South River Science Team

Expert Panel Meeting

October 8-9, 2014

Task Team meetings were held on October 7. Those included ROPs, Monitoring, and Human Exposure. Summaries of these meetings were presented during the Expert Panel Meeting. Briefing Papers and presentations can be found on the SRST website www.southriverscienceteam.org.

Wednesday, October 8

1. **Panel: Stream Implementation Issues – Public Engagement and Lessons Learned for Successful Projects**

Dave Hirshman served as moderator of this session and opened with explanation of the importance of the presentations that followed. The following speakers talked about experiences in doing stream improvement projects.

Bobby Whitescarver, NRM LLC: www.gettingmoreontheground.com

"How to get Johnny to do what he doesn't want to do" was the theme of Mr. Whitescarver's talk. He said the Upper South River has a problem with cattle in the stream. In order to get an idea of how to get landowners to participate in stream conservation/improvement programs, you first need to look at the reasons others landowners have participated. Reasons include:

- The need for more water
- Eliminating calving risk areas
- Herd movement/grazing distribution
- Program assistance (there are over 200 different programs excluding cattle from streams)
- Conservation ethic
- Fear of future regulations

Facts regarding issues with cattle in streams:

- 94% of bacteria in Middle River from bovine source
- There are 40 strains of *Leptospirosis* but only vaccines for 5 strains
- 50% of all cattle diseases in Mid-Atlantic states are transmitted through oral-fecal pathway
- Illnesses associated with polluted water include: Mastitis, Scours, Leptospirosis, IBR, BVD, Crptosporidiosis, foot rot, parasites

Obstacles to getting cattle out of stream:

- Change….people do not like change
- Fence maintenance
- Buffer maintenance
- Loss of Land
- Apathy
- Stigma associated with government assistance
- Too much paperwork/complicated process/bureaucratic red tape

More buffer/fencing facts:

- 60% of buffers fail
- $9 million backlog in Virginia program (which doesn't plant trees)

Recommendations for Upper South River Restoration:

- Break down into smaller watersheds / segments.
- Hire personnel to build relationships with the landowners.
- Market your science.

Brian Wagner, Ecosystem Services: www.ecosystemllc.com

Mr. Wagner discussed stream project implementation issues. His company, Ecosystem Services, among other things, works on stream restoration projects. According to Mr. Wagner, a successful stream restoration project must do the following:

- Attain goals
- Restore physical and ecological function
- Be self sustaining
- Serve as a model for future projects

Goals of restoration projects include one or more of the following:

- Physical: hydrologic and geologic
- Chemical: water quality improvements
- Biological: habitat (optimal and diverse)
- Society Value: recreation and aesthetics

There are many different design methodologies which are used, depending upon which of the above goals are trying to be achieved; however, only one tries to achieve all four goals and that is "natural channel design." Natural channel design involves designing streams to mimic stable channels in undisturbed, "natural" settings. Natural channel design restores functions including physical, biological and chemical processes. Natural stable channels are self-maintaining. Natural channel design philosophy:

- Look for converging lines of evidence from multiple methodologies to reduce the error of one.
- Use judgment in weighing each method based on the data available and the applicability of the methodology to the particular project reach.
- Streams are dynamic systems that need to be designed for adjustment- don't be rigid.

Mr. Wagner then went over the natural channel design process showing pictures of construction, successful and unsuccessful projects.

Bill Stack, Center for Watershed Protection: www.cwp.org

Mr. Stack discussed stream restoration protocols for meeting sediment and nutrient goals in the Chesapeake Bay. The Chesapeake Bay Program has a process for BMP crediting in which project removes TP, TN and TSS. Mr. Stack went into great detail about the process, history and how it currently works. When comparing the cost effectiveness of urban stormwater BMPs, Urban Stream Restoration is the most cost effective for reducing TP, TN and TSS.

Trafford McRae, City of Waynesboro

Mr. McRae discussed the MS4 program, what it means for Waynesboro (load allocations) and how stream/bank restoration provides the most cost effective load reductions.

Paul Bugas, VADGIF

Paul gave quick talk on urban stream restoration for water quality and habitat improvement showing pictures of successful projects and failures explaining challenges implementing these projects such:

- Infrastructure/other physical constraints (utilities, roads, bridges, culverts, etc)
- Altered hydrology (increased frequency and magnitude; decreased duration)
- Weather (during and immediately after construction)
- Land management (mowing, spraying, etc)

2. Integrating the ERA and HHRA components within the RRM: Wayne Landis, Western Washington University

Dr. Landis has built a human health and well being model based on the RCRA Human Health Risk Assessment (HHRA), integrating the Human Health and Well-Being (HHWB) and the Ecological Risk Assessment (ERA) and can now provide the inputs into the adaptive management Relative Risk Model (RRM). Objectives of the HHRA and ERA integration follow:

- Assess risk to:
  - Human health from mercury exposure via dietary sources
  - Recreational activities in the South River watershed
- Incorporate all of the aspects of the current risk assessment programs into a single framework.
- Maintain consistency/relevancy to RCRA HHRA and ACOE.

All objectives were met. See presentation for model details. Next steps:

- Use integrated model to compare risk to biotic, WQ and human health.
- Assess adaptive management strategies on all endpoints in one model
    - Could be weighted to represent stakeholder or management priorities.
    - Could incorporate cost nodes and/or decision nodes (MCDA)
    - Quantitative part of an Adaptive Management Process

3. Biochar Can Reduce Mercury Bioavailability and Detrital Processing: Mike Newman, William and Mary

Dr. Newman has been studying the effects of sediment amendments on detrital processing (the ability of amphipods to eat and break down leaves). Sedimite, but not biochar, reduced detrital processing. Sedimite efficacy seems more persistent than that of Cowboy Charcoal biochar. But do sediment amendments (Sedimite vs. Cowboy Charcoal) decrease bioavailability? Results:

- Sedimite worked best initially.
- The smaller Cowboy Charcoal sizes worked best initially.
- Substantial reductions in bioavailability seen initially (data only available for the first two out of three periods.)

4. Initial Results of Community-Level Exposures of Stream Biota to Biochar: Will Clements, Colorado State University

Dr. Clements presented **VERY**-preliminary findings on his mesocosm studies looking at biochar's effects on the benthic community. Objectives of the project are:

- Assess effects of Biochar on:
    - Survival and community composition
    - Macroinvertebrate drift
    - Colonization rate
    - Community metabolism
- Quantify combined and interactive effects of 2 size fractions of Biochar (focus on filter feeders)
- Compare Biochar effects to those of a "reference toxicant"

Experimental Approach:

- Field colonization studies (colonization with and without Biochar)
- Effects of Biochar in stream microcosms
    - Large versus small Biochar particles
    - Biochar and reference toxicant (copper)

Preliminary results show highly significant effect on community metabolism. Magnitude of Biochar effects is comparable to copper. Next steps:

- Second microcosm experiment completed Oct. 2.
- Sorting of benthic samples.
- Taxonomic analysis

5. Biochar-Floodplain Pilot Work: JR Flanders, URS

Objective of pilot is to test the effectiveness of carbon amendments on limiting mercury uptake by soil-dwelling ecological receptors and safety of using carbon amendments in the terrestrial environment.
Study Phases:

- Phase 1: Laboratory pilot (completed 2014)
- Phase 2: Caged earthworms (2014-2015)
- Phase 3: Field deployment(2015)

Phase 1 Findings:

- Earthworms
    - No apparent biochar related adverse effects on adult mortality, growth, or reproduction.
    - Adult mortality in RRM 11.8 soils reduced to levels observed in background soil control.
    - Apparent biochar-related increases in growth of worms in RRM 11.8 soils.
    - MeHg concentrations in juveniles are lower in biochar treatments.
    - MeHg concentrations in adults reduced in biochar treatments, but only in background soils.
    - MeHg concentrations in soil appear to be lowered by biochar treatments.
- Plants
    - No differences in emergence between the seedlings grown in the two controls.
    - No biochar related adverse effects on emergence and growth of seedlings.
    - Apparent biochar related increases in growth for wheat (mean height and biomass) and radish (mean biomass) seedlings.
    - MeHg concentrations higher in RRM 11.8, but not different from controls.

Phase 2 Preliminary Study Design:

- Soil will be collected and characterized at 3 locations (RRM 3.0, 8.7, 11.8)
- Carbon will be sieved to < 1.25 cm and added to soil at 5% by volume (contol with no carbon source).
- Two sets of cages will be deployed with 3 replicates each
- Soil and carbon will be aged over winter in the cages.
- Beginning in Spring 2015, one set collected at four weeks, one at 8 weeks.

Phase 2 Preliminary Study Endpoints

- Adult and juvenile tissue (THg, MeHg, lipids).

- Survival and growth (number, length and mass of adults)
- Reproduction (number of juveniles of cocoons produced)
- Soil (THg, MeHg, organic carbon)

Phase 3 Field Application Tentative Study Design:

Plan on conducting trial at the Augusta Forestry Center using both activated carbon and Biochar. Want to till carbon into soil 7 – 12 inches and age one winter. Collect resident earthworms and other invertebrates (e.g. predatory mite, collembolans, enchytraeid worms, spiders).

6. Former DuPont Plant Site Activities and Remediation Status: Ron Wesley, URS

Activities completed to date to reduce mercury loading at Outfall 001 and to prevent mercury migration during remediation:

- Sewer cleaning, lining and rehabilitation
- Sewer abandonment
- Alternate drainage construction
- Downstream filtration (highly effective - ~90% reduction)
- Pump House Sewer sump cleanout
- Waste management (up to 5 roll-offs of impacted sediment and 6 tankers of water removed)
- Performance monitoring (filtration, Outfall 001, ecological)

Summary

- Construction activities started week of June 16th
- De-mob by mid October
- 4,290 man hours to date
- 36 confined space entries
- Isolated Hg sources from infiltrating the sewer
- No increase in Hg loading to river detected during Interim Measures

7. Monitoring Task Team Updates: Ralph Stahl, DuPont

Ralph discussed the monitoring plan an emphasized that as required by the Natural Resources Defense Council (NRDC) settlement, parameters being sampled will continue to be sampled until it can be proven that they are no longer providing relevant information. For more details on the plan, see the briefing paper.

8. Human Exposure Task Team Update: Annette Guiseppi-Elie, DuPont

Activities completed:

- Waterfowl and small game: Briefing paper gives process and results. Annual consumption levels ranges from 4 snapping turtle meals per year to unrestricted number of deer. Fact sheet created on wildlife consumption. Working on peer reviewed paper.
- Livestock: Sampling completed for beef and milk. Calculated consumption levels. Non-detect for all milk samples. Working on fact sheet and peer reviewed publication.
- Health Survey created to address effectiveness of consumption advisories.
- Poultry study conducted to address potential of mercury exposure from consumption of chickens and eggs raised on floodplain. Results for initial (June) and 1st (mid-July) sample events now available. Results for end of August event should be available later this week. Mid-October sample event to be done next week. Completion by end of the year. Factsheet pending completion of project.

Other relevant activities:

- Human Health Risk Assessment Former DuPont Waynesboro Facility (Onsite) is completed and submitted to USEPA, conditional approval pending response to comments.
- Human Health Risk Assessment Report Area of Concern (AOC) 4 (Offsite) is completed and submitted to VADEQ (briefing paper provided).
- Sponsored research activities:
- Wildlife human consumption rates: Environ preparing a scoping evaluation to be completed by 12/2014; results in a peer review publication.
- Bioavailability of mercury: sediments and terrestrial sites; ecological and human receptors. Exponent commissioned; scoping evaluation to be completed 1st quarter 2015.

9. Communications and Outreach: Mike Liberati, DuPont

Mike commented on the large crowd at the meeting and stated the reason was due to next phase of work involves the offsite (AOC4) RCRA work.

- So far, DuPont has created 6000+ pages of documentation for the regulatory process.
- Website is running well and contains all documents.
- A community involvement plan has been created for RCRA. The plan involves creating a citizen advisory panel, meetings with the city, public information sessions, etc.
- The Community Advisory Panel will be led by Dave Hirshman and will include a dozen or so citizens whose job will be to provide feedback to DuPont on remedial work.
- There was another successful trash cleanup on South River held in September. Participants included DGIF, DEQ, JMU, UVA, TU and other citizens.

10. Promotores de Salud: Deb Foy, JMU

Promotores de Salud has held three 40-hr trainings, participated in 6 community events and has held 9 continuing education meetings and 1 CPR class. They have produced 874 (220 on Hg) health contacts, distributed over 780 advisories, trained 11 new Promotoras, and completed 3 translations.

11. Overview of ROPs Activities: Robert Brent, JMU

For summary of ROPs program, see briefing paper.

12. Summary of University of Waterloo Biochar and Leaching Studies: Carol Ptacek, University of Waterloo

For details of experimental design, see presentation.

Overall Goals of Program:

- Evaluate processes controlling release of Hg from sediments under variable geochemical conditions
- Evaluate treatment methods to control Hg release
- Evaluate long-term effectiveness of treatment methods under variable geochemical conditions

Summary of Hg Release from Low-Hg Sediments:

- Leaching of Hg from sediments with South River water decreased over time.
- Re-suspension test not good indicator of Hg release under saturated flow conditions
- Potential to release Hg under saturated flow not directly correlated to THg concentrations in sediment

Summary of Saturated System Treatment Columns:

- Sediment leaching
    - Hg leaching decreased with South River water for input solution over time.
    - Hg concentrations increased after switch to simulated acid rain water as input solution.
- Mercury treatment with biochar
    - Hg concentrations decreased substantially in biochar column.
    - Minimal leaching of Hg with South River water as input solution.
    - Minimal leaching of Hg with simulated acid rain water as input solution.
    - Solid-phase analysis indicates unused capacity.
    - Little evidence for production of MeHg in biochar columns.

Summary of Variably-Saturated Column Tests:

- Enhanced colloidal Hg transport after exposure to wet-dry conditions and acid rain.
    - Colloidal Hg particles associated with Fe, Al and Si
    - Hg particles 7-10 nm
- Mercury methylation observed in cycling experiments.
- Ineffective treatment observed when Cowboy Charcoal was co-blended with floodplain soil.
- Effective treatment without promotion of MeHg using Cowboy Charcoal in packed-bed filter.

Summary of Long-Term Treatment Microcosms

- Lowest THg in Activated Carbon Amendment

- Lowest MeHg in Cowboy Charcoal amendment
- Hg converted to stable form (cinnabar) in Cowboy Charcoal treatment
- High THg in Cowboy Charcoal amendment indicates higher % (current 5%) of Cowboy Charcoal required for treatment of high-Hg sediment.

Summary of Co-blended Treatment Experiments

- Decrease in concentrations of filtered THg for Cowboy Charcoal amended sediment relative to control
    - Similar results for untreated and acid-treated biochar
- No difference in concentrations for limestone amended sediment relative to control.
- Need for further monitoring of unfiltered/filtered THg before conclusions can be drawn.

Summary of Colloid Transport Experiments with Modified Input Solutions

- Increase in THg concentrations in column effluent for column with low-ionic strength input solution
- Little difference in THg with CaCl2-spiked input
- Need for further monitoring of unfiltered/filtered THg before conclusions can be drawn.

Future Studies

- Evaluate long-term potential for biochar to treat or stabilize Hg
    - Characterize biochar from long-term laboratory microcosm studies
    - Characterize biochar samples from Wertman Pond pilot study
- Evaluate treatment effectiveness of different commercial batches of Cowboy Charcoal
- Continue to evaluate Hg-bearing colloids (composition, transport, treatment)
- Characterize new floodplain sediment samples (Forestry Center Pilot Studies)
- Generate comprehensive report

13. Sediment Capping Mesocosm Study: Danny Reible

Dr. Reible is evaluating different capping media measuring the effectiveness by using DGT which correlates well with bioaccumulation.

What does the DGT measure?

- DGT is measuring dissolved Hg, Hg associated with molecular size complexes and small DOM associated Hg.
- DGT does not measure particulate and large colloidal Hg.
- Pore size of agarose gel of order of 50-100 nm with smaller pores at surface excluding Hg associated with colloidal matter that is not biologically relevant.

- DGT appears (with limited data) to better relate to bioaccumulation of Hg- more biologically relevant?

Hg Risk Management

- Goal of remediation is to lower mercury levels in biota
- Sediment amendment does this by lowering the amount of available mercury through sorption.
- To reduce methylation, control aqueous (e.g. bioavailable HgS) or solid phase sorption of TotHg (sorbing amendments)

Baseline Cap Studies Assessment RRM 3.5

- Mesocosms have been allowed to equilibrate and build a natural redox zonation (characterization underway).
- Candidate cap materials will be placed and capping studies evaluated
    - Evaluation of capping in channel and bank sediments
    - Sand, native soil and AC/organophilic clay and biochar (final selection based upon screening studies in site waters).
    - Operation in saturated mode but cyclic saturated/unsaturated mode planned.
- Deliverable – screening assessment of effectiveness of cap materials for channel and bank deposits Hg control at RRM 3.5

Reactive Capping Assessment – Summary

- Potential Vectors to Manage
    - THg, MeHg from river bottom
    - Leaching of THg from HRAD areas during drainage cycles
- Baseline studies
    - Mesocosm studies from RRM 11.8
        - Redox profiles and THg availability in aerobic zone
        - Benthic bioaccumulation and relationship to DGTs
    - Mesocosm studies from RRM 3.5 ongoing
        - Baseline THg and MeHg concentrations
- Effects of various sediment caps (RRM 3.5)
    - Cap amendments
        - Screening tests support activated carbon, biochar, permability control
        - Steady and dynamic testing needed
    - Completion of initial mesocosm studies (static release) Dec 2014

14. Phase 1 Intern Measures Study: Clay Patmont, Anchor QEA

Short-Term Remedial Action Objectives

- General response objectives

    - Reduce Hg transport and exposure and improve bank habitat functions within the upper 2 miles of the South River
- Performance objectives
    - Conduct and/or maintain bank remediation actions to achieve sustainable reductions in Hg concentrations and improve water quality and bank habitat functions
- Measurable metrics
    - Incorporated into short-term monitoring plan

Corrective Measure Implementation

- Test hypothesis that reducing bank loading to the channel will accelerate recovery
- Use proven bank remediation technologies
- Phased implementation, monitoring and adaptive management over 5 – 10 years
    - Beginning with Phase 1 Interim Measures in RRM 0 - 2
- Future phases will include downstream corrective actions and terrestrial/floodplain evaluations

Refinement of Phase 1 BMAs

- Erosion rate correlation analysis
    - Recent UD LiDAR resurveys of 12 banks in RRM 2 – 10 evaluated in 2006/2007
    - Supplements detailed tree root analyses
    - Broader application of laser survey methods
- THg concentrations in bank soils
    - Detailed characterization completed in 2014
- Refined THg loading estimates
    - Address erosion rate uncertainties to identify BMAs in RRM 0 – 2

Cumulative Bank THg Loading: RRM 0 – 2

- Based on regression relationships, roughly 90% of THg loading to RRM 0 – 2 comes from 23% OF banks
- Corresponds to banks with an estimated unit loading greater than roughly 2 kg THg/mile per year
- But uncertainties in erosion rate regression model; BMA sensitivity analysis using constant erosion rate.

Refinement of Phase 1 BMAs

- Address erosion rate uncertainties by applying both the regression model and constant erosion rate sensitivity analysis to identify BMAs
- Results in a total of 1.3 miles (0.9 mi + 0.4 mi) of BMAs within 0 – 2
    - Phase 1A (City owned) BMAs total 0.7 miles
    - Includes banks adjacent to City of Waynesboro parks and wastewater treatment plant

    - Design and implementation agreements currently under development.

Next Steps

- Focused bathymetric, geotechnical and bank soil data collection in October/November to inform Phase 1A bank remediation designs.
- Location-specific corrective action designs
    - Designs tailored to bank characteristics
    - Collaborative development with City of Waynesboro
- Develop preliminary designs over next 6 months
- Permitting and final design in 2015
- Implementation agreements
- Target Phase 1A construction beginning in 2016

Thursday, October 9

1. Mercury Cycling Model: Reed Harris,

Reed is proposing to create mechanistic model of mercury cycling and bioaccumulation in the South River.

Objectives:

- Help predict and assess the benefits of bank stabilization.
- Help interpret monitoring data.
- Help integrate multi-disciplinary studies carried out on the South River.
- Help address uncertainty.
- Provide another line of support for decisions.

Model will work with adaptive management model. Sources will be able to be "turned on and off".

Questions that could be addressed with model:

- What will happen to fish mercury levels after bank stabilization (magnitude, timing, effects at different locations)?
- Where does mercury in fish originate?
- What processes control the natural recovery of the system?
- What processes can be altered to accelerate recovery?
- What do the monitoring data tell us?
- Confounding factors: e.g. effects of climate change?

What does Dynamic Mercury Cycling Model (D-MCM) do?

- Predicts Hg cycling and bioaccumulation in aquatic systems.
- Predicts response to Hg loading and changes to environmental conditions.

- Includes water, sediments and food web.
- Methylmerucry, inorganic Hg, elemental Hg
- Outputs through time
- Focuses on Hg: does not model environmental conditions that are inputs (e.g. pH, temp)

Next Steps:

- Discuss how to best model food web.
- Discuss how to estimate sediment transport.
- Develop proposal.

2. Enhanced Adaptive Management Model: Christy Foran, USACE

Development of a quantitative decision model for adaptive management:

- Aids identification of plan of action with available information
- Archives predicted effects and outcomes to allow learning with implementation
- Reduces time in adjusting course of action as monitoring results are collected

EAM Benefits

- Encourages preferred action under uncertainty
- Provides a framework on which to learn from current actions
- Focuses monitoring and research needs on the reduction of uncertainty
- Allows development of anticipated effects in time under phased implementation

See presentation for modeling diagrams.

EAM integration – Next steps

- Ensure the evaluation criteria and metrics are accurate and comprehensive.'
- Choose an initial set of remedial plans to compare.
- Identify the input parameters for MCM, RRM, etc. that need to be estimated for each alternative remedial plan.
- Characterize the model outputs (their form, i.e. uncertainty) so they go be added smoothly to the EAM.
- Develop a frame for accepting all the information in the EAM.

Conclusion

- The effort required to develop this approach results in a rigorous, transparent framework.
- Performance of different plans on specific criteria can be visualized.
- The anticipated effects provide a benchmark against which to compare implementation outcomes.
- Differences allow a better understanding of the system, and a reduction in uncertainty.

3. Integrating ROPs Data and Models: Nancy Grosso, DuPont

Why Adaptive Management?

- Uncertainties in the Conceptual System Model
- Uncertainty in public acceptance of remedies
- Implementability
- Scale lends itself to phased implementation
- "Stress" the system in order to validate the CM

See presentation for different steps of EAM. The following fit into the process.

4 & 5: Develop Management Strategies/Actions, Develop Monitoring Plan

- Developed Interim Measures Work Plan
- Developing Enahnced Adaptive Management Model and links to MCM and RRM
    - MCM quantifies the CM and predicts system Hg response to remedy/timing
    - RRM frames current risks and predicts changes based on proposed remedy including unintended consequences/benefits
    - EAM decision model compares alternatives based on all evaluation criteria using the MCM for decision analysis and will incorporate output from the RRM
- Collect Baseline Data (long and short term monitoring)

6: Implement Strategies and Actions to Achieve Objectives

- IM Phase 1 Remedy Design and Construction
    - Fill design data gaps and complete preliminary remedial design
    - Obtain landowner feedback and prepare final remedial design
    - Obtain permits and access agreements
    - Construct and Monitor
        - Remedy Performance Monitoring
        - STM: THg and MeHg in clams and sediments, rabid bioassessment protocol

7: Evaluate Management Effectiviness

- Evaluate whether remedial action was constructed as designed or planned
- Evaluate effectiveness of Phase 1 remedy; compare actual post-remedy monitoring results with predicted short-term outcome using mapping and statistical data analysis, MCM and RRM, etc.
- Evaluate overall implementability and cost effectiveness
- If outcome does not meet predicted, input new data and run EAM decision model

8: Report Findings and Recommendations of Evaluation

- Work with VADEQ and SRST to identify lessons learned on the conceptual model and effectiveness of off-site Phase 1 corrective actions.

- Review effectiveness and robustness of monitoring program
- Communicate results to other affected stakeholders and obtain feedback on successes/concerns.

9: Adjust Management Actions and Arrangements to Enhance Effectiveness

- Incorporate findings and recommendations and update the Conceptual Model, the MCM, RRM and EAM
- Incorporate learnings on remedy design, permitting and stakeholder preferences
- Incorporate learnings on remedy design, permitting and stakeholder preferences
- Incorporate findings from ongoing ROPs programs
- Review and refine outreach plan
- Refine or optimize short-term monitoring plan
- Implement next phase of risk management strategies

10: Periodically Review overall Management Program

- Assess whether trends can be ascertained in downstream and terrestrial monitoring stations
- After sufficient time, evaluate long-term monitoring data for trends in performance indicators based on projections and refine the CM or the overall objectives, as needed.
- May require more than one phase of remedial action to assess long term/systemic management objectives.

4. Paul Bugas of DGIF took a moment to show examples (photos) of DGIF stream stabilization projects.

5. Discussion/Open Dialog – Current and Future South River Work

The Expert Panel was asked to lead discussions on South River topics. Ralph Turner, Will Clements and Dave Hirschman all participated. Will and Dave both prepared short presentations. Will concentrated his portion of the discussion on questions about monitoring (when can we cut back?), differences between lab and field experiments, modeling, engaging stakeholders, relevance of statistically significant relationships and alternative approaches. Dave concentrated his discussion on biochar research and how to apply in river setting (showing examples of coffer dams, dikes, etc. He also questioned the necessity of the expert panel and asked what kind of collaborative structure could help guide implementation of remediation, emphasizing that engaging Waynesboro is the first shot at working with landowners.

6. SRST meetings for 2015: Feb 24 (via web), May 12-13, Aug 18-19, Oct 21-22.

7. Adjourn