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Issue II 2010

FRIENDS OF THE SHENANDOAH RIVER
We All Live Downstream

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Message from the Treasurer

The Friends Current Financial Status*, by Bud Nagelvoort, Treasurer*

The financial status of the Friends of the Shenandoah River is reasonably good through three quarters of the calendar year. The current projection for the end of the year suggests the possibility of a surplus in the amount roughly equal to the income received of $75,000 net for the sale of 10 acres in Frederick County on 340/522 donated to FOSR in 2008.

While the sale of the property was budgeted, this positive picture would not be possible if our staff had not been able to secure substantial agreements from several organizations including the Friends of the North Fork for unbudgeted monitoring and lab analysis of water samples the cost for which we are reimbursed. We're anticipating such activities to continue through the end of the year.

I'm certain our members understand that our regularly scheduled water quality monitoring program performed at more than 100 sites in the Shenandoah River and its tributaries in Augusta, Rockingham, Page, Shenandoah, Frederick and Clarke Counties is not a program paid for by anyone on a per sample basis. It is only through a small grant from the Department of Environmental Quality ($11,000 this year), our membership dues ($8,435 this year to date from our membership roster of over 400 members), and donations from foundations, Clarke and Warren Counties and our Friends (totaling about $35,000 this year) that most of our lab and two person staff costs are covered. The balance for the last several years has come from the "outside" work that we perform.

Shenandoah University has provided the FOSR with space for the water quality lab, for which we are forever grateful. The constructing and equipping of the lab was made possible through generous donations from FOSR supporters and the Commonwealth of Virginia.

We look forward to continued financial support from our Friends as this financial year comes to a close.

(Detailed financial statements are available on our web site at www.fosr.org.)

Article from the Chesapeake Bay Journal;

EPA finds flaws in most states' plans to clean up waterways

Summarized by George L. Ohrstrom, II

The Environmental Protection Agency (EPA) has released its findings about the Water Implementation Plans (WIP's) that each of the states in the Chesapeake Bay Watershed recently submitted. These submissions were part of the new Federal TMDL that the EPA is going to administer. In the past these TMDL (Total Maximum Daily Load) programs were state based voluntary programs, but after the President issued his executive order declaring the Bay a "National Treasure" the EPA became involved. A TMDL sets the maximum amount of pollution that a water body may receive and still meet its water quality standards. Overall, the TMDL would require that the amount of nitrogen and phosphorus reaching the Bay each be reduced by about 23 percent, and the amount of sediment by about 22 percent. Nutrient and sediment loads would have to remain at those reduced levels in the future despite population growth and further development.

If fully implemented, most people in the watershed would feel the TMDL's effect in some way, such as increased sewer or storm water fees for urban residents. Farms would come under more scrutiny, and some could see increased regulations. Homeowners may find their choices for lawn fertilizer reduced as more states look at switching to phosphate-free fertilizer. Septic owners, at least in some areas, may find themselves switched to sewer systems, or be required to install nitrogen-removing systems if they upgrade.

In return, the public would get a cleaner Bay and - in many cases - healthier streams, although the exact benefits to local waterways would hinge on what types of pollution control measures were used on the land.

The TMDL is designed to ensure that all of the practices needed to achieve water quality standards are in place by 2025, with 60 percent in place by 2017. Because it takes a number of years for some practices, such as stream buffers or cover crops to result in changes in local streams, actual water quality goals may not be met until sometime after 2025.

TMDLs not only establish maximum loads, but also divide those loads between "waste load allocations," reductions that will come from regulated sources, and "load allocations," those from unregulated sources, such as most types of runoff. Waste load allocations are achieved by incorporating the goals into discharge permits for municipal wastewater treatment plants, regulated stormwater systems and concentrated animal feeding lots.

When they reviewed the state plans, EPA officials found "serious deficiencies" in those submitted by Delaware, New York, Pennsylvania, Virginia and West Virginia. None of the seven plans fully demonstrated "reasonable assurance" that they would successfully control runoff pollution. The deficiencies, EPA said, included vague or no strategies for filling resource gaps in programs; few enforceable or binding commitments in programs; reliance on inadequate nutrient trading programs; and a lack of specific dates or milestones to improve programs.

The states have until the end of November to respond to the EPA's criticisms and if the EPA doesn't feel that these responses are adequate, they could administer the TMDL themselves. If they do get involved, it's likely to be extra costly and very heavy-handed.

I would urge all of our readers to contact the governor's office and ask him to reply to the EPA with a WIP that has real goals, real funding strategies, and real achievable timelines. That's the only way to avoid the Feds coming in and taking over.

The charts on the next page present the draft total maximum daily load numbers for states and the portions of tributaries within state boundaries for nitrogen, phosphorus and sediment. For comparison, model estimates for nutrient and sediment loads are also presented for 1985, the baseline year from which reductions are measured, and 2009.

For the complete article, EPA finds flaws in most states' plans to clean up waterways, by Karl Blackenship go to: http://www.bayjournal.com/article.cfm?article=3929

Interpreting These Charts

EPA is requiring that nutrient and sediment controls sufficient to meet the TMDL be in place by 2025. In addition, 60 percent of the reductions are to be achieved by 2017.

TMDLs are required for "impaired" water bodies - those that fail to meet water quality standards. The Bay is listed as impaired because of nutrient and sediment pollution.

Nutrients spur algae blooms, which block sunlight needed by underwater plants that provide important habitat for juvenile crabs, fish and waterfowl. When the algae die, they sink to the bottom and are decomposed in a process that removes oxygen from the water, creating so-called "dead zones." Sediment also blocks sunlight from reaching underwater grasses. It also smothers bottom habitats, such as oyster reefs.

Computer models suggest that if TMDL levels are reached for nitrogen, phosphorus and sediment, the Bay could be removed from the impaired waters list.

Agriculture is the leading source of nitrogen, phosphorus and sediment pollution, but wastewater treatment plants and urban runoff are also significant sources. Air pollution is also a major source of nitrogen.

Air figures presented for nitrogen are for the amount of deposition that lands directly on the Bay and its tidal tributaries. Airborne nitrogen largely stems from fossil fuel combustion which generates nitrogen oxides, and animal feedlots and manure, which generate ammonia.

Phosphorus and sediment are not airborne pollutants.

States, By Numbers

Here's how the states stacked up in their watershed implementation plans, according to the EPA. Figures "over" the TMDL mean that the nutrients or sediments goals are not met in the plans. Figures "under" the goal mean that plans would control more than what is required.

- *District of Columbia*: 5 percent under for nitrogen, 3 percent under for phosphorus, 25 percent over for sediment.
- *Delaware*: 17 percent over for nitrogen, 8 percent over for phosphorus, 20 percent under for sediment.
- *Maryland*: Met overall nitrogen, phosphorus and sediment goals, although some individual river basins did not meet TMDL limits.
- *New York*: 15 percent over for nitrogen, 14 percent over for phosphorus, 17 percent under for sediment.
- *Pennsylvania*: Met nitrogen goal, 11 percent over for phosphorus, 1 percent over for sediment.
- *Virginia*: 6 percent over for nitrogen; 7 percent over for phosphorus, 12 percent under for sediment.
- *West Virginia*: 18 percent over for nitrogen, 6 percent under for phosphorus, 38 percent over for sediment.

PHOSPHORUS LOADS TO THE BAY BY STATE
(Annually, in millions of pounds)

Jurisdiction	Basin	1985	2009	Draft TMDL
PENNSYLVANIA	Susquehanna	4.48	3.41	2.31
	Potomac	0.57	0.53	0.42
	Eastern Shore	0.02	0.02	0.01
	Western Shore	0	0	0.001
	PA Total	**5.08**	**3.96**	**2.74**
MARYLAND	Susquehanna	0.90	0.62	0.05
	Eastern Shore	1.70	1.17	1.09
	Western Shore	1.62	0.77	0.46
	Patuxent	0.48	0.29	0.21
	Potomac	1.49	1.00	0.90
	MD Total	**5.38**	**3.35**	**2.72**
VIRGINIA	Eastern Shore	0.26	0.19	0.16
	Potomac	2.20	1.94	1.47
	Rappahannock	1.30	1.09	0.90
	York	1.03	0.63	0.54
	James	6.49	3.25	2.34
	VA Total	**11.27**	**7.14**	**5.41**
DISTRICT OF COLUMBIA	Potomac	0.10	0.14	0.12
	DC Total	**0.10**	**0.14**	**0.12**
NEW YORK	Susquehanna	1.07	0.80	0.52
	NY Total	**1.07**	**0.80**	**0.52**
DELAWARE	Eastern Shore	0.37	0.32	0.26
	DE Total	**0.37**	**0.32**	**0.26**
WEST VIRGINIA	Potomac	0.85	0.90	0.74
	James	0.01	0.01	0.01
	WV Total	**0.87**	**0.91**	**0.75**
AIR		**N/A**	**N/A**	**N/A**
TOTAL		**24.14**	**16.62**	**12.52**

NITROGEN LOADS TO THE BAY BY STATE
(Annually, in millions of pounds)

Jurisdiction	Basin	1985	2009	Draft TMDL
PENNSYLVANIA	Susquehanna	127.31	99.83	71.74
	Potomac	7.25	6.11	4.72
	Eastern Shore	0.57	0.44	0.28
	Western Shore	0.04	0.03	0.02
	PA Total	**135.17**	**106.41**	**76.77**
MARYLAND	Susquehanna	2.29	1.52	1.08
	Eastern Shore	16.57	12.38	9.71
	Western Shore	29.99	13.94	9.74
	Patuxent	4.16	3.09	2.85
	Potomac	29.57	18.51	15.70
	MD Total	**79.59**	**49.42**	**39.09**
VIRGINIA	Eastern Shore	2.15	2.85	1.21
	Potomac	30.15	2.85	17.46
	Rappahannock	8.92	6.85	5.84
	York	7.60	6.36	5.41
	James	42.58	31.30	23.48
	VA Total	**91.40**	**66.63**	**53.40**
DISTRICT OF COLUMBIA	Potomac	6.21	2.85	2.32
	DC Total	**6.21**	**2.85**	**2.32**
NEW YORK	Susquehanna	16.77	10.54	8.23
	NY Total	**16.77**	**10.54**	**8.23**
DELAWARE	Eastern Shore	4.59	4.18	2.95
	DE Total	**4.59**	**4.18**	**2.95**
WEST VIRGINIA	Potomac	8.09	5.75	4.67
	James	0.02	0.02	0.02
	WV Total	**8.11**	**5.77**	**4.68**
AIR		**26.10**	**17.40**	**15.70**
TOTAL		**367.94**	**263.22**	**203.14**

SEDIMENT LOADS TO THE BAY BY STATE
(Annually, in millions of pounds)

Jurisdiction	Basin	1985	2009	Draft TMDL
PENNSYLVANIA	Susquehanna	2,609	2,224	1,758.20
	Potomac	320	306	233.93
	Eastern Shore	38	31	21.12
	Western Shore	1	1	0.37
	PA Total	**2,971**	**2,576**	**2,013.62**
MARYLAND	Susquehanna	104	73	62.94
	Eastern Shore	261	187	169.70
	Western Shore	311	238	170.38
	Patuxent	189	114	90.12
	Potomac	930	776	682.33
	MD Total	**1,797**	**1,387**	**1,175.47**
VIRGINIA	Eastern Shore	22	16	10.91
	Potomac	1,287	1,084	810.07
	Rappahannock	886	752	688.51
	York	209	141	107.09
	James	1,539	1,239	852.77
	VA Total	**3,943**	**3,233**	**2,469.35**
DISTRICT OF COLUMBIA	Potomac	23	36	11.16
	DC Total	**23**	**36**	**11.16**
NEW YORK	Susquehanna	383	326	292.96
	NY Total	**383**	**326**	**292.96**
DELAWARE	Eastern Shore	76	65	57.82
	DE Total	**76**	**65**	**57.82**
WEST VIRGINIA	Potomac	422	347	248.11
	James	29	28	16.65
	WV Total	**451**	**376**	**264.76**
AIR		**N/A**	**N/A**	**N/A**
TOTAL		**9,644**	**8,000**	**6,285.14**

STATE OF THE RIVER REPORT: OCTOBER 2010, *by Charles Vandervoort*

Turbidity is now the 800 pound gorilla in the room. From the time the FOSR first started formal monitoring in 1997, average turbidity in the rivers measured at the 27 river sampling sites in the Shenandoah river basin increased from 4.3 NTU in 1997 to 13.09 NTU in 2010 – an annualized growth rate of almost 10%. Of course, as any investment counselor will tell you, past growth rates will not guarantee continuation into the future – there are simply too many variables involved. However, these trends should alert us to potential problems. The concentrations of nitrogen in the rivers and tributaries appear to be much less of a problem. (This newsletter focuses on turbidity, more space will be devoted to nitrogen and other water quality parameters in future newsletters).

Turbidity

Turbidity refers to how clear the water is. The greater the amount of total suspended sediments (TSS) in the water, the murkier it appears and the turbidity measured as nephelometric turbidity units (NTU) becomes. Turbidity is caused by sediments that include many forms of solids including sand, silt, clay, and various organic particles such as decomposing leaves and algae.

Figure 1 shows the average annual turbidity for the past 13 years, and averaged over all the sample sites for the rivers.

Figure 1: Average Turbidity, in Rivers, NTU

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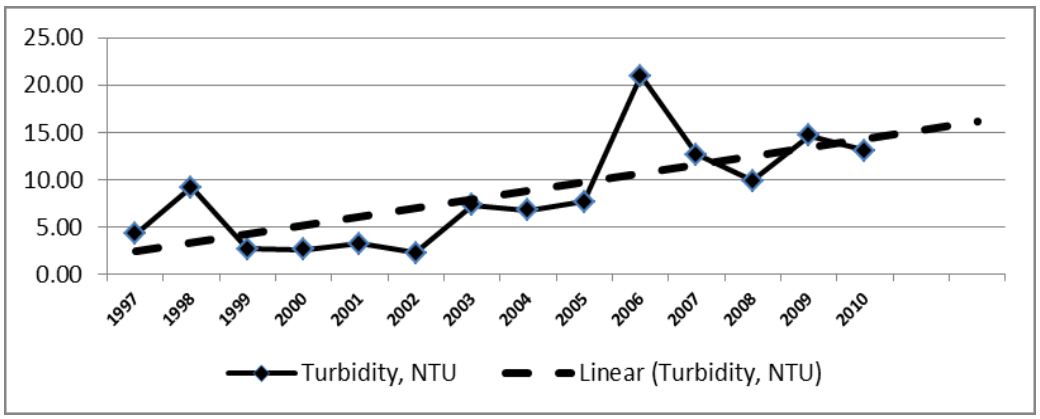
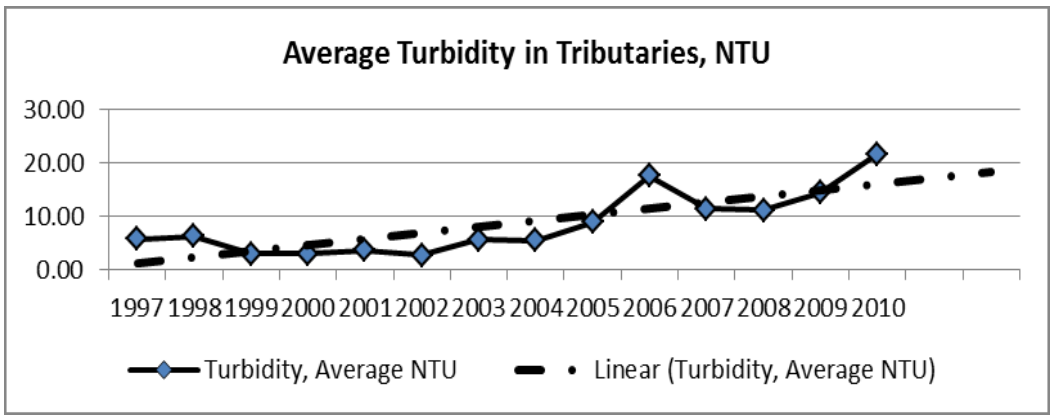


For the tributaries, (Figure 2) the concentrations are higher. For the 52 sampling sites the average turbidity increased from 5 NTU in 1997 to 22 NTU in 2010; an annual compound growth rate of 12%.

Figure 2: Average Turbidity in Tributaries, NTU



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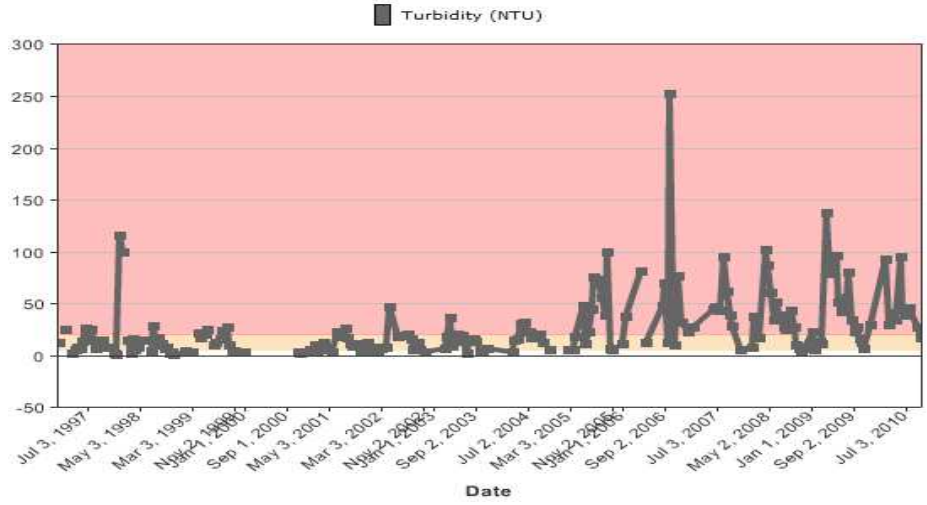
It is important to note that the averages hide wide swings. Figure 3 shows the extent of the variation in turbidity at the GA17[1] Hebron sampling site in the Middle River, Augusta County -- one of the most polluted tributaries in the Shenandoah river basin.

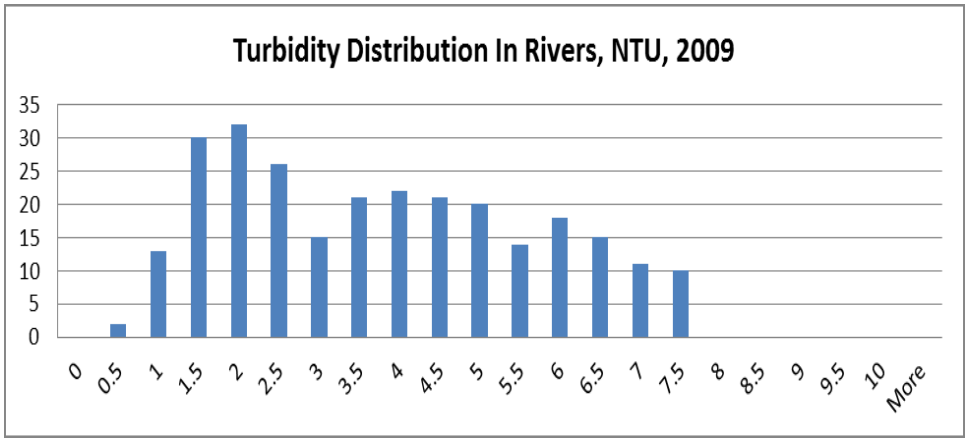
The deviations into the pink "impaired" zone are striking. It is not known for how many hours or days these excursions into the pink zone last[2]. An interval of only a few hours, although stressful to many forms of aquatic life forms, would not cause long-lasting damage. If, however, these elevated spells in turbidity would last for days, weeks or months, many fish could die. Very high levels of turbidity for a short period of time may not be significant and may even be less of a problem than a lower level that persists longer[3].

Figure 3: Turbidity values for each sampling day at GA17.



As for turbidity, the average hides large fluctuations. For example, as shown in the histogram below (Figure 4), 48% of the turbidity measurements in the rivers during 2009 were above the average value of 3.52 NTU.

Figure 4: Histogram of Turbidity in Rivers, 2009.



[1]Graphs such as this one are easy to retrieve from the www.fosr.org web page. Left click on Monitoring Map and Data Portal; wait for the map and sampling sites to show; left click on the sampling site you want to examine, and then left click on "show graph." Give me a call at 540-837-1637 if any problem, and I will walk you through it.

[2]The USGS is now installing instruments measuring turbidity continuously; this will provide much needed data on the duration of abnormally high levels swings in turbidity.

[3]Suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries management 16: 693-727.

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Conclusions

High concentrations of suspended sediment can reduce light penetration and, upon settling on the bottom, smother benthic habitats and impacting both aquatic animals and their eggs. As particles of silt, clay, and other organic materials settle to the bottom, they can suffocate newly hatched larvae and fill in spaces between rocks which could have been used by aquatic organisms as habitat. Fine particulate material also can clog or damage sensitive gill structures, decrease their resistance to disease, prevent proper egg and larval development, and potentially interfere with feeding activities.

We generally know the factors that cause excessive turbidity. Such factors include crumbling stream banks, runoff from urban and agricultural areas, and even little things such as too many bottom dwelling fish -- such as carp -- stirring up the bottom. And we also know effective measures to reduce turbidity, such as installing riverine buffers, restoring stream banks, better supervision of construction projects, and reductions of impervious surfaces. It appears however, as evidenced by the sharply increasing trend in turbidity, that the efforts allocated to such remedial efforts measures are inadequate.

Turbidity, however is a growing problem. The average turbidity concentrations in the rivers and tributaries have increased drastically, and many streams are now highly impaired. What is cause for greater alarm is that the trend is increasing sharply. The volunteer organizations such as the FOSR and FNFSR are doing their best to reduce turbidity levels by implementing best management practices, such as restoring riverine buffers, but they have very limited resources. Greater involvement is needed from local, State, and Federal government. Please express your concern about turbidity to your legislator or county official whenever you have a chance.

To the membership of the FOSR:

My name is John Simpers, and I am currently the Secretary of the Friends of the Shenandoah River. It has been my privilege to serve this organization during the past nine years – first as a volunteer in our laboratory located at Shenandoah University, and later as an active member of the FOSR Board of Directors.

Although our board is entrusted with making the decisions that direct and focus the work of our organization, nothing can truly take place without the valuable input of our membership. As members, you have already displayed a profound interest in the health and prosperity of the Shenandoah River and its communities. Your thoughts and feelings about what the FOSR is doing today, and where it could offer the most benefit in the months and years ahead, can greatly influence the work we do and the impact we have.

On behalf of the Board of Directors, I would like to invite you all to share your ideas and concerns with us. Most especially, I would ask you to come and attend a board meeting and learn firsthand how you could take a more active role in the ongoing efforts of the FOSR. We want to hear new voices and fresh ideas as we move forward with our monitoring work, our outreach activities, and our educational programs, all with the goal of improving and sustaining the health of the Shenandoah River.

Please contact us – by phone, e-mail, or post – and let us know that you would like your voice to be heard. From the entire Board, thank you once again for your continued support of the FOSR, and we hope to hear from you in the very near future.

Sincerely,

John Simpers

Secretary of the Friends of the Shenandoah River

South River Science Team Expert Panel Meeting, *by Bob Luce*

The South River Science Team last meeting of the year was held on October 5 and 6 at the Harrisonburg offices of DEQ. About 50 people attended in person and 4 others were in phone (Webinar) contact. This is the tenth year that the SRST has been in existence. In that time an astonishing amount of field and laboratory research has been done. As reported in our last newsletter, now most attention is focused on what is needed in order to devise remedial options to deal with the initiating problem--methyl mercury bioaccumulates up the trophic web so that smallmouth bass (a top predator) in the South and Shenandoah Rivers, should not be eaten by humans, or eaten only in limited amounts, for health reasons.

The concentrations of methyl mercury and total mercury in these river waters are way below drinking water standards; it is the bioaccumulation that causes the problem(s). Prodded by the Natural Resources Defense Council, the SRST has looked for deleterious effects of methyl mercury on a large number of indigenous faunal aquatic and terrestrial species. However, there is no smoking gun yet. Species populations have not yet been observed to decrease (the biology standard) although nesting and hatching behavior of some birds have been affected. It is possible that longer duration studies may reveal critical problems.

Working backwards with the trophic webs that he constructed for both aquatic and terrestrial species by means of carbon and nitrogen isotopes, Michael Newman, one of the experts guiding the team, summed up the situation: “Any remediation needs to reduce bioavailable mercury in fine sediments or periphyton by 95% to get most bass below mercury of 0.3 to 0.5 ug/g.” To achieve this TMDL level it is apparent that a mixture of remedial activities will be needed. This reflects the fact that the mercury causing the problems is finely dispersed at very low concentrations over a wide area of river and floodplain.

Remedial options task teams have been formed to evaluate engineering options (including bank stabilization), microbial methylation disruption, and trophic modification. The first of these has been shown in a pilot study to work effectively but it is insufficient by itself because of access and cost problems. The second intriguing category has begun in earnest with extensive literature research into the factors affecting mercury methylation. The third could work by shifting emphasis to fishing for species lower in the food chain, e.g., trout, or by manipulating invertebrates and forage fish species.

Another promising method of immobilizing mercury for eventual removal comes from studies of colloid and surface chemistry properties of the fine-grained sediments in the South River and embankments by Carol Ptacek and co-workers at the University of Waterloo, Ontario. They found that the mercury mineral speciation is highly variable but most is present as minute grains of meta-cinnabar (mercury sulfide) bound in organic or inorganic colloids. They have shown that this material can be leached and that greater than 90% of the mercury can be adsorbed by activated charcoal.

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