

Health Consultation

**PUBLIC HEALTH EVALUATION OF FISH CONTAMINANT DATA IN THE
HOUSATONIC RIVER**

**LAKE ZOAR, LAKE LILLINONAH, WEST CORNWALL,
AND BULL'S BRIDGE IN KENT, CONNECTICUT**

APRIL 4, 2005

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333**

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR

or

Visit our Home Page at: <http://www.atsdr.cdc.gov>

HEALTH CONSULTATION

PUBLIC HEALTH EVALUATION OF FISH CONTAMINANT DATA IN THE
HOUSATONIC RIVER

LAKE ZOAR, LAKE LILLINONAH, WEST CORNWALL,
AND BULL'S BRIDGE IN KENT, CONNECTICUT

Prepared by:

Connecticut Department of Public Health
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

HEALTH CONSULTATION

**Public Health Evaluation of Fish Contaminant Data in the
Housatonic River**

**LAKE ZOAR, LAKE LILLINONAH, WEST CORNWALL,
AND BULL'S BRIDGE IN KENT, CONNECTICUT**

**Connecticut Department of Public Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry**

The conclusions and recommendations in this health consultation are based on the data and information made available to the Connecticut Department of Public Health (CTDPH) and the Agency for Toxic Substances and Disease Registry (ATSDR). CTDPH and ATSDR will review additional information when received. The review of additional data could change the conclusions and recommendations listed in this document.

BACKGROUND AND STATEMENT OF ISSUE

The Patrick Center for Environmental Research, Academy of Natural Sciences of Philadelphia (Philadelphia Academy) samples fish in the Housatonic River for General Electric (GE) on a biennial basis and reports this information to Connecticut Department of Public Health (CTDPH) and Connecticut Department of Environmental Protection (CTDEP) Fisheries Program. The sampling locations were chosen in the 1970's and remain in place for the purpose of evaluating temporal trends. CTDPH reviews new fish tissue data collected by the Philadelphia Academy from the Housatonic River biennially and evaluates whether the current fish consumption advisory needs to be modified to protect public health based on the level of PCB contamination. This sampling program has been in place since 1984 (EPA, 2005). CTDPH has evaluated fish sampling data from 2002 and the results of this evaluation are the focus of this health consultation.

The Housatonic River is approximately 130 miles long, beginning in the Berkshire mountains in western Massachusetts, and flows south through western Connecticut into the Long Island Sound (Appendix A). The GE facility, which produced and handled polychlorinated biphenyls (PCBs) from the 1930's to 1977 in its Pittsfield, Massachusetts facility, caused significant contamination of Housatonic River sediments and fish in the Massachusetts portion of the river. PCB-contaminated sediments have been transported into the Connecticut portion of the river over the years. This has resulted in fish becoming contaminated with PCBs to the extent that fish consumption advisories have been in place in several parts of the Housatonic River in CT since 1977.

Demographics

Since the area surrounding the Housatonic River in Connecticut is very large, the demographics described here include only the towns surrounding the four stations where fish sampling occurred: West Cornwall, Bull's Bridge, Lake Zoar, and Lake Lillinonah (Appendix A). As seen in Table 1, some of the nearby populations are large because the lakes are surrounded by several towns. However, this is a very conservative estimate of a population that may be affected. We do not expect a large number of people to fish in these four sampling areas along the Housatonic River.

Table 1. Demographics for Fish Sampling Locations along the Housatonic River[^]

Sampling Station	Surrounding Towns	Total Population	Area (square miles)
West Cornwall	West Cornwall	1,434	46
Bull's Bridge	Kent	2,858	50
Lake Zoar	Monroe, Oxford, Newtown, Southbury	72,666	194.39
Lake Lillinonah	Brookfield, Bridgewater, Newtown, Southbury, New Milford	88,207	156.02

[^]United States Census Bureau, 2000

Health Comparison Values and Fish Tissue Contaminant Levels

In August and October 2002, thirty brown trout were collected from West Cornwall and analyzed for PCB content as part of the Housatonic River's biennial fish monitoring program described previously. In addition, forty smallmouth bass from the four stations along the Housatonic River (West Cornwall, Bull's Bridge, Lake Zoar, and Lake Lillinonah) were also collected. Several of the fish fillets contained PCB levels that exceeded CTDPH's Modified Great Lakes Protocol PCB value for fish consumption which is described below.

1. Health Comparison Values

In order to set safe levels of PCBs in fish, CTDPH uses a modified version of the Protocol for a Uniform Great Lakes Sport fish Consumption Advisory (GLP) (1993). The GLP is a framework for setting risk-based fish consumption advisories in the Great Lakes states. Using the GLP, the Great Lakes Task Force developed a Health Protective Value (HPV) for PCBs of 0.05 micrograms per kilogram per day ($\mu\text{g}/\text{kg}/\text{day}$) by using a "weight of evidence" approach which considered all of the existing toxicological values and studies (mostly human and monkey). The "weight of evidence" approach differs from a reference dose which typically uses a single critical study. The HPV is a unique value developed specifically for the Great Lakes sport fish advisory process. The development of the HPV was based on some key assumptions: average meal size for a 70 kg adult of 1/2 pound (227 grams) and a 50% reduction in PCB fish fillet content (skin on, scales off fillet) through trimming and cooking losses of fatty portions of the fish. The goal of the advisory program was to limit PCB exposure to 3.5 $\mu\text{g}/\text{day}$ ($0.05 \mu\text{g}/\text{kg}/\text{day} * 70 \text{ kg} = 3.5 \mu\text{g}/\text{kg}/\text{day}$). At this exposure level, cancer risks would not be expected to exceed 1 excess cancer in 10,000 exposed people and non cancer health effects would not be likely.

Concerning non-cancer health effects, there are several animal and human studies that resulted in a variety of adverse health effects from exposure to PCBs. The main effects from exposure to PCBs in animals include hepatic, dermal, immunological, and neurobehavioral development. Because the most sensitive effects are immunological and neurobehavioral development, the GLP Task Force tended to weigh more heavily on these studies when developing its HPV (Great Lakes Sport Fish Advisory Task Force, 1993).

Cancer risks associated with the HPV were evaluated using a cancer slope factor (CSF) of 2.0 milligrams per kilogram per day⁻¹ (mg/kg/day⁻¹). If a population was exposed to PCB levels of 0.05 µg/kg/day (HPV) every day for 70 years (a lifetime), there would be a theoretical excess cancer risk of 1 person in a population of 10,000. This theoretical excess cancer risk is on the upper end of a generally acceptable range (1 in 10,000 to 1 in 1,000,000). The cancer slope factor of 2.0 (mg/kg/day)⁻¹ was derived from rat studies resulting in liver cancer from oral exposure to PCBs.

CTDPH's version of the GLP takes into account detection limit issues and the somewhat greater concern for higher risk individuals (Ginsberg and Toal, 1999). CTDPH allows for unlimited consumption at PCB levels up to 0.1 parts per million (ppm), the point where quantification of PCBs in fish becomes certain. The GLP allows unlimited consumption only up to 0.05 ppm. CTDPH believes that PCBs in fish cannot be reliably or accurately quantified at concentrations below 0.1 ppm. Thus, it is not practical for the advisory to restrict consumption at concentrations below 0.1 ppm.

High risk individuals include pregnant women, women planning to become pregnant within a year, breastfeeding women, or children under the age of six. Pregnant women or women planning to become pregnant are particularly sensitive because PCBs can be passed through the mother to the unborn fetus and can result in central nervous system (CNS) effects as well as others (ATSDR, 2000). Children under the age of six are also particularly vulnerable because they tend to eat more per body weight. In addition, the developing organs (brain and thyroid gland) of children can sustain permanent damage if exposure to PCBs occurs during critical growth stages. Breastfeeding women are also in the high risk group because PCBs can pass through breast milk and expose young children to PCBs. Low risk individuals include the remaining population. Table 2 gives the details of CTDPH's fish consumption advisory as it relates to PCB levels in fish samples.

Table 2. Connecticut Department of Public Health's Modified Great Lakes Protocol for Fish Consumption (Ginsberg and Toal, 1999).

PCB Level (ppm or parts per million)	Consumption Advisory
Less than 0.1	Unlimited Consumption
0.1-0.2	One meal per week
0.21 - 1.0	One meal per month
1.1 - 1.9	One meal every 2 months (high risk group - do not eat)
Greater than 1.9	Do not eat (everyone)

Regarding the issue of higher risk individuals, the animal toxicology studies support an HPV that is in the same range for reproductive and other (immunological, dermal) endpoints. This suggests that in utero development is no more sensitive to PCBs than are endpoints seen in adult animals. However, the evidence of low dose effects in humans is strongest for in utero effects (central nervous system development). This creates a somewhat greater concern for pregnant women and women planning pregnancy. Additionally, while the cumulative PCB dose from long-term exposure may be the most critical determinant for immunological or dermal effects, the period of exposure needed for in utero effects is uncertain. Monkeys exposed to low doses of PCBs during pre-pregnancy over several years resulted in adverse health effects among offspring. Therefore, it is uncertain whether the accumulation of maternal PCB body burden prior to and during pregnancy is critical or a relatively short exposure period (during pregnancy) could also produce low dose developmental effects (Ginsberg and Toal, 1999). Two short term studies in mink and rats also resulted in low dose developmental effects from exposure to PCBs. Therefore, CTDPH believes that there may be a greater sensitivity during in utero exposure such that recent exposures that do not involve a cumulative body burden (which is important to adult toxicity) could produce an adverse health effect. This uncertainty over PCB pharmacokinetics and developmental outcomes supports a prudent avoidance (do not eat) approach for pregnant women for markedly elevated PCB concentrations (e.g., over 1 ppm). CTDPH's recommendation of "do not eat" for high risk groups for PCB levels in fish of 1.1-1.9 ppm differs from the GLP's approach which recommends a "one meal every 2 months" restriction for fish consumption for all risk groups for PCB levels of 1.1-1.9 ppm (Ginsberg and Toal, 1999).

Using the HPV, setting limits based on cancer risk less than 1 in 10,000 would lead to virtually no fish consumption (local or commercial) due to the widespread occurrence of low levels of PCBs in fish. This would result in the benefit of fish consumption to be lost in the interests of minimizing cancer risks. Given that the number of frequent consumers of locally caught fish in Connecticut may not be large, the theoretical 1 in 10,000 cancer risk is of less concern than if this were a population-wide exposure (Ginsberg and Toal, 1999). Therefore, CTDPH and The Great Lakes Protocol focus on prevention of non-cancer health effects of PCBs.

2. Fish Contaminant Levels

PCB concentrations in all of the fish fillet samples from the four Housatonic River sampling locations were above the concentration limit for unlimited consumption (0.1 ppm). Smallmouth bass PCB concentration levels tended to be lower in Lake Lillinah and Lake Zoar than in West Cornwall and Bull's Bridge.

Table 3 gives the average aroclor-based¹ PCB concentrations in four locations along the Housatonic River in two fish species sampled in 2002. The PCB concentrations for Lake Lillinah and Lake Zoar in smallmouth bass were 0.35 and 0.36 ppm, respectively,

¹ The aroclor-based analysis method is a measurement of commercial mixtures of PCB compounds.

while the average for West Cornwall and Bull’s Bridge were higher at 1.07 and 0.77 ppm, respectively for the same species. In addition, the PCB levels in brown trout in West Cornwall were the highest with an average of 1.73 ppm.

Table 3. Polychlorinated Biphenyl (PCB) Concentrations in Fish Caught in Four Locations along the Housatonic River in 2002.

Location	Species	Average (Aroclor Based) PCBs parts per million (ppm)	Range (Aroclor Based) PCBs ppm
West Cornwall	Smallmouth Bass	1.07	0.45-1.55
West Cornwall	Brown Trout	1.73	0.67-4.77
Bull’s Bridge	Smallmouth Bass	0.77	0.33-1.45
Lake Zoar	Smallmouth Bass	0.35	0.12-0.89
Lake Lillinonah	Smallmouth Bass	0.36	0.13-0.89

It is also informative to evaluate trends in contaminate levels in fish tissue over time. Table 4 gives the trend over time for PCB contamination in the four locations in smallmouth bass and brown trout. The PCB levels have decreased greatly in all of the locations from a high of 7.25 ppm in West Cornwall in brown trout in 1992 to a low of 0.35 ppm in smallmouth bass in Lake Zoar in 2002. Overall, there has been a large decrease in PCB levels in all of the locations from the 1980’s to the mid 1990’s and the levels have now stabilized.

In calculating average aroclor-based PCB concentrations in fish, CTDPH used average concentrations for each species and sampling location rather than 95% upper confidence limits (UCLs). A 95% UCL provides a conservative estimate of the average concentration and is unlikely to underestimate the “true” average. However, there is a tendency to sample larger fish in this Health Consultation, providing for conservatism because larger fish tend to have higher PCB concentrations. For this reason, CT DPH decided that it was not necessary to calculate 95% UCLs. CTDPH is confident that the average concentration it has calculated for each year provides a conservative estimate of the “true” average.

Table 4. Polychlorinated Biphenyl (PCB) Level History along the Housatonic River in Four Locations

Location	Species	Highest Average (Aroclor Based) PCBs Before 2000 parts per million (ppm) (Year)	Average (Aroclor Based) PCBs ppm in 2000	Average (Aroclor Based) PCBs ppm in 2002
West Cornwall	Smallmouth Bass	3.77 (1988)	1.00	1.07
West Cornwall	Brown Trout	7.25 (1992)	1.54	1.73
Bull's Bridge	Smallmouth Bass	2.33 (1988)	0.98	0.77
Lake Zoar	Smallmouth Bass	1.13 (1992)	0.32	0.35
Lake Lillinonah	Smallmouth Bass	1.41 (1992)	0.51	0.36

DISCUSSION

Exposure Pathway Analysis

To evaluate potential exposures to the contaminated fish in the Housatonic River and its lakes, CTDPH evaluated the fish tissue data and considered how people may come into contact with contaminants in the fish. The possible pathway of exposure is by ingestion (eating) of fish.

Environmental data show that fish in the four locations sampled along the Housatonic River and its lakes (Zoar and Lillinonah) are contaminated with PCBs. Individuals who catch and eat fish in these water bodies would likely be exposed to PCBs in the fish. In addition, their families would also be exposed to PCBs if they eat the fish.

Public Health Implications for Adults and Children

When determining the public health implications of exposure to hazardous contaminants, CTDPH considers how people might come into contact with contaminants and compares contaminant concentrations with health protective levels. When contaminant levels are below health-based comparison values, health impacts from exposure to those levels are unlikely. Contaminant levels exceeding comparison values do not indicate that health impacts are likely, but instead warrant further investigation. In this health consultation, CTDPH used a modified Great Lakes Protocol for fish consumption to set a health

protective value (HPV) for PCBs in fish. As stated previously, this modified protocol is a risk-based protocol which takes into account detection limit issues and the somewhat greater concern for higher risk individuals.

Environmental data indicate the average PCB levels in smallmouth bass from four stations and brown trout from one location (West Cornwall) are above the PCBs levels for unlimited consumption according to CTDPH’s modified Great Lakes Protocol for fish consumption (Table 2). The average levels in Lake Lillinonah, Lake Zoar, and Bull’s Bridge are within the “one meal per month” restriction for both high risk and low risk groups (Table 3). However, average PCB levels in Bull’s Bridge are about twice the average levels in the two lakes. In the West Cornwall location however, the PCB levels are bordering between “one meal per month” restriction and one meal per 2 months (high risk group-do not eat) consumption restrictions. The brown trout in the West Cornwall station had the highest PCB levels (average 1.73 ppm) and were within the “do not eat” restriction category for high risk groups and “one meal every 2 months” for low risk groups.

Table 5 gives the updated CTDPH fish consumption advisory in response to the 2002 PCB data from the four sampling locations along the Housatonic River and compares it to the previous advisory. In response to the trend of lower PCB levels over time in smallmouth bass in Lakes Lillinonah and Zoar, CTDPH has relaxed its advisory from “do not eat” for high risk groups and “one meal per 2 months” for low risk groups to “one meal per month” for both groups.

Table 5. Updated 2004 Fish Advisory for Largemouth Bass and Brown Trout in the Housatonic River.

Location	Fish Species	Consumption Advisory	
		Previous - 2003	Updated - 2004
Housatonic River above Derby Dam [^] (with exception below)	Smallmouth Bass	One Meal per 2 Months /Do Not Eat –High Risk	No Change
	Brown Trout	Do Not Eat	No Change
Lakes Zoar and Lillinonah	Smallmouth Bass	One Meal per 2 Months /Do Not Eat –High Risk	One Meal per Month

[^]Includes West Cornwall and Bull’s Bridge sampling locations.

In regards to brown trout in the Housatonic River, CTDPH has decided to maintain the advisory at “do not eat” for both risk groups for the following reasons:

1. Although the PCB levels are within the restriction levels of “one meal per 2 months” for low risk groups and “do not eat” for high risk groups, the PCB levels approach the “do not eat” restriction for both risk groups.
2. Past fish sampling has indicated high levels of PCB contamination on the Housatonic River.
3. Further sampling is necessary to show that PCB levels in brown trout are low enough to allow some fish consumption.

Since the 2002 sampling event, smallmouth bass PCB levels in the Housatonic River above the Derby Dam have not dropped significantly in this round of sampling, CTDPH has decided not to modify the previous advisory. Consumption advisories remain as “do not eat” for high risk groups and “one meal every 2 months” for low risk groups.

CTDPH believes that this updated consumption advisory is necessary to protect public health while allowing community members to benefit from the nutritional advantages of eating fish. One such nutritional benefit is omega three fatty acids, a nutrient oil that enhances brain development and helps prevent heart disease.

EVALUATION OF COMMUNITY CONCERNS

CTDPH received the following questions from the community:

1. I eat fish often in the Housatonic River. Why have I not gotten sick?

The PCBs in fish in the Housatonic River are not present at levels that will make you acutely (immediately) sick. PCBs are chronic toxins (i.e. they take a long time to cause an effect). The health effects of concern for PCBs are potential cancers and developmental problems in children/fetuses. PCBs accumulate in your body over time. The more PCB contaminated fish you eat, the greater the PCB levels that will build up in your body. PCB exposure is a particular concern to pregnant women because the exposure their unborn child receives through the mother can cause development, behavioral, and learning problems in children.

2. I have eaten lots of fish from the Housatonic River. Is there medicine I can take to get rid of these chemicals?

There is no medicine or other procedure to get rid of the chemicals your body has accumulated from eating fish. The chemicals will very slowly leave your body over time. If you follow the advisory you will decrease your exposure and allow your body the time needed to reduce the levels of the chemicals.

3. Are there areas along the Housatonic River that have less contaminated fish?

The Housatonic River (below Derby Dam) as well as Lakes Lillinonah and Zoar are areas that are less contaminated. You can safely eat a greater amount of fish from these areas.

4. I am concerned that there are not enough signs along the river to alert people to this advisory. In addition, I am concerned that there may be a language barrier preventing people from understanding these signs.

Signs are posted by conservation officers at every access point along the Housatonic River. If you need more signs, then contact your local health department to request signs. Consumption advisory signs in other languages have been prepared and are posted in areas where these populations are thought to fish.

CONCLUSIONS

Fish samples from four locations along the Housatonic River detected elevated levels of PCBs in two species, smallmouth bass and brown trout. CTDPH uses this fish tissue data to issue a general fish consumption advisory for the northern section of the Housatonic River above Derby Dam. The PCB levels in 2002 are elevated enough to warrant a consumption advisory which is already in place in the northern section of the Housatonic River above Derby Dam. However, a trend over time towards lower PCB levels in two locations, Lake Lillinonah and Lake Zoar, in smallmouth bass prompted CTDPH to loosen its consumption advisory from “one meal per 2 months /do not eat –high risk” to “one meal per month” for both risk groups. A trend over time towards lower PCBs has been observed for smallmouth bass in the other sampling locations, Bull’s Bridge and West Cornwall and for brown trout in West Cornwall, however, the PCB levels have not decreased enough to loosen the consumption advisory. CTDPH has not modified the consumption advisory in 2004 for these two fish species in these two locations along the Housatonic River.

ATSDR has a characterization scheme whereby the level of public health hazard at a site is assigned to one of five conclusion categories (Appendix B). CTDPH has concluded that the brown trout from West Cornwall and smallmouth bass in Lake Lillinonah, Lake Zoar, Bull’s Bridge, and West Cornwall present a *public health hazard* to individuals who do not follow the consumption advisory. If community members adhere to the current consumption advisory, exposure to PCBs in fish would not be significant enough to cause adverse health effects. CTDPH believes that this updated consumption advisory is necessary to protect public health while allowing community members to benefit from the nutritional advantages of eating fish.

RECOMMENDATIONS

1. CTDPH recommends that the Connecticut Department of Environmental Protection (CTDEP) Fisheries and GE continue to work together with CTDPH on their biennial fish sampling plan for the Housatonic River.
2. CTDPH recommends that CTDEP Fisheries and GE to continue to work together to educate minority fishing populations along the Housatonic River about the consumption advisory.

PUBLIC HEALTH ACTION PLAN

Actions Taken

1. CTDPH along with CTDEP Fisheries and GE have worked together to educate minority fishing populations along the Housatonic River about the consumption advisory as well as other populations along the river.
2. CTDPH updated its Housatonic River fish consumption advisory in May 2004 in response to the 2002 fish sampling data. CTDPH has modified its advisory for the Lakes of the Housatonic River (Lillinonah and Zoar).

Actions Planned

1. CTDPH along with CTDEP Fisheries and GE will continue to work together to educate minority fishing populations along the Housatonic River about the consumption advisory as well as other populations along the river.
2. CTDPH will continue to evaluate new fish contaminant data and will update its current Housatonic River fish consumption advisory as needed.

REFERENCES

EPA 2005. EPA Website. <http://www.epa.gov/boston/ge/sitehistory.html>.

Ginsberg and Toal 1999. Risk-Based Approach for PCBs Fish Consumption Advisories in Connecticut. Connecticut Department of Public Health. May 1999.

Great Lakes Sport Fish Advisory Task Force 1993. Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory. September 1993.

United States Census Bureau 2000. United States Census Bureau Website. http://factfinder.census.gov/home/saff/main.html?_lang=en.

ATSDR 2000. Toxicological Profile for Polychlorinated Biphenyls (PCBs). US Department of Health and Human Services. Public Health Service. November 2000.

PREPARERS OF THE HEALTH CONSULTATION

Health Assessor:

Sharee Major Rusnak, MSPH, ScD
Epidemiologist
Environmental Epidemiology and Occupational Health
Connecticut Department of Public Health

ATSDR Region I Representative:

William Sweet

ATSDR Technical Project Officer:

Tammie McRae
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

CERTIFICATION

This Housatonic River (Public Health Evaluation of Fish Contaminant Data in the Housatonic River, General Electric Facility in Pittsfield, Massachusetts) Public Health Consultation was prepared by the Connecticut Department of Public Health under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

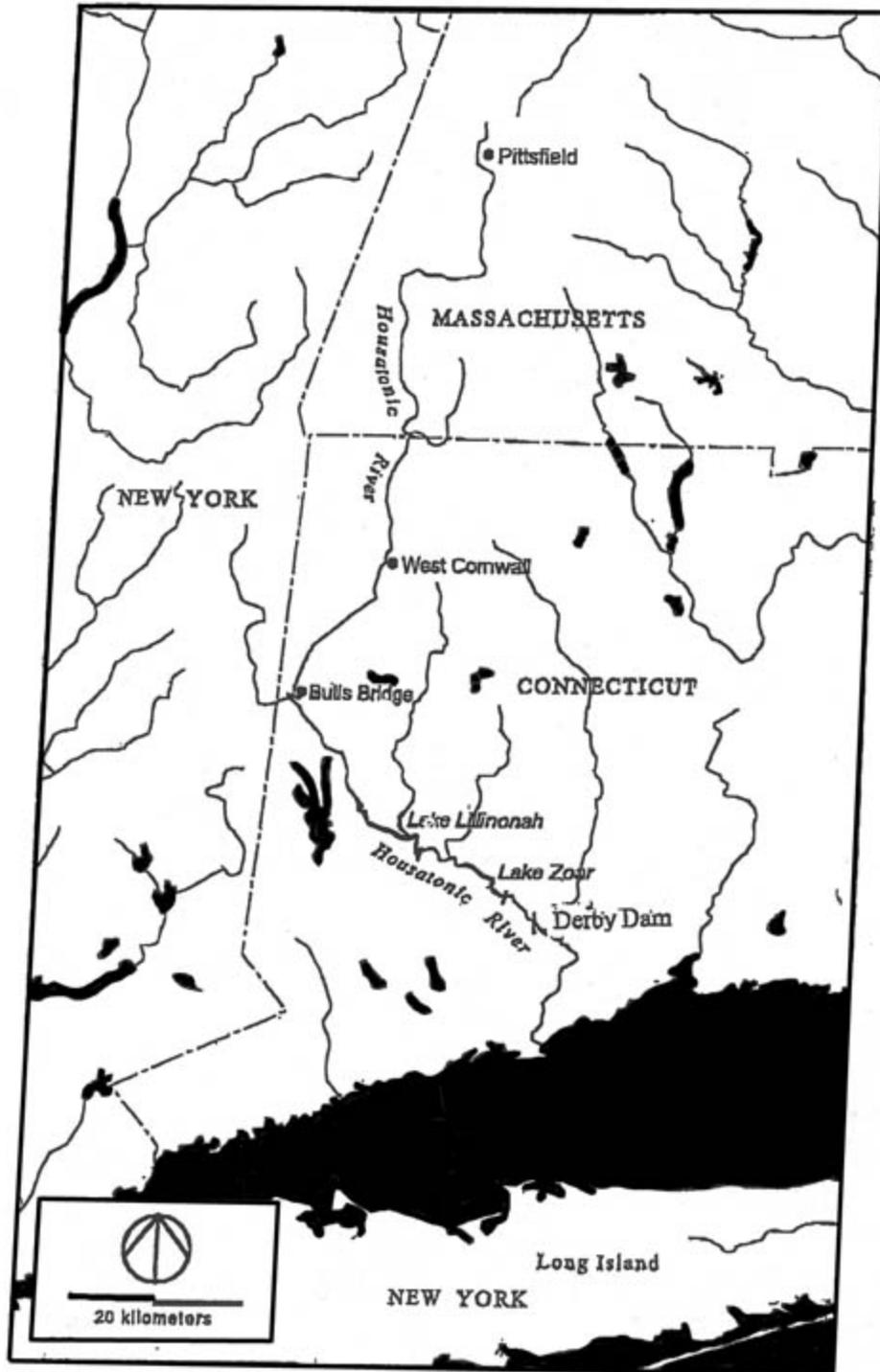
Technical Project Officer, CAT, SPAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.

Team Lead, CAT, SPAB, DHAC, ATSDR

Appendix A

Map of Sampling Locations along the Housatonic River



Map of the Housatonic River showing sampling stations for the 2002 fish and benthic insect collections in Connecticut. Smallmouth bass were collected at West Cornwall, Bulls Bridge, Lake Lillinonah, and Lake Zoar. Brown trout and benthic insects were collected only at West Cornwall. Approximate locations of dams at Bulls Bridge, Lake Lillinonah, and Lake Zoar are indicated by bars across the river.

Appendix B. ATSDR Public Health Categories

<i>CATEGORY / DEFINITION</i>	<i>DATA SUFFICIENCY</i>	<i>CRITERIA</i>
<p>A. Urgent Public Health Hazard</p> <p>This category is used for sites where short-term exposures (< 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.</p>	<p>This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.</p>	<p>Evaluation of available relevant information* indicates that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safety hazards.</p>
<p>B. Public Health Hazard</p> <p>This category is used for sites that pose a public health hazard due to the existence of long-term exposures (> 1 yr) to hazardous substance or conditions that could result in adverse health effects.</p>	<p>This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.</p>	<p>Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical or safety hazards.</p>
<p>C. Indeterminate Public Health Hazard</p> <p>This category is used for sites in which “critical” data are insufficient with regard to extent of exposure and/or toxicologic properties at estimated exposure levels.</p>	<p>This determination represents a professional judgement that critical data are missing and ATSDR has judged the data are insufficient to support a decision. This does not necessarily imply all data are incomplete; but that some additional data are required to support a decision.</p>	<p>The health assessor must determine, using professional judgement, the “criticality” of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.</p>
<p>D. No Apparent Public Health Hazard</p> <p>This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.</p>	<p>This determination represents a professional judgement based on critical data which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.</p>	<p>Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in any adverse impact on human health.</p>
<p>E: No Public Health Hazard</p> <p>This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.</p>	<p>Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future</p>	

*Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data; monitoring and management plans.