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Doug T.

John G. Haggard, Manager
Hudson River Program

U.S. EPA, REGION II
EMER. & REM. RES. DIV.
2000 DEC 27 AM 11:26
DIRECTOR'S OFFICE

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December 22, 2000

Mr. Richard L. Caspe, Director
Emergency & Remedial Response Div.
USEPA, Region II
290 Broadway, 19th Floor
New York, NY 10007-1866

Dear Mr. Caspe:

During the town meeting televised December 14 on Channel 10 in Albany, you indicated that EPA had not seen the results of the GE sponsored PCB analysis of fish collected in 2000 by Dr. Ron Sloan of NYSDEC from the Upper Hudson River. Furthermore, you also indicated that NYSDEC had received this data. Please note that this data was been presented to Mr. Tomchuk and Mr. Josephson of your staff during our meeting on August 16, 2000. Copies of the presentation materials are attached. As you can see, this includes both wet weight and lipid based PCB levels for brown bullhead and largemouth bass from Thompson Island Pool and Stillwater.

This data was also presented to NYSDEC at the August 16 meeting. In addition, the results were transmitted to Dr. Ron Sloan of NYSDEC as received from the laboratory between August 4 and 14, 2000. Finally, we transmitted the data to Mr. Tomchuk of your staff today via E-mail.

Please let me know if you have any questions concerning this data.

Yours truly,

John G Haggard/RGG

John G. Haggard

JGH/bi
Attachments
cc: Michael O'Toole, NYSDEC
Ron Sloan, NYSDEC
Douglas Tomchuk, EPA

Temporal Trends in Upper Hudson River PCBs

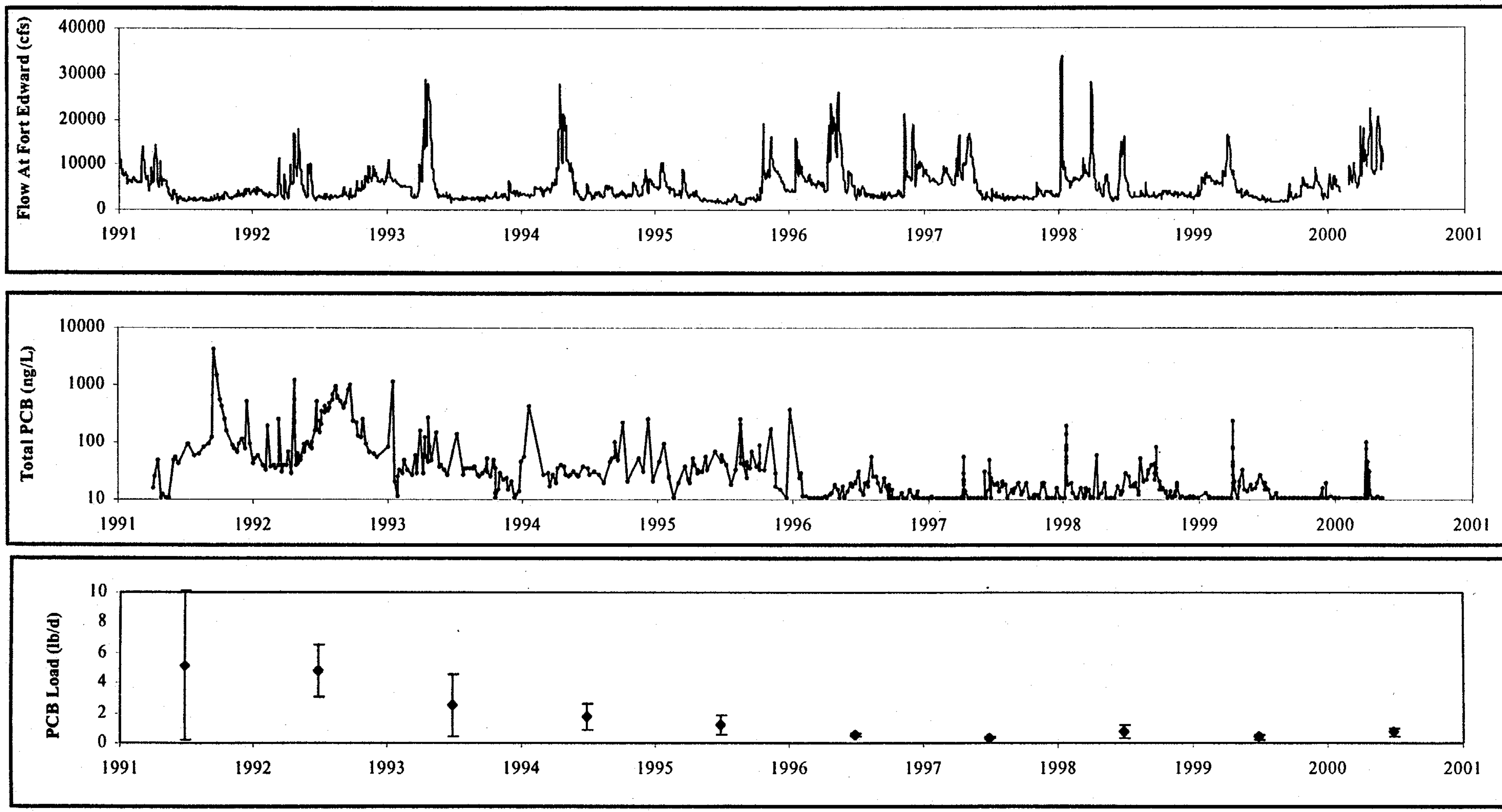
August 16, 2000

Albany, NY

322791

Quantitative Environmental Analysis, LLC

River Flow and PCBs at Rogers Island in Fort Edward



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August 16, 2000

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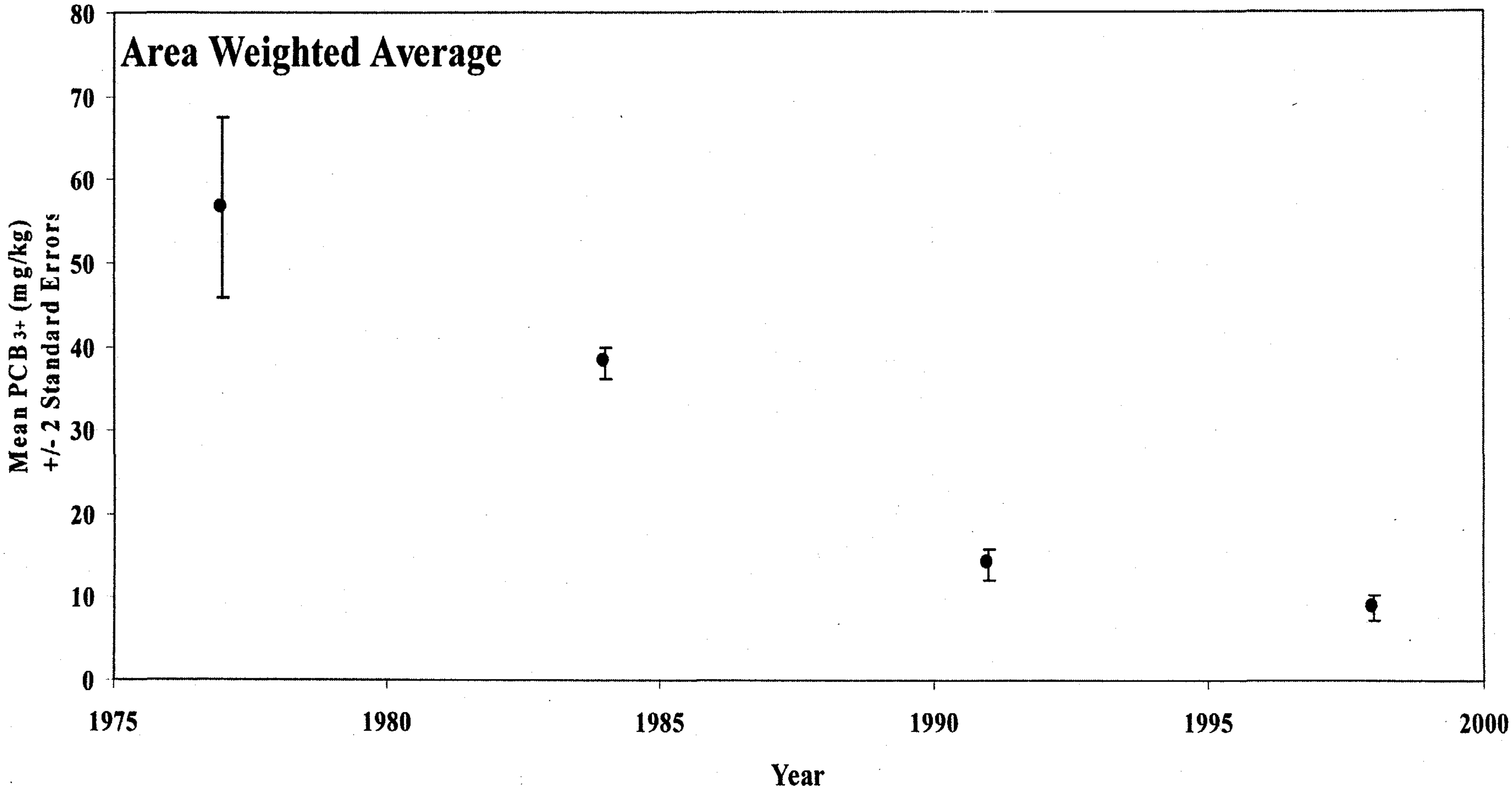
Temporal trend in TIP Surface Sediments



Note: Data averages were developed to represent 0-5 cm layer. However, 1984 average includes surface samples with depths up to 20 cm.

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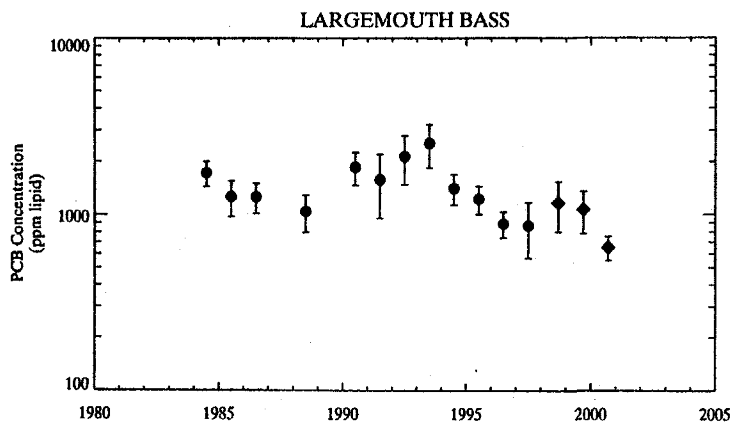
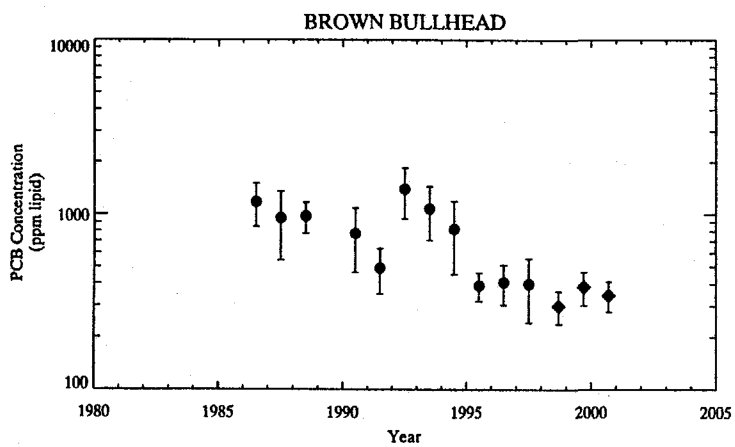
Temporal trends in fish

Thompson Island Pool

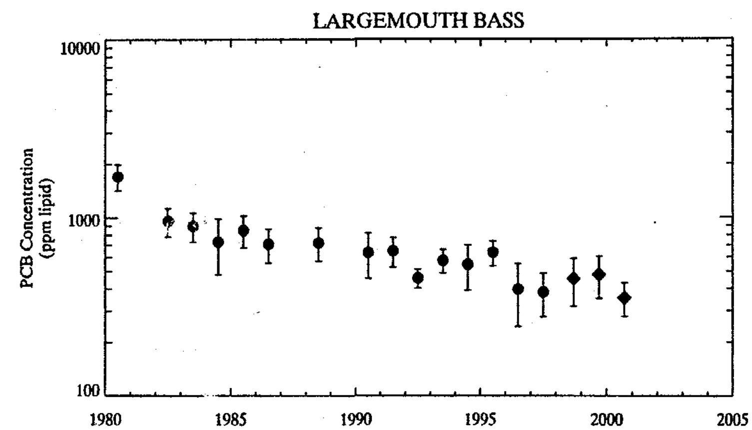


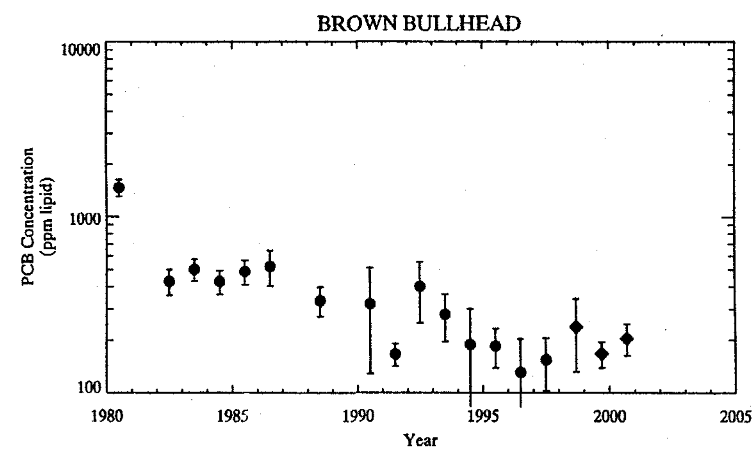


Data are arithmetic means +/- 2 standard errors: years with greater than or equal to 3 measurements are included.

Circles = NYSDEC, Diamonds = GE.

Stillwater





Data are arithmetic means +/- 2 standard errors: years with greater than or equal to 3 measurements are included.

Circles = NYSDEC, Diamonds = GE.

Note: 2000 data are preliminary - undergoing QA checks

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How will Fish PCB Levels Change in the Future?

- **Depends on changes in surface sediment PCB concentrations**
- **Surface sediment PCB levels depend on:**
  - burial rates
  - erosion rates
  - PCB loading from upstream sources
  - impacts of remediation

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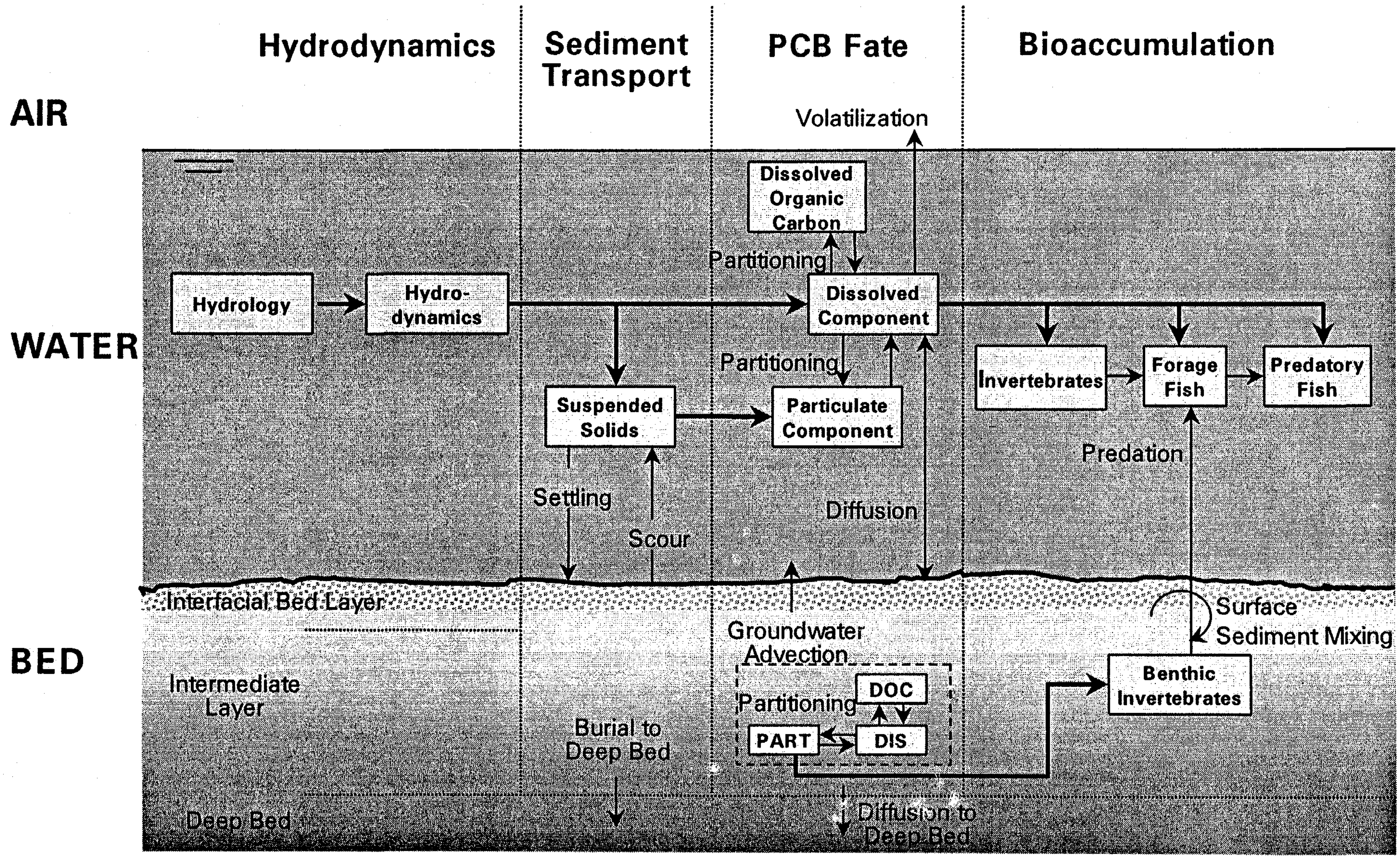
Options to Predict Changes in Fish PCBs

- **Extrapolate from historical trends**
  - however, factors that determined historical trends are not likely to propagate to the future
    - variations in upstream PCB loading
- **Use intuition and professional judgement**
  - difficult to account for complex relationships that exist
  - not constrained to be consistent with *all* data
- **Use a calibrated mass balance model**
  - accounts for all known processes of significance
  - accuracy can be seen by comparison to historical data
  - allows quantitative evaluation of alternatives

Processes Accounted For By the Model



August 16, 2000

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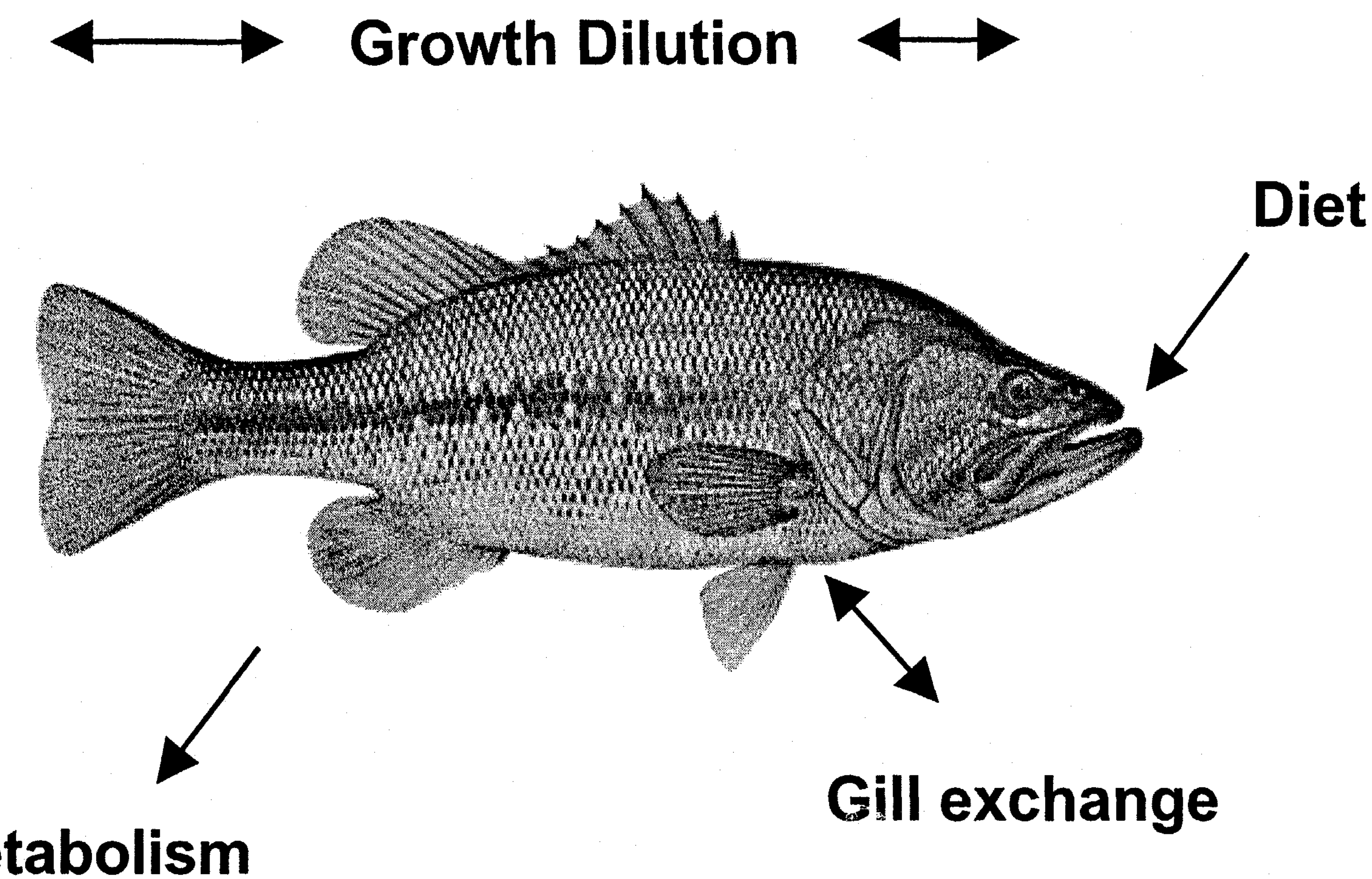
Bioaccumulation Mechanisms



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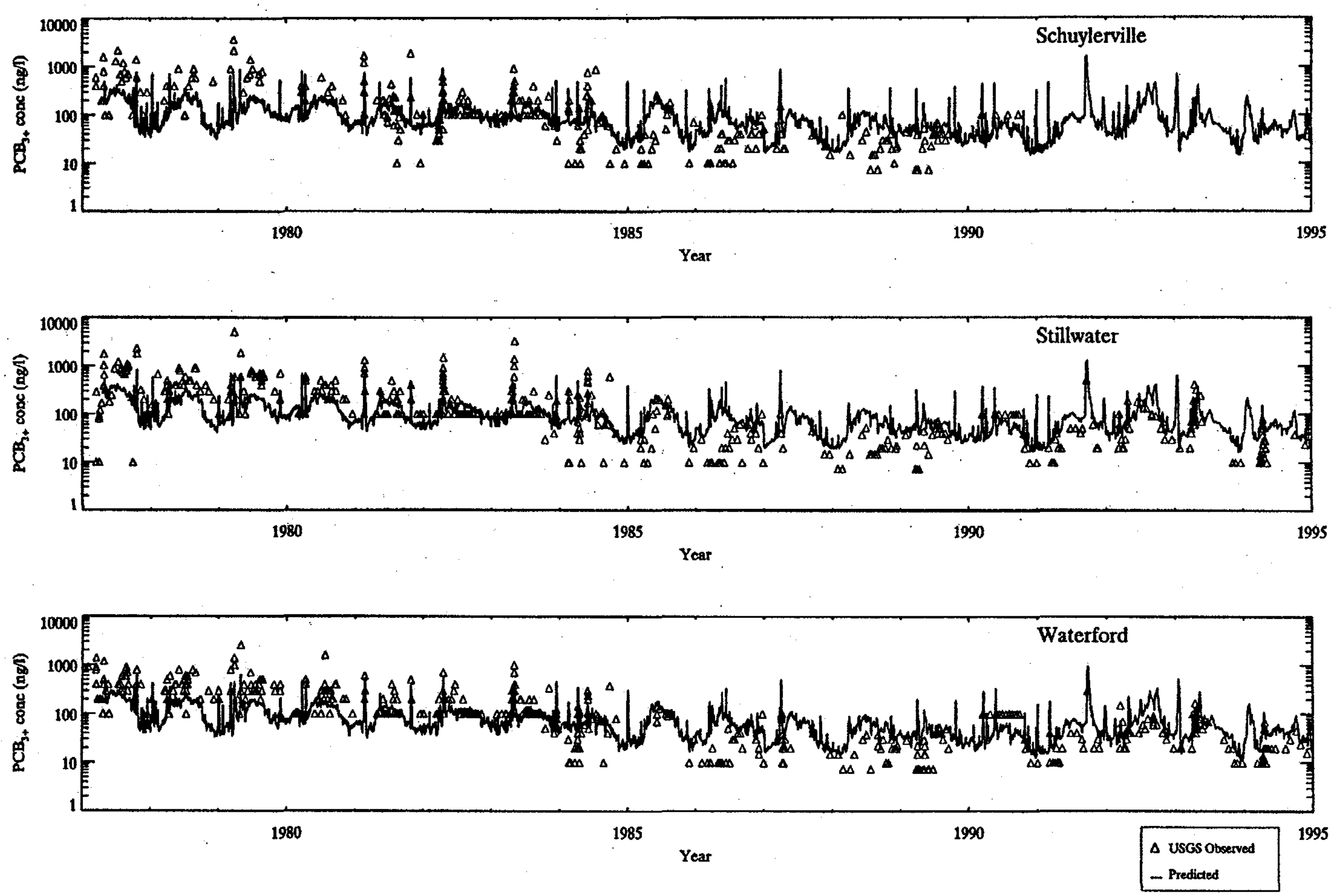
PCB Fate Model Calibration

- **Long-term water column trends**



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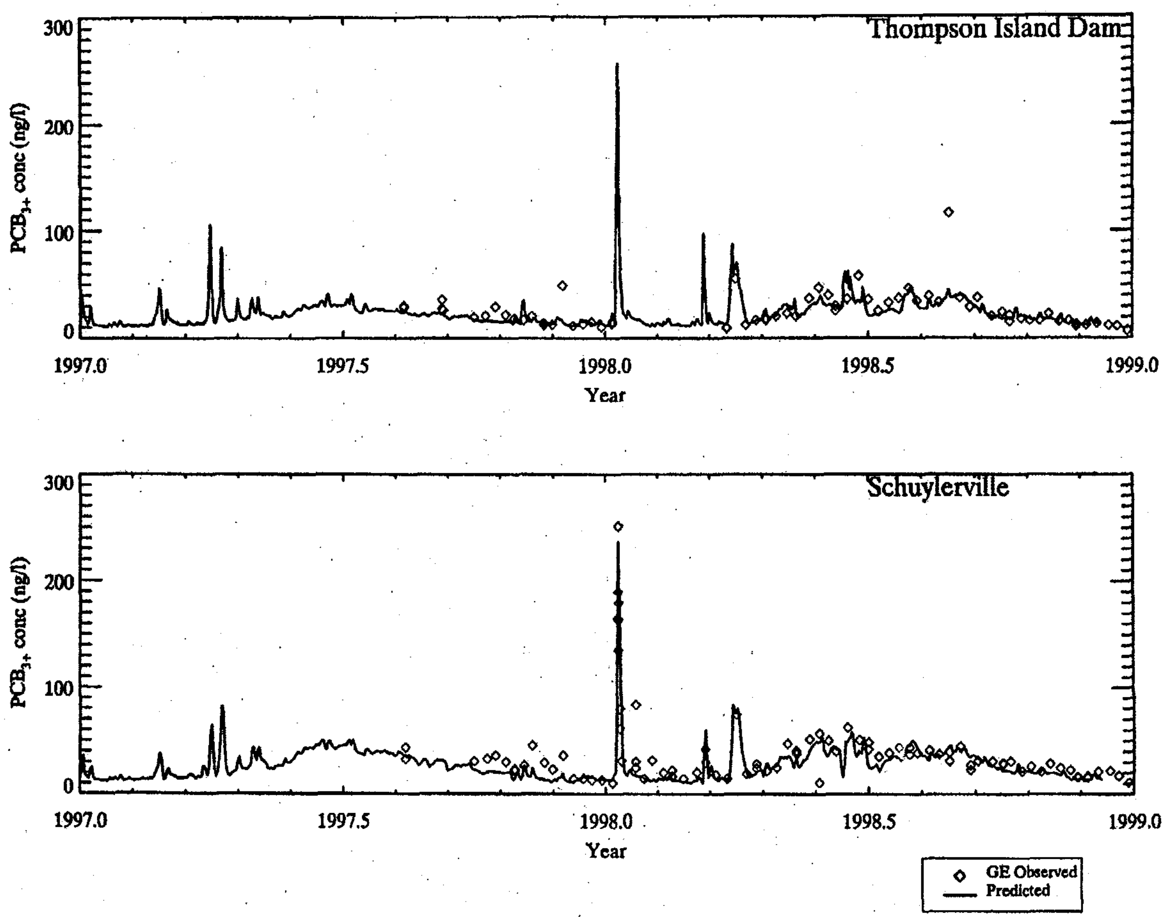
PCB Fate Model Calibration

- **High-flow water column response**



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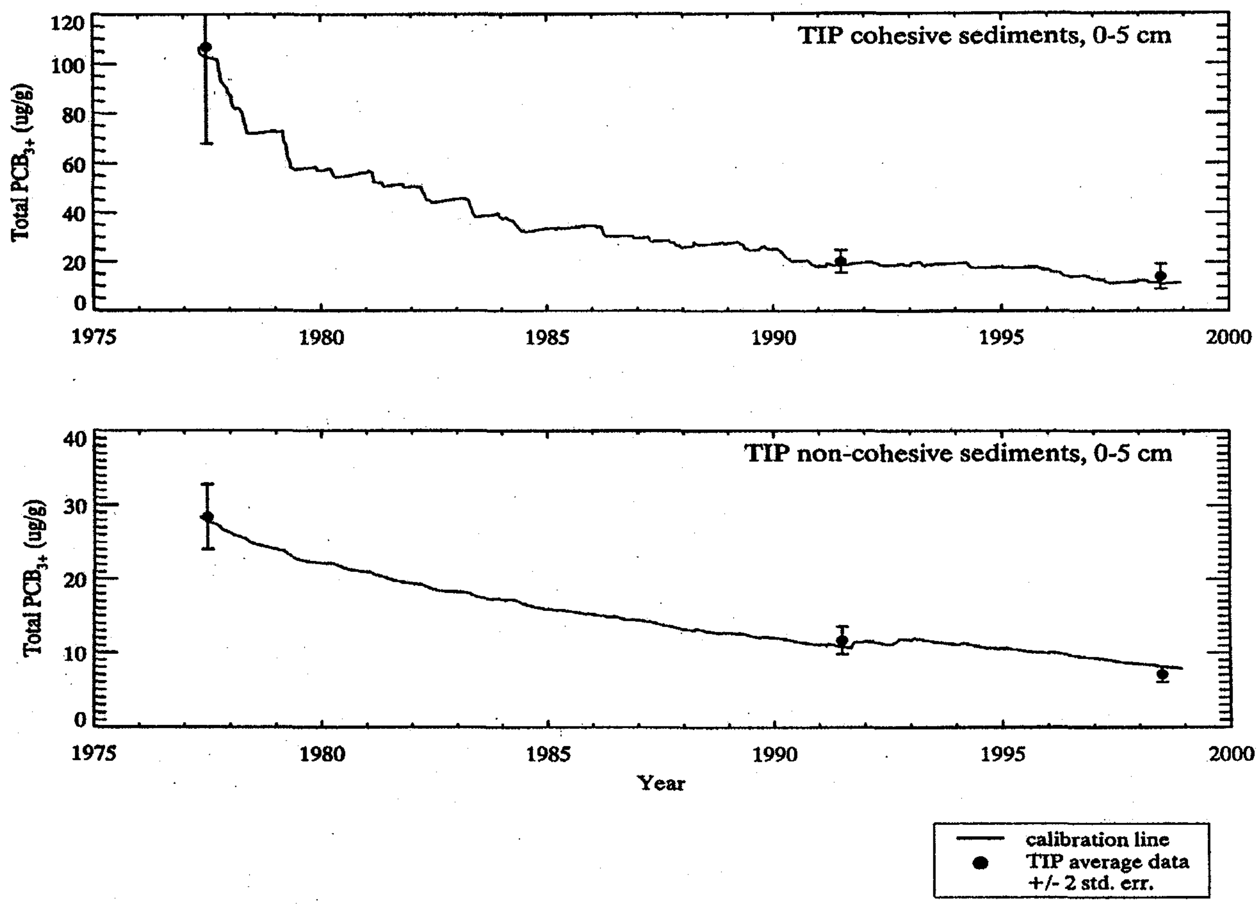
PCB Fate Model Calibration

- **Long-term sediment trends**



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August 16, 2000

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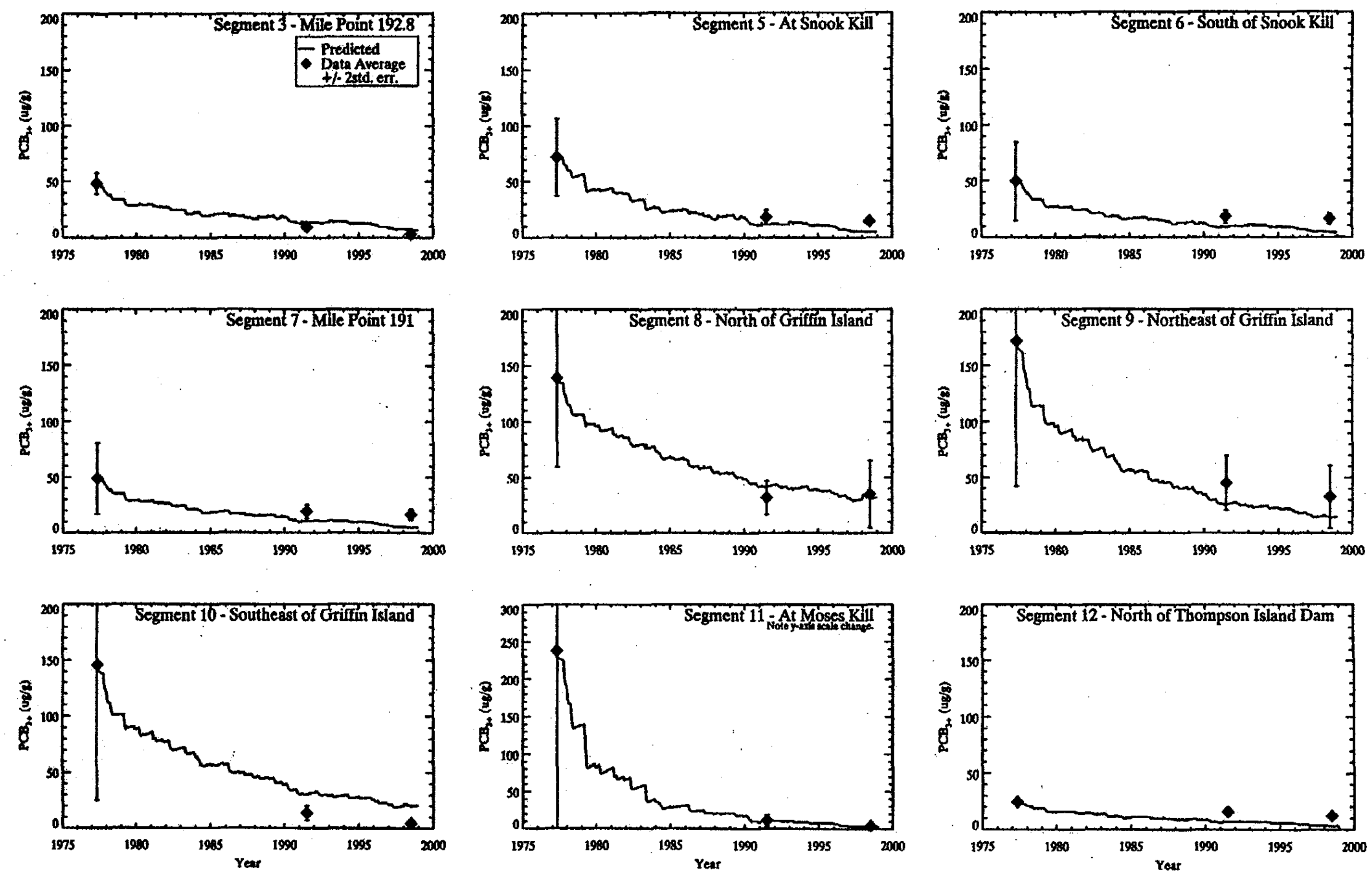
PCB Fate Model Calibration

- **Long-term sediment trends by location in the TIP**

Cohesive Sediments



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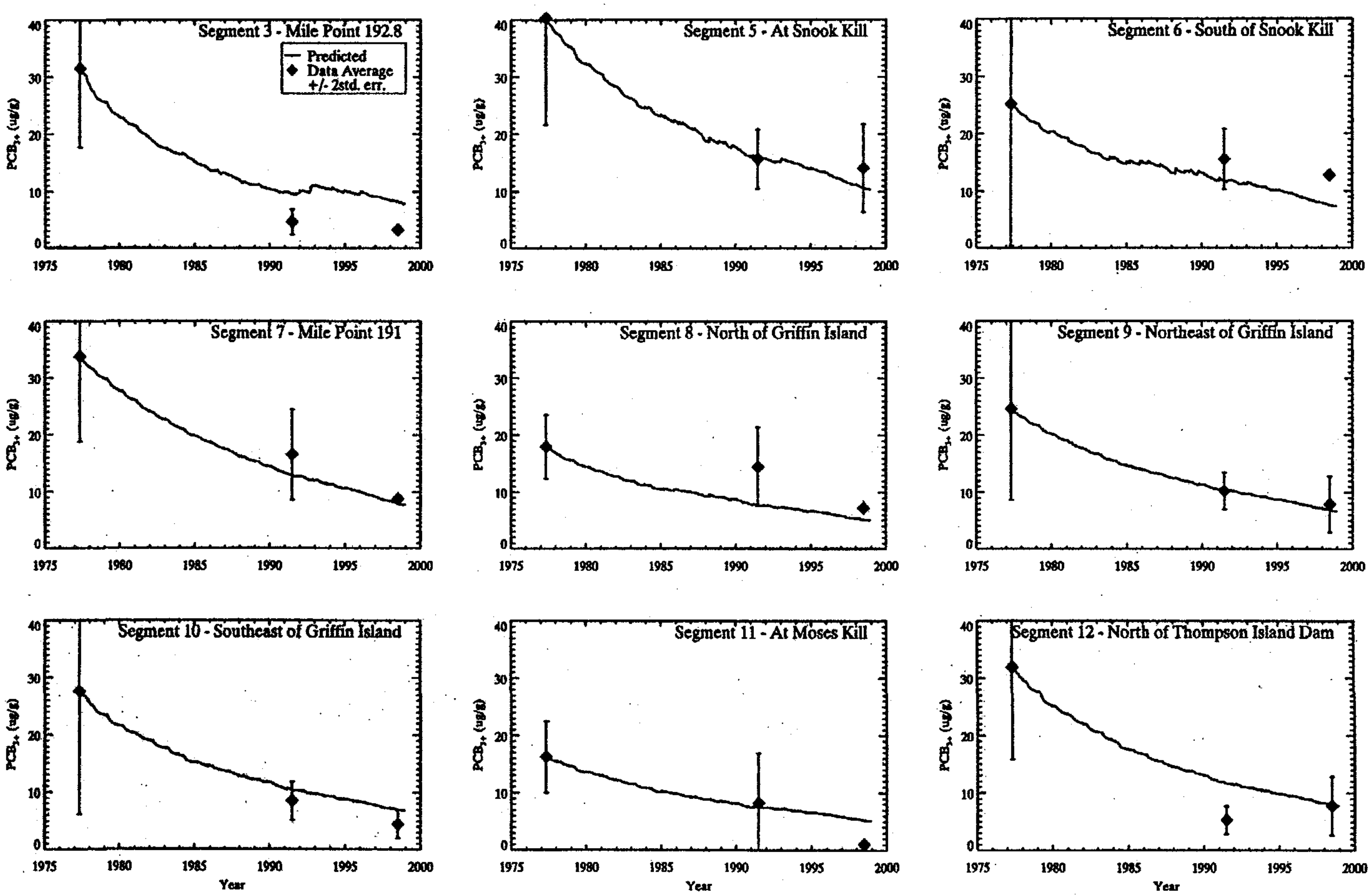
PCB Fate Model Calibration

- **Long-term sediment trends by location in the TIP**

Non-Cohesive Sediments



QEA
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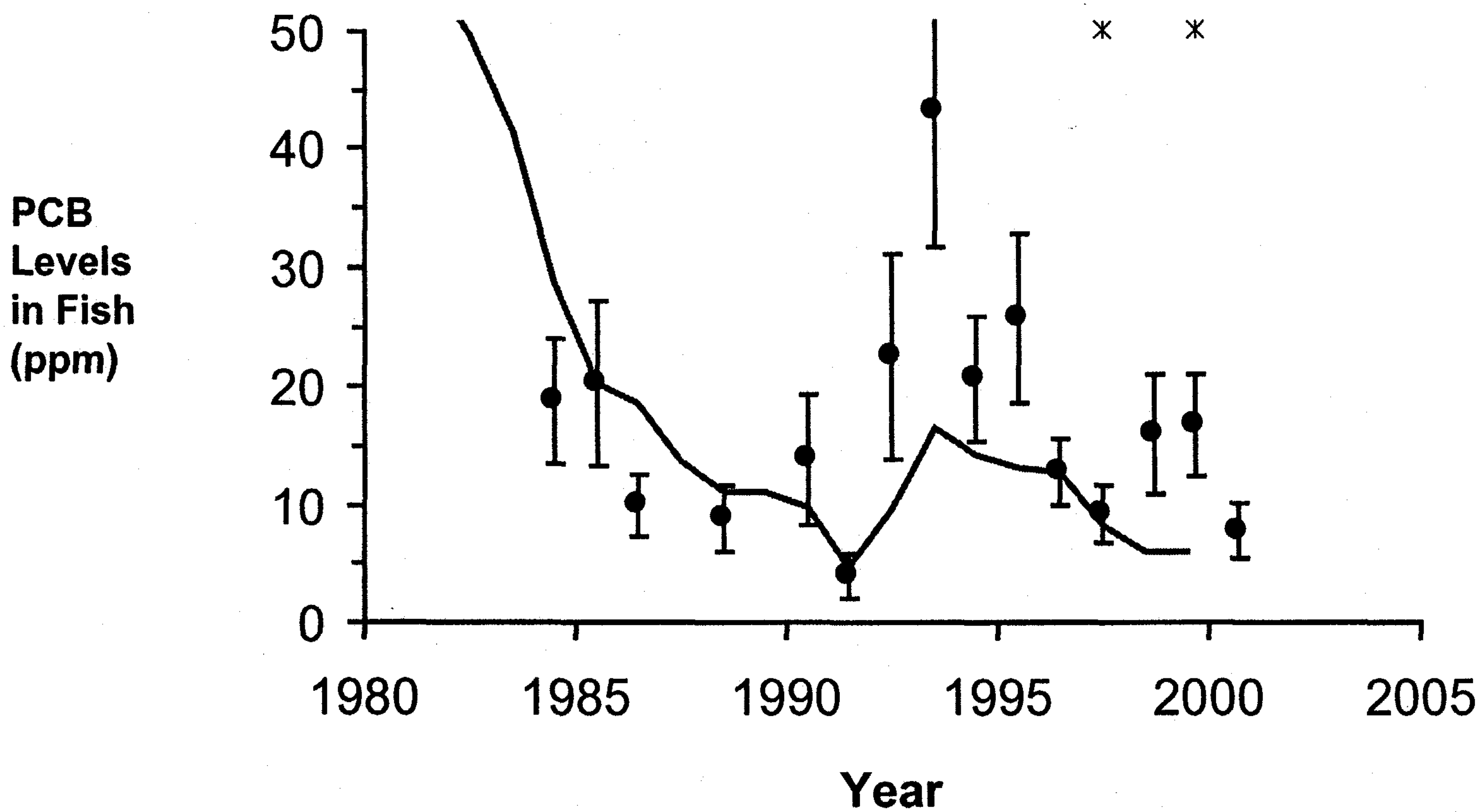
Bioaccumulation Model Calibration

Thompson Island Pool Largemouth Bass - All ages



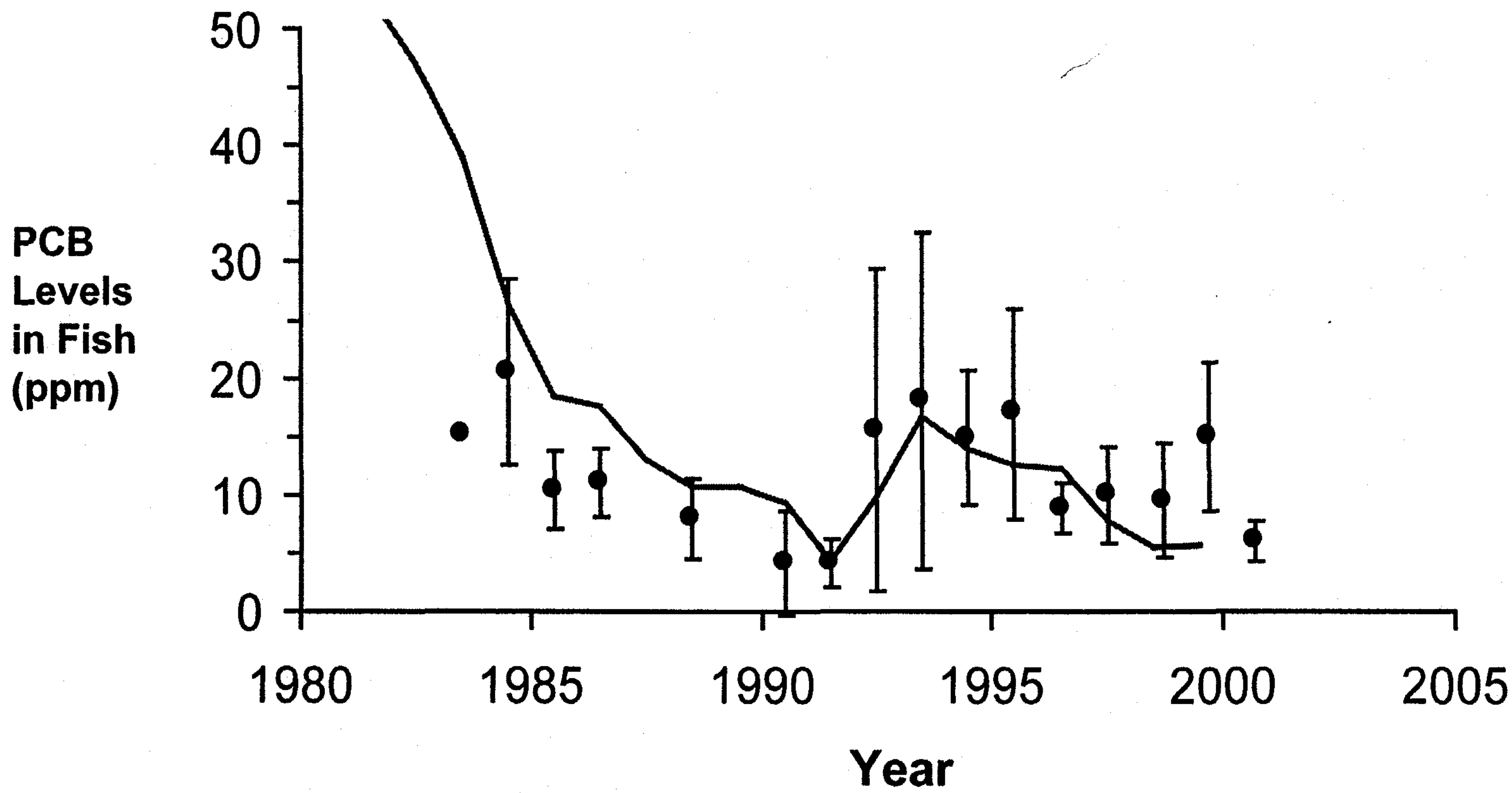
322804

August 16, 2000

QEA Quantitative Environmental Analysis, LLC

Bioaccumulation Model Calibration

Thompson Island Pool 3 and 4 Year Old Largemouth Bass

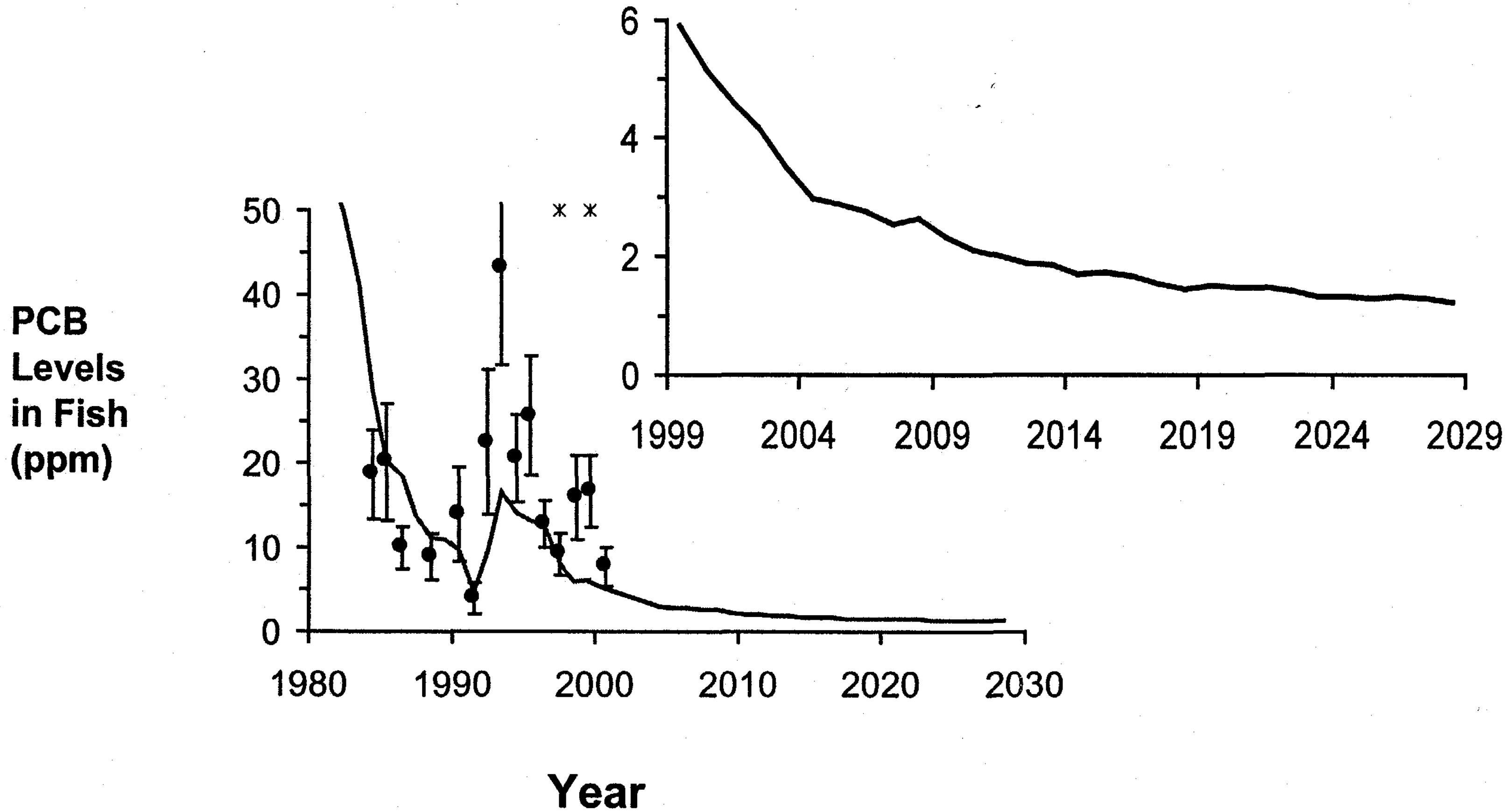


322805

Bioaccumulation Calibration/Projection

Thompson Island Pool Largemouth Bass - All ages

Natural Recovery with Upstream Source @ 10 ng/L



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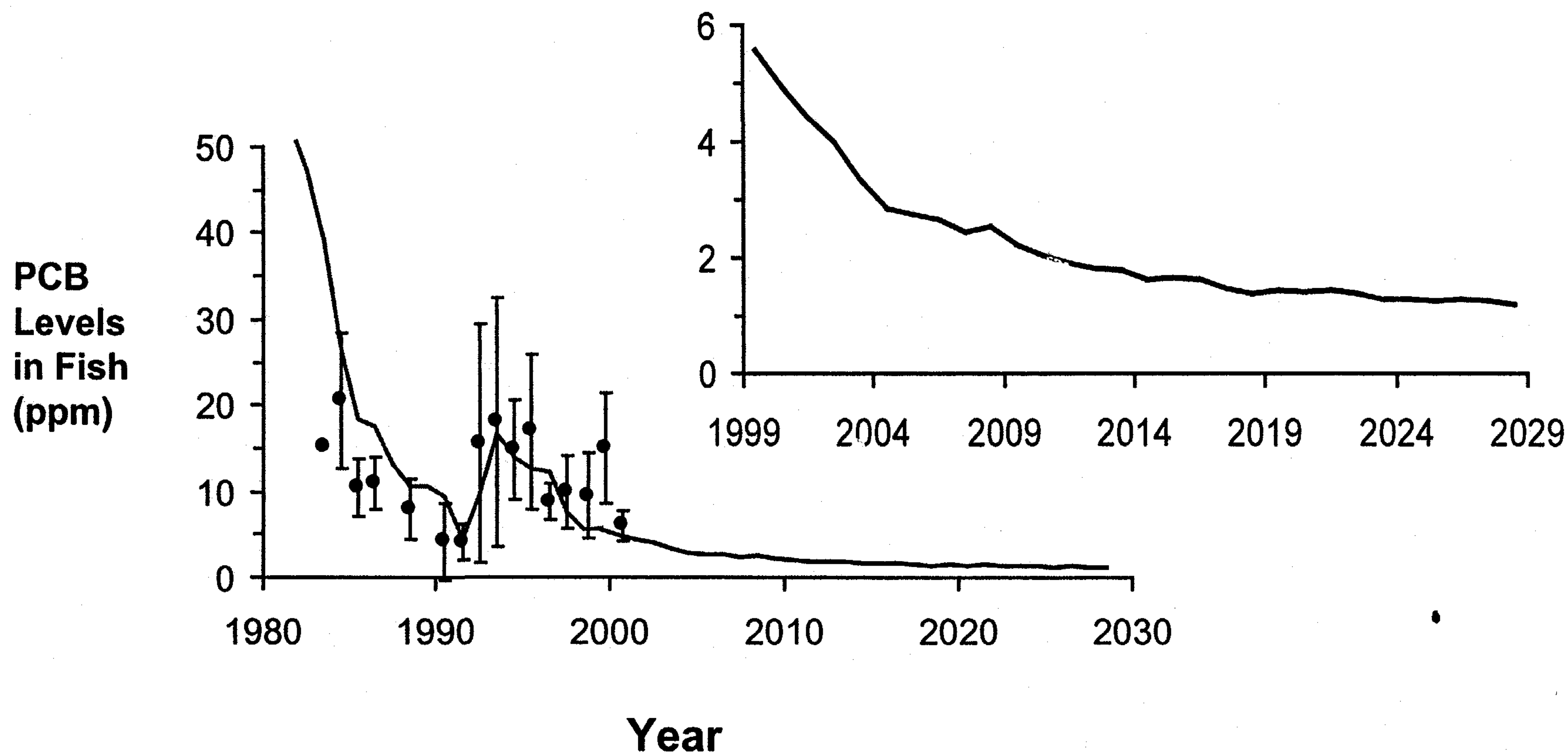
August 16, 2000

Quantitative Environmental Analysis, LLC

Bioaccumulation Calibration/Projection

Thompson Island Pool 3 and 4 Year Old Largemouth Bass
Natural Recovery with Upstream Source @ 10 ng/L



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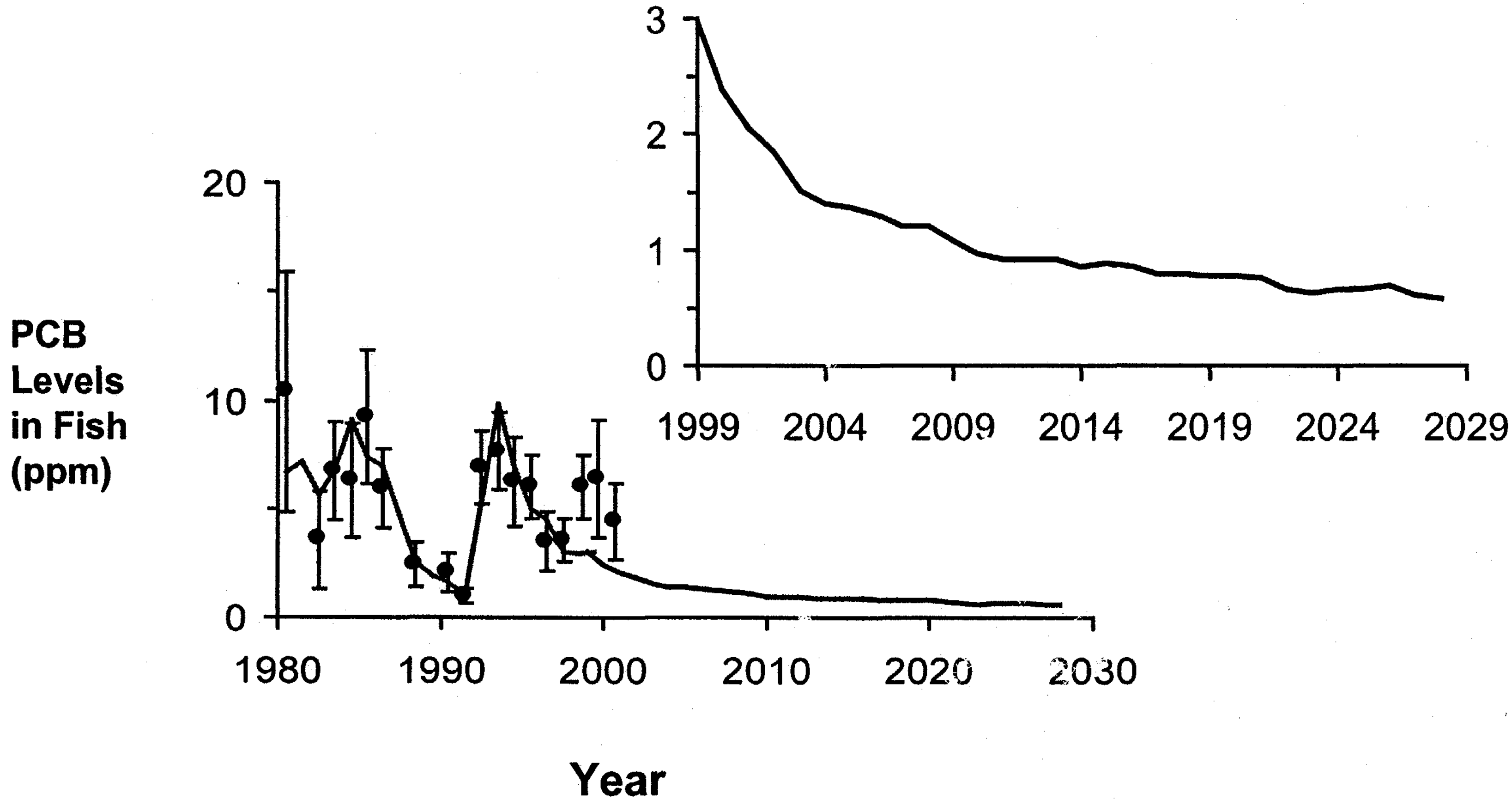
QEA
Quantitative Environmental Analysis, LLC

Bioaccumulation Calibration/Projection

Stillwater Largemouth Bass - All ages

Natural Recovery with Upstream Source @ 10 ng/L

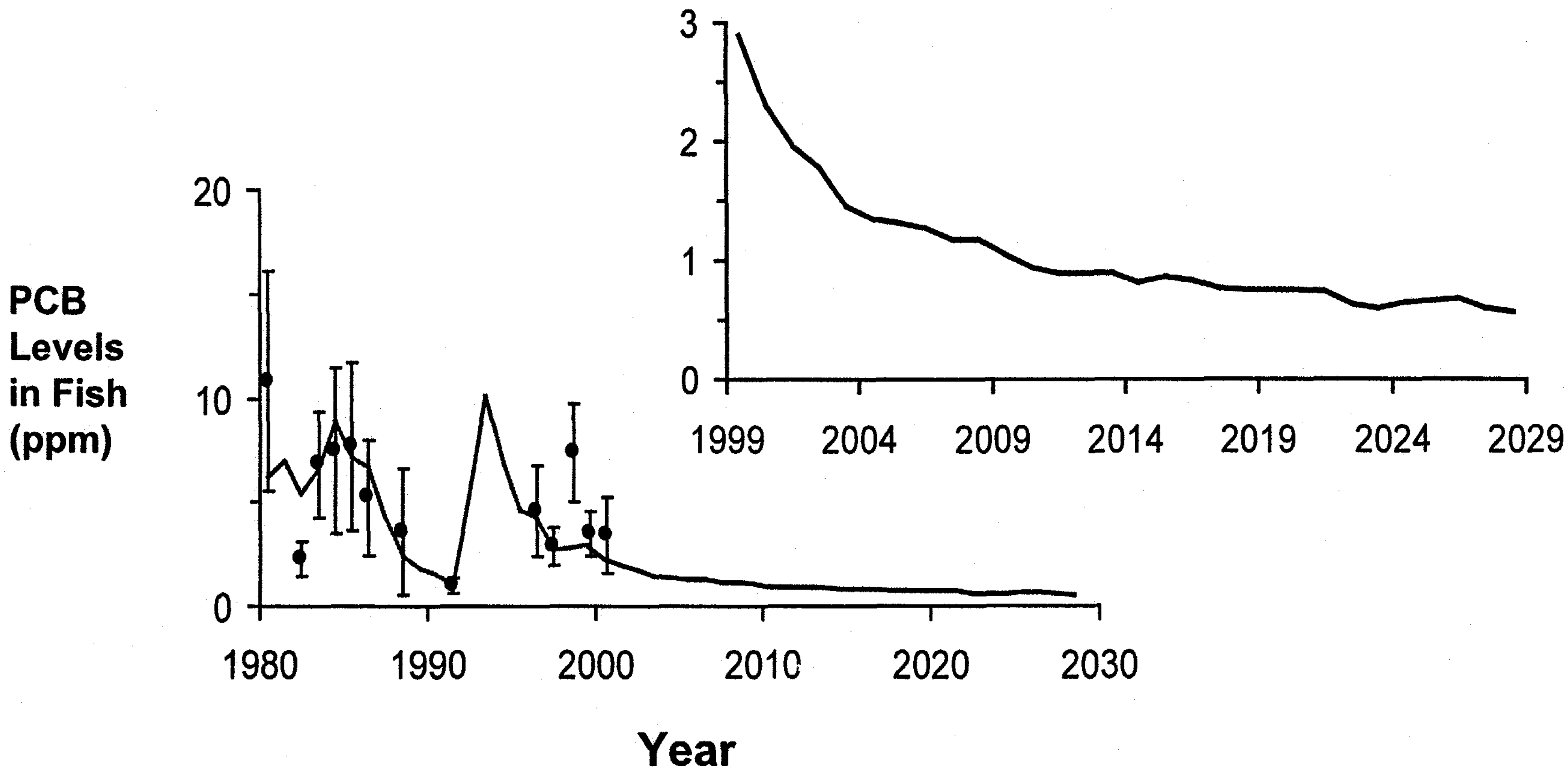


322808

Bioaccumulation Calibration/Projection

Stillwater 3 and 4 Year Old Largemouth Bass

Natural Recovery with Upstream Source @ 10 ng/L

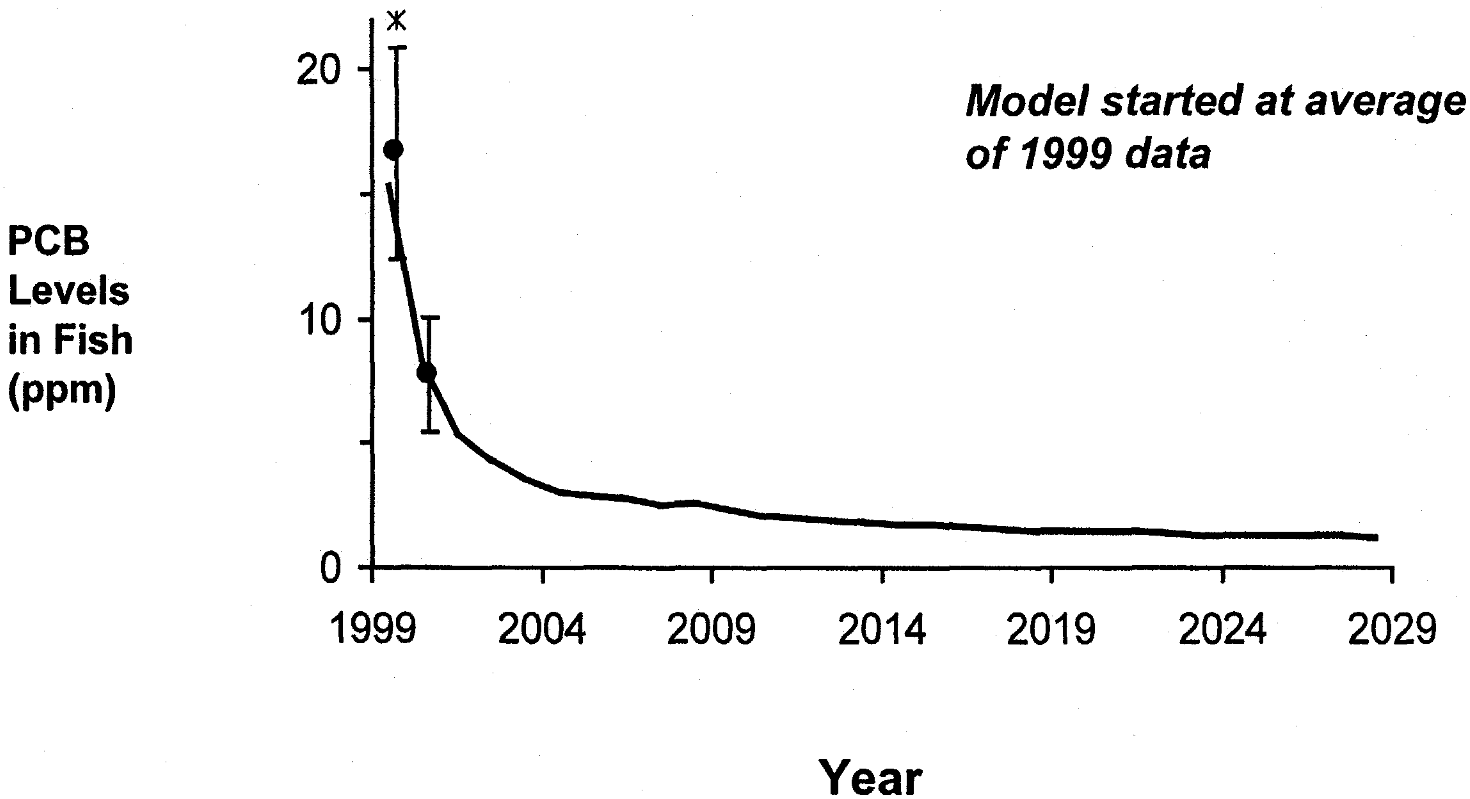


322809

Bioaccumulation Model Projection

Thompson Island Pool Largemouth Bass - All ages

Natural Recovery with Upstream Source @ 10 ng/L



* Indicates value excluded from 1999 annual average

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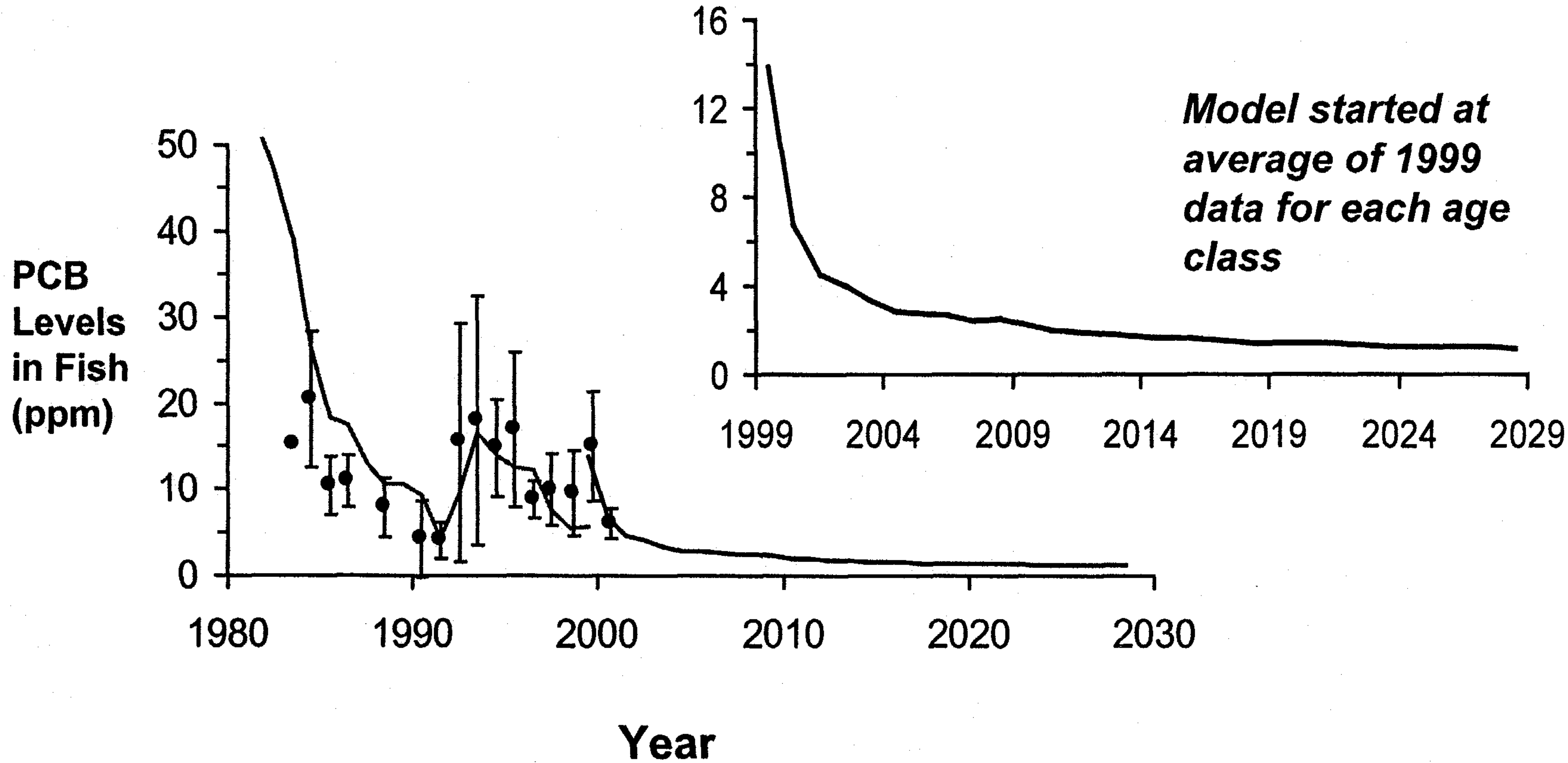
Bioaccumulation Model Projection

Thompson Island Pool 3 and 4 Year Old Largemouth Bass

Natural Recovery with Upstream Source @ 10 ng/L



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Conclusions

- **PCB levels in water, surface sediment and fish have declined over the last 20 years**
- **The model replicates the overall trends**
  - The bioaccumulation model is most accurate for the 3 and 4 year old largemouth bass
    - older fish exhibit year-to-year variability that is not captured by the model
- **The demonstrated prediction ability of the model supports its use to estimate how fish PCB levels will respond to continued natural recovery and active remediation**
  - incorporates **all** the data and science at our disposal

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Issues to Consider When Using Fish PCB Data for Trend Analysis

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Issues that confound the interpretation of trends in Fish PCB Data

- Presence of extreme values in some years and locations
- Changes in growth rate
- Changes in lipid content

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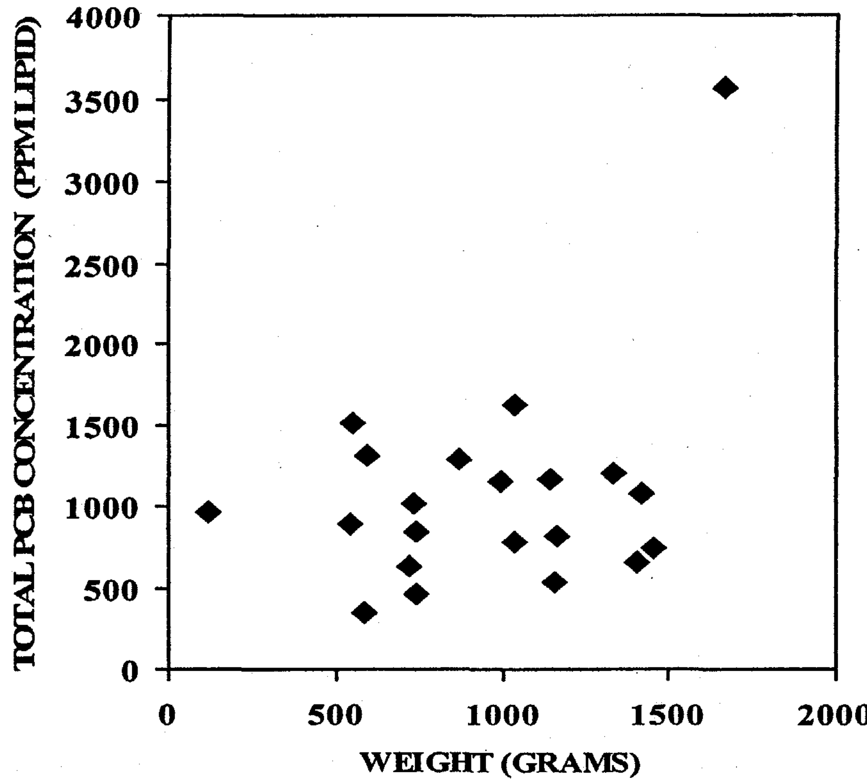
Extreme values can bias a mean & increase uncertainty.



Largemouth bass
Thompson Island Pool
1999

- *Outliers* are extreme values that may not be representative of the population as a whole.
- Elimination of outliers reduces uncertainty in overall population trends.

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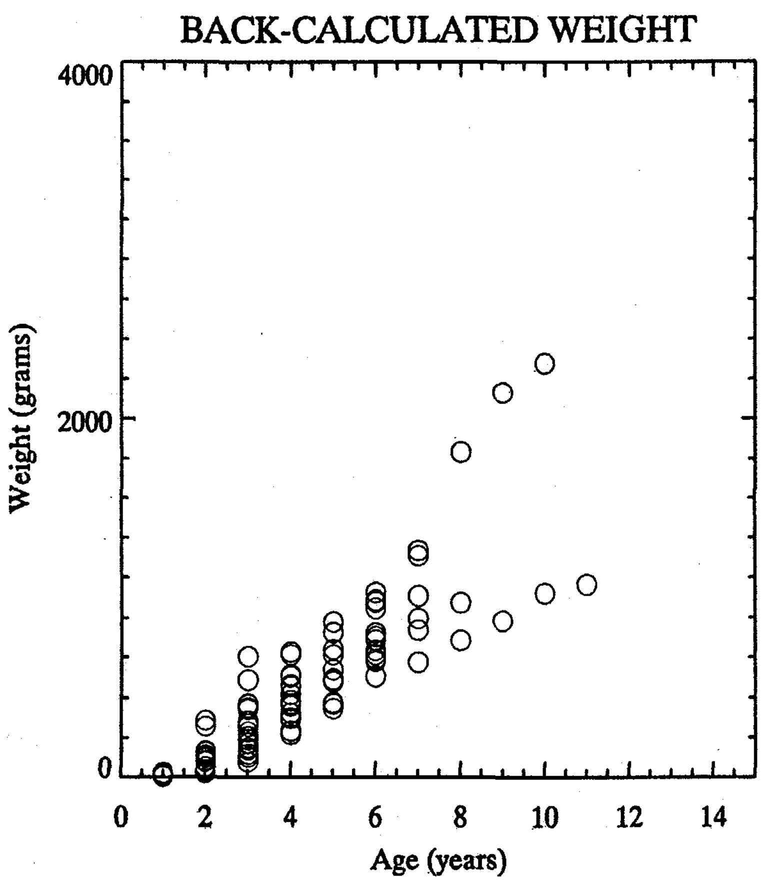
Identifying and flagging outliers

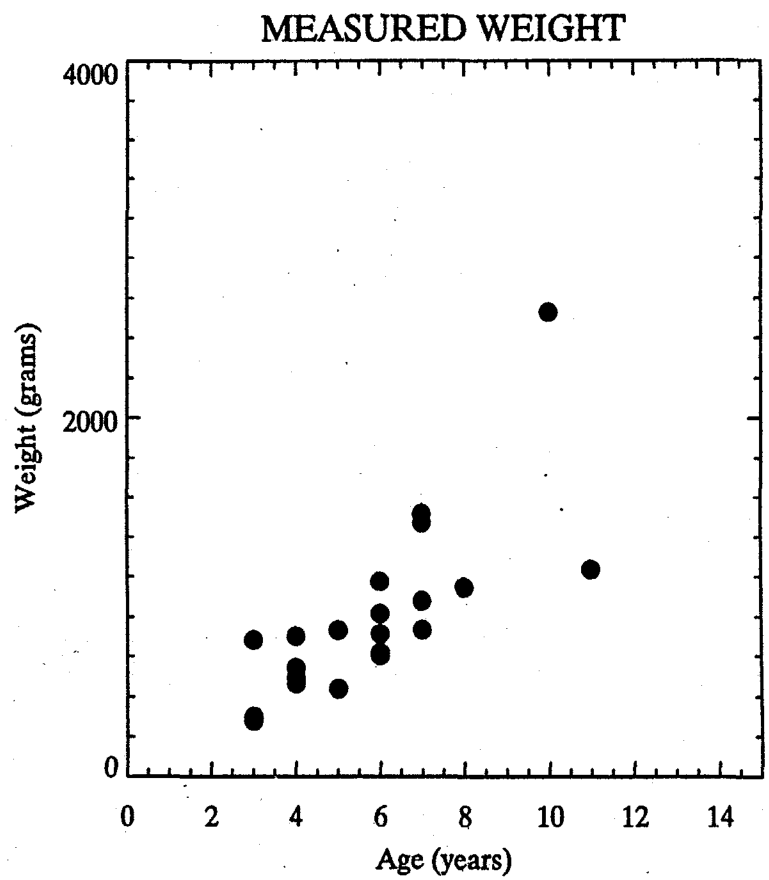
- **Use judgement to identify suspected outliers.**
- **Perform a statistical test.**
  - Dixon's test.
- **Exclude outliers from calculation of average and standard error.**
- **Present the outliers on trend plots with symbols.**

Growth rate has been measured in Hudson bass.

Back-Calculated Weight at Age for Individual Fish



Measured Weight at Age for Individual Fish



Data Collected in Spring, 2000

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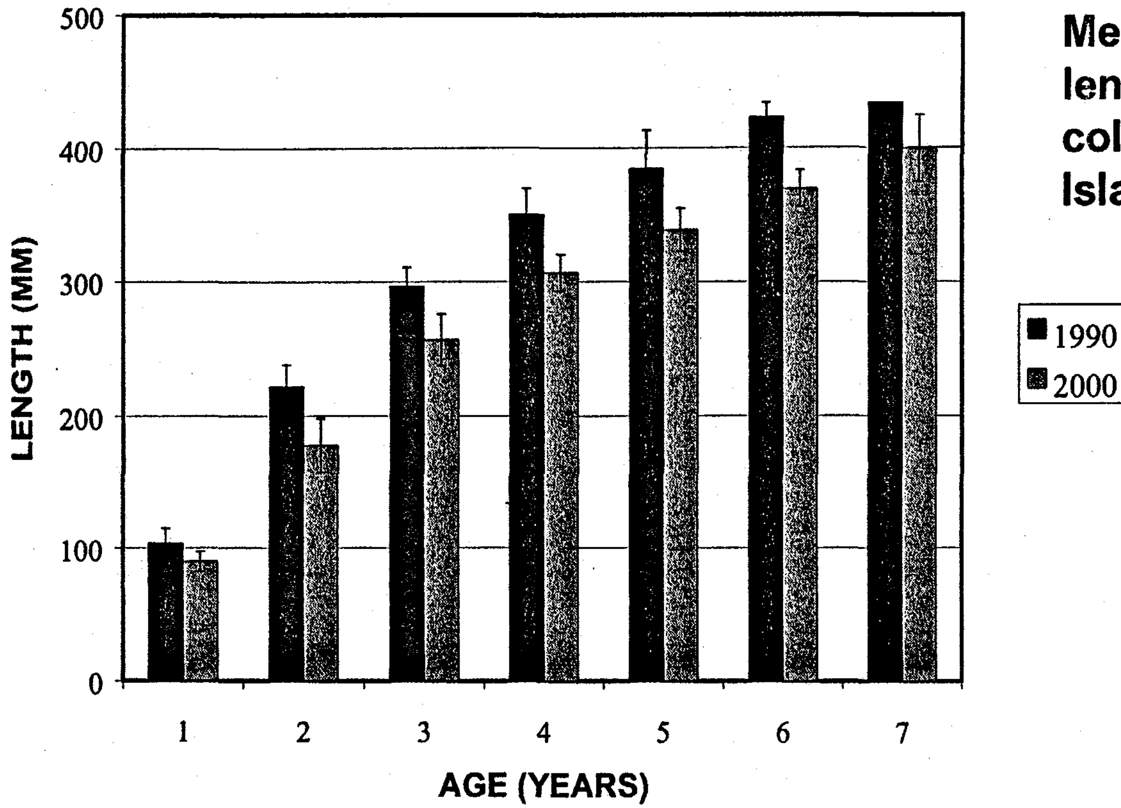
Growth rate of the bass appears to have changed over time.



Mean back-calculated length at age of bass collected in Thompson Island Pool in 1990 and 2000.

- **Growth rate affects fish PCB concentration (lower growth = higher PCB concentration)**
- **Growth rate appears to have declined.**
- **Changes in average growth rate over time may cloud trends.**
  - The importance of this factor cannot be evaluated without a model.

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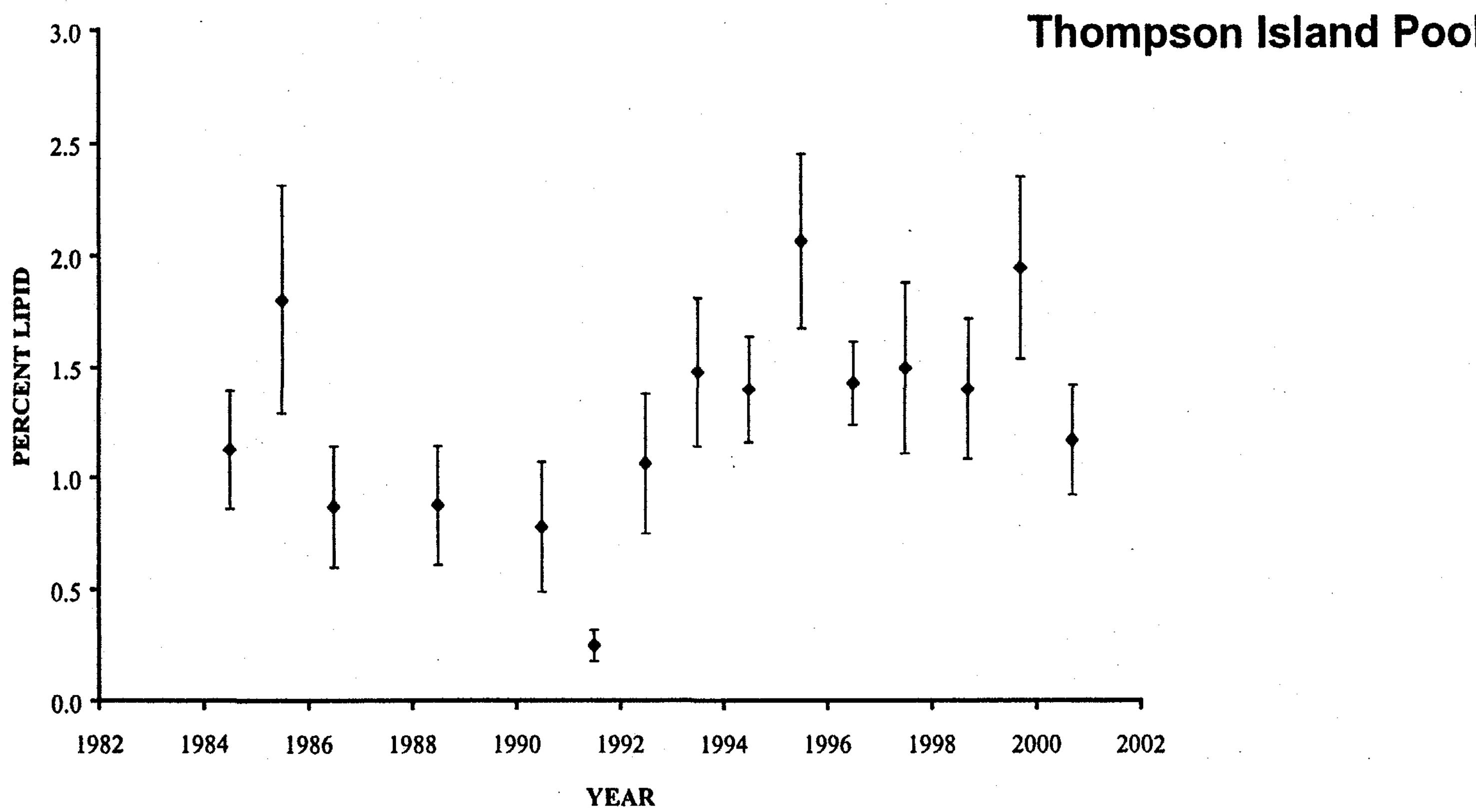
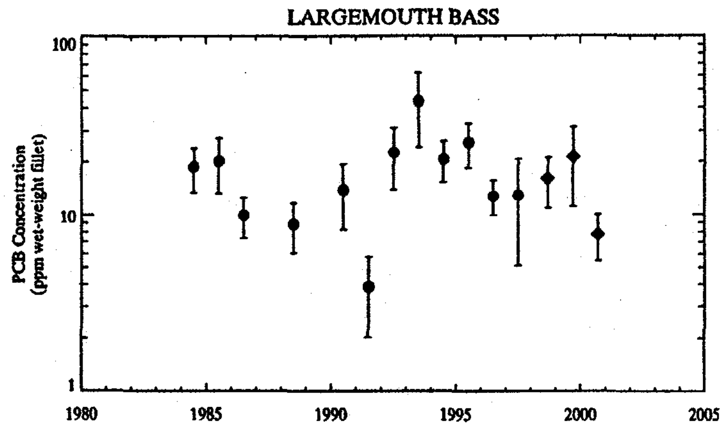
Largemouth bass lipid content has changed over time.

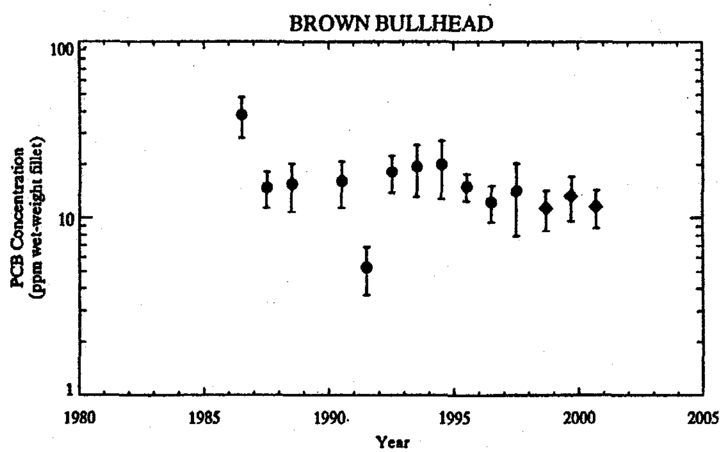


- **Lipid content affects PCB concentration (higher lipid = higher PCB concentration)**
- **Lipid normalization of the PCB data partially accounts for the effects of changing lipid content.**
  - Lipid content has changed so rapidly in the bass, that PCB concentrations may not always have been in steady state with regard to lipid.

Temporal trends in fish - wet weight basis

Thompson Island Pool

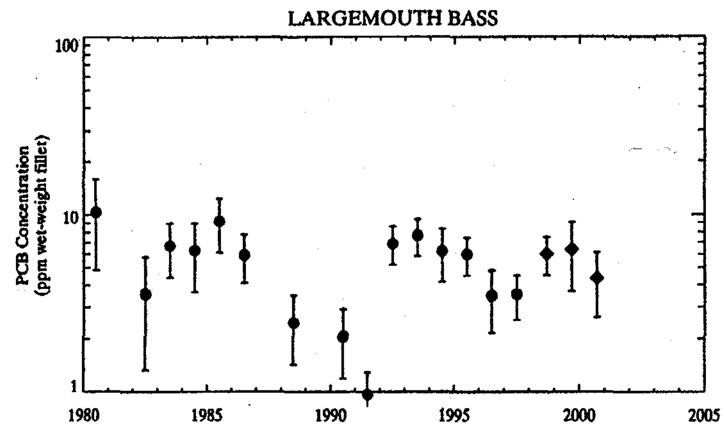


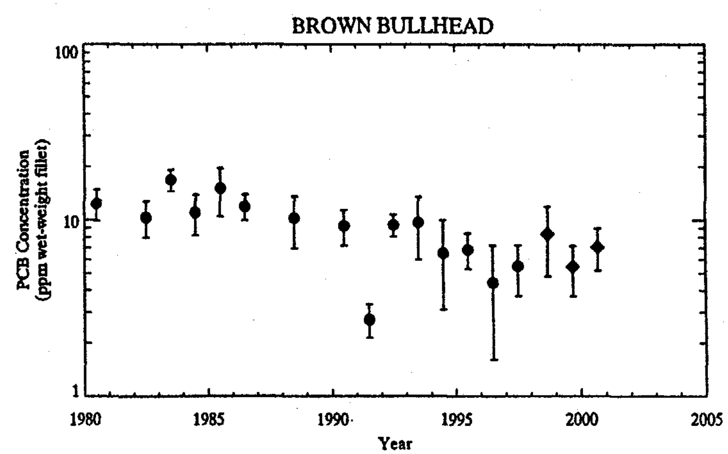


Data are arithmetic means +/- 2 standard errors: years with greater than or equal to 3 measurements are included.

Circles = NYSDEC, Diamonds = GE.

Stillwater





Data are arithmetic means +/- 2 standard errors: years with greater than or equal to 3 measurements are included.

Circles = NYSDEC, Diamonds = GE.

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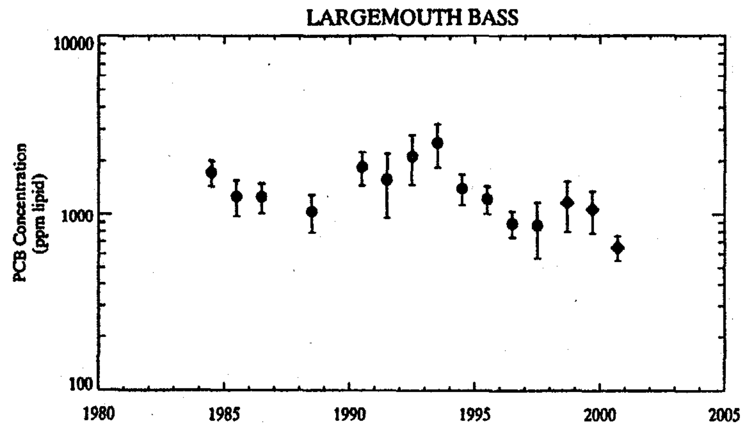
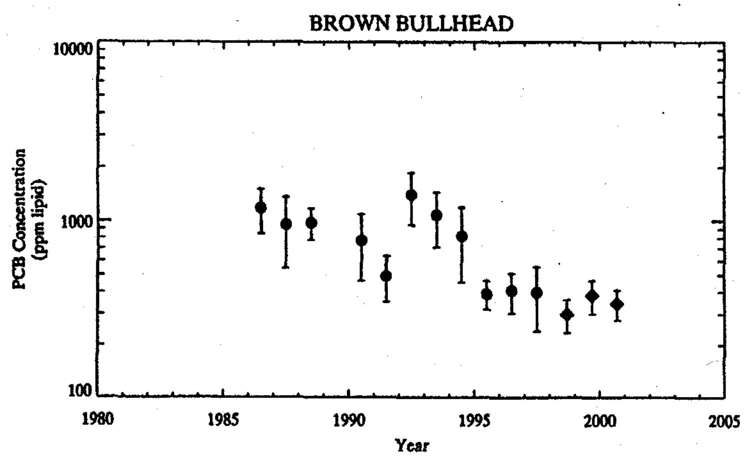
Temporal trends in fish - lipid basis

Thompson Island Pool





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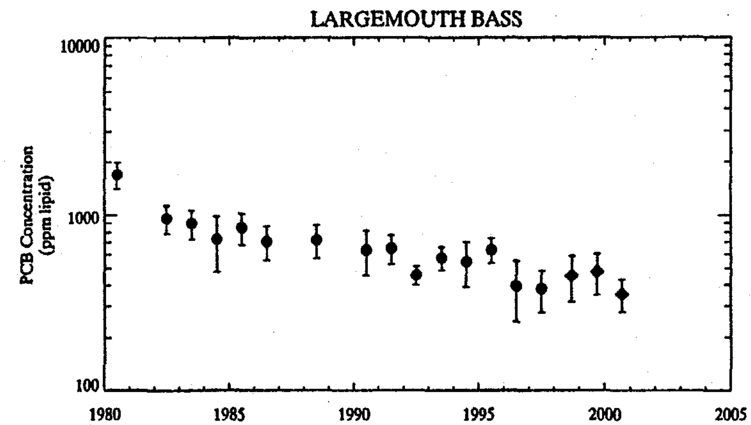
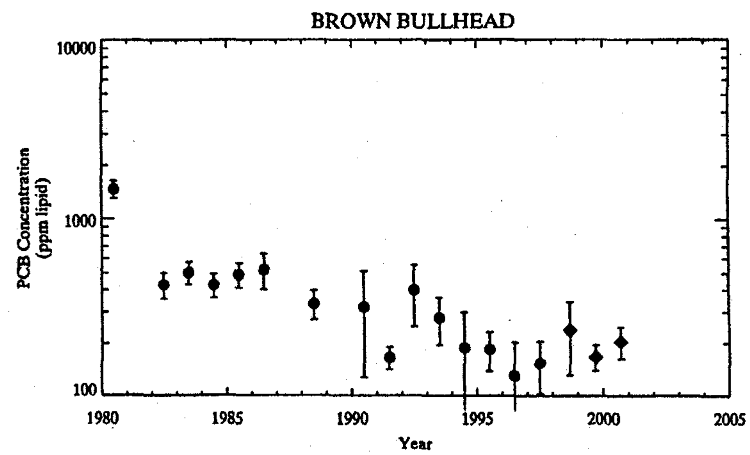
Circles = NYSDEC, Diamonds = GE.

Stillwater





Data are arithmetic means +/- 2 standard errors: years with greater than or equal to 3 measurements are included.

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Other factors that can affect trend analysis

- **Variation in fish weight**
  - The historical data suggest that very small and very large fish may differ in concentration from intermediate-sized fish.
- **Changes in food web structure**
  - A change in prey species availability may affect exposure sources.
- **Physiological stress**
  - May change the degree of bioaccumulation.
- **Timing of sampling relative to spawning**
  - Physiological changes during spawning may affect bioaccumulation.
- **Changes in laboratory techniques**

Conclusions

- **Trends in fish PCB levels can be masked by a number of factors.**
  - These factors impart year-to-year variability unrelated to long-term trends.
  - Therefore, long-term trends should be explored on a multi-year basis.

- **Trends should be explored in all monitored species for which a multi-year record is available.**

- **Trends should be explored on a lipid basis.**

- **A regular procedure should be developed to identify and remove outliers from trend analysis.**