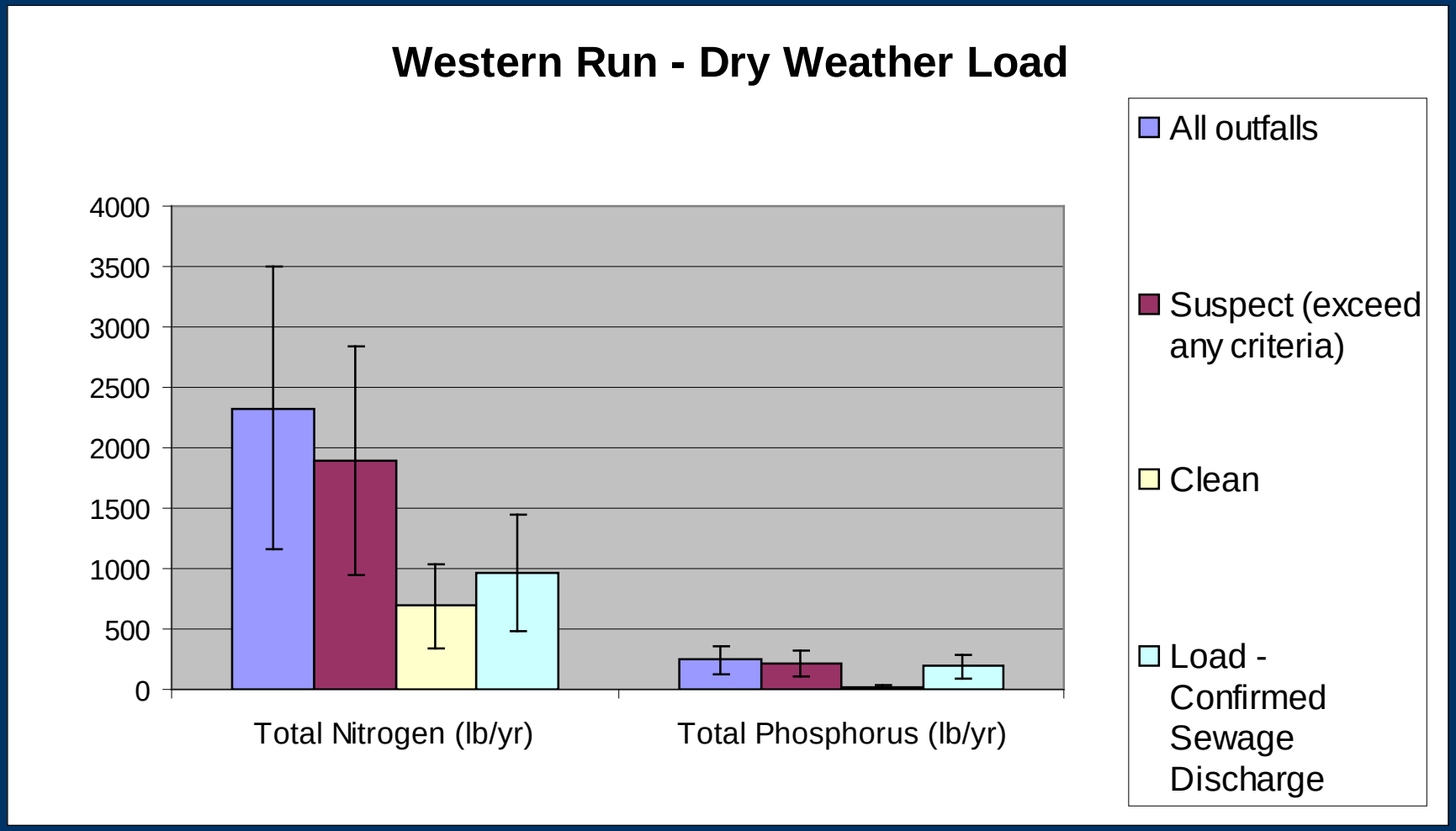
1.47 lb/day

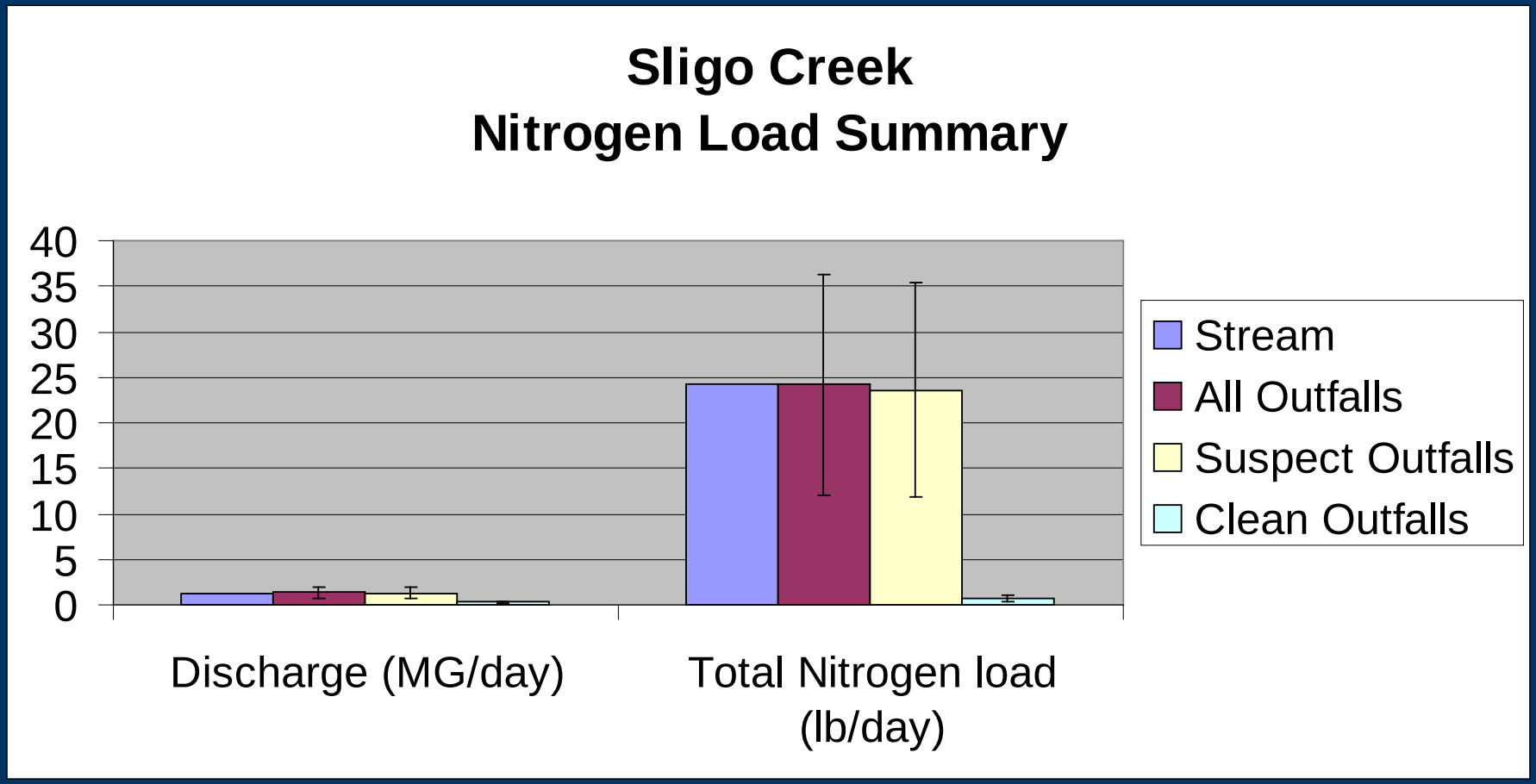
As of 6/11/2012 -

~16.7 million gallons + ?

Total nitrogen load = 767 lbs + ?

IDDE, meet TMDL

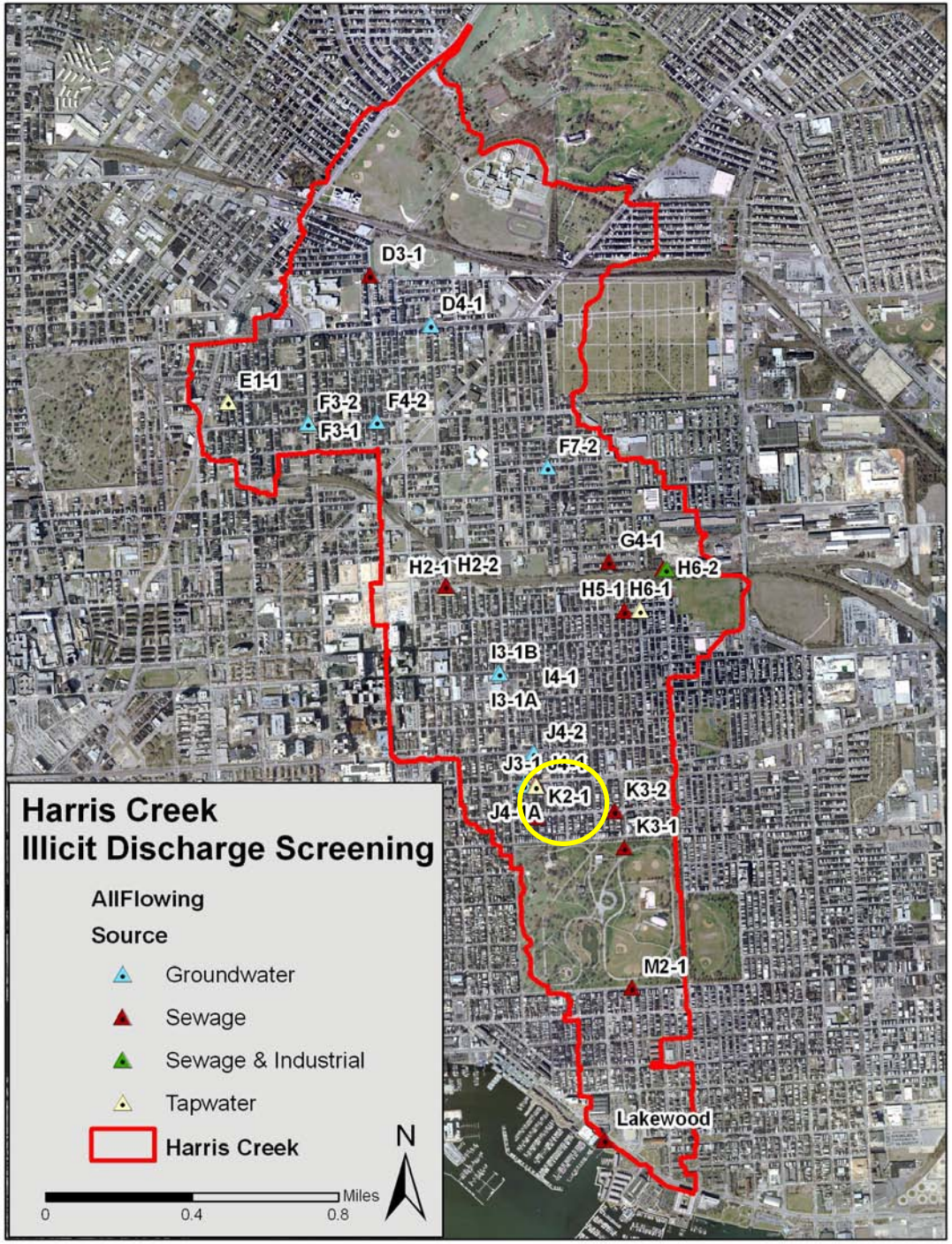

Western Run - Dry Weather Load
4000
3500
3000
2500
2000
1500
1000
500
0
Total Nitrogen (lb/yr)
Total Phosphorus (lb/yr)
All outfalls
Suspect (exceed any criteria)
Clean
Load - Confirmed Sewage Discharge


Sligo Creek
Nitrogen Load Summary
40
35
30
25
20
15
10
5
0
Discharge (MG/day)
Total Nitrogen load (lb/day)
Stream
All Outfalls
Suspect Outfalls
Clean Outfalls

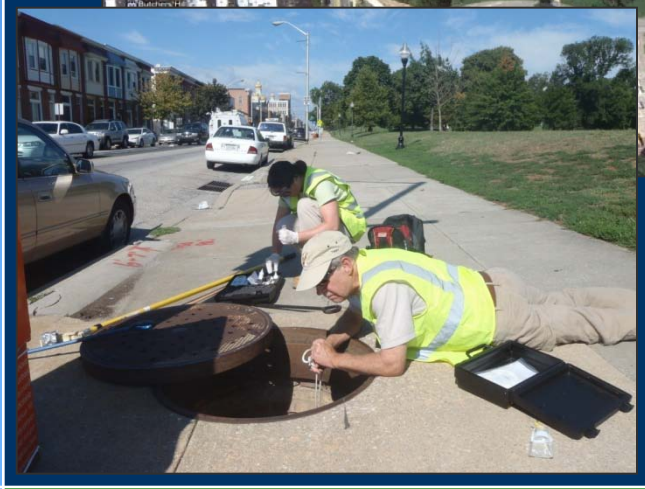
Pollutant accounting...

B'more example

NH3: 1.61 mg/l
Detergents: 0.5 mg/l
Bacteria: TNTC



Pollutant accounting continued…



TN: 41.86 mg/l

TP: 3.410 mg/l

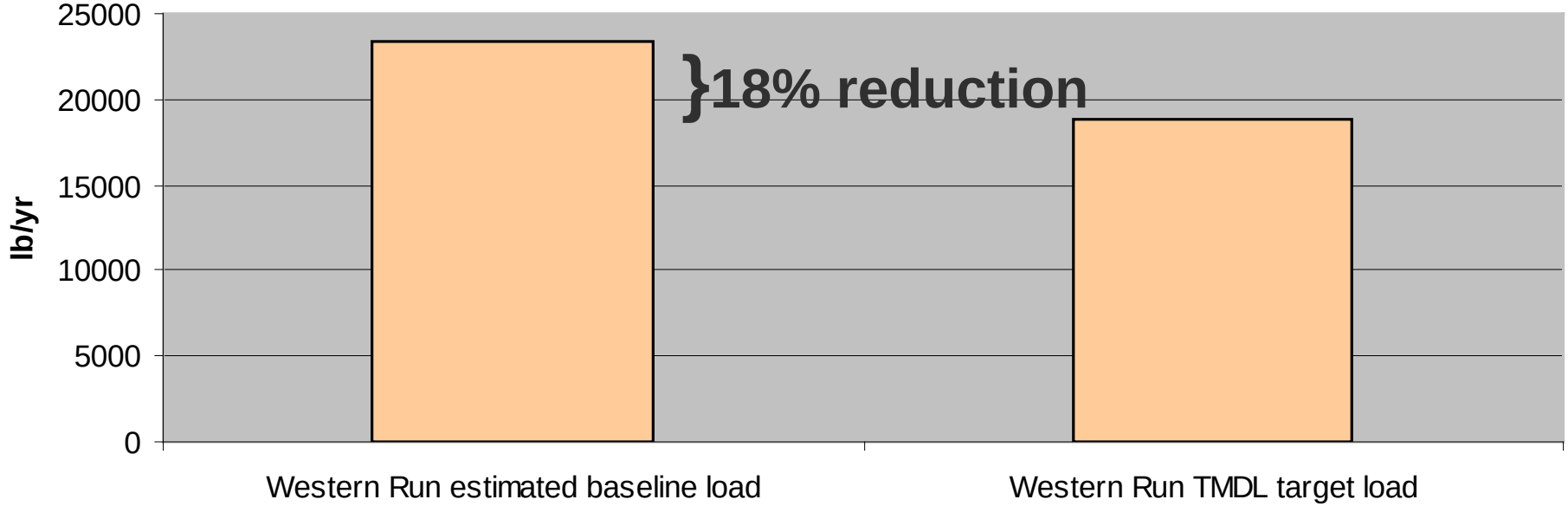
Estimated flow: 0.14 cfs

Estimated Load:

- TN = 1118 lb/yr
- TP = 93 lb/yr

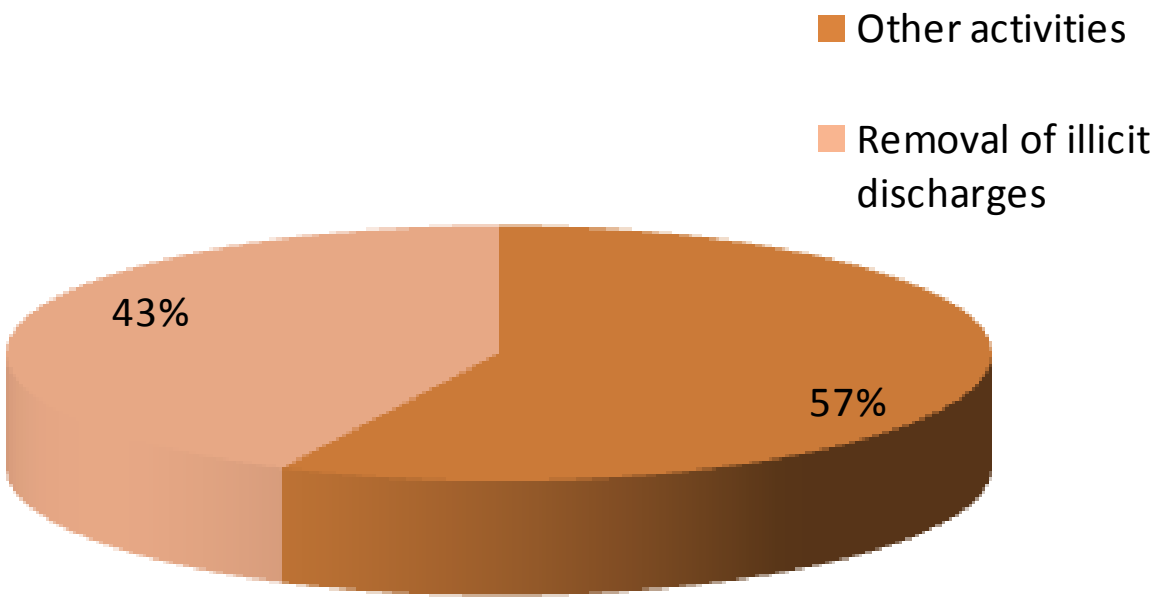
City prioritizes fixes based on volume

Nitrogen TMDL Load Reduction Estimates for Western Run



*Based on load assumptions derived from CWP, 2008 and Phase I Watershed Implementation Plan estimates for the Chesapeake Bay TMDL.

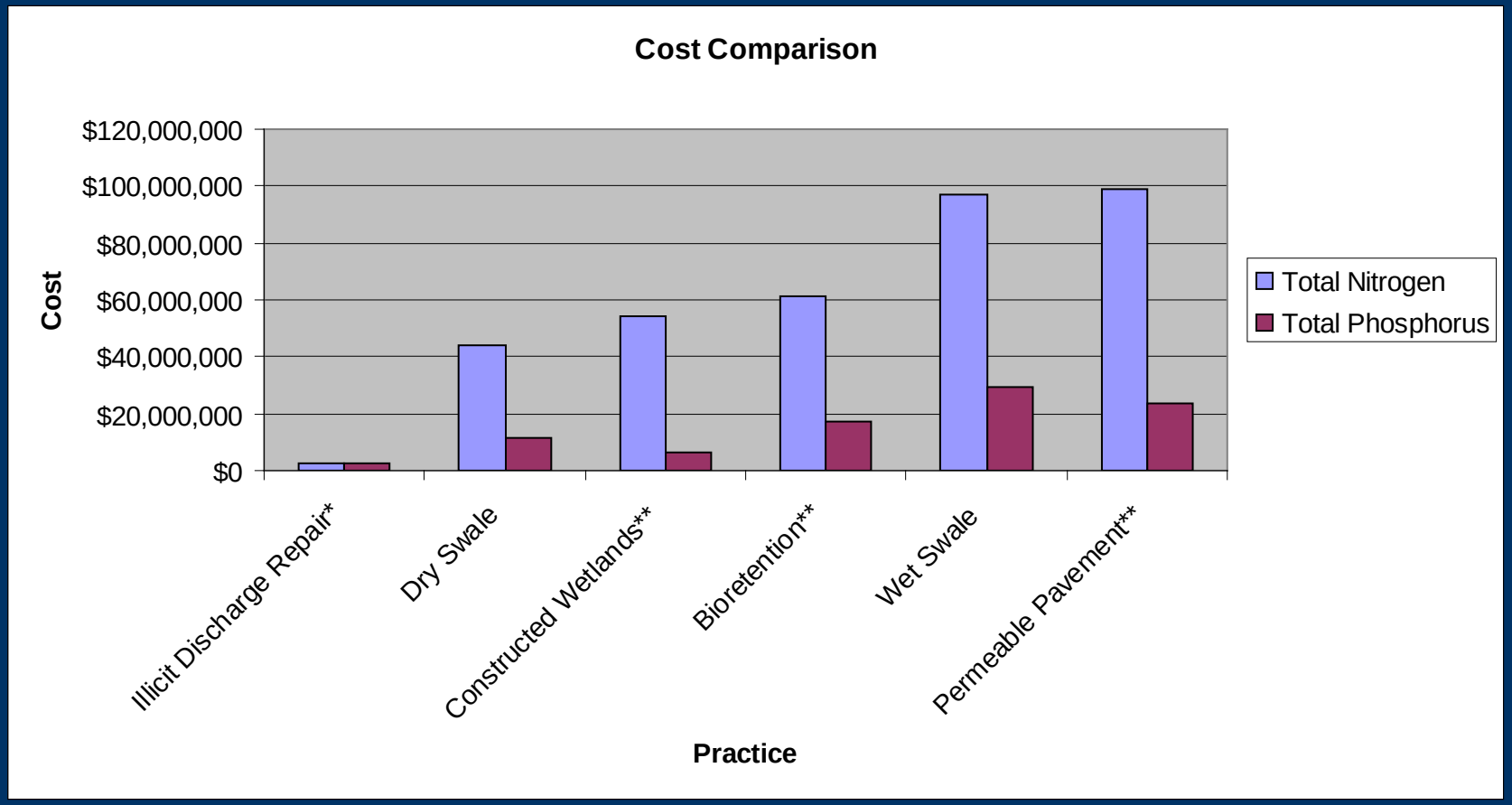
Estimated percent of required total nitrogen reduction that can be met through removal of illicit discharges in Western Run



Sligo Creek required 79% reduction and 17% could met be through illicit discharge elimination

*Illicit discharge load estimates based on single grab sample

Illicit discharge elimination is a cost effective approach to nutrient management



*Assumes 50K per repair for 47 repairs

**Assumes 100% of the water quality volume provided by treating 1" of rainfall

Recommendations to Montgomery County

- Follow up on identified problems; need sewer camera
- Dedicated IDDE staff
- Additional staff training for new parameters / isolating sources
- Education & outreach needs for transitory discharges
- Hotspot assessments needed
- Complex drainage areas need attention

Recommendations to County

- Walk streams for outfall surveys
- Complete outfall & stormwater mapping for watersheds ~ unmapped outfalls contributed 37% of total phosphorus load & 63% of total nitrogen load
- Addition of (or replacement with) ammonia, potassium, fluoride and bacteria to monitoring parameters
- Keep detergents, consider lowering threshold
- Look into sump pumps

Recommendations to County

- Future monitoring:
  - Resurvey confirmed polluted outfalls four times per year until clean for 1 year;
  - Resurvey remaining suspect and potentially polluted outfalls at least one time per year;
  - Engage/encourage citizen water monitoring efforts to expand the County's capacity to address water pollution issues
  - Continue monitoring, or have citizens continue to monitor, for bacteria and assure that standards improve after elimination of the identified problems.

Recommendations to FOSC

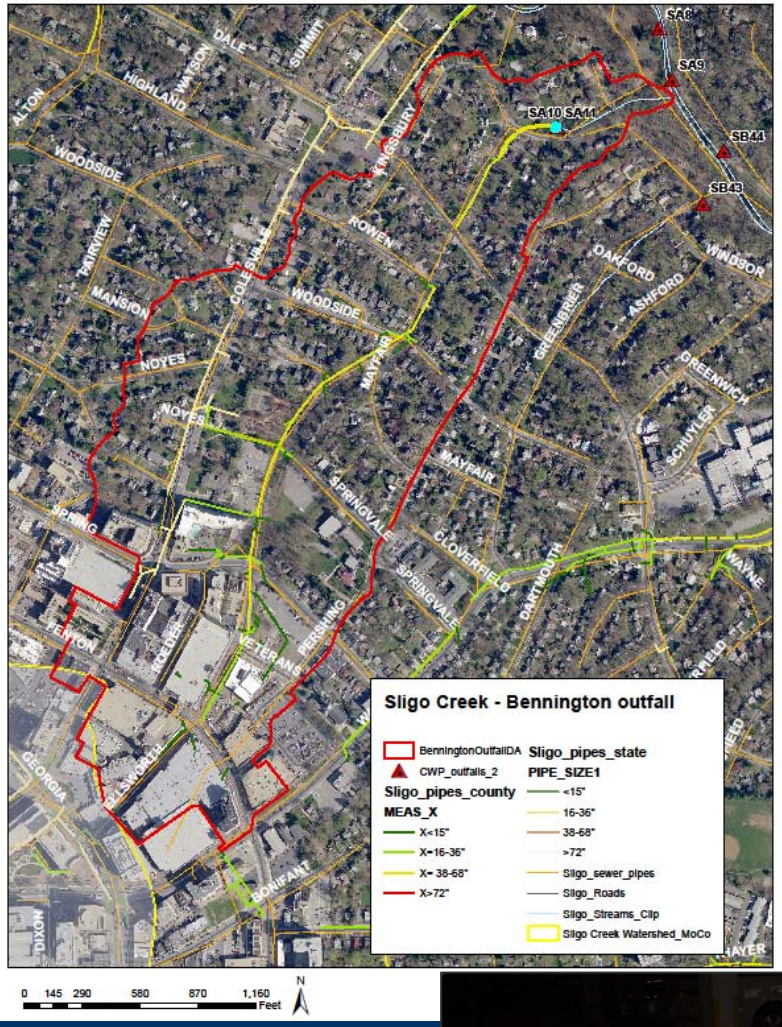
- Ensure follow-up on identified problems
- Education & outreach in hotspot areas
- Communicate the message that IDDE needs to be a priority for clean waterways
- Follow-up monitoring? Eyes and ears for dry weather flows

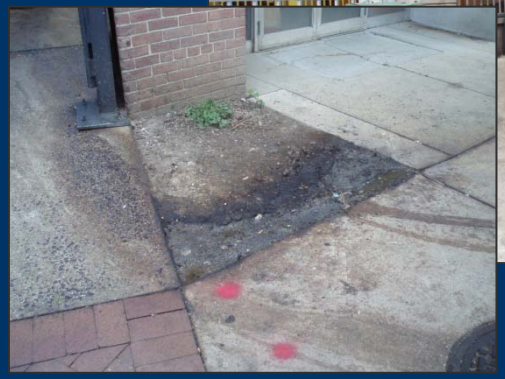
CWP Next steps

- Continuing outreach and education on the issue
- Received funding to continue work in two Sligo Creek drainages – Bennington and Maple Ave
- Pending NFWF proposal for IDDE Regional Cooperative
- IDDE Panel forming to evaluate IDDE as a BMP for Bay TMDL credit

Why should governments get credit for something that they are required to do?

- Illicit discharges fall through the cracks of MS4 permits and Consent Decrees
- MS4 permit requirements and guidance for IDDE is deficient
- Pollution load from illicit sources has not been accounted for in the Bay Model – coordinated action and response is needed
- We need more tools in the toolbox


Sligo Creek - Bennington outfall
BenningtonOutfallDA
CWP_outfalls_2
Sligo_pipes_county
MEAS_X
X<15"
X=16-36"
X= 38-68"
X>72"
Sligo_pipes_state
PIPE_SIZE1
<15"
16-36"
38-68"
>72"
Sligo_sewer_pipes
Sligo_Roads
Sligo_Streams_Clip
Sligo Creek Watershed_MoCo
SA8
SA9
SA10 SA11
SB44
SB43
0 145 290 580 870 1,160 Feet
N



GREENLIGHT BIOFUELS
FRYER-TO-FUEL

IDDE Regional Cooperative

Project Goals

- Bring together local and state governments, utilities and NGOs in the DC Metro region to demonstrate that IDDE is a cost effective BMP for pollution control
- Raise awareness of the relevance of illicit sewage discharges to Bay restoration efforts
- Build a model through which other Chesapeake Bay communities can learn and benefit by engaging traditionally disparate agencies that oversee the various components of IDDE
- Address multiple needs related to IDDE such as standardization, research, monitoring, field assessment, quantification of pollutant load reduction, cost effectiveness and community engagement

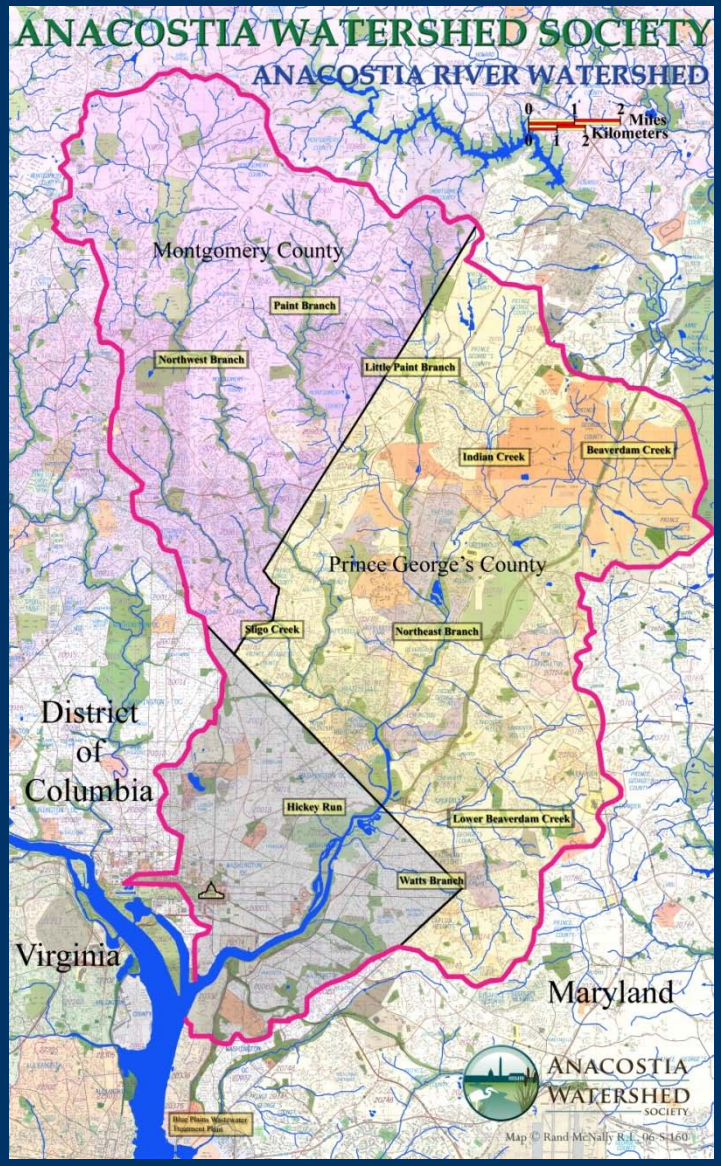
Project Partners

- Center for Watershed Protection (lead)
- Montgomery County
- Prince Georges County
- District of Columbia
- Maryland Department of Environment
- MNCPPC
- WSSC
- Anacostia Watershed Society
- Audubon Naturalist Society
- Friends of Sligo Creek
- University of Maryland
- Chesapeake Stormwater Network

Geographic Scope

- Northwest Branch
- Watts Branch

*Build more robust IDDE programs to improve overall watershed water quality



NFWF grant proposal

- Submitted May 16, 2012
- Expected notification in late summer/early fall
- Applied to Innovative Nutrient and Sediment Reduction for $750K – ~$247K for subcontractors and “fixing” and ~$50K for equipment and supplies, most to be left with governments and NGOs
- Partners contributed >$5 million of in-kind match
- 11 tasks defined in scope of work

Scope of Work

- Program coordination and administration – Cooperative meetings, project administration and management
- Baseline program and BMP review – assess existing and proposed BMPS for the study area, costs and expected pollutant load reduction; review MS4 Annual Report; identify IDDE program synergies and limitations; review other cooperative models around the nation

Scope of Work

- Baseline monitoring – estimate dry weather pollution loading from illicit sewage discharges using stable isotope analysis and dye injection techniques; use sampling results to provide data for partitioning the “Urban Load” in the Bay Model to account for illicit sewage discharges
- Procedures and Quality Control – develop standard operating procedures and QAPP for detecting and elimination IDs; develop tracking database and elimination schedule; assess use closed-circuit television to detect illicit discharges

Scope of Work

- Training – IDDE and pollution prevention training for jurisdictions
- Desktop Assessment for Illicit Discharge Potential in the Anacostia watershed - include analysis of stormwater/wastewater elevation data, inflow/infiltration and exfiltration
- Field Assessment of Northwest Branch and Watts Branch and Source Tracking
- ID Elimination and Follow-up – work with governments, utilities and private sector to make repairs; develop chemical fingerprint library; conduct cost analysis to determine potential extent of problem across remaining Anacostia and cost to fix

Scope of Work

- NGO Engagement – existing program assessment for integrating IDDE methods; simple protocols for citizen monitoring; develop citizen tracking system
- Load Reduction Quantification and CB Model Calibration – quantify load reduced based on field assessment; correlate with baseline assessment; provide data and findings to states and EPA Bay Program with recommendations

Scope of Work

- Building Sustainability and Information Exchange – recommendations for overall gaps and capacity analysis so that programs can be more streamlined in the future; determine best opportunities for resource exchange; web portal to house training and other materials produced by project; develop transferability package with project highlights and lessons learned

Outputs

- Elimination of up to 20 illicit sewage discharges
- Reduction of 4,520 lb/yr of total nitrogen
- Reduction of 164 lb/yr of total phosphorus
- Reduction of 1.5 $x10^{13}$ CFU/yr of bacteria

Outcomes

- Sustainability of DC Metro Regional Cooperative
- Use of IDDE as a creditable practice for the Bay TMDL and bacteria TMDLs
- Recognition of IDDE as a cost effective practice, esp. where retrofits are limited and waterways have significant impairments for bacteria and nutrients
- More robust IDDE programs in the Bay/transferability to other communities
- Integration of IDDE methodology into NGO water quality and education programs

Q/A