

Sediment and Fish Tissue Study of Scippo Creek

Pickaway County, Ohio

2001

June 14, 2002

OEPA Technical Report EAS/2001-6-5

Prepared for

State of Ohio Environmental Protection Agency
Division of Emergency and Remedial Response

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INTRODUCTION

The Division of Emergency and Remedial Response, Central District Office, requested the services of the Division of Surface Water, Ecological Assessment Section, to collect and analyze fish tissue and sediment from Scippo Creek in the vicinity of PPG Industries' wastewater discharge outfall. The purpose of these samples is to confirm that the fish and sediments near-field and further downstream from PPG's outfall into Scippo Creek continue to comply with the no further action designation identified in the November 1996 Decision Document. The 1996 Remedial Investigation Report for the Scippo Creek Operable Unit determined that PCB levels in remaining sediments and in fish tissue samples, did not exceed acceptable risk levels.

Specific objectives of this study were to:

- 1) determine if concentrations of PCBs in sediment and fish tissue were still protective of human health and the environment, and
- 2) evaluate trends in results between 1994 and 2001.

METHODS

All chemical, physical, and biological field, laboratory, data processing, and data analysis methodologies and procedures adhere to those specified in the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio Environmental Protection Agency 1989), the Ohio EPA Sediment Sampling Guide and Methodologies (Ohio EPA 2001), and the Ohio EPA Fish Tissue Guidance Manual (Ohio EPA 1994). All sediment and fish tissue sampling locations are listed in Table 1, and identified in Figure 1.

Sediment

Fine grain sediment samples were collected in the upper 0-2 inches of bottom material at all locations using a decontaminated stainless steel scoop. Decontamination of sediment sampling equipment followed procedures outlined in the Ohio EPA Sediment Sampling Guide and Methodologies (Ohio EPA 2001). Collected sediment was homogenized in stainless steel pans, transferred into clear glass jars with teflon lined lids, placed on ice (to maintain 4°C) in a cooler, and shipped to an Ohio EPA contract lab. A split blind duplicate sample was collected from one of the sediment sampling locations. Sediment evaluations were conducted using guidelines established in MacDonald *et.al.* (2000), and in the 1996 PPG site-specific risk assessment RI report.

Fish Tissue

Fish were sampled using pulsed DC electrofishing gear (wading method). Tissue fillet samples were processed at each sampling location. Fillets were collected from edible size game fish, either as

single individuals or composites of two or more individuals. Fillet samples were wrapped in aluminum foil, placed in plastic sealable bags, and stored on dry ice. Sampling, processing, and decontamination protocols followed those listed in the Ohio EPA Fish Tissue Guidance (Ohio EPA 1994).

SUMMARY/CONCLUSIONS

Seven PCB Aroclors were tested in sediment samples collected from four locations in Scippo Creek (Table 2). The results were evaluated using guidelines established in *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems* (MacDonald et. al. 2000). These guidelines define two levels of ecotoxic effects, the threshold effect concentration (TEC) and a probable effect concentration (PEC). The TEC is defined as the level below which harmful effects to sediment-dwelling organisms are unlikely to be observed, while the PEC is the level above which harmful effects are likely to be observed. Sediments which exceed PEC levels are likely to be toxic to sediment-dwelling organisms. Based on the TEC and PEC guidelines noted in MacDonald *et. al.* (2000), total PCBs exceeded the probable effects level at river mile (RM) 2.44 and the threshold effects level at RM 4.32 and RM 1.49. However, it should be noted that fine-grained depositional material (where contaminants are most likely to concentrate), which was sampled for this project, was very sparse within the study area. Overall PCB levels would be expected to be lower across the entire stream bottom, where sand and gravel substrates predominated. Based on the PPG 1996 Remedial Investigation report, the site-specific risk assessment for recreational receptors identified that sediment PCB levels less than 9.0 mg/kg would meet acceptable human health risk goals.

Ohio EPA sediment results from Scippo Creek during 1993 documented non-detectable levels upstream from PPG and elevated concentrations (451 and 1924 ug/kg) downstream. Although 1993 and 2001 sediment sampling sites did not directly match in location, the limited data appears to indicate that PCB1248 levels have declined over the last nine years downstream from the PPG outfall. The Remedial Investigation report (ICF Kaiser 1996) reported an average downstream concentration for PCB 1248 of 3400 ug/kg.

A total of four fish species (rock bass, smallmouth bass, spotted bass, and yellow bullhead) were collected in the Scippo Creek study area for tissue analysis. The species and size classes collected are summarized in Table 3. Both rock bass and smallmouth bass were collected at all four sampling locations. Only fillet samples were analyzed, and parameters included PCBs, organochlorinated pesticides, and percent lipid. The fish tissue sampling results are summarized in Table 5. Fish tissue results from the site upstream (RM 5.4) from PPG indicated non-detectable levels of PCBs. Sampling results at three sites downstream from PPG (RM 4.3 - RM 1.5) revealed four samples with non-detectable levels of PCBs and six samples with total PCB levels ranging between 56.3 and 358.2 ug/kg (results are summarized in Table 4). Based upon Ohio Department of Health fish consumption guidelines, five of the six fish samples with detectable levels of PCBs were at the slight restriction level of one meal per week, and one fish sample was at a moderate restriction level of one meal per month. None of the fish tissue samples had PCB levels which exceeded the 'do not

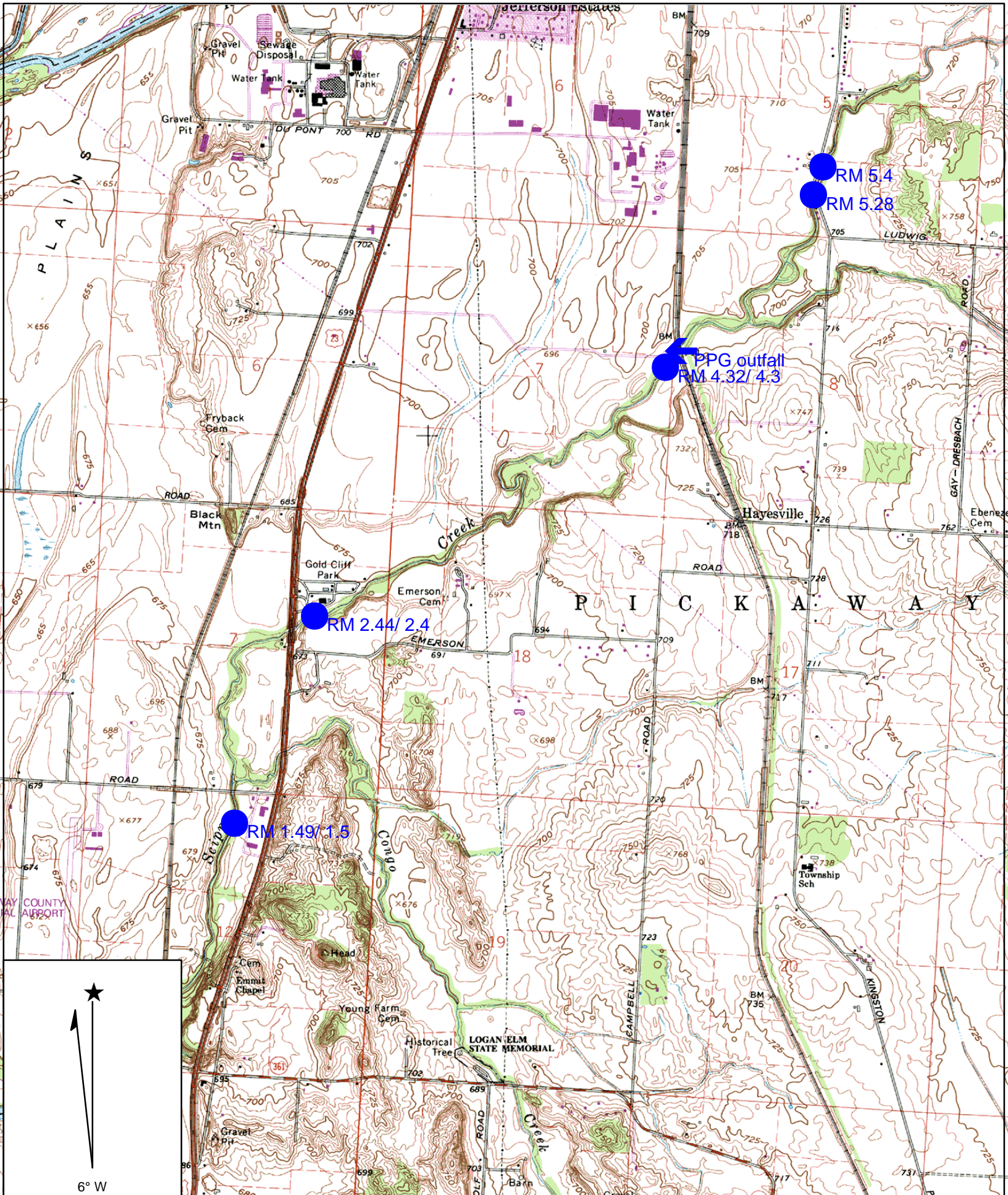
consume' concentration of 1,900 ug/kg. PCB 1248 concentrations ranged between non-detect and 282 ug/kg. These PCB 1248 values were below the acceptable risk level of 1,100 ug/kg reported in the 1996 Remedial Investigation risk assessment report. Scatter plots of fish tissue results are noted in Figure 2.

A decline in PCB levels (both total and aroclor 1248) in fish fillet samples was observed between 1994 (both Ohio EPA and PPG - RI data) and 2001 (Figure 3). Currently, the Ohio Department of Health has a recommended fish consumption advisory of one meal per month for all fish species collected from Scippo Creek between Kingston Pike and the Scioto River, and this was based on the 1994 results. Results of the 2001 fish tissue collections in Scippo Creek will be forwarded to the Ohio Department of Health for further analysis.

The lower 15 miles of Scippo Creek is designated Exceptional Warmwater Habitat based on monitoring results from 1992 and 1993, which revealed most sites in this section fully attaining exceptional conditions. Some impairment was noted immediately downstream from the PPG outfall, however, this impairment was in part associated with fish kills and not sediment contamination. The existence of an exceptional warmwater biological community in the lower Scippo Creek was a major reason for the no further action remedy. Monitoring of Scippo Creek in 1997 confirmed the continued presence of exceptional biological communities.

Table 1. Sediment and fish tissue sampling locations in Scippo Creek, 2001.

Sample Location/ River Mile	Sample Type	Latitude	Longitude	Landmark	County	USGS Quad. Map
Scippo Creek						
5.4	Fish Tissue	39.5555	82.9321	Ust. Kingston Pike Road	Pickaway	Circleville
5.28	Sediment	39.55406	82.93268	@ Kingston Pike Rd.	Pickaway	Circleville
4.32	Sediment	39.54516	82.94252	Just dst. PPG outfall	Pickaway	Circleville
4.3	Fish Tissue	39.5456	82.9426	Just dst. PPG outfall	Pickaway	Circleville
2.44	Sediment	39.53226	82.96591	Ust. US 23	Pickaway	Circleville
2.4	Fish Tissue	39.5322	82.9666	Ust. US 23	Pickaway	Circleville
1.5	Fish Tissue	39.5221	82.9711	Dst. River Road	Pickaway	Circleville
1.49	Sediment	39.52154	82.97122	Dst. River Road	Pickaway	Circleville



Name: CIRCLEVILLE
 Date: 6/3/2002
 Scale: 1 inch equals 2222 feet

Location: 039.5331149° N 082.9533066° W
 Caption: Figure 1. River mile (RM) locations of sediment and fish tissue sites in Scippo Creek, 2001.

Table 2. PCB concentrations in sediment collected from Scippo Creek on September 13, 2001 by Ohio EPA. Values are reported in dry weight.

Sample Location	RM 5.28	RM 4.32*	RM 4.32* (Duplicate)	RM 2.44**	RM 1.49*
Sample Date	Sept.13, 2001	Sept.13, 2001	Sept.13, 2001	Sept.13, 2001	Sept.13, 2001
Sample Time	1100	1230	1230	1405	1535
PCB-1016 (mg/kg)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)
PCB-1221 (mg/kg)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)
PCB-1232 (mg/kg)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)
PCB-1242 (mg/kg)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)
PCB-1248 (mg/kg)	ND (<0.100)	0.185	0.114	0.884	0.305
PCB-1254 (mg/kg)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)
PCB-1260 (mg/kg)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)	ND (<0.100)

C Sample exceeds the TEC level for total PCBs (0.0598 mg/kg).

** Sample exceeds the PEC level for total PCBs (0.676 mg/kg).

Table 3. Fish tissue sample information for Scippo Creek, 2001.

Sample Site	Sample Number	Fish Species	Sample Type	Individual Fish Measurements Total Length (mm)/ Weight (grams)
RM 5.4	443-01	yellow bullhead	SFF	246/215
RM 5.4	444-01	rock bass	SOF	168/90
RM 5.4	445-01	smallmouth bass	SOFC	270/244, 276/267, 250/176
RM 4.3	449-01	smallmouth bass	SOFC	240/188, 242/160, 236/158
RM 4.3	450-01	rock bass	SOFC	174/101, 174/91, 161/75, 161/80
RM 4.3	451-01	smallmouth bass	SOF	280/276
RM 2.4	446-01	smallmouth bass	SOFC	306/372, 352/532
RM 2.4	447-01	rock bass	SOF	186/120
RM 2.4	448-01	smallmouth bass	SOFC	214/111, 230/152
RM 1.5	452-01	spotted bass	SOFC	255/184, 255/222
RM 1.5	453-01	rock bass	SOF	170/100
RM 1.5	454-01	smallmouth bass	SOF	382/812
RM 1.5	455-01	smallmouth bass	SOF	295/330

SFF - skin off fillet

SOF - skin on fillet

SOFC - skin on fillet composite

Table 4. Summary of PCB results from fish fillet samples collected in Scippo Creek, 2001. Results are reported in ug/kg wet weight.

Sample Location/ Fish Species	PCB 1016	PCB 1221	PCB 1232	PCB 1242	PCB 1248	PCB 1254	PCB 1260	PCB Total
RM 5.4								
Rock bass	ND	ND	ND	ND	ND	ND	ND	ND
Smallmouth bass	ND	ND	ND	ND	ND	ND	ND	ND
Yellow bullhead	ND	ND	ND	ND	ND	ND	ND	ND
RM 4.3								
Rock bass	ND	ND	ND	ND	94.3	ND	ND	94.3
Smallmouth bass	ND	ND	ND	ND	56.3	ND	ND	56.3
Smallmouth bass	ND	ND	ND	ND	ND	ND	ND	ND
RM 2.4								
Rock bass	ND	ND	ND	ND	ND	ND	ND	ND
Smallmouth bass	ND	ND	ND	ND	282	ND	76.2	358.2
Smallmouth bass	ND	ND	ND	ND	110	ND	ND	110
RM 1.5								
Rock bass	ND	ND	ND	ND	ND	ND	ND	ND
Smallmouth bass	ND	ND	ND	ND	178	ND	56.6	234.6
Smallmouth bass	ND	ND	ND	ND	110	ND	56.9	166.9
Spotted bass	ND	ND	ND	ND	ND	ND	ND	ND

ND = not detected.

Ohio Department of Health fish consumption recommendations for total PCB levels: Unrestricted (0-50 ug/kg), one meal per week (51-300 ug/kg), one meal per month (301-1,000 ug/kg), six meals per year (1,001-1,900 ug/kg), and do not consume (>1,900 ug/kg).

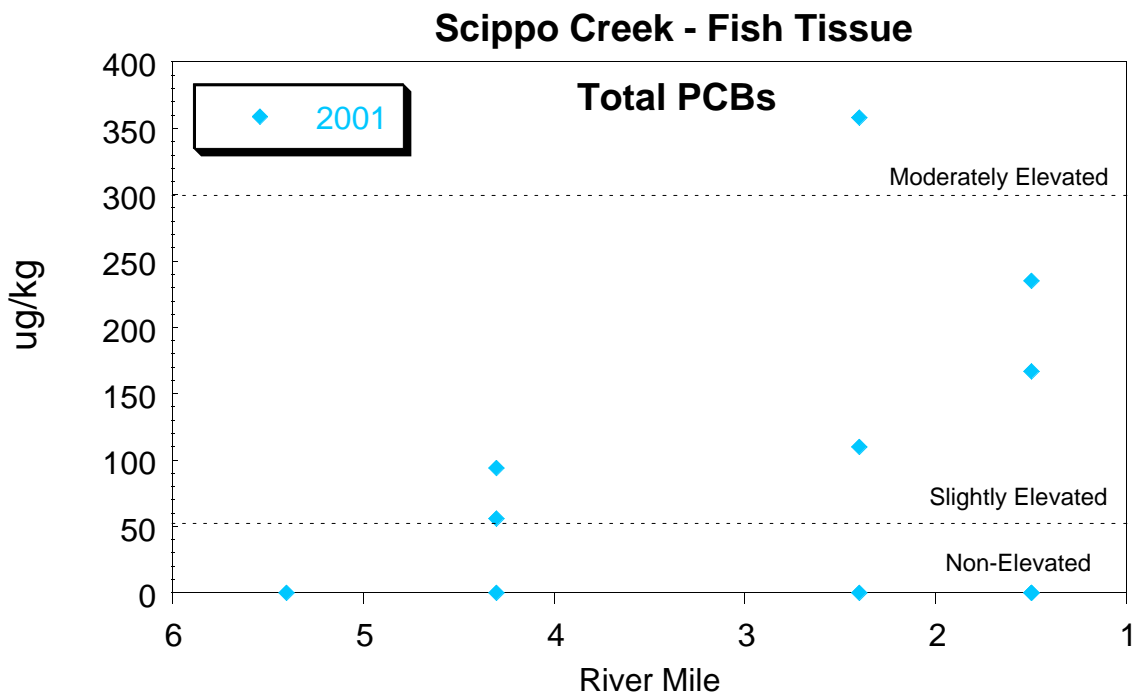


Figure 2. Scatter plot of total PCB levels in fish fillets collected from Scippo Creek by Ohio EPA during 2001. Qualitative descriptions of non-elevated, slightly elevated, and moderately elevated correspond to Ohio Department of Health consumption recommendations of unrestricted, one meal per week, and one meal per month as noted in the Ohio Fish Tissue Contaminant Monitoring report (Ohio EPA 1996).

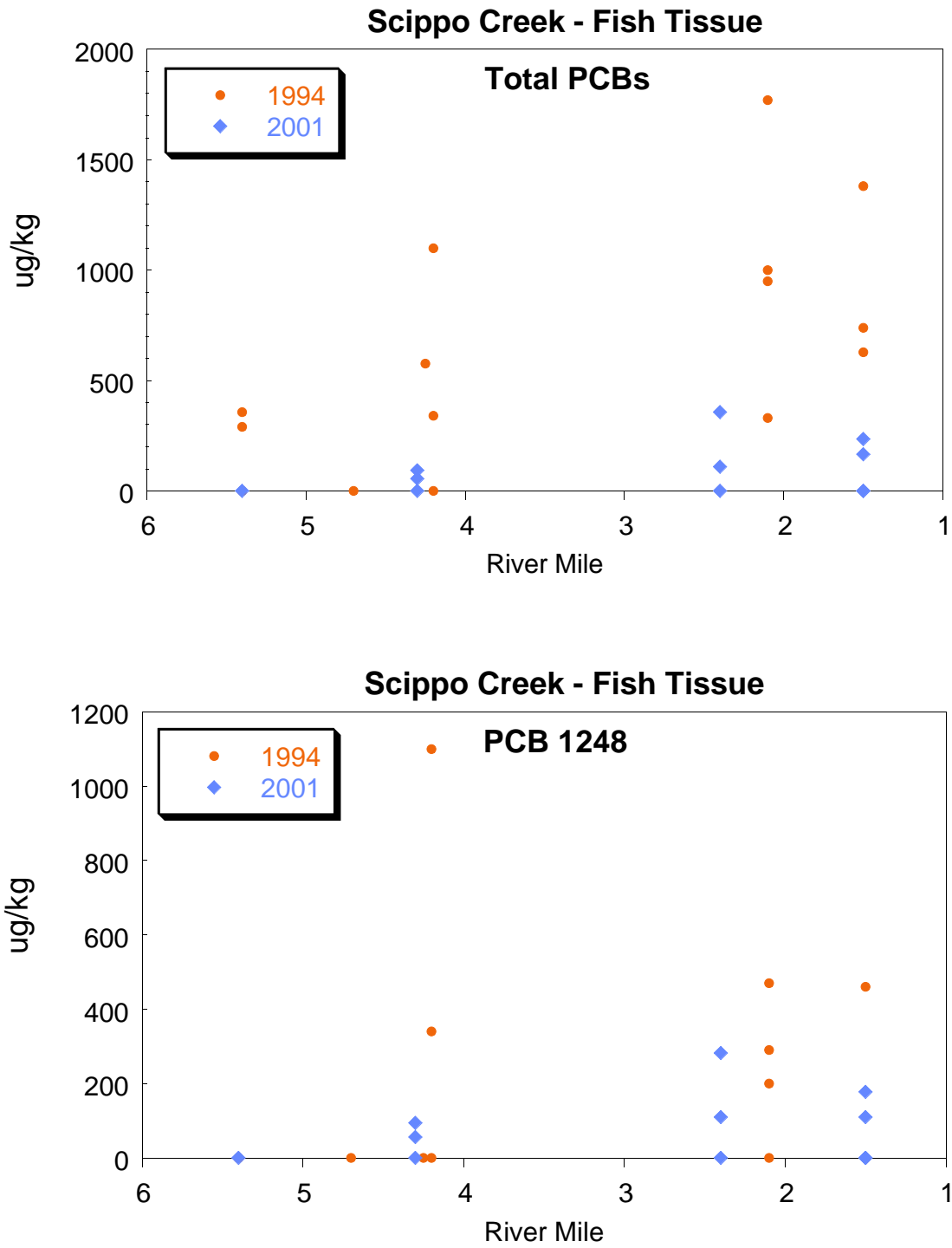


Figure 3. Scatter plots of total PCBs and PCB 1248 in fish fillet samples collected in Scippo Creek during 1994 and 2001.

Table 5. Pesticides, PCBs, and percent lipid measured in fish fillets collected from Scippo Creek, September 13, 2001 by Ohio EPA.

Sample Location	RM 5.4	RM 5.4	RM 5.4	RM 4.3	RM 4.3	RM 4.3
Sample Number	444.01	445.01	443.01	450.01	449.01	451.01
Fish Species	Rock bass	Smallmouth bass	Yellow bullhead	Rock bass	Smallmouth bass	Smallmouth bass
Date Sampled	13-Sep-2001	13-Sep-2001	13-Sep-2001	13-Sep-2001	13-Sep-2001	13-Sep-2001
Aldrin (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
a-BHC (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
b-BHC (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
d-BHC (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
γ-BHC (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
4,4'-DDD (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
4,4'-DDE (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
4,4'-DDT (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Dieldrin (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Endosulfan I (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Endosulfan II (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Endosulfan sulfate (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Endrin (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Heptachlor (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Heptachlor epoxide (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Methoxychlor (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Mirex (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Hexachlorobenzene (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Alpha-Chlordane (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Gamma-Chlordane (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
Oxychlordane (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
cis-Nonachlor (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
trans-Nonachlor (ug/kg)	<10.0	<10.0	<10.0	<10.0	<10.0	<14.7
PCB-1016 (ug/kg)	<49.8	<50.0	<50.0	<49.9	<49.8	<73.7
PCB-1221 (ug/kg)	<49.8	<50.0	<50.0	<49.9	<49.8	<73.7
PCB-1232 (ug/kg)	<49.8	<50.0	<50.0	<49.9	<49.8	<73.7
PCB-1242 (ug/kg)	<49.8	<50.0	<50.0	<49.9	<49.8	<73.7
PCB-1248 (ug/kg)	<49.8	<50.0	<50.0	94.3	56.3	<73.7
PCB-1254 (ug/kg)	<49.8	<50.0	<50.0	<49.9	<49.8	<73.7
PCB-1260 (ug/kg)	<49.8	<50.0	<50.0	<49.9	<49.8	<73.7
Lipids (%)	0.279	0.779	0.53	0.319	0.965	0.472

Table 5. Continued.

Sample Location	RM 2.4	RM 2.4	RM 2.4	RM 1.5	RM 1.5	RM 1.5
Sample Number	447.01	446.01	448.01	453.01	454.01	455.01
Fish Species	Rock bass	Smallmouth bass	Smallmouth bass	Rock bass	Smallmouth bass	Smallmouth bass
Date Sampled	13-Sep-2001	13-Sep-2001	13-Sep-2001	13-Sep-2001	13-Sep-2001	13-Sep-2001
Aldrin (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
a-BHC (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
b-BHC (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
d-BHC (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
γ-BHC (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
4,4'-DDD (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
4,4'-DDE (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
4,4'-DDT (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Dieldrin (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Endosulfan I (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Endosulfan II (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Endosulfan sulfate (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Endrin (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Heptachlor (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Heptachlor epoxide (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Methoxychlor (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Mirex (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Hexachlorobenzene (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Alpha-Chlordane (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
Gamma-Chlordane (ug/kg)	<9.9	<10.0	<10.0	<10.0	11	14.5
Oxychlordane (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
cis-Nonachlor (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
trans-Nonachlor (ug/kg)	<9.9	<10.0	<10.0	<10.0	<9.9	<10.0
PCB-1016 (ug/kg)	<49.6	<49.9	<49.8	<49.8	<49.4	<49.8
PCB-1221 (ug/kg)	<49.6	<49.9	<49.8	<49.8	<49.4	<49.8
PCB-1232 (ug/kg)	<49.6	<49.9	<49.8	<49.8	<49.4	<49.8
PCB-1242 (ug/kg)	<49.6	<49.9	<49.8	<49.8	<49.4	<49.8
PCB-1248 (ug/kg)	<49.6	282	110	<49.8	178	110
PCB-1254 (ug/kg)	<49.6	<49.9	<49.8	<49.8	<49.4	<49.8
PCB-1260 (ug/kg)	<49.6	76.2	<49.8	<49.8	56.6	56.9
Lipids (%)	0.258	1.33	0.768	0.398	1.11	0.567

Table 5. Continued.

Sample Location	RM 1.5				
Sample Number	452.01				
Fish Species	Spotted bass				
Date Sampled	13-Sep-2001				
Aldrin (ug/kg)	<10.0				
a-BHC (ug/kg)	<10.0				
b-BHC (ug/kg)	<10.0				
d-BHC (ug/kg)	<10.0				
γ-BHC (ug/kg)	<10.0				
4,4'-DDD (ug/kg)	<10.0				
4,4'-DDE (ug/kg)	<10.0				
4,4'-DDT (ug/kg)	<10.0				
Dieldrin (ug/kg)	<10.0				
Endosulfan I (ug/kg)	<10.0				
Endosulfan II (ug/kg)	<10.0				
Endosulfan sulfate (ug/kg)	<10.0				
Endrin (ug/kg)	<10.0				
Heptachlor (ug/kg)	<10.0				
Heptachlor epoxide (ug/kg)	<10.0				
Methoxychlor (ug/kg)	<10.0				
Mirex (ug/kg)	<10.0				
Hexachlorobenzene (ug/kg)	<10.0				
Alpha-Chlordane (ug/kg)	<10.0				
Gamma-Chlordane (ug/kg)	<10.0				
Oxychlordane (ug/kg)	<10.0				
cis-Nonachlor (ug/kg)	<10.0				
trans-Nonachlor (ug/kg)	<10.0				
PCB-1016 (ug/kg)	<49.8				
PCB-1221 (ug/kg)	<49.8				
PCB-1232 (ug/kg)	<49.8				
PCB-1242 (ug/kg)	<49.8				
PCB-1248 (ug/kg)	<49.8				
PCB-1254 (ug/kg)	<49.8				
PCB-1260 (ug/kg)	<49.8				
Lipids (%)	0.149				

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