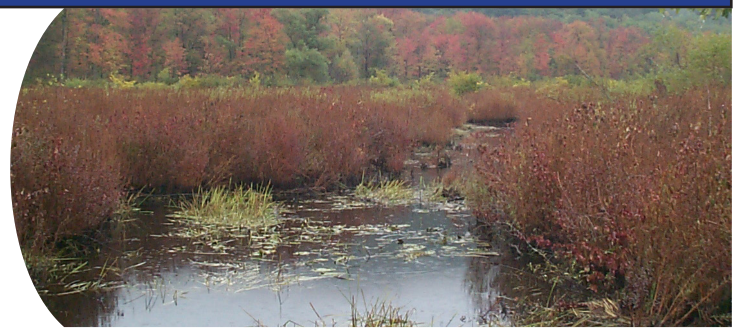
Housatonic River Mini Workshops

Mini Workshop Two:

Getting the Facts on PCBs
Human Health Risks,
Ecological Risks and PCBs



All Workshops • 5:30pm - 8:30pm

TUE. APRIL 5	TONIGHT	THU. APRIL 7
Mini Workshop One: Why Working with River Processes Matters *History, Ecology, and PCBs*	Mini Workshop Two: Getting the Facts on PCBs *Human Health Risks, Ecological Risks, and PCBs*	Mini Workshop Three: Exploring Alternatives for Cleanup *Remediation, Restoration, Alternatives, and Environmentally Sensible Remediation Concepts*

Public Charrette • 8:30am - 5:30pm

SAT. MAY 7

The Community Contributes
A Practical, All-Day, Hands-On Workshop for the Community to Better Understand the "Rest of River" Issues, to Explore the Pros and Cons of the Alternatives, and for EPA to Hear the Community's Ideas

All events will be held at Shakespeare & Co., 70 Kemble Street, Lenox, MA

This Workbook contains key information and materials being presented at the Mini Workshop. Additional information and full presentations will be available at:
www.housatonicworkshops.org

United States Environmental Protection Agency
5 Post Office Sq.,
Suite 100
Boston, MA 02109-3912

Dear Friends,

It is my pleasure to welcome you to this important series of workshops regarding the Housatonic River. First, I would like to thank you for taking the time to participate in these important public engagement and education programs. I am keenly aware of the high level of interest in EPA's upcoming decision about the scope and type of work that will be required of GE in the "Rest of River" portion of the Housatonic, as the river winds south from Pittsfield through Berkshire County and Connecticut. I have been very impressed with everyone's commitment to the River and its connection to the people in the communities through which it flows. There is a lot at stake – including protecting the character of the Housatonic and making the right decisions for current and future generations to safely enjoy the river environment.

EPA has designed this series of workshops and subsequent charrette not only to help you better understand what we've learned about the River and the PCB contamination but to also help us better understand your views as we move forward in our decision-making process. I am committed to making decisions based on sound science, and based on the best available information. I am also committed to an open, inclusive and transparent process that allows the communities of the Berkshires and Connecticut to weigh in with their concerns and priorities. These workshops are important steps towards that goal.

EPA hopes to use what we learn from you and others at these workshops to aid in our ongoing evaluation of cleanup options. We also hope that, through this process, you gain a broader understanding of the numerous technical and policy issues at hand. After EPA issues our formal cleanup proposal, all members of the public will, once again, have an opportunity to comment on the proposal. EPA will then review those comments and make our final cleanup decision. I will ensure that whatever plan EPA ultimately decides is best, it will be implemented by GE in a manner that is sensitive to the unique character of the river and to the community.

Thank you again for attending and I hope you find these workshops informative and worthwhile.

Curt Spalding
Regional Administrator

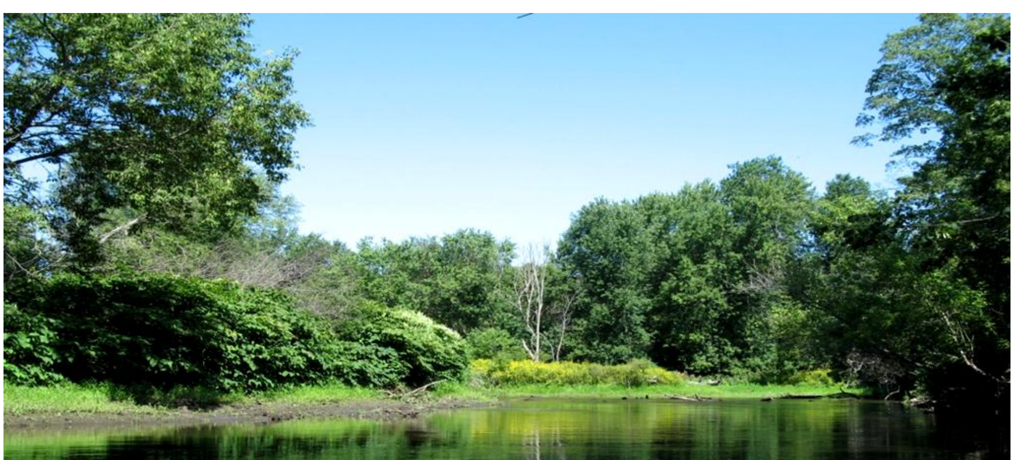
LEARN MORE AT: www.epa.gov/region1/ge

Tonight's Agenda

- **Welcome and Introduction; EPA's Public Outreach and Decision Making Criteria** – Larry Brill*, EPA*
- **Panelists' Introduction** – Steve Shapiro, *Certus Strategies*
- **Presentation One: PCB Distribution, Fate, and Transport** – **E**dward Garland, *HDR HydroQual*
    - *Brief Q&A*
- **Presentation Two: Human Health Risks** – Donna Vorhees, Sc.D, *The Science Collaborative*
    - *Brief Q&A*

Brief Break

- **Presentation Three: Ecological Risks** – Gary Lawrence, *Golder Associates*
    - *Brief Q&A*
- **Presentation Four: Why Use Models for the Housatonic River?** – Mark Velleux, Ph.D, *HRD HydroQual*
    - *Brief Q&A*
- **Q&A – Full Panel**
- **Conclusion/Wrap-Up**



Please register for May 7 Public Charrette on Registration form or at www.HousatonicWorkshops.org!

EPA's Public Outreach and Decision Making Criteria

Under the Consent Decree for the GE Housatonic River Site, GE was required to submit its Corrective Measures Study (CMS) to evaluate cleanup alternatives for the Rest of River to reduce risk to human health and the environment from PCBs, and to prevent further downstream transport of PCBs. The initial CMS was submitted in March 2008. After receiving public input, EPA submitted comments to GE on the CMS. GE then submitted the Revised CMS (RCMS) in October of 2010. In the RCMS, GE evaluated 10 sediment alternatives, 9 floodplain alternatives, and 5 treatment and disposal alternatives.

EPA held an informal public input period on the RCMS, and the comment period closed on January 31, 2011. EPA has now begun its decision making process for the cleanup of the Rest of River, considering the RCMS, other relevant information, and public input.

As part of its public input process, EPA's consultant held a series of interviews with stakeholders regarding their view of the process and information needs. An outgrowth of these interviews is this series of mini workshops designed to address the information needs identified by the stakeholders. The goal of the workshops is to provide a better understanding of the issues associated with selecting a cleanup for Rest of River. In addition, an all-day hands-on session, or charrette, will be held on May 7th for stakeholders to learn and interact regarding the Rest of River cleanup.

Please keep in mind that under the terms of the Consent Decree, EPA must evaluate all cleanup alternatives against the following 9 criteria:

<u>General Standards</u>

- Overall protection of human health and the environment
- Control of sources of releases
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

<u>Selection Decision Factors</u>

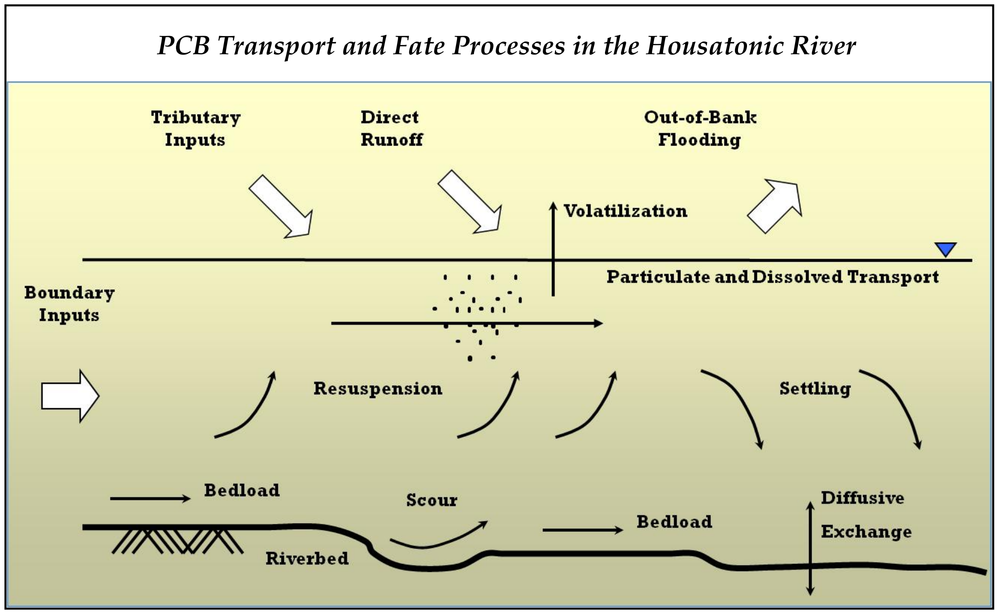
- Long-term reliability and effectiveness
- Attainment of Interim Media Protection Goals (IMPGs, or cleanup goals)
- Reduction of toxicity, mobility, volume
- Short-term effectiveness
- Implementability
- Cost

For additional information see "EPA's Cleanup Decision Process" and "Cleanup Alternatives in the Revised CMS" information sheets at http://www.epa.gov/ne/ge/thesite/restofriver-reports.html#CommunityUpdates.

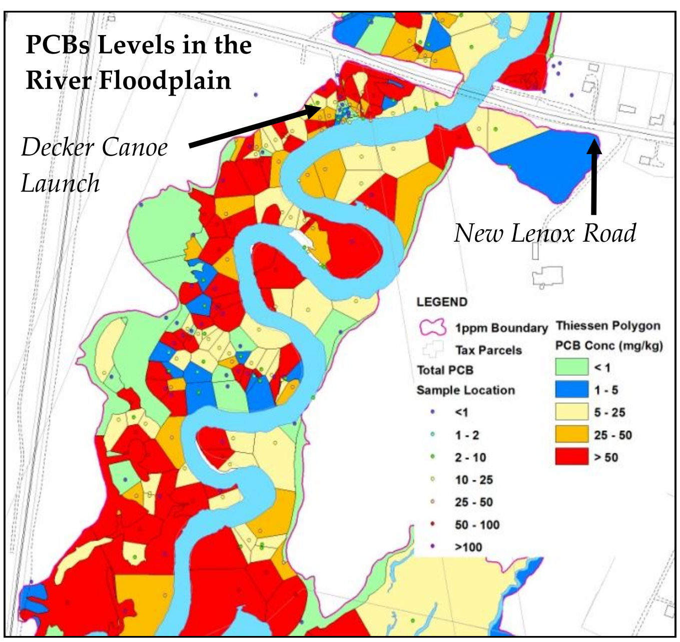
Presentation One: PCB Distribution, Fate, and Transport

Ed Garland, *HDR|HydroQual*

The Housatonic River is a complex and ever-changing environment. PCBs in the River have been extensively studied as part of a wide range of detailed site investigations, risk assessments, and modeling studies. A primary purpose of all these studies was to help us understand where PCBs occur in the River and floodplain and how much is there (**distribution**), how they move through the River and floodplain (**transport**), and where they go over time (**fate**). In addition to helping better understand the River and its complexities, this information is being used by EPA to select the best possible cleanup approach for the Rest of River.



Thousands of PCB samples and other measurements have been collected from River water, sediment, floodplain soils, and fish. Data were also collected to measure riverbed, riverbank, and floodplain characteristics. From these data, EPA learned that some riverbanks upstream of Woods Pond are not stable and are eroding. When banks erode, they put PCBs back into the water and the sediment bed. Riverbanks account for nearly half of all PCBs entering the River. The data show that the River floodplain is heavily contaminated with PCBs because when floods occur, PCBs move onto the floodplain. The data also show that PCBs are present throughout the riverbed at concentrations that vary widely over very short distances (i.e. feet). This means that PCB contamination is extensive and that there are no hotspots (small areas that are large PCB sources).

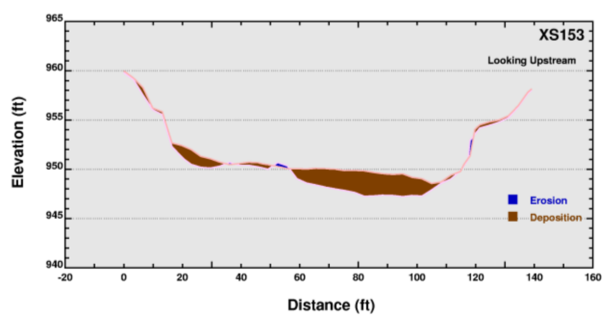


Bank Failure and Erosion Puts PCBs into the River over Time

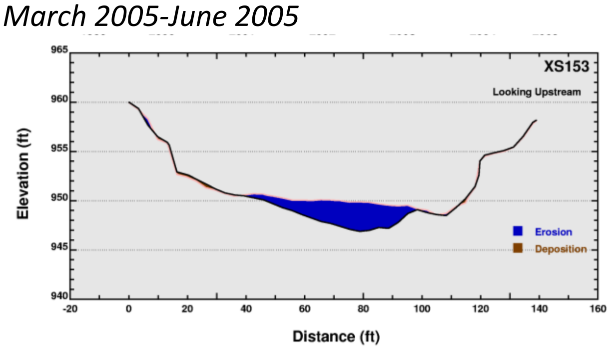
PCBs occur deep in the riverbed as well as at the bed surface. Sediment transport is very active, so PCBs deeper in the riverbed are not always permanently buried. Like riverbanks, the riverbed is subject to erosion and deposition. Sediment eroded from the bed carries PCBs into River water where it is transported downstream. Similarly, sediment that settles brings PCBs back to the bed where they may be picked up and transported downstream at a later time. Several feet of erosion can occur over time, re-exposing PCBs once located deep in the bed. This process was confirmed by carefully surveying River cross-sections at many locations over several years.

River Cross-Section Survey Results Showing Erosion and Deposition Across the River Over Time

June 2003 to March 2005



March 2005-June 2005



Brown indicates areas of deposition. Blue indicates areas of erosion. Results shown are for Cross-Section (XS) 153.

Natural recovery of the River depends on how fast cleaner sediments accumulate on the riverbed and bury PCBs. However, relatively little sediment accumulates on the bed because long-term sediment erosion and deposition rates in the River are roughly equal over time. This means the rate of natural recovery in the River is slow. Even in areas like Woods Pond, sedimentation rates are low. On average, it takes 4-6 years to accumulate one inch of sediment in the Pond. About 90% of the PCBs entering Woods Pond end up going over the dam and travel downstream, meaning that only 10% of the PCBs are retained in the Pond.

Presentation Two: Human Health Risks

Donna J. Vorhees, Sc.D, *The Science Collaborative*

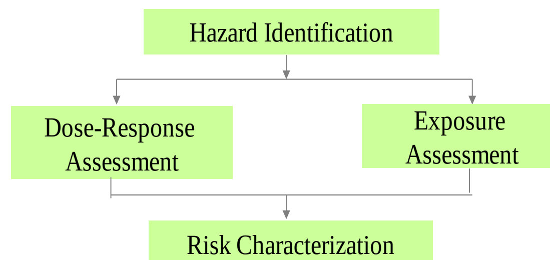
HOW DID EPA DETERMINE IF PCBs THREATEN THE HEALTH OF PEOPLE USING THE HOUSATONIC RIVER AND ASSOCIATED FLOODPLAIN?

EPA's Human Health Risk Assessment[1] (HHRA) for the Rest of River was designed to answer this question by characterizing cancer risk and adverse noncancer effects for adults and children who are exposed to PCBs while living or working near the River, or while using the River and floodplain for fishing or agricultural purposes. EPA's HHRA was peer-reviewed by an independent panel of experts in evaluating human health risk.

WHAT IS HUMAN HEALTH RISK ASSESSMENT?

Human health risk assessment is a systematic approach to organizing and analyzing scientific knowledge and information about contaminants, such as PCBs, that might harm people's health under certain conditions. These assessments provide answers to four basic questions, which then provide estimates of risk to people's health:

1. ***Are PCBs present? (Hazard Identification)*** Samples of soil, water, air, fish, waterfowl and vegetation were collected to find out if they contain PCBs.
2. ***Who is exposed to PCBs and by how much? (Exposure Assessment)*** Chemicals may enter the body through breathing (inhalation), eating or drinking (ingestion), or by skin contact (dermal). People are not all exposed to the same amount of PCBs, so the risk assessment quantified a reasonable maximum exposure (RME), which represents a highly exposed person and a central tendency exposure (CTE), which represents a person with an average exposure.



3. ***How toxic are PCBs? (Dose-Response Assessment)*** EPA uses information from animal and human studies to assess the potential for chemicals to cause cancer or noncancer effects.
4. ***Could PCBs harm people's health? (Risk Characterization)*** The Risk Characterization describes the potential risks to people from exposure to PCBs in the Housatonic River.

HOW DO PCBs AFFECT PEOPLE'S HEALTH?

Cancer - Studies demonstrate that PCBs cause cancer in animals. As a result, EPA and other agencies have classified PCBs as probable human carcinogens.

Other Health Effects - PCBs have been associated with a range of adverse effects in animal studies that might also occur in humans. In addition, high exposures in human populations have been associated with eye and skin effects, and lower exposures in human populations suggest other adverse effects, including effects on the immune system, neurological system, and endocrine system.

HOW MIGHT PEOPLE BE EXPOSED TO PCBs?

The HHRA evaluated three primary ways that people may be exposed to PCBs originating from the GE facility in Pittsfield, Massachusetts:

- Direct contact with soil and sediment during recreational, residential, commercial, and agricultural activities in the floodplain

[1] Please see the EPA's Community Update – Rest of River Risk Assessments for more information at http://www.epa.gov/ne/ge/thesite/restofriver/reports/456069.pdf.

- Consumption of fish and waterfowl taken from the Housatonic River
- Consumption of agricultural products produced in the floodplain such as milk, eggs, and plants.

WHAT ARE THE RISKS FROM PCBs IN…

Soil?

- Nearly all cancer risk estimates are within or below the acceptable EPA risk range
- Noncancer hazard indices (HIs) exceed the EPA benchmark of 1 in some exposure areas for almost all exposure scenarios

Sediment?

- Cancer risk estimates are within or below the acceptable EPA risk range in all 8 sediment exposure areas
- Noncancer hazard index is exceeded in 4 of the 8 sediment exposure areas

Fish and waterfowl?

- Cancer risk estimates are above the acceptable EPA risk range
- Noncancer hazard indices are above the EPA benchmark
- Cancer risk estimates and noncancer hazard indices are higher from fish or waterfowl sampled closer to the GE facility than those collected farther downstream

Agricultural products?

- No cancer risk estimates are above EPA's acceptable risk range and no noncancer hazard indices are above EPA's benchmark for home gardens, wild edible plants, and currently operating commercial farms, but this conclusion could change if farming locations and practices are altered in a way that involves more intensive or frequent exposure to contaminated soils
- Depending on farm management practices, commercial and backyard farming in some floodplain areas would be associated with cancer risk estimates above EPA's acceptable risk range and noncancer hazard indices above EPA's benchmark

HOW IS "RISK" QUANTIFIED?

CANCER RISK is the increased probability, or chance, of getting cancer as a result of exposure to chemicals at a site. In the reports for this site, a 1 in 1,000,000 chance is written as 1E-06 or 1×10^{-6}. Acceptable risks for cancer are considered by EPA to be less than 1 in 1,000,000. Between a 1 in 1,000,000 and a 1 in 10,000 chance, sometimes referred to as the "acceptable EPA risk range", EPA makes a site-specific risk management determination..

NONCANCER HAZARD is a comparison of an allowable exposure to the amount of exposure estimated at a site, and the comparison is called the Hazard Index (HI). An HI less than 1 means people are unlikely to be harmed.

WHAT DO THE RISK RESULTS MEAN FOR YOU?

It depends on where you go near the River and what you do while you are there.

- Some activities are okay just about everywhere (e.g., canoeing)
- Some activities are okay in some locations but not others (farming)
- Some activities are not okay anywhere in Massachusetts (although some fish consumption is okay in some locations in Connecticut)

Depending on the scope of the selected cleanup plan, more floodplain locations and River reaches may be suitable for the land uses and activities evaluated in the risk assessment. Also, fish can be caught and consumed from the River sooner with some cleanup alternatives vs. others.

Presentation Three: Ecological Risks

Gary Lawrence, *Golder Associates, Inc.*

Do polychlorinated biphenyls (PCBs) really affect animals?

The assessment of PCB toxicity to wildlife is grounded in published and peer-reviewed science, with thousands of studies spanning several decades of research. Based on this information, several broad conclusions can be drawn regarding the harm caused by PCBs to numerous animals:

- Organisms are often sensitive to PCB toxicity during early life stages, with malformations and deformities observed in the young of many species due to PCBs; often these effects are severe enough to result in premature death of the animal.
- The degree of harm depends on how sensitive an animal is and how much exposure to PCBs occurs. As expressed by the "father of toxicology," Paracelsus, the "dose makes the poison."
- The entire PCB mixture is important, because non-dioxin-like PCBs cause effects to animals, including impaired reproduction and development.
- Of the 209 PCB congeners, a few of them are particularly toxic because they cause responses similar to dioxin.

If PCBs can be harmful, why are there many animals found in the Housatonic River and floodplain?

Incidental observations of animals do not reveal some important ecological concerns, such as:

- In highly contaminated reaches of the River, some species are absent that should be present given the habitat quality available. Others are present, but at reduced numbers from what should be found.
- The ecological potential of the system is not currently being realized due to PCB effects.
- If other stressors increase, whether local influences such as habitat fragmentation or global influences related to climate change, the ability of populations to withstand PCB stresses may decline.

Why are some animals affected, but not others?

Not all animals respond in the same way to PCBs. Animals have different behaviors that influence their exposure to PCBs, such as feeding preferences and ranges of movement. In addition, individual species have different biological characteristics that affect how PCBs are handled in the body. As a result, there is a range in sensitivity, with some animals resistant to effects, and others affected by very low environmental exposures. The abundance and health of one type of animal should not be taken as an indication that all other types are unaffected.

Which organisms were assessed in the Ecological Risk Assessment (ERA)?

In an ecological risk assessment, it is not possible to evaluate every species. Instead, the focus is on animals that are representatives of each major grouping of animals, and assess them in detail. Among the animals present in the system, many of the choices in the ERA were made because the animal was evaluated by other investigators at other contaminated sites and in other PCB investigations. At the end of the ERA, the results from this evaluation are discussed in the context of the implications of the findings to the broader community.

What tools were used to assess ecological risk in the ERA?

State-of-the-science methods were applied in 3 categories:

1. *Chemistry* – Estimates of exposure (dose or concentration) for each organism were compared to a toxicity threshold found in the scientific literature. This previous research was applied where appropriate, using chemistry data as the bridge between other studies and the ones performed for the ERA, and assessed the degree of adverse effects that could be expected relative to PCB exposure.
2. *Site-Specific Toxicity* – Well-established procedures were used for measuring toxicity to animals in a controlled environment (usually laboratory-based). Typically toxicity tests evaluate one organism at a time, and look for differences in responses between exposure to contaminated media (e.g. sediment) from the site and uncontaminated media. Tests measured organism survival, growth, reproduction, malformation, or other endpoints that indicated how the animal may respond in the wild. The toxicity tests applied in the ERA were conducted by experts in environmental toxicology; they included "routine" tests, and also included specialized tests.

3. *Field Studies* – This tool directly evaluated animals in their natural environment. In a field study, the abundance and diversity of animals, their health, and measures of their ability to grow and reproduce is assessed. A limitation of this approach is that is it not always easy to discern a contaminant effect from the many other factors that influence animals in the wild. Because natural communities are inherently variable, field studies require large numbers of samples to identify changes due to any individual factor (such as PCBs). At the River, numerous studies of populations were conducted by GE and EPA (e.g., kingfishers, robins, tree swallows, largemouth bass, wood frogs, mink and otter).

What did the results of these studies tell us?
For most animals, the estimated exposures to PCBs were greater than thresholds for adverse effects found in the literature. Site-specific toxicity tests also indicated a number of adverse effects to survival, growth, and/or reproduction of organisms. Mink were the most sensitive test animals, but benthic invertebrates and amphibians also showed toxicity at exposure levels well below the average PCB concentration observed in the Primary Study Area of the River. Fish also exhibited adverse effects, but these generally occurred toward the higher end of the current contamination levels.

As expected, the field studies of community conditions showed a range of responses to PCBs, reflecting the sensitivity differences described above. Some studies were inconclusive because reliable information was unavailable for a specific organism. However, in many cases the studies provided evidence for or against PCB toxicity at concentrations measured. For example, in the case of benthic invertebrates, the sediment concentration causing alteration of communities was similar to the toxicity-based threshold. In contrast, the tree swallow and robin field studies did not show responses as strong as were predicted from other lines of evidence.

How were the final determinations of risk made?
Each group of organisms was formally evaluated by combining the available lines of evidence. This procedure included assessment of the strength and/or reliability of each line of evidence. Evidence was weighed more strongly if it provided more compelling information on the relationship between PCB contamination and effects to local animal populations.

Which animals are at greatest risk, and which are at lower risk?
Conclusions of high risk were made for fish-eating mammals, amphibians, and sediment-dwelling invertebrates. For these animals, there was evidence of ecological harm from all three lines of evidence:

(Source: Hyalella © Dale Parker, AquaTax Consulting)

- Literature studies indicated that mink feeding in the River would be likely to experience severe reproductive effects. These effects were confirmed by a feeding study that tested low amounts of contaminated River fish in the diets of captive mink. Even low percentages of fish in the diet (much lower than expected for resident mink) indicated impaired reproduction. Extensive field surveys by GE and EPA documented few reliable signs of resident mink and otter.
- Two species of amphibians were studied (leopard frog and wood frog) and showed a number of adverse effects including delayed development, malformations, alteration of sex ratios, and reduced survival at certain life stages. The timing, magnitude, and pathway of PCB exposure were all important in determining toxicity. Frogs were most sensitive to sediment PCB exposure during metamorphosis, when the larvae mature into frogs. Risks to amphibians were confirmed in field studies that showed reduced variety of amphibians and lower numbers of salamanders in PCB-contaminated vernal pools compared to uncontaminated pools.
- For benthic invertebrates, the concentrations of PCBs observed in the River are well above literature-based effects thresholds for sediment and tissue contamination. Toxicity tests in the laboratory and the field showed impairment of survival, growth, and/or reproduction for most species. Field assessments showed reduced overall abundance and reduced variety of invertebrates in the PCB contaminated sediments relative to reference areas.

Other animals have lower risk, including fish, insect-eating birds, fish-eating birds, small mammals, and several endangered species. For these animals, the estimated degree of harm was lower and the lines of evidence were not always in full agreement, so there is some uncertainty in these risk estimates

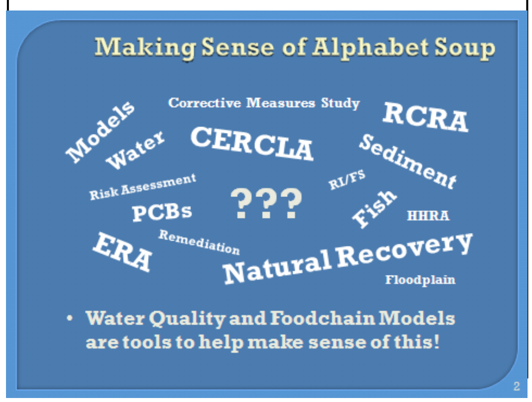
Presentation Four: Why Use Models for the Housatonic River?

Mark Velleux, Ph.D, *HDR|HydroQual*

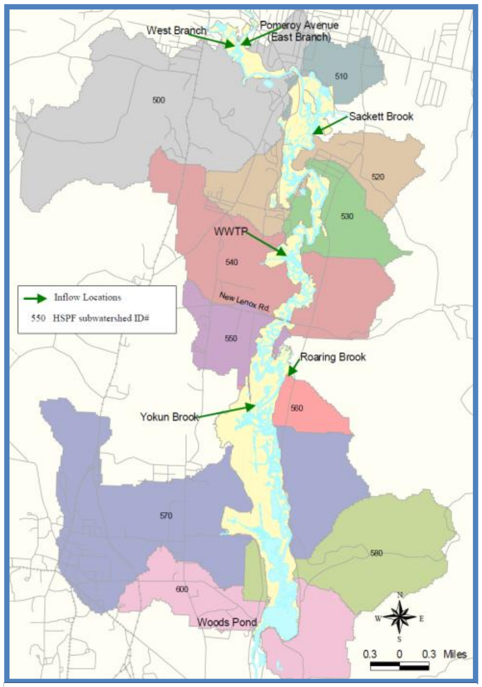
PCB investigations in the Housatonic River have been conducted for several decades. As required by the Consent Decree, in the 2000's EPA conducted a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA). These studies concluded that PCBs in the Housatonic River and surrounding floodplain pose risks to people and wildlife. In addition, EPA was required to develop a water quality and food chain model framework, working with GE, to demonstrate how PCBs move through the River and the foodchain (e.g. fish). In its Corrective Measures Study (CMS) and subsequent revisions, GE used the models EPA had developed.

Models can be as simple as a diagram on paper or as complex as computer models. The latter is what was used to describe how PCBs move through the River and end up in aquatic animals. All of the models have been used extensively at other sites and are in the public domain. The PCB transport model for the River is the Environmental Fluid Dynamics Code (EFDC) and the Food Chain Model is called FCM. In addition, there is a third model, Hydrological Simulation Program-Fortran (HSPF), that simulates inputs from the surrounding watershed. These models are called mass balance models. The concept behind mass balance models is similar to balancing your checkbook: you add up all sources (gains) and subtract all sinks (losses) to determine how much is left (accumulation). Mass balance models are useful tools because they help to organize data, illustrate trends, and estimate the time to reach acceptable risk levels for PCBs in water, sediment, soil, fish and wildlife, and for human health.

Sometimes it seems like there are so many terms and acronyms for different programs, documents, and PCB cleanup options, but no clear answers. At this point, you might wonder what things like CMS or HHRA mean. If you are like a lot of folks who live in communities near the River, you might ask "How can I make sense of this alphabet soup of all of this?" Models are an important tool to help to make sense of all of this.



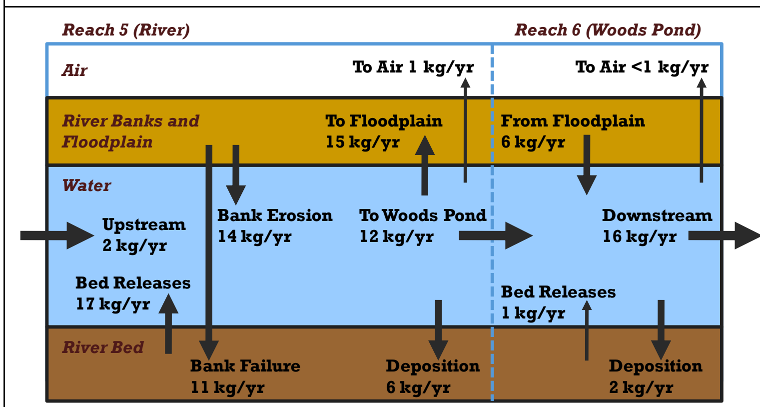
EFDC includes many detailed processes that occur in the River. It simulates PCB levels in water, sediment, and floodplain soil within the 10-year floodplain. The EFDC model grid has thousands of small compartments stretching from the confluence of the East and West Branches of the River just outside of Pittsfield down to Rising Pond near Great Barrington. For every one of these compartments, mass balance calculations are performed over time steps as small as seconds. FCM includes detailed biological and exposure processes that occur in aquatic biota. It takes output from EFDC and uses it to simulate how PCBs move through the foodchain. HSPF includes detail about watershed processes. All three models were calibrated and validated using data collected from the River. The entire model framework was subject to three Peer Reviews by an independent panel of experts. The model framework is an important tool that can be used to explore “what if” scenarios to assess the impact and benefits of remediation for different cleanup options.



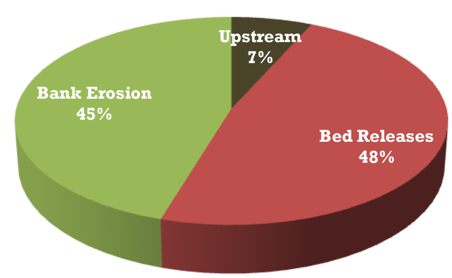
PCB concentrations in the River can potentially change over time. During development, the models were tested to ensure that they could simulate any changes in PCB levels in water, sediment, and fish and other biota over time frames as short as a few hours (storm events) up to decades. This validated that the models provide an understanding of how PCBs move in the River, where they come from, and where they go over time, as well as identifying the important sources of PCBs to the River. In addition, these models are used to evaluate performance of the different cleanup alternatives.

Model results and site-specific data should be considered together. Detailed information from River monitoring and modeling studies provides a thorough understanding of the River. Importantly, monitoring data and modeling results document that there are no hotspots (small areas that have much higher PCBs levels relative to other areas) in the first 10 ½ miles of Rest of River. The results also show that the River is not cleaning itself fast enough to significantly reduce risks in the foreseeable future. PCBs from riverbanks and the riverbed continue to move downstream and can be deposited on the floodplain. The riverbanks in Rest of River account for nearly half the PCBs going into the River. When used with monitoring data, the models are useful tools to evaluate cleanup alternatives.

Where PCBs Go Over Time: 52-Year MNR Forecast



Importance of PCB Sources



Riverbanks are the source of 45% of PCBs going into the River (includes riverbank PCBs remobilized from the riverbed).

MNR = Monitored Natural Recovery

Presentation 1 - Biography

Edward J. Garland, Senior Professional Associate
HDR HydroQual, Inc., Mahwah, NJ

Ed Garland is an environmental engineer with 30 years of experience in water and sediment quality modeling, including over 25 years with HydroQual, Inc., where he serves as Technical Director of the Environmental Fate and Transport practice area. His expertise includes developing and applying complex, integrated models of environmental hydrodynamics, sediment transport, and contaminant transport and fate to studies of contaminated rivers and estuaries. For the Housatonic River Project, Mr. Garland has overall technical and supervisory responsibility for the team that has calibrated, validated, and applied the three-part linked modeling framework (HSPF/EFDC/FDCHN) to evaluating the effect of the proposed remedial alternatives on PCB concentrations in the Housatonic River, its floodplain, and its resident biota.

In addition to his work on the Housatonic, Mr. Garland has developed national recognition for his direction of modeling efforts for contaminated sediment mega-sites such as the Passaic River, New Jersey, and Green Bay, Wisconsin. He has also applied numerical models of hydrologic processes to a wide variety of other riverine sites across the United States in support of waste load application regulatory processes, and has authored a number of technical articles and presentations at national and international technical conferences.

Presentation 2 - Biography

Donna J. Vorhees, Sc.D., Principal
The Science Collaborative, Ipswich, MA

Dr. Donna Vorhees specializes in multi-pathway exposure assessment and human health risk assessment of chemicals in indoor and outdoor environments. Dr. Vorhees (at the time with Menzie-Cura Associates) participated in all aspects of the Human Health Risk Assessment for the GE/Housatonic River Site and was the primary author of the assessment of agricultural products such as milk, beef, chicken, eggs, and vegetables, and the probabilistic assessment of soil exposure and agricultural products. She holds an Sc.D. from the Harvard School of Public Health and has nearly 20 years of experience conducting deterministic and probabilistic exposure and risk modeling for environmental contaminants such as polychlorinated biphenyls, dioxins and furans, petroleum hydrocarbons, volatile organic compounds, and metals (e.g., arsenic, lead, and mercury). She is also an Adjunct Assistant Professor in the Department of Environmental Health at the Boston University School of Public Health where she teaches Risk Assessment Methods. In addition to her work on the Housatonic River, Dr. Vorhees has conducted risk assessments on a wide range of environmental health issues, including determining whether and to what extent contaminated sites should be remediated, identifying research priorities and comparing risks among dredged material management alternatives for the U.S. Army Corps of Engineers, and providing guidance for responding to and evaluating petroleum spills in and near private residences. She is also leading a health study as part of a United Nations environmental assessment of petroleum contamination in the Niger Delta. Dr. Vorhees is a Councilor for the Society for Risk Analysis and recently served on two National Research Council Committees (Health Risks of Phthalates and Sediment Dredging at Superfund Megasites). She is the author or co-author of numerous scientific publications and has presented the results of her work at a variety of national and international technical conferences.

Presentation 3 - Biography

Gary Lawrence, M.R.M., R.P.Bio Associate/Senior Environmental Scientist - Risk Assessment
Golder Associates, Inc., Vancouver, BC, Canada

Gary Lawrence is a Senior Scientist with Golder Associates. He specializes in aquatic and terrestrial ecological risk assessment, ecotoxicology, risk modeling of environmental systems (including chemical bioaccumulation modeling), sediment quality assessments, resource management, and statistical data analysis. Because of his broad technical skills and project experience, he has served in a variety of capacities on the Housatonic River Project. Mr. Lawrence has primary responsibility for the calibration, validation, and application of the food-chain/bioaccumulation model that predicts PCB concentrations in fish and other biota under each of the proposed remedial alternatives. He also was responsible for Ecological Risk Assessment for the benthic invertebrate and fish receptor groups, and consulted on the amphibian risk assessment. Mr. Lawrence has served as Project Manager and Principal Investigator for numerous ecological and human health environmental risk assessments, both in North America and internationally. He has contributed to regional and national guidance documents on the implementation and interpretation of detailed risk assessments. This involvement included guidance on weight-of-evidence approach, sediment quality triad, application of toxicity tests, and risk characterization methods. He specializes in the fate and effects of substances that bioaccumulate and/or biomagnify in the environment, including PCBs, dioxins/furans, mercury, and tributyltin. Mr. Lawrence currently manages a group of approximately 25 environmental professionals in the Golder Associates Greater Vancouver Office, and has more than 15 years of experience in risk and environmental assessment.

Presentation 4 - Biography

Mark Velleux, Ph.D., P.H., P.E. Senior Project Manager
HDR HydroQual, Inc., Mahwah, NJ

Dr. Mark Velleux is a civil engineer with over 20 years of experience in the development and application of surface water and watershed-scale contaminant transport and fate models. He has both technical and managerial experience investigating contaminated sediment sites, establishing clean-up goals, and evaluating remediation alternatives. For the Housatonic River Project, Dr. Velleux was responsible for review and analyses of EFDC model results to evaluate model performance to support supplemental data collection and field surveys related to modeling studies. He conducted analyses to quantify PCB transport and fate processes in river sediment and surface water that were used to define inputs for model validation and demonstration simulations, and contributed to sediment transport and PCB transport and fate model performance evaluations as well as efforts to evaluate model sensitivity and uncertainty. In addition to his work on the Housatonic, Dr. Velleux has also been a senior member of teams investigating metals transport in the Upper Columbia River, PCB transport and fate modeling efforts and analysis in the Lower Fox River, and modeling the potential for PCB release from confined disposal facilities in Saginaw Bay (Lake Huron). With the Wisconsin Department of Natural Resources, he was responsible for PCB transport and fate models developed for CERCLA (Superfund) and NRDA efforts for the Lower Fox River/Green Bay PCB Superfund Site. He is the author of a number of peer-reviewed articles in scientific journals, in addition to a wide variety of presentations at national and international scientific conferences.

Notes

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STATE AND LOCAL RESOURCES

Berkshire Athenaeum Public Library
(413) 499-9480

Cornwall Public Library
(860) 672-6874

Kent Memorial Library
(860) 927-3761

Housatonic Valley Association
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