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General Electric-Housatonic River

Pittsfield, Massachusetts
CERCLIS #MAD002084093

Site Exposure Potential

The General Electric (GE) Housatonic River site extends from the GE facility on the East Branch of the Housatonic River in Pittsfield, Massachusetts, to Rising Pond, an impoundment on the river approximately 35 km downstream (Figure 1). The Housatonic River flows into Long Island Sound approximately 200 km from Pittsfield. The site also encompasses Silver Lake, next to the GE facility and hydraulically connected to the Housatonic River via a concrete conduit (Figure 2; BBL 1996).

The GE Pittsfield facility manufactured transformer products containing PCBs from 1932 until 1977. There are numerous contaminant source areas associated with the site, including a PCB spill at Building 68; eleven former oxbows (Oxbows A through K) that were filled with soil containing facility wastes; two landfills (in Unkamet Brook Area, and in Hill 78 Landfill Area); and several areas of contaminated soils along East Street, Newell Street, Lyman Street, and at Allendale School. In addition, there are about 13 km of PCB-contaminated floodplain soils downstream from the facility that are potential sources of PCB contamination to the river. Table 1 describes these source areas. Figure 2

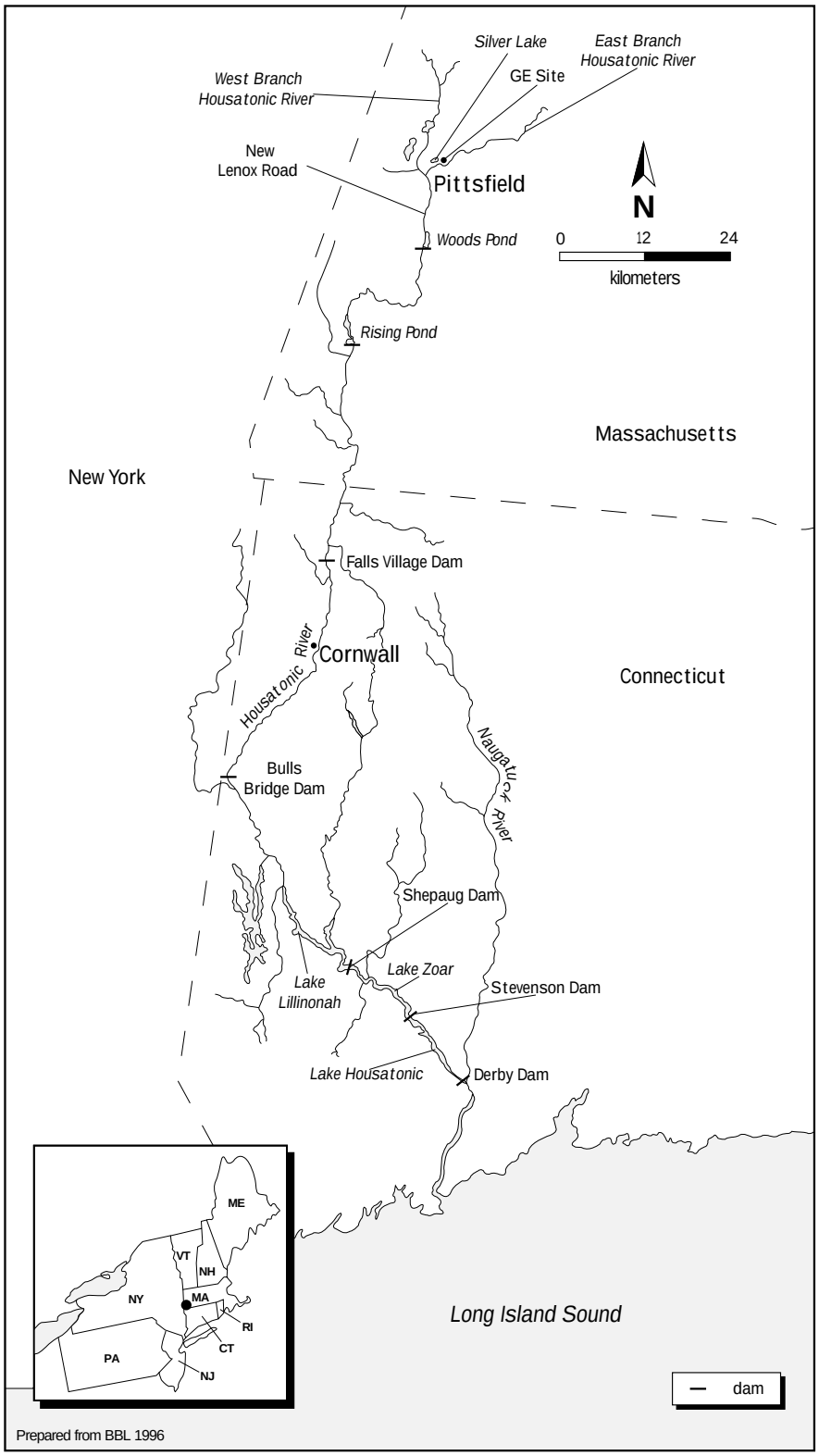

Figure 1. Location of the GE Housatonic site.

Table 1. Contaminant source areas associated with the GE facility (EPA 1994; BBL 1997).

Contaminant Source Area	Size	Description	Nature and Extent of Contamination
Building 68	NA	A storage tank at building 68 containing Aroclor 1260 collapsed in the late 1960s, releasing a portion of its contents onto adjacent soils and river sediments. Approximately 3,800 L of PCBs were released. Impacted surface rocks and sediments were removed to the extent possible but substantial contamination remains.	Concentrations of PCBs up to 102,000 mg/kg were found in riverbank soils and up to 54,000 mg/kg in river sediment.
Other Former Oxbows (A, B, C, E, F, J, K)	6.9 ha	These oxbows include seven of eleven oxbows that were filled during a rechanneling project in the early 1940s. Filling from various sources continued into the 1980s.	PCBs were measured at concentrations up to 1,800 mg/kg. Metals, SVOCs, dioxins, and furans also have been detected.
Lyman Street Parking Lot (contains Oxbow D)	1.6 ha	This area is an inactive GE auxiliary parking lot. An oil and groundwater pump and treat system was installed to minimize PCB seepage into the river.	Coal tar wastes and PCB oils are present in LNAPL and DNAPL in groundwater. Elevated VOCs, SVOCs, dioxins/furans, and PCBs have been detected in groundwater.
Newell Street Area I (Oxbow I)	4.4 ha	This oxbow was filled during the 1940 rechanneling project and is now used by various commercial facilities. Limited soil removal and capping has been completed.	PCBs were measured in subsurface soils at concentrations up to 290,000 mg/kg. Soils contain elevated concentrations of trace elements, VOCs, SVOCs, dioxins, and furans.
Newell Street Area II (Parking Lot) (Oxbow G)	1.2 ha	This area is an oxbow filled with various types of materials from various sources. The site is an inactive GE auxiliary parking lot.	PCBs were measured in subsurface soils at concentrations up to 80,000 mg/kg.
East Street Area I	20 ha	This area includes part of the GE facility and some adjacent commercial property.	LNAPL layer is present in groundwater.
East Street Area II (contains Oxbow H)	54 ha	This area includes the former Berkshire Gas plant. A slurry wall was installed to minimize PCB oil seepage into the River. An oil and groundwater pump and treat system retrieves approximately 3,800 L of PCB-contaminated oil per month.	LNAPL and DNAPL are present. Elevated concentrations of VOCs, SVOCs, dioxins and furans, and metals were found in groundwater and soil. PCB concentrations in subsurface soils were as high as 4,500 mg/kg.
Unkamet Brook Area	51 ha	This area includes the former GE Ordnance plant (now Martin Marietta). Unkamet Brook flows through the area, which contained a former unlined waste lagoon and landfill area.	A dissolved VOC plume is present in groundwater, containing benzene, toluene, methylene chloride, and chlorobenzene; a maximum concentration of 230,000 mg/kg total VOCs was detected. PCB oil has been found in groundwater.
Hill 78 Landfill Area	23 ha	GE facility landfill between 1940 and 1980, currently the Altresco power plant. Soils containing less than 50 mg/kg PCBs from excavations of other facility areas were stored here from 1980 to 1990. The area was capped and is currently inactive.	PCBs were measured in sub-surface soils at concentrations up to 120,000 mg/kg.
Allendale Schoolyard	4.9 ha	Contaminated fill was used to grade the schoolyard in the 1950s. Area was capped in 1991 to minimize exposure, and is now an active schoolyard.	PCBs were detected in subsurface soils at concentrations up to 1,100 mg/kg.

shows the locations of the source areas, except for the contaminated floodplain areas, the Lyman Street Parking Lot, and the associated Oxbow D. Specific locations for the latter three source areas could not be found in the reviewed documents.

EPA ordered GE to remove contaminated sediments near Building 68, and a work plan was submitted in February 1997 (BBL 1997). In September 1997 the Housatonic River downstream of GE Pittsfield was proposed for the National Priorities List.

The primary pathways for migration of PCBs to the Housatonic River are flow of non-aqueous phase liquid, both LNAPL and DNAPL; groundwater flow; surface runoff; and erosion. Following the Building 68 spill, PCB contamination was redistributed when PCB-contaminated soils were used to fill oxbows. These contaminated soils release PCBs to the river, especially during floods. PCBs reportedly were discharged to sewers leading directly to the river (ChemRisk 1997), but locations for these sewer outfalls were not provided in the reviewed documents. Currently, stormwater runoff from the GE facility drains to Silver Lake, which has a piped overflow to the river.

Groundwater is also an important potential pathway for contaminants to migrate from the site. Geology in the upper Housatonic basin consists of soluble carbonate limestone and dolomite bedrock, overlain by a deep layer of unconsolidated, well-sorted, coarse-grained sand and gravel. Both formations are highly permeable (BBL 1991). Water table depths were not provided, but some contaminated areas have been identified as discharging groundwater to the Housatonic, including the Unkamet Brook Area, East Street Area II, Newell Street Area, and the Lyman Street Parking Lot (BBL 1991).

In September 1998 the various Federal, state, and local governments, and GE concluded an Agreement in Principle for cleanup actions at the site. Beginning in June 1999, GE will remove and restore the first 0.8 km of river and riverbank below the plant. The agreement also commits the parties to conduct a coordinated cleanup of the remainder of the river, its banks, the former oxbows, and the ten-year floodplain in subsequent years (EPA 1998).

NOAA Trust Resources and Habitats

The habitats of concern to NOAA are the Housatonic River from the East Branch on the upper watershed to the River's mouth on Long Island Sound, and the associated riparian and nearshore areas. The Housatonic basin covers approximately 5,000 km^2 in three states (Massachusetts, New York, and Connecticut). None of the dams on the river provide for migratory fish passage. The larger dams form the impoundments of Woods Pond, Rising Pond, Falls Village Impoundment, Bulls Bridge Impoundment, Lake Lillinonah, Lake Zoar, and Lake Housatonic (Figure 1). Most of the river is estuarine below Derby Dam.

The catadromous American eel, several anadromous fish species, and numerous estuarine species are the NOAA trust species of concern (Table 2). The American eel, which can traverse most dam structures, are found throughout much of the watershed, including near the site. Anadromous fish are blocked at the Derby Dam, approximately 20 km upstream from the river mouth (Figure 1). There are estuarine fish throughout the lower river, except for the first few kilometers below Derby Dam, which are freshwater tidal.

Ten anadromous fish species use the lower Housatonic River below the Derby Dam (Table 2). Five of the species—white perch, blueback herring, alewife, American shad, and gizzard shad—spawn during the spring in tidal freshwater areas below the dam. White perch complete their

Table 2. Common NOAA trust species of concern in the Housatonic River and estuary.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
ANADROMOUS/CATADROMOUS FISH						
Alewife	*Alosa pseudoharangus*	♦	♦			
American eel	*Anguilla rostrata*		♦			♦
American shad	*Alosa sapidissima*	♦	♦			♦
Brown trout	*Salmo trutta*		♦			
Blueback herring	*Alosa aestivalis*	♦	♦			
Gizzard shad	*Dorosoma cepidianum*	♦	♦			
Hickory shad	*Alosa mediocris*		♦			
Sea lamprey	*Petromyzon marinus*		♦			♦
Striped bass	*Morone saxatilis*		♦			♦
White perch	*Morone americana*	♦	♦	♦		
ESTUARINE FISH						
Atlantic menhaden	*Brevoortia tyrannus*		♦	♦		♦
Atlantic tomcod	*Microgadus tomcod*	♦	♦	♦		
Bay anchovy	*Anchoa mitchilli*		♦	♦		♦
Bluefish	*Pomatomus saltatrix*		♦			
Cunner	*Tautoga onitis*	♦	♦	♦		
Goby	*Gobiosoma* sp.	♦	♦	♦		
Killifish	*Fundulus* sp.	♦	♦	♦		
Red hake	*Urophycis chuss*		♦			
Sheepshead minnow	*Cyprinodon variegatus*	♦	♦	♦		
Skates	*Raja* sp.	♦	♦	♦		
Silversides	*Menidia* sp.	♦	♦	♦		
Tautog	*Tautogolabrus adspersus*	♦	♦	♦		♦
Weakfish	*Cynoscion nebulosus*		♦			
Windowpane flounder	*Scophthalmus aquosus*	♦	♦	♦		♦
Winter flounder	*Pleuronectes americanus*	♦	♦	♦		
INVERTEBRATES						
Bay shrimp	*Crangon septemspinosa*	♦	♦	♦		
Blue crab	*Callinectes sapidus*	♦	♦	♦		
Blue mussel	*Mytilus edulis*	♦	♦	♦		♦
Eastern oyster	*Crassostrea virginica*	♦	♦	♦	♦	
Grass shrimp	*Palaemonetes pugio*	♦	♦	♦		♦
Northern quahog	*Mercenaria mercenaria*	♦	♦	♦		♦
Soft shell clam	*Mya arenaria*	♦	♦	♦		

life cycle within the more saline reaches of the estuary, so Housatonic River populations likely spawn, rear, and reside in the lower river. Adult blueback herring, alewife, American shad, and gizzard shad reside in coastal areas of Long Island Sound and migrate into the river during spawning runs. Juveniles of these four species use the river as a nursery before returning to the Sound (Gephard personal communication 1998).

Numerous estuarine fish and invertebrate species occupy the Housatonic estuary and Long Island Sound (Table 2). Eastern oyster and northern quahog are the most common mollusks in the Sound's intertidal and subtidal waters. Grass and bay shrimp also are abundant, year-round residents of nearshore estuaries (Stone et al. 1994).

Several small forage species, including Atlantic menhaden, bay anchovy, sheepshead minnow, killifish, goby, and silversides, are abundant in Long Island Sound and probably inhabit the estuary, as well. Adult menhaden and anchovy move offshore seasonally, but populations of the other four species probably reside in the estuary year-round (Stone et al. 1994; Gephard personal communication 1998). Atlantic tomcod are inshore, shallow-water fish that spawn in low-salinity, and even fresh water, during the late fall and early winter. Red hake are found in the lower estuary and near coastal areas (Scott and Scott 1988). Both are common within Long Island Sound. It is likely that tomcod spawn in the lower Housatonic (Stone et al. 1994; Gephard personal communication 1998). Cunner and tautog are common, medium-sized fish in Long Island Sound associated with complex estuarine habitats such as rocky areas, mollusk beds, wharves, and submerged seaweed. Winter flounder, windowpane flounder, and skate are common demersal species that spawn and reside in nearshore estuaries of the Sound. Larger predators such as bluefish and weakfish are common coastal dwellers of the Sound that use estuaries and embayments as nurseries (Scott and Scott 1988; Stone et al. 1994).

The State of Connecticut tentatively plans to place fish passage facilities on the Derby Dam allowing anadromous fish access to Lake Housatonic and its tributaries. While fish passage construction around Derby Dam is not yet scheduled, the State currently is restoring the Naugatuck River, a tributary that discharges to the Housatonic River below the dam. Restoration of the Naugatuck would likely increase the number of anadromous fish using the Housatonic estuary. Currently, there are no plans to provide fish passage around the dams farther up the Housatonic (Gephard personal communication 1998).

There are recreational fisheries for several estuarine and anadromous species in the lower Housatonic River. Commercial fisheries in the lower river are limited, but commercial oyster beds are present. The states of Connecticut and Massachusetts have health advisories over the entire river below the GE site due to PCB contamination of edible fish (Gephard personal communication 1998).

Site Contamination

Data were available to characterize contaminant concentrations in soils along the riverbank near Building 68 and in the downgradient river floodplain (Table 1). Riverbank soils collected around Building 68 are highly contaminated with PCBs, with a maximum concentration of 102,000 mg/kg and an average surficial (0-5 cm) concentration of 720 mg/kg (BBL 1997). Floodplain soils also are highly contaminated with PCBs. Maximum concentrations were 377 mg/kg between the GE facility and New Lenox Road Bridge, 430 mg/kg between the New Lenox Road Bridge and Woods Pond, and 16 mg/kg downstream from Woods Pond (BBL 1996).

Sediment contaminant data are available from over 1,500 samples collected from Pittsfield to Long Island Sound to define the horizontal and vertical extent of PCB contamination (ChemRisk 1997). The highest concentrations of PCBs in river sediment were found in samples collected in 1996 from the Building 68 area (Table 3; BBL 1997). The maximum concentration of PCBs in these samples was 54,000 mg/kg and the area-weighted average concentration was 1,500 mg/kg. Sediment PCB concentrations up to 160 mg/kg were measured as far downstream as Woods Pond (BBL 1996). The maximum reported surficial sediment PCB concentration was 26 mg/kg in Rising Pond.

In 1994, sediment data collected in Silver Lake showed concentrations of PCBs as high as 3,100 mg/kg at depths between 30 and 36 cm. Concentrations were measured at 18,000 mg/kg at depths between 1.8 and 2 m (BBL 1996). The maximum PCB concentration in sediment from the 0- to 30-cm horizon was 350 mg/kg.

Other contaminants, including trace elements, PAHs, and dioxins were analyzed in a limited number of sediment samples collected in 1994 from Silver Lake and from the East Branch downstream to the confluence with the West Branch (BBL 1996). Maximum concentrations of these contaminants are shown in Table 3. Concentrations of lead (15,000 mg/kg) in sediment collected downstream from the GE facility were substantially higher than the TEL (35.0 mg/kg). Concentrations of chromium, copper, lead, mercury, nickel, and zinc in Silver Lake sediment all were notably higher than their respective TEL concentrations.

Concentrations of PAHs in sediment from the Housatonic River and Silver Lake were substantially higher than the TEL. Total dioxin and furan concentrations converted to toxic equivalent (TEQ) concentrations of 2,3,7,8-TCDD using TEQ factors from both EPA and the Massachusetts Department of Environmental Protection (MDEP) are reported in Table 3 (BBL 1996). The highest total TEQ concentrations (1.3 and 0.37 µg/kg) were found near the Lyman Street Bridge, exceeding the EPA interim sediment quality guideline (0.060 µg/kg) for low risk to fish (EPA 1993a). A TEQ summation for Silver Lake sediments was not reported.

Table 3. Maximum concentrations of contaminants in sediment (mg/kg except where noted) and surface water (µg/L) detected in Housatonic River and Silver Lake compared to NOAA screening guidelines.

	Sediment[a]					Surface Water[a]			
Contaminant	Upstream from Building 68	Building 68 to Elm St. Bridge	Elm St. Bridge to W. Branch Confluence	Silver Lake	TEL[b]	Upstream from Unkamet Brook	Unkamet Brook to Dawes Ave. Bridge	Silver Lake	AWQC[c]
Trace Elements									
Arsenic	5.1	7.4	ND	12	5.9	<2.5	<2.5	5.2	190
Chromium	18	33	18	180	37	<1.8	5.1	NA	NA
Copper	31	130	23	2,000	36	3.5	9.2	13	11[g]
Lead	73	16,000	210	3,900	35	1.5	3.6	8.4	3.2[g]
Mercury	0.38	0.28	0.67	5.2	0.17	ND	ND	ND	0.012
Nickel	18	24	11	200	18	<3.6	<3.6	ND	160[g]
Silver	3.8	ND	ND	24	1.0[i]	ND	ND	ND	0.12
Zinc	110	160	96	1,900	120	12	16	31	110[g]
Organic Compounds									
PCBs	6.0	54,000[d]	96	3,100	0.00227	0.13	0.54	0.34	0.014
PAHs	7.4	13	42	91	4.0[i]	NA	NA	NA	300[h]
Dioxins/furans (ug/kg) (EPA TEQs)	0.013	1.3	0.091	0.055[e]	0.06[f]	NA	NA	NA	NA
Dioxins/furans (ug/kg) (MDEP TEQs)	0.0018	0.37	0.042	0.055[e]	0.06[f]	NA	NA	NA	NA

a: Data from BBL (1996) except where noted. Data are presented for sediment collected to a maximum depth of 61 cm.
b: Threshold effect level; concentration below which adverse effects were rarely observed (geometric mean of the 15% concentration in the effects dataset) as compiled by Smith et al. (1996).
c: Freshwater chronic ambient water quality criteria (EPA 1993b).
d: Data from BBL (1997).
e: Value presented is concentration of 2,3,7,8-TCDD only; TEQ for sum of dioxins/furans not calculated.
f: Interim value representing low risk to fish (EPA 1993a).
g: Hardness-dependent criterion; 100 mg/L $CaCO_3$ assumed.
h: Lowest observed effects level.
i: Freshwater TEL not available, marine effects-range low (ERL) provided instead (Long et al. 1995).
NA: Not available.
ND: Not detected; detection limit not reported.

Table 3 presents maximum surface water concentrations collected in 1995 (BBL 1996). Surface water concentrations of lead in the Housatonic River and Silver Lake, and copper in Silver Lake, slightly exceeded their respective freshwater chronic AWQC concentrations. Concentrations of PCBs in Housatonic River and Silver Lake surface waters exceeded the chronic AWQC by more than an order of magnitude.

Several sampling rounds from the Massachusetts portion of the river provide data on PCBs in fish tissue (Tables 4 and 5). Young-of-year fish from New Lenox Road, Woods Pond, and near the Connecticut border were collected from 1994 to 1996 and analyzed as composite, whole-body samples. The maximum PCB concentration in these samples was 58 mg/kg in yellow perch from Woods Pond (BBL 1996; ChemRisk 1997). Between 1984 and 1992, the Academy of Natural Sciences of Philadelphia analyzed PCBs in adult fish from the Connecticut portion of the River (ANSP 1993). They found maximum PCB concentrations in brown trout from Cornwall (29 mg/kg) and in American eel from Lake Zoar (28 mg/kg) (BBL 1996).

Table 4. Maximum concentrations of PCBs (mg/kg wet weight) in composite young-of-year fish collected from the Housatonic River in Massachusetts in 1994 and 1996 (BBL 1996; ChemRisk 1997).

Species	New Lenox Road	Woods Pond	Connecticut Border
Bluegill or pumpkinseed	31	26	4.2
Largemouth bass	36	37	4.8
Yellow perch	35	58	4.6

Summary

Activities at the GE facility in Pittsfield, Massachusetts have contaminated the Housatonic River with PCBs and other substances. Sediment, surface water, riverbank soils, and floodplain soils are highly contaminated near the site. PCBs have been measured in sediment as far downstream as Rising Pond at concentrations substantially exceeding the ERL. Catadromous American eel is the only NOAA trust resource inhabiting the river upstream of the Derby Dam, although tentative plans to provide fish passage around this dam will allow anadromous fish to access Lake Housatonic. Concentrations of PCBs as high as 28 mg/kg have been detected in American eel collected from Lake Zoar, which is separated from Lake Housatonic by the Stevenson Dam. An Agreement in Principle among the government agencies and the General Electric Company provides for cleanup of the river, its banks, and floodplain beginning in June 1999.

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Table 5. Maximum concentrations of PCBs (mg/kg wet weight) in composite fish samples from the Housatonic River in Connecticut from 1984 to 1992 (ANSP 1993).

Species	Cornwall	Bulls Bridge	Lake Lillinonah	Lake Zoar
American eel	NA	NA	NA	28
Bluegill	NA	NA	1.8	1.3
Brown trout	29	NA	NA	NA
Pumpkinseed	NA	NA	0.37	0.51
Redbreast sunfish	NA	NA	1.9	0.61
Smallmouth bass	14	5.7	7.3	3.3
Sunfish	NA	NA	1.9	1.3
White perch	NA	NA	NA	7.1
Yellow perch	NA	6.3	1.2	0.99

NA: Data not available.

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