# Housatonic River Ecological Risk Assessment

**Housatonic River Initiative**

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Environmental Stewardship Concepts

Richmond VA

Jan. 13, 2004

# Outline

- General Comments
- Specific topics:
    - exposure
    - toxicity
    - risk estimates
- Uncertainties, omissions, limitations
- Conclusions

# General Comments

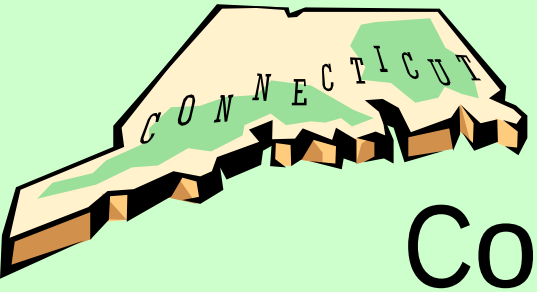
- Relies on a wealth of previous information to estimate ecological risks
- Well written, easy to understand and follow.
- Uses standard EPA practices and guidelines
- Uses more recent techniques for quantitatively evaluating risks
- The ERA concludes that contaminants in the Housatonic River pose a risk to wildlife
- SchaghticokeTribe not addressed in the RA

# Response to charge questions

- The ecosystem was well characterized
- Ecosystem information could have been better used- other species
- Contaminants were characterized
- Connecticut received little effort

# Exposure Issues

- Sediment levels in CT are not evaluated sufficiently
- CT floodplain is discounted
- Sediment volume and depth is not considered in CT
- Issues pertaining to use of the river by the Schaghticoke Tribe are not considered.



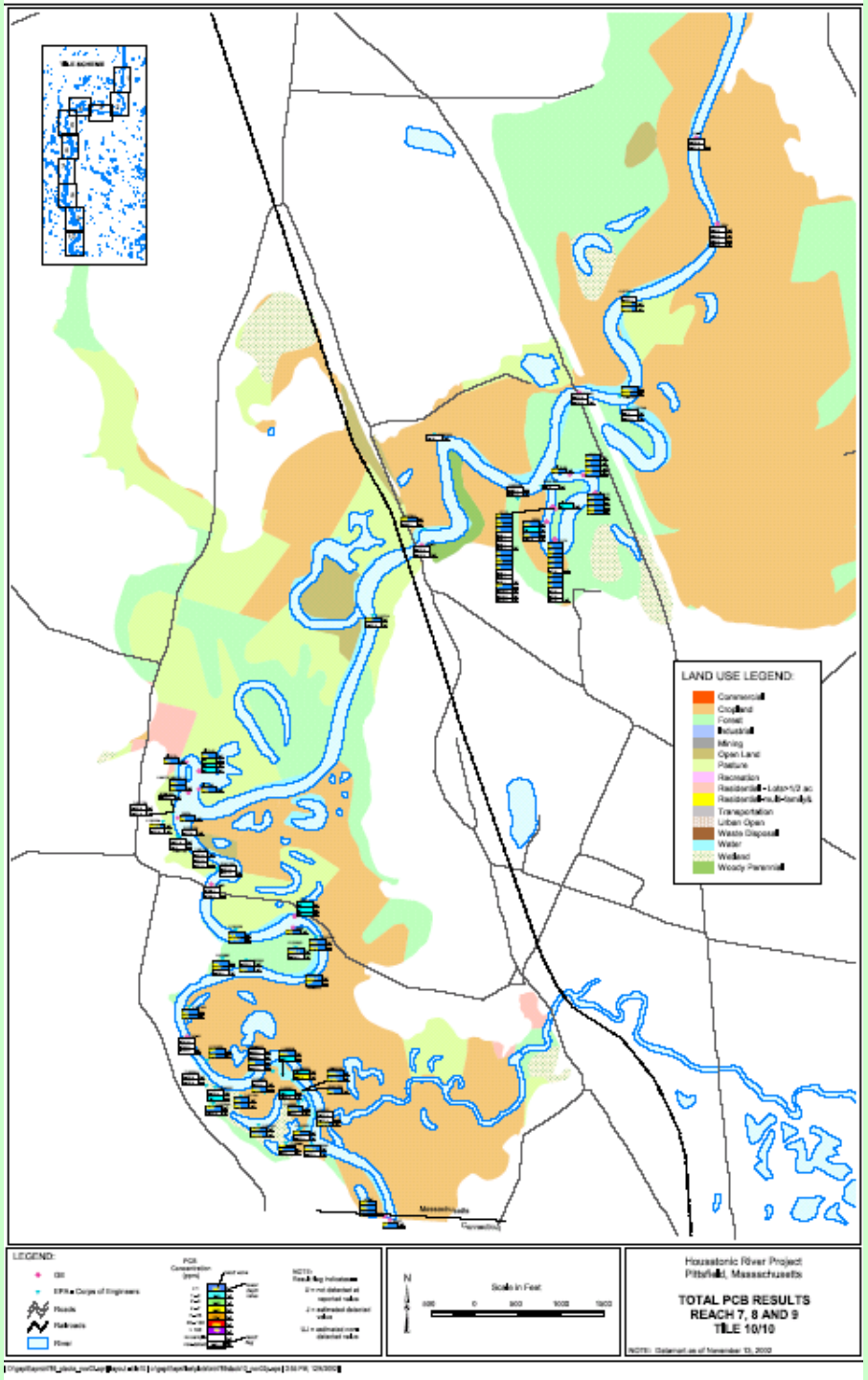

# Connecticut Sediments

- The sediment sampling effort was focused on MA; little sampling in CT.
- The majority of the data (from sediment samples) are from historical samples, obtained by GE, not an independent contractor, and not by EPA or EPA contractor.

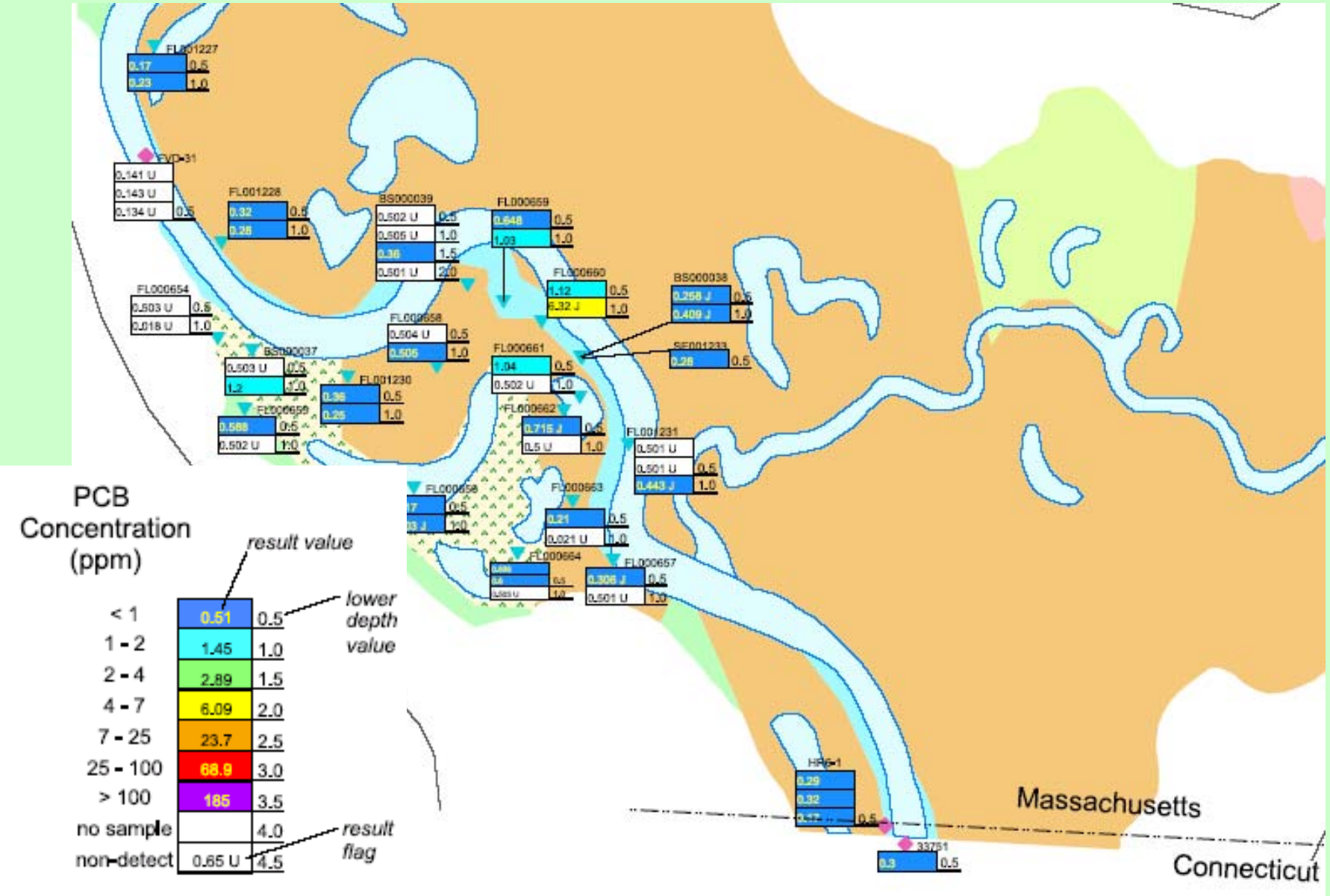
# Housatonic River Watershed – MA. and CT.

Most of the length of the river and the watershed lie within Connecticut

Lowest Reach of the Housatonic River in MA. showing sediment samples and land use types – taken from the risk assessment



# Selected sediment sample results: Reach 9, rest of river

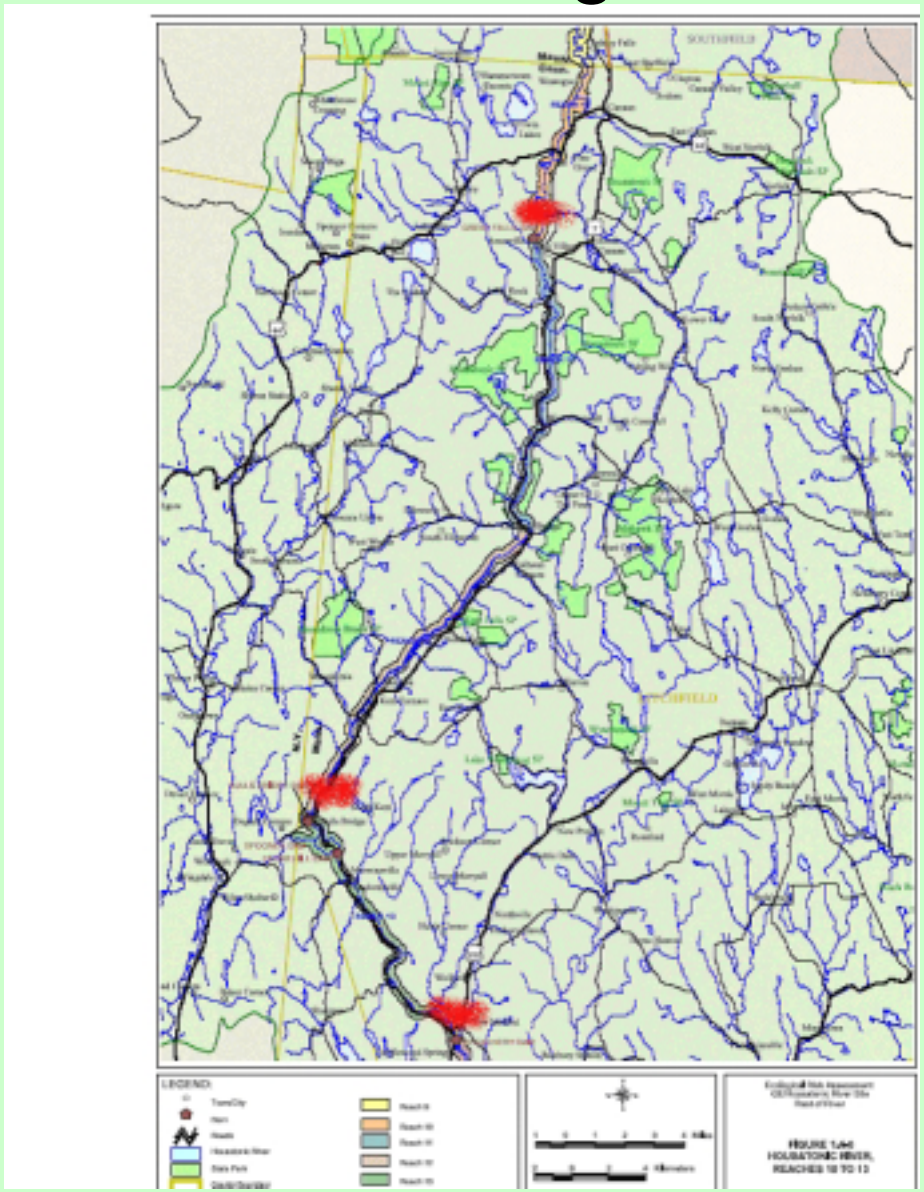


# Upper Housatonic River in CT, showing 3 dams sampled

Great Falls Dam – mile 77

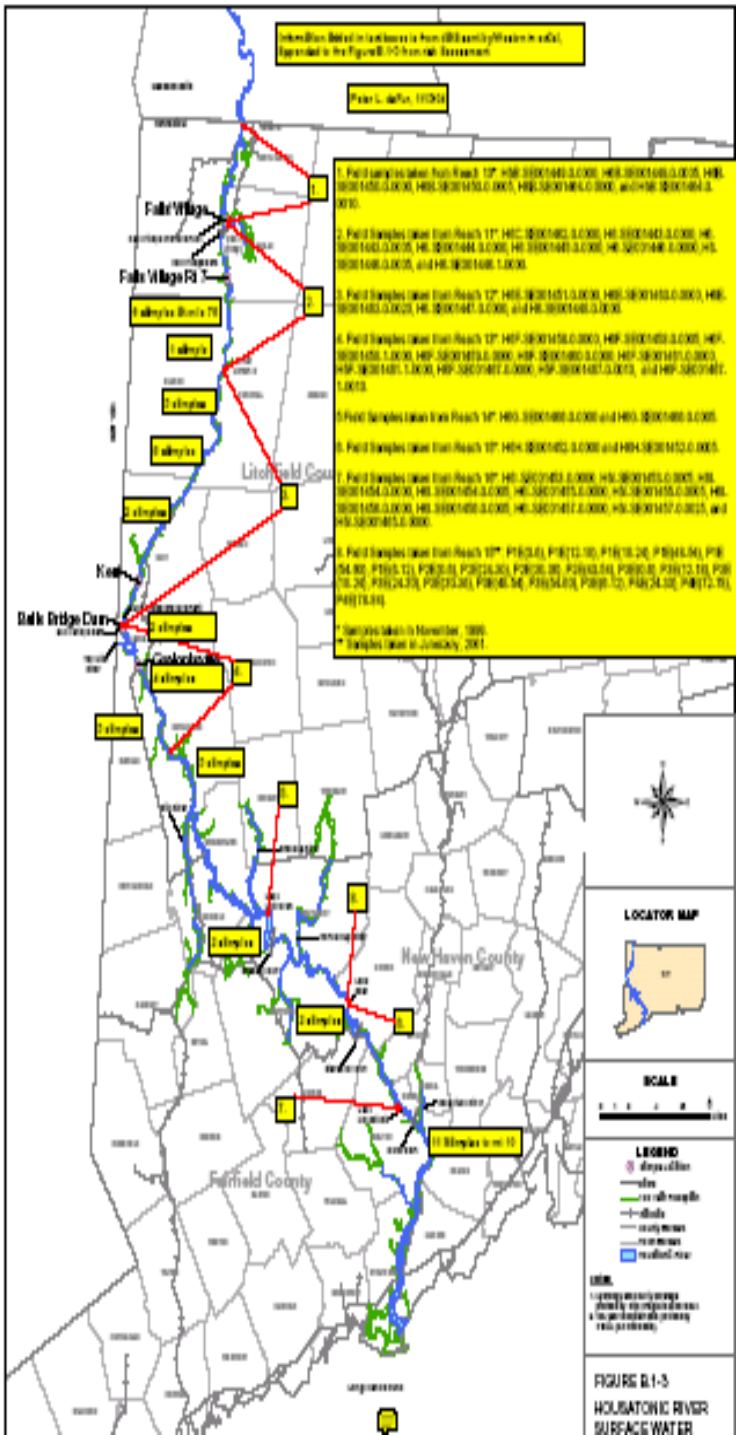
Bull's Bridge Dam – mile 49

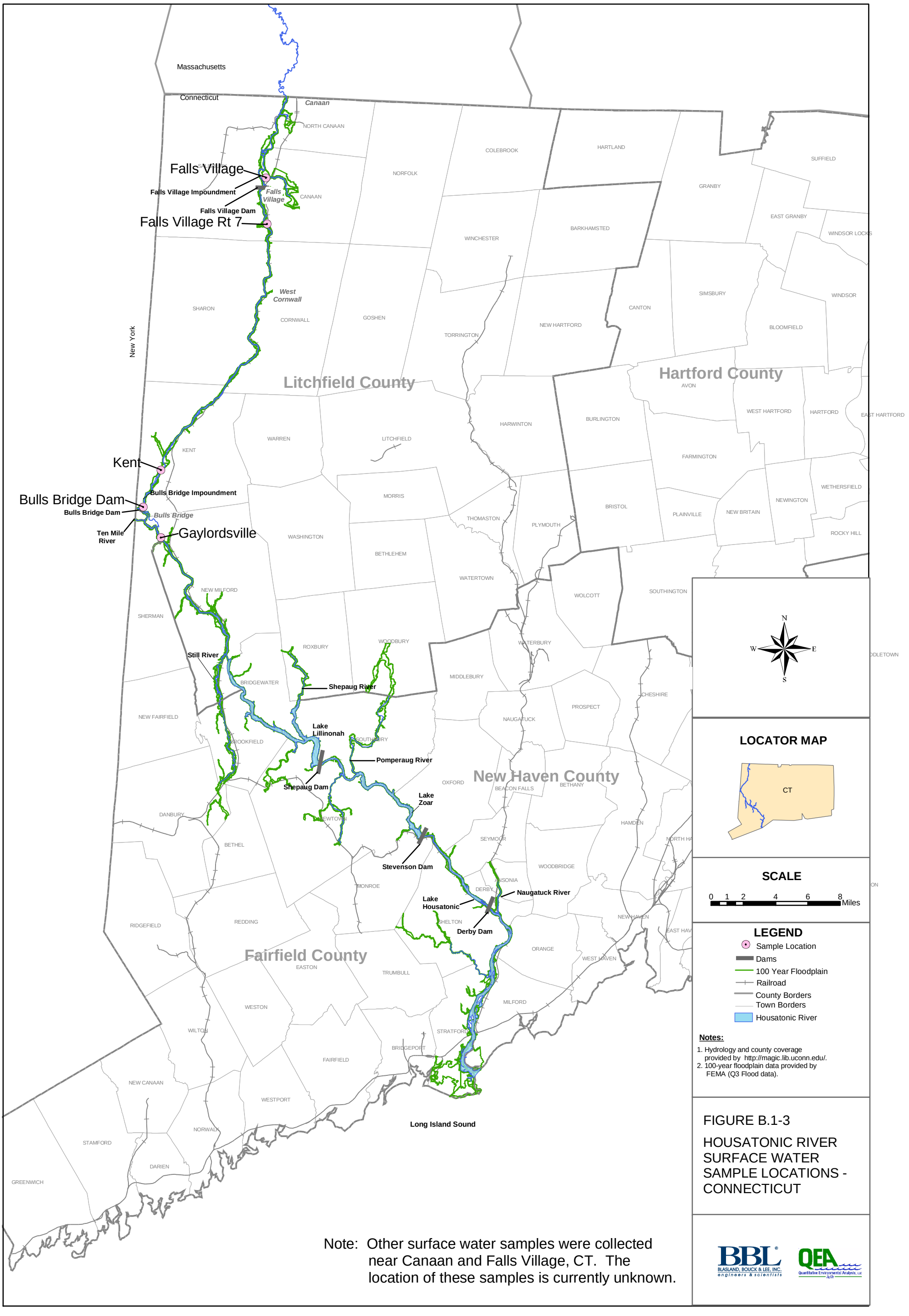
Blackberry Dam –mile 39



# Sediment Samples

Taken in CT in the last sampling in 2001 from ca. 100 mi of river – 40 samples;  22 samples in 1999



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# Sediment Samples in Connecticut- all years

| Year | Number of Samples |
|---|---|
| 1972 | 2 |
| 1973 | 3 |
| 1974 | 3 |
| 1975 | 3 |
| 1976 | 3 |
| 1977 | 2 |
| 1979 | 1 |
| 1980 | 146 |
| 1986 | 100 |
| 1992 | 147 |
| 1998 | 78 |
| 1999 | 20 |
| 2001 | 44 |
| Total | 552 |

Data obtained from Weston and submitted in comments

# Sediment samples by reach in CT- all years

| Reach | Number of Samples |
|---|---|
| 10 | 80 |
| 11 | 16 |
| 12 | 78 |
| 13 | 41 |
| 14 | 172 |
| 15 | 148 |
| 16 | 17 |
| Total | 552 |

Data obtained from Weston and submitted in comments

# Most recent samples – 2001- by depth

| Depth | 2001 sampling |
|---|---|
| feet | No. samples per depth |
| 0-.5 | 23 |
| 0-.25 | 3 |
| 0-.45 | 1 |
| .5-.75 | 4 |
| .5-1 | 6 |
| 0-.417 | 1 |
| 0-.834 | 1 |
| 2.5-3 | 1 |
| 2-2.5 | 1 |
| 1-1.5 | 3 |
| Total | 44 |

2 sediment samples taken behind each of the following 3 dams:

Bull's Bridge

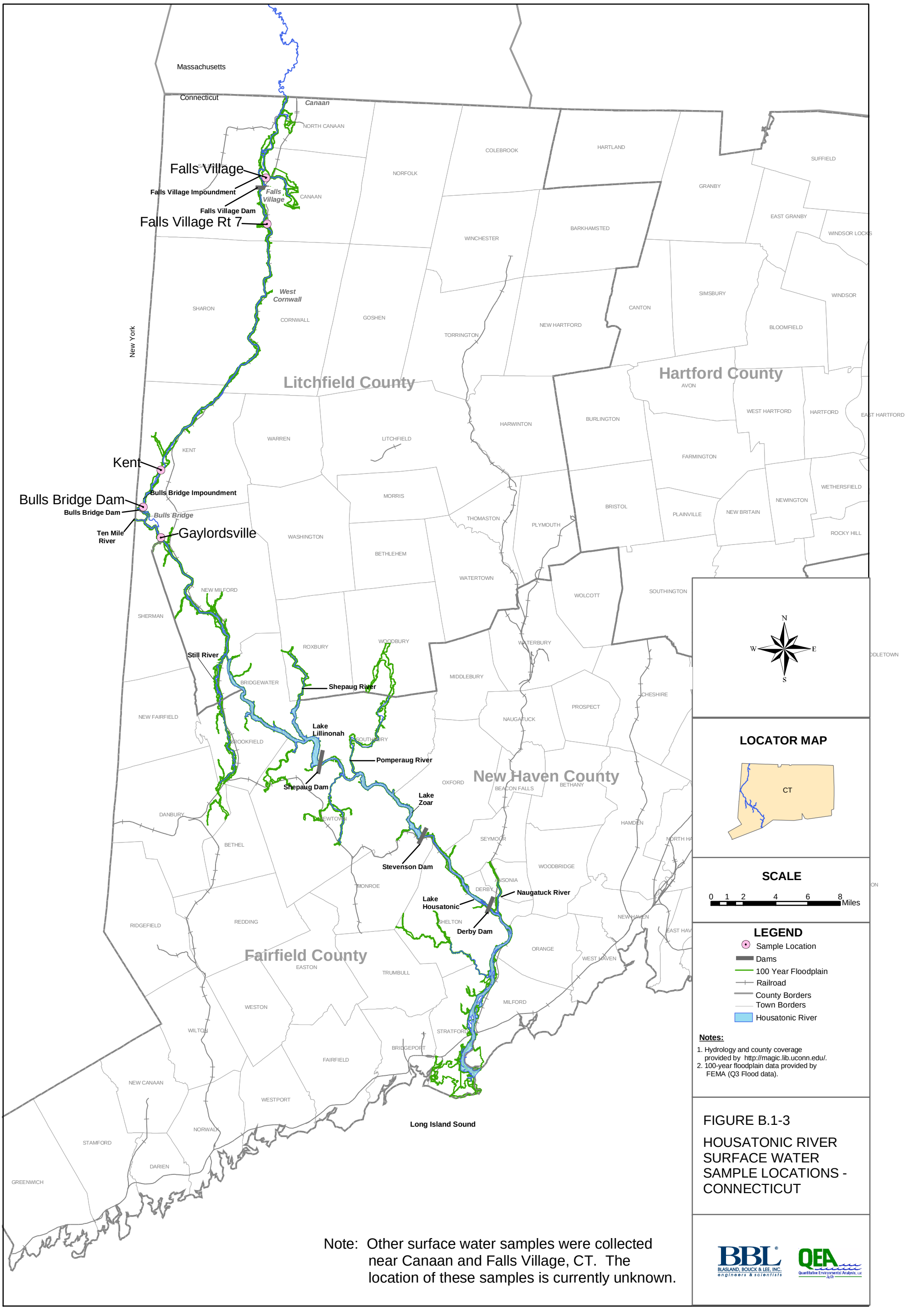
Great Falls

Blackberry

Data obtained from Weston and submitted in comments

Conneticut Floodplain Data

| Location | Year | Comments |
|---|---|---|
| Hartford & Oxford | 1993 | Flooding (flood gates opened wider at Shepaug Dam and the Stevenson Dam) at least 6 inches over flood stage. |
| Milford & Harford | 1996 | Flooding (close Route 7 in Milford) |
| North Canaan, Ledyard, Westbrook, Middlefield, Norwich | 1996 | Flooding (rain and icemelting) (flooded basements of homes) |
| Litchfield County | 2000 | Flood warnings |
| Stratford | 02/2001 | Flooding (businesses flooded) |
| Bulls Bridge to Derby | 03/2003 | Flood warnings |
| Falls Village | 03/2003 | Minor Flooding (1.1 feet above flood stage) |
| Gaylordsville | 03/2003 | Flooding (1.3 feet above flood stage) |
| Stevenson Dam | 03/2003 | Flooding (1.5 feet above flood stage) |
| Ashley Falls, Mass to Cornwall Bridge, Ct. | 04/2003 | Flood warnings |
| Gaylordsville | 04/2003 | 7-8.7 feet above flood stage |

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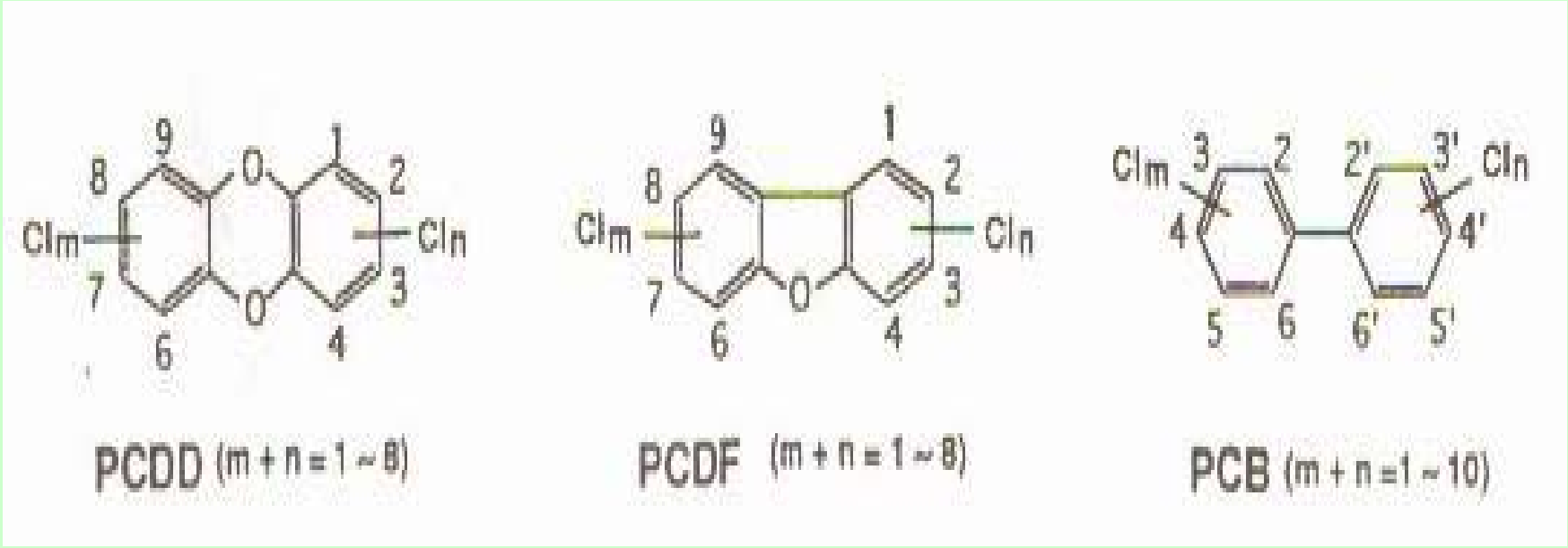
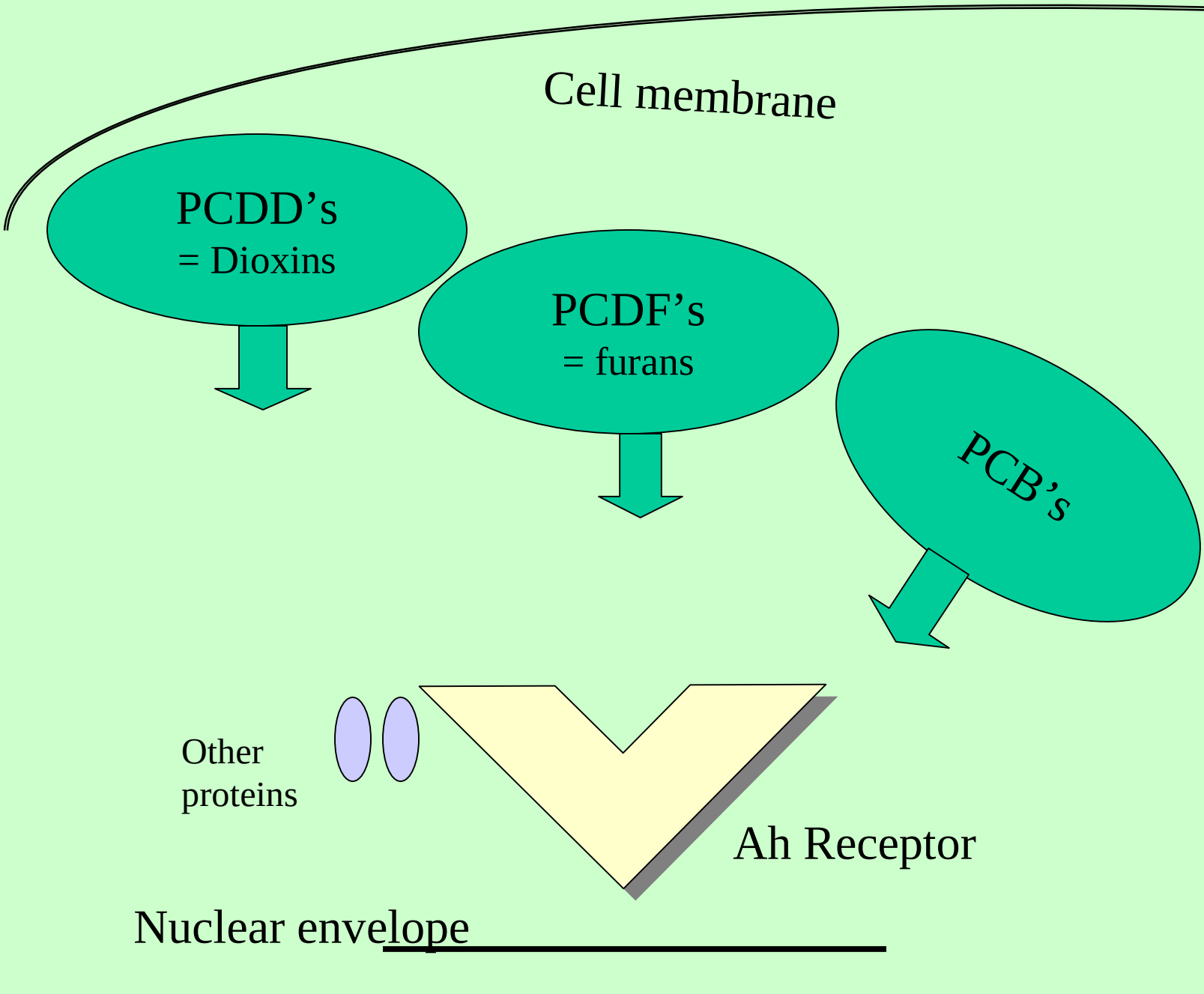
# Effects of PCBs on wildlife include:

- Reproductive impairment in:
  - **Fish**
  - **Birds**
  - **Mink**
- Reproductive failure in mink and river otter
- Developmental abnormalities in fish, mammals and birds

# PCDD, PCDF, and PCB Molecules:




Cell membrane
PCDD's
= Dioxins
PCDF's
= furans
PCB's
Other
proteins
Ah Receptor
Nuclear envelope

# Effects of PCBs on fish

- Population declines
- Mortality
- Developmental abnormalities
- Behavioral problems?
- Migration
- Egg mortality

# Rainbow Trout

# Blue Sac Disease

# Protecting Individuals/Populations

- EPA holds that a species is unaffected if the population can sustain itself, even if the individual members of the population suffers from abnormalities. A population of unhealthy organisms is unacceptable.

# Populations continued

- Housatonic R fish display lesions and other abnormalities
- Other rivers display this pattern
- Elizabeth River
  - Research by Charles Rice, Peter Van Veld, etc. on *Fundulus* populations
  - Research by Garman et al -catfish in the James R

# PCB's in Lake Trout in the Great Lakes



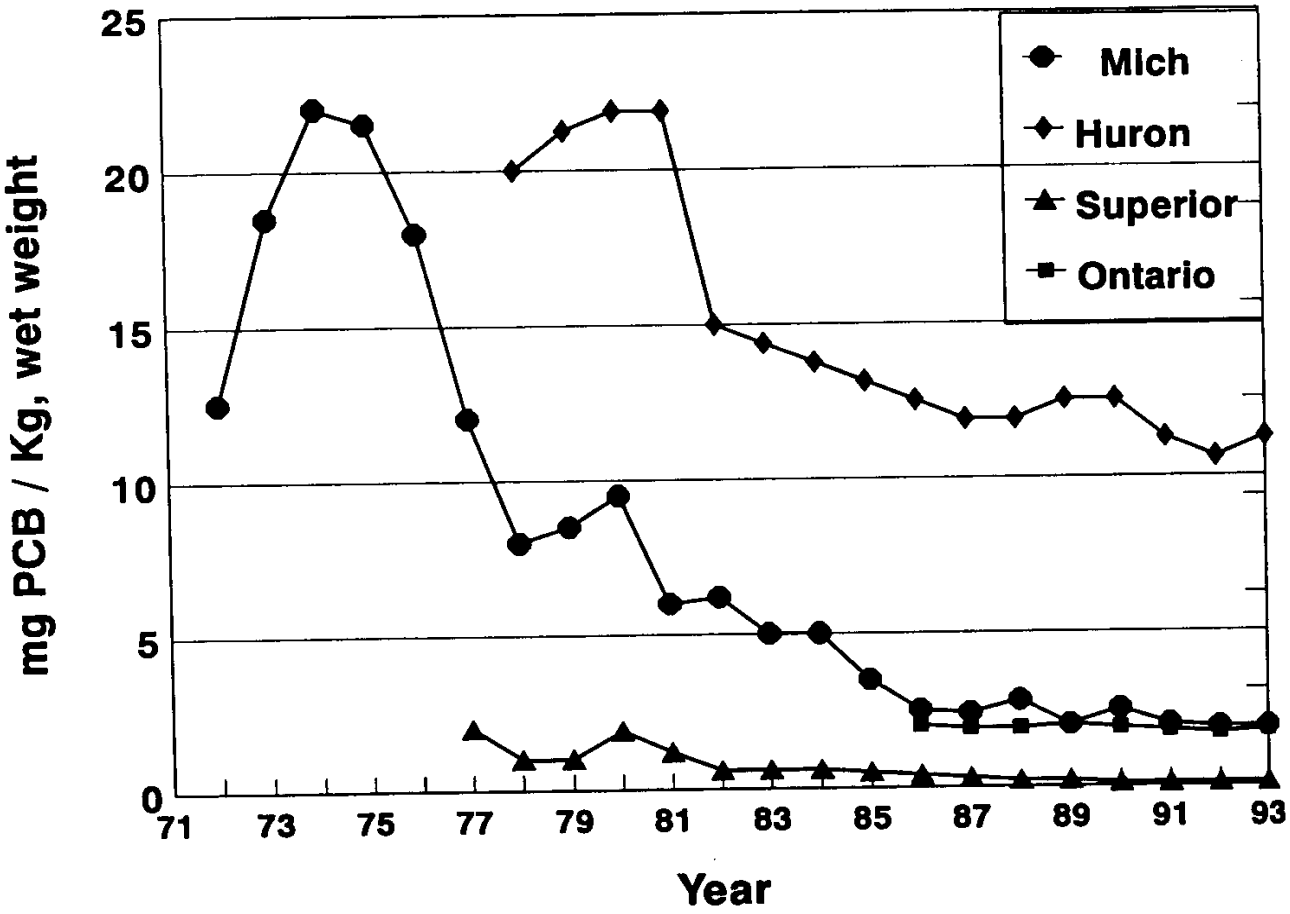
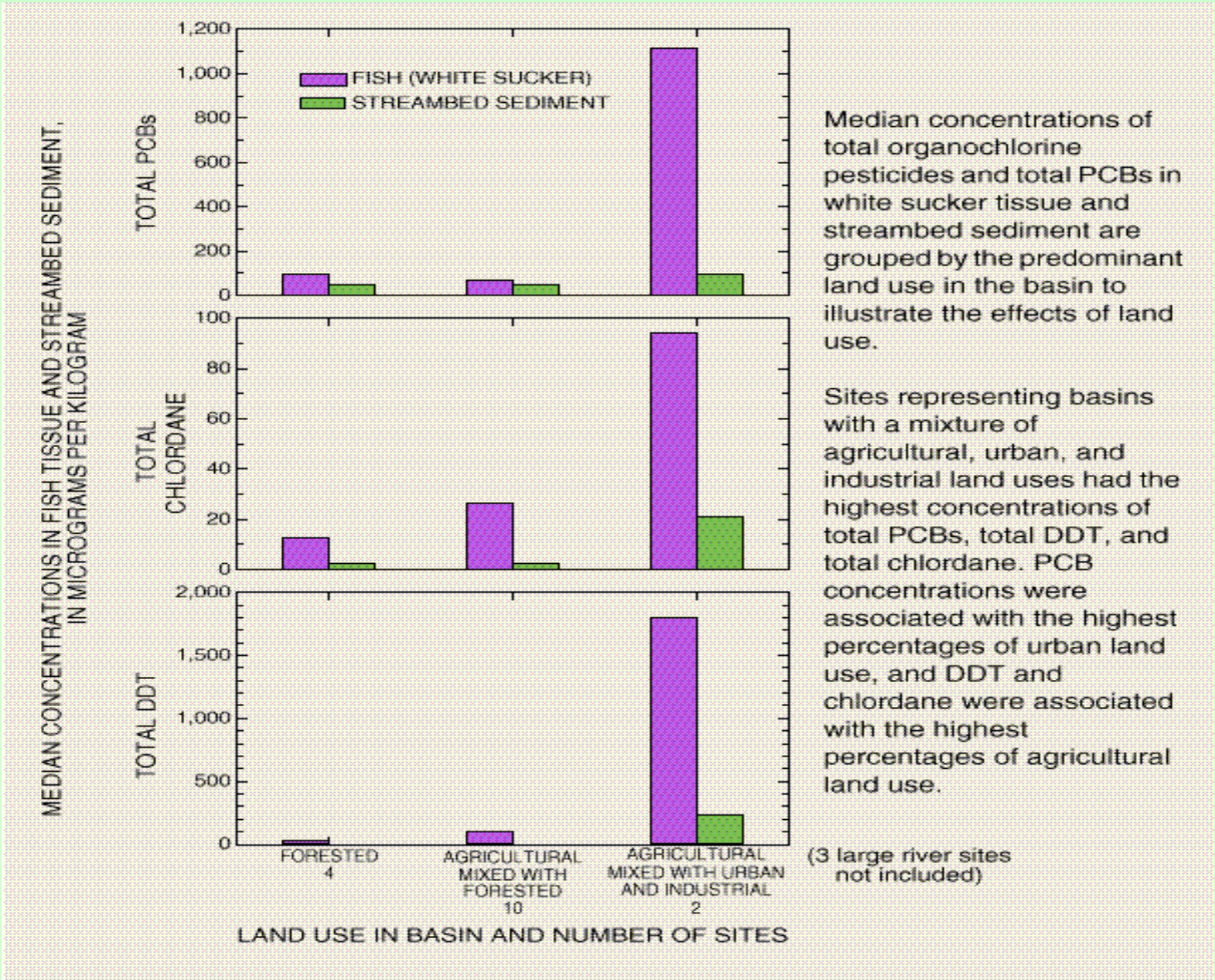



Figure 8-2 Mean total concentrations of PCBs (reported as mg total PCB/kg, w/w) in whole lake trout from North American Great Lakes, 1972–1990. Reprinted with permission from *Michigan Fish Contaminant Monitoring Program 1994 Annual Report.*

# Risk Characterization Issues

- Population effects may obscure sick fish issues
- Combinations of chemicals exist but are not examined
- Other animals
- Tribal information

# Fish tissue and sediment levels of PCB's etc.




Median concentrations of total organochlorine pesticides and total PCBs in white sucker tissue and streambed sediment are grouped by the predominant land use in the basin to illustrate the effects of land use.

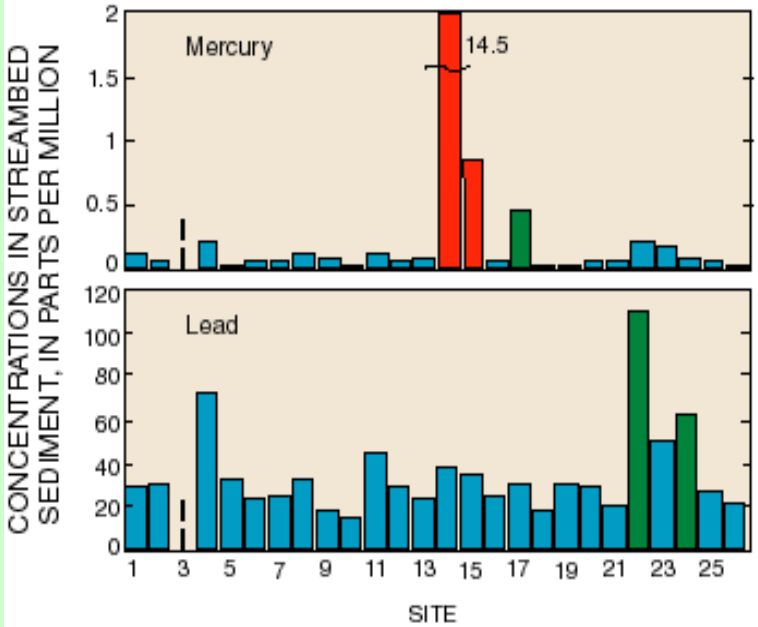
Sites representing basins with a mixture of agricultural, urban, and industrial land uses had the highest concentrations of total PCBs, total DDT, and total chlordane. PCB concentrations were associated with the highest percentages of urban land use, and DDT and chlordane were associated with the highest percentages of agricultural land use.

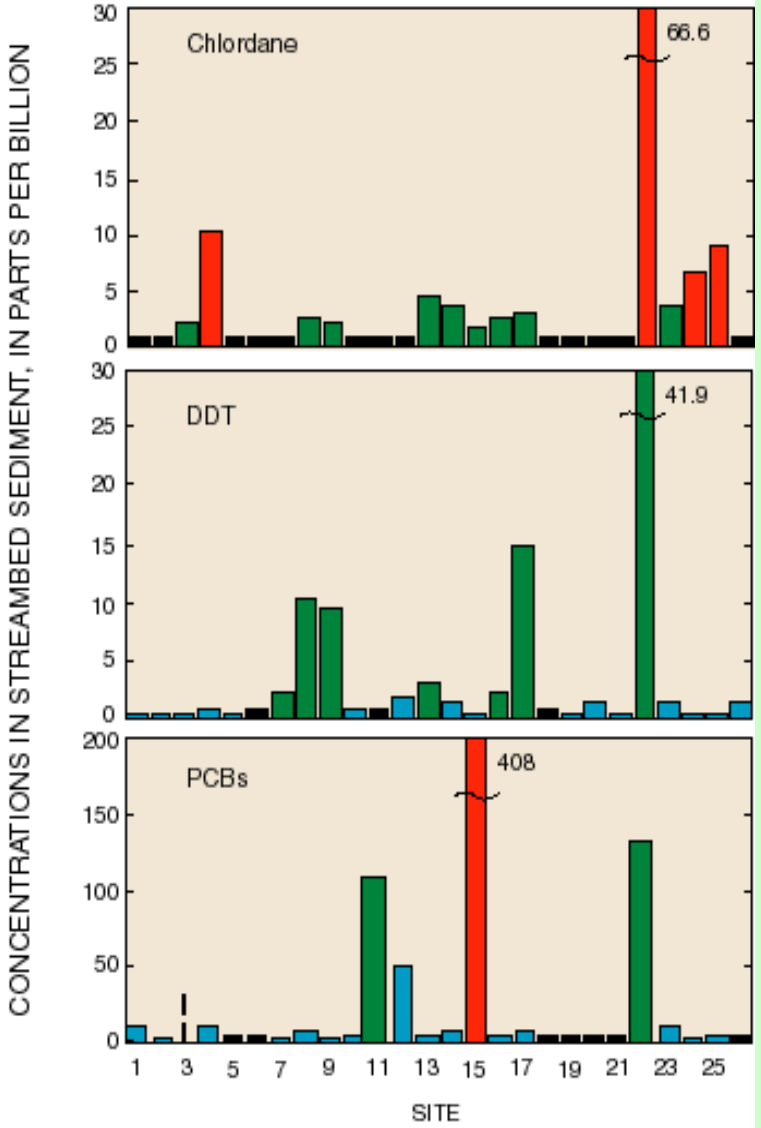
(3 large river sites not included)

## EXPLANATION

**Probability of organic contaminants or metals in streambed sediment causing adverse effects on aquatic life** — Mercury and lead concentrations were adjusted for particle-size distribution for screening purposes

- **High**
- **Intermediate**
- **Low**
- **Not detected**
- **Not sampled**
- **Site location and number**



# Toxicity-altered fish populations

- Altered Ah receptor signal transduction pathway
- Gene products involved in xenobiotic biotransformation and efflux
- Tumor-bearing populations of affected fish exhibit patterns of protein and enzyme expression similar to multidrug-resistance in cancer

(Van Veld and Nacci 2003)

# Studies from New Bedford Harbor and Elizabeth River

**Physical and biological factors**

**+**

**Species attributes-**

i.e. genetic variation and life-stage specific dispersal characteristics may contribute to the development, evolution, maintenance and costs of adaptation to toxic pollutants

Van Veld and Nacci 2003

# Tribal Issues

- No tribal issues in the final ERA
- The Schaghticoke Tribe (CT) is a state recognized tribe
- The Risk Assessment work plans call for assessing tribal issues
- Cultural significance of the ecological resources not examined
- Natural resources data in the CT portion should be updated

# Specific Tribal Issues

- Historically the tribe has relied on foods from the Housatonic River and adjacent watershed- knowledge of local species
- Foods include squirrel, turkey, turtles, frogs, and catfish – cooked by wrapping them in river mud, then baking in a fire.

# Uncertainties - omissions

- Tribal use of the river, watershed
- No agricultural or domestic animals assessed in either the HH or ecological RA
- Few data on waterfowl and many fish were not included
- Bears and other major predators absent

# Conclusions and recommendations

- Evidence of affected populations
- Insufficient data on CT contamination
- Tribal issues not addressed
- Reproducing population of sick fish is unacceptable
- Proceed to develop remediation for R.O.R.

# Recommendations continued

- Sampling plan for Connecticut
  - **NO** delay
- Contact the Schaghticoke Tribe in February 2004
  - Arrange for interview