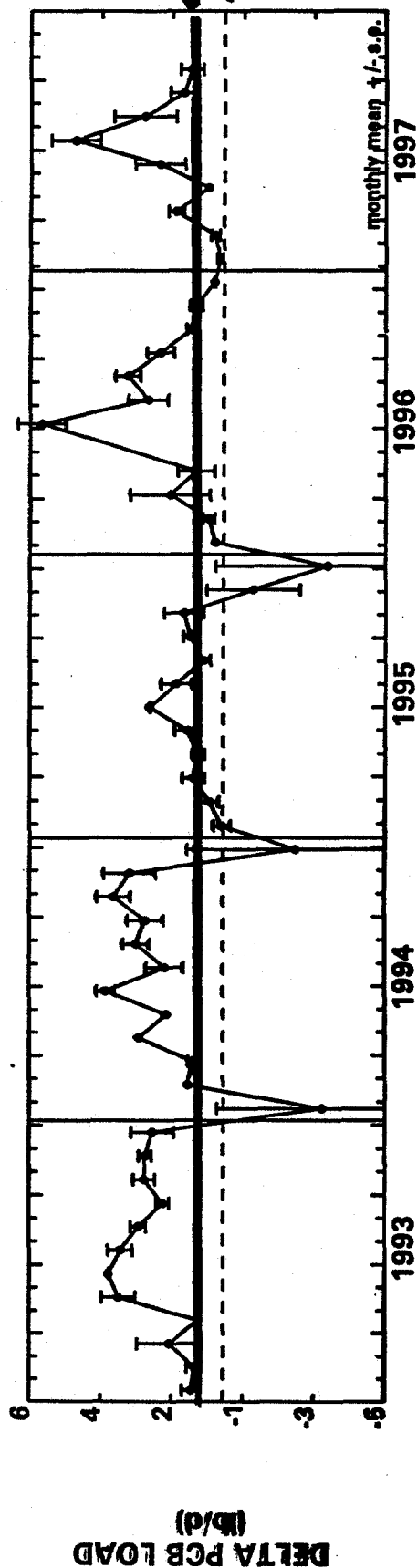
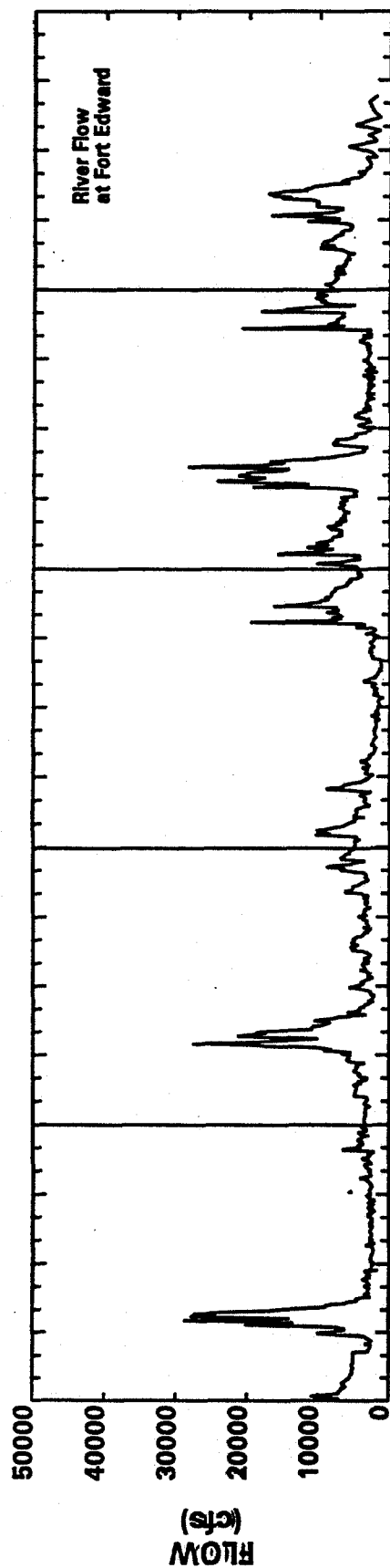


RESULTS OF THE GENERAL ELECTRIC 1996-97 THOMPSON ISLAND POOL RESEARCH PROGRAM

Background

- **The flux of PCBs from Thompson Island Pool (TIP) sediments has been estimated based on the increase in PCB concentration from Rogers Island to Thompson Island Dam**
- **The calculated flux varies seasonally and annually:**
 - ☐ **excluding flood events, the maximum occurs in early summer and the minimum occurs in winter**
 - ☐ **highest levels are about 5 to 6 lb/d**
 - ☐ **the summer average is about 2 to 3 lb/d**
 - ☐ **fluxes were lower in 1995, a year without a spring high flow event.**
- **GE has contended that the estimated flux is anomalously high, particularly during summer low flow conditions:**
 - ☐ **diffusion of PCBs from sediments contaminated at the levels observed in 1991 can account for, at most, 0.5 to 1 lb/d**
 - ☐ **water column data collected at Schuylerville in the late 1980s by the USGS suggest a flux from TIP sediments of 0.2 to 0.4 lb/d**
 - ☐ **the estimated flux of PCBs from sediments between the TI Dam and Schuylerville is much lower, despite similar sediment PCB levels**

River Flow and Apparent PCB Flux from TIP Sediment



Thompson Island Dam-Ft Edward PCB Load Difference
excluding FE flows > 10,000 cfs

RESULTS OF THE GENERAL ELECTRIC 1996-97 THOMPSON ISLAND POOL RESEARCH PROGRAM

Hypotheses

- Several hypotheses have been proposed to explain such a high flux:
 - 1) *Additional mechanisms that move PCBs from the sediments to the water column*
 - ☐ groundwater inflow
 - ☐ resuspension of sediments
 - 2) *Higher PCB levels in surface sediments than is indicated by the 1991 data*
 - ☐ PCB oil (transported from the vicinity of the GE Hudsons Falls plant site)
 - ☐ oily sediments (scoured from the Allen Mill when the gate structure failed)
 - 3) *Overestimation of the PCB Flux leaving the TIP*
 - ☐ the PCB levels in the shoreline water sampled at Thompson Island Dam are higher than the average level in water passing the dam

RESULTS OF THE GENERAL ELECTRIC 1996-97 THOMPSON ISLAND POOL RESEARCH PROGRAM

Research Program

Hypothesis 1: Additional mechanisms that move PCBs from the sediments to the water column
--

- ☐ estimation of the effect of long-term high flux on sediment PCB composition and inventory
- ☐ measurement of groundwater inflow rates
- ☐ measurement of water column TSS changes through the TIP for evidence of resuspension

RESULTS OF THE GENERAL ELECTRIC 1996-97 THOMPSON ISLAND POOL RESEARCH PROGRAM

Program Results

Hypothesis 1: Additional mechanisms that move PCBs from the sediments to the water column
--

- ☐ The historical contaminated sediments (as measured in 1984) could not sustain the estimated PCB flux to the present time. The surface sediments would have been depleted of PCBs, particularly the lower chlorinated homologs.
- ☐ Measured groundwater inflow rates are at least a factor of ten too low to account for the estimated flux.
- ☐ TSS changes through the TIP show no evidence of resuspension. Levels are low and do not increase except at the locations of tributaries.

RESULTS OF THE GENERAL ELECTRIC 1996-97 THOMPSON ISLAND POOL RESEARCH PROGRAM

Research Program

Hypothesis 2: Higher PCB levels in surface sediments than is indicated by the 1991 data
--

- ☐ simulation of PCB oil transport from Hudsons Falls using a particulate tracer
- ☐ measurement of bed load and water column PCBs for evidence of substantive PCB transport during high flow events
- ☐ measurement of PCB transport during periodic flooding of Bakers Falls plunge pool
- ☐ measurement of PCBs throughout the TIP to search for areas of elevated flux that might indicate areas of elevated surface sediment PCBs

RESULTS OF THE GENERAL ELECTRIC 1996-97 THOMPSON ISLAND POOL RESEARCH PROGRAM

Program Results

Hypothesis 2: Higher PCB levels in surface sediments than is indicated by the 1991 data
--

- ☐ The particle tracer study indicated a potential for PCB oil to be stored above the TIP under low flow and transported to the TIP, and trapped therein, during flood events.
- ☐ No substantive PCB flux was observed in bed load or in water passing Rogers Island during the 1997 spring high flow event. Such transport may have occurred in earlier years due to greater PCB releases from the Hudsons Falls plant site area.
- ☐ Periodic flooding of Bakers Falls plunge pool transported small quantities of PCBs downstream.
- ☐ PCB concentration changes through the TIP indicated a widespread flux of PCBs from sediments throughout the pool that contributed about 1 lb/d of PCBs to the water column.
- ☐ The observed flux is at or above the limit of what could come from historical sediments, and may indicate some contribution from the Hudsons Falls releases
- ☐ Although localized areas of higher PCB concentration were observed, flow analyses indicated that lack of flushing in these areas was the cause rather than greater flux from sediments.

RESULTS OF THE GENERAL ELECTRIC 1996-97 THOMPSON ISLAND POOL RESEARCH PROGRAM

Research Program

Hypothesis 3: Overestimation of the PCB Flux leaving the TIP
--

- ☐ sample at opposite shoreline for comparison to routine sampling location
- ☐ sample at transect in the river immediately upstream of the dam for comparison to the shoreline sampling location
- ☐ sample in the main flow of the river immediately downstream of the shoreline sampling location for comparison to the shoreline sampling location and the transect upstream of the dam

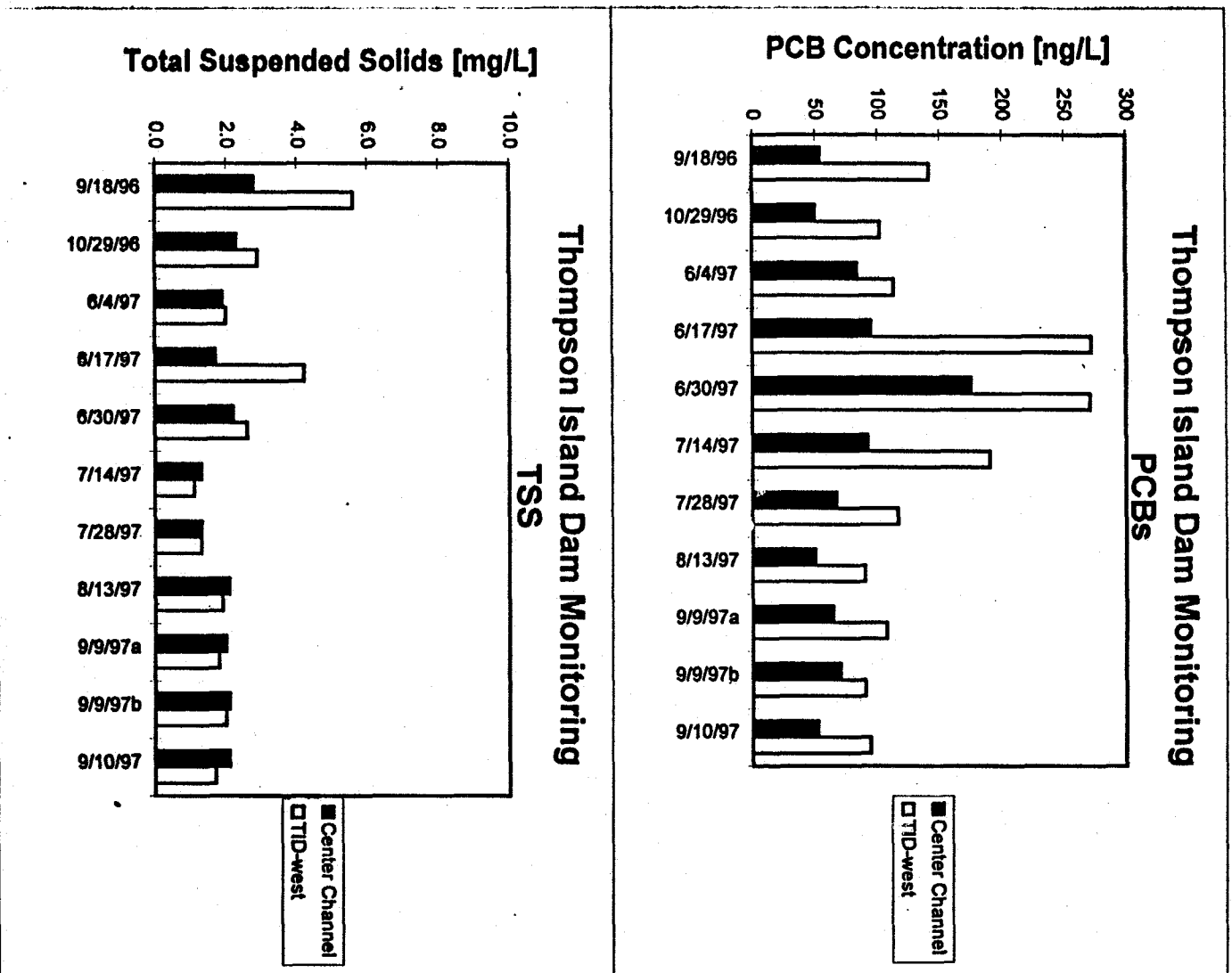
RESULTS OF THE GENERAL ELECTRIC 1996-97 THOMPSON ISLAND POOL RESEARCH PROGRAM

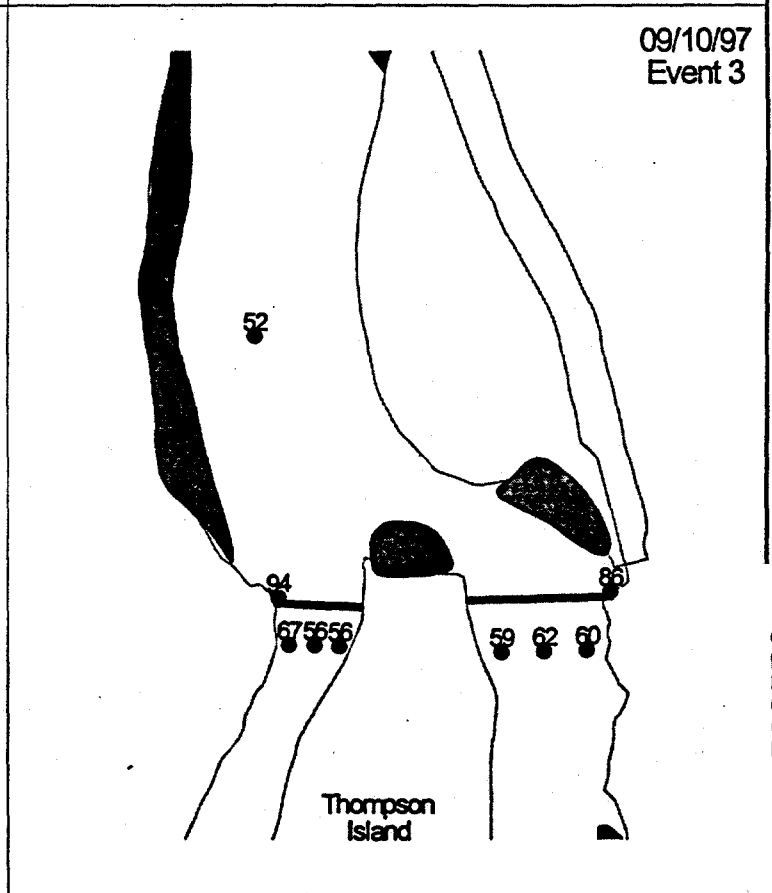
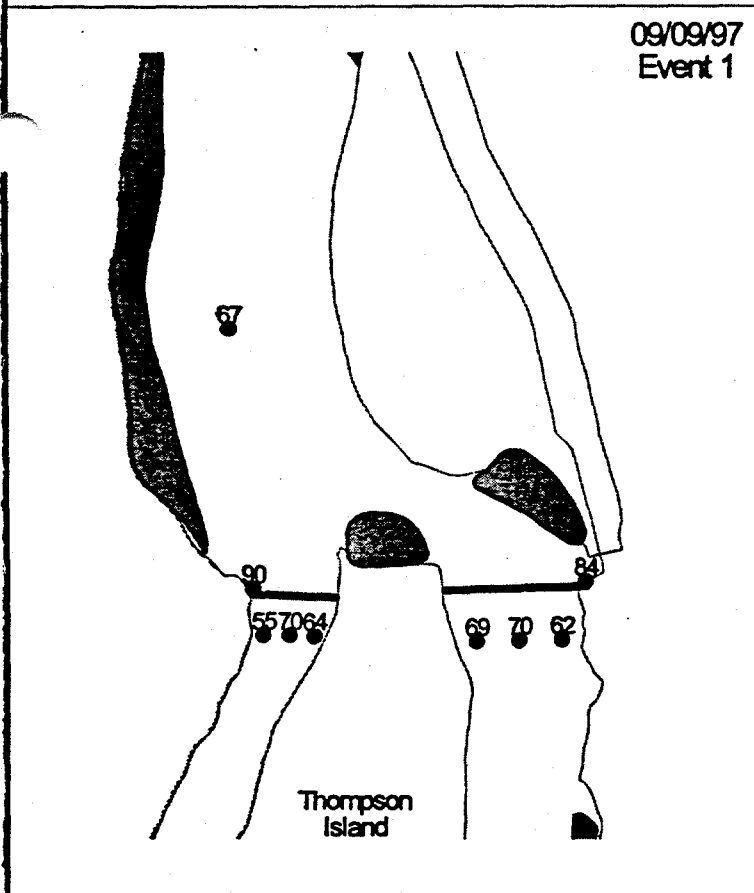
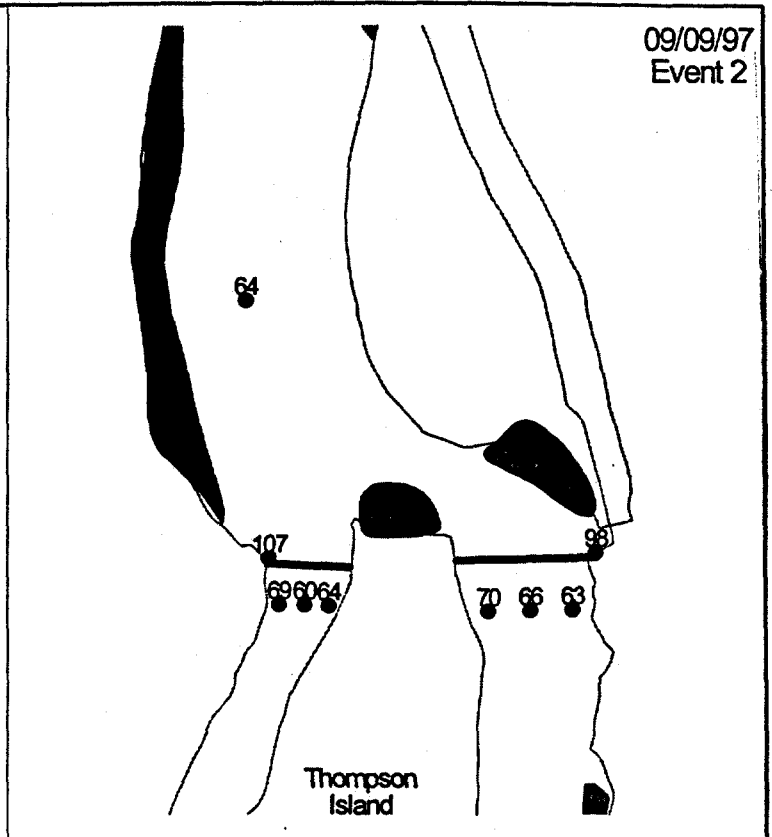
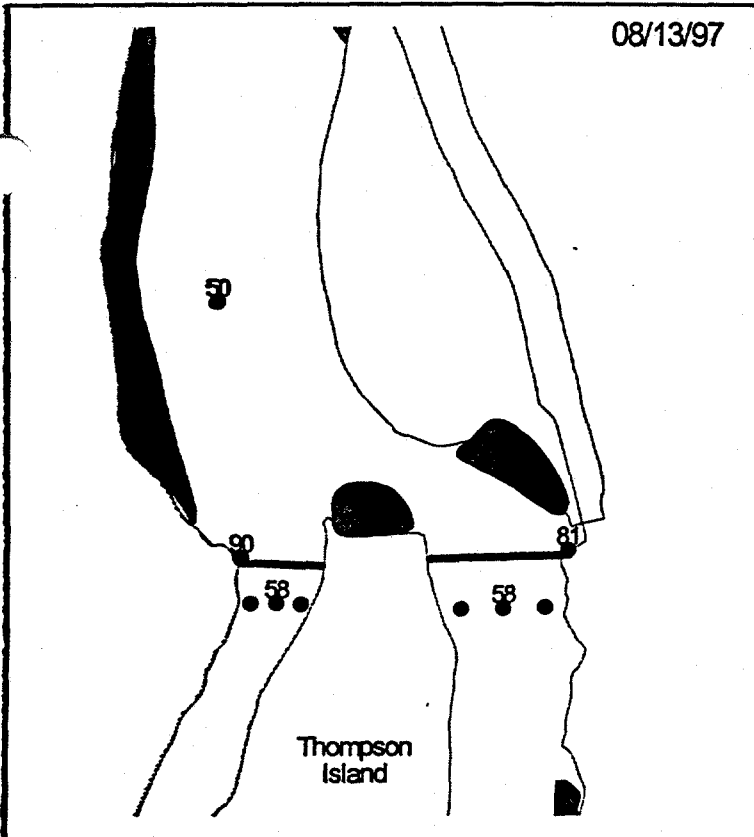
Program Results

Hypothesis 3: Overestimation of the PCB Flux leaving the TIP

- ☐ samples at the opposite shoreline had PCB levels similar to those at the routine sampling location
- ☐ samples from a transect about 1000 ft. upstream of the dam had PCB concentrations significantly lower than samples taken at the routine sampling location
- ☐ samples in the main flow of the river immediately downstream of the shoreline sampling location had concentrations similar to those measured at the transect upstream of the dam

Figure 1. Center Channel and TID-west PCB and TSS Results





<ul style="list-style-type: none"> ● PCBs (ng/L) ■ 1976 NYSDEC Hot Spots — Shoreline — Thompson Island Dam <p>500 0 500 Feet</p>	<p>New York State</p>	<p>Upper Hudson</p>	<p>The General Electric Company Thompson Island Dam Monitoring Study Total PCB Concentrations</p> <p>HydroQual, Inc. October, 1997</p>
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RESULTS OF THE GENERAL ELECTRIC 1996-97 THOMPSON ISLAND POOL RESEARCH PROGRAM

Main Conclusions

- Current estimates of PCB load from TIP sediments (2 to 3 lb/d with maxima of 5 to 6 lb/d) are erroneous due to a sampling bias at the Thompson Island Dam
- The summer average low flow PCB load from TIP sediments is probably on the order of about 1 lb/d; additional loading measured at downstream stations comes from downstream sediments
- The TIP PCB load is derived from surface sediments throughout the TIP

Ancillary Conclusions

- The PCB flux from TIP sediments results in a gradual increase in PCB levels through the TIP
- Water column PCB concentrations tend to be highest in backwater areas
- Little PCB oil or oily sediment entered the TIP in 1997

RESULTS OF THE GENERAL ELECTRIC 1996-97 THOMPSON ISLAND POOL RESEARCH PROGRAM

Next Steps

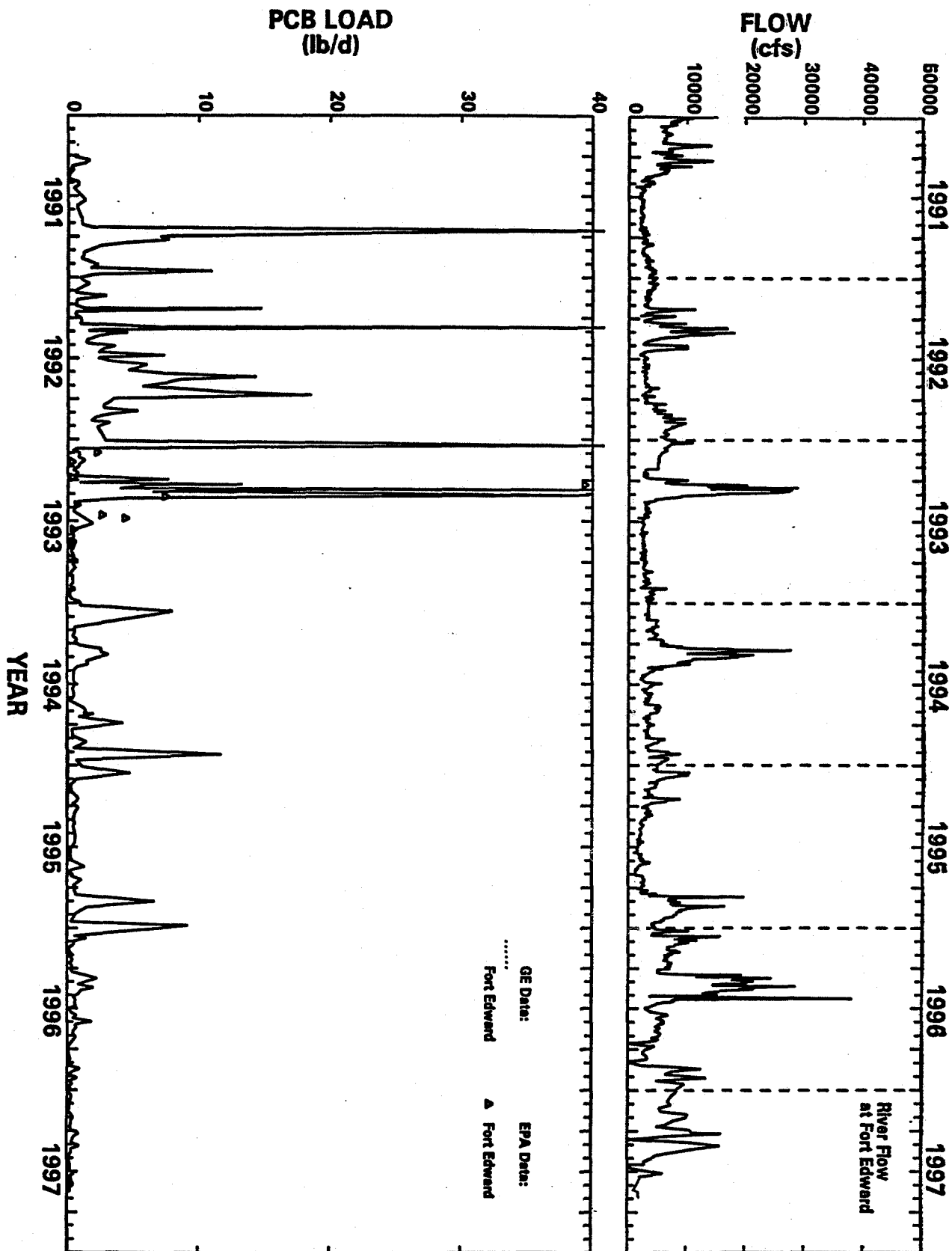
- **Confirm the sampling bias**
 - ☐ resample upstream and downstream of the Dam, at the routine station and at Schuylerville
 - ☐ sample water where the Dam abuts Thompson Island
- **Confirm that samples taken from the river center just downstream of the Dam represent conditions in water passing the Dam**
 - ☐ compare concentrations above and below the dam
- **Move routine monitoring to the river center just downstream of the Dam**
- **Determine the cause of the sampling bias at the TI Dam**
 - ☐ test hypothesis that water from upstream shoreline backwater areas is carried alongshore to the sampling location
 - ☐ sample at the following locations:
 - main channel upstream of the Dam
 - backwater area along the shore
 - routine station at the Dam
 - downstream of the Dam
- **Investigate whether the TI Dam data can be corrected**
 - ☐ do the new data indicate a systematic bias?

UPDATE ON THE UPSTREAM SOURCE AND CHANGES IN FISH PCB LEVELS

Upstream Source

- PCB levels at Rogers Island have been significantly reduced in response to remedial actions in the vicinity of the Hudsons Falls Plant site
 - ☐ measurements have been near or below the MDL since October 1996
 - ☐ recent data indicate that the loading is averaging about 0.2 lb/d

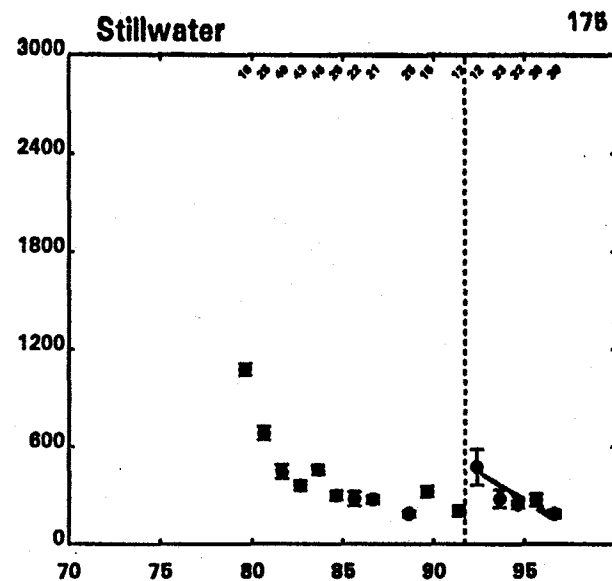
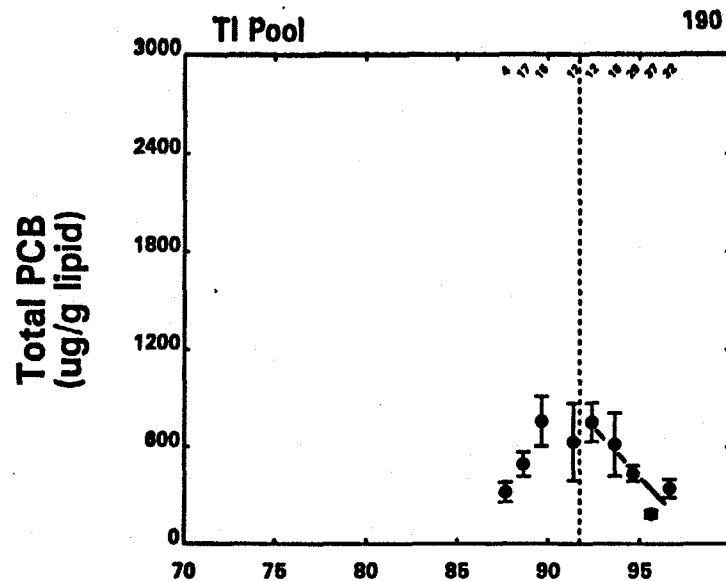
Date	River Flow	PCB Level	PCB Load
	(cfs)	(ng/l)	(lb/d)
July 14	2,000	14	0.15
July 21	2,900	20	0.31
July 28	1,500	19	0.15
Aug. 4	5,000	< 11	—
Aug. 14	1,500	15	0.12
Aug. 20	2,300	13	0.16
Aug. 26	2,700	16	0.23
Sept. 3	3,100	19	0.32
Sept. 11	2,000	17	0.18



UPDATE ON THE UPSTREAM SOURCE AND CHANGES IN FISH PCB LEVELS

Upper River Fish PCB Levels

- All fish have shown a continued reduction since peaking in 1992
- Mean fish PCB levels are at or below levels observed prior to the Allen Mill event
- Natural recovery is taking place



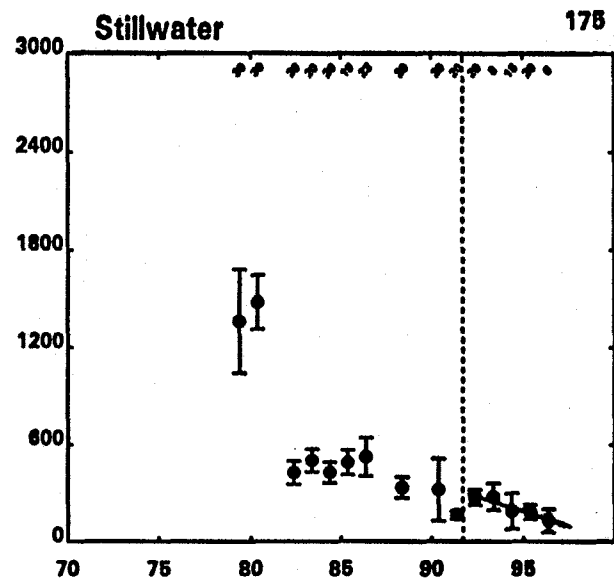
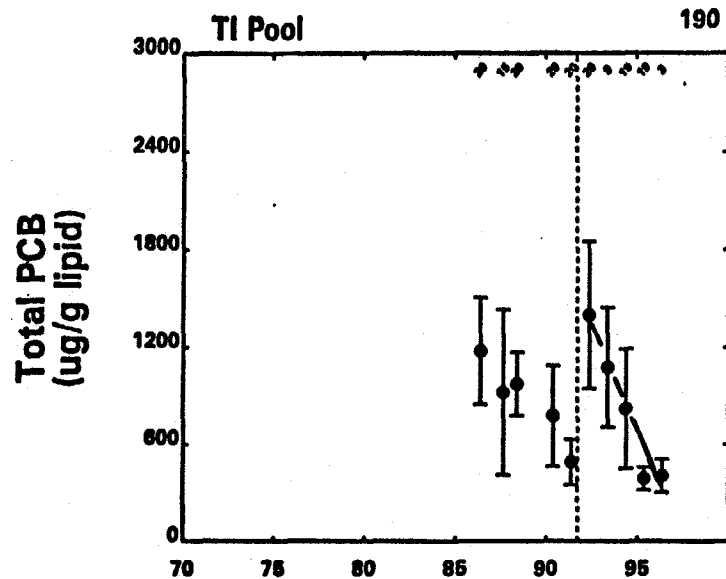
All sizes
 Apr - Sep
 All tissues (see database notes)
 Males & Females
 Mean +/- 2 std errors

Vertical line at Sept 17, 1991
 Values are plotted approximately at the midpoint of each season
 Number of observations are indicated at the bottom of each panel

Temporal patterns in Total PCB Concentration in PKSD

Tue Aug 26, 1997 15:43:07

/power2/geco0510/OLD_STRUC/geco0330/DATA/SUMMARY [temp9junk]



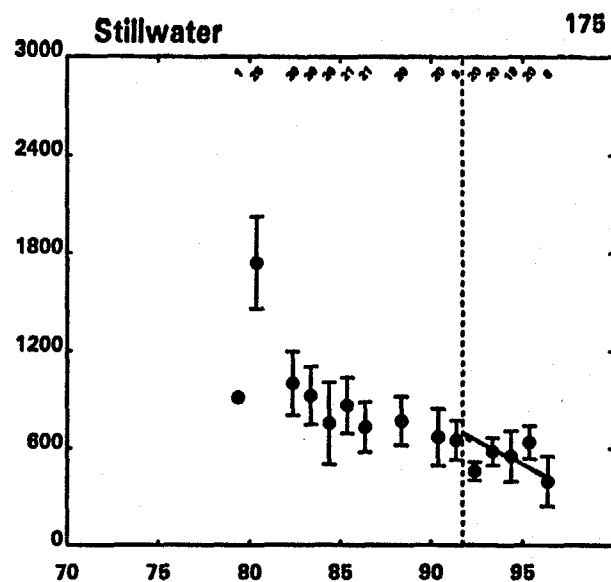
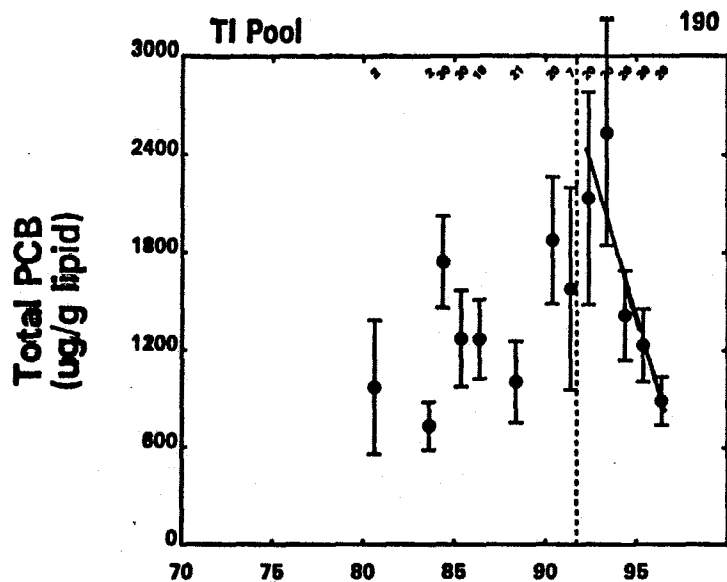
All sizes
 Apr - Sep
 All tissues (see database notes)
 Males & Females
 Mean \pm 2 std errors

Vertical line at Sept 17, 1991
 Values are plotted approximately at the midpoint of each season
 Number of observations are indicated at the bottom of each panel

Temporal patterns in Total PCB Concentration in BB

Tue Aug 26, 1997 15:51:10

/power2/geco0510/OLD_STRUC/geco0330/DATA/SUMMARY [temp9]junk]



All sizes
 Apr - Sep
 All tissues (see database notes)
 Males & Females
 Mean +/- 2 std errors

Vertical line at Sept 17, 1991
 Values are plotted approximately at the midpoint of each season
 Number of observations are indicated at the bottom of each panel

Temporal patterns in Total PCB Concentration in LMB

Tue Aug 26, 1997 15:50:36

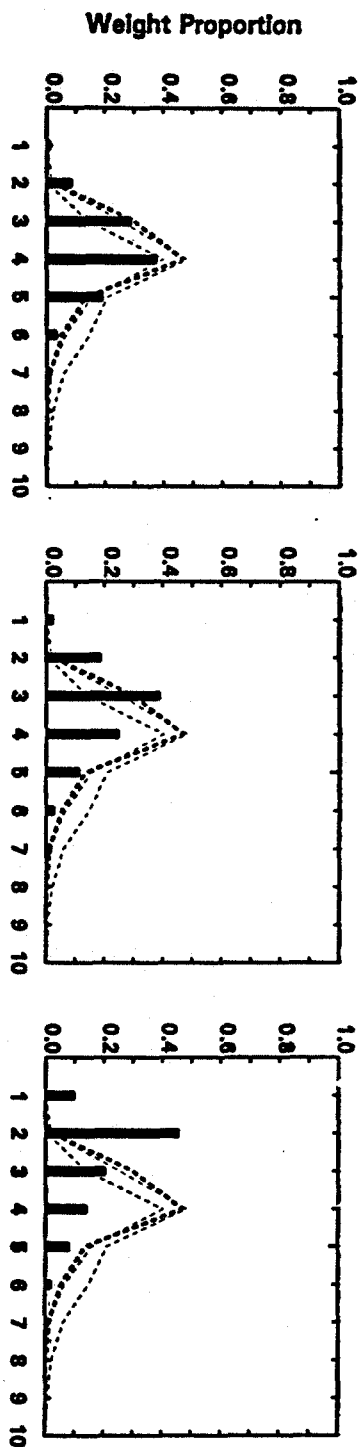
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UPDATE ON THE UPSTREAM SOURCE AND CHANGES IN FISH PCB LEVELS

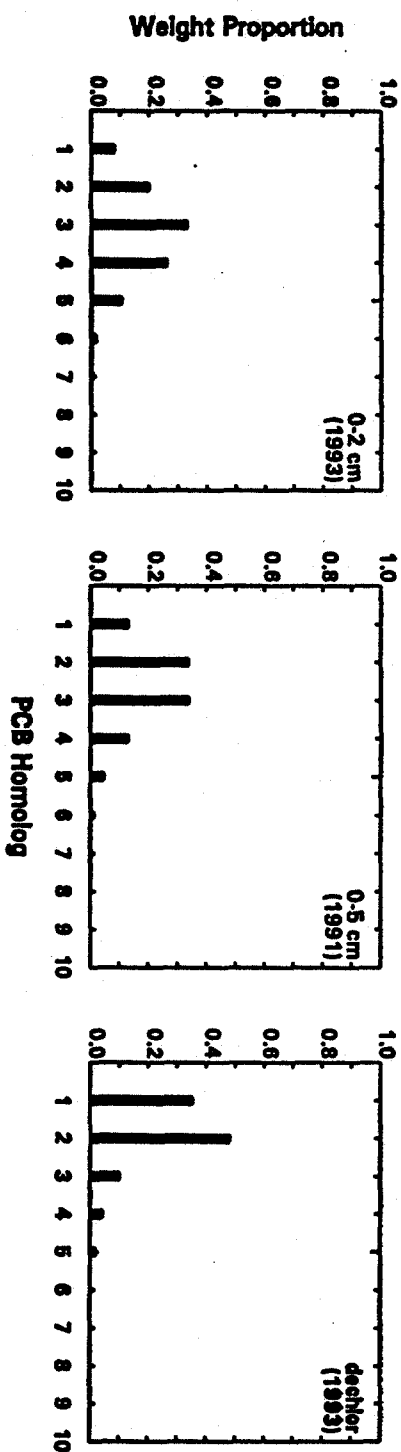
Why are fish PCB levels declining?

- Modeling of PCB bioaccumulation on a homolog basis indicates that PCBs in sediments greater than a few centimeters below the sediment are sequestered from the food web
- PCB congener fingerprinting indicates that fish are exposed to undechlorinated PCBs (i.e., surface sediment PCBs)
- Together these two findings indicate that fish will respond to changes in surface sediment PCB levels
- Surface sediment PCB levels likely have been declining because the PCB concentration on depositing particles has been declining in response to reduced PCB inputs from upstream

Brown Bullhead



Sediment



STEADY STATE FOOD WEB MODEL

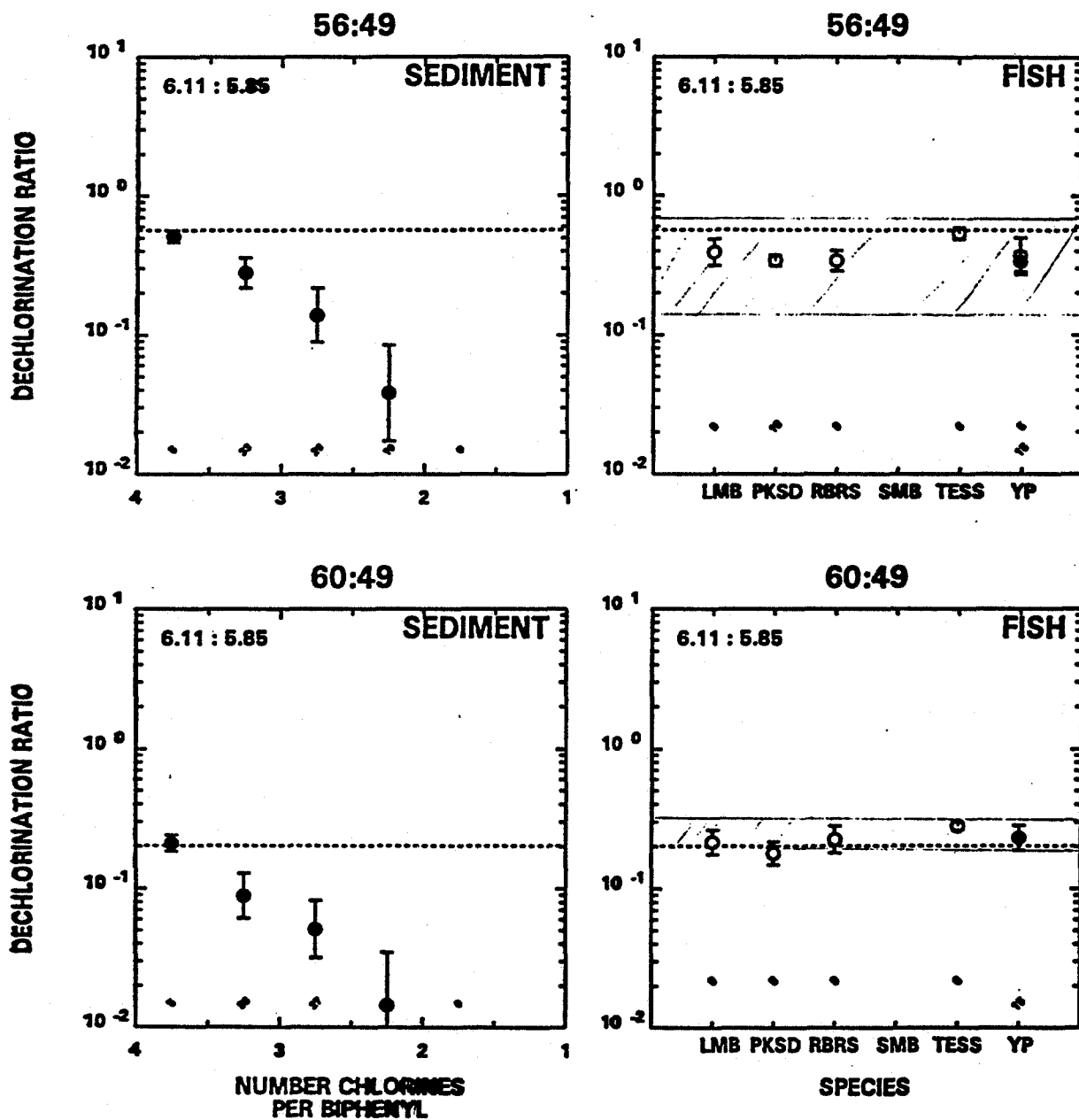
BROWN BULLHEAD IN THOMPSON ISLAND POOL

Data: after 1989

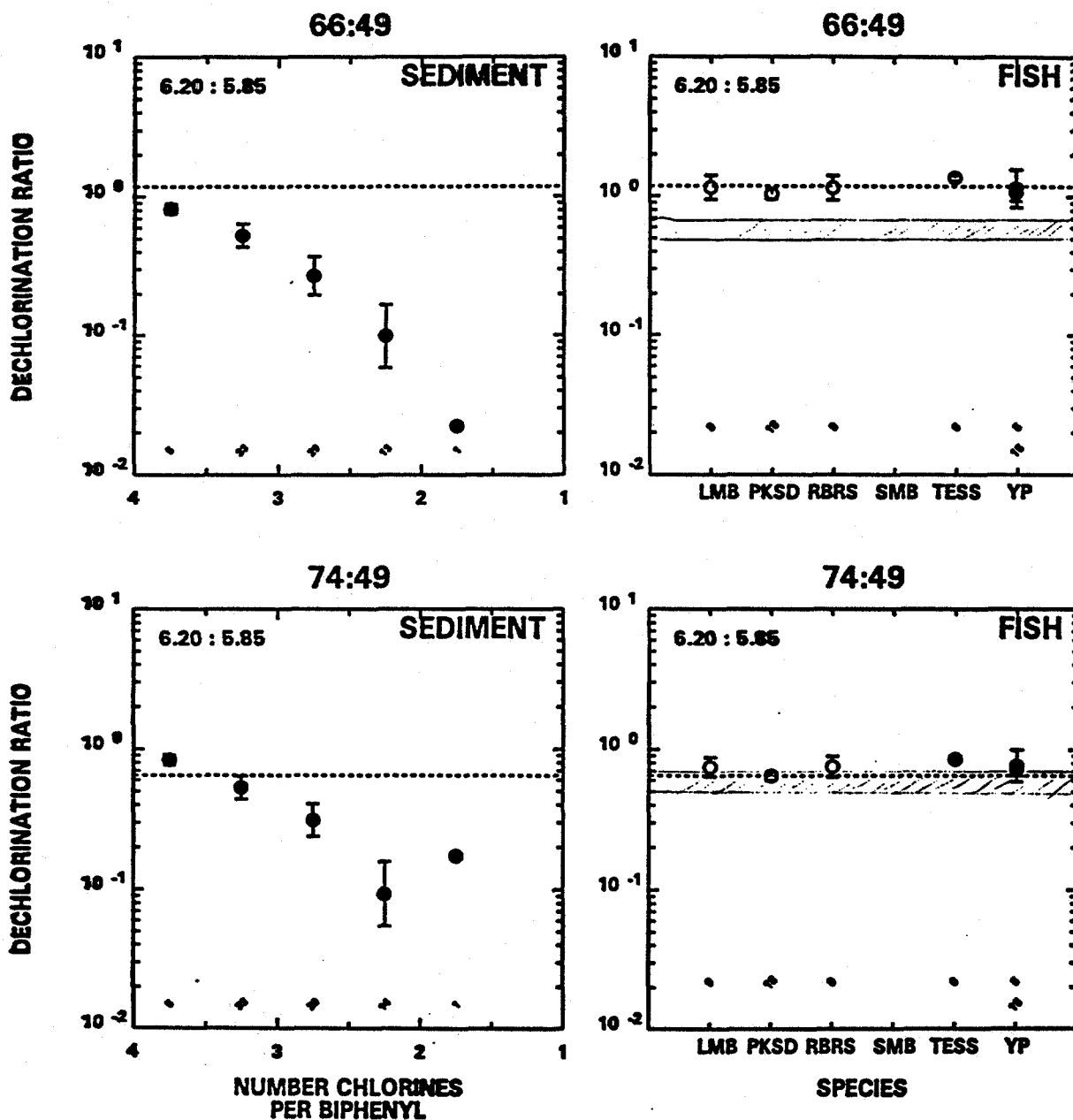
light dashed lines: Upper HR, +/-2 std errs

heavy dashed lines: TI Pool

Model: Age 3 Brown Bullhead



PCB Congener Dechlorination Ratios in Upper Hudson River (RM > = 153)
 Geometric Mean +/- 2 Standard Errors
 Sediment: USEPA Phase II High Resolution Cores 0-40 cm (0.5 CL/BP bins)
 Fish: ○ NOAA
 ● USEPA Phase II
 Horizontal Dashed Line Represents Ratio in Aroclor 1242



PCB Congener Dechlorination Ratios in Upper Hudson River (RM > = 153)
 Geometric Mean +/- 2 Standard Errors
 Sediment: USEPA Phase II High Resolution Cores 0-40 cm (0.5 CL/BP bins)
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 Horizontal Dashed Line Represents Ratio in Aroclor 1242