



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

DocID 80151

**HUDSON RIVER PCBs REASSESSMENT
COMMUNITY INTERACTION PROGRAM**

JOINT LIAISON GROUP MEETING

Monday, October 28, 1996

7:30 p.m.

Albany, New York

A G E N D A

Welcome

Ann Rychlenski
Community Relations Coordinator
USEPA

Introduction to the Preliminary
Model Calibration Report

Doug Tomchuk
Project Manager, USEPA

Technical Presentations on the
Preliminary Model Calibration Report:

Transport and Fate Modeling

Dr. Victor Bierman
Limno-Tech, Inc.

Bioaccumulation Modeling

Dr. Jon Butcher
TetraTech, Inc.

Commenting on the Report

Doug Tomchuk

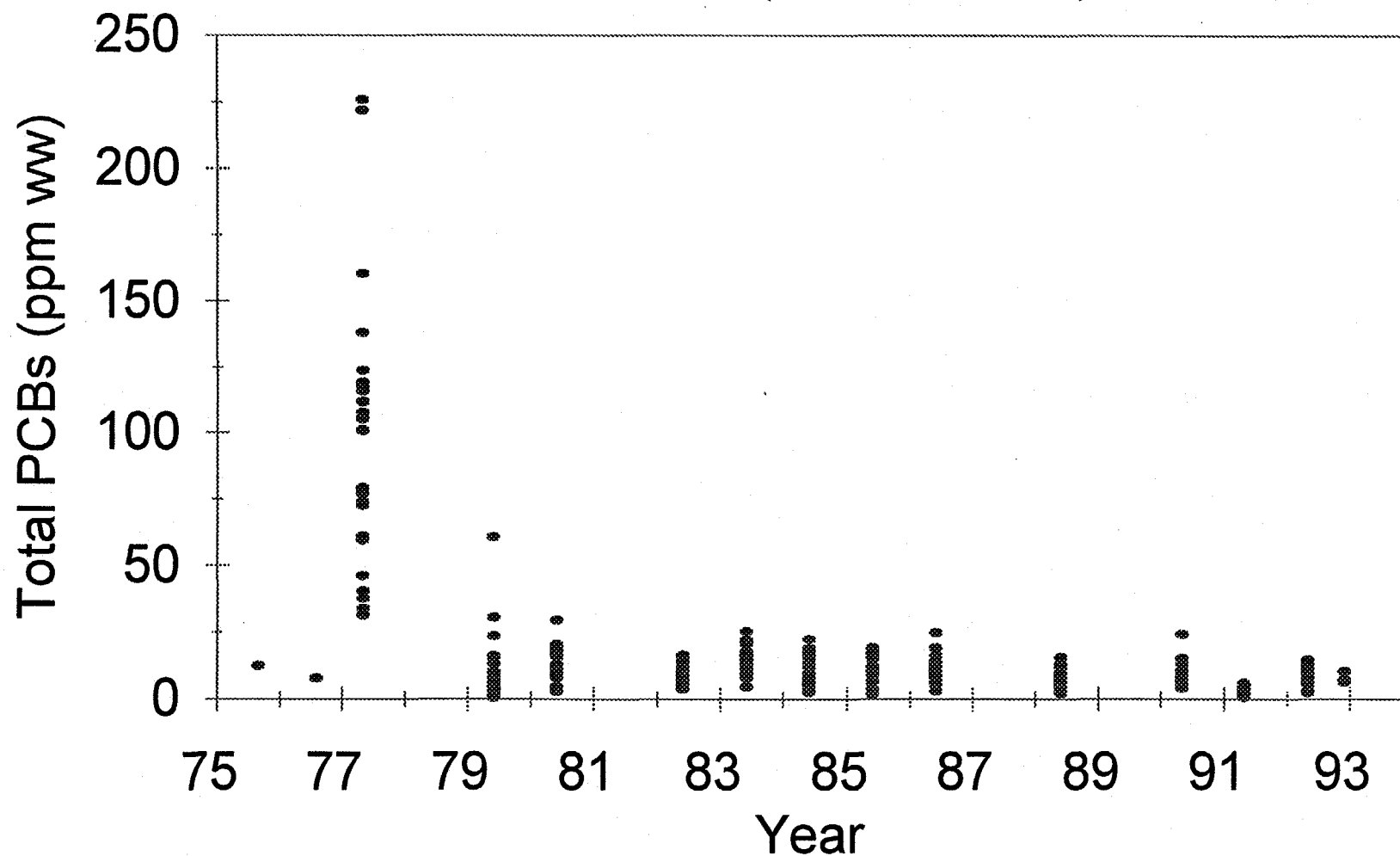
Questions & Answers

Bivariate Bioaccumulation Model

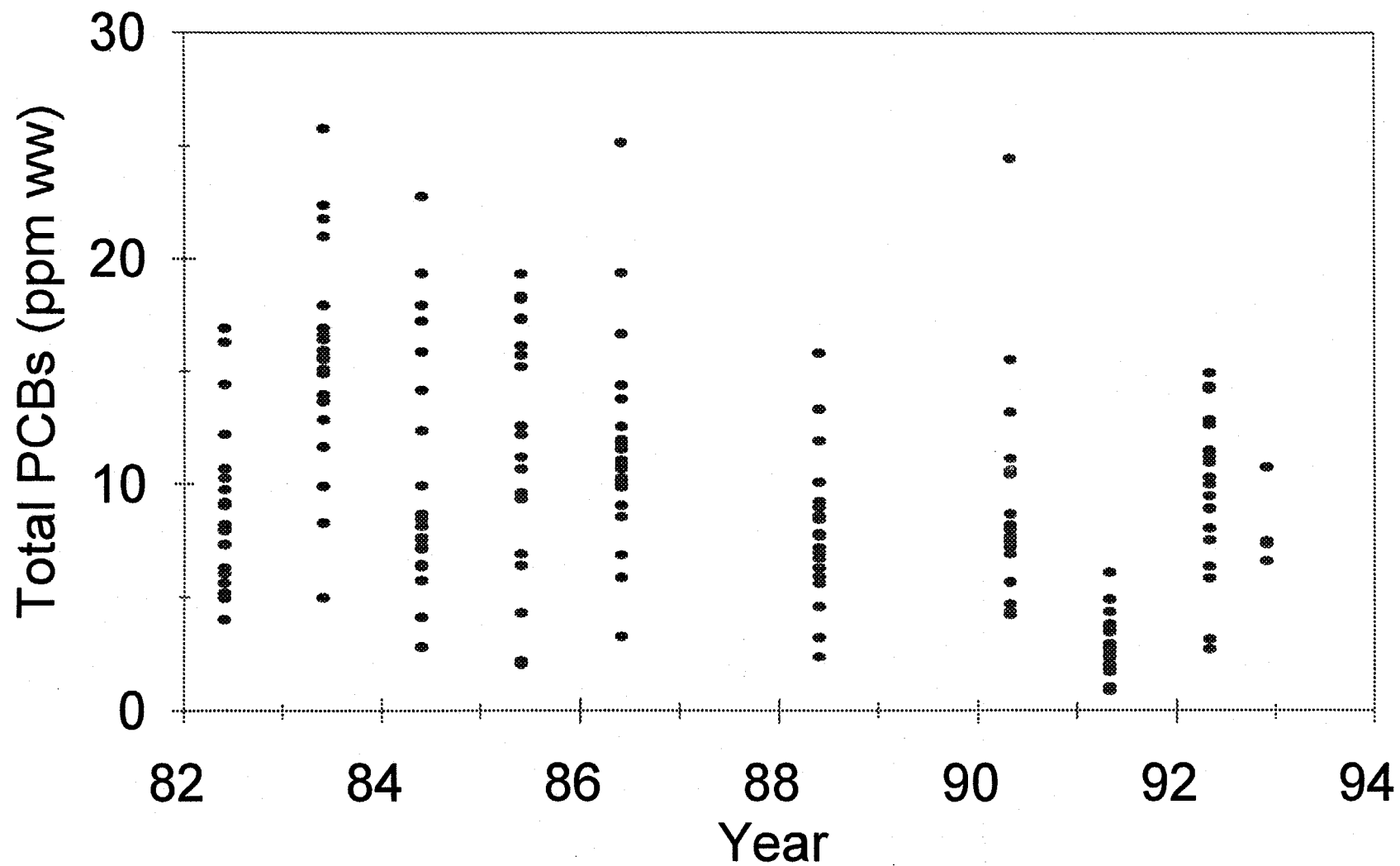
- Relate historical fish data to environmental concentrations
- Scoping analysis: approximates and supports food web model formulation
- Provides valuable insights into dynamics of PCBs in Hudson River fish



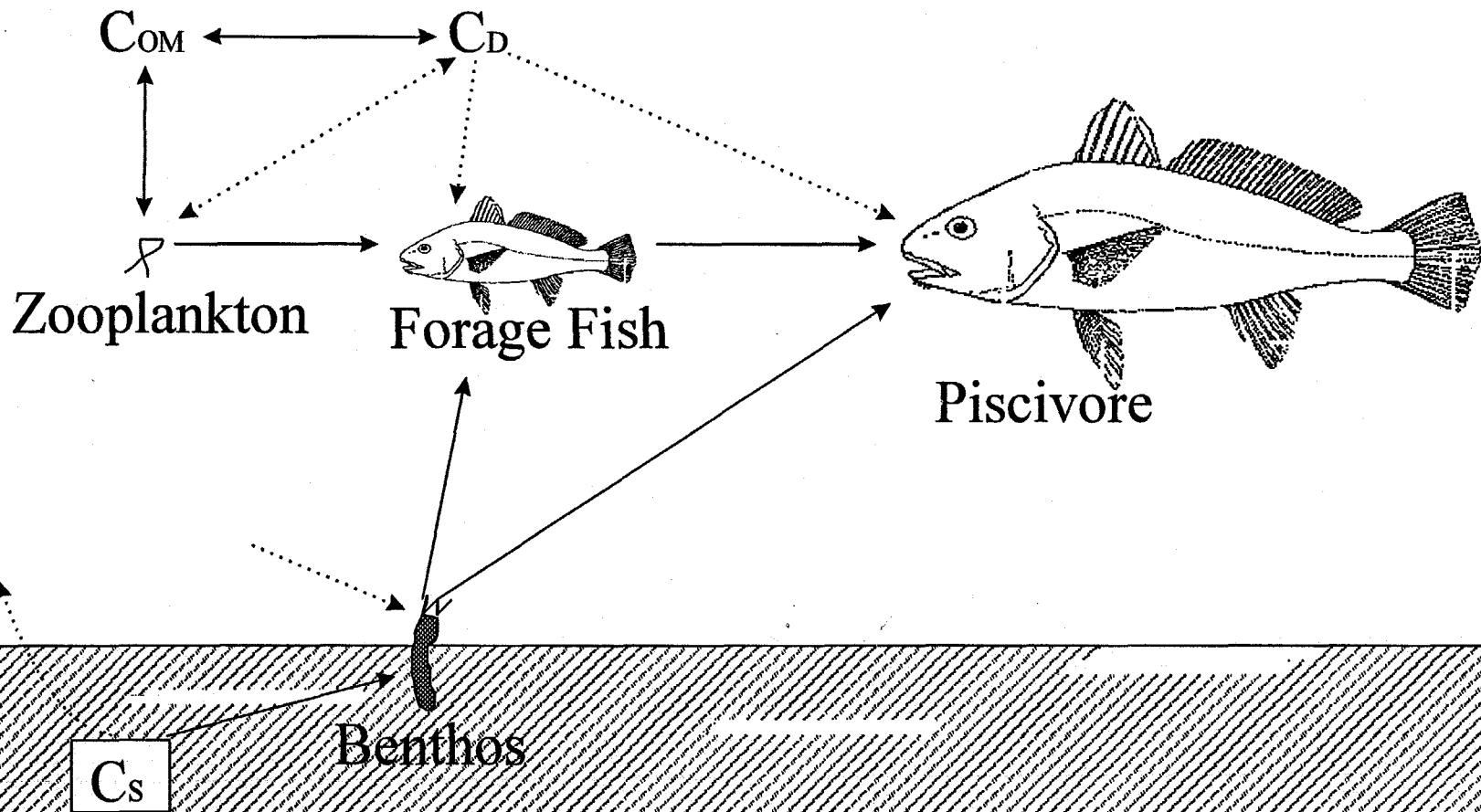
Total PCBs in Brown Bullhead Stillwater (RM 175)



Total PCBs in Brown Bullhead

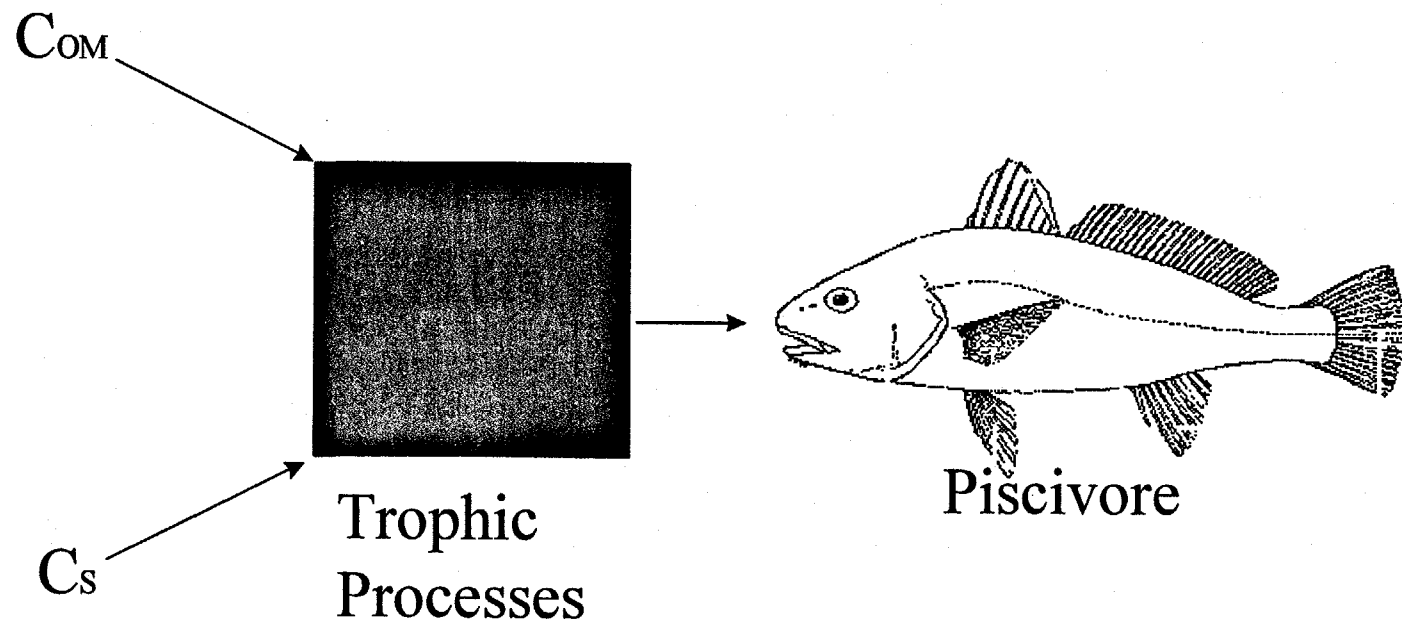


Conceptual Food Web



Black Box Model

Equivalent to Steady-State Food Web



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Bioaccumulation Factors

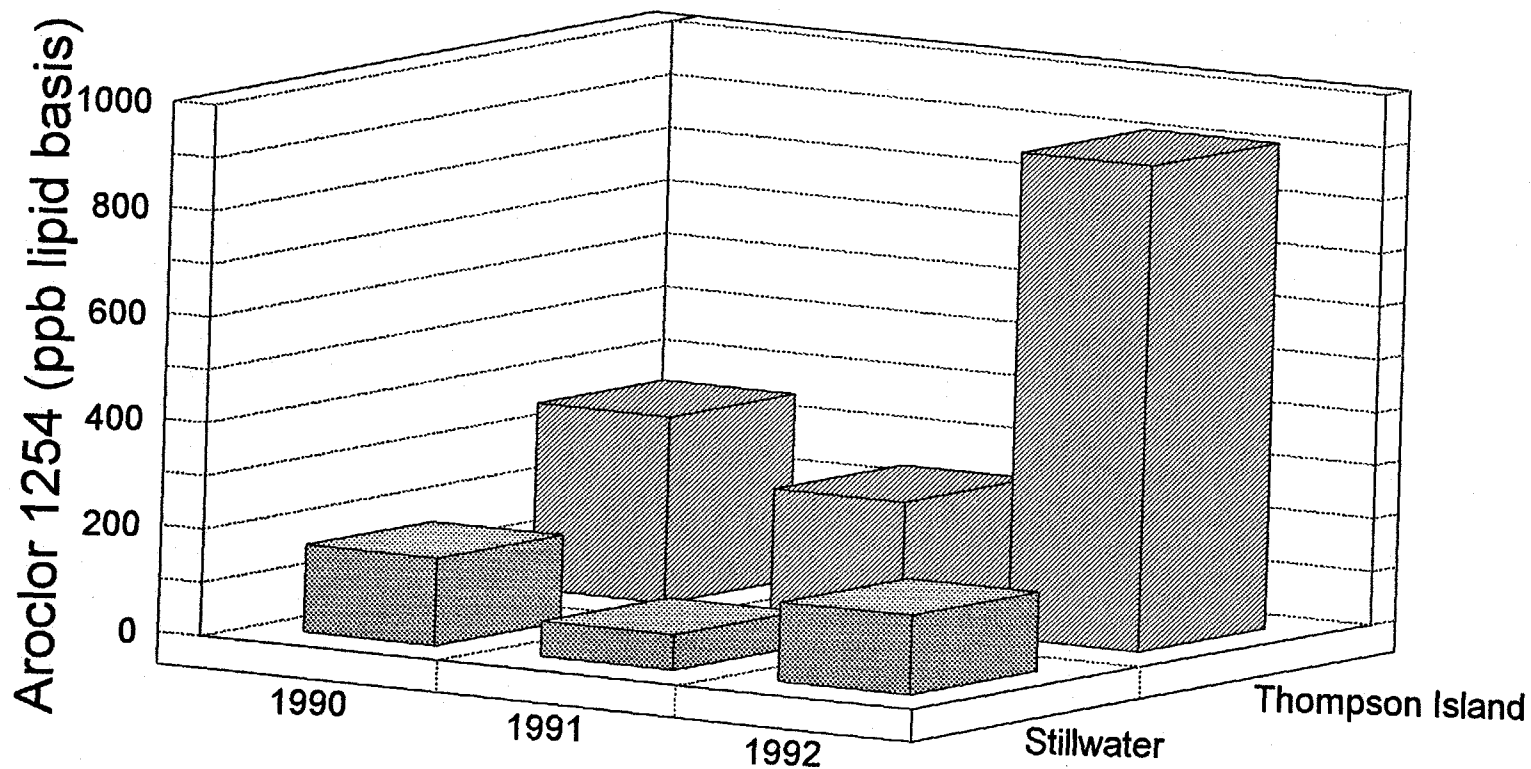
BAF: $C(\text{fish}) = \text{BAF} \cdot C_w$

BSAF: $C(\text{fish}) = \text{BSAF} \cdot C_s$

Bivariate BAF: $C(\text{fish}) = B_w \cdot C_w + B_s \cdot C_s$

These are equivalent only if water and sediment are in equilibrium

Aroclor 1254 in Brown Bullhead



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Bivariate BAF

$$\frac{Cf_i}{fl_i} = Bw_i \cdot \frac{Cs_w}{foc_w} + Bs_i \cdot \frac{Cs_s}{foc_s}$$

in which, for species i:

Cf = PCB concentration in fish (wet weight)

fl = lipid fraction in fish

Bw = Partial BAF relating fish concentration to water column concentration

Cs_w = PCB concentrations on suspended solids

foc_w = organic carbon fraction of suspended solids

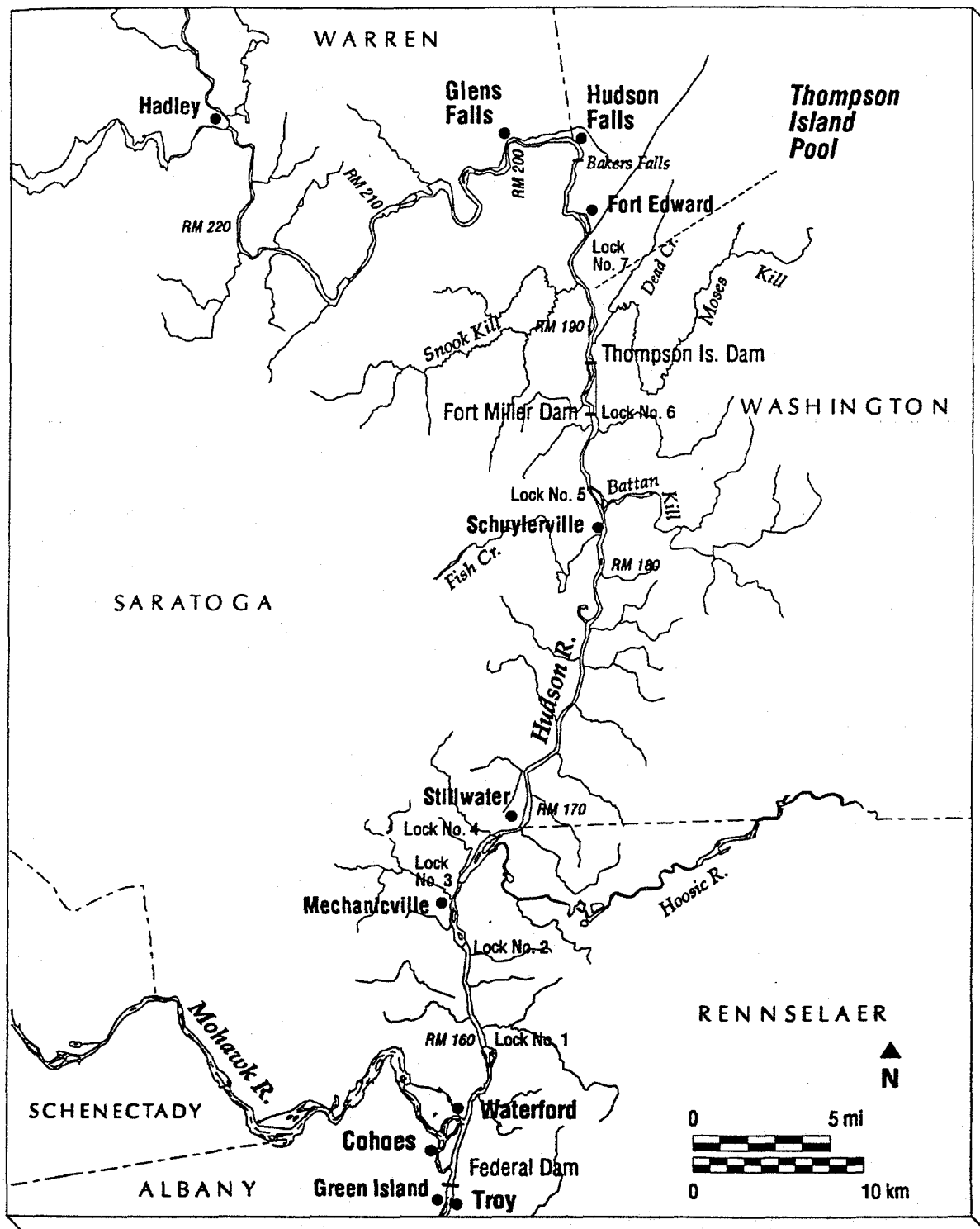
Bs = Partial BAF relating fish concentration to upper zone sediment concentration

Cs_s = PCB concentration in upper zone sediments (dry weight basis)

foc_s = organic carbon fraction of the sediments

Available Data

- NYSDEC Fish Data, 1975-1992
 - Used River Miles 142 - 193
- USGS Water Column Data, 1977-present
 - Use summer median
 - Total PCBs / whole water basis only
- Sediment Surveys
 - Dated core data
 - GE and earlier cross-sectional surveys



Upper Hudson River

Converting Fish Data to Consistent Basis

- Change in selection of quantitation peaks in 1979 and 1983
- Comparison made through analysis of Phase 2 congener-specific analyses
- 1977 method for 1016 inconsistent with later quantitations
- Data converted to consistent 1983 basis

Summer Average Water Column Concentrations of Total PCBs

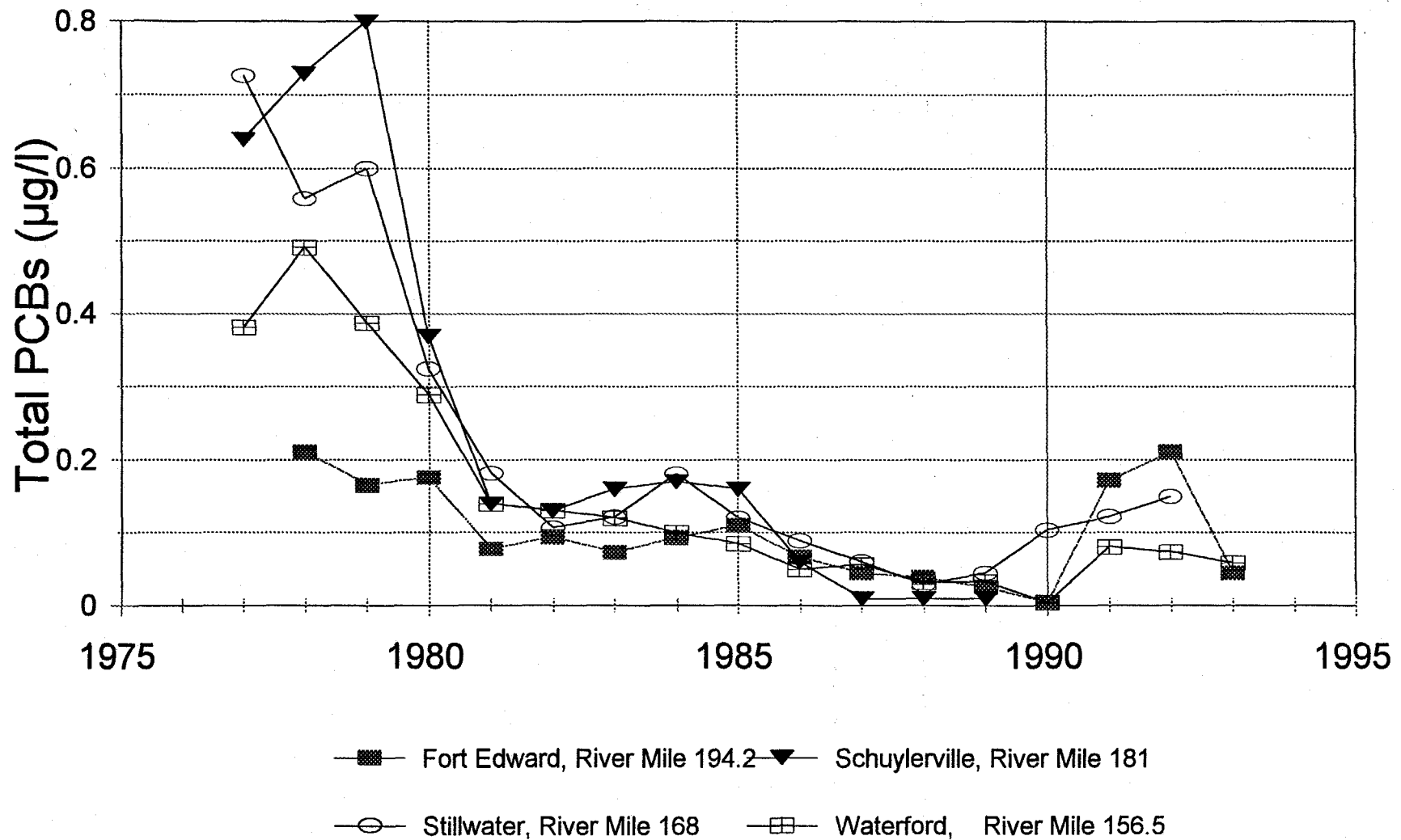
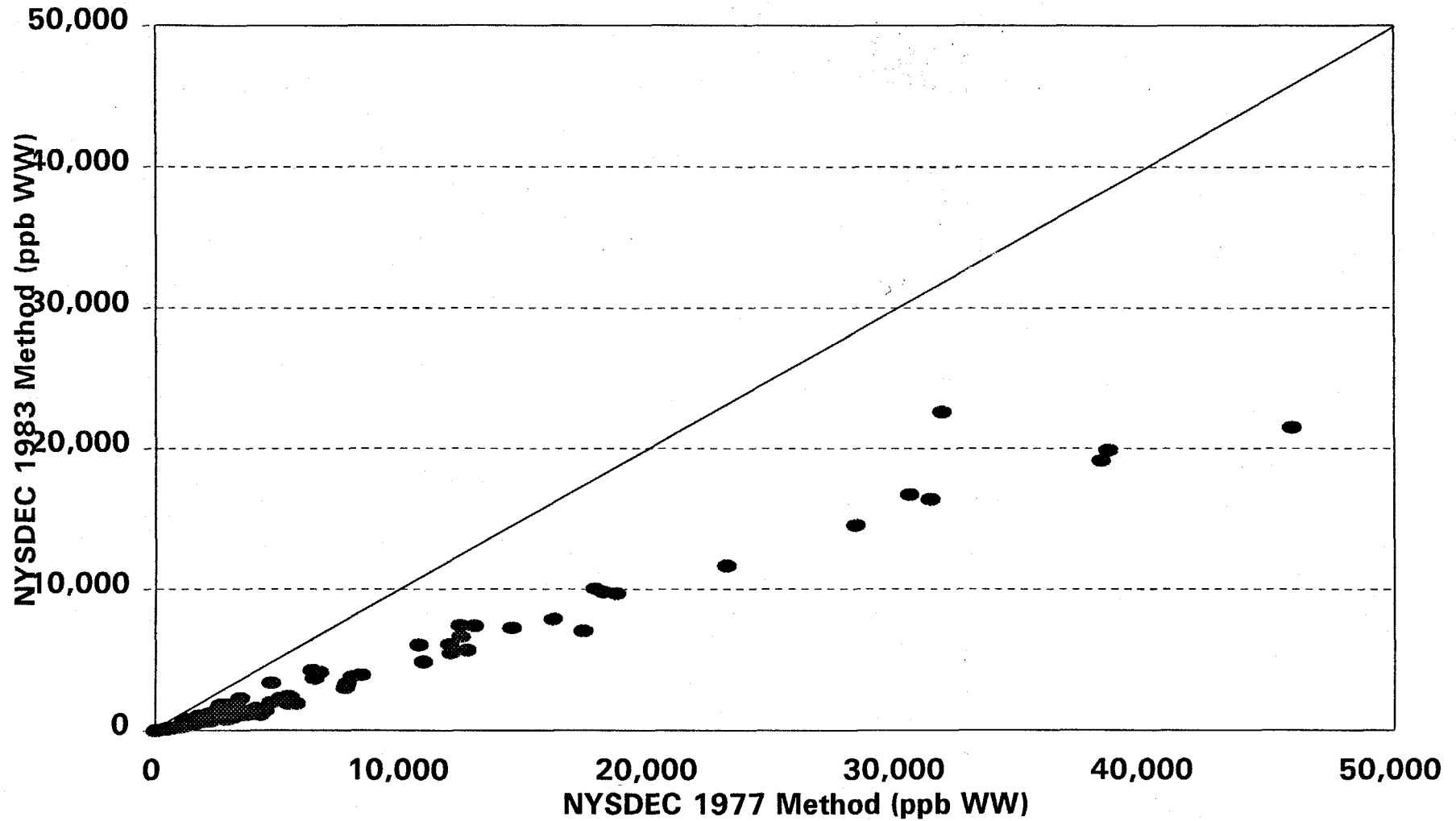


Figure 9-4

Comparison of Aroclor 1016 Concentrations Calculated by NYSDEC 1983 Method and NYSDEC 1977 Method for TAMS/Gradient Phase 2 Hudson River Fish Samples



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Model Development

- Summer water column concentration is a good predictor of Aroclor 1016
- Depositional sediment concentration time series do not add explanatory power
- Assuming constant sediment concentrations by location (based on GE survey) provides better fit

Model Log BAFs for Total PCBs

Pumpkinseed	6.15
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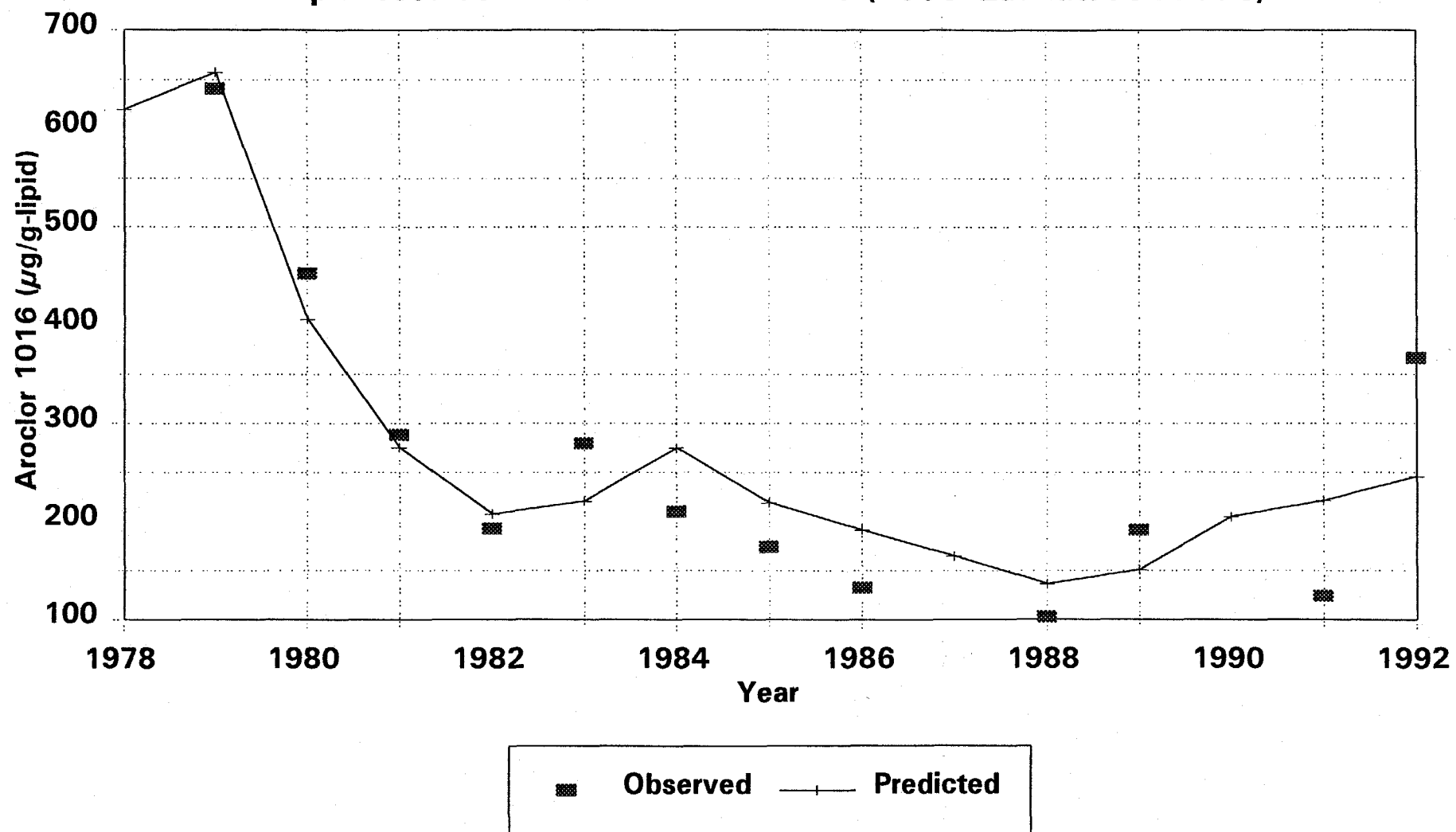
Largemouth Bass	6.52
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Brown Bullhead	6.22
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Carp	6.78
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Yellow Perch	6.41
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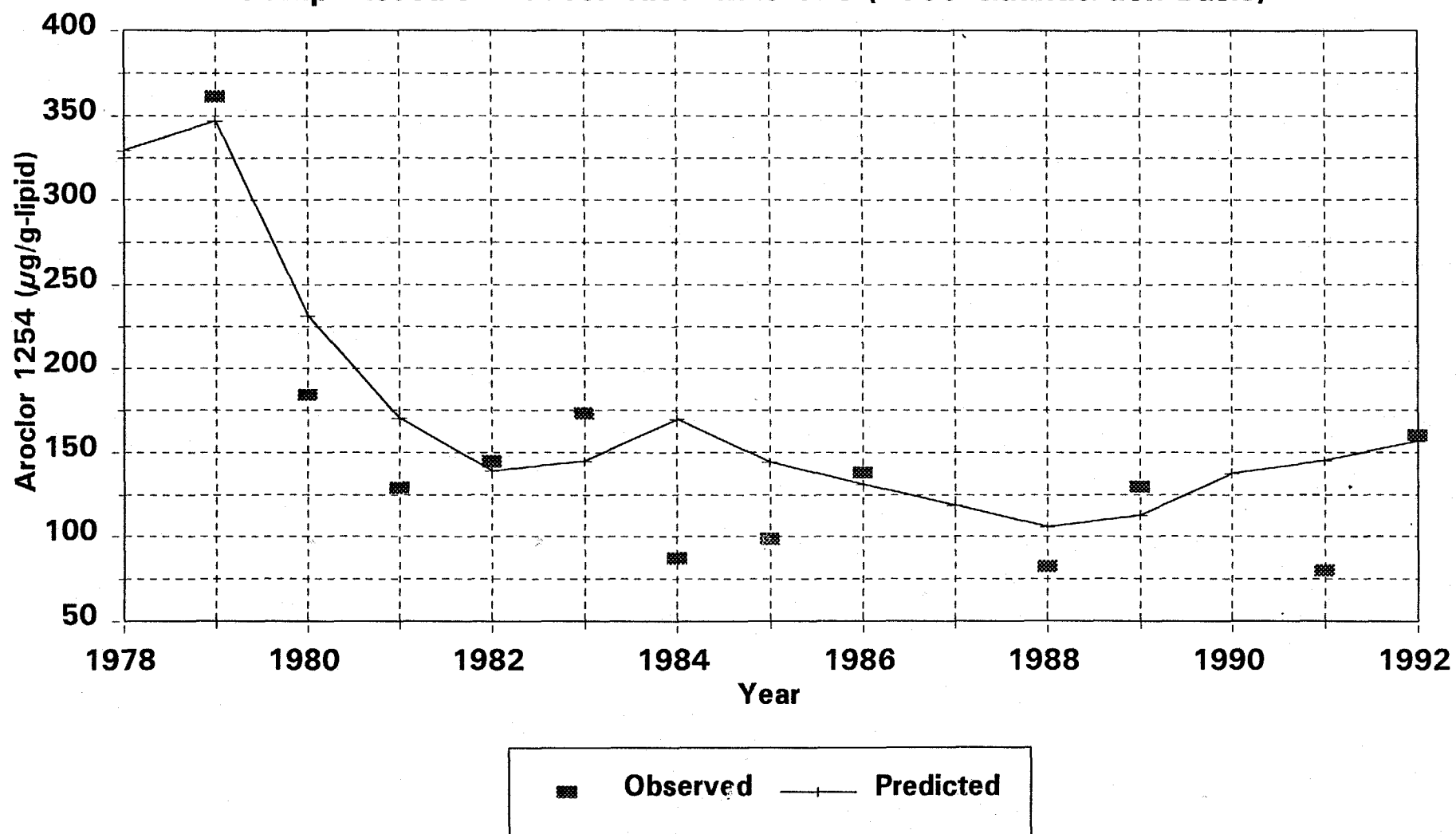
Figure 9-14
Observed and Predicted Average Concentrations of Aroclor 1016 in
Pumpkinseed at Hudson River Mile 175 (1983 Quantitation Basis)



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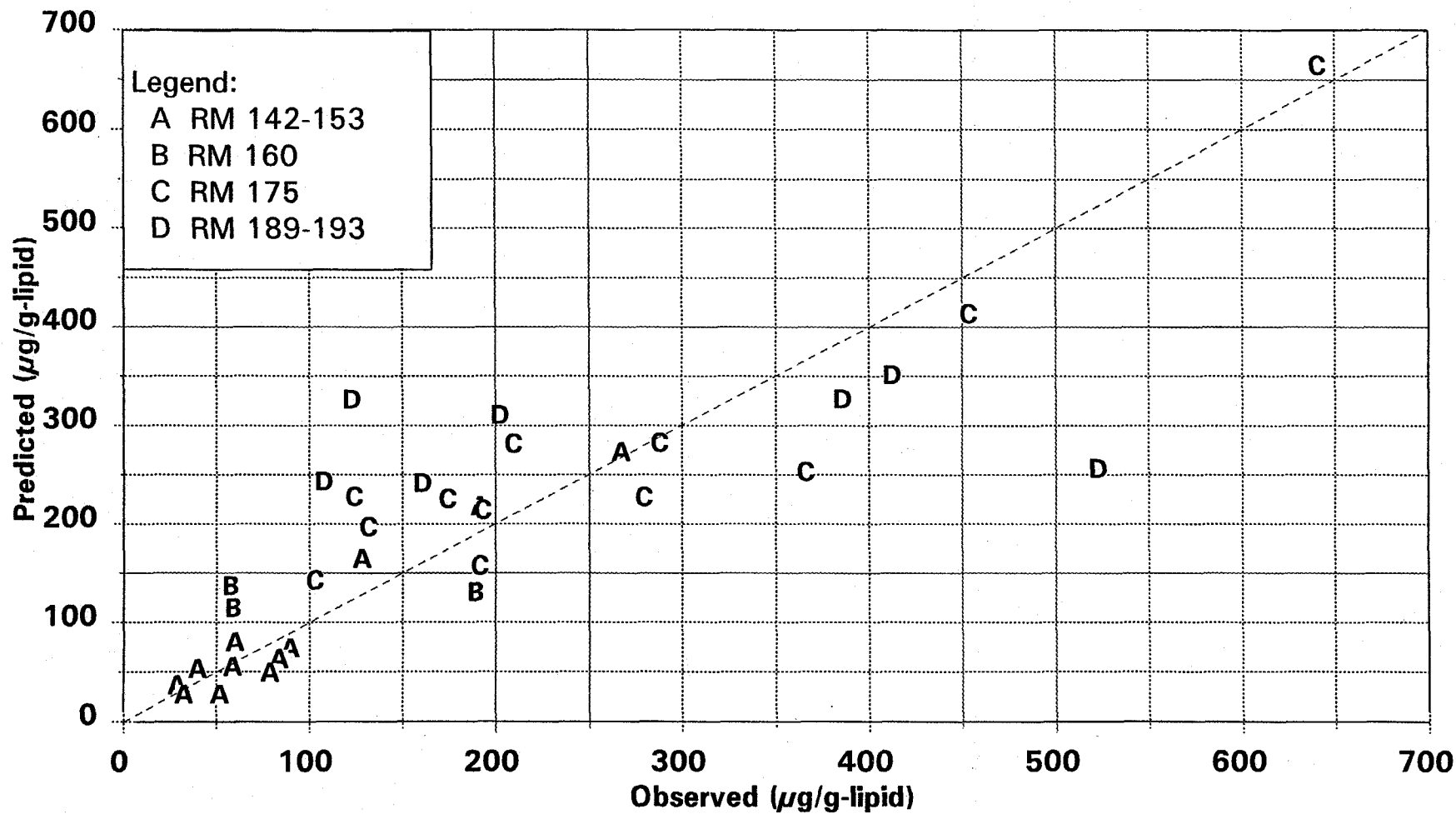
Figure 9-15
Observed and Predicted Average Concentrations of Aroclor 1254 in
Pumpkinseed at Hudson River Mile 175 (1983 Quantitation Basis)



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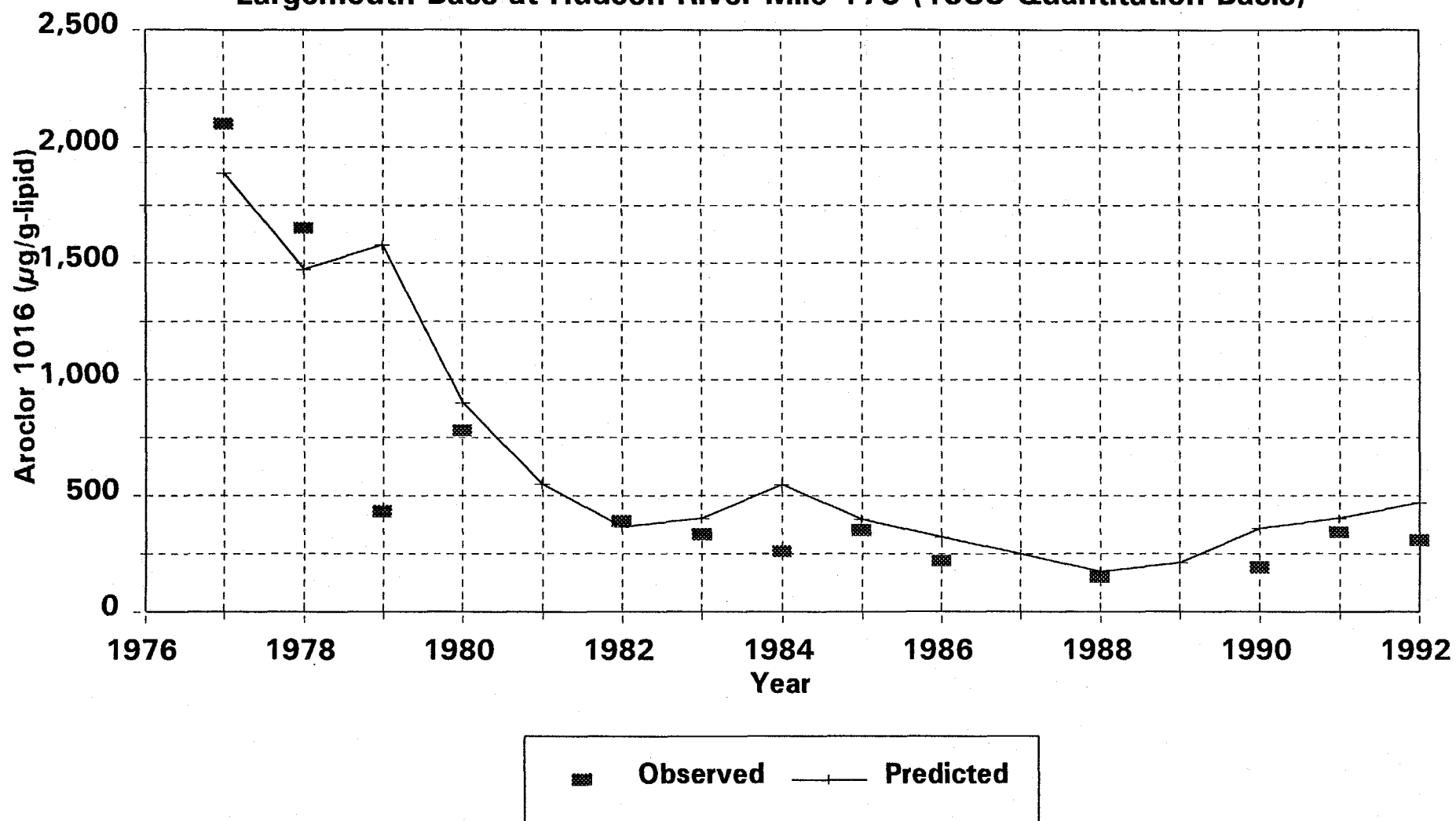
Figure 9-8
Comparison of Observed and Predicted Aroclor 1016 Concentrations in
Hudson River Pumpkinseed (Corrected to NYSDEC 1983 Quantitation Basis)



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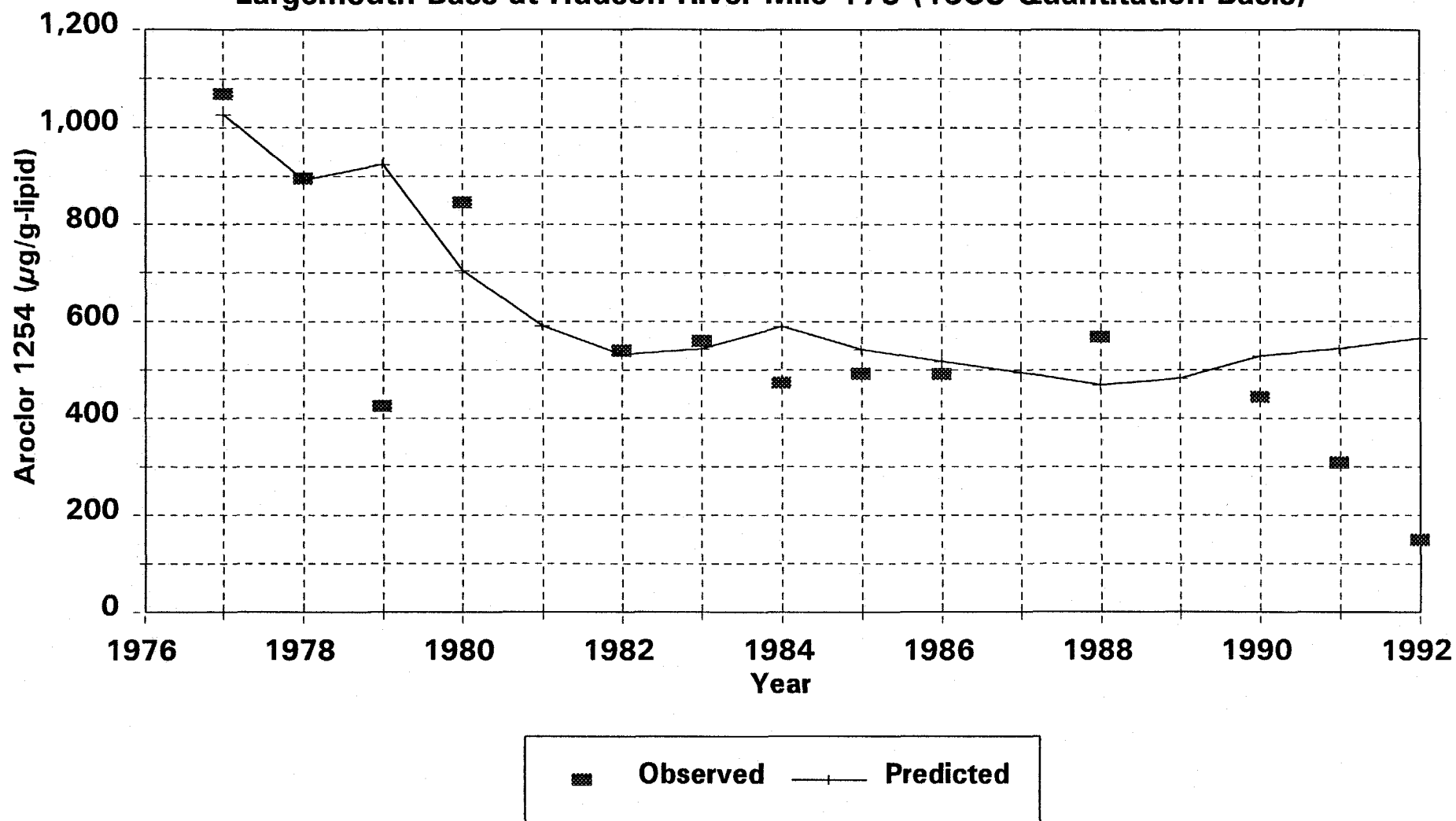
Figure 9-16
Observed and Predicted Average Concentrations of Aroclor 1016 in
Largemouth Bass at Hudson River Mile 175 (1983 Quantitation Basis)



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Figure 9-17
Observed and Predicted Average Concentrations of Aroclor 1254 in
Largemouth Bass at Hudson River Mile 175 (1983 Quantitation Basis)



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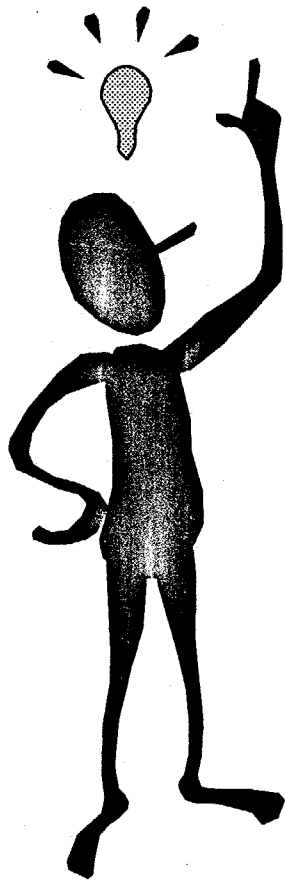
Estimated Importance of Water and Sediment Pathways

Species	Proportion of Variability (%)			
	Aroclor 1016		Aroclor 1254	
	Water (%)	Sediment (%)	Water (%)	Sediment
Brown Bullhead	73.2	26.8	13.7	86.3
Cyprinids	99.7	0.03	94.7	5.3
Largemouth Bass	88.5	11.5	41.5	58.5
Pumpkinseed	61.4	38.6	71.6	28.4
Yellow Perch	83.9	16.1	80.7	19.3

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Conclusions



- Bivariate BAF provides good power to explain average fish concentration
- Consistent with BAF results for Lake Ontario
- Steady-state Food Web Model is feasible, should improve predictions by accounting for additional variables

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