

# Minutes of the Driscoll Modeling Results Presentation and Meeting

May 18, 2012

## Participants:

National Park Service: Kevin Fitzgerald, Jeff Troutman, Steve Moore, Matt Kulp, Becky Nichols, Tom Remaley, Jim Renfro

TN Department of Environment and Conservation: Paul Schmierbach

NC Department of Environment of Natural Resources: Kathy Stecker

University of Tennessee: John Schwartz, Joshua Fu

USGS: Scott Gain, Greg Johnson

EPA: Shawneille Campbell-Dunbar, Amy Finegold, William Melville, Tara Houda, Alya Singh-White

US Forest Service: Bill Jackson

TVA: Terry Cheek

Syracuse University: Dr. Charles Driscoll

## Definitions

### Minutes:

The meeting was initiated by all participants providing an introduction and affiliation. Steve Moore then provided a historical overview of the steps leading to the Tennessee Department of Environment and Conservation developing a Total Daily Maximum Load (TMDL) for the 12 listed streams in TN. He also provided background on the steps leading to an agreement with Dr. Charles Driscoll, Syracuse University to assess the response of soils and streams in watersheds of the GRSM to changes in acid deposition, through analysis of existing data and application of the biogeochemical model PnET-BGC.

Dr. Charles Driscoll then provided an over view of the inputs and outputs of the PnET-BGC and the results of his modeling efforts to date. He provided the following key points:

- Critical and target loads can be developed for any pollutants. Typically they are sulfur and nitrogen deposition loadings.
- **Critical Load:** The quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge.” (Nilsson and Grennfelt 1988)
- **Target Load:** The level of exposure to one or more pollutants that results in an acceptable level of resource protection; may be based on political, economic, or temporal considerations.
- **TMDL** is the water related equivalent of a critical load.
- ANC values of 0, 20 and 50 are EPA established values used in the modeling effort
- Driscoll is currently using a monthly time step for modeling, but this could be changed to a six month value if necessary
- 100% reduction in deposition does not mean zero deposition, but a return to historic background values

- Noland Divide represents the high elevation portion of the Park that is most sensitive to acid deposition. Current acid neutralizing values (ANC) for this site is about 4.3  $\mu\text{eq/L}$ . Aluminum plays a large role in the results
- Based on hind cast from the model, the historic ANC for Noland Divide should have been 20 - 25
- For Noland Divide, nitrate reductions will be more effective for ANC improvements than sulfate reductions
- Currently model runs have been completed for the 12 streams listed on the 303d list. Data are also being analyzed to produce a park-wide analysis of deposition effects.
- The model provides managers with a tool to determine how much  $\text{SO}_x$  and  $\text{NO}_x$  must be reduced in combination to achieve target loads within a given timeframe.

Bill Jackson, US Forest Service indicated that he has data for 66 sites outside the Park in western NC and TN mainly above 3,000 feet and that these samples indicate more of a sulfate effect and little nitrogen effect. The bulk of his samples are based on a single sample collected between March and May with most samples being collected in streams flowing through hardwood forest. His results have been calculated using the MAGIC model. He is also looking to reach an ANC of 30 by 2100.

The group then discussed the next steps for modeling. Some of the key points and questions are as follows:

- Jeff Troutman: Can we agree that the model is ready to use? Are sulfate adsorption precision/accuracy estimates good?
- Dr. Driscoll, indicated that the preliminary results of model performance between simulated and observed data are promising and indicate agreement. Additionally the model is continually being reviewed by the scientific community
- Driscoll also discussed the potential for better sensitivity analysis by September but indicated this would be difficult
- Scott Gain: Indicated that sulfate – nitrate sensitivity and sulfate adsorption must be evaluated. He also suggested looking at soils data in more detail and to determine if there is a good relationship between soil water and stream chemistry
- Scott Gain suggested we attempt to determine what a uniform reduction for the Park would accomplish in terms of what percent of a stream would reach full attainment, as some may be too sensitive to recover. He also suggested evaluating biological impairment, the loss of brook trout or aquatic life, will reductions in deposition result in these streams recovering enough to restore life? We must realize this will be a long term process and that we must start somewhere.
- Kathy Stecker: Need to evaluate expected reduction rates (mandatory and voluntary) and have the model calculate expected improvements. She stated we must calculate what historic ANC values were to establish realistic expectations and ANC values. She also stated that we must attempt to define the uncertainty in the historic ANC value calculations.
- Given a projected or modeled target ANC for the most sensitive streams, the model should be able to project a time to recovery
- Kathy Stecker indicated that NC could take Park water quality data for NC streams and list them as Category 4, impaired but no TMDL required.

- Bill Melville, EPA, stated that NC could reference the TN TMDL and adopt it because it covered air deposition in NC also.
- Jim Renfro stated that he would like NC to complete an analysis of the data for the NC portion of the park so we can be sure the TMDL for TN is adequate for NC.

### **Thoughts for Potential Next Steps**

- For the proposed larger fall meeting determine who needs to be involved and how to get in touch with them. The week of November 12, 2012 was proposed as a potential date for the meeting.
- Kathy Stecker proposed looking at 3 areas, 1) very sensitive and perhaps to acidified to recover; 2) Areas that have the potential to recover to an ANC of 50, and 3) utilizing the hind cast data determine what the appropriate ANC for the more sensitive areas should be and adjust the TMDL values based on this information
- There will be a need for policy input and this will need a recommendation for reductions in SO<sub>x</sub> and NO<sub>x</sub> emissions and deposition
- Need a regulatory agency to prepare a summary of air regulatory initiatives, what is happening, what is planned and where we are in the process
- Need EPA air and water staff to develop maps showing where the SO<sub>x</sub> and NO<sub>x</sub> is coming from and to show current deposition. How will air quality impacts to water quality be addressed?
- Tamara Blett asked if states can mandate or regulate sources outside their boundaries. The TN TMDL is for water violations and has no authority to regulate air sources. But the Clean Air Act references air quality related values and links this to water quality values
- Jeff Troutman asked if the ANC values produced by the PnET-BGC model would be in the range of those in the TN TMDL?
- Jeff Troutman stated that part of the management decision to be made is to determine how much each contributing pollutant must be reduced to achieve target loads. Target ANC values along an elevational gradient must also be determined. A map showing current ANC based on existing data by elevation band or elevational gradient is needed.
- Paul Schmierbach, stated that reductions necessary to reach a certain ANC need to be defined and that we must set target ANC values desired.
- Paul Schmierbach also indicated that the group needed to agree on a timeline for the largest area to be affected. The timeline needs to be practical and have short and long term goals.
- A realistic target ANC should be based on these considerations: 1) political; 2) cost-effective; 3) biologically effective and 4) biggest bang for the buck
- How will the information and data relative to this process be shared?

### **Questions Not Resolved**

- What recommendations should come from the core group and what is our target audience?
- What decisions are outside this group?

- How do we identify and contact potential stakeholders?
- How do we identify educational opportunities?
- How do we engage legal, political, industrial and other stakeholders?
- What is the defined project boundary?
- An in-depth discussion that addresses differences between what research says historical deposition levels were (or should be) and how this is connected to critical loads and a TMDL of pH of 6.0 and ANC of 50 is needed.