Delaware Center for the Inland Bays Scientific and Technical Advisory Committee Meeting

September 8, 2017, 9:00 am – 12:00 pm

DNREC Lewes field Facility

Attendees:

STAC MEMBERS	CIB STAFF	OTHER
Scott Andres	Bob Collins	Andy Howard, DNREC
John Austin	Andrew McGowan	Paul Imhoff, UD
Steve Britz	Marianne Walch	Maddy Lauria, Cape Gazette
Chris Brosch		Zach Garmoe, MCBP
Judy Denver		George Junkin, S. Bethany
Doug Janiec		Amanda Poskaitis, MCBP
Kari St. Laurent		E. Anne Riley, LWV
Chris Main		Alison Rogerson, DNREC
Hassan Mirsajadi		Claire Sevcik, UD CMP
Mark Nardi		Frank Weisgerber, S. Bethany
A.G. Robbins		
Steve Smailer		
Kelly Somers, EPA		
Robin Tyler		
Bill Ullman		
Richard Watson		
Ed Whereat		

Meeting called to order at 9:04 a.m., Scott Andres (DGS, Chair of STAC)

- Round robin introductions
- Scott introduced new STAC member Richard Watson

Announcements, Marianne Walch (CIB)

- CIB is completing its FY2018 workplan for EPA
- Thanks to STAC members who reviewed the environmental monitoring plan. The CIB is now making revisions based on comments and will submit the final plan to EPA for approval.
- Yet another reminder to submit updated CVs to Marianne if you wish to remain on STAC.

9:10 a.m. - Application of Biochar to Soils and Bioretention Media to Reduce Stormwater Volume and Nutrient Concentrations, Paul Imhoff (Univ. of DE) – [see presentation]

- Over the past five years, his group has applied biochar to soils and bioretention media, employing both laboratory and field experiments. A major goal is to find possible ways to reduce the high cost of stormwater retrofits.

- Proposed solution 1 – roadways soil modification to increase infiltration, water retention, and biological removal of pollutants.
    - Hypotheses: Biochar additions will enhance retention of nitrogen and water in the soil zone and increase rates of infiltration and chemical transformations.
    - Both lab and roadside field studies conducted, with controls.
    - Biochar reduced peak flow by 77%; tillage alone reduced peak runoff rate by 53%.
    - Biochar reduced runoff volume by 83%; tillage alone reduced volume by 54%.
    - Is biochar affecting hydraulic conductivity of soil? Biochar increased geometric mean K_{sat} by ~ 50% over control (tilled);

    - Encourages fungal growth and soil particle aggregation >> larger pores. Decreased compaction, partly because mixing a less dense material into soil.
    - Cost per acre similar to urban grass buffer, but much less land needed.

- Proposed Solution 2 – Bioretention with biochar and zero-valent iron amendments
    - Field test site built on UD campus; engineered experiments, focusing on nitrate.
    - Removal better in warmer months, biochar amended region outperforms standard bioretention mix.
    - Why enhanced denitrification? Biochar acts as electron storage device in aerobic conditions, and these are bioavailable as source for denitrification. Biochar does something natural soil will not.

- Questions
    - Anne Riley - How long does it take tilled control to compact? PI - Not sure, but after year and a half, has not returned to untilled condition.
    - Kari St. Laurent –formation of aggregates is interesting; any sense how long biochar will last, breakdown of functional groups? PI – Direct evidence of macropores in soil with biochar, likely due to aggregates. Doing microbial work now to determine mechanisms of aggregate formation. Not sure about longevity; need to sample a few more years.
    - Marianne Walch – Have considered using biochar in living shoreline projects. Any info on what happens with biochar in estuarine environments? PI – Unsure. Depends on type of biochar; salt will affect ion exchange, as will aerobic/anaerobic dynamic.
    - Robin Tyler – Scale is important in measuring overall environmental impact; at same time anything that can be done to reduce pollutant input is good. Is it feasible to get large enough supply of biochar to do this on a grand scale? Also, what about maintenance of this and who would be doing it? Private business opportunity? PI: Supply depends on type of biochar. Manure-based biochars tend to leach more, but can be pyrolyzed higher temps to reduce this. Oversupply of poultry/pig biochar. Wood biochar is less abundant – come from sawmills now. That's what stormwater people are looking for. Looking for a market. Remains to be seen.
    - Steve Smailer - Does the difference go away at a certain size storm event, impact on design standards? PI – Curves do converge eventually. Working on this.
    - R. Tyler- If have control over smaller storm events, which may have higher concentrations of pollutants, probably doing lot of good.
    - K. St. Laurent – Biochar would be really efficient at adsorbing organic pollutants.
    - Scott Andres – What's coming out the bottom of the bioretention, into the groundwater? Unintended consequences – infiltrating water now quite different. Measuring infiltration part and downstream effects? PI – Do have samplers below 30 cm depth. Don't have data yet. From a regulatory point of view, if water is infiltrated consider the pollutants "gone."

9:58 a.m. - The Effects of Irrigation on Nitrate Transport to Groundwater, Delmarva Peninsula, Judy Denver (USGS) – [see presentation]

- Presented the results of two studies comparing the effects of irrigated versus dryland farming on nitrate transport to shallow groundwater in different Coastal Plain settings.
- Still don't always understand how easy it is to get to groundwater in DE; come along way, but anything we put in has opportunity to get into drinking water and streams.
- 17-18% Increase in irrigation Delmarva since the 1950s; also higher potential for infiltration than other places in Chesapeake watershed.
- In Chesapeake Bay Program, irrigation is given 4% credit as a BMP; goal was to test this hypothesis: Nitrogen use efficiency is generally greater with irrigated than dryland farming

resulting in less residual nitrogen in soils that can leach to groundwater. Doubted this hypothesis would hold.

- Two projects – Bucks Branch, ditched system, high nitrogen (w/DNREC); and Andover Branch. Adjacent irrigation and dry land fields.
- Transport different. Streams different because of setting; 17-yr average travel to stream in Andover Br; oldest water in Bucks Br, ~30 yrs, longer flow paths, most water coming up through stream bed.
- More fertilizer is applied to irrigated crops, different yields on irrigated vs dry fields.
- Data tell where riparian areas most effective, based on path of groundwater to stream.
- Rainfall on saturated soil >> more recharge; Significant recharge under irrigated fields during growing season. Get more runoff on dry soil. Thus, different flow paths between irrigated and dry.
- Conclusions:
    - Significant leaching of NO_3 occurs beyond root zone during growing season; Nitrate concentrations in soil water are higher than during other times of the year. Higher nitrate concentrations in leachate with irrigation because of greater amount available from recent nitrogen application and greater soil saturation
    - question: what is significance?
- Where were going: modeling of leaching load during growing season at both sites (VFM, ER, SWB models).

- <u>Questions</u>
    - Paul Imhoff – How are fields fertilized, any in nitrate form? JD – Almost all NO_3.
    - Scott Andres – Are all models based on mass balance chemistry, or are any physical models? JD – BFM has hydraulic conductivity. SWB is a physical model.
    - Chris Brosch - question about nutrient application rates. JD – worked with planners to control and calibrate.
    - Hassan Mirsajadi –
    - Robin Tyler – He's familiar with Bucks Branch watershed. One of first things he noted was NO_3 concentration higher compared to any other place he was sampling.

Break 10:47 – 11:00 a.m.

11:00 a.m. – Long-term Saltmarsh Monitoring in the Inland Bays, Andrew McGowan (CIB) – [see presentation]

- Results from first report on results of the CIB's elevation and water level monitoring at Angola Neck, Piney Point, and Slough's Gut.
- 3 sites, 3 SETs (levee and two interior) at each site; monitored twice annually. Period of collection varies by SET, oldest 2008.
- Shallow SET measures changes in root zone/surface layer; Deep SET does not move relative to accretion or subsidence above base of rod.
- Feldspar clay plots measure accretion on surface layer – just capture surface level changes.
- SLR calculations; compare average change in height over time with SLR rate
- Results
    - 2 tables not keeping pace with SLR (Piney Point Slough's Gut interior sites)
    - 7/9 are keeping pace with SLR
    - Angola Neck most vulnerable
    - If we compare current rates against DNREC sea level rise projections (5 mm/yr, 10 mm/yr, 15 mm/yr), Angola Neck does not keep pace with 5 mm/yr. No marsh keeps pace with 10 mm/yr or 15 mm/yr.

- At current rate, marshes keeping pace (Does not mean marsh is healthy!).

- Questions
    - Doug Janiec – For the marshes not keeping pace, are they all waterlogged? AM - not necessarily. At high tide yes, low tide it depends.
    - Scott Andres - If increasing accretion on surface, does it increase root zone compaction? AM – Where have high accretion, generally do have root zone compaction. AM - Flushing has big impact on weight and biomass. Angola highly ditched.
    - Robin Tyler – when was ditching done? DJ – equally important when ditching stopped. PRT - permanent damage and decline could be traced, but really noticeable now.
    - Bill Ullman – 10-year data on SET table is an excellent record. Suspects losses in sediment supply contribute. Might be able to tease this apart by looking at sediment supply in individual streams, marshes.
    - D. Janiec – Suggests to plot trend over time, especially at Angola. Andrew says he has these plots.

11:30 a.m. - Remarks from Robin Tyler (DNREC)

- Retiring from DNREC but not from STAC; expressed appreciation to everyone he's worked with on STAC. Thanks to Andrew McGowan and CIB for taking over seaweed monitoring in the Bays.
- Remarked on how much good has happened in the Bays in 25 years, STAC advocacy, regulatory groups all played big part. If we think about how we've held line given the tremendous development in watershed, it's remarkable. Massive seaweed levels in 1990s – the 12 sites in study all selected because in 1999 they were problem areas. In several of them can't even find enough seaweed now to cover bottom of sieve bucket. Chlorophyll a is fairly flat too.
- Hired as environmental scientist – but always describes himself as an aquatic ecologist.
- One thing he'd like to see going forward is a return to emphasis on knowing what things are. Much emphasis now is on quantifying and measuring, but there's a decline in people who know what plants and animals are that they are looking at. Would be good to get solid understanding of what's living in bottom of bays.
- Old dumps – a lot has been done.
- Bill Ullman expressed – pleasure for many years of contribution. Keep doing it. We need the expertise, and Robin is still it. Needs to write!

Adjourn 11:45.

Next regular STAC meeting scheduled for December 1, 2017.

Meeting notes compiled and submitted by Marianne Walch.