

# **HEALTH CONSULTATION**

**Public Health Evaluation of Fish Contaminant Data in the  
Quinnipiac and Eight Mile Rivers**

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SOUTHINGTON, WALLINGFORD, CONNECTICUT**

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

## SUMMARY

### INTRODUCTION

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The Quinnipiac River is approximately 38 miles long and originates at the borders of New Britain, and Farmington, Connecticut in Deadwood Swamp. The river flows southward to New Haven where it empties into Long Island Sound. The Quinnipiac River Watershed flows through New Britain, Plainville, Southington, Cheshire, Meriden, North Haven and New Haven. Major Tributaries are the Eight Mile River, Ten Mile River, Harbor Brook (Meriden), and the Muddy River (Wallingford). There are two major impoundments on the Quinnipiac River which are the Hanover Pond (Meriden) and Hamlin Pond (Plainville).

In 1996, buried drums containing polychlorinated biphenyls (PCBs) were found along the Quinnipiac River in Southington. Emergency response teams from both the Connecticut Department of Energy and Environmental Protection (CTDEEP) and the United States Environmental Protection Agency responded to the discovery and identified that high levels of polychlorinated biphenyl (PCB) contamination were also present in river sediments and in some fish. This contamination resulted in “Do not eat” consumption advice for that section of the Quinnipiac River as well as the Eight Mile River. CTDEEP conducted an extensive cleanup of the river, removing the drums and the contaminated sediments. CTDPH has evaluated fish sampling data from 2013 and 2014 and the results of this evaluation are the focus of this document.

### CONCLUSION

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CTDPH reached two important conclusions in the health consultation:

#### **Conclusion 1**

The most recent round of fish tissue data shows that PCB levels have decreased in two fish species from several locations along the Quinnipiac River north of the Quinnipiac Gorge (Quinnipiac River N) and the Eight Mile River. The current PCB levels (based on 2013 and 2014 data) have decreased to a level where it is no longer necessary to continue a consumption advisory for The Quinnipiac River N and the Eight Mile River.

Basis for  
Conclusion

PCB levels from two fish species from the Quinnipiac River N and the Eight Mile River over a long period of time are not harmful to people’s health.

Next Steps CTDPH updated its Quinnipiac River N and Eight Mile River fish consumption advisory in the spring of 2015 in response to the 2013-2014 fish sampling data. The advisory was printed in our annual brochure and distributed to towns and local health departments along the Quinnipiac and Eight Mile Rivers. The advisory was also mentioned in a May 2015 press release.

**Conclusion 2** CTDPH has decided to maintain the advisory of “1 meal/month-everyone” for all species in the Quinnipiac River south of the Gorge to Hanover Pond (Quinnipiac River S).

Basis for Conclusion CTDPH has decided to maintain the current advisory for the Quinnipiac River S because there isn’t enough recent sampling data to warrant modifying the current consumption advisory. PCB levels from fish species from the Quinnipiac River S could harm people’s health if they do not follow the consumption advisory. If community members adhere to the current consumption advisory, exposure to PCBs in fish is unlikely to harm people’s health. 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.

Next Steps CTDPH has maintained its Quinnipiac River S fish consumption advisory in the spring of 2015 in response to the 2013-2014 fish sampling data. The advisory was printed in our annual brochure and distributed to towns and local health departments along the Quinnipiac and Eight Mile Rivers. The advisory was also mentioned in a May 2015 press release.

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**FOR MORE INFORMATION:** If you have concerns about your health, you should contact your health care provider. Please call The CTDPH at (860)-458-FISH (3474) for more information on Connecticut’s fish consumption advisories.

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## **BACKGROUND AND STATEMENT OF ISSUE**

The Quinnipiac River is approximately 38 miles long and originates at the borders of New Britain, Connecticut, and Farmington in Deadwood Swamp. The River flows southward to New Haven where it empties into Long Island Sound. The Quinnipiac River Watershed flows through New Britain, Plainville, Southington, Cheshire, Meriden, North Haven and New Haven. Major Tributaries are the Eight Mile River, Ten Mile River, Harbor Brook (Meriden), and the Muddy River (Wallingford). There are two major impoundments on the Quinnipiac River which are the Hanover Pond (Meriden) and Hamlin Pond (Plainville). A map of the Quinnipiac River can be found in Appendix A.

In 1996, buried drums containing polychlorinated biphenyls (PCBs) were found along the Quinnipiac River in Southington. Emergency response teams from both the Connecticut Department of Energy and Environmental Protection (CTDEEP) and the United States Environmental Protection Agency (US EPA) responded to the discovery and identified that high levels of contamination were also present in river sediments and in some fish. This contamination resulted in “Do not eat” consumption advice for that section of the Quinnipiac River as well as the Eight Mile River. CTDEEP conducted an extensive cleanup of the river, removing the drums and the contaminated sediments. CTDPH has evaluated fish sampling data from 2013 and 2014 and the results of this evaluation are the focus of this document. It is the state of Connecticut’s goal to restore the Quinnipiac and Eight Mile Rivers so that in the future, fish consumption advisories would not be needed.

### *Health Comparison Values and Fish Tissue Contaminant Levels*

In 2013 and 2014, twenty brown trout (4 fish composites<sup>1</sup>) and one white sucker from the Eight Mile River and twenty brown trout (4 fish composites) and 10 white suckers (2 fish composites) from the Quinnipiac River north of the Quinnipiac Gorge (Quinnipiac River N) were sampled and analyzed for PCB content as part of the Quinnipiac fish biomonitoring program. One white sucker from the Quinnipiac River south of the Quinnipiac Gorge (Quinnipiac River S) was also sampled and analyzed for PCB content.

#### 1. Health Comparison Values

In order to set safe levels of PCBs in fish associated with fish consumption advisories, CTDPH uses a modified version of the Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory (GLP) (1993). The risk-based PCB fish concentration cutoffs for different meal frequencies developed in the GLP are listed in Appendix B. The GLP is a

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<sup>1</sup> Fish composites are comprised of 5 individual fish each.

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 µg/kg/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 (Great Lakes Sport Fish Advisory Task Force 1993). The development of the HPV was based on some key assumptions: average meal size for a 70 kg adult of one-half 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 µg/day (0.05 µg/kg/day \*70 kg = 3.5 µg/kg/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.

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 ppm (parts per million), the point where practical quantification of PCBs in fish becomes certain whereas the GLP allows unlimited consumption only up to 0.05 ppm (Table 2).

A more detailed explanation of health comparison values used in this document can be found in Rusnak (2012).

**Table 2. CTDPH’s Modified Great Lakes Protocol for Fish Consumption<sup>^</sup>**

Restriction Category (Level)	PCB Level (ppm <sup>*</sup> )	Consumption Advisory	
		Low Risk <sup>@</sup>	High Risk <sup>#</sup>
A	< 0.1	No Consumption Advice	No Consumption Advice
B	0.1-0.2	One meal per week	One meal per month
C	0.21 - 1.0	One meal per month	One meal per month
D	1.1 - 1.9	One meal every 2 months	Do not eat
E	> 1.9	Do not eat	Do not eat

<sup>^</sup>(Ginsberg and Toal, 1999)

<sup>\*</sup>Parts Per Million

<sup>@</sup>Includes all other groups not included in the high risk group

<sup>#</sup>Includes pregnant women, women planning to become pregnant within a year, nursing women, and children under 6 years old

## 2. Fish Contaminant Levels

The 2013 and 2014 contaminant data show that average PCB concentrations in 2 fish species from the five Quinnipiac and Eight Mile River sampling locations only exceeded levels where CTDPH issues a consumption advisory (0.1 ppm) twice. The other sampling results were well below levels where CTDPH issues a consumption advisory. Table 3 gives the total aroclor-based<sup>2</sup> PCB concentrations in five locations along the Eight Mile and Quinnipiac River in 2 fish species sampled in 2013 and 2014.

**Table 3. PCB Concentrations in Two Species of Fish Caught in Four Locations along the Quinnipiac and Eight Mile Rivers in 2013 and 2014.**

Location	Species	(2013) Number of Samples	(2013) Total Number of Individuals	(2013) Average (Total Aroclor) PCBs (ppm <sup>^</sup> )	(2013) Total Aroclor PCB Range (ppm)	(2014) Number of Samples	(2014) Total Number of Individuals	(2014) Average (Total Aroclor) PCBs (ppm <sup>^</sup> )	(2014) Total Aroclor PCB Range (ppm)
<b>Sampling Locations, Eight Mile River and Quinnipiac River N</b>									
Eight Mile River	Brown Trout	1	5	0.1	--	3	15	0.05	0.04-0.07
Eight Mile River	White Sucker	1	1	0.03	--	--	--	--	--
Quinnipiac River /Southington	Brown Trout	1	5	0.23	--	3	15	0.07	0.05-0.1
Quinnipiac River/Southington	White Sucker	1	5	0.05	--	--	--	--	--
Quinnipiac River/Cheshire	White Sucker	1	5	0.34	--	--	--	--	--
<b>Sampling Location, Quinnipiac River S</b>									
Quinnipiac River/Wallingford	White Sucker	1	4	0.04	--	--	--	--	--

\*The total aroclor-based analysis method is a measurement of commercial mixtures of PCB compounds.

<sup>^</sup>Parts per Million

## 3. PCB Level History

It is also informative to look at contaminant levels in fish tissue over time. Table 4 gives the PCB level history in the four locations in 2 fish species sampled. There is a large decrease in PCB levels in brown trout in the Eight Mile River from 1996 to 2013-2014. PCB levels are low overall in all of the fish sampled in 2013 and 2014.

<sup>2</sup> The total aroclor-based analysis method is a measurement of commercial mixtures of PCB compounds.

**Table 4. PCB Level History along the Quinnipiac and Eight Mile Rivers in Five Locations 1996-2014**

Location	Fish Species	Maximum Total Aroclor PCBs 1996-1997 (ppm <sup>@#</sup> ) (Year)	Average (Total Aroclor) PCBs (ppm) (2013)	Average (Total Aroclor) PCBs (ppm) in 2014
<b>Sampling Locations Eight Mile River and Quinnipiac River N</b>				
Eight Mile River	Brown Trout	2.7 (1996)	0.1	0.05
Eight Mile River	White Sucker	0.028 (1996)	0.03	NS <sup>\$</sup>
Quinnipiac River/Southington	Brown Trout	NPS <sup>^</sup>	0.23	0.07
Quinnipiac River/Meriden	Brook Trout	0.46 (1997)	NS	NS
Quinnipiac River/Cheshire	White Sucker	NPS	0.34	NS
<b>Sampling Location Quinnipiac River S</b>				
Quinnipiac River/Wallingford	White Sucker	NPS	0.04	NS

<sup>@</sup>parts per million

<sup>#</sup>The total aroclor-based analysis method is a measurement of commercial mixtures of PCB compounds.

<sup>\$</sup>Not Sampled

<sup>^</sup>Not previously sampled

## DISCUSSION

### *Exposure Pathway Analysis*

To determine if community members are exposed to contaminated fish in the Quinnipiac and Eight Mile Rivers, CTDPH evaluated the environmental and human components that lead to human exposure. CTDPH evaluated the fish tissue data and considered how people may be exposed to contaminants in the fish. The only possible complete pathway of exposure is via ingestion (eating the fish). An exposure pathway consists of five elements (ATSDR 2005):

1. A source of contamination;
2. Transport through an environmental medium;
3. A point of exposure;
4. A route of human exposure; and
5. A receptor population.

ATSDR categories an exposure pathway as either completed, potential, or eliminated. In a completed pathway, all five elements exist and indicate that exposure to a contaminant has occurred in the past, is occurring, or will occur in the future. In a potential exposure pathway, at least one of the five elements has not been confirmed, but it may exist. Exposure to a contaminant may have occurred in the past, may be occurring, or may occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present (ATSDR 2005).

Environmental data show that fish in the 5 locations sampled along the Quinnipiac and Eight Mile Rivers 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 and friends 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 described in the Environmental Contamination section of this document. 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.

Ingestion of two species of fish in the Quinnipiac and Eight Mile Rivers which contain elevated levels of PCBs is a complete exposure pathway and is evaluated in this health consultation. Using CTDPH's Modified Great Lakes Protocol for Fish Consumption, we have classified each fish species according to its appropriate consumption category (restriction level). Table 2 also gives 5 restriction level categories; "A" being the least restrictive and "E" being the most restrictive. CTDPH has concluded that the two fish species from the Quinnipiac River N and the Eight Mile River contain very low PCB levels such that a consumption advisory is no longer necessary to protect public health (Category A). However, there is not enough sampling data to make any conclusions or changes to the current advisory for the Quinnipiac River S.

Table 5 gives the updated CTDPH fish consumption advisory in response to the 2013 and 2014 PCB data from the five sampling locations along the Quinnipiac and Eight Mile Rivers and compares it to the previous advisory.

### Quinnipiac River N and the Eight Mile River

#### 1. All Species

Environmental data indicate the average PCB levels in brown trout and white sucker from sampling locations in the Quinnipiac River N and Eight Mile River are generally below levels where CTDPH issues a consumption advisory according to CTDPH's modified Great Lakes Protocol for fish consumption (Table 2). PCBs levels in fish sampled from this region have decreased over time from a high of 2.7 ppm in Brown Trout from the Eight Mile River to concentrations where a consumption advisory is no longer necessary.

In summary, CTDPH has decided that a consumption advisory for the Eight Mile River and the Quinnipiac River N is no longer necessary for the following reasons:

1. Two recent rounds of fish sampling has indicated very low levels of PCB contamination in this region.
2. Extensive cleanup of the Quinnipiac River following the discovery of the drums in 1996 has resulted in lower levels of contamination in the Quinnipiac and Eight Mile Rivers.

### Quinnipiac River S

#### 1. All Species

There are only limited data to suggest that PCB levels have decreased over time in fish from the Quinnipiac River S. Because of this, it is necessary to maintain the fish consumption advisory Category C restriction level.

CTDPH has decided to maintain the advisory of Category C restriction level for the Quinnipiac River S for the following reasons:

1. Past fish sampling has indicated moderately high levels of PCB contamination on this river.
2. Further sampling is necessary to show that PCB levels in fish are consistently low enough to allow more consumption.

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.

**Table 5. Updated 2015 Advisory for All Fish Species in the Quinnipiac and Eight Mile Rivers**

Location	Fish Species	Restriction Category	Consumption Advisory	
			Previous (2014)	Updated (2015)
Quinnipiac River (Gorge, south to Hanover Pond, Meriden)	All Species	C	1 Meal per Month-Everyone	No Change
Quinnipiac River (north of the Gorge, Meriden) and Eight Mile River	All Species	A	Do Not Eat-Everyone	No Advisory

## CONCLUSIONS

A recent round of fish tissue data shows that PCB levels have decreased in two fish species in the Quinnipiac and Eight Mile Rivers. The current PCB levels (based on 2013 and 2014 data) have decreased to a level where it is no longer necessary to continue a consumption advisory for the Quinnipiac River N and the Eight Mile River. CTDPH has concluded that PCB levels from two fish species from the Quinnipiac River N and the Eight Mile River over a long period of time are not harmful to people’s health.

CTDPH has decided to maintain the advisory of “One meal/month-everyone” for all species in the Quinnipiac River S to Hanover Pond because there is insufficient sampling data to warrant modifying the current consumption advisory. PCB levels from fish species from the Quinnipiac River S to Hanover Pond could harm people’s health if they do not follow the consumption advisory. If community members adhere to the current consumption advisory for this region of the Quinnipiac River, exposure to PCBs in fish is unlikely to harm health. 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 CTDEEP Inland Fisheries Division continue to work together with CTDPH and develop a PCB fish sampling plan for the Quinnipiac River S.
2. CTDPH recommends that CTDEEP Inland Fisheries Division continue to work with CTDPH to educate fishing populations along the Quinnipiac and Eight Mile Rivers about the statewide mercury consumption advisory and the consumption advisory for the Quinnipiac River S.

## REFERENCES

ATSDR 2005. Public Health Assessment Guidance Manual. Agency for Toxic Substance and Disease Registry, Available at

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

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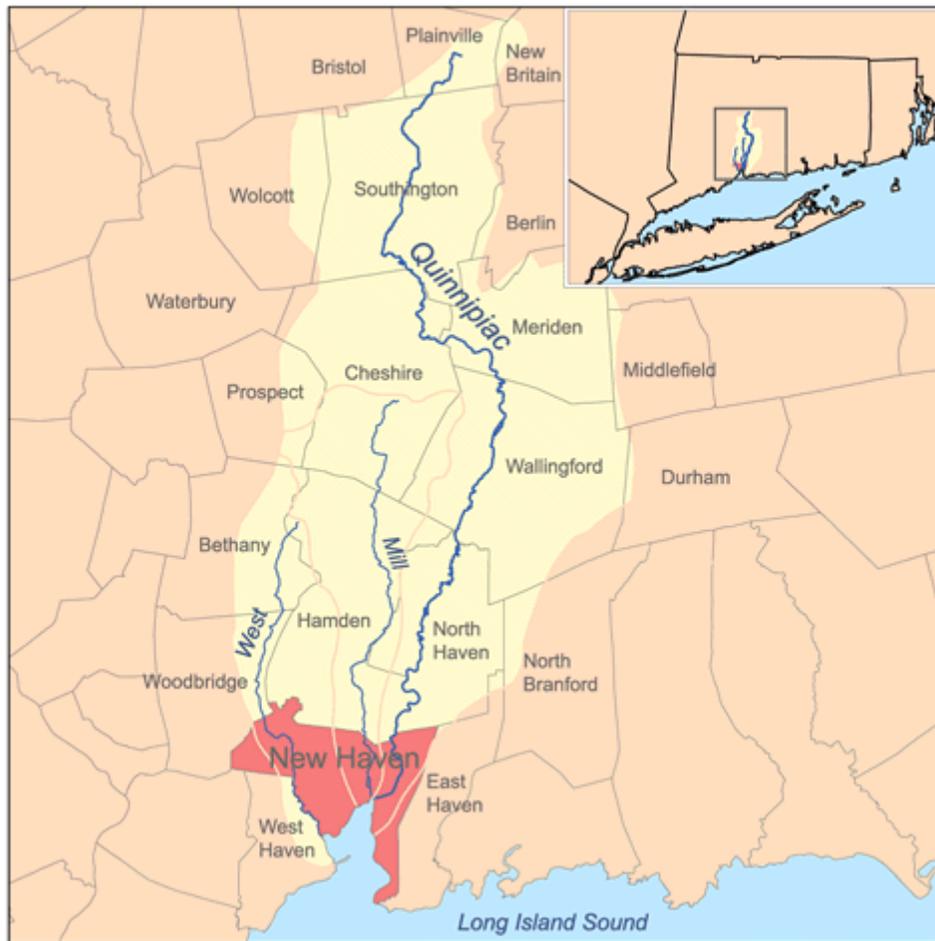
## **REPORT PREPARATION**

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# Appendix A

## Map of the Quinnipiac River



## Appendix B

### Risk Based PCB Fish Concentrations for Different Meal Frequencies Developed in the Great Lakes Protocol

- No advice for consumption for concentrations  $\leq 0.05$  ppm (assuming 1 meal every 1.6 days or 140 grams fish/day).
- One meal per week for concentrations 0.06 to 0.2 ppm
- One meal per month for concentrations 0.21 to 1.0 ppm
- One meal every other month for concentrations 1.1-1.9 ppm
- No consumption  $> 1.9$  pm