U.S. Army
Corps of Engineers

New England District
Concord, Massachusetts

U.S. Environmental
Protection Agency

New England Region
Boston, Massachusetts

Report on the 2010-2011 Situation Assessment, Mini Workshops, and Charrette Housatonic River, Rest of River

DCN HR-053012-AARJ

SDMS 508641

May 2012

Environmental Remediation Contract
General Electric (GE)-Pittsfield/Housatonic River Project
Pittsfield, Massachusetts

Contract No. W912WJ-08-D-0008

Task Order No. 0002

12P-0457-B

POOLE DESIGN, LLC
Landscape Architecture • Urban Design • Ecological Infrastructure

WESTON SOLUTIONS

U.S. Environmental Protection Agency
New England Region

GE-Pittsfield/Housatonic River Site
Rest of River

Report on the 2010-2011 Situation Assessment, Mini Workshops, and Charrette

May 2012

Prepared and Submitted by
POOLE DESIGN, LLC
Landscape Architecture • Urban Design • Ecological Infrastructure
6101 Blackburn Lane
Baltimore, MD 21212
www.kathypoole.com

TABLE OF CONTENTS

Title **Page**

TABLE OF CONTENTS (CONTINUED)

TITLE **PAGE**

TABLE OF CONTENTS (CONTINUED)

TITLE **PAGE**

LIST OF FIGURES

Title **Page**

VIDEO TABLE OF CONTENTS

EPA filmed two of the Public Outreach efforts—the Three Mini Workshops and portions of the Pubic Charrette. The videos were available on the website www.HousatonicWorkshops.org, a site that EPA created to support these public outreach efforts. The DVD provided at the back of this binder includes all of the videos:

LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Federal and State Requirement
CCC	Citizens Coordinating Council
CD	Consent Decree
CMS	Corrective Measures Study
yd^3	cubic yards
EA	Exposure Area
EPA	U.S. Environmental Protection Agency
GE	General Electric Company
GIS	geographic information system
IMPG	Interim Media Protection Goal
km	kilometer
mg/kg	milligrams per kilogram
MNR	Monitored Natural Recovery
NGO	nongovernmental agency
O&M	operations and maintenance
PCB	polychlorinated biphenyl
ppm	parts per million
Q&A	question and answer
RCRA	Resource Conservation and Recovery Act
River	Housatonic River
RME	reasonable maximum exposure

EXECUTIVE SUMMARY

Public engagement has been a focus of the U.S. Environmental Protection Agency (EPA) with respect to the GE-Pittsfield/Housatonic River Site for many years. In 1998, EPA established a Citizens Coordinating Council (CCC) to serve as a focal point for community participation in the cleanup. In addition, community relations has been a part of the 2000 Consent Decree governing Site cleanup. Between the CCC and implementation of the Decree, community engagement has been a major focus of EPA.

This report focuses on efforts by EPA in 2010-2011 to engage the public on the Rest of River process. More specifically, in 2010-11, EPA and its consultants performed several community engagement actions to keep the public informed and to promote community understanding of the Rest of River process being undertaken. Specific steps completed by EPA in this effort included the following:

Situation Assessment (Late 2010 – Early 2011)
Specifically, EPA identified three needs: 1) to learn from stakeholders what questions on complex technical issues remained in their minds; 2) to gather more meaningful input from stakeholders on remediation options for EPA to consider; and 3) to learn what strategies and activities for public engagement had been working and which needed improvement, and particularly if more engaged strategies like workshops and charrettes would be effective.

Outgrowth of the Situation Assessment (Early 2011 – May 2011)
The results of the Situation Assessment made clear that—despite EPA's multiple and significant efforts to share process and technical information with the public—the complexity of the project and the number of proposed alternatives left stakeholders of varied interests with questions and desires for information and data to help inform their thinking. The Situation Assessment also made clear that stakeholders wanted significant input into EPA's proposed remedy and needed additional information to meaningfully do so. EPA responded by increasing its public outreach, targeting in its efforts to provide additional information to the public and to elicit input from the public that EPA could apply to its evaluation of alternatives.

This outreach included the following: 1) three Mini Workshops, 2) a Public Charrette, and 3) a Supporting Website, www.HousatonicWorkshops.org. The Mini Workshops were designed to prepare stakeholders to fully and knowledgeably participate in the Public Charrette, and the Supporting Website was designed to support and document both the Mini Workshops and Public Charrette so that all stakeholders would have immediate access to the information.

Mini Workshops
On the evenings of April 5-7, 2011, EPA sponsored three, 3-hour plus Mini Workshops designed to provide the public with more information through 1) presentations by a broad range of technical experts who had spent several years or more working on the project, and 2) question/answer sessions between those experts and audience members.

Public Charrette

On Saturday, May 7, 2011, EPA conducted a public "charrette"—an all-day, intense, hands-on and practical workshop filled with various activities. Whereas the primary purpose of the Mini Workshops was to equip stakeholders with the tools to understand the issues, the primary intention of the Public Charrette was to help the public *apply* the information in ways that provided meaningful input to EPA's evaluation of alternatives.

Supporting Website

In response to Situation Assessment feedback that the official EPA/Housatonic River website was comprehensive but also difficult to navigate, EPA developed a simpler, supporting website that acted as a "one-stop shop" for the Rest of River outreach effort.

Taken together, EPA's efforts extended beyond conventional, time-tested methods to also include progressive public outreach initiatives that demanded rigorous planning and exceptional levels of direct and active engagement with the public. EPA's actions included both extensive efforts to disseminate pertinent information to the public and intensive efforts to solicit input from the public on the Proposed Alternatives and their components for EPA to consider in its development of a final preferred alternative. EPA instituted, through all feasible means, efforts to create, stimulate, and support opportunities for public participation, to be as responsive as possible to public concerns, and to fully consider the public's input.

1 INTRODUCTION TO THE REST OF RIVER PUBLIC ENGAGEMENT PROCESS

1.1 Project Context

The Housatonic River (River) is approximately 149 miles (240 km) long, flows south to southeast through western Massachusetts and western Connecticut, and drains about 1,950 square miles (5,100 km^2) of southwestern New England, discharging into Long Island Sound. The Housatonic River, its sediment, and associated floodplain are contaminated with polychlorinated biphenyls (PCBs) and other hazardous substances released from the General Electric Company (GE) facility located in Pittsfield, Massachusetts. The entire site, known as the General Electric-Pittsfield/Housatonic River Site, consists of the 254-acre (103-hectare) GE manufacturing facility; the Housatonic River and associated riverbanks and floodplain from Pittsfield, MA, to Long Island Sound; former river oxbows that have been filled; neighboring commercial properties; Allendale School; Silver Lake; and other properties or areas that have become contaminated as a result of GE's facility operations.

In response to the PCB contamination, the United States, Massachusetts, Connecticut, GE, the City of Pittsfield, and the Pittsfield Economic Development Authority entered into a Consent Decree (CD), which was approved by the court on October 27, 2000. The CD provided for, among other things, the cleanup of the GE facility, cleanup and restoration of the former oxbows, cleanup and restoration of Silver Lake, cleanup of Allendale School, environmental restoration of the Housatonic River and floodplain, compensation for natural resource damages, and government recovery of past and future response costs.

The Housatonic River cleanup was divided into three segments. The first ½-Mile Reach on the East Branch is adjacent to the GE facility, and remediation was completed in September 2002. Remediation of the next 1½–Mile Reach downstream to the Confluence was completed in 2006. The area known as Rest of River comprises the Housatonic River and its floodplain from the Confluence to Long Island Sound; however, due to practical considerations, the Rest of River ends at Derby Dam in Connecticut because of other sources of PCBs downstream of the dam in the tidal portion of the river.

For the Rest of River, under the terms of the CD, EPA conducted studies and investigations to accomplish two goals: 1) to characterize the magnitude and extent of the PCB contamination of the river, riverbanks, and floodplain and 2) to support the development of Human Health and Ecological Risk Assessments and the calibration and validation of a linked sediment/contaminant/food-chain model of PCB fate and transport in the river and floodplain. The reports from these activities underwent formal external Peer Review by independent panels of experts. Following the Resource Conservation and Recovery Act (RCRA) process outlined in the Reissued RCRA Permit (Appendix G to the Consent Decree), GE prepared a Supplemental RCRA Facility Investigation Report and proposed interim cleanup goals for the Rest of River upon completion of the risk assessment Peer Reviews. GE submitted a proposal for evaluating cleanup alternatives and, after EPA conditional approval of this proposal, GE evaluated cleanup alternatives (Corrective Measures) for the Rest of River, including the no-action scenario, in its March 2008 Corrective Measures Study (CMS). In September 2008, EPA submitted over 150 comments regarding the CMS to GE for response. In October 2010, GE submitted its Revised

Corrective Measures Study. EPA is currently in its decision-making process to select a remedy for Rest of River, considering the Revised CMS, public input, and other relevant data and information.

All aforementioned studies and reports have been submitted to the public for their examination, and EPA has answered questions, received public comments, and responded as appropriate.

1.2 Project-Specific Needs

EPA continues to recognize that all stakeholders have a significant role in providing meaningful public participation. Government agencies, public interest organizations, community members, and regulated facilities are all stakeholders in the Rest of River process.

Since 1998, EPA has fulfilled the requirements of the Consent Decree by developing a community relations and engagement plan that includes cooperation with the Citizens Coordinating Council (CCC) as well as a host of other traditional and innovative initiatives that, together, formed a comprehensive and extensive Public Engagement Plan that supported an ongoing and robust information exchange between the public and EPA.

In response to the Consent Decree and the specific needs of the Rest of River project, EPA has engaged the public by including a range of strategies and activities. These efforts have included fact sheets and meetings, as well as public workshops and a charrette. This report focuses on the 2010-11 Situation Assessment, Mini Workshops, and Public Charrette. The following provides a brief summary of the activities, which are discussed chronologically by initiation date:

1 • Situation Assessment (Late 2010 – Early 2011)
EPA contracted an outside consultant to conduct person-to-person interviews as an additional means of assessing the needs and concerns of the public.

2 • Outgrowth of Situation Assessment (Early 2011—May 2011)
To address the public's expressed needs as recorded in the Situation Assessment, EPA developed an intensified public engagement program to provide additional information to the public regarding the technical and policy aspects of the alternatives under consideration, to obtain input from stakeholders on their thoughts, and to understand their specific questions regarding the alternatives. The program included three public forums that operated independently but also complemented and integrally supported one another:

> ***Mini Workshops***
> EPA sponsored three intense workshops to provide the public with more information regarding the technical and policy aspects of the alternatives under consideration through presentations by technical experts and through question & answer sessions between EPA's experts and audience members.
>
> ***Public Charrette***
> In the month following the Mini Workshops, EPA sponsored a practical, all-day, intense, hands-on workshop for the community to better understand Rest of River issues, to

explore the pros and cons of the Proposed Alternatives, and for EPA to hear the community's ideas.

Supporting Website

To support the Mini Workshops and Public Charrette, EPA launched a supporting website to EPA's "official" EPA/Housatonic River website. This supporting website focused on the Mini Workshops and Public Charrette.

2 SITUATION ASSESSMENT (LATE 2010 – EARLY 2011)

EPA contracted an outside consultant to conduct independent, unbiased person-to-person interviews as an additional means of assessing the needs and concerns of the public.

2.1 Needs

The Consent Decree for the GE-Pittsfield/Housatonic River Site (approved in October 2000 by the U.S. District Court) requires GE (among other items) to identify remedial alternatives and submit a Corrective Measures Study (CMS) to EPA. GE completed its initial CMS in March 2008, to which EPA provided over 150 comments. In October 2010, GE submitted a Revised CMS. At that time, EPA began reviewing GE's revised CMS, and working on a decision-making process to select a remedy for Rest of River, considering the Revised CMS, public comments, and other information as necessary, according to the nine criteria for remedy selection specified in the Reissued RCRA Permit.

At this important point in the Rest of River remedy selection process, EPA determined that in order to incorporate the public's concerns into its decision-making process, it needed a more in-depth appraisal of the spectrum of public understanding and opinion on the technical and policy aspects of the alternatives under consideration.

2.2 EPA Response

In late 2010, EPA contracted SRA, who subcontracted Certus Strategies, to conduct a Situation Assessment that provided an in-depth, independent, and unbiased appraisal of the community's interests and concerns regarding the Rest of River decision process. Certus was tasked with interviewing individual stakeholders and synthesizing their views into a report to help EPA craft effective public engagement strategies and activities as its decision-making process moved forward. EPA sought information in three particular areas:

1) Identification of stakeholders' needs for additional information on technical issues:
   What information did stakeholders feel they needed to make informed decisions on the cleanup?
   About what issues were they expressing the need for clarity?

2) Identification of core interests of the community:
   Which issues and concerns did stakeholders feel were most important?
   How did stakeholders value the balance of ecological, social, and economic impacts of proposed cleanup alternatives?

3) Stakeholders' ideas on how to best engage them in the cleanup decision process:
   What strategies and activities for public engagement were working and which needed improvement?
   Would more interactive public engagement forums, such as a charrette, be beneficial?

Interviews were primarily conducted by phone but also included in-person discussions. Interviewees included nearly 70 people, including representative members from 50 organizations, who provided information on the following topics:

Levels of Available Information that Stakeholders Felt They Had

- Awareness of peer-reviewed studies prepared by EPA.
- Risks to human health and the environment from PCBs currently in the River and floodplain.
- Alternatives being considered regarding whether and how much contamination to remove and how to dispose of the removed, contaminated soil and sediment.
- Impact on the use and aesthetics of the River in each of the various alternatives.
- Impact on local communities, including PCB excavation actions, disposal alternatives, roads, and the effects of such actions on the local economy.
- Function of the Citizens Coordinating Council in relation to Rest of River remediation and restoration activities.
- The required criteria EPA must use in making its decision.

Public Engagement Process

- What had worked or had not worked regarding EPA's interaction with the public thus far.
- Steps to be included in EPA's public engagement efforts as the project moved forward.

Interviewees were also welcome to comment on anything else they wished or to express any other concerns that they had.

2.3 Situation Assessment Report

Following is the complete report, *Situation Assessment: Report on Stakeholder Assessment Interviews Concerning Next Steps for the Rest of River*. The report topically organized stakeholders' responses and offered an overview of themes and ideas that appeared across topics.

U.S. Environmental Protection Agency
New England Region

GE-Pittsfield/Housatonic River Site
Rest of River

Situation Assessment: Report on Stakeholder Assessment Interviews Concerning Next Steps for Rest of River

May 2012

Prepared and Submitted by
POOLE DESIGN, LLC
Landscape Architecture • Urban Design • Ecological Infrastructure
6101 Blackburn Lane
Baltimore, MD 21212
www.kathypoole.com

TABLE OF CONTENTS

Title **Page**

TABLE OF CONTENTS (Continued)

Title **Page**

EXECUTIVE SUMMARY

In late 2010, the U.S. Environmental Protection Agency (EPA) began its review of the Corrective Measures Study (CMS) prepared by GE, which evaluated numerous cleanup scenarios for remediation of polychlorinated biphenyls (PCBs) and other hazardous substances in Rest of River portion of the General Electric Company (GE)-Pittsfield/Housatonic River Site. As part of its ongoing public engagement efforts on the project, EPA commissioned a Situation Assessment of stakeholders' understanding of issues associated with the cleanup. An outside consultant conducted in-depth, unbiased telephone and in-person interviews with a broad range of stakeholders, focusing on three objectives:

- To learn from stakeholders what questions on technical issues remained in their minds.
- To gather from stakeholders input on remediation options for EPA to consider, particularly (but not limited to) the Proposed Alternatives that GE had put forward in its Revised Corrective Measures Study (Revised CMS).
- To learn what strategies and activities for public engagement had been working, which needed improvement, and, particularly, if stakeholders thought more active engagement strategies such as workshops and charrettes would be effective.

This Situation Assessment records responses from over 50 respondents, most of whom were affiliated with at least one of over 50 organizations—from government (at various levels and in various capacities), commercial entities, civic groups, environmental groups and agencies, neighborhood associations, economic development associations, and a variety of groups formed in relation to the GE-Pittsfield/Housatonic River Site. In responses generally forthright and candid, stakeholders offered diverse and divergent reflections and suggestions on the following topics:

- Harm or Risk to Human Health
- River Use and Aesthetics
- Local Impacts
- Proposed Alternatives of the Revised CMS
- Public Engagement Process.

With regard to human health risks, most respondents acknowledged that PCBs pose risks to human health but disagreed on the warranted degree of concern regarding those risks. Some thought that the negative consequences of removal outweighed the risks. Most respondents underscored the value of reducing risks via PCB removal, many noting the value of such efforts not only for themselves but also for others in the community (primarily those downstream) and for generations to follow. Stakeholders expressed strong concerns and requested better information on a myriad of PCB-related concerns, among them accuracy and sources of data, ongoing sources of PCBs, the risks of both leaving PCBs and removing them, and EPA's accepted or assumed risk thresholds.

With regard to Housatonic River use and aesthetics, many noted concern for the risks to wildlife and natural habitats both from leaving the PCBs and from removing them. Whatever their positions, most favored planning for an entire habitat rather than focusing on particular floral or faunal species; yet, respondents were split on the potential success of wholesale habitat restoration efforts. Several expressed concern about the negative consequences of dredging to tourism and River use—and fishing in particular—while others noted potential benefits to cleanup such as new bike paths or opportunities for increasing environmental education and stewardship.

With regard to local impacts, respondents focused considerable attention on the economic development consequences that might accompany a remedy that includes sediment/soil removal and replacement. Some believed that the removal of PCBs and the corresponding, increased focus on the River would have positive economic and public education outcomes; most expressed more cautionary views and feared potentially severe, negative consequences on marketing and tourism. Many expressed concerns about the current criteria for assessing economic impacts, some believing that the criteria should include a broader spectrum of factors as well as some form of financial compensation to the community. The other predominant concern of stakeholders was disposal of contaminated sediment/soil: some were comfortable with the prospect of a new landfill(s) within the area; others reported struggling with the ethical dilemma of shipping contaminated soil to other communities and making it their problem; and the majority expressed adamant opposition to a landfill in any local community, whether theirs or another.

With regard to the Proposed Alternatives, the responses indicated wide differences in attitudes regarding the appropriate extent of remediation and how well any of the Proposed Alternatives would achieve the desired PCB risk levels. On the one hand, many respondents expressed doubt that the costs of remediation were worth the benefits or that the risks due to the contamination were greater than the risks associated with removal. On the other hand, many respondents asserted that comprehensive, total PCB removal or "as much as possible" was the appropriate action. Most respondents indicated leaning toward a position in between, that is, favoring remediation that involves some level of sediment/soil removal and replacement; yet, stakeholders' unanswered questions prevented their taking definitive positions on where within that spectrum they believed the optimal solution lay. Within this "in between" spectrum, some respondents advocated avoiding various types of areas that they deemed special, and several respondents favored a small scale, site-specific approach in which the remediation of the River is considered section by section rather than as a single entity. In any effort involving river bed and river bank alteration, many would like to see something different from that of the first two miles of remediation in Pittsfield (though respondents did not specify what "different" meant). Many noted a particular interest in the consideration of emerging remediation technologies that remove PCBs without significant sediment/soil removal and replacement, calling for EPA to include such technologies in its considerations of a proposed remedy, if not in initial remediation efforts, then in future stages. Finally, many stakeholders ardently supported the incorporation of what they termed adaptive management, which they characterized as a process in which the cleanup is accomplished incrementally and in small sections, applying "lessons learned" to subsequent efforts, and including continual community input—all of which, some believed, would better allow the introduction of emerging technologies.

Regarding the public engagement process, many respondents voiced both satisfaction and displeasure for the many types of interactions involved in the project—between EPA and the public, within the Citizens Coordinating Council, between GE and the public, between organizations, and between organizations and the public. Comments included both praise for and criticism of EPA's efforts, skepticism about partiality on the parts of many parties, intentional obfuscation of information on the part of particular parties, and the general nature of a years-long, protracted project and its resultant consequences. In addressing their concerns, stakeholders offered a host of ideas on improving information exchange, including increased opportunities for community involvement and input to EPA, extended outreach efforts on the part of EPA, and support for alternative forums for information exchange, such as roundtables, workshops, and (in particular) charrettes, about which most respondents were decidedly enthusiastic. Most stakeholder ideas were aimed at ensuring that the community had greater input into any proposed remedy.

A recurring theme across topics concerned information availability. Many respondents had attended meetings and read the Fact Sheets provided by EPA. Still others had searched on the EPA/Housatonic River website and could not find what they had sought or were left unsatisfied by what they had found. Whatever their query, stakeholders from across the spectrum of positions repeatedly stressed their struggles with information and noted that the issue needed to be addressed. Some understood that the issues surrounding cleanup were, by their nature, complex and required careful consideration of numerous factors; some noted how information from various sources was sometimes conflicting and, therefore, confusing. Consequently, many noted the need for additional information—on technical issues, the Proposed Alternatives of the Revised CMS, and the decision process—so that they, as concerned citizens, could best provide EPA input on a remedy decision as well as to understand the remedy that EPA would ultimately propose. Specific requests regarding the nature of this information included the following:

- More thorough and in-depth addressing of technical issues
- More layperson friendly and jargon-free
- More readily accessible and more user-friendly than currently available on the EPA/Housatonic website
- Unbiased, objective, and balanced in its presentation.

Another recurring theme that spanned topics concerned the process of arriving at a proposed remedy. Many stakeholders noted the importance of a "balanced" proposed remedy in which the costs were worth the benefits, that is, a solution that not only balanced both the qualitative and quantitative factors in the life of the community but also remained unbiased toward a single criterion, particularly that of the lowest monetary cost. Many noted their expectations for EPA to clearly articulate its criteria and fully explain the reasons for its chosen remedy, including the data and studies upon which EPA based the definition of its criteria. Many underscored the need for EPA to remain transparent in its decision-making process, to increase community participation, to ensure that the community had a meaningful role in contributing input into whatever remedy was chosen, and to continue to include the community in the remediation process as it progressed into the future, including construction and/or monitoring efforts.

1. INTRODUCTION

The Housatonic River (River) is approximately 149 miles (240 km) long, flows south to southeast through western Massachusetts and western Connecticut, and drains about 1,950 square miles (5,100 km^2) of southwestern New England. The Housatonic River, its sediment, and associated floodplain are contaminated with polychlorinated biphenyls (PCBs) and other hazardous substances released from the General Electric Company (GE) facility located in Pittsfield, Massachusetts. In 2000 the federal court approved a Consent Decree (CD) among EPA, several federal and state government agencies, GE, the City of Pittsfield, and the Pittsfield Economic Development Authority. The CD provided for, among other things, the cleanup of the GE facility, cleanup and restoration of the former oxbows, cleanup and restoration of Silver Lake, cleanup of Allendale School, cleanup of the Housatonic River and floodplain, compensation for natural resource damages, and government recovery of past and future response costs.

The Housatonic River cleanup was divided into three segments. The first ½-Mile Reach on the East Branch is adjacent to the GE facility, and remediation was completed in September 2002. Remediation of the next 1½–Mile Reach downstream to the confluence of the East and West Branches in Pittsfield (Confluence) was completed in 2006. The area known as Rest of River comprises the Housatonic River and its floodplain from the Confluence to Long Island Sound, a distance of approximately 135 miles (217 km).

For Rest of River, GE was required by the CD to identify cleanup goals and submit a Corrective Measures Proposal/Study (CMS) to the U.S. Environmental Protection Agency (EPA). GE completed its initial study in March 2008; in September 2008, EPA required GE to respond to over 150 comments regarding the CMS. In October 2010, GE submitted its Revised CMS.

Along with considering the Revised CMS, public comments, and other information, EPA believed that further stakeholder input was needed to determine the best approach for remediation of Rest of River. In addition, EPA wanted to respond to stakeholders' questions and requests for additional information but was unclear on the precise nature of the community's questions and concerns. Consequently, EPA commissioned an independent consultant to conduct in-depth and unbiased interviews of stakeholders in Western Massachusetts and Northwestern Connecticut and to compile its findings into a comprehensive report of the community's interests and concerns regarding next steps for Rest of River.

EPA identified three specific areas of input on which the interviews should focus:

- To learn from stakeholders what questions on technical issues remained in their minds.
- To gather from stakeholders more meaningful input than it presently had on remediation options for EPA to consider.
- To learn what strategies and activities for public engagement had been effective and which needed improvement, and particularly if more engaged strategies like workshops and charrettes would be effective.

In telephone and in-person interviews conducted from November 2010 to February 2011, a broad range of individuals offered responses that were solicited and recorded for the most part using the standardized Interview Response Form included in the appendix. Interviewees included unaffiliated stakeholders and those who were members of a range of organizations.

This report characterizes the spectrum of beliefs, opinions, interests, and options offered by respondents, including both summaries of respondents' views and most of the actual statements shared by individuals on various topics. The organization of the report is modeled after the categorization and organization of the Interview Response Form that was used to conduct the interviews (appendix) with variations where necessary to reflect interviewees' responses as clearly and accurately as possible.

2. APPROACH

2.1 Goal and Objectives

Consistent with EPA's practice of seeking meaningful input from the public in determining the best remediation alternative, the primary goal of the Situation Assessment was twofold:

- To learn and what specific questions, concerns, issues, and interests a diverse set of stakeholders had regarding the Rest of River remediation, the options presented by the Revised CMS, and the process for arriving at a proposed remedy.
- To record these inputs for the public's review and use in planning future outreach in the community.

Specific objectives supporting this goal included three interrelated subjects: Technical Information; Regulatory Criteria; and Public Engagement Process. EPA's objectives in each of these subjects were to discover how it could best fulfill specific needs that the public articulated in the course of the interviews. These objectives and the interview questions developed to address them are outlined in the sections immediately following.

2.1.1 Technical Information

EPA's primary question and objective regarding technical information asked, "What did stakeholders need regarding technical information so that they could best contribute input on a remediation solution?" To address this question, the interviewers asked the following:

- Do you have questions regarding risks to human health and the environment from *leaving* the PCBs in the ground, river bed, river banks, etc.?
- Do you have questions regarding any harm to human health or the environment from *removing* the PCBs?
- Do you have questions regarding alternatives being considered in terms of moving and disposal of PCBs?
- Do you have questions regarding disruption to roads under various Proposed Alternatives?
- Do you have questions regarding impact on the use and aesthetics of the River under various Proposed Alternatives?
- Do you have questions regarding impact on local communities, including the local economy (both positive and negative)?

2.1.2 Regulatory Criteria

EPA's primary question and objective regarding regulatory criteria asked, "What did stakeholders know of and need regarding regulatory criteria and the standards/studies used to assess the criteria so that they could best contribute input on a remediation solution?" To address this question, the interviewers asked the following:

- Do you have questions regarding the criteria that EPA must use in making its decision?

- Are you aware of the peer-reviewed studies prepared by EPA over the last ten years, including the Human Health Risk Assessments, Ecological Risk Assessments, and Model Framework development?

2.1.3 Public Engagement Process

EPA's primary question and objective regarding public engagement asked, "What do stakeholders need to further the continued building of an effective public engagement process and dialogue?" To address this question, the interviewers asked the following:

- What has worked or has not worked for you thus far regarding how you have been consulted on the Rest of River cleanup project?
- Do you have questions regarding how the Citizens Coordinating Council will function in relation to remediation?
- Are there any steps that you would like to see included in this process going forward?

2.1.4 Stakeholder Concerns

In addition to the three major categories and in order to capture the most comprehensive input from stakeholders, EPA also included two opportunities to open up the interview to more free discussion by 1) asking if the interviewees had "questions on subjects not covered above" and 2) prompting respondents to offer their thoughts on "any other concerns or issues."

2.2 Interview Methods

2.2.1 People and Organizations

The initial list of interviewees, compiled by EPA over its years of work on the Housatonic River, included approximately 300 names and organizations. It was determined that resources could be conserved while still reaching a range of stakeholders by limiting the number of representatives from each organization to one contact name and maintaining individuals who listed no affiliations. Thus, the final interviewee list was narrowed to approximately 150 and provided a solid foundation for the Situation Assessment.

Considerable effort was made to ensure that the entire spectrum of viewpoints from the Berkshire region's diverse range of groups was included in the interviews. In terms of types of groups, responses were distributed across the spectrum, and the groups included can be characterized as follows:

- Civic
- Chambers of Commerce/Economic Development Authorities
- Commercial
- Economic development
- Environmental (Wildlife/Conservancies/Trusts/Animal/Ecology)
- Federal departments/services
- Groups formed in relation to the GE-Pittsfield/Housatonic River Site
- Heritage

- Municipal government
- Neighborhood/home owner associations
- Planning groups
- Realty
- Recreation
- State-related departments
- Tourism
- Town Selectmen/Councils/Mayors/City Managers

The interviewee list also included citizens who were not known to be associated with any group. Individuals—rather than organizations or collections of individuals—were interviewed, and many inferred or explicitly noted that they were speaking for themselves. In two cases, in accordance with the request of the interviewees, two "group" interviews were conducted; one organization was represented by two members and another organization by three members. In each case, a single interview was conducted, and the responses were recorded as a single set of comments.

At its conclusion, the interview process had recorded the comments of over 50 people, most of whom were affiliated with at least one of over 50 organizations.

2.2.2 Interview Assessment Process

Certus Strategies, LLC, a firm specializing in public outreach and consultation, led the interview process and acted as an unbiased recorder of responses. Once the standardized Interview Response Form (appendix) and interview protocols had been developed, the potential interviewee list was divided between five Certus affiliates, who conducted the majority of interviews by telephone. For the sake of expediency, several interviews were conducted in person.

Balancing due diligence and individuals' right to privacy, interviewers made no more than three attempts to contact each individual (leaving telephone messages or emails). Once contact was made, interviewers stressed that participation in the interviews was entirely voluntary, and some of those contacted declined to participate. Many individuals were not reachable. However, most people interviewed chose to participate in detailed conversations and candidly expressed their perspectives about the River and what they believed was needed.

2.2.3 Report Assembly

Identifying consensus or tallying statistics on comments were not among the goals of the Situation Assessment. Rather, learning the range and specificity of stakeholder needs was the objective. Thus, aside from understanding themes across topics, this report does not attempt to reduce responses to binary tallies of "yes" or "no." Instead, for each topic, this report offers an overview of issues on which respondents expressed concern or interest and then lists (in a grouped but non-hierarchical order) respondents' direct commentary. In short, interviewees' responses constitute the primary substance of this report. The lists of comments include over ninety percent of stakeholders' recorded responses, omitting only those in which individuals presumed to speak for a collection of others with whom they had no direct contact or knowledge (akin to hearsay) and statements inappropriate for publication because they were extraneous, hyperbolic, personal accusations, or clearly defamatory; these types of comments numbered less than two dozen comments out of well over five hundred. Responses were edited only for vulgarity, clarity/grammar, or protection of anonymity. This report has taken respondents' words at face value, making no attempt to second-guess or modify intent, regardless of the positions or technical accuracy of the comments. When responses covered two or more topics or subtopics and could not be divided without taking them out of context, which was frequently the case, they were categorized according to their primary intent and not duplicated in other lists.

3. INTERVIEW RESPONSES

3.1 Respondent Profiles

Respondents' replies showed that those interviewed represented the entire array of experience with the issues and the GE-Pittsfield/Housatonic River Site—from those with almost no knowledge, to those who were quite familiar with some issues but had significant questions remaining, to those who were confident in their understanding and had been heavily involved for many years. Respondents' distribution of experience was fairly evenly distributed, showing no clustering around any particular profile.

Of those who responded to the question of whether they were aware of the peer-reviewed studies prepared by EPA over the last ten years, approximately half were aware and half unaware or only partially aware. Many noted that when they looked for the studies on EPA's GE/Housatonic River website, they had could not find or had difficulty locating them.

3.2 Interview Dynamics

Respondents fluidly moved between and conjoined questions, often commenting on an issue "outside" of a question asked at that point in the interview, a practice that interviewers neither discouraged nor urged. For example, the issue of dredging was often raised when commenting on risks to human health *and* impact on the River *and* Proposed Alternatives. This made categorizing responses challenging, but it also demonstrated that many citizens understood the interrelatedness of precepts, methods, and remediation techniques that would likely have cascading effects in Rest of River discussions and cleanup decisions.

Despite the formatted structure used by the interviewers, the interviews were generally conversational in nature, with many lasting over 30 minutes and several upwards of 45 minutes to an hour. This was due, in part, to the interviewers' encouragement for respondents to say anything that they wished. Also, it was due in part to many interviewees' enthusiasm to have an opportunity to express thoughts—and express extended thoughts—in a casual forum in which they had previously been unable. In addition, most respondents answered "yes" to the question of interest in being contacted for meeting announcements or other sorts of follow up.

3.3 Topics Overview

The following sections present respondents' ideas on a range of topics associated with the Rest of River cleanup decision, each of which includes multiple subtopics that were determined in response to stakeholders' comments:

- Harm or Risk to Human Health
- River Use and Aesthetics
- Local Impacts
- Proposed Alternatives Presented in the Revised CMS
- Public Engagement Process.

Respondents' comments demonstrated that community members hold widely divergent opinions on every topic, all of which are noted in the summaries of each topic.

3.4 Risks to Human Health

3.4.1 Overview • Risks to Human Health

The following overview focuses on respondents' comments on the issues of risks to human health at a conceptual level and reserves comments on the practical consequences of the issues to Section 3.7, Proposed Alternatives in the Revised CMS. This organization of materials was chosen because it was understandably difficult for people to consider human health apart from River use and aesthetics or local impacts—whether cleanup involves alteration of none, some, or all of the River and its floodplain. By addressing the practical consequences of the Proposed Alternatives as a separate topic, the report better maintains the sensibilities of people's responses and is a clearer articulation of the range of views they expressed.

The majority of respondents underscored the importance of reducing the risks of PCBs to human health, and they weighed the issue in terms of both removing PCBs and leaving them in place. Respondents expressed health concerns for themselves but even more so for their children, grandchildren, fellow citizens who live downstream, and immigrant populations who they believe eat the fish they catch from the River. Respondents perceived the sources of human health risks being from the River itself but also from PCBs that are airborne and potentially polluting drinking water supplies. A smaller number of respondents expressed that they have doubts about the level of risk to human health, including those who do not believe that the risks are significant enough to warrant remediation. A few highlighted that, in addition to human health, they were concerned with the health of animals and associated habitats.

Many respondents placed considerable weight upon the importance of balancing human health risks, environmental impacts, and economic and lifestyle issues—albeit with no consensus. Some expressed that human health must remain the primary criterion while others favored a more distributed valuing of many criteria in which human health was valued in commensurate proportions with other criteria. In their considerations of whether quantitative or qualitative aspects—or both—should bear more importance, most respondents clearly struggled, having no discernibly definitive answers.

Some people reported their alignment with scientific data suggesting that PCB risks are lower than the EPA's Human Health Risk Assessment. Others thought that there were sources of data not being fully considered by EPA. Some also stressed that they hoped emerging science would be considered as it becomes available. Most, however, understood that conflicting scientific data exist and that there were choices to be made. No matter their leanings on PCB risks, respondents were consistent in their calls for EPA to be clear with the public on both the sources of information and the criteria upon which it was basing its remedy decision.

Perhaps most notably, respondents from across the spectrum of positions noted a myriad of unanswered questions that they wish to have addressed. Most noted broad, fundamental questions like, "Will dredging release more PCBs into the air?" Others noted practical and specific matters like, "Should little children be walking by the River?" Some, finding the information they had received from various sources as confusing and perhaps even obfuscatory, called for EPA to act as impartial technical expert—in whatever media it utilized—in answering stakeholder questions on technical issues and information relevant and applicable to all potential proposed remedies.

Following are respondents' specific comments on these points as recorded in the Interview Response Forms.

3.4.2 Stakeholder Comments • Risks to Human Health

3.4.2.1 Valuing Human Health Concerns

- Public health question is paramount.
- Concerned about the impact from PCBs on both short-term and long-term health.
- One of main concerns is the public health aspect.
- Concern with homes in Pittsfield where they found PCBs at 44 ppm.
- Flooding could have grave consequences on agriculture, and farmers are terrified.
- Need to put a fence around the River because the ground is not clean yet.
- [I ask myself,] What do I want for the next generation? What level of construction is appropriate?
- Reports that many eat the fish, despite signs in Pittsfield saying it is not safe, particularly those from [the respondent presumes] outside the country. Concerned that so many people are doing this—and probably feeding fish to their children—that this is a major issue.
- Lots of poaching lately and immigrants may not understand that the fish are dangerous to eat.
- Knows this [the existence of PCBs] is harmful.
- Recognizes that PCBs are harmful.
- Concerned with health risks to habitat and water quality [in addition to human health].
- States that people were dying from PCB vapors in the 1930s and that PCBs cause hormone disruptions, so GE's questions about the impact on health are a form of misdirection.
- Used to play in the oil floating in the River when a child in the 1960s and 1970s—when poking a stick in the mud in the River, circles of gleaming oil would float up. Once the River caught fire outside the house. The River is much nicer now and looks a lot better, but PCBs are continuing to flow into the River from a couple of sources, Unkamet [Brook] and Silver Lake, which are scheduled to be resolved.
- The cleanup should occur so that future generations should be able to enjoy a clean river.
- Thinks the PCBs are one of many problems and thinks the sum of different particles may be worse than an individual particle.
- There do not appear to be any developmental diseases with children.
- EPA says there is a high incidence of bladder cancer; however, believes there was just one more case than comparable studies in other areas.
- EPA's tested levels do not justify cleanup. The local population's health is the best evidence. GE workers believe that the health concerns are unwarranted.

- Concern that once the public hears there is a risk to human health, they believe it.
- "Known" case is when it is identified at the molecular level, e.g., uranium; whereas "probable" case means the science is almost there which is where PCBs fit.
- The public is not eager for the specifics, and they don't understand how it could affect them. For example, PCB threats present a very real threat; but since it is not immediate, they don't perceive them as threats at all.

3.4.2.2 PCBs in the Water Supply

- Great Barrington has PCBs in the river bed, and this has to be a huge detriment to what the community can do.
- Water supply going to Great Barrington from the Housatonic. 950 customers and 1,500 in the Great Barrington Fire District. This is a shallow well aquifer. Pump 1.3 million gallons a day in August. Great Barrington has 4 aquifers.
- Concern: Do PCBs in the water supply hurt future options for our water supply?

3.4.2.3 Airborne PCBs

- Concern that airborne PCBs may be dangerous to people.
- Concern that dredging will release more PCB into air.
- Suggests that Hill 78 is producing air quality concerns with airborne PCBs. Need a peer review on children at Pittsfield Elementary School. Suggests that excavating part of the ground proved how ineffective capping is.
- Believes corridors along the River are emitting PCBs into the air.
- Concern that in Pittsfield air quality testing was done up to a 4 to 5 mile radius, including in houses. What is being done in similarly concentrated areas?
- Am I breathing PCBs? Is there anything that can be done to find out?

3.4.2.4 Balancing Values

- Human health has to be number one; impact to wildlife is minor. Need to tell me about the impacts.
- Need to take time to identify a strategy that puts public health first, ecosystem second and then impact on the lifestyle of the Berkshires.
- Would like to see a process that balances the qualitative and quantitative aspects of these [human health] risks.
- This is the time to remove the PCBs from the river. To protect health.
- Public health should be the main criterion. But to just say it is a public health problem misses the point. We don't need to fish in the River to live. But, even if the River poses little immediate risk to local public health, PCBs there is not an acceptable outcome. EPA needs to take into account the whole environment and ecology, including the impact downstream—including fish in Long Island Sound. The broad impact of PCBs in the environment must be addressed. We know the River is a 'point' source of PCBs which, as we know, are ubiquitous in the environment. Why would we as a society not take the opportunity to clean them up?
- Questions how to weigh human health in terms of numbers or algorithms.

- Wants a clean river but also wants to make sure the trade offs are worth it.
- Wonders whether the impact to wildlife is a reasonable substitute for human health.

3.4.2.5 Sources of Data and Decision Criteria

- Not sure the human health risk is fully understood.
- Concerned that EPA does not support its assertions with the "right" science.
- Wants more emphasis placed on the work of Dr. David Carpenter, who has studied the impact of PCBs on human health and has conducted a peer review study on the Hudson and shows direct impact on IQ, ADD, cancer.
- Standards have to be met and show there is a reasonable expectation of achieving favorable results. EPA's eventual choice must meet these standards.
- What are the base assumptions about why we are doing all of this, and are they still valid?
- Do EPA studies and future work take into account new information?
- What are the basic goals of various remediation efforts? Eating the fish, swimming in it, what?
- What are the criteria in terms of getting all the PCBs out? Or what can EPA live with? What are EPA's objectives?
- Wants to know how EPA assesses human health risk.
- Recognizes the importance of EPA decision-making criteria but knows the issue is often ignored.
- Wants to know goals of remediation.
- Need to stay sensitive to the best science today and also into the future.
- The public is authorized to see the process. Otherwise, there is no trust. The community is authorized to know what measurements EPA is coming up with. The community is authorized to know what statistical data is being used. The community needs to know that its concerns about drinkable water are all legitimate.
- Community needs to understand the gap in science. What is real and what is not– and discuss the real science.
- Needs to gain confidence in the science that is being proposed to use for cleanup.
- There is nothing that addresses the health impacts of dredging.
- If able to eat fish is a performance standard, will the cleanup accomplish that?
- When testing for PCBs, a finer grid needs to be used so that samples are gathered closer together, such as every five feet or so rather than 25 or 50 feet, to keep from taking away clean dirt or missing hot spots.
- How will the cleanup impact/affect neighboring communities (i.e., air quality impacts, etc.)?
- EPA just is not clear about any of it [decision criteria] with the community.
- Is clear on what GE wants to do but not clear about what the real alternatives are. GE is presenting the alternatives as if it's either dig up the PCBs or not dig them up or some combination of both. It's the combination of both that all don't have a handle on. Is also not clear on what EPA's position is, which [he] understands is a consequence of the appropriate, legal protocol. Nonetheless, this is something

that [he] believes must be made very clearly by EPA, particularly the consequences of EPA's decision, which should be enumerated and explained one by one according to the important issues (economics, health, traffic, etc.)

- Is concerned about wood duck example. Does not feel there was an open exchange of information after the duck was tested.
- Should be able to say here is a map of the River, and here is the contamination.
- Concerns that the public health departments have not been consulted more and quicker. Both are local and have resources to help communicate to the citizens. Critical that EPA assist to help people understand the options and that the local citizens have the opportunity to make informed judgments—and communicate those judgments to EPA—before the remedy is selected.
- Not interested in hearing further platitudes. We need statements backed up with science.

3.4.2.6 Unanswered Questions and Information Needs

- Would like to know documented cases of PCBs causing cancer. Need to address this question somehow. Any evidence of people having died.
- Wants to know if the children are at risk. Should little children be walking by the River?
- Wants to know how dangerous this River is. What is the toxicity of this River?
- Conflicting information – in past told not to go in the River, but now understands it is ok to swim.
- Knows the risks of PCBs to human health. However, no one really knows the entire effects; it's all guesswork. So wants to know more.
- Not sure what the impact is to human health.
- What is the aggregate impact of PCBs?
- Wants to know the connection between PCBs that flow down the River and human health.
- Wants to know if human health risks change if the community is further from the River.
- What is the quality of the science related to airborne nature of PCBs? What is the relevance of the science?
- Will dredging release more PCBs into the air?
- Not clear whether you will ever be able to eat fish, even after work is performed.
- Community does not know if the downstream areas are dangerous or not. We're not even really sure what to tell people what the nature of the problem is.
- Wants to know air quality test results.
- Wants to know how the calculations work to determine risk to human health.
- Not sure that the public has a full understanding of the risks. What are the pathways? Are small amounts posing risks? Unknown at this point.
- How do you measure PCBs vs. mercury vs. other contaminants (along with ongoing releases from GE) over time?
- Questions regarding disturbing PCBs and causing more harm.
- What is the impact of PCBs that cannot be captured?
- Concern with misinformation [not specific about source].

- There is layer upon layer of obfuscation. And it is very complicated to begin with.
- Can't find information [on EPA's studies on human health and environmental risks or modeling] on the website.
- Would like much more information (perhaps in a link to the appropriate documents) about the Human Health and Ecological Risk Assessments and development of the Model Framework—especially to summaries and other, shorter documents explaining the studies, their results, and contemplated actions by EPA.
- Wish EPA would create some overall descriptions about the cleanups that are both accessible (in terms of where to find them on the EPA website) and readable/understandable to lay persons as well as with information that is useful and meaningful for professionals.

3.5 River Use and Aesthetics

3.5.1 Overview • River Use and Aesthetics

As in the previous section, the overview following considers respondents' comments on River use and aesthetics at a conceptual level and reserves comments on the practical consequences of various remediation techniques to Section 3.7, Proposed Alternatives in the Revised CMS. Respondents' comments on River use and aesthetics included concerns about wildlife and natural habitats, River and floodplain activities, and the value of the River as a natural system and aesthetic resource.

Of those who identified the importance of wildlife and natural habitats, many stakeholders commented on the risks of leaving the PCBs vs. the risks of removing them. In either case, most respondents stressed the importance of using a holistic approach; few identified the need to focus on particular floral or faunal species and, instead, favored planning for an entire habitat. Regarding the probable success of restoring a habitat and/or reintroducing a suite of species, respondents were split between those believing it was entirely achievable, those with doubts that habitats can be replaced to the same level of ecological function, and those believing it hubris to even try.

Many respondents said that they valued the recreational and tourism opportunities provided by the River and are concerned about the negative consequences that a solution involving dredging might have, most notably the effects on fishing. Some had specific ideas for new elements that might accompany remediation such as bike paths and programs/activities that would increase not only use but also general knowledge of rivers, understanding of the natural systems that govern the River and floodplain, and stewardship of the River environment. A few stakeholders noted the importance of considering those natural systems—particularly their dynamic qualities—in any proposed cleanup solution.

Following are respondents' specific comments on these points as recorded in the Interview Response Forms.

3.5.2 Stakeholder Responses • River Use and Aesthetics

3.5.2.1 Wildlife and Natural Habitats

- Concerned about shellfish beds, eelgrass beds and re-vegetation, with special concern for the mouth of the River. More concern is with the wetlands and the vernal pools.
- Concerned about wildlife issues.
- Even if the River poses little immediate risk to local public health, leaving PCBs there is not an acceptable outcome. EPA needs to take into account the whole environment and ecology, including the impact downstream – including fish in Long Island.
- Not just an issue of fish; must put "bug life" back as well.
- No time to plan work around each species in the system. Look at the suite of species impacted and their restorative nature in 50 years. Need to look at habitat as a whole. But hate to write them off.
- [In response to idea of dredging]—it's arrogant to think that people can replicate the ecological system that's there.
- Suspicious that you can replicate the animals.
- Could breed animals off-site and repopulate during restoration. Collect all animals, propagate off-site, and then put them back. There is nothing so sensitive you can't breed it and put it back.
- Restoration processes generally are getting better and better.
- Vernal pools are very difficult to fix, and none are functional with PCBs. GE restored only one vernal pool and didn't do it well (not enough cover), then uses it to show it can't be done.
- Not convinced by GE studies on vernal pools. Do not feel that baseline studies were carefully presented.
- Particularly worried about vernal pools along the River, which thinks need to be studied better so there can be better restoration.
- Remediation will just destroy the wildlife.

3.5.2.2 River and Floodplain Activities

- Silver lining of fish being inedible is that catch and release allows fish to grow larger which makes it more sporting to fish.
- Would hate to see anything done that would destroy the fishing. But if one section of the River at a time is cleaned it might be possible to fish on the other sections.
- Fears that if people are not buying fishing licenses, the state will be less interested in taking care of the River.
- Reports that last poll of 3,000 fisherman were 10-1 not wanting to see the river dug up.
- Assumes wearing waders is sufficient protection when going into the River to fish now.

- Interested in seeing the plan to learn if dredging is proposed and how the River will be accessed. Concerned that the River will be shut down between April and November when it is used by fishermen.
- Applauds HRI [Housatonic River Initiative] for arranging 3 additional boat launches.
- When Pittsfield negotiated Consent Decree, it did not negotiate for public use.
- Lenox is interested in a pretty bike path near the River.
- He and his family used to spend a lot of time on the River until the PCB information came out.

3.5.2.3 Value of River As Natural System and Aesthetic Resource

- Everyone needs to be grounded in the nature of a dynamic river system. River is its own architect and will carve its own bed. Has to be grounded in dynamic river system, a living biological system.
- The Berkshires benefit from its scenic beauty.
- The River is an important feature for tourism. This is a Federally Designated Area that makes this a very special River.
- Consideration should be given to how climate change will impact the situation. For example, if there is more rainfall, then there may be more erosion and the buried PCBs may be more likely to be exposed [if not remediated now].
- We need to teach the next generation about the River. We need more kids and people on the River.
- Kids don’t know what it [the River] looks like. Need to attract more kids and more people.
- The more people outdoors the better. Particularly important to be able to get kids outdoors and into fishing and off of video games.
- Need to create a sense of stewardship and caring around the River.
- Difficult to understand what will happen if you base your review [of resulting aesthetics] on GE’s comments of total destruction.
- Knows how aesthetics of River can be impacted because he has seen what’s been done already.

3.5.2.4 Unanswered Questions and Information Needs

- Understands that it is easy to replant a forest, but can you “replant” the animals? Would like to hear more about that.
- Wonders how long it would take for insects and small fish to come back after remediation and when the River would be back to normal.
- Lot of questions regarding backwater. Uses can shift from hunting and fishing to a kayak-preferred river. Animals will be gone either way.
- Where are the wetland habitats? What are they?

3.6 Local Impacts

3.6.1 Overview • Local Impacts

As in the previous section, the overview following focuses on respondents' comments on the issues of local impacts at a conceptual level and reserves comments on the practical consequences of various remediation techniques to Section 3.7, Proposed Alternatives in the Revised CMS.

Although no precondition was defined by the interviewers, most respondents offered comments on this topic/question as if under the assumption 1) that EPA's preferred remediation strategy would involve some level of sediment/soil removal and replacement; *or* 2) that if EPA's preferred remediation strategy was Monitored Natural Recovery, the local impacts would not be significant enough to warrant comment. Whatever the case, stakeholders only offered responses to the assumption of a solution that involved sediment/soil removal and replacement.

Respondents voiced some general concerns on the impact of a proposed remediation strategy that involves sediment/soil removal and replacement. However, they were much more vocal and varied in their views on the consequences of such a remedy on the region's economic development. On the cautionary side, some noted the negative population and economic development trends over the last decades; others noted the importance of tourism to the region's economy. In either case, many expressed concern that negative aesthetic impacts to the River and impeded use of the River—along with the truck traffic associated with soil transport—might have further, even more negative impacts on the region's ability to recruit new residents, businesses, and tourists. Others expressed a different cautionary concern, namely, that foregoing remediation had its own negative magnetism for attracting those same potential contributors to the area's economy and that a cleanup would do nothing but improve marketing efforts. Still other respondents viewed active remediation as a potential economic generator, attracting attention, jobs, and tourists related to the study and execution of the cleanup—a living classroom that modeled cleanup techniques and processes for other remediation efforts at EPA cleanup sites.

On the issue of landfills (a potential outcome of a removal action), some respondents were comfortable with the possibility of new, local disposal sites, noting that their primary concerns were related to determining the optimal location(s) for such a facility. However, the vast majority of residents voiced firm opposition to locating any landfill within their communities and certainly within official town or city limits. They cited many reasons for their opposition, among them human health risks from facility leakage, property devaluation, and perception as a waste site by outsiders. Nonetheless, several noted, with sincere tones and vexation for not knowing an alternative soil disposal strategy, that they were uncomfortable transferring the waste—and the potential problem—to another community.

Within this topic, a notable common thread was respondents' considerable concern over how economic consequences were being valued in the decision process. Some stakeholders noted that they were unclear and unhappy that the potential economic costs to the local communities were not being properly studied or tallied. Some of these same stakeholders were joined by others who believed that the criteria used to evaluate and ultimately choose a preferred alternative properly valued neither the short- or long-term economic impacts to the community nor what they believed was justified remuneration to the community.

Following are respondents' specific comments on these points as recorded in the Interview Response Forms.

3.6.2 Stakeholder Responses • Local Impacts

3.6.2.1 Local Roads

- Concern with how [existing, local] roads will be impacted.
- If trucks haul away contaminants, must repave [existing, local] roads.
- Does not make sense to bring trucks through people's backyards.
- Believes that there are trucking prohibitions against trucking in the zoning code. Needs to research. This has been accomplished in other communities.
- Concerned that trucks would have to use Stevenson Dam.
- Doesn't care about the impact of cleanup to roads, but recognizes that the public does care. Wants what is best for the environment.

3.6.2.2 Economic Development

- Major population loss here over the last three decades; need to reverse this.
- Concern that Berkshire County is still losing population.
- Workforce average age is older; we want to attract new business and people to the area.
- Already having difficult time attracting young families [without additional negative element].
- Berkshire is not a well-to-do county, but has a higher poverty rate than other Massachusetts counties.
- This River is a major economic engine—due to its aesthetics, not industrial uses—in the area. Very concerned that some of the remedies will have a serious negative impact on this and would only support such remedies if shown there is an impact on public health.
- If we are digging up toxic material for the next 30 years, the impacts to the community are tangible. If there is a 30-year cleanup program, we do not stand a chance to attract people.
- Be cautious about putting a hand on the scale that impacts tourism and recreation.
- Many businesses are relying on the continued success of Tanglewood.
- Eleven million jobs associated with tourism in this area. This is a central artery of the Berkshires. What happens here affects everyone all around.
- How the area is perceived as a destination spot is a huge wildcard. The Berkshires area has spent tremendous effort and money over a number of years to market the area internationally. The cleanup could set them back for years. It's not about whether there is a pile of dirt somewhere. It's much bigger than that.
- It is difficult to see any positive impacts; easy to see negatives in a holiday area, especially where it runs through towns. To shut down a downtown would be a serious problem.

- We can't hide the fact that there is a poison in the River. How do regional tourist bureaus communicate, "This Is a PCB Site"?
- Decisions being made are important to the future of the Berkshires. What tourists see and what they don't see in terms of dredging is important.
- [Active remediation solution] affects the way we market the Berkshires and second homes here.
- There are economic impacts. Trucks! Dust! Don't confuse with science.
- Concerned about the types of impact major construction would have [to everyday life.]
- Economic development should be considered in terms of how much people will be exposed to PCBs in the future.
- Cleaning the River will actually improve the economic activity on the River long term because people have turned their back on the River because they see it as toxic. Cleaning it up would help change the perception of the River and will make up for the temporary loss from the cleanup. This is all about the future. If we don't grab this moment, to clean it up now, it will be lost forever.
- [In the case of active remediation,] area could become an ecological study showcase and job creator.
- The River could be even more of a recreational and tourism attraction once cleaned up. So, the fact that some parts of the River would be unavailable does not mean that the whole River would be impacted. And that means the economy isn't necessarily so hugely impacted. And the remedy will create jobs, and a cleaned up River will expand economic opportunity around the River.
- [In the event of active cleanup], establish River as a classroom—have an endowed chair, use for community college, use for independent study, teach management process of the cleanup; study the community interaction perspective; turn into case studies. Let it serve the interest of science so it translates to other cities.
- EPA could promote the cleanup as one of the large job creators in the region.
- Tourists should not be impacted in Lenoxdale area, and if able to use railroad even less impact.
- Doesn't like the fact that [stakeholder group] spreads fear through the airwaves. It's understandable that we cannot move businesses here.

3.6.2.3 Landfills

- Does not see dump sites as a cause for immediate health risk.
- Identify all possible sites for a landfill. Definite aversion to a landfill in the floodplain, but no aversions outside floodplain. Should not be in a meander belt.
- Rising Pond is good site for landfill.
- Need to store PCBs near collection points.
- Has only heard about local sites for storing PCBs right next to the River.
- Hill 78 has no demonstrated problems.
- Hill 78 is seeping and leaves a negative mark; therefore, how can you trust where a landfill needs to go?
- The higher the levels of contamination in a local storage/disposal option, the greater the concerns. Conversely, if dredge spoils contain low levels or zero of

PCBs or other hazardous substances, there might be willingness to consider local disposal.

- Thinks City of Pittsfield does not want *any* more disposal within the city limits. Perceived that fellow citizens feel they have already paid a high price in the last round of remedial actions and will not support or agree to any more disposal within the city limits. They do not want to become known as a storage place for PCBs.
- Worked for 25-30 years on Housatonic [River] issues. Originally thought GE should just clean it up but has reversed view and doesn't believe that making a new pile of waste is what is needed.
- Community needs to say we do not want the landfill.
- Finding a dump site out of the area is important. This has to be addressed.
- Definitely do not want a dump in Lee or Lenox.
- There are archaeological and endangered species, and other reasons to object to dumps. Landfills not allowed per Areas of Critical Environmental Concern Program in the state [of Massachusetts].
- Suggests that there not be any sites in Berkshire County, given what is going on in Pittsfield with its dump.
- Concern with killing any property values near site.
- PCBs should be removed and taken to an off-site facility; it may be possible in the future to treat and destroy PCBs, so all PCBs should be landfilled together. Get the PCBs to a facility designed to store them securely. A disposal site within the watershed is unacceptable. Should be shipped some place outside of Berkshire County.
- Hears a lot of people saying, "Don't dump it here [in our town]" and others not considering the effects of merely passing it off to others in different jurisdictions.
- Hate to see another hazardous waste site created. Don't want to see the PCBs simply shipped to another community.
- Do not want PCBs dumped in another community.
- Concerned about proposal for six dumps and trying to scare the hell out of everyone.
- Doesn't like how the community is being unnecessarily threatened with nearby landfills and huge staging areas.

3.6.2.4 Valuing Economic Impacts

- No local community/economic impacts are included in the criteria to evaluate remedial alternatives.
- It does not appear that the long-term economic impact of the cleanup is factored into the process.
- There is data on the economics in terms of cost, but there seems to have been no study or reporting on the economic impact to the community.
- Has seen nothing that considers the economic outcomes of what happens when there are three PCB dumps.

3.6.2.5 Unanswered Questions and Information Needs

- How will materials that are being cleaned up leave the area? Concern is not only with dumps but also with dredging.
- Cannot understand whether there have been any PCB leakages from original operations or disposal areas previously completed.
- What are the economic impacts? Taxes? Community growth?
- Interested in whether the PCB cleanup can have spillover benefits, such as coordinating with towns to improve systems to keep stormwater from dumping straight into the River.

3.7 Proposed Alternatives in the Revised CMS

3.7.1 Overview • Proposed Alternatives in the Revised CMS

The previous sections have addressed respondents' concerns on conceptual matters and values—what might be termed "framework" concerns that are crucial in developing remediation approaches and solutions. This section addresses the application of those ideas to the Proposed Alternatives presented in GE's Revised CMS.

Stakeholders' responses indicated that there are wide differences in attitudes among stakeholders regarding 1) the extent of remediation that stakeholders believe is warranted to solve the contamination problems and 2) how well any of the Proposed Alternatives would accomplish the task. Several respondents were definitive in their positions that none of the Proposed Alternatives was acceptable, but on the whole, people expressed that they did not adequately understand the specifics of the Proposed Alternatives well enough to provide EPA fully informed input on any particular alternative (which respondents often called "options"). As indicated in Section 3.7.2.6 Unanswered Questions and Information Needs, stakeholders underscored their need for additional information on a range of subjects—from specifics and comparisons of the Proposed Alternatives, EPA's decision criteria and process, consequences of actions on immediate areas and communities downstream, to a broad range of general and specific technical issues. Calls for additional information related to the Proposed Alternatives far outweighed any other topic in terms of volume as well as breadth and specificity of content.

Rather than respond to specific Proposed Alternatives, respondents tended to more categorically respond to an either/or question of whether the risk to human health and the environment warranted or did not warrant cleanup in the first place. Many respondents believed that the costs are not worth the benefits or that there are greater risks from remediation than from leaving the contamination in place. Some people leaned one way or the other toward remediation but were also ambivalent, expressing that they had too many questions to make a firm decision. Most respondents believed that active cleanup in the form of removal and replacement of the river bed and river banks (which respondents more often than not shorthanded as "dredging") was the appropriate direction for a solution. However, respondents identified a spectrum of levels of intervention—in both intensity of effort and spatial extent—that they believed was necessary.

On one end of the 'sediment/soil removal and replacement spectrum,' some respondents favored comprehensive or total PCB contamination removal or "as much as possible," asserting that the River's natural processes would allow flora, fauna, and natural processes to recover over time and that waiting was worth the benefits of a more complete cleanup. On the other end of the 'sediment/soil removal and replacement spectrum,' some stakeholders favored minimizing River corridor disturbance and limiting remediation to only the "hot spots" (where PCB concentrations are highest) that are directly related to human health risks, such as high-volume recreation areas, like boat launches. Some advocated more extensive interventions, such as bank-to-bank River sediment removal for significant lengths of the River or areas exceeding a certain PCB concentration. Many more respondents, however, were opposed to such extensive, uniform treatments and recommended avoiding special areas such as those with rare and endangered species, Areas of Critical Environmental Concern (a Massachusetts program), habitats that had already been restored, properties that contained specific habitat types, special fishing spots, and particularly beautiful areas. This removal strategy of identifying specific areas was stated outright by several respondents who advocated a small scale, site-specific approach in which the remediation of the River is considered section by section rather than as a single entity.

Respondents commented on Woods Pond separately, expressing concerns about PCB accumulation and the need for repeated dredging and the potentially protracted time scale of operations. In addition, several interviewees suggested that rail service be investigated and perhaps used as a way to transport contaminated material from remediated areas.

Three themes emerged from respondents' reflections on alternatives that involve removal and replacement: Remediation in Pittsfield; Adaptive Management; and Emerging Technologies.

Although some respondents felt that the vegetation has now sufficiently recovered and is visually acceptable, for most stakeholders, the clearing and riprap work associated with the remediation in Pittsfield was a scene that had left decidedly negative impressions and that this type of operation should not be repeated. Stakeholders were not specific about preferred methods for avoiding the same result—such as abstaining from dredging, using no riprap or a different stabilizing material, employing active vegetation restoration, etc.

In any preferred alternative other than Monitored Natural Recovery, many respondents strongly recommended that EPA become more receptive than they currently perceived them to be toward emerging remediation technologies that do not require the extensive vegetation and sediment/soil removal of dredging, capping, and/or bank armoring. Instead of these traditional techniques, emerging technologies treat the PCBs *in situ* using microbes, thermal processes, and other techniques. Even those who agreed that some of these alternative technologies were not necessarily ready for immediate application to the Housatonic commented that, given the timeframe potentially necessary to remediate such an extensive portion of the River, emerging technologies might prove better solutions at some future point in the cleanup.

With equal ardor, many respondents also urged the incorporation of adaptive management (as defined by respondents), an iterative process that is not to be confused with Monitored Natural Recovery or any other low intervention strategy. Rather, they articulated, it is a cleanup intensive process in which remediation is completed incrementally, in small amounts, rather than executing a single, large, and monolithic plan. Before implementing the next effort, the small extent is monitored and evaluated, and its lessons are applied to the following efforts. Each subsequent effort would repeat the process. Such an approach, many respondents noted, would not only support a more robust and desired level of stakeholder participation in decision-making but also increase the likelihood of incorporating emerging technologies.

Regardless of respondents' preferences on extent of cleanup, stakeholders expressed strong concern that EPA clearly articulate the decision criteria upon which it is basing its preferred alternative. They also noted that those criteria should include short-term and long-term solutions, be based on solutions that have high rates of success, that the trade-offs be clear and commensurate with the costs, and that the primary criterion *not* be that of lowest cost. Several people, citing the importance of the cleanup decision and various skepticisms within the community, noted that EPA needed to exercise greater transparency in the decision-making process and further its efforts to solicit and incorporate public input.

Following are respondents' specific comments on these points as recorded in the Interview Response Forms.

3.7.2 Stakeholder Responses • Proposed Alternatives in the Revised CMS

3.7.2.1 Revised CMS Proposed Alternatives

- Not crazy about any of the options.
- [Current] options are not good options. We should not want to shift the problem from one place to another.
- Doesn't think any of GE's options need to be chosen and that the EPA and public don't have to agree to any of them as adequate. Totally new and innovative ideas can be chosen.
- Wonders what other options are available beyond the three GE is proposing.
- Concern that none of the options will allow for consumption of fish.
- Concerned with GE [Revised CMS] Report and misstatements.

3.7.2.2 The Question of Remediation

- Clean River is better than a dirty River.
- The cleanup should occur so that future generations should be able to enjoy a clean River.
- PCBs are hazardous materials and are not naturally occurring. Remediation will take less time than it took GE to cause the problem. Benefit will be thousands of years.
- People are afraid of and do not want change.
- Has bias toward cleaning up problem.
- Expressed shock at the GE film taking a "let it be" approach because you can't just "let it be"—it won't go away. Shocked at doing nothing. Must do something.
- Hates the idea of leaving the dirt. Hates the idea of digging it up. If had to choose, would lean to removal.
- Unacceptable for GE to do nothing, but dredging the entire River is also not acceptable.
- We need to remediate. Can't monitor for 2 years and then say it is done. It needs to be on a long-term basis. EPA needs authority to say we are not done.

- Dredging and removing PCBs are probably better than leaving them in place.
- Yes, there is a concern about removing PCBs, but there is also a risk of leaving them in place. Surge downstream, dust, etc. Hard to compare the risk of one versus the other, except that the risk of leaving the stuff in place is likely to last a longer time, rather than the short-term risks from removal. Removal risks might be akin to a year of wet spring floods. Once is one thing; every spring is quite another.
- Aware that the Hudson cleanup is very different but very concerned about what the impacts [of dredging/soil removal] will be, particularly what will happen downstream by what is done upstream.
- Removal is not going to get it all, so it's definitely going to cause more contamination in the short term.
- Understand it took decades to contaminate; could take decades to clean. Also, the program will and should take time, a decade or even longer.
- Understands that it will look different years 1-5, but the benefit is worth it moving towards year 50.
- Streams are not good places to store contaminated sediments.
- Without remediation, every time a big tree falls over there is a chance that PCBs will be released into the River and environment. This is the same issue that comes up when people object to removing dams because of the contaminated sediments behind the dam.
- Generally favors removing sediments, as they are not stable remaining in the River over generations. But where they should go and how they should be stored are difficult questions. Has concerns about where they end up.
- Four new canoe launching sites are on River, which mitigates [limitations on] access for boaters during cleanup.
- Interested in the consensus of the sportsmen, public health, and people who use the River.
- [Wouldn't want to respond to a question about "harm to human health or the environment from *removing* PCBs"] because doesn't want GE to use his answer as an excuse to leave them [PCBs] alone.
- GE is bad for polluting the River, but EPA may be bad for destroying the River.
- River will not come back the same way.
- Considerable dredging turns River upside down.
- Believes sportsmen do not want to see the river dredged.
- Doesn't like option of dredging hundreds of feet of wetlands; destroying wetlands, that is worse than leaving PCBs in place.
- Dredging may cause silt to flow downstream and release PCBs.
- Dredging is not good for the River. Favors leaving the River alone, *if* [he] knew it was safe.
- Not sure if there is a benefit, or are we better off letting the River clean itself up.
- Does not see how we will get the benefits after all the remediation.
- Are we destroying the River to save it? Is it a worthwhile cost?
- Not willing to watch a 30-year massacre of the River that took countless years to develop.

- Believes the River could be destroyed for hundreds of years.
- Would not be happy if River dredged, as thinks people can live with PCBs down in the mud, where they may be contained and benign. But if that is not true, "can't kill off the population" by failing to take action.

3.7.2.3 Remediation Extent and Intensity

3.7.2.3.1 Comments Related to No Remediation or Monitored Natural Recovery

- Thinks that if River is left alone the PCBs may disappear in 100-200 years.
- Do not see the human health risks that warrant dredging the river.
- Shouldn't be remediation. Would hate to see River dredged unless there is a serious risk to the community.
- If PCBs have already been buried for generations, doesn't make sense to dig them up and put them in a big pile.
- At this point not convinced that dredging is a viable/useful/good option. Don't understand the benefits to human health nor understand the costs, both dollars spent dredging and more significantly the costs of the impact on the River. Also not at all clear about the harm in leaving most PCBs in place.

3.7.2.3.2 Comments Related to Comprehensive/Total PCB Removal

- Replace all materials—10k of River miles. Let Mother Nature restore it. River is correcting itself today. There may be elements of truth about new technologies. Not clear it will work in this area. But people do not know how restoration can work. Need to visualize for them how it can mature, showing trees hanging over the River. Show what work looks like in the first ½ mile, as now it looks pretty good.
- Want to see PCBs dredged from sediment in the river. Then let it become the river it is in the end. Knowing that it will take time to recover. They believe that cleanup is possible without 'trashing' the river. The best solution to go forward with comprehensive remedy that removes as much of the PCBs as possible. Over time the river will recover from the work. Within a few generations, this river, if cleaned up, will come back. And one needs to looks at the costs and benefits over time, not just this one moment.

3.7.2.3.3 Comments Related to Selective Remediation (Spanning a Range of Extents)

- Public health should be the main criterion. EPA needs to do more and better risk communication because at this point there does not seem to be enough information to justify the more significant dredging options. Believe that EPA should only dredge those areas that, from a public health perspective, need to be addressed.
- Remediate recreational soils to 25 ppm.
- Focus on hot spots; establish minimum criteria that will need to be cleared; then focus on the rest of the Rest of River.
- Can't treat the whole River like Pittsfield; must identify and clean the PCB hot spots where the River is highly contaminated.

- Doesn’t want to see the River “destroyed.” Just find the hot spots and zero in on each location. Can’t let the PCBs stand.
- There should be a moderate cleanup. The results need to be monitored. Utilize an adaptive management policy. Continue to focus on hot spots. Want to continue to look for in situ treatment to take care of job. Non-invasive. Employ new technology for other areas.
- Areas of Critical Environmental Concern 28-29 [in Massachusetts] need to be identified – wetland habitat and notable significance.
- Hydrologic dredging, use railroad tracks, take PCBs from River. Do not touch the banks—leave them alone.
- Draw a line on either side of 50’ belt. Excavate 8-20” deep. Armor and prevent River from meandering.
- While the use of protective armoring may be necessary in certain, limited parts of the River, in general, the River must remain free to migrate within the floodplain. Don’t think the character of the River should, long term, be changed dramatically. Some armoring could be biodegradable. Should use the best available, most environmentally sensitive, technology.
- Each part of the Rest of River must be considered separately in order to preserve the beauty.
- Wants to see the rest of the river broken up into a multitude of decisions based on site-specific conditions rather than a singular condition of the river [and then adaptive management process used for subsequent sections].
- Want to see timelines [of construction and restoration] on each section of construction.
- Notes that 100 years ago, there were almost no trees along the River.
- Does not want to see bank to bank dredging for Rest of River. It would impact multiple generations waiting for the ecosystem to replace itself.
- Putting in roads will destroy what is already beautiful in the environment.
- The Land Trust has been involved in riparian buffer restoration. It would be a shame to lose this work, especially because much of it was done by volunteers. This would be a concern.
- Reports that resorts are upset about the possibility of knocking down trees, destroying river banks, and are concerned it will be done the way that the first 1-½ mile stretch of the River was done.
- Does not see dredging every last part of soil.
- Does not understand why we are talking about dredging an area where people do not live. There are no neighborhoods.
- Radical surgery is not a pretty picture.
- Need careful look at bank remediation. Idea that you can’t hang trees over because of PCBs. Concern that muskrat, otters will not have shelter.
- Recognizes there is nothing pretty about the cleanup, but should focus on restoration as the solution. Can’t focus just on remediation without restoration.
- Need to make sure that restoration plans are adequate.

3.7.2.3.4 _Woods Pond_

- Woods Pond resident concerned with prospect of 20 years of restoration.
- Concern that if you dredge Woods Pond, a heavy storm would simply move PCBs back into the Pond.
- Should be consideration that PCBs will build up over time after the remedy in Woods Pond, so there should be consideration of periodic dredging in Woods Pond. Should be carefully looked at.

3.7.2.3.5 _Landfill and Rail Transport_

- Need to study rail options.
- Wants to move contaminated soil out of area and by train.
- Consider use of railroad. There is a rail line right along the river; perhaps they could upgrade the rail line to use as a means to remove the dredge spoils and at the end the locals would have an upgraded rail line. Upgrading the rail line would be necessary to make rail removal safe and it could result in a rail line safe for passenger use.
- Rail should be a viable option; easy way to move [dredge spoils] within the community.
- Rail corridor may be utilized and move some landfill to New York. Incumbent on EPA to do a thorough rail study in lieu of utilizing roads.
- Consider hydraulic dredging and utilizing the railroad tracks.

3.7.2.4 Recurring Themes Associated with Sediment/Soil Removal and Replacement

3.7.2.4.1 _Remediation in Pittsfield_

- Last 3 years seeing what happened in Pittsfield is a rude awakening.
- [Though wants PCBs removed at this time,] does not want to see the River left armored and rip rapped.
- Believes that three-fourths of the Berkshire population does not want to see the River dredged like Pittsfield.
- The Rest of River is really a different set of issues than the first part of the cleanup.
- Believes that people fear riprap, but it now looks pretty good.
- Believes that people do not want to see what happened in Pittsfield happen to the Rest of River.
- Citizens need to ask EPA how it will get the job done, not like it was done in Pittsfield.
- Supported past cleanup until saw what happened in Pittsfield.

3.7.2.4.2 _Emerging Technologies_

- Shovel and wheel barrow technology [are predominating current discussions]. There have to be better ways.
- Why continue to use big, yellow machines if there are new technologies out there?

- EPA needs to give a more fair consideration of pilot projects that experiment and explore in a more open and supportive fashion. Believes that the technologies deserve a more thorough and open-minded consideration, particularly since they tend to be very site specific. This is possibly because EPA has been such an under-funded agency. EPA tends to rely on landfill technology rather than exploring other technologies that have no more questions than landfills. Not that he necessarily disagrees that the technologies are not yet ready. However, if the EPA doesn't get behind these, try them, or take better looks, they will never emerge as viable.
- There should be other alternatives and means of doing the work than the "fear factor" that you have to cut every tree down.
- Wants to see what new dredging techniques there are and innovative removal processes.
- Wonders if there isn't technology that could destroy the PCBs, rather than just moving them around. Expects that such technology would cost a lot of money.
- Thinks the Governor's office should be lobbied to support innovative technologies and a pilot project with a company like BioTech Restorations.
- EPA needs to demonstrate willingness to keep looking at new technologies.
- Wishes that they would canvass the experimental sites and people from across the country who are exploring alternative cleanup technologies. Wants emerging technologies to apply to a river-specific environment (such as what has been done in Region 5).
- EPA seems to have a wide variety of specialists regarding the scope of the cleanup who might consider rare and endangered species, where too much is lost by digging the River up. In these cases and perhaps others, hopes that they will consider for these species a temporary solution of doing nothing for now and waiting on emerging technologies that can treat the PCBs in place.
- Why use big machines if not state of the art?
- Reports that some community members are interested in thermal desorption.
- Wants to see new technology and new dredging ideas.
- Wants to make sure EPA continues to support new technologies. Just discovered a company called BioTech Restorations in California with a bacteria-based product supposedly being used in the Gulf and at a Navy base that is cleaning up PCBs. Works much like a hydro seeder. Believes EPA should pilot this equipment.
- Research BioTech Restorations, a remediation company using a bioremediation process. They claim their work is reliable and offer a money back guarantee. Discovered there are seven sites that BioTech is working at, with four of them contaminated with PCBs. We need more information about this resource, and citizens should not be the ones having to do the research.
- Want to find a company (with new technology) for the PCB cleanup.
- Would like to learn more about bacteria and other methods to see if any are really workable.
- It took 50 years to destroy the River. We can wait for new technologies. Microbes can eat up PCBs.

3.7.2.4.3 Adaptive Management

- For the all actions, including removal, remedy and restoration, there should be adaptive management, using lessons learned over time. New technology and cleanup methods should be undertaken when appropriate. Most important is to cleanup as well as possible, learning from actions, with the goal of removal of the PCBs.
- No sense of adaptive management involved [in Proposed Alternatives]. [Each alternative] seems so rigid—it's this and nothing else.
- Favors adaptive management and the ability to move to new technologies and ideas but fears that a particular party might use adaptive management in the future to undermine the process that is put in place now.
- Want plan that is an adaptive one in a way that the second, third, etc. sections not be determined until the results of the first reach are in and that other projects around the country are scoured for the most current result.
- Do one small part of the River at a time. One-half mile at a time. Restore it. Convince the community that this is the way to do it.
- Adaptive management is key.
- Believes strongly in the adaptive management approach to remediation/restoration process and have CCC [Citizens Coordinating Council] and others be part of ongoing communication and decision-making. At a minimum the community needs to be involved at certain milestones.
- For all actions, including removal, remedy, and restoration, there should be adaptive management. Also, the program will and should take time, a decade or even longer. New technology and cleanup methods should be undertaken when appropriate.
- Need to use adaptive management, phased over time.
- Use adaptive management to develop a classroom model approach.

3.7.2.5 Decision Criteria and Process

- Knows that the [decision] criteria have been presented but doesn't remember the specifics.
- Hopes that EPA really looks into the alternatives and considers everything with a "fine tooth comb."
- Issues of both short-term and long-term impacts must be considered.
- Short-term fixes are not desirable. Should be finding the best solution for the longest term that can be considered.
- Would like to see more focus on the big picture both in time horizon and in our responsibility in the scope of the larger world. To take this moment in time to act so that we aren't dumping PCBs in the Long Island Sound for the next 10,000 years.
- Demonstrate reasonable expectation of achieving fishable and swimmable River; EPA's final recommendation must meet that standard.
- Concern that none of the options will allow consumption of fish.
- Sportsmen's groups need to be consulted with.

- Believes that whatever the choice, the cheapest cost is not the answer that people want to hear.
- People do not want the primary criterion to be one of lowest cost. People are really going to want to know the long-term effects of whatever effort is chosen. What if it doesn't work? How long will it be monitored? How to fix problems that arise?
- Views the issue of whether to remediate as a cost-benefit analysis, considering the dollars and impact on the River.
- Want a clean River and want to make sure trade-offs are worth the result.
- What do we actually achieve for each level of cleanup? Not interested in hearing back it will be a cleaner river. What performance standards are operating?
- What do we actually achieve for each increment of cleanup?
- What is the cost and what is the benefit?
- Need to figure out cost of remediation/restoration in advance and devise multiple approaches to get there.
- Believes this situation does not fit a standard EPA algorithm: If we do X, then you get Y; GE paradigm is off, too: How do we get off with the least amount of work?
- This is not a minor decision. Wants to give inputs—what gets planted, what will remediation look like. It feels like an act of faith—do not know what the process will look like.
- We need to be using the National Data Bank of Information concerning what other sites are doing for PCB remediation. Whatever process we undertake it has to be state of the art.
- Concerned about a "secret government plan" for the cleanup.
- Wonders what decision EPA will make. Wonders if EPA is influenced politically.
- Earlier PCB cleanup determined in Pittsfield, but now community has no say in the matter. People in Lenox and Lee should have a say.
- Does not understand how no one has contacted the Planning Board. Whenever there is a development project in the community, the developer is required to come in way in advance to discuss its plans. That is not happening here.
- It is a matter of trust and who you believe in evaluating and reporting the alternatives being proposed; trusts local EPA officials.
- Concerned about a small group of people determining that every inch needs to be dredged. Believes it is time for the community to weigh in.
- Not worried; confident cleanup will be done right.

3.7.2.6 Unanswered Questions and Information Needs

- Could not easily find information on the options or the issues on the EPA website.
- The community needs to know and understand the options.
- Needs a clearer presentation of the consequences of one option vs. the other option vs. a combination of both.
- Aware of two principal options: 1) dredge and store or 2) monitor. Does not understand the science enough to know more.

- Concerned that it is coming down to 2 options: 1) do nothing or 2) dig out the floodplain and put it in three locations, or ship it to Texas. Believes that there must have been other options but does not understand what they were.
- [Questions about] EPA timeframe on making the decision and many other questions about the process that EPA is undertaking, particularly how they are involving the communities in the conversations.
- What alternatives is EPA considering?
- Wishes there could have been and will be more education on this area [criteria], not so much about the specific criteria being used but the process and what, when, here, and how EPA can say things.
- We need to know what has worked and hasn’t worked.
- What are the optional ways of cleaning PCBs?
- How can impacts to the river bed be minimized?
- Concerned and has questions on the materials/PCBs/drums that are left behind and their future leaching or potential for release into the environment.
- The CMS talks about monitoring “ongoing” sources of PCBs. What are they, and what does that mean, and why are they not being addressed?
- Thinks that citizens are of the opinion that GE must pay for its having dumped all the PCBs out there. So, if EPA is choosing an aggressive cleanup as the only way to extract money from GE and not necessarily because the aggressive cleanup is needed, then why can’t EPA, in essence, “fine” GE for an extraordinary amount of money to do what is actually needed and then give the rest of the money to the towns?
- How do you deal with differences in testing results from one point on the river bed to another?
- Wants more detail about what is involved in the remediation. Will it fix the problem?
- What are the financial impacts?
- Not at all clear about the harm in leaving most PCBs in place and/or the benefits in removing.
- Wonders about the equipment that would be used when go in to clean the River.
- Important for Pittsfield to know what is in the four-mile stretch above Woods Pond.
- What comes back after demolition? Can the River come back?
- What’s the impact to Connecticut by stirring up PCBs?
- What was the impact on Lenox from what was done in Pittsfield?
- What are low impact solutions?
- What is threshold for defining a hot spot?
- How will materials that are being cleaned up leave the area? Concern is not only with dumps but also with dredging.
- How do we know what the right decision will be in this stretch of the River?

3.8 Public Engagement Process

3.8.1 Overview • Public Engagement Process

Via the Interview Response Form, EPA solicited responses on what public engagement processes had worked for people thus far and what could be done better as the process moved forward. Interviewees were also asked if they had questions on how the Citizens Coordinating Council (CCC) operated and if they thought it would be beneficial for EPA to host more active engagement sessions such as mini workshops and, in particular, charrettes (intense, hands-on workshops that result in guidance, input, or direction for the charrette sponsors).

Many respondents had positive reflections on EPA's public engagement efforts thus far, noting the effectiveness of EPA-issued Fact Sheets, the effort that EPA had put into public engagement, the number of meetings it had held, and the difficulty in addressing so many different audiences and interests. Others expressed less complimentary views, expressing that EPA had not held enough meetings and had not directly engaged the full gamut of stakeholders. A few stakeholders noted problematic aspects that are more atmospheric in nature and source, such as the protracted nature of the project, the range of interests that must be addressed, and personnel turnover. Problematic issues extended, according to respondents, to stakeholders' skepticisms regarding partiality on the parts of both EPA and GE. Some noted how similar skepticisms had resulted in a mixed view of the CCC's role in the process, with some believing it had been effective and others believing that its usefulness was hampered by politics and the same problematic aspects as the process in general.

Respondents' thoughts on future public engagement efforts were numerous, creative, and varied. While most were decidedly supportive, even enthusiastic, on the proposition of mini workshops and (particularly) a charrette, several offered cautionary advice: ensuring participation of the full range of stakeholders in the charrette; including impartial technical experts; and careful defining of objectives and subjects. Some respondents noted that EPA should consider not only a singular charrette but also multiple mini workshops/charrettes, not only in the immediate months but also in future stages of the Rest of River remediation. Others offered advice on specific techniques that might engage fellow stakeholders more effectively and in greater numbers, and they included a host of general and specific ideas for charrettes and other interactive forums.

Respondents' most voluminous and ardent comments concerned their desires for EPA to increase the level of community participation in the decision process. Some of those who were complimentary to EPA on its level of engagement thus far also wanted EPA to extend its efforts. Other respondents echoed these appeals, some citing more stakeholders in general, others citing specific groups—including organizations, governmental boards, and downstream residents, and still others requesting alternate forums. A few respondents noted the need to slow down the decision process to ensure adequate community input and ensure that the issues were fully and rigorously investigated. In addition, although few respondents explicitly noted the word "transparency" in their comments on how EPA should run the decision process, many respondents described the same concept in other terms, noting—as they had on other topics—their expectation that EPA would clearly articulate its decision criteria and be forthcoming and specific about why it chose the preferred alternative and why that alternative was the best alternative possible. No matter what alternative EPA chooses, numerous stakeholders voiced that they want the community to have a meaningful part in that decision.

On the topic of public participation, many stakeholders reiterated their need for additional information, and on this topic, they more fully articulated the exact nature of those needs, detailing that it was not only more information that they sought but also particular kinds of information. First, some respondents requested specific information on case studies to which they might compare potential solutions for the Housatonic, even if those studies serve to demonstrate how particular techniques would not be effective for Rest of River. Second, several stakeholders noted that highly technical information needed to be made more accessible to laypeople—free of jargon, simpler, and consumable—so that they could be fully informed, engaged, and capable of providing meaningful input. Third, many stressed the importance of EPA's making available unbiased presentations and tools, both to assuage sentiments that information to date has been skewed by various parties and to enable stakeholders to fully understand potential rates of success of various remediation alternatives. Finally, many noted the need for improved function of the EPA's GE/Housatonic River website as a central information repository—including reports, meeting minutes, announcements, studies, etc.

Following are specific comments on these points as recorded in the Interview Response Forms.

3.8.2 Stakeholder Responses • Public Engagement Process

3.8.2.1 Efforts to Date

3.8.2.1.1 General Reflections

- EPA's previous newsletters/Fact Sheets were extremely helpful in getting word out on the facts and making people aware of what was going on and how to understand the issues.
- Consultants handling the CCC meetings have done a great job in a difficult situation; EPA and its consultants have been very accessible for questions or to obtain additional information.
- What has worked is there has been extensive effort for the most part by the various agencies (specifically the EPA) to conduct public meetings at which time information has been provided but not necessarily in ways that are accessible to people, as professionals tend to speak in their own jargon.
- Aware that Pittsfield and Tri-Town Boards (Lee-Lenox-Stockbridge) have had input and is glad that the EPA is extending to the County Boards to including greater range.
- No shortage of public participation through stakeholder organizations' public meetings. Recognizes that EPA is not an advisory body.
- So many different audiences and interests.
- No one holds my organization's interests.
- Concerned that the environmental community is disagreeing about what is the right thing to do.
- People get tired of participating. Dealing with third generation of public officials. So highly protracted and politicized that people tire. New people involved and they have to get re-educated.

- Some concern with those who attend the public meetings may not be the true representatives of the community. A small group can be engaged. A large group cannot understand what is to be done.
- Should have more public events. More than just report.
- Believes people feel like they are being used and fear being left alone.
- States that no one on the Sheffield Board has been consulted.
- Concerned that some groups are browbeating EPA. Also concerned that many businesses and other stakeholders have been left out of the process.
- People need to respond to EPA.
- Sees EPA as the regulator, GE as the Principal Responsible Party; EPA needs public participation now, as they sit as decider.
- Skeptical of EPA. Skeptical of GE.

3.8.2.1.2 Views on EPA

- EPA knows how to dispose of PCBs.
- EPA has intelligent people and will make decisions in the best interest of the community. The average Joe cannot make this type of technical determination.
- Recognizes that EPA is trying hard.
- Thinks it's great that the EPA is being this thorough and undergoing this public interview process in coming to its decision; applauds them for this.
- Has "faith in government and its good intentions."
- EPA has done a good job of reaching out.
- EPA has been doing great job in a difficult situation in keeping people informed and creating ways for them to be heard by EPA.
- EPA is good at listening to comments but recognizes that doesn't "always get my way."
- Thought EPA's Peer Review Studies were excellent and the process was equally well done.
- Understands what EPA must do, but has felt that EPA's silence over the past couple of years had been a major point of contention, despite the constraints EPA has been dealt.
- Concerned that EPA may only talk to be able to say they are talking.
- EPA is tainted by the Consent Decree; Agency is not representing the common Joe.
- EPA needs to be involved on the ground and not "shadow boxing" with GE.
- Views the top down approach of EPA very suspiciously.
- If EPA wants to improve credibility, they have to show examples.
- Bias is there with EPA. There are trust concerns. EPA doesn't have credibility to handle the process right.
- [Information] needs to be fair and unbiased, not coming from EPA. Does not trust EPA to be impartial.
- Hopes EPA is impartial and is not "picking on" a corporation.
- Concern that EPA was folding to GE.

3.8.2.1.3 <u>Views on GE</u>

- GE didn't cause the problem on purpose, so there are issues of both accountability and fairness.
- Suspicious of the emergence of a three-prong solution and efforts to push people into one of three options.
- Not impacted by GE's lobbying efforts which say that EPA wants to destroy the River in order to save it.
- Considers GE to be masterful at "propaganda" and getting its word out.
- Concern that GE is luring the fishermen and hunters.
- The loudest voice seems to be GE. This erodes trust in a fair process.
- It seems the public has been clearly getting the message. The GE information has been very effective. They have used fear tactics to get what they want.
- Stunned by magnitude of resources GE has put into effort to diffuse the issues.
- Believes GE doesn't want to do anything.
- For decades GE has been opposed to cleanup—sweeping things under the rug.
- Feels that GE has stacked the deck in their favor by scaring everyone.
- Concern that planning board/town can't/doesn't have the money to go up against GE.
- Believes that GE has spent $10 billion or more on "Ecomagination" and has conducted great research trying to look green, including wind turbine production but needs to clean up its mess on the River.

3.8.2.1.4 <u>Citizens Coordinating Council</u>

- Being part of the CCC was an excellent forum, but not perfect; great way to be informed and raise concerns. Has felt for the last 5 years that can ask CCC to bring up anything useful to talk about.
- Suggests that CCC has been a way of managing the public, not a way for the public to input the process.
- CCC not as vibrant as it was during the early years.
- Stopped going to CCC meetings. It was not useful to go when the only purpose seemed to be to beat up on GE.
- When the CCC was established, town officials did not have a seat at the table.
- Questions if people pay attention to the CCC. Representatives show up, and the public doesn't go.

3.8.2.2 Future Efforts

3.8.2.2.1 <u>General Reflections, Concerns, and Ideas</u>

- Wants to be clear on the EPA timeframe on making the [remedy] decision and many other questions about the process that EPA is undertaking, particularly how they are involving the communities in conversations.
- EPA needs to sit in small groups answering questions.
- There needs to be a clearly defined mechanism for the community to provide feedback.

- It would very valuable when whatever plan is presented if EPA also presents alternative plans because people will not accept any plan without proof that it was one of many considered and why it is the very best plan.
- Wants to see next level of detail. What does each option/choice mean on the ground?
- Facts need to be clearly supported and backed up.
- EPA should make the most of having a new Region 1 Administrator and new head of EPA itself. Believes that Curt Spalding is well known and has good credibility.
- Present information in community centers and local schools.
- Have people come to fire station for follow-on information sessions.
- Send out flyers to people's homes. Cleanup announcement attracts people, like zebra mussels in the River south of Lenox.
- EPA has to keep its schedules, no setting and then canceling deadlines.
- Keep presenting information in the press on a timely basis.
- EPA can give a presentation to Selectmen.
- If more money is going to be available to communities for restitution/mitigation, a better process should be used to distribute it to keep from causing conflict. When money was available previously, it caused a huge amount of political infighting. People "fought like hell" and are still mad at one another.

3.8.2.2.2 Charrettes, Mini Workshops, and other Activities

- [A charrette] sounds terrific.
- Very much likes charrettes as long as there is a really good sampling of stakeholder groups.
- Conducting a charrette is a good idea, although it may generate more heat than light, given the controversial nature of the issues. Welcomes a different approach. Better to have a charrette than a regular facilitated discussion, as many stakeholders are weary of the normal processes and need something new. Value of charrette depends on how the objectives are designed. Feels that objectives are often defined in terms of the engineering solutions that are available, that whatever is feasible drives the process. Thus, if armoring the sides of the River as in Pittsfield is what's available then that is the outcome chosen, rather than basing decisions on the water quality and wildlife needs.
- Possible use of multiple technical panels on new technologies, including dredging.
- Have a panel of scientists and discussion; build it into charrette planning.
- Consider doing mini charrettes because groups are split—in early summer.
- Could hold seminars over 6 nights. Done by educators.
- Potential to reach out to CCC with updates about the charrette process.
- Likes idea of charrette to drum up enthusiasm.
- Thinks EPA should have as many charrettes as possible now, which will encourage people to come out and participate.

- Want to know why the major meeting (the charrette) is scheduled to be after the public comment period is closed. This schedule seems to make the charrette (or whatever EPA decides to call it) not a particularly useful exercise.
- Would like to see a post-charrette meeting with key stakeholder groups.
- Mini workshops and/or charrettes can't be the end of the engagement.
- Suggests that EPA focus on involving the people on the ground in the region who work on the long-term stewardship of the River and watershed. EPA should partner with concerned groups and use the charrette to address the issues, opportunities, challenges and how to overcome the challenges. Value of the charrette goes beyond determining what to do with the PCBs and can further strengthen and encourage collaboration among the groups involved. Towns, NGOs, and the states will be the stewards over the long term of whatever plan is ultimately reached. EPA has capacity to convene organizations and towns and should strengthen existing collaboration.
- Multi-sensory learning is important, and EPA cannot have enough approaches. Hearings are good, but these formats are quite challenging because of the opinions of some of the people. The decision should come out in a couple of different ways and media. EPA should also distribute printed materials for "non-scientist dummies." There should be a DVD that shows the options/ consequences. In short, one can't sell this enough. It's not information that's the issue. It's misinformation.
- Use a visioning process with lots of public forums involving every community in the region.
- Giving people the vision of the restoration will give them the courage to make this decision.
- What happens must be upfront and transparent.
- Urges that EPA be very transparent.

3.8.2.2.3 Community Participation

- We want more information. It is important for us to know who presents information and that we have input into the process. Important that we have input into the process.
- Wants a situation that would allow the public to have a meaningful part of moving the project forward—other than a unilateral decision on the part of the EPA.
- Concerned that the communities who are impacted—especially those affected first—will be consulted and that the downstream communities will not be a part of the conversation.
- Allow the public to have a meaningful part of moving the project forward.
- Need to listen to the community. Show understanding that you know this can be ugly, that there is nothing pretty.
- More engagement is advisable, as believes many stakeholders and NGOs are not being listened to.
- Good community association is needed.
- Would like to see more towns involved in the processes.

- Wants CCC to be more than a vehicle through which to make announcements and thank everyone for attending. Wants it to have a more meaningful involvement in the decision.
- EPA needs to engage in active community in real time.
- Landowners should have a seat at the table.
- Would be interested in roundtable discussion with landowners.
- The people who have been most directly damaged, who have the closest contact to the River, to be properly paid attention.
- Advises EPA directly interact with the Boards of Health all along the project.
- Advises that EPA meet with local health boards before any remedy is decided to have a full discussion of the various remedy options, the costs and benefits of each, and to consider local concerns about the projects.
- Feels that EPA could make better use of promoting the efforts of stakeholder organizations. Could produce a flyer with study of those the stakeholder groups have identified. Possibly create a panel of experts.
- Understands that Pittsfield may have less of a voice at the table but still concerned.
- Not clear on what EPA's position is; believes it must be made very clear by EPA, particularly the consequences of EPA's decision, which should be enumerated and explained one by one according to the important issues (economics, health, traffic, etc.).
- Wants EPA to know that the community will continue organizing if cleanup standards and process do not meet public health goals. Does not believe either GE or EPA. Is prepared to lead community with leaflets, contacting the news media and conducting own public meetings. Sees the public pressure against a company in Maryland as similar pressure that needs to be put to bear against EPA.
- For any future educational forums, meetings, and the like, people need plenty of lead time in order to attend; having something away is no good.
- After years of waiting, there seems like a "hurry up and get it done" at this point that does not include the entire community and all options, that it will produce a result that is not entirely thoughtful.
- Speeding things up could be in conflict with the community's wanting to slow things down to support a good decision-making process.
- Steps to include: 1) Educate the public on the breadth of options; 2) Educate the public on each option according to the criteria articulated by EPA; 3) Engage the public and get options (understanding that the public is not a monolith and is, in fact an array of constituencies); 4) Slow down the decision; and 5) Get control of the press.

3.8.2.3 Unanswered Questions and Information Needs

3.8.2.3.1 More Information

- Need more information.
- Thinks that people on the River need more information.

- Need to reprint brochures and fact sheets.
- There is a tremendous information gap. The Berkshire Eagle is the only source of public information right now. Does not feel this is a level playing field. The community needs to hear from EPA.
- Thinks that one must closely be following the situation to have any information in Connecticut. Has the sense that there is a large difference in public awareness the further downstream one goes from Pittsfield.
- Lots of public information is already available, and anyone can get more information if they try.
- Thinks an important issue is how well the Hudson River cleanup is perceived. Is EPA happy with how it's going? Are the local communities satisfied?
- Doesn't get the sense, either from the peer review studies or the CMS from GE, that anyone includes or factors in what is learned from other sites and studies.
- Community should know who has paid for all the various studies.
- Each cleanup situation is different; the Hudson River is entirely different than the Housatonic. Everything needs to be assessed independently.
- CCC is not permitted to compare [Housatonic] to the Hudson.
- Need to know if Maine River is comparable; is it the same type of river as the Housatonic?

3.8.2.3.2 Layperson Accessibility

- Has difficulty with documents.
- Public needs to know what is going on—with highly technical information translated for the layperson.
- EPA needs to translate highly complex information and make more simple.
- People are not involved because the facts and situation are so confusing. It intimidates people, and they don't want to participate. Need to simplify, make user friendly, "Help me understand." Need to use multiple mediums and maps. Presenters can't be too steeped in technical jargon. Must give clear examples of the River/what worked/how they got there. Needs to be presented as clear and unbiased, not seen as coming from EPA because there is wariness about EPA's being impartial.
- Need bullet points—quick education.

3.8.2.3.3 Objectivity

- Need an instructional tool—not generated by GE and non-biased.
- Bring in outsiders to give objective assessments.
- Would be useful to have less "presentation" by EPA and GE in meetings and more discussion, with more give and take. Wonders whether it would be useful to bring in third-party experts.
- EPA needs to hire consultants independent of EPA and GE to conduct studies for the community. Has been lobbying for Informational Public Meetings. Experts should provide enough information over 6-month period to a year that provides enough information to the public to advocate a position. Wants to see

independent advisors, not someone who is invested in what has always been done in the past.

- Would like an objective synopsis, summarizing both sides, strengths and weaknesses, fully transparent. Then, how it impacts Lenox—play out multiple scenarios. Show visual simulations under various scenarios.
- Concerned with the imbalance in information between what GE filed 2½ years ago and today.
- Believes CMS is worded arbitrarily and is manipulative.
- Notes major thing of more education and info, especially as he sees that many half-truths have been put out there and many people are taking them as gospel truths.

3.8.2.3.4 Website Accessibility

- Aware of EPA studies, but would like much more information (perhaps in a link to appropriate documents) about the studies – especially to summaries and other, shorter documents explaining the studies, their results and contemplated actions by EPA. One problem is that the EPA web site, while rich in information and documents, is complex and has made it difficult for people to find the most relevant and succinct documents.
- Important to determine how to get information out to stakeholders. Making things available electronically with web links and PDF files is best.
- Would like to see a central point for information; the EPA website should function this way.
- Need to do a lot more on the internet.
- Need easier access to information.
- Having all on a website where people can go to see all of what's going on would be extraordinarily helpful: description of process; meeting announcements; meeting minutes; reports. There are just too many things happening at once to be able to keep up with it if you are a regular, caring citizen. You have to be fixated on it/extremely devoted [to the project] to degrees [that are] not realistic to keep up with everything.

3.9 Recurring Themes Across Topics

The purpose of the Situation Assessment was to learn what specific questions, concerns, issues, and interests a diverse set of stakeholders had regarding Rest of River remediation, the options presented by the Revised CMS, and the process for arriving at a proposed remedy. The purpose was specifically not to draw any synthesizing conclusions. Nonetheless, within respondents' diverse range of responses, there are a few recurring themes that warrant identifying because they indicate needs that stakeholders from across the spectrum share. The recurring themes concern additional information, the decision process, and specific components that they would like to see included in EPA's cleanup remedy.

Many of those interviewed expressed sincere confusion or lack of confidence in the information that they are weighing regarding the appropriate cleanup solution, a condition underscored by the sheer number of questions they verbalized. Though they did not agree on the cause for this state of affairs—citing everything from economic self-interest, lack of presentations, lack of personal effort, the protracted nature of the project, the complexity of technical issues, deliberate delivery or obfuscation and misinformation, to politics—they were united in urging EPA to offer them additional information on a host of technical issues involved in a successful cleanup, the Proposed Alternatives put forward in the Revised CMS, as well as others that they believed might warrant consideration. Furthermore, they called for the information to include particular qualities, namely, that it be 1) high-level, comprehensive, and in-depth; 2) lay person friendly; 3) objective and balanced in its presentation of data; and 4) readily available online and in a more user-friendly format than the EPA's current GE/Housatonic River website. An information area of note was that of emerging remediation technologies that do not require significant sediment/soil removal in order to rid the treated area of PCBs; many said that they wanted EPA to more thoroughly consider these technologies and perhaps include them in a solution—if not in initial remediation efforts, then in future stages.

On multiple topics, many respondents stressed that EPA's proposed remedy needs to reasonably and fairly balance the multiple considerations of cleanup—human health risks, ecological risks, tourism, River uses, aesthetics, temporal and spatial extents, economic impacts, and the like; rather than skewing the decision in favor of a single criterion, they called for a solution in which, as several respondents expressed it, the costs were worth the benefits.

Some of the same people, along with others, also expressed their expectations regarding EPA's decision-making process. Many noted the need for EPA to be transparent and forthcoming to the public, including clear articulation of decision criteria, why those criteria had been chosen, what those criteria were based upon, and what the short- and long-term consequences to the community (extent, methods, economics, levels of risk, etc.) would be as a result of those criteria's being chosen. On the issue of consequences, some noted their belief that the economic costs are not being adequately calculated; they noted that there are economic costs to the community that are not being included in the cost comparisons of the Proposed Alternatives and that remuneration to the community should be part of the costs for which GE is responsible.

The topic categories were not structured to allow the final recurring issue to appear in each topic with equal weight. Nonetheless, the issue of community participation clearly emerged as a major theme. Stakeholders noted different versions of what improved community participation meant to them, among them suggestions on processes and venues that would increase community participation, identifying and including more and/or specific groups/boards/constituencies, and for EPA to demonstrate that it is sincerely listening; the sum total of their comments was a desire for the community to have a meaningful role in EPA's proposed remedy and its execution.

APPENDIX — Interview Response Form

Date:_________ Interviewer:_______________

***Phone* __ *In Person* __**

Introduction of Certus Strategies; Personal Introduction; EPA's Response to GE's Corrective Measures Study Report; and Purpose of the Stakeholder Interview.

Specific Questions:

a) *May I confirm your name, address, email, and phone to verify our records?*

First Name	Last Name	Title (if any)	Organization (if any)	Address	City	State	Telephone	Email

b) *Can you tell me a little bit about your involvement (if any) with the EPA-GE Housatonic River cleanup to date?*
____
____

c) *Are you aware of the peer-reviewed studies prepared by EPA over the last ten years, including the Human Health and Ecological Risk Assessments and development of the Model Framework?* ***Yes___ No___ Maybe/Partial___;Explanation____***

d) *Can you tell me what has worked for you or has not worked regarding how you have been consulted on this cleanup project thus far?* ____
____

e) ***Do you have questions regarding the following?***

i. *Risks to human health and the environment from* ***leaving*** *PCBs in the ground, river bed, river banks, etc.* ***Yes___ No___***

ii. *Any harm to human health or the environment from* ***removing*** *PCBs* ***Yes___ No___***

iii. *Alternatives being considered in terms of moving and disposal of PCBs* ***Yes___ No___***

iv. *The criteria that EPA must use in making its decision* ***Yes___ No___***

v. *Disruption to roads under various Proposed Alternatives* ***Yes___ No___***

vi. *Impact on the use and aesthetics of the River under various Proposed Alternatives* ***Yes___ No___***

vii. *Impact on local communities, including the local economy (both positive and negative)* ***Yes___ No___***

viii. *How the Citizens Coordinating Council will function in relation to this activity* ***Yes___ No___***

f) *Do you have questions on subjects not covered above?* ***Yes___ No___*** *If so, what are they?*
____
____

g) *May we contact you from time to time announcing meetings or other sorts of follow up?* ***Yes___ No___***

h) *Are there any other steps that you would like to see included in this process going forward?*
____
____

Any Other Concerns or Issues Raised?____
____

3 OUTGROWTH OF SITUATION ASSESSMENT (EARLY 2011 – MAY 2011)

To address the public's expressed needs as recorded in the Situation Assessment, EPA developed an intensified public outreach program to provide additional information to the public regarding the technical and policy aspects of the cleanup alternatives under consideration and to obtain input from stakeholders on their general thoughts and specific questions regarding the proposed alternatives.

3.1 Needs

The Situation Assessment identified gaps in stakeholders' knowledge and, therefore, impediments to their abilities to provide meaningful input to EPA regarding the remedial alternatives. The Situation Assessment also underscored EPA's need to rethink *how* it was conducting public engagement—the structure and content of public engagement activities—as it approached making a preferred alternative recommendation.

3.1.1 Situation Assessment Findings

The Situation Assessment provided practical information to guide EPA's intensified public engagement efforts, particularly on six fundamental points:

1) Stakeholders were not fully aware of the studies completed by GE, EPA, and others regarding Rest of River issues. In fact, there were vast differences in levels of awareness and understanding regarding a range of important issues:

    <u>Harm or Risks to Human Health</u>
    - General Human Health
    - Concerns about Water
    - Skepticism about Problems Analysis—Trying To Understand Airborne PCBs

    <u>Impacts on the River and Environment, Including Aesthetics</u>
    - "Destroying" the River
    - Wetlands, Vernal Pools and Impact on Animals
    - Use of River
    - Natural Beauty
    - River As a Dynamic System

    <u>Local Impacts, Including Roads and the Economy</u>
    - Landfills and Roads
    - Economic Impact, Jobs, and Tourism

    <u>Alternatives for Remediation and Restoration</u>
    - Big Picture
    - Need for More Information
    - Alternative Technologies
    - Dredging, Landfills
    - Impact on River
    - Riverbed and Riverbanks
    - Alternatives for Animals
    - Decision-Making Regarding Alternatives
    - Impact on GE and GE Options

    In addition, citizens reported needing more information, more specific information, and more readily understandable and unbiased technical information in order to offer EPA input on cleanup plans with confidence.

2) Stakeholders were unaware of the mandatory criteria that EPA is required by the Consent Decree to follow in evaluating remedial alternatives.
3) Stakeholders were not clear on the process for arriving at a cleanup decision and how public input was going to be considered.
4) Stakeholders were not familiar with the range of remedial alternatives being considered nor fully familiar with the relative merits.
5) Stakeholders strongly supported the idea of more highly interactive forms of Public Engagement.
6) Stakeholders were interested in providing significant input into EPA's remedial alternative decision.

3.2 EPA Response

Given the extent of gaps in the public's information base, EPA determined that continuing the traditional public engagement efforts it had employed thus far for Rest of River—as extensive and comprehensive as they had been—would not prove completely effective, especially given the complexity of the issues and the diversity of public opinion. In terms of the types of public engagement efforts it might employ, the Situation Assessment clearly revealed that stakeholders believed a typical town hall style meeting would not allow the time necessary to convey the requested information, let alone answer questions from participants. Even if a more extended public forum were considered, such as charrette or conference-style workshop, the amount and complexity of information would be overwhelming, and participants would not have the opportunity to consider thoughtfully the *application* of information to the Rest of River project.

To address the public's expressed needs, EPA developed three public forums that operated independently but also complemented and integrally supported one another:

1 • Mini Workshops

EPA sponsored three intense workshops to provide the public with more information regarding the technical and policy aspects of the alternatives under consideration through presentations by technical experts and through question & answer sessions between EPA's experts and audience members. The primary intentions of the workshops were to provide stakeholders with complete and accurate information on a full range of issues and to answer any of the public's questions.

2 • Public Charrette

In the month following the Mini Workshops, EPA sponsored a practical, all-day, intense, hands-on workshop for the community to better understand Rest of River issues, to explore the pros and cons of the proposed alternatives, and for EPA to hear the community's ideas. The primary intentions of the event were for EPA to provide stakeholders opportunities to *apply* the information from the Mini Workshops and other sources and for EPA, in turn, to listen to community members' ideas for a Rest of River cleanup.

3 • Supporting Website

To support the Mini Workshops and Public Charrette, EPA launched a complementary website to EPA's "official" GE/Housatonic River website that focused on these efforts. The primary intention of the effort was to provide an accessible website that presented the content and the products of the Mini Workshops and the Public Charrette so that the exchange between EPA and the community was readily available to both the public and EPA as it formed its decision, particularly to those who could not attend either the Mini Workshops or Charrette.

The details of these public outreach efforts and their products are included in the following sections. Though the Supporting Website was implemented first, given its function as a support apparatus to the Mini Workshops and Public Charrette, it is described last among the public outreach efforts.

Together, the efforts formed a holistic approach to addressing the public's concerns for information in ways that also offered, in reciprocal fashion, practical public input to EPA.

3.3 Mini Workshops

EPA sponsored three sequential workshops to provide the public with more information regarding the technical and policy aspects of the alternatives under consideration through presentations by technical experts and through question & answer sessions between EPA's experts and audience members.

The Mini Workshops formed the first major component of EPA's intensified public outreach efforts. The series of three public information sessions, each three hours, offered on consecutive evenings, was developed in direct response to feedback that EPA had received from the public, and from the Situation Assessment, in which stakeholders requested additional information on the technical issues relevant to a Rest of River cleanup solution and the ability to ask experts and EPA direct questions.

3.3.1 Objectives

EPA's primary intention for the Mini Workshops was to respond to the public request for additional information. Specific objectives for the Mini Workshops were multiple and included integration with the separate but also interdependent Public Outreach Components of the Public Charrette and Supporting Website:

- To provide a forum for the public to receive information regarding physical/chemical processes in the Housatonic River works and how the river is affected by PCBs.

- To ensure that the public understands what studies have been completed on the Housatonic River by EPA and others.

- To present information in clear, concise, unbiased, and consumable forms to all citizens, regardless of scientific background or number of years of involvement in the project.

- To offer citizens opportunities to ask questions directly of EPA and its technical experts and have them answered directly—and to do so in a public forum where all questions and answers were shared.

- To fully document all presentations and Questions/Answers for future access and for citizens unable to attend one or more Workshops.

- To equip citizens with the essential project information that would help them to participate confidently and fully in the Public Charrette.

3.3.2 Themes

The content of the Mini Workshops was organized by theme, according to the feedback EPA had received from the Situation Assessment and so that each evening covered a comprehensive topic:

- Mini Workshop One: Why Working with River Processes Matters

- 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.

3.3.3 Logistics

3.3.3.1 Venue

The Mini Workshops were held on three subsequent evenings, 5:30 pm – 8:30 pm, April 5-7 at the Founder's Theatre of Shakespeare & Co., 70 Kemble Street, Lenox, Massachusetts. EPA requested prior registration and had as many as 148 pre-register for a single evening; the selected location had more than ample space to accommodate all those who wished to attend.

3.3.3.2 Attendance

The Mini Workshops were very well attended, with most attendees staying until past the official end of each evening so that as many audience-submitted questions as possible could be answered before the venue was closed by Shakespeare & Co. All of the almost 200 questions submitted by audience members were answered. For questions that there was no time to answer at the Mini Workshops, EPA asked its experts to answer the questions after the sessions ended and the answers were posted on the website. The presentations and question & answer sessions were also videotaped and made available on the Internet via the supporting website www.HousatonicWorkshops.org (discussed in full in Section 3.13).

In addition to EPA staff, Mini Workshop Presenters, and event support staff, the Mini Workshops tallied the following attendee totals: Mini Workshop One – 72; Mini Workshop Two – 73; Mini Workshop Three – 109.

3.3.3.3 Workbooks

For each evening and upon arrival, attendees were given a workshop-specific Workbook that contained the following materials:

- Overview of the three Workshops
- Welcome Letter from Curt Spalding, EPA New England Regional Administrator
- Agenda for the evening
- Overview of EPA's Public Outreach and Decision-Making Criteria
- 2-Page Summaries of each of the four presentations for the evening
- Brief Biographies of each of the Presenters
- Feedback Forms/Charrette Registration Form
- Question/Comment Forms for the audience to submit during Q&A Session.

Workbooks for each evening are contained in this report in the "Supporting Materials" sections associated with the Mini Workshops described.

3.3.3.4 Additional Informational Materials

EPA also made available previously prepared Fact Sheets and other project-related informational flyers for attendees to take home.

3.3.3.5 Tell Us About Your River

In the theater lobby and available during registration and breaks, "Tell Us About Your River" was an interactive engagement exercise that foreshadowed the more interactive nature of the upcoming Public Charrette and provided a way for attendees to offer EPA information *spatially*—via maps—about specific places of note on the Housatonic River. The exercise consisted of nine aerial photographs, printed large scale, depicting the Rest of River Reaches (from the Confluence to Long Island Sound). As Figures 1, 2, and 3 show, participants were asked to take strips of paper and record what parts of the River they cared most about and what parts they liked least and/or they believed needed improvements (and why). Using T-pins, participants located their comments on the maps so that their thoughts were shared with all Mini Workshops for all three evenings. "Tell Us About Your River"—along with participants' contributions—was stored and made available at the Public Charrette.

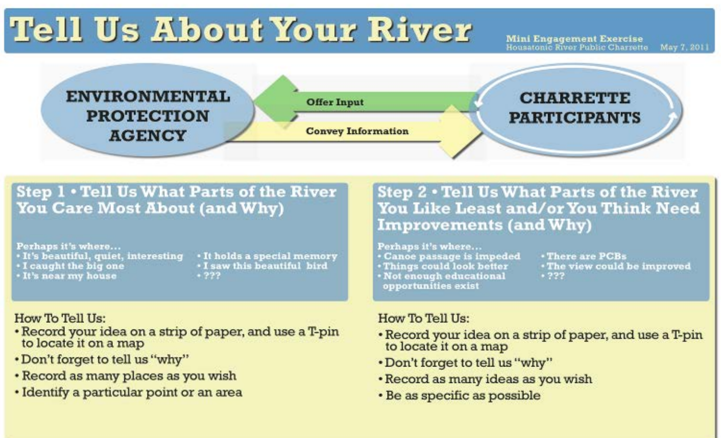


Figure 1. *Tell Us About Your River* Mini-Engagement Exercise Available at all Mini Workshop Evenings.

Figure 2. *Tell Us About Your River* Mini-Engagement Exercise.

Figure 3. *Tell Us About Your River* Mini-Engagement Exercise.

3.3.4 Agenda

Each workshop followed an identical agenda:

- Welcome and Introduction; EPA's Public Outreach and Decision-Making Criteria
- Introduction of Panelists
- Presentations One & Two
- Brief Break
- Presentations Three & Four
- Question & Answer (Q & A) Session with All Panelists
- Conclusion/Wrap-Up.

3.3.5 Presenters

The Mini Workshop Presentations were prepared and delivered by noted national and international experts in their fields, many of whom were the individuals who had conducted the EPA field studies and reports. Their biographies are included in this report at the conclusion of this section in the "Supporting Materials." The presentations included the following:

Mini Workshop One • Why Working with River Processes Matters

History of the River—John Field, Ph.D., *Field Geology Services* and Richard DiNitto, Principal/Co-Owner, *The Isosceles Group, Inc.*

Geomorphology/River Processes— Keith Bowers, RLA, PWS, Present and Founder, *Biohabitats Inc.* (Presenter), David Bidelspach, P.E., Stream Restoration Specialist, and George Athanasakes, P.E., Ecosystem Restoration Services Manager, *Stantec Consulting Inc.*

Ecological Characterization—John Lortie, Vice President, *Stantec Consulting Inc.*

PCBs—Richard McGrath, Principal/Co-Owner, *The Isosceles Group, Inc.*

Mini Workshop Two • Getting the Facts on PCBs: Human Health Risks, Ecological Risks, and PCBs

PCB Distribution, Fate & Transport—Edward Garland, P.E., *HDR|HydroQual*

Human Health Risks—Donna Vorhees, Sc.D., *The Science Collaborative*

Ecological Risks—Gary Lawrence, *Golder Associates*

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

Mini Workshop Three • Exploring Alternatives for Cleanup: Remediation, Restoration, Alternatives, and Environmentally Sensible Remediation Concepts

Remediation Technologies and Techniques—Michael Palermo, Ph.D., P.E., President, *Mike Palermo Consulting, Inc.*

Restoration Techniques—Keith Bowers, RLA, PWS, President and Founder, *Biohabitats, Inc.*

Alternatives and Technologies—Robert Cianciarulo, Chief, Massachusetts Superfund Section, Office of Site Remediation and Restoration, EPA New England, *US EPA*

Environmentally Sensible Remediation Concepts—Susan Svirsky, Project Manager Rest of River, *US EPA*

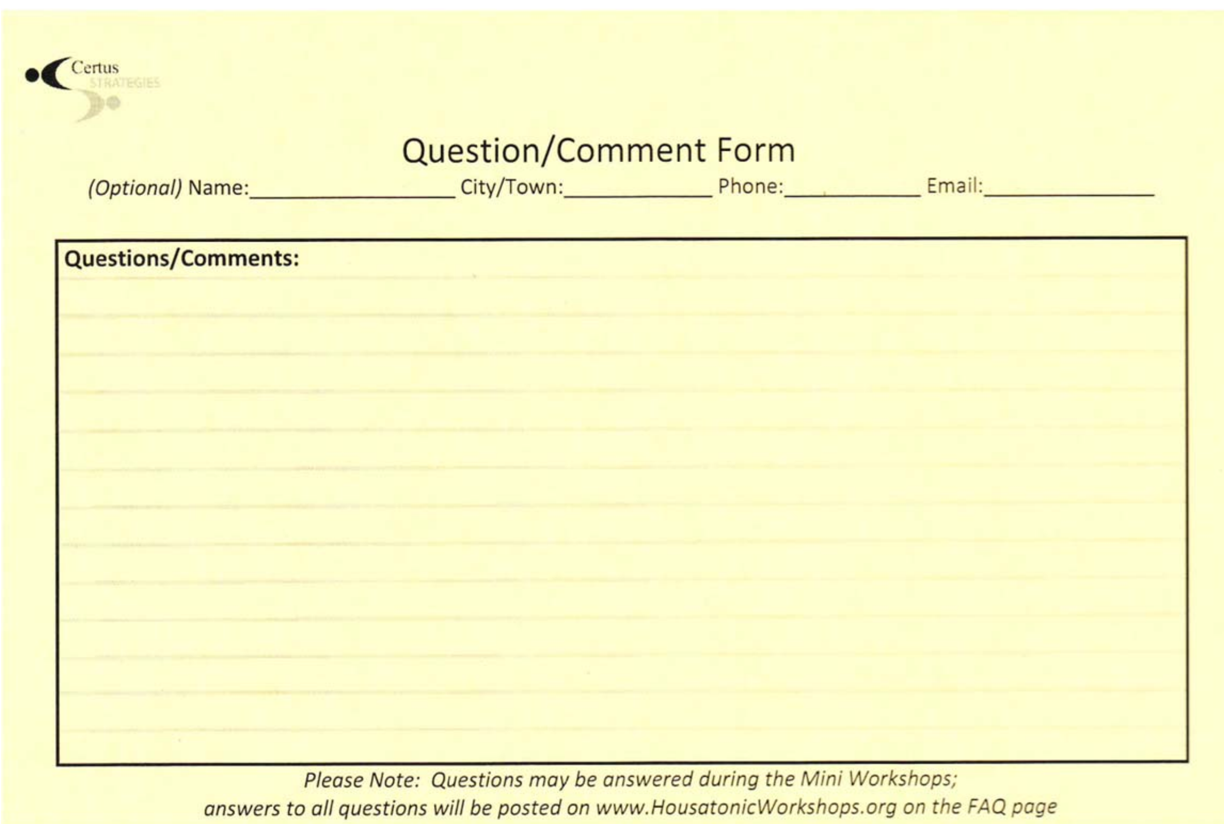
3.3.6 EPA Representation

EPA New England senior management staff attended various evenings in both presenter and observer roles, including Curt Spalding, EPA New England Regional Administrator, who opened

Mini Workshop Three. The workshops had in attendance key EPA staff responsible for the cleanup decision: Tim Conway, Senior Enforcement Counsel; Larry Brill, Branch Chief, Office of Site Remediation and Restoration; Robert Cianciarulo, Chief, Massachusetts Superfund Section, Office of Site Remediation and Restoration; Jim Murphy, Community Outreach Coordinator; Susan Svirsky, EPA Project Manager Rest of River; and Dean Tagliaferro, EPA GE-Pittsfield/Housatonic River Team Leader.

3.3.7 Question & Answer Sessions

For the Q & A Sessions, all of the presenters for the evening—along with an independent moderator—assembled onstage to take questions submitted by audience members. The submitted questions were sorted according to the most appropriate panelist to answer and were then delivered to the moderator. An example of the Question/Comment Form is shown in Figure 4. Due to the high volume of questions submitted by the audience, no Mini Workshop ended at the scheduled time or was able to address all submitted questions. For questions left unanswered, presenters provided answers after the sessions ended, all of which were subsequently posted on www.HousatonicWorkshops.org, the website associated with the public outreach efforts. The website also included the questions/answers that panelists had answered during each Mini Workshop's Q & A Session.


Certus STRATEGIES

Question/Comment Form

(Optional) Name:________ City/Town:________ Phone:________ Email:________

Questions/Comments:

Please Note: Questions may be answered during the Mini Workshops; answers to all questions will be posted on www.HousatonicWorkshops.org on the FAQ page

Figure 4. Example Question/Comment Form.

3.3.8 Feedback Summary

For each Mini Workshop, participants were encouraged, via a Feedback Form (Figure 5), to provide ratings and comments for each presenter and the Mini Workshop overall.

Certus Strategies

We value your input. Please leave your completed evaluation in boxes at exit
If completed later, fax to 301-770-1616 or email and scan to Admin@Certus-Strategies.us

Feedback

Mini Workshop *(Please check one)* __One __Two __Three

	(Please circle one)						*(Please circle one)*				
	Great				Poor		Great				Poor
Mini Workshop – General	5	4	3	2	1	Introduction	5	4	3	2	1
Presentation One – Overall	5	4	3	2	1	Presentation Two - Overall	5	4	3	2	1
Presenter	5	4	3	2	1	Presenter	5	4	3	2	1
Materials	5	4	3	2	1	Materials	5	4	3	2	1
Usefulness	5	4	3	2	1	Usefulness	5	4	3	2	1
Presentation Three- Overall	5	4	3	2	1	Presentation Four - Overall	5	4	3	2	1
Presenter	5	4	3	2	1	Presenter	5	4	3	2	1
Materials	5	4	3	2	1	Materials	5	4	3	2	1
Usefulness	5	4	3	2	1	Usefulness	5	4	3	2	1

Mini Workshop Overall *(Please check one)*: ___Too Technical ___About Right ___Not Technical Enough

Other Comments on Workshop *(Continue on other side if needed)*:

Note: Please use the separate Question/Comment form for all questions and substantive comments

(Optional) Name:________________ City/Town:____________ Phone:___________ Email:______________

Charrette Registration Form

You are invited to the May 7 Public Charrette.
If you have not yet registered, please use this form and leave it in the boxes at the exit

Name (s):

Address:

Email:

Phone #:

Event: ____ **Public Charrette, May 7, 2011, 8:30am – 5:30pm at Shakespeare & Company**

******Those attending the Charrette for the full day will receive the fullest benefit and make the greatest contribution to this effort.******

Figure 5. Example Mini Workshop Feedback Form/Public Charrette Registration Form.

As depicted in the following three figures (Figures 6, 7, and 8), for each of the three Mini Workshops, most participants ranked the Overall Evening and all of the Presentations with a score of 4 or 5, considering them on the "Great" end of the spectrum.

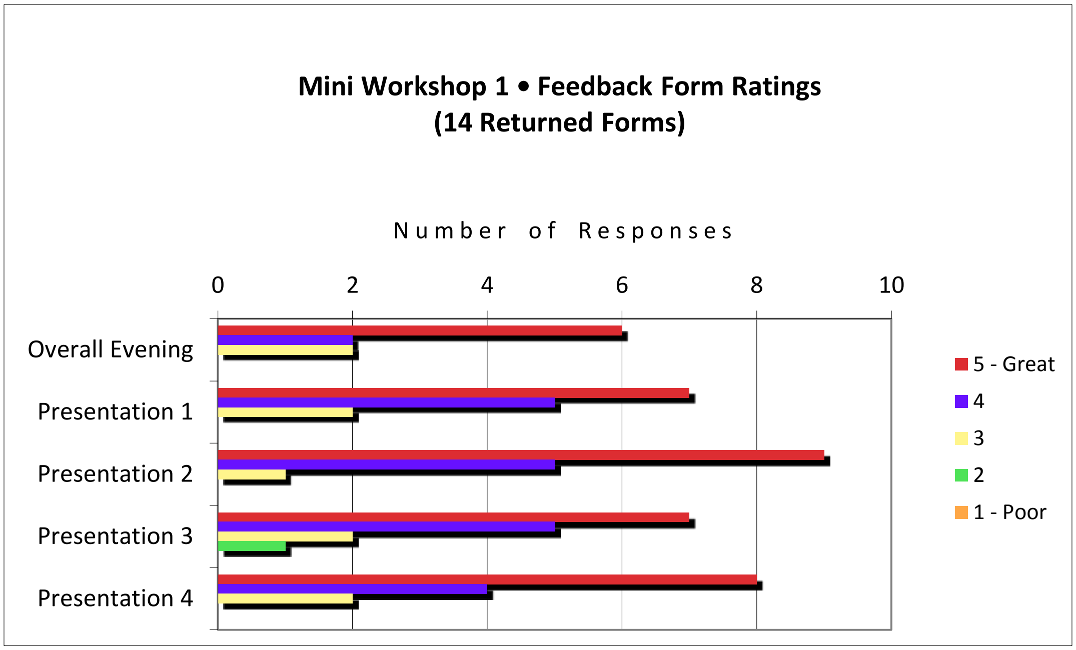


Figure 6. Summary of Mini Workshop One Feedback Forms.

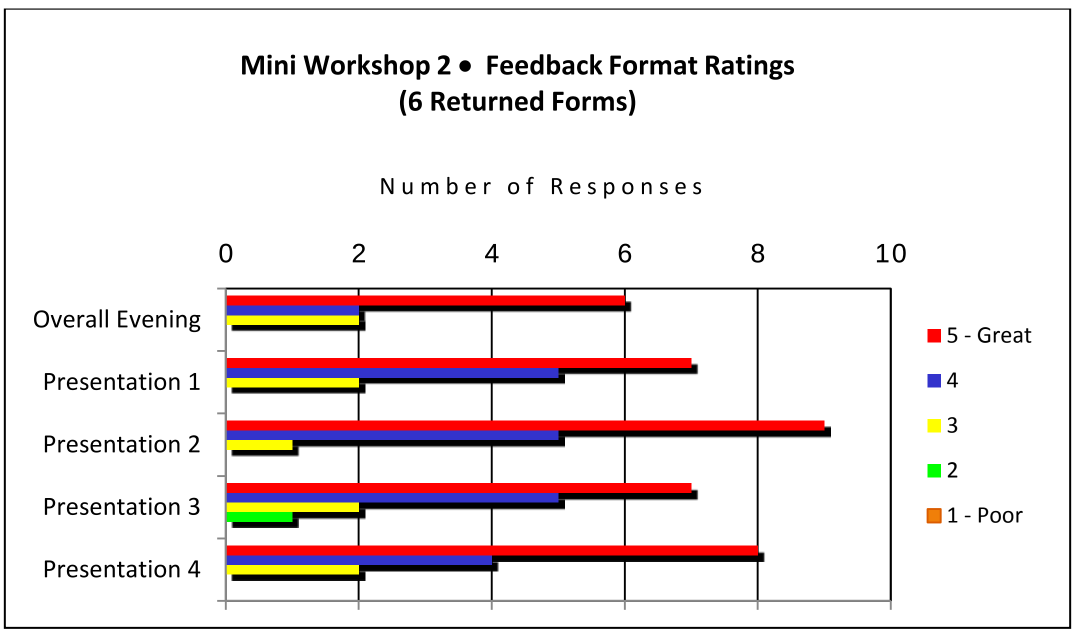


Figure 7. Summary of Mini Workshop Two Feedback Forms.

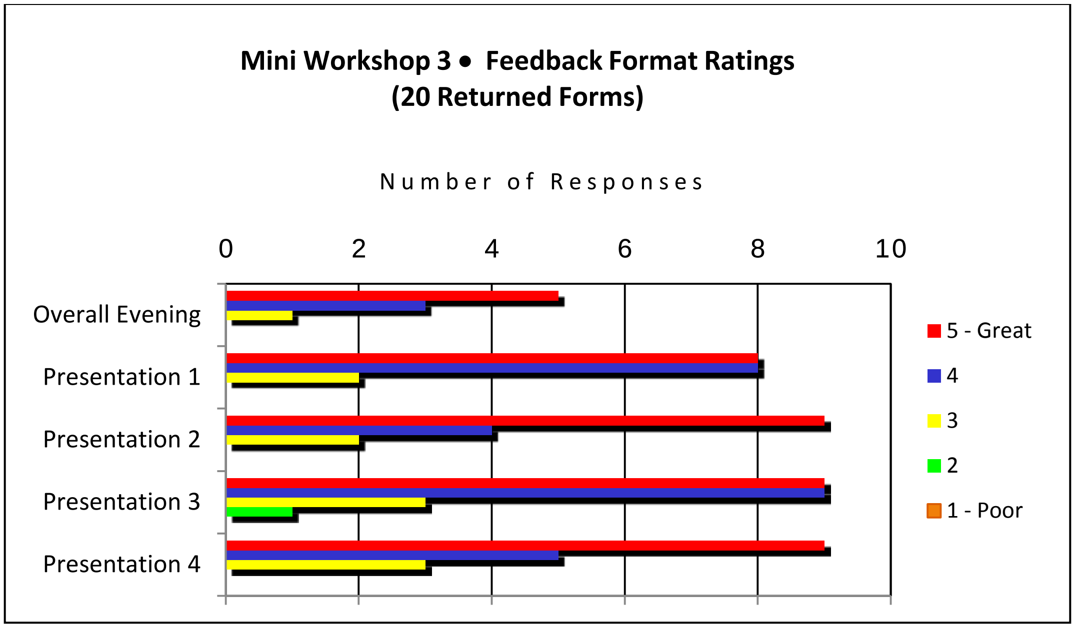


Figure 8. Summary of Mini Workshop Three Feedback Forms.

When asked to respond on the appropriateness of the level of technical information, 0% thought that the information was "too technical," 9% thought it was "not technical enough," and 91% thought it was "about right."

3.3.9 Documentation

So that citizens had the Mini Workshop materials available for their future reference and for those citizens who were unable to attend a session, all of the materials presented at each of the Mini Workshops were documented and posted on the www.HousatonicWorkshops.org website:

- Videos of Presentations and Q & A Sessions
- Slide Presentations for Introductions and Presentations
- Workbooks for each Mini Workshop.

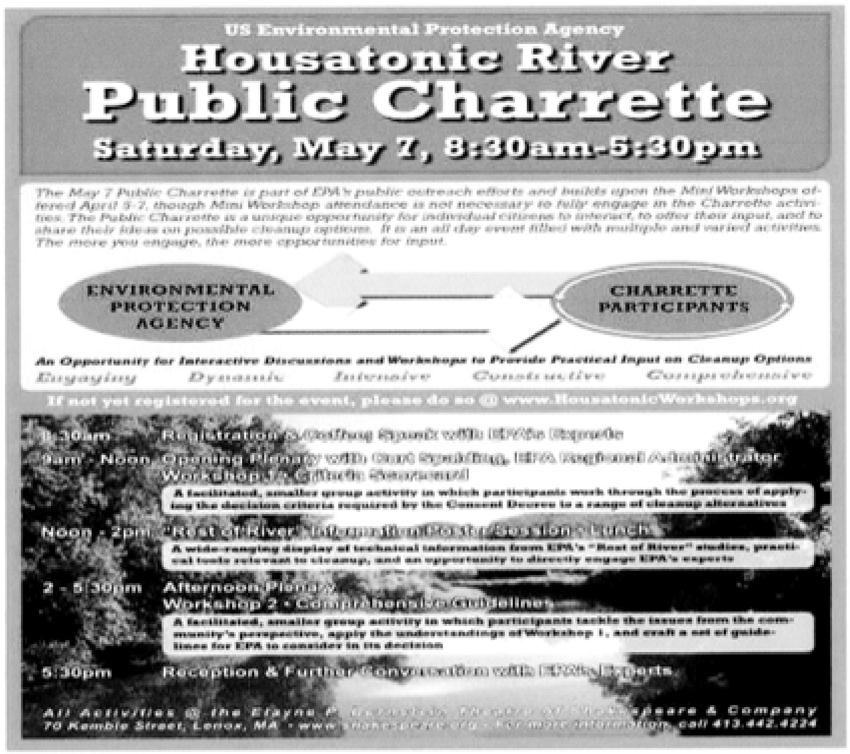
The printable materials for each Mini Workshop are included in the following pages in sections associated with the specific Mini Workshop.

3.3.10 Invitations/Publicity

Invitations to the Mini Workshops were extended to the public through four methods:

1) Advertisements in the Berkshire Eagle on April 5, April 6, and April 7, 2011 (Figure 9).
2) Emails from EPA to those who had signed up to receive Rest of River information and updates.
3) Announcements and registration opportunities posted on the HousatonicWorkshops.org website created as part of the intensified public outreach effort.
4) 22" x 28" Full Color Posters posted throughout the Rest of River municipalities in local community buildings and local businesses. A total of 65 posters were distributed (Figure 10 indicates locations). The posters are presented on the following pages.

Berkshire Eagle Berkshire Eagle 04/22/2011 B: Berkshire (5-eag_0422-!b07!edit-cmyk.pdf.0) Page B07



April 22, 2011 Powered by TECNAVIA Copyright © 2011 Berkshire Eagle 04/22/2011 12:25 pm

Figure 9. Mini Workshop Advertisement in Berkshire Eagle.

TOWN	PLACE	TOWN	PLACE
Dalton	Post Office	Pittsfield	Stop & Shop Supermarket
	Town Hall		AAA
	Library		Taconic High School
	Community Recreational Association		Berkshire Community College
Egremont	Town Hall		Pittsfield Post Office
Great Barrington	Post Office		Berkshire Athenaeum
	Town Hall		Pittsfield City Hall
	Big Y Supermarket		Juice & Java
	Monument Valley Middle School		Bloodmobile
	Monument Valley Regional High School		National Archives
	Mason Library		Dick's Sporting Goods
	Great Barrington Bagel Co.		Reid Middle School
	Cove Bowling	Richmond	Post Office
	Riverbend Organic Coffee		Town Hall
	Barrington Brewery	Sheffield	Town Hall
Hinsdale	Post Office		Bushnell-Sage Library
Housatonic	Corner Market		Mt. Everett High School
	Taft Farm and Country Store		Dewey Hall/Library
Lanesboro	Berkshire Mall		Silk's Variety
Lee	Post Office	Stockbridge	Post Office
	Town Hall		Town Hall
	Library		Library
	Lee Hardware		Elm St. Market
	Joe's Diner		Stockbridge General Store
	Athena's Pizza	West Stockbridge	Post Office
	Claire's Café		Town Hall
Lenox	Town Hall		Shaker Mill Tavern
	Library		Public Market
	Post Office		
	Loeb's Food Store		
	Caligari's Hardware		
	Stop & Shop		
	Nejaime's Wine & Liquor		
	Haven Café		
	Berkshire Bagel		
	Community Center		
	Lenox Middle and High School		

Figure 10. Mini Workshop Advertisement Poster Locations.

<u>Supporting Materials for Mini Workshops Introduction (Following)</u>

Poster

MINI WORKSHOP POSTER

US Environmental Protection Agency

Housatonic River Mini Workshops

To register and for up-to-date information, visit www.HousatonicWorkshops.org

A series of workshops sponsored by EPA to provide the public with more information and an all-day interactive opportunity for discussion and to offer input to the "Rest of River" cleanup decision

Mini Workshop 1
Tuesday, April 5, 2011, 5:30-8:30pm

Why Working with River Processes Matters:

Housatonic Evolution, Ecology, and PCBs

Mini Workshop 2
Wednesday, April 6, 2011, 5:30-8:30pm

Getting the Facts on PCBs:

Human Health Risks, Ecological Risks, and PCBs in the Housatonic River

Mini Workshop 3
Thursday, April 7, 2011, 5:30-8:30pm

Exploring Alternatives for Cleanup:

Remediation, Restoration, Alternatives, and Environmentally Sensible Remediation Concepts

HOLD THE DATE! **Saturday, May 7, 2011 8:30am - 5:30pm**

Public Charrette —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 the EPA to Hear the Community's Ideas

All Mini Workshops and the Public Charrette are being held at Shakespeare & Company
70 Kemble Street, Lenox, MA 01240 ***www.shakespeare.org***

For more information, call 413.442.4224

3.4 Mini Workshop One • Why Working with River Processes Matters

3.4.1 Theme

The Tuesday, April 5 Mini Workshop focused on the historical, ecological, and physical/chemical processes relevant to Housatonic River PCB contamination and its cleanup, offering participants a primer on how these processes work and why considering them matters to developing any cleanup plan: how the River came to be the way that it is: where it is going; the character of the River; and the nature of the PCBs that are polluting the system. Presentations included natural processes, human actions, and the interrelationships between the two.

3.4.2 Presentations

The Mini Workshop opened with a Welcome and Introduction by Jim Murphy, Community Outreach Coordinator, EPA, who shared an overview of the cleanup decision process, including the following:

- Background for where the cleanup decision stands in terms of process
- Goals of the Mini Workshops
- Agenda for the evening and Workshops Two and Three
- Introduction to the Decision Criteria that EPA is required to follow
- Introduction to the Charrette.

The four Technical Presentations followed. The evening concluded with a Q & A session in which audience members submitted questions to the presenters.

The Workbook that follows includes the printed versions of all presentations for the evening. The videos of the presentations and Q & A session, as well as printed answers to the questions, were posted on the www.HousatonicWorkshops.org Website.

Supporting Materials for Mini Workshop One (Following)

Mini Workshop One Workbook

Mini Workshop One Presentations

Introduction Presentation

Presentation One

Presentation Two

Presentation Three

Presentation Four

MINI WORKSHOP ONE WORKBOOK

Housatonic River Mini Workshops

Mini Workshop One:

Why Working with River Processes Matters
History, Ecology, and PCBs

All Workshops • 5:30pm - 8:30pm

TONIGHT	WED. APRIL 6	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

Tonight's Agenda

- **Welcome and Introduction; EPA's Public Outreach and Decision Making Criteria** – Jim Murphy, *EPA*
- **Panelists' Introduction** – Steve Shapiro, *Certus Strategies*
- **Presentation One: History of the River – Richard DiNitto** (Presenter), *The Isosceles Group* and John Field, Ph.D, *Field Geology Services*
    - *Brief Q&A*
- **Presentation Two: Geomorphology/River Processes – Keith Bowers** (Presenter), *Biohabitats Inc*., and David Bidelspach and George Athanasakes with *Stantec Consulting Inc.*
    - *Brief Q&A*

Brief Break

- **Presentation Three: Ecological Characterization – John Lortie**, *Stantec Consulting Inc.*
    - *Brief Q&A*
- **Presentation Four: PCBs – Richard McGrath**, *The Isosceles Group*
- **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

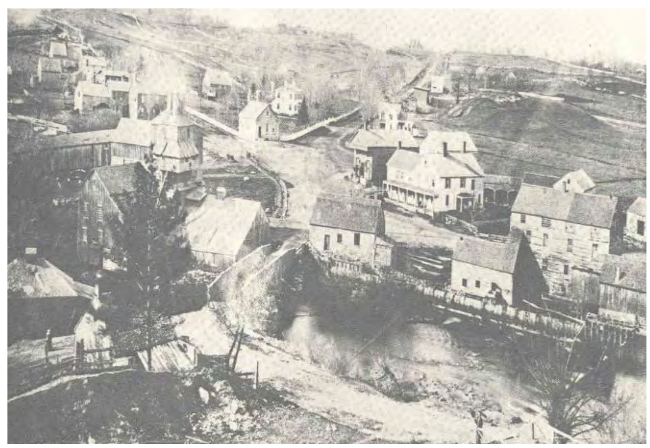
For additional information see "EPA's Cleanup Decision Process" and "Cleanup Alternatives in the Revised CMS" information sheets at http://www.epa.gov/ne/ge/thesite/restofriver-reports.html#CommunityUpdates.

Presentation One: History of the River

Richard DiNitto, *The Isosceles Group*, and John Field, Ph.D, *Field Geology Services*

This history of the Housatonic River begins in the recent geologic past when the last great ice sheets covered North America from 25,000 to 14,000 years ago. The ice sheets extended from Canada down to the southern edges of Long Island Sound. As the ice sheets melted and the ice fronts receded northward, meltwaters began to cut into the uncovered landscape and, with remnant blocks of ice acting as dams, form large glacial lakes. One was Glacial Lake Housatonic, covering much of the present-day valley from north of Pittsfield down to Connecticut. Once these ice dams melted, the remaining meltwater and rainwater runoff created the current Housatonic River and valley.

The first people to inhabit the area were Paleo-Indians, settling into the Housatonic valley perhaps as early as 13,000 years ago. Radiocarbon dating firmly places people in the valley as far back as 10,000 years ago. Although European settlers and subsequent generations developed extensive settlements and industries along the River, Native Americans were the first people to use the River and manipulate it for their benefit through the use of fish weirs and related stone-based structures. These simple acts had the potential for creating changes in the River's flow, albeit minor. More significant changes occurred shortly after the region was settled in the very late 1600s and early 1700s. By the mid-1700s, most of western Massachusetts and Connecticut was fully incorporated, delineated and settled.

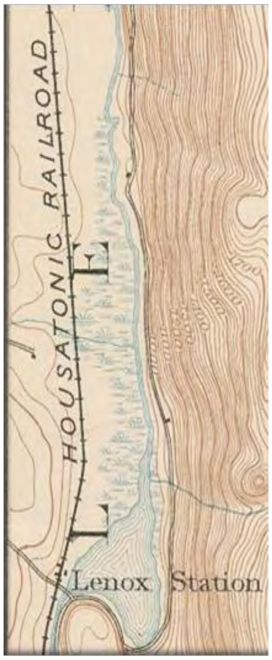


Lenox Furnace (c. 1875)

Land clearing for homes, industry, and farming dramatically increased after the discovery of iron ore in several locations in northwestern Connecticut and western Massachusetts. Blast furnaces, fueled by wood, were needed to smelt the iron ore. The area of today's Lenox Dale was once the home of one of the larger blast furnace and smelting operations, known as Lenox Furnace. The effect of all this land clearing, which by 1850 was as much as 80% of all the land in the Berkshires, was to cause more runoff and associated soil to enter the River than would have occurred otherwise. Early descriptions depict Lenox as a desolate-looking village stripped of trees.[1]

The advent of the 19th Century saw the start of paper mill operations along the River and dams to channel water to power them. These dams had the added effect of creating backwaters and slowing the velocity of the River. All of these actions had the unintended effect of changing the River's dynamic processes. For example, the creation of Woods Pond Dam around 1890 resulted in a significant expansion of the floodplain upstream.

[1] See http://www.townoflenox.com/Public_Documents/LenoxMA_WebDocs/about.



USGS Topographic Map 1886

Further significant changes occurred during the 1800s when railroads arrived and agriculture became more prevalent in the valley. It was during this period that the River channel, which naturally seeks equilibrium through the development of meanders, was extensively modified and straightened along many sections of the River. Actions like these created larger tracts of contiguous properties for farming and allowed the installation of railroad beds.

The clearing of rivers and rechannelization has a long history in the Northeast, with many local governments passing laws and ordinances allowing local businesses and towns to clear materials such as boulders, and even to use dynamite to modify rivers. For instance, in the 1940s, the East Branch of the river was straightened for flood control through its once natural course just south of East Street in Pittsfield, eliminating a number of River meanders and side channels.

Channelization of the East Branch in Pittsfield (Source: City of Pittsfield Department of Public works & Utilities)

Today the effects of these changes and the subsequent natural evolution of the River is evident when comparing older maps and present-day topographical surveys. Portions of the River are clearly shown to have been straightened and/or moved.

All of the human activity that has occurred over the past several hundred years, from the simple fish weirs of Native Americans to logging, industrialization, and rechannelization, has changed the River and surrounding ecology, so that what exists today, while appearing to be a natural pristine environment, is actually a disturbed river system trying to naturally restore itself. In many cases since the 1800s (through the mid-20th Century), the course of the River has naturally returned, albeit over several decades, to a more meandering pattern. Since the 1950s few additional changes to the River's course have occurred. Also, in many areas new woodlands have replaced the once-deforested terrain, and many species of plants and animals have returned.

The history of the River makes it clear that today's landscape and surrounding natural environments are not the same as existed thousands of, or even one hundred years ago.

Presentation Two: Geomorphology/River Processes

Keith Bowers, *Biohabitats, Inc.*, George Athanasakes and David Bidelspach with *Stantec Consulting Inc.*

Fluvial geomorphology is a multidiscliplinary science concerned with the influence of rivers and streams on the Earth's surface. Many features have been formed by running water due to erosion and depositional processes. By analyzing sediment transport and other processes, geomorphology is a useful tool to predict channel and riverbank responses.

RIVER STABILITY

A stable river transports the water and sediment produced by its watershed without aggrading (building up) or degrading (cuttting into the channel bed) over the long term.

- Stable systems maintain dimension, pattern, and profile.
- Stable rivers are connected to their floodplains. Rivers that are disconnected from their floodplains experience increased shear stress and mass bank failure.
- This can be expressed by a formula used for qualitative analysis: (Sediment LOAD) x (Sediment SIZE) is directly proportional to (Stream SLOPE) x (Stream DISCHARGE). This is called Lane's Relationship. Both sides of the equation are balanced in a stable system.
- Excess shear stress caused by impacts to the watershed results in a shift in the balance of Lane's Relationship. Channel evolution is the stream's tendency to morph back to a state of equilibrium through a series of predictable unstable channel succession stages.

INDICATORS OF INSTABILITY

These include Incision and Headcutting, Channel Filling, Entrenchment/Eroding Stream Banks, Lateral Migration**,** Over-Widening, two of which are illustrated below.

Over-Widening:

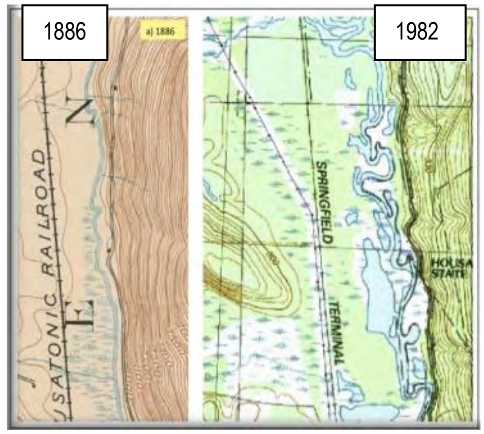
Entrenchment/Eroding Stream Banks:

PAST IMPACTS ON THE HOUSATONIC RIVER

The Housatonic River has a long history of human impacts, including river straightening, logging activities and agricultural uses. Examples of specific impacts include:

- Lenox Iron Works operation (1780s)
- Housatonic Railroad construction (1850s)
- Gravel and wood harvesting up to the 1970s
- Construction of Woods Pond Dam (c. 1890)

The River has also undergone channel relocation, channelization, channel impoundments, and placement of significant confining floodplain fill over the last 300 years.

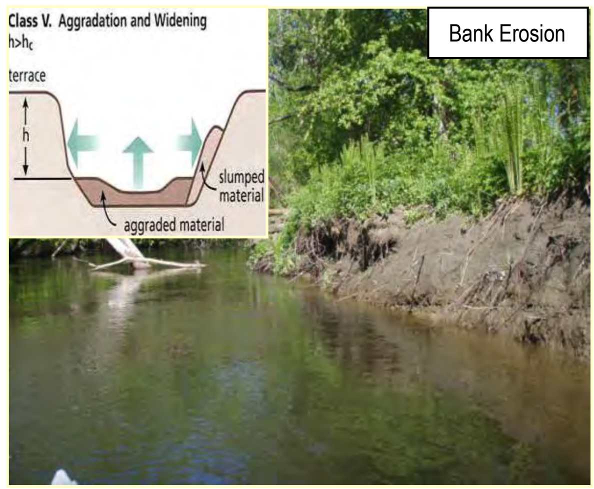


(Source: US Geological Service)

INSTABILITY OF THE HOUSATONIC RIVER

The Housatonic River is currently recovering from these and other historical impacts and modifications. However the River still faces:

- Horizontal instability evidenced by bank erosion
- Bank erosion rate of 6,600 tons per year of sediment (± 25%)
- Accelerated bank erosion over ten times the rate of a stable channel
- The River cannot attain stability through natural geomorphic processes without the accelerated erosion of the floodplain and stream banks contaminated with PCBs.



(Source: Stream Corridor Restoration: Principles, Processes, and Practices: October 1998)

HOUSATONIC RIVER RECOVERY PROCESS

An essential requirement for restoration planning associated with any remediation of the River is a comprehensive understanding of the geomorphologic function of the River channel and floodplain.

- Restoration should be consistent with natural geomorphic processes
- Restoration can restore the dimension, pattern, and profile of the River
- Restoration should achieve a dynamic state of equilibrium (stability) in the River
- Restoration provides an opportunity to restore ecosystem processes

Presentation Three: Ecological Characterization

John Lortie, *Stantec Consulting Services, Inc.*

During the last decade, extensive characterization of the physical setting, habitats, and biological communities of the Housatonic River and its floodplain was conducted by EPA, General Electric, the Massachusetts Natural Heritage & Endangered Species Program (MA NHESP), and numerous consultants. The result of these surveys describes in great detail the ecology of the River and the surrounding watershed and provides more in-depth understanding of the natural communities and biological species inhabiting the site than is typical for hazardous waste sites in the US.

The primary objectives of the ecological characterization were to:

- Identify the type and spatial distribution of natural communities/habitats
- Identify the plants and animals in each community and specify in which of the natural communities they occur (Species:Habitat Associations)
- Describe interrelationships between plants and animals and exposure pathways
- Collect information for the ecological risk assessment, human health risk assessment and remedial action decision-making

EPA's study was focused primarily on the portion of the River and floodplain between the confluence of the East and West Branches and Woods Pond Dam, a distance of approximately 10 ½ miles. To estimate whether there were differences in animal populations between this area which contains elevated levels of PCBs, and other similar areas nearby with no or low levels of PCBs, several reference areas were also chosen for study. These included the Hinsdale Flats State Wildlife Management Area (SWMA), October Mountain State Forest, Ashley Lake, and Threemile Pond SWMA.

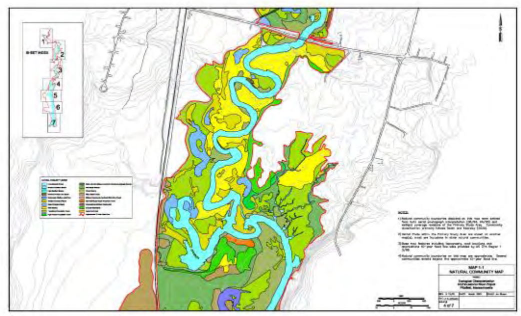
Although the Housatonic River and surrounding areas have been significantly altered by many generations of humans, the area also has a number of unique features. Portions of the River valley are known as "marble valley" because of the bedrock that occurs in this region. While most of the glaciated northeast is dominated by acidic soil conditions, the marble valley has calcium-rich soils which support a different array of plants and animals, many of which are rare or only locally-common (the watershed contains 110 plant species and 51 animal species listed by the Massachusetts Endangered Species Act (MESA)). Adjacent to the River and floodplain in this area is a large amount of protected land.

While some of the identified communities, such as the bur oak forest, older silver maple forest, and some of the older oxbows, are essentially in a natural state, other communities show the effects of farming or other man-made influences in spite of the current diversity and abundance of their biota. Such resilience and ability to recover from short-term disruption is also evident in the rapid re-establishment of animal populations in the floodplain following periodic flooding events that result in widespread mortality for species unable to rapidly leave the area, as well as temporary disruption of the riparian corridor.

A good example of ecosystem resilience is found upstream on the East Branch where PCBs in sediment and bank soil were remediated approximately 70 years after much of the area was cleared when the river was channelized. The aquatic insects in the River reestablished themselves quickly following cleanup and with a community that was more diverse than before remediation, and reflective of non-polluted rivers.

At the same time, however, there are clear indications that the system downstream of the confluence, while appearing normal and healthy, is experiencing stress due to elevated concentrations of PCBs. Chief among these is the near-complete absence of resident mink and otter populations in spite of what otherwise would be optimal habitat. Although other populations, such as invertebrates, fish, and amphibians appear healthy, site-specific studies for the ecological risk assessment have shown that these taxonomic groups are experiencing reproductive and other problems due to the effects of PCBs, problems that are not always evident when observing individual adults.

Eighteen natural communities, defined as recurring assemblages of plants, animals, and their habitat showing minimal effects from human intervention, were identified in the area of the River and floodplain between the confluence and Woods Pond; an additional 7 natural communities were identified in the reference areas. The communities identified in the study area included a single lacustrine (lake) community (Woods Pond), 3 different riverine communities distinguished by the gradient of the River, 9 palustrine (wetland) communities, and 5 terrestrial communities. The 3 most common natural community types, each comprising over 80 hectares (approx. 200 acres) of area, were low-gradient stream, shrub swamp, and transitional floodplain forest. Maps showing the location and extent of each community type were prepared, as were example transects across different areas of the floodplain showing the typical interrelationships of the communities.



Sample map showing location and extent of natural communities in the study area

Surveys conducted by EPA during the ecological characterization field work found 13 rare plant species per the Massachusetts Endangered Species Act (MESA): 2 endangered; 4 threatened; 4 special concern; and 3 watch list. Two rare natural communities were found: bur oak forest and circumneutral floodplain forest. Additional surveys by the MA NHESP and their consultants have recorded additional sites. Invasive plants are common or abundant in many parts of the River and floodplain, reflective of past land alteration and disturbances.

Rare species, including the American bittern, were catalogued

During EPA surveys 16 rare[2] animals were observed in the area including: triangle floater (SC), riffle snaketail (T), zebra clubtail (E), arrow clubtail, Jefferson salamander (SC), four-toed salamander (SC), wood turtle (SC), American bittern (E), bald eagle (E), northern harrier (T), sharp-shinned hawk (SC), common moorhen (SC), northern parula (T), blackpoll warbler (SC), water shrew (SC), and small-footed myotis (SC).

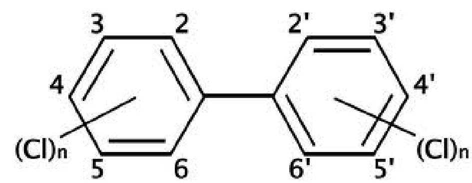
[2] Based on MESA, E = Endangered; T = Threatened; SC = Species of Special Concern.

Presentation Four: What Are PCBs and How Do They Behave in the Environment?[3]

Richard A. McGrath, *The Isosceles Group, Inc.*

“PCBs” is an abbreviation for **p**oly**c**hlorinated **b**iphenyls, a group of man-made organic chemicals that are members of a larger class of chemicals known as chlorinated hydrocarbons including many pesticides and industrial solvents. PCBs were first synthesized in the late 1800s and were manufactured in the US by Monsanto from 1929 until 1977; their manufacture was banned by the government in 1979. PCBs vary in consistency from thin, light-colored liquids to yellow or black waxy solids. Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications, including in electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics, and rubber products; in pigments, dyes, carbonless copy paper; and in many other industrial applications.

In general, PCBs tend to be non-volatile and relatively insoluble in water. In a river environment they typically are associated with particles, especially particles of organic carbon. They preferentially partition into fats, and so they both bioaccumulate and biomagnify (increase in concentration up the food chain) in animals. They are resistant to chemical and biological degradation, and are therefore extremely persistent in the environment, with some PCBs requiring decades or even centuries to degrade.



Generic biphenyl ring structure of the PCB molecule

PCBs have a chlorine atom substituted for the hydrogen atom attached to one or more of the 10 carbon atoms in the 12-carbon double ring structure known as biphenyl, which is related to the chemical known as benzene (the other two carbons hold the rings together, so are not available for chlorine substitution). A single chlorine atom can be added to each of the 10 carbons, so individual PCB molecules may contain from one to 10 chlorine atoms. The number of chlorine atoms in the molecule, and their exact location on the biphenyl ring structure, is extremely important in determining PCB biogeochemical behavior and toxicity.

Because different numbers of chlorines can be added to the biphenyl molecule and they can be added in different positions there are many distinct PCB molecules – in fact, there are 209 different PCBs, each of which is known as a **congener**. Congeners that have the same number of chlorine atoms tend to have similar physical properties, and so are referred to as being members of the same **homologue** group. Each of the homologue groups is referred to by a name derived from the number of chlorines: Monochlorobiphenyl = 1 chlorine, Dichlorobiphenyl = 2 chlorines, and so forth, using the prefixes Tri-, Tetra-, Penta-, Hexa-, Hepta-, Octa-, Nona-, and Deca- for 3, 4, 5, 6, 7, 8, 9, and 10 chlorines, respectively. There are only three different ways to add a single chlorine atom to the biphenyl molecule, so there are three monochlorobiphenyls. There are six different ways to add two chlorines, so there are six dichlorobiphenyls. As the number of chlorines increases to five, there are more possibilities, so these homologue groups have more congeners in them. After that, the number of possibilities begins to decrease again until, upon reaching the 10-chlorine decachlorobiphenyl, there is just a single congener in the group.

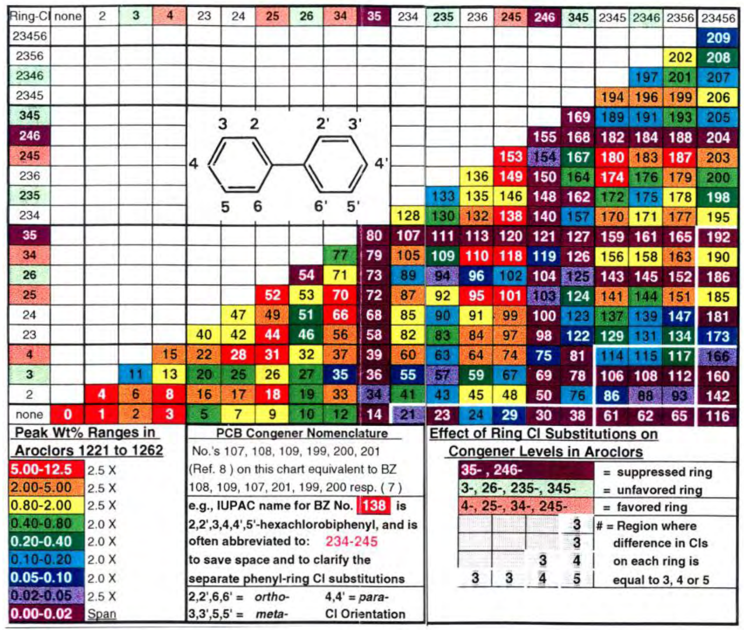
---

[3] For more information see EPA’s fact sheet on PCBs at http://www.epa.gov/ne/ge/thesite/restofriver/reports/477424.pdf

Aroclor, a trade name of the Monsanto Company, is just one of several names under which PCBs were produced. Aroclors are mixtures of many different congeners that were created to have particular physical properties. Different Aroclors are generally referred to by a four-digit number starting with "12" in reference to the number of carbons, followed by two digits ranging from 10 to 68 which indicate the percent of chlorine (by weight) in the Aroclor mixture.

Aroclors with a fewer number of chlorines tend to be thin, oily liquids while those with higher amounts of chlorine are heavier oils and, for the most-chlorinated Aroclors, waxy solids. The PCBs used at GE's Pittsfield facility and now found in the Housatonic River and floodplain are on the "heavier" end of the range – mostly Aroclor 1260, with some Aroclor 1254. They are very different from the "lighter" Aroclors (mostly 1242) present in the Hudson River. Different Aroclors behave differently in the environment, which is one of the reasons why it is difficult to make comparisons between the PCB contamination at different sites.

Once released into a river environment, PCBs for the most part adsorb onto sediment particles and ultimately end up in riverbed sediments due to the settling of the sediment particles carrying the PCBs with them. Each congener has a characteristic ratio between the amount attached to sediment and the amount dissolved in water, known as the partitioning coefficient or K_d. In general, the lower-chlorinated homologues are less associated with sediments and are more soluble and volatile, while the reverse is true for the higher-chlorinated homologues. Because Aroclors are mixtures of many congeners, this, among other things, makes simulating the movement of PCBs in the environment using numerical models complex.



Ring-Cl	none	2	3	4	23	24	25	26	34	35	234	235	236	245	246	345	2345	2346	2356	23456
23456																				209
2356																			202	208
2346																		197	201	207
2345																	194	196	199	206
345																169	189	191	193	205
246															155	168	182	184	188	204
245														153	154	167	180	183	187	203
236													136	149	150	164	174	176	179	200
235												133	135	146	148	162	172	175	178	198
234											128	130	132	138	140	157	170	171	177	195
35										80	107	111	113	120	121	127	159	161	165	192
34									77	79	105	109	110	118	119	126	156	158	163	190
26								54	71	73	89	94	96	102	104	125	143	145	152	186
25							52	53	70	72	87	92	95	101	103	124	141	144	151	185
24						47	49	51	66	68	85	90	91	99	100	123	137	139	147	181
23					40	42	44	46	56	58	82	83	84	97	98	122	129	131	134	173
4				15	22	28	31	32	37	39	60	63	64	74	75	81	114	115	117	166
3			11	13	20	25	26	27	35	36	55	57	59	67	69	78	106	108	112	160
2		4	6	8	16	17	18	19	33	34	41	43	45	48	50	76	86	88	93	142
none	0	1	2	3	5	7	9	10	12	14	21	23	24	29	30	38	61	62	65	116

Peak Wt% Ranges in Aroclors 1221 to 1262

5.00-12.5	2.5 X
2.00-5.00	2.5 X
0.80-2.00	2.5 X
0.40-0.80	2.0 X
0.20-0.40	2.0 X
0.10-0.20	2.0 X
0.05-0.10	2.0 X
0.02-0.05	2.5 X
0.00-0.02	Span

PCB Congener Nomenclature

No.'s 107, 108, 109, 199, 200, 201 (Ref. 8) on this chart equivalent to BZ 108, 109, 107, 201, 199, 200 resp. (7)

e.g., IUPAC name for BZ No. 138 is 2,2',3,4,4',5'-hexachlorobiphenyl, and is often abbreviated to: 234-245 to save space and to clarify the separate phenyl-ring Cl substitutions

2,2',6,6' = *ortho-* 4,4' = *para-*
3,3',5,5' = *meta-* Cl Orientation

Effect of Ring Cl Substitutions on Congener Levels in Aroclors

35- , 246- = suppressed ring
3-, 26-, 235-, 345- = unfavored ring
4-, 25-, 34-, 245- = favored ring

			3	# = Region where
			3	difference in Cls
		3	4	on each ring is
3	3	4	5	equal to 3, 4 or 5

"Periodic Table" of PCB congener nomenclature, showing the structure associated with each congener number (Source: George Frame, GE Research Laboratory)

PCBs have been shown to be toxic in a very large number of studies conducted over approximately 80 years, although the seriousness of the problem was not initially appreciated during the early days of their manufacture. The number and location of the chlorines on the biphenyl ring structure is an important determinant of PCB toxicity. PCBs that lack chlorines in the "ortho" positions – the carbons next to where the two rings are joined—are able to assume a structure similar to that of dioxin. As a result, these so-called "co-planar" or "dioxin-like" PCBs act similarly to dioxin in the body.

The toxicity of PCBs to animals came to notice in the 1970s, when emaciated seabird corpses with very high levels of PCBs in their bodies washed up on beaches. Since then, PCBs have been shown to be toxic to numerous and varied species.

PCBs are classified by most public health agencies around the world as "probable" human carcinogens; "probable" meaning that they have been shown to cause cancer in laboratory animals and so are assumed to also cause cancer in humans. In addition, they have been shown to have numerous serious non-cancer (*i.e.* toxic) health effects in humans, including, for example, skin and liver damage and disruption of hormone systems.

Presentation One - Biographies

Richard G. DiNitto, Principal/Co-Owner
The Isosceles Group, Inc.
Boston, MAC

Mr. DiNitto is a Principal of The Isosceles Group of Boston, Massachusetts with more than 30 years of environmental consulting experience. During the past 11 years, Mr. DiNitto has been working on the GE/Housatonic River Rest of River Site in several roles: as a Project Hydrogeologist and Geomorphologist, Site Assessment Analyst, Chemical Fate and Transport Scientist, Public Communications Specialist, and as a Project Coordinator. Mr. DiNitto has been one of the principal investigators in determining the nature and extent of PCB contamination at the site. He worked with the modeling and risk assessment teams to evaluate the data in conjunction with fate and transport mechanisms and human and ecological exposures. He also assisted in the coordination of a variety of subcontractors and their efforts, primarily the fate and transport modeling using HSPF, EFDC, and FCM. Recently, Mr. DiNitto has been involved with the historical land use analyses associated with the Housatonic River valley and its influence on fate and transport characteristics. Mr. DiNitto's 30 years of experience includes environmental multi-media assessments and remediation of contaminated sediments, riverine and groundwater systems. He has completed more than 1000 environmental assessment projects across the United States and internationally, and has successfully managed several environmental, engineering and energy-related consulting firms.

John J. Field, Ph.D.
Field Geology Services
Farmington, ME

Dr. John Field is a fluvial geomorphologist and hydrologist with 25 years of experience specializing in assessments of stability and habitat conditions of rivers and streams, identifying restoration strategies at the watershed scale, and evaluating results to ensure improvements to channel stability and aquatic habitat are sustainable. For the Housatonic River Project, Dr. Field provided historical analysis and interpretation of shifts in the morphology of the Housatonic River over time and is reviewing proposed remedial alternatives for their effects on river geomorphology and long-term stability. During eight years as a university professor, Dr. Field was active in training teachers and government agency personnel on techniques for the practical application of river morphology. His research has included previous work in Massachusetts, including an erosion control study of Turners Falls Pool on the Connecticut River, an assessment of causes for channel instability on the Sawmill River in Montague, and the design for a bank stabilization project on the South River in Ashfield. Dr. Field's research on flooding and habitat issues both in the United States and internationally has been published in numerous peer-reviewed scientific publications and presented at professional conferences.

Presentation Two - Biographies

J. George Athanasakes, P.E., Ecosystem Restoration Services Manager
Stantec Consulting Services, Inc., Louisville, KY

George Athanasakes leads the Ecosystem Restoration Group for Stantec, Inc. He has a diverse background which includes civil engineering, stream restoration, wetland restoration, and watershed planning. For the Housatonic River Project, Mr. Athanasakes provides review of GE submittals and proposed remedial alternatives with particular emphasis on habitat restoration following remediation. Mr. Athanasakes completed his first stream restoration project nearly 20 years ago and has served as the Project Manager and/or Design Engineer on over 100 stream restoration and assessment projects incorporating natural channel design principles and soil bioengineering techniques. His involvement with these projects has included conceptual level planning, preliminary and final design, permitting, assistance during construction, and post-construction monitoring. Mr. Athanasakes has also helped to bring innovation to the field of stream restoration by leading the development of the RIVERMorph software, which is the industry standard for software providing a tool for stream assessment, monitoring and Natural Channel Design throughout the United States and internationally. Because of his broad stream restoration experience, Mr. Athanasakes has instructed several stream restoration training workshops and has presented at many national conferences on the subject. In addition, he has authored a number of technical papers on the subject of stream restoration.

David A. Bidelspach, P.E., Stream Restoration Specialist,
Stantec Consulting Services, Inc., Raleigh, NC

Dave Bidelspach is an environmental engineer with 10 years of experience designing and constructing river restoration projects. He has been recognized for the development of a 3D design process that allows the rapid evaluation of numerous iterations to optimize the designs for river restoration, and has piloted the use of Survey Grade GPS equipment to lower the costs associated with pre- and post-construction surveys. Mr. Bidelspach has worked hand-in-hand with contractors to couple his 3D designs with GPS-enabled construction equipment to speed the construction process and insure the right outcome, and has been responsible for the development and application of several new in-stream structures which have proven to be robust yet easy to construct. As one of the few stream restoration designers who has actually operated equipment and constructed restoration projects, Mr. Bidelspach is known for producing accurate estimates and designs that are both constructible and have long-term stability and effectiveness. For the Housatonic River Project, Mr. Bidelspach has conducted the detailed study of river bank stability and erodability from the Confluence to Woods Pond Dam. He is reviewing and evaluating proposed remedial options with regard to restoration and geomorphic stability issues.

Keith Bowers, RLA, PWS, President and Founder
Biohabitats, Inc., North Charleston, SC

Mr. Keith Bowers is the President and Founder of Biohabitats, Inc., one of the premier firms specializing in environmental restoration, conservation planning and regenerative design. He is an internationally recognized landscape architect who has planned, designed, and managed the construction of over 200 ecological restoration projects throughout the United States. Mr. Bowers also teaches ecological restoration seminars and workshops and participates on numerous industry panels. He is currently serving as Chairman of the Board for the Society for Ecological Restoration International. For the Housatonic River Project, he has a lead role in evaluating remedial alternatives with respect to their ecological restoration components, and provides senior level expertise in the feasibility and expected effectiveness of proposed restoration plans and techniques. He also assists in community outreach and meeting facilitation.

Presentation Three - Biography

John Lortie, Vice President
Stantec Consulting Services, Inc.
Topsham, ME

John Lortie is a Professional Wetland Scientist, a Certified Wildlife Biologist, an accomplished botanist, and an experienced ecological risk assessor. He has directed numerous projects involving complex environmental regulations at hazardous waste sites and marine facilities, and has taught short courses at international environmental conferences on ecological risk assessment protocols, field methods, and restoration design. For the Housatonic River Project, Mr. Lortie serves as the lead ecologist for the G.E./Housatonic River Site Ecological Risk Assessment, with particular responsibility for the Ecological Characterization and in evaluating risks to amphibians. In his previous position as President of Woodlot Alternatives, Inc. (now part of Stantec), Mr. Lortie was responsible for many aspects of the site investigations, including the field studies program, and was the lead investigator for the Ecological Characterization of the site. In addition to managing significant habitat restoration projects and ecological risk projects, he has also led large-scale ecological inventories to search for rare animals and plants, directed coastal migratory bird studies, and evaluated complex natural communities throughout the northern Atlantic region. A former National Wildlife Refuge manager, he also offers special expertise in migratory bird studies. As a Professional Wetland Scientist, Mr. Lortie also specializes in interpretation of wetland regulations, and wetland identification, evaluation, mitigation and restoration.

Presentation Four - Biography

Richard A. McGrath, Principal/Co-Owner
The Isosceles Group, Inc.
Boston, MA

Dick McGrath is an aquatic ecologist with 40 years of experience conducting and managing research in oceans, estuaries, and rivers. He has served as the Technical Director for the Rest of River investigations for the last 10 years and, for 2 years prior to that, was the Quality Assurance Manager. In addition to his continuing wide-ranging technical oversight and coordination responsibilities on the project, he also provides specialized expertise in PCB analysis and biogeochemistry and has provided assistance to EPA on many of the technical documents presenting the results of the studies conducted on the project. Mr. McGrath specializes in the assessment and remediation of contaminated sediments, particularly sediments contaminated with PCBs and other organic compounds. In his career, he has been a Vice President and/or General Manager for three large international consulting organizations, and has conducted investigations of contaminated sediments on all three coasts of the United States as well as in the Great Lakes. He has authored, edited, and reviewed hundreds of scientific papers, reports, and other documents and has been an invited participant at national and international technical conferences. He has also been an invited participant on the PBS NOVA television series, discussing his work on PCB-contaminated sediments in New Bedford Harbor.

www.epa.gov/region1/ge

KEY CONTACTS:

JIM MURPHY
U.S. EPA Community Involvement Coordinator
(617) 918-1028
murphy.jim@epa.gov

SUSAN SVIRSKY
U.S. EPA Rest of River Project Manager
(617) 918-1434
svirsky.susan@epa.gov

GENERAL INFO:

EPA NEW ENGLAND
5 Post Office Sq.,
Suite 100
Boston, MA 02109-3912

TOLL-FREE CUSTOMER SERVICE
1-888-EPA-7341

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
(860) 672-6678

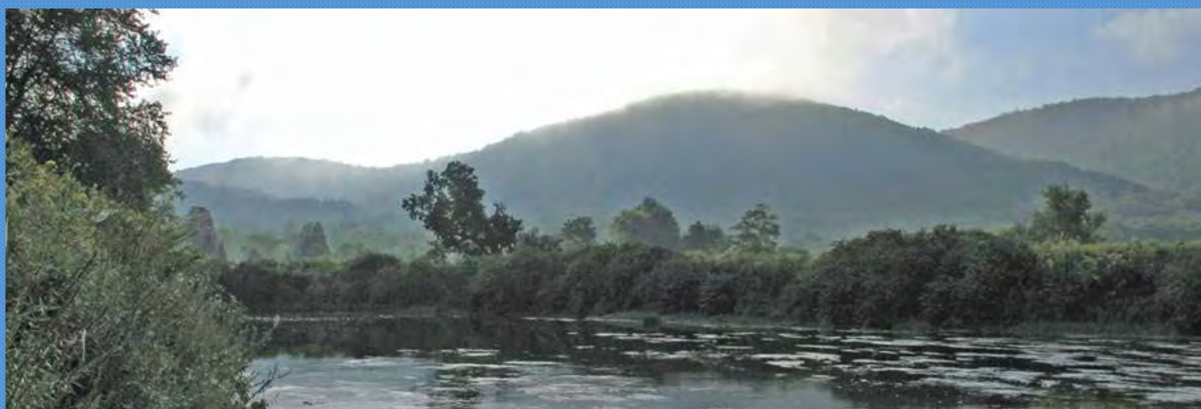
Massachusetts DEP
(413) 784-1100

Connecticut DEP
(860) 424-3854

MINI WORKSHOP ONE PRESENTATIONS

EPA Mini Workshop Series

April 5, 2011

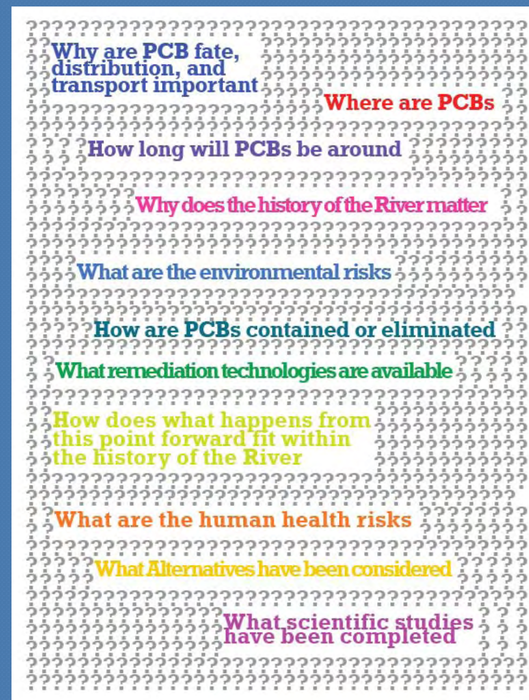


Background

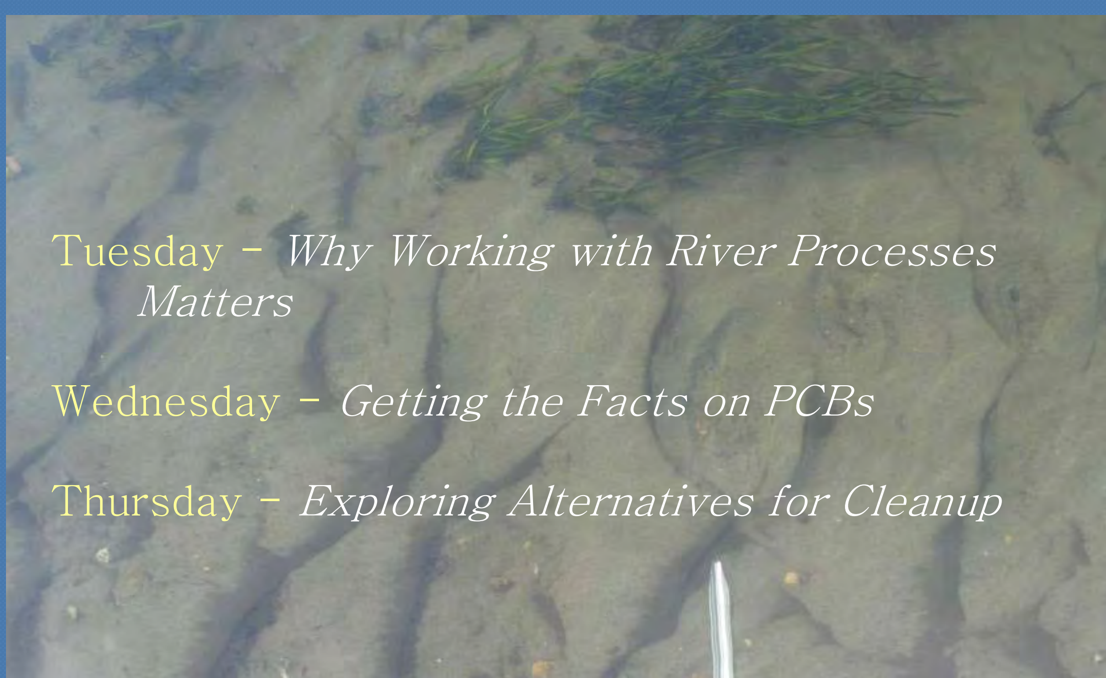
- GE submitted its Revised Corrective Measures Study (RCMS) in October 2010
- Informal Public Input period held, which closed on January 31st
- EPA's consultants held a series of interviews with stakeholders over the past few months regarding their view of the process and information needs
- One of the outcomes of these interviews is this series of Mini Workshops and the all-day hands-on Public Charrette session on May 7th to learn and interact regarding the Rest of River

Goals of Mini Workshops

- Provide the Community with an:
  - Understanding of the work that EPA and others have done on the Rest of River
  - Understanding of how the River works and is affected by the PCB contamination
  - Opportunity to get questions answered
- Result – Stakeholders should have a better understanding of the issues associated with any cleanup of the Rest of River and are prepared for the Public Charrette



The Three Workshop Sessions



Tuesday – *Why Working with River Processes Matters*

Wednesday – *Getting the Facts on PCBs*

Thursday – *Exploring Alternatives for Cleanup*

Decision Criteria for the Cleanup

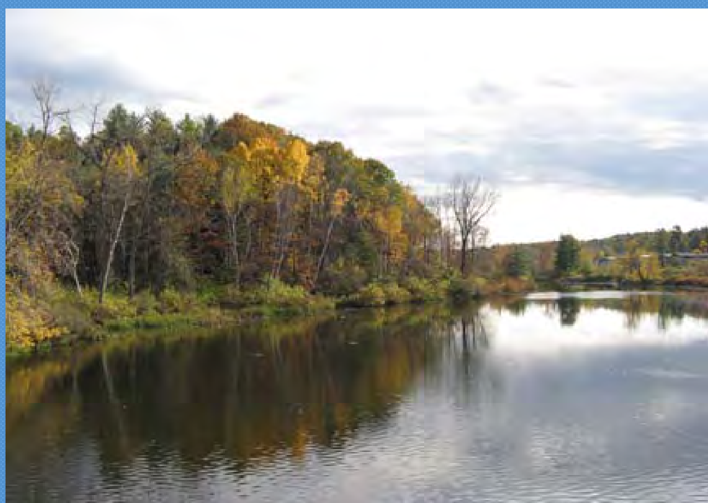
- EPA will make a decision on the cleanup considering:
  - Input received from stakeholders
  - GE's Revised Corrective Measures Study
  - The 9 evaluation criteria specified in the RCRA Permit (listed below)
- General Standards
  - Overall protection of human health and the environment
  - Control of sources of releases
  - Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)
- Selection Decision Factors
  - Long term reliability and effectiveness
  - Attainment of IMPGs (interim cleanup goals)
  - Reduction of toxicity, mobility, volume
  - Short term effectiveness
  - Implementability
  - Cost

Tonight's Agenda

- *Why Working with River Processes Matters*
  - History of the Housatonic River
  - River Evolution
  - Ecological Characterization
  - PCBs
- Goal – for the community to understand how the River came to be what it is, where it is going, the character of the River and floodplain, and the nature of the PCBs that are polluting the system

Public Charrette, May 7, 8:30am – 5:30pm

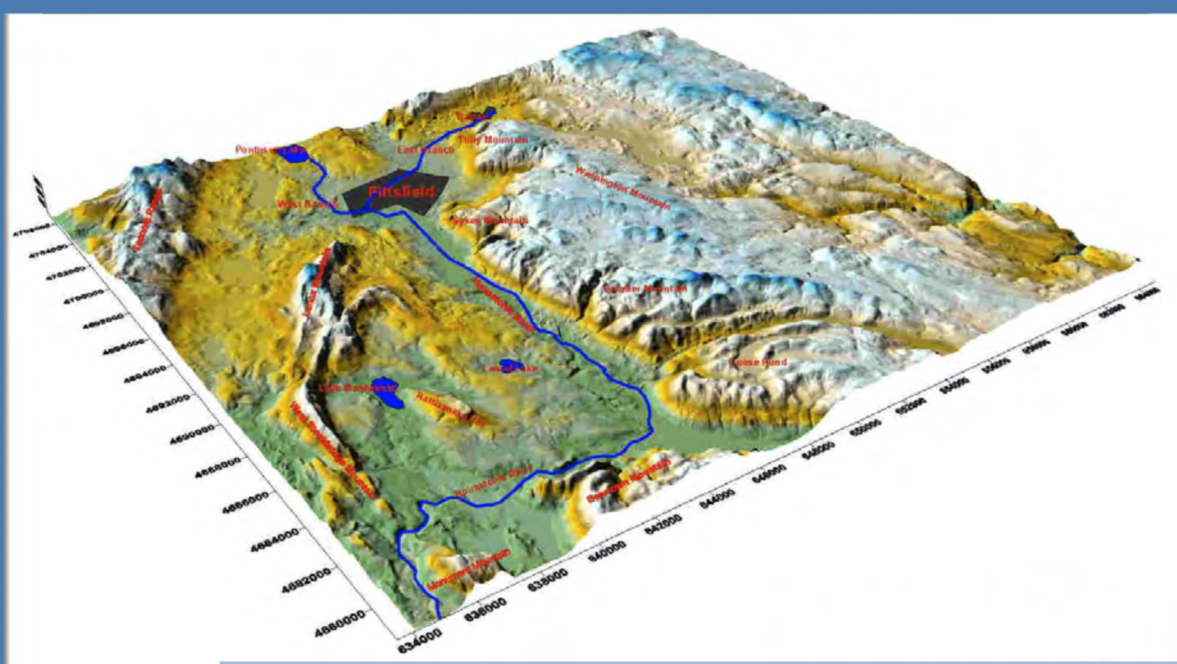
History of the Housatonic River



Richard DiNitto
The Isosceles Group

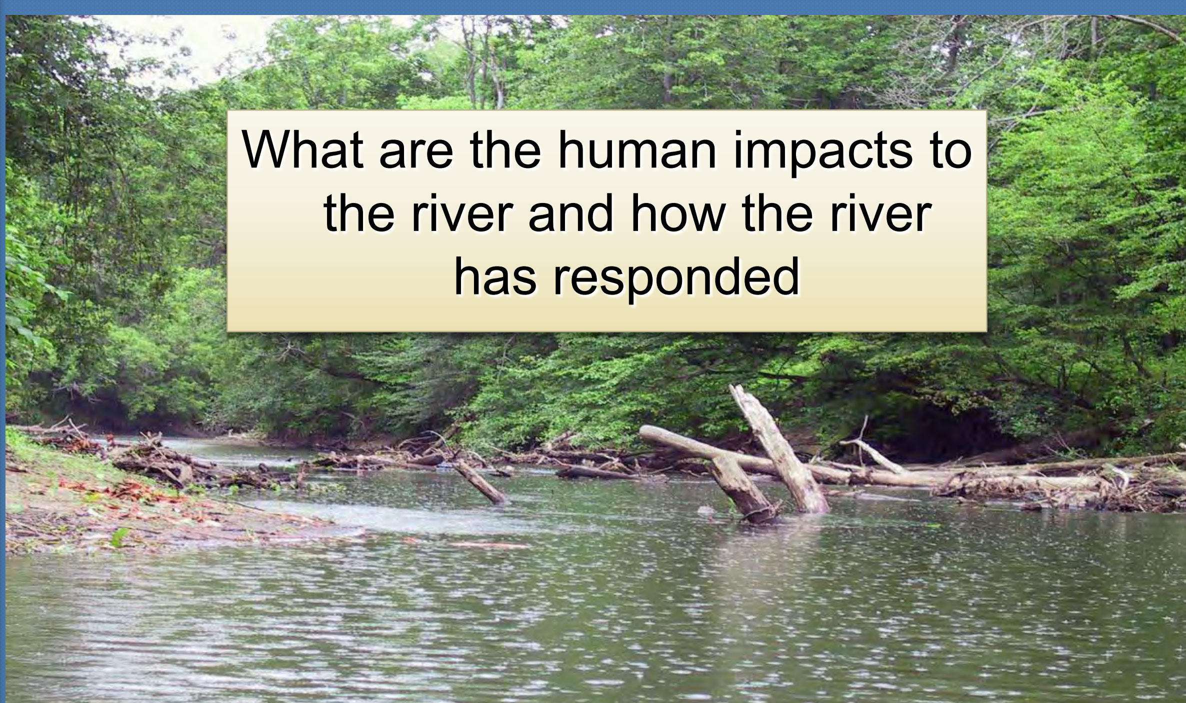
John Field
Field Geology Services

Existed for Thousands of Years



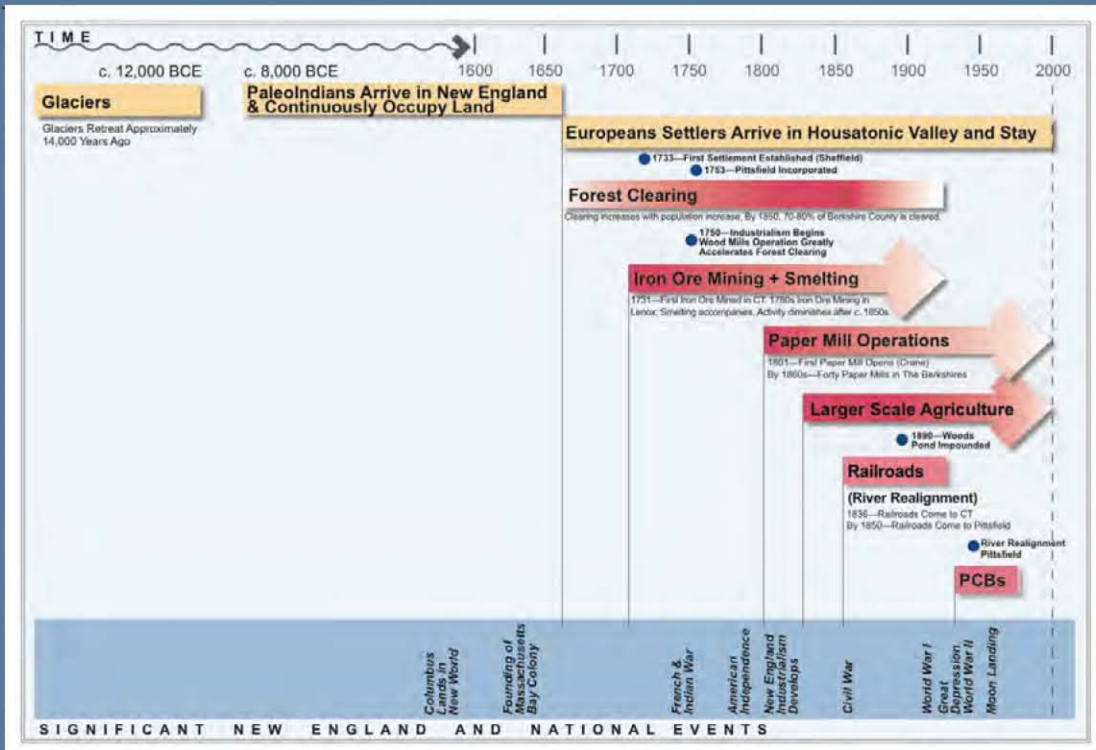
Glacial Lake Housatonic

(in light blue)



What are the human impacts to the river and how the river has responded

Timeline of Key Events



Paleo-Indians - Mohicans

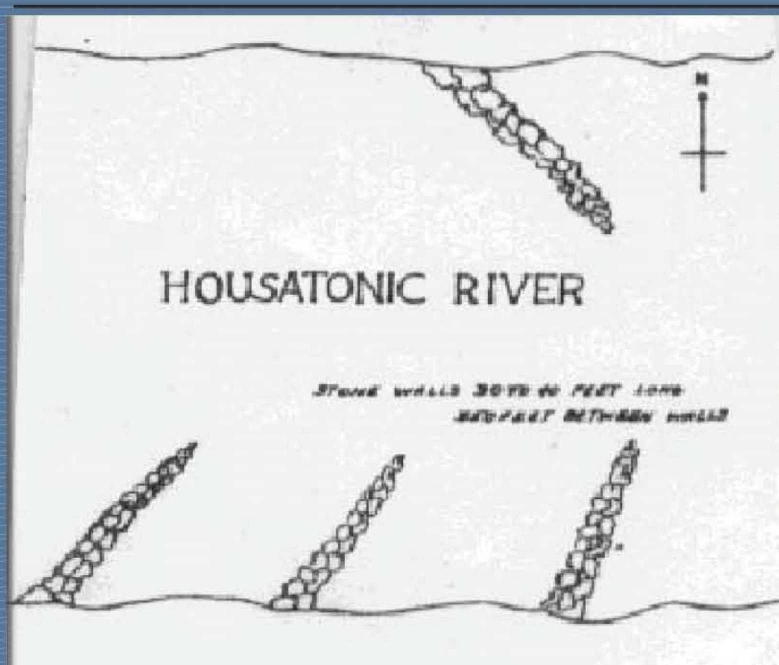
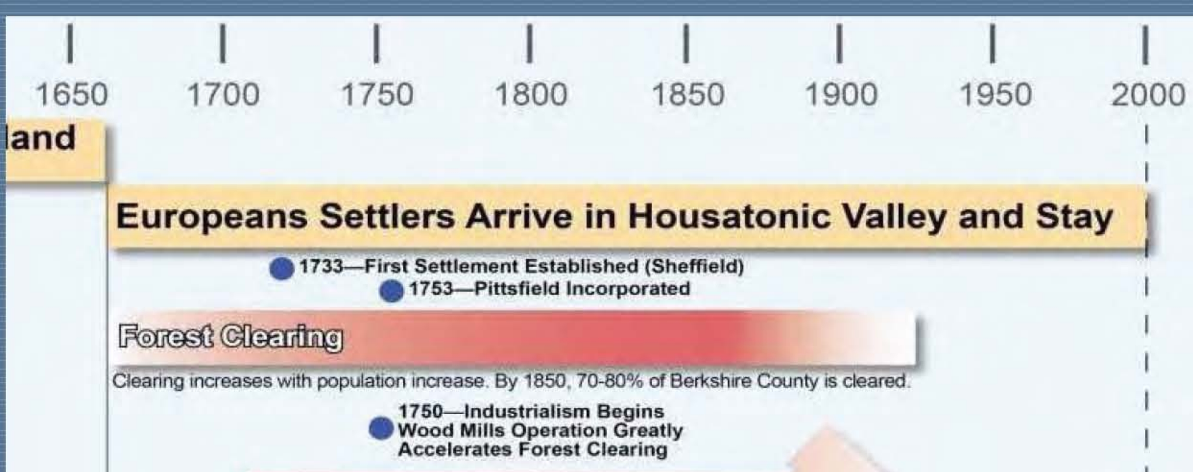
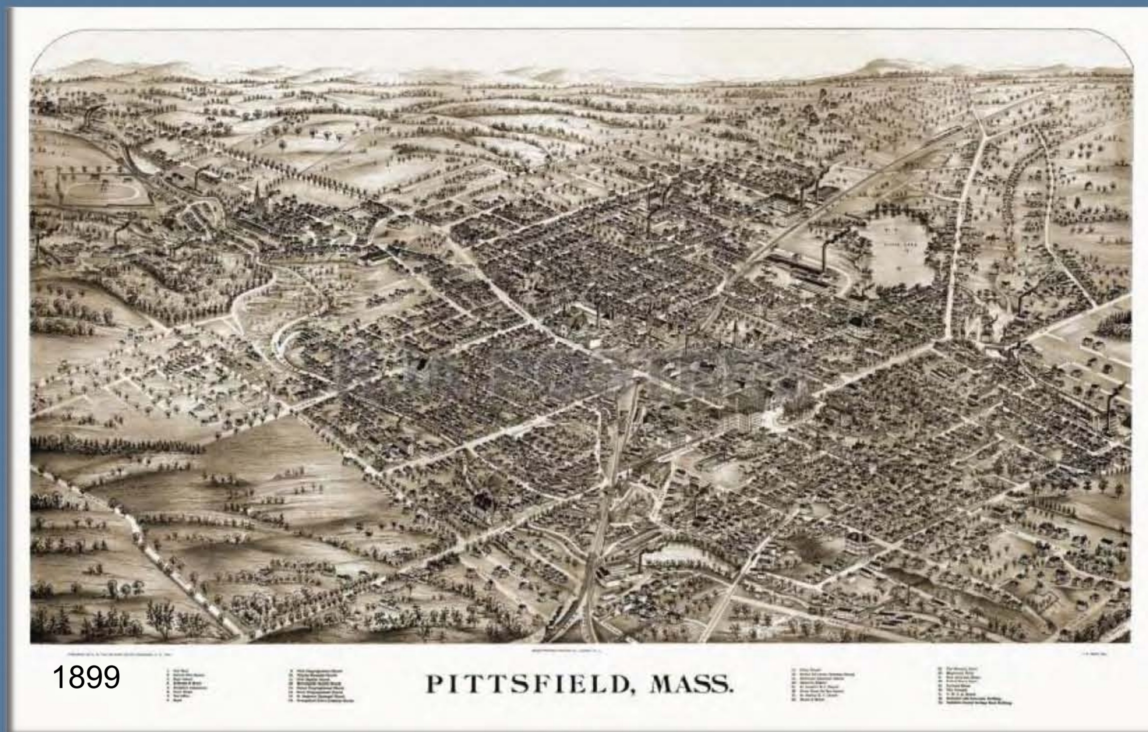


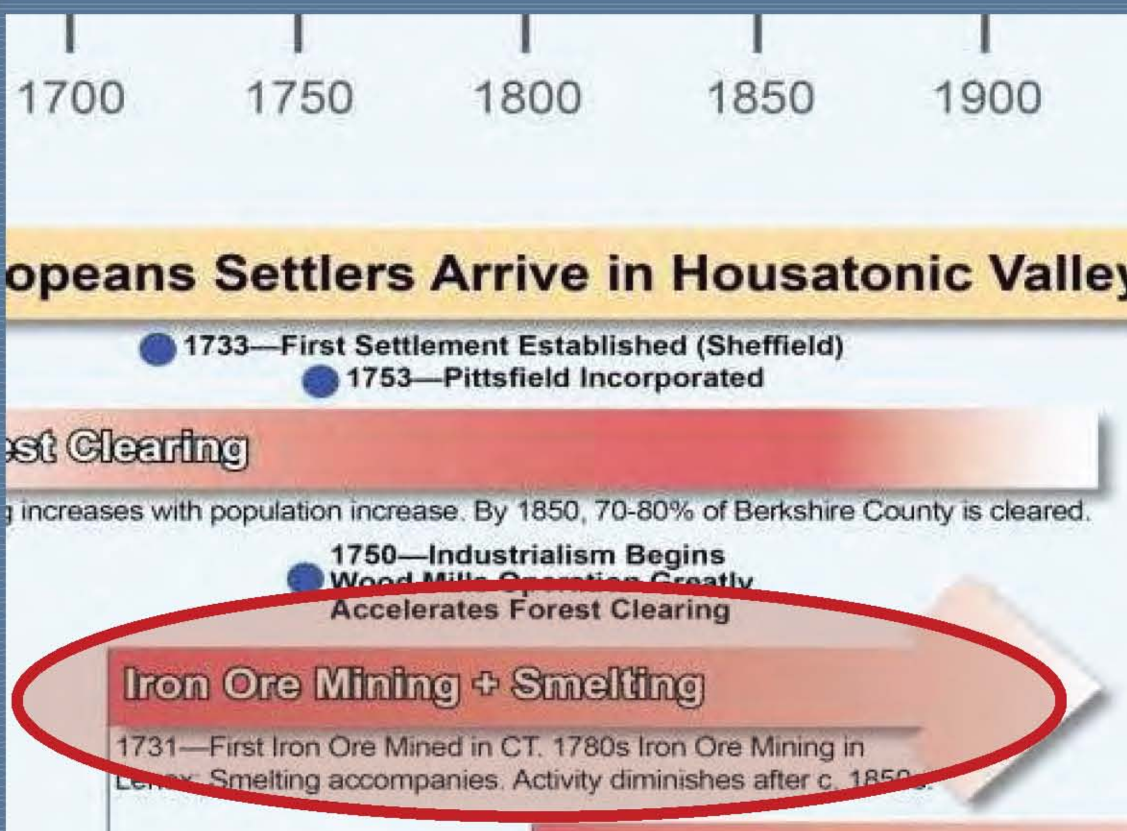
Fig. 10. Indian Fish Weirs along the Banks of the Housstonic River.

1690s/1700s - Early European Settlers

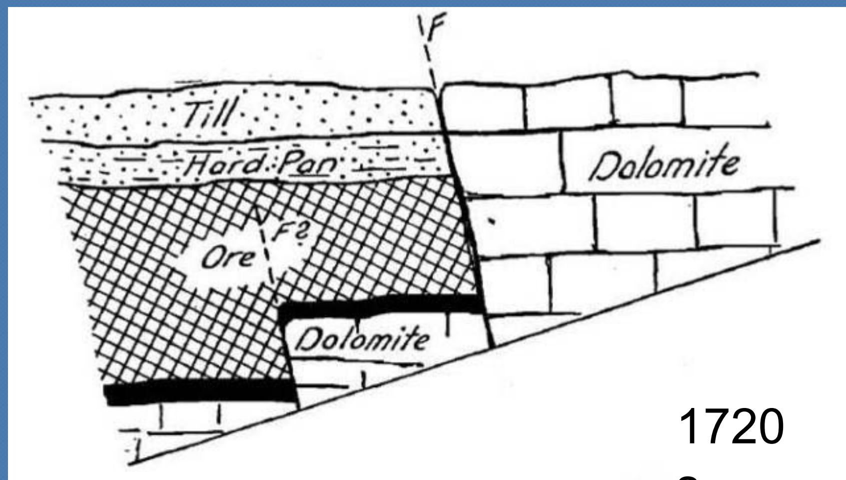


Forest Clearing



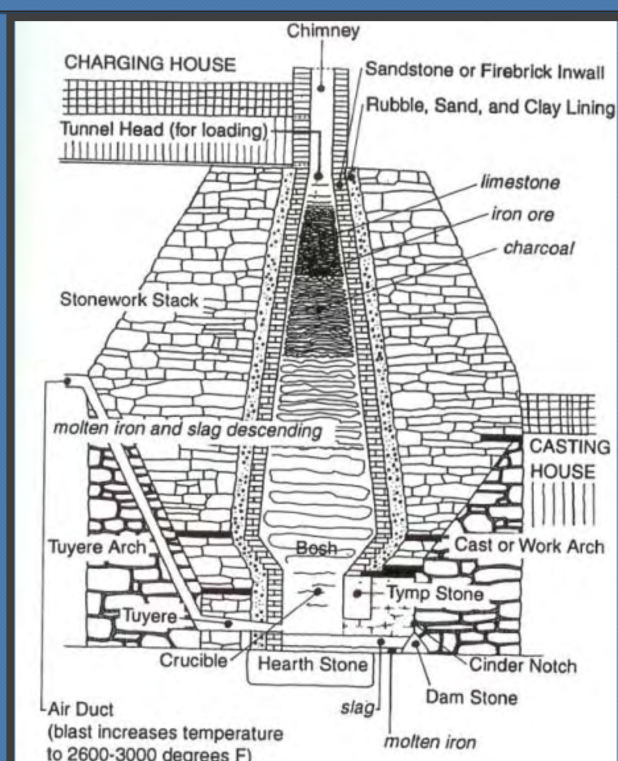


Discovery of Iron Ore



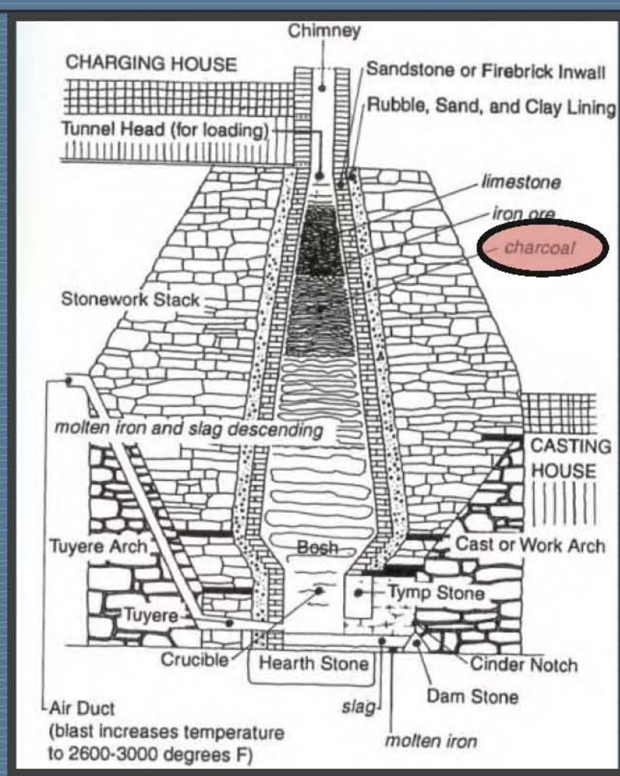
1720 s

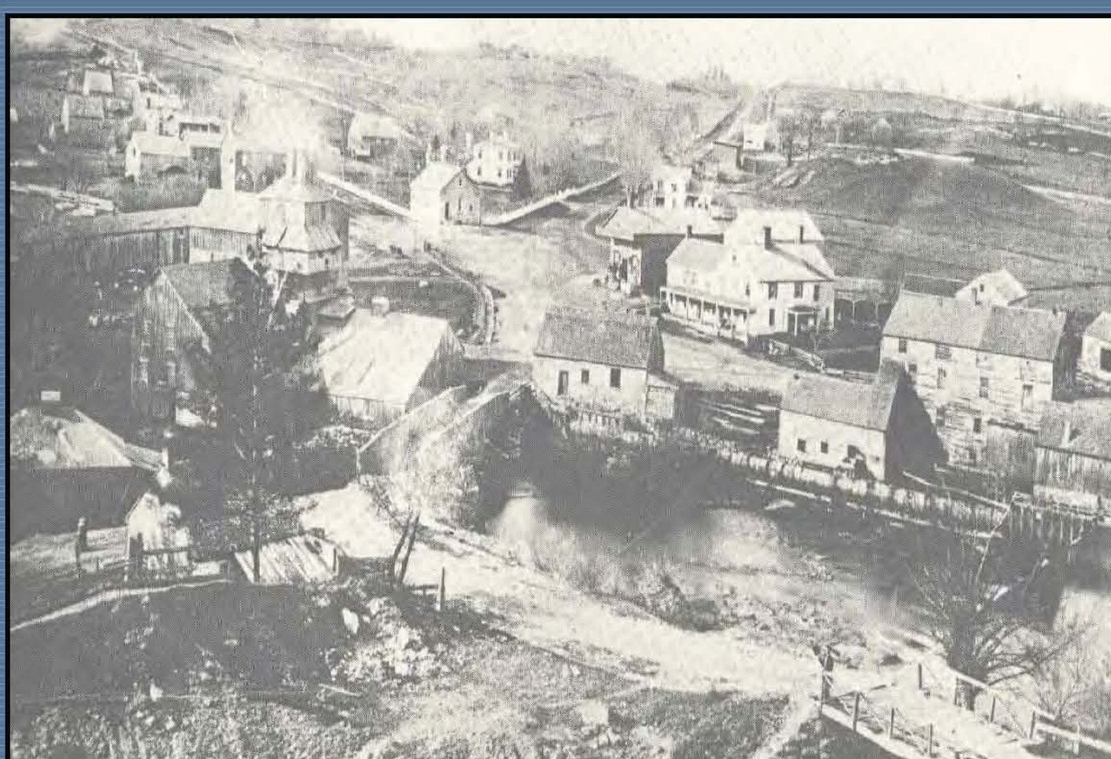
Discovery of Iron Ore

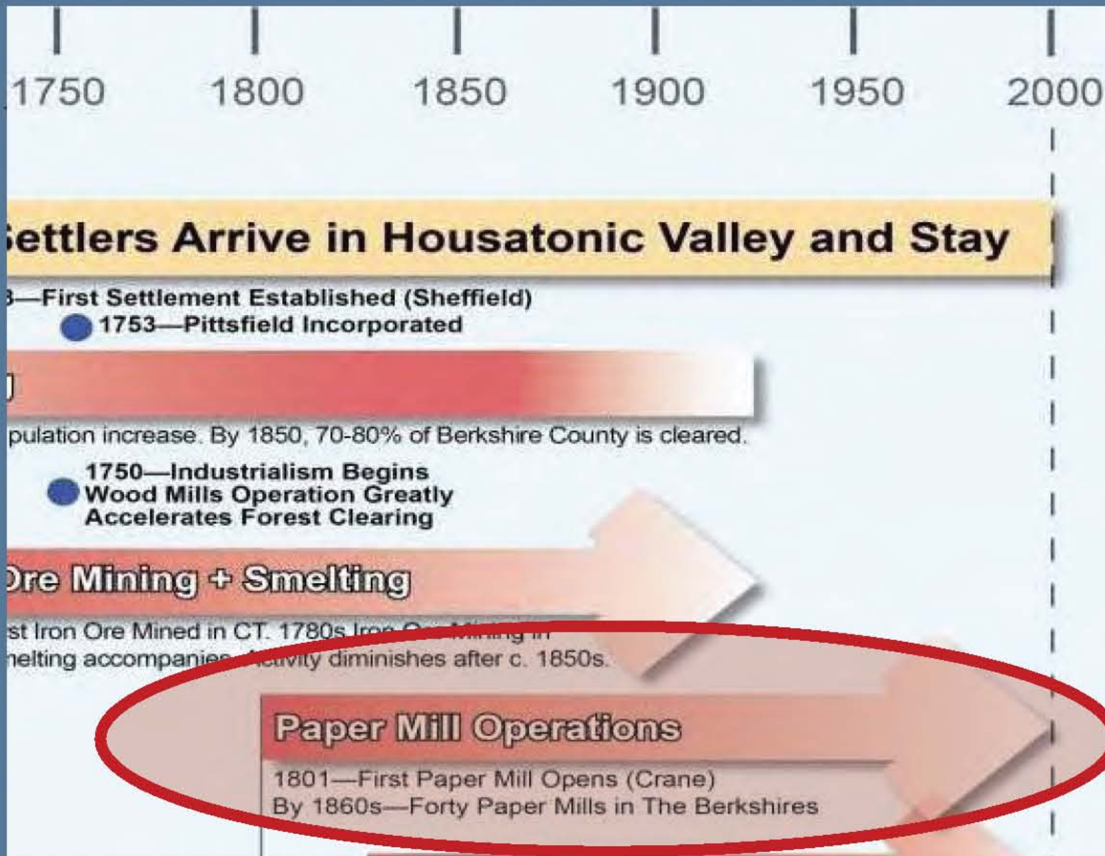


Discovery of Iron Ore

Discovery of Iron Ore

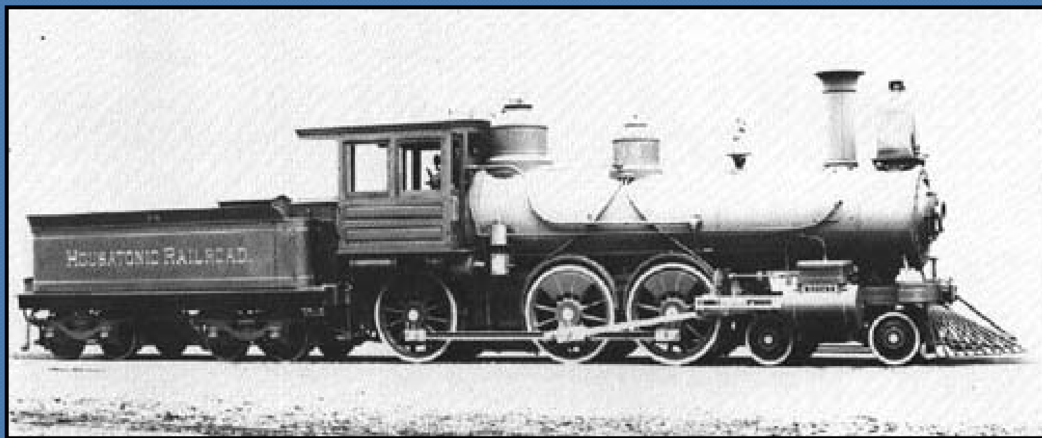






Paper & Woolen Mills – 1800s

1830s - 1850s: Railroad



1830s - 1850s: Railroad

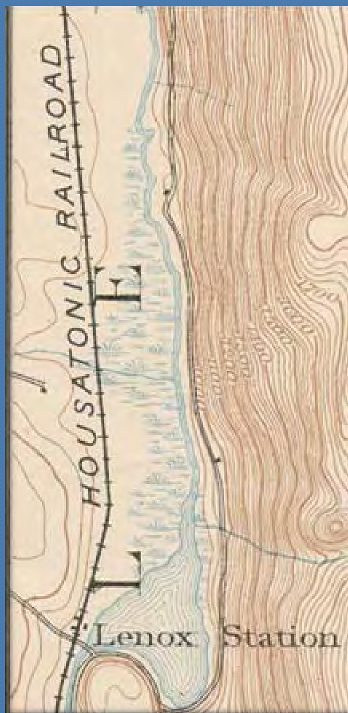
What Changes Occurred?

- The river was cleared
- The river was dammed
- The river was moved & straightened

What is Some of the Evidence?

- Review of older topographic maps and still older maps of the Berkshires.
- State legislatures passed laws for these actions.
- In the 1940s, the River was straightened through Pittsfield along East Street.

Moving the River

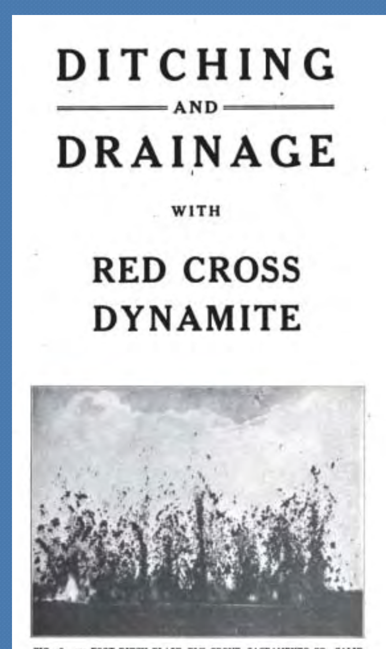


- Commonly done to create farmland, or
- To create buffer for a railroad bed.

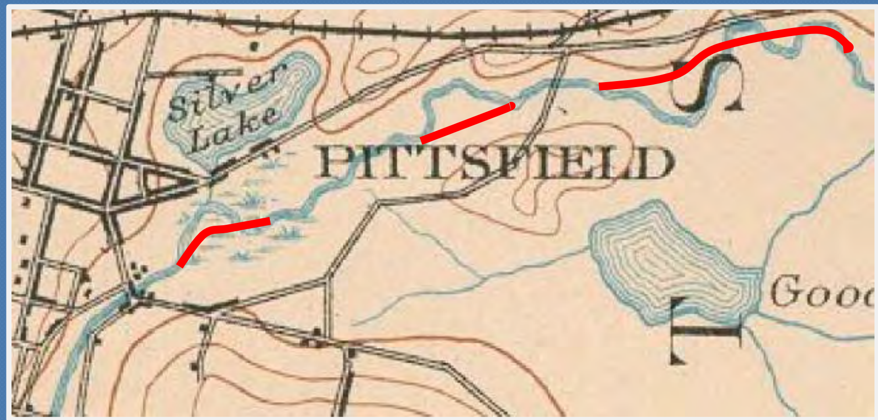
1886

What is Some of the Evidence?

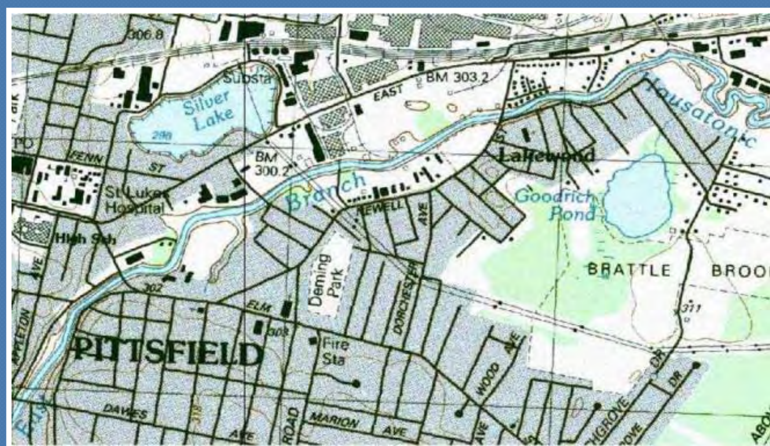
An 1863 New Hampshire statute gave the Upper Connecticut River and Lake Improvement Company permission to "***remove the boulders and rocks and all other obstructions from, and enlarge the channel of***" the Connecticut River



1886

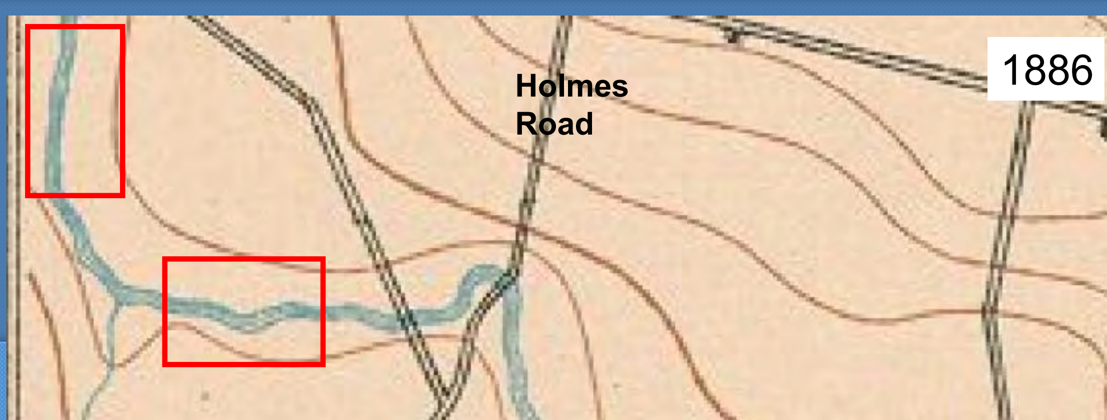


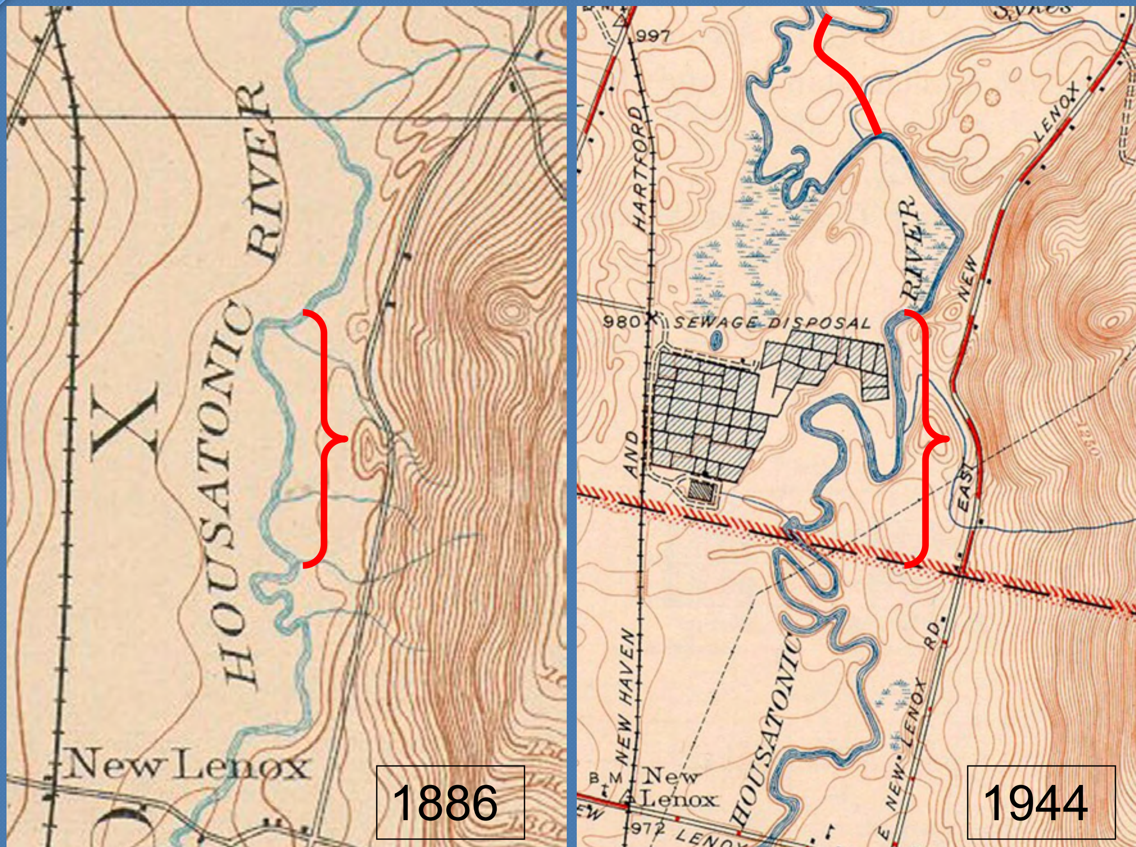
1988

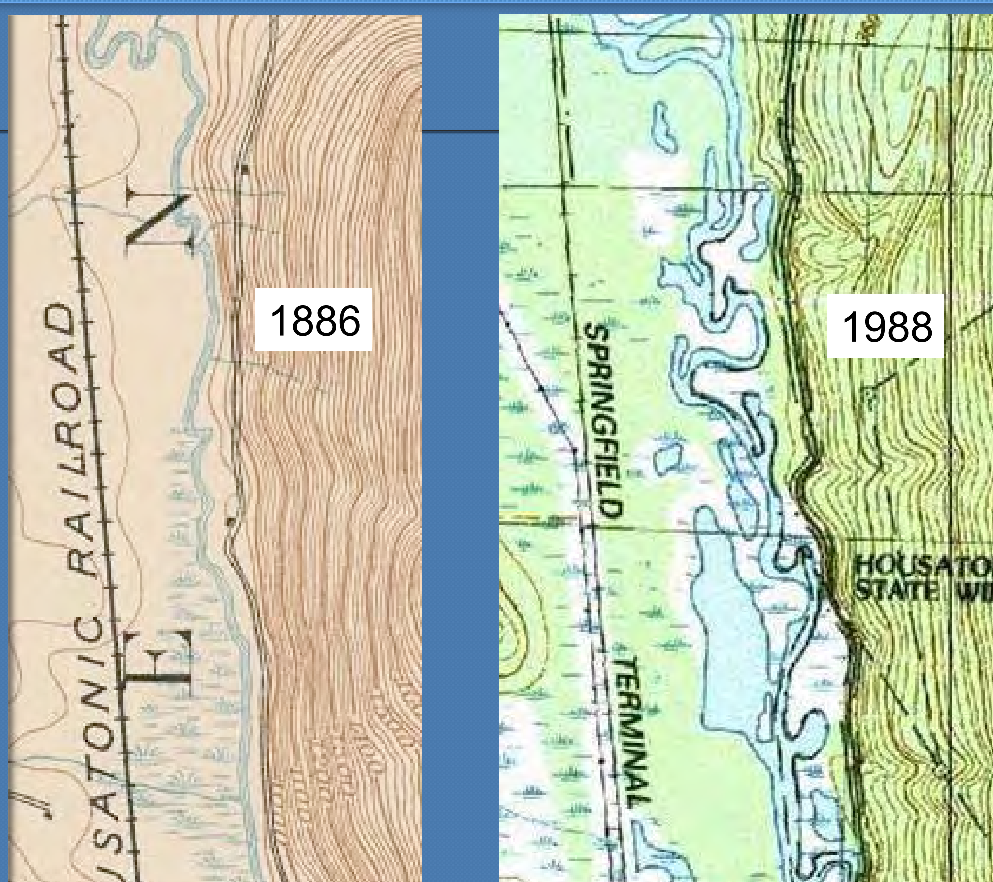


River Channelization

Evidence of Downstream Changes




HOUSATONIC RIVER
X
New Lenox
1886
997
HARTFORD
AND
NEW HAVEN
980
SEWAGE DISPOSAL
RIVER
HOUSATONIC
NEW
EAST
RD.
NEW LENOX
New Lenox
972
LENOX
1944


N
E
USATONIC RAILROAD
1886
SPRINGFIELD
TERMINAL
1988

Summary

- At least 92% of the River from the Confluence to Woods Pond was straightened prior to 1886
- At least 55% of the River from the Confluence to Woods Pond redeveloped meanders along straightened segments prior to 1944
- While meanders have grown in size, no new meanders have developed along straightened segments since 1944

Key Messages

- Portions of the River are less than 200 years old. It is not stable
  - Straightened sections remain prone to re-creation of meanders; and
  - These sections can destabilize adjacent/downstream portions of the river
- Past modifications to the River have subsequently changed. Much of what we see today is the result of reforestation in only the last 70+ years.
- Rivers want to meander. They are seeking equilibrium.

Geomorphology: River Processes

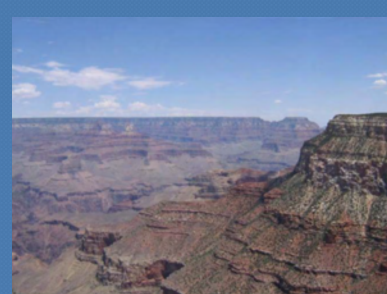
Keith Bowers
Biohabitats, Inc.

Geomorphology

The study of the evolution and configuration of landforms

Sub-Branches Include:

- Desert Geomorphology
- Coastal Geomorphology
- Fluvial Geomorphology



Fluvial Geomorphology

Branch of science concerned with influence of rivers and streams on the formation of the earth's surface

Governing Processes:

- Erosion
- Sediment Transport
- Deposition

Photo Source: Stream Corridor Restoration: Principles, Processes, and Practices; October 1998

River Processes

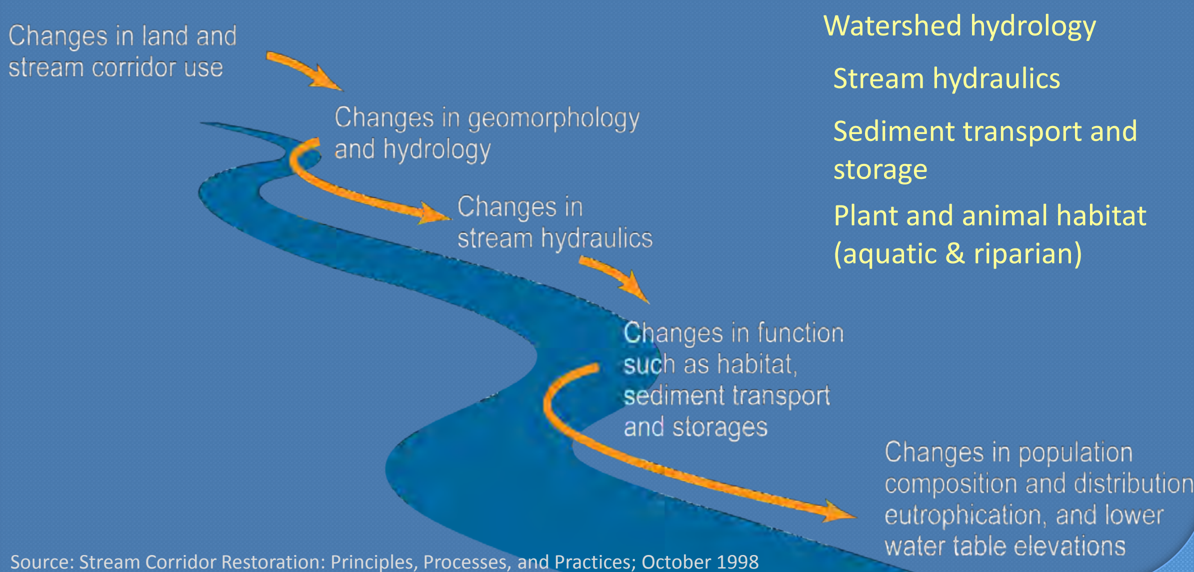
Disturbance to a stream corridor system typically results in an increasingly negative spiral of degradation to stream structure and function.

Watershed hydrology

Stream hydraulics

Sediment transport and storage

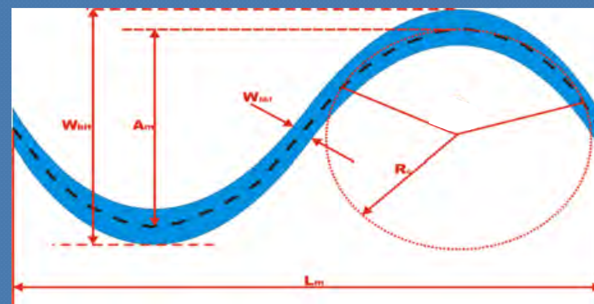
Plant and animal habitat (aquatic & riparian)



Source: Stream Corridor Restoration: Principles, Processes, and Practices; October 1998

River Components

- Meander pattern (plan form)



Straightened Walla Walla River in Washington Returns to Meandering Stream During Major Flooding

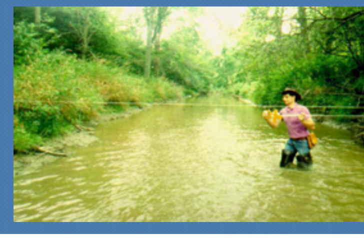
River Components

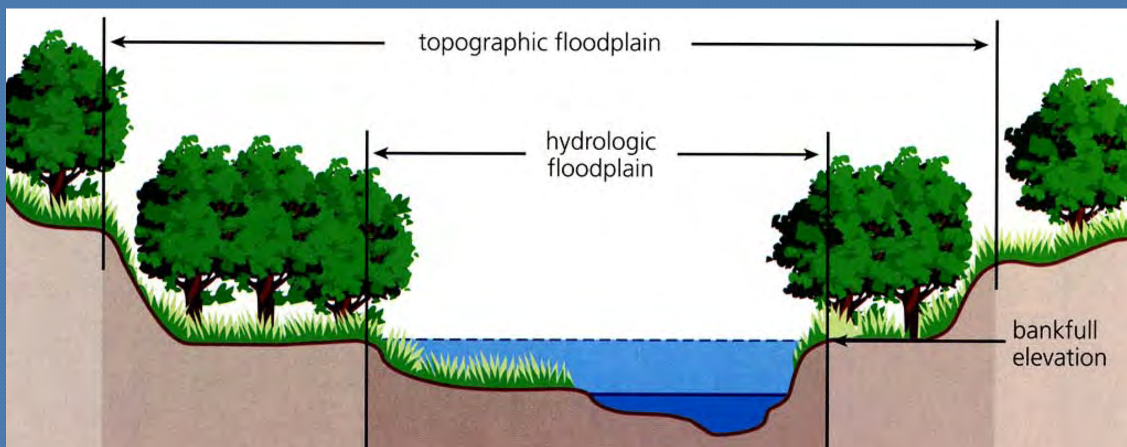
- Meander pattern (plan form)

Straightened Walla Walla River in Washington Returns to Meandering Stream During Major Flooding

River Components

- Meander pattern (plan form)
- Channel Cross-Section

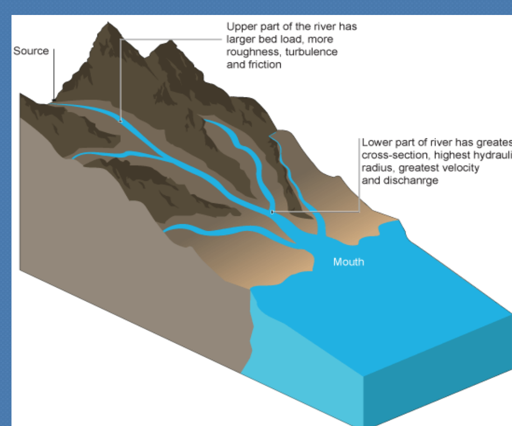


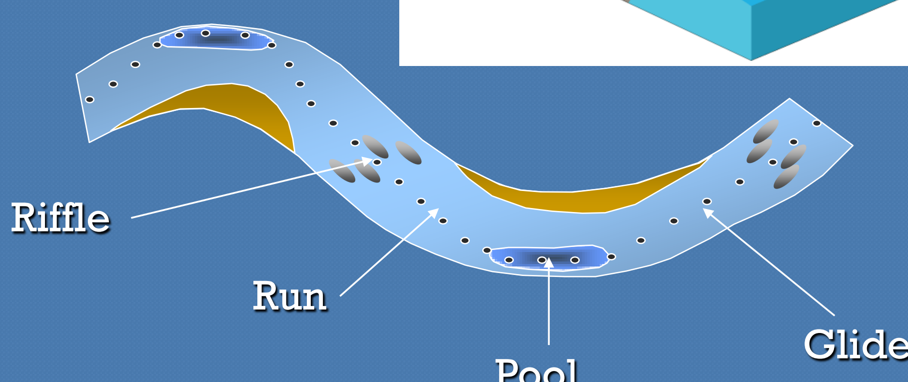


Source: Stream Corridor Restoration: Principles, Processes, and Practices; October 1998

River Components

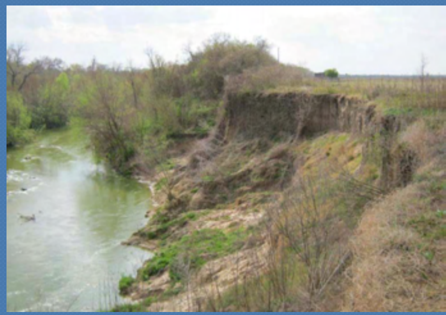
- Meander pattern (plan form)
- Channel Cross-Section
- Channel Profile





River Components

- Meander pattern (plan form)
- Channel Cross-Section
- Channel Profile
- Floodplain Connectivity



River that is disconnected from its floodplain results in increased shear stress and mass bank wasting

River Components

- Meander pattern (plan form)
- Channel Cross-Section
- Channel Profile
- Floodplain Connectivity

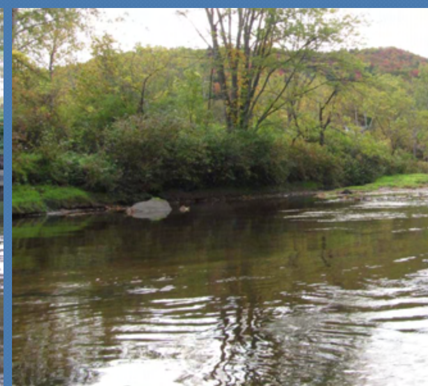
River with good floodplain connection typically has stable banks and good habitat

River Stability Definition

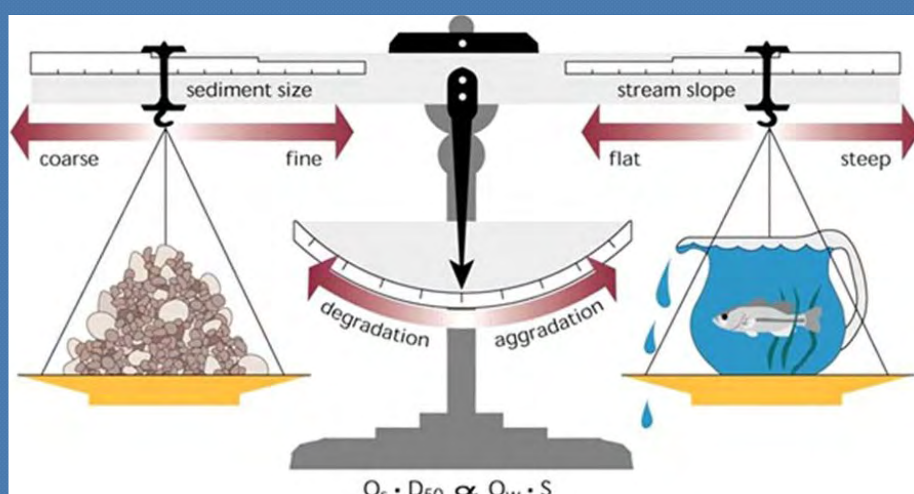
River stability (equilibrium or quasi-equilibrium) is defined as,

"the ability of a river, over time, in the present climate to transport the flows and sediment produced by it's watershed in such a manner that the stream maintains its dimension, pattern and profile without either aggrading or degrading" (Rosgen, 1994)





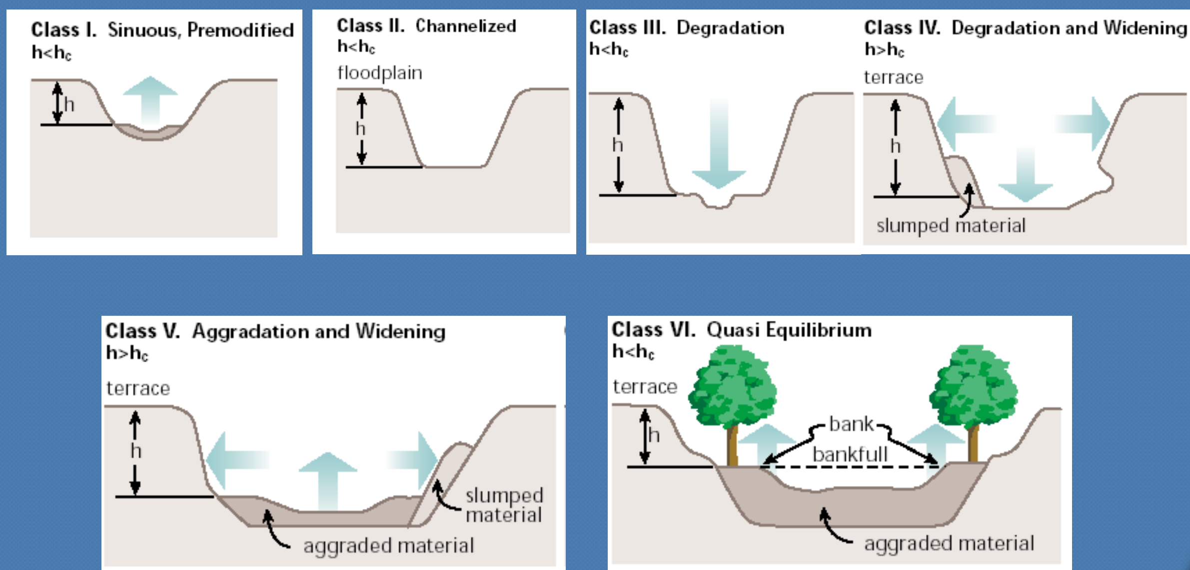
River Stability Definition



Lane's Relationship

Source: Applied River Morphology; 1996

Channel Evolution

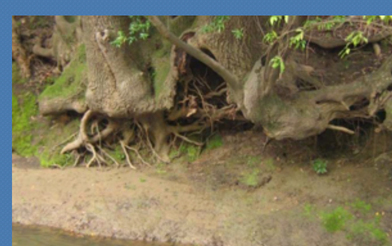


Source: Stream Corridor Restoration: Principles, Processes, and Practices; October 1998

Channel Evolution

Indicators of Instability

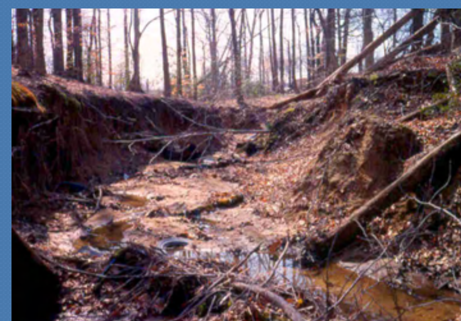
- Incision/Headcutting
- Channel Filling
- Entrenchment/Eroding Stream Banks
- Lateral Migration
- Over-Widening



Channel Evolution

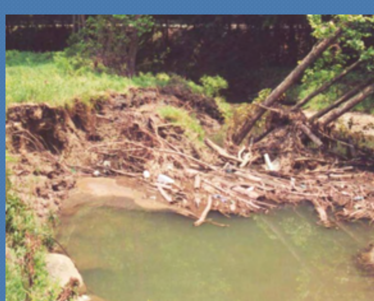
Indicators of Instability

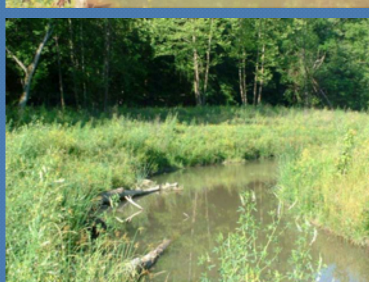
- Incision/Headcutting
- Channel Filling
- Entrenchment/Eroding Stream Banks
- Lateral Migration
- Over-Widening

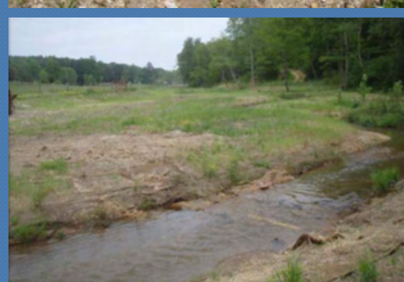


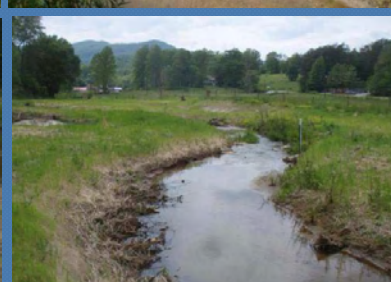
Channel Evolution

Restoring stability in river systems









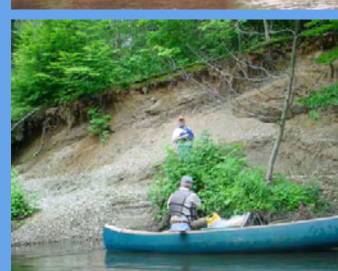
Dynamic Equilibrium

- Stream Maintains Dimension, Pattern and Profile
- Does not Aggrade or Degrade
- Natural Streams Adjust Slowly Over Time


Housatonic River

Ongoing Adjustments in the Housatonic River





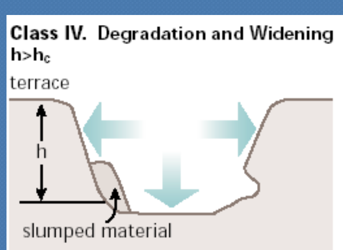

Housatonic River

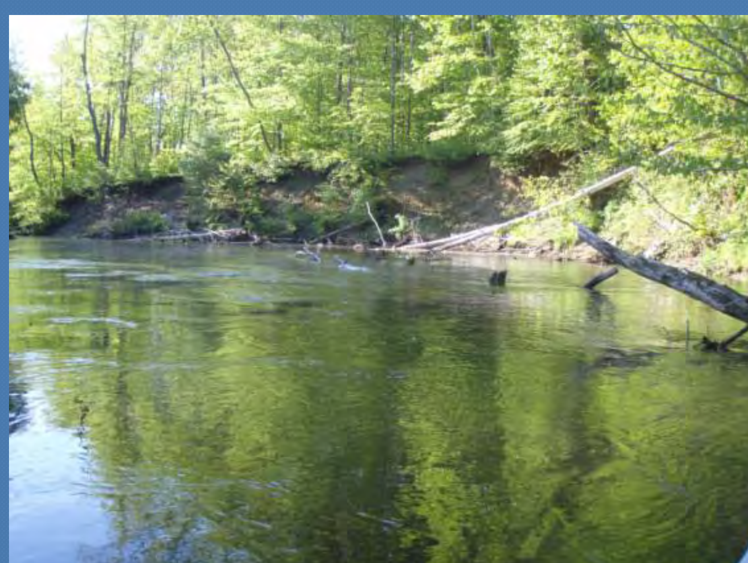
River Reaction – Geomorphic Response

1886 - 2006 @ WWTP   1886 – 2006 @ New Lenox Road

Housatonic River

Channel Widening – Bank Erosion

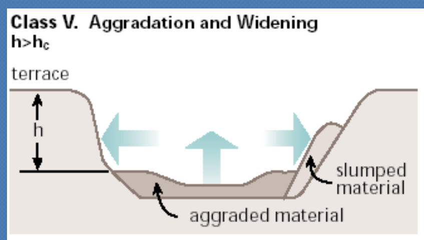


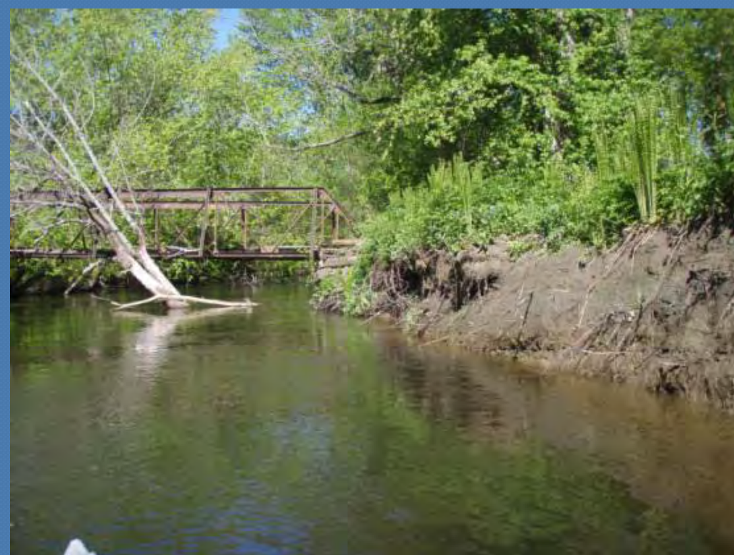


Bank Erosion   High Terrace

Housatonic River

Horizontal Migration – Bank Erosion & Aggradation



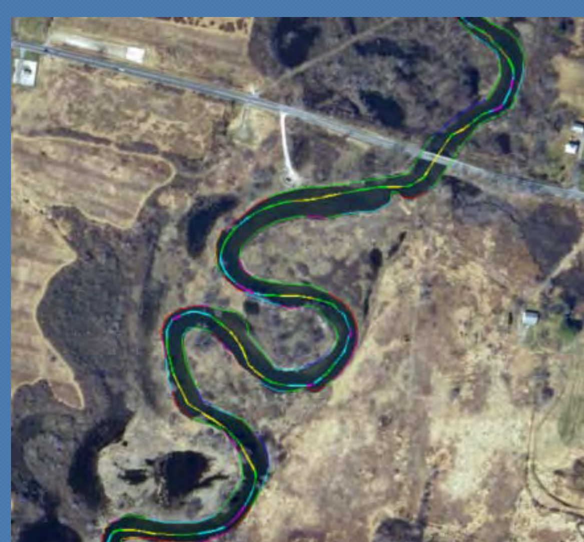


Bank Erosion Floodplain Deposition

Housatonic River

On-Going Adjustments

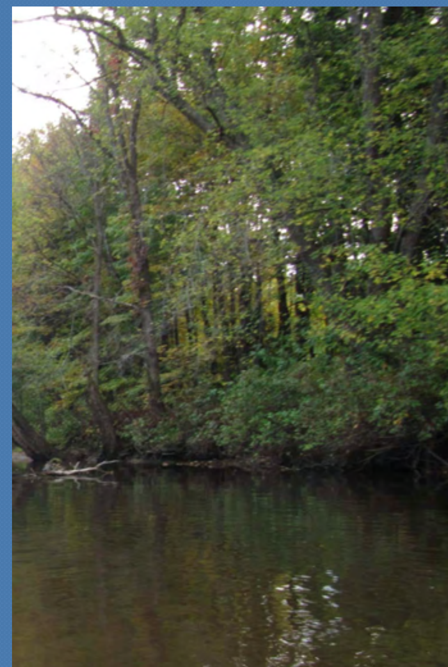
- Bank Erosion Rate - 6,600 Tons/yr (+ 25%)
- Accelerated Bank Erosion over 10 times the Rate of a Stable Reference Channel
- Areas of High Bank Erosion Out of Phase with Meander Pattern (Inside of Meander Bends)



Housatonic River

Summary

- All rivers exhibit geomorphic processes
- Dimension, Pattern & Profile are important components of river systems
- Floodplain connectivity is key to a stable river
- Dynamic equilibrium

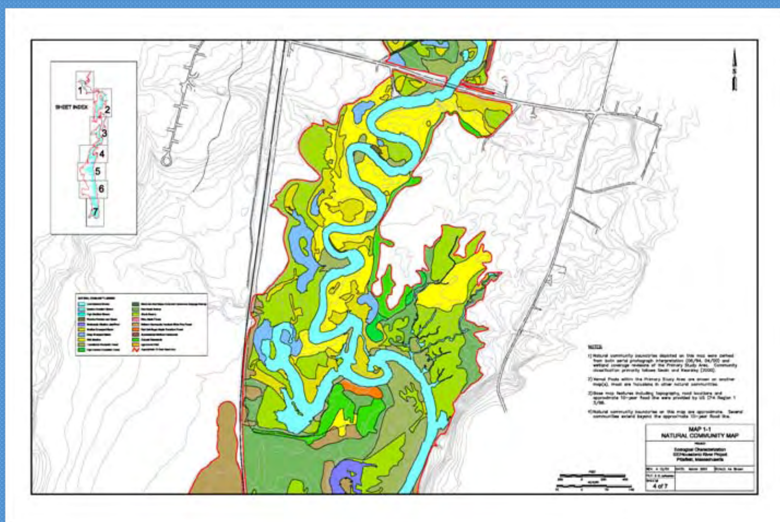


Geomorphology: River Processes

Keith Bowers
Biohabitats, Inc.

THANK YOU

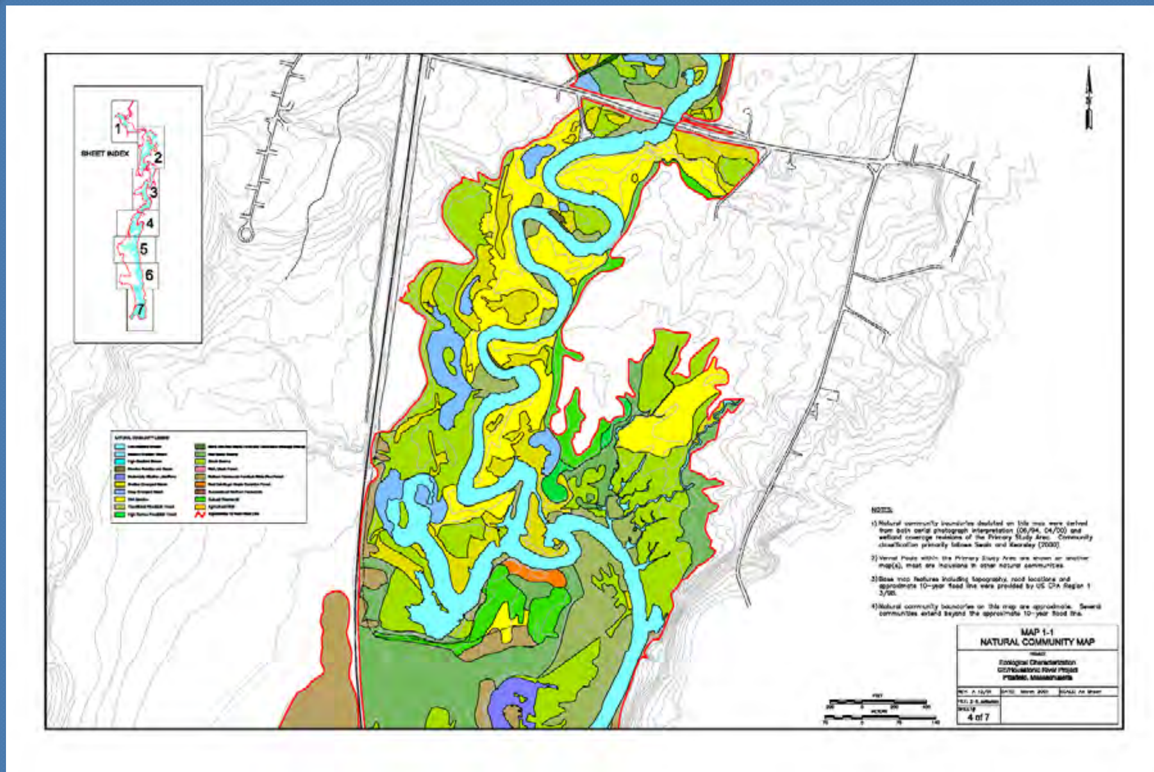
Ecological Characterization



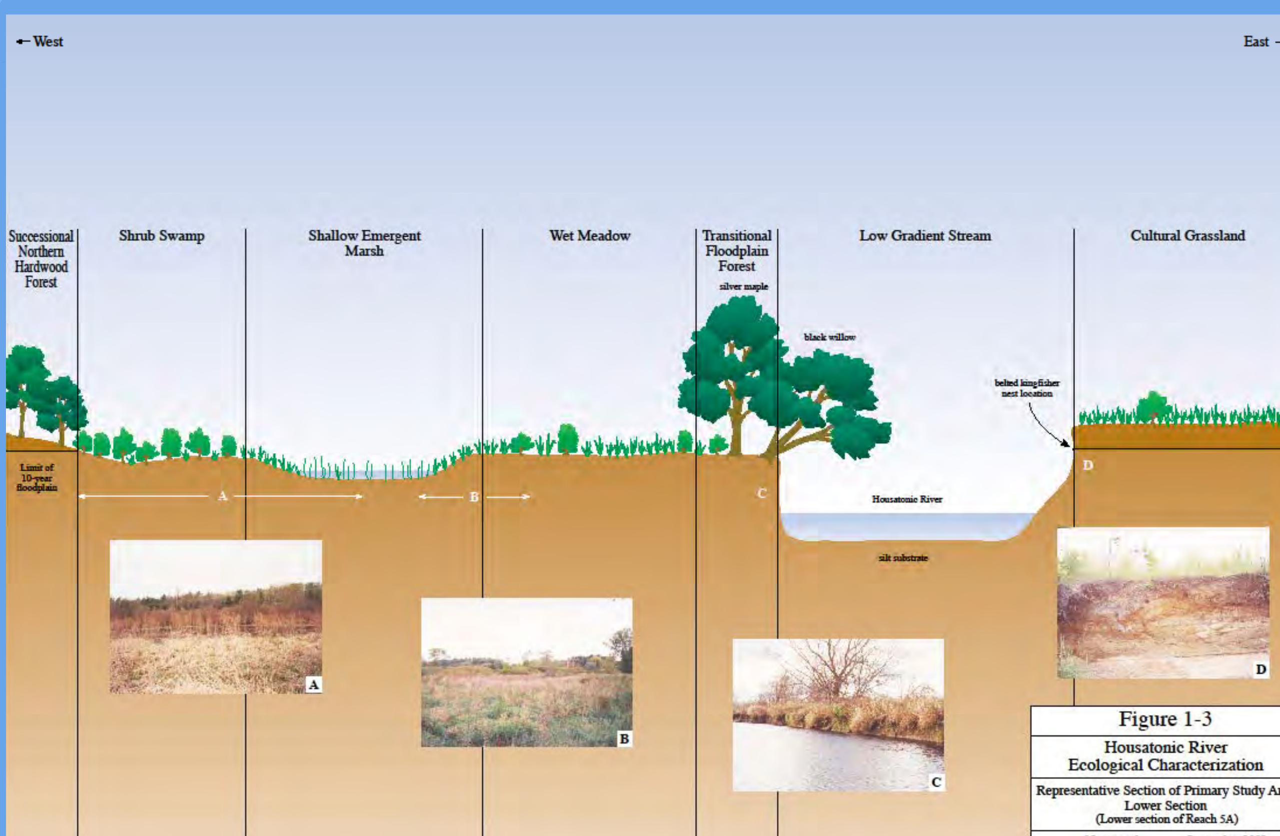
John Lortie
Stantec, Inc.

Natural Communities

- Natural Community: A recurring assemblage of plants, animals, and their habitat showing minimal effects from human intervention
- Provides a framework for understanding animal-habitat associations
- 18 natural communities identified in the PSA; 7 additional communities in reference areas
- Communities in PSA include:
  - 1 Lacustrine (Woods Pond)
  - 3 Riverine
  - 9 Palustrine (wetlands)
  - 5 Terrestrial
- Principal community types are low-gradient stream, shrub swamp, and transitional floodplain forest



Maps were prepared to show the location and
extent of the identified natural communities



Representative sections show the relationship of identified
natural communities at different locations along the river

Rare Species

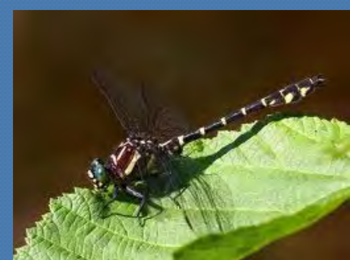
- Includes Threatened, Endangered, Special Concern, and other categories
- Ranked according to state and global occurrence, vulnerability, other biological factors
- Rare species, especially rare plants, provide an indication of the uniqueness of a habitat
- Rare plants considered by MA Endangered Species Act (MESA) to be of conservation concern
- Rare species identified in EPA Ecological Characterization Study supplemented with information provided by Massachusetts NHESP
- An important consideration in the evaluation of remedial alternatives

Invertebrates

- Comprise the base of many aquatic and terrestrial food chains
- Studies focused on:
  - Easily sampled groups
  - Groups targeted for PCB tissue analysis – HHRA and ERA
  - Groups of importance for other ongoing studies
- Occurrences of both common and rare species were documented

Invertebrates (2)

- Freshwater Mussels
  - 3 species observed
  - Triangle Floater listed as Special Concern
  - Numbers smaller than expected may be related to unstable sediment or other disturbances
- Dragonflies
  - 38 species observed
  - Zebra clubtail (T)
  - Arrow clubtail (E)
  - Riffle snaketail (E)
- Vernal Pool Invertebrates
  - 17 Vernal Pools Surveyed
  - Variety of taxa observed

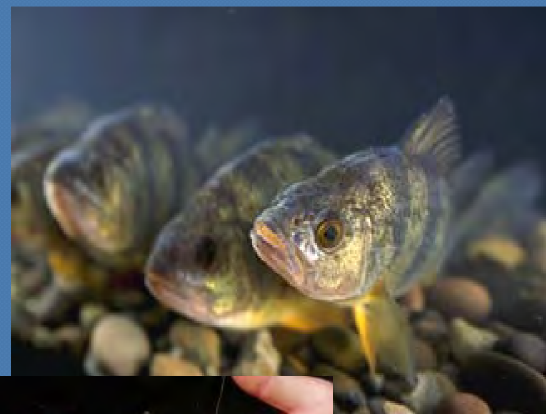


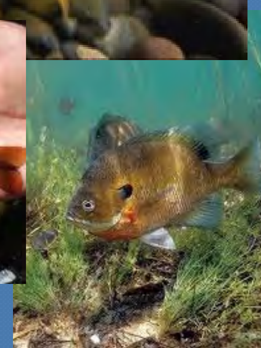
Fish

- Function as predators, foragers, bottom feeders
- Higher trophic level species, important component of the food chain
- Prey for a variety of mammals and birds, as well as other fish
- Important recreational resource in the river – exposure pathway for HHRA
- Major component of the PCB Fate & Transport Model

Fish (2)

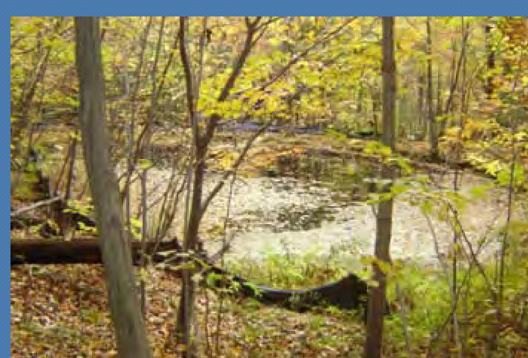
- 41 Fish species catalogued from the Housatonic River in MA/CT
- 25 Species observed in the PSA
- Most fish species exhibit fidelity to one of the 3 aquatic natural communities
- Five most common species:
  - White sucker
  - Largemouth Bass
  - Yellow perch
  - Bluegill
  - Common Carp
- Several introduced species (e.g., carp, goldfish, rainbow and brown trout
- No rare, threatened or endangered fish species





Reptiles and Amphibians

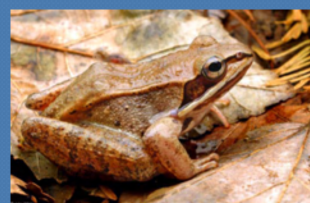
- Collectively known as "herptiles"
- Amphibians, in particular, are good indicators of environmental stress
- 68 potential breeding areas surveyed (i.e. vernal and permanent pools)
- Both structure and function of vernal pools is important to breeding success



Reptiles and Amphibians (2)

- 5 Reptile species observed
  - Garter snake
  - Northern water snake
  - Snapping turtle
  - Painted turtle
  - Wood turtle (Special Concern)
- 14 Amphibian species observed
  - Vernal Pools
    - Leopard frog
    - Green frog
    - Bullfrog
    - Red spotted newt
    - Wood frog
    - Spotted Salamander
  - Semi permanent pools/backwaters
    - Leopard frog
    - Green frog
    - Bullfrog
    - Red spotted newt
- 2 Salamander species of Special Concern
  - Jefferson salamander (SC)
  - Four toed salamander (SC)

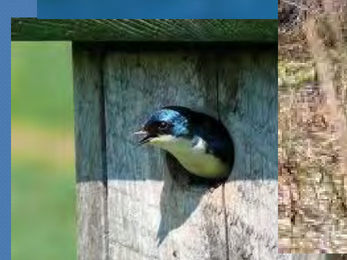





Birds

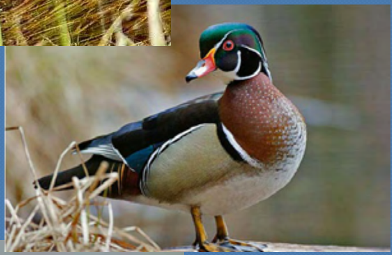
- Occupy a variety of ecological niches and trophic levels
- Exhibit a wide range of response to disturbance and ecological stressors
- Provide important recreational opportunities
- Breeding behavior can be an indicator of environmental disturbance





Birds (2)

- Wading Birds – 5 species observed in breeding season
  - Virginia rail
  - Sora rail
  - Green backed heron
  - Great blue heron
  - Common moorhen
- Forest Birds – 47 species identified as likely nesters
- Waterfowl – 3 species observed breeding
  - Mallard
  - Wood duck
  - Canada goose
- Kingfisher – several nesting pairs



Hawks and Owls

- 14 species observed overall : 10 in study area, 9 in reference areas
- Hawks:
  - Northern harrier
  - Sharp shinned hawk,
  - Cooper's hawk
  - Goshawk
  - Red shouldered
  - Broad winged
  - Red tailed
  - Kestrel (1 nest)
- Owls:
  - Great horned owl
  - Barred owl
  - Northern saw whet owl
- Other raptors:
  - Turkey vulture
  - Osprey (territorial no nesting)
  - Bald eagle

Rare Bird Species

- American bittern (E)
- Bald eagle (T) (E-MNHESP)
- Northern Harrier (E)
- Sharp-shinned hawk (SC)
- Common moorhen (SC)
- Northern parula warbler (T)
- Blackpoll warbler (SC)

Mammals

- Objective was to identify mammals using the PSA, characteristic habitats, and seasonality
- Mink & Otter Studies
  - Snow Tracking
  - Scent Posts
  - Otter Scat Analysis
- Small Mammal Study
  - Catch per unit effort
  - Species diversity
- Bat surveys – Anabat detection system

Mammals (2)

- 52 Species potentially occurring – 42 observed, 10 likely but not verified
- Common:
  - White footed mouse
  - Meadow vole
  - Short tailed shrew
  - Little brown bat
  - Cottontail
  - Gray squirrel
  - Raccoon
  - Red Fox
  - Coyote
  - Whitetail deer
- Mink and Otter more rare than expected based on habitat and reference areas
- Rare Species:
  - Water shrew (SC)
  - Southern bog lemming (SC)
  - Small footed myotis (SC)

State-Listed Species Summary

16 rare animals were observed:

- triangle floater (SC)
- riffle snaketail (T)
- zebra clubtail (E)
- arrow clubtail (T)
- Jeffersons salamander (SC)
- four-toed salamander (SC)
- wood turtle (SC)
- American bittern (E)
- bald eagle (E)
- northern harrier (T)
- sharp-shinned hawk (SC)
- common moorhen (SC)
- northern parula (T)
- blackpoll warbler (SC)
- water shrew (SC)
- small-footed myotis (SC)

Based on the Massachusetts Endangered Species Act, E Endangered; T Threatened; SC = Species of Special Concern

Summary

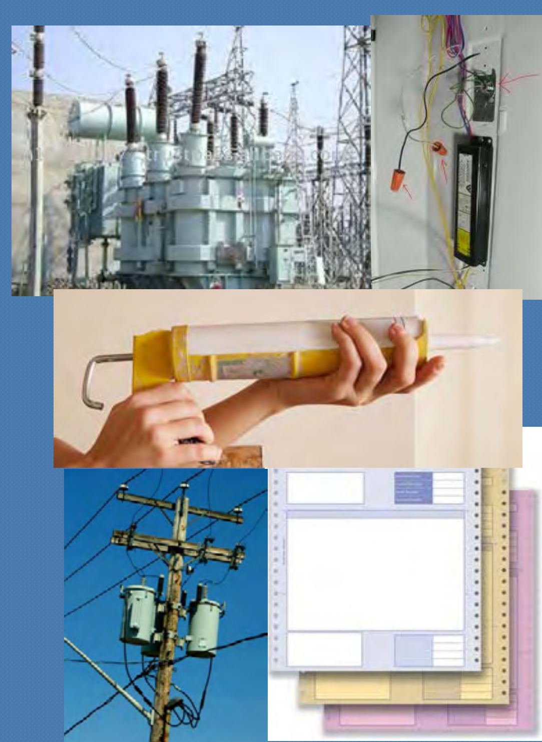
- Large tracts of undeveloped protected land are adjacent to PSA
- Historic alterations of river and floodplain are extensive
- Rare, threatened, and endangered species were infrequently observed, and only observed in discrete areas
- Invasive species (plants and animals) are common to abundant in many areas

What are PCBs
and how do they behave in the environment?

Dick McGrath
The Isosceles Group, Inc.

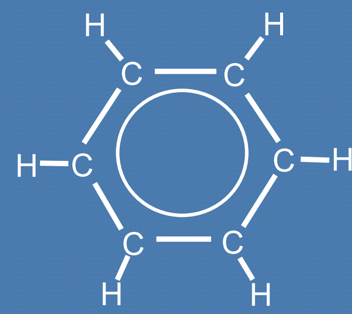
PCBs – A Quick Overview

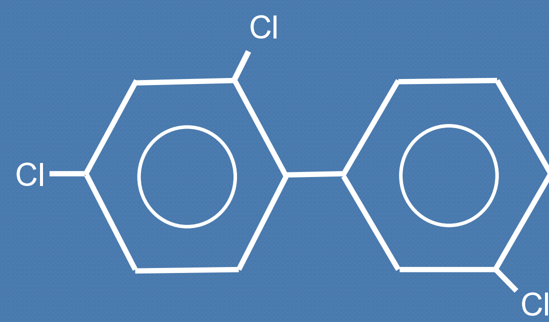
- "PCB"   "polychlorinated biphenyl"
- Man made chemicals, first synthesized in the late 1800s
- Many industrial applications, part of many products and processes
- Particularly useful for cooling and insulating electrical transformers
- Environmental and human health risks were quickly discovered
- Manufacturing and most uses of PCBs in the US were banned by 1979
- Persistent   most PCBs released to the environment remain there today

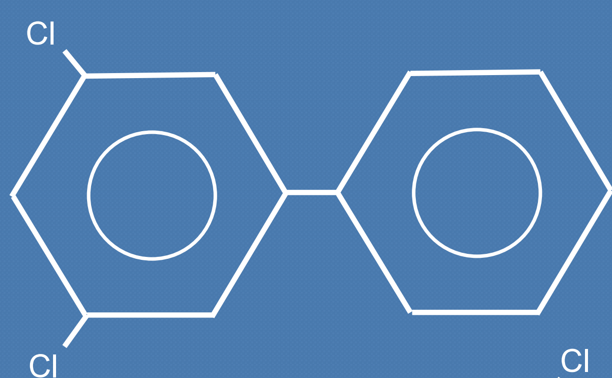


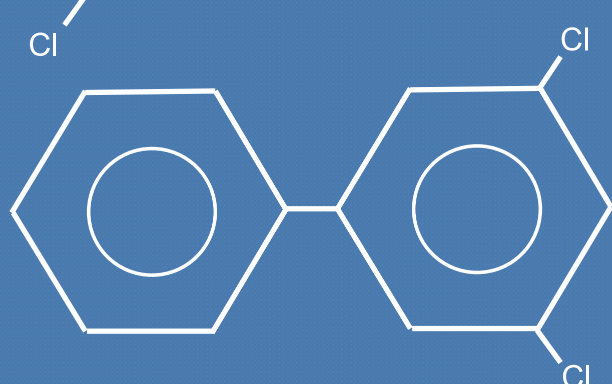
PCB Chemistry

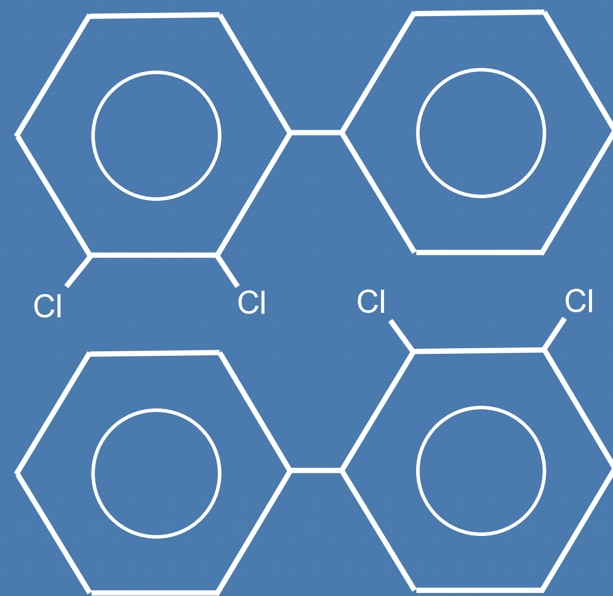
- PCBs are molecules composed of carbon, hydrogen, and chlorine atoms.
- Carbon atoms have four “bonds” and can join with each other to form long chains or rings
- Two 6-carbon rings = “biphenyl”
- Replacing hydrogen atoms with chlorine atoms creates [poly]chlorinated biphenyls - PCBs



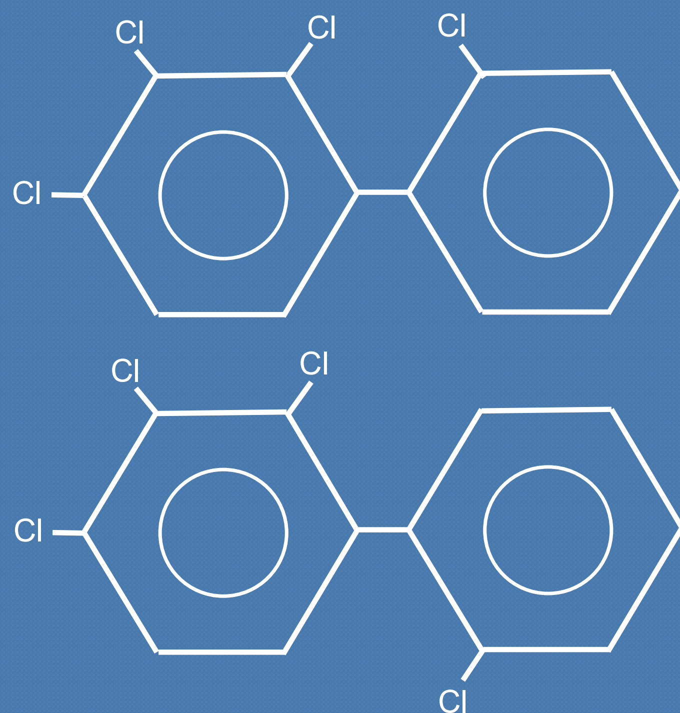








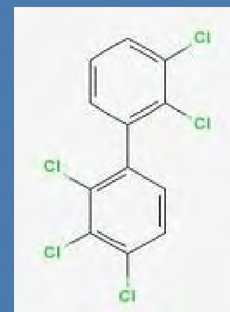
5

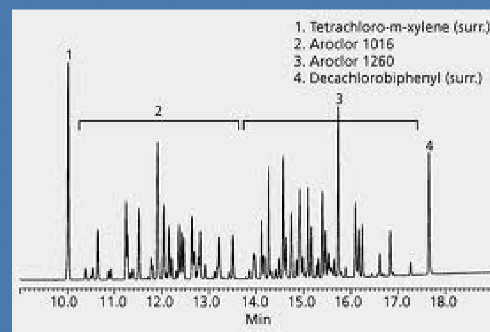


6

PCB Terminology

- **Congener** – of the 209 distinct PCB molecular structures
  - ± 175 congeners included in Aroclors
- **Homologue (Group)** – congeners with the same level of chlorination (10 homologue groups)
  - Homologues tend to have similar physical/chemical properties
- **Aroclor** – mixture of ±50 congeners with a specified percent of chlorination
  - Trade name of Monsanto Company
  - “12” (carbons) plus %Cl by weight, e.g. 1242, 1248, 1254, 1260
  - “1016” approximately 1241





Congener Properties

- **Physical behavior is largely determined by number of chlorines (homologue group)**
  - MonochloroPCBs (1 chlorine): 3 congeners
  - DichloroPCBs (2 chlorines): 6 congeners
  - (Tri , Tetra , Penta , Hexa , Hepta , Octa)
  - NonachloroPCBs (9 carbons): 3 congeners
  - DecachloroPCBs (10 carbons): 1 congener
- **As chlorines increase, congeners tend to be:**
  - Less volatile
  - Less biodegradable
  - More strongly attached to sediment particles
  - More lipophilic

Aroclor Properties

- Less-chlorinated Aroclors = light oils
- More-chlorinated Aroclors = heavier oils, waxy solids
- The PCB Aroclors used in Pittsfield were mostly 1260, with some 1254. (Hudson River PCBs were mostly 1242.)
- Aroclors, particularly less-chlorinated blends, change congener proportions in the environment = "weathering"
- PCBs in Housatonic ROR (Aroclor 1260 & Aroclor 1254) show very little weathering

PCB Biogeochemistry

- PCBs are stable, persistent, and ubiquitous in the environment and in our bodies.
- PCBs tend to:
  - Not volatilize (some congeners are volatile)
  - Adsorb to particles (relatively insoluble)
  - Partition to organic carbon (particulate and dissolved)
  - Partition into lipids (fats)
  - Bioaccumulate
  - Biomagnify
  - Biodegrade slowly, if at all

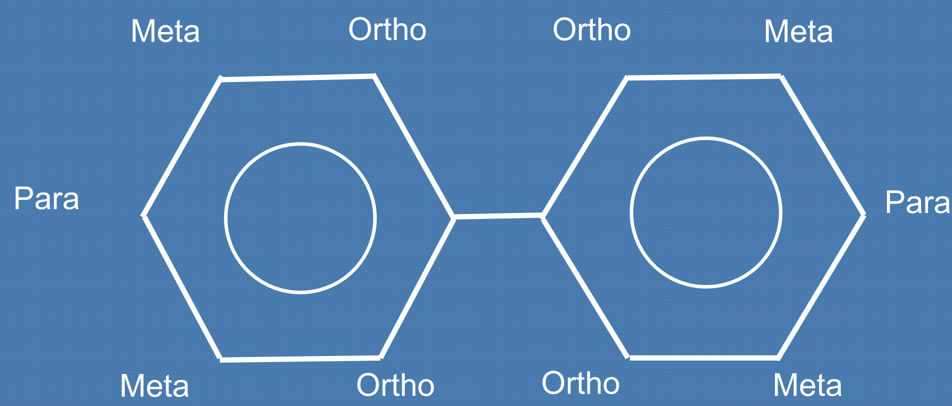
Biodegradation of PCBs

- Studied extensively, particularly by GE in Woods Pond and using Woods Pond sediment
- Occurrence, process, and rates vary by congener
- Both aerobic and anaerobic pathways identified
- Biodegradation pathways often do not continue to completion; can lead to other toxic compounds
- More highly-chlorinated congeners show virtually no biodegradation
  - Natural resistance
  - Tightly bound to sediment particles
- More highly-chlorinated congeners likely have biodegradation half-lives measured in decades to centuries
- Reports of progress with enhanced biodegradation on excavated soil/sediment
- Currently no practical means of large-scale enhanced biodegradation in-situ

PCB Toxicity

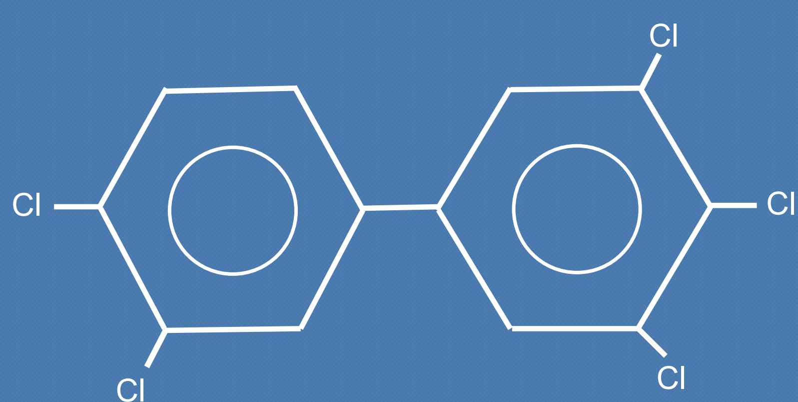
- PCBs have been shown to cause cancer and have other non-cancer effects.
- Multiple agencies classify PCBs as probable carcinogens:
  - Environmental Protection Agency
  - Department of Health and Human Services
  - Agency for Toxic Substances and Disease Registry (ATSDR)
  - National Cancer Institute
  - National Toxicology Program
  - International Agency for Research on Cancer (IARC)
  - World Health Organization (WHO)
- Toxicity of PCBs at both elevated laboratory concentrations and at environmental concentrations has been documented in numerous peer-reviewed studies.

Structure and Toxicity



PCB congeners that don't have a lot of chlorine atoms in the "Ortho" positions are the most toxic. They're sometimes called "co-planar" PCBs because the two rings can be in the same plane. Their structure and effects mimic those of dioxin.

Co-planar PCBs and Dioxin



This is: 3,3',4,4',5' – pentachlorobiphenyl ("penta" means five)

or 34-345 PCB

or PCB-126

And it's the most dioxin-like of all 209 congeners in terms of toxicity.

Tomorrow’s Workshop Topics

- Learn more about:
  - How PCBs are transported in the river and onto the floodplain
  - Where they’re found and in what concentrations
  - The toxic effects of PCBs on humans and the environment
  - How the Housatonic River Model predicts what happens to them now

At the next Workshop

3.5 Mini Workshop Two • Getting the Facts on PCBs, Human Health Risks, Ecological Risks, and PCBs

3.5.1 Theme

The Wednesday, April 6 Mini Workshop focused on providing an understanding of how PCBs move through the Housatonic River and the risks that they pose to people and animals.

3.5.2 Presentations

Larry Brill, Branch Chief, US EPA Office of Site Remediation and Restoration, opened the evening with an Introduction to the Agenda for the evening.

The four Technical Presentations followed. The evening concluded with a Q & A session in which audience members submitted questions to the presenters.

The Workbook that follows includes the printed versions of all presentations for the evening. The videos of the presentations and Q & A session, as well as printed answers to the questions, were posted on the www.HousatonicWorkshops.org Website.

Supporting Materials for Mini Workshop Two (Following)

Mini Workshop Two Workbook
Mini Workshop Two Presentations
- *Introduction Presentation*
- *Presentation One*
- *Presentation Two*
- *Presentation Three*
- *Presentation Four*

MINI WORKSHOP TWO WORKBOOK

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

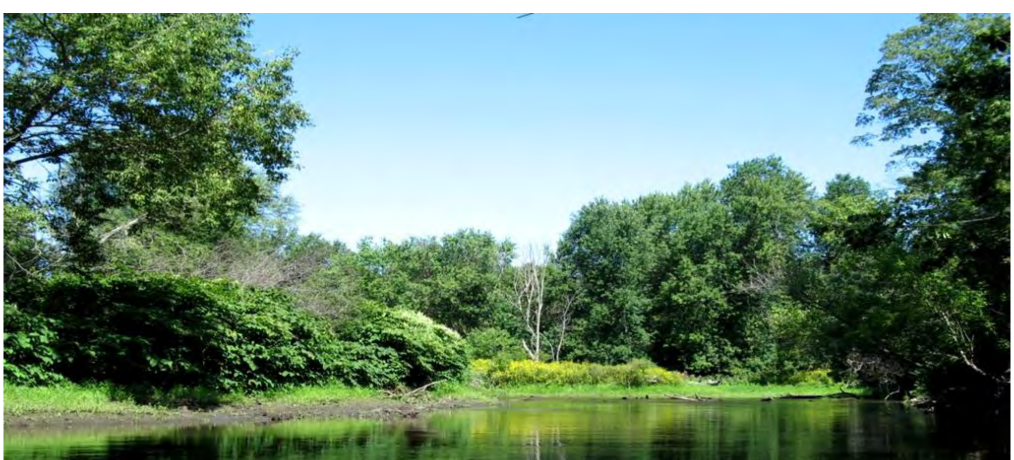
LEARN MORE AT: www.epa.gov/region1/ge

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.

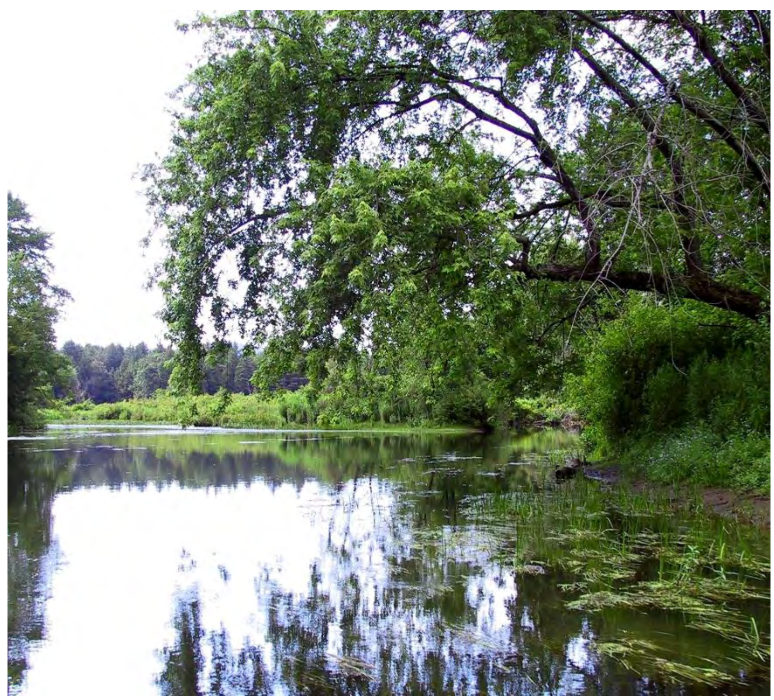
Please keep in mind that under the terms of the Consent Decree, EPA must evaluate all cleanup alternatives against the following 9 criteria:

<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

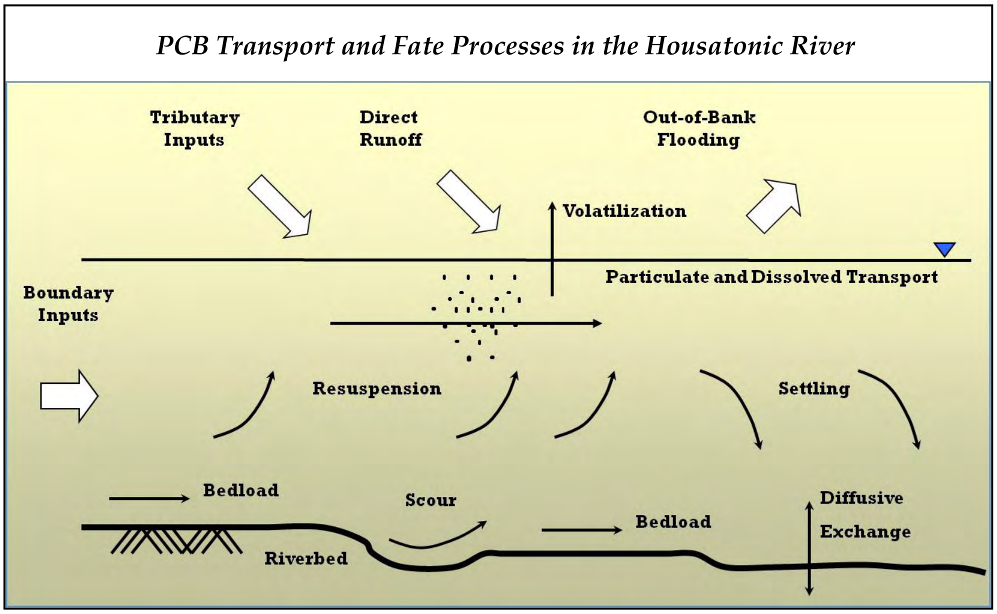


For additional information see "EPA's Cleanup Decision Process" and "Cleanup Alternatives in the Revised CMS" information sheets at http://www.epa.gov/ne/ge/thesite/restofriver-reports.html#CommunityUpdates.

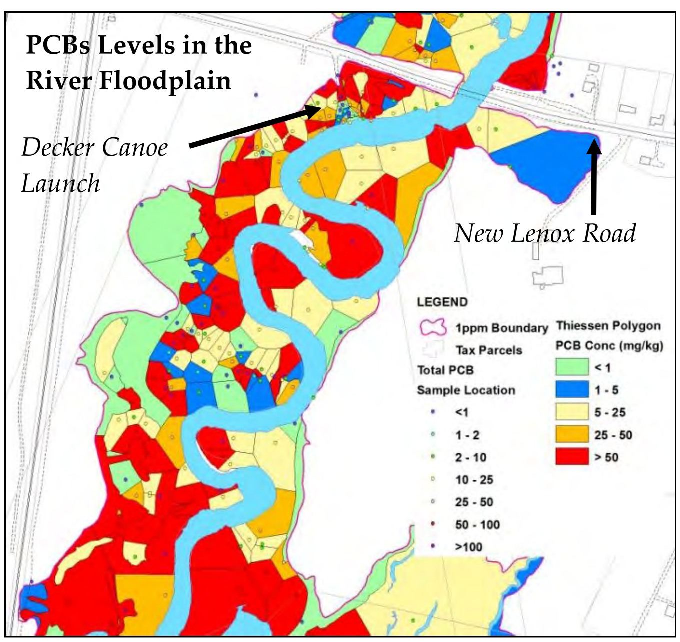
Presentation One: PCB Distribution, Fate, and Transport

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).

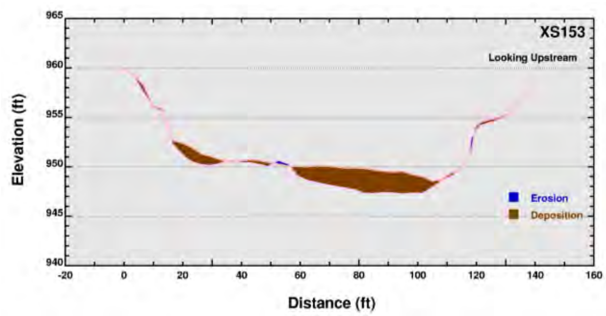


Bank Failure and Erosion Puts PCBs into the River over Time

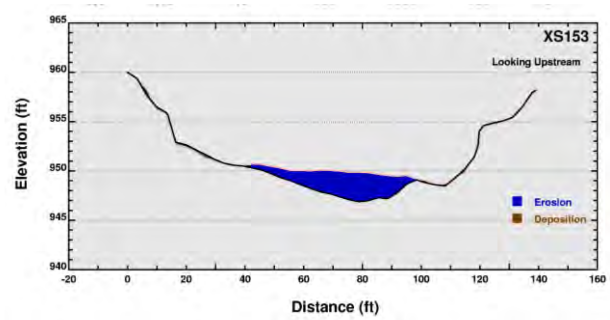
PCBs occur deep in the riverbed as well as at the bed surface. Sediment transport is very active, so PCBs deeper in the riverbed are not always permanently buried. Like riverbanks, the riverbed is subject to erosion and deposition. Sediment eroded from the bed carries PCBs into River water where it is 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*

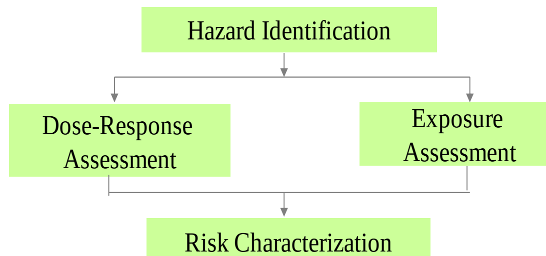
HOW DID EPA DETERMINE IF PCBs THREATEN THE HEALTH OF PEOPLE USING THE HOUSATONIC RIVER AND ASSOCIATED FLOODPLAIN?

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 2[2] 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

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.

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

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.

[2] Corrected 4/21/11

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.

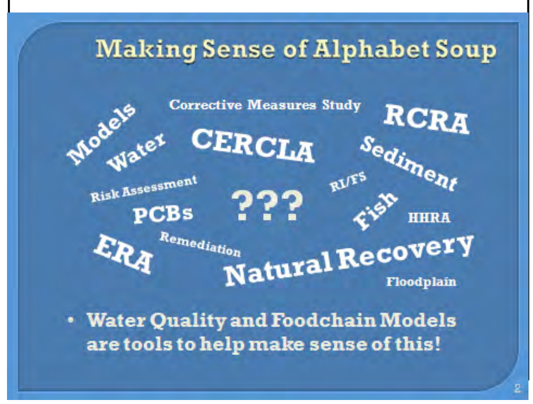
Other animals have lower risk, including fish, insect-eating birds, fish-eating birds, small mammals, and several endangered species. For these animals, the estimated degree of harm was lower and the lines of evidence were not always in full agreement, so there is some uncertainty in these risk estimates

Presentation Four: Why Use Models for the Housatonic River?

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

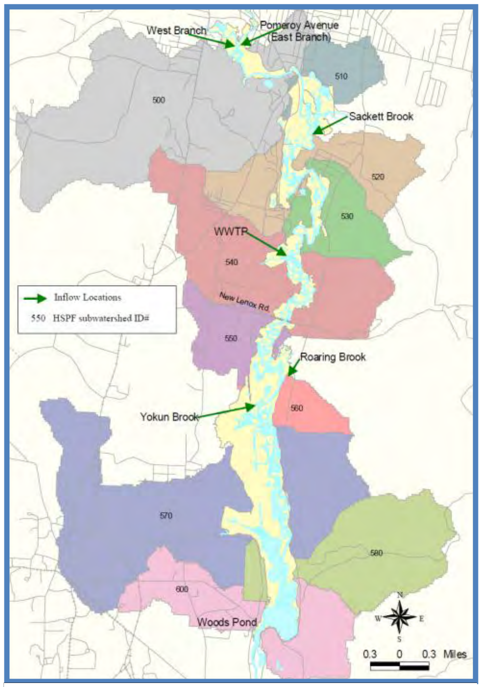
PCB investigations in the Housatonic River have been conducted for several decades. As required by the Consent Decree, in the 2000's EPA conducted a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA). These studies concluded that PCBs in the Housatonic River and surrounding floodplain 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.

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.



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.

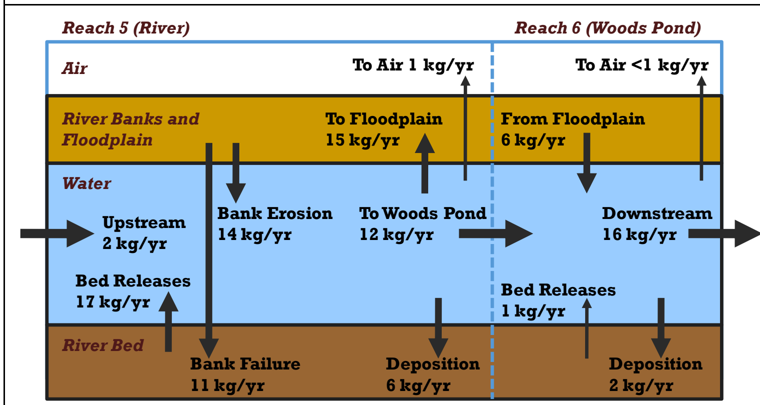
EFDC includes many detailed processes that occur in the River. It simulates PCB levels in water, sediment, and floodplain soil within the 10-year floodplain. The EFDC model grid has thousands of small compartments stretching from the confluence of the East and West Branches of the River just outside 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.

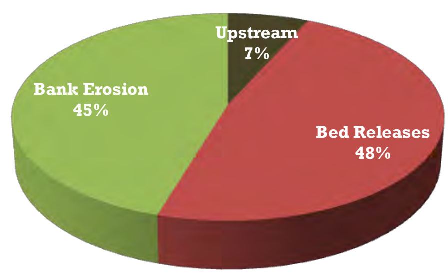
Model results and site-specific data should be considered together. Detailed information from River monitoring and modeling studies provides a thorough understanding of the River. Importantly, monitoring data and modeling results document that there are no hotspots (small areas that have much higher 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



MNR = Monitored Natural Recovery

Importance of PCB Sources



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

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

www.epa.gov/region1/ge

KEY CONTACTS:

JIM MURPHY
U.S. EPA Community Involvement Coordinator
(617) 918-1028
murphy.jim@epa.gov

SUSAN SVIRSKY
U.S. EPA Rest of River Project Manager
(617) 918-1434
svirsky.susan@epa.gov

GENERAL INFO:

EPA NEW ENGLAND
5 Post Office Sq.,
Suite 100
Boston, MA 02109-3912

TOLL-FREE CUSTOMER SERVICE
1-888-EPA-7341

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
(860) 672-6678

Massachusetts DEP
(413) 784-1100

Connecticut DEP
(860) 424-3854

MINI WORKSHOP TWO PRESENTATIONS

EPA Mini Workshop Series

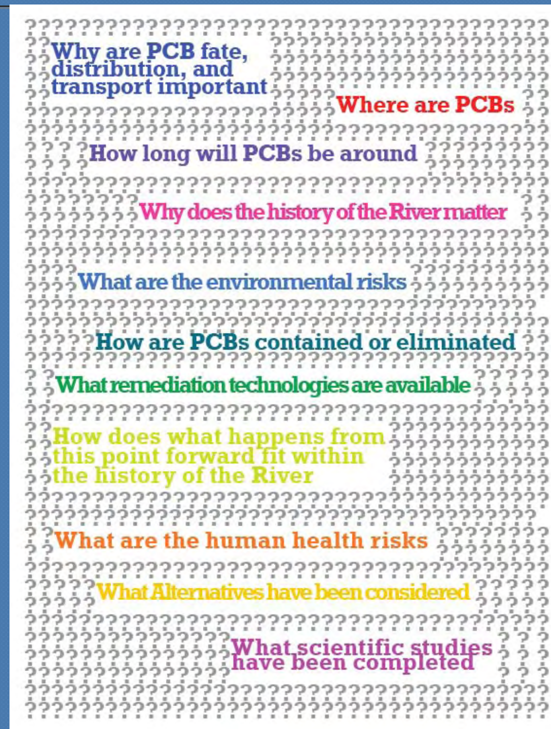
April 6, 2011

Background

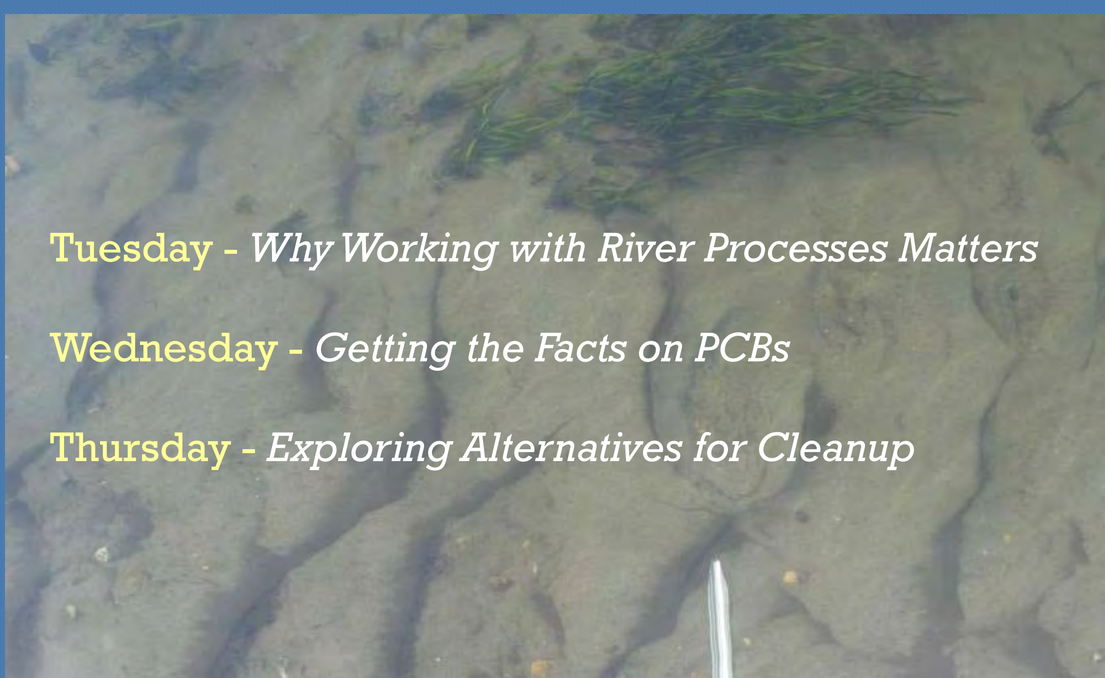
- GE submitted its Revised Corrective Measures Study (RCMS) in October 2010
- Informal Public Input period held, which closed on January 31st
- EPA's consultants held a series of interviews with stakeholders over the past few months regarding their view of the process and information needs
- One of the outcomes of these interviews is this series of Mini Workshops and the all-day hands-on Public Charrette session on May 7th to learn and interact regarding the Rest of River

Goals of Mini Workshops

- Provide the Community with an:
  - Understanding of the work that EPA and others have done on the Rest of River
  - Understanding of how the River works and is affected by the PCB contamination
  - Opportunity to get questions answered
- Result – Stakeholders should have a better understanding of the issues associated with any cleanup of the Rest of River and are prepared for the Public Charrette



The Three Workshop Sessions



Tuesday - *Why Working with River Processes Matters*

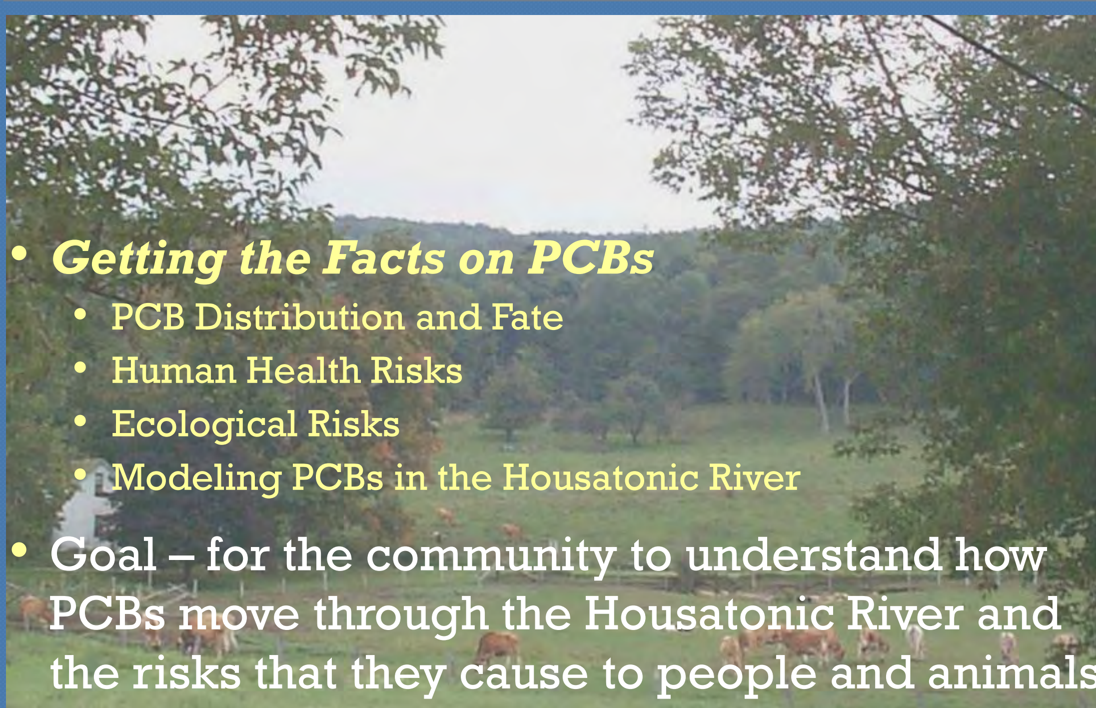
Wednesday - *Getting the Facts on PCBs*

Thursday - *Exploring Alternatives for Cleanup*

Decision Criteria for the Cleanup

- EPA will make a decision on the cleanup considering:
  - Input received from stakeholders
  - GE's Revised Corrective Measures Study
  - The 9 evaluation criteria specified in the RCRA Permit (listed below)
- General Standards
  - Overall protection of human health and the environment
  - Control of sources of releases
  - Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)
- Selection Decision Factors
  - Long term reliability and effectiveness
  - Attainment of IMPGs (interim cleanup goals)
  - Reduction of toxicity, mobility, volume
  - Short term effectiveness
  - Implementability
  - Cost

Tonight's Agenda



- ***Getting the Facts on PCBs***
  - PCB Distribution and Fate
  - Human Health Risks
  - Ecological Risks
  - Modeling PCBs in the Housatonic River
- Goal – for the community to understand how PCBs move through the Housatonic River and the risks that they cause to people and animals

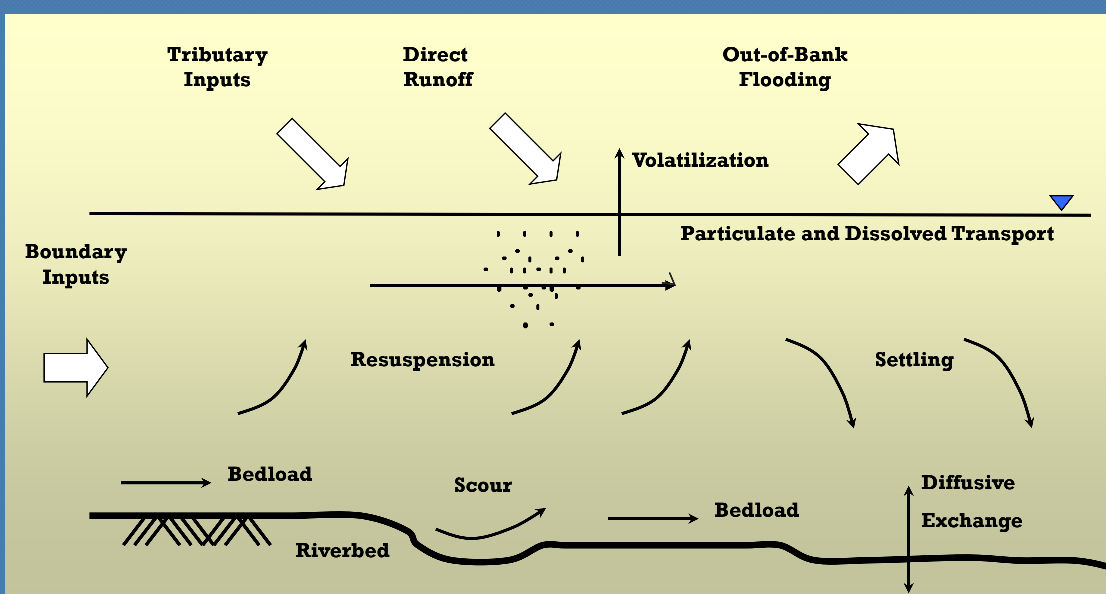
Public Charrette, May 7, 8:30am - 5:30pm

PCB Distribution, Fate & Transport

Ed Garland
HDR|HydroQual

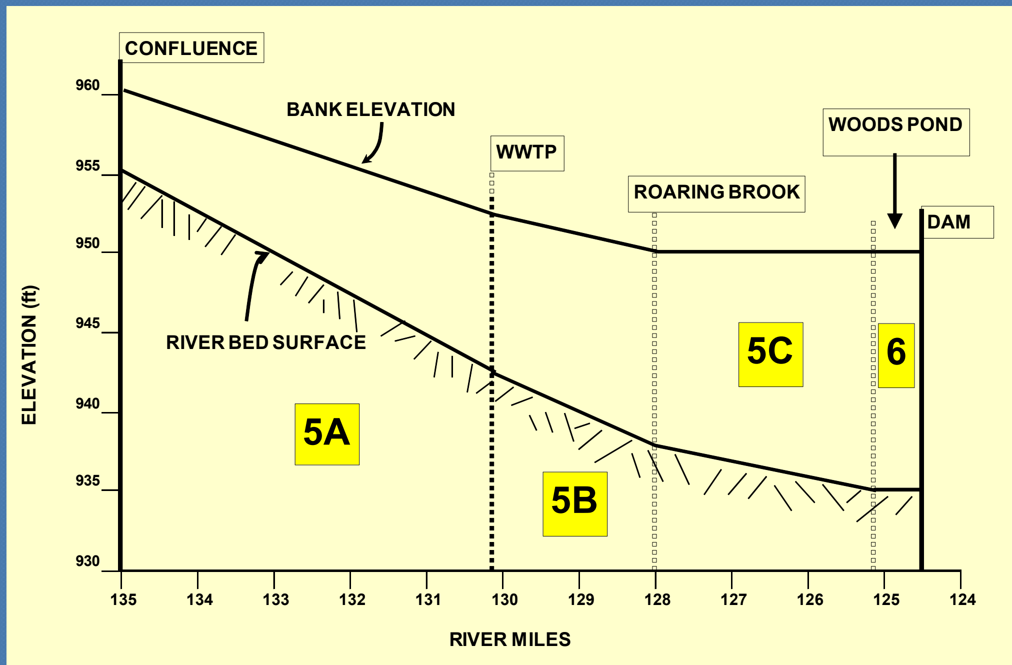
How Do PCBs Move in the River?

- A wide range of studies have been conducted to understand how PCB move through the river



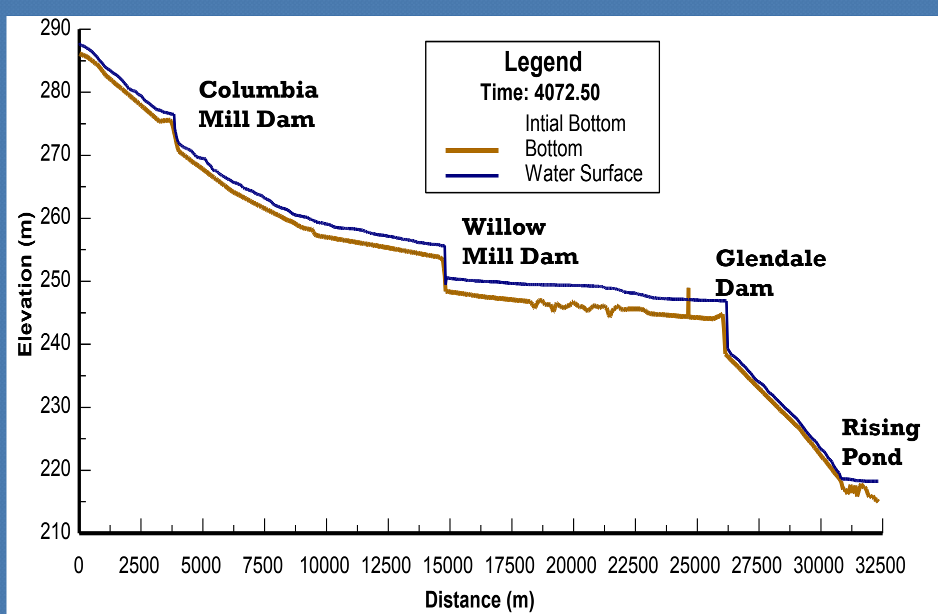
River Changes As You Go Downstream

- Bed Slope from Pittsfield to Woods Pond



River Changes As You Go Downstream

- **Bed Slope from Woods Pond to Rising Pond near Great Barrington**



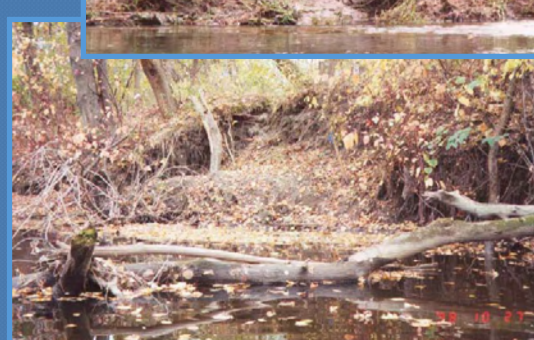
Extensive Site Data

- There are thousands of measurements for water, sediment, floodplain soils and biota
- These data were used to diagnose how PCBs move through the river and cause risk

Use	Data Type	Number Data
River Flow	**Stage**	**80,000**
Sediment Movement	**Suspended Solids**	**2,700**
	Sediment Grain Size	**3,300**
PCB Fate & Transport	**Water Column PCBs**	**1,100**
	Sediment PCBs	**4,100**
	Floodplain Soil PCBs	**over 5000**
	Biota	**over 5000**

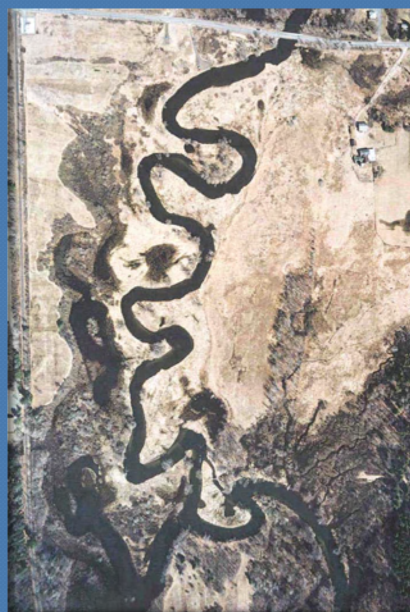
Some River Banks Are Eroding

- Banks in the upper reaches in Pittsfield and Lenox are not stable
- When banks erode, they put PCBs back into water and the sediment bed
- They account for ~45% of all PCBs entering the river



Floods Move PCBs

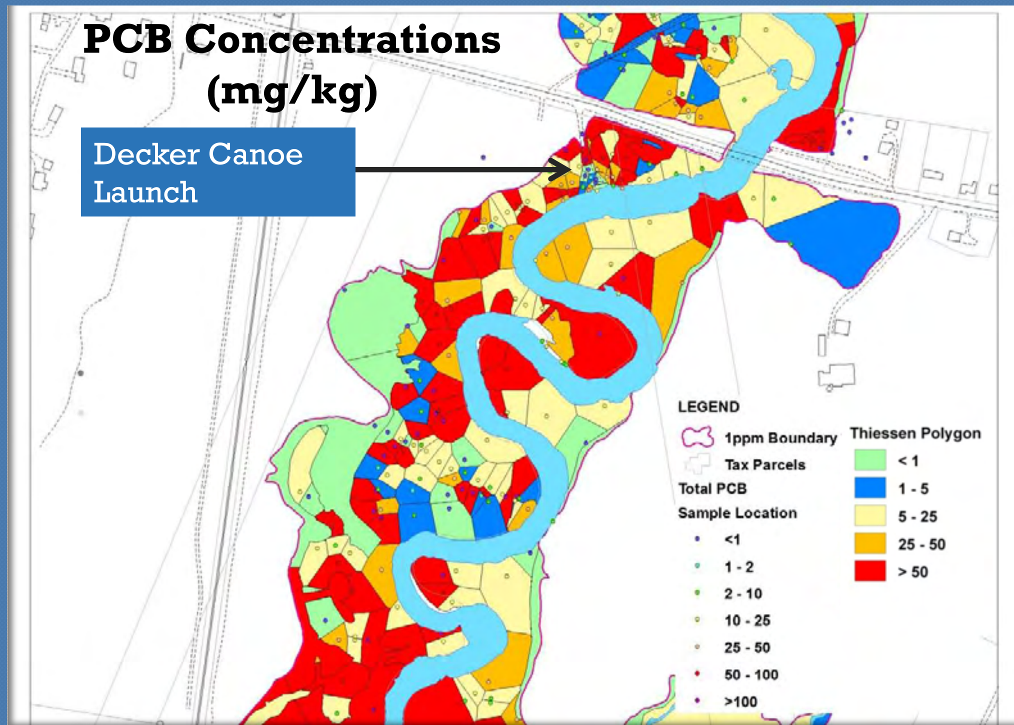
- Floods move PCBs onto the floodplain



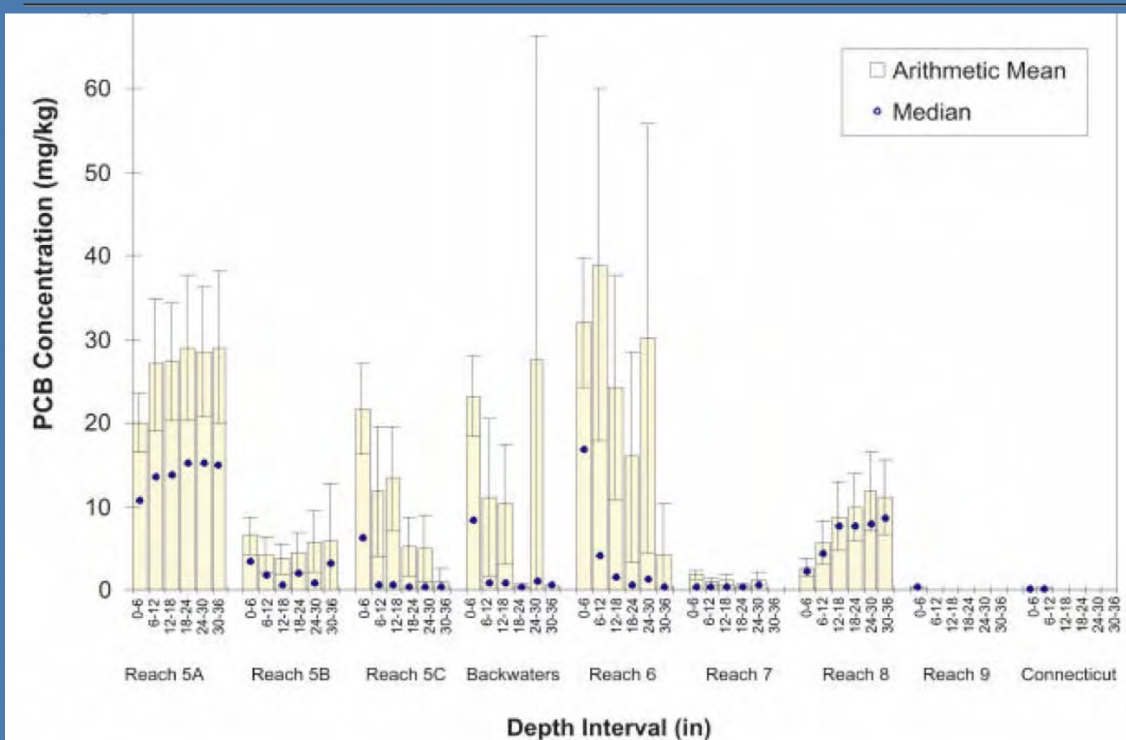
Deposition Following a Flood

- Sediment deposited at the top of a river bank following a flood (PCBs are deposited too)

PCBs Occur Throughout Floodplain

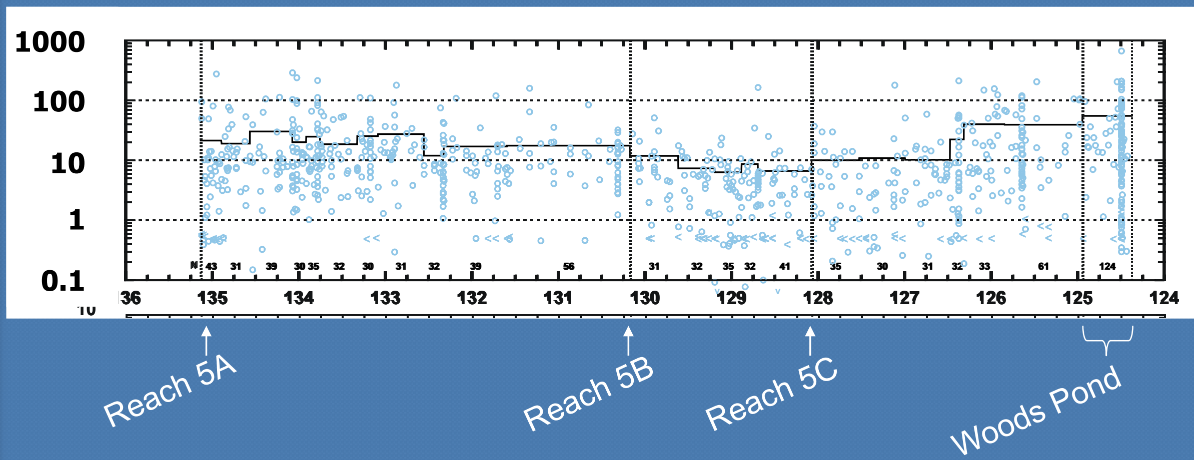


PCBs Levels are Highest between Pittsfield and Woods Pond



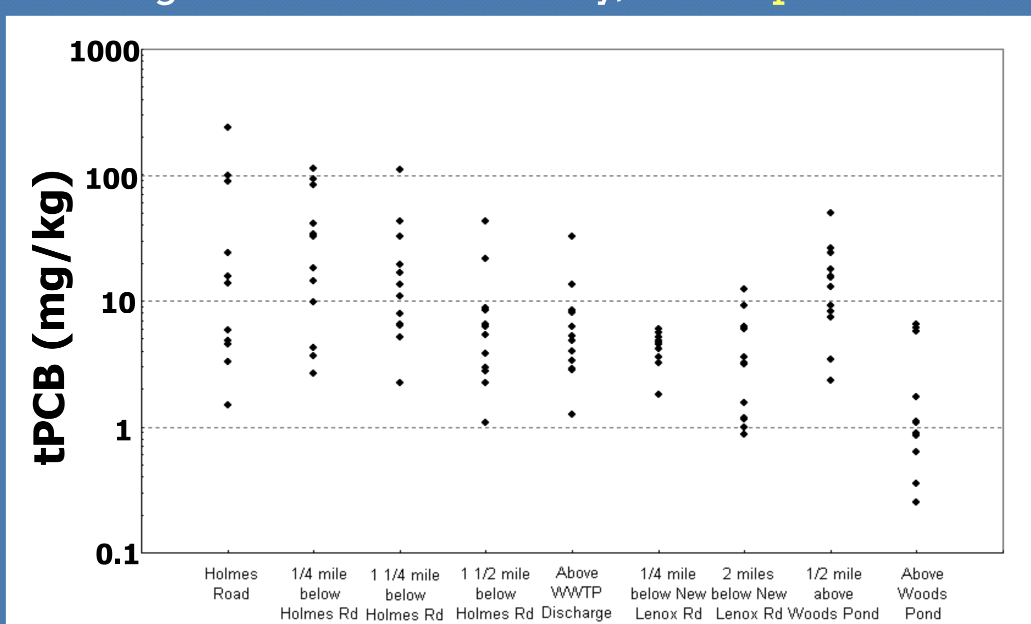
Sediment PCB Concentrations Vary Widely

Total PCBs (mg/kg) by River Mile



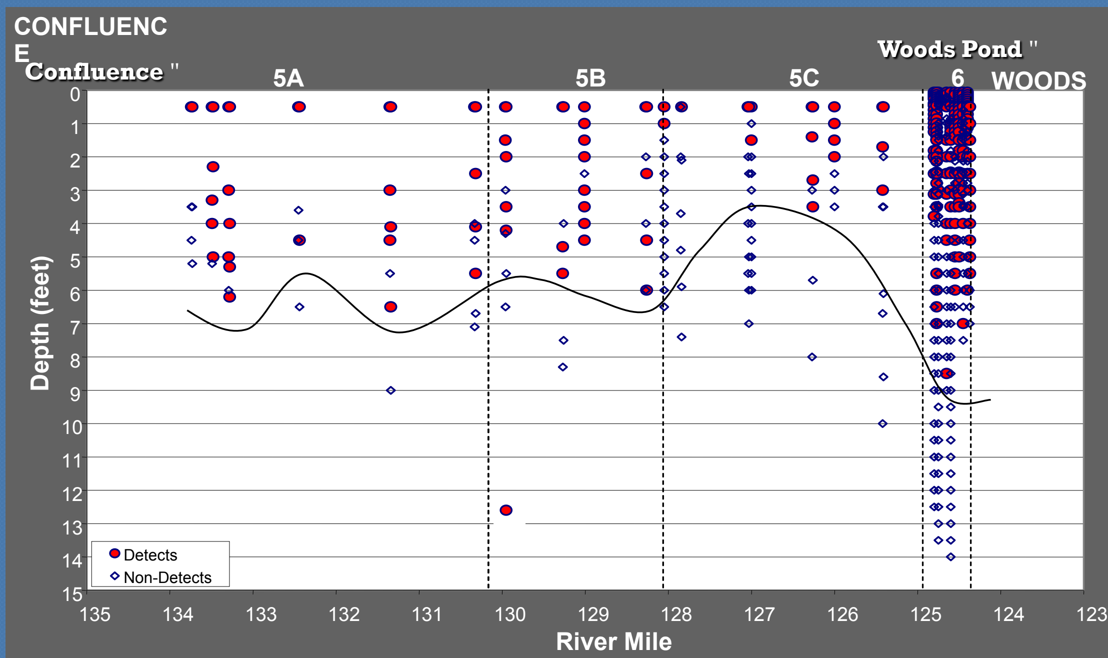
Do PCB Hotspots Exist in the Bed?

- A hotspot has higher PCBs relative to nearby areas
- Although PCBs in the bed vary, no hotspots occur

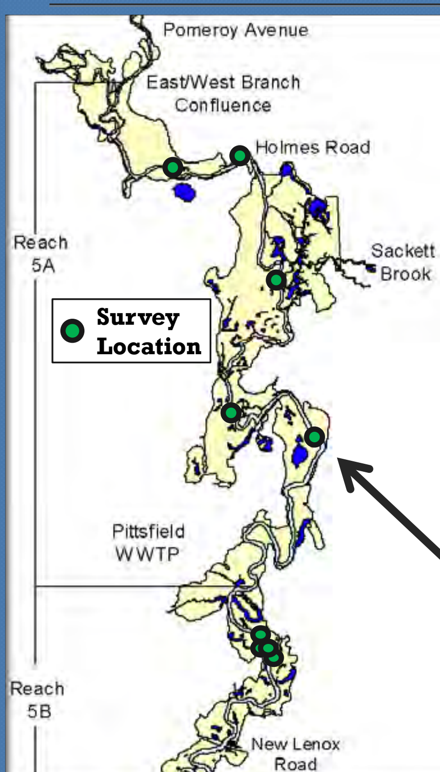


PCBs Are Present at Depth

- PCBs are up to 4-9 feet deep in sediment and soil #



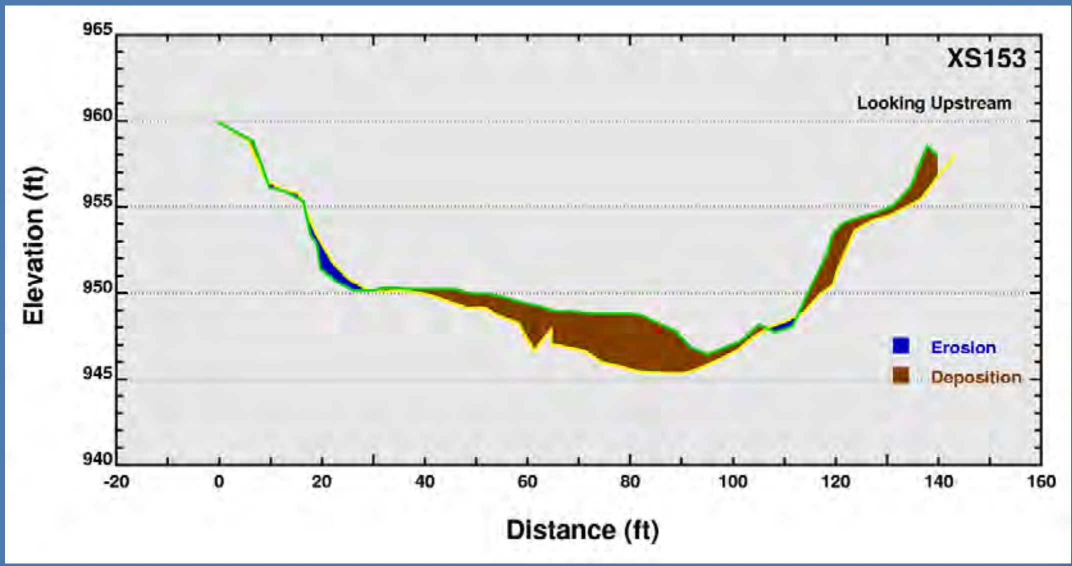
Are PCBs Permanently Buried?



- The riverbed is subject to both erosion and deposition
- Several feet of erosion can occur over time, moving PCBs at the surface and re-exposing PCBs once located deeper in the bed
- This process was confirmed by carefully surveying river cross-sections at many locations over several years
- Survey results for an example cross-section in Reach 5A follow

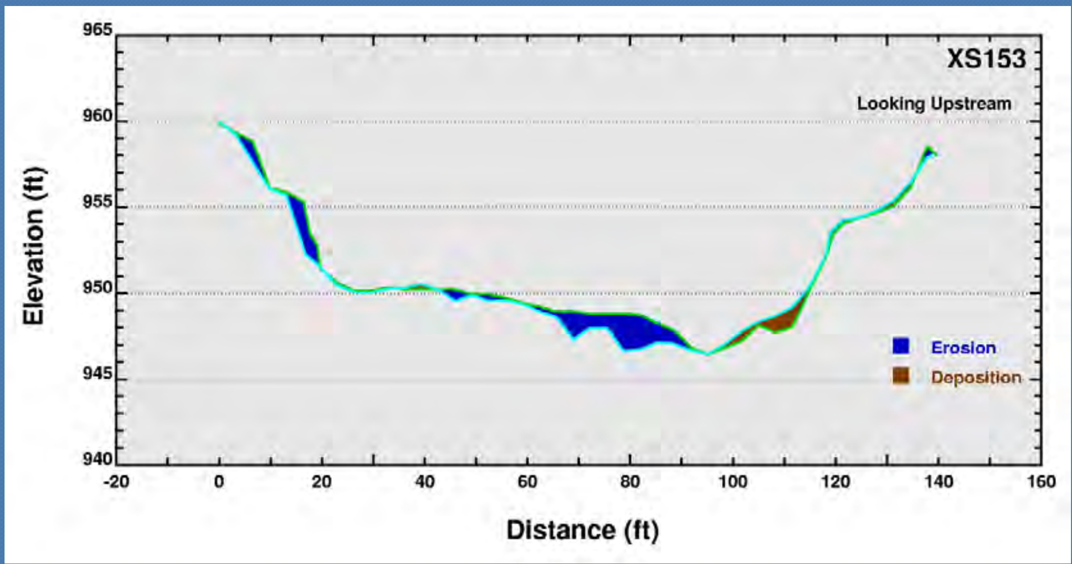
River Bed Changes Over Time

- **July 2001 to February 2002:**
  - **Substantial sediment deposition with two small erosion areas**



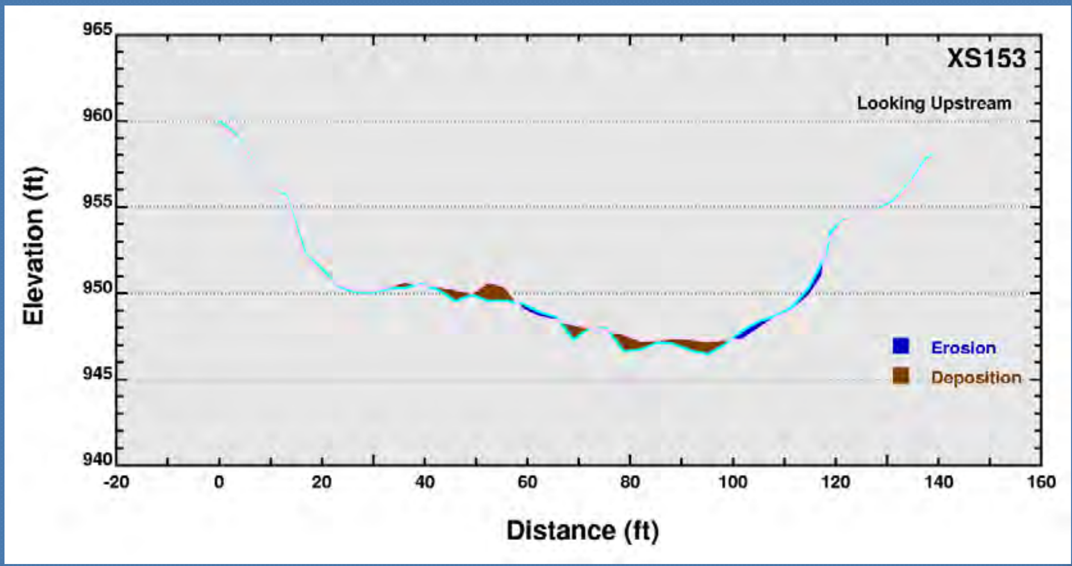
River Bed Changes Over Time

- **February 2002 to April 2002**
  - **A small area of deposition with larger areas of moderate erosion**



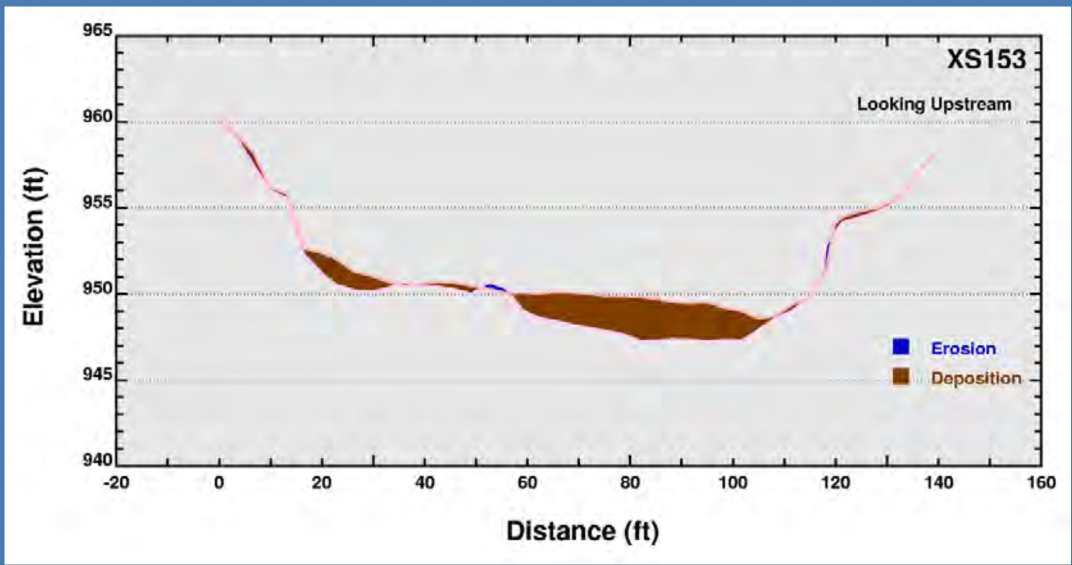
River Bed Changes Over Time

- **April 2002 to June 2003**
  - **Many small areas of erosion and deposition with little net change overall**



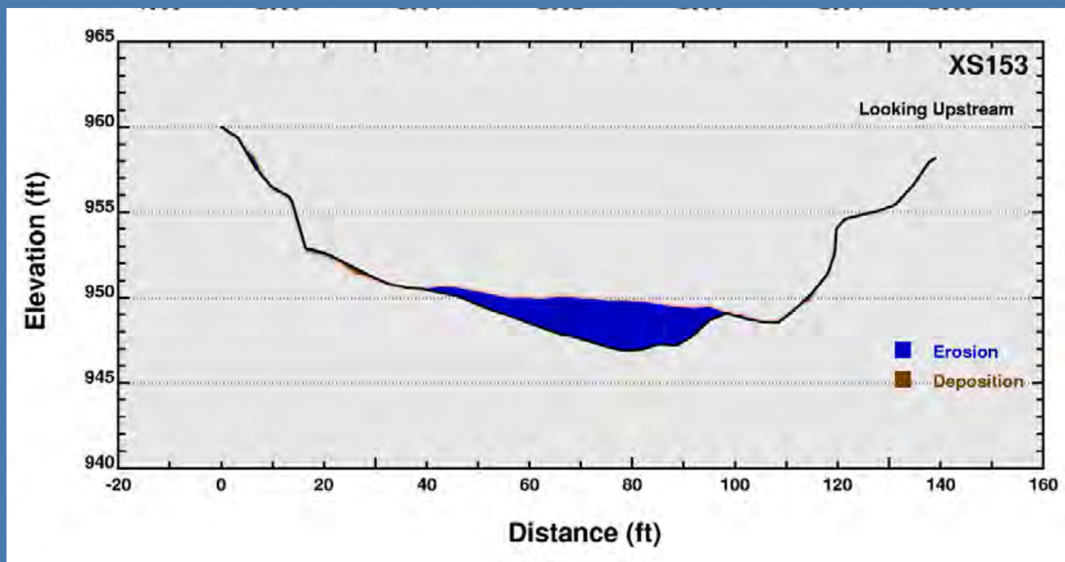
River Bed Changes Over Time

- **June 2003 to March 2005**
  - **Large areas of widespread deposition with one very small area of mild erosion**

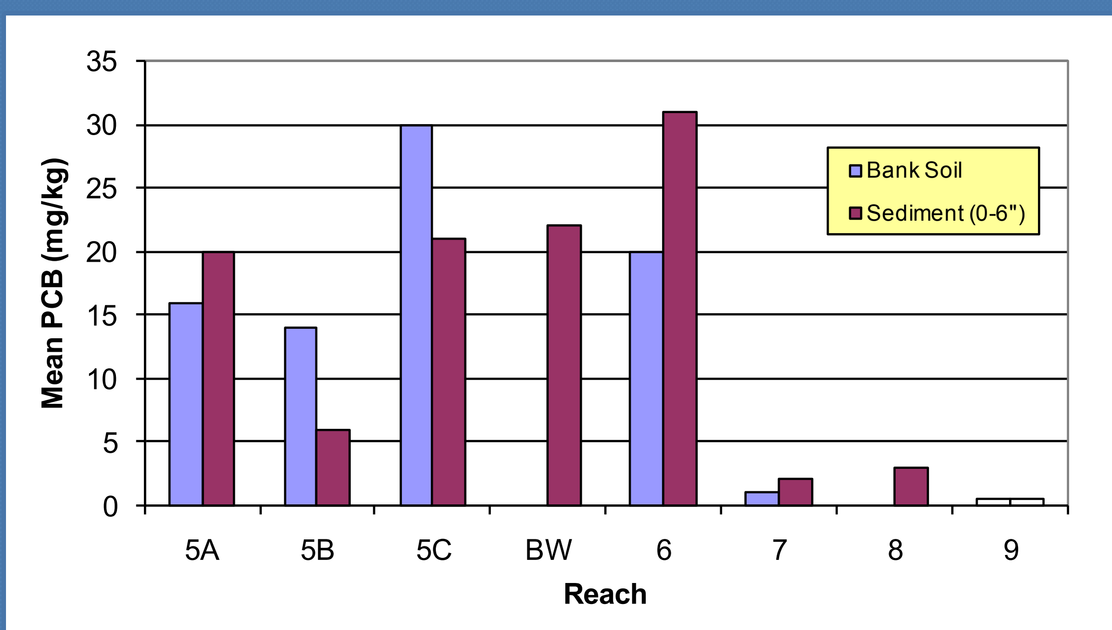


River Bed Changes Over Time

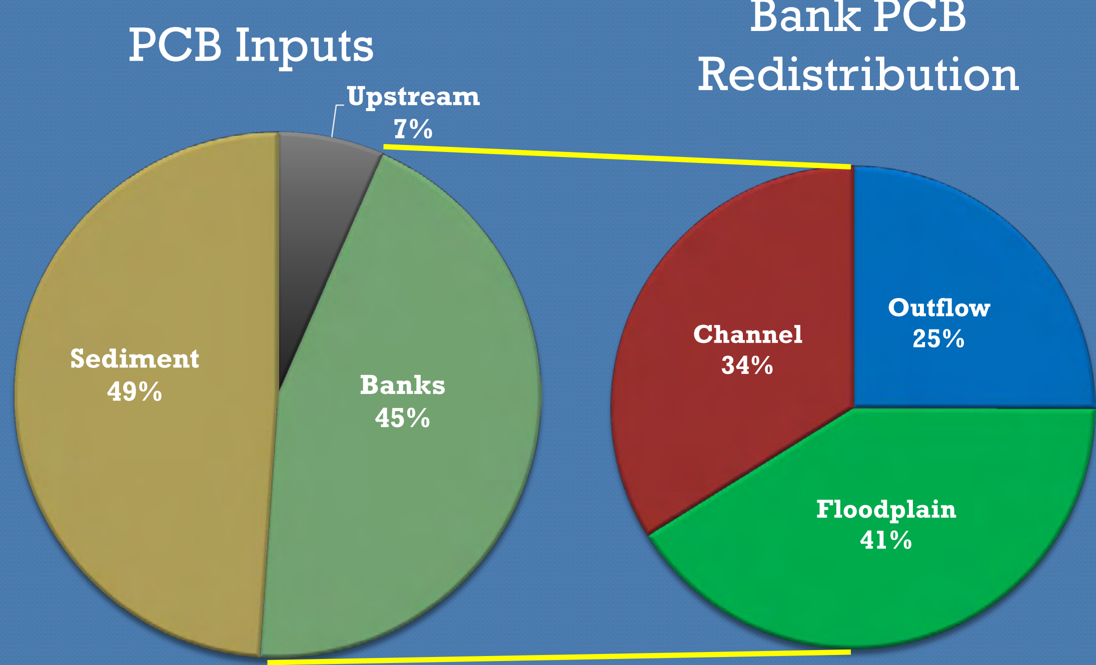
- March 2005 to June 2005
  - Large area with substantial erosion mid-channel



Sediment and Bank PCB Concentrations



Redistribution of Bank PCBs



Does Woods Pond Trap PCBs?

- Not really – Trap efficiency is low.
- Trap efficiency:
  - Measures how well sediments or chemicals are retained
  - Depends on what goes in and out
- For Woods Pond:
  - Sedimentation is slow: 0.4 – 0.6 cm/yr (Cs-137 data)
  - It takes 4-6 years to accumulate just one inch of sediment
  - PCBs: only 9-13% trap efficiency
  - Approximately 90% of PCBs leave Woods Pond.

PCB Fate and Transport

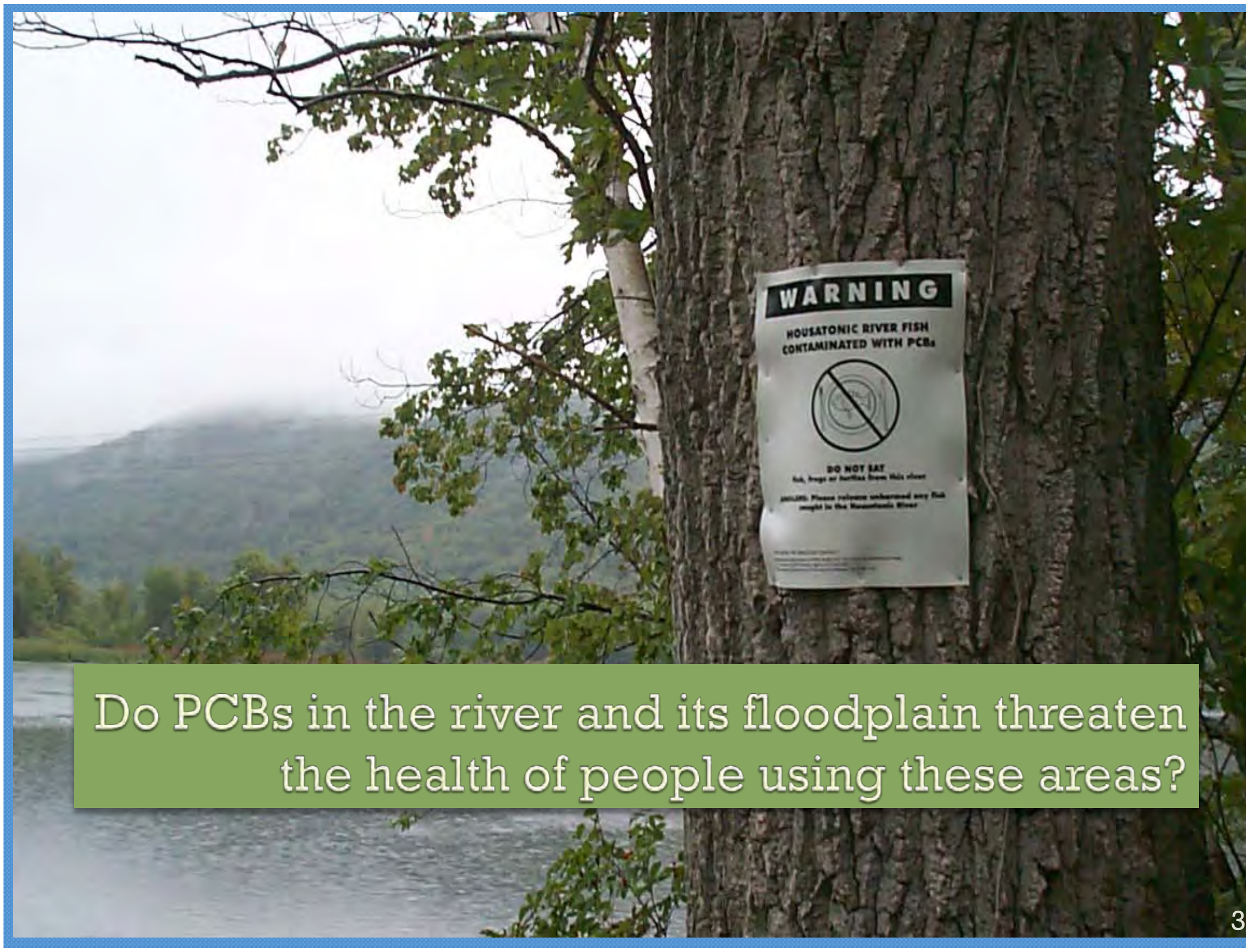
- PCB distribution and transport analyses based on extensive data collection efforts with many thousands of measurements
- PCBs are widespread, there are no sediment hotspots
- PCBs are not always permanently buried, erosion can re-expose PCBs in the bed
- Riverbanks are eroding and release PCBs
- Floodwaters carry PCBs onto floodplain
- Rate of natural recovery is slow – despite 2-mile cleanup, no appreciable decrease in PCBs in Woods Pond

Human Health Risk Assessment

Donna J. Vorhees
Science Collaborative

How do you enjoy the Housatonic River and nearby areas?

Photo credit: Cristin McKee



PCBs and noncancer effects

Immune Effects
- Studies in rhesus monkeys and other animals show adverse effects on the immune system

Neurological Effects
- Newborn monkeys experienced deficits in neurological development
- Studies in humans have also suggested effects on neurodevelopment

Endocrine Effects
- PCBs can affect thyroid hormone levels in animals and humans

Reproductive Effects
- Studies in rhesus monkeys and other animals suggest potential effects on the reproductive system
- Studies of women who ate large quantities of fish and who worked with PCBs in factories also suggest potential effects on the reproductive system

Other Noncancer Effects
- PCBs can affect the skin, eyes, liver, and possibly the cardiovascular system

PCBs and cancer

- Studies demonstrate that PCBs cause cancer in animals
- EPA and the International Agency for Research on Cancer have classified PCBs as probable human carcinogens

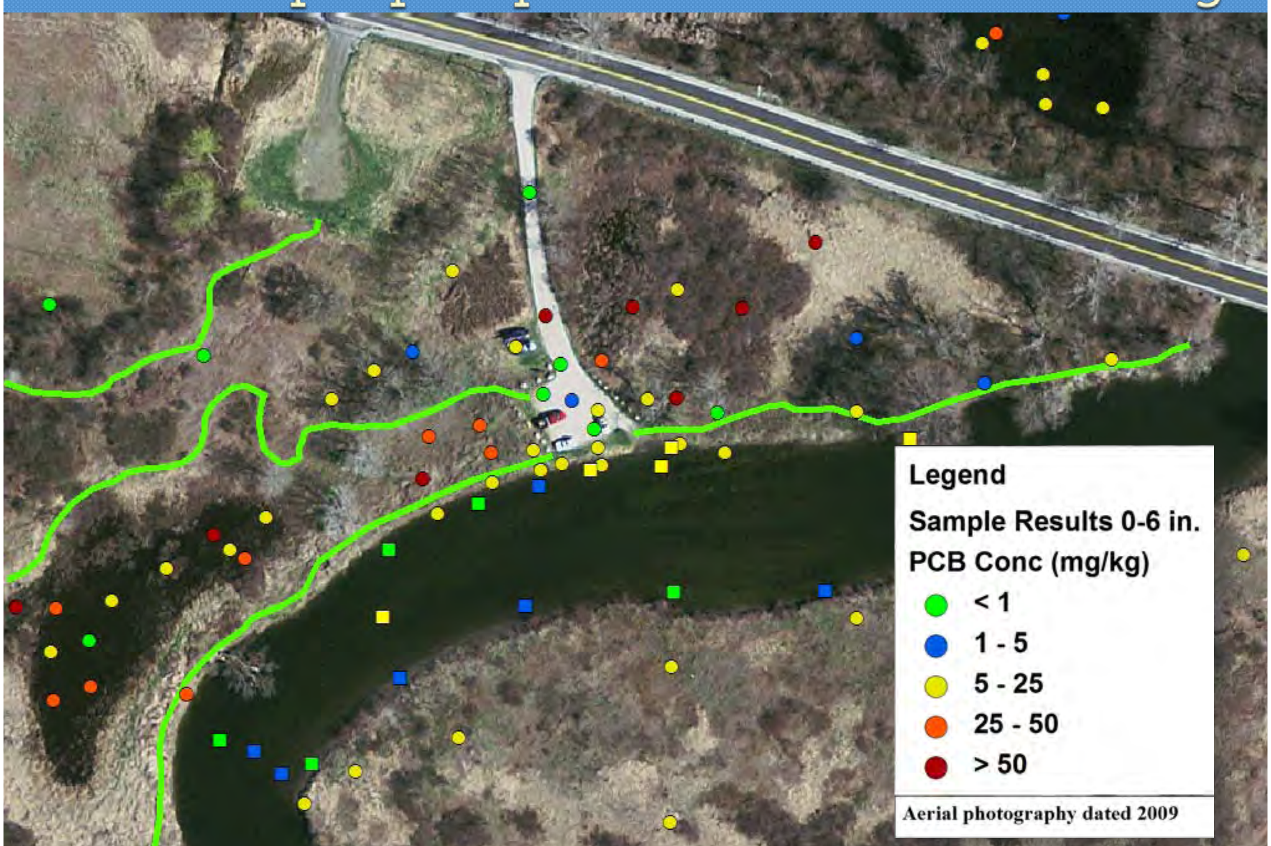
Questions evaluated in the risk assessment

- Is it okay to…
  - Let children play down by the river?
  - Walk, camp, mountain bike, and go birding in the floodplain?
  - Wade, swim, and canoe on the river?
  - Consume milk, poultry, beef, vegetables from the floodplain?
  - Collect and eat wild plants growing near the river?
  - Fish in the river and eat the fish?
  - Hunt near the river and consume waterfowl?

How people use the river and floodplain dictates their exposure to PCBs

- The risk assessment incorporates results of extensive research on how people use the area:
  - Observations during many visits to the area
  - Interviews with farmers, anglers, regional land use planners
  - Results from the Massachusetts Department of Public Health Survey
  - Relevant results from studies of other water bodies
  - Data regarding the intensity and frequency of exposure that might result from different types of activities

Where do people spend time and for how long?



Exposure Scenarios: direct contact with soil and sediment

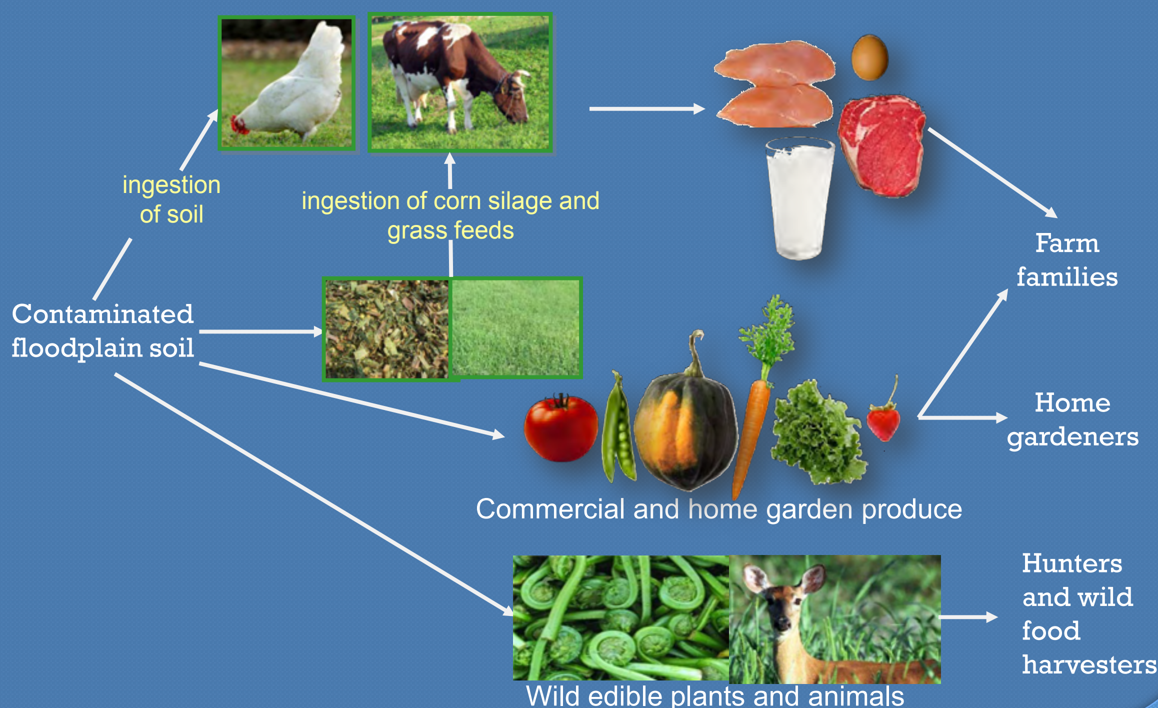
- Residential
- Agricultural
- Commercial & Industrial
  - Utility worker
  - Groundskeeper

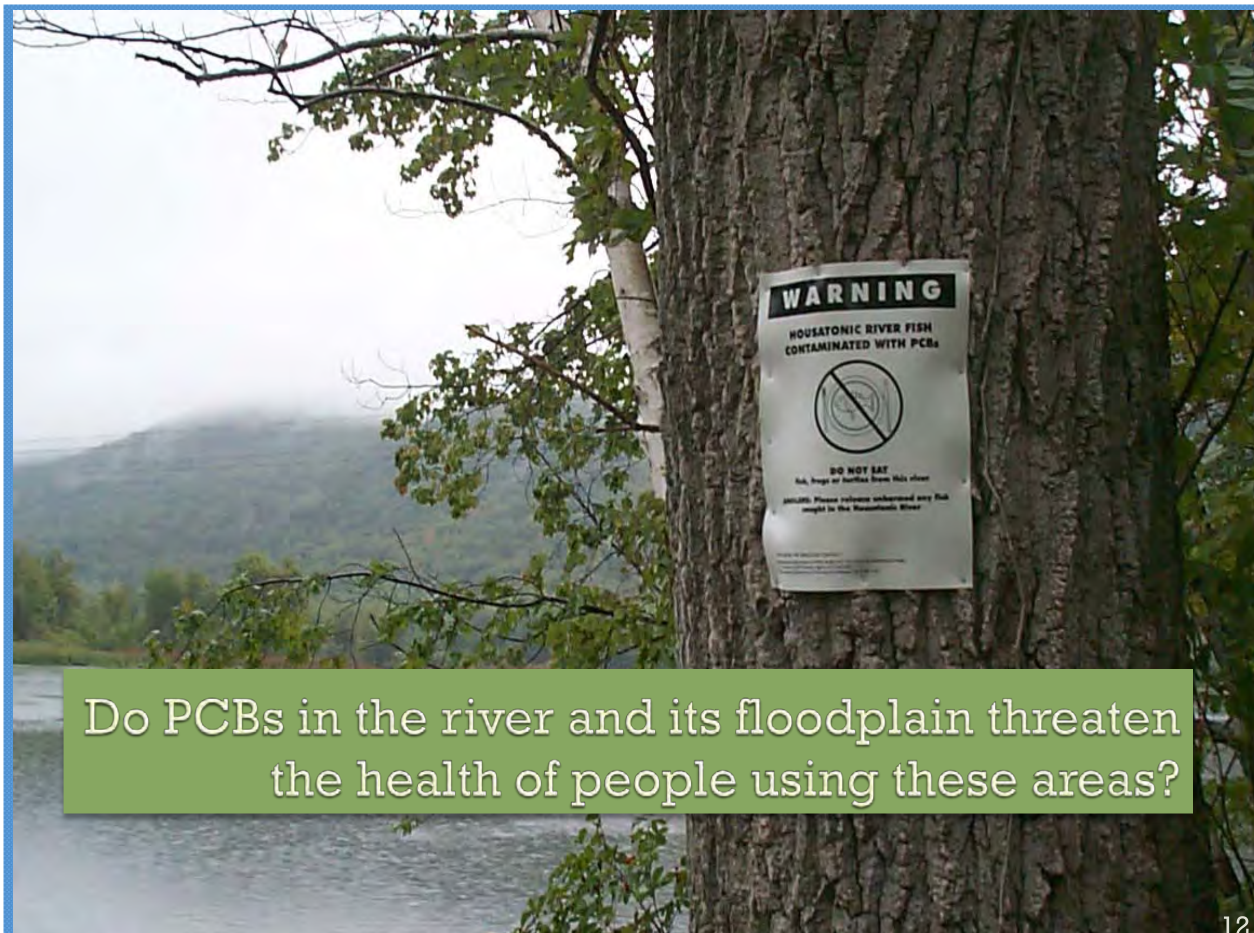
- Recreational
  - General recreation
  - ATV/dirt and mountain bike rider
  - Recreational canoeist/boater
  - Marathon canoeist
  - Angler
  - Waterfowl hunter

Exposure Scenarios: fish and waterfowl consumption

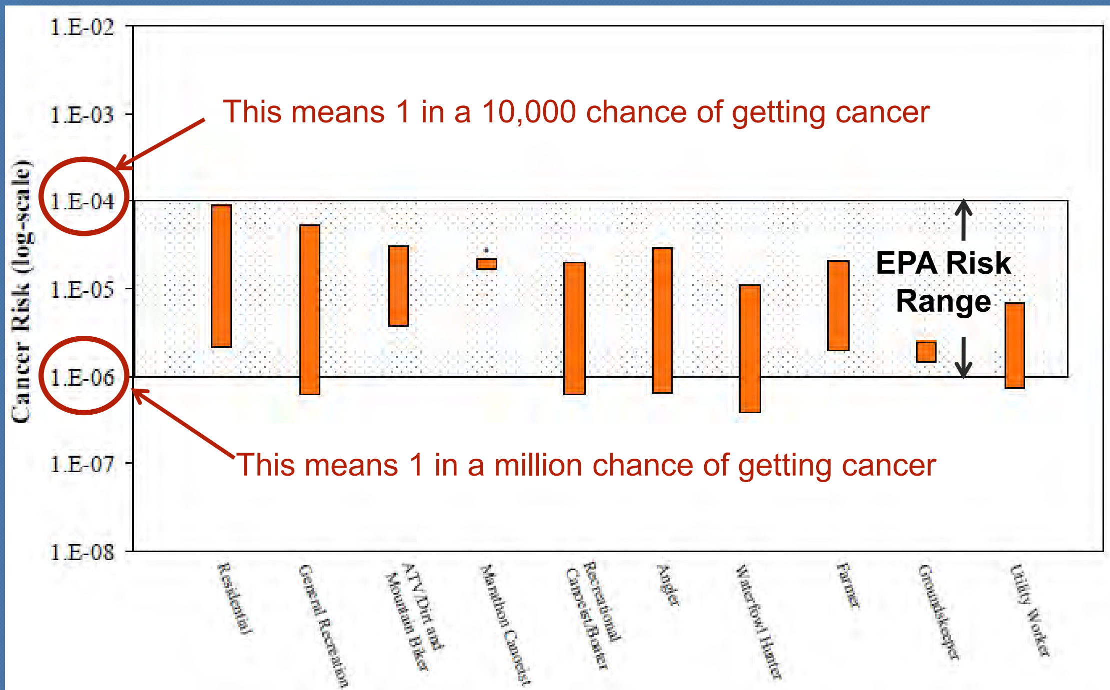
- Massachusetts:
  - brown bullhead
  - largemouth bass
  - sunfish
  - yellow perch
- Connecticut
  - smallmouth bass
  - trout
- Massachusetts:
  - wood duck
  - mallard

Exposure Scenarios: agricultural products and home gardens



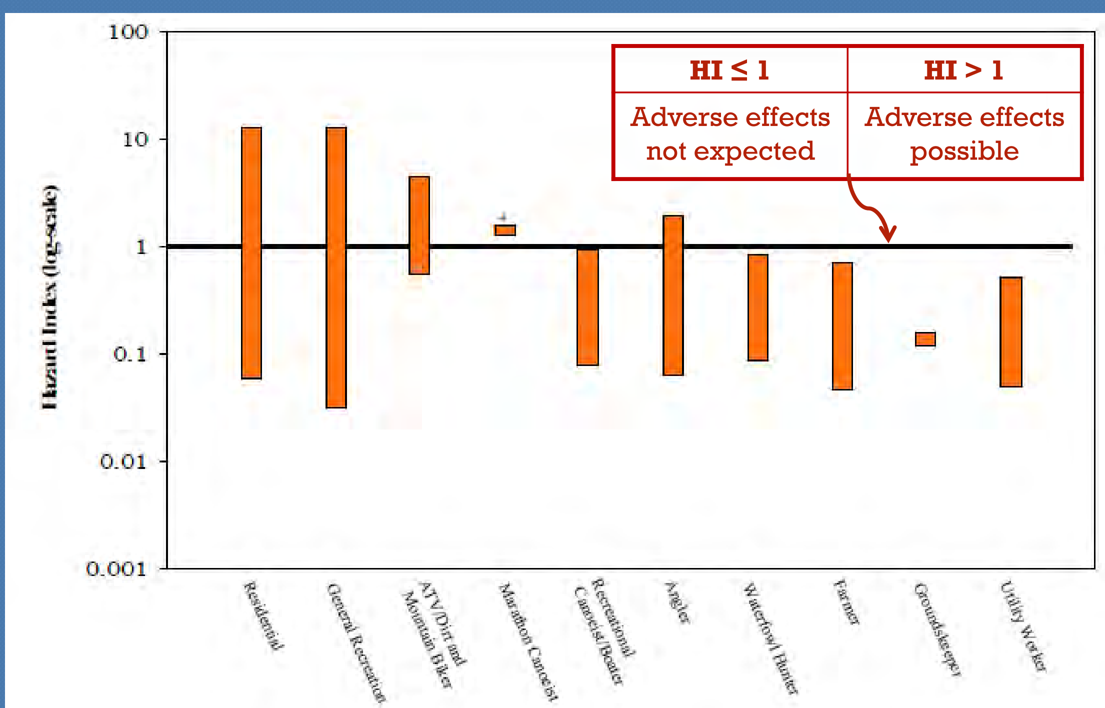


Cancer risk: increased probability of getting cancer over a lifetime



Land Use Scenarios Exposure to Soil

Hazard Index (HI): compares site exposure to level without appreciable risk



Land Use Scenarios Exposure to Soil

Risk from direct contact

Source: www.americantrails.org/resources/art/MA GBHtrailAWS.html

PCBs in Soil

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

PCBs in Sediment

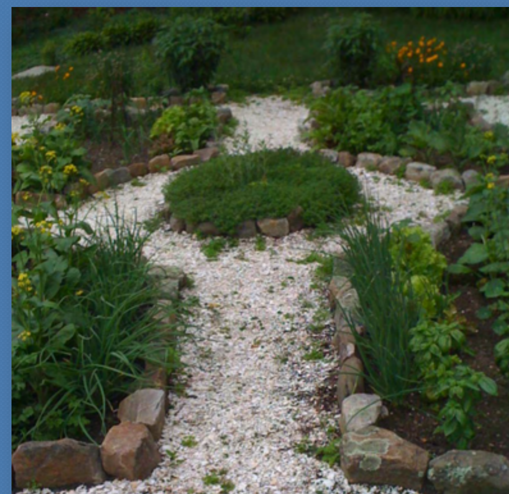
- Cancer risk estimates are within the EPA risk range at all eight sediment exposure areas.
- Noncancer hazard indices exceed 1 at 2* of the 8 sediment exposure areas
- * Corrected 4/21/11

Risk from fish and waterfowl consumption

- Cancer risk estimates are well above the EPA risk range
- Noncancer hazard indices are well above the EPA benchmark of 1
- Cancer risk estimates and noncancer hazard indices are generally higher from fish or waterfowl taken closer to the site of PCB releases, than from those taken farther downstream

Risk from agricultural products

- No cancer risk estimates above EPA's risk range and no noncancer hazard indices above EPA benchmark for:
  - home gardens
  - wild edible plants
  - currently operating commercial farms
- This conclusion could change if farming locations and practices change in a way that involves more intensive or frequent exposure to contaminated soils

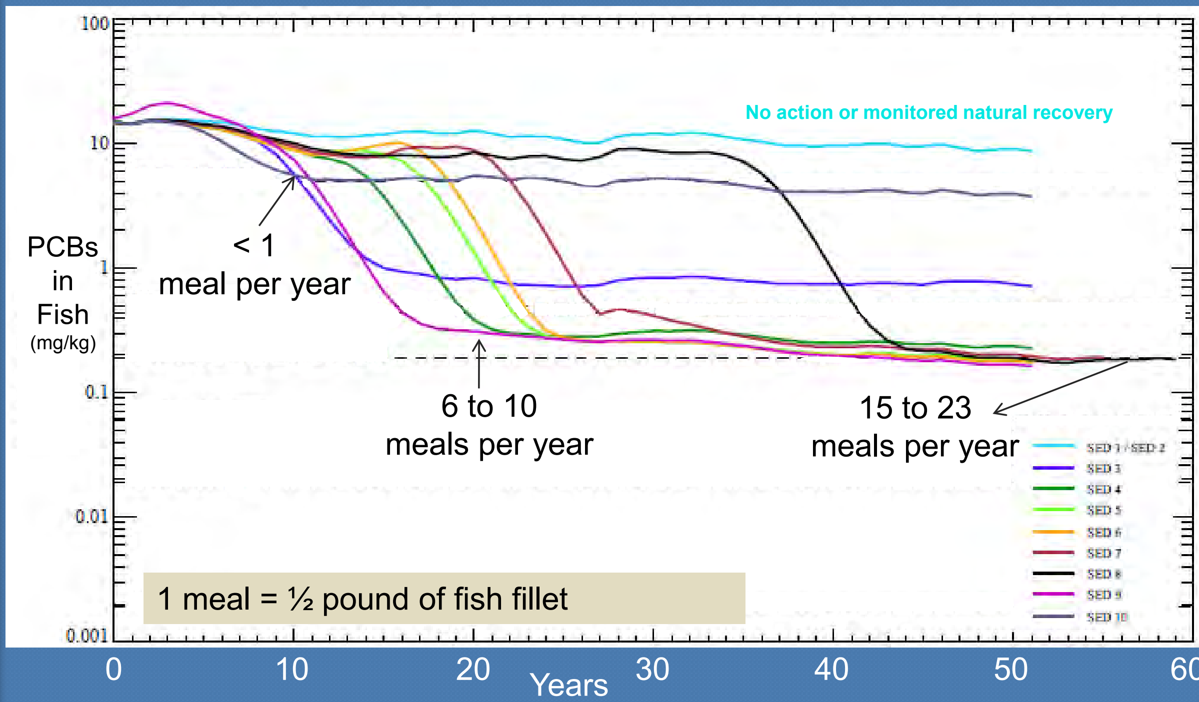


What do risk results mean for you?

- Now -
  - 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 (fish consumption)
- With Remediation -
  - More floodplain locations and river reaches will be suitable for the land uses and activities evaluated in the risk assessment
  - Fish can be caught and consumed from the river sooner than if no remediation occurs

How much fish can an adult eat?

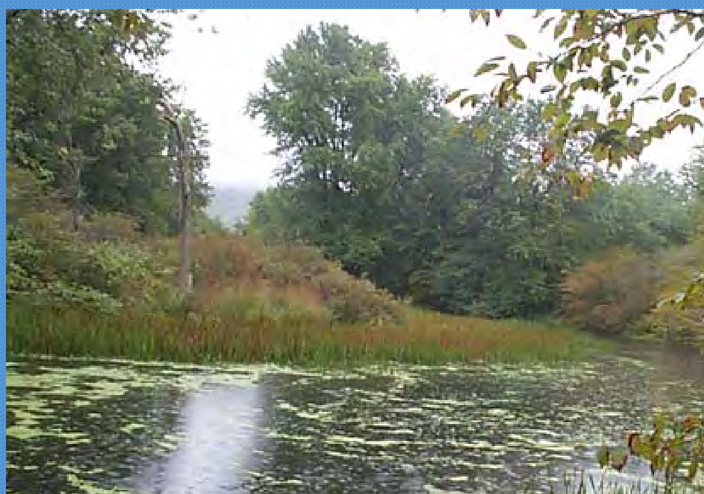
River Reach 6: Woods Pond



Peer review

- Recommended quantitative uncertainty analysis to explicitly evaluate uncertainty in predicting concentrations of PCBs in plants and animal products
- The revised risk assessment incorporated this analysis and responses to other peer reviewer comments

Ecological Risk Assessment



Gary Lawrence
Golder Associates

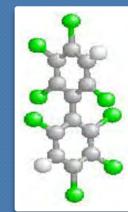
Paracelsus – The Father of Toxicology

- "All things are poison, and nothing is without poison; only the dose permits something not to be poisonous. "
- "The <u>dose</u> makes the poison."

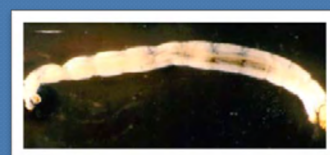
Potrait by Quentin Matsys, obtained at http://en.wikipedia.org/wiki/Paracelsus

Do PCBs really affect animals?

Manufacture banned in the U.S. in 1979 because of evidence that they build up in the environment and can cause harmful health effects (humans and wildlife).

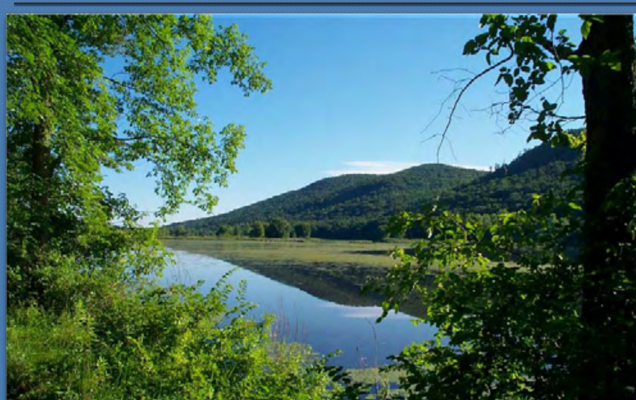


- Since then, an enormous effort has been directed to understanding PCB toxicity
- Some PCB responses occur via <u>dioxin-like toxicity</u> (e.g., trout deformities, mink jaw lesions)
- Other PCBs act in <u>other ways</u> (e.g., reduced survival and development)



Images: http://www.epa.gov/ne/ge/ (fish)

Looks healthy to me?



- *The river and floodplain appear attractive enough – so why should we be concerned?*

- You cannot see what is <u>missing</u>.
- The Rest of River area could be even better (realize full ecological potential).
- Meaningful ecological damage can occur without obvious or catastrophic effects.
- Cumulative effects - adds to other stressors.

Image: http://www.epa.gov/ne/ge/

Why are some affected but not others?

- Not all organisms are equally susceptible (sensitive)

	Wildlife (Birds, Mammals)	Aquatic Vertebrates	Aquatic Invertebrates
More Sensitive			
Less sensitive			

Image credits: http://www.flickr.com/photos/gmnonic/4881062678/ ; http://www.aquatax.ca/crayfish.html ; http://rybicky.net/atlasostatnich/zizalice_pestra; http://www.fly-fishing-discounters.com/largemouth-bass.html

Representative Species

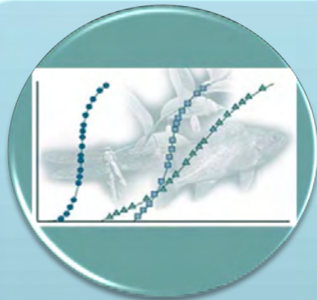
- Represent different animal types and habitats
- Goal is to assess each major component of environment
- Some are known to be sensitive to PCBs, others not
- Results are extrapolated to other animals of similar type

Why evaluate just a few?

- Limits to scientific information
- Minimize destructive sampling
- Some species have been studied in depth elsewhere

Images: http://www.enature.com/fieldguides/enlarged.asp?imageID=18733 (shrew) ; http://www.epa.gov/ne/ge/ (others)

Three Main Lines of Evidence



Chemistry

Literature based evaluation of PCB dose response

Toxicity

Site specific testing in controlled environment

Field Studies

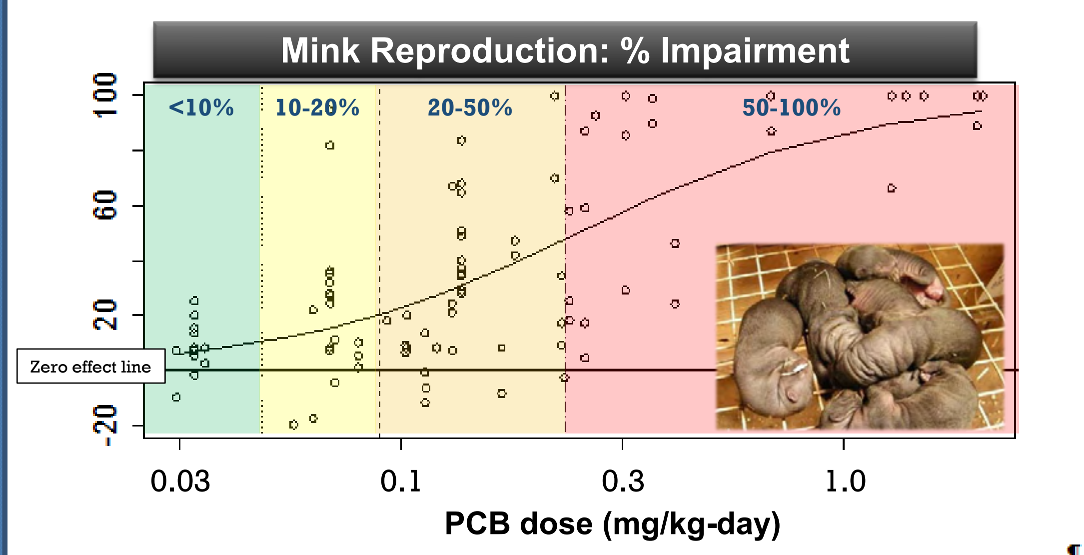
Site specific surveys in natural (field) environment

Assessed ecological response versus PCB concentration

Image credit: http://www.isbnlib.com/isbn/1566705789/Species-sensitivity-distributions-in-ecotoxicology; http://www.epa.gov/ne/ge/

1. Chemistry Line of Evidence

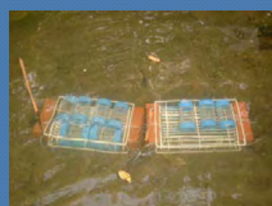
- Many other sites and experiments have investigated PCBs (similar mixtures) on similar organisms
- Thresholds for ecological effects can be derived

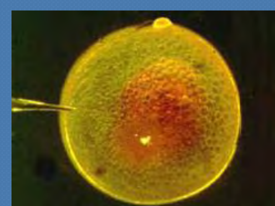


Images credit: http://springpeeperfarm-lisa.blogspot.com/

2. Toxicity Line of Evidence

- Site-specific (and expensive!)
- Multiple species and endpoints tested
- Survival, growth, reproduction, development and malformations
- Assesses toxic effects of site media on relevant organisms
  - Laboratory exposures (controlled conditions)
  - Field exposures (*in situ*)
  - Combined exposures (cross-over study)





Images: http://www.epa.gov/ne/ge/

Who conducted the toxicity work?

- ERA applied world-class expertise.
- Field surveys and toxicity assessments were conducted by experts in the field, such as:
  - Invertebrate Toxicity (Laboratory and *In Situ*) – Wright State University (Dr. Allen Burton, now at U. of Michigan)
  - Amphibian Toxicity – Fort Environmental Laboratories (Dr. Douglas Fort); Old Dominion University (Dr. W.J. Resetarits, Jr.)
  - Fish Toxicity – Columbia Environmental Research Center, U.S. Geological Survey (Dr. Donald Tillitt)
  - Mink Feeding Study – Michigan State University, Department of Animal Science (Dr. Steven Bursian)
  - Tree swallow study – Upper Midwest Environmental Sciences Center, U.S. Geological Survey (Dr. Christine Custer)

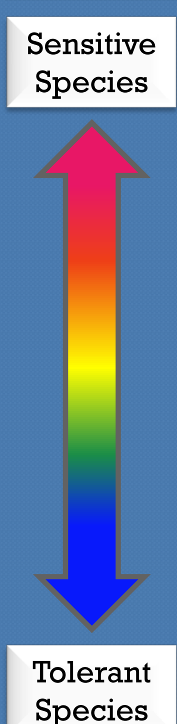
3. Field Study Line of Evidence

- Direct assessment of animals (real responses)
- Advantage: No need for lab to field extrapolation
- Disadvantage: Responses can be hidden by natural variability

- Examples:
  - Invertebrates in sediment
  - Amphibians (frogs, salamanders)
  - Fish (largemouth bass)
  - Birds (swallow, robin, kingfisher)
  - Mammals (mink, otter, shrew)

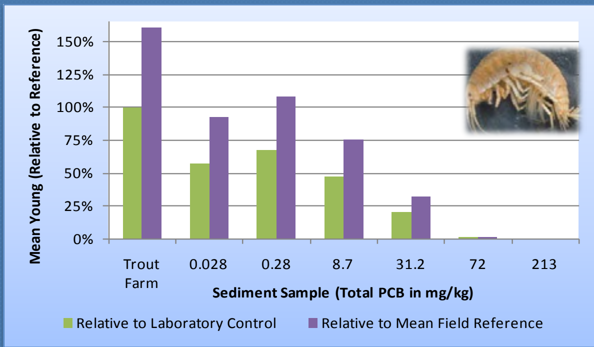
Images: http://www.epa.gov/ne/ge/

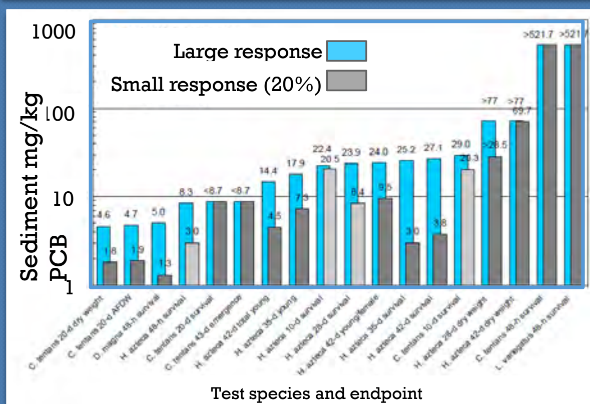
What did the field studies show?



- Some studies confirmed toxic responses :
  - Few mink/otter signs relative to habitat quality
  - Benthic invertebrates in high PCB sediments had fewer and less diverse organisms
  - Fewer types of amphibians in high PCB vernal pools
- Some studies showed lack of major damage, but did not assess sensitive indicators:
  - Largemouth bass are reproducing, but effect on recruitment of young possible
  - Shrews are abundant, but PCB effects possible
- Some studies showed tolerance, where no toxicity data were available:
  - Tree swallows appeared to be unaffected by PCB exposure
  - Kingfishers less sensitive than some other bird species

Benthic Invertebrates

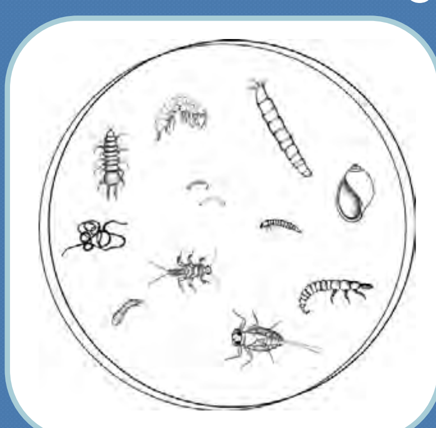




- Toxicity tests showed significant effects for most species
- Greater effects at higher sediment PCB concentrations
- Both lab and field tests showed similar results
- Sensitive species were midges and amphipods
- Worms were tolerant of PCB exposure
- TIE confirmed that toxicity was from organic chemicals

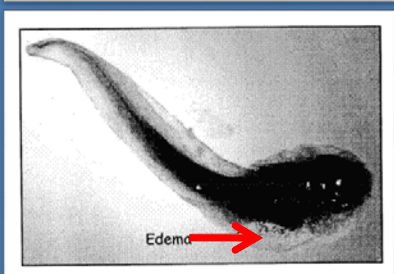
Benthic Invertebrates

- All three lines of evidence predicted significant effects
- Responses were not as large as predicted by sediment quality guidelines
- Site-specific threshold of 3 mg/kg total PCB

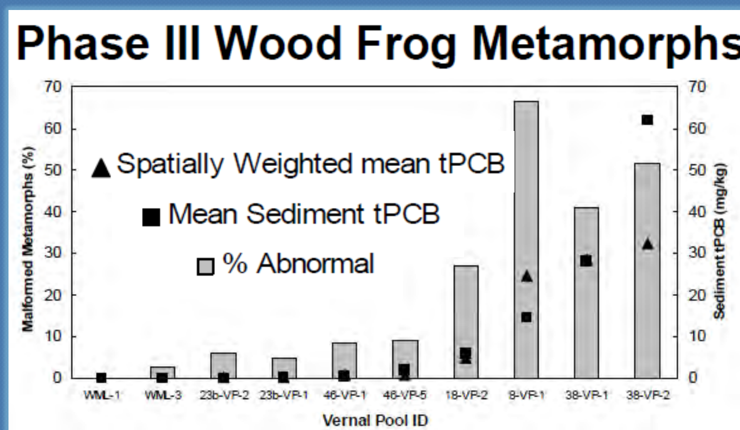


High Risk

Amphibians



- Significant toxicity to both wood frogs and leopard frogs (delayed development, malformations)
- Timing and magnitude of PCB exposure important – metamorph stage was sensitive



Images: http://www.epa.gov/ne/ge/

High Risk

Amphibians (continued)

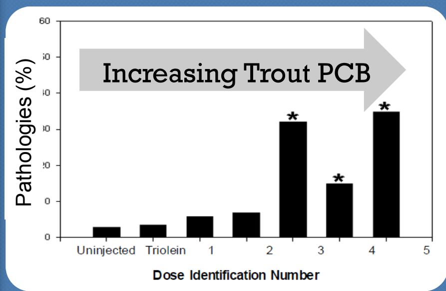
- Tissue PCBs in larvae often exceeded safe levels
- Community assessment showed indications of harm, although some reproduction is occurring:
  - Reduced number of species
  - Fewer salamanders
- Population model indicated increased chance of extinction for wood frogs

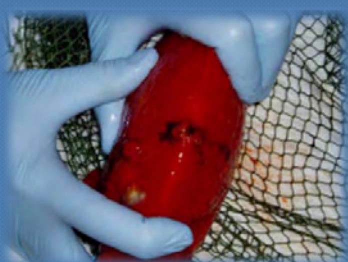
Image: http://www.epa.gov/ne/ge/

Low to Moderate Risk

Fish

- Toxicity tests showed adverse effects in trout, bass, and medaka
  - Phase I: delayed development, reduced survival of fry, developmental deformities
  - Phase II: cranofacial deformities, swim bladder problems, edema, deformed fins
- Some effects were indicative of dioxin-like toxicity
- Warmwater fish less sensitive than coldwater fish (trout)
- Self-sustaining bass population present in river
- Fish tissue PCBs in river overlap the derived effect threshold



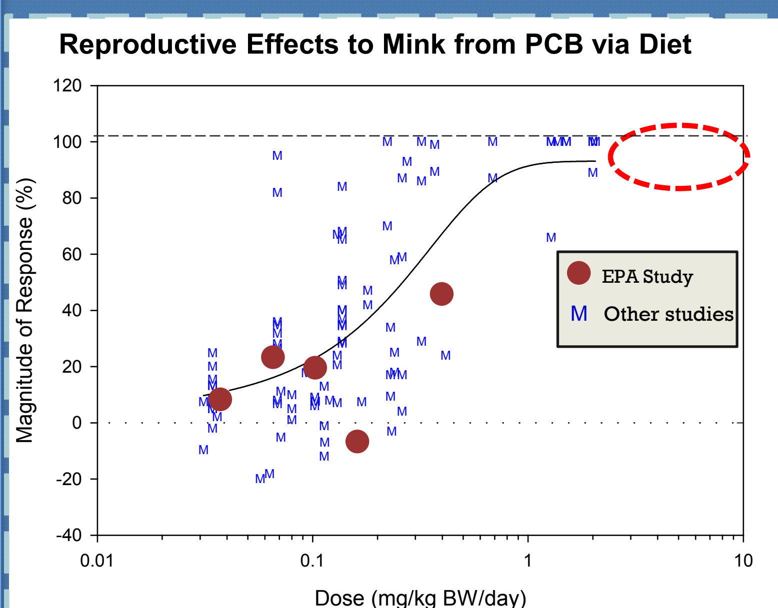


Images: http://www.epa.gov/ne/ge/; http://www.fly-fishing-discounters.com/largemouth-bass.html

High Risk

Fish-eating Mammals

- Mink in EPA feeding study showed responses similar to literature data



Maximum dose was 3.7 mg/kg fish, less than one tenth of average PSA fish PCB concentration.

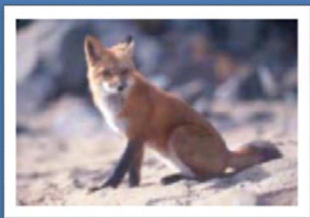
"Contaminated fish that composed approximately 1% of the diet would reduce mink kit survival by 20% or more."

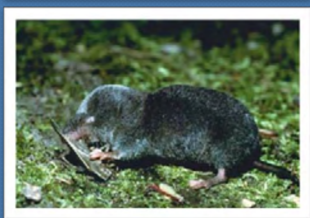
"Consumption expected for wild mink would have an adverse effect on wild mink populations."

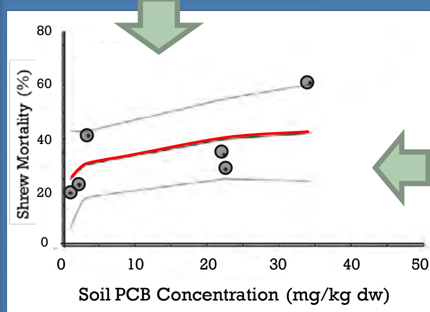
Image credit: http://www.flickr.com/photos/qmnonic/4881062678

Moderate Risk

Other mammals







- Elevated risks predicted based on comparison of estimated doses to literature data
- No site-specific toxicity tests performed, and few studies of similar species in literature
- Field surveys conducted:
  - EPA surveys – relative abundance of mammals versus soil PCB concentrations (semi-quantitative)
  - GE surveys – population demography study for short-tailed shrew
  - Shrew study showed some indication of response at highest PCB concentration

Images: http://www.enature.com/fieldguides/enlarged.asp?imageID=18733

Weight of Evidence

Animal Group	Chemistry LOE	Toxicity LOE	Field Study LOE	Overall Risk
Benthic Invertebrates	★★★	★★★★	★★★	High
Amphibians	★★★	★★★★	★★★	High
Fish	★★★	★★★★	★★★	Low to Moderate
Insect-eating birds	★★★	Not tested	★★★★★	Low to Moderate
Fish-eating birds	★★★	Not tested	★★★	Moderate
Fish-eating mammals	★★★	★★★★★	★★★★	High
Other mammals	★★★★	Not tested	★★★★	Moderate
Threatened/Endangered	★★★	Not tested	★★	Moderate

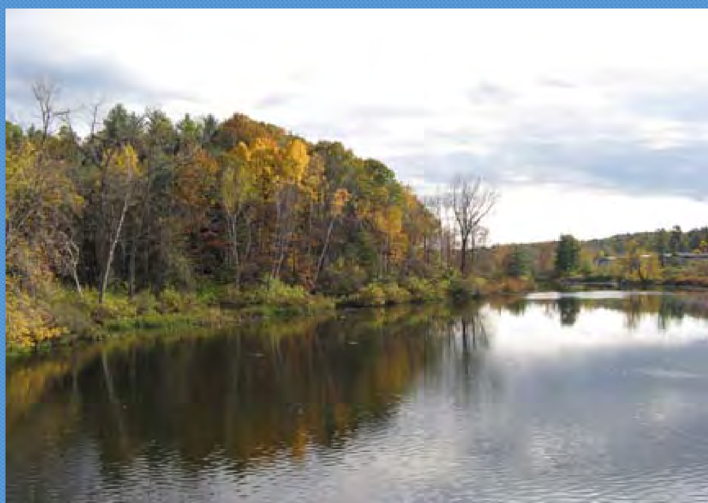
ERA Peer Review

- First draft ERA (July 2003) was reviewed by seven independent international experts in risk assessment (as required by Consent Decree)
- Final comments received January 2004
- ERA was updated to address comments, and finalized November 2004

"Charge" for the Ecological Risk Assessment Peer Review for the Rest of the Housatonic River

Images:

Why Use Models for the Housatonic River?



Mark Velleux
HDR|HydroQual

Making Sense of Alphabet Soup

Models
Corrective Measures Study
RCRA
Water
CERCLA
Sediment
Risk Assessment
RI/FS
PCBs
???
Fish
HHRA
ERA
Remediation
Natural Recovery
Floodplain

- Water Quality and Food Chain Models are tools to help make sense of this!

What is a Model?

Model = *Framework + Site Data for Parameters

Framework = *Computer program to solve equations describing movement of sediment and PCBs in water, sediment, floodplain soil, and uptake by fish. Equations represent processes that affect PCB fate (need site data for parameters)

Site Data = *Measurements of water and sediment conditions at different locations or times used to assign model parameter values (flow, concentration, etc.)

How Do Models Help?

- Organize data and see trends that would otherwise be hidden
- Estimate time to reach risk thresholds for PCBs in:
  - Water
  - Sediment
  - Floodplain soil
  - Fish, wildlife, and human health
- Explore "what if" alternatives to assess likely impact/benefits of remediation

Housatonic River Models

- EPA developed models, GE used them
  - HSPF – Watershed runoff and soil erosion
  - EFDC – PCB transport in river water, sediment, and floodplain soil (exposure)
  - FCM – Foodchain model describing PCB uptake by aquatic biota (bioaccumulation)
  - Risk Assessment – Probability of ecological or human health effects caused by PCBs (risks)
- Based on 15+ years of data collection:
  - Calibrated, Validated, Peer-Reviewed

EFDC Sediment PCB Mass Balance

Gains – Losses = Accumulation

Processes and Parameterization Approach

Sources:
- ***Bed elevations <u>increase</u>***
- ***PCB concentrations in bed can increase or decrease***

Process: Deposition
Parameters: w_s, P_{dep}

<u>Non-Cohesive Particles</u>
$w_s = f(d_p)$
$P_{dep} = 1$

<u>Cohesive Particles</u>
$w_s \rightarrow$ literature and calibration
$P_{dep} = f(\tau_d)$
$\tau_d \rightarrow$ literature and calibration

Transports particulate PCBs

Sinks:
- ***Bed elevations <u>decrease</u>***
- ***PCB concentrations in bed can increase or decrease***

Process: Mass Transfer (low flow)
Parameter: k_f

$K_f = f$(low flow PCB spatial gradient), refined by calibration

Transports dissolved, bound PCBs

Process: Erosion (high flow)
Parameters: $v_r = f(q_b, E_s, E_{coh})$

<u>Non-Cohesive Particles</u>
$q_b = f(d_p, \rho_s)$ (bed load)
$E_s = f(d_p, \rho_s)$ (suspended load)

<u>Cohesive Particles</u>
$E_{coh} = f(M, n, \tau_{ce})$
$M, n \rightarrow$ site-specific Sedflume data
$\tau_{ce} \rightarrow$ site-specific Sedflume data, refined by calibration

Transports particulate PCBs

Change Over Time, can increase or decrease (GAINS – LOSSES):
- ***Bed elevations***
- ***Sediment PCB concentrations***

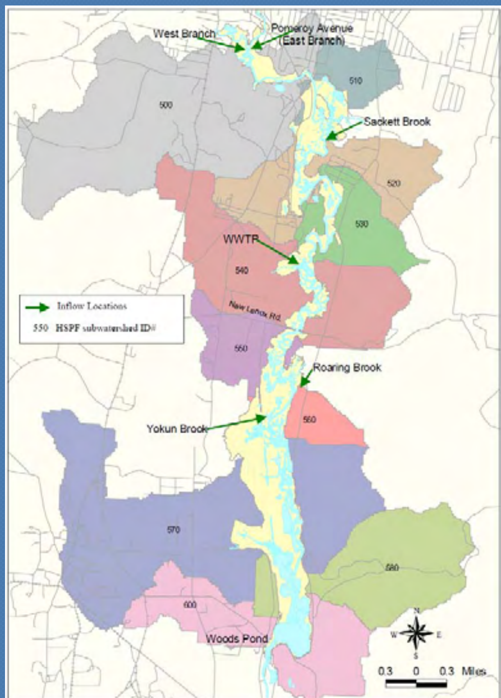
Rate: Bed Elevation Change (Sedimentation Rate)
Parameters: None

Independently estimated from Cs-137 data (See FMD Appendix B.6)

Rate: Sediment PCB Concentration Change (Temporal Trend)
Parameters: None

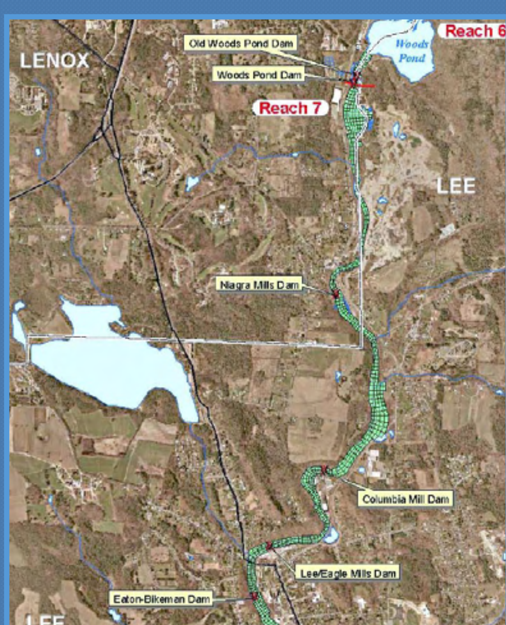
Independently estimated trend from sediment bed PCB data over time (See FMD Appendix A.3)

EFDC Grid: Reaches 5 and 6 (PSA) Pittsfield to Woods Pond

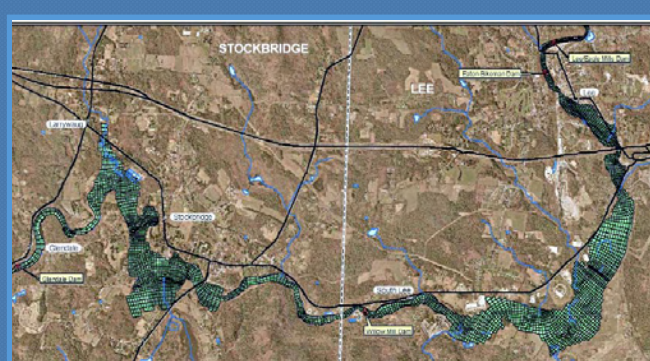


- Includes surface water, sediment, and soil
- Covers backwaters and the 10-year floodplain
- Divided into thousands of small grid cells
- PCB mass balance calculations performed in each cell

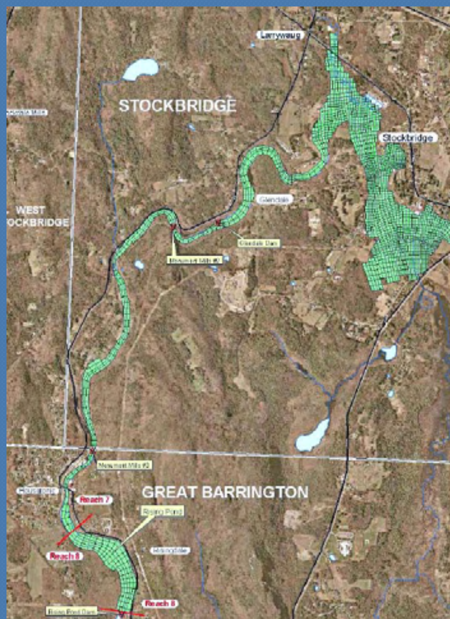
EFDC Grid: Reaches 7 and 8 Woods Pond to Stockbridge



- River and floodplain from Woods Pond to Stockbridge included…



EFDC Grid: Reaches 7 and 8 Stockbridge to Great Barrington



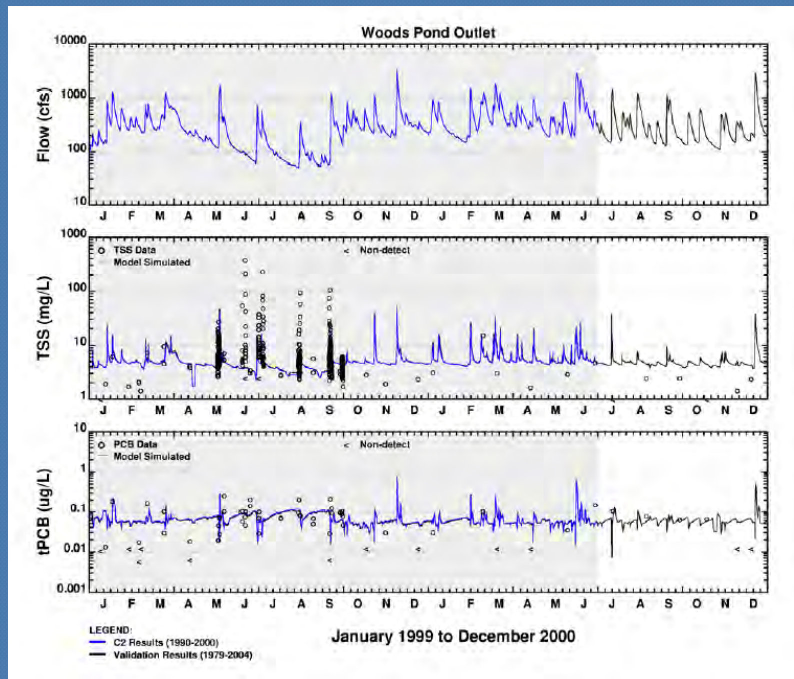
- River and floodplain from Stockbridge to Great Barrington too…
- Other modeling tools exist for areas further downstream

Calibrated and Validated to Site Data

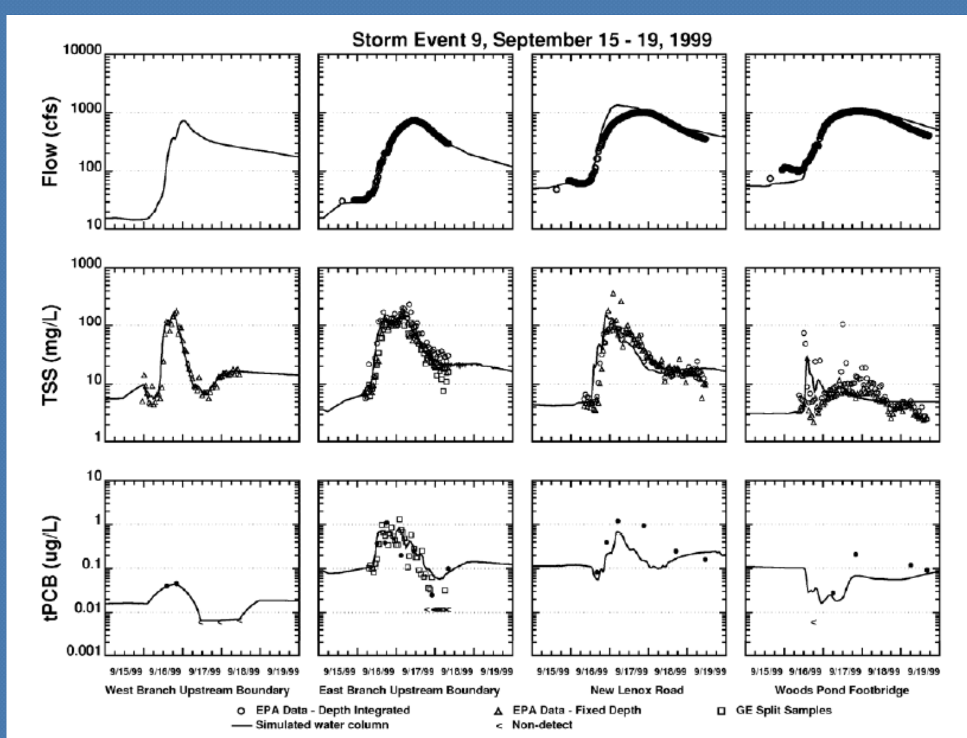
- Phase 1 Calibration: 14 months (1999-2000)
  - Looks at shorter-term PCB behavior
  - Time scale is Hours to Days → Weeks to Months
- Phase 2 Calibration: 10½ years (1990-2000)
  - Looks at intermediate-term PCB behavior
  - Time scale is Months to Years
- Validation: 26 years (1979-2004)
  - Looks at long-term PCB behavior
  - Time scale is Years to Decades
  - Also evaluated the effects of an extreme storm event

Results for Water: Woods Pond 1999-2000

- Modeled and measured TSS & PCBs in water

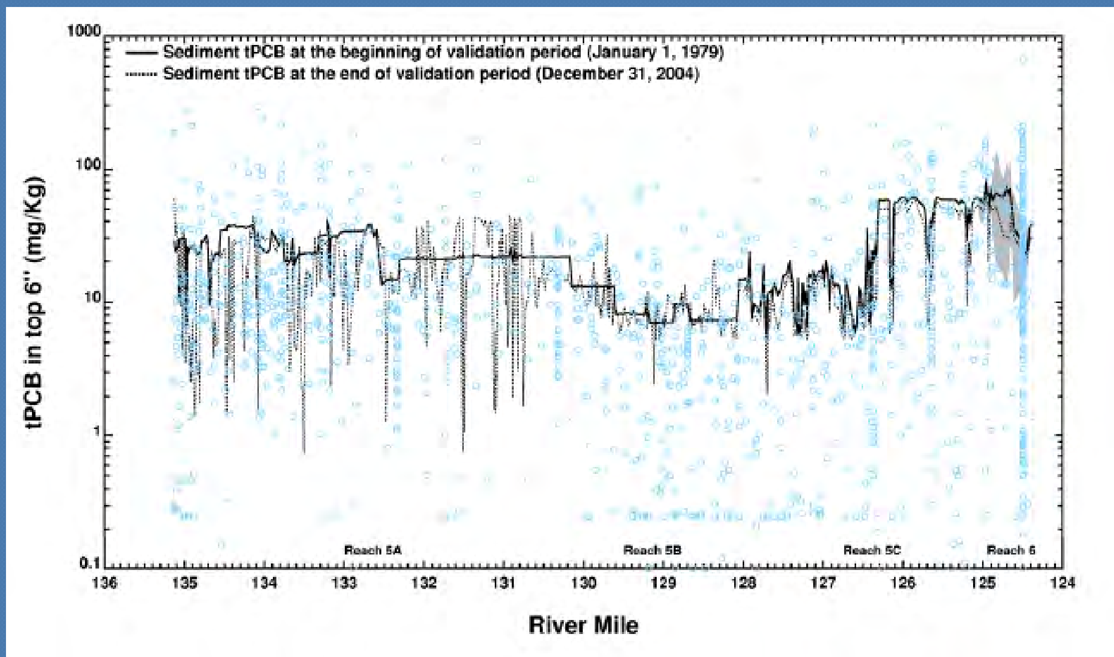


Results for Water: A Single Storm



Sediment Results: Reach 5&6 1979, 2004

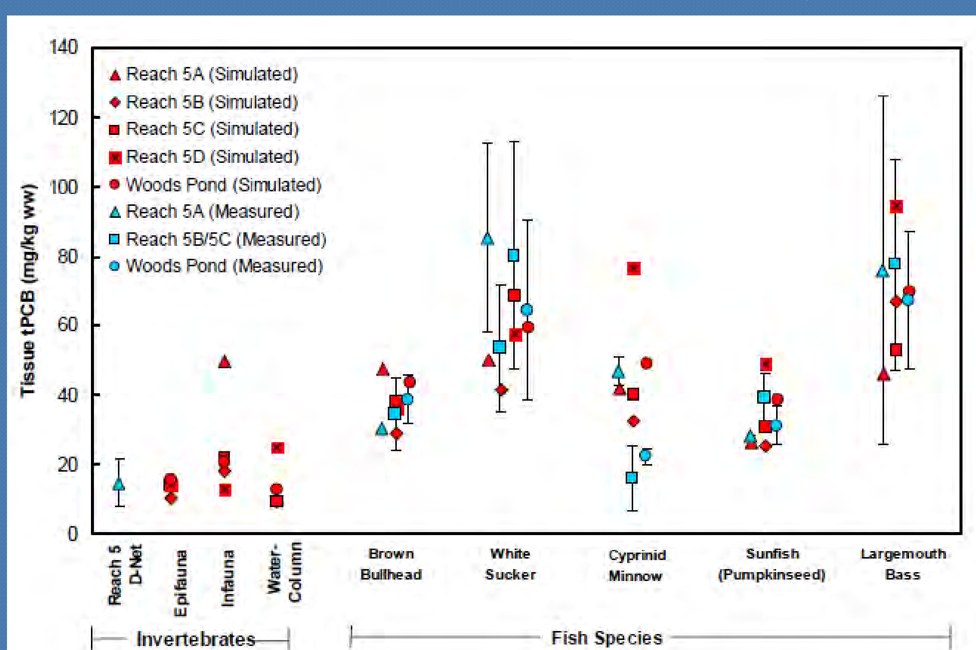
- Modeled and measured PCBs in sediment



13

Results for Fish: Reaches 5&6 1998-2000

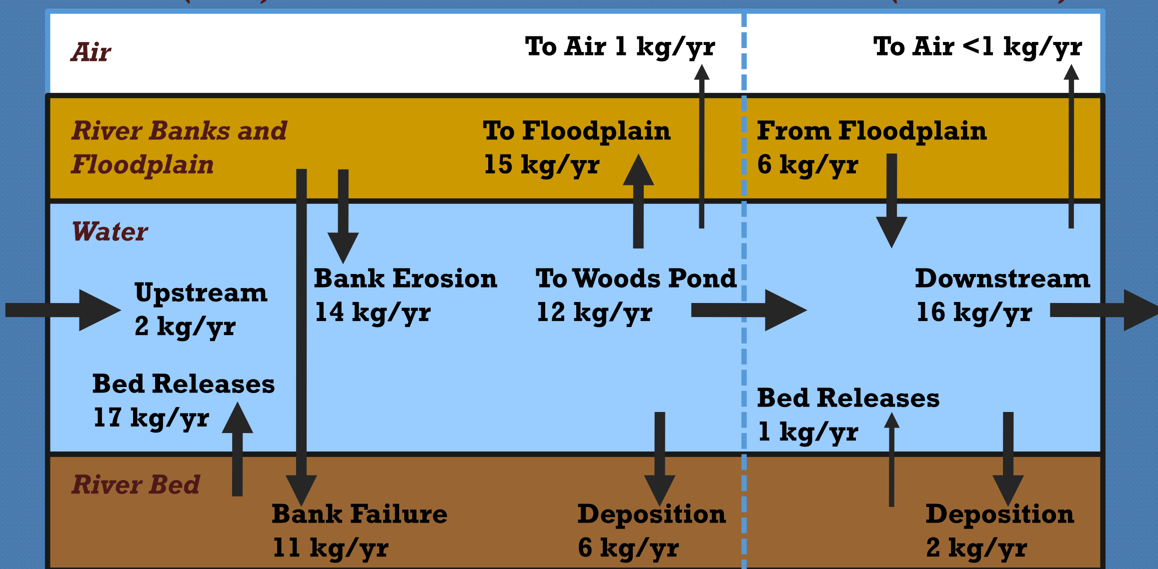
- Measured and modeled PCBs in fish (& benthos)



14

Where Do PCBs Go Over Time?

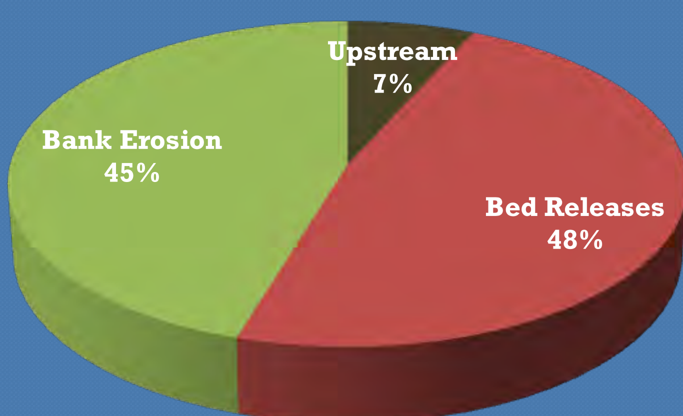
- Average PCB transport rates: MNR Forecast



Bed Releases (E)rosion + (D)iffusion (R5: E=12 + D=5; R6: E=0.4 + D=0.6)

Importance of PCBs Sources

Percent of PCB Sources: MNR Forecast



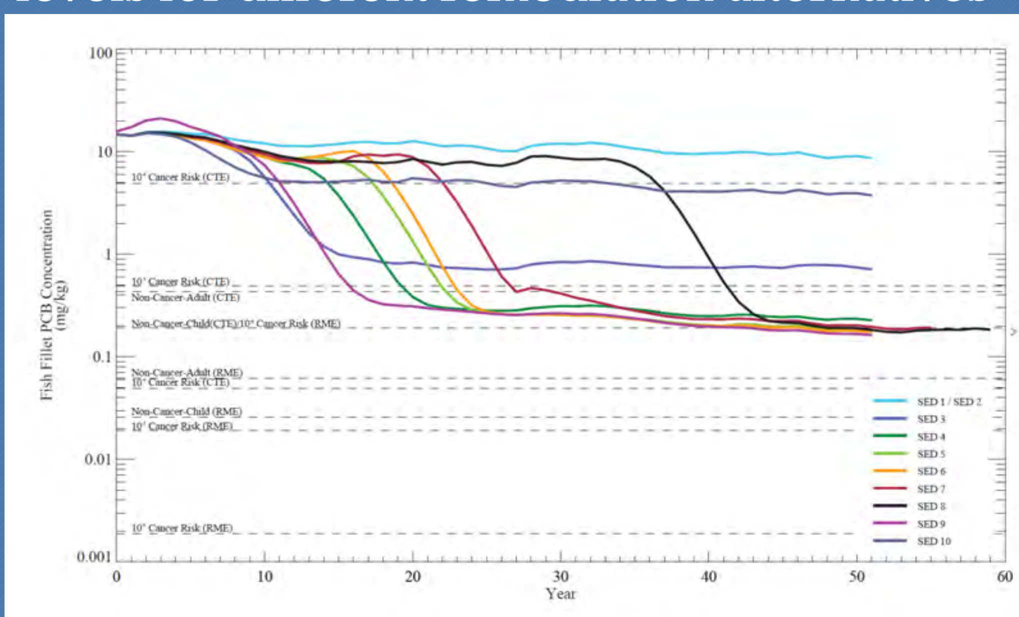
- River banks account for 45% of PCB inputs
- Additional PCBs go to the riverbed when banks fail

"What If" Alternatives for the Future

- 52-year (+) simulations to estimate impacts or benefits for different remediation options
- Estimate future PCB concentrations in water, sediment, soil, and fish
- Estimate future PCB export to downstream areas
- Simulations for "No Action/MNR" and representative remediation scenarios
- Evaluated response of alternative to an extreme storm event

Future Fish PCB Levels

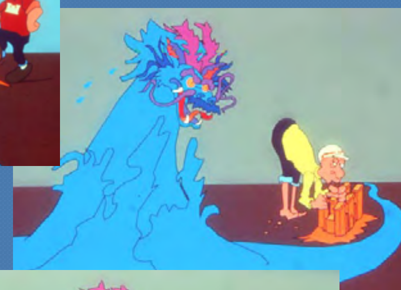
- Projected PCBs in Woods Pond fish and risk levels for different remediation alternatives



Final Thoughts for the Housatonic

- Site data and model results demonstrate that PCBs from the river and floodplain pose long-term risks
- Without cleanup, risks will % remain for more than 250 years % in many locations %
- Over 30 years of data, and over % 50 years of predicted % concentrations show that significant natural recovery is % not occurring %

Work with the river!



Images courtesy of D. Biedenharn

3.6 Mini Workshop Three • Exploring Alternatives for Cleanup, Remediation, Restoration, Alternatives, and Environmentally Sensible Concepts

3.6.1 Theme

The Thursday, April 7 Mini Workshop focused on providing an understanding of cleanup potentials, including the potential cleanup techniques, restoration following any cleanup, an overview of the 10 sediment and 9 floodplain cleanup alternatives, and EPA's view regarding environmentally sensible remediation concepts.

3.6.2 Presentations

Curt Spalding, EPA New England Regional Administrator, opened the evening with comments on EPA's commitment to the cleanup of the Housatonic and the Berkshires community as well as an introduction to the Agenda for the evening.

The four Technical Presentations followed. The evening concluded with a Q & A session in which audience members submitted questions to the presenters.

The Workbook that follows includes the printed versions of all presentations for the evening. The videos of the presentations and Q & A session, as well as printed answers to the questions, were posted on the www.HousatonicWorkshops.org Website.

Supporting Materials for Mini Workshop Three (Following)

Mini Workshop Three Workbook
Mini Workshop Three Presentations
- *Introduction Presentation*
- *Presentation One*
- *Presentation Two*
- *Presentation Three*
- *Presentation Four*

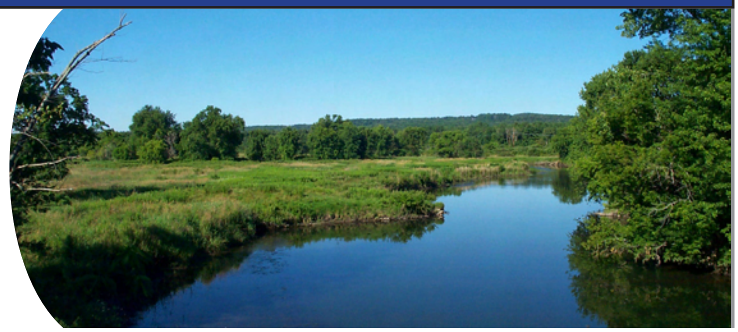
MINI WORKSHOP THREE WORKBOOK

Housatonic River Mini Workshops

Mini Workshop Three:

Exploring Alternatives for Cleanup

Remediation, Restoration, Alternatives, and Environmentally Sensible Remediation Concepts



All Workshops • 5:30pm - 8:30pm

TUE. APRIL 5

Mini Workshop One:
Why Working with River Processes Matters
History, Ecology, and PCBs

WED. APRIL 6

Mini Workshop Two:
Getting the Facts on PCBs
Human Health Risks, Ecological Risks, and PCBs

TONIGHT

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

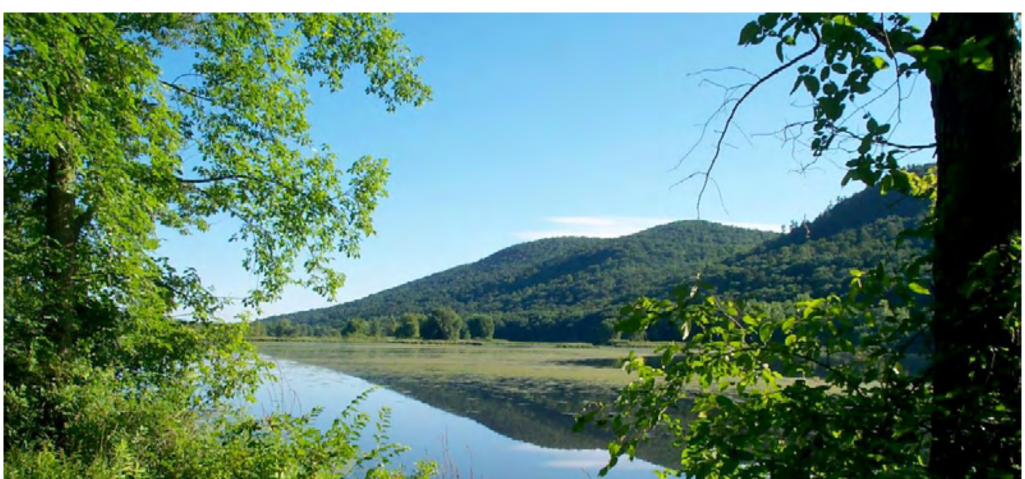
LEARN MORE AT: www.epa.gov/region1/ge

Tonight's Agenda

- **Welcome and Introduction; EPA's Public Outreach and Decision Making Criteria** – Curt Spalding, *EPA Regional Administrator*
- **Panelists' Introduction** – Steve Shapiro, *Certus Strategies*
- **Presentation One: Remediation Technologies and Techniques** – Michael Palermo, Ph.D, *Mike Palermo Consulting, Inc.*
    - *Brief Q&A*
- **Presentation Two: Restoration Techniques** – Keith Bowers, *Biohabitats, Inc.*
    - *Brief Q&A*

Brief Break

- **Presentation Three: Alternatives and Technologies** – Bob Cianciarulo, *EPA Chief, Massachusetts Superfund Section*
    - *Brief Q&A*
- **Presentation Four: Environmentally Sensible Remediation Concepts** – Susan C. Svirsky, *EPA Project Manager, Rest of River*
    - *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

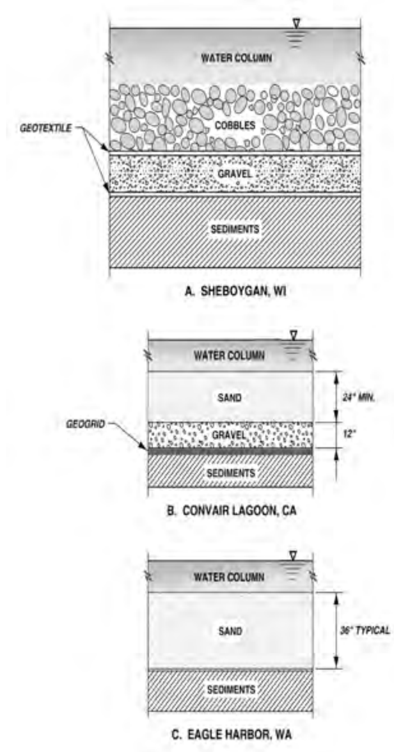
For additional information see "EPA's Cleanup Decision Process" and "Cleanup Alternatives in the Revised CMS" information sheets at http://www.epa.gov/ne/ge/thesite/restofriver-reports.html#CommunityUpdates.

Presentation One: Remediation Technologies and Techniques

Michael R. Palermo, Ph.D, *Mike Palermo Consulting, Inc.*

The basic techniques and technologies for sediment remediation are well established. These include non-removal options, such as monitored natural recovery and *in-situ* (in place) capping, and removal options, such as dredging with containment, and dredging with sediment treatment. Other remedies involve combinations of these options. All of these options have been applied to sediment remediation projects in the US, and there is considerable field experience with such projects. This summary provides a basic description of the options for sediment remediation and the associated technical considerations.

Monitored Natural Recovery (MNR) is a remedial option that relies on natural processes to contain or reduce the bioavailability or toxicity of sediments left in place. Processes that result in natural recovery include burial and in-place dilution following deposition of clean sediment and biodegradation or physical and/or chemical (abiotic) transformation processes which convert the contaminants to less-toxic forms. There are criteria established for what sites may be candidates for selecting MNR[1]. MNR is not a "no action" alternative because by definition it includes source control (such as burial) and an appropriate monitoring program to ensure the processes are effective. In some cases, MNR is enhanced by the addition of a thin layer of sand, often referred to as Enhanced MNR or Thin Layer Capping (TLC). MNR is a common component of remedies with a combination of actions, *i.e.,* at sites addressed by capping or dredging in areas of higher contamination, with MNR for areas of lower contamination. The major disadvantages of MNR are that contaminated sediment is left in the aquatic environment for the long time it takes natural processes to reduce risks, and there is the potential for future disruption of buried contaminants by storms, floods, or other events. Therefore, a rigorous evaluation of the likelihood of these events occurring must be a component in selecting MNR.



The design of an in-situ cap depends on the specific conditions of the site

In-Situ Capping (ISC) is an active remediation option in which a layer of clean isolating material (usually clean sediment or soil) is placed to contain and stabilize the contaminated sediment in place. A variety of capping materials and cap placement techniques are available. Monitoring data collected from a number of projects has indicated capping, in most cases, is a highly effective remedy. However, the potential for extreme events such as storms, floods, or earthquakes to disrupt a cap must be carefully examined and addressed in the design of an ISC, including appropriately conservative safety margins. There is also the disadvantage that contaminated material remains in the aquatic environment. As sediment remedies have become more commonplace and have a documented history, ISC has gained increased acceptance as an effective and efficient remedial option in recent

[1] See http://www.epa.gov/superfund/health/conmedia/sediment/guidance.htm

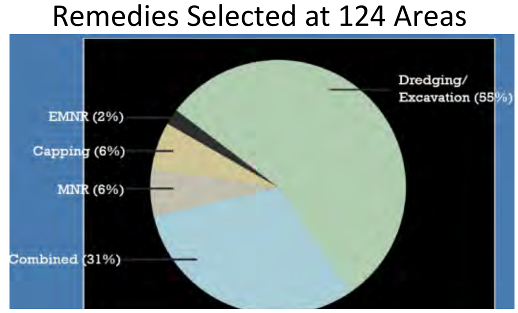
years; it has been implemented as a remedy component at a number of major sites, including the Fox, Hudson, and Housatonic Rivers.

Environmental Dredging, including both dredging and/or dry excavation, is the most common approach for sediment remediation in the US. Removal of contaminated sediment (or in the case of wetlands, soil) provides an advantage in that the contaminants are permanently removed from the aquatic environment. The removal process for dry excavation uses conventional earth moving equipment, and the removal efficiency or effectiveness of such operations is not debated. However, the effectiveness of dredging must be carefully evaluated. The major considerations for evaluating the effectiveness of dredging include the risk of re-suspension of sediment during the dredging process, which can lead to the release of contaminants, and the residual contaminated sediment left in place following dredging.

While removal of the sediment mass is straightforward, addressing re-suspension and residual contamination remaining after dredging can be more complex. Consequently, the definition of success for older environmental dredging projects has been the subject of some debate, however for most newer projects it is now better understood. There are a variety of engineering controls that may be used, including isolating the dredging area from the waterbody using silt curtains, and in some cases, sheet pile enclosures. The selection of appropriate dredging equipment and the compatibility of equipment with the selected disposal option is also an important factor, and may conflict with goals related to re-suspension. Equipment normally used for navigation dredging can and is often used for remediation projects, but US and international dredge designers, manufacturers, and dredging contractors are also using a variety of innovative hydraulic and mechanical dredges especially designed for environmental work to directly address the issue of resuspension and residual management.

Disposal of the dredged material is a necessary component of any environmental dredging option and can often be a controversial, complex and expensive component of dredging. Disposal options include confinement, pre-treatment, or treatment. Confined Disposal Facilities (CDFs) and Contained Aquatic Disposal (CAD) sites are commonly used for contaminated sediments from navigation dredging and have also been used for remediation projects. However, the most common containment option in the US for contaminated sediments dredged for purposes of remediation has been disposal in upland landfills

Remedies Selected at 124 Areas



PCBs are involved at about 50% of the Sites; cleanup/ action levels range from approx. 0.1 to 4000 mg/kg

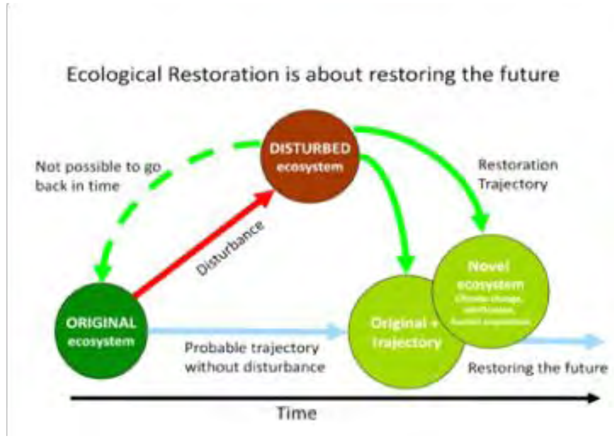
Remedy selection should give appropriate attention to: 1) site-specific considerations such as hydrodynamics, adjacent resources and infrastructure, water depths, and other factors which may influence the risks and costs of a given approach; 2) project-specific considerations such as the volume of contaminated materials or areas to be addressed, the regulatory framework under which the project is being implemented, and other factors which may dictate feasible and cost-effective solutions; and 3) sediment-specific considerations such as the type of contaminants, contaminant concentrations, physical properties of the sediments. Ultimately, experience has shown that, for large or complex sites, combinations of options are often the most desirable remedies.

Presentation Two: Restoration Techniques

Keith Bowers, *Biohabitats, Inc.*

"Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed."

– Society for Ecological Restoration (SER), 2004



ECOLOGICAL RESTORATION AND RECOVERY

Ecological restoration initiates or accelerates the recovery of an ecosystem. Active ecological restoration "sets the stage" for natural, passive restoration processes to take over, and can reduce the time needed for recovery from many decades to years.

EVOLUTION OF RIVER RESTORATION

Around the world, ecological restoration has gained recognition as a valuable tool to repair landscapes that have been impacted by human activities.

- Early coordinated stream restoration efforts focused on patching sections of channel
- Early missteps resulted when practitioners mischaracterized systems based on overly simplistic understandings of stream processes
- Current restoration efforts emphasize the need for a better understanding of geomorphic and ecologic history
- More holistic approaches to restoration consider broader contexts – both in time and space
- Focuses on: credible scientific, economic, and social evaluation; understanding the physical and biological context; establishing a more resilient and self-sustaining system; setting measurable goals; and monitoring to maximize learning from past efforts

RIVER RESTORATION EXAMPLES

Many examples of successful restoration projects exist in different settings and spatial scales. Demonstrated restoration successes of impacted sites throughout the world have shown that it is possible to restore both the appearance and ecological function of areas after they are disrupted. A few examples include:

(Source: Utah Reclamation, Mitigation and Conservation Commission)

- Provo River Restoration Project, UT – Similar in size to the Housatonic River, the purpose was to restore the river form and ecological function to recover fish, wildlife and recreational angling losses caused by federal water projects in Utah. The restoration consisted of creating a multiple-thread, meandering river channel, and reconnecting the river to existing remnants of the historic secondary channels.

- Nine Mile Run River Restoration Project, PA – US Army Corps of Engineers partnered with the City of Pittsburgh to restore over a mile of aquatic habitat by reconnecting the stream to its floodplain, eliminating leachate from an adjacent slag dump, reducing fish migration barriers, creating meanders and step pools, stabilizing eroding slopes using vegetation or soil bioengineering, managing invasive vegetative species, and enhancing/enlarging wetlands.

(Source: © John Moyer)

RESTORATION AND RECOVERY ALONG THE HOUSATONIC RIVER AND FLOODPLAIN

The Housatonic River appears to be a pristine natural river system that has evolved by meandering over millennia. Some fear that disrupting these natural processes will result in irreparable harm to the ecosystem. However, analysis of historical documents and maps of the River reveals a history of alterations in the River associated with a number of human activities. An altered river channel is inherently unstable due to factors such as the increase in channel gradient and stream power associated with a shortened stream length if the river is straightened.

(Source: City of Pittsfield Department of Public Works and Utilities)

Over time, straightened river channels may undergo a series of channel adjustments that ultimately lead to the return to a stable meandering riverbed and banks that approximate the pre-disturbance condition. Active ecological restoration can accelerate the full recovery not only of past human impacts, but also of impacts caused by remediation, often in a few decades.

At Newell Street in Pittsfield, photographs show that vegetation along the River was removed in both the 1940s and 1990s. These photos demonstrate that the River can reestablish channel and riparian function relatively quickly following first the clearing in 1940 and then remediation in 1999. Active ecological restoration can accelerate the full recovery from remediation. As shown in the photographs below and as observed, not only was there a recovery following the river channelization efforts in the 1940's, but a decade after remediation in 1999, significant vegetative growth and recovery again occurred at Newell Street with active restoration.

1940

1999

2009

Presentation Three: Alternatives and Technologies

Bob Cianciarulo, *EPA Chief, Massachusetts Superfund Section*

For additional information see "EPA's Cleanup Decision Process" and "Cleanup Alternatives in the Revised CMS" info sheets.

GENERAL ELECTRIC'S SUMMARY OF SEDIMENT ALTERNATIVES

Alt.	Reach 5A	Reach 5B	Reach 5A/5B Banks	Reach 5C	Reach 5 Backwaters	Reach 6 (Woods Pond)	Reach 7 Impoundments	Reach 7 Channel	Reach 8 (Rising Pond)	Reaches 9 - 16
SED 1	No action	No action	No action	No action	No action	No action	No action	No action	No action	No action
SED 2	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR
SED 3	2-foot removal with capping	MNR	Stabilization/ bank soil removal	Combination of thin-layer capping and MNR	MNR	Thin-layer capping	MNR	MNR	MNR	MNR
SED 4	2-foot removal with capping	Combination of 2-foot removal with capping and thin-layer capping (dep. on depth & velocity)	Stabilization/ bank soil removal	Combination of thin-layer capping (in shallow and depositional areas) and capping (in deeper areas)	Combination of thin-layer capping and MNR	Combination of 1.5-foot removal with capping in shallow areas and thin-layer capping in deep area	MNR	MNR	MNR	MNR
SED 5	2-foot removal with capping	2-foot removal with capping	Stabilization/ bank soil removal	Combination of 2-foot removal with capping (in shallow areas) and capping (in deeper areas)	Combination of thin-layer capping and MNR	Combination of 1.5-foot removal with capping in shallow areas and capping in deep area	MNR	MNR	Thin-layer capping	MNR
SED 6	2-foot removal with capping	2-foot removal with capping	Stabilization/ bank soil removal	2-foot removal with capping	Removal of sediments >50 mg/kg in top 1 foot (with capping[2]); thin-layer capping for remainder >1 mg/kg	Combination of 1.5 foot removal with capping in shallow areas and capping in deep area	Thin-layer capping	MNR	Combination of thin-layer capping in shallow areas and capping in deep areas	MNR
SED 7	3- to 3.5-foot removal with backfill	2.5-foot removal with backfill	Stabilization/ bank soil removal	2-foot removal with capping	Removal of sediments >10 mg/kg in top 1 foot (with capping[2]); thin-layer capping for remainder >1 mg/kg	Combination of 2.5-foot removal with capping in shallow areas and capping in deep area	Removal of higher PCB levels (e.g., >3 mg/kg) in top 1.5 feet (with capping[2]); thin-layer capping for remainder >1 mg/kg	MNR	Comb. of removal of higher PCB levels (e.g., >3 mg/kg) in top 1.5 feet (with capping[2]) & thin-layer capping in shallow areas and capping in deep areas	MNR
SED 8	Removal to 1 mg/kg depth horizon with backfill	Removal to 1 mg/kg depth horizon with backfill	Stabilization/ bank soil removal	Removal to 1 mg/kg depth horizon with backfill	Removal to 1 mg/kg depth horizon with backfill	Removal to 1 mg/kg depth horizon with Backfill	Removal to 1 mg/kg depth horizon with backfill	MNR	Removal to 1 mg/kg depth horizon with backfill	MNR
SED 9	2-foot removal with capping	2-foot removal with capping	Stabilization/ bank soil removal	Combination of 2-foot removal with capping (in shallow areas) and 1.5-foot removal with capping (in deeper areas)	In areas with sediments >1 mg/kg, combination of 1-foot removal with capping (areas with water < 4 feet) and capping w/o removal (areas with water > 4 feet)	Combination of 3.5-foot removal with 1-foot cap in shallow areas and 1-foot removal with capping to grade in deep area	Combination of 1.5-foot removal with capping (in areas of high bottom shear stress) and 1-foot removal with capping (in areas of low bottom shear stress)	MNR	Combination of 1.5-foot removal with capping (in areas of high bottom shear stress) and 1-foot removal with capping (in areas of low bottom shear stress	MNR
SED 10	2-foot removal with capping in select areas; MNR in remaining areas	MNR	Stabilization/ bank soil removal in select areas	MNR	MNR	2.5-foot removal where sediments generally >13 mg/kg in top 6 inches; MNR in remainder	MNR	MNR	MNR	MNR

MNR Monitored Natural Recovery, mg/kg milligram per kilogram.

GENERAL ELECTRIC'S SUMMARY OF SEDIMENT ALTERNATIVE VOLUMES, AREAS, AND DURATIONS

	SED 1/2	SED 3	SED 4	SED 5	SED 6	SED 7	SED 8	SED 9	SED 10
Sediment removal volume (cubic yards [cy])	0	134,000	262,000	377,000	521,000	770,000	2,252,000	886,000	235,000
Bank soil removal volume (cy)	0	35,000	35,000	35,000	35,000	35,000	35,000	35,000	6,700
Capping after removal (acres)	0	42	91	126	178	150	0	333	20
Backfill after removal (acres)	0	0	0	0	0	69	351	0	0
Capping without removal (acres)	0	0	37	60	45	45	0	3	0
Thin-layer capping (acres)	0	97	119	102	112	72	0	0	0
Time to implement (years)	0	10	15	18	21	26	52	14	5

Note: MNR would be a component of all alternatives except SED 1.

GENERAL ELECTRIC'S SUMMARY OF FLOODPLAIN ALTERNATIVES

Alternative	Description
FP 1	No action.
FP 2	Soil removal/backfilling to achieve the health-based IMPGs based on 10-4 cancer risk or on non-cancer (whichever is lower).
FP 3	Same as FP 2 except: (a) in certain frequently used areas, soil removal/backfilling to achieve the health-based IMPGs based on 10-5 cancer risk or on non-cancer (whichever is lower); and (b) supplemental remediation to achieve upper-bound IMPGs for ecological receptors.
FP 4	Soil removal/backfilling to achieve the health-based IMPGs based on 10-5 cancer risk or on non-cancer (whichever is lower). Supplemental remediation to achieve upper-bound IMPGs for ecological receptors.
FP 5	Removal of soils that contain PCB concentrations of 50 mg/kg or greater, with backfilling.
FP 6	Removal of soils that contain PCB concentrations of 25 mg/kg or greater, with backfilling.
FP 7	Soil removal/backfilling to achieve the health-based IMPGs based on 10-6 cancer risk , but no lower than 2mg/kg for direct human contact (level specified in Consent Decree as the standard for residential use). Supplemental remediation to achieve lower-bound IMPGs for ecological receptors.
FP 8	Soil removal/backfilling to achieve the health-based IMPGs based on 10-5 cancer risk or on non-cancer (whichever is lower). Supplemental remediation in vernal pools to achieve lower-bound IMPG for amphibians. Additional removal of all remaining soils that contain PCB concentrations of 50 mg/kg or greater, with backfilling.
FP 9	Same as FP2 with additional soil removal/backfilling to achieve the health-based RME IMPGs based on 10-4 cancer risk or on non-cancer (whichever is lower) in top 3 feet in certain heavily used subareas.

Notes: 1. The health-based IMPGs refer to the IMPGs that were based on EPA's "Reasonable Maximum Exposure"assumptions in its Human Health Risk Assessment. 2. For all alternatives, the remediation described applies to the top foot of soil, except that FP3 through FP 9 also involve additional remediation in certain heavily used subareas as necessary to achieve criteria in the top 3 feet of soil.

GENERAL ELECTRIC'S SUMMARY OF FLOODPLAIN ALTERNATIVE VOLUMES AND AREAS

	FP1	FP2	FP3	FP4	FP5	FP6	FP7	FP8	FP9
Removal volume (cy)	0	22,000	74,000	121,000	104,000	320,000	631,000	177,000	26,000
Removal area (acres)	0	13	44	72	63	197	387	108	14

GENERAL ELECTRIC'S COST ESTIMATES FOR SED/FP/TD COMBINATIONS

Alternative	TD1	TD2[2]	TD3[3]	TD4	TD5[4]
	Off-Site Disposal	Confined Disposal Facility	Upland Disposal Facility	Chemical Extraction	Thermal Desorption
SED 2/FP 1	$5 M	NA	$5 M	$5 M	$5 M
SED 3/FP 3	$251 M	NA	$204 - 228 M	$274 M	$337 - 366 M
SED 5/FP 4	$483 M	NA	$362 - 402 M	$509 M	$679 - 709 M
SED 6/FP4	$612 M	$487 M	$444 - 493 M	$619 M	$860 - 891 M
SED 8/FP7	$1,740 M	$1,337 M	$1,160 M	$1,826 M	$2,866 - 3,026 M
SED 9/FP8	$729 M	$558 M	$435 - 512 M	$662 M	$1,132 - 1,175 M
SED 10/FP 9	$183 M	NA	$121 - 146 M	$181 M	$283 - 290 M

[1] Cost are give in 2010 dollars; $M = million dollars [2] Where applicable, estimated costs assume placement in CDFs of certain hydraulically dredged sediments and off-site disposal for remaining excavated materials. [3] Range depends on location of Upland Disposal Facility. For sediment-floodplain alternatives in which the removal volume exceeds the capacity of the Upland Disposal Facility at a given location, cost estimates were made only for the location(s) where that entire volume of material could be disposed of. [4] Low end of range assumes reuse in floodplain of half of treated floodplain soils and off-site disposal of remaining treated materials; high end of range assumes off-site disposal of all treated material.

Presentation Four: Environmentally Sensible Remediation Concepts

Susan C. Svirsky*, EPA Project Manager, Rest of River*

EPA has begun its decision making process for the cleanup of the Housatonic "Rest of River" considering the RCMS, other relevant information, and public input. Under the terms of the Consent Decree, EPA must evaluate all cleanup alternatives against 9 criteria in selecting its proposed alternative:

<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

Cleanup alternatives range from taking no action to other alternatives with different levels of active remediation. EPA believes that if an active remedy is chosen, it then must be implemented using environmentally sensible remediation concepts. Some of these concepts are discussed below.

<u>PCB Contamination and Risk Reduction</u>
PCBs in the Rest of River and associated floodplain pose a risk to human health and are harming many species of wildlife. These risks and harm will continue as the PCBs are not degrading or being permanently buried in the foreseeable future.

<u>River Processes</u>
The Rest of River has been altered by humans in the past for agriculture, industry, transportation, and other uses. These alterations included straightening or relocating the River channel, altering the connection of the River to the floodplain, clearing the floodplain, and changing the load of sediment washing into the River. The River is seeking to regain its equilibrium from the past activities. Any cleanup must work with the River and floodplain, not against it.

<u>Species/Habitats of Concern and Cultural Resources</u>
Any active cleanup must be implemented with care for both the issue of species and habitats of concern and the potential for impacts to cultural resources such as Native American relics. With regard to the species of concern, any cleanup should be implemented in such a manner as to avoid impacts to the

species of concern where practicable, or otherwise minimize or mitigate any impacts. Any cleanup must also have a component whereby cultural resources are researched, and during implementation any resources that are identified are documented and/or preserved.

Downstream Impacts

PCB concentrations are highest in the first 30 miles of Rest of River, with concentrations from the Confluence to Woods Pond similar to those originally measured in the 1 ½ Mile Reach, which is located above the Confluence, and has since been cleaned up.

However, PCBs continue to impact the River further downstream below Rising Pond, resulting in fish consumption advisories in both Massachusetts and Connecticut, concerns regarding sediment management associated with structures in the River such as dams and bridges, and degraded water quality that has resulted in the River being on Connecticut's Clean Water Act List of Impaired Waters. During any active remediation it is expected that there would be some short-term impacts associated with resuspension that may potentially be measurable outside the area to be remediated. Appropriate engineering controls must be used to ensure that any such impacts would be minimized and do not result in a permanent degradation of the River quality downstream.

Quality of Life

Implementation of any active remedy must be done in a way that minimizes any adverse economic impacts to the community as well as impacts to nearby property owners. Careful consideration must be given to optimize the routing of vehicles or other means of transportation. A mechanism must be in place for interaction with and input from affected property owners and other stakeholders. Thought must be given to allow for recreational opportunities to continue during the remediation.

Other Considerations

Implementation of any active remedy must be approached with a surgical mindset.

- Any cleanup and associated infrastructure (such as roads, staging areas, equipment, etc.) must be designed to have the smallest footprint possible, and impacts to any given area be minimized in duration.
- Thought should be given within any risk reduction strategy if there are circumstances where cleanup may have a disproportional impact relative to risk to address some specific contaminated areas, if risk reduction can be obtained in other, less intrusive locations.
- Habitat restoration must be considered hand-in-hand with any cleanup design, with consultation with stakeholders, oversight by professionals, and tailored to the specific habitat that is affected.
- Restoration goals and timeframes need to be clearly communicated among all parties, and monitoring the success of restoration efforts is essential.

Adaptive Management

As any active cleanup would take place over a period of years, this would provide the opportunity to stage the design and implementation to allow for a critical review of the work and the ability to incorporate any lessons learned in the subsequent work. This would also provide for the opportunity to consider new technologies and/or equipment if they become available.

Presentation 1 - Biography

Michael R. Palermo, Ph.D., P.E. President
Mike Palermo Consulting, Inc., Durham, NC

Dr. Mike Palermo is a consulting engineer with extensive internationally recognized experience in dredged material management and contaminated sediment remediation. For the majority of his career, Dr. Palermo served with the U.S. Army Corps of Engineers as a Research Civil Engineer and Director of the Center for Contaminated Sediments at the Engineer Research and Development Center (ERDC) at the Waterways Experiment Station (WES), where he managed and conducted both research and applied studies for the USACE, EPA, DOJ, NOAA, U.S. Navy, and others. He also managed the WES/ERDC research focus area for contaminated sediments. Since entering private practice in 2003, he has provided design services and technical review and oversight for clients, both in the U.S. and abroad, on a wide range of sediment remediation and navigation projects involving contaminated sediments including sediment mega-sites such as the Hudson River, Housatonic River, Fox River, Portland Harbor, and Onondaga Lake. In his role on the Housatonic River Project Dr. Palermo serves as Senior Reviewer and technical resource for issues related to sediment dredging, capping, and dredged material management. Dr. Palermo is a Registered Professional Engineer and a member of the Western Dredging Association (WEDA), International Navigation Association (PIANC), and American Society of Civil Engineers (ASCE). He has served on the adjunct faculty at Texas A&M University and Mississippi State University and is also Associate Editor for the WEDA Journal of Dredging Engineering. He has authored numerous publications in the area of dredging and dredged material disposal technology and remediation of contaminated sediments. He is a lead author of USACE, EPA, and international guidance documents pertaining to contaminated sediments, including the USEPA 1998 Guidance for In-Situ Subaqueous Capping of Contaminated Sediment, USEPA 2005 Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, and the USACE/USEPA 2008 Technical Guidelines for Environmental Dredging of Contaminated Sediments.

Presentation 2 - Biography

Keith Bowers, RLA, PWS President and Founder
Biohabitats, Inc., North Charleston, SC

Mr. Keith Bowers is the President and Founder of Biohabitats, Inc., one of the premier firms specializing in environmental restoration, conservation planning and regenerative design. He is an internationally recognized landscape architect who has planned, designed, and managed the construction of over 200 ecological restoration projects throughout the United States. Mr. Bowers also teaches ecological restoration seminars and workshops and participates on numerous industry panels. He is currently serving as Chairman of the Board for the Society for Ecological Restoration International. For the Housatonic River Project, he has a lead role in evaluating remedial alternatives with respect to their ecological restoration components, and provides senior level expertise in the feasibility and expected effectiveness of proposed restoration plans and techniques. He also assists in community outreach and meeting facilitation.

Presentation 3 – Biography

Bob Cianciarulo, Chief, Massachusetts Superfund Section
Office of Site Remediation and Restoration, EPA New England

Bob Cianciarulo is Chief of the Massachusetts Superfund Section in EPA's New England Regional Office. In that capacity, he supervises a group of fourteen Remedial Project Managers (RPMs) overseeing investigation, cleanup, and monitoring of Superfund National Priorities List (NPL) sites in Massachusetts. In his over 20 years with EPA, Mr. Cianciarulo has served as a RCRA hazardous waste inspector, a project manager in both RCRA Corrective Action and in Superfund, and in the region's Brownfields program. Prior to his current position, he served as Chief of Region I's Superfund Technical Support and Site Assessment Section. Mr. Cianciarulo has a degree in Chemical Engineering from the University of Lowell (MA).

Presentation 4 - Biography

Susan C. Svirsky, EPA Project Manager
Rest of River

Ms. Svirsky has worked for EPA for over 30 years in many different capacities. She graduated with a degree in Wildlife Ecology from the University of Maine and subsequently worked for Maine Inland Fisheries and Wildlife. From there, she began her career at EPA in the Water Quality Monitoring Program in Washington, D.C. Upon returning to New England, she worked with EPA in various roles, including serving as the chair of the multi-agency regional Superfund Ecological Assessment Team. In this role Ms. Svirsky began her work with contaminated sediment site assessment, cleanup, and restoration, with a particular focus on PCB-contaminated sites, and participated in national guidance development. Her involvement with the GE-Housatonic River site began over 14 years ago. This involvement led to her becoming the Project Manager for Rest of River, overseeing all of the data collection, risk assessment, modeling, and Corrective Measures Study activities. In addition, Ms. Svirsky has taught sessions on ecological risk assessment and restoration of contaminated sediment sites, and has authored numerous technical papers on these issues as well as those associated with Rest of River.

Notes

www.epa.gov/region1/ge

KEY CONTACTS:

JIM MURPHY
U.S. EPA Community Involvement Coordinator
(617) 918-1028
murphy.jim@epa.gov

SUSAN SVIRSKY
U.S. EPA Rest of River Project Manager
(617) 918-1434
svirsky.susan@epa.gov

GENERAL INFO:

EPA NEW ENGLAND
5 Post Office Sq.,
Suite 100
Boston, MA 02109-3912

TOLL-FREE CUSTOMER SERVICE
1-888-EPA-7341

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
(860) 672-6678

Massachusetts DEP
(413) 784-1100

Connecticut DEP
(860) 424-3854

MINI WORKSHOP THREE PRESENTATIONS

EPA Mini Workshop Series

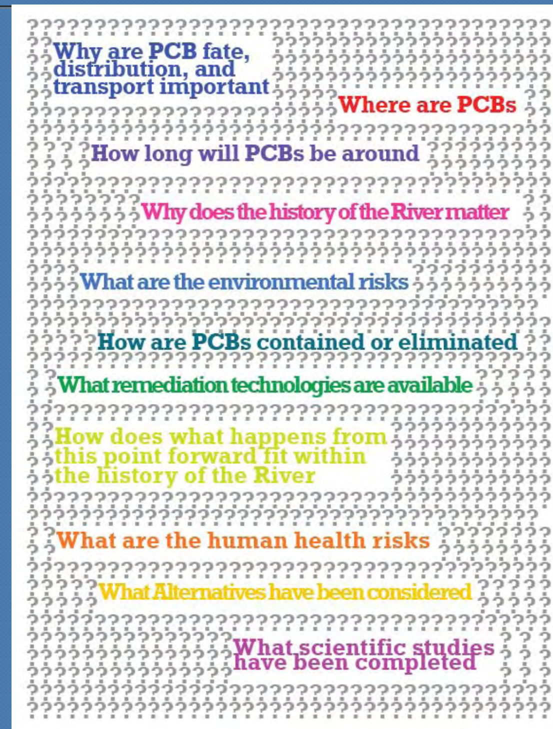
April 7, 2011

Background

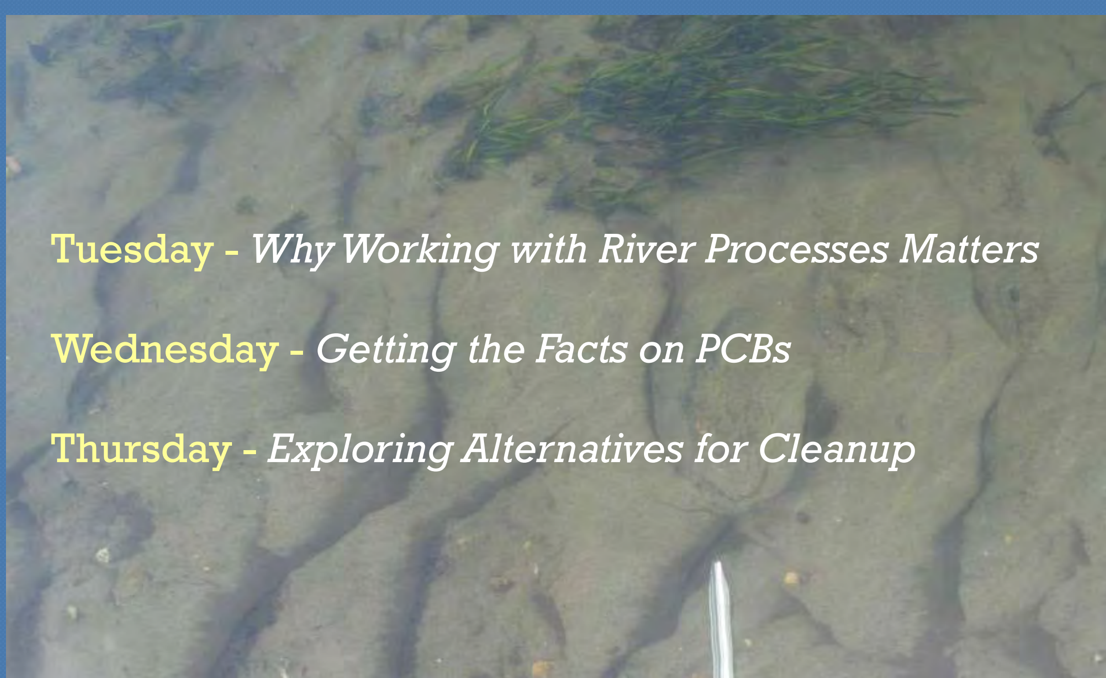
- GE submitted its Revised Corrective Measures Study (RCMS) in October 2010
- Informal Public Input period held, which closed on January 31st
- EPA's consultants held a series of interviews with stakeholders over the past few months regarding their view of the process and information needs
- One of the outcomes of these interviews is this series of Mini Workshops and the all-day hands-on Public Charrette session on May 7th to learn and interact regarding the Rest of River

Goals of Mini Workshops

- Provide the Community with an:
  - Understanding of the work that EPA and others have done on the Rest of River
  - Understanding of how the River works and is affected by the PCB contamination
  - Opportunity to get questions answered
- Result – Stakeholders should have a better understanding of the issues associated with any cleanup of the Rest of River and are prepared for the Public Charrette



The Three Workshop Sessions



Decision Criteria for the Cleanup

- EPA will make a decision on the cleanup considering:
  - Input received from stakeholders
  - GE's Revised Corrective Measures Study
  - The 9 evaluation criteria specified in the RCRA Permit (listed below)
- General Standards
  - Overall protection of human health and the environment
  - Control of sources of releases
  - Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)
- Selection Decision Factors
  - Long term reliability and effectiveness
  - Attainment of IMPGs (interim cleanup goals)
  - Reduction of toxicity, mobility, volume
  - Short term effectiveness
  - Implementability
  - Cost

Tonight's Agenda

- ***Exploring Alternatives for Cleanup***
  - Remediation Techniques
  - Restoration Techniques
  - Alternates and Technologies
  - Environmentally Sensible Remediation Concepts
- Goal – for the community to have an understanding of the potential cleanup techniques, restoration following any cleanup, an overview of the 10 sediment and 9 floodplain cleanup alternatives, and EPA's view regarding environmentally sensible remediation concepts

Public Charrette, May 7, 8:30am - 5:30pm

Remediation Technologies and Techniques

Mike Palermo, Ph.D., PE
Mike Palermo Consulting, Inc.

Sediment Remediation Alternatives

- No Action
- Monitored Natural Recovery
- In-Situ Capping
- In-Situ Treatment
- Dredging
  - CDFs, CADs, or Licensed Landfills
  - Treatment and Disposal

Monitored Natural Recovery

- Advantages
  - Actions limited to monitoring and institutional controls
  - No disruption to waterbody
  - Low cost
- Disadvantages
  - Sediments remain in the aquatic environment
  - Processes act slowly
  - Subject to episodic storms, floods, etc.
  - Long-term monitoring/ institutional controls required

In-Situ Capping (ISC)

- Advantages
  - Quick risk reduction
  - Easy to implement
  - Cost
  - Potential for enhancement
- Disadvantages
  - Sediments remain in the aquatic environment
  - Water depths may be reduced
  - Habitat changes
  - Subject to episodic storms, floods, etc.
  - Long-term monitoring/ maintenance required
  - Institutional controls required

Primary Functions of a Cap

- Physical isolation of contaminated sediment from the aquatic environment
- Stabilization/erosion protection of contaminated sediment, preventing resuspension and transport
- Chemical isolation/reduction of movement (flux) of contaminants to the water body

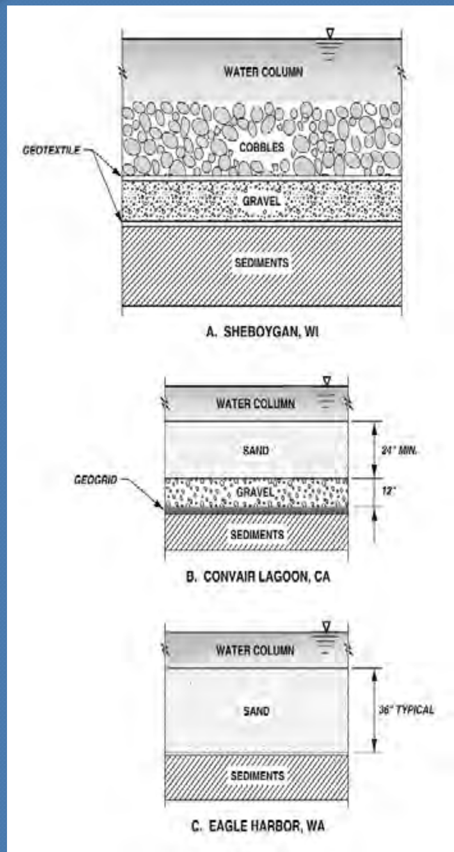
To achieve these results, capping projects must be ENGINEERED.

Success requires that the cap be properly designed, constructed, and maintained.

Feasibility Determination for ISC

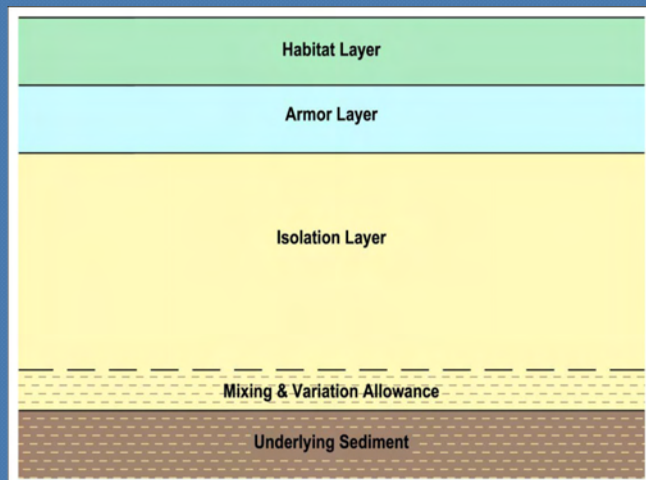
- Compatibility with waterway uses
- Flow modification
- Depth limitations
- Groundwater flow conditions
- Erosion potential

May be easier to evaluate factors which eliminate capping



Design Components

- Bioturbation
- Consolidation
- Erosion
- Operational
- Chemical isolation



Where has ISC been applied?

- Housatonic River
- Fox River
- Sheboygan WI Demo
- Convair Lagoon
- Japan
- Sweden
- Norway
- Hamilton Harbor, Ontario
- Palos Verdes Shelf Pilot
- Puget Sound
  - Simpson Kraft Tacoma
  - Denny Way CSO
  - Pier 51
  - Pier 54
  - Eagle Harbor
- Pine Street Superfund
- Future sites:
  - Onondaga Lake
  - Silver Lake

Cap Management Actions

- Management actions integrated with monitoring
- Tiered Management
  - Increased monitoring
  - Add more cap thickness
  - Add a cap component
  - Removal

Dredging and Disposal

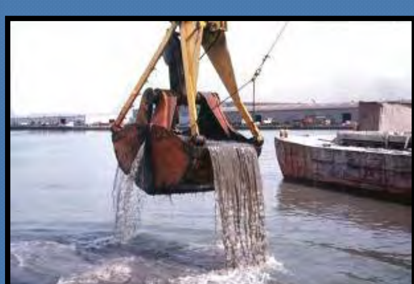
- Advantages
  - Mass removal
  - Proven technology
  - Easily implemented
- Disadvantages
  - Resuspension and release
  - Residuals
  - Disposal is expensive

Dredging is Common

- Navigational Dredging
  - US Army Corps of Engineers, Port Authorities, other government agencies, and private companies dredge millions of cubic yards of sediment each year from channels, berths, and docks for navigational purposes
  - Contaminated sediments and environmental impact issues are common to navigational dredging, but cost-effectiveness is the driving factor
- Environmental Dredging
  - Removal of contaminated sediments for the primary purpose of environmental remediation
  - Costs are secondary to project goals

11

Environmental Dredging Equipment Categories



Conventional Clam

Enclosed Bucket

Articulated Fixed-Arm

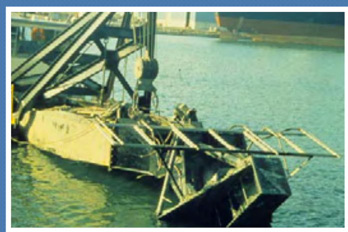
Conventional Cutterhead

Swinging Ladder Cutterhead

Horizontal Auger

12

Environmental Dredging Equipment Categories



Plain Suction

Pneumatic

Specialty Dredges

Diver-Assisted

Dry Excavation

Environmental Dredging Bottom Line

- No universal solution
- Conventional equipment can be used
- Specialty equipment is available
- All dredges will resuspend some sediment and leave residuals
- Resuspension and residuals can be predicted and controlled in most situations
- All decisions are inherently risk-based

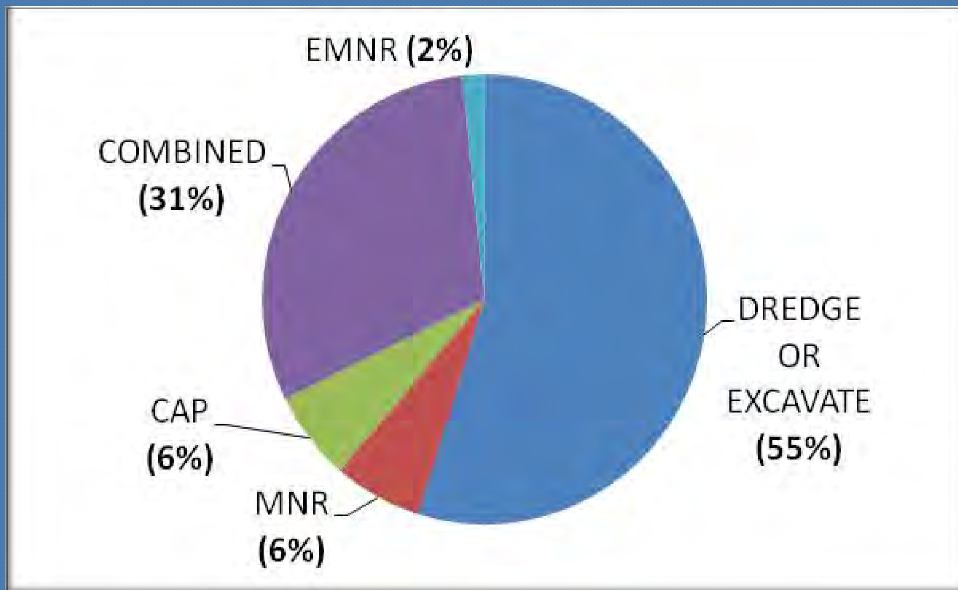
Containment

- Advantages
  - Proven technology
  - Engineered controls
  - Cost-effective
- Disadvantages
  - Superfund preference for treatment
  - Siting difficult
  - Monitoring required

Ex-situ Sediment Treatment

- Advantages
  - Popular option
  - Technologies available
  - Superfund preference
- Disadvantages
  - Very expensive
  - Emissions/ discharges
  - Pre-treatment may require a CDF
  - Residual requires disposal and may pose risks

Remedies Selected at 124 Sites

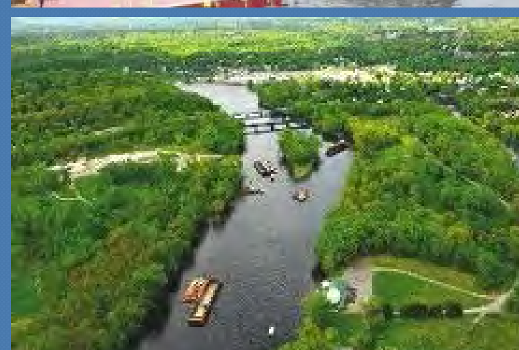


Source: Ells, USEPA and Gustavson, USACE, 2011

PCBs are a COC at about 50% of the Sites; #
cleanup/action levels range from approx. 0.1 to 4000 mg/kg. #

Remedy Implementation

- Control sources
- Sequential - upstream to downstream
- Stepwise – only small portion of river or floodplain disturbed at any one time
- Adaptive management
- Combined technologies may offer the best solution



10 Principles for Effective Sediment Remedies

1. All decisions should be risk based
2. Control sources
3. Set realistic RAOs, RGs, and CULs
4. Compare effectiveness of options on an equal footing
5. Evaluate spatial and temporal aspects of exposure
6. Tailor operations to achieve short term effectiveness
7. Design for long term effectiveness and permanence
8. Develop site specific, project specific, and sediment specific remedies
9. Optimize effectiveness by combining options
10. Monitor to document effectiveness

Ecological Restoration: Perspectives and Applications for the Housatonic River

Keith Bowers
Biohabitats, Inc.

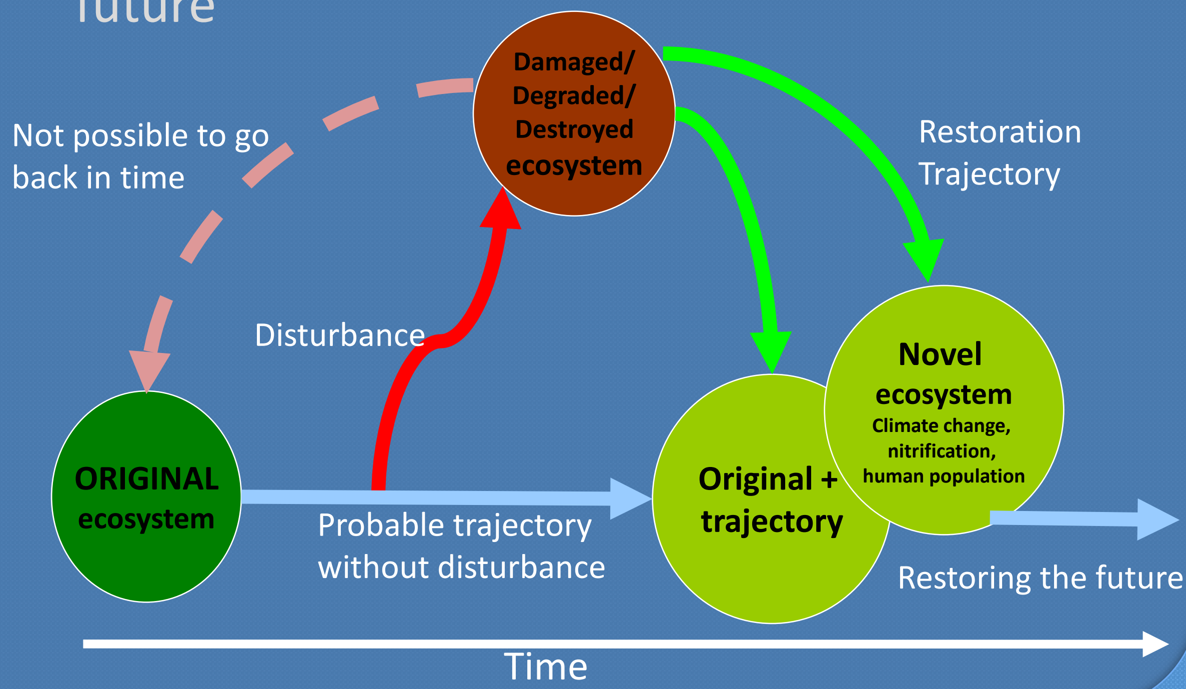
What is *Ecological Restoration*?

"Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed."

Initiates and accelerates recovery of an ecosystem along an intended trajectory that supports critical ecological processes.

Society for Ecological Restoration
www.ser.org

Ecological Restoration is about restoring the future



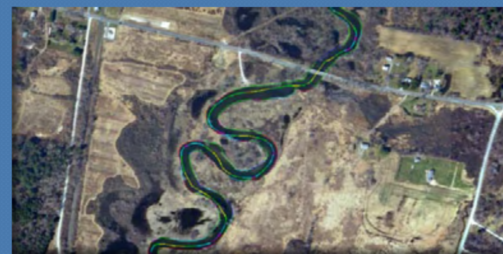
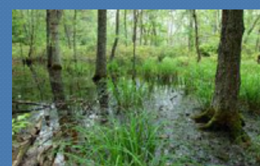
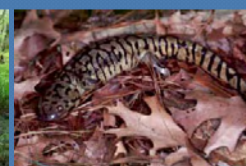
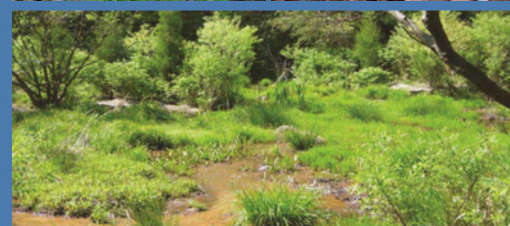
Good restoration should embrace…

- Processes -> function -> form
- Diversity, complexity and resiliency
- Clear trajectory towards success
- Adaptive



Good restoration relies on templates

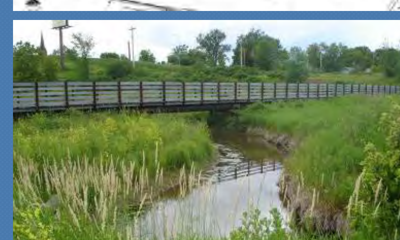
- Analysis of historical and existing conditions can help inform the restoration conceptual design
- Processes (hydrology, hydraulics, nutrient cycles, trophic flows) that provide ecosystem functions
- Form (dimensionless ratios) provides a template for landscape structure (channel shape, floodplain morphology)
- Vegetation composition and structure
- Human engagement and use

Recipe for Success

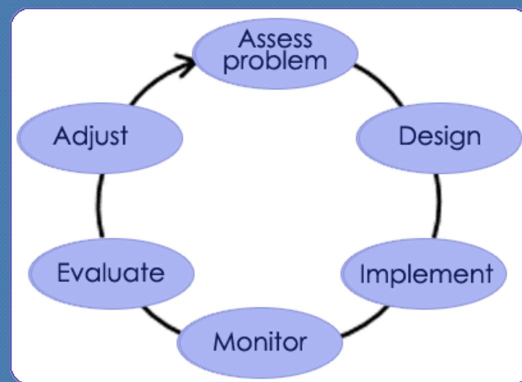
- Clear rationale (remediation)
- Goals & trajectory for success
- Thorough ecological description of the site (and surrounding ecosystem)
- Sound science and engineering
- Designation & description of a reference system – (Stretches of the Housatonic perhaps)
- Integration with the surrounding landscape
- Explicit plans, schedules, budgets…





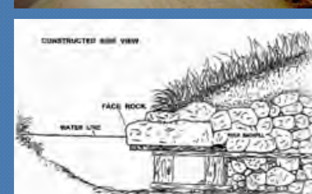
Recipe for Success

- Monitoring and evaluation
- Adaptive Management
- **…openly acknowledges uncertainty about how ecological systems function and how they respond to management actions**
- **…is designed to improve our understanding of how a system works, so we can achieve management objectives**
- **…is about taking action in pursuit of desired outcomes**



River restoration has come a long way…

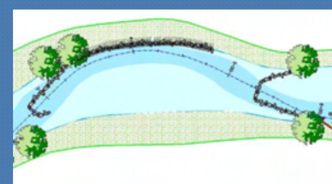
- 1600s – Agriculture/Forestry – ditching, straightening
- 1950s – Urbanization – more of the same + flood control
- 1960s – Sport fishery – habitat enhancements
- 1970-80s – Age of rip-rap – emphasis on stream bank stabilization, some habitat enhancement



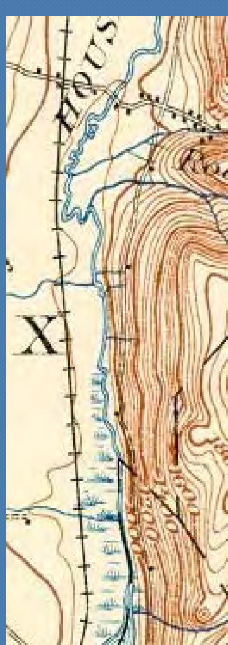
http://www.co.vernon.wi.gov/LWCD/lunkers.htm

River restoration has come a long way…

- 1980s – current emphasis is on river processes and how they shape, form and influence the river
  - ✓ Integrating the river with the surrounding landscape
  - ✓ Integrating cultural and recreation attributes
  - ✓ Taking into account future changes
  - ✓ Establishing a more resilient & self-sustaining river/floodplain system



Housatonic – a recovering river

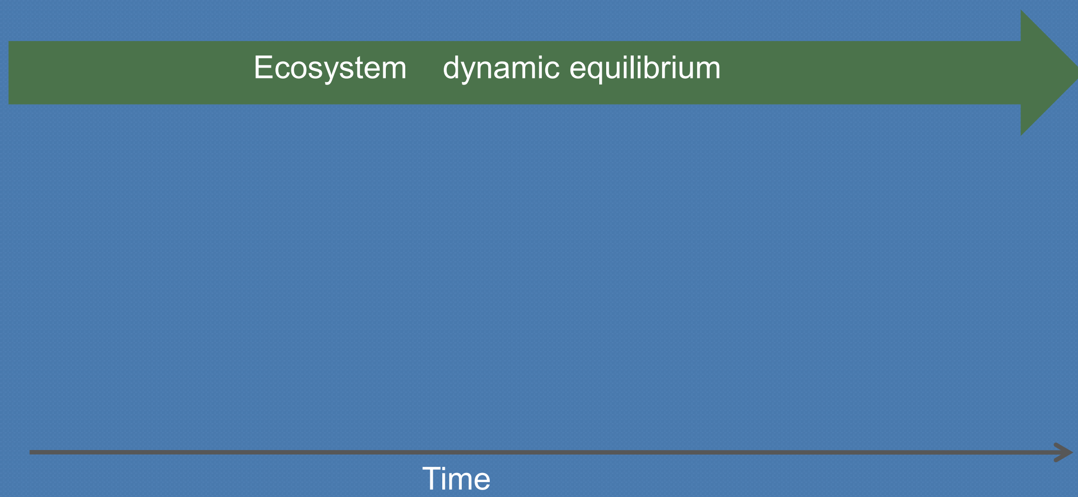


University of New Hampshire Library
Digital Collections Initiative

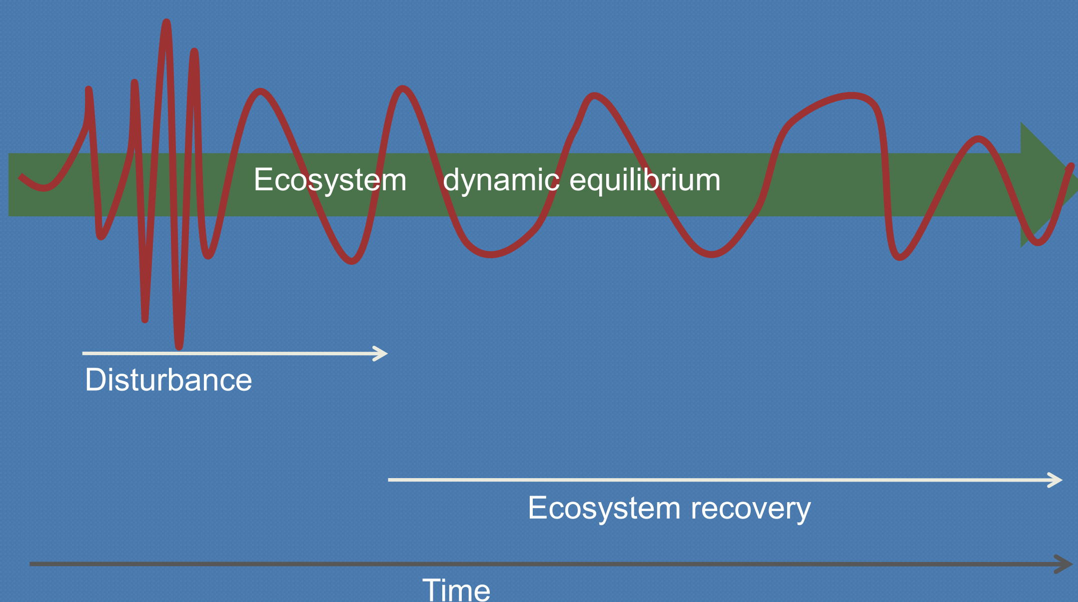
Gove, B., 2003, Log Drives on the Connecticut River

City of Pittsfield Department of Public Works & Utilities

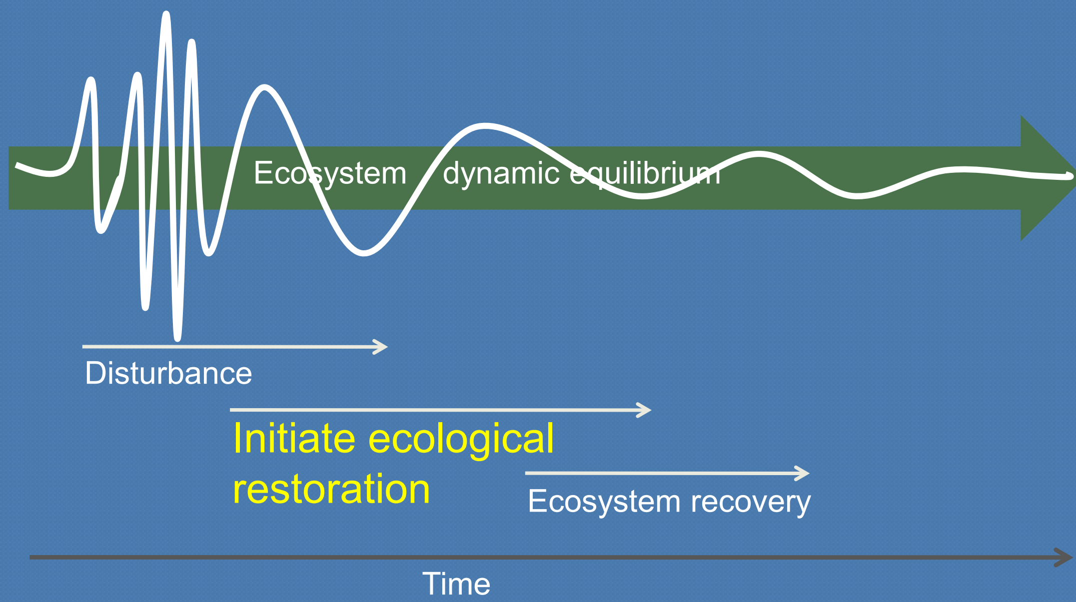
Accelerating the recovery process



Accelerating the recovery process

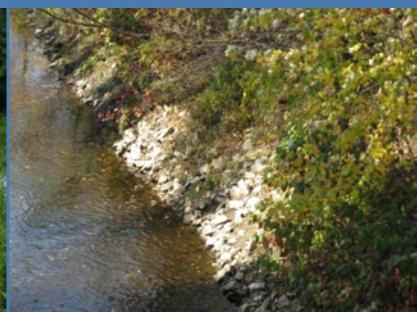
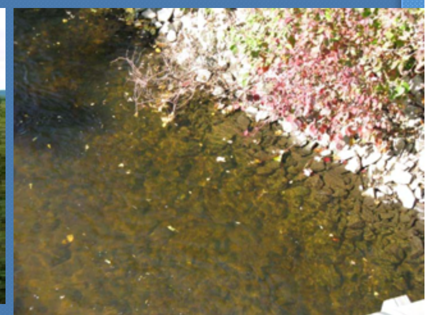


Accelerating the recovery process



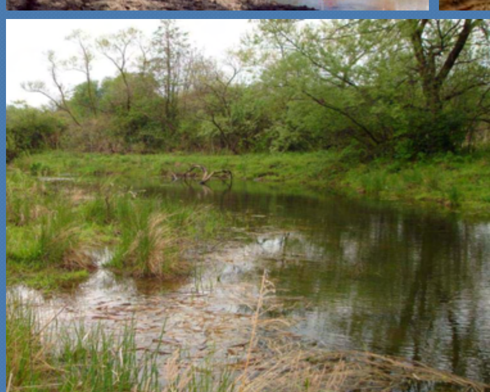
Housatonic – Upper 2-Mile Reach Remediation

Housatonic – Upper 2-Mile Reach Remediation

River restoration success stories






River restoration success stories

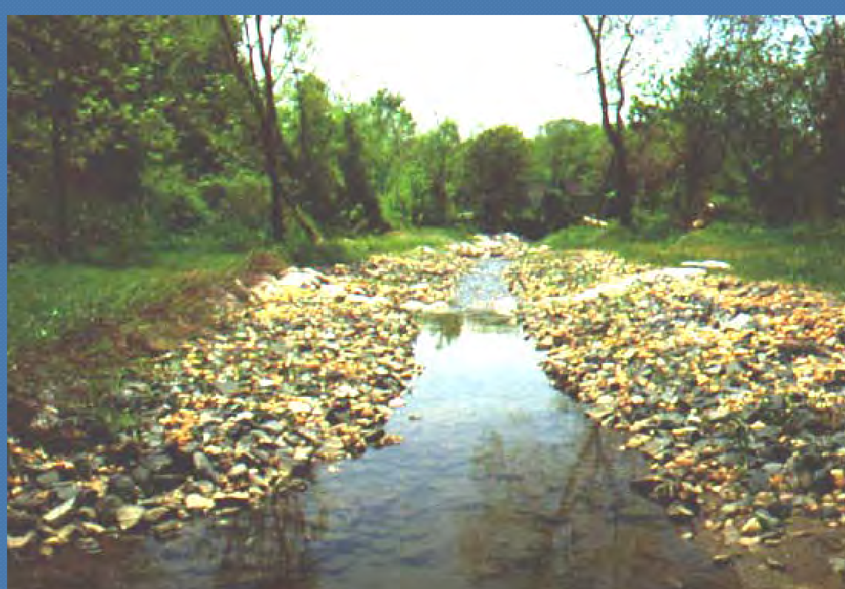
River restoration success stories

River restoration success stories

River restoration success stories

River restoration success stories

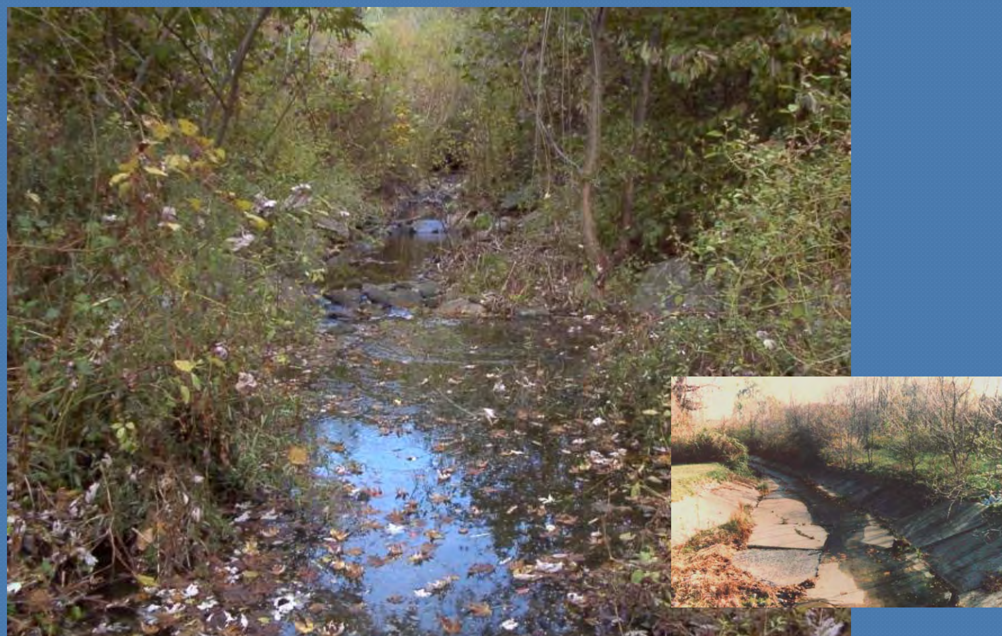
River restoration success stories



River restoration success stories

River restoration success stories

River restoration success stories



River restoration success stories

River restoration success stories

Loring AFB
ME

- Contaminated soil & sediment remediation
- Restored stream and wetland/floodplain habitats
- Restored native plant communities
- Restored instream habitat to support trout fishery

River restoration success stories

Provo River
Salt Lake City, Utah

- Restore river form & ecological function
- Multiple-thread channel with complex floodplain features, oxbows, side channels and floodplain wetlands
- Levee setbacks and reconnected floodplain

Utah Reclamation, Mitigation and Conservation Commission

River restoration success stories

Upper Clark Fork Restoration
MT

•Consent decree State vs ARCO Superfund cleanup to remove toxic metals from streambeds, streambanks and the floodplain along 43 river miles

•Community outreach, restoration vision and scientific learning serve as the foundation for the project.

•Goal to provide a vibrant model for integrated restoration that provides long term ecologial, economic, and cultural assets for the watershed.

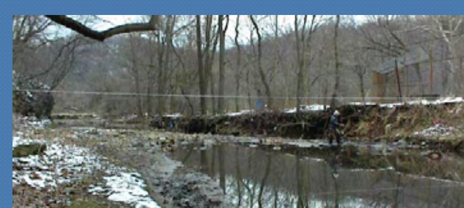
Clark Fork River Technical Assistance Committee

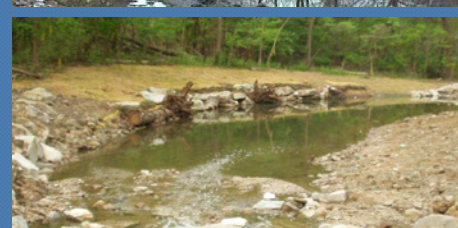
A graphic of the state s restoration plan for Clark Fork River flood plain.

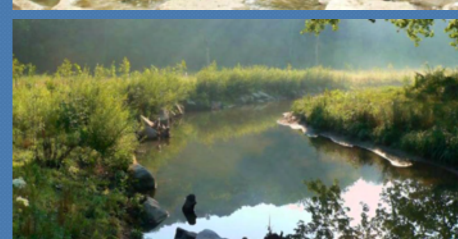
River restoration success stories

Nine Mile Run
Pittsburgh, PA

- Large, urban channel with adjacent contaminated soils
- Channel stabilization
- In-stream aquatic habitat enhancement
- Floodplain reconnection & wetland creation







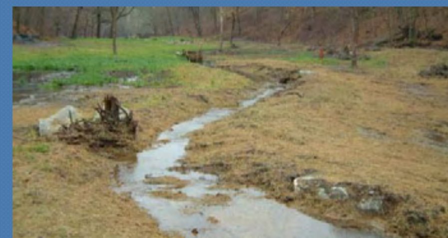
Copyright John Moyer

River restoration success stories

Nine Mile Run

Pittsburgh, PA

- Large, urban channel with adjacent contaminated soils
- Channel stabilization
- In-stream aquatic habitat enhancement
- Floodplain reconnection & wetland creation



River restoration success stories

Nine Mile Run

Pittsburgh, PA

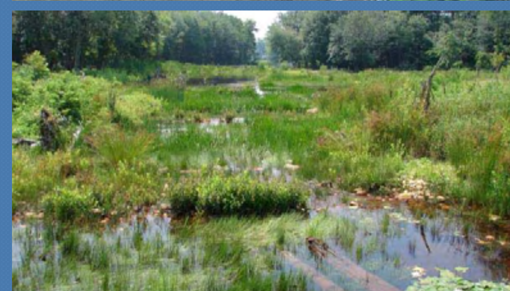
Nine Mile Run Watershed Association

River restoration success stories

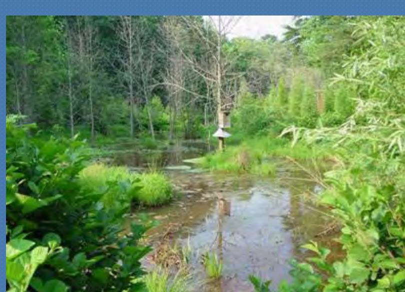
North Gray’s River Restoration
MD

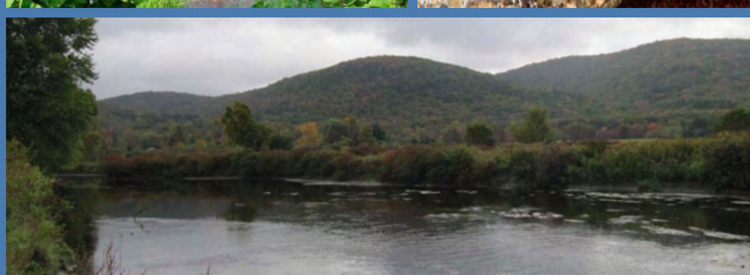
- Restored complex of riparian wetlands/bogs and vernal pools
- Restored stream and wetland/floodplain habitats
- Restored native plant communities
- Restored habitat to support RT&E species





What would a restored Housatonic River look like to you?






Ecological Restoration: Perspectives and Applications for the Housatonic River

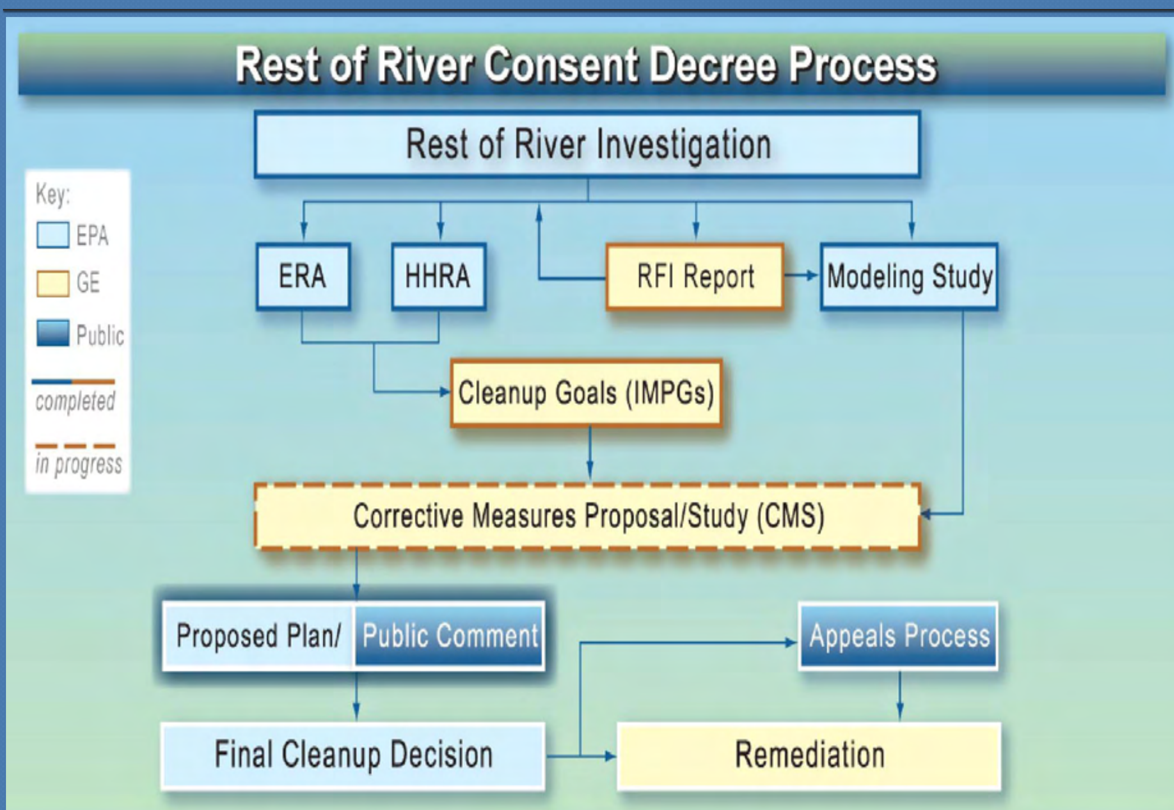
Keith Bowers
Biohabitats, Inc.

THANK YOU

Alternatives and Technologies

Bob Cianciarulo
US EPA, Region 1

Process of Developing Alternatives



General Approaches to Cleanup

- The Corrective Measures Study (CMS) has gone through two iterations, last updated in October 2010
- There are a wide range of cleanup approaches evaluated in the CMS, including:
  - 10 alternatives for sediment remediation
  - 9 alternatives for floodplain remediation
  - 5 alternatives for treatment and/or disposal of any excavated soil or sediment

Matrix of Sediment Cleanup Alternatives

- The complete array of the 10 sediment alternatives for each reach is available in your workbook on page 9.

GENERAL ELECTRIC'S SUMMARY OF SEDIMENT ALTERNATIVES

Alt.	Reach 5A	Reach 5B	Reach 5A/5B Banks	Reach 5C	Reach 5 Backwaters	Reach 6 (Woods Pond)	Reach 7 Impoundments	Reach 7 Channel	Reach 8 (Rising Pond)	Reaches 9 - 16
SED 1	No action	No action	No action	No action	No action	No action	No action	No action	No action	No action
SED 2	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR
SED 3	2-foot removal with capping	MNR	Stabilization/ bank soil removal	Combination of thin-layer capping and MNR	MNR	Thin layer capping	MNR	MNR	MNR	MNR
SED 4	2-foot removal with capping	Combination of 2-foot removal with capping and thin-layer capping (dep. on depth & velocity)	Stabilization/ bank soil removal	Combination of thin-layer capping (in shallow and depositional areas) and capping (in deeper areas)	Combination of thin-layer capping and MNR	Combination of 1.5-foot removal with capping in shallow areas and thin-layer capping in deep area	MNR	MNR	MNR	MNR
SED 5	2-foot removal with capping	2-foot removal with capping	Stabilization/ bank soil removal	Combination of 2-foot removal with capping (in shallow areas) and capping (in deeper areas)	Combination of thin-layer capping and MNR	Combination of 1.5-foot removal with capping in shallow areas and capping in deep area	MNR	MNR	Thin-layer capping	MNR
SED 6	2-foot removal with capping	2-foot removal with capping	Stabilization/ bank soil removal	2-foot removal with capping	Removal of sediments >50 mg/kg in top 1 foot (with capping[1]); thin-layer capping for remainder >1 mg/kg	Combination of 1.5-foot removal with capping in shallow areas and capping in deep area	Thin-layer capping	MNR	Combination of thin-layer capping in shallow areas and capping in deep areas	MNR
SED 7	3- to 3.5-foot removal with backfill	2.5-foot removal with backfill	Stabilization/ bank soil removal	2-foot removal with capping	Removal of sediments >10 mg/kg in top 1 foot (with capping[1]); thin-layer capping for remainder >1 mg/kg	Combination of 2.5-foot removal with capping in shallow areas and capping in deep area	Removal of higher PCB levels (e.g., >3 mg/kg) in top 1.5 feet (with capping[1]); thin-layer capping for remainder >1 mg/kg	MNR	Comb. of removal of higher PCB levels (e.g. >3 mg/kg) in top 1.5 feet (with capping[1]) & thin layer capping in shallow areas and capping in deep areas	MNR
SED 8	Removal to 1 mg/kg depth horizon with backfill	Removal to 1 mg/kg depth horizon with backfill	Stabilization/ bank soil removal	Removal to 1 mg/kg depth horizon with backfill	Removal to 1 mg/kg depth horizon with backfill	Removal to 1 mg/kg depth horizon with Backfill	Removal to 1 mg/kg depth horizon with backfill	MNR	Removal to 1 mg/kg depth horizon with backfill	MNR
SED 9	2-foot removal with capping	2-foot removal with capping	Stabilization/ bank soil removal	Combination of 2-foot removal with capping (in shallow areas) and 1.5-foot removal with capping (in deeper areas)	In areas with sediments >1 mg/kg, combination of 1-foot removal with capping (areas with water < 4 feet) and capping w/o removal (areas with water > 4 feet)	Combination of 3.5-foot removal with 1-foot cap in shallow areas and 1 foot removal with capping to grade in deep area	Combination of 1.5-foot removal with capping (in areas of high bottom shear stress) and 1-foot removal with capping (in areas of low bottom shear stress)	MNR	Combination of 1.5-foot removal with capping (in areas of high bottom shear stress) and 1 foot removal with capping (in areas of low bottom shear stress	MNR
SED 10	2-foot removal with capping in select areas, MNR in remaining areas	MNR	Stabilization/ bank soil removal in select areas	MNR	MNR	2.5-foot removal where sediments generally >13 mg/kg in top 6 inches. MNR in remainder	MNR	MNR	MNR	MNR

MNR Monitored Natural Recovery, mg/kg milligram per kilogram.

Matrix of Floodplain Cleanup Alternatives

Alternative	Description
FP 1	No action.
FP 2	Soil removal/backfilling to achieve the health-based IMPGs based on 10-4 cancer risk or on non-cancer (whichever is lower).
FP 3	Same as FP 2 except: (a) in certain frequently used areas, soil removal/backfilling to achieve the health-based IMPGs based on 10-5 cancer risk or on non-cancer (whichever is lower); and (b) supplemental remediation to achieve upper-bound IMPGs for ecological receptors.
FP 4	Soil removal/backfilling to achieve the health-based IMPGs based on 10-5 cancer risk or on non-cancer (whichever is lower). Supplemental remediation to achieve upper-bound IMPGs for ecological receptors.
FP 5	Removal of soils that contain PCB concentrations of 50 mg/kg or greater, with backfilling.
FP 6	Removal of soils that contain PCB concentrations of 25 mg/kg or greater, with backfilling.
FP 7	Soil removal/backfilling to achieve the health-based IMPGs based on 10-6 cancer risk , but no lower than 2mg/kg for direct human contact (level specified in Consent Decree as the standard for residential use). Supplemental remediation to achieve lower-bound IMPGs for ecological receptors.
FP 8	Soil removal/backfilling to achieve the health-based IMPGs based on 10-5 cancer risk or on non-cancer (whichever is lower). Supplemental remediation in vernal pools to achieve lower-bound IMPG for amphibians. Additional removal of all remaining soils that contain PCB concentrations of 50 mg/kg or greater, with backfilling.
FP 9	Same as FP2 with additional soil removal/backfilling to achieve the health-based RME IMPGs based on 10-4 cancer risk or on non-cancer (whichever is lower) in top 3 feet in certain heavily used subareas.

Notes: 1. The health-based IMPGs refer to the IMPGs that were based on EPA's "Reasonable Maximum Exposure"assumptions in its Human Health Risk Assessment. 2. For all alternatives, the remediation described applies to the top foot of soil, except that FP3 through FP 9 also involve additional remediation in certain heavily used subareas as necessary to achieve criteria in the top 3 feet of soil.

The complete array of the 9 floodplain alternatives for each reach is available in your workbook on page 10.

Cleanup Options

How many possible cleanup options have been identified?

- The CMS describes 10 Sediment Alternatives over 10 River Reaches (100 combinations)
- Along with 9 different Floodplain Alternatives
- And 5 different Treatment and Disposal Alternatives
- So how many possible cleanup options have been evaluated?

Cleanup Options

- Let's do the math:

44 Sediment/Reach Options that create dredged sediment
x 8 Floodplain Alternatives that create excavated soil
352 Combinations that create both sediment and soil
+432 (54 x 8) Combinations that create only sediment
+ 44 (44 x 1) Combinations that create only soil
828 Combinations of Alternatives that require Treatment/Disposal (T/D)
x 5 Treatment/Disposal Alternatives
+ 54 Combinations of Alternatives that require no T/D

4,194 Available Options

…and this does not even account for the variations and permutations on these options.

General Approaches to Cleanup

- The general cleanup approaches evaluated in the CMS for sediment include:
  - No Action
  - Monitored Natural Recovery ("MNR")
  - Removal with Capping
  - Removal with Backfill
  - Thin Layer Capping ("TLC")
  - Engineered Capping
  - Bank Stabilization

Matrix of Sediment Cleanup Alternatives

- Let's look at an example:

Alt.	Reach 5A	Reach 5B	Reach 5A/5B Banks	Reach 5C	Reach 5 Backwaters	Reach 6 (Woods Pond)	Reach 7	Reach 7 Channel	Reach 8	Reach 9-16
SED 5	2-foot removal with capping	2-foot removal with capping	Stabilization/ bank soil removal	Combination of 2-foot removal with capping (in shallow areas) and capping (in deeper areas)	Combination of thin-layer capping and Monitored Natural Recovery	Combination of 1.5 foot removal with capping in shallow areas and capping in deep area	Monitored Natural Recovery	Monitored Natural Recovery	Thin-layer capping	Monitored Natural Recovery

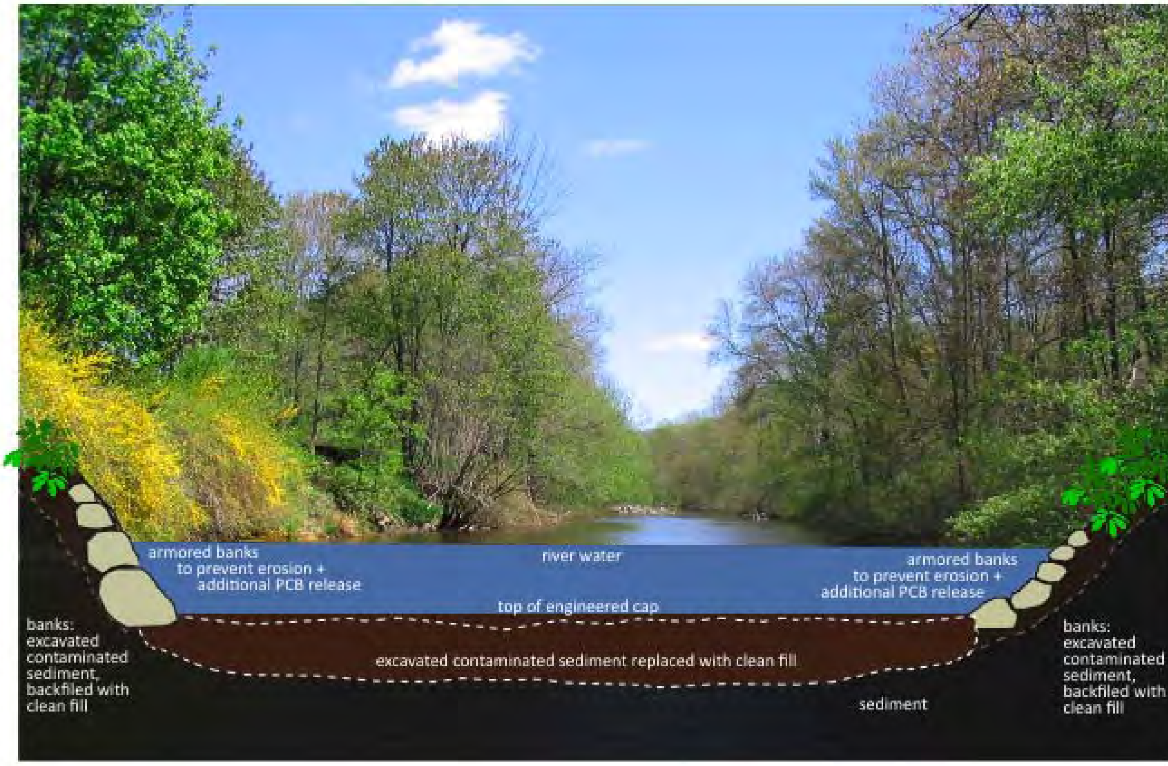
Monitored Natural Recovery

Thin Layer Capping (TLC)

Sediment Removal/Bank Stabilization

- Many alternatives involve sediment removal from the riverbed and banks
- There are a number of ways to approach stabilization of the riverbanks

Rock-Stabilized Bank & PCB Containment Section Diagram



Bank Stabilization & PCB Containment With Armor and Planting Section Diagram

Bioengineered Bank & PCB Containment Section Diagram

Floodplain Cleanup Alternatives

Floodplain (FP) alternatives were designed to meet various goals:

- Human Health risk-based cleanup levels
  - Increased cancer risk of 10^{4}, 10^{5} or 10^{6} (one in 10,000 to one in 1 million)
  - Non-Cancer hazard (e.g., "Hazard Index" of 1)
- Ecological risk-based cleanup levels
- Other PCB concentration-based limits (25 parts per million, 50 parts per million)

Alternative	Description
FP 1	No action.
FP 2	Soil removal/backfilling to achieve the health-based IMPGs based on 10-4 cancer risk or on non-cancer (whichever is lower).
FP 3	Same as FP 2 except: (a) in certain frequently used areas, soil removal/backfilling to achieve the health-based IMPGs based on 10-5 cancer risk or on non-cancer (whichever is lower); and (b) supplemental remediation to achieve upper-bound IMPGs for ecological receptors.
FP 4	Soil removal/backfilling to achieve the health-based IMPGs based on 10-5 cancer risk or on non-cancer (whichever is lower). Supplemental remediation to achieve upper-bound IMPGs for ecological receptors.
FP 5	Removal of soils that contain PCB concentrations of 50 mg/kg or greater, with backfilling.
FP 6	Removal of soils that contain PCB concentrations of 25 mg/kg or greater, with backfilling.
FP 7	Soil removal/backfilling to achieve the health-based IMPGs based on 10-6 cancer risk , but no lower than 2mg/kg for direct human contact (level specified in Consent Decree as the standard for residential use). Supplemental remediation to achieve lower-bound IMPGs for ecological receptors.
FP 8	Soil removal/backfilling to achieve the health-based IMPGs based on 10-5 cancer risk or on non-cancer (whichever is lower). Supplemental remediation in vernal pools to achieve lower-bound IMPG for amphibians. Additional removal of all remaining soils that contain PCB concentrations of 50 mg/kg or greater, with backfilling.
FP 9	Same as FP2 with additional soil removal/backfilling to achieve the health-based RME IMPGs based on 10-4 cancer risk or on non-cancer (whichever is lower) in top 3 feet in certain heavily used subareas.

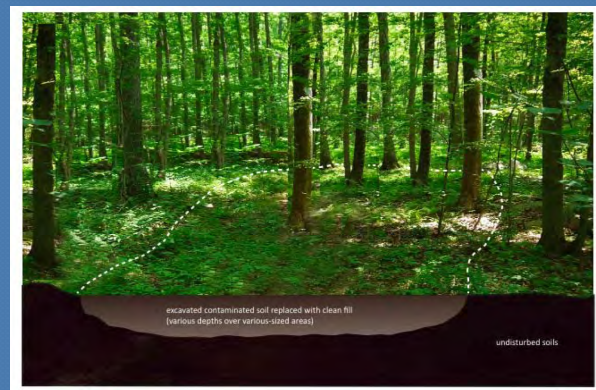
Notes: 1. The health-based IMPGs refer to the IMPGs that were based on EPA's "Reasonable Maximum Exposure"assumptions in its Human Health Risk Assessment. 2. For all alternatives, the remediation described applies to the top foot of soil, except that FP3 through FP 9 also involve additional remediation in certain heavily used subareas as necessary to achieve criteria in the top 3 feet of soil.

Floodplain Remediation Section Diagram

Combined Sediment/Floodplain Alternatives

- Several "Combination Alternatives" outlined in CMS to better evaluate how sediment/floodplain cleanups would be implemented
- Combinations in the CMS:
  - SED2/FP1
  - SED3/FP3
  - SED5/FP4
  - SED6/FP4
  - SED8/FP7
  - SED9/FP8
  - SED10/FP9
- This is not an exhaustive list of alternatives or combinations; all options are "still on the table"

Example of Option Combinations



Treatment/Disposal Options

- Disposal in a Landfill
  - Off-site permitted facility (TD1)
  - Local Disposal in upland area near the River (TD3) – GE's CMS identified 3 potential locations
- Disposal in a Confined Disposal Facility (CDF) in the River (TD2)
- Treatment of Excavated Soil/Sediment
  - Chemical Extraction (TD4)
  - Thermal Desorption (TD5)
  - Treatment followed by disposal unless reuse option was found

Treatment/Disposal Options

- All of the Treatment/Disposal alternatives evaluated in detail in the CMS are *"ex-situ"* approaches, dealing with soil/sediment that has been excavated

- Innovative technologies to deal with contamination *"in-situ"*, without removing soils/sediments, are in varying stages of development.
  - Potential future opportunities for pilot tests in the short- and long-term.
  - "Adaptive Management" allows future consideration.

Making a Cleanup Decision

- EPA will evaluate the alternatives against the nine evaluation criteria specified in the RCRA Permit (listed below) and then propose its "preferred alternative"

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

- Selection Decision Factors
  - Long-term reliability and effectiveness
  - Attainment of IMPGs (interim cleanup goals)
  - Reduction of toxicity, mobility, volume
  - Short-term effectiveness
  - Implementability
  - Cost

How EPA Selects a Remedy

- Internal EPA reviews, including review by EPA's National Remedy Review Board
  - GE and community groups have the opportunity to submit their own views for Board consideration
- EPA then presents the proposal for public comment prior to making final cleanup decision
  - The proposed cleanup plan will include a draft revision to GE's RCRA Permit
  - Minimum 45 day comment period
  - EPA will hold additional public meetings and hearing(s)

How EPA Selects a Remedy

- This Mini Workshop and the more extensive and interactive Public Charrette on Saturday, May 7 will help EPA better understand the public's views prior to proposing a remedy for formal comment

- Materials for this Mini Workshop and those of the past 2 nights is available online:

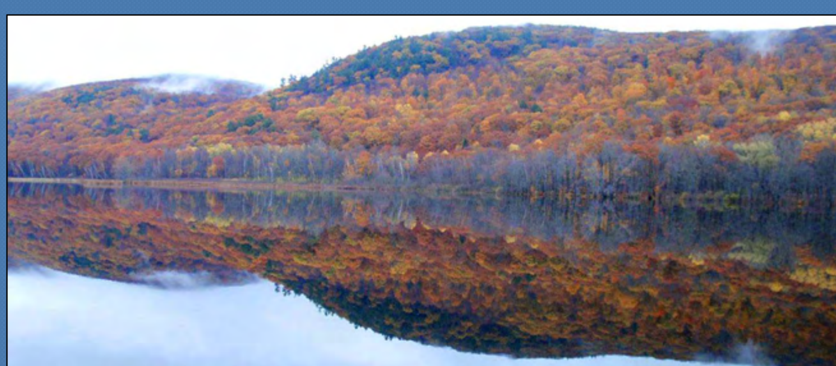
  www.HousatonicWorkshops.org

Environmentally Sensible Remediation Concepts

Susan Svirsky
April 7, 2011

Where is EPA in the Decision Process?

- EPA is beginning its decision-making process for the Rest of River
- We are considering input from stakeholders, GE's CMS submittals, and other relevant information
- If an active remedy is selected by EPA, then we believe that it must be approached by applying environmentally sensible concepts or principles …



What does EPA mean by Environmentally Sensible Remediation Concepts?

- Any cleanup of the river, banks, or floodplain should:
  - be done in a carefully planned and thoughtful manner considering:
    - PCB contamination and risk reduction
    - River processes
    - Species/habitats of concern and cultural resources
    - Downstream impacts
    - Quality of life
  - have a surgical mindset
  - ensure that restoration is an integral component of any action
  - provide the ability to improve and adapt as any cleanup progresses
  - take into consideration stakeholder input

PCB Contamination and Risk Reduction

- PCBs in the Housatonic River and floodplain are posing a real risk to humans and are harming many species of wildlife
- These risks and harm will continue as the PCBs are not going away or being buried in the foreseeable future (>250 yrs)

River Processes

- The river channel has not yet recovered from past alterations by man
  - Channel straightening
  - Channel relocation
  - Changing connection of river to floodplain
  - Clearing of the floodplain
  - Altering the sediment load
- Any cleanup should work with the river and floodplain, not against it

Species/Habitats of Concern and Cultural Resources

- There are species of both plants and animals of concern in the river and floodplain

- Any cleanup should look for opportunities to:
  - Avoid
  - Minimize
  - Mitigate

- Need to research and implement a program during any cleanup to document and/or preserve cultural resources

Downstream Impacts

- While PCB contamination is greatest in the first 30 miles below the Confluence, PCBs have had and will continue to have adverse impacts downstream, including -
  - Fish consumption advisories
  - Concerns regarding sediment management for activities in the river (e.g. dam maintenance/removal, bridge repair)
  - Degraded water quality (e.g. the river is on CT's impaired waters list for PCBs)
- Any cleanup should be conducted in a way that allows only short-term impacts downstream from resuspension

Quality of Life

Any cleanup should consider ways to:

- Minimize impacts to nearby homeowners, e.g. -
  - Hours of operation
  - Lighting
  - Sound
  - Dust Control
- Optimize routing of trucks for minimal impacts to residents/public roads/traffic
- Provide a mechanism for interaction with and input from potentially affected property owners and other stakeholders
- Provide ways to allow for continued recreational opportunities during cleanup

A Surgical Mindset

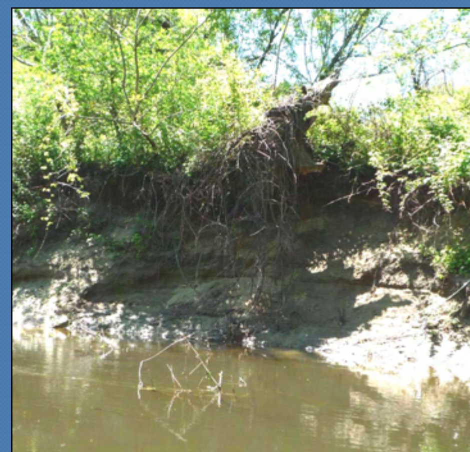
- Any river cleanup is like a surgery; it is necessary to address the disease, painful while occurring, yet heals with time
- Cleanup infrastructure and equipment should have the smallest possible footprint
- Consider leaving some contamination that requires a disproportionate impact to address, offset risks with cleanup of other, perhaps less contaminated, but easily accessible areas
- Minimize the time in which any given area is being affected (e.g. confine work to small areas proceeding from upstream to downstream)

Restoration

- Restoration -
  - must be considered upfront in designing any cleanup
  - goals should be established with input from stakeholders
  - must be overseen by professional restoration specialists &
  - should take advantage of opportunities provided during cleanup &
  - is not "one size fits all" but must be tailored to the habitat type and location in the landscape &
- Restoration goals and timeframes need to be clearly presented and understood
- Monitoring the success of the restoration is essential

Adaptive Management

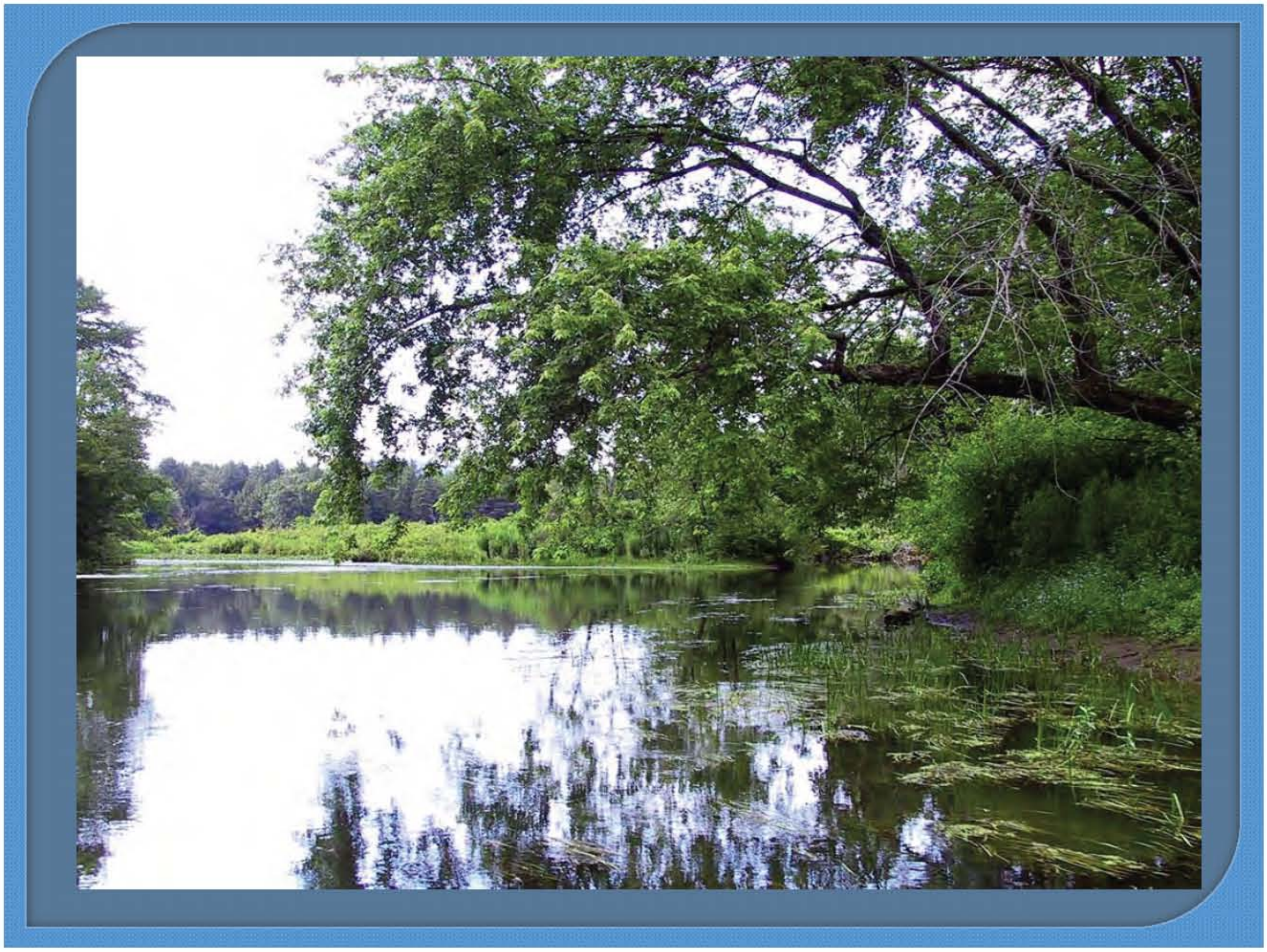
- Any cleanup will take place over a period of years
- Stage the design in a way that allows for critical review of previous work and incorporation of lessons learned
- Allow the opportunity to consider new technologies, equipment, and/or methods if they become available



Summary

EPA recognizes that if an active remedy is selected, with proper planning, management, and stakeholder involvement, it can be successfully implemented such that there will be:

- permanent reductions in risk to human health and the environment &
- a permanent reduction in PCB transport downstream
- a river and floodplain that, over time, will regain its & natural beauty and habitat quality, with an active & restoration component that will put it on the right & trajectory for recovery &
- no long-term loss of, and improvement in health of, species of concern &



3.7 Rest of River Public Charrette

In May, the month following the Mini Workshop, EPA sponsored a practical, all-day, intense, hands-on workshop for the community to better understand Rest of River issues, to explore the pros and cons of the Proposed Alternatives, and for EPA to hear the community's ideas.

3.7.1 Choice of Charrette Forum and Technique

A "charrette" can take many forms but, at its essence, is an intense, hands-on workshop that results in guidance, input, or direction for the charrette sponsors to consider in subsequent planning efforts. EPA selected the format after considerable research because it offered a number of advantages over more traditional outreach methods:

- The intense, hands-on format of a charrette allows participants to delve into complex projects in much greater depth than town hall meetings or less interactive workshops.

- Crafting exercises in which participants must work toward a common goal (even if the goal is, as a group, merely to complete the exercise) tends to foster productive collaboration and engaged dialogue rather than destructive posturing and debate.

- The more personal and casual atmosphere of a charrette tends to make people more comfortable and, therefore, more forthcoming with their questions and sharing of opinions.

- Because a charrette typically involves activities that lead participants through thinking exercises, the format helps stakeholders understand the *processes* that charrette sponsors are bound to follow, more likely leading to stakeholder input that is grounded in viable, useful input.

- Most people find the intensity of a charrette exhausting but also rewarding and fun, which spurs their interest in the effort and their continued participation.

With regard to length, charrettes can be conducted within timeframes ranging from a few hours to several days. EPA decided that a single, all-day event would be the most effective, efficient, and respectful of stakeholders' time.

3.7.2 Objectives

Whereas the primary intention of the Mini Workshops was to equip stakeholders with accurate information on Rest of River issues, the objectives of the Public Charrette were to help the public *apply* the information of the Mini Workshops to a Rest of River remedy and, in turn, share their ideas with EPA. The information exchange was to function equally and reciprocally between charrette participants and EPA—for everyone's voices to be heard, as represented by Figure 11.

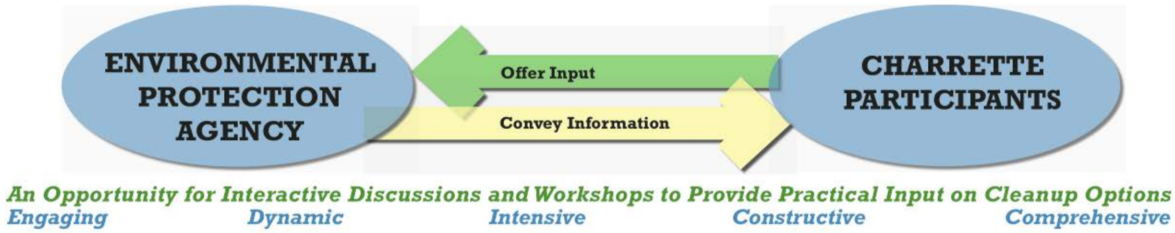


Figure 11. Two-Way Dynamic of Public Charrette.

EPA's primary objective of a two-way dynamic was supported by secondary objectives in which the needs of participants and EPA formed complementary components in achieving the objectives. The reciprocal relationship of the objectives is best represented in the following foldout (Figure 12).

.

Figure 12. Charrette Purpose and Activities

Five objectives of the Public Charrette warrant highlighting:

1) *Offer Stakeholders an Opportunity to Interact with One Another in Constructive Ways*
Previous public forums offered citizens opportunities to publicly state opinions and to debate issues. EPA believed that a forum in which interaction was required would produce a constructive dialogue that would, in turn, allow citizens to see each other's views and, perhaps, find common ground.

2) *Offer Stakeholders the Opportunity To Understand the Decision Process*
The Situation Assessment revealed that stakeholders were unaware of the Reissued RCRA Permit requirements and the 9 Criteria that EPA must evaluate in its comparative evaluation of remedial alternatives. EPA believed that if stakeholders better understood the 9 Criteria, they could offer more practical and useful feedback for EPA to consider in its development of a preferred alternative.

3) *Offer Participants Information and Direct Access to Experts on a Range of Topics and Strategies*
The public's direct access to EPA's technical experts at the Mini Workshops was highly effective at clarifying and informing stakeholders on issues related to cleanup. EPA believed that the availability of these experts at the Public Charrette would continue stakeholders' learning and, in addition, assist stakeholders in making technically sound and practical cleanup recommendations to EPA.

4) *Offer Participants Opportunities for In-Depth Exploration of and Response to the Alternatives and Potential Components of a Remedy*
The Situation Assessment revealed that stakeholders were inadequately informed of the range of alternatives and methods that were available to EPA in crafting a remedy. Although the Mini Workshops provided an overview of methods and the alternatives evaluated by GE in the Corrective Measures Study, stakeholders had not had the opportunity to thoroughly explore the options and understand the full range of consequences—an effort that would more effectively be accomplished during the Public Charrette.

5) *Offer EPA Thoughtful Input on a Range of Options that EPA Could Use Regardless of Which Actions It Selects*
The Situation Assessment found that citizens occupied positions across the spectrum of potential solutions, from "Do no cleanup and monitor" to "Remove any sediment and soil contaminated with PCBs." Yet, EPA did not have a good understanding of what the community would want to do across the range of options between those two extremes. Furthermore, EPA believed that many in the community would like to have a say in how an alternative would be implemented even if it were not their preferred solution—information that would be useful for EPA to consider in crafting a remedy.

3.7.3 Components Overview

In achieving these objectives, EPA devised a Public Charrette plan that consisted of a full day of intense activities in which there would be "something for everyone," spanning the range of veteran Housatonic cleanup stakeholders to those recently arriving to the area or newly interested in the project. Accompanied by supporting exhibits, three primary types of activities composed the substance of the Public Charrette:

1) Poster Session
   The Poster Session provided an opportunity for the public to learn more about the technical issues involved in developing a remedy for the River, to learn more about modeling tools that will be used in EPA's remedy decision, and to speak one-on-one with experts spanning a range of disciplines. Interpretive posters and exhibits were placed in a single, large room for the entire day, allowing participants to review materials at their leisure. In addition, the EPA experts were present at their posters for a two-hour period over lunch, ensuring that stakeholders would have time to interact directly with them.

2) Workshops
   The Workshops provided an opportunity for the public to apply their understanding of technical information to a range of cleanup options and offer EPA substantive and practical suggestions. Participants, in groups of 10 to 20, engaged in a Morning and an Afternoon Workshop that produced specific and practical information to EPA. Each group was assisted by a facilitator and a scribe, the pair conducting the process and recording group members' responses. The work of the 1-1/2 to 2-hour Workshops involved discussion, complex decision-making, and consideration of a range of cleanup options. The EPA experts circulated during the Workshops to be available to answer any questions or provide requested clarifications that arose during the group discussions.

3) Plenary Sessions
   Three Plenary Sessions were interspersed throughout the day in order to collectively gather participants and to introduce the Workshops and take questions and comments. Plenary Session A, the Morning Plenary, began with a welcome by Curt Spalding, EPA New England Regional Administrator and provided an explanation of Workshop One. Plenary B, the Afternoon Plenary, served to explain Workshop Two. Plenary C, the Closing Plenary, gathered participants to explain upcoming opportunities for public input, briefly outline EPA's cleanup decision process, and listen to participants' feedback on the events of the day. In this report—for organizational clarity—the Plenary Sessions are described in a section following the descriptions of the Poster Session and Workshops.

The Public Charrette Agenda details the chronological order of the individual components:

PUBLIC CHARRETTE AGENDA

8:30 - 9:00 Registration + Coffee • Poster Session Tour

9:00 - 10:15 PLENARY A • Bernstein Theatre
Welcome by Curt Spalding–EPA New England Regional Administrator
Introduction of Workshop 1 • Criteria Scorecard

10:15 - 10:30 Break + Move to assigned Workshop 1 Groups according to name tag color and symbol

10:30 - 12:00 Workshop 1 • Permit Scorecard • Meeting the Criteria
A facilitated group activity in which participants work through the process of applying the decision criteria required by the Consent Decree to a range of cleanup alternatives

12:00 - 2:00 Poster Session • Lunch
• A wide-ranging display of technical information from EPA's "Rest of River" studies, practical tools relevant to cleanup, and an opportunity to directly engage EPA's experts
• Lunch

2:00 - 2:45 PLENARY B • Bernstein Theatre
Workshop 1 Group Reports
Introduction of Workshop 2 • Comprehensive Guidelines
2:45 - 2:55 Break + Move to Workshop 2 groups

2:55 - 4:30 Workshop 2 • Comprehensive Guidelines
A facilitated group activity in which participants tackle the issues from the community's perspective, apply the understandings of Workshop 1, and craft a set of guidelines for EPA to consider in its decision
4:30 - 4:40 Move to Closing Plenary

4:40 - 5:30 PLENARY C • Bernstein Theatre
• Workshop 2 Group Reports
• Moving Forward
• Thank you

5:30 Reception + Further Conversation with EPA's Experts

3.7.4 Logistics

3.7.4.1 Venue

The Rest of River Public Charrette was held on Saturday, 7 May 2011 at the Elayne P. Bernstein Theatre of Shakespeare & Co., 70 Kemble Street, Lenox, Massachusetts. A sequence of activities was offered from 8:30 am – 5:30 pm, including a Poster Session, Workshops, and Plenary Sessions. A reception followed at which participants could view the products of the day's activities as well as speak further with EPA's experts who were available throughout the day.

The Lobby hosted exhibits, registration, and the closing reception. Plenary Sessions were held within the Bernstein Theatre. The Poster Session was held in the largest rehearsal studio for the entire day, and the smaller group Workshops were distributed between two rehearsal studios, the Theatre, and a partitioned portion of the Lobby.

3.7.4.2 Attendance

EPA requested prior registration and had obtained 107 registrations by the day of the charrette; because the venue could comfortably accommodate up to 125 people, all individuals who expressed interest were able to attend. On the day of the Public Charrette, a definitive count of attendees could not be made; however, 69 people registered in the morning and 54 participated in the afternoon Workshop.

3.7.4.3 Workbooks

Upon registration, participants were given a Charrette Workbook that contained copies of materials that they would be using for the two workshops:

- Reissued RCRA Permit Criteria for evaluating alternatives
- Description of 4 Options To Be Considered at the Charrette
- Workshop One • Criteria Scorecard
- Workshop Two • Comprehensive Guidelines Worksheets

The Workbook also included additional support information:

- EPA Welcome by Curt Spalding, EPA New England Regional Administrator
- The Agenda for the day
- River Reach Reference Maps
- Poster Session Exhibits—Brief Descriptions
- Biographies of EPA's Experts

The Workbook in its entirety follows this section of the report.

3.7.4.4 Exercise Signups

Upon receiving their nametags, participants were randomly assigned to one of five groups for Workshop One (all groups contained the same content for Workshop One). For Workshop Two signup, EPA provided participants with descriptions for the four different group topics: Community Life; River Aesthetics; River Ecology; and River Uses. Charrette staff were available to help participants decide on the optimal topic choice for their interests.

3.7.4.5 Exhibits

EPA included three large-scale exhibits in the Bernstein Theatre lobby to support the efforts of the Public Charrette:

1 • Tell Us About Your River

This interactive exhibit was a continuation of the same exhibit at the Mini Workshops and a way for attendees to offer EPA information spatially—via maps—about specific places on the Housatonic River of interest to them.

2 • PCB Concentrations in the Housatonic River and Floodplain

This exhibit comprised a series of maps covering the area between the Confluence and the Massachusetts border with Connecticut. The maps showed the locations of the numerous soil and sediment samples collected by EPA and GE and the concentration of PCBs found at each location and depth.

Figure 13. Public Charrette Image of Participants with Two-Sided Accordion Exhibit in Background Showing the PCB Concentrations in the Housatonic River and Floodplain.

Figure 14. Public Charrette Exhibit of Completed Worksheets for Workshop 1 and Workshop 2 Reports.

3 • Workshop Reports

Each of the five groups from Workshop 1 • Permit Scorecard and Workshop 2 • Comprehensive Guidelines produced a 30" x 42" Worksheet that summarized for EPA the group's discussions (Figure 14). All 10 of these Worksheets were posted so that members of other groups could review and compare. In addition, any individual member who wished to post her/his own worksheet was encouraged to do so. These Worksheets are included with the following descriptions of the Workshops.

3.7.5 Feedback Summary

Participants were encouraged, via Feedback Forms (Figure 15), to provide ratings on the Public Charrette as well as their overall experience.

Certus

We value your input. Please leave your completed evaluation in boxes at exit.
If completed later, fax to 301-770-1616 or email and scan to Admin@Certus-Strategies.us.

Charrette Feedback

(Please circle one)

	Great				Poor
Charrette - General	5	4	3	2	1
Opening Plenary - Overall	5	4	3	2	1
Afternoon Plenary - Overall	5	4	3	2	1
Closing Plenary - Overall	5	4	3	2	1
Poster Session - Overall	5	4	3	2	1
Presenters	5	4	3	2	1
Materials	5	4	3	2	1
Usefulness	5	4	3	2	1

(Please circle one)

	Great				Poor
Workshop One - Overall	5	4	3	2	1
Facilitator	5	4	3	2	1
Materials	5	4	3	2	1
Usefulness	5	4	3	2	1
Workshop Two – Overall	5	4	3	2	1
Facilitator	5	4	3	2	1
Materials	5	4	3	2	1
Usefulness	5	4	3	2	1

(Optional) Name:__________________ City/Town:_____________ Phone:____________ Email:________________

Other Comments on Charrette *(Continue on other side if needed)*:

Note: Please use the separate Comment form for all substantive comments

Comment Form

(Optional) Name:__________________ City/Town:_____________ Phone:____________ Email:_______________

Comments *(Continue on other side if needed)*:

Figure 15. Example of Public Charrette Feedback Form.

As the chart in Figure 16 notes, the vast majority of participants who offered a response rated the Public Charrette overall, the Poster Session, and the Workshops on the "Great" end of the spectrum.

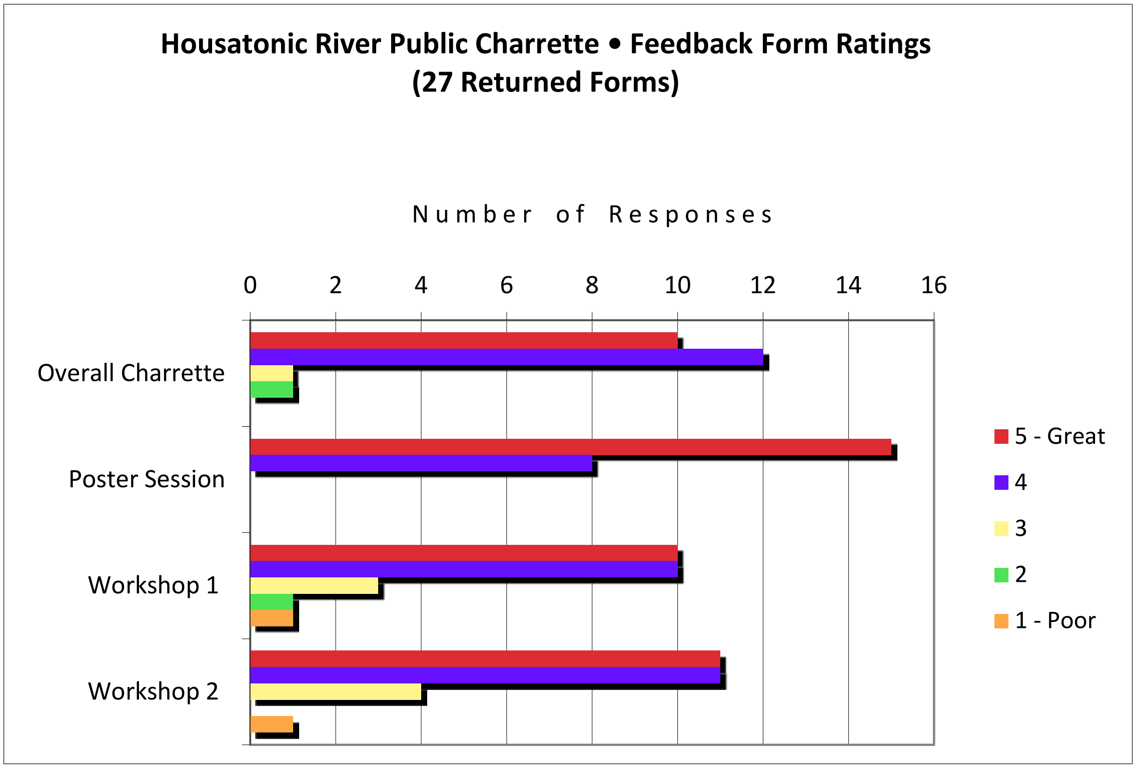


Figure 16. Summary of Public Charrette Feedback Forms.

3.7.6 Documentation

For those who could not attend the Public Charrette and to make the charrette activities and outcomes available to all, EPA posted materials on the www.HousatonicWorkshops.org website:

- Videos of Plenary Sessions and Montage of Workshops
- Group Worksheets from Workshop 1 • Criteria Scorecard
- Group Worksheets from Workshop 2 • Comprehensive Guidelines
- Individual Worksheets
- Posters from Poster Session.

The printable materials for each Workshop and Poster Session are included in the following pages in their associated sections.

3.7.7 Invitations/Publicity

EPA extended invitations to the public for the Rest of River Public Charrette through five methods:

- Advertisements in the Berkshire Eagle: April 22, May 3, and May 5 (Figure 17).
- Emails from EPA to those who had signed up to receive Rest of River information and updates.

- Announcements and registration opportunities posted on the Website created as part of the intensified public outreach effort: www.HousatonicWorkshops.org.
- Registration forms in the Workbooks for each of the Mini Workshops, as well as through announcements at each Mini Workshop.
- 22” x 28” Full-Color Posters posted throughout the Rest of River townships in local community buildings (town halls, libraries, post offices, schools, etc.) and local businesses, as noted in Figure 18. Total Posters Posted = 61.

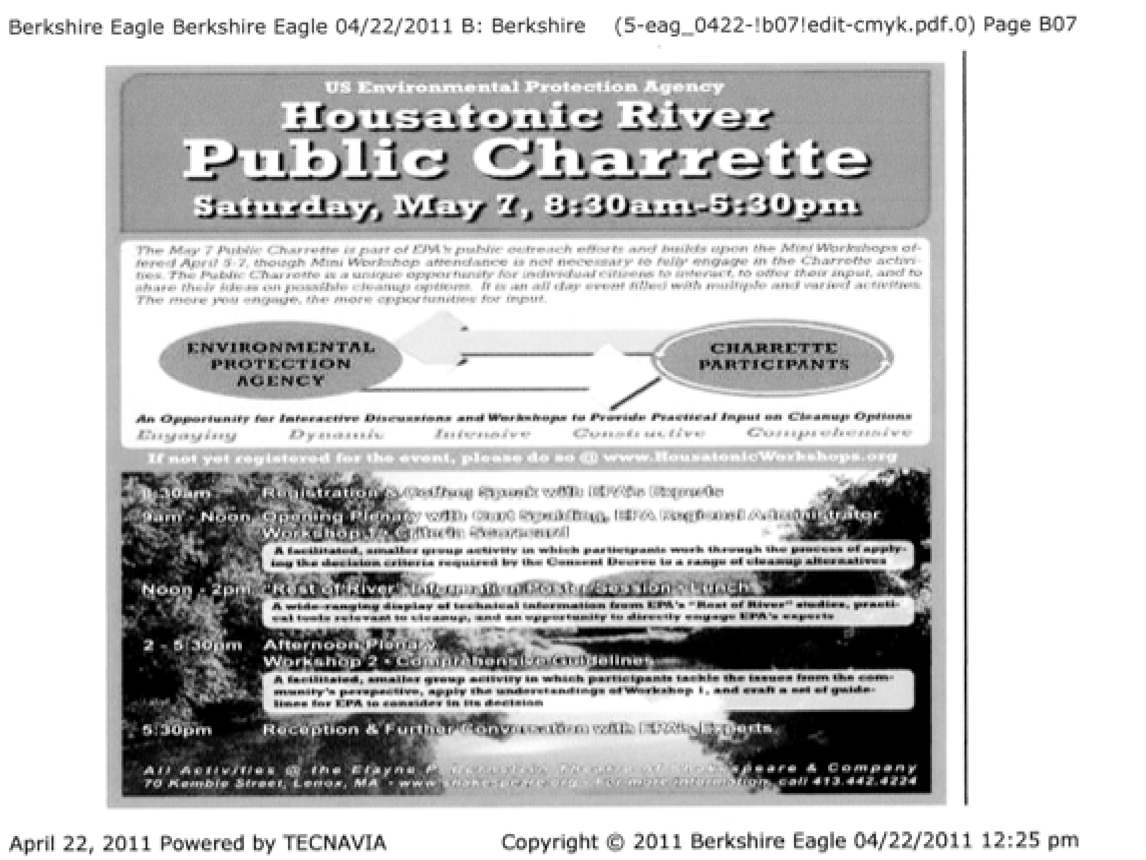


Figure 17. Public Charrette Advertisement in Berkshire Eagle.

TOWN	PLACE	TOWN	PLACE
Dalton	Post Office	Pittsfield	Stop & Shop
	Town Hall		Taconic High School
	Library		Berkshire Community College
	Community Recreational Association		Pittsfield Post Office
Egremont	Town Hall		Berkshire Athenaeum
Great Barrington	Post Office		Pittsfield City Hall
	Town Hall		Pittsfield High School
	Big Y Supermarket		Mission Rest
	Monument Mountain Regional High School		Dottie's Coffee
	Mason Library		Big Y Supermarket
	Great Barrington Bagel Co.		Juice & Java
	Cove Bowling	Richmond	Post Office
	Riverbend Organic Coffee		Town Hall
	Barrington Brewery	Sheffield	Town Hall
Housatonic	Post Office		Post Office
	Corner Market		Bushnell-Sage Library
	Taft Farm and Country Store		Mt. Everett High School
Lee	Post Office		Silk's Variety
	Town Hall	Stockbridge	Post Office
	Library		Town Hall
	Lee Hardware		Library
	Joe's Diner		Elm St. Market
	Athena's Pizza		Stockbridge General Store
	Claire's Café	West Stockbridge	Post Office
Lenox	Town Hall		Town Hall
	Library		Public Market
	Post Office		
	Loeb's Food Store		
	Caligari's Hardware		
	Stop & Shop		
	Nejaime's Wine & Liquor		
	Haven Café		
	Berkshire Bagel		
	Community Center		
	Lenox Middle and High School		

Figure 18. Public Charrette Advertisement Poster Locations.

Supporting Materials for Public Charrette (Following)

Public Charrette Poster

Public Charrette Workbook

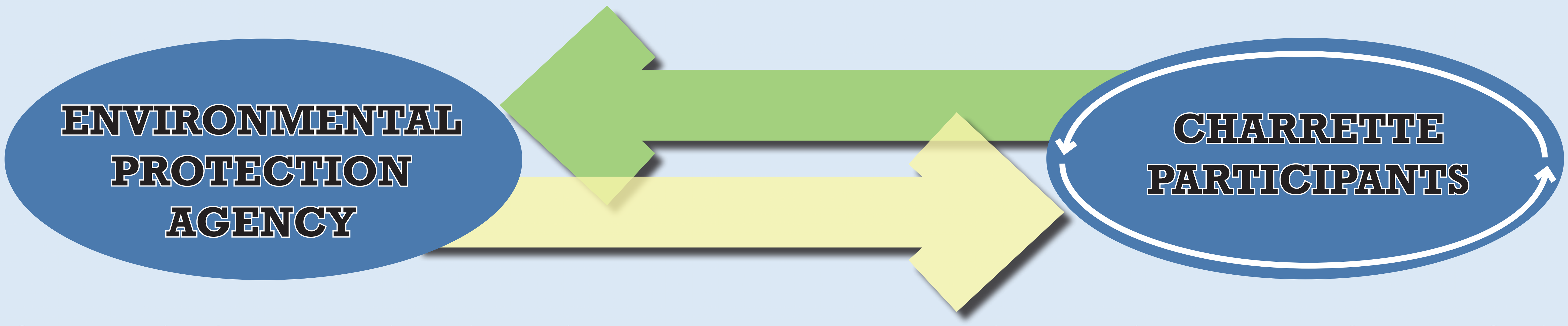
PUBLIC CHARRETTE POSTER

US Environmental Protection Agency

Housatonic River Public Charrette

Saturday, May 7, 8:30am-5:30pm

The May 7 Public Charrette is part of EPA's public outreach efforts and builds upon the Mini Workshops offered April 5-7, though Mini Workshop attendance is not necessary to fully engage in the Charrette activities. The Public Charrette is a unique opportunity for individual citizens to interact, to offer their input, and to share their ideas on possible cleanup options. It is an all day event filled with multiple and varied activities. The more you engage, the more opportunities for input.



An Opportunity for Interactive Discussions and Workshops to Provide Practical Input on Cleanup Options

Engaging Dynamic Intensive Constructive Comprehensive

If not yet registered for the event, please do so @ www.HousatonicWorkshops.org

8:30am Registration & Coffee; Speak with EPA's Experts

9am - Noon Opening Plenary with Curt Spalding, EPA Regional Administrator
Workshop 1 • Criteria Scorecard

A facilitated, smaller group activity in which participants work through the process of applying the decision criteria required by the Consent Decree to a range of cleanup alternatives

Noon - 2pm "Rest of River" Information Poster Session • Lunch

A wide-ranging display of technical information from EPA's "Rest of River" studies, practical tools relevant to cleanup, and an opportunity to directly engage EPA's experts

2 - 5:30pm Afternoon Plenary
Workshop 2 • Comprehensive Guidelines

A facilitated, smaller group activity in which participants tackle the issues from the community's perspective, apply the understandings of Workshop 1, and craft a set of guidelines for EPA to consider in its decision

5:30pm Reception & Further Conversation with EPA's Experts

All Activities @ the Elayne P. Bernstein Theatre of Shakespeare & Company
70 Kemble Street, Lenox, MA • www.shakespeare.org • For more information, call 413.442.4224

PUBLIC CHARRETTE WORKBOOK

Housatonic River Public Charrette

This Public Charrette is part of the EPA's public outreach effort and builds upon the Mini Workshops offered April 5-7, 2011. It is a unique opportunity for individual citizens to interact, to offer their input and to share their ideas on possible cleanup options.

SATURDAY • MAY 7, 2011

Public Charrette • The Community Contributes
8:30am - 5:30pm followed by Reception

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 the EPA to Hear the Community's Ideas

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

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

Table of Contents

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

Dear Friends,

Once again, it is my pleasure to welcome you to this important event 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 designed the series of workshops held in April and today's 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. Today's charrette is another important step towards that goal.

EPA hopes to use what we learn from you and others 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 the hands-on workshops that are part of today's agenda informative and worthwhile.

Curt Spalding
Regional Administrator

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

Today's Agenda

8:30 - 9:00	**Registration + Coffee • Poster Session Tour**
9:00 - 10:15	**PLENARY A • Bernstein Theatre** Welcome by Curt Spalding–EPA New England Regional Administrator Introduction of Workshop 1 • Criteria Scorecard
10:15 - 10:30	Break + Move to assigned Workshop 1 Groups according to name tag color and symbol
10:30 - 12:00	**Workshop 1 • Permit Scorecard • Meeting the Criteria** A facilitated group activity in which participants work through the process of applying the decision criteria required by the Consent Decree to a range of cleanup alternatives
12:00 - 2:00	**Poster Session • Lunch** • A wide-ranging display of technical information from EPA's "Rest of River" studies, practical tools relevant to cleanup, and an opportunity to directly engage EPA's experts • Lunch
2:00 - 2:45	**PLENARY B • Bernstein Theatre** Workshop 1 Group Reports Introduction of Workshop 2 • Comprehensive Guidelines
2:45 - 2:55	Break + Move to Workshop 2 groups
2:55 - 4:30	**Workshop 2 • Comprehensive Guidelines** A facilitated group activity in which participants tackle the issues from the community's perspective, apply the understandings of Workshop 1, and craft a set of guidelines for EPA to consider in its decision
4:30 - 4:40	Move to Closing Plenary
4:40 - 5:30	**PLENARY C • Bernstein Theatre** • Workshop 2 Group Reports • Moving Forward • Thank you
5:30	**Reception + Further Conversation with EPA's Experts**

Poster Session Exhibits

History of the River, Richard DiNitto, *The Isosceles Group* and John Field, Ph.D, *Field Geology Services*

Summarizes the geological and cultural history of the Housatonic River watershed, with particular emphasis on how the River has been shaped by human activity over the last 250 years

Geomorphology/River Processes, George Athanasakes, *Stantec Consulting, Inc.*, Keith Bowers, *Biohabitats Inc*., and David Bidelspach, *Stantec Consulting, Inc.*

Discusses the fundamental processes that govern the structure and evolution of all rivers, and their implications for potential remediation of the Housatonic River

Ecological Characterization, John Lortie, *Stantec Consulting, Inc.*

Describes the habitats and natural communities found in the Housatonic River and floodplain, their interrelationships, and their resident species, with details on rare, threatened, and endangered species in the area

What Are PCBs and How Do They Behave in the Environment?, Richard McGrath, *The Isosceles Group*

Provides information on the physical structure and chemistry of PCBs (polychlorinated biphenyls), with additional information on PCB toxicity, and their behavior following release to the environment

PCB Distribution, Fate, and Transport, Edward Garland, *HDR HydroQual*

Summarizes the location and concentrations of PCBs in the Housatonic River, and what EPA has learned about their transport and fate

Human Health Risks, Donna Vorhees, Sc.D, *The Science Collaborative*

Provides a summary of EPA's Human Health Risk Assessment, including an overview of risks due to the exposure pathways of direct contact, fish and waterfowl consumption, and consumption of agricultural products grown in the floodplain

Ecological Risks, Gary Lawrence, *Golder Associates*

Summarizes EPA's Ecological Risk Assessment, which included an analysis of risks to eight different receptor groups due to their exposure to PCBs

Why Use Models for the Housatonic River? Mark Velleux, Ph.D, *HRD HydroQual*

Describes and summarizes the results of the linked hydrological/hydrodynamic and sediment/contaminant fate and transport/food-chain models being used to better understand the movement of contaminants in the River and floodplain and to evaluate potential remedial alternatives

Remediation Technologies and Techniques, Michael Palermo Ph.D, *Mike Palermo Consulting Inc.*

Presents the various options for remediating contaminated sediments and discusses their relative merits

Ecological Restoration, Keith Bowers, *Biohabitats Inc.*

Provides an overview of habitat restoration, and presents several examples of successful restoration projects conducted on ecosystems similar to and different from that of the Housatonic River

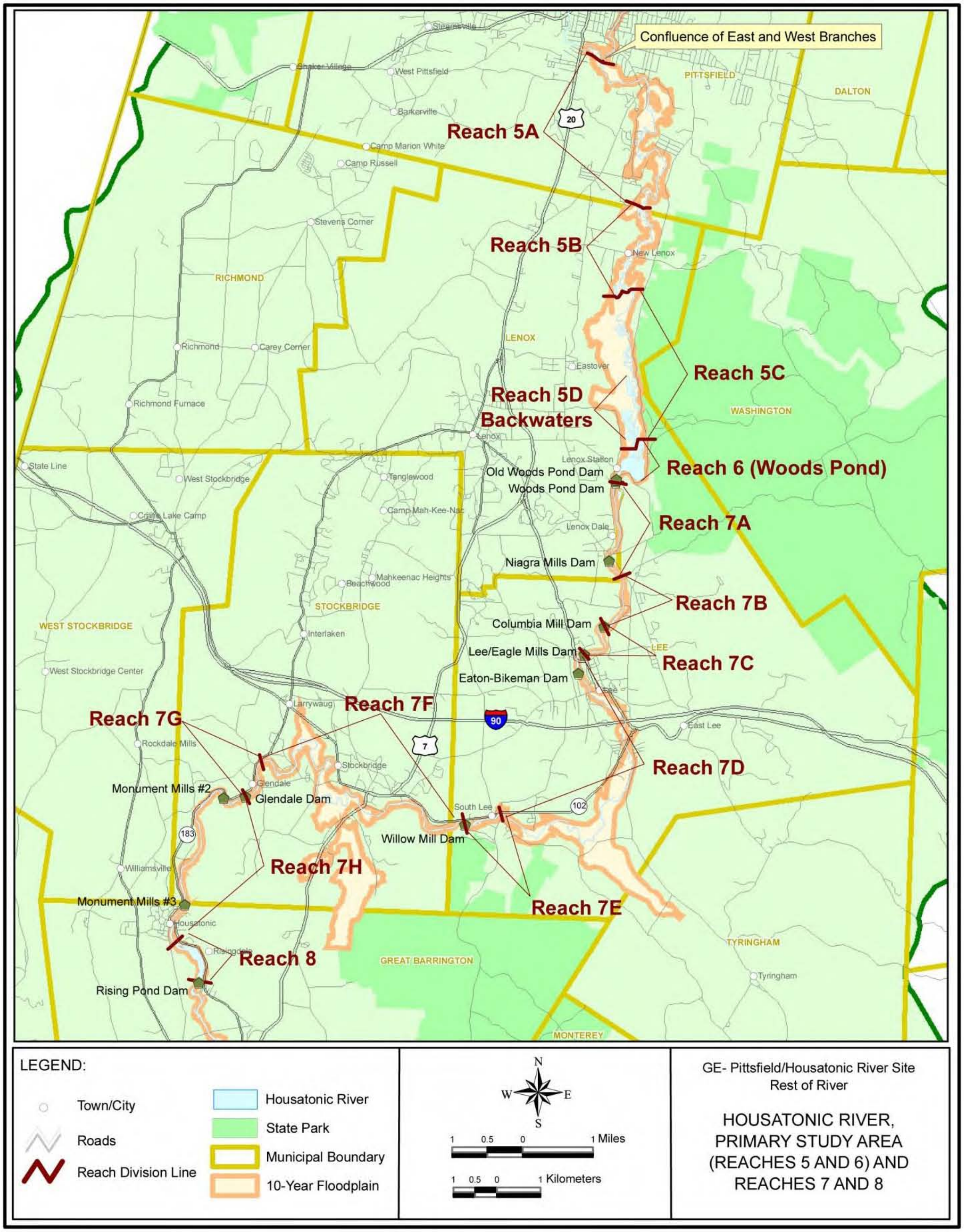
Stream Table Demonstration, Richard DiNitto, *The Isosceles Group* and David Bidelspach, *Stantec Consulting, Inc.* (Presenters); Stream tables compliments of John Field, Ph.D, *Field Geology Services* and John Cassels, *Geodesy, Inc.*

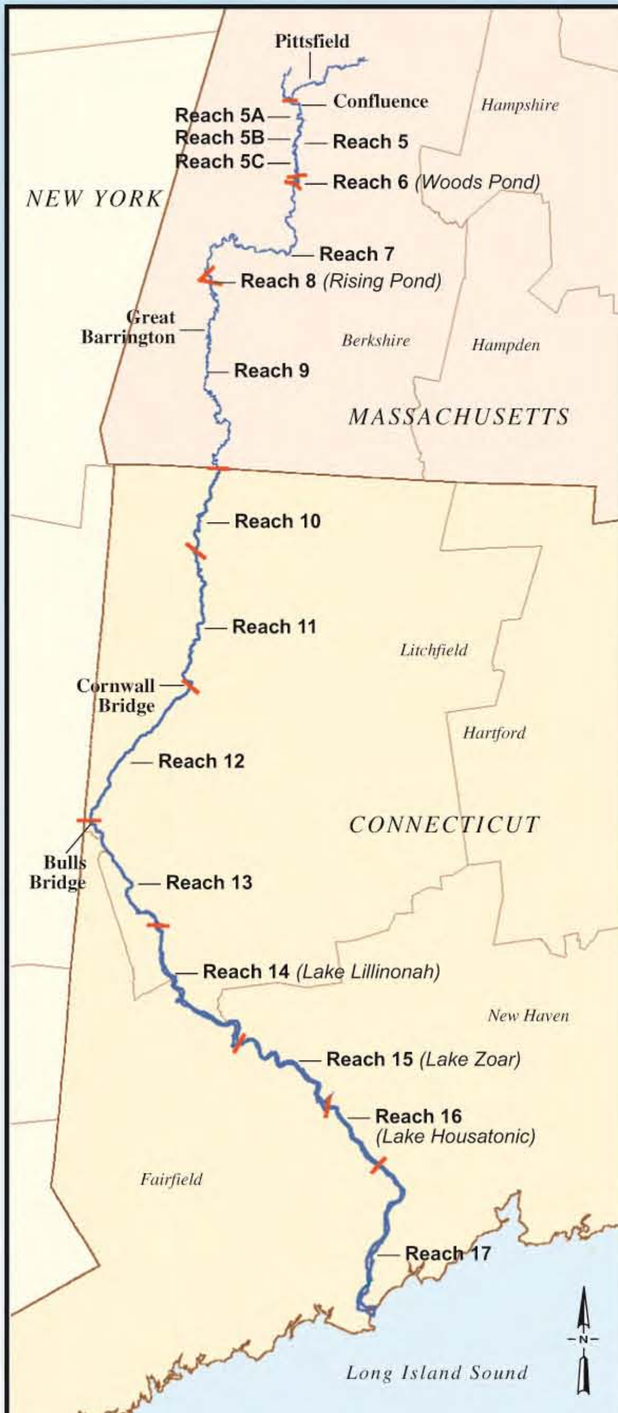
Provides observers an opportunity to watch in real time as flowing water and basic stream processes shape the morphology of a stream

Using GIS to Understand Remedial Alternatives, John Cassels, *Geodesy, Inc.*

Highlights the computerized tool EPA has developed to evaluate ways to implement potential remedial alternatives while minimizing their impact on the river and floodplain

River Reaches





GE-Pittsfield/Housatonic River Site

HOUSATONIC RIVER, REACHES 5 THROUGH 17

11D-0379

Description of the Remedial Action Objectives + the 9 Decision Criteria Specified in the RCRA

Remedial Action Objectives (RAOs)

The RAOs describe overall goals and desired outcomes for the Rest of River.

- "Reduce the cancer risk and non-cancer health hazard for humans (defined as achieving concentrations that do not pose unacceptable risks using EPA's cancer risk range of 1 x 10-6 to 1 x 10-4 and a non-cancer Hazard Index [HI] of 1) from exposure to PCBs in dietary items, floodplain soil, and/or sediment in the Rest of River."

- "Reduce the risks to ecological receptors from exposure to PCBs in dietary items, floodplain soil, and/or sediment in the Rest of River to levels that will result in the recovery and maintenance of healthy local populations and communities of biota."

- "Eliminate/minimize the long-term downstream transport of PCBs in the Rest of River. The objective of this RAO is to reduce the transport of PCBs from the highly contaminated upper reaches of the River to downstream reaches as quickly as possible and over the long term. This RAO also includes the control of sources of releases to the River."

Under the terms of the Consent Decree, EPA must evaluate all cleanup alternatives against the following 9 Criteria:

3 General Standards

1. **Overall Protection of Human Health and the Environment**
   How each alternative or combination of alternatives would provide human health and environmental protection, taking into account EPA's Human Health and Ecological Risk Assessments.

2. **Control of Sources of Releases**
   How each alternative or combination of alternatives would reduce or minimize possible further releases, including (but not limited to) the extent to which each alternative would eliminate the effects of a flood that could cause contaminated sediments to become available for human and ecological exposure.

3 Compliance with Applicable or Relevant and Appropriate Federal and State Requirements (ARARs)

How each alternative or combination of alternatives would meet such requirements or, when such a requirement should not be met, the basis for 'a waiver under CERCLA and the National Contingency Plan (NCP).

6 Selection Decision Factors

1 Long-Term Reliability and Effectiveness

- Magnitude of residual risk, including (but not limited to) the extent to which each alternative would mitigate long-term potential exposure to residual contamination, and the extent to which and time over which each alternative would reduce the level of exposure to contaminants;

- Adequacy and reliability of each alternative or combination of alternatives, including (i) operation, monitoring, and maintenance requirements; (ii) availability of labor and materials needed for operation; (iii) whether the technologies have been used under analogous conditions; and (iv) whether the combination of technologies (if any) have been used together effectively; and

- Any potential long-term adverse impacts of each alternative or combination of alternatives on human health or the environment, including (but not limited to) potential exposure routes and potentially affected populations, any impacts of dewatering and disposal facilities on human health or the environment, any impacts on wetlands or other environmentally sensitive areas, and any measures that may be employed to mitigate such impacts.

2 Attainment of Interim Media Protection Goals (IMPGs)

The ability of each alternative or combination of alternatives to achieve the Interim Media Protection Goals approved by EPA including (if applicable) the time period in which each alternative would result in the attainment of the IMPGs and an evaluation of whether and the extent to which each alternative would accelerate such attainment compared to natural processes.

3 Reduction of Toxicity, Mobility, and Volume

- If applicable, treatment process used and materials treated;
- If applicable, amount of hazardous materials destroyed or treated;
- If applicable, degree of expected reductions in toxicity, mobility, or volume;

- If applicable, degree to which treatment is irreversible; and
- If applicable, type and quantity of residuals remaining after treatment.

4 Short-Term Effectiveness

Impacts to nearby communities, workers, or the environment during implementation of each alternative, including (but not limited to) risks associated with excavation, transportation, dewatering, disposal, or containment of sediments, soils, or other materials containing hazardous constituents.

5 Implementability

- Ability to construct and operate the technology, taking into account any relevant site characteristics;
- Reliability of the technology;
- Regulatory and zoning restrictions;
- Ease of undertaking additional corrective measures if necessary;
- Ability to monitor the effectiveness of the remedy;
- Coordination with other agencies;
- Availability of suitable on-site or off-site treatment, storage, and disposal facilities and specialists; and
- Availability of prospective technologies.

6 Cost

- Capital costs;
- Operating and maintenance costs; and
- Present worth costs.

Four Representative Options Spanning the Range of Those Evaluated in the Revised Corrective Measures Study

GLOSSARY

MNR	Monitored Natural Recovery
HI	Hazard Index
EAs	Exposure Areas
RME	Reasonable Maximum Exposure
IMPGs	Interim Media Protection Goals
Upper-Bound	Those IMPGs based on a 10^{-4} cancer risk or a noncancer HI of 1, whichever is lower for humans, or the higher IMPG for animals
Mid-Range	Those IMPGs based on a 10^{-5} cancer risk or a noncancer HI of 1, whichever is lower
Lower-Bound	Those IMPGs based on a 10^{-6} cancer risk or a noncancer HI of 1, whichever is lower for humans, or the lower IMPG for animals
2 mg/kg	The residential cleanup standard specified in the Consent Decree

OPTION A

Option A consists of a combination of Monitored Natural Recovery (MNR) with institutional controls for all reaches of the River downstream of the Confluence and no action for the floodplain. This combination would rely on upstream source control and remediation measures, natural recovery processes in the River and floodplain, and institutional controls. The River monitoring program would include biota, water column, and sediment monitoring for a period of 100 years.

OPTION B

The sediment component of Option B would involve sediment removal followed by capping in portions of Reach 5A and Woods Pond (Reach 6). Some soil removal and bank stabilization would be conducted in Reaches 5A and 5B. Specifically, the components of Option B include the following:

- Reach 5A: Sediment removal (66,000 yd^3 over 20 acres), followed by capping, in areas determined based on ecological criteria.
- Riverbanks in Reaches 5A and 5B: Bank stabilization adjacent to certain of the sediment removal areas in Reach 5A and areas in Reach 5B determined based on ecological criteria (total of 1.6 linear miles), with removal of bank soils where necessary as part of the stabilization (6,700 yd^3).
- Reach 6 (Woods Pond): Sediment removal (169,000 yd^3 over 42 acres) in areas with PCB concentrations generally greater than 13 mg/kg in the top 6 inches.

- Remainder of Rest of River: MNR.

The floodplain component of Option B would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet upper-bound RME IMPGs for human health. Specifically, this option has been developed to achieve the following IMPGs:

- The upper-bound RME IMPGs for human health (i.e., those based on a 10^{-4} cancer risk or a noncancer HI of 1, whichever is lower) based on direct contact with floodplain soils.
- The upper-bound RME IMPGs for human health (i.e., those based on a 10^{-4} cancer risk or a noncancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain.
- Not designed to achieve any of the ecological IMPGs, although some may be met in some areas.

Option B would involve removing and replacing floodplain soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the above-mentioned IMPGs. In addition, this option would involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of Frequent-Use EAs as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increment that are equal to or less than the upper-bound IMPGs based on human direct contact. This option would involve the removal of approximately 26,000 yd^3 of soil from approximately 14 acres of the floodplain.

OPTION C

The sediment component of Option C would involve sediment removal followed by capping in Reaches 5A through 5C, portions of the backwaters (Reach 5D), Woods Pond (Reach 6), the Reach 7 impoundments, and Rising Pond (Reach 8). Riverbank soil would be removed as necessary, and the eroding banks stabilized in Reaches 5A and 5B. Specifically, the elements of this option include the following:

- Reach 5A: Sediment removal in the entire reach (134,000 yd^3 over 42 acres), followed by capping.
- Reach 5B: Sediment removal in the entire reach (88,000 yd^3 over 27 acres), followed by capping.
- Reach 5C: Sediment removal in the entire reach (156,000 yd^3 over 57 acres), followed by capping.
- Riverbanks in Reaches 5A and 5B: Bank stabilization of eroding banks (14 linear miles, comprising both banks along 7 miles of river) and removal of bank soils where necessary as part of the stabilization (35,000 yd^3).
- Reach 5 backwaters: Combination of sediment removal with capping (109,000 yd^3 over 68 acres) and capping without removal (3 acres).
- Reach 6 (Woods Pond): Sediment removal (244,000 yd^3 over 60 acres), followed by capping.

- Reach 7 impoundments (Reaches 7B, 7C, 7E, 7G): Sediment removal (84,000 yd^3 over 38 acres), followed by capping.
- Reach 8 (Rising Pond): Sediment removal (71,000 yd^3 over 41 acres), followed by capping.
- Reach 7 (channel) and Reaches 9 through 16: MNR.

Option C differs from the other sediment removal alternatives in that: (1) All sediment removal and capping work, including in Reaches 5A and 5B, would be performed in the "wet" by equipment operating in the river (either on the river bottom or on barges); and (2) Removal of the sediment in the Reach 5 backwaters and Reaches 6, 7, and 8 would be performed concurrently with removal activities in the Reach 5 channel. However, capping in those reaches would be delayed, where necessary, until after all the removal/capping activities in Reach 5 have been completed.

The floodplain component of Option C would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet the mid-range (10^{-5}) RME IMPGs for human health and lower-bound IMPGs for amphibians in vernal pools, as well as removal of any additional soils within the top foot that contain PCB concentrations at or above 50 mg/kg. Specifically, this alternative would achieve the following IMPGs:

- The mid-range RME IMPGs for human health (i.e., those based on a 10^{-5} cancer risk or a noncancer HI of 1, whichever is lower) based on direct contact with floodplain soils.
- The mid-range RME IMPGs for human health (i.e., those based on a 10^{-5} cancer risk or a noncancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain.
- The lower-bound IMPG for amphibians in vernal pools.

Option C would involve removing and replacing floodplain and vernal pool soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the above-mentioned IMPGs. In addition, this alternative would involve the removal and backfill of any additional soils within the top foot that contain PCB concentrations at or above 50 mg/kg. Lastly, this option would involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of Frequent-Use EAs as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increment in those areas that are equal to or less than the mid-range IMPGs based on human direct contact. This option would involve the removal and backfill of approximately 177,000 yd^3 of soil across approximately 108 acres of the floodplain.

<u>Option D</u>

The sediment component of Option D would include the removal of a total of 2,287,000 cy of sediment and riverbank soil, including 2,252,000 cy of sediment over 351 acres plus 35,000 cy of bank soil as part of bank stabilization over 14 linear miles of riverbank. Sediment removal would be performed in Reaches 5A, 5B, and 5C, the Reach 5 backwaters, Woods Pond, the Reach 7 impoundments, and Rising Pond to the 1 mg/kg depth horizon, and would be followed by backfilling to grade. MNR would be included for the remaining portions of the River (Reach 7 channel and Reaches 9 through 16). Additionally, the eroding riverbanks along 7 miles on both sides of the River in Reaches 5A and 5B, comprising 14 linear miles, would be stabilized. Remediation would proceed from upstream to downstream to minimize the potential for recontamination of remediated areas.

The floodplain component of Option D would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet lower-bound RME IMPGs for human health and the lower-bound IMPGs for ecological receptors. Specifically, this alternative would achieve the following IMPGs:

- The lower-bound RME IMPGs for human health (i.e., those based on a 10^{-6} cancer risk or a noncancer HI of 1, whichever is lower) based on direct contact with floodplain soils, but not lower than 2 mg/kg (the residential standard specified in the Consent Decree).
- The lower-bound RME IMPGs for human health (i.e., those based on a 10^{-6} cancer risk or a noncancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain.
- The lower-bound floodplain IMPGs for ecological receptors, i.e., amphibians (represented by wood frogs), omnivorous/carnivorous mammals (represented by shrews), insectivorous birds (represented by wood ducks), and piscivorous mammals (represented by mink), assuming, for the latter two receptors, the floodplain soil IMPGs associated with a sediment target level of 1 mg/kg.

Option D would involve removing and replacing floodplain soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the above-mentioned IMPGs. In addition, this alternative would involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of the Frequent-Use EAs as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increment that meet the lower-bound IMPGs based on human direct contact, but not lower than 2 mg/kg.

Option D would involve the removal and backfill of approximately 615,000 yd^3 of soil across approximately 377 acres. Approximately 287 acres of this removal (464,000 yd^3) would occur within the Reaches 5 and 6 floodplain; the remaining 90 acres of removal (151,000 yd^3) would occur in the Reach 7 floodplain.

Notes

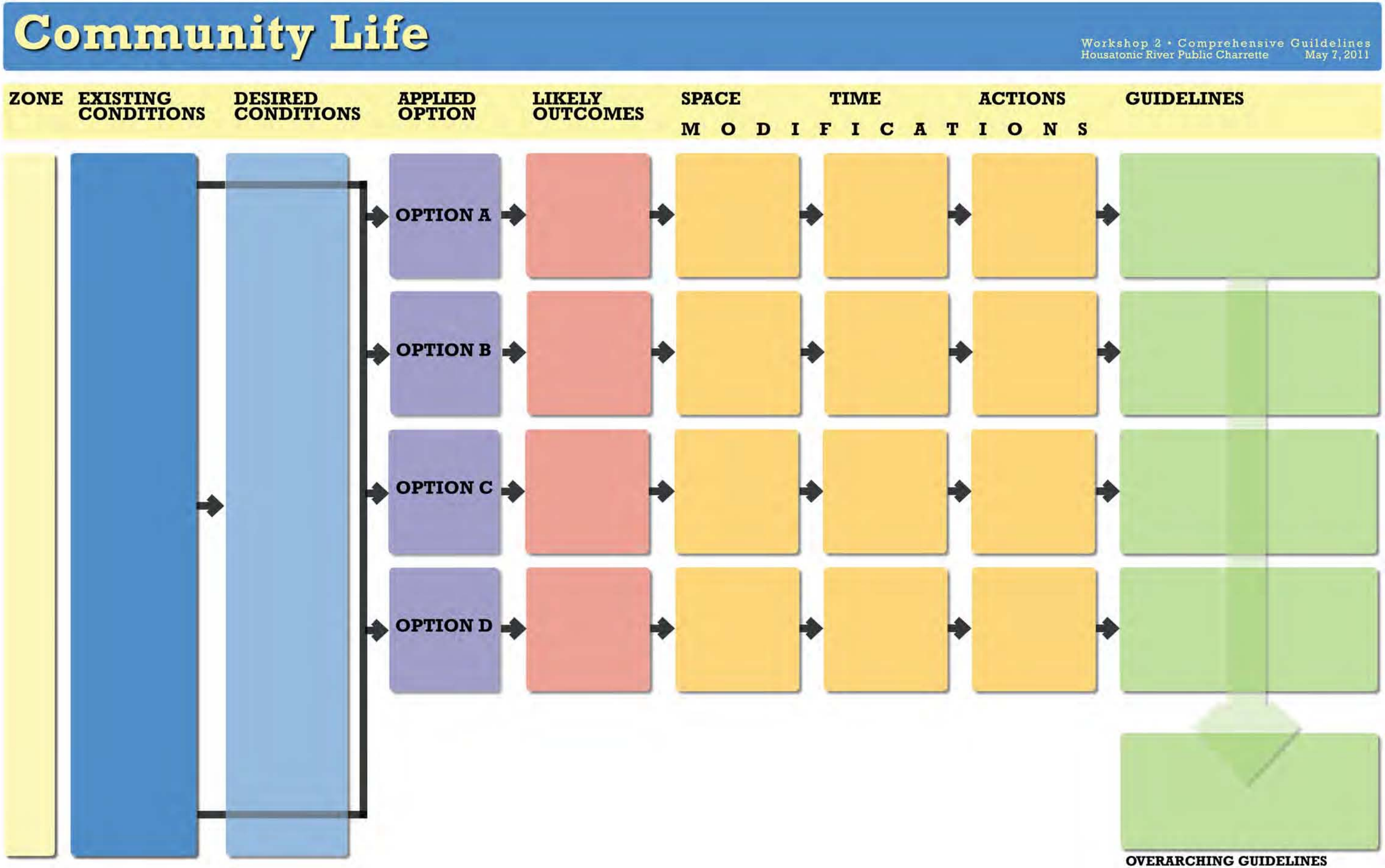
Workshop 1 • Criteria Scorecard Worksheet

Workshop 1 • Criteria Scorecard
Housatonic River Public Charrette May 7, 2011

Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS						
1 Overall Protection of Human Health and the Environment						
2 Control of Sources of Releases						
3 Compliance with ARARs						
FIRST TIER ASSESSMENT						
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness						
2 Attainment of Interim Media Protection Goals (IMPGs)						
3 Reduction of Toxicity, Mobility, and Volume						
4 Short-Term Effectiveness						
5 Implementability						
6 Cost						
SECOND TIER SCORE						

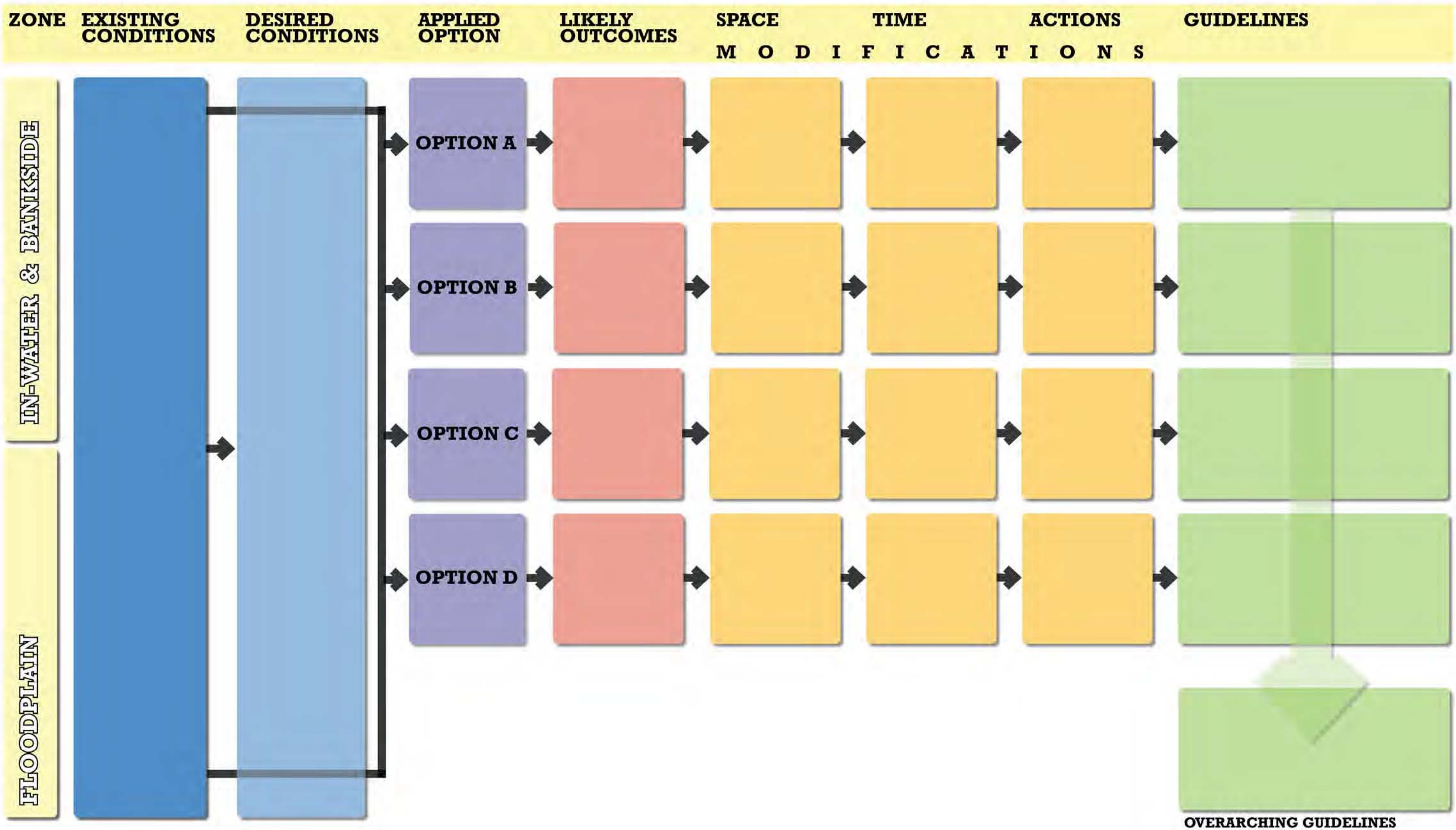
scoring scale

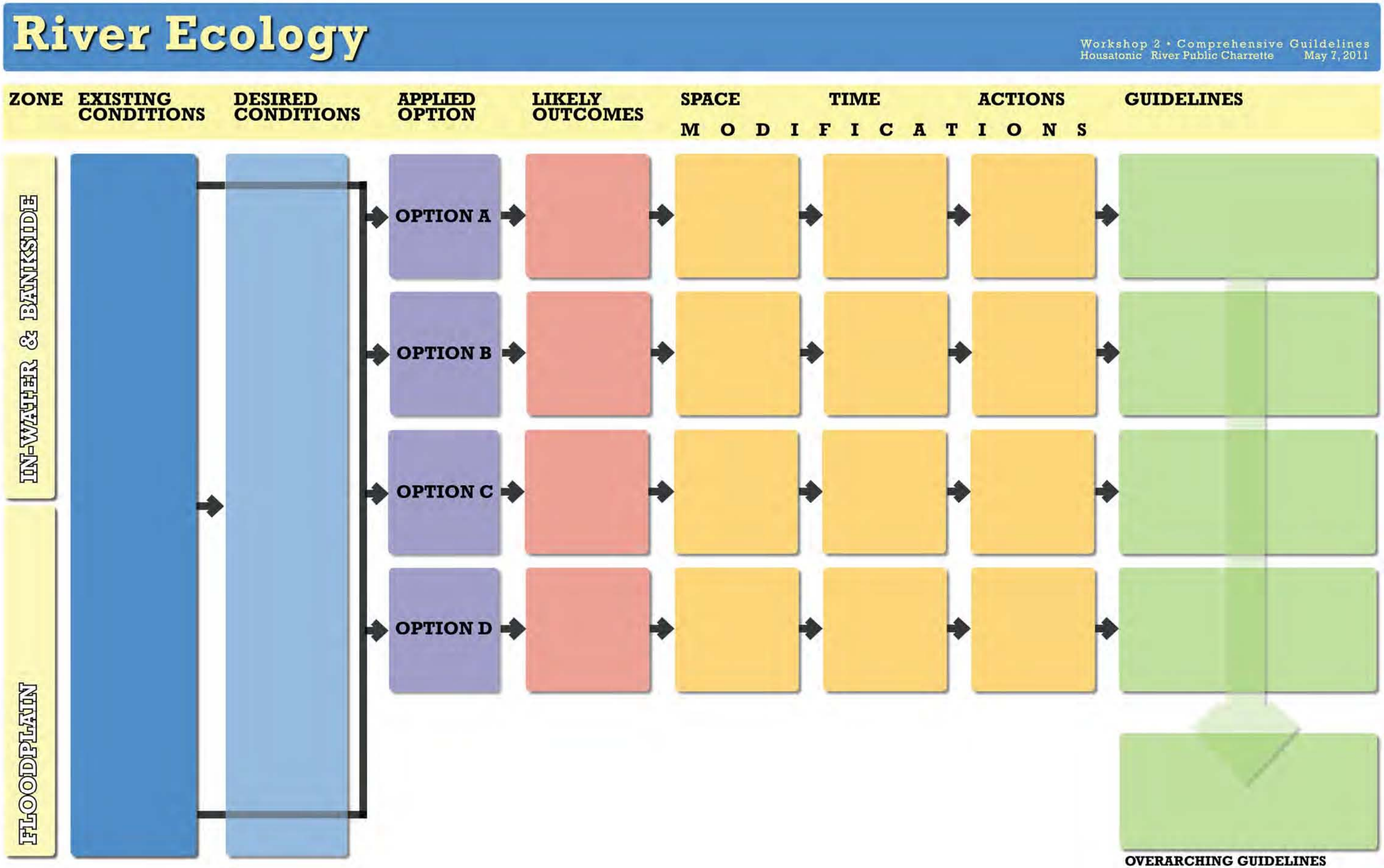
Does Not Meet This Criterion → Partially Meets This Criterion → Best Meets This Criterion

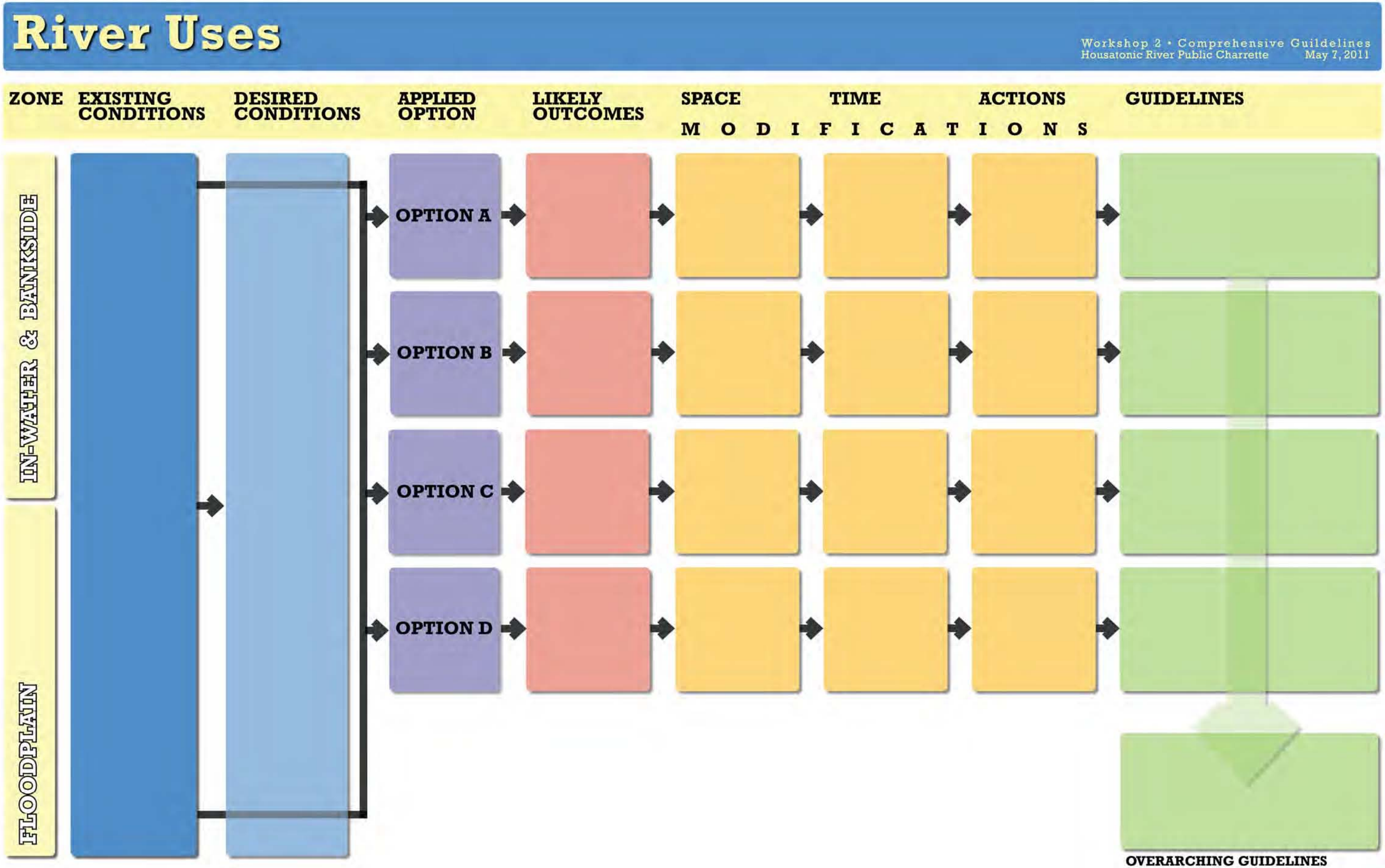

Community Life
Workshop 2 • Comprehensive Guildelines
Housatonic River Public Charrette May 7, 2011
ZONE
EXISTING CONDITIONS
DESIRED CONDITIONS
APPLIED OPTION
LIKELY OUTCOMES
SPACE
TIME
ACTIONS
GUIDELINES
M O D I F I C A T I O N S
OPTION A
OPTION B
OPTION C
OPTION D
OVERARCHING GUIDELINES

River Aesthetics

Workshop 2 • Comprehensive Guidelines
Housatonic River Public Charrette May 7, 2011




River Ecology
Workshop 2 • Comprehensive Guildelines
Housatonic River Public Charrette May 7, 2011
ZONE
EXISTING CONDITIONS
DESIRED CONDITIONS
APPLIED OPTION
LIKELY OUTCOMES
SPACE
TIME
ACTIONS
GUIDELINES
M O D I F I C A T I O N S
IN-WATER & BANKSIDE
FLOODPLAIN
OPTION A
OPTION B
OPTION C
OPTION D
OVERARCHING GUIDELINES


River Uses
Workshop 2 • Comprehensive Guidelines
Housatonic River Public Charrette May 7, 2011
ZONE
EXISTING CONDITIONS
DESIRED CONDITIONS
APPLIED OPTION
LIKELY OUTCOMES
SPACE
TIME
ACTIONS
GUIDELINES
M O D I F I C A T I O N S
IN-WATER & BANKSIDE
FLOODPLAIN
OPTION A
OPTION B
OPTION C
OPTION D
OVERARCHING GUIDELINES

Biographies

J. George Athanasakes, P.E., Ecosystem Restoration Services Manager
Stantec Consulting Services, Inc., Louisville, KY

George Athanasakes leads the Ecosystem Restoration Group for Stantec, Inc. He has a diverse background which includes civil engineering, stream restoration, wetland restoration, and watershed planning. For the Housatonic River Project, Mr. Athanasakes provides review of GE submittals and proposed remedial alternatives with particular emphasis on habitat restoration following remediation. Mr. Athanasakes completed his first stream restoration project nearly 20 years ago and has served as the Project Manager and/or Design Engineer on over 100 stream restoration and assessment projects incorporating natural channel design principles and soil bioengineering techniques. His involvement with these projects has included conceptual level planning, preliminary and final design, permitting, assistance during construction, and post-construction monitoring. Mr. Athanasakes has also helped to bring innovation to the field of stream restoration by leading the development of the RIVERMorph software, which is the industry standard for software providing a tool for stream assessment, monitoring and Natural Channel Design throughout the United States and internationally. Because of his broad stream restoration experience, Mr. Athanasakes has instructed several stream restoration training workshops and has presented at many national conferences on the subject. In addition, he has authored a number of technical papers on the subject of stream restoration.

David A. Bidelspach, P.E., Stream Restoration Specialist
Stantec Consulting Services, Inc., Raleigh, NC

Dave Bidelspach is an environmental engineer with 10 years of experience designing and constructing river restoration projects. He has been recognized for the development of a 3D design process that allows the rapid evaluation of numerous iterations to optimize the designs for river restoration, and has piloted the use of Survey Grade GPS equipment to lower the costs associated with pre- and post-construction surveys. Mr. Bidelspach has worked hand-in-hand with contractors to couple his 3D designs with GPS-enabled construction equipment to speed the construction process and insure the right outcome, and has been responsible for the development and application of several new in-stream structures which have proven to be robust yet easy to construct. As one of the few stream restoration designers who has actually operated equipment and constructed restoration projects, Mr. Bidelspach is known for producing accurate estimates and designs that are both constructible and have long-term stability and effectiveness. For the Housatonic River Project, Mr. Bidelspach has conducted the detailed study of river bank stability and erodability from the Confluence to Woods Pond Dam. He is reviewing and evaluating proposed remedial options with regard to restoration and geomorphic stability issues.

Keith Bowers, RLA, PWS, President and Founder
Biohabitats, Inc., North Charleston, SC

Keith Bowers is the President and Founder of Biohabitats, Inc., one of the premier firms specializing in environmental restoration, conservation planning and regenerative design. He is an internationally recognized landscape architect who has planned, designed, and managed the construction of over 200 ecological restoration projects throughout the United States. Mr. Bowers also teaches ecological restoration seminars and workshops and participates on numerous industry panels. He is currently serving as Chairman of the Board for the Society for Ecological Restoration International. For the Housatonic River Project, he has a lead role in evaluating remedial alternatives with respect to their ecological restoration components, and provides senior level expertise in the feasibility and expected effectiveness of proposed restoration plans and techniques. He also assists in community outreach and meeting facilitation.

John W. Cassels, Principal Scientist
Geodesy, Inc., Downingtown, PA

John Cassels is a biologist with over with 27 years of experience supporting scientific staff in ecological and human health risk assessments. He is an expert in GIS development, database analysis, and cartographic presentation. Mr. Cassels has served as the GIS Manager for the GE/Housatonic River Project since 1999, with responsibility for managing geospatial information related to contaminant assessments of all Operable Units (OU's) within the investigation area. His efforts support the various program components and principal investigators in the compilation of large analytical databases. Under his guidance, several innovative data management, analysis, and presentation approaches were developed to effectively streamline the flow of information to Project Managers, decision makers and stakeholders on the project.

Bob Cianciarulo, Chief, Massachusetts Superfund Section Office of Site Remediation and Restoration, EPA New England

Bob Cianciarulo is Chief of the Massachusetts Superfund Section in EPA's New England Regional Office. In that capacity, he supervises a group of fourteen Remedial Project Managers (RPMs) overseeing investigation, cleanup, and monitoring of Superfund National Priorities List (NPL) sites in Massachusetts. In his over 20 years with EPA, Mr. Cianciarulo has served as a RCRA hazardous waste inspector, a project manager in both RCRA Corrective Action and in Superfund, and in the region's Brownfields program. Prior to his current position, he served as Chief of Region I's Superfund Technical Support and Site Assessment Section. Mr. Cianciarulo has a degree in Chemical Engineering from the University of Lowell (MA).

Tim Conway, Senior Enforcement Counsel, EPA New England

Tim Conway is currently a Senior Enforcement Counsel at the U.S. Environmental Protection Agency's office in Boston. Prior to his current position, Tim served as Deputy Commissioner for Legal Affairs for the Indiana Department of Environmental Management, supervised environmental attorneys at EPA in Boston, and worked as a staff attorney at EPA's offices in Boston and Chicago. Prior to working at EPA, Tim served as a VISTA Volunteer. Tim is a Phi Beta Kappa graduate of Indiana University/Bloomington, a cum laude graduate of Indiana University School of Law, and received a M.P.A from the I.U. School of Public and Environmental Affairs.

Richard G. DiNitto, Principal/Co-Owner
The Isosceles Group, Inc., Boston, MA

Mr. DiNitto is a Principal of The Isosceles Group of Boston, Massachusetts with more than 30 years of environmental consulting experience. During the past 11 years, Mr. DiNitto has been working on the GE/Housatonic River Rest of River Site in several roles: as a Project Hydrogeologist and Geomorphologist, Site Assessment Analyst, Chemical Fate and Transport Scientist, Public Communications Specialist, and as a Project Coordinator. Mr. DiNitto has been one of the principal investigators in determining the nature and extent of PCB contamination at the site. He worked with the modeling and risk assessment teams to evaluate the data in conjunction with fate and transport mechanisms and human and ecological exposures. He also assisted in the coordination of a variety of subcontractors and their efforts, primarily the fate and transport modeling using HSPF, EFDC, and FCM. Recently, Mr. DiNitto has been involved with the historical land use analyses associated with the Housatonic River valley and its influence on fate and transport characteristics. Mr. DiNitto's 30 years of experience includes environmental multi-media assessments and remediation of contaminated sediments, riverine and groundwater systems. He has completed more than 1000 environmental assessment projects across the United States and internationally, and has successfully managed several environmental, engineering and energy-related consulting firms.

John J. Field, Ph.D
Field Geology Services, Farmington, ME

Dr. John Field is a fluvial geomorphologist and hydrologist with 25 years of experience specializing in assessments of stability and habitat conditions of rivers and streams, identifying restoration strategies at the watershed scale, and evaluating results to ensure improvements to channel stability and aquatic habitat are sustainable. For the Housatonic River Project, Dr. Field provided historical analysis and interpretation of shifts in the morphology of the Housatonic River over time and is reviewing proposed remedial alternatives for their effects on river geomorphology and long-term stability. During eight years as a university professor, Dr. Field was active in training teachers and government agency personnel on techniques for the practical application of river morphology. His research has included previous work in Massachusetts, including an erosion control study of Turners Falls Pool on the Connecticut River, an assessment of causes for channel instability on the Sawmill River in Montague, and the design for a bank stabilization project on the South River in Ashfield. Dr. Field's research on flooding and habitat issues both in the United States and internationally has been published in numerous peer-reviewed scientific publications and presented at professional conferences.

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.

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.

John Lortie, Vice President
Stantec Consulting Services, Inc., Topsham, ME

John Lortie is a Professional Wetland Scientist, a Certified Wildlife Biologist, an accomplished botanist, and an experienced ecological risk assessor. He has directed numerous projects involving complex environmental regulations at hazardous waste sites and marine facilities, and has taught short courses at international environmental conferences on ecological risk assessment protocols, field methods, and restoration design. For the Housatonic River Project, Mr. Lortie serves as the lead ecologist for the G.E./Housatonic River Site Ecological Risk Assessment, with particular responsibility for the Ecological Characterization and in evaluating risks to amphibians. In his previous position as President of Woodlot Alternatives, Inc. (now part of Stantec), Mr. Lortie was responsible for many aspects of the site investigations, including the field studies program, and was the lead investigator for the Ecological Characterization of the site. In addition to managing significant habitat restoration projects and ecological risk projects, he has also led large-scale ecological inventories to search for rare animals and plants, directed coastal migratory bird studies, and evaluated complex natural communities throughout the northern Atlantic region. A former National Wildlife Refuge manager, he also offers special expertise in migratory bird studies. As a Professional Wetland Scientist, Mr. Lortie also specializes in interpretation of wetland regulations, and wetland identification, evaluation, mitigation and restoration.

Richard A. McGrath, Principal/Co-Owner
The Isosceles Group, Inc., Boston, MA

Dick McGrath is an aquatic ecologist with 40 years of experience conducting and managing research in oceans, estuaries, and rivers. He has served as the Technical Director for the Rest of River investigations for the last 10 years and, for 2 years prior to that, was the Quality Assurance Manager. In addition to his continuing wide-ranging technical oversight and coordination responsibilities on the project, he also provides specialized expertise in PCB analysis and biogeochemistry and has provided assistance to EPA on many of the technical documents presenting the results of the studies conducted on the project.

Mr. McGrath specializes in the assessment and remediation of contaminated sediments, particularly sediments contaminated with PCBs and other organic compounds. In his career, he has been a Vice President and/or General Manager for three large international consulting organizations, and has conducted investigations of contaminated sediments on all three coasts of the United States as well as in the Great Lakes. He has authored, edited, and reviewed hundreds of scientific papers, reports, and other documents and has been an invited participant at national and international technical conferences. He has also been an invited participant on the PBS NOVA television series, discussing his work on PCB-contaminated sediments in New Bedford Harbor.

Michael R. Palermo, Ph.D., P.E., President
Mike Palermo Consulting, Inc., Durham, NC

Dr. Mike Palermo is a consulting engineer with extensive internationally recognized experience in dredged material management and contaminated sediment remediation. For the majority of his career, Dr. Palermo served with the U.S. Army Corps of Engineers as a Research Civil Engineer and Director of the Center for Contaminated Sediments at the Engineer Research and Development Center (ERDC) at the Waterways Experiment Station (WES), where he managed and conducted both research and applied studies for the USACE, EPA, DOJ, NOAA, U.S. Navy, and others. He also managed the WES/ERDC research focus area for contaminated sediments. Since entering private practice in 2003, he has provided design services and technical review and oversight for clients, both in the U.S. and abroad, on a wide range of sediment remediation and navigation projects involving contaminated sediments including sediment mega-sites such as the Hudson River, Housatonic River, Fox River, Portland Harbor, and Onondaga Lake. In his role on the Housatonic River Project Dr. Palermo serves as Senior Reviewer and technical resource for issues related to sediment dredging, capping, and dredged material management. Dr. Palermo is a Registered Professional Engineer and a member of the Western Dredging Association (WEDA), International Navigation Association (PIANC), and American Society of Civil Engineers (ASCE). He has served on the adjunct faculty at Texas A&M University and Mississippi State University and is also Associate Editor for the WEDA Journal of Dredging Engineering. He has authored numerous publications in the area of dredging and dredged material disposal technology and remediation of contaminated sediments. He is a lead author of USACE, EPA, and international guidance documents pertaining to contaminated sediments, including the USEPA 1998 Guidance for In-Situ Subaqueous Capping of Contaminated Sediment, USEPA 2005 Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, and the USACE/USEPA 2008 Technical Guidelines for Environmental Dredging of Contaminated Sediments.

Kathy Poole, RLA, LEED AP, Principal
Poole Design, LLC, Baltimore, MD

Kathy Poole is Principal of Poole Design, a firm specializing in Landscape Architecture, Urban Design, and Ecological Infrastructure. For the Housatonic River Project, she assists EPA in developing community outreach programs. Through her 25 years of collegiate teaching and professional practice, she has developed a national reputation for integrating ecology and design toward projects that both regenerate ecological systems and connect people to landscapes in engaging and beautiful ways. Her many successful environmental design projects include a range of scales, from public plazas of a few hundred square feet, to new communities of hundreds of acres, to master plans encompassing thousands of acres. She completed her undergraduate architecture degree at Clemson University and was awarded her Master of Landscape Architecture degree at Harvard University with distinction and garnering the university's top awards. She has published several book chapters and over a dozen articles, and her work has been exhibited across the nation. A popular speaker, Ms. Poole has keynoted conferences both at home and abroad. These skills, combined with her 10 years of experience as an academic, result in her often being called upon to lead public forums, working sessions, and charrettes, and to lead mediations between private citizens and public or corporate entities.

Susan C. Svirsky, EPA Project Manager Rest of River

Ms. Svirsky has worked for EPA for over 30 years in many different capacities. She graduated with a degree in Wildlife Ecology from the University of Maine and subsequently worked for Maine Inland Fisheries and Wildlife. From there, she began her career at EPA in the Water Quality Monitoring Program in Washington, D.C. Upon returning to New England, she worked with EPA in various roles, including serving as the chair of the multi-agency regional Superfund Ecological Assessment Team. In this role Ms. Svirsky began her work with contaminated sediment site assessment, cleanup, and restoration, with a particular focus on PCB-contaminated sites, and participated in national guidance development. Her involvement with the GE-Housatonic River site began over 14 years ago. This involvement led to her becoming the Project Manager for Rest of River, overseeing all of the data collection, risk assessment, modeling, and Corrective Measures Study activities. In addition, Ms. Svirsky has taught sessions on ecological risk assessment and restoration of contaminated sediment sites, and has authored numerous technical papers on these issues as well as those associated with Rest of River.

Dean Tagliaferro, EPA Pittsfield/Housatonic River Team Leader

Dean Tagliaferro is the Team Leader for the GE-Pittsfield/Housatonic River Consent Decree Site. He also is EPA's project manager for the 1 ½ Mile Reach and other cleanup actions at the Site. He has over 25 years of experience at EPA. For the last 14 years, he has been involved in the GE-Pittsfield Site, first as the project manager for the Building 68 removal action, then the Upper ½-Mile reach cleanup, and for the last seven years as the Team Leader. Prior to that, Mr. Tagliaferro has worked as an On-Scene Coordinator directing short-term cleanup actions at Superfund sites and as a member of the emergency response team. Mr. Tagliaferro has a bachelor's degree in chemical engineering from Tufts University and a master's degree in civil (environmental) engineering from the University of Lowell (MA).

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.

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.

www.epa.gov/region1/ge

KEY CONTACTS:

JIM MURPHY
U.S. EPA Community Involvement Coordinator
(617) 918-1028
murphy.jim@epa.gov

SUSAN SVIRSKY
U.S. EPA Rest of River Project Manager
(617) 918-1434
svirsky.susan@epa.gov

GENERAL INFO:

EPA NEW ENGLAND
5 Post Office Sq.,
Suite 100
Boston, MA 02109-3912

TOLL-FREE CUSTOMER SERVICE
1-888-EPA-7341

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
(860) 672-6678

Massachusetts DEP
(413) 784-1100

Connecticut DEP
(860) 424-3854

3.8 Poster Session

The Poster Session provided an opportunity for the public to learn more about the technical issues involved in developing a remedy for the River, to learn more about modeling tools developed to aid in EPA's remedy decision, and to speak one-on-one with experts spanning a range of disciplines. Interpretive posters and exhibits were available for participants' perusal at any time during the day, and EPA's experts were present at their posters for a specified two-hour period over lunch to ensure opportunities for direct interaction between stakeholders and experts.

3.8.1 Objectives

The public response to EPA's experts and their presentations at the Mini Workshops in April—the first of EPA's intensified public outreach efforts—was overwhelmingly positive. Therefore, EPA brought the same experts and technical content back to the Public Charrette to further the public's opportunities to have their questions answered directly and to further the positive dynamic between public and EPA that the experts' engagement had engendered.

EPA worked with each expert to create a large-scale poster (18" x 36") that conveyed fundamental information about his/her topic. EPA also added experts that brought project-relevant, engaging and interactive tools:

1) Three stream tables—tools that are not only effective in explaining the dynamics of river processes but also engaging and fun (Figure 19).
2) The Geographic Information System (GIS) computer model that is one of the tools being used to evaluate remedial alternatives. The model creator was on-hand to show how EPA is using the model to simulate remedial action in the floodplain and selectively remove contaminated soils to effectively reduce human health and ecological risks while avoiding sensitive features.

The Poster Session remained available from registration to closing reception.

3.8.2 Presentations

History of the River, Richard DiNitto, *The Isosceles Group* and John Field, Ph.D., *Field Geology Services*
Summarized the geological and cultural history of the Housatonic River watershed, with particular emphasis on how the River has been shaped by human activity over the last 250 years.

Geomorphology/River Processes, George Athanasakes, *Stantec Consulting, Inc.*, Keith Bowers, *Biohabitats Inc*., and David Bidelspach, *Stantec Consulting, Inc.*
Discussed the fundamental processes that govern the structure and evolution of all rivers, and their implications for potential remediation of the Housatonic River.

Ecological Characterization, John Lortie, *Stantec Consulting, Inc.*
Described the habitats and natural communities found in the Housatonic River and floodplain, their interrelationships, and their resident species, with details on rare, threatened, and endangered species in the area.

What Are PCBs and How Do They Behave in the Environment?, Richard McGrath, *The Isosceles Group*
Provided information on the physical structure and chemistry of PCBs (polychlorinated biphenyls), with additional information on PCB toxicity and their behavior following release to the environment.

PCB Distribution, Fate, and Transport, Edward Garland, *HDR|HydroQual*
Summarized the location and concentrations of PCBs in the Housatonic River and what EPA has learned about their transport and fate.

Human Health Risks, Donna Vorhees, Sc.D., *The Science Collaborative*
Provided a summary of EPA's Human Health Risk Assessment, including an overview of risks due to the exposure pathways of direct contact, fish and waterfowl consumption, and consumption of agricultural products grown in the floodplain.

Ecological Risks, Gary Lawrence, *Golder Associates*
Summarized EPA's Ecological Risk Assessment, which included an analysis of risks to eight different receptor groups due to their exposure to PCBs.

Why Use Models for the Housatonic River? Mark Velleux, Ph.D., *HDR|HydroQual*
Described and summarized the results of the linked hydrological/hydrodynamic and sediment/contaminant fate and transport/food-chain models being used to better understand the movement of contaminants in the River and floodplain and to evaluate potential remedial alternatives.

Remediation Technologies and Techniques, Michael Palermo Ph.D., *Mike Palermo Consulting Inc.*
Presented the various options for remediating contaminated sediments and discussed their relative merits.

Ecological Restoration, Keith Bowers, *Biohabitats Inc.*
Provided an overview of habitat restoration, and presented several examples of successful restoration projects conducted on ecosystems similar to and different from that of the Housatonic River.

Stream Table Demonstration, Richard DiNitto, *The Isosceles Group*, and David Bidelspach, *Stantec Consulting, Inc.* (Presenters); Stream tables provided by John Field, Ph.D., *Field Geology Services* and John Cassels, *Geodesy, Inc.*
Provided observers an opportunity to watch in real time as flowing water and basic stream processes shape the morphology of a stream.

Using GIS to Understand Remedial Alternatives, John Cassels, *Geodesy, Inc.*
Highlighted the computerized tool EPA developed to evaluate ways to implement potential remedial alternatives while minimizing their impact on the river and floodplain.

Figure 19. EPA Expert Dave Bidelspach and Charrette Participants at one of the Poster Session Stream Tables, Discussing the Dynamics of Rivers' Hydraulics, Sediment/PCB Transport, and Morphology. (Photo: Keith Seat)

Figure 20. Environmental Scientist and Risk Assessor Gary Lawrence, Answering a Question in the Poster Session.

Posters (Following)

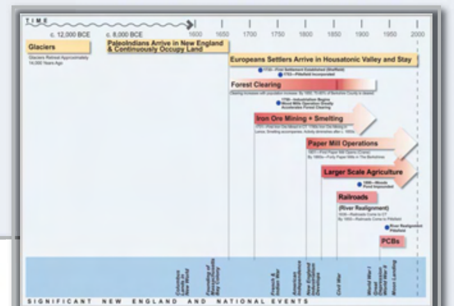
History of the River

Richard DiNitto, *The Isosceles Group* | John Field, Ph.D, *Field Geology Services*

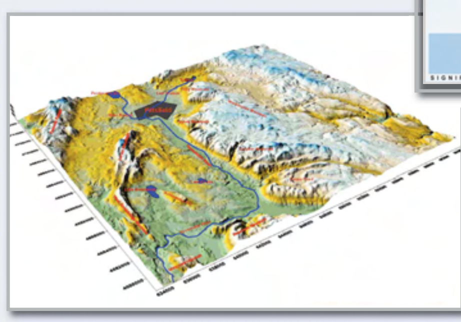
Recent Geologic Past

The last great ice sheets covered North America from 25,000 to 14,000 years ago, extending from Canada down to the southern edges of Long Island Sound.

- Melting ice sheets formed large glacial lakes, including Glacial Lake Housatonic
- Ice dams later melted, creating the current Housatonic River and valley



Housatonic Timeline



The Housatonic River watershed has been a prominent landform for thousands of years

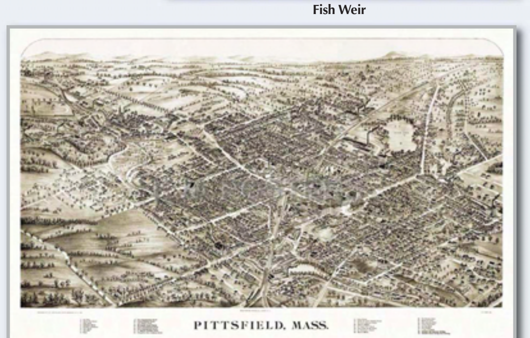
Fish Weir

First People

settled in the Housatonic valley 10,000 to 13,000 years ago.

- Native Americans relied on the River, using fish weirs and related stone-based structures which had potential for creating changes in the River's flow, albeit minor
- More significant changes occurred shortly after the region was settled in the very late 1600s and early 1700s

By the mid-1700s, most of western Massachusetts and Connecticut was fully incorporated, delineated and settled.



Land Clearing

Land clearing for homes, industry, and farming dramatically increased after the discovery of iron ore.

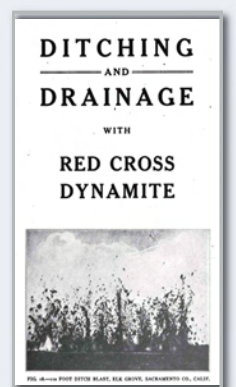
- Blast furnaces, fueled by wood, were needed to smelt the iron ore
- As much as 80% of all the land in the Berkshires was cleared by 1850, causing more runoff and associated soil to enter the River

Development in the 1800s

Paper mill operations along the River led to dams to channel water for power.

- Dams created backwaters and slowed the velocity of the River, changing the River's dynamic processes
- The railroad arrived and agriculture became more prevalent in the valley

During this period the River channel was extensively modified and straightened along many sections to create larger tracts of contiguous properties for farming and installation of railroad beds.



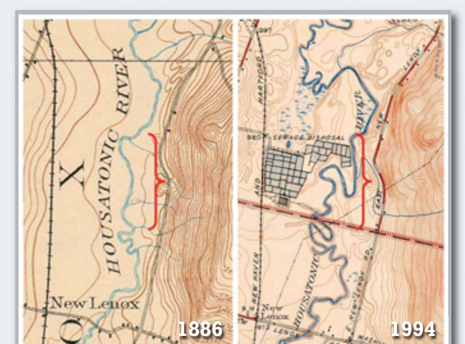
DITCHING AND DRAINAGE WITH RED CROSS DYNAMITE

More Changes in River

Comparing older maps and present-day topographical surveys shows portions of the River have been straightened and/or moved.

- Clearing of rivers and rechannelization has a long history in the Northeast, even using dynamite to modify rivers

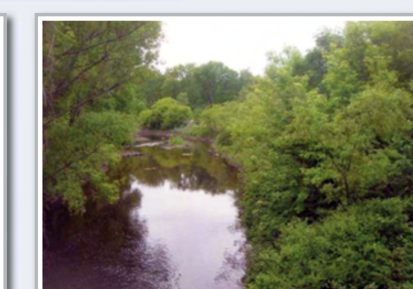
Log Drive



Channel evolution is a natural response to historical alterations such as channel straightening and relocation.

River straightened through Pittsfield.

Channelization of the East Branch in Pittsfield



The Houstonic River Today

Results

All of the human activity that has occurred has changed the River and surrounding ecology.

- What appears a natural pristine environment today is actually a disturbed river system trying to naturally restore itself
- Thus the River is seeking to regain a state of dynamic equilibrium to recover from past human influences

Today's landscape and surrounding natural environments are not the same as existed thousands of, or even one hundred years ago.

Geomorphology/River Processes

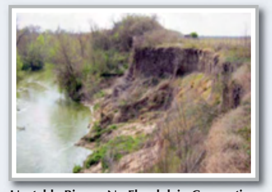
George Athanasakes, *Stantec Consulting, Inc.* | Keith Bowers, *Biohabitats, Inc.* | David Bidelspach, *Stantec Consulting, Inc.*

The Role of Geomorphology in Remedial Design

Stable River – With Good Floodplain Connection

Fluvial geomorphology is a multidisciplinary science concerned with the influence of rivers and streams on the Earth's surface.

- Many features have been formed by running water due to erosion and depositional processes.
- By providing an understanding of sediment transport and other processes, geomorphology is a useful tool to predict channel and riverbank responses to alterations.

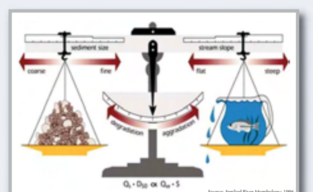


Unstable River – No Floodplain Connection

River Stability

A stable river transports the water and sediment from its watershed without aggrading (building up) or degrading (cutting into the channel bed) over the long term.

- Stable systems maintain dimension, pattern, and profile.
- Stable rivers are connected to their floodplains. Rivers that are disconnected from their floodplains experience increased shear stress and mass bank failure.
- This relationship can be expressed by a qualitative formula: (Sediment LOAD) x (Sediment SIZE) is directly proportional to (Stream SLOPE) x (Stream DISCHARGE). This is called Lane's Relationship. Both sides of the equation are balanced in a stable system.
- Excess shear stress caused by impacts to the watershed results in a shift in the balance of Lane's Relationship. Channel evolution is the stream's attempt to return to a state of equilibrium through a predictable series of channel successional stages.

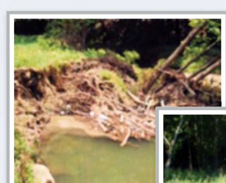


Lane's Relationship

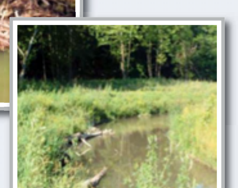
Indicators of Instability

Instability indicators include Incision and Headcutting, Channel Filling, Entrenchment/Eroding Stream Banks, Lateral Migration, and Over-Widening.

Over-Widening:

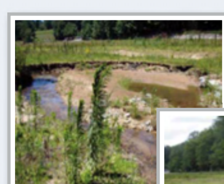


Before Restoration

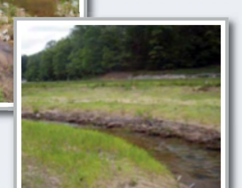


After Restoration

Entrenchment/Eroding Stream Banks:



Before Restoration



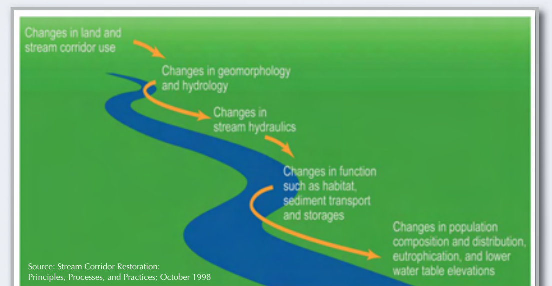
After Restoration

Instability of the Housatonic River

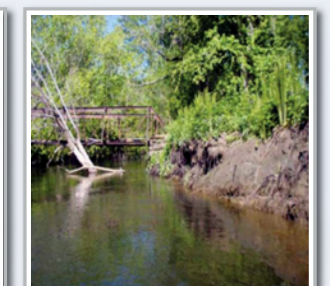
The Housatonic River has a long history of human impacts, including river straightening, logging activities and agricultural uses. The River has also undergone channel relocation, channelization, damming, and placement of significant confining floodplain fill over the last 300 years. The Housatonic River is currently recovering from these and other historical impacts and modifications. However the River still faces:

- Horizontal instability evidenced by bank erosion
- Bank erosion rate of 6,600 tons per year of sediment (± 25%)
- Accelerated bank erosion over ten times the rate of a stable channel

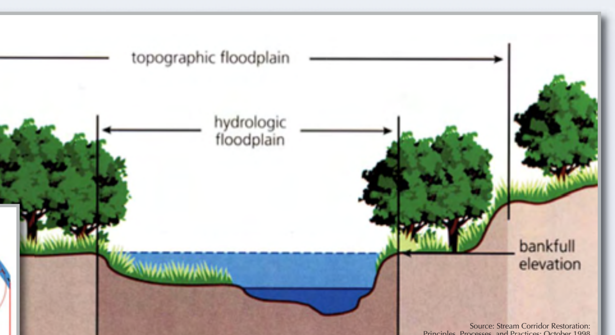
The River cannot attain stability through natural geomorphic processes without continued accelerated erosion of the floodplain and river banks contaminated with PCBs.



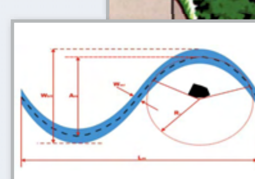
Disturbance to a stream corridor system typically results in an increasingly negative spiral of degradation to stream structure and function.



Bank Erosion



Channel Cross-Section



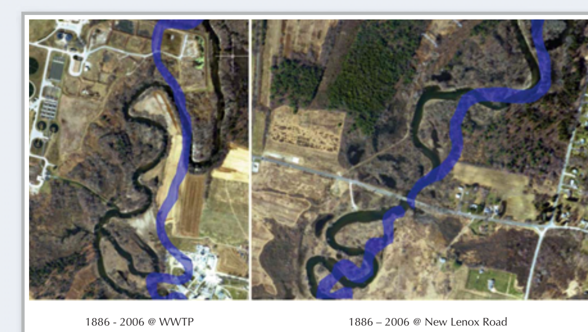
Meander Pattern *(plan form)*

Restoring stability in river systems

Housatonic River Recovery Process

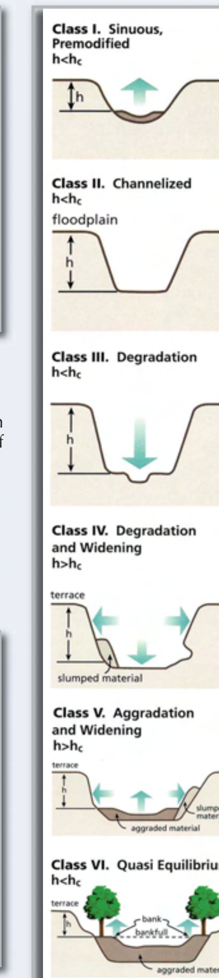
An essential requirement for restoration planning associated with any remediation of the River is a comprehensive understanding of the geomorphologic function of the River channel and floodplain.

- Restoration should be consistent with natural geomorphic processes
- Restoration can restore the dimension, pattern, and profile of the River
- Restoration should achieve a dynamic state of equilibrium (stability) in the River
- Restoration provides an opportunity to restore ecosystem processes



River Reaction – Geomorphic Response

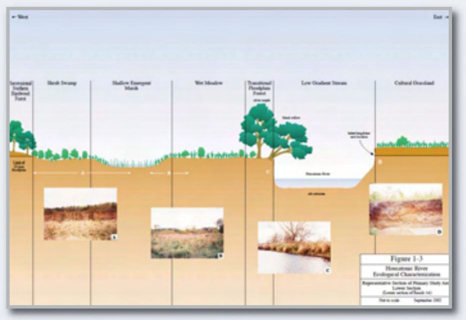
Channel Evolution



(Source: Stream Corridor Restoration: Principles, Processes, and Practices; October 1998)

Ecological Characterization

John Lortie, *Stantec Consulting, Inc.*



Representative sections show the relationship of identified natural communities at different locations along the river

The Rest of River Ecological Characterization

An extensive characterization of the physical setting, habitats, and biological communities of the Housatonic River and floodplain was conducted by EPA to provide a more in-depth understanding of the River and the surrounding watershed than is typical for hazardous waste sites in the US. The primary objectives of the Eco-Characterization were to:

- Identify the type and spatial distribution of natural communities/habitats
- Identify the plants and animals in each community (including species of special concern) and specify in which of the natural communities they occur (Species: Habitat Associations)
- Describe interrelationships between plants and animals and exposure pathways
- Collect information for the ecological risk assessment, human health risk assessment and remedial action decision-making

Study Area

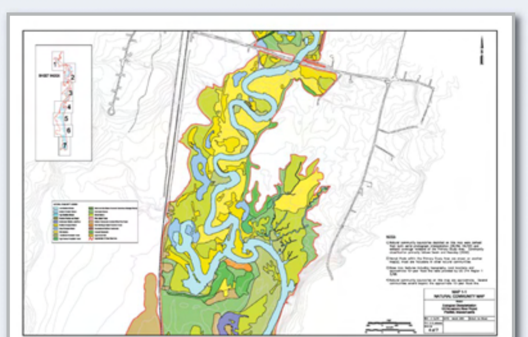
EPA's study was focused on the portion of the River and floodplain between the Confluence of the East and West Branches and Woods Pond Dam, a distance of approximately 10½ miles (although the characterization was completed for the entire Rest of River area). To estimate whether there were differences in animal populations between this area, which contains elevated levels of PCBs, and other similar areas nearby with no or low levels of PCBs, several reference areas were also chosen for study, including:

- Hinsdale Flats State Wildlife Management Area (SWMA)
- October Mountain State Forest
- Ashley Lake
- Threemile Pond SWMA

Natural Communities

Eighteen natural communities were identified in the area of the River and floodplain between the Confluence and Woods Pond (and an additional 7 natural communities were identified in the reference areas), including:

- A single lacustrine (lake) community (Woods Pond)
- 3 different riverine communities distinguished by the gradient of the River
- 9 palustrine (wetland) communities
- 5 terrestrial communities



Maps were prepared to show the location and extent of the identified natural communities

Rare Plants, Animals and Other Findings

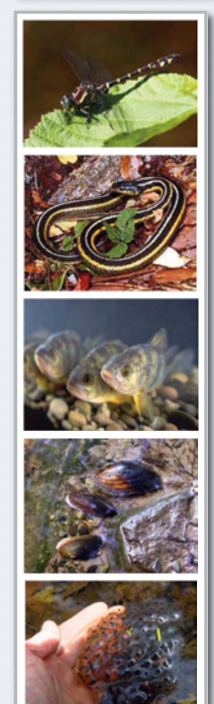
EPA surveys during the ecological characterization field work found:

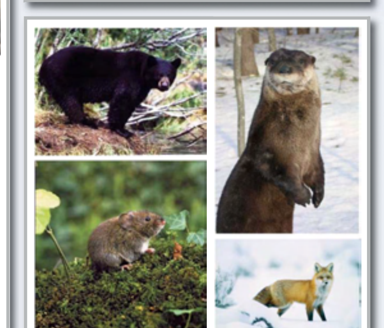
- 13 rare plant species and 16 animal species listed under the Massachusetts Endangered Species Act (MESA)
- Two rare natural communities: bur oak forest and circumneutral floodplain forest.
- Invasive plants are common or abundant in many parts of the River and floodplain, reflective of past land alteration and disturbances.

Unique Features

Portions of the Housatonic River valley are known as "marble valley" because of its bedrock.

- While most of the glaciated northeast is dominated by acidic soil conditions, the marble valley has calcium-rich soils which support a different array of plants and animals, many of which are rare or only locally common.
- The entire watershed in MA contains 110 plant species and 51 animal species listed by MESA. The Commonwealth has since documented 25 state-listed species in the study area between the Confluence and Woods Pond Dam. A majority of these species were observed during the Eco-Characterization.





An Ecosystem in Recovery

While some of the identified communities, such as the bur oak forest, older silver maple forest, and some of the older oxbows, are essentially in a natural state, other communities show the effects of farming or other human influences in spite of the current diversity and abundance of their biota.

- Such resilience and ability to recover from short-term disruption is also evident in the rapid re-establishment of animal populations in the floodplain following periodic flooding events.
- A good example of ecosystem resilience is found upstream on the East Branch in Pittsfield where PCBs in sediment and bank soil were remediated from 2000 to 2006. The aquatic insects in the River reestablished themselves quickly following cleanup and the re-established community was more diverse than before remediation, and reflective of non-polluted rivers. The concentrations of PCBs were reduced by 99%.

Continuing Stress from PCBs

There are clear indications that the system downstream of the Confluence, while appearing normal and healthy, is experiencing stress due to elevated concentrations of PCBs.

- Although some animals, such as invertebrates, fish, and amphibians may appear healthy when observing individual adults, site-specific studies for the ecological risk assessment have shown that these taxonomic groups are experiencing reproductive and other problems due to the effects of PCBs. In addition, other animals, such as mink and otter, are nearly completely absent in spite of what otherwise would be optimal habitat in the absence of PCBs.

What Are PCBs and How Do They Behave in the Environment?

Richard A. McGrath,
The Isosceles Group, Inc.

PCBs had many industrial applications.

PCBs – Man-made chemicals

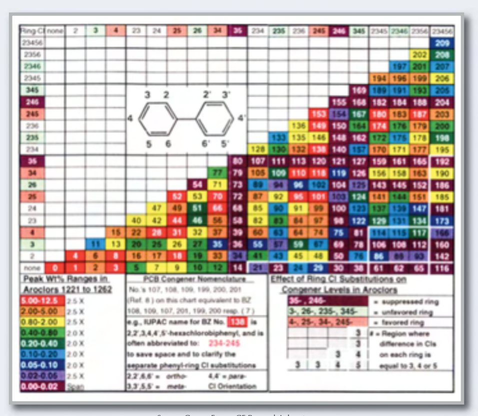
Although almost everyone has now heard of PCBs, they were only created a little over 100 years ago.

- "PCBs" is an abbreviation for polychlorinated biphenyls, a group of chlorinated organic chemicals that is similar in structure to some pesticides and industrial solvents.
- First synthesized in the late 1800s, they were manufactured in the US from 1929 until 1977; their manufacture was banned in 1979.
- Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications, including:
  - in electrical, heat transfer, and hydraulic equipment;
  - as plasticizers in paints, plastics, and rubber products;
  - in pigments, dyes, carbonless copy paper; and
  - in many other industrial applications.

Chemical Structure of PCBs

PCBs consist of a 12-carbon double ring structure known as biphenyl with a chlorine atom attached to one or more of the 10 available carbons. The number and location of the chlorine atoms in the molecule determine biogeochemical behavior and toxicity.

- There are 209 different PCBs, each of which is known as a **congener**. Each of the congeners is identified with a unique number.
- Congeners that have the same number of chlorine atoms tend to have similar properties, and are members of the same **homologue** group. Each of the 10 homologue groups is referred to by a name derived from the number of chlorines:
  - Monochlorobiphenyl = 1 chlorine
  - Dichlorobiphenyl = 2 chlorines, etc.
- **Aroclors** are mixtures of many different congeners that were created to have particular physical properties. Aroclor 1260, a heavy oil, is predominant in the Housatonic River; conversely the PCB contamination in the Hudson River is the lighter Aroclor 1242.



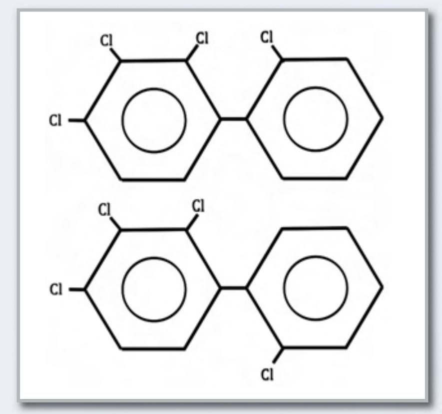
Source: George Frame, GE Research Laboratory

"Periodic Table" of PCB congener nomenclature, showing the structure associated with each congener number

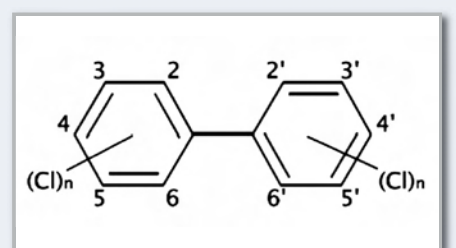
PCBs in the Environment

Once released into a river environment, PCBs adsorb onto sediment particles and often end up in riverbed sediments due to the settling of the sediment particles carrying the PCBs with them.

- Each congener has a characteristic partitioning coefficient that quantifies how strongly it becomes attached to sediment particles.
- Lower-chlorinated homologues are less strongly associated with sediments and are more soluble, while the reverse is true for the higher-chlorinated homologues.
- Although some PCB congeners are volatile, in general the more highly chlorinated congeners that are predominant in Aroclor 1260 and 1254 are considered non-volatile.
- Because Aroclors are mixtures of many congeners, simulating the movement of PCBs in the environment using numerical models is complex.
- PCBs bioaccumulate in animals, and biomagnify (increase in concentration) as they move up the food chain.

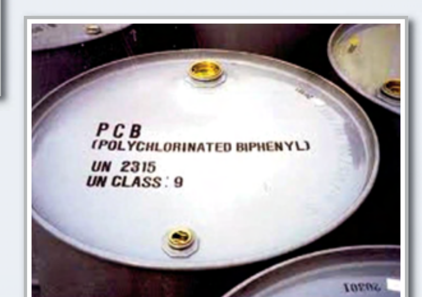


The number and location of the chlorines on the PCB molecule determines physical behavior and toxicity.



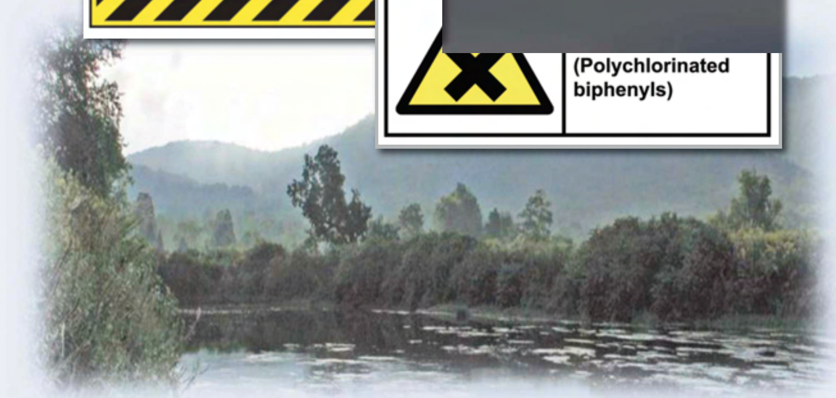
Generic biphenyl ring structure of the PCB molecule

PCBs are resistant to chemical and biological degradation, and are therefore extremely persistent in the environment, with some PCBs requiring decades or even centuries to degrade.



Toxicity of PCBs

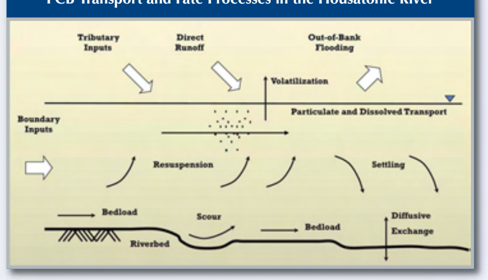
- PCBs have been shown to cause cancer in laboratory animals, and are assumed to cause cancer in humans.
- As a result, PCBs have been classified by EPA and international health and environmental agencies as "probable" carcinogens.
- PCB exposure has been documented to result a variety of serious non-cancer effects in humans, including skin and liver damage and disruption of hormone systems.
- The toxicity of PCBs is related to the structure of the individual congeners, with more chlorinated PCBs generally more toxic to higher animals. PCBs with few or no chlorines attached to the carbons adjacent to the bond between the rings act similarly to dioxin in the body.



PCB Distribution, Fate and Transport

Edward Garland, *HDR HydrQual*

PCB Transport and Fate Processes in the Housatonic River



PCBs in the Housatonic River

The Housatonic River is a complex and ever-changing environment. PCBs in the River have been extensively studied as part of detailed site investigations, risk assessments, and modeling studies to help us understand:

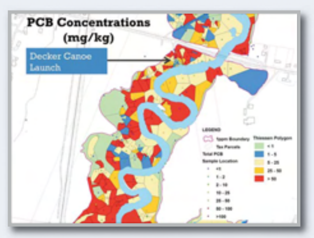
- Where PCBs occur in the River and floodplain and how much is there (distribution)
- How PCBs move through the River and floodplain (transport)
- Where PCBs go over time (fate)

In addition to helping better understand the River and its complex processes, this information is being used by EPA to select the best possible cleanup approach for the Rest of River.

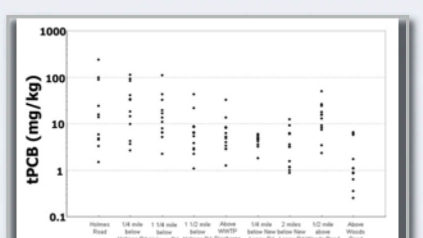
Where are the PCBs Now?

Thousands of samples of water, sediment, floodplain soils, and biota have been collected by EPA, GE, and others over a period of many years. Data were also collected to measure various riverbed, riverbank, and floodplain characteristics. EPA learned that:

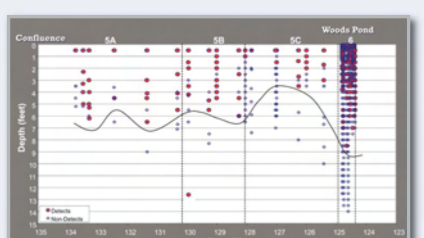
- Some riverbanks upstream of Woods Pond are not stable and are eroding. When banks erode, they put PCBs back into the water and the sediment bed. Riverbanks now account for nearly half of all PCBs entering the River.
- The floodplain upstream of Woods Pond is heavily contaminated with PCBs because when floods occur, PCB-contaminated sediment is deposited on the floodplain.
- 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 (identifiable small areas of higher contamination).
- PCBs occur deep in the riverbed as well as at the bed surface.



PCB concentrations in floodplain soil at a representative location along the river



Do PCB hotspots exist in the bed?



PCBs are up to 4-9 feet deep in sediment and soil

Is Burial Permanent?

Burial of PCB-contaminated sediment with cleaner sediment is an ongoing process in the river, however it is a process that is often reversed.

- The sediment bed may be disrupted during storm events, so PCBs deeper in the sediment are not permanently buried.
- Sediment eroded from the bed carries PCBs into the water column and downstream.
- Suspended sediment that settles returns 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, and through examination of deep sediment cores.

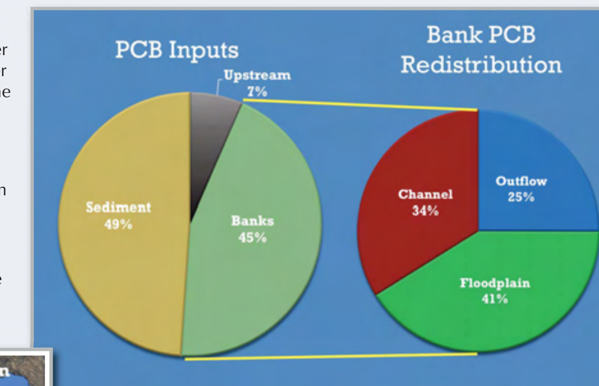
Bank failure and erosion puts PCBs into the river over time

Floods move PCBs onto the floodplain

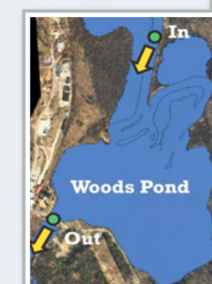
Natural Recovery

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 very slow.



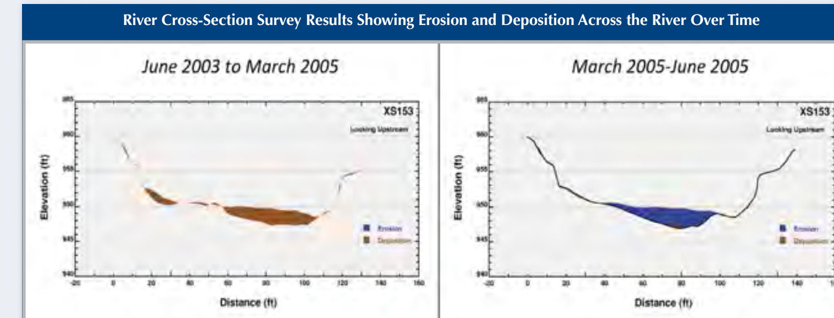
Redistribution of bank PCBs



Does Woods Pond trap PCBs?

- 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 currently entering Woods Pond end up going over the dam and travel downstream, meaning that only 10% of the PCBs are retained in the Pond.

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



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

Human Health Risks

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

Consumption of fish from the Housatonic River was found to pose a serious risk to human health.

Design of the Human Health Risk Assessment

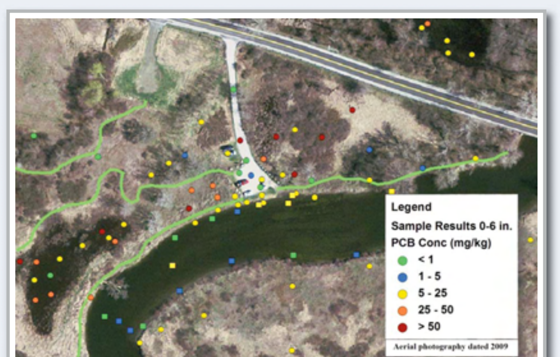
EPA's Human Health Risk Assessment (HHRA) for the Rest of River was designed to quantify cancer risk and noncancer hazard effects for adults and children who are exposed to PCBs while living, recreating, or working near the River. The HHRA was conducted to answer the following questions:

- **Are PCBs present, and in what concentrations? (Hazard Identification)** Samples of soil, water, air, fish, waterfowl and vegetation were collected to find out if they contain PCBs.
- **Who is exposed to PCBs and by how much? (Exposure Assessment)** 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.
- **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.
- **Could PCBs harm people's health? (Risk Characterization)** The Risk Characterization combines all the three components above to quantify the potential risks to people from exposure to PCBs in the Housatonic River.

PCBs: Clear Evidence of Cancer and Noncancer Health Effects

The scientific community has reached a clear consensus on the health effects of exposure to PCBs.

- **Cancer –** Studies demonstrate that PCBs cause cancer in animals. As a result, EPA and other agencies around the world have classified PCBs as probable human carcinogens.
- **Other Health Effects –** PCBs have been shown to cause a variety of adverse effects in animal studies; these are likely to also occur in humans. In addition, PCB exposures in human populations have been associated with eye and skin effects, and effects on the immune system, neurological system, and endocrine system.

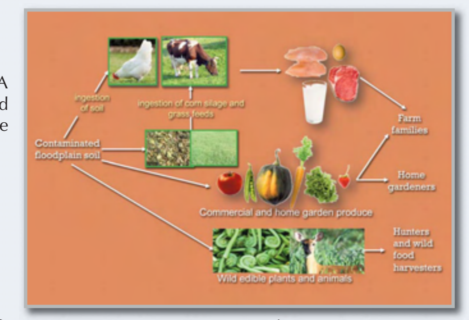


The HHRA evaluated where and for how long people use the river and floodplain

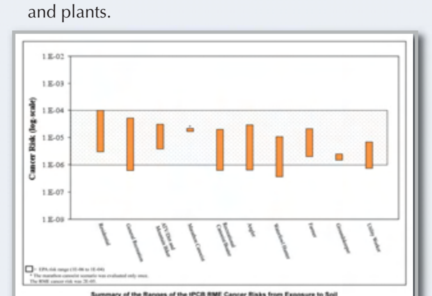
How are people exposed to PCBs in the River and floodplain?

There were three primary ways evaluated in the HHRA that people may be exposed to PCBs that originated from the GE facility in Pittsfield and now contaminate the River and floodplain.

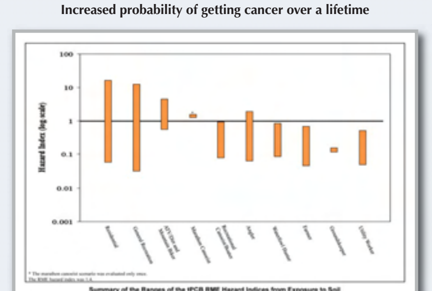
- Direct contact with soil and sediment during recreational, residential, commercial, and agricultural activities in the floodplain
- Consumption of fish and waterfowl taken from the Housatonic River
- Consumption of agricultural products that may be produced in the floodplain such as milk, eggs, and plants.



Exposure Scenarios:
Agricultural products and home gardens



Cancer Risk:
Increased probability of getting cancer over a lifetime



Hazard Index (HI):
Compares site exposure to level without appreciable risk

What are the risks from PCBs in…

Soil?

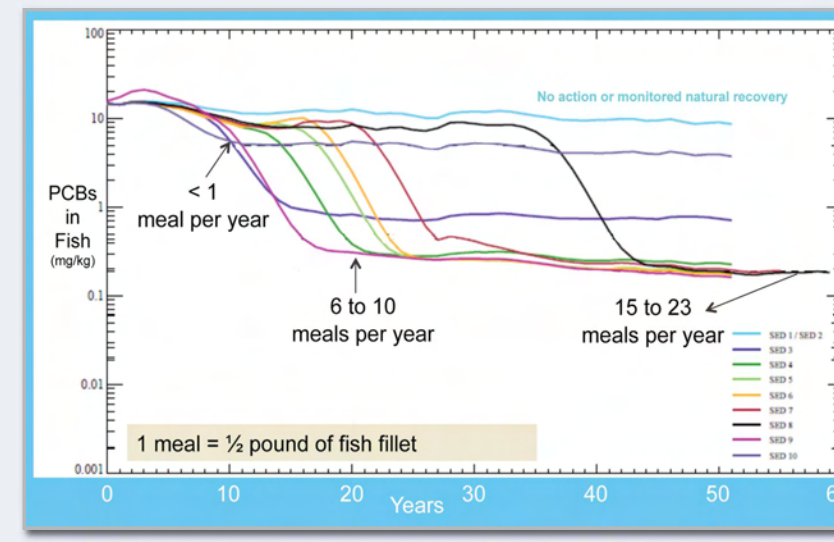
- Nearly all cancer risk estimates are within or below the acceptable EPA risk range
- Noncancer hazard indices (HIs) exceed the EPA benchmark of 1 in some exposure areas for almost all exposure scenarios

Sediment?

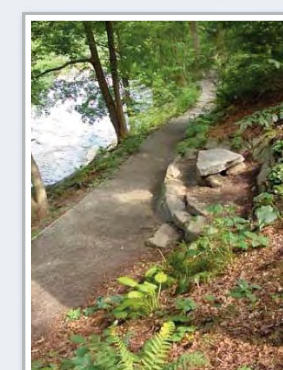
- Cancer risk estimates are within or below the acceptable EPA risk range in all 8 sediment exposure areas
- Noncancer hazard index is exceeded in 2 of the 8 sediment exposure areas

Fish and waterfowl?

- Cancer risk estimates are well above the acceptable EPA risk range
- Noncancer hazard indices are well 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



Risk assessment is used to find answers to questions about how much fish is safe to eat



Source: www.americantrails.org/resources/art/MA-GBHtrailAWS.html

Some activities conducted near the river and floodplain pose risks due to contact with contaminated soil

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.

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.

Ecological Risks

Gary Lawrence, *Golder Associates*

PCBs – Clear evidence of toxicity to wildlife

Many studies have demonstrated the toxicity of PCBs to wildlife. A clear consensus on several important aspects of the harm caused by PCBs has been reached.

- Early life stages tend to be more sensitive to PCB toxicity. Often these effects are severe enough to result in premature death.
- There is a wide range of sensitivity to PCB toxicity in the animal kingdom.
- Of the 209 PCB congeners, a few of them are particularly toxic because they cause responses similar to dioxin.

Numerous scientific studies have shown that PCBs cause a variety of adverse effects on wildlife, such as deformities in juvenile fish

Although PCB-impacted communities may appear normal, particularly sensitive species such as mink may be absent.

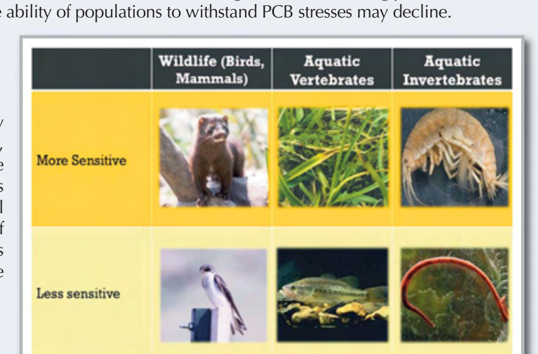
If PCBs are toxic, why are there many animals found in the Housatonic River and floodplain?

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.
- The ecological potential of the system is not currently being realized due to PCB effects.
- If other stressors such as habitat fragmentation or fishing pressure increase, the ability of populations to withstand PCB stresses may decline.

Different species exhibit different sensitivity

Not all animals respond in the same way to PCBs, or other stressors. 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.



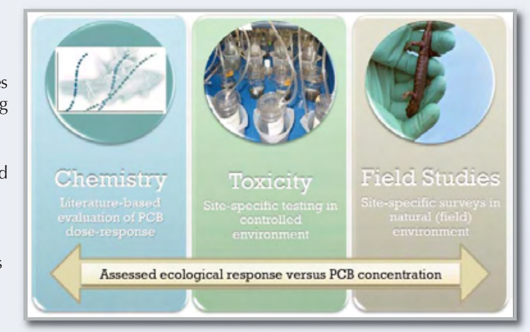
(Source: Hyalella © Dale Parker, AquaTax Consulting)

Different species of wildlife exhibit different sensitivities to PCBs and other environmental contaminants

Design of the Ecological Risk Assessment (ERA)

In an ecological risk assessment, some species are selected to represent each major grouping of animals, and then assessed in detail.

- Many of the choices in the ERA were made because the species was evaluated at other contaminated sites and/or in other PCB investigations.
- As part of the ERA, the results from the evaluations of the representative species are translated into implications for the broader groups of animals.



The ecological risk assessment was conducted using three independent lines of evidence

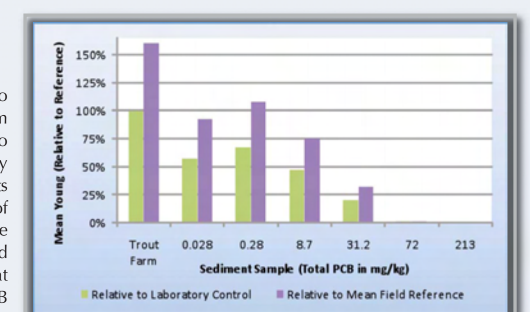
Lines of Evidence

The ERA was conducted by using three independent lines of evidence to evaluate the effects of PCBs on the representative species where possible. The three lines of evidence were:

- ***Chemistry –*** Estimates of exposure at the Housatonic River site for each species were compared to a toxicity threshold published in the scientific literature.
- ***Site-Specific Toxicity –*** Toxicity of contaminated site media to animals was evaluated in a controlled environment (usually in the laboratory). Tests measured organism survival, growth, reproduction, malformation, or other endpoints that indicated how the animal may be affected in the wild.
- ***Field Studies –*** This line of evidence 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.

What did the results of these studies tell us?

For most animals, the estimated exposures to PCBs at the site were greater than minimum levels shown by other published studies to cause adverse effects. 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 River.



In many cases the studies demonstrated clearly that PCBs were causing harm to a species, or showed that the particular species was not affected. For example, in the case of benthic invertebrates, the sediment concentration shown to be causing alteration of communities was similar to the threshold identified from the site-specific studies.

Final determinations of risk using weight-of-evidence

Each group of organisms was formally evaluated by combining the available lines of evidence, with consideration of the strength and/or reliability of each line. Evidence was weighed more strongly if it provided more compelling information on the relationship between PCB contamination and effects to local animal populations.

Animal Group	Chemistry LOE	Toxicity LOE	Field Study LOE	Overall Risk
Benthic Invertebrates	★★★	★★★★	★★★	High
Amphibians	★★★	★★★★	★★★	High
Fish	★★★	★★★★	★★★	Low to Moderate
Insect-eating birds	★★★	Not tested	★★★★★	Low to Moderate
Fish-eating birds	★★★	Not tested	★★★	Moderate
Fish-eating mammals	★★★	★★★★★	★★★★	High
Other mammals	★★★★	Not tested	★★★★	Moderate
Threatened/Endangered	★★★	Not tested	★★	Moderate

The final determinations of risk were made using a weight-of-evidence approach

Ecological Risk Assessment – Conclusions

A determination of high risk was 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:

- 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. 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 delayed development, malformations, alteration of sex ratios, and reduced survival at certain life stages. Risks to amphibians were confirmed in field studies that showed reduced diversity 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. 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 are at lower risk than these high-risk species, but to varying degrees. These species include fish, insect-eating birds, fish-eating birds, small mammals, and several endangered species.

Benthic invertebrates, amphibians, and fish-eating mammals were shown to be at high risk due to exposure to PCBs

Why Use Models for the Housatonic River?

Mark Velleux, Ph.D, *HRD HydroQual*

The Housatonic River Modeling Framework

The need for a numerical model to provide a means for quantitative evaluation of remedial options for the Rest of River was recognized during the negotiation of the Consent Decree and, along with the two risk assessments, became one of the three major components of the Housatonic River Study.

- As required by the Consent Decree, EPA developed a framework for modeling the transport and fate of PCBs in the River, floodplain, and biota.
- The modeling framework established by EPA specified three linked models for hydrology, hydrodynamics and sediment/contaminant transport, and food-chain transfer.
- The models were subsequently calibrated, validated, and subjected to independent peer review.
- In its Corrective Measures Study (CMS) and subsequent revisions, GE used the EPA model to evaluate the effectiveness of the remedial alternatives.

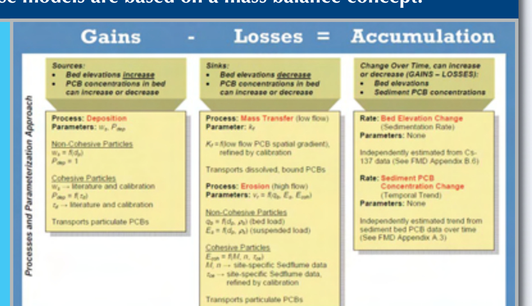
Modeling Components

The individual models selected as part of the modeling framework represent established approaches to numerical simulation of environmental processes. All of the models have been used extensively at other sites and are in the public domain. The model domain extended from Reach 5 through Reach 8, after which another model was applied.

- The Hydrological Simulation Program-Fortran (HSPF) simulates inputs from the surrounding watershed to generate a hydrograph of river flow that drives river transport processes
- The hydrodynamic/sediment-PCB transport model for the River is the Environmental Fluid Dynamics Code (EFDC):
  - EFDC includes numerical representation of many detailed processes that occur in the River in order to simulate PCB concentrations in water, sediment, and floodplain soil.
  - The EFDC model grid has thousands of small compartments stretching from the Confluence down to Rising Pond. For every one of these model cells, many mass balance calculations are performed over time steps as small as seconds.
- The Food Chain Model (FCM) represents biological processes that occur within aquatic biota and between the biota and the environment. It takes output from EFDC and uses it to simulate how PCBs move through the food chain.

Like your checkbook, these models are based on a mass balance concept.

- 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 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.



Model Testing

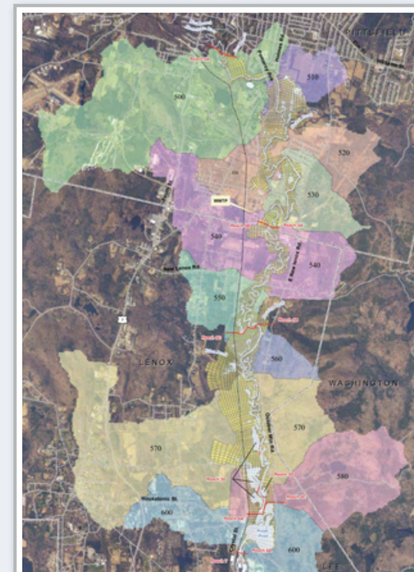
All three models were calibrated and validated using data collected from the River.

- During development, the models were tested to ensure that they could duplicate data collected on PCB concentrations in water, sediment, and biota over time frames as short as a few hours (storm events) up to decades.
- This testing demonstrated that the models provide a good understanding of how PCBs move in the River and where they go over time under current conditions, as well as under the different cleanup alternatives.
- The entire model framework, calibration, and validation were subject to three Peer Reviews by an independent panel of experts.

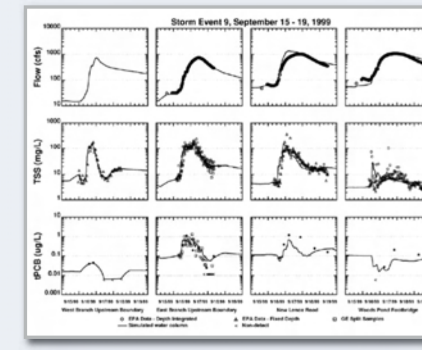
Model Application

- Simulation of current conditions has provided important insights into how and where PCBs are moving through the River system.
- One important observation from the modeling is the importance of the river banks as a continuing source of PCBs to the river. The banks in Reach 5 are the source of nearly half the PCBs mobilized in the river, and are approximately as large a source as bed sediments. Data collected in the river supported this assessment.
- The modeling results also show that the River is not undergoing "natural recovery" quickly enough to significantly reduce risks in the foreseeable future.

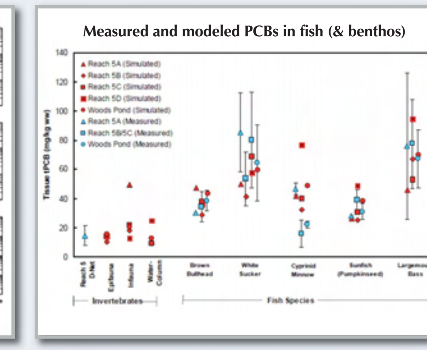
When used with monitoring data, the models are useful tools to evaluate cleanup alternatives.



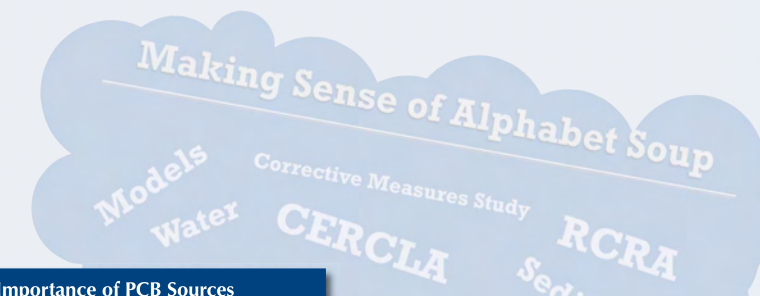
EFDC Grid Example:
Reaches 5 and 6 (PSA) Pittsfield to Woods Pond



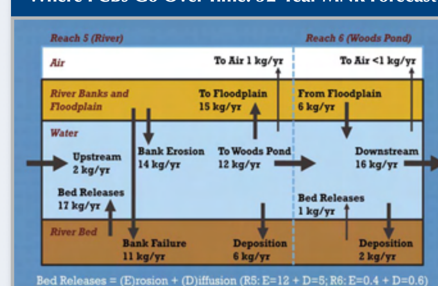
Results for Water: A Single Storm



Results for Fish: Reaches 5&6 1998-2000

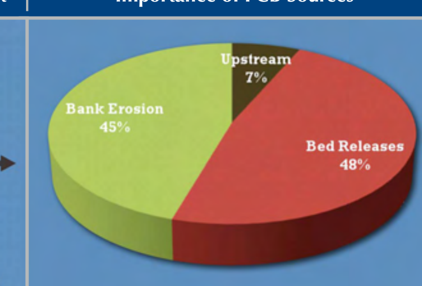


Where PCBs Go Over Time: 52 Year MNR Forecast



MNR = Monitored Natural Recovery

Importance of PCB Sources



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

Remediation Technologies and Techniques

Michael R. Palermo, Ph.D, *Mike Palermo Consulting, Inc.*

Remedy Implementation

Sediment Remediation Techniques and Technologies

The basic techniques and technologies for sediment remediation are well established. These include:

- **Non-removal options** – such as monitored natural recovery and in situ (in place) capping.
- **Removal options** – such as dredging, with disposal in containment facilities or landfills, or with sediment treatment.

Other remedies involve combinations of these options. All of these options have been applied to sediment remediation projects in the US.

Monitored Natural Recovery (MNR) relies on natural processes to contain or reduce the bioavailability or toxicity of sediments left in place. Processes that result in natural recovery include:

- Burial and in-place dilution following deposition of clean sediment.
- Biodegradation or physical and/or chemical (abiotic) transformation processes which convert the contaminants to less toxic forms.

Monitoring

MNR is not a "no action" alternative because by definition it includes source control (such as burial) and an appropriate monitoring program to ensure the processes are effective.

- MNR is a common component of remedies with a combination of actions.
- The major disadvantages of MNR are that contaminated sediment is left in the aquatic environment for the long time it takes natural processes to reduce risks, and there is the potential for future disruption of buried contaminants by storms, floods, or other events.
- Enhanced MNR may include thin-layer capping (TLC).

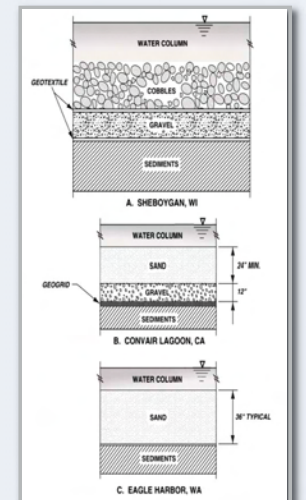
***In Situ* Capping** (ISC) involves placing a layer of clean isolating material (usually clean sediment or soil) to contain and stabilize the contaminated sediment in place.

- A variety of capping materials and cap placement techniques are available.
- Monitoring data collected from a number of projects has indicated capping, in most cases, is a highly effective remedy.
- The potential for extreme events such as storms, floods, or earthquakes to disrupt a cap must be carefully examined and addressed.
- A disadvantage is that contaminated material remains in the aquatic environment.

ISC has gained increased acceptance as an effective and efficient remedial option and has been implemented as a remedy component at a number of major sites, including the Fox, Hudson, and Housatonic Rivers.

Environmental Dredging, and/or dry excavation, is the most common approach for sediment remediation in the US. Dredging of contaminated sediment permanently removes contaminants from the aquatic environment. Dry excavation uses conventional earth-moving equipment, and there are no issues with removal efficiency and effectiveness. However, the effectiveness of dredging requires more careful evaluation:

Environmental Dredging Equipment Categories



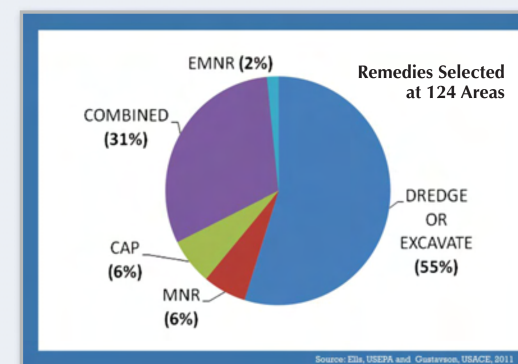
The design of an in situ cap depends on the specific conditions of the site

- A major consideration in evaluating the effectiveness of dredging includes the evaluation of resuspension and residuals (sediment that remains after dredging).
- A variety of engineering controls may be used, including isolating the dredging area using silt curtains or sheet pile enclosures.
- Selection of appropriate dredging equipment and the compatibility of equipment with the selected disposal option is an important factor.
- Equipment normally used for navigation dredging is often used for remediation projects, but US and international dredging contractors are also using innovative hydraulic and mechanical dredges especially designed to address the issue of resuspension and residual management.

Disposal of the dredged material is a necessary component of any environmental dredging option and can often be controversial, complex and expensive.

- Disposal options include confinement, pre-treatment, or treatment.
- Confined Disposal Facilities (CDFs) and Contained Aquatic Disposal (CAD) sites are commonly used for contaminated sediments from navigation dredging and have also been used for remediation projects.
- The most common containment option in the US for contaminated sediments dredged for purposes of remediation has been disposal in upland landfills

Confined Disposal Facility (CDF)



PCBs are Contaminants of Concern at about 50% of the Sites; cleanup/action levels range from approx. 0.1 to 4000 mg/kg.

Remedy selection should give appropriate attention to:

- Site-specific considerations such as hydrodynamics, adjacent resources and infrastructure, water depths, and other factors which may influence the risks and costs of a given approach.
- Project-specific considerations such as the volume of contaminated materials or areas to be addressed, the regulatory framework under which the project is being implemented, and other factors which may dictate feasible and cost-effective solutions; and
- Sediment-specific considerations such as the type of contaminants, contaminant concentrations, and physical properties of the sediments.

Experience has shown that, for large or complex sites, combinations of options are often the most desirable remedies.

Ecological Restoration

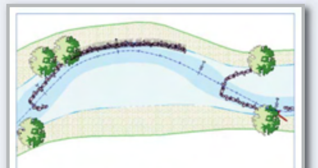
Keith Bowers, *Biohabitats, Inc.*

Restoration

Active restoration initiates or accelerates the recovery of an ecosystem following a disturbance and:

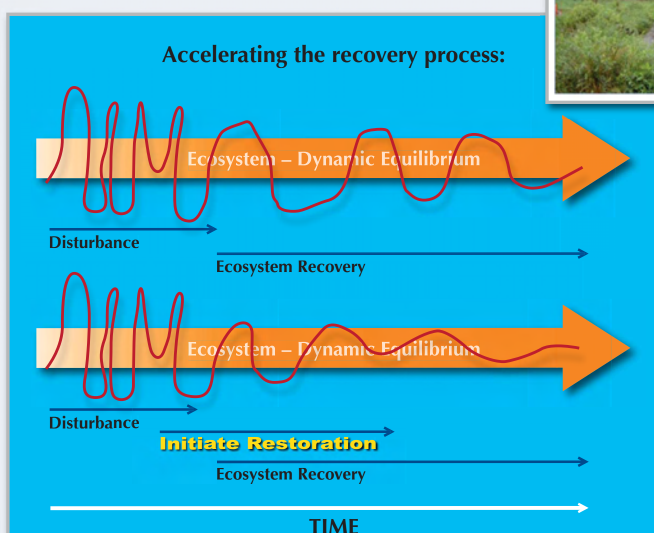
- Puts the ecosystem along an intended trajectory that supports critical ecological processes
- "Sets the stage" for natural, passive restoration processes to take over
- Can reduce the time needed for recovery from many decades to years

> *"Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed."*
>
> – Society for Ecological Restoration (SER), 2004



Evolution of Restoration

Around the world, ecological restoration has gained recognition as a valuable tool to repair landscapes that have been impacted by human activities.



- Early missteps resulted when practitioners mischaracterized systems based on overly simplistic understandings of stream processes
- Now the emphasis is on river processes and how they shape, form, and influence the river

Good restoration should embrace…

- Processes → function → form
- Diversity, complexity and resiliency
- Clear trajectory towards success
- Adaptive management

The Recipe for Success Includes…

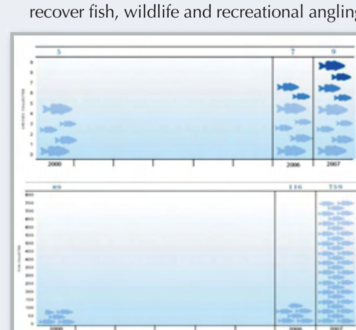
Integrating the restoration with a remedial design and:

- Having a thorough ecological description of the site (and surrounding ecosystem) and an understanding of the river processes
- Applying sound science and engineering
- The integration of the restoration with the surrounding landscape
- Stakeholder involvement
- Explicit plans, schedules, budgets
- Monitoring and evaluation

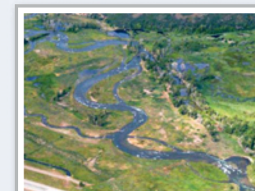
Examples of Restoration Projects

Demonstrated restoration success at impacted sites throughout the world has shown that it is possible to restore both the appearance and ecological function of areas after they are disrupted. Examples include:

- **Provo River, UT –** Similar in size to the Housatonic River, the Provo River project involved 12 miles of river along a corridor 800' to 2,200' wide. The purpose was to restore the river form and ecological function to recover fish, wildlife and recreational angling losses caused by federal water projects in Utah. The restoration consisted of creating a multiple-thread, meandering river channel, and reconnecting the river to existing remnants of the historic secondary channels.



Nine-Mile Run –
Recovery of the fish community following restoration



Provo River Restoration

- **Nine Mile Run River, PA –** The US Army Corps of Engineers partnered with the City of Pittsburgh to restore over a mile of aquatic habitat by reconnecting the stream to its floodplain, reducing fish migration barriers, creating meanders and step pools, stabilizing eroding slopes using vegetation or soil bioengineering, managing invasive vegetative species, and enhancing/enlarging wetlands.

- **North Gray's River, MD –** The North Creek Bog project restored 95,000 sq. ft. of degraded wetlands, including a complex of riparian wetlands/bogs and vernal pools. The restoration involved removal of dredged material, and the addition of sand fill and cobble weirs. The native plant communities were re-established, providing habitat to support species of concern.

North Gray's River Restoration

The Housatonic River

The Housatonic River appears to be a pristine natural system that has evolved over millennia. Some fear that disrupting the "natural" processes in the river will result in irreparable harm. However, analysis of historical documents and maps of the Housatonic River reveals a history of alterations in the River associated with human activities.

- An altered river channel is inherently unstable due to factors such as the increase in channel gradient and stream power associated with a shortened stream length if the river is straightened.
- Over long periods of time, straightened river channels undergo a series of channel adjustments that ultimately lead to the return of a stable meandering riverbed and banks that approximate the pre-disturbance condition.

Active restoration can accelerate the full recovery not only of past human impacts, but also of impacts caused by remediation.

In the East Branch of the Housatonic River at Newell Street, photographic records show that vegetation along the River was removed in both the 1940s and the 1990s. A recent view, taken less than a decade after remediation and restoration, shows significant recovery has already occurred.

Stream Table Demonstration

Richard DiNitto, *The Isosceles Group*
and David Bidelspach, *Stantec Consulting, Inc.*

Understanding how river sediment, vegetation, woody debris and flowing water interact to form stream channels is essential in determining how to restore and manage them. While it's difficult to directly observe these processes occurring naturally in real time, these stream models accurately portray stream processes.

Stream tables can compare the amount of erosion with and without bank protection

Among other things, these models can demonstrate:

- Channel stability and bank stabilization
- Response to channelization and river straightening
- Head cutting and erosion
- Effects of debris
- How floodplains function
- How meanders form
- Effective restoration techniques

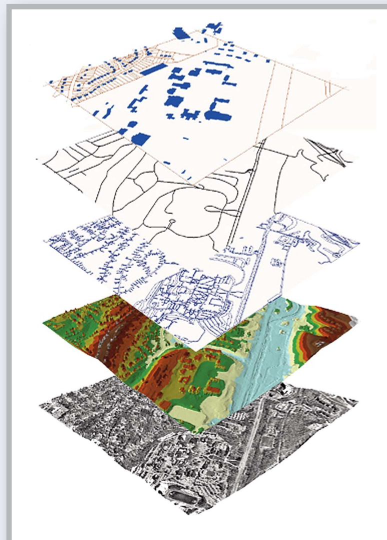
Stream tables compliments of
John Field, Ph.D, *Field Geology Services*
and John Cassels, *Geodesy, Inc.*

Using GIS to Understand Remedial Alternatives

John Cassels, *Geodesy, Inc.*

EPA uses Geographic Information System (GIS) technology to coordinate data to understand complex environmental issues such as the remedial alternatives under consideration for Rest of River.

- In working with the River, all data need to be referenced by location so EPA knows where specific conditions exist.
- Once we understand **where** the conditions are, EPA can then determine **how** best to deal with the situation and **what** the best way is to do it.



Source: Jefferson County, Alabama, Department of Information Technology

Data Layers

GIS manages data in layers and can represent a variety of significant features in the landscape. Layers in this GIS demonstration include:

- Aerial photography
- Man-made structures such as roads, parking lots, bridges, and buildings
- Rivers, streams and ponds; wetlands, uplands and sensitive habitats
- Occurrence of rare, threatened and endangered species
- Soil sample locations with PCB concentrations at various depths

In this demonstration, the GIS model developed by EPA is used to simulate remedial action in the floodplain and selectively remove contaminated soils from an area to effectively reduce human health and ecological risks while avoiding sensitive features.

3.9 Charrette Workshops

The Charrette Workshops provided an opportunity for the public to apply their understanding of technical information to a range of cleanup options and to offer EPA substantive and practical suggestions. A poster session provided additional technical information. Participants, in groups of 10 to 20, applied their knowledge in morning and afternoon workshops and, working with a facilitator assisted by a scribe, tackled exercises that produced specific and practical information to EPA. The work of the 1-1/2 to 2-hour workshops involved discussion, complex decision-making, and consideration of a range of cleanup options.

3.9.1 Structure

Along with the Poster Session, Workshop 1 • Criteria Scorecard (morning) and Workshop 2 • Comprehensive Guidelines (afternoon) were the principal activities of the Public Charrette. The Workshops were the activities in which citizens engaged in dialogue and worked to deliver a substantive and usable product that EPA could consider in its Rest of River decision.

The Workshops were designed as a complementary pair:

Workshop 1 • Criteria Scorecard provided an opportunity for stakeholders to provide input from the viewpoint of EPA and the regulatory criteria stipulated by the Reissued RCRA Permit. It was an opportunity for the community to understand the guidelines that EPA must follow in developing any cleanup remedy.

Workshop 2 • Comprehensive Guidelines provided an opportunity for stakeholders to provide input from the viewpoint of community issues. It was an opportunity for EPA to understand the guidelines that the community wanted to offer to EPA as it evaluated remedial alternatives.

3.9.2 Protocols

EPA developed a number of protocols to help ensure the success of the Workshops:

- Each group was staffed with a trained facilitator to expedite the activity and a trained scribe to record responses.

- So that participants might speak with complete candor, EPA staff who had long-term involvement with the project were not assigned to groups; rather, EPA staff were to roam and respond to a group's questions when their input was requested.

- EPA's experts were to roam between groups so that they were not perceived as "belonging" to any group. Like EPA staff, they were to respond to a group's questions when requested by the group.

- Each group was to contain a minimum of 12 and a maximum of 25 participants to ensure critical mass and, conversely, that all participants had an opportunity to actively contribute.

- Individuals within a group who wished to file a dissenting view were encouraged to do so by completing their own Worksheets and submitting them in addition to the group output.

- Each Workshop was to last no more than 2 hours, striking a balance between productive intensity and pushing too hard.

- Facilitators, scribes, EPA staff, and EPA's experts were not to lead, bias, or in any way influence the content of the groups' conversations or decisions.

3.9.3 Facilitators and Scribes

All groups were led by trained and experienced facilitators, and the groups' activities were recorded by scribes. In addition, EPA assembled the facilitator/scribe team to include a range of expertise—those who worked within EPA, those who had long-term experience on the Housatonic River cleanup project, and those who brought facilitation and conflict management experience from other arenas:

- Anna Abbey, Conflict Prevention and Resolution Center, US EPA
- Scott Campbell, Housatonic River Project Manager, Weston Solutions, Inc.
- Deborah Dalton, Conflict Prevention and Resolution Center, US EPA
- Richard G. DiNitto, Hydrogeologist and Geomorphologist, The Isosceles Group, Inc.
- Daniel Dozier, Esq., Conflict Management and Dispute Resolution Specialist
- Elizabeth Murphy, Independent Facilitator
- Keith L. Seat, Esq., Conflict Management and Dispute Resolution Specialist
- Mark Velleux, Ph.D., P.H., P.E., Senior Project Manager, HDR|HydroQual, Inc.
- Dan Wainberg, On-Scene Coordinator, US EPA, New England Region
- Ernest Waterman, Acting Deputy Director, Office of Environmental Measurement and Evaluation, US EPA, New England Region.

3.9.4 EPA Staff

Curt Spalding, EPA New England Regional Administrator, opened the Public Charrette in the morning plenary session. In addition, most of the senior EPA staff currently associated with the Rest of River project were in attendance at the Public Charrette:

- Susan Svirsky, EPA Project Manager Rest of River
- Dean Tagliaferro, EPA GE-Pittsfield/Housatonic River Team Leader
- Jim Murphy, EPA New England Community Outreach Coordinator
- Robert Cianciarulo, Chief, Massachusetts Superfund Section, Office of Site Remediation and Restoration
- Tim Conway, Senior Enforcement Counsel, EPA New England.

3.9.5 EPA's Experts

EPA's technical experts—a total of 13—consisted almost entirely of those who offered presentations at the Mini Workshops. These experts included physical engineers, stream and habitat restoration specialists, biologists, geologists/geomorphologists, hydrological engineers, environmental risk specialists, human health risk specialists, and wetland scientists/aquatic ecologists. For a full list of experts and their biographies, see the preceding section, "Poster Session."

3.9.6 Trial Run and Additional Outreach Effort

Both workshops received a trial run in the week prior to the Public Charrette, due to the generosity and offer of Professor Donald Roeder and his class at Bard College at Simon's Rock. The workshops were modified slightly to conform to the different context of a classroom. Having studied the Rest of River issues for the semester and sagacious in their insights, the students made suggestions for workshop improvements that were incorporated into the "final" versions executed at the Public Charrette. EPA was grateful for both the opportunity to assist a public education effort and to receive input that improved the quality of the Public Charrette.

WORKSHOP 1 • CRITERIA SCORECARD

3.10 Workshop 1 • Criteria Scorecard

3.10.1 Intention

The primary intention of Workshop 1 • Criteria Scorecard was to help participants understand the requirements of the RCRA Permit and the 9 Criteria by which EPA must evaluate the remedial alternatives. Given EPA's desire to elicit practical input from Public Charrette participants, having a basic working knowledge of these Criteria was essential.

EPA accomplished its objective through an exercise in which groups of approximately 15 people reviewed four representative cleanup solutions and evaluated how each would score against the Three General Standards and Six Selection Criteria as specified in the Reissued RCRA Permit. Each group discussed, negotiated, formulated, and submitted a single "Criteria Scorecard Worksheet" as shown below.

Workshop 1 • Criteria Scorecard Worksheet

Workshop 1 • Criteria Scorecard
Housatonic River Public Charrette May 7, 2011

Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS						
1 Overall Protection of Human Health and the Environment						
2 Control of Sources of Releases						
3 Compliance with ARARs						
FIRST TIER ASSESSMENT						
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness						
2 Attainment of Interim Media Protection Goals (IMPGs)						
3 Reduction of Toxicity, Mobility, and Volume						
4 Short-Term Effectiveness						
5 Implementability						
6 Cost						
SECOND TIER SCORE						

scoring scale

○ Does Not Meet This Criterion → ◉ Partially Meets This Criterion → ● Best Meets This Criterion

Figure 21. Criteria Scorecard Worksheet.

3.10.2 Process Overview

The process for working through Workshop 1 was created to mimic the complex and challenging process that EPA must follow in remedy selection, but do so in a simplified form that could be accomplished by the participants within the allotted time. The participants in each group undertook a five-step effort:

Step 1 • Gain familiarity with the Three General Standards + Six Selection Criteria specified in the Reissued RCRA Permit

Step 2 • Gain familiarity with the 28^{+} Metrics for which EPA had definitive data for each of the Four Representative Cleanup Options

Step 3 • Match Metrics to applicable General Standards and/or Selection Criteria

Step 4 • Understand the Four Representative Cleanup Options used for the Public Charrette

Step 5 • Score how each of the Four Representative Cleanup Options ranked in relation to the 9 Criteria.

In reality each one of the first four steps required significant "loading" of information, much of which was new to participants and required explanation. That information is outlined in the following narrative (Sections 3.10.2.1 through 3.10.2.3).

3.10.2.1 Three General Standards + Six Selection Criteria Specified in the RCRA Permit

Under the terms of the Reissued RCRA Permit, EPA must evaluate all cleanup alternatives against the following 9 Criteria:

Three General Standards

1 Overall Protection of Human Health and the Environment
2 Control of Sources of Releases
3 Compliance with Applicable or Relevant and Appropriate Federal and State Requirements (ARARs)

The Public Charrette did not include discussion of the ARARs because of the very specific legal and regulatory expertise necessary. EPA believed it more important to obtain meaningful feedback on the other eight Criteria.

Six Selection Decision Factors

1 Long-Term Reliability and Effectiveness
2 Attainment of Interim Media Protection Goals (IMPGs)
3 Reduction of Toxicity, Mobility, and Volume
4 Short-Term Effectiveness
5 Implementability
6 Cost

EPA included in participants' Workbooks more detailed explanations of the Standards and Selection Decision Factors, which were also available in poster form in each Workshop 1 group. (An example Workbook is included at the end of this section).

3.10.2.2 28^{+} Metrics for which EPA Had Definitive Data for the Alternative Options

1 Sediment and Soil Removal Volumes for Four Options
2 PCB Mass (lbs) Removed in Sediment and Soil for Four Options
3 Sediment and Soil Removal Acres for Four Options

4 Annual Mass of PCBs Passing Woods Pond and Rising Pond and Transported to Reach 5 & 6 During the Model Period for each of the Four Options
5 Solids Trapping Efficiency of Woods Pond for Four Options Relative to MNR (15% solids trapping efficiency)
6 Model Predicted Average Surface Sediment (0-6") PCB Concentration at End of Projection Period for Four Options
7 Model Predicted Average Surface Water PCB Concentration at End of Projection Period for Four Options
8 Projected Warmwater Fish Tissue (whole body) PCB Concentration at the End of Model Projection Period
9 Projected Coldwater Fish Tissue (whole body) PCB Concentration at the End of Model Projection Period
10 Benthic Invertebrates IMPG Attainment in Acres for Four Options
11 Amphibian IMPG Attainment in Acres for Four Options
12 Insectivorous Birds (Wood Duck) IMPG Attainment in Acres for Four Options
13 Upper and Lower Bound IMPG Attainment (in Acres) for Omnivorous and Carnivorous Mammals for Four Options
14 Piscivorous Mammals (Mink) IMPG Attainment (in Acres) for Four Options
15 Summary of Percent of Averaging Areas Achieving Piscivorous Bird IMPG
16 Summary of Percent of Averaging Areas Achieving Threatened and Endangered Species IMPG
17 Impacts of Four Options on State-Listed Species
18 Habitat Areas in Primary Study Area Affected for Four Options
19 Greenhouse Gas Emissions for Four Options
20 Duration in Years for Completion of Four Options
21 Incidence of Accident-Related Injuries Due to Implementation of Four Options
22 Incidence of Accident-Related Fatalities Due to Implementation of Four Options
23 Estimated Annual Truck Trips for Removal of Excavated Material and Delivery of Capping/Backfill Material for Four Options
24 Average Annual Incidence of Accident-Related Injuries Due to Increased Truck Traffic
25 Average Annual Incidence of Accident-Related Fatalities Due to Increased Truck Traffic
26 Acres Impacted by Access Roads and Staging Area for Four Options
27 Total Cost For Four Options— Cost is total capital cost and estimated annual operation, monitoring, and maintenance (OMM) cost. Does not include disposition/treatment
28-46 Average Fillet PCB Concentrations in Largemouth Bass (at various locations within Rest of River project area)

Figure 22 shows an example metric. The full set of metrics is available in "Supporting Material for Workshop 1" at the end of Section 3.10.

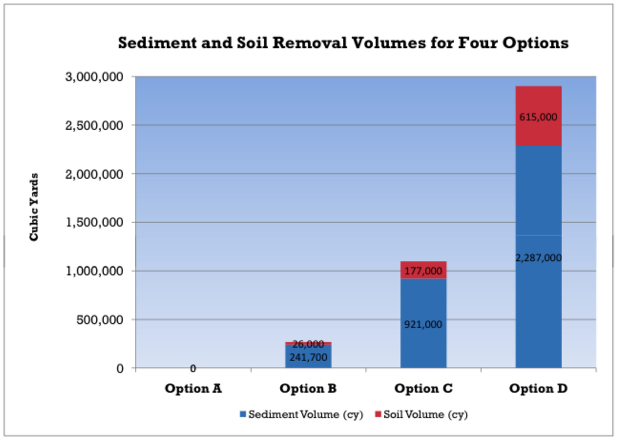


Figure 22. Example Metric.

Figure 23. EPA's Robert Cianciarulo on-hand to Answer Questions from a Workshop 1 Group with the Full Set of Metrics in Background.

3.10.2.3 Four Representative Cleanup Options Used for the Public Charrette

The Revised Corrective Measures Study included 10 Sediment Options and 9 Floodplain Options, and with the possibility of additional options, the number of combinations that EPA could consider for its remedy were far too many to consider within a public workshop. Therefore, EPA chose four representative cleanup options for use in the Public Charrette according to three primary criteria:

- The options should cover the range of alternatives being evaluated—from the least intervention to the greatest so that all positions were fairly represented and so that EPA would receive input on all alternatives.
- The options must be "real" alternatives that had been considered in the Revised Corrective Measures Study and for which real data existed.
- The options must be presented without bias.

EPA included full descriptions of the "Four Representative Options Spanning the Range of Those Evaluated in the Revised Corrective Measures Study" (Four Representative Cleanup Options) in the Public Charrette Workbook, which follows at the end of this section of the report. The Options are described here in brief:

Option A • Lowest Level Intervention

Consists of a combination of Monitored Natural Recovery (MNR) with institutional controls for all reaches of the River downstream of the Confluence and no action for the floodplain. This combination would rely on upstream source control and remediation measures, natural recovery processes in the River and floodplain, and institutional controls. The River monitoring program would include biota, water column, and sediment monitoring for a period of 100 years.

Option B • Lower Level Intervention

The sediment component would involve sediment removal followed by capping in portions of Reach 5A and Woods Pond (Reach 6). Some soil removal and bank stabilization would be conducted in Reaches 5A and 5B. Specifically, the components of Option B include the following:

- Reach 5A: Sediment removal (66,000 cubic yards (yd^3) over 20 acres), followed by capping, in areas determined based on ecological criteria.
- Riverbanks in Reaches 5A and 5B: Bank stabilization adjacent to certain of the sediment removal areas in Reach 5A and areas in Reach 5B determined based on ecological criteria (total of 1.6 linear miles), with removal of bank soils where necessary as part of the stabilization (6,700 yd^3).
- Reach 6 (Woods Pond): Sediment removal (169,000 yd^3 over 42 acres) in areas with PCB concentrations generally greater than 13 milligrams per kilogram (mg/kg) in the top 6 inches.
- Remainder of Rest of River: MNR.

The floodplain component would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet upper-bound reasonable maximum exposure (RME) IMPGs for human health. Specifically, this option has been developed to achieve the following IMPGs:

- The upper-bound RME IMPGs for human health (i.e., those based on a 10^{-4} cancer risk or a noncancer hazard index (HI) of 1, whichever is lower) based on direct contact with floodplain soils.
- The upper-bound RME IMPGs for human health (i.e., those based on a 10^{-4} cancer risk or a noncancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain.
- Not designed to achieve any of the ecological IMPGs, although some may be met in some areas.

Option B would involve removing and replacing floodplain soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the abovementioned IMPGs. In addition, this option would involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of Frequent-Use Exposure Areas (EAs) as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increment that are equal to or less than the upper-bound IMPGs based on human direct contact. This option would involve the removal of approximately 26,000 yd^3 of soil from approximately 14 acres of the floodplain.

Option C • Mid-Level Intervention

The sediment component would involve sediment removal followed by capping in Reaches 5A through 5C, portions of the backwaters (Reach 5D), Woods Pond (Reach 6), the Reach 7 impoundments, and Rising Pond (Reach 8). Riverbank soil would be removed as necessary, and the eroding banks stabilized in Reaches 5A and 5B. Specifically, the elements of this option include the following:

- Reach 5A: Sediment removal in the entire reach (134,000 yd^3 over 42 acres), followed by capping.
- Reach 5B: Sediment removal in the entire reach (88,000 yd^3 over 27 acres), followed by capping.
- Reach 5C: Sediment removal in the entire reach (156,000 yd^3 over 57 acres), followed by capping.
- Riverbanks in Reaches 5A and 5B: Bank stabilization of eroding banks (14 linear miles, comprising both banks along 7 miles of river) and removal of bank soils where necessary as part of the stabilization (35,000 yd^3).
- Reach 5 backwaters: Combination of sediment removal with capping (109,000 yd^3 over 68 acres) and capping without removal (3 acres).
- Reach 6 (Woods Pond): Sediment removal (244,000 yd^3 over 60 acres), followed by capping.
- Reach 7 impoundments (Reaches 7B, 7C, 7E, 7G): Sediment removal (84,000 yd^3 over 38 acres), followed by capping.
- Reach 8 (Rising Pond): Sediment removal (71,000 yd^3 over 41 acres), followed by capping.
- Reach 7 (channel) and Reaches 9 through 16: MNR.

Option C differs from the other sediment removal alternatives in that: (1) All sediment removal and capping work, including in Reaches 5A and 5B, would be performed in the "wet" by equipment operating in the river (either on the river bottom or on barges); and (2) Removal of the sediment in the Reach 5 backwaters and Reaches 6, 7, and 8 would be performed concurrently with removal activities in the Reach 5 channel. However, capping in those reaches would be delayed, where necessary, until after all the removal/capping activities in Reach 5 have been completed.

The floodplain component would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet the mid-range (10^{-5}) RME IMPGs for human health and lower-bound IMPGs for amphibians in vernal pools, as well as removal of any additional soils that contain PCB concentrations at or above 50 mg/kg within the top foot. Specifically, this alternative would achieve the following IMPGs:

- The mid-range RME IMPGs for human health (i.e., those based on a 10^{-5} cancer risk or a noncancer HI of 1, whichever is lower) based on direct contact with floodplain soils.
- The mid-range RME IMPGs for human health (i.e., those based on a 10^{-5} cancer risk or a noncancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain.
- The lower-bound IMPG for amphibians in vernal pools.

Option C would involve removing and replacing floodplain and vernal pool soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the above-mentioned IMPGs. In addition, this alternative would involve the removal and backfill of any additional soils within the top foot that contain PCB concentrations at or above 50 mg/kg. Lastly, this option would involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of Frequent-Use EAs as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increment in those areas that are equal to or less than the mid-range IMPGs based on human direct contact. This option would involve the removal and backfill of approximately 177,000 yd^3 of soil across approximately 108 acres of the floodplain.

<u>Option D • Higher Level Intervention</u>
The sediment component would include the removal of a total of 2,287,000 yd^3 of sediment and riverbank soil, including 2,252,000 yd^3 of sediment over 351 acres plus 35,000 yd^3 of bank soil as part of bank stabilization over 14 linear miles of riverbank. Sediment removal would be performed in Reaches 5A, 5B, and 5C, the Reach 5 backwaters, Woods Pond, the Reach 7 impoundments, and Rising Pond to the 1 mg/kg depth horizon, and would be followed by backfilling to grade. MNR would be included for the remaining portions of the River (Reach 7 channel and Reaches 9 through 16). Additionally, the eroding riverbanks along 7 miles on both sides of the River in Reaches 5A and 5B, comprising 14 linear miles, would be stabilized. Remediation would proceed from upstream to downstream to minimize the potential for recontamination of remediated areas.

The floodplain component would involve the removal and backfill of floodplain soils to achieve average PCB concentrations that would meet lower-bound RME IMPGs for human health and the lower-bound IMPGs for ecological receptors. Specifically, this alternative would achieve the following IMPGs:

- The lower-bound RME IMPGs for human health (i.e., those based on a 10^{-6} cancer risk or a noncancer HI of 1, whichever is lower) based on direct contact with floodplain soils, but not lower than 2 mg/kg (the residential standard specified in the Consent Decree).
- The lower-bound RME IMPGs for human health (i.e., those based on a 10^{-6} cancer risk or a noncancer HI of 1, whichever is lower) based on consumption of agricultural products from the floodplain.
- The lower-bound floodplain IMPGs for ecological receptors, i.e., amphibians (represented by wood frogs), omnivorous/carnivorous mammals (represented by shrews), insectivorous birds (represented by wood ducks), and piscivorous mammals (represented by mink), assuming, for the latter two receptors, the floodplain soil IMPGs associated with a sediment target level of 1 mg/kg.

Option D would involve removing and replacing floodplain soils as necessary to achieve average PCB concentrations in the top foot of the relevant averaging areas that are equal to or less than the abovementioned IMPGs. In addition, this alternative would involve the removal and backfill of soils in the top 3 feet in the Heavily Used Subareas of the Frequent-Use EAs as necessary to achieve average PCB concentrations in the 0- to 3-foot depth increment that meet the lower-bound IMPGs based on human direct contact, but not lower than 2 mg/kg.

Option D would involve the removal and backfill of approximately 615,000 yd^3 of soil across approximately 377 acres. Approximately 287 acres of this removal (464,000 yd^3) would occur within the Reaches 5 and 6 floodplain; the remaining 90 acres of removal (151,000 yd^3) would occur in the Reach 7 floodplain.

3.10.3 Workshop in Action

The Morning Plenary introduced participants to the Workshop 1 process and gave an overview of the 9 Criteria and the Four Representative Cleanup Options. Once assembled in approximately 15-person groups, facilitators led participants—with their Workbooks in hand to have access to detailed descriptions of components—through more detailed considerations of the 9 Criteria and the Four Representative Cleanup Options. Figure 24 below offers a full picture of the Workshop 1 process.

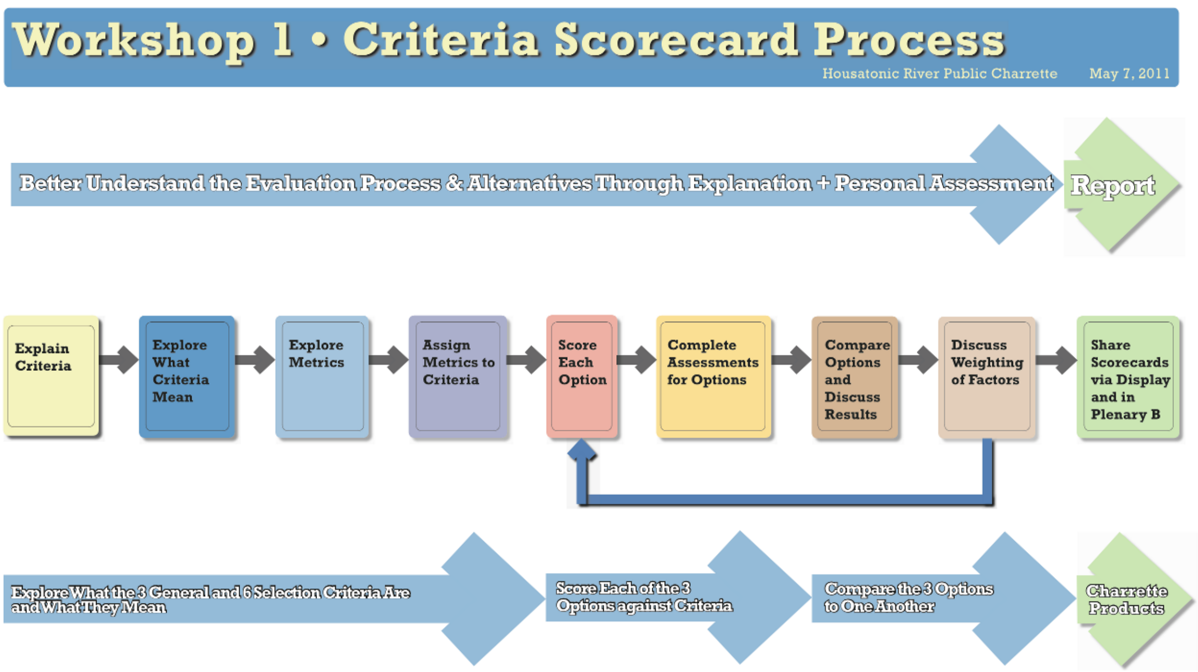


Figure 24. Workshop 1 • Criteria Scorecard Process.

3.10.3.1 Matching Metrics with Criteria

EPA anticipated that the more challenging tasks for participants would be understanding the Metrics and deciding to which Criteria they best belonged. Therefore, the physical layout and Workshop process was designed to promote these efforts:

- Lots of Choices and Easy to Move Around
  Groups had available individually titled placards for each of the 28⁺ Metrics that could be moved and placed under any of the 9 Criteria via hook-and loop strips on the backs.

- Making Metrics Applicable to Multiple Criteria
  Groups were provided with blank placards so that participants could create duplicates of the metrics and assign them to more than one criterion.

- Allowing for Participants to Create Their Own Metrics
  If groups had ideas for a metric that was not among the 28^{+} Metrics, then participants could use blank placards to create titles for new metrics.

Figure 25. Participant Placing a Metric Placard Within one of the 9 Criteria Categories in Workshop 1 • Criteria Scorecard.

Figure 26. Facilitator Receiving Direction from his Group on a Metrics Placement in Workshop 1 • Criteria Scorecard.

3.10.3.2 Filling Out Scorecards

Once participants established metrics for the 9 Criteria, they scored each of the Four Representative Cleanup Options according to the Three General Standards and Six Selection Criteria. To make the process as intuitive as possible, EPA chose to use a process familiar to most participants:

- Does not meet the Criterion,
- Partially meets the Criterion, or
- Best meets the Criterion.

After each option was rated, groups compared the Four Representative Cleanup Options against one another and discussed the results. They also discussed the consequences of how weighting the criteria differently might influence how options were ultimately ranked.

3.10.4 Group Products

Following are the Scorecards for each of the five Workshop 1 groups, along with a summary authored by each group's Facilitator/Scribe team.

3.10.4.1 Group 1 Summary + Scorecard

The group had a very lively discussion on metrics and how they fit into and support the various decision criteria. Some key points raised by various participants on the decision process included the following:

- Whether an option that fails a specific metric supporting a criterion can be rated as more than "partially meets criterion" if there are other supporting metrics that are met or exceeded.
- Whether cost should be viewed narrowly as only including construction and O&M costs or should be interpreted more broadly to include health costs, economic redevelopment impacts, etc.
- That understanding disposal options is an important consideration in evaluating remedy options.
- That the ability to implement alternative remedial technologies as they become practicable is important, and pilot studies should be conducted to help prove the feasibility of options and improve alternative selection.
- Participants expressed a desire to have more quantitative metrics relating to restoration rather than the number of or acreage of habitats affected by construction.

When asked at end of the session, workshop participants indicated that they found the session useful, that it had helped them learn something about the decision process, and that the facilitator and scribe had accurately recorded their input.

GROUP 1

Workshop 1 • Criteria Scorecard Worksheet

Workshop 1 • Criteria Scorecard
Housatonic River Public Charrette May 7, 2011

Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS						
1 Overall Protection of Human Health and the Environment	All Metrics were important - Group did not assess					
2 Control of Sources of Releases	Upstm Source Control - did not carry through assessment					
3 Compliance with ARARs	ACEC					
FIRST TIER ASSESSMENT						
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness	AG Viability + Safety in floodplain Restoration Time frame	10 3				
2 Attainment of Interim Media Protection Goals (IMPGs)						
3 Reduction of Toxicity, Mobility, and Volume	Control of upstm sources - GE Facility, Unkamet Brook, Silver Lake					
4 Short-Term Effectiveness	Economic Impacts to dams being left in-place					
5 Implementability Transport	Disposal by rail Ability to develop/implement alternative remedial Alternatives					
6 Cost	Capturing Healthcost, cost to environment and economics costs					
SECOND TIER SCORE						

Group felt disposal information essential to completing assessment.

s c o r i n g   s c a l e

Does Not Meet This Criterion → Partially Meets This Criterion → Best Meets This Criterion

3.10.4.2 Group 2 Summary + Scorecard

Group 2 participants were quick to understand the nature of the assignment, and while they were equally quick to assign most metrics to criteria, there was lively discussion as to why each one fit. As the participants in the group worked their way through General Standards and Selection Criteria, the number of assigned metrics increased. In addition, they also added some new metrics for consideration, in part to be more explicit on certain issues or parameters but also to cover areas that were not obvious in the suite of metrics selected for the Workshop. Some participants also noted the absence of “adaptive management” among the criteria and their definitions. This seemed to cause several of the workshop attendees some concern, and they asked that this be brought up in the summary.

Almost all attendees observed that in many cases, the components of a criterion (as defined in the handouts provided to them) were perceived to be opposed to one another. That made the individual assignments of criteria more difficult and sometimes contentious.

In scoring the selected metrics in combination against the Four Representative Cleanup Options, the individual attendees successfully worked through all nine criteria and through the four options, expressing concern about being consistent from option to option in both scoring and weighting criteria. For Option A, nearly all attendees concluded that the components of the option did not meet the majority of the criteria. For Option B, members of the group had varied assessments, but more believed that the option fell into the category of “not meeting the criteria” than of “partially meeting” or “best meeting.” For Option C, individual participants in the group were more evenly split among the three scoring assessments (i.e., does not, partially, or best meets). Option D was most favored as “best meeting” the majority of the criteria.

Final comments from the attendees clearly indicated that they gained a greater understanding of the complexity of the EPA’s decision-making process. Participants also added additional comments on the criteria, noting that some criteria were poorly worded, vague, and hard to understand. In addition, attendees offered that under the scoring method employed, a “low-cost option” would always seem to obtain a high “best meets” score even when the opposite cleanup option is more desirable for other reasons. Finally, the attendees strongly voiced concerns of there not being enough included in the methodology to factor in costs to the community, be they positive or negative and what the future financial benefits are.

GROUP 2

Workshop 1 • Criteria Scorecard Worksheet

Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS						ADAPTIVE MGMT. IS NOT INCLUDED IN CRITERIA
1 Overall Protection of Human Health and the Environment	15 10 16 13 12 11 14 17 8 9 18 28 25 30	○ · 10 ◉ · 2 ●	○ · 10 ◉ · 2 ●	○ · 3 ◉ · 4 ● · 3	○ · ◉ · 7 ● · 4	
2 Control of Sources of Releases	1 2 3 4 5 6 7 28	○ · 10 ◉ · 2 ● ·	○ · 9 ◉ · 3 ● ·	○ · 2 ◉ · 4 ● · 2	○ · 1 ◉ · 5 ● · 5	
3 ~~Compliance with ARARs~~						
FIRST TIER ASSESSMENT						
	GENERAL COMMENT — COMPONENTS OF A CRITERIA CAN BE OPPOSITIONAL TO ONE ANOTHER					
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness	1, 2, 28, 8, 9, 10, 15, 16, 17, 20, 18	○ - 11 ◉ - ● -	○ - 9 ◉ - 2 ● -	○ - 1 ◉ - 6 ● - 3	○ - ◉ - 2 ● - 8	
2 Attainment of Interim Media Protection Goals (IMPGs)	10, 11, 12, 13, 14, 15, 16, 28	○ · 11 ◉ · ● ·	○ - 10 ◉ · 1 ● ·	○ · 1 ◉ · 5 ● · 4	○ · ◉ · 6 ● · 4	
3 Reduction of Toxicity, Mobility, and Volume	1, 3, 4, 5, 6, 7, 8, 9, 17, 2	○ - 11 ◉ ●	○ - 10 ◉ · 1 ●	○ · 2 ◉ · 7 ● · 2	○ · ◉ · 2 ● · 9	
4 Short-Term Effectiveness	21, 22, 23, 24, 25, 28, 26, 17, 18. 2, 3, 1	○ · 2 ◉ · 5 ● ·	○ · ◉ · 7 ● · 1	○ · ◉ · 4 ● · 3	○ · 3 ◉ · 4 ● ·	TOO DIFFICULT/POORLY WORDED TO SCORE; TIMEFRAME/DURATION NOT WELL DEFINED
5 Implementability	1, 2, 3, 29, 30, 21, 22, 23, 24, 16, 17, 11, 12, 19, 20, 18, 26	○ · ◉ · ● · 10	○ · ◉ 4 ● 7	○ · ◉ · 9 ● · 3	○ · 7 ◉ · 4 ● ·	OPPOSITE THINKING SINCE MNR IS EASY TO IMPLEMENT, BUT NOT NECESS WHAT IS WANTED
6 Cost	21, 22, 23, 24, 25, 26, 27 FUTURE BENEFITS (29) LOCAL IMPACTS (30)	○ - 7 ◉ 4 ● - ø	○ - 5 ◉ - 5 ● - 1	○ - ø ◉ - 6 ● - 5	○ - 4 ◉ - 1 ● - 5	SHOULD INCL. COSTS TO COMMUNITY, BOTH POSITIVE & NEG. & FUTURE FINAN. BENEFITS; DIFF. TO SCORE SINCE
SECOND TIER SCORE						A LOW COST OPTION WOULD SCORE AS BETTER MEETING THE CRITERIA, BUT SEEMS OPPOSITE TO WHAT IS DESIRED.

#
29 – FUTURE BENEFITS ($)
30 – IMPACT TO LOCAL ECON. +/-
31 – RECOVERY OF ECOSYSTEM

scoring scale

○ Does Not Meet This Criterion → ◉ Partially Meets This Criterion → ● Best Meets This Criterion

3.10.4.3 Group 3 Summary + Scorecard

Members of the group were able to sort through the metrics and assign metrics to each criterion. Individuals assigned many of the same metrics across the criteria. The cost metric was viewed differently. In particular, individual suggestions from the group assigned many metrics to the cost criterion beyond simple cost. There was a general discussion that the cost criterion was too narrow and needed to go beyond capital costs and operational, monitoring and maintenance costs to include community costs. Some of the group suggested that an additional Selection Decision Factor called "Community Cost" be added to consider long-term PCB-related costs that are implicitly borne by the community. If there were such a community cost criterion, individuals within the group would have ranked it opposite to the way that decision factor 6 (Cost) was ranked. As an example of the community cost metric, suggestions were discussed, among them lost tourism or lost fishing days due to PCB contamination in the river and fish and economic liability to local business and property owners due to PCBs behind dams along the river. A number of participants in the group felt that the options in the Revised CMS were not adequate. Most participants suggested that more protective options were better than less protective ones. Based on feedback received, the participants in the group came to a greater understanding and appreciation of the difficulties associated with making a remedy decision using the RCRA Permit criteria.

Options in CMS not adequate

GROUP 3

would like to see state option

Workshop 1 • Criteria Scorecard Worksheet

Workshop 1 • Criteria Scorecard
Housatonic River Public Charrette May 7, 2011

Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS						
1 Overall Protection of Human Health and the Environment		○	◓	◓	●	Long-term / End of Program
2 Control of Sources of Releases	1,2,3,4,5	○	◓	◓	●	Long-term / End of Program
3 Compliance with ARARs						
FIRST TIER ASSESSMENT						
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness	18/28 : 1,2,3,5-19,4 What re: greenhouse gas	○	○	◓	●	Opt. D: What is impact 100 yrs from now? Opt A: Does not meet requirements.
2 Attainment of Interim Media Protection Goals (IMPGs)	8/28 : 10-16,28	○	◓	◓	●	
3 Reduction of Toxicity, Mobility, and Volume	5/28 : 1,2,3,4,5	○	◓	●	●	
4 Short-Term Effectiveness	19,21-25 what re: greenhouse gas	●	◓	◓	○	"effectiveness" read to mean impacts
5 Implementability	21-25	●	◓	◓	◉	Opt D- Some risk remains re: zoning, etc.
6 Cost → should include costs to community	21, 26, + write-ins	●	◓	◓	○	~~considered both~~ would like category 7) Long-term costs/reverses criteria 6 so implicit community costs are explicitly considered.
SECOND TIER SCORE						

What is economic liability of PCBs behind dams + impacts to local businesses/property owner

s c o r i n g s c a l e

○ Does Not Meet This Criterion → ◉ Partially Meets This Criterion → ● Best Meets This Criterion

Continuum, not discrete

GROUP 3

3.10.4.4 Group 4 Summary + Scorecard

In evaluating the Four Representative Cleanup Options, some members of the group were adamant that the cost of the remedy should not be a determining factor. They also pointed out that there are other costs that are not included in the metrics, such as costs to the community economically, in health, and in inconvenience and hassle.

Generally, the individuals in the group felt that the more PCBs that are removed by an option the better that option met the 8 Criteria evaluated at the Public Charrette (because ARARs were not included for consideration). Options C and D were regarded as being very close but not completely best at meeting the criteria.

Option A performed well only on the cost and implementability measures, but many individuals characterized Option A as "doing nothing" with regard to removing PCBs and not meeting the 2 (of 3) General Standards of 1) Overall Protection of Human Health and the Environment and 2) Control of Sources of Releases.

Option B was judged by most of the individuals as lacking in effectiveness—perhaps about halfway to the goals. Most of the individuals in the group felt that continuing technological innovation in cleanup was important to doing better in achieving the criteria.

The group reflected that all of the metrics should be applied to all of the criteria, but especially the Criterion: Overall Protection of Human Health and the Environment.

While individuals commented that Option A was likely to be more implementable, some felt that the balance of the criteria should favor protecting health and the environment (General Standard 1) and should not consider cost at all.

Most of the participants in the group expressed a strong preference for a "surgical approach" somewhere between Options C and D in which individual localities/ecosystems/reaches were dealt with according to the unique characteristics of that particular site—"Artists, not butchers"—and felt the most ideal option was not among those provided for consideration.

GROUP 4

Workshop 1 • Criteria Scorecard Worksheet

Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS						
1 Overall Protection of Human Health and the Environment	1-28					Want adaptive management, more nuanced C&D are both good options Somewhere btwn C&D is perhaps the best option
2 Control of Sources of Releases						Upstream Sources will still be a problem. None of these options fully meet this criteria
3 Compliance with ARARs						
FIRST TIER ASSESSMENT						
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness	1, 2, 3, 8, 18 + Ability to Restore vs. damage by PCBs • Long term impact on Rare Species • IMPG Attainment forever • Ability of remedy to withstand the test of time					
2 Attainment of Interim Media Protection Goals (IMPGs)	10-16, 28					
3 Reduction of Toxicity, Mobility, and Volume	1-7					
4 Short-Term ~~Effectiveness~~ Effect (Impact)	19, 21-26 • Community impacts					
5 Implementability	21-26 • Adaptive management					
6 Cost	20, 27 • ~~unintended costs~~ unacknowledged costs (Health, env, etc) • relative costs: tech that generates % of CEO Salary	N/A	N/A	N/A	N/A	Not relevant. Financial costs not relevant to this decision making. Least important.
SECOND TIER SCORE						

scoring scale

Does Not Meet This Criterion → Partially Meets This Criterion → Best Meets This Criterion

GROUP 4

3.10.4.5 Group 5 Summary + Scorecard

Initially, a number of individuals in this group were frustrated or confused by the amount of information they were supposed to assess and understand in order to engage in the workshop process. By the end of the session, however, most or all of the participants felt engaged and that the workshop was productive and understood that the two main goals were to capture their individual input and for them to get a sense of the complexity and parameters EPA works under to make decisions.

Some major themes that were called out by multiple individuals included:

- Option D is very preferable with respect to General Standard 1.
- For General Standard 2, all options were evaluated with the caveat of no local dumps.
- Alternatives for decontamination should be fully explored.
- For the cost criterion, costs should include external costs (society and human health) such as lost wages due to illness, health care costs, and long-term costs.

Finally, individuals added a number of metrics during the workshop. These metrics included the following: children and the future, rail transportation, and impacts to air quality.

Group 5

Workshop 1 • Criteria Scorecard Worksheet

Workshop 1 • Criteria Scorecard
Housatonic River Public Charrette May 7, 2011

Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS						
1 Overall Protection of Human Health and the Environment	3, 1, 2, 4, 5, 6, 7, 8, 9, 10-16, 17, 18, 26, 28 Children/Future, Air, RA	○ All ◉ ●	○ 5 ◉ 4 X	○ 1 ◉ 6 ● 2	○ ◉ 2 ● 7	-Option D very preferable -Option C&D Risk = These relates to ~~ones~~ risk -Can always do better over time as new methods ~~become~~, data become available
2 Control of Sources of Releases	1, 2, 3, 4, 5, RA Children/Future	○ All ◉ ●	○ 6 ◉ 3 ●	○ 3 ◉ 5 ●	○ ◉ 2 ● 6	-With NO local dumps
3 Compliance with ARARs						
FIRST TIER ASSESSMENT						
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness	1, 2, 3, 4, 5, 6, 7, 10-16, 17, 18, RA Children/Future	○ 9 ◉ ●	○ 7 ◉ 1 ●	○ 3 ◉ 5 ● 1	○ ◉ 2 ● 5	-Long term means complete removal -Look into alternative methods of Decontamination
2 Attainment of Interim Media Protection Goals (IMPGs)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10-16, 28, RA	○ 7 ◉ ●	○ 7 ◉ 1 ●	○ 3 ◉ 5 ● 1	○ ◉ 3 ● 5	-Look into alternative methods of Decontamination
3 Reduction of Toxicity, Mobility, and Volume	1, 2, 3, 4, 5, 8, 9, 10-16, 17, 18, 20, RA	○ 7 ◉ ●	○ 6 ◉ 4 ●	○ 3 ◉ 4 ● 2	○ ◉ 2 ● 6	-Look into alternative methods of Decontamination
4 Short-Term Effectiveness	1, 2, 3, 4, 23, 26, 20, Train Transportation RA	○ [illegible] ◉ ● 6	○ 1 ◉ 4 ● 1	○ 2 ◉ 3 ●	○ 4 ◉ 1 ● 1	- Weight general standards & Decision Factors 1-3 Higher than 4-6. Hard difficult Time scoring these (4-6) the same way) - This is a reverse type question (ie. fewer impacts = Best) - ~~Abstains because concerned with long term big health effects~~
5 Implementability	1, 2, 3, 10-16, 20, 26, Train Transportation RA, 23	○ 1 ◉ 2 ● 2	○ 2 ◉ 4 ● 1	○ 1 ◉ 7 ● 1	○ 5 ◉ 2 ● 2	- This is a reverse type question ~~(ie fewer impacts = Best)~~ Less work = greater ability to implement
6 Cost	1, 2, 3, 20, 23, 26, 27, Train Transportation RA	○ 3 ◉ ● 4	○ 3 ◉ 4 ●	○ 3 ◉ 3 ● 1	○ 2 ◉ 4 ● 1	- External Cost to Society and Human Health - Cost GE + EPA - All costs to Society should be included
SECOND TIER SCORE						- Difficult for all of grp to understand this criteria as standard - Does not incorporate overall and long term costs in future dollars, lost wages due to illness, and health care costs

s c o r i n g s c a l e

○ Does Not Meet This Criterion → ◉ Partially Meets This Criterion → ● Best Meets This Criterion

3.10.4.6 Individual Scorecards

Four participants chose to submit Scorecards apart from their group. These Scorecards are presented on the following pages.

GROUP 5

Workshop 1 • Criteria Scorecard Worksheet

Workshop 1 • Criteria Scorecard
Housatonic River Public Charrette May 7, 2011

Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS						
1 Overall Protection of Human Health and the Environment		○	○	◐	●	Option D very preferable
2 Control of Sources of Releases		○	○	◐	●	
3 Compliance with ARARs						
FIRST TIER ASSESSMENT						
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness		○	○	○	●	long term means complete removal
2 Attainment of Interim Media Protection Goals (IMPGs)		○	○	◐	●	
3 Reduction of Toxicity, Mobility, and Volume		○	◐	◐	●	
4 Short-Term Effectiveness		○	○	◐	~~●~~ ○	
5 Implementability		○	○	◐	●	
6 Cost		●	◐	◐	~~●~~ ◐	external cost to society and human health?
SECOND TIER SCORE						

scoring scale

○ → ◐ → ●

Does Not Meet This Criterion — Partially Meets This Criterion — Best Meets This Criterion

Group 5

Workshop 1 • Criteria Scorecard Worksheet

Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS						
1 Overall Protection of Human Health and the Environment		○	○	◎	●	
2 Control of Sources of Releases		○	◎	◎	●	
3 Compliance with ARARs		○	○	◎	●	
FIRST TIER ASSESSMENT						
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness		○	○	◎	●	
2 Attainment of Interim Media Protection Goals (IMPGs)		○	○	○	●	
3 Reduction of Toxicity, Mobility, and Volume		○	◎	◎	●	
4 Short-Term Effectiveness		—	—	—	—	weight General stds + Decision Factors 1-3 higher than these ... so had difficult time scoring these in the same way
5 Implementability		—	—	—	—	
6 Cost		—	—	—	—	
SECOND TIER SCORE						

scoring scale

○ → ◎ → ●

Does Not Meet This Criterion — Partially Meets This Criterion — Best Meets This Criterion

GROUP 5

Workshop 1 • Criteria Scorecard Worksheet

Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS	RA = Remedial Alternatives					
1 Overall Protection of Human Health and the Environment	1, 2, 3, 4, 5, 6, 7, 8+9, 10-16 17+18, 26 28 CHILDREN/FUTURE CF AIR, RA	O	O	O	ϕ	✓ Can always do BETTER over time As new methods, data become avail
2 Control of Sources of Releases	1, 2, 3, 4 CHILDREN/FUTURE, AIR, RA	O	O	O	ϕ	✓ WITH NO LOCAL DUMPS!
3 Compliance with ARARs						
FIRST TIER ASSESSMENT						
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness	1, 2, 3, 4, 5, 6, 7, 10-16 CF + AIR, + RA	O	O	O	ϕ	✓ LOOK INTO ALTERNATIVE METHODS/ DECONTAM!
2 Attainment of Interim Media Protection Goals (IMPGs)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10-16, 28 CF A RA	O	O	O	ϕ	✓
3 Reduction of Toxicity, Mobility, and Volume	1, 2, 3, 5, 8, 9, 10-16, 17-18, 20, 28	O	O	O	ϕ	✓
4 Short-Term Effectiveness	23 TRAIN	O				✓ ABSTAIN BECAUSE CONCERNED w/ LONG TERM BIG-PICTURE & Health Effects
5 Implementability "IMPACT"		O	O	O	ϕ	Implementabilile is
6 Cost		O	O	O	ϕ	✓ DOES NOT INCORP OVERALL + LONG TERM COSTS in future Dollars, Lost Wages due to ILLNESS, Health Care Costs
SECOND TIER SCORE						

scoring scale

○ Does Not Meet This Criterion → ◎ Partially Meets This Criterion → ● Best Meets This Criterion

Group 5

Workshop 1 • Criteria Scorecard Worksheet

Groups

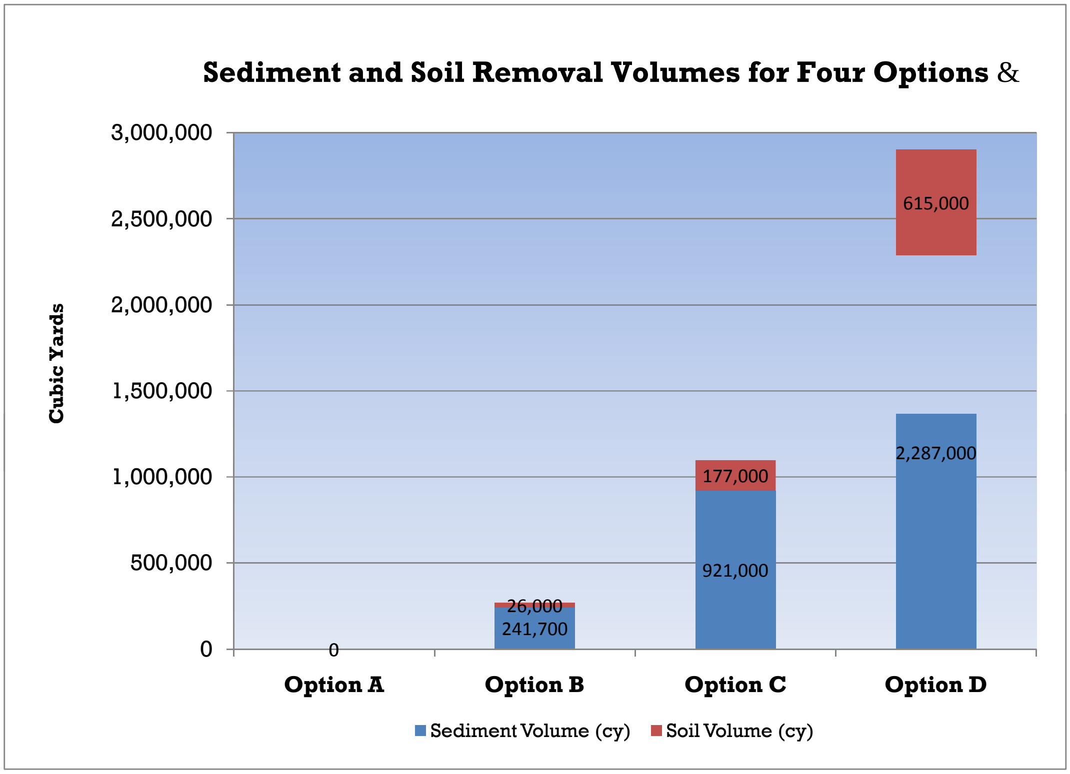
Criterion	Metric(s)	Option A	Option B	Option C	Option D	Assessment
GENERAL STANDARDS						
1 Overall Protection of Human Health and the Environment	3, 1, 2, 4, 5 – 18 26, 28	○	◎	◎	●	This relates to our Option C + D = acceptable risk.
2 Control of Sources of Releases	1 – 5	○	◎	◎	●	
3 Compliance with ARARs						
FIRST TIER ASSESSMENT						
SELECTION DECISION FACTORS						
1 Long-Term Reliability and Effectiveness	1 – 7, 10 – 18	○	◎	◎	●	
2 Attainment of Interim Media Protection Goals (IMPGs)	1 – 10	○	◎	◎	●	
3 Reduction of Toxicity, Mobility, and Volume	1 – 5, 8, 9, 10 – 18, 20, 28	○	◎	◎	●	
4 Short-Term Effectiveness (Impacts)	1 – 3, 23, 20, 26	●	◎	◎	○	This is a reverse-type Question ie. fewer impacts = Best
5 Implementability	1 – 3, 10-16, 20, 26	●	◎	◎	○	This is a reverse Type Question less work = greater ~~implementa~~ ability to implement
6 Cost	ie less Cost to GE | 1 – 3, 20, 23 26	●	◎	◎	○	Cost to GE + ~~implementation~~ Cost to EPA
SECOND TIER SCORE						

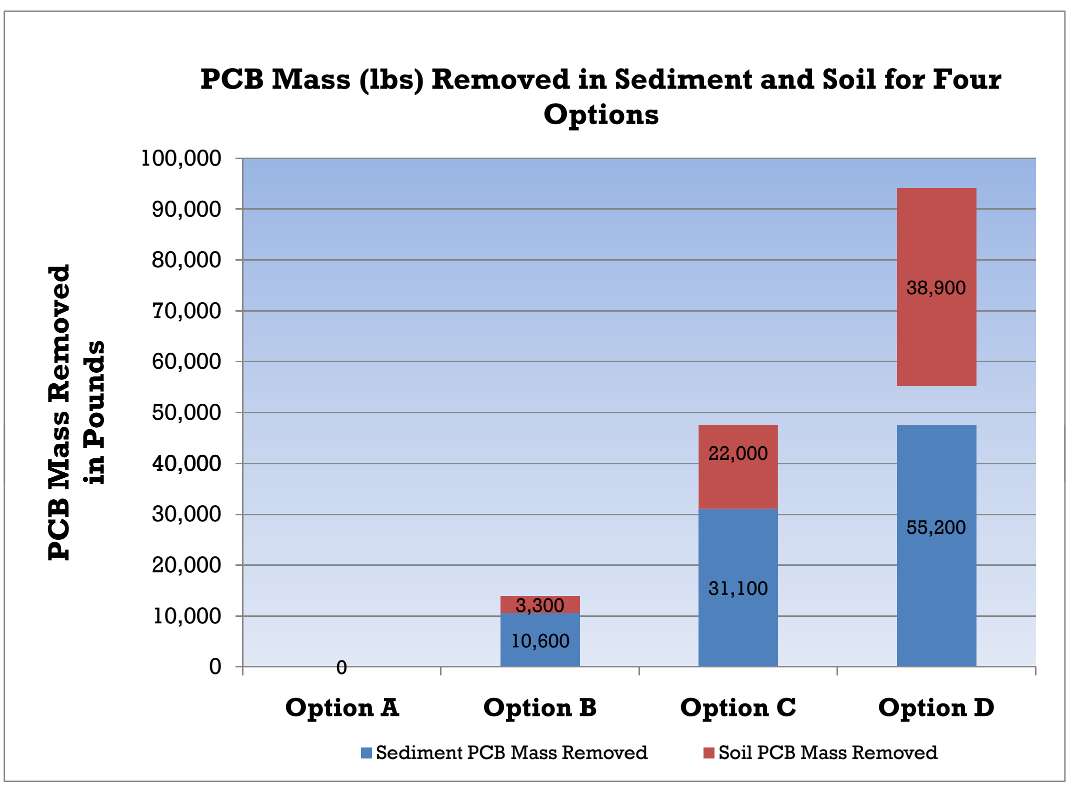
s c o r i n g   s c a l e

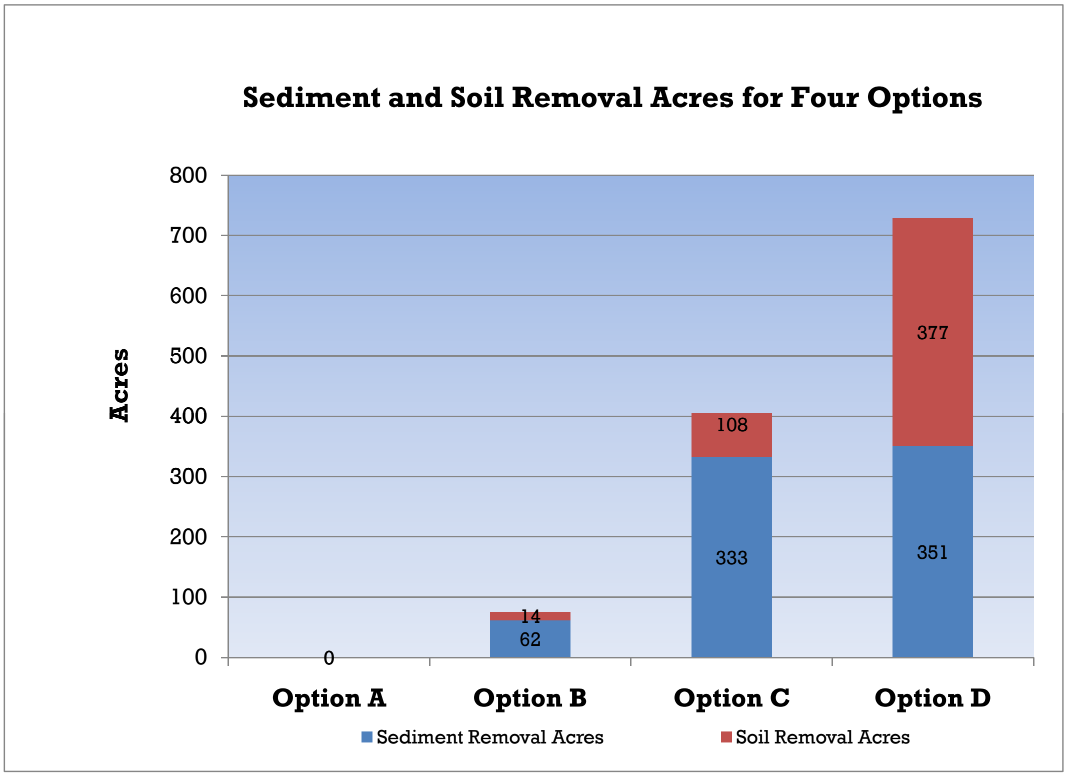
○ Does Not Meet This Criterion → ◎ Partially Meets This Criterion → ● Best Meets This Criterion

Difficult for all group to understand criteria as standard

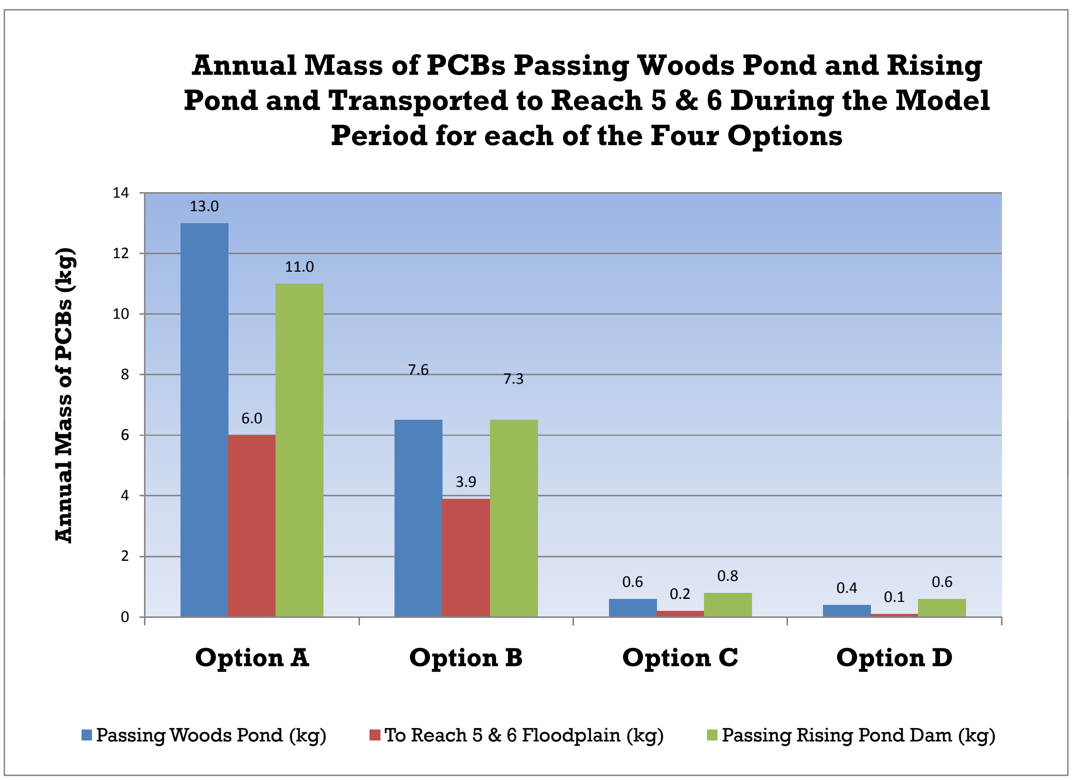
FULL SET OF METRICS AVAILABLE TO PUBLIC CHARRETTE PARTICIPANTS


Sediment and Soil Removal Volumes for Four Options &
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Cubic Yards
615,000
177,000
2,287,000
921,000
26,000
241,700
0
Option A
Option B
Option C
Option D
Sediment Volume (cy)
Soil Volume (cy)

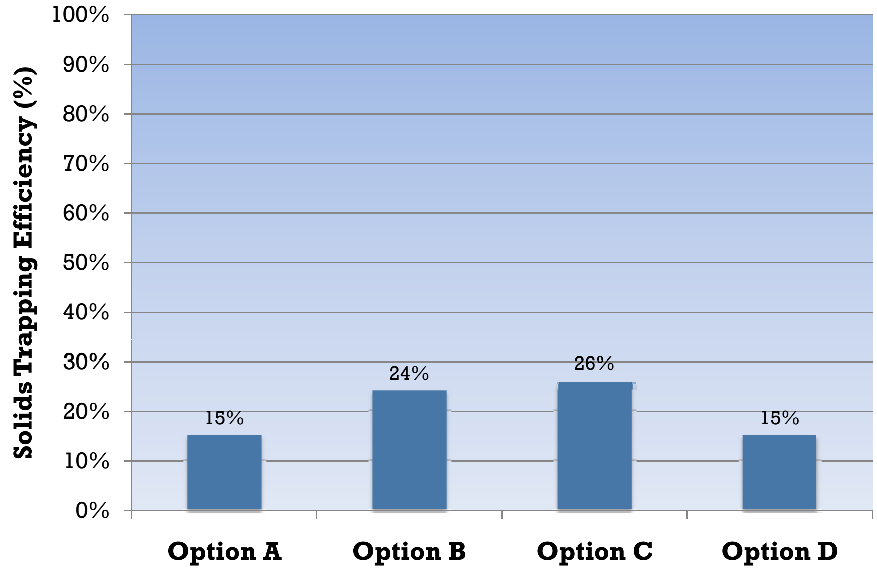

PCB Mass (lbs) Removed in Sediment and Soil for Four Options
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
PCB Mass Removed in Pounds
38,900
22,000
55,200
31,100
3,300
10,600
0
Option A
Option B
Option C
Option D
Sediment PCB Mass Removed
Soil PCB Mass Removed


Sediment and Soil Removal Acres for Four Options
Acres
800
700
600
500
400
300
200
100
0
0
14
62
108
333
377
351
Option A
Option B
Option C
Option D
Sediment Removal Acres
Soil Removal Acres

3

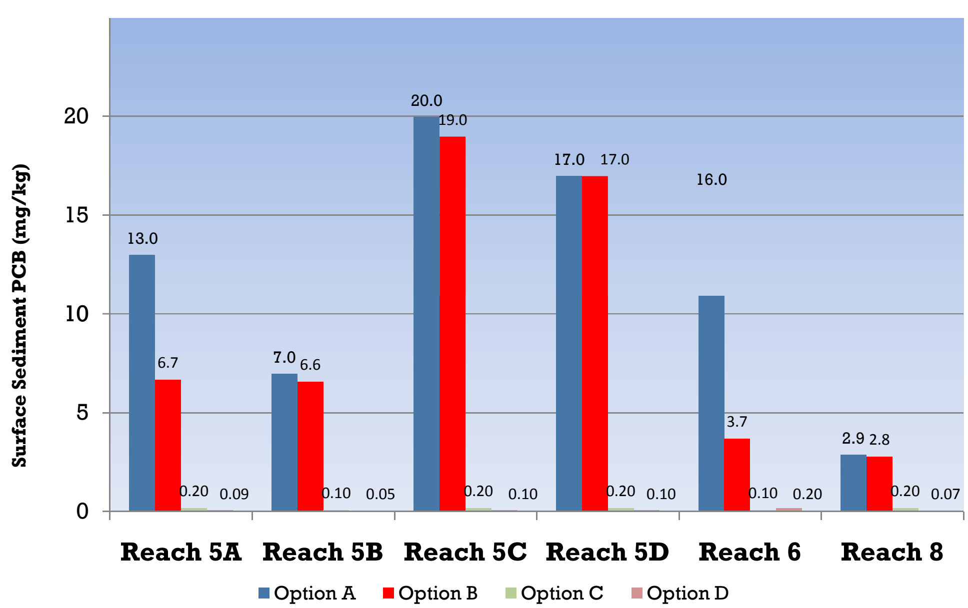

Annual Mass of PCBs Passing Woods Pond and Rising Pond and Transported to Reach 5 & 6 During the Model Period for each of the Four Options
Annual Mass of PCBs (kg)
14
12
10
8
6
4
2
0
13.0
6.0
11.0
7.6
3.9
7.3
0.6
0.2
0.8
0.4
0.1
0.6
Option A
Option B
Option C
Option D
Passing Woods Pond (kg)
To Reach 5 & 6 Floodplain (kg)
Passing Rising Pond Dam (kg)

Solids Trapping Efficiency of Woods Pond for Four Options Relative to MNR (15% solids trapping efficiency) &

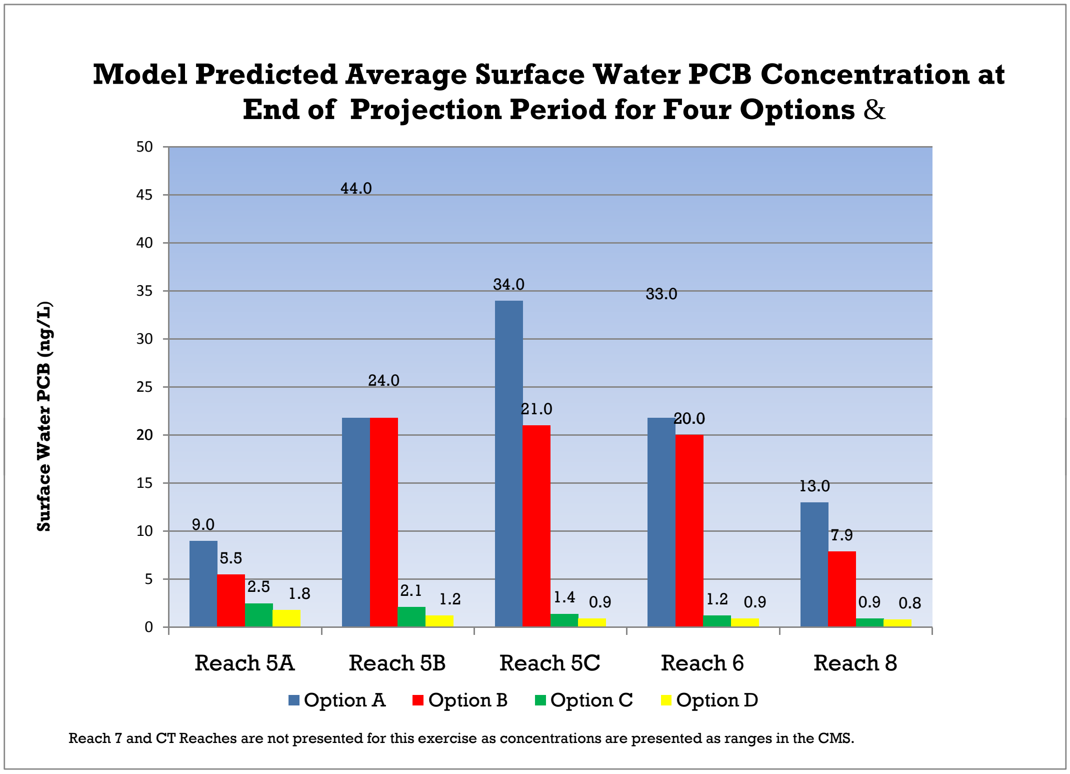


Trapping efficiencies for PCBs were not provided in the Corrective Measures Study Report. The PCB trapping efficiency numbers will be lower than the solids shown above.

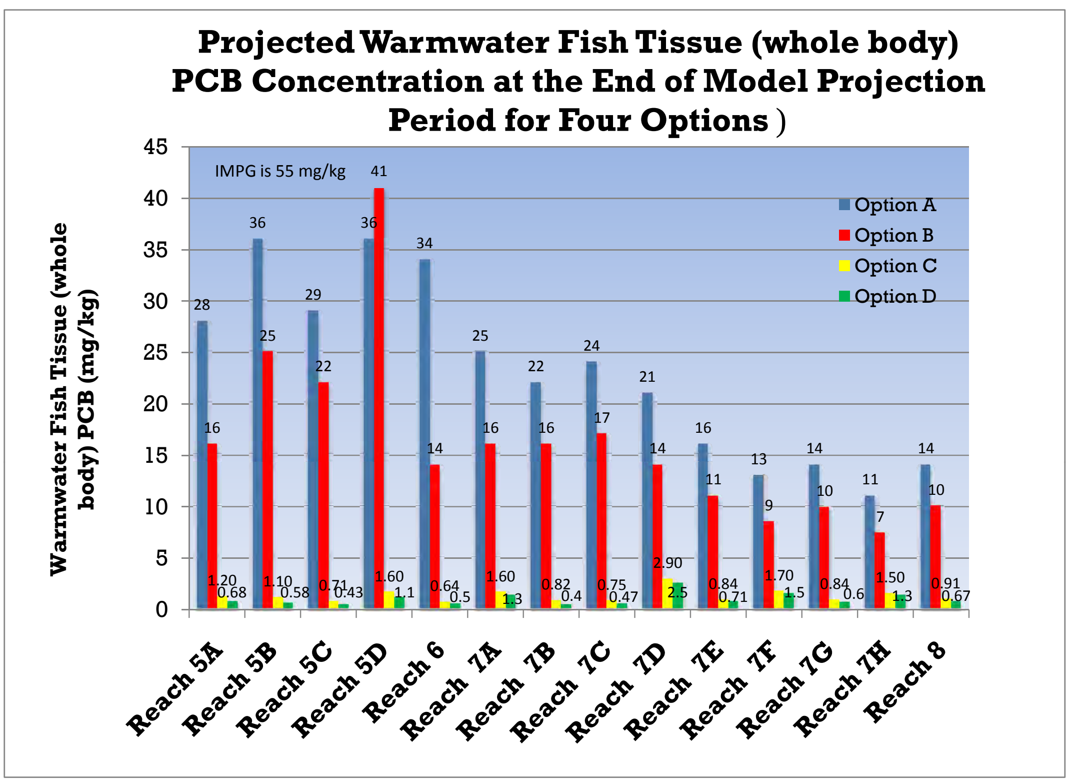
Model Predicted Average Surface Sediment (0-6") PCB Concentration at End of Projection Period for Four Options



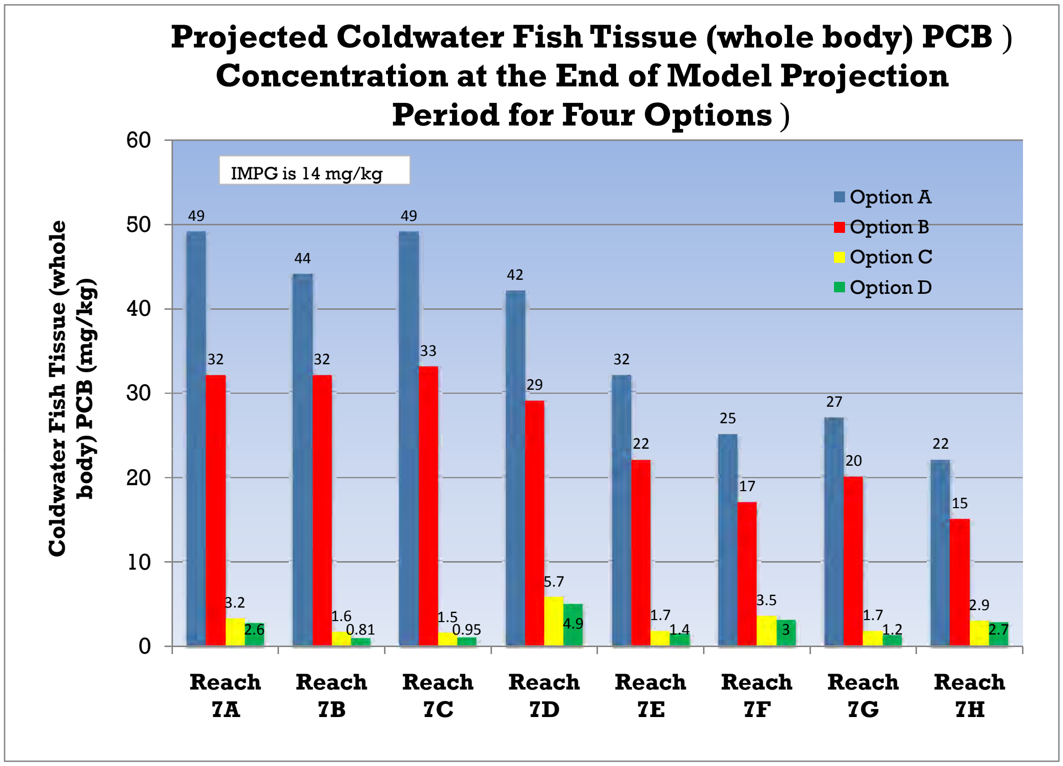
Reach 7 and CT Reaches are not presented for this exercise as concentrations are presented as ranges in the CMS.



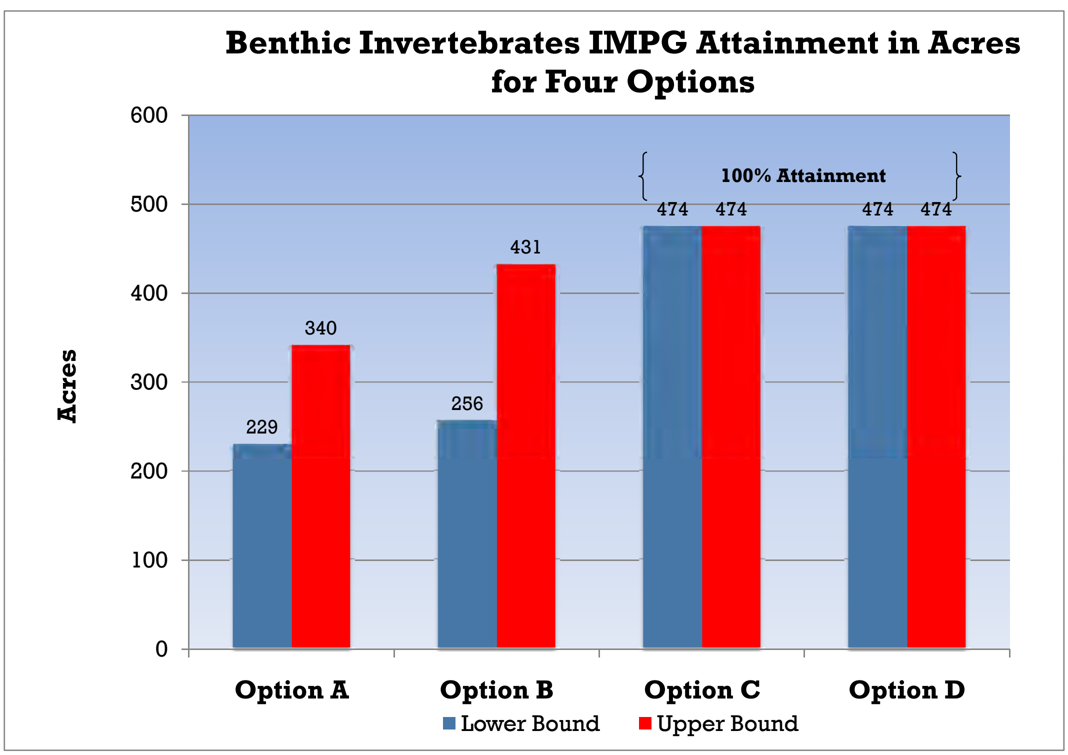
Model Predicted Average Surface Water PCB Concentration at End of Projection Period for Four Options &
Surface Water PCB (ng/L)
Reach 5A
Reach 5B
Reach 5C
Reach 6
Reach 8
Option A
Option B
Option C
Option D
Reach 7 and CT Reaches are not presented for this exercise as concentrations are presented as ranges in the CMS.



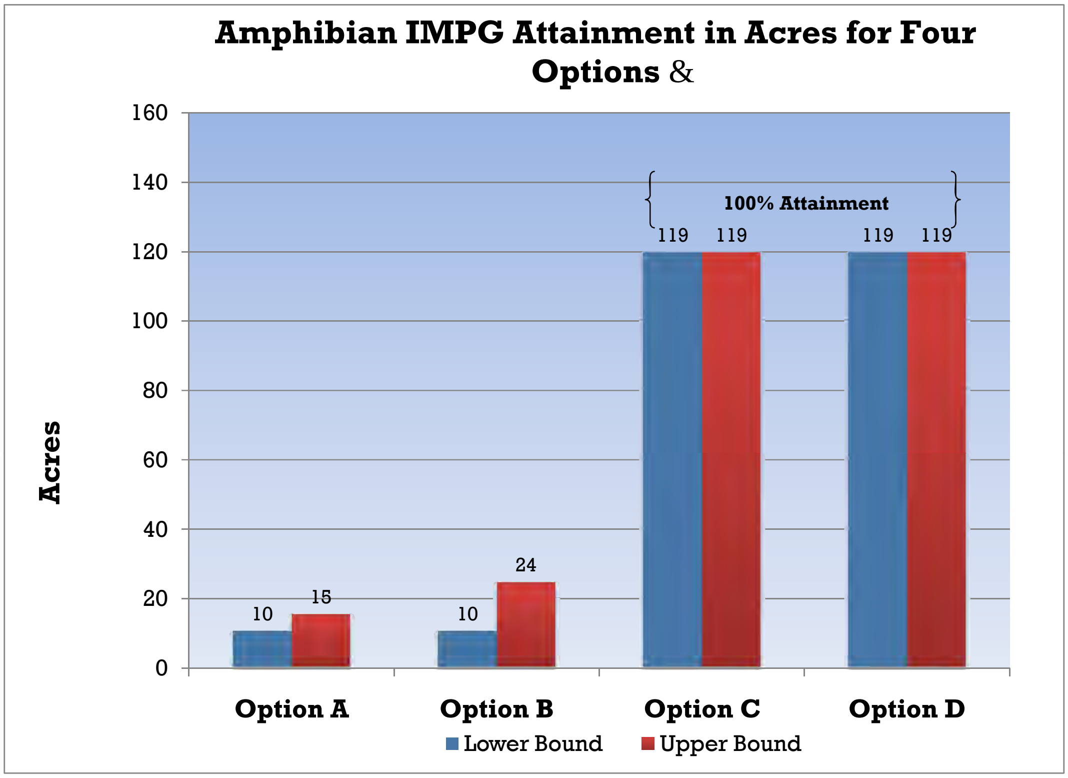
Projected Warmwater Fish Tissue (whole body) PCB Concentration at the End of Model Projection Period for Four Options)
Warmwater Fish Tissue (whole body) PCB (mg/kg)
IMPG is 55 mg/kg
Option A
Option B
Option C
Option D
Reach 5A
Reach 5B
Reach 5C
Reach 5D
Reach 6
Reach 7A
Reach 7B
Reach 7C
Reach 7D
Reach 7E
Reach 7F
Reach 7G
Reach 7H
Reach 8

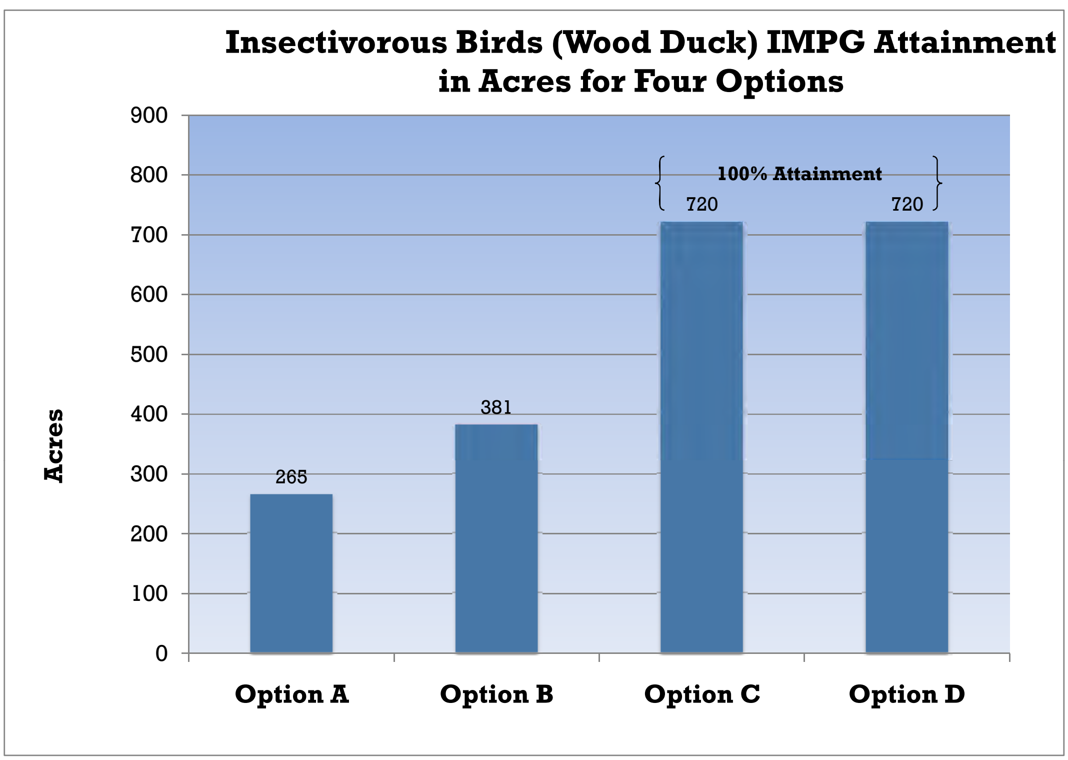


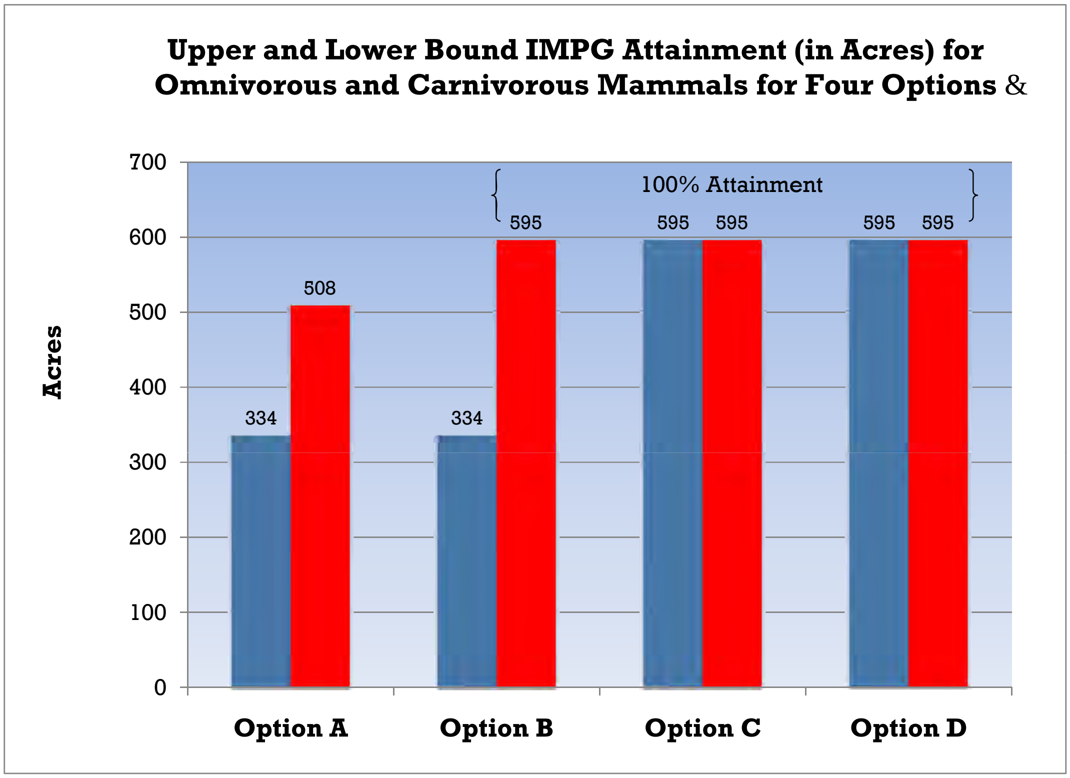
Projected Coldwater Fish Tissue (whole body) PCB)
Concentration at the End of Model Projection
Period for Four Options)
IMPG is 14 mg/kg
Coldwater Fish Tissue (whole body) PCB (mg/kg)
60
50
40
30
20
10
0
Option A
Option B
Option C
Option D
49
32
3.2
2.6
44
32
1.6
0.81
49
33
1.5
0.95
42
29
5.7
4.9
32
22
1.7
1.4
25
17
3.5
3
27
20
1.7
1.2
22
15
2.9
2.7
Reach 7A
Reach 7B
Reach 7C
Reach 7D
Reach 7E
Reach 7F
Reach 7G
Reach 7H

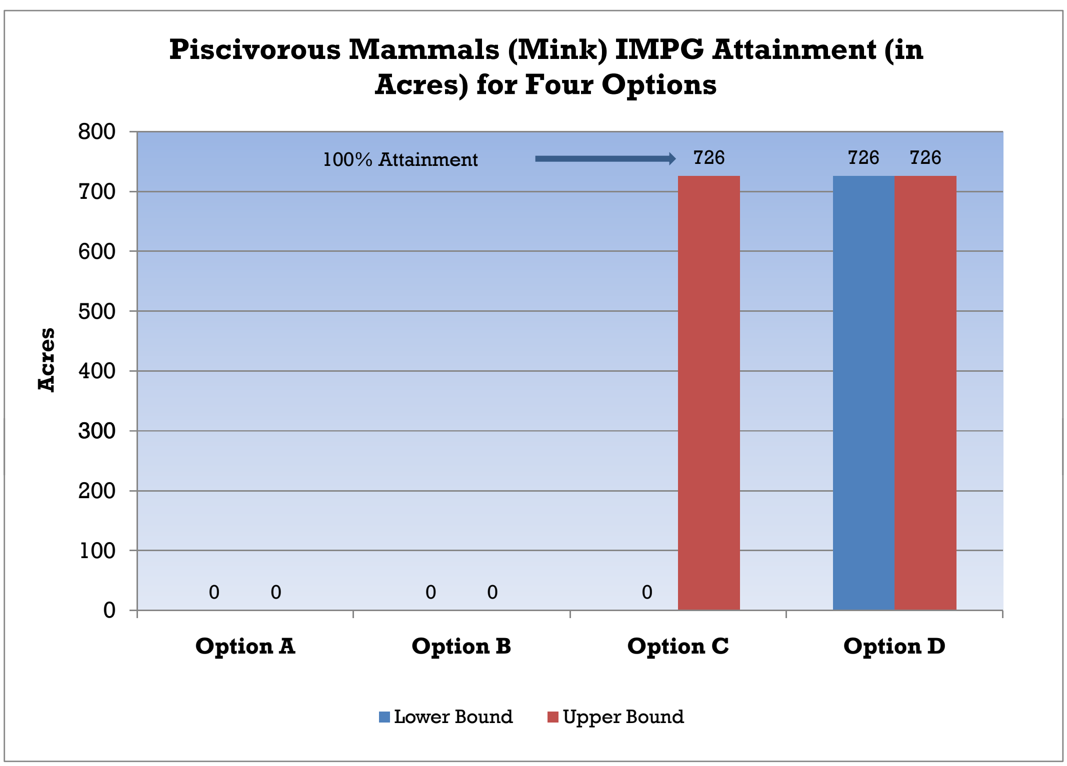


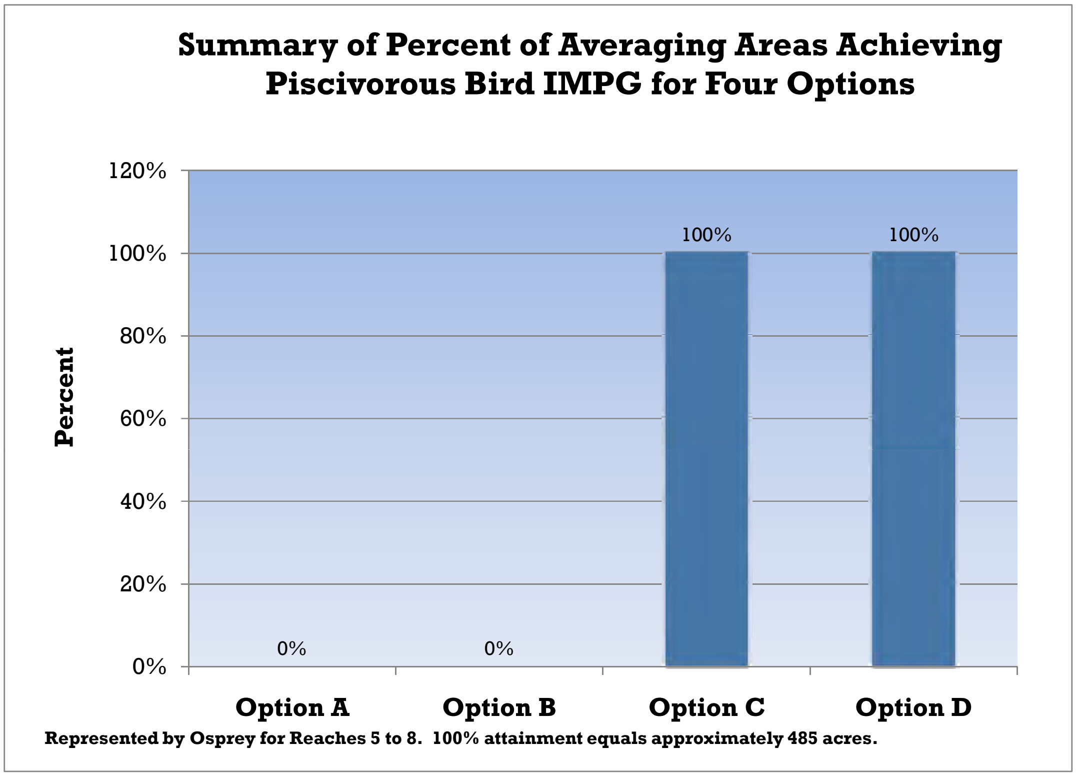
Benthic Invertebrates IMPG Attainment in Acres for Four Options
Acres
600
500
400
300
200
100
0
100% Attainment
229
340
256
431
474
474
474
474
Option A
Option B
Option C
Option D
Lower Bound
Upper Bound


Amphibian IMPG Attainment in Acres for Four Options &
Acres
160
140
120
100
80
60
40
20
0
100% Attainment
10
15
10
24
119
119
119
119
Option A
Option B
Option C
Option D
Lower Bound
Upper Bound

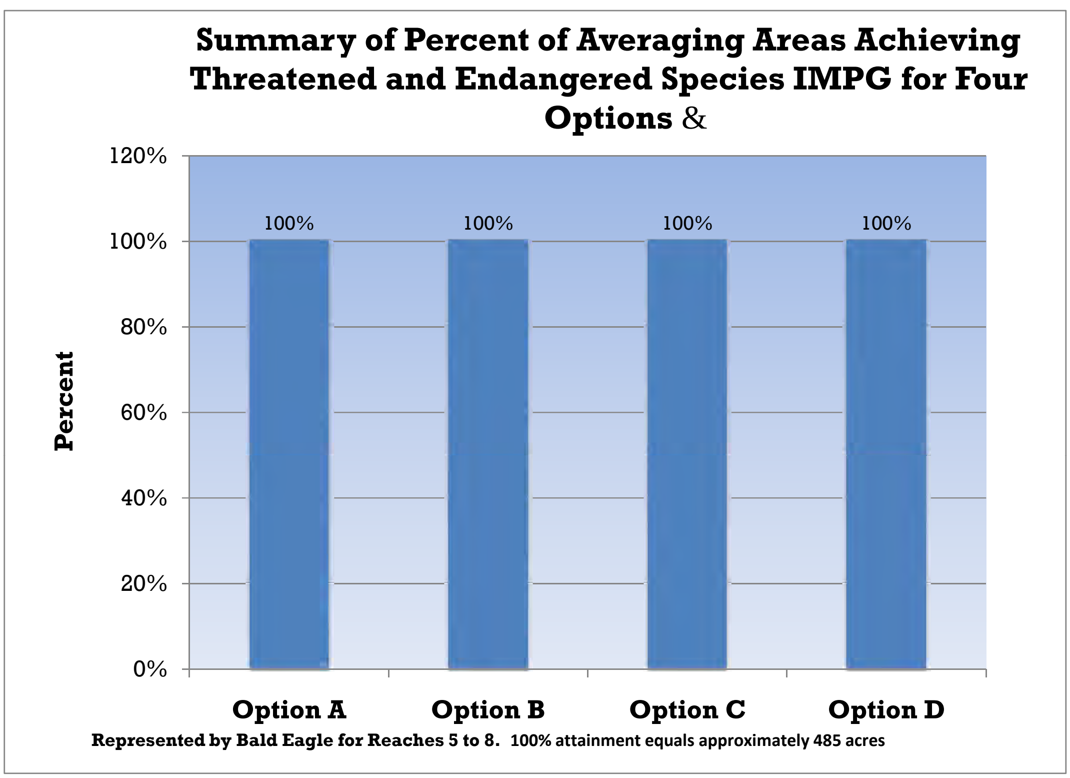

Insectivorous Birds (Wood Duck) IMPG Attainment in Acres for Four Options
Acres
900
800
700
600
500
400
300
200
100
0
100% Attainment
265
381
720
720
Option A
Option B
Option C
Option D


Upper and Lower Bound IMPG Attainment (in Acres) for Omnivorous and Carnivorous Mammals for Four Options &
Acres
100% Attainment
334
508
334
595
595
595
595
595
Option A
Option B
Option C
Option D
700
600
500
400
300
200
100
0

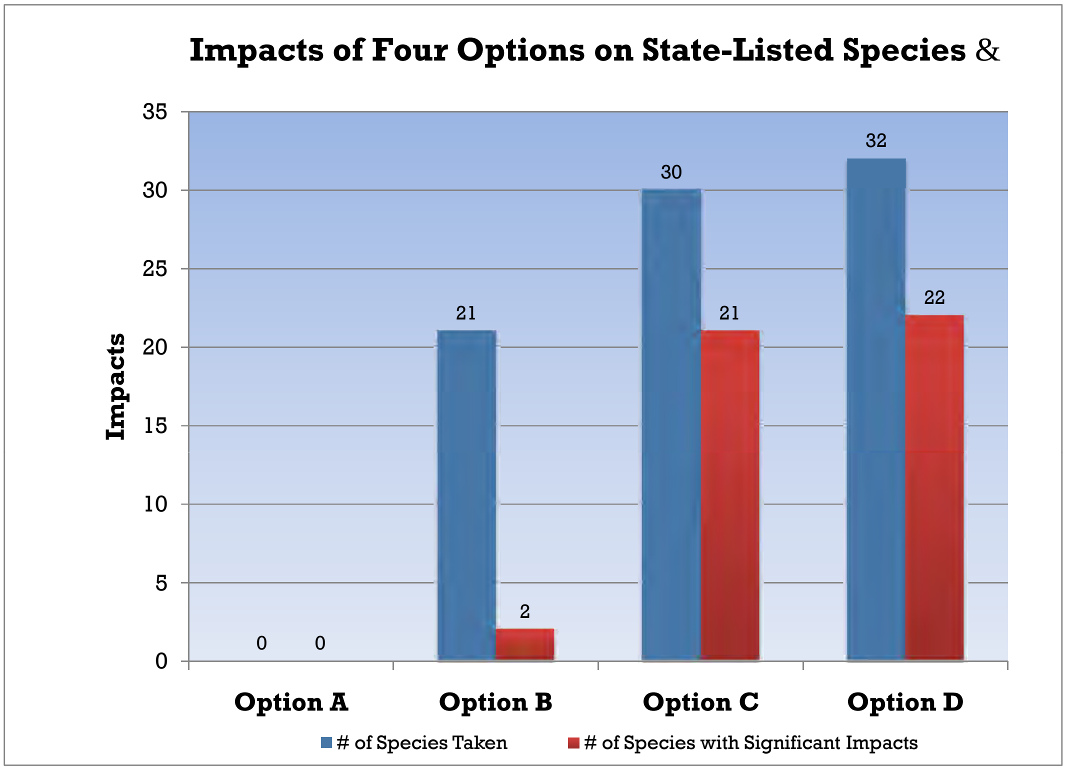

Piscivorous Mammals (Mink) IMPG Attainment (in Acres) for Four Options
Acres
100% Attainment
726
726
726
0
0
0
0
0
Option A
Option B
Option C
Option D
Lower Bound
Upper Bound
800
700
600
500
400
300
200
100
0



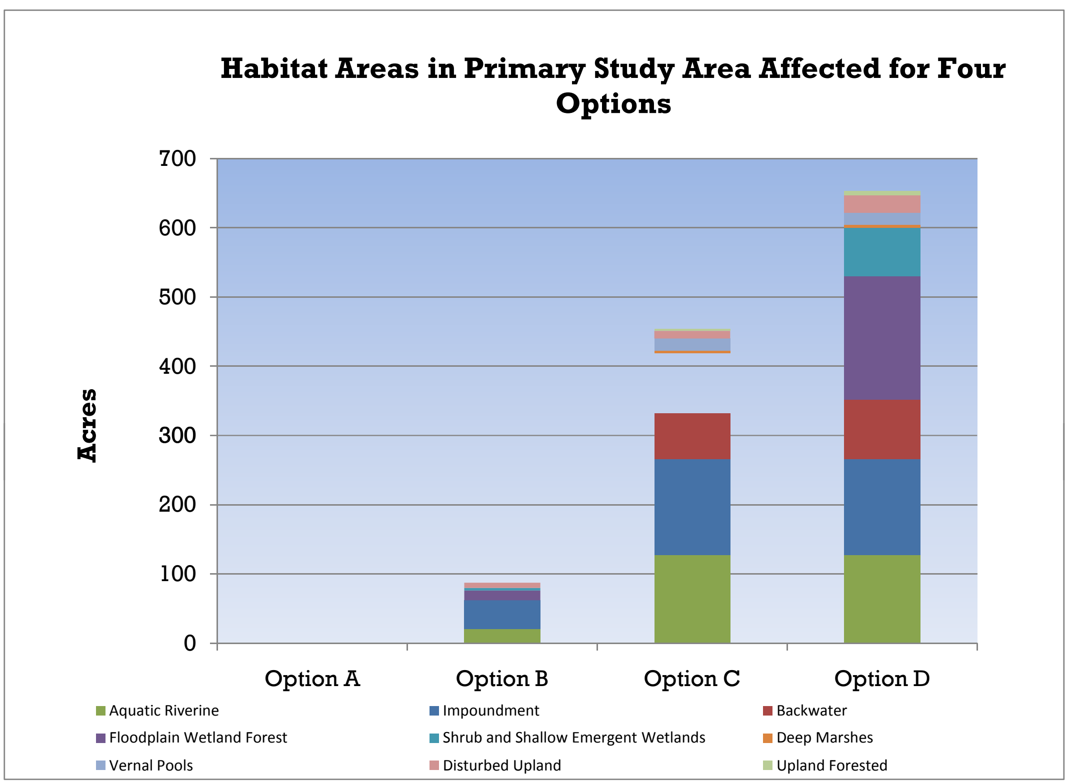
Summary of Percent of Averaging Areas Achieving Piscivorous Bird IMPG for Four Options
120%
100%
80%
60%
40%
20%
0%
Percent
0%
0%
100%
100%
Option A
Option B
Option C
Option D
Represented by Osprey for Reaches 5 to 8. 100% attainment equals approximately 485 acres.



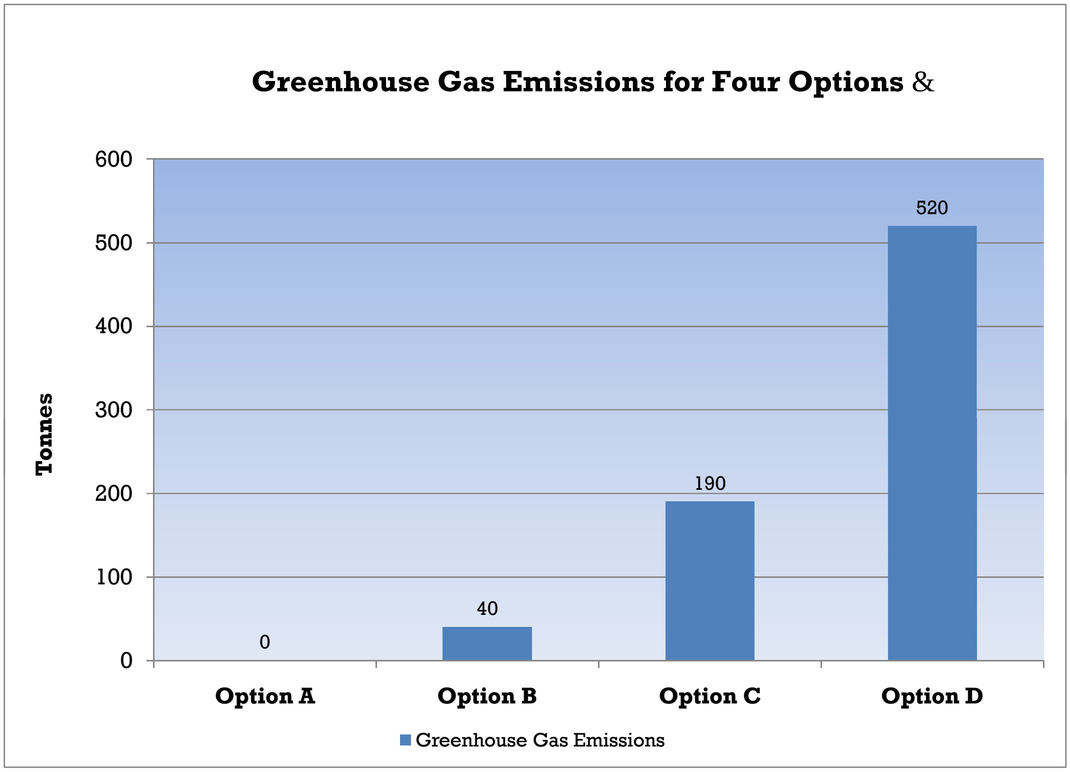
Summary of Percent of Averaging Areas Achieving Threatened and Endangered Species IMPG for Four Options &
120%
100%
80%
60%
40%
20%
0%
Percent
100%
100%
100%
100%
Option A
Option B
Option C
Option D
Represented by Bald Eagle for Reaches 5 to 8. 100% attainment equals approximately 485 acres

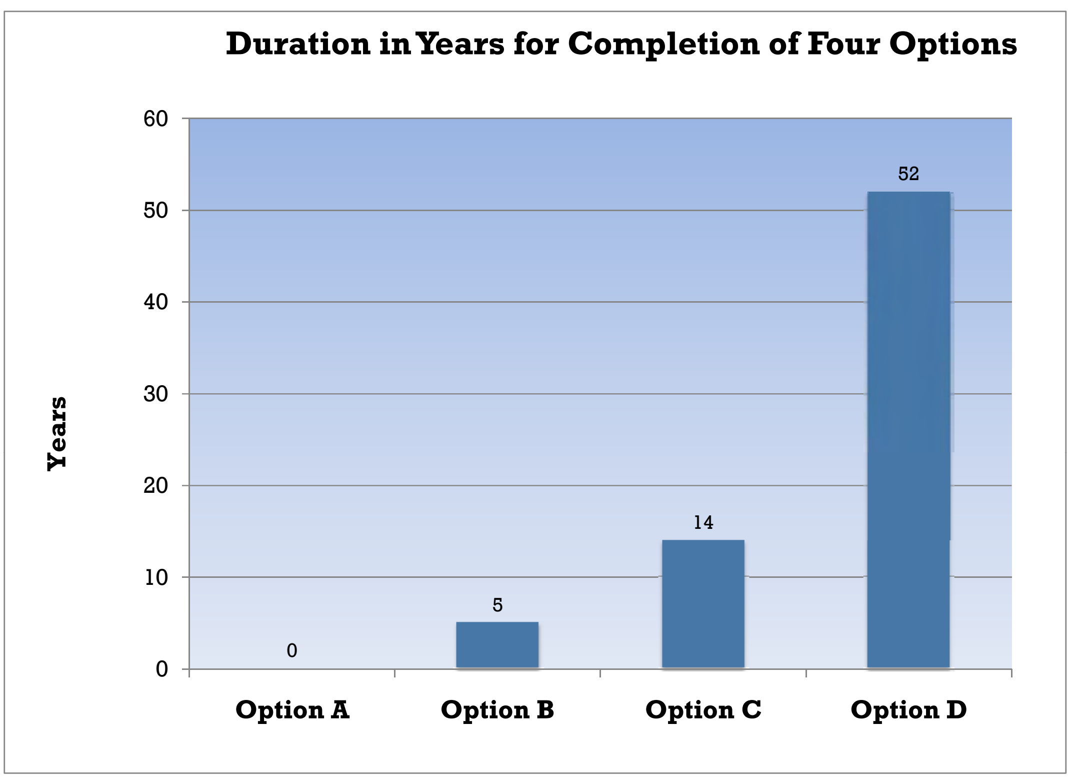


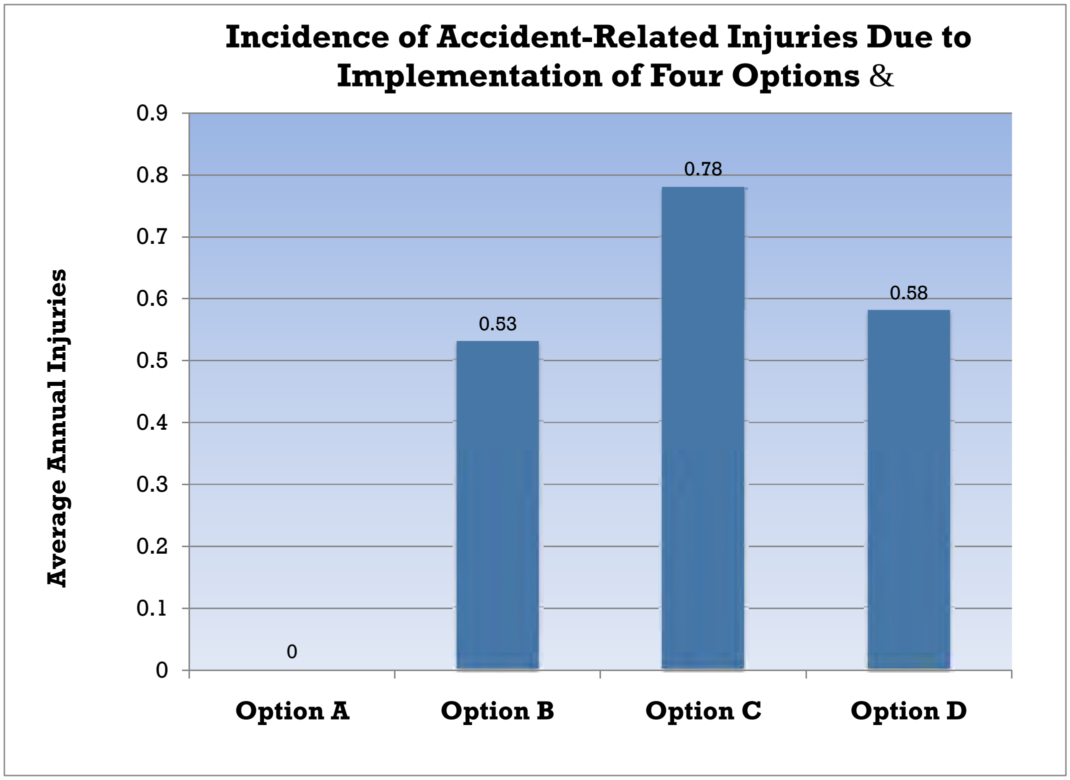
Impacts of Four Options on State-Listed Species &
Impacts
35
30
25
20
15
10
5
0
0
0
21
2
30
21
32
22
Option A
Option B
Option C
Option D
# of Species Taken
# of Species with Significant Impacts



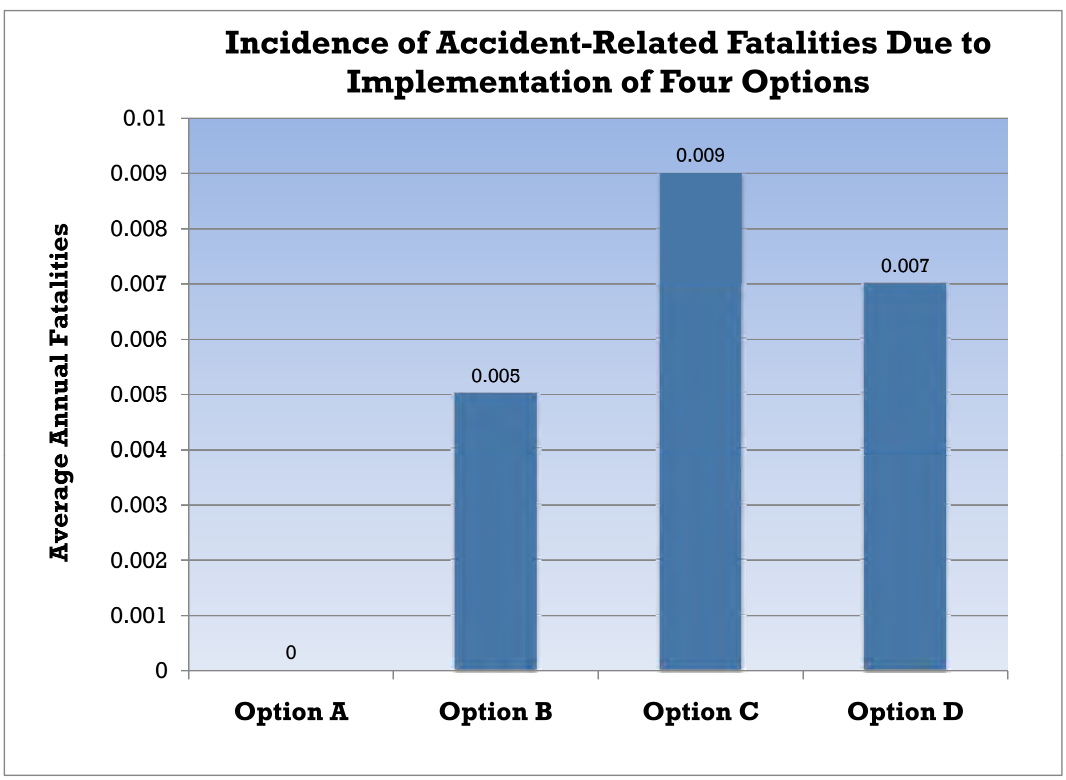
Habitat Areas in Primary Study Area Affected for Four Options
Acres
700
600
500
400
300
200
100
0
Option A
Option B
Option C
Option D
Aquatic Riverine
Impoundment
Backwater
Floodplain Wetland Forest
Shrub and Shallow Emergent Wetlands
Deep Marshes
Vernal Pools
Disturbed Upland
Upland Forested


Greenhouse Gas Emissions for Four Options &
Tonnes
600
500
400
300
200
100
0
520
190
40
0
Option A
Option B
Option C
Option D
Greenhouse Gas Emissions

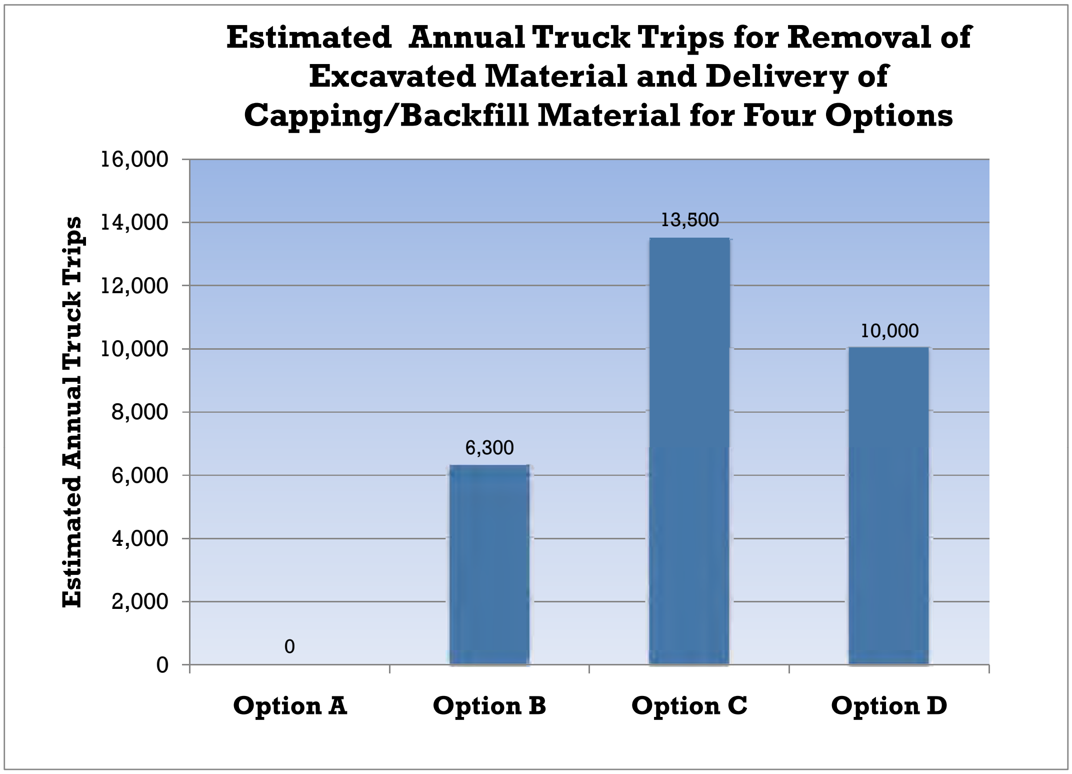

Duration in Years for Completion of Four Options
Years
60
50
40
30
20
10
0
52
14
5
0
Option A
Option B
Option C
Option D

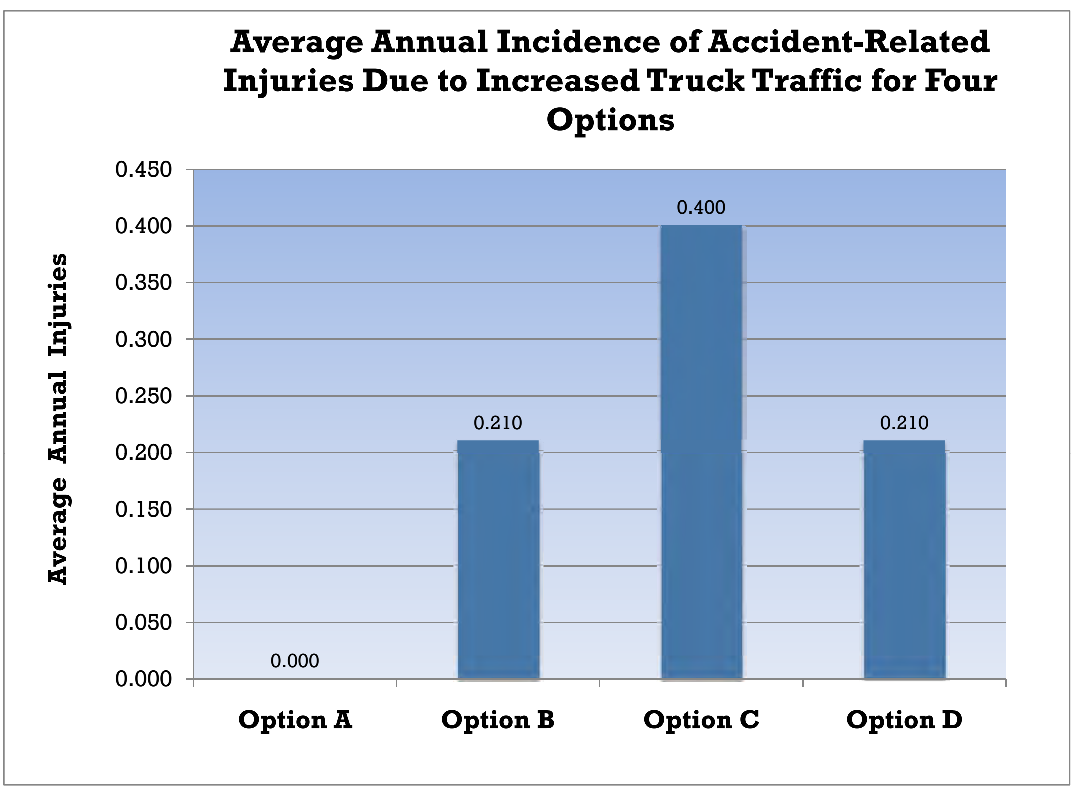


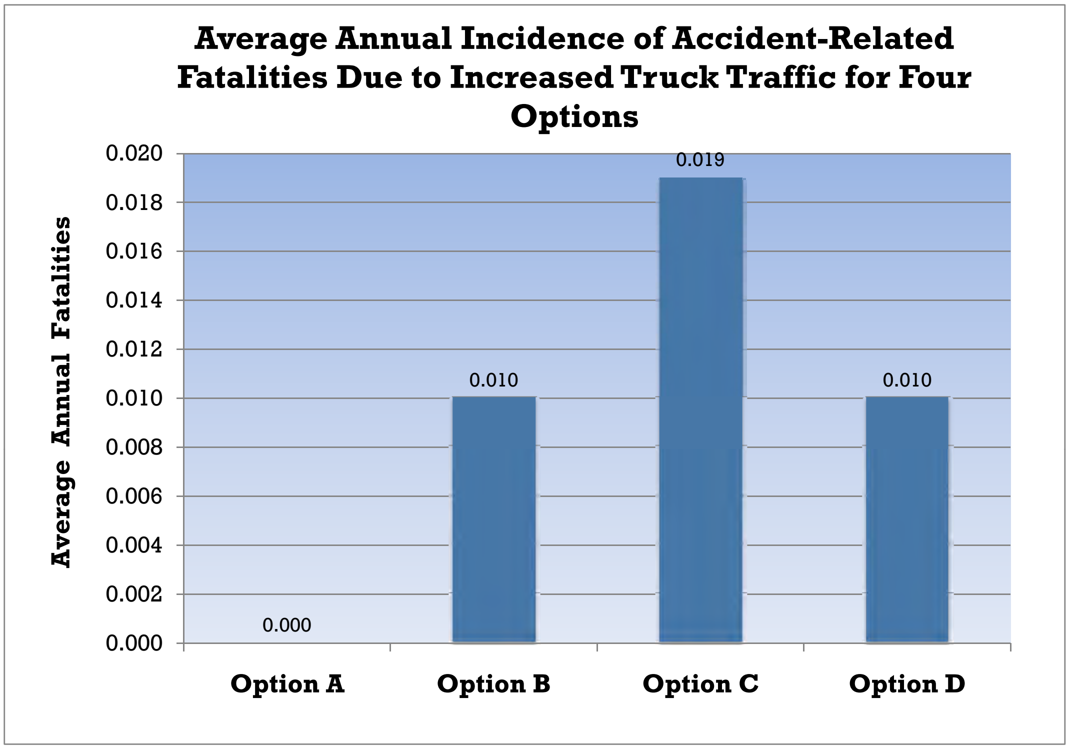
Incidence of Accident-Related Injuries Due to Implementation of Four Options &
Average Annual Injuries
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.78
0.58
0.53
0
Option A
Option B
Option C
Option D



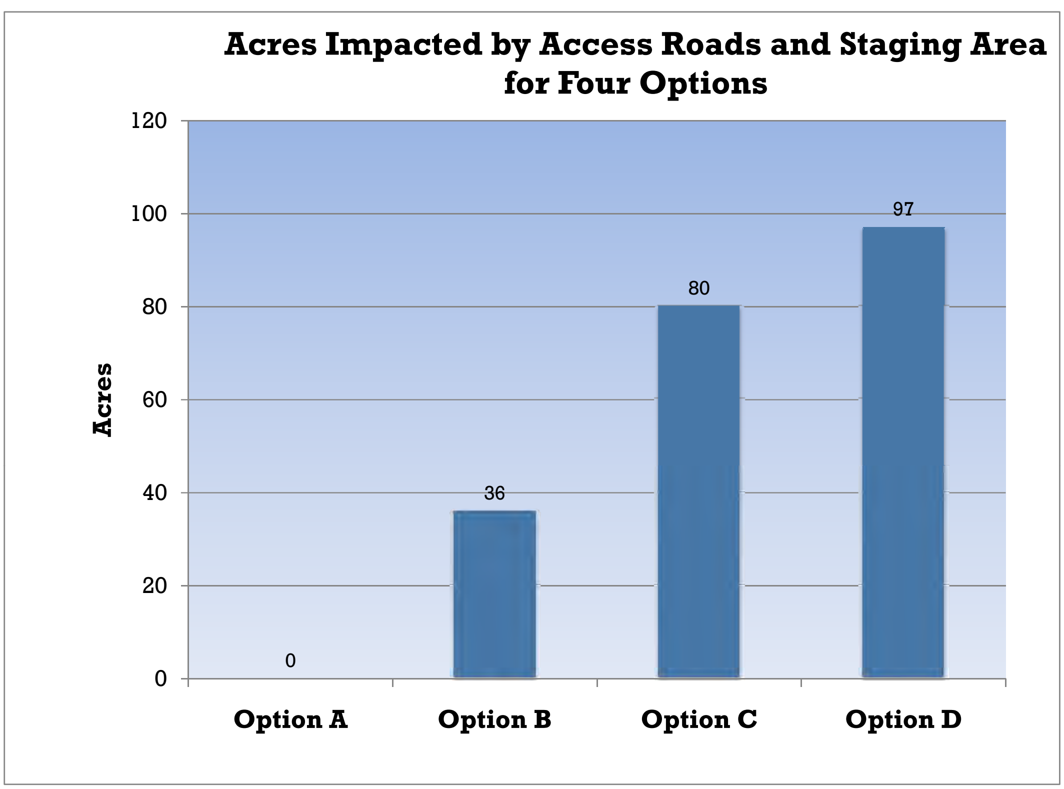
Incidence of Accident-Related Fatalities Due to Implementation of Four Options
Average Annual Fatalities
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
0.009
0.007
0.005
0
Option A
Option B
Option C
Option D

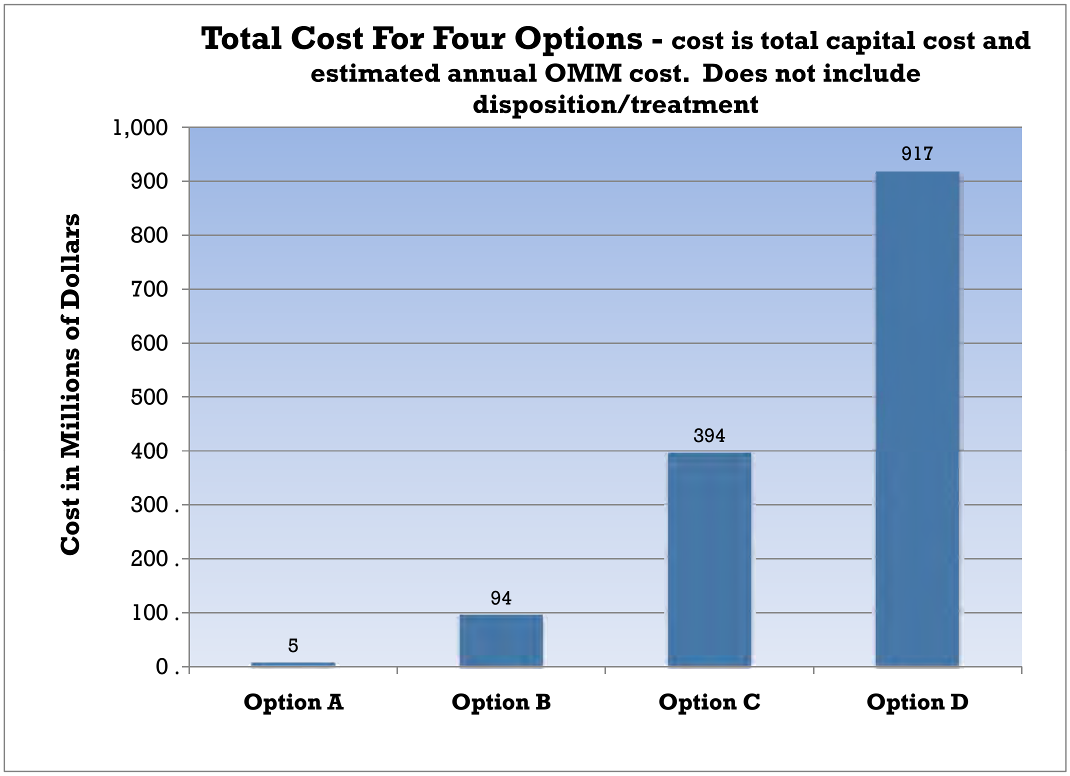

Estimated Annual Truck Trips for Removal of Excavated Material and Delivery of Capping/Backfill Material for Four Options
Estimated Annual Truck Trips
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
0
6,300
13,500
10,000
Option A
Option B
Option C
Option D


Average Annual Incidence of Accident-Related Injuries Due to Increased Truck Traffic for Four Options
Average Annual Injuries
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
0.000
0.210
0.400
0.210
Option A
Option B
Option C
Option D

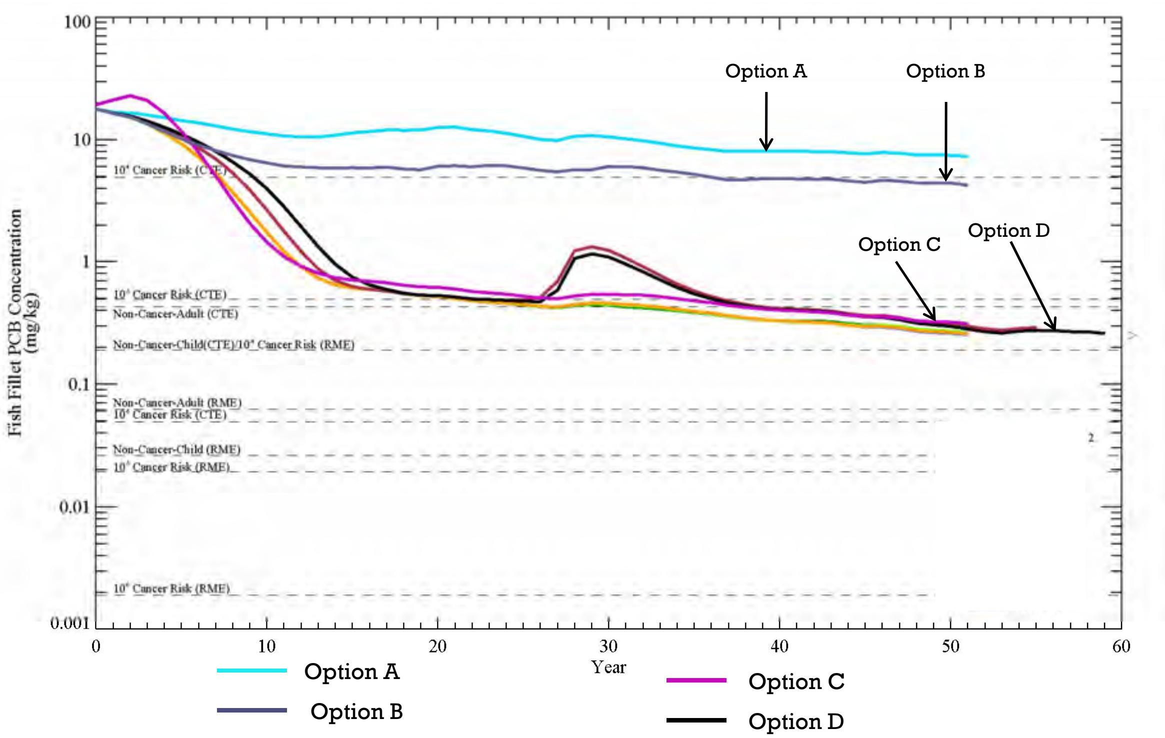

Average Annual Incidence of Accident-Related Fatalities Due to Increased Truck Traffic for Four Options
Average Annual Fatalities
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
0.000
0.010
0.019
0.010
Option A
Option B
Option C
Option D

25

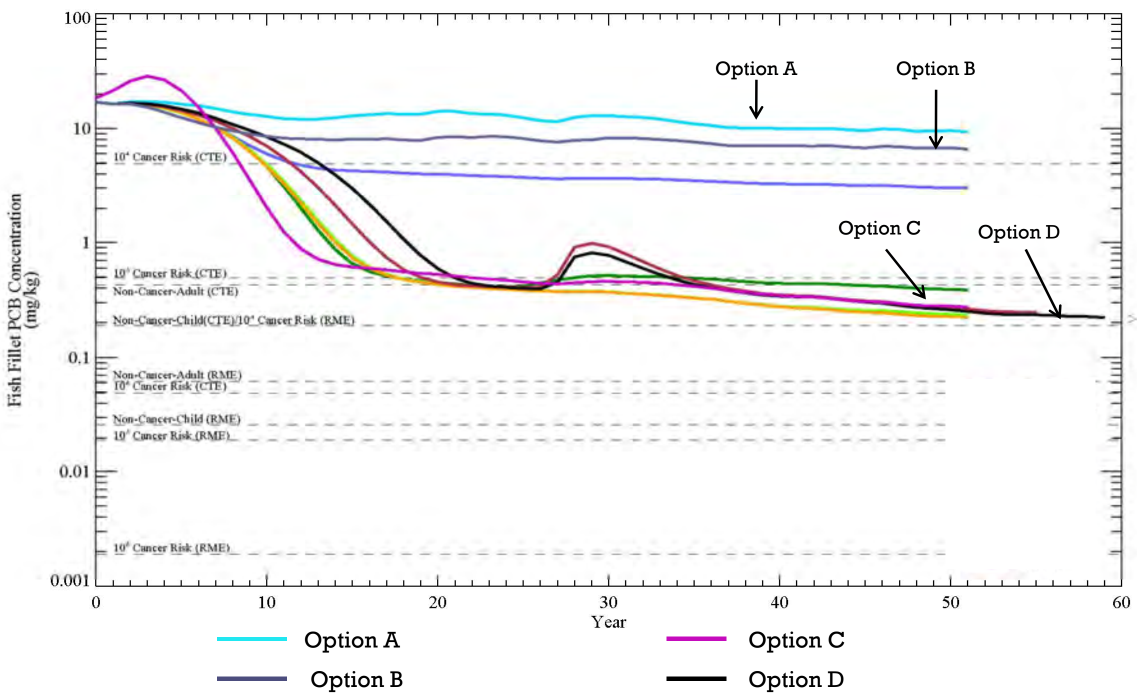

Acres Impacted by Access Roads and Staging Area for Four Options
Acres
120
100
80
60
40
20
0
0
36
80
97
Option A
Option B
Option C
Option D



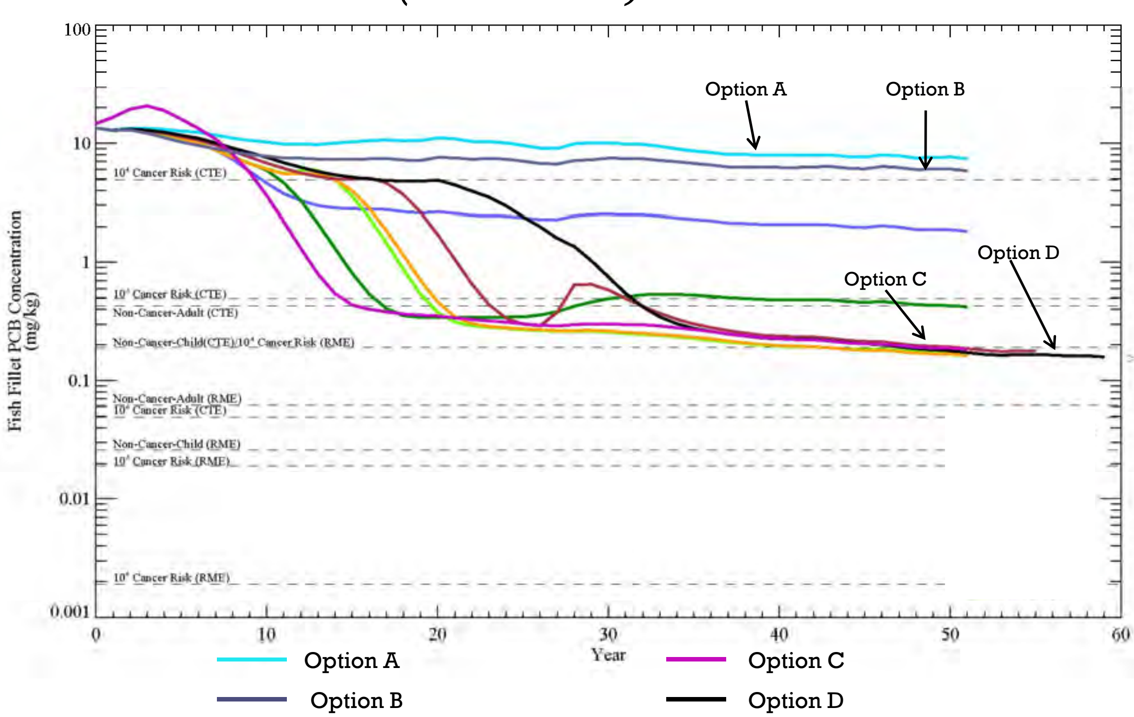
Average Fillet PCB Concentrations in Largemouth Bass from Reach 5A – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



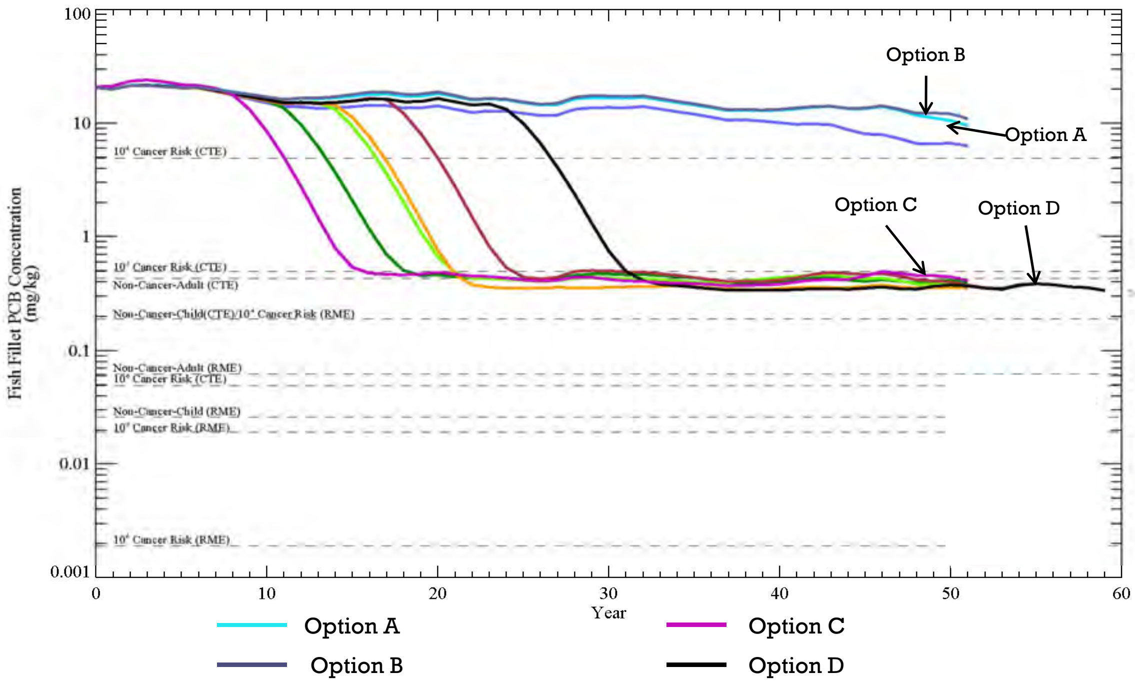
Average Fillet PCB Concentrations in Largemouth Bass from Reach' 5B – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



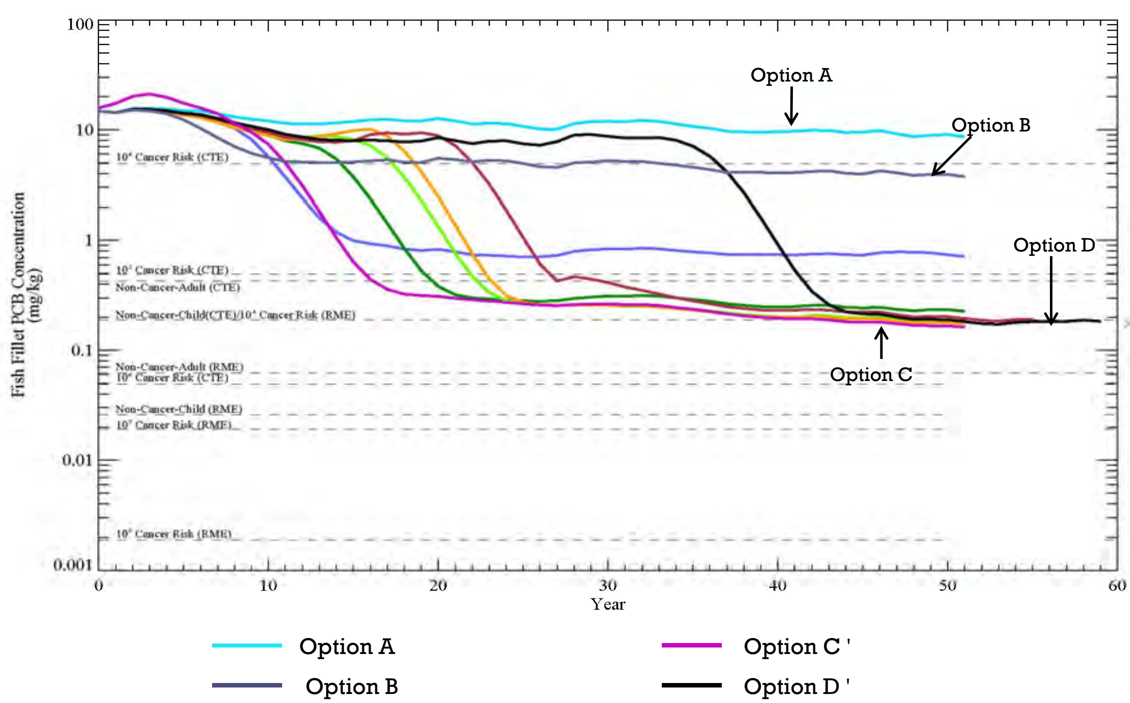
Average Fillet PCB Concentrations in Largemouth Bass from Reach 5C – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



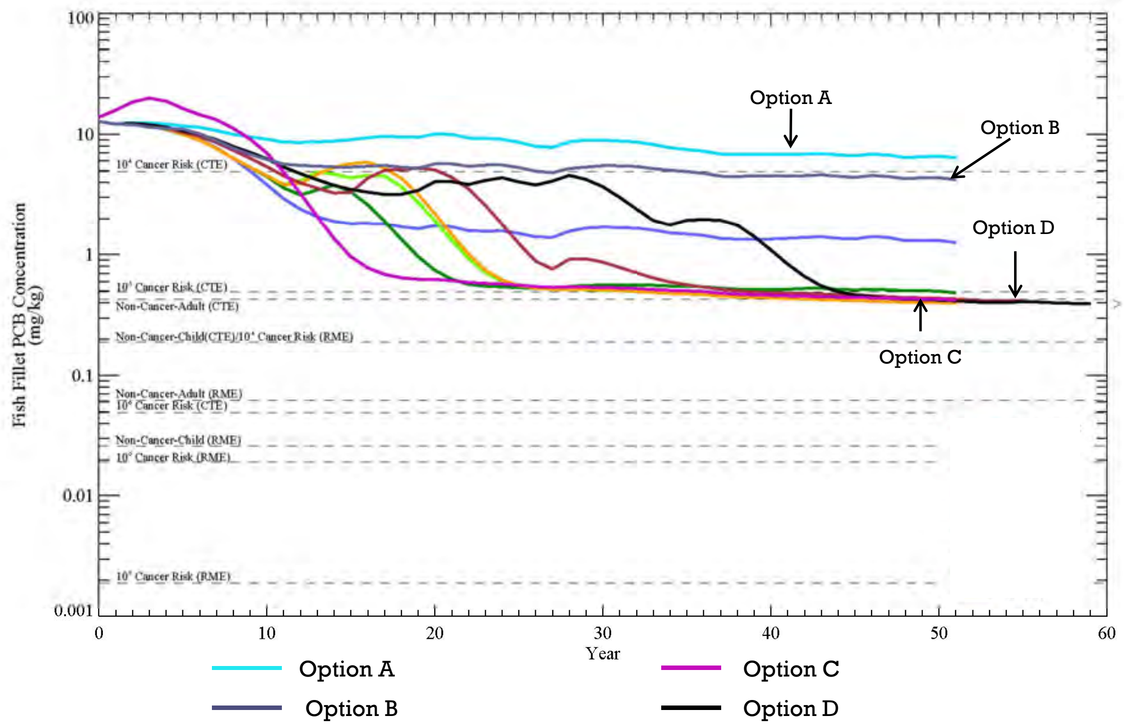
Average Fillet PCB Concentrations in Largemouth Bass from Reach 5D – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs* *



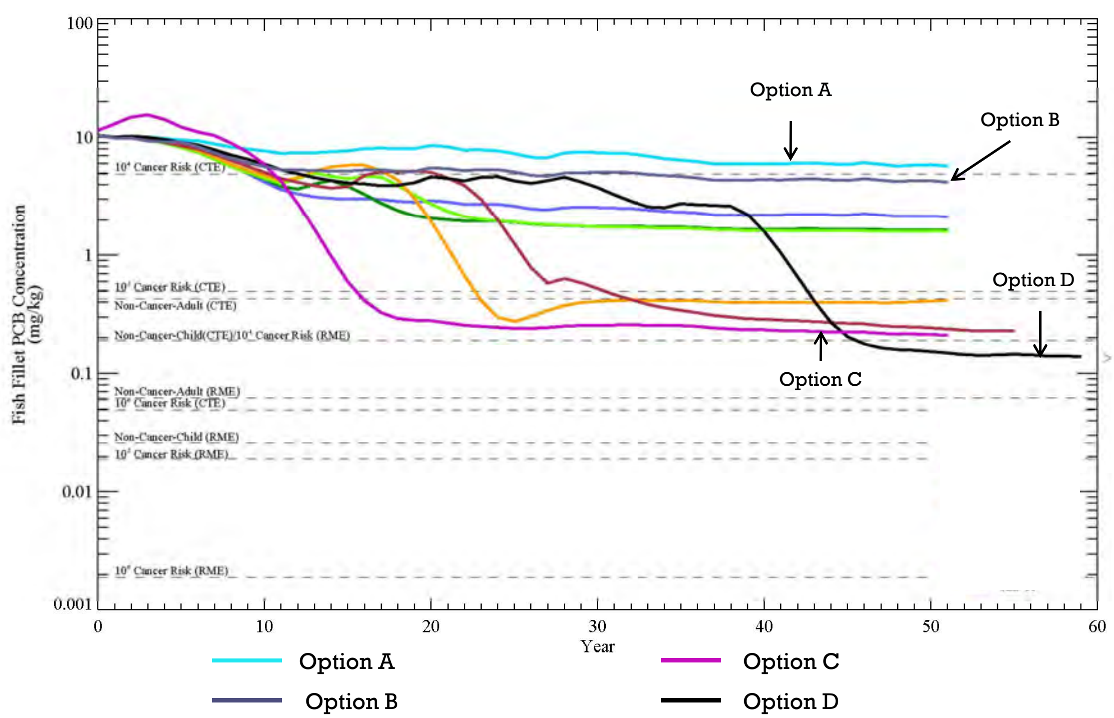
Average Fillet PCB Concentrations in Largemouth Bass from Reach 6 – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



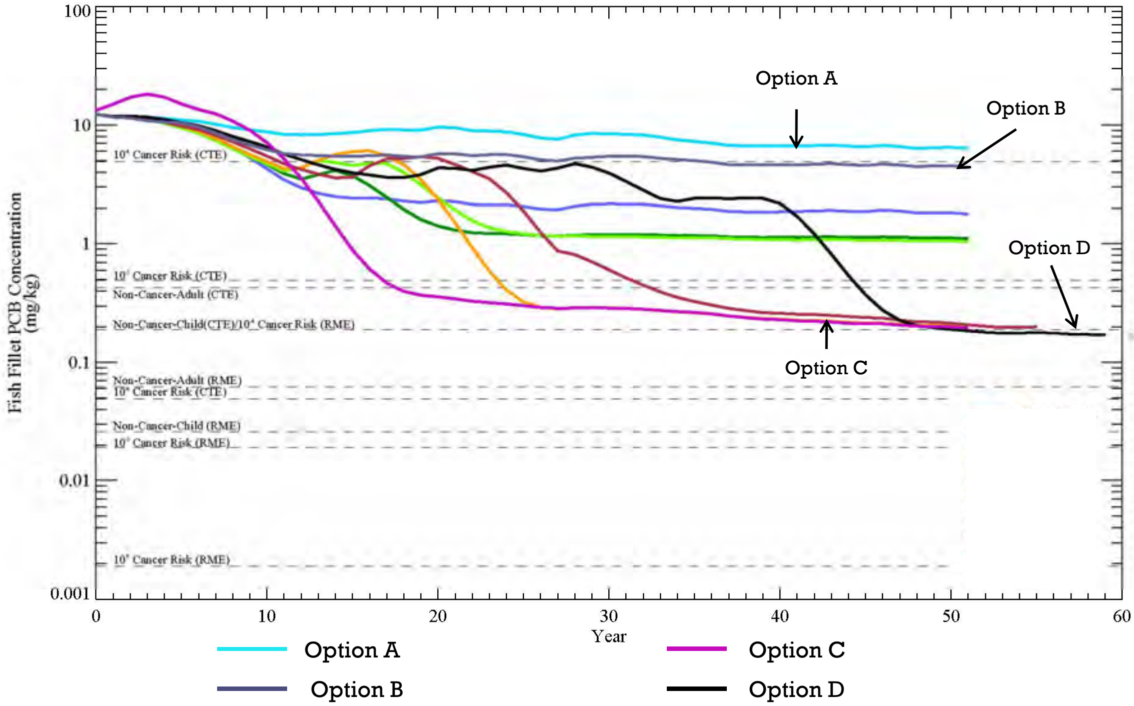
Average Fillet PCB Concentrations in Largemouth Bass from Reach 7A – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



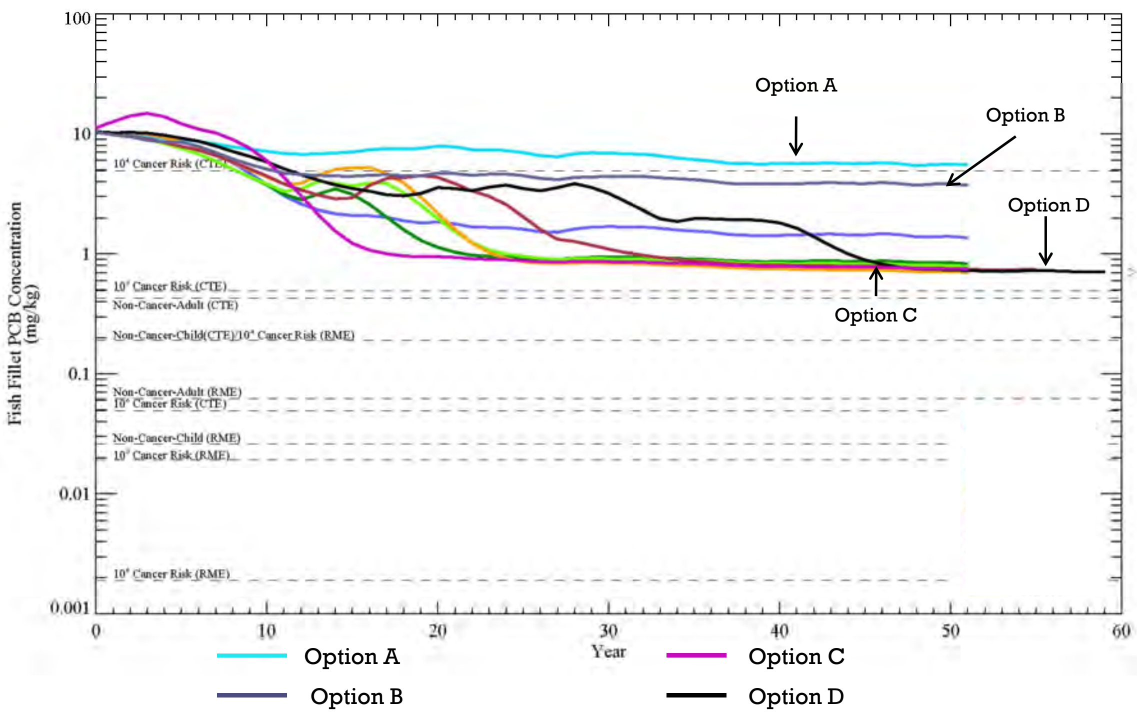
Average Fillet PCB Concentrations in Largemouth Bass from Reach 7B – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



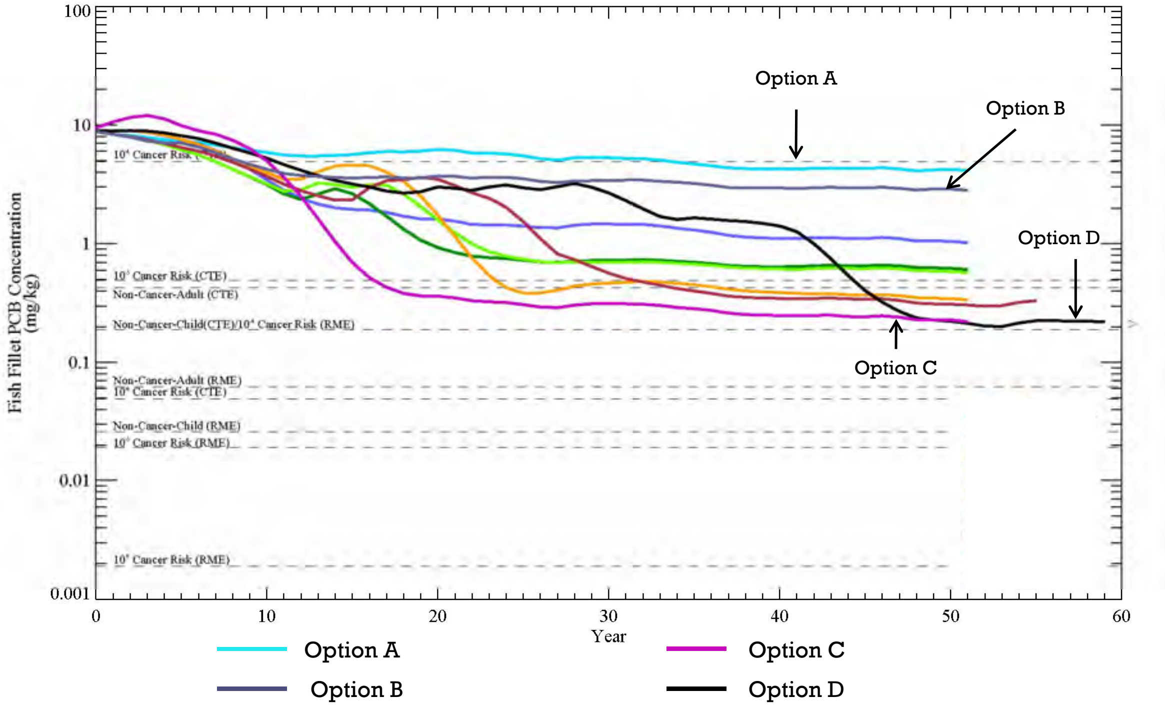
Average Fillet PCB Concentrations in Largemouth Bass from Reach 7C – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



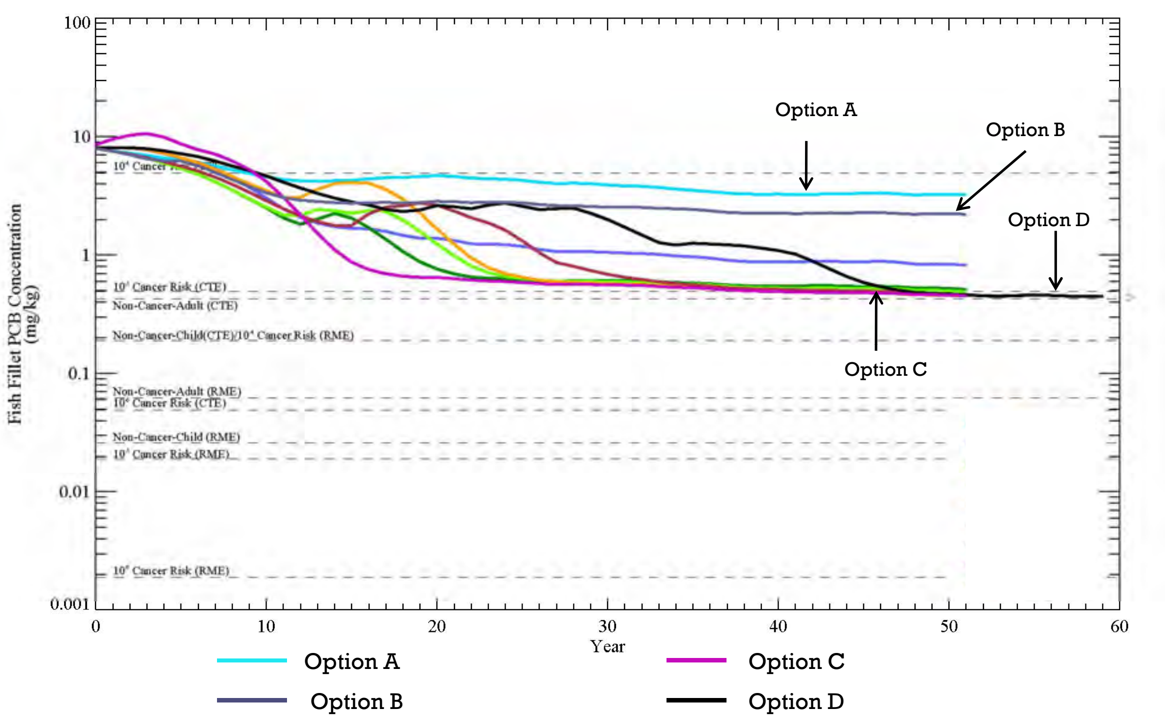
Average Fillet PCB Concentrations in Largemouth Bass from Reach 7D – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



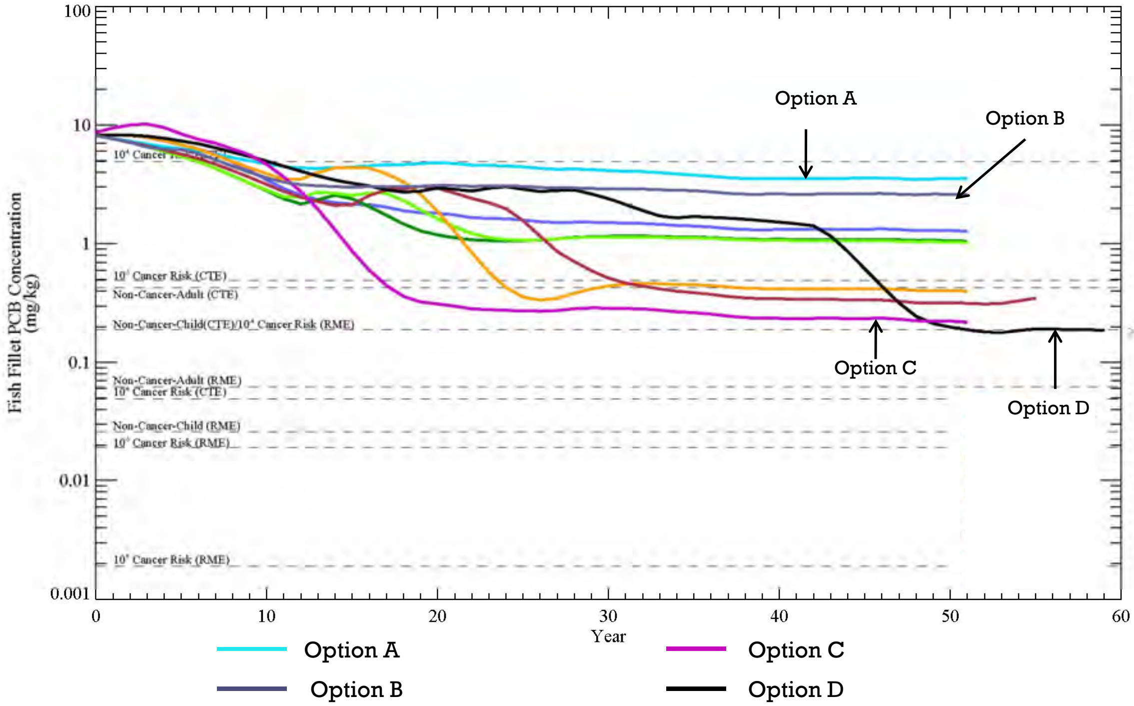
Average Fillet PCB Concentrations in Largemouth Bass from Reach 7E – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



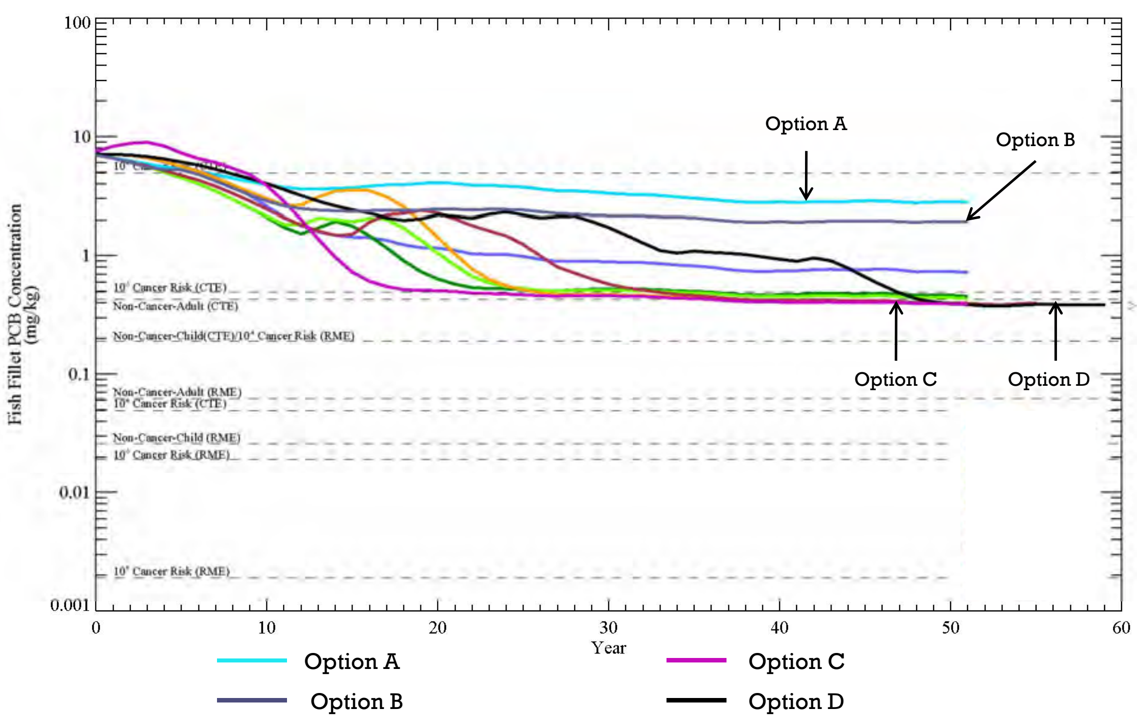
Average Fillet PCB Concentrations in Largemouth Bass from Reach 7F – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



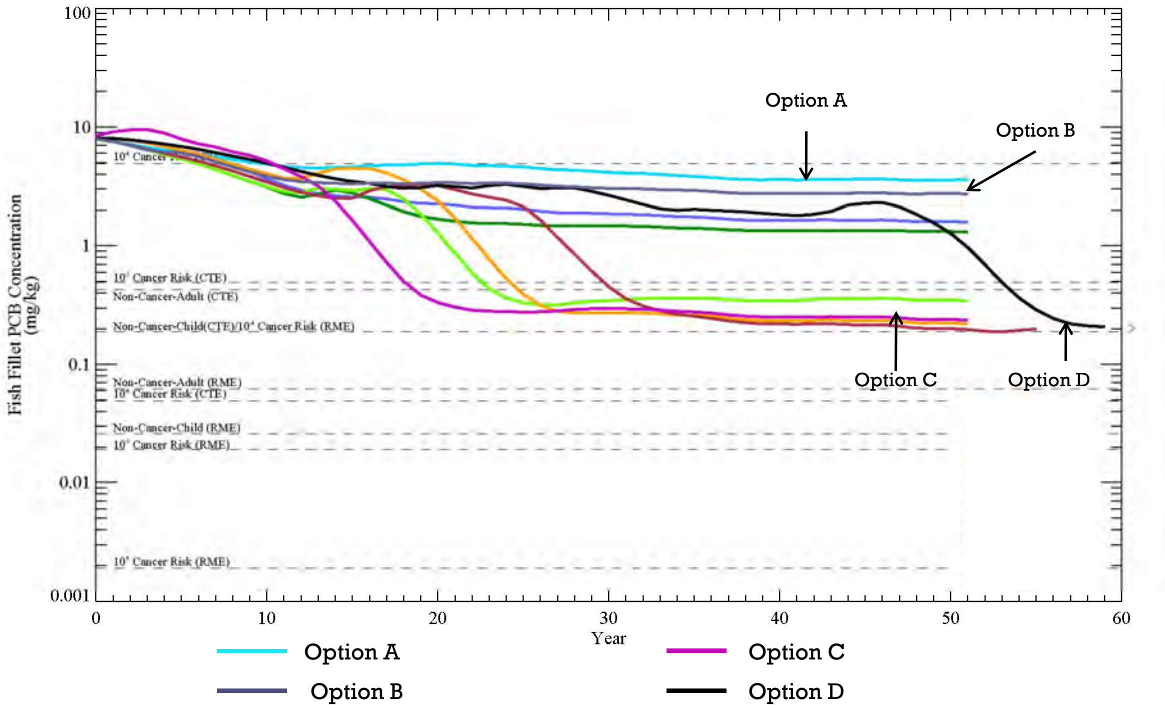
Average Fillet PCB Concentrations in Largemouth Bass from Reach' 7G – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



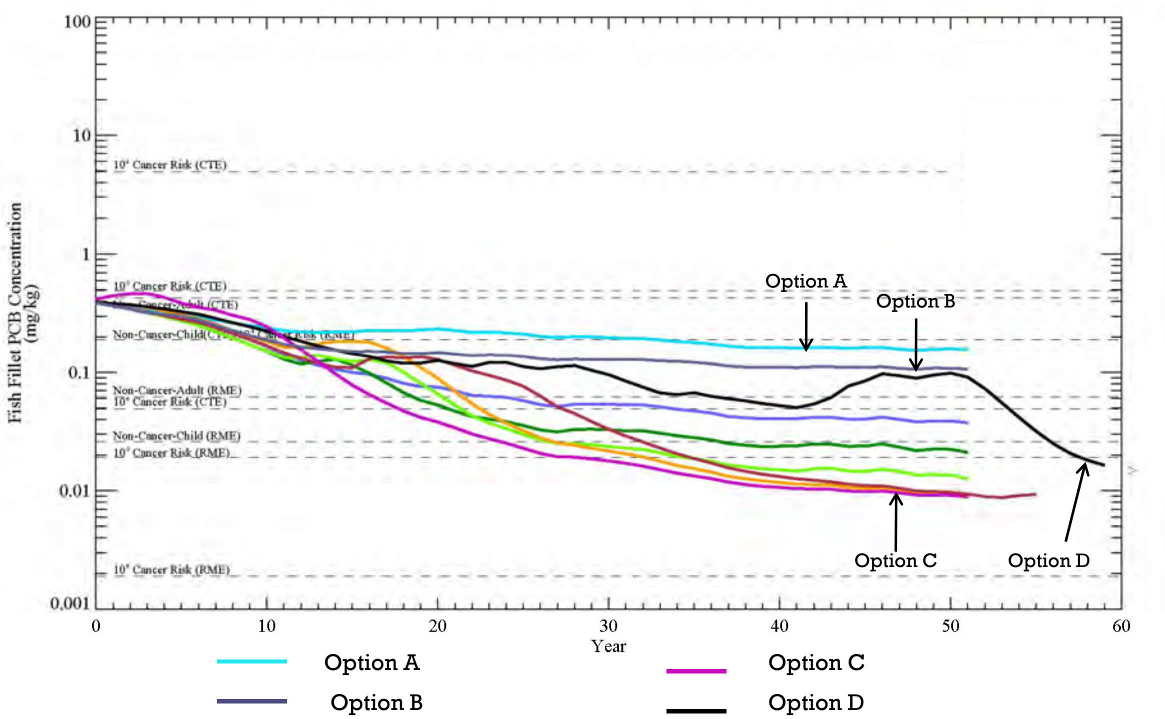
Average Fillet PCB Concentrations in Largemouth Bass from Reach 7H – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



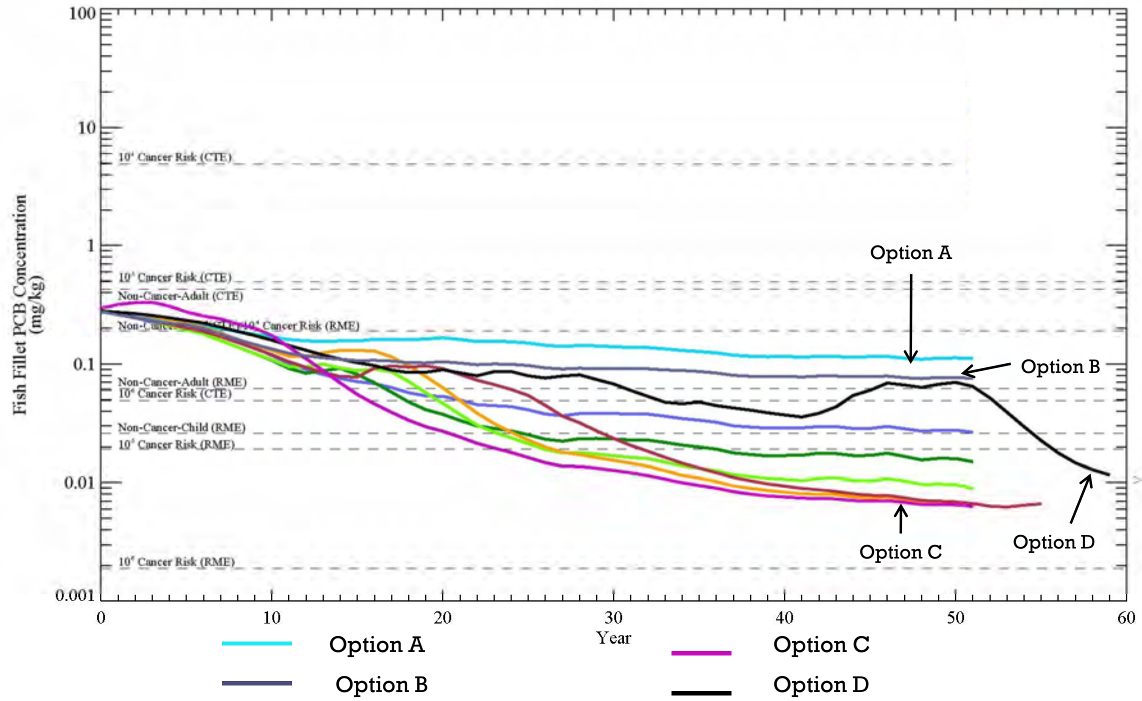
Average Fillet PCB Concentrations in Largemouth Bass from Reach 8' – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs* *



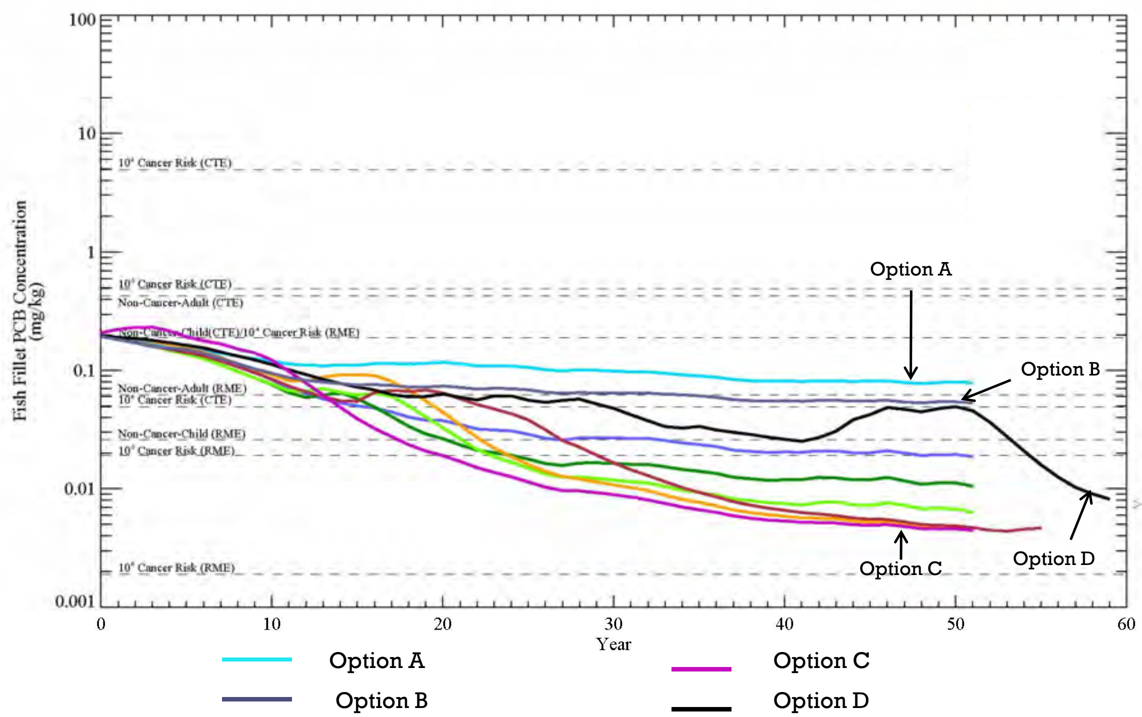
Average Fillet PCB Concentrations in Largemouth Bass from Bulls' Bridge – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



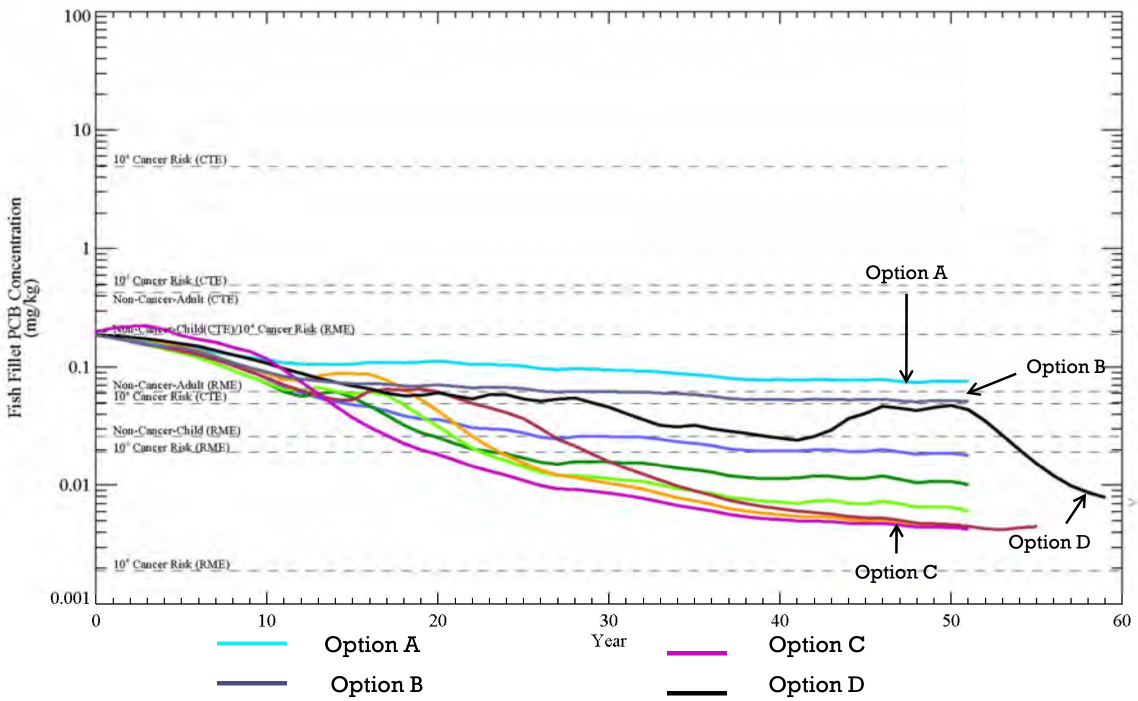
Average Fillet PCB Concentrations in Largemouth Bass from Lake Lillinonah – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



Average Fillet PCB Concentrations in Largemouth Bass from Lake Zoar– *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



Average Fillet PCB Concentrations in Largemouth Bass from Lake Housatonic – *Horizontal Lines Represent Fish Consumption (deterministic) IMPGs*



3.11 Workshop 2 • Comprehensive Guidelines

3.11.1 Intention

The primary intention of afternoon Workshop 2 • Comprehensive Guidelines was complementary to the morning Workshop 1 • Criteria Scorecard. Whereas the morning workshop encouraged the participants to evaluate remedial options using EPA's perspective, the afternoon workshop was an opportunity for EPA to develop a better understanding of the community's perspective. Whereas the morning workshop focused on the guidelines that EPA must follow (in the form of the 9 Criteria of the Reissued RCRA Permit), the goals of the afternoon workshop were for groups, focusing on a set of issues, to produce a set of guidelines they wished EPA to follow in developing any cleanup decision.

Like the morning workshop, Workshop 2 • Comprehensive Guidelines used the Four Representative Cleanup Options so that EPA received feedback on the range of remedial alternatives included in the Revised Corrective Measures Study. Unlike Workshop 1, Workshop 2 participants chose which of four topic groups they wished to attend:

Community Life

Issues that are important to remediation and tend to be larger than the River and floodplain and that do not fall within aesthetic, ecological, or use categories.

River Aesthetics

Issues of citizens' scenic and cultural experiences of the River and floodplain during and after cleanup.

River Ecology

The natural processes that form the River and floodplain and support the habitats and wildlife within them, the effects of PCBs on the ecosystem, and how a cleanup may affect these processes.

River Uses

The activities that citizens want to engage in within the River and floodplain and how the range of options might affect them.

The four topics were derived from citizens' comments and concerns throughout the Rest of River process and, in particular, the Situation Assessment interviews.

Ten to twenty members formed each group. Due to its popularity, two groups were established to consider River Ecology. Each group discussed, negotiated, formulated, and submitted a single "Guidelines Worksheet" such as that shown in Figure 27.

Figure 27. Example Worksheet for Workshop 2 • Comprehensive Guidelines.

3.11.2 Process Overview

The process for Workshop 2 was considerably less complex than that for Workshop 1, in part because most participants were already familiar with the Four Representative Cleanup Options and had a better understanding of the technical issues from having worked through them in Workshop 1. The challenge of this workshop was to translate participants' desires for outcomes into specific parameters and actions for EPA to consider.

Completing the exercise was a 7-step process for participants (as shown in Figure 28 following):

Step 1 • Identify the issues relevant to the topic
Step 2 • Identify existing conditions (both positive and negative)
Step 3 • Identify desired conditions post-cleanup
Step 4 • Apply actions of Representative Option A and identify its likely outcomes
Step 5 • Repeat Step 4 for Options B, C, and D
Step 6 • Consider if modifications to any action/protocols of the Option(s) might produce an outcome closer to the desired outcome. Modifications might include, for example, changes to the scale/extent of an action, its timing, the method by which it is to be accomplished, or the protocol used for a decision.
Step 7 • Define Guidelines *separately* for Option A, Option B, Option C, and Option D.

Anticipating that participants might determine that some guidelines should be applied to any option, EPA included a category "Overarching Guidelines" for participants' use should they consider it necessary.

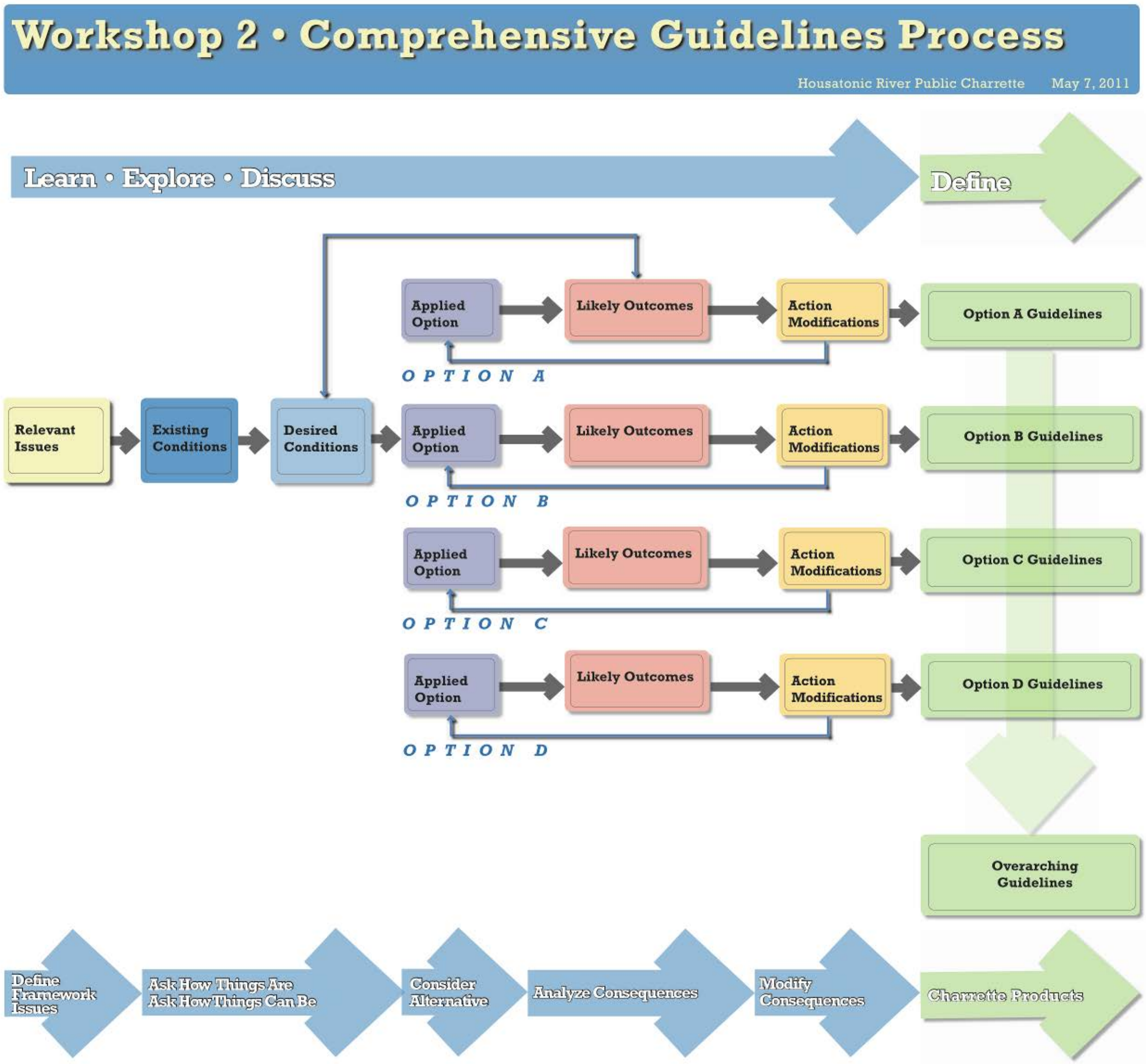


Figure 28. Process for Workshop 2 • Comprehensive Guidelines.

3.11.3 Workshop in Action

The exercise steps were relatively straightforward in definitions and tasks. The difficulty lay in the limited time frame of 1-1/2 to 2 hours. Consequently, participants were asked to prioritize their top three to five Desired Conditions and extend them throughout the entire workshop process. If they completed a set of guidelines for each option, then they could then return to their second tier priorities and complete the process for those Desired Conditions.

To solicit candid and unbiased community input, EPA instructed facilitators to let the groups define their own Desired Outcomes with no suggestions from facilitators as to what those might be. EPA also instructed facilitators to allow participants to make their own interpretations regarding the Likely Outcomes of actions without technical correction; rather than attempt interpretations themselves, facilitators were to encourage participants to ask clarification from EPA staff and EPA's experts on technical questions.

Figure 29. Workshop Group Members Exchange Ideas on a Concern while Facilitator and Scribe Listen.

Figure 30. EPA's Susan Svirsky, Project Manager Rest of River, and Community Members Discuss Technical Issues in Workshop 2.

3.11.4 Group Products

Following are the Comprehensive Guidelines Worksheets for each of the five Workshop 2 groups, along with a summary by each group's Facilitator/Scribe team.

3.11.4.1 Community Life Summary + Guidelines Worksheet

The group spent a few minutes suggesting definitions for zones of community life as immediate river and its uses, floodplain, local communities, and the entire Berkshire region. The group engaged in a very lengthy discussion of existing conditions and desired conditions. There appeared to be an overall sense of negativity surrounding the existing conditions. Many individuals expressed concern that the area is underutilized from a recreational standpoint, undervalued from an economic/personal property perspective, and damaged in terms of ecosystem value. After exploring conditions, the participants moved directly to discussing guidelines that various members of the group espoused and valued. These included the following:

- Favoring short segment remediation;
- Using Adaptive and Active Management;
- Using the Berkshire Regional Planning Commission Sustainability Plan as a guide to how remediation infrastructure can be dove-tailed with post-remediation uses;
- Assuring easy access for community input at all stages;
- Assuring ongoing and accurate public education;
- Assuring ongoing coordination with the State;
- Cleaning up first for human health to the most protective level possible and then for ecological receptors (note there was a great deal of debate on the point of the relative importance of human health versus ecological health and whether the appropriate term to use was "possible" or "feasible");
- Using local labor and suppliers; and

- Mitigating against downstream impacts and treat downstream as important as upstream.

In evaluating Options A and D, some members of the group also raised issues of whether remedies that are less aggressive in active removal of PCBs require more expansive monitoring of human health and ecological effects and the commitment of funding to local communities to offset the economic impacts.

When asked at end of the session, workshop participants indicated that they found the session useful and they felt the facilitator and scribe had accurately recorded individuals' perspectives.

W2/Topic A

Community Life

Workshop 2 • Comprehensive Guidelines
Housatonic River Public Charrette May 7, 2011

ZONE | **EXISTING CONDITIONS** | **DESIRED CONDITIONS** | **APPLIED OPTION** | **LIKELY OUTCOMES** | **SPACE** | **TIME** | **ACTIONS** | **GUIDELINES**

M O D I F I C A T I O N S

Zone

On & about River

Floodplain & abutters

Broader Community

Region (watershed) Pittsfield South

Existing Conditions

Disinformation/where do you get acc. info

- Can't eat fish frogs or ducks
- Percieved limitations in recreation fon river
  - on land (floodplain)
- limitation on mill (asset) reuse.
- property value (liability)
- farming impacts
- Its a beatiful (but not pristine area)
- mosquito issues
- uncertainty/local control of destiny
- Stigma of contamination
- River not fully embraced
- Time Horizon
- Do have habitats/diversity (impaired but there)
- GE landbank purchases
- monitoring (PCB migration river to comm. & back
- Fear
  - GE will not do whats right below Rising Pond forgotten
  - PCBs will be stored w/in comm.
  - talking about/state of denial
- State of human health (costs assoc.)
- General economic condition/health in jeopardy

NO Consensus

Desired Conditions

- Certainty of outcome
  - timeframe
- clean, swimmable fishable, river & surrounding area
- Remove PCBs not relocate w/in comm. Dispose in ecologically resp. way.
- Properties along river can be used w/o limitation
- River fully accessible player in tourist economy
- Removal of uneeded dams/use of useable ones
- Implementation of EPA ~~recommended~~ option
- Existing uses properties protected
- Downstream equal importance
- GE deal w/other economic impacts (health, etc.)
- opportunity for better access & conditions
- Short term impacts minimized
- Rail used more/more useable
- Information (trusted) open comparative disclosive
- Real time monitoring
- Post remediation useable infrastructure
- School education (about river, history, issue)
- Maintain/restore beauty while making healthier
- Nothing excluded because of ownership
- latest technology employed
- consensus

Options

Applied Option	Likely Outcomes	Space	Time	Actions	Guidelines
OPTION A	Status Quo remains for a 1,000 years → People excluded from River → political climate will change → more people getting sick			$ into Community (development) Stepped up HH monitoring monitor eco health	Stop if unsuccessful w/in 10 yrs (models wrong)
OPTION B					
OPTION C					
OPTION D	Short term pain PCBs would be removed IMPGs achieved neg. impact - properties short term - economy - habitats winner & loser comm. Construction/transport impacts jobs created			ensure equity. mitigate against downstream transport of PCB • use local contractors	Use local contractors/suppliers mitigation of downstream impacts

Restoration alongside remediation
↳ Reach by reach
Adaptive ~~progm~~ active mgmt
Post restoration uses ↔ tie ins to BRPC sustainability plan
& of clean up infrastructure
Easy access for Comm. input at all stages
Ongoing education

OVERARCHING GUIDELINES

Ongoing coord w/State
cleanup to most protective human health and eco std possible
N.G —
use local contractors/suppliers
Mitigation of downstream

3.11.4.2 *River Aesthetics Summary + Guidelines Worksheet*

The group consisted of individuals who use the river for kayaking, homeowners who live on the River, Massachusetts and Connecticut state environmental representatives, and people who have followed the project long-term.

The main concern of the individuals in the group was that the current aesthetic should be maintained or restored to what it looks like today. This was defined as protecting the vernal pools, the other floodplain and river ecosystems (including bank habitats), and the aesthetic beauty of the river vegetation and fauna. Most didn't want the intricate flows and diversity of tributaries to be sacrificed. Each felt strongly that bank stabilization should not result in riprap along the banks or artificial-looking remedies.

There was an interest expressed in increasing the depth of Woods Pond; it was believed that such deepening would increase the fish population and improve fishing,

Concerns over remedies also extended to the impact on homeowners from traffic, the view of the river, and the potential future long-term impacts on private properties.

As part of the discussion on aesthetics, there was heavy emphasis that the continued contamination of the PCBs would have (and is having) a negative long-term impact on the animals of the Housatonic River and floodplain and on people's ability to safely enjoy the River.

PCB cleanup was a high priority. Option A was immediately rejected as unacceptable due to its lack of removal of PCBs, despite the low short-term impacts on the river aesthetics.

Option B was not seen to be much better than Option A, but the possibility of bank stabilization brought up, once again, the concern of maintaining natural-looking banks (not riprap).

Individuals in the group were divided between Options C and D, with some feeling strongly that D was overprotective or C not quite protective enough. Option D's timeframe for cleanup of 52 years was problematic to many in the group and considered excessive, although some individuals thought that 52 years in the life of a river was a tiny period of time to ensure long-term clean environmental conditions.

Overall, members of the group wanted to maximize the extent of PCB cleanup and efficiency of cleanup while maintaining or restoring the natural environment to the greatest extent possible.

There was discussion about the impact of the cleanup, and a wish was expressed to minimize impact to individual homeowners or distinct groups of community members (hunters, fishers, kayakers). One option would be to remediate a section of river at a time so that no one section or sector of the public was impacted for many years.

Engineered caps to isolate PCBs left behind following remediation were discussed as part of Options B, C, and D. Concerns were expressed as to whether the cap would be of natural or artificial (rubber) materials. After consulting the EPA experts, members of the group commented that as long as the material for the caps was natural, the concerns about them were diminished.

Each of the members of the group also wanted EPA to use the most advanced and protective technologies (low impact on environment) and to continually seek out new and improved technologies (especially as long-term remedies proceed).

Group members were also concerned about long-term monitoring and adjustment of the remedies so that if restoration was proceeding as expected it could be adjusted and readapted. They were concerned with Options A, B, and somewhat about Option C regarding what happens when natural events and conditions (floods, erosion, etc.) cause PCBs to become re-exposed: Is GE responsible if and when this should happen? And they were concerned about the pain of going through future cleanups in this case.

Group B

River Aesthetics

ZONE	EXISTING CONDITIONS	DESIRED CONDITIONS
IN-WATER & BANKSIDE	• Looks natural • Diversity of tributaries, complex flow • Vegitation - Wetland Plants - low hanging trees • PCB contamination • unstable banks • Recycled growth • Bank habitats	★ • Maintain/restore natural aesthetics "Make it like you'd never know work was done" • maintain/restore - Diversity of tributaries - Veg. - Habitats - Animals ★ • Clean up PCB's • Secure Riverway (maintain properties) • Improve fishing in Wood's Pond • Don't chanelize • No RipRap
FLOODPLAIN	• vernal Pools • Natural env. • PCB Contamination	• Maintain/restore vernal pools, wetlands, marshes • Accountability on long term impact of restoration • Low impact of selected remedy

APPLIED OPTION	LIKELY OUTCOMES	SPACE (MODIFICATIONS)	TIME (MODIFICATIONS)	ACTIONS (MODIFICATIONS)	GUIDELINES
OPTION A	• No change in Aesthetic (short term) • PCBs degrade flaura & fauna • Bank erosion continues (w/ PCB release)				• Not viable due to lack of protection • You'll have to go back & re-assess
OPTION B	• limits access impacts for cleanup • Still has PCBs degrade flaura & fauna • Impact on aesthetics from bank stabilization	• Only work in highly impacted areas			• New cleanups for more areas as technology improves
OPTION C	• less impact of PCBs on floura & fauna • Short term construction impact • Time impact on quality of life • Trade off between construction & time	• Minimize staging/access areas	• Be efficient • minimize impact of remedy on any given river use or Community subset		• Minimize Staging/access/areas • Be efficient • Minimize impact of remedy on any given river use or Community subset
OPTION D	• Most destructive (short term) • longest recovery • less PCBs • long term protectiveness of flora & fauna • Don't have to go back & clean up again • longer restoration period	• Constantly apply new improved technology		• Replant • Restore to natural • Use natural looking stabilization • Monitor/maintain long term	• Constantly apply new improved technology • Restore to natural, replant • Use natural looking stabilization • Monitor/maintain in long term

• Maintain overall river beauty (no artificial riprap)
• Make it the most efficient possible
• Maintain/restore ecology
• Go back later & cleanup what wasn't done prior

OVERARCHING GUIDELINES

• Constantly apply new improved technology

3.11.4.3 River Ecology (Group 1) Summary + Guidelines Worksheet

Members of the group struggled with separating existing from desired conditions. However, the group had a greater sense of direction with respect to specification of a desired future condition. Each participant in the group (no dissenters) recommended that EPA should reject Option A outright. Additionally, there was very strong discomfort among the individuals with Option B, and at least one member of the group recommended that EPA should reject Option B because it is inadequate as a remedy. There were common themes that came up during evaluation of Options C and D. Those themes included the following:

- Use of pilot projects to evaluate cleanup approaches and restoration;
- Being more selective about where remediation would occur;
- Modifying the sequence of remediation (sometimes going more slowly and sometimes working on multiple areas simultaneously); and
- More detailed examination of tradeoffs between remediating PCBs in riverbanks versus PCBs on the floodplain. Participants in the group stated that they would like to see an option that combined aspects of Options C and D. In particular, some individuals stated that they wanted Option C to be more like Option D and Option D to be more like Option C in order to find a common ground.

Some overarching guidelines that were offered by participants included the following:

- Conduct ongoing investigation of alternative technologies;
- Consider adaptive management;
- Minimize impacts of access roads; and
- Where possible, consider opportunities to improve ecological conditions (restoration) while remediation is underway.

As an example of the latter issue, many individuals within the group stated that invasive species should be removed from areas subject to remediation. As another example, some participants suggested that ecological impacts arising from dam maintenance (e.g., keeping dams in place) or dam removal be considered. For example, EPA could add fish ladders/passage where dams remain in place or remove dams if they can be safely removed. Based on feedback received the individual participants within the group were focused on finding more protective remediation options and that MNR (Option A) was inadequate.

River Ecology

Workshop 2 • Comprehensive Guidelines
Housatonic River Public Charrette May 7, 2011

ZONE | **EXISTING CONDITIONS** | **DESIRED CONDITIONS** (Restoration Goals) | **APPLIED OPTION** | **LIKELY OUTCOMES** (3)-(8) | **SPACE** | **TIME** | **ACTIONS** | **GUIDELINES**

M O D I F I C A T I O N S (Space, Time, Actions)

Zone

- IN-WATER & BANKSIDE
- FLOODPLAIN (Includes Vernal Pools)

Existing Conditions

- PCB'S - Banks; River
- Diversity of Banks
- Erosion of Banks release PCBs
- Inedible Fish
- Not at Full potential for Flora & Fauna
- Invasive species
- Lost opportunity for fishing/use due to PCBs.
- PCBs
- Flood Storage capacity adequate in MA, poor in CT

Desired Conditions

- Removal of PCB Contamination
- Edible Fish
- Improved Diversity & #s of Fish
- Edible Flora & Fauna
  - Snails
  - Fish...
  - Should be PCB Free
  - For people and throughout Foodweb
- Maintain/Improve Ecosystem Function
- Remove Invasive species
- Woods Pond Dam
  - ⇒ Removal
  - ⇒ Keep it!
- Other Dams
  - Fish ladders
- Reproductive success for Flora & Fauna
  - Heathy, sustainable
  - Population and at individual levels
- Fishable/Edible/Swimmable
- Diversity of community functional types as influenced by:
  - Riverbanks
  - Forest
- Maintain Flood storage capacity
  - Floodplain connectivity

Options

Applied Option	Likely Outcomes	Space	Time	Actions	Guidelines
OPTION A	~~SAAF~~ cannot meet Healthy diverse habitat		500-1000 yrs		Disregard Option A
OPTION B	unclear science to foresee outcome				Strong Discomfort w/Option B
OPTION C		- Modify sequencing	modify sequence	- Consider alternative technologies - Consider phytoremediation	- Minimize impact of access road - Modify sequencing - Make C more like D
OPTION D	yes: 1	- Implement in increments - Use pilot projects - target worst areas for pilot projects (5A) - Deal with Hotspots - More selective Bank stabilization - Modify sequencing	- learn as we go - give enough time to monitor condition and measure success before moving downstream modify sequence	- Do it quickly? w/pilots - Consider alternative tech. - Consider phytoremediation - More selective bank stabilization - tradeoffs between PCBs removed from banks vs. floodplain	- adaptive management - minimize impact of access roads - Make D more like C

0

- investigate alternative tech.'s (ongoing) No local dumps
- adaptive management
- No riverside PCB deposits left after remedy
- Use trains not trucks
- Extend timeframe for monitoring (ongoing)
- Continuing opportunities for public input

OVERARCHING GUIDELINES

- Fish passage
- Control invassive species
- Long-term monitoring
- Consider dams/dam removal
- Consider opportunities for improving ecological conditions

3.11.4.4 River Ecology (Group 2) Summary + Guidelines Worksheet

Participants in this workshop represented a diverse group of community, citizen, and state agency representatives that led to some robust discussions and thoughtful input. The attendees spent considerable time developing their responses to the two types of "current conditions" that it would prioritize in its assessment. Discussions focused on three conditions:

- That fish and wildlife are currently impacted;
- That there were consumption restrictions placed on the community along with impacts to human health; and
- That contaminated sediments are resuspended and transported either downstream or onto the floodplains with each new high-flow event.

By clarifying these defined "current conditions," the group was able to focus on "desired conditions."

Extensive group discussions in this workshop on selected outcomes and perhaps on how to get there prevented participants from addressing all of the questions for this workshop or defining "guidelines" for each option. On the other hand, the robust discussion allowed participants to very successfully meet the workshop's goals in a different way. Specifically, the group developed—a series of global guidelines or "approaches"—that should be applied for any remedy selected.

Principal elements of the discussions and guidelines or approaches included the following:

- That Connecticut needs to be better included in both remedy actions and public awareness;
- That a surgical approach to the cleanup is much more preferable to a gross treatment;
- That each habitat should be individually evaluated and treated versus a large-scale restoration of the entire, affected area; and
- That *in situ* destruction technologies should be given a first priority over removal options.

Participants also suggested that key components of any and all future plans, especially for long-term monitoring, should include more and better inter-agency coordination and transparency as well as more public outreach and awareness.

Participants strongly suggested that adaptive management needs to be a part of any guidelines for whatever remedy is selected.

River Ecology

GROUP 2 – Keith & Rich

Workshop 2 • Comprehensive Guildelines
Housatonic River Public Charrette May 7, 2011

ZONE: IN-WATER & BANKSIDE / FLOODPLAIN

EXISTING CONDITIONS	DESIRED CONDITIONS
F&W Impacted	Healthy & Diverse Species
Species Consump. Restrict. & HH Impacts	Safe level of consumption; river use & Agriculture
Resuspen. of Contamin. Sed. During Storms	Uncont. sed. resusp. from Storms & monitoring after events

APPLIED OPTION	LIKELY OUTCOMES	SPACE (MODIFICATIONS)	TIME (MODIFICATIONS)	ACTIONS (MODIFICATIONS)	GUIDELINES
OPTION A	F& W Are impacted in perpetuity			Clear defin. of what future monitoring is	• Public awareness of biota consump. • Include CT in actions
OPTION B	Not much difference in outcome as Option A				
OPTION C					• Eliminate all pipe outfalls to river • Better Source Control; monit.; & action thresholds
OPTION D	Is not 100% remediation of PCB				•

- ~~Surgical~~
- Surgery not butchery
- Ea. habitat should be eval. & treated individually
- Restored to full habitat diversity potential

- PCB destruct tech. should be first priority & removal to another location 2nd
- Plans to handle/monitor major events (such as storms/dam removals)
- Better intragency coord. & transparency
- No use of riprap; no armoring; no capping; no confined disp. facility
- Allow for maximum river movement

OVERARCHING GUIDELINES

* Apply Adaptive Mgmt & Innov. Tech Across Entire river & remed. (incl. pilot proj.)
- Definition of Monitoring should include regular testing, action thresholds, QA Plan & public outreach/awareness

3.11.4.5 River Uses Summary + Guidelines Worksheet

Individuals in this workshop provided feedback indicating they were engaged and that the session was productive and useful. This session included many individuals who indicated that their main interest was either in boating on the river or fishing. To start, individuals generated a list of existing conditions. This was followed by a brainstorming session to generate desired conditions. In light of the time constraints of the workshop, desired conditions 1-6 were run through the remaining process. In the end, some concerns that individuals mentioned were captured, as well as some guidelines. The overarching concerns included the following:

- From Desired Condition 4: Preserve contiguous riparian habitat (because construction disturbs contiguity)
- From Desired Condition 5: Concern that Silver Lake could be a continuing source of PCBs
- From all six desired conditions that were discussed: 1) Is there technology to minimize and/or restore the impacts of construction? and 2) Is there a commitment to take the necessary steps to minimize impacts and fully restore habitat post-construction?

The overarching guidelines included the following:

- Remove invasive species
- Remove trash
- Isolate or remove PCBs in the recreational areas
- Minimize riprap (use alternatives where possible)
- Minimize redeposition
- Include actions to improve contiguous habitat.

DANS

River Uses

Workshop 2 • Comprehensive Guidelines
Housatonic River Public Charrette May 7, 2011

ZONE	EXISTING CONDITIONS	DESIRED CONDITIONS	APPLIED OPTION	LIKELY OUTCOMES	SPACE	TIME	ACTIONS	~~GUIDELINES~~ Concerns
					MODIFICATIONS			

IN-WATER & BANKSIDE / **FLOODPLAIN**

EXISTING CONDITIONS

- Dynamic Sport Fishery
- Un-Swimmable
- Smells (at times)
- Fragmented River Habitat
- Canoeing
- Habitat Along the rivers supports many species
- Undeveloped meandering river with conservation set asides
- Quiet & Solitude
- ~~Trash~~
- Inedible Fish
- Increased Pickeral Grass
- Many Invasive Species

DESIRED CONDITIONS

1. Keep River Beautiful
2. Swimmable
3. Pollution Perception Issues
4. Contiguous Habitat
5. Fish Consumption
6. Peace & Solitude
7. Non Essential Dam Removal
8. More Public Access
9. Edible Ducks
10. Reintroduce Native Species
11. Excavate/Design Dams for deeper ponds
12. Source to Sound canoeing (Portage)
13. Pickable
14. Desirable Riverfront
15. ~~Ecological~~ Balance ecological & economic needs

APPLIED OPTION	LIKELY OUTCOMES
OPTION A 1 - Keep River Beautiful 2 - Swimmable 3 - Pollution Perception Issues 4 - Contiguous Habitat 5 - Fish Consumption 6 - Peace & Solitude	1 Yes 2 No 3 No 4 Maybe 5 No 6 Maybe
OPTION B 1 2 3 4 5 6	1 ? 2 Probably Not 3 Probably Not 4 ? 5 No 6 Yes for some / No for some
OPTION C 1 2 3 4 5 6	1 ? 2 Yes 3 Sort of and Yes 4 ? 5 Closer 6 Maybe
OPTION D 1 2 3 4 5 6	1 ? 2 Yes 3 Best Option 4 ? 5 Closer 6 It Depends

Concerns

4. Preserve contiguous riparian Habitat; construction disturbs habitat)
5. Concern that Silver lake could ~~contaminate~~ be a source

All – Concern of construction on rivers
1. Is there technology to minimize or restore post-construction
2. Is there a commitment to take the necessary steps to minimize impact and fully restore post construction

Overarching Guidelines

- Remove Invasive Species
- Trash Removal
- Isolate or Remove PCBs in recreational Area
- Minimize Rip Rap (use alternatives where possible)

OVERARCHING GUIDELINES

- Minimize Redeposition
- Include actions to improve contiguousness

3.11.4.6 Individual Guidelines Worksheet

One participant submitted an individual Guidelines Worksheet, which follows.

River Ecology

ZONE	EXISTING CONDITIONS	DESIRED CONDITIONS	APPLIED OPTION	LIKELY OUTCOMES	SPACE	TIME	ACTIONS	GUIDELINES
					MODIFICATIONS			
IN-WATER & BANKSIDE	PCBs	-No PCBs -Natural river processes -No rip rap -healthy VP + reptiles -no stormwater run off - infiltrate	OPTION A					
			OPTION B					
	stormwater pipes sewer treatment outfalls		OPTION C					monitoring plan for — — events + superstorm, dam removal, etc.
FLOODPLAIN	VPs impacted mink trouble rare species habitat bank nesting animals		OPTION D					

micro habitats
+
ecosystems
good before + after science

OVERARCHING GUIDELINES

adaptive mgt.
real monitoring all the way thru CT
No rip rap, no capping
innovative technologies

3.12 Plenary Sessions

All Plenary Sessions were held in the main theatre of the Elayne P. Bernstein Theatre, which allowed all attendees to convene in the same space, to hear each other's general questions and comments, and to receive identical workshop instructions.

3.12.1 Morning Plenary Highlights

3.12.1.1 Welcome by Curt Spalding

Curt Spalding, EPA New England Regional Administrator, opened the Morning Plenary and the Public Charrette with a welcome to all participants and expressed his appreciation for their contributing their time and efforts to the Public Charrette. He underscored what a tragedy the pollution of the Housatonic River is and how EPA had worked for several years to study the River and to work with the community for the best way to proceed in a cleanup. He noted that EPA was sensitive to the existing habitat and how it "cannot happen" that through intended or unintended consequences the cleanup would "ruin the River to clean the River."

Mr. Spalding also conveyed how EPA's planned remedy will be reviewed by a larger team than EPA New England to ensure that the best solution and the best planning is brought to bear on the Housatonic. He also reiterated that the process was a long-term effort of years, not months, and that EPA would be engaging in a feedback process through which EPA would continue to learn and listen to the best information and ideas. Mr. Spalding offered reassurance that the input from the community at the Public Charrette was very important, as EPA would be constructing a remedy within the coming months, which would be available for public comments, with a final remedy, hopefully, by the end of the year. He pledged that, as the process went forward, EPA would not be closing its doors to the public; rather, it would continue to ask the public to tell EPA more about its concerns and ideas.

Administrator Spalding closed his remarks with his appreciation for everyone's participation in a unique and groundbreaking public engagement activity for the EPA, noting that the team that put the Mini Workshops and Public Charrette together is one of the best there is, and that he looked forward to an exciting day.

3.12.1.2 Facilitator Introduction

Kathy Poole, Public Charrette Coordinator, introduced the Agenda for the day and the primary objectives of the Morning Workshop, Afternoon Workshop, and the Poster Session. She also set the context and tone for the day by highlighting the following points:

- The Charrette Team was not there to speak for EPA or anyone else. The Charrette Team's primary job was to facilitate a healthy discussion that helped everyone's voice be heard.
- The Charrette Team would not attempt to bring participants to a consensus or to mediate (bring them to common ground). Quite the contrary, it was the plurality of voices that was of greatest interest.
- The day was designed with the objective of supporting individual ideas and voices rather than the collective opinion of groups. Although group input was important,

participants had had other opportunities to speak collectively, whereas the Public Charrette was meant to capture all opinions across the entire spectrum of positions.

- The day was designed to facilitate participants' offering EPA practical advice in as specific a manner as is appropriate at this stage in the decision process.
- The workshops were meant to be engaging and exciting but were also going to be difficult because the project itself is complex and difficult.
- The outcomes and products of all Public Charrette activities would be recorded—some in print and some in video form—and made available to the public, including a report of the public outreach activities (which this report constitutes).

Ms. Poole then introduced Workshop One • Criteria Scorecard, including the Four Representative Cleanup Options, and the 9 Criteria as specified in the Reissued RCRA Permit. After taking general questions on the Four Representative Cleanup Options and 9 Criteria, Ms. Poole directed group members to their appropriate locations for the workshops and thanked them for their attention.

3.12.2 Afternoon Plenary Highlights

With fewer than a half dozen participants joining the Public Charrette since the Morning Plenary, Charrette Coordinator Kathy Poole—with the audience's permission—skipped repeating the explanation of the Four Representative Cleanup Options, reiteration of the day's context, and similar introductory information. Instead, she proceeded directly into an introduction of Workshop 2 • Comprehensive Guidelines, which resulted in providing more time for Workshop 2 and/or allowed for an earlier conclusion to the day.

3.12.3 Closing Plenary Highlights

3.12.3.1 Next Steps

Susan Svirsky, Project Manager for the Rest of River, thanked participants and reminded them of the final opportunities of the day: reviewing all of the Worksheets from Workshop 1 and Workshop 2; further discussion with EPA's experts; and further discussion with other participants. She then outlined upcoming opportunities for public input, notably the following:

- National Remedy Review Board Meeting, in which EPA would present its proposed remedy for review, including an analysis of how EPA responded to the evaluation criteria delineated in the RCRA Permit and how EPA's proposal compares to other remedies across the country. Through citizens' groups, stakeholders would have the opportunity to submit letters of up to 20 pages for the Board to consider. Public notice would be given 6 weeks before the meeting.

- After EPA addresses the National Remedy Review Board's comments, EPA will issue a formal cleanup proposal. A Public Comment Period will follow the issuance of the proposal. During that period, EPA will be available for public outreach to explain what the proposed plan entails, listen to concerns, and gather public comments.

- The Public Comment Period and Public Hearing codifies everyone's comments, for which EPA must prepare a Responsiveness Summary to issue with its final decision.

Ms. Svirsky advised participants that www.HousatonicWorkshops.org would eventually be merged into the official EPA Website and urged citizens, if they were not already, to become subscribers to EPA's mailing list, the best way to receive information quickly and guarantee notice on all public input opportunities.

Ms. Svirsky took questions from the audience, whose queries primarily concerned public notifications and the composition of expertise on the National Remedy Review Board.

3.12.3.2 Public Commentary

Charrette Coordinator Kathy Poole thanked participants for their efforts and thorough engagement throughout the day—and throughout the many years of the project. She then asked if it had been a worthwhile use of their day, if they had learned anything new, and if it was useful to hear from their neighbors—to which most participants nodded "yes."

The four closing comments from the audience were as follows:

At Ms. Poole's thank you for participants' hearty and congenial participation, an audience member jocundly asked, "Did you expect *less* hospitality?" Ms. Poole explained that each charrette is different and that in some the dialogue is not always constructive, whereas today's groups were content-filled, collegial, and helpful. The audience member responded with the reply, "It was well organized," for which Ms. Poole thanked him.

An audience member asked, "Are you disappointed at the empty chairs?" to which Ms. Poole answered emphatically, "No. Not at all," and explained that EPA had made plans for comfortably accommodating a maximum of 125 while ensuring that the workshop groups remained small so that everyone could speak; these plans were in place on the outside chance that this many attended. 90 registrants with 69 participants was gratifying.

One audience member offered, "I really hope that this will be taken to other EPA Regions and other communities will get the benefit because it's very helpful to have EPA in the same room with the community and really listening to what the communities have to say because at the end of the day, it's the community that's left behind. Now, I can pack up my lab and go somewhere else, but it's nice to see the interaction between the community and EPA. And looking at the problem and the process which EPA has to go by to come to a conclusion. And I really hope that this gets taken to other regions and other sites and other communities and is used as a model because I think that it really would help."

An audience member who has been active in the project for decades offered his account of the day by saying, "I'd just want to say a great thank you to the EPA for doing this. It was an extraordinary exercise. And as somebody who's bothered you for many years, I've gained an incredible appreciation for what you do. So, thank you very much."

The Public Charrette adjourned to the lobby for the Reception.

Figure 31. A Portion of the Audience at the Closing Plenary.

3.13 Supporting Website

To support the Mini Workshops and Public Charrette, EPA launched a supporting website to EPA's "official" GE/Housatonic River website. This supporting website focused on and supported the Mini Workshops and Charrette.

3.13.1 Needs

A recurring message from the Situation Assessment interviews was community members' difficulty in navigating the official GE/Housatonic River website (http://www.epa.gov/region1/ge/thesite/restofriver.html). Interviewees appreciated the comprehensiveness of the Website's content (over 600 PDFs, including fact sheets, reports, letters, public comments, project images, and informational maps) but at the same time, found that content overwhelming. As the Situation Assessment underscored, the public had considerable confusion over what work had been undertaken by EPA and others to assist stakeholders' assessment of GE's Revised Corrective Measures Study and to inform EPA's cleanup decision. Although the reports and responses were available on the official website, their relevance was unclear.

Another stakeholder need that the Situation Assessment revealed was the public's desire for clear and concise explanations of the extensive and highly technical data in the studies produced by EPA, GE, and others. In particular, they wanted to ask specific questions and receive specific answers. Finally, stakeholders felt the EPA Website was difficult to navigate and were unable to keep abreast of new developments and upcoming events.

3.13.2 EPA Response

While EPA has endeavored to respond constructively to communication obstacles that stakeholders had identified, EPA determined that revamping the GE/Housatonic River website was not a viable option, due primarily to two aspects. First, the website had been operating within a known structure for many years, and reconfiguring it might lead to more confusion than clarity. Second, when the comments from the Situation Assessment were received, EPA was developing plans for the public outreach efforts of the Mini Workshops and Public Charrette that were to occur in one month and two months, respectively. One of EPA's goals for these events was to notify and engage as many participants as possible, which a more effective contact tool would support. Furthermore, EPA plans for the Mini Workshops included responding as quickly as possible to specific, technical questions that citizens posed during each of the three Mini Workshops, which a more direct and easily accessible venue than the GE/Housatonic River website.

Consequently, EPA determined that a sensible and effective solution was to create a user-friendly website that complemented the official website, was limited in content, and focused on the Mini Workshops and Public Charrette. The URL of that website is/was www.HousatonicWorkshops.org.

Because the content of the new website had been reduced to Rest of River project essentials, the site functioned as a "one-stop shop" for citizens, allowing them to satisfy, with relative ease, a number of concerns:

- To understand exactly where the project stood in its development process—in terms of both schedule and responsibility
- To identify specific and current opportunities for stakeholder input in the process
- To understand what studies had been completed and which documents were essential
- To find answers to important issues and questions.

Several other Supporting Website functions warrant underscoring:

- The Website provided easy access for citizens to technical experts' answers to their submitted questions (as well as those of fellow citizens), a public forum mechanism through which EPA could provide, via its technical experts, clear and direct answers to the 196 questions posed at the Mini Workshops by participants—which until the launch of www.HousatonicWorkshops.org neither the "official" Rest of River Website nor EPA's public engagement efforts had a mechanism to support.
- In preparation for the Mini Workshops and Public Charrette, the site functioned as an easy, on-line signup for all of the events.
- For each Mini Workshop, users could review ahead of time the full roster of speakers (and their biographical summaries) and the specific subjects that each speaker would be addressing.
- For each Mini Workshop, users could download the full Workbook (descriptive handouts of the evening's presentations) as early as the day after the Workshop.
- For each Mini Workshop, users could view a video of the entire evening's events, including all presentations and the Q & A session.
- For the Public Charrette, users could download the Workbook as well as view a synopsis video of the day's events.

3.13.3 Site Map

The full site map with brief component descriptions of www.HousatonicWorkshops.org follows. Full descriptions of Mini Workshops and Public Charrette components may be found in the preceding sections, "Public Outreach Component 3 • Mini Workshops" and "Public Outreach Component 4 • Public Charrette."

Welcome	Brief description of purpose of Website; link to Workshop and/or Public Charrette registration	
Workshops	Overview of purposes of Workshops and their themes; links to each Workshop's Agenda	
	Workshop 1	Agenda, including presenter names, affiliations, and titles of presentations
	Workshop 2	Agenda, including presenter names, affiliations, and titles of presentations
	Workshop 3	Agenda, including presenter names, affiliations, and titles of presentations
	Public Charrette	Agenda, including activities descriptions and timetable
	Handouts & Materials	List of available materials for each Workshop and Public Charrette: links to downloadable PDFs
	Videos	List of available videos for each Workshop and Public Charrette; links to streamed videos
	Bios	Brief biographies for major Mini Workshop and Public Charrette participants
Calendar	List of Mini Workshop and Public Charrette, including times and locations; links to location and agenda for each event	
	Location	Venue details; link to venue Website
	Other Public Meetings	List of upcoming public meetings (if available/ applicable)
Background	Description of purpose of public engagement efforts associated with Situation Assessment, Mini Workshops, and Public Charrette and current status of cleanup decision process	
	Consent Decree	Brief description of the Consent Decree and what it means
	Fact Sheets	List of available Rest of River Fact Sheets prepared by EPA; links to documents available for download • PCB Fact Sheet • EPA Community Update Fact Sheet • Ecological Risk Assessment Fact Sheet • Human Health Fact Sheet • EPA Requires GE to Revise Its Corrective Measures Study • Corrective Measures Study Fact Sheet • Corrective Measures Study Process Fact Sheet • EPA's Cleanup Decision Process • Cleanup Alternatives in the Revised CMS
	Project Reports	List of available reports directly relevant to the Rest of River cleanup; links to documents available on Rest of River Website • Cleanup Agreements (link to PDF) • EPA's Ecological Risk Assessment (link to PDF) • EPA's Human Health Risk Assessment (link to PDF) • EPA's Modeling Reports (link to PDF) • GE's Corrective Measures Study Reports (link to PDF) • GE's Corrective Measures Study Proposal Reports (link to PDF) • GE's Interim Media Protection Goals Proposal Report (link to PDF) • GE's RCRA Facility Investigation Report (link to PDF)
	Maps & Figures	Link to documents available on Rest of River Website

Q&A	Description of Q&A process associated with Mini Workshops; links to Mini Workshop tables of contents by Workshop	
	Mini Workshop One	List of Workshop One presentation titles and presenters; links to questions and answers, organized by presentation Presentation One Questions and Answers (5 questions) Presentation Two Questions and Answers (11 questions) Presentation Three Questions and Answers (9 questions) Presentation Four Questions and Answers (21 questions)
	Mini Workshop Two	List of Workshop Two presentation titles and presenters; links to questions and answers, organized by presentation Presentation One Questions and Answers (21 questions) Presentation Two Questions and Answers (41 questions) Presentation Three Questions and Answers (17 questions) Presentation Four Questions and Answers (7 questions)
	Mini Workshop Three	List of Workshop Three presentation titles and presenters; links to questions and answers, organized by presentation Presentation One Questions and Answers (16 questions) Presentation Two Questions and Answers (14 questions) Presentation Three Questions and Answers (16 questions) Presentation Four Questions and Answers (18 questions)
Contact Us	Link to email contact form	

WEB PAGES FOR WWW.HOUSATONICWORKSHOPS.ORG
(AS OF SEPTEMBER 2011)

US Environmental Protection Agency

Housatonic River Workshops

Welcome!

The U.S. Environmental Protection Agency (EPA) recognizes the importance of having substantial participation from the Berkshire community in helping to shape the decisions regarding what could be done with the "Rest of River." This website is part of a public engagement and outreach program designed to fulfill that recognition.

EPA brought in Certus Strategies, a firm specializing in public outreach and consultation, to conduct assessment interviews of the needs and concerns of public stakeholders in Western Massachusetts and Northwestern Connecticut - with a focus on Berkshire County - relating to the next steps for the Rest of River. EPA asked Certus to interview stakeholders to identify core interests and concerns, and provide EPA their views about the cleanup efforts and how best to involve the Berkshire community.

As a result of Certus' assessment interviews, EPA has sponsored three evening Mini Workshops and a full day Public Charrette, which are described on the **Workshops page**. This website has been created by EPA to make information more easily available to the public so that the Berkshire community can fully engage in the Workshops and contribute to EPA's ongoing analysis of the Rest of River.

In addition to this website, additional background and technical information about the Housatonic River cleanup, including Rest of River issues, is available on the EPA's GE-Housatonic River Site **webpage**.

US Environmental Protection Agency

Housatonic River Workshops

Welcome
Workshops
Session 1
Session 2
Session 3
Charrette
Handouts & Materials
Videos
Bios
Calendar
Background
Q & A
Contact Us

You are here: Workshops Home » Workshops

Why Mini Workshops?

Mini Workshops featured technical experts who have been working for years to study, analyze, and are working to devise the best approach to clean and restore the Rest of River. Although primarily informational, the Mini Workshops provided the community with opportunities to pose written questions to the panels.

The Mini Workshops focused as follows:

- **Day One** emphasized the history of the Housatonic River - its geomorphology, its ecological characteristics, and characteristics of PCBs.
- **Day Two** focused on PCB distribution and transport, human health risks, ecological risks, and effective modeling of PCBs in the River.
- **Day Three** focused on remediation technologies, restoration techniques, alternative technologies, and Environmentally Sensible Remediation Concepts.

The Mini Workshops were held the evenings of April 5th, 6th, and 7th, 2011, from 5:30 - 8:30 pm, at

Founder's Theater at **Shakespeare & Co.**
70 Kemble Street
Lenox, MA 01240

Why a Charrette?

The Public Charrette was a Practical, Hands-On Workshop for the Community to Better Understand the "Rest of River" Issues, to Explore the Pros and Cons of the Proposed Alternatives, and for the EPA to Hear the Community's Ideas.

The Charrette provided the community with a direct experience and in-depth understanding of the alternatives, trade-offs, and the intricacies involved in deciding how to proceed with the Rest of River.

- Welcome
- Workshops
  - **Session 1**
  - Session 2
  - Session 3
  - Charrette
  - Handouts & Materials
  - Videos
  - Bios
- Calendar
- Background
- Q & A

You are here: Workshops Home » **Workshops** » Session 1

Session One - *Why Working with River Processes Matters:* *Housatonic History, Ecology, and PCBs*

- Welcome by US EPA
- Panelists Introduction by Steve Shapiro, Certus Strategies
- History of the River by John Field, Field Geology Services and Richard DiNitto, The Isosceles Group
- Geomorphology/River Processes by David Bidelspach and George Athanasakes with Stantec Consulting Inc and Keith Bowers, Biohabitats Inc.
- Ecological Characterization by John Lortie, Stantec Consulting Inc.
- PCBs by Richard McGrath, The Isosceles Group

US Environmental Protection Agency

Housatonic River Workshops

Session Two - *Getting the Facts on PCBs:*
Human Health Risks, Ecological Risks, and PCBs in the Housatonic River

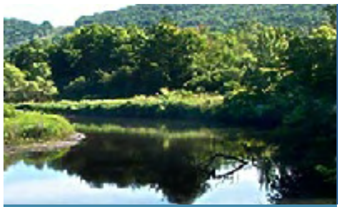
- Welcome by US EPA
- Panelists Introduction by Steve Shapiro, Certus Strategies
- PCB Distribution, Fate & Transport by Edward Garland, HDR HydroQual
- Human Health Risks by Donna Vorhees, Science Collaborative
- Ecological Risks by Gary Lawrence, Golder Associates
- Modeling by Mark Velleux, HRD HydroQual

US Environmental Protection Agency

Housatonic River Workshops

Session Three - *Exploring Alternatives for Cleanup:*
Remediation, Restoration, Alternative Technologies, and Environmentally Sensible Remediation Concepts

- Welcome by US EPA
- Panelists Introduction by Steve Shapiro, Certus Strategies
- Remediation Technologies and Techniques by Michael Palermo, Mike Palermo Consulting Inc
- Restoration Techniques by Keith Bowers, Biohabitats Inc
- Alternatives and Technologies Robert Cianciarulo, US EPA
- Environmentally Sensible Remediation Concepts by Susan Svirsky, US EPA



Welcome
Workshops
Session 1
Session 2
Session 3
Charrette
Handouts & Materials
Videos
Bios
Calendar
Background
Q & A
Contact Us

You are here: Workshops Home » Workshops » Charrette

Charrette Agenda

- **8:30 - 9:00 Registration + Coffee - Poster Session Tour**
- **9:00 - 10:15 PLENARY A - Bernstein Theatre**
  Welcome by Curt Spalding-EPA New England Regional Administrator
  Introduction of Workshop 1 - Criteria Scorecard
- **10:15 - 10:30** Break + Move to assigned Workshop 1 Groups according to name tag color and symbol
- **10:30 - 12:00 Workshop 1 - Permit Scorecard - Meeting the Criteria**
  A facilitated group activity in which participants work through the process of applying the decision criteria required by the Consent Decree to a range of cleanup alternatives
- **12:00 - 2:00 Poster Session - Lunch**
  - A wide-ranging display of technical information from EPA's "Rest of River" studies, practical tools relevant to cleanup, and an opportunity to directly engage EPA's experts
  - Lunch
- **2:00 - 2:45 PLENARY B - Bernstein Theatre**
  - Workshop 1 Group Reports
  - Introduction of Workshop 2
  - Comprehensive Guidelines
- **2:45 - 2:55** Break + Move to Workshop 2 groups
- **2:55 - 4:30 Workshop 2 - Comprehensive Guidelines**
  A facilitated group activity in which participants tackle the issues from the community's perspective, apply the understandings of Workshop 1, and craft a set of guidelines for EPA to consider in its decision
- **4:30 - 4:40** Move to Closing Plenary
- **4:40 - 5:30 PLENARY C - Bernstein Theatre**
  - Workshop 2 Group Reports
  - Moving Forward
  - Thank you
- **5:30 Reception + Further Conversation with EPA's Experts**

US Environmental Protection Agency

Housatonic River Workshops

- Welcome
- Workshops
  - Session 1
  - Session 2
  - Session 3
  - Charrette
  - **Handouts & Materials**
  - Videos
  - Bios
- Calendar
- Background
- Q & A
- Contact Us

You are here: **Workshops Home** » **Workshops** » Handouts & Materials

Mini Workshop Handouts and Materials

Mini Workshop 1 (April 5th) Presentation

- **Workbook Mini Workshop Day 1**
- **Welcome and Introduction - EPA's Public Outreach and Decision Making Criteria**
- **History of the Housatonic River**
- **Geomorphology-River Processes**
- **Ecological Characterization**
- **What are PCBs and how do they behave in the environment**

Mini Workshop 2 (April 6th) Presentation

- **Workbook Mini Workshop Day 2**
- **Welcome and Introduction - EPA's Public Outreach and Decision Making Criteria**
- **PCB Distribution, Fate, and Transport**
- **Human Health Risk Assessment**
- **Ecological Risk Assessment**
- **Why Use Models for the Housatonic River**

Mini Workshop 3 (April 7th) Presentation

- **Workbook Mini Workshop Day 3**
- **Welcome and Introduction - EPA's Public Outreach and Decision Making Criteria**
- **Remediation Technologies**
- **Ecological Restoration**
- **Alternatives and Technologies**
- **Environmentally Sensible Remediation**

Charrette (May 7th)

- **Charrette Workbook**
- **Morning Plenary Presentation Slides**
- **Workshop 1 - Criteria Scorecards**
  - **Criteria Scorecard Worksheet for Group 1**
  - **Criteria Scorecard Worksheet for Group 2**
  - **Criteria Scorecard Worksheet for Group 3**
  - **Criteria Scorecard Worksheet for Group 4**

- **Individual/Citizen Scorecard Worksheet for Group 4**
- **Individual/Citizen Scorecard Worksheet for Group 4**
- **Criteria Scorecard Worksheet for Group 5**
- **Individual/Citizen Scorecard Worksheet for Group 5**
- **Individual/Citizen Scorecard Worksheet for Group 5**
- **Individual/Citizen Scorecard Worksheet for Group 5**
- **Individual/Citizen Scorecard Worksheet for Group 5**

- **Workshop 2 - Comprehensive Guidelines Worksheets**
  - **Community Life**
  - **River Aesthetics**
  - **River Ecology**
    - **Group 1**
    - **Group 2**
    - **Individual/Citizen Worksheet**
  - **River Uses**
- **Metrics for Four Options**
- **Posters**
  - **Ecological Characterization**
  - **Ecological Restoration**
  - **Ecological Risk**
  - **Geomorphology and River Processes**
  - **History of the River**
  - **Human Health Risks**
  - **PCB Distribution, Fate, & Transport in the Environment**
  - **Remediation Technologies and Techniques**
  - **Stream Table Demonstration**
  - **Using GIS to Understand Remedial Alternatives**
  - **What are PCBs and How do They Behave in the Environment**
  - **Why Use Models for the Housatonic River**
- **Restoration Animation**

US Environmental Protection Agency

Housatonic River Workshops

- Welcome
- Workshops
  - Session 1
  - Session 2
  - Session 3
  - Charrette
  - Handouts & Materials
  - **Videos**
  - Bios
- Calendar
- Background
- Q & A
- Contact Us

You are here: **Workshops Home** » **Workshops** » Videos

Mini Workshop Videos

Day 1

- **Workshop Video Part 1 (Introduction, History of the River, and Geomorphology)**
- **Workshop Video Part 2 (Ecological Characterization and PCBs)**
- **Q & A Full Panel**

Day 2

- **Workshop Video Part 1 (Introduction, PCB Distribution, Fate, & Transport and Human Health Assessment)**
- **Workshop Video Part 2 (Ecological Risk Assessment and Why Use Models for the Housatonic River)**
- **Q & A Full Panel**

Day 3

- **Workshop Video Part 1 (Introduction, Remediation Technologies, and Ecological Restoration)**
- **Workshop Video Part 2 (Alternatives and Technologies and Environmentally Sensible Remediation)**
- **Q & A Full Panel**

Charrette

- **Charrette**

US Environmental Protection Agency
Housatonic River Workshops

Bios of Major Participants - Housatonic River Project

- **George Athanasakes**
- **David Bidelspach**
- **Keith Bowers**
- **Bob Cianciarulo**
- **Richard DiNitto**
- **John Field**
- **Edward Garland**
- **Gary Lawrence**
- **John Lortie**
- **Richard McGrath**
- **Michael Palermo**
- **Kathy Poole**
- **Steve Shapiro**
- **Susan C. Svirsky**
- **Mark Velleux**
- **Donna Vorhees**

US Environmental Protection Agency

Housatonic River Workshops

J. George Athanasakes, P.E.
Ecosystem Restoration Services Manager
Stantec Consulting Services, Inc.
Louisville, KY

George Athanasakes leads the Ecosystem Restoration Group for Stantec, Inc. He has a diverse background which includes civil engineering, stream restoration, wetland restoration, and watershed planning. For the Housatonic River Project, Mr. Athanasakes provides review of GE submittals and proposed remedial alternatives with particular emphasis on habitat restoration following remediation.

Mr. Athanasakes completed his first stream restoration project nearly 20 years ago and has served as the Project Manager and/or Design Engineer on over 100 stream restoration and assessment projects incorporating natural channel design principles and soil bioengineering techniques. His involvement with these projects has included conceptual level planning, preliminary and final design, permitting, assistance during construction, and post-construction monitoring. Mr. Athanasakes has also helped to bring innovation to the field of stream restoration by leading the development of the RIVERMorph software, which is the industry standard for software providing a tool for stream assessment, monitoring and Natural Channel Design throughout the United States and internationally. Because of his his broad stream restoration experience, Mr. Athanasakes has instructed several stream restoration training workshops and has presented at many national conferences on the subject. In addition, he has authored a number of technical papers on the subject of stream restoration.

David A. Bidelspach, P.E.
Stream Restoration Specialist
Stantec Consulting Services, Inc.
Raleigh, NC

Dave Bidelspach is an environmental engineer with 10 years of experience designing and constructing river restoration projects. He has been recognized for the development of a 3D design process that allows the rapid evaluation of numerous iterations to optimize the designs for river restoration, and has piloted the use of Survey Grade GPS equipment to lower the costs associated with pre- and post-construction surveys. Mr. Bidelspach has worked hand-in-hand with contractors to couple his 3D designs with GPS-enabled construction equipment to speed the construction process and insure the right outcome, and has been responsible for the development and application of several new in-stream structures which have proven to be robust yet easy to construct.

As one of the few stream restoration designers who has actually operated equipment and constructed restoration projects, Mr. Bidelspach is known for producing accurate estimates and designs that are both constructible and have long-term stability and effectiveness. For the Housatonic River Project, Mr. Bidelspach has conducted the detailed study of river bank stability and erodability from the Confluence to Woods Pond Dam. He is reviewing and evaluating proposed remedial options with regard to restoration and geomorphic stability issues.

US Environmental Protection Agency

Housatonic River Workshops

Keith Bowers, RLA, PWS
President and Founder
Biohabitats, Inc.
North Charleston, SC

Mr. Keith Bowers is the President and Founder of Biohabitats, Inc., one of the premier firms specializing in environmental restoration, conservation planning and regenerative design. He is an internationally recognized landscape architect who has planned, designed, and managed the construction of over 200 ecological restoration projects throughout the United States. Mr. Bowers also teaches ecological restoration seminars and workshops and participates on numerous industry panels. He is currently serving as Chairman of the Board for the Society for Ecological Restoration International. For the Housatonic River Project, he has a lead role in evaluating remedial alternatives with respect to their ecological restoration components, and provides senior level expertise in the feasibility and expected effectiveness of proposed restoration plans and techniques. He also assists in community outreach and meeting facilitation.

Bob Cianciarulo
Chief, Massachusetts Superfund Section
Office of Site Remediation and Restoration
EPA New England

Bob Cianciarulo is Chief of the Massachusetts Superfund Section in EPA's New England Regional Office. In that capacity, he supervises a group of fourteen Remedial Project Managers (RPMs) overseeing investigation, cleanup, and monitoring of Superfund National Priorities List (NPL) sites in Massachusetts. In his over 20 years with EPA, Mr. Cianciarulo has served as a RCRA hazardous waste inspector, a project manager in both RCRA Corrective Action and in Superfund, and in the region's Brownfields program. Prior to his current position, he served as Chief of Region I's Superfund Technical Support and Site Assessment Section. Mr. Cianciarulo has a degree in Chemical Engineering from the University of Lowell (MA).

US Environmental Protection Agency

Housatonic River Workshops

Richard G. DiNitto
Principal/Co-Owner
The Isosceles Group, Inc.
Boston, MA

Mr. DiNitto is a Principal of The Isosceles Group of Boston, Massachusetts with more than 30 years of environmental consulting experience. During the past 11 years, Mr. DiNitto has been working on the GE/Housatonic River Rest of River Site in several roles: as a Project Hydrogeologist and Geomorphologist, Site Assessment Analyst, Chemical Fate and Transport Scientist, Public Communications Specialist, and as a Project Coordinator. Mr. DiNitto has been one of the principal investigators in determining the nature and extent of PCB contamination at the site. He worked with the modeling and risk assessment teams to evaluate the data in conjunction with fate and transport mechanisms and human and ecological exposures. He also assisted in the coordination of a variety of subcontractors and their efforts, primarily the fate and transport modeling using HSPF, EFDC, and FCM. Recently, Mr. DiNitto has been involved with the historical land use analyses associated with the Housatonic River valley and its influence on fate and transport characteristics.

Mr. DiNitto's 30 years of experience includes environmental multi-media assessments and remediation of contaminated sediments, riverine and groundwater systems. He has completed more than 1000 environmental assessment projects across the United States and internationally, and has successfully managed several environmental, engineering and energy-related consulting firms.

US Environmental Protection Agency

Housatonic River Workshops

John J. Field, Ph.D.
Field Geology Services
Farmington, ME

Dr. John Field is a fluvial geomorphologist and hydrologist with 25 years of experience specializing in assessments of stability and habitat conditions of rivers and streams, identifying restoration strategies at the watershed scale, and evaluating results to ensure improvements to channel stability and aquatic habitat are sustainable. For the Housatonic River Project, Dr. Field provided historical analysis and interpretation of shifts in the morphology of the Housatonic River over time and is reviewing proposed remedial alternatives for their effects on river geomorphology and long-term stability.

During eight years as a university professor, Dr. Field was active in training teachers and government agency personnel on techniques for the practical application of river morphology. His research has included previous work in Massachusetts, including an erosion control study of Turners Falls Pool on the Connecticut River, an assessment of causes for channel instability on the Sawmill River in Montague, and the design for a bank stabilization project on the South River in Ashfield. Dr. Field's research on flooding and habitat issues both in the United States and internationally has been published in numerous peer-reviewed scientific publications and presented at professional conferences.

- Welcome
- Workshops
  - Session 1
  - Session 2
  - Session 3
  - Charrette
  - Handouts & Materials
  - Videos
  - **Bios**
- Calendar
- Background
- Q & A
- Contact Us

You are here: **Workshops Home** » **Workshops** » **Bios** » Edward J. Garland

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 calibrating, validating, and applying 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.

- Welcome
- Workshops
  - Session 1
  - Session 2
  - Session 3
  - Charrette
  - Handouts & Materials
  - Videos
  - **Bios**
- Calendar
- Background
- Q & A
- Contact Us

You are here: **Workshops Home** » **Workshops** » **Bios** » Gary Lawrence

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.

US Environmental Protection Agency

Housatonic River Workshops

John Lortie
Vice President
Stantec Consulting Services, Inc.
Topsham, ME

John Lortie is a Professional Wetland Scientist, a Certified Wildlife Biologist, an accomplished botanist, and an experienced ecological risk assessor. He has directed numerous projects involving complex environmental regulations at hazardous waste sites and marine facilities, and has taught short courses at international environmental conferences on ecological risk assessment protocols, field methods, and restoration design. For the Housatonic River Project, Mr. Lortie serves as the lead ecologist for the G.E./Housatonic River Site Ecological Risk Assessment, with particular responsibility for the Ecological Characterization and in evaluating risks to amphibians. In his previous position as President of Woodlot Alternatives, Inc. (now part of Stantec), Mr. Lortie was responsible for many aspects of the site investigations, including the field studies program, and was the lead investigator for the Ecological Characterization of the site.

In addition to managing significant habitat restoration projects and ecological risk projects, he has also led large-scale ecological inventories to search for rare animals and plants, directed coastal migratory bird studies, and evaluated complex natural communities throughout the northern Atlantic region. A former National Wildlife Refuge manager, he also offers special expertise in migratory bird studies. As a Professional Wetland Scientist, Mr. Lortie also specializes in interpretation of wetland regulations, and wetland identification, evaluation, mitigation and restoration.

US Environmental Protection Agency

Housatonic River Workshops

Richard A. McGrath
Principal/Co-Owner
The Isosceles Group, Inc.
Boston, MA

Dick McGrath is an aquatic ecologist with 40 years of experience conducting and managing research in oceans, estuaries, and rivers. He has served as the Technical Director for the Rest of River Investigations for the last 10 years and, for 2 years prior to that, was the Quality Assurance Manager. In addition to his continuing wide-ranging technical oversight and coordination responsibilities on the project, he also provides specialized expertise in PCB analysis and biogeochemistry and has provided assistance to EPA on of many of the technical documents presenting the results of the studies conducted on the project.

Mr. McGrath specializes in the assessment and remediation of contaminated sediments, particularly sediments contaminated with PCBs and other organic compounds. In his career, he has been a Vice President and/or General Manager for three large international consulting organizations, and has conducted investigations of contaminated sediments on all three coasts of the United States as well as in the Great Lakes. He has authored, edited, and reviewed hundreds of scientific papers, reports, and other documents and has been an invited participant at national and international technical conferences. He has also been an invited participant on the PBS NOVA television series, discussing his work on PCB-contaminated sediments in New Bedford Harbor.

Michael R. Palermo, Ph.D., P.E.
President
Mike Palermo Consulting, Inc.
Durham, NC

Dr. Mike Palermo is a consulting engineer with extensive internationally recognized experience in dredged material management and contaminated sediment remediation. For the majority of his career, Dr. Palermo served with the U.S. Army Corps of Engineers as a Research Civil Engineer and Director of the Center for Contaminated Sediments at the Engineer Research and Development Center (ERDC) at the Waterways Experiment Station (WES), where he managed and conducted both research and applied studies for the USACE, EPA, DOJ, NOAA, U.S. Navy, and others. He also managed the WES/ERDC research focus area for contaminated sediments. Since entering private practice in 2003, he has provided design services and technical review and oversight for clients, both in the U.S. and abroad, on a wide range of sediment remediation and navigation projects involving contaminated sediments including sediment mega-sites such as the Hudson River, Housatonic River, Fox River, Portland Harbor, and Onondaga Lake. In his role on the Housatonic River Project Dr. Palermo serves as Senior Reviewer and technical resource for issues related to sediment dredging, capping, and dredged material management.

Dr. Palermo is a Registered Professional Engineer and a member of the Western Dredging Association (WEDA), International Navigation Association (PIANC), and American Society of Civil Engineers (ASCE). He has served on the adjunct faculty at Texas A&M University and Mississippi State University and is also Associate Editor for the WEDA Journal of Dredging Engineering. He has authored numerous publications in the area of dredging and dredged material disposal technology and remediation of contaminated sediments. He is a lead author of USACE, EPA, and international guidance documents pertaining to contaminated sediments, including the USEPA 1998 Guidance for In-Situ Subaqueous Capping of Contaminated Sediment, USEPA 2005 Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, and the USACE/USEPA 2008 Technical Guidelines for Environmental Dredging of Contaminated Sediments.

US Environmental Protection Agency

Housatonic River Workshops

Kathy Poole, RLA, LEED AP
Principal
Poole Design, LLC
Baltimore, MD

Kathy Poole is Principal of Poole Design, a firm specializing in Landscape Architecture, Urban Design, and Ecological Infrastructure. For the Housatonic River Project, she assists EPA in developing community outreach programs. Through her 25 years of collegiate teaching and professional practice, she has developed a national reputation for integrating ecology and design toward projects that both regenerate ecological systems and connect people to landscapes in engaging and beautiful ways. Her many successful environmental design projects include a range of scales, from public plazas of a few hundred square feet, to new communities of hundreds of acres, to master plans encompassing thousands of acres. She completed her undergraduate architecture degree at Clemson University and was awarded her Master of Landscape Architecture degree at Harvard University with distinction and garnering the university's top awards. She has published several book chapters and over a dozen articles, and her work has been exhibited across the nation. A popular speaker, Ms. Poole has keynoted conferences both at home and abroad. These skills, combined with her 10 years of experience as an academic, result in her often being called upon to lead public forums, working sessions, and charrettes, and to lead mediations between private citizens and public or corporate entities.

US Environmental Protection Agency

Housatonic River Workshops

You are here: Workshops Home » **Workshops** » **Bios** » Steven A. Shapiro

Steven A. Shapiro, J.D.
Partner
Certus Strategies, U.S., LLC
Rockville, MD

Steve Shapiro, a partner of Certus Strategies, has 25 years experience working with diverse groups including landowners, industry, government (State and Federal), energy companies and others, in the area of large multi-party facilitation/mediation. For the Housatonic River Project, Mr. Shapiro provides senior-level support in the areas of public outreach and dispute resolution. He will also facilitate the upcoming visioning workshops.

Mr. Shapiro served as the Alternative Dispute Resolution Specialist for the Federal Energy Regulatory Commission, resolving many matters of stakeholder and public concerns. He organized the community/stakeholders in the Augusta Canal 401 Water Certification Process, working with local industry, NOAA, environmental officials from Georgia and South Carolina, and a power producer. On that project, he met with and interviewed all stakeholders and designed a multi-party mediation process that enabled full participation by all members of the community. Mr. Shapiro also trained Commission staff in how to interact effectively when working with the public. He also recently concluded a large multi-party facilitation in the Albany area of New York State, with over 40 parties that included municipal governments, consumer advocates, the State utility commission, energy suppliers and transmission owners.

- Welcome
- Workshops
  - Session 1
  - Session 2
  - Session 3
  - Charrette
  - Handouts & Materials
  - Videos
  - **Bios**
- Calendar
- Background
- Q & A
- Contact Us

You are here: **Workshops Home** » **Workshops** » **Bios** »Susan C. Svirsky

Susan C. Svirsky
EPA Project Manager
Rest of River

Ms. Svirsky has worked with EPA for over 30 years in many different capacities. She graduated with a degree in Wildlife Ecology from the University of Maine and subsequently worked for Maine Inland Fisheries and Wildlife. From there, she began her career at EPA in the Water Quality Monitoring Program in Washington, D.C. Upon returning to New England, she worked with EPA in various roles, including serving as the chair of the multi-agency regional Superfund Ecological Assessment Team. In this role Ms. Svirsky began her work with contaminated sediment site assessment, cleanup, and restoration, with a particular focus on PCB-contaminated sites and participated in national guidance development.

Her involvement with the GE-Housatonic River site began over 14 years ago. This involvement led to her becoming the Project Manager for Rest of River, overseeing all of the data collection, risk assessment, modeling, and Corrective Measures Study activities. In addition, Ms. Svirsky has taught sessions on ecological risk assessment and restoration of contaminated sediment sites, and has authored numerous technical papers on these issues as well as those associated with Rest of River.

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, and worked 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.

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.

Welcome
Workshops
Calendar
Location
Other Public Meetings
Background
Q & A
Contact Us

You are here: **Workshops Home** » Calendar

Mini Workshops

A series of workshops sponsored by the EPA to provide the public with more information about the "Rest of River" cleanup decision.

Mini Workshop 1: Tuesday, April 5th, 2011, 5:30-8:30pm
Why Working with River Processes Matters:
Housatonic History, Ecology, and PCBs

> Founder's Theater at **Shakespeare & Co.**
> 70 Kemble Street
> Lenox, MA 01240

Click **here** to view the Mini Workshop 1 schedule.

Mini Workshop 2: Wednesday, April 6th, 2011, 5:30-8:30pm
Getting the Facts on PCBs:
Human Health Risks, Ecological Risks, and PCBs in the Housatonic River

> Founder's Theater at **Shakespeare & Co.**
> 70 Kemble Street
> Lenox, MA 01240

Click **here** to view the Mini Workshop 2 schedule.

Mini Workshop 3: Thursday, April 7th, 2011, 5:30-8:30pm
Exploring Alternatives for Cleanup:
Remediation, Restoration, Alternatives, and Environmentally Sensible Remediation Concepts

> Founder's Theater at **Shakespeare & Co.**
> 70 Kemble Street
> Lenox, MA 01240

Click **here** to view the Mini Workshop 3 schedule.

Charrette

Public Charrette: Saturday, May 7th, 2011, 8:30am - 5:30pm
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 the EPA to Hear the Community's Ideas.

> Bernstein Theatre at **Shakespeare & Co.**
> 70 Kemble Street
> Lenox, MA 01240

Click **here** to view the Charrette agenda.

Outreach Program Purpose

Housatonic Rest of River is the term used in the Consent Decree to describe the investigation and decision making process for the Housatonic River from the confluence of the East and West Branch downstream into Connecticut. Under the terms of the Consent Decree, EPA conducted studies and investigations to support the Agency in developing Human Health and Ecological Risk Assessments and in performing a Modeling Study of the hydrodynamics, sediment transport, and PCB fate and bioaccumulation in the river. The reports from these activities underwent formal external Peer Review. Following the RCRA process outlined in the Reissued RCRA Permit (Appendix G to the Consent Decree) GE prepared a Supplemental RCRA Facility Investigation Report, and proposed interim cleanup goals for the Rest of River upon completion of the risk assessment Peer Reviews. GE submitted a proposal for evaluating cleanup alternatives and, after EPA conditional approval of this proposal, GE evaluated cleanup alternatives (corrective measures) for the Rest of River, including a no action scenario. EPA will then propose a selected alternative for public comment.

EPA is beginning its decision-making process for the cleanup of the Housatonic Rest of River. In doing so, EPA is considering the information presented in the Revised Corrective Measures Study (RCMS) submitted by GE in October of 2010, as well as public input and other information as necessary. The purpose of the RCMS was to evaluate potentially applicable technologies and 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.

There are three categories of actions being evaluated:

- Management of in-place sediment and riverbank soil (the SED alternatives),
- Management of in-place floodplain soil (the FP alternatives), and
- Treatment and disposition (TD alternatives).

These actions are evaluated against nine criteria specified in the Revised RCRA Permit. In addition, the RCMS contains GE's recommendation as to which alternative it believes best meets the criteria and objectives. GE concluded that either Monitored Natural Recovery (SED 2 and FP1) or the combination of SED 10/FP9, and onsite disposal of contaminated sediment and soil in a local landfill best met the criteria.

Now EPA is evaluating the alternatives and combinations of alternatives against the criteria to determine which cleanup plan EPA believes best meets the criteria.

EPA's consultants held a series of interviews with stakeholders over the past few months regarding their view of the process and information needs.

One of the outcomes of these interviews is this series of mini workshops and the all-day hands-on session scheduled for May 7 for stakeholders to learn and interact regarding the Rest of River cleanup. The purpose if these meetings are to

- Provide the community with -
  - an understanding of the work that EPA (and others) have done on the Rest of River
  - an understanding of how the river works and it is affected by the PCB contamination
  - an opportunity to get their questions answered
  - Result - Stakeholders have a better understanding of the issues associated with any cleanup of the Housatonic River

After public comment, EPA will finalize the corrective measure(s) to be implemented for the Rest of River. GE and/or the public may then appeal EPA's decision to the EPA Environmental Appeals Board, and then to the Federal Court of Appeals. As specified in the Consent Decree, upon completion of all appeals, the remedy that was upheld will be implemented by GE as a CERCLA action.

US Environmental Protection Agency
Housatonic River Workshops

Consent Decree

The comprehensive remediation and restoration of the GE-Pittsfield/Housatonic River Site is being performed pursuant to a court-ordered **Consent Decree**. The parties to the Decree include EPA, the U.S. Department of Justice, the Commonwealth of Massachusetts' Attorney General's Office, Executive Office of Environmental Affairs, and Department of Environmental Protection, the State of Connecticut's Attorney General's Office and Department of Environmental Protection, the U.S. Department of Interior, the National Oceanic and Atmospheric Administration, the City of Pittsfield ("City"), the Pittsfield Economic Development Authority ("PEDA"), and the General Electric Company. The Decree was approved by the U.S. District Court on October 27, 2000.

The Consent Decree provides for cleanup of the Housatonic River, the former General Electric facility, several former oxbows of the river, contaminated floodplain properties along the river, contaminated groundwater, Allendale School, Silver Lake and Unkamet Brook. The Decree also provides for recovery by the governments from GE of costs incurred in implementing the Decree cleanups, and provides for activities and funding by GE to address damage to natural resources.

In addition, a Definitive Economic Development Agreement among GE, the City, and PEDA became effective as of the entry of the Decree, and provides for economic redevelopment of the GE facility. Moreover, to facilitate successful redevelopment, on April 30, 2002, EPA entered into a Prospective Purchaser agreement with the City and PEDA to eliminate potential legal hurdles to PEDA's redevelopment.

Fact Sheets

Please Note: That clicking one of these links will open a PDF in a new window.

Rest of River Fact Sheets

- **PCB Fact Sheet**
- **EPA Community Update Fact Sheet**
- **Ecological Risk Assessment Fact Sheet**
- **Human Health Fact Sheet**
- **EPA Requires GE to Revise Its Corrective Measures Study**
- **Corrective Measures Study Fact Sheet**
- **Corrective Measures Study Process Fact Sheet**
- **EPA's Cleanup Decision Process**
- **Cleanup Alternatives in the Revised CMS**

US Environmental Protection Agency

Housatonic River Workshops

- Welcome
- Workshops
- Calendar
- Background
  - Consent Decree
  - Fact Sheets
  - **Project Reports**
  - Maps & Figures
- Q & A
- Contact Us

You are here: **Workshops Home** » **Background** » Project Reports

Project Reports

Please Note: That clicking one of these links will take you to the EPA's website in a new window.

Major Project Documents

- **Cleanup Agreements**
- **EPA's Ecological Risk Assessment**
- **EPA's Human Health Risk Assessment**
- **EPA's Modeling Reports**
- **GE's Corrective Measure Study Reports**
- **GE's Corrective Measure Proposal Study Reports**
- **GE's Interim Media Goals Proposal Report**
- **GE'S RCRA Facility Investigation Report**

US Environmental Protection Agency

Housatonic River Workshops

Maps & Figures

Click **here** to open the EPA's website in a new window and view the Rest of River - Maps/Figures.

Welcome
Workshops
Calendar
Background
Q & A
Mini Workshop One
Mini Workshop Two
Mini Workshop Three
Contact Us

You are here: **Workshops Home** » **Q & A** » Mini Workshop One

Mini Workshop One (April 5) - Why Working with River Processes Matters: History, Ecology, and PCBs

- **Presentation One: History of the River, Richard DiNitto (Presenter), The Isosceles Group and John Field, Ph.D, Field Geology Services**
- **Presentation Two: Geomorphology/River Processes, Keith Bowers (Presenter), Biohabitats Inc., and David Bidelspach and George Athanasakes with Stantec Consulting Inc.**
- **Presentation Three: Ecological Characterization, John Lortie, Stantec Consulting Inc.**
- **Presentation Four: PCBs, Richard McGrath, The Isosceles Group**

Presentation One: History of the River, Richard DiNitto (Presenter), The Isosceles Group and John Field, Ph.D, Field Geology Services

1-1-A.

Q: Why does the old history matter now?

A: Understanding the impacts to the River in the past and how the River reacted to those changes promotes a better understanding of the fluvial processes that operate within the system and how the River responds to these processes. This knowledge helps inform the remediation decision-making process now and how to better design and plan future actions.

1-1-B.

Q: How does the history of the river, man-made changes to it and its reaction to these changes, inform your remediation decisions?

A: Knowledge of the River's changes and responses to them helps us to understand how each remediation alternative may impact the River, what responses the River may have to those alternatives, and what restoration techniques may be necessary to minimize or eliminate any predicted negative responses in the River.

1-1-C.

Q: Can you anticipate how the river will change in the future?

A: We never know exactly what the River will do in the future, but from our understanding of the past history of the River and the fluvial geomorphological processes at work, we can estimate the likely changes that may occur. For example, we can estimate that certain existing meanders that have begun to cut into their banks and the adjacent floodplain may continue that process causing the River to migrate from its current location. The paths of those migrating meanders can also be estimated and if they are close to another meander, we can predict the possible creation of new cutoffs or oxbows. The studies conducted to date also help us understand where more of the energy of the River is being transferred into bank erosion and from that we can predict areas that are at risk for future bank erosion and resultant changes to the River's depth and geometry.

1-1-D.

Q: If the history of the river shows that it has been drastically modified, including clear-cutting along its banks and even has been re-routed such as in the 1940s and became the system that exists today, then won't the thorough cleaning of the river of PCBs result in a clean, swimmable and fishable river with a renewed and flourishing, ecological environment?

A: EPA believes that the history of the River, particularly its documented recovery from the extensive historical modifications such as clear-cutting and rechanneling, is testimony to the resilience and natural restorative powers of this system. This history provides compelling evidence that the River can and will recover from any remediation that may be necessary, and because the system will only be healthier without the documented stress due to PCB contamination, such recovery will likely be quicker and more complete than has been the case previously. GE's projections show that the River will not "clean itself" in more than 250 years.

1-1-E.

Q: On Slide #29 (Split Map slide comparing an area in 1886 to the same location in 1944), where is the sewage disposal area noted on the later map? What has become of it? What is there now?

A: The maps on this slide show the area of the River between Joseph Drive to the north and New Lenox Road to the south. The 1944 map shows a series of rectangular wastewater lagoons located at the east end of Utility Drive, Pittsfield. These lagoons were not present in the 1886 map shown on this slide. Today, this same area is the location of the Pittsfield wastewater treatment facility. Most of the lagoons shown on the 1944 map are no longer in use; however many still remain, with some having been backfilled. The lagoons have been replaced with aboveground wastewater treatment systems.

- Welcome
- Workshops
- Calendar
- Background
- Q & A
  - **Mini Workshop One**
  - Mini Workshop Two
  - Mini Workshop Three
- Contact Us

You are here: **Workshops Home** » **Q & A** » **Mini Workshop One** » Presentation Two

Presentation Two: Geomorphology/River Processes, Keith Bowers (Presenter), Biohabitats Inc., and David Bidelspach and George Athanasakes with Stantec Consulting Inc.

1-2-A.

Q: Has the cleanup of the 2 miles changed the stability of the river downstream?

A: No. The cleanup work associated with the 1½-Mile and ½-Mile Reaches did not substantially change the morphology of the channel, which was reconstructed as a flood control channel about 60+ years ago, nor did it result in significant changes downstream. During the period of the last of the cleanup work, an extremely large storm occurred in October 2005, with some of the highest flows ever recorded. This storm did result in changes in the downstream reaches.

1-2-B.

Q: There is no disputing that the river has been disturbed, but would you agree that it is trending towards a more natural state below the confluence, in the PSA?

A: Yes.

1-2-C.

Q: To what "reference systems" is Keith comparing the Housatonic erosion rate?

A: The reference systems used to compare the Housatonic erosion rate were extrapolated from Bank Erosion Hazard Index (BEHI) curves developed in North Carolina. The reference stream was assumed to have a BEHI corresponding to very low or low and a near bank stress index of moderate or less.

1-2-D.

Q: Explain "Much of what we see today is the result of reforestation in only the last 70+ years".

A: Historical records show that logging and/or clearing throughout the Housatonic Valley had become widespread by the 1800s. Most of the trees that we see now are a result of natural recolonization and growth since that time.

1-2-E.

Q: Why is it that "disturbance of a stream corridor typically results in an increasingly negative spiral of degradation"? Why do some changes/"disturbances" not result in positive effects?

A: All river systems are dynamic and experience naturally induced disturbances, or changes, all the time. Typically river systems adjust to these changes on a continuous basis within an overall threshold. These changes provide diversity and complexity to a river system, which certainly has a positive effect to the ecosystem. However, more severe or permanent changes to a river system can often cause a reverberating effect throughout the system. A river will recover from these changes, but may take many decades or centuries to return to a state of dynamic equilibrium.

1-2-F.

Q: How did the remediation that was done in Pittsfield affect the hydromorphology downstream and upstream?

A: Please see the response to Question 1-2-A, above.

1-2-G.

Q: Since rivers want to meander, then why don't we try to not change its behavior?

A: We do not want to interfere with the natural recovery process of the River. However, if there is an opportunity to accelerate the recovery process which will assist in the design of a potential active remedy then we should consider options to do so.

1-2-H.

Q: What is the potential impact of dredging on unstable portions of the river?

A: Dredging unstable portions of the River without addressing the instability in post dredging actions would most likely lead to continued instability in the stretch being dredged and could potentially perpetuate instability in both upstream and downstream stretches of the River.

1-2-I.

Q: Does reforestation stabilize the river edges yielding less meandering?

A: Trees serve to stabilize riverbanks. However, if the River is continuing to readjust its meander pattern and geomorphological plan form from past impacts, then trees alone may not be able to keep riverbanks from eroding.

1-2-J.

Q: What is the relevance and impact of Lane's equation to dredging?

A: If dredging a channel changes one of the parameters of Lane's equation (sediment size, sediment load, discharge or slope) without corresponding adjustments to the other parameters then the channel will enter into a disequilibrium state, resulting in accelerated erosion (degradation) or increases in sediment deposition (aggradation).

1-2-K.

Q: What does the sediment actually look like behind the dams? How is it distributed, i.e.- evenly or thicker on the bottom? On average, how deep or thick is the contaminated layer?

A: Sediments behind the dams generally have greater fractions of fine-grained, richly organic material than the reach of the river upstream of the impoundments. For example, Woods Pond sediments are generally a two-to-one mix of fine-grained silt and clay to very fine sand. In contrast, Rising Pond, which is downstream of a fast moving, high gradient reach of the river, has higher proportions of sand than Woods Pond.

In Woods Pond, the thickest deposits have been identified in the area of the deep hole, located in the southeast portion of the pond.

In Woods Pond, PCB concentrations have been detected at depths of six to eight feet. In Rising Pond, PCBs were detected in sediments at least three feet deep.

Welcome
Workshops
Calendar
Background
Q & A
Mini Workshop One
Mini Workshop Two
Mini Workshop Three
Contact Us

You are here: **Workshops Home** » **Q & A** » **Mini Workshop One** » Presentation Three

Presentation Three: Ecological Characterization, John Lortie, Stantec Consulting Inc.

1-3-A.

Q: How can the younger generation get involved to help protect our local environment?

A: Getting a good education is the single most important thing young people can do if their goal is to help protect the environment. That education does not necessarily need to be in science or engineering fields. Although the technical disciplines are where most opportunities will be found, there is also need for communication specialists, facilitators, and educators, among many other disciplines.

1-3-B.

Q: What about population data for birds and mammals, especially fish eaters? Did you find numbers that could be classified as normal?

A: Although rigorous quantitative assessment of bird and mammal populations was not a major objective of the ecological characterization, semi-quantitative assessment of several species was possible based on observations made during the field surveys. The numbers of mink and otters in the PSA (study area) was lower than observed in reference areas, indicating that the numbers may not be normal, particularly considering the suitability of the habitat for both species. Bird use in the PSA was similar to that found in reference areas.

1-3-C.

Q: What is the status of Fringed Polygala?

A: This is a relatively common plant in rich moist woods and is not considered rare.

1-3-D.

Q: Any explanation why no Common or Hooded Mergansers? Aren't they fish eaters?

A: Common mergansers use the PSA primarily in the winter and during migration; they do not nest in this area. Hooded mergansers were infrequently seen and should be nesting in this area based on their home range and habitat. There were no studies specifically conducted on hooded mergansers. They are fish eaters.

1-3-E.

Q: What is the likelihood of an endangered species returning after its habitat has been destroyed and then restored? Can you cite examples where endangered species have returned after major disturbance and restoration?

A: If restoration is successful, and there are numerous documented successful environmental restoration projects, the probability of both common and endangered species re-establishing themselves is high.

1-3-F.

Q: Have you studied wildlife in the first two miles after remediation? Have species returned?

A: An aquatic assessment survey was conducted in the summer of 2007 at three locations in the 1½-Mile Reach. Because the 1½-Mile remediation was conducted over a period of several years, for the most upstream location this represented approximately 5 years of recovery, while for the most downstream location the survey was conducted only a year following remediation. The survey consisted of a quantitative assessment of the benthic invertebrate community and measurement of PCB concentrations in the tissues of benthic invertebrates, along with a semi-quantitative assessment of the fish community. The results of the survey clearly indicated that the benthic community had become re-established following remediation at all locations and that there was greater abundance and diversity of benthic fauna compared with similar samples collected prior to remediation. Tissue PCB concentrations had decreased by over 99% from pre-remediation measurements. The fish sampling conducted at the same time indicated that fish populations of species appropriate for the habitat type had also become re-established.

1-3-G.

Q: Sounds like lots of rare species in the river; so is the river ok and better to leave it alone?

A: The number of rare species in the River and floodplain is not unusually high for an area of this size and diversity of habitat. In addition, the presence of rare species should not be interpreted to indicate that there is no ecological risk due to the PCB contamination; rare species are not necessarily rare because of their sensitivity to PCB contamination, so their presence should not be interpreted to indicate a lack of effects of PCB contamination. Furthermore, the ecological risk assessment has clearly shown a variety of types and severity of impacts to many other species, so ignoring the PCB contamination solely to avoid impacting rare species during remediation may not be good environmental management. Techniques exist to protect or mitigate for impacts to rare species during any potential remediation and such techniques will be employed should remediation be determined to be necessary.

1-3-H.

Q: If there are PCBs on the species, what does that mean? Are they inside or outside their bodies?

A: When reference is made to PCB contamination in biota, that contamination is within the tissues of the particular species, i.e., inside the body. Although there may also be some PCBs found on the body surfaces of these species, such surficial contamination is minor in comparison to that found in the tissues.

1-3-I.

Q: What happens to the plants and animals during a flood?

A: Many plants that live in floodplains are adapted to flooding, and hence during a flood they tolerate the inundated or saturated conditions. Animals that live in the floodplain either move out during a flood event, stay put in cases where they can live in flooded conditions (e.g., wood turtles), or perish if they are unable to migrate out and cannot withstand flooding (e.g., some small mammals). Some species of animals that perish during a flood event are able to quickly re-establish themselves by immigration back into the floodplain from adjacent areas.

Presentation Four: PCBs, Richard McGrath, The Isosceles Group

1-4-A.

Q: When did we start discharging PCBs in the Housatonic and for how long?

A: PCBs were used at the GE facility in Pittsfield from approximately 1932 through 1977. Although no records indicate when PCBs were discharged from the facility, releases are believed to have spanned approximately the entire period of use.

1-4-B.

Q: How did they come to the conclusion PCBs are dangerous?

A: The toxicity of PCBs has been demonstrated in a wide variety of laboratory toxicity studies conducted with animals. Epidemiological studies of human populations show adverse effects at high occupational exposures, such as chloracne, and also suggest some adverse effects at lower environmental exposures, with growing evidence of neurodevelopmental effects (for example, see Birnbaum and Staskal-Wikoff [2010] 5th international PCB workshop - Summary and implications. Environment International, 36:814-818).

1-4-C.

Q: It sounds like there was little success with man-made vernal pools. Do you know a more successful way of doing it now?

A: EPA believes it is possible to restore vernal pools successfully. Numerous examples of the successful creation or restoration of vernal pools may be found throughout the technical literature; vernal pools are being restored every day in a wide variety of locations. One vernal pool was cleaned up and restored in conjunction with the 1½-Mile Reach remediation. Monitoring surveys conducted before and after the cleanup demonstrate that the obligate species and structure and function of that vernal pool are equivalent to their pre-remediation conditions.

1-4-D.

Q: What are the odds of successful breeding of bald eagles near the river due to PCB levels?

A: The results of the ecological risk assessment indicate that bald eagles reproducing in the study area would be at risk due to PCBs in fish, their primary food source.

1-4-E.

Q: Would it be a good idea to study PCBs further before going ahead with remediation?

A: The studies conducted to date provide sufficient information for EPA to evaluate the alternatives and propose a cleanup plan. The biogeochemical behavior and toxicological properties of PCBs are sufficiently well understood to quantify human health and ecological risks at the site, and their site-specific distribution is sufficiently well documented to evaluate the need for remediation and to select among remedial alternatives.

1-4-F.

Q: What was the year of the GE biodegradation study in Woods Pond?

A: The biodegradation studies conducted by GE in Woods Pond and in the laboratory using sediment collected from Woods Pond were reported in a series of technical papers in the late 1980s and early 1990s.

1-4-G.

Q: If there are no more PCBs, how are there still PCBs in water? Can they jump from sediment to water?

A: In spite of the elimination of sources of PCBs at the GE Facility and the completed remediation adjacent to and downstream of the facility on the East Branch, the mass of PCBs in River sediment and bank soil remains a significant continuing source of PCBs to the River. Although PCBs are generally relatively insoluble, there is movement of sediment-bound PCBs to the water column in the dissolved phase via flux of sediment pore water into the water column, and in the particulate phase when bed sediments are resuspended into the water column.

1-4-H.

Q: Can you verify that low molecular weight (MW) PCBs, those that can volatize, are found in higher concentrations in trees up to 3 miles from the River? What about agricultural crops grown in the floodplain?

A: EPA is aware of published studies indicating that airborne PCBs may be detected in tree bark from studies where tree bark has been used to evaluate the atmospheric transport of PCBs. However, EPA is not aware of studies involving quantification of PCBs in tree bark near the Housatonic River. Atmospheric PCB concentrations adjacent to the River were measured early during the Human Health Risk Assessment and again during remediation activities on the East Branch. All results were either non-detect or well below established screening guidelines. In general, plants do not take up PCBs from soil; however, PCBs in soil may be transferred to the surfaces of vegetables and other crops grown in the floodplain via rainwater splash, evaporation, and windborne dust, and the sampling program and Human Health Risk Assessment evaluated exposures associated with this transfer.

1-4-I.

Q: Can I assume that high MW PCBs stay in the sediment and are not volatile?

A: Although there are exceptions for some congeners, in general the higher molecular weight PCB congeners (i.e., those with higher numbers of substituted chlorines) are bound to sediment particles, relatively insoluble, and non-volatile.

1-4-J.

Q: How deep in the riverbed are PCBs found?

A: In some locations, PCBs have been detected through the entire sediment column down to the clay bed of glacial Lake Housatonic, a distance of several feet. This is the result of the instability of bed sediment in the River. Detailed examination of deep sediment cores provides evidence of large-scale disruption of sediments during high-flow events, allowing PCB-laden surface sediments to be redeposited at depth.

1-4-K.

Q: What does the partition coefficient indicate about PCBs that have volatized?

A: The partitioning coefficient is a ratio of the concentration of PCBs adsorbed to sediment divided by the concentration of PCBs dissolved in the overlying water. It therefore has no applicability to PCBs that may have volatilized.

1-4-L.

Q: Are 1260 PCBs more or less toxic than 1242?

A: Some human and animal studies have been conducted using different commercial mixtures of PCBs called Aroclors, and some animal data indicate that more highly chlorinated PCB mixtures, such as Aroclor 1260, have greater potential to cause cancer than less chlorinated PCB mixtures, such as Aroclor 1242. More recent toxicological investigations have focused on individual congeners instead of Aroclors.

1-4-M.

Q: Is there a concern about dried mud kicking up as dust and being inhaled?

A: There is certainly the potential for exposure to PCBs if dried contaminated soil or sediment is dispersed in air as dust and then inhaled.

1-4-N.

Q: How do we absorb PCBs other than eating them?

A: PCBs can be absorbed through the skin to some extent. They also can be absorbed following inhalation.

1-4-O.

Q: What other hazardous effects besides cancer exists?

A: There is clear evidence from animal toxicity studies that PCBs can adversely affect different systems, such as the immune system, the reproductive system, the nervous system and the endocrine system. Studies of human populations suggest that some of these effects occur under some exposure conditions. This is an active area of scientific inquiry.

1-4-P.

Q: Are the Housatonic River PCBs the 126 PCBs?

A: PCB-126 is one of the 209 PCB congeners. PCB-126 was never more than a trace component of any of the Aroclor blends and, although it has been identified in some River samples, it is not found in significant quantities in the River or floodplain.

1-4-Q.

Q: How dioxin-like are our PCBs?

A: The World Health Organization and EPA have identified 12 PCB congeners that have structural similarity to dioxin and so mimic the toxicity of dioxin in the body, though at a much lower potency. Some of these congeners have been detected in River soil, sediment, and grass samples.

1-4-R.

Q: What is the relationship of PCBs and other contaminants, for example dioxin? And have other contaminants been identified in the Housatonic River?

A: Dioxins and furans are known to co-occur with PCBs and have been identified in samples of soil and sediment from the site. Other potential contaminants have also been identified, but at concentrations that are not considered to pose a risk to humans or animals. PCBs, dioxins, and furans are the only contaminants that were retained as contaminants of potential concern (COPCs) for the Human Health Risk Assessment and Ecological Risk Assessment.

1-4-S.

Q: Do the results of tissue samples show PCBs?

A: Fish and wildlife at the Rest of River site have some of the highest tissue concentrations of PCBs ever documented.

1-4-T.

Q: Even with the presence of PCBs, there seems to be very rich and thriving wildlife. How much stress are the PCBs causing and is this stress decreasing over time now that no new sources of PCBs exist and existing PCBs are being buried naturally?

A: Although the wildlife inhabiting the River and floodplain may appear to be rich and thriving, this is not an assessment that can be made through casual observation. The ecological risk assessment has clearly documented significant harm to a number of representative species, and this may not necessarily be evident to the casual observer. It has been documented, for example, that mink and otter are at very high risk due to PCBs in fish, their principal food source, and are virtually absent from the area, and that amphibians are being developmentally impaired.

Although PCBs at the GE facility and other upstream sources of have been cleaned up, the mass of PCBs in the Rest of River sediment and bank soil remains a continuing source of contamination. Extensive data collected on the vertical distribution of PCBs in sediments indicates that widespread burial of PCBs with clean sediment is not occurring and is not effectively isolating contaminated sediments from ecological and human receptors.

1-4-U.

Q: Would we be here tonight having this presentation if GE were not a "deep pocket"? How literally did the PCBS get in the river? Did GE "dump" PCBs in the river? Was it a by-product of manufacturing, etc.?

A: Although GE performed many functions at the Pittsfield facility throughout the years, the activities of the Transformer Division, including the construction and repair of electrical transformers using dielectric fluids, some of which contained PCBs (primarily Aroclors 1260 and, to a lesser extent, 1254), were one likely significant source of PCB contamination. According to GE's reports, from 1932 through 1977, releases of PCBs reached the wastewater and stormwater systems associated with the facility and were subsequently conveyed to the East Branch of the Housatonic River and to Silver Lake.

US Environmental Protection Agency

Housatonic River Workshops

- Welcome
- Workshops
- Calendar
- Background
- Q & A
  - Mini Workshop One
  - **Mini Workshop Two**
  - Mini Workshop Three
- Contact Us

You are here: **Workshops Home** » **Q & A** » Mini Workshop Two

Mini Workshop Two (April 6) - Getting the Facts on PCBs: Human Health Risks, Ecological Risks, and PCBs

- **Presentation One: PCB Distribution, Fate, and Transport, Edward Garland, HDR HydroQual**
- **Presentation Two: Human Health Risks, Donna Vorhees, Sc.D, The Science Collaborative**
- **Presentation Three: Ecological Risks, Gary Lawrence, Golder Associates**
- **Presentation Four: Why Use Models for the Housatonic River?, Mark Velleux, Ph.D, HRD HydroQual**

- Welcome
- Workshops
- Calendar
- Background
- Q & A
  - Mini Workshop One
  - **Mini Workshop Two**
  - Mini Workshop Three
- Contact Us

You are here: Workshops Home » **Q & A** » **Mini Workshop Two** » Presentation One

Presentation One: PCB Distribution, Fate, and Transport, Edward Garland, HDR HydroQual

2-1-A.

Q: Are consulting firms and EPA itself "allowed" to tell us how much confidence they have in GE's own studies - e.g., the data presented in a slide by Ed Garland?

A: Although measurements performed at different labs can differ, our experience has been that data collected by GE and EPA are similar. All environmental data collected in connection with the project were subject to a rigorous, EPA-approved, quality assurance and quality control plan. However, EPA's scientific interpretation of data may differ from GE's interpretation of these data.

2-1-B.

Q: If sediment deposition occurs continually, how is it PCBs are found in near 10 feet of river bed?

A: Sediment deposition is not a continuous process, as sediments are both deposited to and eroded from the riverbed. Although the exact sequence of conditions that caused PCBs to accumulate deep in the riverbed and floodplain are not fully known, analysis of the deep cores has shown that storm events have extensively reworked the riverbed over time.

2-1-C.

Q: How did PCBs get into the bank to begin with?

A: Flood events cause sediments and PCBs to deposit on the riverbanks and floodplain; other processes may be involved as well.

2-1-D.

Q: The presence of hot spots is a matter of scale; you may not have hot spots comparing at a desktop size. However there are areas of higher concentrations as shown on your figure of the PSA.

A: Spatial scale is important. When considering Reaches 5 and 6 (Pittsfield to Woods Pond), no one small area of the riverbed greatly contributes to PCB exposure compared to other nearby areas. When looking at the concentrations of PCBs over the scale of the entire River including Reaches 9-16 in Connecticut, PCB transport from Reaches 5-8 is contributing to the downstream spread of PCBs.

2-1-E.

Q: We heard last night that PCBs adsorb onto sediment. Why then is Woods Pond impoundment not capturing more PCBs?

A: Measurements and model results indicate that Woods Pond does not efficiently trap much of the PCBs transported through it. On average, Woods Pond only traps about 10% of the PCBs that enter it, while 90% of the PCBs go over the dam and move downstream. Many factors limit PCB trap efficiency. One factor is that relatively little sediment accumulates in the pond over time. On average it takes 4-6 years to accumulate just one inch of sediment in the Pond. Most solids and PCBs move through the Pond during storm events and little material entering the Pond during storms settles because much of it is fine sediment with low settling velocities. Another factor is that not all PCBs stay attached to sediment. Some PCBs in the pond are dissolved. Other PCBs move out of the bed in a dissolved form and return to the water column.

The physics of water movement and how gravity acts on particles suspended in water indicate that dredging is unlikely to substantially increase PCB trapping efficiency in Woods Pond. Water does not move uniformly through the pond and during high flow events water tends to flow much faster, moving though only a small part of the pond, and go over the dam quicker. Dredging the pond to make it deeper likely would not substantially alter flow patterns during storms. Further, PCBs usually attach to smaller particles like clays and organic matter, and these particles don't settle quickly (i.e. low settling velocity). This combination of factors indicates that PCB trapping in the Pond would not substantially increase if the pond were dredged.

2-1-F.

Q: Would Woods Pond serve as a more effective PCB "trap" if it is dredged? How much more so?

A: Please see the response to Question 2-1-E, above.

2-1-G.

Q: If Woods Pond were made deeper, would it slow down out flow of PCBs to be collected later?

A: Please see the response to Question 2-1-E, above.

2-1-H.

Q: You said that Woods Pond does not efficiently trap PCBs. Would that change if Woods Pond were dredged and capable of holding more sediment?

A: Please see the response to Question 2-1-E, above.

2-1-I.

Q: Since you are saying only 10% of PCBs are "trapped" by/at Woods Pond, and the rest of PCBs are going downstream, why aren't we talking more about Connecticut in these presentations? Connecticut people are stakeholders, and have attended meetings dedicatedly and actively for years (10+); this is a travesty that more inclusion of the Connecticut areas are not included in these presentations.

A: PCBs from Reaches 5-8 (Pittsfield to Rising Pond) move into downstream areas and into Connecticut (Reaches 9-16). River reaches in Connecticut have been studied, and sediment concentrations are non-detect or very low, and fish tissue concentrations have decreased significantly over time. The reason why there is greater focus on the potential for remediation in areas upstream of Rising Pond is that the risks in Reaches 5-8 are much greater than risks in downstream areas. Importantly, managing PCBs in upstream areas would reduce risks in downstream areas and control PCB sources flowing into Connecticut.

2-1-J.

Q: Where are the PCBs from Woods Pond going? The slide presentation would indicate over half are going on to the floodplain. Are the rest moving downstream?

A: Please see the response to Question 2-1-I, above.

2-1-K.

Q: Does any amount of the PCB sediment load and H2O column load after it exits Woods Pond continue down river into Connecticut, or does it all stop at the Massachusetts border?

A: Please see the response to Question 2-1-I, above.

2-1-L.

Q: If Woods Pond is not beneficial for settling out PCBs then why are there such high levels of PCBs in Woods Pond?

A: PCB concentrations in sediment cannot be used to infer high PCB trap efficiency. PCB presence in sediments only indicates that some portion of PCBs entering the Pond are transported to the bed. In contrast, PCB trapping efficiency is based on determining what fraction of the PCBs entering the Pond stays in sediments. High concentrations in the Woods Pond sediment only indicate that PCB levels on solids were high at the time those particles were deposited.

2-1-M.

Q: In its current state, Woods Pond is a 10% trap for PCBs. The high concentration in Woods Pond would indicate that is has historically been a significant trap. Agree?

A: Please see the response to Question 2-1-L, above.

2-1-N.

Q: Several of the slides presented this evening have shown soil samples from the floodplain to have higher concentrations of PCBs than samples taken from the river. How often is this the case? [What are the] implications for remediation of these sections of the river?

A: In some areas, PCB concentrations in floodplain soils may appear higher than those in the River, because the concentrations in the River were shown as averages Reach-wide, yet the example map showing concentrations in the floodplain showed concentrations in discrete areas, some of which were higher than the reach average. However, there are samples collected in the River sediment that are high as well. The presence of high PCB concentrations in floodplain soils contributes to ecological and human health risks for animals and people that use the floodplain. However, PCBs do not generally erode from the floodplain surface and return to the River.

2-1-O.

Q: Did your remediation modeling take into account recontamination by PCBs of "cleaned" areas from point source pollution still in place, like Silver Lake and Unkamet Brook?

A: Yes, the model accounts for this as well as other inputs from upstream areas. Over time, the amount of PCBs entering the Rest of River has decreased as remediation has been completed. This reduction is also included in the model.

2-1-P.

Q: PCB concentrations in Hudson River fish have increased during the dredging there. If the cleanup takes several decades here, can we expect elevated PCB levels in fish that are consumed from the Housatonic?

A: Independent of any cleanup activities, PCB concentrations in Housatonic River fish are among the highest found anywhere and fish consumption advisories state that fish from the River should not be consumed.

The impact that cleanup actions might have on fish concentrations was explicitly considered in model simulations GE presented in the Corrective Measures Study (CMS) and in the Revised CMS. The potential for impacts to PCB levels in fish included the consideration of potential PCB releases (resuspension) during cleanup, such as was observed at the Hudson. Experience from other sites indicates that there may be small, short-term increases in PCB levels in fish associated with some remediation techniques. The extent of any temporary increases is expected to be small because remediation would likely occur in stages and affect only one part of the River at any time. Monitored Natural Recovery (MNR) model simulations and extrapolations that GE performed indicate that PCB levels in fish for Reaches 5-6 of the River (Pittsfield to Woods Pond) are expected to exceed acceptable risk levels for more than 250 years. However, GE's modeling results show that some active remediation approaches can significantly reduce the recovery time for fish, allowing for relaxation of the advisories and some consumption within a few years following completion of the cleanup.

2-1-Q.

Q: What are the most recent dates of your soil, sediment, and animal samples, and have you compared those with earlier samples?

A: Soil samples collected by EPA as part of initial site characterization efforts started in the 1990s and more recently in support of Risk Assessment efforts that were completed in 2004. For sediment, particularly in Reaches 5 and 6, samples have been collected over time as part of the site investigations in the 1990s, as well as efforts to support model development in about 2002. Surveys of sediment and biota were also conducted at three locations in the East Branch in June of 2007, approximately one year after the conclusion of the 1½-Mile remediation. The results of these surveys indicated a 99% reduction in sediment PCB concentrations, which was mirrored by an equivalent reduction in benthic invertebrate tissue PCB concentrations and a marked recovery in community diversity and abundance. The fish community showed a similar recovery, with fish species and abundance found to be typical for that reach of river.

For biota, sampling started in late 1970s. In the last 15 years, there were major sampling events between 1998-2000, with periodic supplemental sampling since. Beginning in 1994, juvenile fish have been sampled every two years at four locations (two locations in areas upstream of Woods Pond Dam and also in two areas downstream of Woods Pond). In the last five years, a supplemental adult fish study (largemouth bass) was also completed. The juvenile fish sampling has indicated statistically significant decreases over time for PCB concentrations in largemouth bass, yellow perch, and sunfish; however the magnitudes of the decreases are small. Over the 16 years of monitoring, the average concentrations measured in recent events are generally within a factor of two of the yearly averages observed over the period of record. Similarly, while samples of adult largemouth bass indicate a gradual decline in average tissue PCB concentrations since 1994, there is substantial variability among individual fish and individual sampling events.

2-1-R.

Q: Is it true that if Woods Pond was cleared of PCBs that would constitute up to 25% of the mass of PCBs from Lenox to Long Island Sound?

A: GE estimated that between 22,000 and 118,000 lbs. of PCBs are in River sediment from the Confluence through Reach 16, and that an additional 89,000 to 460,000 lbs. are in floodplain soil. GE estimated that between 3,000 and 29,000 lbs of PCBs are in Woods Pond sediment. So if only the high end estimates in sediment are evaluated, then the reduction would be approximately 25%. However, as GE states in its 2003 RCRA Facility Investigation Report, "The large range in the current PCB mass estimates highlights the uncertainty inherent in the calculations."

2-1-S.

Q: How does EPA plan to monitor the potential movement of PCBs - in water or sedimentation - from upstream areas to downstream areas if remediation includes dredging upstream? What actions might the EPA take if such movement does take place? Has such movement been shown in your modeling?

A: The potential for PCB releases (resuspension) during remediation was explicitly included in modeling efforts. Each remediation simulation GE presented in the Corrective Measures Study (CMS) and the Revised CMS includes PCB releases during remediation. However, details of how PCBs will be monitored during any cleanup cannot be entirely described until a cleanup decision is made and a design for the cleanup process is established with the associated monitoring requirements. At other sites, EPA has used a number of techniques to monitor and control PCB releases during all phases of remediation including silt curtains, turbidity meters, water column total suspended solids (TSS) and PCB sampling, air emission monitoring, and other control measures.

2-1-T.

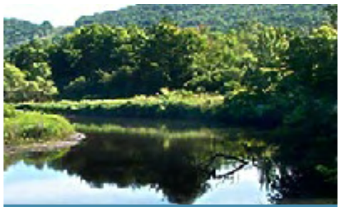
Q: Has the migration of PCBs outside the Housatonic watershed been studied by the EPA? If so, how are "our" PCBs impacting the global community?

A: PCBs can be found in almost every environment on the planet and many studies have documented global transport patterns of PCBs. However, no specific study has been performed to determine the exact disposition of all PCBs that were transported away from the GE site by the Housatonic River. Housatonic River PCB studies have focused on areas where risks are measurable and exceed acceptable levels.

2-1-U.

Q: What is the time it takes for PCB laden silt/sediment to move a mile? What is the biggest influence on flow of sediment?

A: The time it takes solids to move depends on River flow conditions and factors such as the slope of the riverbed. If solids are continuously suspended in the water and do not settle to the bed, they can move as fast as the water that is carrying them. If solids move continuously along the surface of the bed, they move at a slower rate (roughly one-tenth as fast as the water). However, solids do not typically move continuously and will settle to the bed and be resuspended at a later time.



Presentation Two: Human Health Risks, Donna Vorhees, Sc.D, The Science Collaborative

2-2-A.

Q: What studies with actual human statistical data have shown that PCBs actually cause cancer in humans? We know there are animal studies, but not many studies that link cancer in humans to PCB exposure.

A: The evidence that PCBs are carcinogenic in rodents is sufficient, as demonstrated by studies based on commercial Aroclor mixtures (EPA 1996) and a newer study of PCB congener 126 (NTP 2004). The evidence of carcinogenicity of PCBs in humans is inadequate but suggestive (EPA 1996). Data from human studies have been characterized by the International Agency for Research on Cancer (IARC) as providing limited evidence of carcinogenicity (IARC 1987). The results of epidemiological studies, coupled with the animal data, support the conclusion that PCBs are probable human carcinogens (EPA 1996, 2011).

References:

EPA (U.S. Environmental Protection Agency). 1996. PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures. Prepared by the National Center for Environmental Assessment, Office of Research and Development, Washington, DC. EPA/600/P-96/001F.

EPA (U.S. Environmental Protection Agency). 2011. Integrated Risk Information System Database.

IARC (International Agency for Research on Cancer). 1987. IARC Monographs on the Evaluation of Carcinogenic Risk to Humans, Supplement 7, Overall Evaluations of Carcinogenicity: an Updating of IARC Monographs, Volumes 1-42. Lyon, France.

NTP (National Toxicology Program). 2004. TR-520 Toxicology and Carcinogenesis Studies of 3,3',4,4',5-Pentachlorobiphenyl (PCB-126) (CAS No. 57465-28-8) in Female Harlan Sprague-Dawley Rats (Gavage Studies).

2-2-B.

Q: What is the actual pathway where PCBs affect human tissue, and what is the pathology that shows cause and effect with statistical confidence?

A: Please see the response to Question 2-2-A regarding the potential for PCBs to cause cancer in humans. Noncancer effects have been observed in animal toxicity studies and in some epidemiological studies. Epidemiological studies of human populations show some adverse effects at high occupational exposures, such as chloracne, and also suggest some adverse effects at lower environmental exposures, with growing evidence for neurodevelopmental effects. Many of these studies are summarized in the Human Health Risk Assessment (See Section 4 in Volume 1) and the Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profile for PCBs (**http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=142&tid=26**). A number of possible pathways, or mechanisms, of PCB toxicity are under investigation, with many highlighted in a summary of a recent PCB workshop sponsored by the National Institute of Environmental Health Sciences (i.e., Birnbaum and Staskal-Wikoff [2010] 5th international PCB workshop - Summary and implications. Environment International, 36:814-818).

2-2-C.

Q: In her book and documentary film, Living Downstream, Dr. Sandra Steingraber states that PCBs have been found on the tops of the White

Mountains in New Hampshire. If PCBs attached to dry sediments can move to those remote regions, shouldn't we be concerned that PCBs from the Housatonic River floodplain, which are in much higher concentrations, present a danger of inhalation to people who live in communities near the River?

A: Inhalation of airborne contamination is a potential pathway for exposure to PCBs and other contaminants from the GE/Housatonic River site. The less-chlorinated PCBs have a greater tendency to volatilize, whereas the more highly chlorinated PCBs have a greater tendency to adhere to soil. The PCBs in the Housatonic River area are complex mixtures of individual congeners with various levels of chlorination; at this site the more highly chlorinated congeners are more prevalent because the releases from the GE facility were primarily Aroclor 1260, with 60% chlorine by weight.

A screening-level risk assessment was conducted to evaluate whether the air exposure pathway may be a significant contributor to risk for individuals living near the River or using the River for recreational purposes. Based on the site-specific sampling in the Rest of River, it was concluded that the air concentrations of PCBs do not pose a human health risk for individuals living near or using the River for recreational purposes. Air sampling data in the upper reaches of the River collected during excavation activities support this conclusion. More detailed discussion of air concentration data and the screening process is provided in the Human Health Risk Assessment (Volume 1, Section 5.1).

2-2-D.

Q: What kinds of cancer or what specific organs or systems are most often affected or caused by PCBs? What are the exposure levels/risk ratios?

A: Please see the responses to Questions 2-2-A and 2-2-B and associated references for information about the types of cancer and adverse noncancer effects that have been associated with PCBs.

According to ATSDR (2000), PCBs have been shown to cause liver and thyroid cancer in animal toxicity studies. In occupational studies, PCBs have been associated with a number of different cancers, such as cancer of the liver, biliary tract, intestines, and skin. Some non-occupational epidemiological studies suggest a link between PCB exposure and some forms of cancer, such as non-Hodgkin's lymphoma. However, studies involving human populations alone are not adequate to determine the carcinogenicity of PCBs or to answer the more specific question about the type and incidence of cancer that might result from different levels of exposure to PCBs.

PCBs have been shown to affect various systems in animal toxicity studies, including reduction in immune system function, behavioral changes, impaired reproduction, and blocking or mimicking thyroid hormone action. PCBs might have similar effects in some human systems. As with cancer studies, data from human studies are not adequate to determine the type and incidence of adverse noncancer effects that might result from different levels of exposure to PCBs.

2-2-E.

Q: Is there anything people can do to "clean" their bodies of PCBs or ways to remove them from human tissue?

A: EPA is not aware of effective methods for removing PCB contamination from the body. If exposure is eliminated, normal processes of metabolism and elimination will very slowly reduce PCB concentrations in tissue.

2-2-F.

Q: How do people avoid exposure IF they do not fish in the River, eat the fish, or live nearby the River? Is PCB exposure avoidable?

A: Someone who does not fish in the River, eat the fish, live near the River, or use the River and/or floodplain is unlikely to be exposed to PCBs in the River or the adjacent floodplain. Regarding other sources of exposure, the Agency for Toxic Substances Disease Registry (ATSDR 2000) provides additional advice for reducing exposure to PCBs:

1. Observe fish and wildlife consumption advisories from areas beyond the Housatonic River.
2. Children should not play with old appliances, electrical equipment, or transformers, since they may contain PCBs. Children who live near hazardous waste sites should be discouraged from playing in the dirt near these sites and should not play in areas where there was a transformer fire.
3. Workplace exposure to PCBs can still occur during: repair and maintenance of old PCB transformers; accidents, fires, or spills involving these transformers or other PCB-containing items; and disposal of PCB materials. Occupational health and safety officers at work can state whether chemicals at work may contain PCBs and how to avoid inadvertently carrying them home in clothing and work materials.

2-2-G.

Q: I would appreciate information on the risk assessment [for a specific neighborhood].

A: A response will be provided directly to this individual.

2-2-H.

Q: Are there ways to remove PCBs from the human body (i.e., detoxify)?

A: Please see the response to Question 2-2-E, above.

2-2-I.

Q: How do you show that PCBs in the river threaten human health of those living along the river: -are they airborne? -hasn't EPA tested the air around the river and found no contamination? -didn't the Massachusetts Department of Public Health find no elevated blood levels among the Allendale School population? -and Lakewood population?

A: Please see the response to Question 2-2-C regarding EPA testing of air near the River. The populations at Allendale School and Lakewood neighborhood were studied as part of investigations that are separate from the evaluation of the Rest of River site.

2-2-J.

Q: My information is anecdotal, but I understand that there has been more recent use of Woods Pond for winter fishing and considerable consumption of fish. Have you collected this information and incorporated in data?

A: EPA is aware of ice-fishing in Woods Pond and also has received anecdotal information regarding fish consumption. With regard to the Human Health Risk Assessment, this has no effect because the risk assessment for consumption of contaminated fish assumed no fish consumption advisory and that individuals would consume their catch at rates that were reported in a survey that was conducted of freshwater anglers in a similar uncontaminated river system; these rates are also consistent with surveys conducted in the watershed.

2-2-K.

Q: How are PCBs accumulated into the human body? Can they be ingested through skin contact and through breathing in dust? Would excavation and treating increase airborne ingestion?

A: PCBs are lipophilic, or "fat loving." Therefore, they tend to accumulate in body fat. They can enter the body via accidental ingestion of or dermal contact with contaminated soil or sediment or by inhaling PCBs in air that are attached to dust particles or that have evaporated from soil or sediment. Excavation of soil or sediment could increase concentrations of PCB-contaminated dust; however, any excavation, removal, transport and handling of contaminated soil and sediment in the context of a remediation project would be subject to strict controls to prevent the generation of dust or any other exposures of possible concern to human health.

2-2-L.

Q: Please help me with the math: The background risk for cancer is 1 in 4 or .25. EPA cleans up for a 1/1mm (1 x 10 -6) risk. Does that mean that remediation starts when the risk is increased from .25 to .250001? Or 1 in 10,000 (.2501)? What about doses?

A: The National Cancer Institute reports statistics on the lifetime risk of being diagnosed with cancer among the U.S. population (**http://seer.cancer.gov/statfacts/html/all.html**) as about 40%, although risks vary greatly by sex, race, and other factors. Risk assessments conducted for hazardous waste sites evaluate the excess or incremental risk of developing cancer, i.e., the additional risk above and beyond background risk, as a result of exposure to contamination at the site. EPA considers incremental cancer risk exceeding 1 x 10-4, or one in ten thousand, from exposure to a hazardous waste site to be unacceptable and evaluates such sites for remediation. Conversely, EPA considers incremental risks of less than 1 x 10-6 (one in one million) to be acceptable and does not consider remediation to be necessary for such sites. Risks between these two levels are referred to as being in the "risk range" and remediation decisions for these sites are evaluated in the context of other site-specific factors.

2-2-M.

Q: An article in the Berkshire Eagle on April 5, 2011 rated Berkshire County as fourth from the bottom out of 14 Massachusetts Counties in health rankings. The low ranking was based on percentage of people in poor or fair physical and/or mental health, rate of people who die before age 75, low weight newborns and other factors. Could the health effects of PCBs, both cancer and non-cancer effects, be contributing to this low ranking since we think of ourselves as living in the best part of Massachusetts?

A: It is possible that PCBs are a contributor, but it would be difficult to discern a specific effect given the wide range of factors that contribute to the general health of populations, such as obesity, smoking, and lack of exercise.

2-2-N.

Q: On the chart [in the Mini Workshop]: Is there a breakdown of the risk rates between eating fish and catch and release? Which one is represented on the chart? If someone only caught and released what is the exposure? Is it real bad in the catch and release stretch?

A: Risks from consumption of contaminated fish assume that the fish is caught and eaten (fillet or muscle tissue only). Risks for catch and release fishing were evaluated via the Angler scenario, which assumed that exposure was from contact with PCBs in soil, sediment, and water but not via consumption of the catch. Risks associated with an adult angler's exposure to soil, sediment, and water were within or below the EPA cancer risk range and noncancer hazard benchmark of 1. Risks associated with an older child angler's exposure to soil, sediment, and water were within or below the EPA cancer risk range and noncancer hazard benchmark of 1 in most locations.

2-2-O.

Q: If the full-fat milk from cows that eat grass in contaminated areas does not pose a cancer or non-cancer risk to humans who consume it, why does recreation in those areas cause unacceptable non-cancer risks to humans?

A: Dairy cows from commercial farms are not currently grazing on grass in the River floodplain; therefore, there was no finding of risk above EPA's cancer risk range or noncancer benchmark. However, such a risk finding might be made if dairy cows graze in the floodplain in the future, depending on the concentration of PCBs in the area being grazed and the contribution of grazing to the cow's diet.

2-2-P.

Q: If my home is located along the river is it safe for my family to play in the backyard?

A: A response will be provided directly to this individual.

2-2-Q.

Q: I have been a member and an active golfer @ Stockbridge Golf Club for 25 years. Have I exposed myself to higher risks than non-golfers in the area?

A: The exposure concentration at the golf course is 4 mg/kg which is below the risk concentration for recreational exposures and groundskeepers. As a point of comparison, the cleanup number for residential properties is 2 mg/kg.

2-2-R.

Q: For your studies, what was the floodplain studied? [That is,] how far outside the banks of low river: 100 year, 50 year? Especially residential.

A: The Human Health Risk Assessment evaluated exposures within the site boundaries, which consisted of the River and the floodplain extending to the 1 ppm PCB isopleth, which corresponds approximately to the 10-year floodplain in Reaches 5 and 6.

2-2-S.

Q: Were the exposure studies only from Garner Park to Woods Pond Dam?

A: The Human Health Risk Assessment evaluated the entire Rest of River, from the Confluence to Derby Dam in Connecticut, just above Long Island Sound. Based on comparisons of measured PCB concentrations to established screening criteria, many of the areas below Rising Pond were not carried through the full risk assessment process.

2-2-T.

Q: For the breast cancer studies that Dr. Vorhees mentioned, can she explain what she means by "negative studies"? What there an effect?

A: The phrase "negative study" refers to a study where the investigators did not detect an association between a given exposure and any adverse effect.

2-2-U.

Q: Human Health Risk: Do epidemiological studies exist for GE transformer workers who were exposed to PCBs? If not, how many deaths from cancer have been attributed to industrial exposure to PCBs?

A: The Massachusetts Department of Public Health evaluated the feasibility of conducting an occupational epidemiologic investigation of workers at the former GE transformer facility in Pittsfield, but concluded that occupational history information essential to assessing exposures and health outcomes was lacking (MDPH 2003). Therefore, no epidemiological studies exist for GE transformer workers at the Pittsfield plant. Transformer workers have been the subject of numerous occupational epidemiologic studies, but these studies are not adequate to quantify cancer incidence or death attributable to occupational exposure to PCBs.

References:

MDPH (2003i) A Study Assessing the Feasibility of Conducting an Occupational Epidemiological Investigation of Former Transformer Division Workers at the General Electric Facility in Pittsfield, Massachusetts, Massachusetts Department of Public Health, Bureau of Environmental Health Assessment, Boston, October, 2003.

2-2-V.

Q: Have there been any "field studies" done on humans? E.g., is there any data on increased occurrence of diseases believed to be associated with PCBs in the human population along the stretch of River under study?

A: Please see the response to Question 2-2-A, above. Also, the Massachusetts Department of Public Health assessed cancer incidence data (MDPH 2002).

References:

MDPH. 2002. Assessment of Cancer Incidence Housatonic River Area, 1982 - 1994. Massachusetts Department of Public Health, Bureau of Environmental Health Assessment, Boston, MA April, 2002.

2-2-W.

Q: Has there been any study of increased occurrence of cancer or immune deficiency diseases in the study area?

A: Please see the response to Question 2-2-V, above.

2-2-X.

Q: Have you read the DPH 1997 study which did not find serum blood levels in river neighbors higher than the general population? Do you agree with the DPH study results?

A: Massachusetts Department of Public Health conducted the Exposure Prevalence Study and the Volunteer Study (MDPH 1997), which was reviewed by an Expert Panel (MDPH 2000). One of the questions addressed by the panel was whether serum PCB concentrations in the Housatonic River area are elevated compared to background concentrations in the U.S. The expert panel did not draw a conclusion about whether PCB blood serum concentrations in the Housatonic River area exceed background and instead discussed the difficulties associated with making an appropriate comparison given declining serum concentrations over time and numerous factors that can influence serum concentrations across available studies. A more detailed discussion of the MDPH study is provided in the Human Health Risk Assessment (See Section 1.7 in Volume 1).

References:

MDPH (Massachusetts Department of Public Health). 1997. Housatonic River Area PCB Exposure Assessment Study, Final Report. Bureau of Environmental Health Assessment, Environmental Toxicology Unit. September 1997.

MDPH (Massachusetts Department of Public Health). 2000. Meeting Summary Expert Panel on the Health Effects of Non-Occupational Exposure to Polychlorinated Biphenyls (PCBs).

2-2-Y.

Q: Are the reduced health risks resulting from remediation of PCB contamination actual or theoretical, i.e. have reduced risks been demonstrated, proven, peer reviewed or widely accepted by the scientific community?

A: No remediation plan has been selected, so it is not possible to reach conclusions about anticipated reductions in risk to human health at this time. EPA is not aware of peer reviewed scientific studies at sites where remediation has occurred that assessed changes in disease incidence or other measures of health status as a result of remediation.

2-2-Z.

Q: I don't understand what a "noncancer hazard index" means to me. What's the risk? What could happen to you when the index is > 1?

A: A noncancer hazard index (HI) is the ratio of a person's average daily dose of PCBs to the Reference Dose for PCBs. The HI is just that - an index, not a probability or estimate of risk. At HIs lower than 1, adverse effects are not expected. At HIs higher than 1, adverse effects might occur.

2-2-AA.

Q: [Vorhees Mini Workshop Presentation,] Slide 14: For the values for non-cancer, three that were significantly above 1: Does the "10" mean a tenfold risk?

A: No, the magnitude of a hazard index (HI) is not proportional to the risk and HIs should not be interpreted in such a manner. Although an HI of 100 indicates greater risk than an HI of 10, which in turn indicates greater risk than an HI of 1, the difference in the magnitude of risk in each case is not necessarily a factor of 10.

2-2-BB.

Q: If commercial dairy farms are "OK," why did GE buy the Noble Farm and one other along the River in the 1990s?

A: EPA cannot speculate on the reasons prompting GE's purchase of private farm properties.

2-2-CC.

Q: If home gardens are OK, why did EPA tell residents in Lakewood not to eat their vegetables from their home gardens?

A: Mass DEP and EPA produced a fact sheet in 1997 during the time that residential cleanups were taking place, including the Lakewood neighborhood, and prior to the Human Health Risk Assessment for Rest of River. The fact sheet can be found at **http://www.epa.gov/ne/ge/pcbshealthandenviro/pcbfact.pdf**. Since then, the Risk Assessment was conducted, and the conclusion was reached that in most cases, the risks from consuming produce from home gardens is acceptable at the concentrations observed in floodplain soil in Rest of River.

2-2-DD.

Q: GE has stated that, even after the most extensive cleanup of Rest of River, there will still be a prohibition from consuming fish due to residual PCBs. But Ms. Vorhees indicated that an extensive cleanup will allow safe consumption 14-23 times per year. Please clarify which is correct.

A: Both positions are correct. GE consistently refers only to unrestricted fish consumption (for the most highly exposed individual [RME] at an incremental risk of one in one million) over the period estimated in the Revised Corrective Measures Study, essentially allowing people to eat whatever amount of fish they might like from the River without any incremental risk. GE concluded that such unrestricted fish consumption would not be possible at the completion of any of the remedial scenarios during the time frame evaluated. While EPA agrees that the statement is factual, EPA notes that unrestricted fish consumption is not the only outcome envisioned when EPA established the concept of a risk range; some cleanup alternatives result in some amount of safe fish consumption which can be done within the EPA risk range (e.g., at an incremental risk of less than one in ten thousand). It is these latter amounts of safe fish consumption that Dr. Vorhees showed in her presentation.

2-2-EE.

Q: Whatever happened to the risk to humans study regarding blood test? Does it still exist?

A: Please see the response to Question 2-2-X, above.

2-2-FF.

Q: At the boat put-ins to the River, a paddler mostly has to wade through up to 2' of mud and with certain paddles, one gets soaked. Does this heighten the risks?

A: Recreational and marathon canoeing were both evaluated in the Human Health Risk Assessment; these scenarios included assumptions regarding exposure to contaminated bank soil and River water and sediment, in addition to other factors. Exposure to these media in many locations was associated with cancer risks within or below EPA's cancer risk range and hazard indices below EPA's benchmark of 1. More information is needed about where these activities are occurring to provide a more detailed response.

2-2-GG.

Q: It's my understanding that the EPA has no standards for judging what is considered safe levels for the inhalation of PCBs for either indoor residential or outdoor exposure, and that the Agency extrapolates from indoor occupational standards. Could you ask Donna Vorhees if that is correct? And could she please cite some current research on the issue of inhalation of PCBs in residential scenarios that might match the experience of residents in the Housatonic corridor. And any current data that informed her assessment of risk via inhalation in outdoor activities along the River?

A: While EPA does not have regulatory standards for "safe levels" of PCBs in indoor air or outdoor air, EPA has established a risk-based regional screening level for PCBs in outdoor air, which was used in the Human Health Risk Assessment to interpret measured concentrations of PCBs in outdoor air. The measured concentrations were below the risk-based screening level. More recently, EPA has issued guidance that includes "public health levels" of PCBs in school indoor air (**http://www.epa.gov/pcbsincaulk/maxconcentrations.pdf**) that range from 70 ng/m3 for pre-school aged children to 600 ng/m3 for high school students. All detected concentrations of PCBs in outdoor air near the Housatonic River are well below these public health levels. The outdoor air concentration data for the Housatonic River area and EPA's analysis of these data are provided in the Human Health Risk Assessment (See Section 5.1 in Volume 1).

A number of studies have investigated concentrations of PCBs in residential settings. Dr. Vorhees conducted such studies in the New Bedford area where she sampled indoor air, outdoor air, yard soil, and house dust. Other investigators have conducted similar studies in other residential settings. However, EPA is not aware of studies that closely match the type of PCBs and exposure conditions that exist in the Housatonic River area.

2-2-HH.

Q: Can PCBs be airborne with River water evaporating from the floodplain?

A: Please see the response to Question 2-2-C, above.

2-2-II.

Q: How can the Interim Media Protection Goals derived by GE be used by EPA? Why argue with GE about numbers when we are talking cancer risks?

A: The IMPGs developed as part of the Rest of River study took into account the results from EPA's Risk Assessments. IMPGs have been calculated both based on cancer risks and on noncancer risks. They are used as part of the evaluation of the various cleanup alternatives. In accordance with the Permit, each alternative's ability to meet various IMPGs is evaluated as one of the "selection decision factors".

2-2-JJ.

Q: Where or what are major differences between Public/Regulatory studies and those of GE? Do you all generally concur?

A: There are differences in opinion between EPA and GE with regard to the adverse effects of PCBs to humans and ecological receptors. With regard to the criteria to be used to evaluate the alternatives under consideration and the computer models used to assist in that evaluation, EPA and GE are required to abide by the same criteria and models. That being said, there may be differences in interpretation of the analyses that are performed.

2-2-KK.

Q: Why does New Jersey DEP have more stringent standards for residential and non-residential land use then EPA and MA DEP use here where standards here are less than 2 parts per million for residential and less then 10 PPM for recreational use but NJ uses 0.2 PPM for residential and 1 PPM for non-residential? What do they know that we don't? On the floodplain slide that shows >80 PPM just how much higher was it measured? What was the highest reading?

A: Many states have developed general standards or guidelines for soil cleanups. EPA does not have a role in each state's selection of cleanup criteria, and as NJ is in Region 2 we do not have direct familiarity with the assumptions used to derive its standards. Under the federal program (including this project) site-specific risk assessments are used to calculate cleanup goals. Regarding the question of PCB concentrations in the Housatonic floodplain, the highest measured concentration was 907 mg/kg.

2-2-LL.

Q: What if any effects have been found in ground water/aquifers?

A: Ground water is being actively monitored at the GE facility. Because the PCB concentrations in Rest of River are low relative to the concentrations that were found at the facility and the PCBs are strongly bound to sediment and soil, PCBs are not an issue in ground water in the Rest of River area.

2-2-MM.

Q: If 90% of the PCS coming into Woods Pond are leaving it, where are they going? The ocean? Or do they later re-adsorb to the sediment particles in the floodplain? What conditions lead to the PCBs leaving the sediments and diffusing back into the water column? Is it unsafe to have contact with the water leaving Woods Pond? How high are the PCB concentrations in that water?

A: PCBs transported out of Woods Pond are transported downstream and are deposited in sediments and on the floodplaindownstream. Some PCBs deposited to the sediments diffuse back into the water column. The PCB mass transported over Rising Pond is approximately 85 to 90% of the mass leaving Woods Pond, although at lower concentrations because of additional inflow from tributaries and runoff.

Release of PCBs from the sediment occurs because PCB concentrations in pore water are generally higher than concentrations in the water column, and the gradient in concentrations results in transport to the water. Activity of biota in the sediment can enhance the transport of PCBs from the sediment to the water column.

The human health risk assessment concluded that direct contact with surface water leaving Woods Pond does not pose an unacceptable risk. PCB concentrations in the outflow of Woods Pond are generally in the range of 0.01 to 1 ug/l, and average approximately 0.1 ug/l.

2-2-NN.

Q: **How would I go about getting my garden soil tested/sampled for possible PCB levels? I live in the river's floodplain.**

A: Extensive environmental sampling has been completed in and adjacent to the Housatonic River. The individual should contact EPA for any data that may already exist in their area of interest.

2-2-OO.

Q: **Where do EPA experts disagree with GE experts? Lot of data- where are the conflicts?**

A: Please see the response to Question 2-2-JJ, above.

Welcome
Workshops
Calendar
Background
Q & A
Mini Workshop One
Mini Workshop Two
Mini Workshop Three
Contact Us

You are here: Workshops Home » Q & A » Mini Workshop Two » Presentation Three

Presentation Three: Ecological Risks, Gary Lawrence, Golder Associates

2-3-A.

Q: Is there significant threat for a species (e.g. mink) which, if it was eliminated, would lead to severe ecological consequences?

A: While it may appear that the loss of one of many resident species should not be of major concern, elimination of any species from an ecosystem may have significant and potentially unknown consequences depending on such factors as the abundance of the particular species, its position in the food chain, and the extent to which other species are dependent upon it for their own health and survival. It is also important to remember that the Ecological Risk Assessment evaluates risks to entire groups of species using a species such as mink as the representative for the entire group. Therefore, the clearly demonstrated impacts to mink due to PCB contamination in the Rest of River apply not only to mink but also to other piscivorous mammals, such as otter. Eliminating entire groups of species that occupy a similar ecological niche multiplies the ecological consequences considerably.

2-3-B.

Q: Concerning biologic risk assessments, it seems that benthic organisms, presumably the base of the food chain, are one of the highly impacted species (at least significant types of benthic organisms). If that population is significantly negatively affected, doesn't that have significant impacts higher up the chain?

A: Yes, impacts to species that are lower on the aquatic food chain will potentially impact higher-trophic level species. Benthic invertebrates are an important food source for many fish, which in turn are an important dietary component of several mammal and bird species.

2-3-C.

Q: Have synergistic effects been studied of PCBs with other chemicals - such as prescription drugs and personal care products coming out of the sewage treatment plant?

A: EPA is not aware of any such studies. The ecological risk assessments were based principally on the effects of PCB contamination in the River, with some additional assessment of dioxins and furans.

2-3-D.

Q: You said the Rest of River is not reaching its full ecological potential: Is there any river with past or current industrial activities along its bank, running through communities in Massachusetts, reaching its full ecological potential?

A: Considerable progress has been made in restoring rivers in Massachusetts and the northeast to pre-industrial conditions, but the objective of Ecological Risk Assessment is not assessing the return of the Housatonic River to a pristine condition, but evaluating conditions in the River relative to reference areas that may be similarly impacted with the exception of the presence of PCBs. Whereas it is difficult to protect rivers from all of the potential influences of human activities, PCBs have been identified as a distinct chemical stressor that significantly diminishes ecological functions.

2-3-E.

Q: In your studies was a control group considered? In the Harmful to Humans presentation was a baseline established for the various toxic risks if possible?

A: The Human Health Risk Assessment used toxicity values that are based on laboratory studies with animals that were designed and conducted with appropriate controls in accordance with established procedures for toxicological studies. These typically included two types of baseline assessment: (1) negative controls, which used clean reference media against which contaminated sample responses were compared, and (2) field references, which are samples from the Housatonic watershed that have relatively low contamination levels. All studies evaluated in the Ecological Risk assessment had appropriate controls.

2-3-F.

Q: What percentage of all species observed in the Primary Study Area did you study with the detail you applied to the mink and otter populations?

A: The actual number of species studied was quite small in comparison to the wide diversity of species present in the River and floodplain. Studying all, or even the majority, of the species is neither possible nor necessary. The Ecological Risk Assessment is based on the "representative species" approach in which animals were placed into functional groups (animals with similar biology, feeding preferences, and migration patterns) and then species representative of each functional group in the conceptual model were selected for detailed evaluation. The representative species selected (in addition to mink and otter) were studied at a similar level of detail.

The results of the risk assessment for the individual representative species are then assumed to apply to all species in the assessment endpoint. The risk assessment also included a discussion of how closely the results of the representative species are expected to match other animals within each group.

2-3-G.

Q: Where can we find a list of all species observed in the Primary Study Area, compared with a list of all the species studied, and compared with the subset that show toxic effects of PCB exposure?

A: The list of species observed in the PSA, along with considerable additional information on each of the more common species and the ecosystem in general, may be found in the Ecological Characterization report, which is Appendix A of the Ecological Risk Assessment (ERA). This report is available at:
http://www.epa.gov/region01/ge/thesite/restofriver/reports/final_era/EcoCharReport.pdf.

The representative species studied for the ERA, and the reasons for their selection, are detailed in Section 2 (Problem Formulation)
http://www.epa.gov/ne/ge/thesite/restofriver/reports/era_nov04/215498_ERA_FNL_Vols1-2.pdf. Additional rationale and discussion of the representative species (and study endpoints) selected for each grouping of animals is provided in Appendices D - K. The nature and magnitude of the effects of exposure to PCB contamination in the River and floodplain is discussed in the Effects Assessment and Risk Characterization sections for each of the assessment endpoints.

2-3-H.

Q: Have any of the EPA studies looked at biomagnification of PCBs in the food chain? If so, what are the results? If not, are there plans to incorporate

this into future research?

A: Biomagnification is an explicit component of the FCM food-chain model that is being used to evaluate the effects of remedial alternatives on PCB concentrations in fish tissue. It is also implicit throughout the Ecological Risk Assessment in the evaluation of representative species that obtain a significant portion of their PCB exposure from food. The risk assessment considered biomagnification using an assessment of both measured PCB concentrations and modeled (estimated) concentrations where site-specific data were not available.

2-3-I.

Q: If fish have low to moderate risk, why is there an advisory against eating fish?

A: The evaluation of low to moderate risk refers to the risk to the fish themselves, i.e., fish populations are at low to moderate risk due to exposure to PCBs. That is separate from the evaluation of high risk to humans (and other animals) from eating those same fish, which is the basis for the fish consumption advisory. There is nothing inconsistent in the conclusion that fish are able to tolerate concentrations of PCBs in their bodies that may not be causing substantial harm to the population of fish, yet would be harmful to humans eating the fish.

2-3-J.

Q: Part 1 - Did field surveys on mink cover the entire Rest of River or only the PSA?

A: The field surveys of mink and otter (both EPA and GE investigations) emphasized the PSA, with EPA studies (1998-2000) conducted throughout the length of the PSA, and the GE studies conducted in the downstream half of the PSA. However, regional reference areas were also evaluated as a baseline for comparison; for example, the EPA surveys evaluated Ashley Lake, Washington Mountain Lake, Threemile Pond, and Muddy Pond as reference areas with suitable mink habitat.

Q: Part 2 - What were the number of individual otter and mink expected and found?

A: The field surveys were designed to detect the signs of the presence of these animals (e.g., scat, tracks, scent posts). Signs of otter and mink were infrequent and much lower in occurrence than would be expected, considering the available habitats and food resources. River otter or indications of their presence were observed 8.7 times more frequently in reference areas, and mink signs were observed twice as much in reference areas as in the PSA floodplain. Furthermore, little or no evidence was found in either the EPA or GE surveys that mink or river otter are resident in the PSA during the non-winter months.

2-3-K.

Q: Compare and contrast PCB pathways to wood ducks vs. mergansers.

A: Wood ducks were chosen as the representative insect-eating waterfowl species (while they also eat plant matter such as acorns during the non-breeding season, during the breeding season they are insectivorous). In terms of PCB pathways, there are two main exposure terms that would affect their relative uptake of PCBs, namely dietary preferences and local site use. The diet of mergansers includes more small fish and invertebrates (which have higher concentrations of PCBs relative to other waterfowl food sources). However, the site use and residency is greater for wood ducks relative to most mergansers. Hooded mergansers would be expected to use the River more than common mergansers because the latter are present only during migration and winter periods. However, despite the suitable habitat, there was little evidence of the presence of hooded merganser during the sensitive reproduction period.

Therefore, in the ERA it was concluded that the PCB risks to mergansers could be either higher or lower than wood duck, depending on the species. Additional information on this topic is found in Appendix G (Section G.4.5.3 - Comparison of Risks to Wood Ducks with Other Species).

2-3-L.

Q: Following remediation, are the benefits of reduced PCB concentrations actual or only theoretical? That is, has it been well demonstrated that remediation reduces the incidence of ecological toxicity effects?

A: Some evidence for ecological recovery (actual, not theoretical) comes from the remediation efforts that have already been conducted in the Housatonic River, specifically the upper 2 miles of the site along the East Branch (above the confluence). A clean up goal for these areas was to enhance riparian and aquatic habitat, including the diversity and productivity of the biological community. The reduction in PCB concentrations in benthic invertebrates (by 99%) is reflected in the ecosystem recovery. A benthic community with higher diversity, increased abundance, and increased presence of pollution-intolerant taxa is now present when compared to the community measured prior to cleanup, and a diverse and abundant fish community is now found in the 1½-Mile Reach.

Unfortunately, historic data collection efforts to evaluate ecosystem recovery following remediation at other sites are scarce. However it is clear from the large body of information available on PCB dose vs. response that decreased exposures for sensitive species are associated with fewer or no adverse effects.

2-3-M.

Q: How are mussels (besides zebra mussels) doing?

A: Freshwater mussel surveys were undertaken in 1998 as part of the Ecological Characterization Study (see ERA Appendix A, Section 3.1.1). While originally thought to be suitable habitat, it was subsequently discovered that much of the physical habitat in Reaches 5 and 6 (Confluence to Woods Pond Dam) is not conducive to development of a community dominated by mussels, after measurements and observations of the erosion and deposition patterns in the area were made. Representative habitats for most freshwater mussels include stable substrates of coarse sand or sand-gravel mixtures.

Field surveys conducted in 1998 by EPA within the PSA resulted in the observation of three freshwater mussel species, including eastern elliptio, eastern floater, and triangle floater. The results of these surveys indicated that very small numbers of these mussels exist within the PSA.

2-3-N.

Q: Are you worried that cleanup efforts could put more stress on species (especially rare/endangered ones) than the current concentrations of PCBs do?

A: This question depends on how any cleanup and restoration would be conducted, both as to extent and implementation. A sensitive, surgical approach should provide net overall long-term benefits to species affected by PCBs. Conversely, a poorly designed and executed plan could increase the stress on sensitive species. As discussed during the workshops, the Housatonic River illustrates the resilience of rivers in the northeast. Species, both common and rare, that live in the River and floodplain have survived numerous human-induced impacts over the past several hundred years. Another important question may be how many decades into the future will PCBs negatively impact species in the Housatonic River if no cleanup and restoration are conducted.

2-3-O.

Q: Please explain the difference between "sound" and "unsound" science.

Be specific to the Rest of River cleanup if possible. Can the appearance of "sound" science be created to suit a pre-chosen result?

A: The terms "sound" and "unsound" in this context refer to whether the scientific method has been appropriately followed. The scientific method includes the formulation, testing, and modification of questions (hypotheses), and uses systematic observation, measurement, and experiment to evaluate these hypotheses. Scientific inquiry is intended to be as objective as possible, to reduce biased interpretations of results, and each element of a scientific method is subject to peer review for possible mistakes and/or bias.

In the Rest of River project, the Consent Decree specified the requirement for a formal independent Peer Review of the risk assessments and modeling studies. The Peer Reviews were intended in part to discern whether the approaches applied were "sound." To help in this determination, EPA's Ecological Risk Assessment used a weight of evidence framework with a transparent rating system that could be critiqued during Peer Review.

If a pre-chosen result were selected, and the investigations or results manipulated to fit that desired result, the process is neither sound nor consistent with the scientific method, and therefore would be considered "unsound."

2-3-P.

Q: Native Brook trout were not recognized--or at least not identified in the presentations. Brook trout are part of the species, are in the river and especially in the streams that feed into the subject area. Brook trout recovery has been an important concern of many environmentalists; what have been the impacts of PCBs in the Housatonic and its influence on Brook trout, and potential impacts on recovery programs for Brook trout?

A: Trout were recognized in the Ecological Risk Assessment as a species of concern in the downstream reaches below Woods Pond Dam. In the River from the Confluence to Woods Pond Dam, the current habitat does not support a cold water fishery. The site-specific studies and literature on fish reproduction and development indicate that trout are more sensitive to the effects of PCBs than warm water fish such as largemouth bass. Slide 17 of the Ecological Risk Assessment presentation on Day Two of the Workshops illustrates the toxic response by trout.

An IMPG was developed for trout and used to estimate risks downstream of Woods Pond Dam. The conclusion was that trout are at a low risk in Reach 7 and not at risk in reaches further downstream with suitable habitat.

2-3-Q.

Q: There have been studies showing caddis fly larva up to 3 miles from the active center of river "bed" meaning there is a connection underground to the actual water in the river as we know it. What do you think this does to any remediation efforts and what [does] it mean?

A: Caddisflies (Order Trichoptera) are common and widespread aquatic insects that inhabit a wide variety of lentic (still) and lotic (flowing) water bodies. It is possible that the caddis larvae in question arose from adults that flew or were blown by wind from the Housatonic River or some other water body and subsequently laid eggs that hatched into larvae. Based on all studies that have been conducted on the hydrology of the Housatonic River watershed, there is no indication of the presence of underground flowages that would be capable of transporting caddisfly larvae or other aquatic organisms to distant locations.

Welcome
Workshops
Calendar
Background
Q & A
Mini Workshop One
Mini Workshop Two
Mini Workshop Three
Contact Us

You are here: Workshops Home » **Q & A** » **Mini Workshop Two** » Presentation Four

Presentation Four: Why Use Models for the Housatonic River?, Mark Velleux, Ph.D, HRD HydroQual

2-4-A.

Q: What is the longest time period that you have modeled or required GE to model?

A: All models were run for a minimum of 52 years. Some simulations were run for roughly 80 years so that there were at least 30 years following the end of the remediation for that alternative. Statistical extrapolations of model results were also performed to extend the results up to an additional 250 years into the future.

2-4-B.

Q: When looking at long range validation models, specifically 10 year extreme storm events, are you accounting for more frequent and violent events due to climate change in future modeling?

A: Flow conditions for model forecasts were based on a period that included many small storms and several very large ones. Each of these storm sequences was repeated during the forecasts. In addition, flow conditions for forecasts included the largest storm ever recorded (Hurricane Bertha). A number of these storm events are much larger than a 10-year event.

2-4-C.

Q: Does the Monitored Natural Recovery model include the effect of chemical decomposition of the PCBs?

A: Yes. For practical purposes, the rate at which PCBs break down in the River is minimal. The possibility of PCB decomposition was extensively explored as part of the initial Model Framework Design (MFD). The MFD report is available on EPA's website for the Housatonic River cleanup project at **http://www.epa.gov/ne/ge/thesite/restofriver/reports/mfd2004/204991.pdf**.

PCB molecules are called congeners and have chlorine atoms as part of their chemical structure. PCB decomposition occurs by a process called dechlorination. Dechlorination removes chlorine atoms from some PCB congeners but does not destroy the PCB molecule. As long as one or more of the chlorine atoms on a PCB molecule remain, it is still a PCB. Consequently, PCBs undergoing dechlorination only change from one PCB congener into another type of PCB congener and are not destroyed. Also, dechlorinated PCB molecules are not always less toxic than they were before dechlorination occurred. This process, also called "weathering" was studied by GE in Woods Pond in the 1980's into the 1990's, and was also investigated by evaluating congener data patterns in all media. Minimal naturally occurring weathering was observed.

2-4-D.

Q: Has there been any modeling done that includes the assimilation of PCBs from bioremediation techniques?

A: Bioremediation techniques for PCBs, particularly those that work in situ, while potentially having great promise, are still in the developmental stage and have not been applied in situ to clean up sites. Although EPA would be pleased to consider application of any proven bioremediation technologies, bioremediation is not currently among the technologies GE evaluated. Accordingly, no modeling has been done relative to bioremediation techniques. The potential application of bioremediation technologies at a future date could be one aspect of adaptive management.

2-4-E.

Q: Why do most of the presenters talk only about the river to Woods Pond or as far as Great Barrington? Is there no evidence, data, modeling for Connecticut? Is Connecticut going to be forgotten in this process? Is there no concern about Connecticut fish and the people who eat them? Is there no concern for the Ocean which is the ultimate destination for the river waters and sediments and is the ultimate ecosystem and food/water generator/incubator for the Planet?

A: Connecticut is not forgotten in the River cleanup process. Data have been collected, risk assessments performed, and models developed for the River in Connecticut (Reaches 9-16) to the Derby Dam, in addition to Massachusetts (Reaches 5-8 for Rest of River). In Reach 17, there are a number of other sources of PCBs to the River, so Reach 17 was not evaluated in the Rest of River process.

With respect to the tools used to perform long-term forecast simulations, the model for Connecticut used by GE in the Revised Corrective Measures Study is called CT1D. It uses field measurements collected in Connecticut and expected PCB inputs from upstream (from EPA's Model Framework) to estimate expected PCBs levels over time in water and sediment. This information is also used to compute expected PCB levels in fish in Connecticut.

2-4-F.

Q: As Dr. Velleux discussed, the modeling used for the river from Rising Pond and upstream is different from the modeling used below Rising Pond. Briefly, how do these modeling approaches differ and what are the implications for EPA's understanding of the river in Reaches 9 into Connecticut?

A: CT1D is the modeling analysis that was used to examine PCB transport and exposures and fish bioaccumulation in Connecticut (Reaches 9-16). It is a mass balance model but is different than the Modeling Framework used for Reaches 5-8. CT1D focuses on the major impoundments along the River in Reaches 9-16, predicting PCB concentrations in water, sediment and fish. This model provides an understanding of natural recovery and how remediation in upstream areas under the various alternatives under consideration are expected to impact Connecticut.

2-4-G.

Q: If [Woods Pond is] losing 16kg/year of PCBs, why do you say no natural cleaning is happening?

A: The issue of concern is that the rate of natural recovery in the River is very slow, so slow that target risk levels will not be achieved for a very long time (more than 250 years in many cases). While the model estimates that on average 16 kilograms of PCBs leave Woods Pond every year over the duration modeled, the amount of PCBs in the River is very large so that downstream transport of 16 kg/year is not significantly depleting the amount of PCBs that are in Reaches 5 and 6. The estimate of 16 kg/yr equates to approximately 35 lbs/yr. GE estimates that there are between 18,000 and 98,000 lbs. of PCBs in the River sediments between the Confluence and Woods Pond Dam. This does not account for the continuing input of PCBs from the eroding river banks. Moreover, PCBs that leave Woods Pond are still in the River and continue to work their way down the River where they contribute to downstream contamination.

US Environmental Protection Agency

Housatonic River Workshops

Mini Workshop Three (April 7) - Exploring Alternatives for Cleanup: Remediation, Restoration, Alternatives, and Environmentally Sensible Remediation Concepts

- **Presentation One: Remediation Technologies and Techniques, Michael Palermo Ph.D, Mike Palermo Consulting Inc.**
- **Presentation Two: Restoration Techniques, Keith Bowers, Biohabitats Inc.**
- **Presentation Three: Alternatives and Technologies, Bob Cianciarulo, EPA Chief, Massachusetts Superfund Section**
- **Presentation Four: Environmentally Sensible Remediation Concepts, Susan C. Svirsky, EPA Project Manager, Rest of River**

Welcome
Workshops
Calendar
Background
Q & A
Mini Workshop One
Mini Workshop Two
Mini Workshop Three
Contact Us

You are here: Workshops Home » Q & A » Mini Workshop Three » Presentation One

Presentation One: Remediation Technologies and Techniques, Michael Palermo Ph.D, Mike Palermo Consulting Inc.

3-1-A.

Q: Are lessons learned by remediation of Hudson River PCB contamination shared with Housatonic remediation efforts? Is the same team working on both?

A: Information gained from the Hudson experience is being applied to the Housatonic as appropriate by normal coordination activities within EPA. The EPA Housatonic Team toured the Hudson during the Phase I remediation, attended the Hudson Peer Review, and has reviewed all of the documents produced in the process. In addition, Michael Palermo, Ph.D., consults for both EPA Region 2 for the Hudson and EPA Region 1 for the Housatonic River.

3-1-B.

Q: Is there a suction system (not dredging) which would discern between PCBs and invertebrates or vertebrates (without killing critters) to return them back to the environment? The PCBs could then be [disposed of by] burning or bacteria, etc.

A: No. There are measures that have been taken to "reject" large organisms (such as sea turtles) from being taken by hopper dredges. Other than that, no dredged equipment or suction equipment that we are aware of has any provision to separate organisms from sediment, nor PCBs from sediment.

3-1-C.

Q: How would you design a cap in a pond or lake that contains natural springs feeding into the lake below the cap?

A: Site specific evaluations would be required. Springs would likely occur in limited areas. If flow velocities were high, conventional caps over these areas may not be feasible. For any project area, the groundwater flow conditions are an important factor in cap design.

3-1-D.

Q: What is the lifetime of an in-situ cap? Have any of the caps failed? If capping is done in Rest of River, who will be responsible for monitoring - EPA or GE? At what cost?

A: The lifetime of a cap can be defined in different terms, so there is no easy answer. We would commonly design the armor layer component of a cap to resist erosion events for a 100-year return interval (i.e. a 100-year storm). But if a higher energy event occurs, any movement of the armor layer would be in localized areas and could be repaired. For sites with contaminants such as PCBs, we can commonly design the cap component for chemical isolation to provide the necessary isolation capacity under steady state conditions in perpetuity.

Construction failure (like a mudwave) can be prevented by taking appropriate care during cap placement. A few sites have experienced movement of contaminants through the caps due to unanticipated conditions (e.g. the presence of mobile non aqueous phase liquid (NAPL) in the sediments). Appropriate site characterization, design, construction, and monitoring of caps is needed to prevent any failure scenario from occurring.

Monitoring is necessary for any capping project. Responsibility for monitoring would be the responsibility of GE with EPA oversight.

3-1-E.

Q: What are "institutional controls"?

A: Institutional controls (ICs) are non-engineering measures intended to affect human activities in such a way as to prevent or reduce exposure to hazardous substances, often by limiting land or resource use. ICs are commonly a part of any MNR or capping remedy. The most common ICs for sediment contamination include fish advisories, restrictions on vessel size operating in capped areas, restrictions on anchorages in capped areas, etc. However ICs are not considered to be the sole component of a remedy if other practicable and more permanent alternatives exist.

3-1-F.

Q: Is the EPA keeping up with the latest technologies in dredging, especially suction type dredges?

A: EPA becomes aware of new information from contacts within regional offices, EPA research labs, and other agencies, especially the US Army Corps of Engineers. In addition, EPA's consultants work to evaluate the latest technologies for possible application to projects. The latest information is presented at national conferences attended by the EPA Housatonic River team and its consultants.

3-1-G.

Q: When planning to remove floodplain soils, how do you determine the extent of area to be removed? Are not floodplains amorphous and extensive?

A: No cleanup of the floodplain has yet been decided. Because the floodplain has numerous Exposure Areas, a range of PCB concentrations, different habitat values and other factors, achieving a desired level of risk reduction could involve selection of subareas based on both PCB concentrations and other factors. A demonstration model at the May 7 Charrette will illustrate a tool which allows for the potential balancing of these factors.

3-1-H.

Q: In 20 years, you have not gone through a 500 year flood, including Silver Lake?

A: In general, the intensity (flow or river stage) of flood events for various return intervals is determined based on statistical evaluations of historic data. If a new severe event occurs, it would be added to the data set, and the nature of events for given return intervals would be appropriately adjusted. In addition to this, any changes in the nature of the drainage basin for the river, such as increased land clearing, has to be considered in characterizing the events for various return intervals.

3-1-I.

Q: How thick is a cap? Woods Pond is very shallow and a cap could perhaps be above water level.

A: Cap thicknesses would vary depending on the erosion potential, PCB concentrations, habitat layers, and other processes at work at sites. In general, engineered cap thicknesses would be on the order of 2 to 3 feet for a PCB site. If a cap is selected as a remedy component for Woods Pond, most active alternatives include some pre-cap sediment removal so that the cap would match the pre-remediation sediment elevation.

3-1-J.

Q: Why is in-situ treatment of sediment not discussed as a remedy? Can you speak about special soil bacteria that treat or break down PCBs?

A: In-situ treatment technologies, whether biological or non-biological, are not among the alternatives in the Revised CMS because of the lack of effectiveness and implementation when considered for in situ applications. While some in-situ technologies could potentially be effective if the treatment media could be brought into contact with the contaminants (i.e. PCBs) in the sediment, this is extremely difficult to do for sediments for a number of reasons, and has never been done effectively over the long-term. Therefore, because contamination in Housatonic River sediments can extend down through several feet of sediment, in-situ technologies were not considered to be effective. While in some cases, PCBs can be broken down by bacteria, the rate of biodegradation for certain PCBs (such as those in the River) is very slow. Moreover, any large-scale continuing disruption of the sediment to achieve a thorough mixing of a treatment media over time would be even more detrimental to organisms in the river than proven removal technologies that can be implemented much more quickly and completely with appropriate restoration. Similar issues exist in the floodplain, with the additional consideration that technologies that have been demonstrated to date would require clearing of the vegetation and subsequent "farming" of the soil to introduce the treatment media.

3-1-K.

Q: How do you factor the damage done by dredging into the project risk assessment? How does the heavy equipment get to the digging location in wetlands or other sensitive areas?

A: Dredging would impact existing benthic organisms living in the sediments due to the excavation process, and also due to the dewatering and disposal of the sediments. Fortunately, recolonization of benthic organisms is typically rapid following a dredging operation.

In the floodplain, the equipment used for any excavation would require some construction of access roadways. In addition, there is an entire industry devoted to the production and implementation of low-impact equipment to minimize the effects of such work in these habitats, and there have been proven restoration techniques following such intrusion as necessary. To the degree possible, sensitive areas would be avoided if the desired reduction in risk can be achieved by active remediation of other areas. The May 7 Charrette will have a demonstration model to illustrate the implementation of trade-offs in the selection of areas for active remediation.

3-1-L.

Q: What kinds of improvements have been made in the past 20-30 years in dredging technologies?

A: The dredging community has developed remarkable improvements in both dredging hardware and software in the last 20 years. New equipment such as environmental buckets for mechanical dredges, articulated ladders for hydraulic dredges, and improved sediment processing methods have been developed and applied to more recent projects. On the software side, the accuracy of dredging operations has been dramatically improved by application of GPS and positioning software that can track progress of work and display locations of the active excavation process to operators in real time.

3-1-M.

Q: How is PCB sediment removed from very rocky areas of the river?

A: Rocky conditions (or other conditions such as the presence of a large amount of debris or bedrock) present difficulty for removal of contaminated sediments present between or below the rocks overlying the area. If dredging is required in such areas, appropriate equipment must be used. Fortunately, such areas in the River are very limited in the Reaches being evaluated for active remediation.

3-1-N.

Q: Aren't vacuum type dredging projects better than claw type projects?

A: There are advantages and disadvantages of each type of dredging approach. Early studies indicated that clamshell dredges with open buckets resulted in somewhat higher resuspension as compared to hydraulic dredges. But with the advent of environmental buckets and better operational practices, there is not a general advantage of hydraulic versus mechanical equipment with respect to sediment resuspension. However, resuspension is only one of a number of factors to consider in selecting the appropriate dredging equipment for cleanup at a given site.

3-1-O.

Q: Do PCBs break down under caps at a similar or higher rate as they would in the "natural" setting - or does it stymie that process?

A: There may be a slight potential for faster PCB breakdown in the first few centimeters of depth in a sediment profile in a natural setting due to aerobic conditions at the sediment surface if this is a condition that promotes greater degradation of the mix of PCBs present at a site. A cap will reduce that potential for the surface sediments. However, because the rates for PCB breakdown for most PCB mixtures are relatively slow in sediment under both aerobic and anaerobic conditions, the practical difference between capped and uncapped sediments is negligible.

3-1-P.

Q: Though there were many references to both Woods and Rising Ponds, with dredging as a possible undertaking, has anyone mentioned that behind the Glendale Dam in Stockbridge there could also be some accumulation of PCBs?

A: EPA has data on PCB concentrations in sediment for all of the impoundments on the River, and some of the remedial alternatives under consideration include removal of sediments from the impoundments in Reach 7 (Woods Pond Dam to the headwaters of Rising Pond), which includes Glendale Dam.

Welcome
Workshops
Calendar
Background
Q & A
Mini Workshop One
Mini Workshop Two
Mini Workshop Three
Contact Us

You are here: Workshops Home » Q & A » Mini Workshop Three » Presentation Two

Presentation Two: Restoration Techniques, Keith Bowers, Biohabitats Inc.

3-2-A.

Q: Could you talk about the use of vanes and weirs to change the energy of the river flow to protect banks instead of using rip-rap?

A: Rock or log vanes and weirs can be used in a channel to direct the river flow to the center of stream, reducing near bank shear stresses and potential riverbank erosion.

3-2-B.

Q: When planning and designing botanical restoration for riparian and floodplain ecosystems, do you account for long term monitoring? These ecosystems are complex and have taken centuries to be created. Is it the height of human hubris to expect one for one replacement?

A: Vegetation monitoring plays an important and critical role in ensuring that targeted plant communities are being established during the restoration process. As has been documented in the River, the current system is the result of responses to perturbations that occurred only a little over a century ago. While one to one replacement may be the goal, other goals may be desirable (such as including an evaluation of the future trajectory of the system). However, if a one to one goal is what is desired, then the timeframe for the measurement of success must be established and will vary according to habitat type.

3-2-C.

Q: Regarding ecological restoration, I did not see animals listed; plants were, but not animals. How does animal restoration (not just fish) occur in river restoration?

A: Animal and fish restoration (as well as plants) are incorporated into all river restoration projects through both active and passive strategies. Passive animal restoration involves restoring the appropriate soil structure, in-stream habitat and riparian plant communities to facilitate natural recolonization of adjacent populations of animals and fish. An active animal and fish restoration strategy may involve capturing, holding (potentially propagating), and replacing species following the restoration.

3-2-D.

Q: Can you talk more about collaboration, especially the input of the environmental community and other river users?

A: Successful ecological restoration projects embrace strategies that engage stakeholders (river users, neighborhoods, property owners, businesses, special interest groups, government agencies and concerned citizens, etc.) throughout the planning, implementation, monitoring and management stages of a project. Adaptive management can provide the framework for facilitating this type of ongoing collaboration.

3-2-E.

Q: How are very rocky riverbeds restored?

A: Conducting sediment particle size and distribution analyses of a reference riverbed prior to restoration and then replicating that same particle size and distribution during the restoration reconstruction process can restore rocky riverbeds.

3-2-F.

Q: When you say you have much data for the Housatonic, do you in fact mean the river from its source to the ocean, or just sites around the GE contamination?

A: The area of Rest of River that is under consideration for active cleanup extending from the Confluence to Rising Pond Dam has had an enormous amount of data collected and evaluated. That being said, extensive characterization has also been conducted down to Derby Dam in Connecticut.

3-2-G.

Q: EPA seems to like to do a lot of capping and dredging; what is your experience with restoration that has occurred with this sort of remediation?

A: Remediation often requires the removal of contaminants through dredging and capping. Ecological restoration can be effectively and successfully used to mitigate the disturbance caused by the removal of the contaminants. As to capping, see response 3-2-I.

3-2-H.

Q: Do muskrats or otters love armored banks?

A: No, it is not likely that they "love" armored banks because they are not equipped to move large rocks. However, as has been observed in the 2 miles of the East Branch that have been remediated, the activities of species such as beaver and muskrat have not been inhibited by the armored banks.

3-2-I.

Q: Can you discuss how the pre-existing ecosystems are re-established under capping or under dredging? Are there differences? How effective is the restoration?

A: If a remediation action that involves capping is selected, then subsequent restoration strategies will need to incorporate the capping into their design, implementation and monitoring. The type and nature of the restoration strategies will vary widely depending on the location and context of the capping and dredging, and may include the explicit inclusion of a habitat layer which is designed into the cap. Done right, these strategies can be very effective in restoring the health, integrity and diversity of the ecosystem.

3-2-J.

Q: Can you walk us through a possible timeline for restoration of the Housatonic down to Woods Pond, assuming an aggressive dredging and removal effort? How long does it take to get the river and flood plain to be similar to what it looks like today?

A: Without a decision yet on the remedy, it is impossible to determine a timeline for restoration. The length of time for the system to be restored to conditions similar to those existing today will depend on the method, approach, and management of both the remediation and restoration strategies. Active, comprehensive, and diligent ecological restoration coupled with a surgical approach to cleanup will greatly accelerate the recovery processes of the River, riverbanks and floodplain from any type of disturbance.

3-2-K.

Q: Some individuals do not believe vernal pool can be restored once they are dredged, etc. Can you comment?

A: Vernal pools can be successfully restored after dredging provided that clear and measurable goals and objectives are established prior to disturbance. That has been already demonstrated at this site with the vernal pool which was cleaned up during the 1½-Mile cleanup. Obligate species including fairy shrimp and wood frogs have been documented repeatedly following restoration.

3-2-L.

Q: Are you satisfied with the restoration of the Housatonic River in Fred Garner Park, Pittsfield? I am talking about the river itself. Do you think it can sustain trout? Micro-invertebrates?

A: Regarding the restoration, yes, the River bottom habitat is very similar to what was present before the removal action, except that the sediments do not contain elevated levels of PCBs. While habitat for trout might be better than it was before cleanup because the River does not contain elevated levels of PCBs for which trout are more susceptible than some of the other fish in the River, temperatures and habitat structure in this stretch of the River have always limited the use of this area by trout during much of the summer season and for reproduction. Any trout found along this stretch of the River would be holdovers from the stocking program that the State conducts. Conditions are not conducive (nor were they prior to cleanup) for reproduction to occur, as is the case in most of Reaches 5 and 6, with very few individuals observed during the intensive fish community characterization efforts. The macroinvertebrate community in this area was studied quantitatively, and the community responded positively to the 99% removal of PCBs that were impacting the community.

3-2-M.

Q: Will the remediation-restoration plan allow for the effects of dam removal?

A: A remedy has yet to be decided, however EPA is considering the concerns and issues regarding dam removal for any remedy which is selected.

3-2-N.

Q: Keith Bowers mentioned cutting down high embankments as part of restoration. What about kingfishers and bank swallows that use those banks as nesting habitat?

A: As part of a potential restoration strategy, high banks on the inside of meander bends could be lowered to allow greater connectivity between the River and its floodplain while outside meander bend riverbanks may be maintained or stabilized to facilitate ample habitat for kingfishers and bank swallows.

Welcome
Workshops
Calendar
Background
Q & A
Mini Workshop One
Mini Workshop Two
Mini Workshop Three
Contact Us

You are here: Workshops Home » Q & A » Mini Workshop Three » Presentation Three

Presentation Three: Alternatives and Technologies, Bob Cianciarulo, EPA Chief, Massachusetts Superfund Section

3-3-A.

Q: Why do public officials always use the word "cleanup" when it is evident that that is not happening in "the Rest of River"?

A: The term cleanup is not referring to the current processes occurring in the Rest of River, except when discussed in the context of Monitored Natural Recovery (MNR). The use of the term cleanup most often refers to the implementation of an active remedy to remove PCBs. Any cleanup of a hazardous waste site is a complex process that often requires many years of study and engineering design to ensure that the appropriate remedy is selected and implemented; that work has been conducted at this site and EPA is now evaluating alternatives to select a remedy that is best suited to the River. This cleanup is also governed by the Consent Decree, with which GE, EPA and other parties must comply.

3-3-B.

Q: When can we eat the fish?

A: Because PCBs bioaccumulate and biomagnify in fish, even small amounts of PCBs in the environment can lead to restrictions or outright bans on fish consumption. The different remedial alternatives for the River that have been examined and are currently being evaluated by EPA all will require fish consumption advisories for the next few decades or longer. However, a number of active alternatives allow for the safe consumption of some fish in a few years following cleanup.

3-3-C.

Q: When in Reaches 9-16 (i.e. the rest of the river [in Connecticut]) the active remedy suggested is "Monitored Natural Recovery." How can that be called a "cleanup" considering the persistence of PCBs?

A: GE evaluated alternatives which focused on the most contaminated sections of the River that pose a risk to human health and ecological receptors. PCB concentrations in sediment drop substantially below Rising Pond (Reach 8) to levels that, according to the peer-reviewed Human Health Risk Assessment, do not pose risks to human health and have only very localized and limited effects on wildlife, yet still result in violation of water quality criteria and fish consumption advisories. Cleanup efforts upstream would reduce PCB inputs to Connecticut (Reaches 9-16).

3-3-D.

Q: Why are we looking at GE's summary of alternatives? Doesn't the EPA have its own summary, for instance how deep some removal has to be?

A: Under the terms of the Consent Decree, GE is responsible for the development of the Corrective Measures Study (CMS) and Revised CMS, which includes a summary of the range of alternatives described and evaluated therein. EPA is using the Revised CMS, along with other sources of information, in developing its own recommended alternative and is not restricted to considering only the alternatives evaluated by GE.

3-3-E.

Q: In the stretch of Housatonic River already restored, rip-rap was used to stabilize banks. Do you anticipate any stretches of the Rest of River using rip-rap for stabilization purposes?

A: The widespread use of stone rip-rap in the upstream remediated portion of the River was necessary due to the unique conditions in that area, primarily the need for preservation of the infrastructure and residential properties located immediately adjacent to the River. This required absolute stabilization of the River channel and banks. Such conditions are less prevalent downstream of the Confluence. Stone rip-rap is only one of several bank stabilization techniques that will be evaluated in the engineering design of any remediation in the Rest of River.

3-3-F.

Q: Is it EPA who does post-restoration monitoring, with GE funding this monitoring? If not EPA, who is responsible and what [role] does EPA have in this ongoing post-remediation/restoration monitoring?

A: Under the Consent Decree, GE is required to conduct and pay for any remediation in the Rest of River. Monitoring during and after remediation is considered a component of the remediation and would therefore be performed and paid for by GE. As has been the case in the past for all of GE's activities, EPA will review and approve all monitoring plans and conduct oversight as appropriate on all remediation and monitoring activities.

3-3-G.

Q: How does EPA view newer, innovative bioremediation techniques for PCBs - [with] skepticism, enthusiasm, curiosity? Is EPA willing to include these techniques (particularly in-situ methods) at least on a trial basis? In such a large and costly project, it would seem that "cutting edge" technology should be welcomed, even if it would mean more time is needed to evaluate its results.

A: EPA agrees that innovative technologies should be considered as part of any hazardous waste site remediation, provided that such technologies are shown to be effective. Accordingly, EPA views innovative bioremediation techniques, particularly for PCB-contaminated sediment and soil, with curiosity and enthusiasm, but - as they have not been proven to work at most sites - also with appropriate skepticism. The advantages of waiting for additional technologies to become available must be weighed against the disadvantages of allowing documented risks to human health and the environment to continue without taking action, as these risks have already occurred over many years.

3-3-H.

Q: In the floodplain area excavation slide presented earlier [in Mini Workshop Three], were the trees present excavated around or were they removed? In cases where trees are removed in the floodplain area, what have been restoration practices on river sites?

A: In most cases it is difficult to excavate around large trees and ensure that the contamination is removed adequately; that being said, it is not a given. Although immediate replacement of large trees that have been growing for several decades is not possible as part of restoration, it is possible to plant smaller trees of the same species and then manage the restored area to ensure that re-establishment of mature forest will occur in the shortest possible time.

3-3-I.

Q: Bob Cianciarulo mentioned parts per million, but the tables in pp. 9 and 10

[of Workbook Three] are in mg/kg. Please help us convert mg/kg to parts per million.

A: Parts per million (ppm) and milligrams per kilogram (mg/kg) are the same; 1 mg/kg = 1 ppm.

3-3-J.

Q: How important is cost as a consideration and why?

A: Cost is one of the six Selection Decision Factors required under the Consent Decree and RCRA Permit. Cost is also considered in selecting a remedy at virtually all Superfund sites.

3-3-K.

Q: Do any of the caps involve geotextile materials, or are only "natural" materials being considered?

A: None of the cap designs currently under consideration include the use of geotextile materials.

3-3-L.

Q: After the Charrette, [what is the] general time frame of future events:

- **EPA Review/Decision - weeks/months?**
- **Then, Public Response - weeks/months?**
- **Then, Appeal - months/years?**

Best guess when it would start and how long to implement (how many years)?

A: EPA Review/Proposal is expected Fall 2011. Public Comments would follow in Fall/Winter 2011. EPA Remedy Selection/Permit Modification is an important stage as well. The time required by a possible appeal is unknown.

3-3-M.

Q: Selection decision standards: Do "costs" simply consider the cost to GE or also consider costs to the community/citizens of alternatives?

A: The Selection Decision Factor of "Cost" refers to the actual cost of designing, implementing, and monitoring the remedy. Community costs, such as (for example) ancillary effects of increased truck traffic, noise and other disruptions, and economic impacts from such things as decreased tourism, are considered in the Selection Decision Factor of "Short-Term Effectiveness."

3-3-N.

Q: What did EPA learn from the first 2 mile cleanup and how does EPA plan to apply these lessons to the rest of the river remediation?

A: There were a number of lessons learned from the cleanup implemented on the East Branch, both the ½-Mile Reach conducted by GE and the 1½-Mile Reach conducted by EPA, both in evaluation of construction methods and cleanup effectiveness. For example, experience was gained in using sheet-pile to permit dry excavation and the use of the dam-and-pipe bypass system when driving sheet-pile was not possible due to bedrock. In addition, the effectiveness of the remedy was measured and continues to be evaluated over time. All lessons learned on the earlier cleanup will be applied to any remediation in the Rest of River.

3-3-O.

Q: When you show floodplain location in an area with trees, that means all the trees come down and out first, right? Is showing the trees misleading? Where in the criteria do you deal with damage caused by the remediation?

A: In some cases trees must be removed from areas of floodplain that are actively remediated, while in others, there may be other options. Impacts from remediation, after all possible ways to reduce, minimize, or mitigate damage have been considered, are considered as part of the "Short-Term Effectiveness" and "Long-Term Effectiveness" Selection Decision Factors. Restoration can speed the return of remediated areas to a desirable condition, as noted above.

3-3-P.

Q: Can the riverbed be divided in half, dried out, driven down by the repair crew and decontaminated (like a high use highway), and then dried out to work on the other side?

A: Yes, this and other techniques will be considered not only in the selection of any active cleanup but more importantly, in any subsequent design for a particular reach of the River.

3-3-Q.

Q: What standards or time frame move an alternative, new, in-situ cleanup option from "No proven ones that we know about" to "Ok, let's fully consider or choose this option"?

A: The question of when a technology becomes sufficiently "proven" for use in an actual site remediation is difficult to answer, other than to note that the process generally requires several years or more. In general, the consequences of applying an innovative but unproven technology that ultimately fails are usually more severe than the potential disadvantages of applying a fully established and effective technology. Also, please see the response to Question 3-4-G, from Presentation Four in Mini Workshop Three.

Presentation Four: Environmentally Sensible Remediation Concepts, Susan C. Svirsky, EPA Project Manager, Rest of River

3-4-A.

Q: **The section of the river from Woods Pond south has historically been an integral part of the economies of Lenox and Lee. Is the remediation of the economic assets part of the overall strategic thinking that will go into the final plan?**

A: EPA certainly shares the concerns of many members of the public, as well as local officials, regarding the impact that a potential remediation might have on the local economy. If a large-scale remediation is implemented, it will have the potential to infuse considerable additional capital into local economies, but like any large construction project it may have some negative aspects as well. EPA will work to ensure that the effects of any remediation are managed to minimize potential negative impacts while maximizing the potential for positive effects on the local economy.

3-4-B.

Q: **The HHRA shows that consumption of fish is such a high risk that consumption advisory signs posted in Massachusetts show a fish on a plate with an X, meaning Do Not Eat. Why are the fish consumption signs in Connecticut small in size and convoluted in wording?**

A: The warning signs in Connecticut were designed by the State of Connecticut; accordingly, EPA has no comment on these signs.

3-4-C.

Q: **In Wednesday's risk assessment [Mini Workshop] presentation, it was declared that the reaches of the river at the Massachusetts-Connecticut border displayed negligible human risk. How is it then that Connecticut lists the river as an impaired waterway?**

A: The Housatonic River in Connecticut is listed as an impaired waterway because it does not meet water quality standards and/or designated uses as defined by the State of Connecticut under the Clean Water Act (**http://www.ct.gov/dep/lib/dep/water/water_quality_standards/wqs.pdf**).

Risks in Connecticut from direct contact to soil and sediment and agricultural activities do not pose an unacceptable risk in EPA's evaluation, however risks remain from consumption of fish.

3-4-D.

Q: **What are the hazards/risks of thermal and chemical treatment of PCBs?**

A: Both thermal desorption and chemical extraction of PCBs, as discussed and evaluated in Section 9 of the Corrective Measures Study, are well-established and well-controlled industrial processes for the separation of PCBs (and/or other organic contaminants) from sediment and soil. If implemented correctly they would not pose any incremental risk to human health or the environment.

3-4-E.

Q: Please explain the Consent Decree: initiation process and ruling requirements, including but not limited to the CMS.

A: See the information relating to the Consent Decree on EPA's website at **www.epa.gov/ne/ge/cleanupagreement.html**.

3-4-F.

Q: Does "overall protection of human health and the environment" include taking steps to encourage the recovery or re-colonization of injured species, such as mink, otter and wood ducks?

A: The term "overall protection of human health and the environment" is intended to have considerable room for interpretation depending on site-specific conditions and requirements. If active remediation is selected as a component of a Rest of River action, restoration measures would be included, and such restoration measures can include recovery or re-colonization of the injured species.

3-4-G.

Q: What is your view of available bacterial bioremediation technologies (esp. Biotech Corp.)?

A: EPA has been in communication with BioTech and has requested both data from the sites which BioTech cites as successes and also references for the other project managers for us to contact. We have yet to receive this information. BioTech has informed EPA that it is intending to conduct a bench-scale test in the lab using Housatonic soil/sediment to measure if its "factor" could result in the degradation of Housatonic PCBs.

It should be noted that Chris Young, the president of BioTech in a meeting with EPA indicated:

- The technology has only been applied in a "land-farming" scenario to date, there have been no in situ applications.
- Mr. Young was doubtful that the technology could be applied in situ to river sediments due to the problems associated with getting contact of their "Factor" to the PCBs in sediment when applied through the water column.
- The company was just beginning to pilot a technique to deliver the "Factor" to floodplain soil in situ, however there are a number of considerations that are still unknown, including most importantly:
    - The ability of a water cannon delivery system (eliminating the need to clear the vegetation)to allow for penetration through the vegetation and then the floodplain surface or "duff" layer (leaves and other degrading materials forming a layer at the surface of the floodplain soil profile)
    - Penetration and effective in situ remediation to the 1 foot target depth
    - The need for effective performance of the "factor" which requires significant enhancement with nutrients, and the subsequent effects on floodplain conditions

EPA remains hopeful that innovative technologies have promise for future consideration within an adaptive management framework for any active remedy.

3-4-H.

Q: When soil bacteria run into PCBs they lose the ability to create a protein that breaks down organic chemicals like PCBs. Chris Young of Biotech builds up a high soil bacteria population and sprays them with the protein they can't synthesize on their own. The PCBs are broken down. Biotech has field tested results with California's EPA seal of approval. Mussels and clams

naturally filter sediment. Mussels exist in the River. Some mussels symbiotically use bacteria. Has anyone thought of using biological routes (mussels) to bioremediate (protein helped bacteria)?

A: Please see the response to Question 3-4-G, above. BioTech Restorations has not indicated that using mussels or any other species is either necessary or desirable as a part of their process. As documented in the Ecological Characterization, few mussels occur from the Confluence to Woods Pond Dam, therefore they have no role in assimilating PCBs from the system from the perspective of remediation. As also measured in the 1½-Mile cleanup, mussels remove a very small fraction of the PCBs from the system.

3-4-I.

Q: How will you keep the capping of Silver Lake from re-contaminating the cleaned up part of the Housatonic River in Pittsfield?

A: The Silver Lake project is being designed to minimize the impacts to the River. The actions being considered are cap placement rates, cap material, silt curtains, turbidity meters, and ongoing sampling of water column total suspended solids (TSS) and PCBs concentrations.

3-4-J.

Q: The community was invited to an information session on sediment remedies. We saw a company with proven field tests of PCB breakdown with simple soil bacteria. We also saw another company present a dredging strategy that had much less footprint then the dredges you showed. The first company, Biotech, got California's EPA to declare highly PCB contaminated land to be open use. You are connected to the Army Corps of Engineers, Biotech spoke of the Army's resistance to this company because, maybe, it would up end convention, put people out of outdated dredging jobs and force people to change the way they think. How do you feel about this?

A: EPA has no knowledge of any resistance on the part of the US Army Corps of Engineers to development of technologies for bioremediation of PCBs or, indeed, to the development of new technologies generally.

3-4-K.

Q: With the success and positive river remediation projects across the country, shouldn't the business community be behind a complete remediation of the Housatonic so they could market the river corridor for increased tourism opportunities?

A: EPA's focus is proposing a remedy for the Rest of River that addresses unacceptable risks to people and the environment. To the extent that questions of marketing go beyond that focus, EPA is not in a position to comment at this point as there is no selected remedy. However, EPA is beginning to discuss with community and local business interests some of their concerns related to potential socioeconomic impacts of various scale projects. Community members have suggested using a range of representative alternatives identified in GE's Revised Corrective Measures Study to illustrate how economic impacts could potentially be assessed or construction impacts potentially mitigated. While specific issues regarding impacts are usually clarified, assessed, and answered following the remedy selection, EPA welcomes these discussions as well as suggestions and guidance from community members in identifying potential socioeconomic issues at any point in the process.

3-4-L.

Q: How can MNR work where PCBs are [not] stable in the banks where flooding and pollution of PCBs is deep and wide, and fish, fowl continue to be affected?

A: A major problem with implementation of MNR as the sole remedy for the entire River is the large inventory of PCBs present in the banks and sediment. The data clearly demonstrate that there are continuing significant sources of internally generated PCBs within the Rest of River. Studies have shown that the banks are a source of approximately half of the mass of PCBs moving downstream and that PCBs in sediment are the source of approximately half of the remaining PCBs moving through the system, with approximately 7% coming from upstream sources. Nothing indicates that the PCBs are being covered by cleaner sediments in the long term.

3-4-M.

Q: Where were the Native American fish weirs that were discovered (or their remains) in both Massachusetts and Connecticut?

A: To protect certain unmonitored archaeological and historical artifacts, the Massachusetts Historical Commission has established a policy of not releasing their locations. EPA believes it is in the best interest of preserving these important artifacts to adhere to this policy.

3-4-N.

Q: Could the tremendous rise in the number of young autistic children in the Lee Public Schools be related to the closeness of their homes to the Housatonic River?

A: EPA is not aware of any scientific studies on the incidence of autism specific to Lee public schools. However, autism is the subject of a great number of ongoing scientific studies to understand its prevalence, underlying causes, and options for treatment. Much research regarding possible causes of autism has focused on genetics, although, more recently, scientists have begun exploring environmental factors that are known or suspected to influence early development of the brain and nervous system. "Recent studies suggest that factors such as parental age and exposure to infections, toxins, and other biological agents may confer environmental risk." (IACC 2011). While there is growing evidence suggesting neurodevelopmental effects of PCBs, EPA is not aware of scientific studies that directly link PCBs with autism. More information about possible causes of autism is available in an April 2011 Public Broadcasting System series on the topic of autism at **http://www.pbs.org/newshour/bb/health/jan-june11/autism_04-18.html**.

References:

Interagency Autism Coordinating Committee. 2011 IACC Strategic Plan for Autism Spectrum Disorder Research. 2011 January. Retrieved from the U.S. Department of Health and Human Services Interagency Autism Coordinating Committee website at **http://iacc.hhs.gov/strategic-plan/2011/index.shtml**.

3-4-O.

Q: Sites around homes in Pittsfield were cleaned up when there were 3 or more parts per million. How can 25 parts per million be okay in the river?

A: Under the terms of the Consent Decree, GE was required to remediate any residential properties with an average soil PCB concentration of 2 mg/kg (ppm) or greater. The threshold concentration of 2 ppm was intended to be protective of human health and assumed a high level of exposure consistent with regular use of residential lawns. Because cleanup decisions regarding contaminated floodplain soil and/or River sediment will be based on non-residential uses (for example, dirt-biking and canoeing, among others, in addition to ecological considerations), the criterion of 2 ppm does not apply. Please note that EPA has not indicated that a concentration of 25 ppm in soil or sediment is either acceptable or unacceptable - the acceptability of a particular concentration in a particular medium is part of the process of evaluating the various remedial alternatives that is currently ongoing.

3-4-P.

Q: Where has and where will money come from for all the research that has gone into preparing for and holding the mini workshops?

A: The mini-workshops were conducted under a U.S. Army Corps of Engineers contract and funded by EPA. Under the terms of the Consent Decree, GE is required to reimburse EPA for many project-related costs, subject to some limitations.

3-4-Q.

Q: To moderator: at times some questions that are asked may not be specific to the current presenters' expertise - will all questions be reviewed by any of the presenters from any of the workshops and be answered on the website even by multiple presenters?

A: Answers to all questions posed at the mini-workshops are now posted **on-line**.

3-4-R.

Q: Why are we even talking about a cleanup for the rest of river when point source pollution still exists at Silver Lake and Unkamet Brook and other areas?

A: The cleanup approaches for non-Rest-of-River areas of the Site were selected at the time of the Consent Decree. The cleanup process at Silver Lake and Unkamet Brook specified in the Consent Decree is ongoing.

3-4-S.

Q: Show the people of the Berkshires what restoration will look like. Suggestion: why don't you require GE to restore a small section of the river- Canoe Meadows- so as to demonstrate what the river will look like once it's restored? As it stands today, many people are none too sure that EPA and GE have the ability to restore the river so that it remains a jubilant place for wildlife and for people.

A: As EPA considers the appropriate course of action for the overall cleanup for Rest of River, we will also consider what, if any, "pilot" studies ought to be conducted.

US Environmental Protection Agency

Housatonic River Workshops

Contact Us

My Comments:	
Name:	
Address:	
E-mail:	
Phone #:	

Submit Reset