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Naval Air Station Patuxent River

St. Mary's County, Maryland
CERCLIS #MD7170024536

Site Exposure Potential

Naval Air Station (NAS) Patuxent River is in St. Mary's County in southern Maryland at the confluence of the Patuxent River and Chesapeake Bay (Figure 1). The station covers 2,600 hectares on a broad headland peninsula known as Cedar Point. Most of the station's operations are concentrated in the western portion of the peninsula. Since 1942 the site has been one of the U.S. Navy's main centers for testing naval aircraft and equipment.

During the Initial Assessment Study, 31 sites within the NAS Patuxent River were identified as potentially contaminated, and 14 were recommended for further study. Two of these sites were transferred to the Navy's Underground Storage Tank Program. After the confirmation studies in 1985 and 1987, two sites were dropped from further investigation because contaminants were not detected. The remaining sites were included in the RI. Table 1 presents the size, location, dates of operation, and type and quantity of wastes disposed at each of the ten sites that were included in the RI, as well as Sites 9 and 34, which were dropped from the RI. The locations of these sites are shown in Figure 2.

The primary pathways for the transport of contaminants from the site to NOAA trust habitats

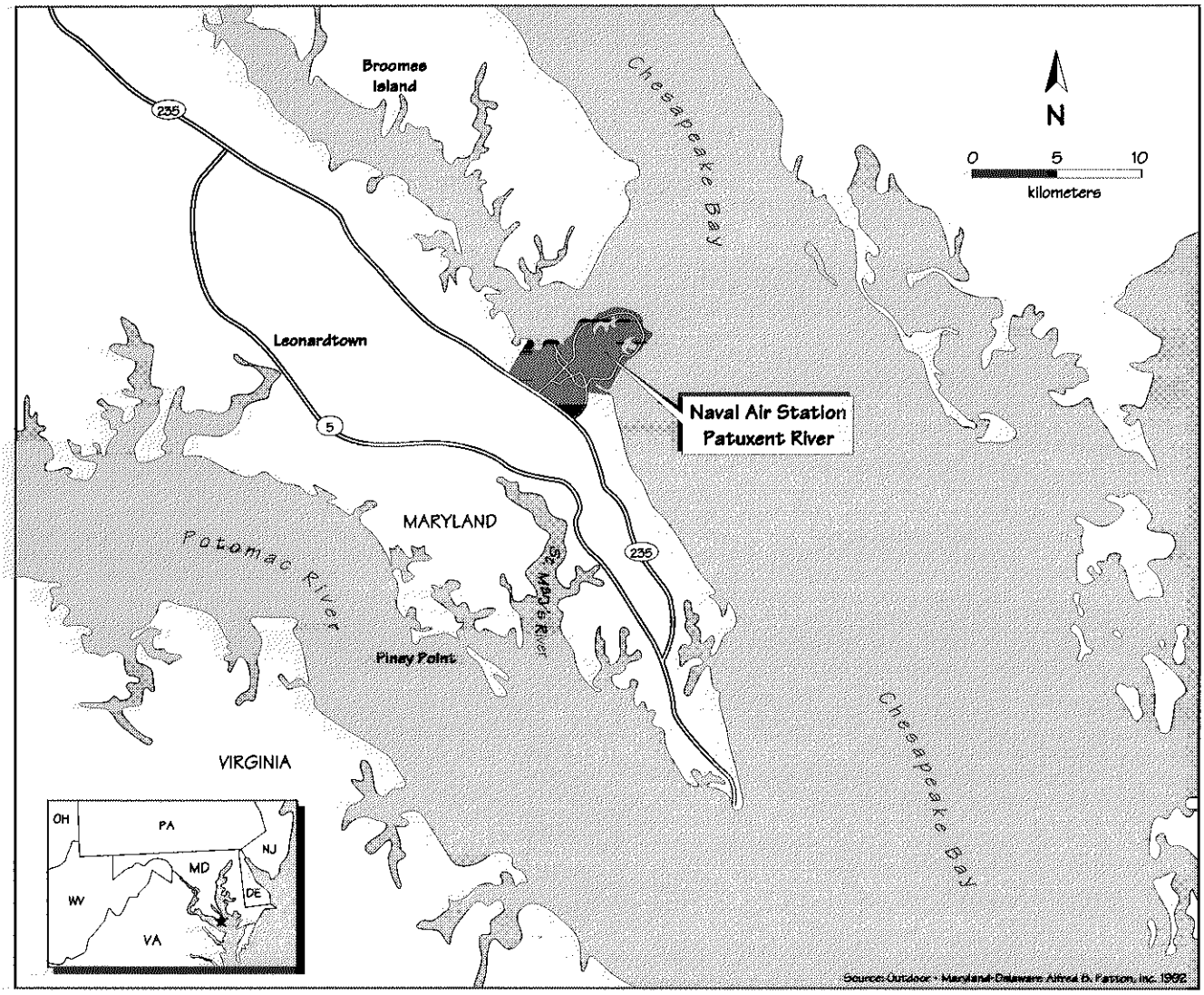

Figure 1. Location of Naval Air Station Patuxent River in St. Mary's County, Maryland.

are surface water runoff and groundwater migration. Two major drainage areas on NAS Patuxent River receive runoff from the ten waste sites. The first of these drainage areas contains Pond 1, and is located in the western portion of NAS Patuxent River (Figure 2). Pond 1 does not appear to have an outlet to the Patuxent River. However, the ground surface near Pond 1 slopes downward to the north toward West Patuxent Basin, which is connected to the Patuxent River. Runoff from Pond 1 would probably flow toward this basin. Three waste sites are situated within the Pond 1 drainage basin: Sites 2, 6, and 29. When wastes were disposed at Site 2, the pond area was a wetland at the bottom of a ravine. In 1950, this wetland was excavated and dammed to create

Table 1. The twelve sites of concern at NAS Patuxent River, Patuxent, Maryland (CH2M Hill 1992).

Site	Dates of Operation	Size	Type and Quantity of Waste/Contaminants of Concern (COCs)
Site 1 Fishing Point Landfill	1960 - 1974	10 hectares	Unspecified amounts of mixed waste were disposed here, including petroleum, oil and lubricant products, construction debris; sewage treatment sludges, paints, solvents, anti-freeze solution, and pesticides. COCs: lead, mercury, silver
Site 2 Disposal Site near Pond 1	1942 -1943	1 hectare	Unspecified quantities of construction debris, miscellaneous wastes, and 55-gallon drums containing various oils were dumped here. COCs: lead, mercury, pesticides/PCBs, PAHs
Site 4 Hermanville Disposal Site	1943 - 1960		Same waste types as described for Site 1. Quantities of waste were not reported. COCs: lead, mercury, silver
Site 6 Boneyard	1943 - 1949	2 hectares	Approx. 5,400 metric tons of fly and bottom ash from the Patuxent NAS coal-fired power plant were disposed here, and about 7,300 metric tons of liquid waste oils, paints, solvents and, possibly, pesticides were stored in drums. The drums have been removed, but a partially buried tank containing waste oil remains. COCs: cadmium, copper, lead, mercury, silver, zinc
Site 9 Drum Disposal Area	Unknown	2 hectares	Approx. 100 55-gallon drums (thought to be empty), scrap aluminum piping, trash cans, sheet metal, and tires were reportedly located near the bottom of a steep embankment bordering the north edge of the Supply Pond. Most of the debris was removed in 1984 during a general cleanup of the site. COCs: PAHs, pesticides
Site 11 Former Sanitary Landfill	1974 - 1980	2.6 hectares	Approx. 20,400 metric tons of paper and plastic trash were dumped. An additional 39 metric tons of waste were dumped, including oil-contaminated soils; petroleum, oil and lubricating wastes; paints, thinners, and solvents; pesticides; and photo lab wastes. COCs: mercury, silver, lead, beryllium, benzene, PCE, DCE, DCA
Site 17 Pest Control Building	1962 - 1989	1 hectare	Approx. 1,100 to 1,500 l/day of pesticide wash waters were generated. The waste was allowed to run off into soils or drainage ditches. Water that collects in ditches near this site eventually discharges to Pond 3. COCs: pesticides, lead

Table 1, cont.

Site	Dates of Operation	Size	Type and Quantity of Waste
Site 23 Defense Property Disposal Office (DPDO) Salvage Yard	1961 - 1971	Less than 1 hectare	Wastes were stored, dumped, or spilled on the ground until the site was paved in 1971. Approx. 6.5 metric tons of sulfuric acid and unspecified amounts of solvents were dumped. Unspecified quantities of residual liquids containing metal plating wastes, trichloroethylene, aliphatic naphthas, and kerosene were disposed here. COCs: lead, SVOCs
Site 24 Dry Well	1943 - 1970	Unspecified area	An estimated 8,300 l /day of rinsate waters from plating operations containing chromium, copper, cadmium, and silver were discharged to the dry well. COCs: cadmium, copper, lead, silver, chromium, cyanide
Site 28 Transformer Storage Area	1940s - 1973	Less than 1 hectare	Unknown quantities of transformer oils containing PCBs were drained onto soils adjacent to concrete pads where transformers were stored. COCs: PCBs
Site 29 Carbon Tetrachloride Disposal Area	Approx. 1947 - 1950	Less than 1 hectare	Approx. 6.8 metric tons of waste oil and 27 metric tons of carbon tetrachloride were poured on the ground. Also, 110 l/month of hydraulic fluid and 380 l/month of motor oil and aviation fuel were dumped on the ground. COCs: pesticides, PAHs, cadmium, copper, lead, zinc
Site 34 Borrow Pit	Unknown	4 hectares	Used as a borrow pit for the excavation of sand and gravel for landfill cover; since used for the disposal of construction debris and soil. COCs: DDT and its metabolites, PAHs

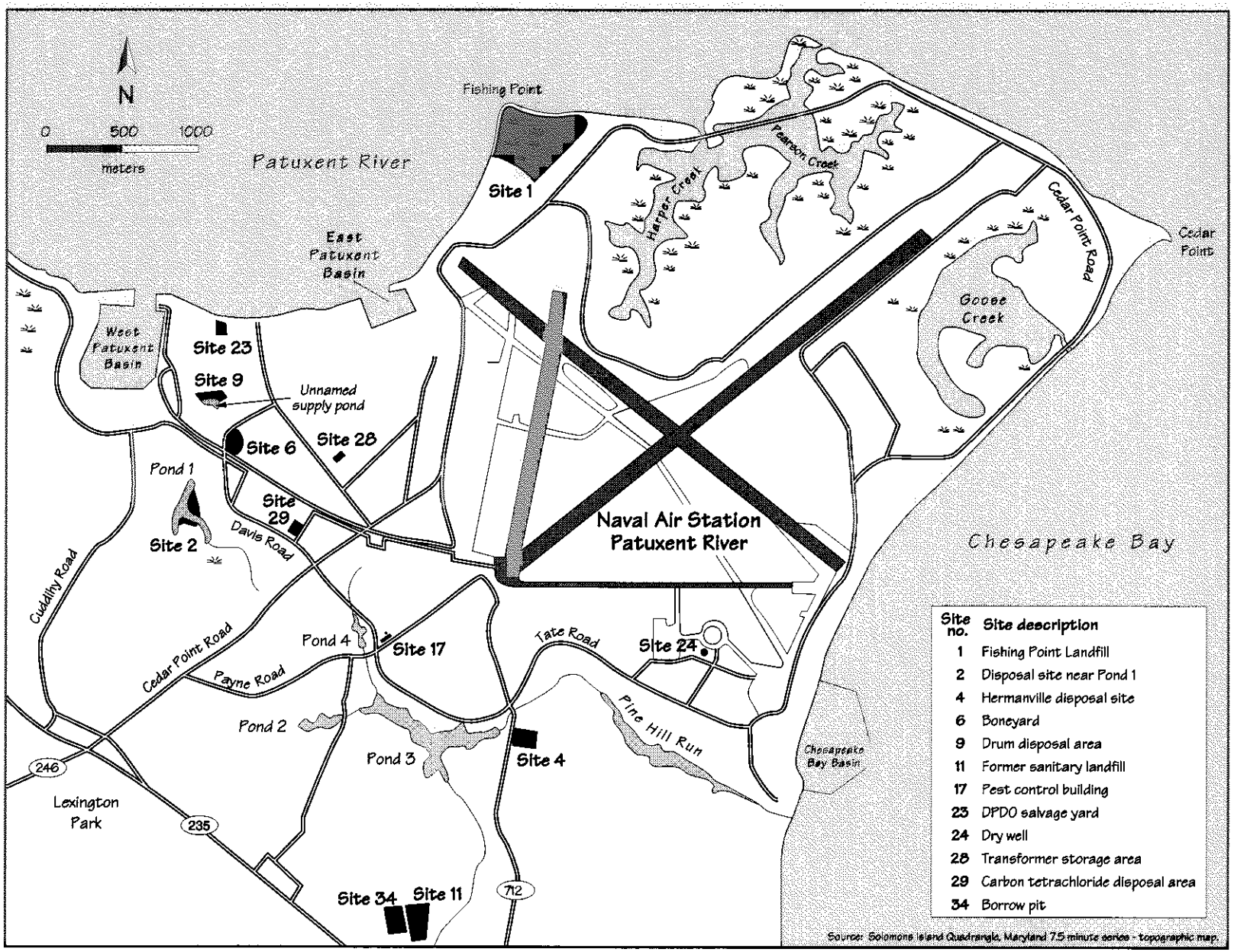

Figure 2. Detail of Naval Air Station Patuxent River in St. Mary's County, Maryland.

Pond 1. Surface runoff from Site 6 is expected to flow to the northwest toward West Patuxent Basin. During storms, surface runoff from Site 29 flows to a drainage ditch, which then flows through underground pipes for 460 m before discharging into Pond 1 (CH2M Hill 1992).

The second major drainage area of concern is Pond 3 and Pine Hill Run, in the southern part of NAS Patuxent River. The discharge from Pond 3 and its associated tributaries enters Pine Hill Run, which flows east into Chesapeake Bay approximately 2.5 km downstream from the pond. There are four waste sites within this drainage basin: Sites 4, 11, 17, and 34. Runoff from Site 4 enters a shallow drainage, which flows into Pine Hill Run to the northeast. Surface water from Sites 11 and 34 flows into two ephemeral tributaries of Pond 3 east and west of the sites. Pesticide rinse water from the Pest Control Building at Site 17 was released into drainage ditches that lead to Pond 3 (CH2M Hill 1992).

Surface water from the five remaining sites flows directly into the Patuxent River or Chesapeake Bay. Sites 1, 9, and 23 are located along the northern shore of the naval station, on land that slopes toward the Patuxent River. Sections of the Site 1 Landfill eroded into the Patuxent River before the shore was stabilized in 1994. Surface runoff from Site 24 is believed to flow into Chesapeake Bay Basin, also known as the Chesapeake Bay Seaplane Basin, about 1 km southeast of the site.

The surficial geological unit underlying NAS Patuxent River consists of about 30 m of unconsolidated gravel, sands, silts, and clays. Groundwater discharges from the surficial aquifer to surface water bodies on the base, including ponds, streams, the Patuxent River, and Chesapeake Bay (CH2M Hill 1994). Groundwater flows from Sites 1, 23, and 28 toward the Patuxent River; from Site 9 to the unnamed supply pond to the immediate south; from Sites 4, 11, 17, and 34 toward Pond 3 and Pine Hill Run; from Sites 6 and 29 toward Pond 1; and from Site 24 toward the Chesapeake Bay.

NOAA Trust Habitats and Species

Primary habitats of concern to NOAA are the surface waters and associated bottom substrates of the Patuxent River and Chesapeake Bay. Secondary habitats of concern are surface waters, bottom substrates, and estuarine emergent wetlands associated with Pine Hill Run.

Salinities in the Patuxent River and Chesapeake Bay near the site range from 10 to 25 ppt and fluctuate throughout the year, depending on rainfall, saltwater intrusion, and upstream freshwater input (Blazer 1992). The Patuxent River and Chesapeake Bay support diverse, abundant populations of NOAA trust resources that migrate close to the site and reside near the site for extended periods during sensitive life stages (Table 2; Ault 1992; Beavin 1992; Blazer 1992; Luo 1992; Rambo 1992). Seven species of

anadromous fish use surface waters near the site for juvenile and adult habitat, including American shad, alewife, blueback herring, hickory shad, striped bass, white perch, and yellow perch, which are considered anadromous in this region. The shortnose sturgeon, a state- and federally listed endangered species, use bottom-dwelling habitats in Chesapeake Bay (Rambo 1992).

Resident estuarine species of the Patuxent River and Chesapeake Bay that occur in substantial numbers include Atlantic menhaden, bay anchovy, mummichog, spot, and silversides (Luo 1992). Spot and Atlantic croaker are commonly present in surface waters surrounding the site during the spring and summer. Catadromous American eel are found throughout the Patuxent River and Chesapeake Bay. Forage fishes in the area include killifish, menhaden, mummichog, silversides, spot, and striped mullet. These species are food for larger predatory species including American eel, bluefish, striped bass, and weakfish (Rambo 1992). Notable populations of

Table 2. Major species that use the Patuxent River and Chesapeake Bay near the Patuxent NAS.

Species		Habitat			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
ANADROMOUS/CATADROMOUS SPECIES						
Blueback herring	*Alosa aestivalis*		♦	♦	♦	
Hickory shad	*Alosa mediocris*		♦	♦		
Alewife	*Alosa pseudoharengus*		♦	♦	♦	
American shad	*Alosa sapidissima*		♦	♦		
American eel	*Anguilla rostrata*			♦		
White perch	*Morone americana*		♦	♦	♦	♦
Striped bass	*Morone saxatilis*		♦	♦		♦
Yellow perch	*Perca flavescens*		♦	♦		
MARINE/ESTUARINE SPECIES						
Bay anchovy	*Anchoa mitchilli*	♦	♦	♦	♦	
Atlantic menhaden	*Brevoortia tyrannus*	♦	♦	♦		
Weakfish	*Cynoscion regalis*	♦	♦	♦	♦	♦
Gizzard shad	*Dorosoma cepedianum*			♦		
Mummichog	*Fundulus heteroclitus*	♦	♦	♦		
Killifish	*Fundulus spp.*	♦	♦	♦		
Spot	*Leiostomus xanthurus*		♦	♦		♦
Silversides	*Menedia spp.*	♦	♦	♦		
Atlantic croaker	*Micropongonias undulatus*	♦	♦	♦		♦
Striped mullet	*Mugil cephalus*	♦	♦	♦		♦
Summer flounder	*Paralichthys dentatus*	♦	♦	♦	♦	♦
Bluefish	*Pomatus saltatrix*			♦	♦	♦
Northern puffer	*Sphoeroides maculatus*		♦	♦		♦
Hogchoker	*Trinectes maculatus*	♦	♦	♦		
INVERTEBRATE SPECIES						
Blue crab	*Callinectes sapidus*	♦	♦	♦	♦	♦
Eastern oyster	*Crassotrea virginica*	♦	♦	♦	♦	♦

eastern oyster are found in surface waters surrounding the site. Surface waters north of the site provide important habitat to large, overwintering populations of blue crab (Ault 1992).

Although limited data were available regarding resource use of the Pine Hill Run, its tidal exchange and proximity to Chesapeake Bay would suggest that trust species periodically use the creek. These species include anchovy, flounder, killifish, mullet, mummichog, weakfish, and silversides (Rambo 1992).

Tidal amplitude near the site is commonly 0.5 m (Rambo 1992). The majority of the NAS Patuxent River shoreline along the Patuxent River and Chesapeake Bay is retained with concrete and timber bulkheads, gabions, and riprap. Limited portions of the shoreline remain as natural beach or bank. Several areas along the northern shore of the site were highly eroded (Rambo 1992). Pine Hill Run is tidally influenced for approximately 1.5 km upstream from Chesapeake Bay and is obstructed by both natural and manmade barriers. Creek depths commonly range from 0.3 to 1.0 m deep. Pond 3, the largest freshwater pond located on the base, is impounded by a structure that limits upstream migration into the freshwater habitat for all trust species except American eel.

Three major types of wetlands are found at NAS Patuxent, including freshwater wetlands, estuaries, and salt marshes. Principal estuaries and associated salt marshes are located at the confluence, and surround the perimeters of Chesapeake Bay, Pine Hill Run, and Goose, Pearson, and Harper creeks (Roy F. Weston, Inc. 1994a). Vegetation within the wetland surrounding Pine Hill Run is dominated by smooth cordgrass *(Spartina alterniflora)*, common reed *(Phragmites communis)*, and button bush *(Cephalanthus occidentalis)*. Bottom substrates of Pine Hill Run and associated wetlands are composed mostly of silt and muck. There are extensive submerged aquatic beds of widgeon grass *(Ruppia maritima)* and horned pondweed *(Zannichellia palustris)* in Pine Hill Run and the other creeks on the base (Rambo 1992).

The Patuxent River and Chesapeake Bay near the site support important recreational and commercial fisheries (Table 2). Commercially harvested species in this area include Atlantic croaker, alewife, white perch, blueback herring, bay anchovy, bluefish, summer flounder, weakfish, eastern oyster, and blue crab. Popular sport fisheries in the area include Atlantic croaker, blue crab, northern puffer, spot, summer flounder, striped bass, and weakfish. Bank and boat fishing are popular along the Patuxent River and Chesapeake Bay surrounding the base (Blazer 1992), as well as on the northern shore, seaplane walls, and Cedar Point (Fred C. Hart and Associates, Inc. 1984). Oyster beds in Harper and Pearson creeks are occasionally seeded. These oyster beds have a history of temporary closures due to nonpoint source pollution (Fred C. Hart and Associates, Inc. 1984).

Moratoriums have been historically imposed near the site due to declining populations of several

NOAA trust resources, including American shad, hickory shad, striped bass, and yellow perch. In 1991, moratoriums on striped bass and yellow perch fishing were lifted, and the fisheries are now managed under strict state regulation (Blazer 1992; Rambo 1992). There has been a moratorium on hickory and American shad fishing since 1972 (Blazer 1992, 1996).

Site-Related Contamination

Data collected during site investigations indicate that groundwater, surface water, sediments, and soils at the NAS Patuxent River site are contaminated (Table 3). All sites had concentrations of at least one contaminant that exceeded screening guidelines. Overall, trace elements and pesticides are the primary contaminants of concern. Sites 1 and 23 are of concern to NOAA due to their proximity to the Patuxent River and the elevated concentrations of trace elements detected in surface waters at and near the sites.

Site 17 had elevated concentrations of pesticides in soils and groundwater, and in sediment and surface water from Pond 3 and a small tributary flowing to Pond 3. These results indicate widespread contamination in all media at the site and a pathway for contaminant migration from the site.

Surface water, sediment, and fish tissue were sampled at Site 2. Numerous contaminants were found in sediment at concentrations exceeding their screening guidelines. Some of these contaminants were also detected in fish tissue from Pond 1, but no screening guidelines are available for fish tissue. Detection limits for surface water contaminants exceeded guidelines. Groundwater and soil have not been collected from this site, so source and pathway information are not available.

At Sites 6, 28, and 29, elevated concentrations of trace elements and pesticides were detected in soils, but no information about sediments or pathways from these sites has been gathered.

Although silver appears to be a concern in groundwater at Sites 4 and 11, information is not available on contaminant migration from these sites to Pine Hill Run.

The data also indicate a source area and movement of trace elements from Site 24 towards Chesapeake Bay. However, sampling has not yet been conducted in the bay downstream from the site to determine whether trace elements have been transported to NOAA trust habitats.

Sites 9 and 34 are of less concern to NOAA because pesticides were detected at relatively low concentrations at the sites. It is not likely that these pesticides have been transported off site at concentrations of concern because of the apparent lack of drainage outlets, the distance from trust habitats, and the relative immobility of pesticides.

Table 3. Concentrations of primary contaminants in media collected from the twelve sites at NAS Patuxent River compared to screening guidelines (CH2M Hill 1994; Roy F. Weston 1994a, 1994b; Halliburton NUS 1995).

	Water (µg/l)			Soil (mg/kg)		Sediment (mg/kg)	
Contaminant	NAS Patuxent Groundwater	Surface Water	Marine Chronic AWQC[1]	NAS Patuxent Soil	Mean Earth's Crust[2]	NAS Patuxent Sediment	ERL[3]
Site 1							
Cadmium	25	<20	9.3	NA	0.06	<2.0	1.2
Lead	30	250	8.5	NA	10	23.0	46.7
Mercury	2.1	4.0	0.025	NA	0.03	<0.4	0.15
Silver	5	50	0.92[p]	NA	0.05	<2.0	1.0
Site 2							
Lead	NA	<80	8.5	NA	10	140	46.7
Mercury	NA	<0.4	0.025	NA	0.03	0.078	0.15
4,4'-DDD	NA	<0.04	3.6[a]	NA	N/A	0.31	NA
4,4'-DDE	NA	<0.04	14[a]	NA	N/A	0.26	0.0022
4,4'-DDT	NA	<0.1	0.001	NA	N/A	0.590	0.0016t
Dieldrin	NA	NR	0.0019	NA	N/A	0.093	NA
PCP	NA	NR	7.9	NA	N/A	0.110	NA
Aroclor 1260	NA	NR	0.03	NA	N/A	0.150	0.0227
Total PAHs	NA	NR	NR	NA	N/A	4.65	4.022
Site 4							
Lead	90	NA	8.5	32	10	NA	46.7
Mercury	UR	NA	0.025	0.6	0.03	NA	0.15
Silver	60	NA	0.92[p]	4.3	0.05	NA	1
Site 6							
Cadmium	2.4	NA	9.3	14	0.06	NA	1.2
Copper	50	NA	2.9[c]	170	30	NA	34
Lead	1,300	NA	8.5	500	10	NA	46.7
Mercury	ND	NA	0.025	0.9	0.03	NA	0.15
Silver	2.0	NA	p 0.92	33	0.05	NA	1
Zinc	94	NA	86	440	50	NA	150
TPH	<60	NA	N/A	18,000	N/A	NA	NA
Site 9							
Total PAHs	ND	ND	N/A	48	N/A	0.6	4.022
4,4'-DDD	ND	ND	3.6[a]	1.7	N/A	0.3	NA
4,4'-DDE	0.067	ND	14[a]	0.16	N/A	0.7	0.0022
4,4'-DDT	ND	ND	0.001	1.2	N/A	0.03	0.0016t
Site 11							NA
Mercury	2	<0.5	0.025	ND	0.03	ND	0.15
Silver	40	7.7	2.3	ND	0.05	ND	1

1: EPA (1993)
2: EPA (1983)
3: Long and MacDonald (1992)

Table 3, cont.

Contaminant	Water (µg/l)			Soil (mg/kg)		Sediment (mg/kg)	
	NAS Patuxent Groundwater	Surface Water	Marine Chronic AWQC[1]	NAS Patuxent Soil	Mean Earth's Crust[2]	NAS Patuxent Sediment	ERL[3]
Site 17							
Lead	82	2.7	8.5	450	10	372	46.7
Aldrin	ND	NR	1.3[c]	94	N/A	NR	0.002[d]
Chlordane	ND	NR	0.004	530	N/A	6.0	0.002[d]
a-Chlordane	0.11	21	0.004	28	N/A	NR	N/A
g-Chlordane	0.11	19	0.004	27	N/A	NR	N/A
4,4'-DDD	0.088	93	3.6[a]	2,900	N/A	420	NA
4,4'-DDE	0.06	17	14[a]	76	N/A	9.9	0.0022t
4,4'-DDT	0.17	480	0.001	5,000	N/A	4.9	0.0016t
Dieldrin	1.9	37	0.0019	220	N/A	0.034	N/A
Endrin ketone	0.37	<0.10	0.0023	NR	N/A	NR	N/A
Site 23							
Lead	ND	37	8.5	23.2	10	NR	46.7
Site 24							
Cadmium	240	<5	9.3	100	0.06	12	1.2
Chromium	<40	9	N/A	3,900	100	140	81
Copper	160	70	2.9[c]	610	30	28	34
Lead	130	37	8.5	934	10	80	46.7
Silver	20	<5	p 0.92	13.8	0.05	<0.6	1
Cyanide	26	NR	1	NR	NR	NR	N/A
Zinc	390	20	86	370	50	42	150
Site 28							
Aroclor-1260	0.48	NA	0.03	6,100	N/A	NA	0.0227
Site 29							
Cadmium	<20	NA	9.3	15	0.06	NA	1.2
Copper	<30	NA	2.9[c]	69	30	NA	34
Lead	<80	NA	8.5	630	10	NA	46.7
Zinc	70	NA	86	270	50	NA	150
4,4'-DDD	NR	NA	3.6[a]	0.28	N/A	NA	NA
4,4'-DDE	NR	NA	14[a]	0.023	N/A	NA	0.0022
4,4'-DDT	NR	NA	0.001	1.0	N/A	NA	0.0016t
Total PAHs	NR	NA	N/A	13	N/A	NA	4.022
Oil and Grease	NR	NA	N/A	2,189	N/A	NA	N/A
Site 34							
4,4'-DDD	0.073	ND	3.6[a]	0.12	120	0.003	NA
4,4'-DDE	0.073	ND	14[a]	0.23	230	0.007	0.0022
4,4'-DDT	0.073	ND	0.001	0.04	43	0.009	0.0016t

1: EPA (1993)
2: EPA (1983)
3: Long and MacDonald (1992)
< Less than the reported detection limit.
NA: Not analyzed.
N/A: Screening guidelines not available.
NR: Not reported.
ND: Concentration was below detection limits, but detection limits were not reported.
UR: Concentration reported in RI was unreadable.
a: Insufficient data to develop criterion; listed concentration is the acute lowest observed effect level (LOEL).
b: Apparent Effects Threshold; entry is lowest value among four AET tests: A - Amphipod bioassay, B - Benthic community impacts, M - Microtox bioassay, O - Oyster larvae bioassay
c: No chronic criterion has been developed. The listed concentration is the acute criterion.
d: Overall Apparent Effects Threshold (OAET)
p: Proposed criterion
t: DDT total

Summary

Elevated concentrations of trace elements, pesticides, PCBs, and petroleum products have been detected in groundwater, surface water, sediment, and soils at NAS Patuxent River. Several of these contaminants were measured at concentrations that far exceed screening guidelines. Data collected during several site investigations indicate a pathway for off-site migration of contaminants to NOAA trust resource habitats. The Patuxent River and Chesapeake Bay support numerous NOAA trust resources, including the shortnose sturgeon, which is listed as an endangered species by both the state of Maryland and the Federal Endangered Species Act. Trust species may also use Pine Hill Run and its associated wetland habitats. These data suggest that site-related contaminants pose a risk to NOAA trust resources.

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