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EXPOSURE OF BALD EAGLE NESTLINGS TO CONTAMINANTS ON NATIONAL PARK SERVICE LANDS WITHIN THE CHSEAPEAKE BAY

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CONTEXT

The United States Fish and Wildlife Service (FWS) originally listed the bald eagle as federally endangered on 11 March 1967 under The Endangered Species Protection Act of 1966 (16 U.S.C. 668aa-668cc) and subsequently under The Endangered Species Act of 1973 (16 U.S.C. 1531 et seq). The primary reason cited for the original listing was broad-scale population declines linked to dichloro-dephenyl-trichloroethane (DDT) and associated reproductive failure. On December 31, 1972, DDT was banned from use in the United States. Since the ban on DDT and formal listing under The Endangered Species Act, bald eagle populations have increased dramatically across much of the lower 48 states. During a periodic population review, the FWS determined that specific reclassification goals had been reached as outlined in regional recovery plans. On 12 July, 1994, the FWS published the proposed rule to reclassify the bald eagle from endangered to threatened in most of the lower 48 states (59 FR 35584). This proposal was followed on 12 July 1995 by the formal downlisting of most bald eagle populations (60 FR 36000). In the lower 48 states bald eagles increased from an estimated low in 1963 of 417 pairs (Sprunt 1963) to an estimated 5,748 pairs by 1998 (Millar 1999). On 6 July, 1999, the FWS published an Advance Notice of an intent to remove the bald eagle from the list of endangered and threatened wildlife (64 FR 36453). Bald eagles were ultimately removed from Endangered Species Act protections on 8 August, 2007 (72 FR 37345). However, bald eagles continue to receive federal protection under the Eagle Act and the Migratory Bird Treaty Act.

Bald eagles in the Chesapeake Bay have experienced a dramatic recovery from a low of approximately 60 breeding pairs in the early 1970s to 601 pairs by 2001 (Watts et al. 2007, 2008). The population is now believed to include more than 2,000 breeding pairs (Watts et al. unpublished). Recovery includes an increase in the number of breeding territories, an increase in reproductive rate, and an expansion in geographic distribution. Since the 1970s population growth rate has been exponential with an average doubling time of 8.2 years. Reproductive rate has increased from 0.2 in the early 1960s to more than 1.5 young per pair by the early 2000s and is now comparable to pre-DDT levels (Watts et al. 2008).

Reproductive rates have exceeded that believed to be required for a stable population in every year since 1984.

The availability of undeveloped waterfront property has become the dominant limiting factor for bald eagles in the Chesapeake Bay. Human activity is the best predictor of eagle distribution within the tidal portion of the Bay. Indicators of human activity such as housing and road density, shoreline use, and boating activity have been related to nest distribution (Watts *et al.* 1994), shoreline use (Buehler *et al*. 1991a, Watts and Whalen 1997), and the likelihood of nest abandonment (Therres *et al*. 1993) or recolonization (Watts et al. unpublished data). Since bald eagles began their most dramatic decline in the 1950s, the human population within the tidal reach of the Bay has increased by more than 50% (Forstall 1996). A preliminary review of development occurring around eagle nests in the lower Chesapeake Bay shows that development had occurred in 55% of shoreline areas by the late 1980s (Byrd *et al*. 1990). Similarly, Buehler *et al.* (1991b) found that in northern areas of the Bay, 75.6% of the shoreline had developments within 500 m. Application of a habitat suitability model to the James River in 1991 revealed that more than 50% of the available area was not suitable for eagle breeding due to human use (Watts *et a*l. 1994).

Due to their position as a top predator, bald eagles within the Chesapeake Bay will always be vulnerable to contaminants that are introduced into the aquatic food chain. Exposure to organochlorine pesticides was the primary cause for the decline in the population during the 1950s and 1960s (Byrd *et al*. 1990). Dieldrin caused direct mortality of adults and subadults and DDT/DDE greatly reduced hatching rates and productivity (Wiemeyer *et al*. 1984, 1993). Survival and successful reproduction of bald eagles in the Chesapeake Bay requires that eggs contain no more than two ppm DDE, 0.3 ppm dieldrin, and five ppm PCBs (Wiemeyer *et al*. 1984, 1993). Eggs collected after they failed to hatch in the 1970s contained mean concentrations of ten ppm DDE, one ppm dieldrin, and 25 ppm PCBs plus other organochlorine pesticides and their metabolites (Wiemeyer *et al*. 1984). These concentrations were among the highest in the species range. Concentrations were much reduced during the 1980s (Wiemeyer *et al*. 1993). Lead poisoning was linked to the death of four eagles within the Bay region during the 1970s and 1980s (Byrd *et al*. 1990) and has become one of the leading contaminant risks throughout the region as the population has recovered. Other contaminants such as carbamate and organophosphate pesticides have been documented in several eagle deaths in Maryland and Virginia (U.S. Fish and Wildlife Service, unpublished data).

Federal, state and other conservation lands are critical to the long-term maintenance of the Chesapeake Bay bald eagle population. Since the 1980s, colonization rates and subsequent breeding densities of bald eagles on government-owned lands have far outpaced those on private lands (Watts et al., unpublished data). Although many government and other conservation lands are managed with a mandate to provide habitat for existing and future breeding territories, breeding pairs should not be considered secure due to the continuing risk of exposure to environmental contaminants emanating from external sources.

OBJECTIVES

The primary objectives of this project are 1) to assess exposure of nestling eagles reared within and around National Park Service properties within the lower Chesapeake Bay to contaminants (heavy metals, legacy classes of organochlorine compounds, Polybrominated diphenyl ethers, etc.) and 2) to compare reproductive rates of pairs within and around parks to the populations within the estuarine systems (James River, York River, Potomac River) in which they are embedded.

The purpose of this interim report is to provide an update on activities related to these objectives.

STUDY AREA

Our study area included selected properties within the National Capital and Northeast regions of the National Park Service and tributaries of the Chesapeake Bay in which they are embedded. We surveyed all eagle habitat within the boundaries of selected properties including Colonial National Historical Park, Washington's Birthplace National Monument, National Colonial Farm and Piscataway Park and Fort Washington. In addition to targeted National Park Service properties, we surveyed portions of the tributaries (Potomac, York and James) in which they are embedded as part of ongoing monitoring programs being conducted by The Center for Conservation Biology.

FIELD METHODS

Nest Survey

We systematically surveyed study areas for breeding eagles using a standard 2-flight approach including 1) a survey flight and 2) a productivity fight. The survey flight was conducted from late February through late March to coincide with the peak of incubation. The productivity flight was conducted from mid-April through early May to take advantage of later brood ages.

Nest Survey – Aerial surveys were used to locate and map bald eagle nests throughout the NPS targeted properties and portions of the broader James, York and Potomac rivers. A high-wing Cessna 172 aircraft was used to systematically overfly the land surface at an altitude of approximately 100 m to detect eagle nests. Flights covered all lands within the boundaries of the national parks. Throughout the broader tributaries the survey plane was maneuvered systematically between the shoreline and a distance of approximately 1 km to cover the most probable breeding locations. Because bald eagles often nest near the headwaters of small streams, a special attempt was made to follow all waterways to their headwaters. All nests detected were plotted on 7.5 min topographic maps or a GPS-enabled laptop loaded with recent aerial imagery and assigned a unique, 3-part code that conforms to national standards.

Productivity Survey (Survey 2) - Active Bald Eagle nests were rechecked between mid-April and mid-May for productivity. A Cessna 172 aircraft was used to fly low over nests, allowing observers to examine nest contents. All eaglets were counted and aged by sight. Following national conventions USFWS 2007, Watts et al. 2008), a breeding territory was considered "occupied" if a pair of birds was observed in association with the nest and there was evidence of recent nest maintenance (e.g., well-formed cup, fresh lining, structural maintenance). Nests were considered "active" if a bird was observed in an incubating posture or if eggs or young were detected in the nest.

Banding

Nests within park boundaries and nearby areas were accessed using standard arborist equipment when the chicks were between 32 and 56 days old. Chicks were lowered to the ground for banding, measurements, and tissue collection. The following morphometric measurements were taken on all chicks: weight, wing length, tail length, culmen length, culmen depth and hallux length. Wing and tail length were measured with a ruler (± 1 mm) and culmen length, culmen depth and hallux length were measured with dial calipers (± 0.1 mm). Eagles were weighed on a digital scale (± 1 g).

Nestlings were marked with numeric federal bands (USGS Bird Banding Lab, Laurel, MD) on the right tarsus and purple alpha-numeric color bands (ACRAFT, Edmonton, Alberta) on the left tarsus. Banding and tissue collection was in accordance with state (VA and MD) and federal permits (USGS).

Blood Sampling

Blood samples were collected from the brachial vein in the wing using 23 gauge butterfly needles and 4cc heparinized Vacutainers©. The blood sample collected was subdivided into three Vacutainers© including one designated for heavy metal analysis, one designated for analysis of organic chemicals and one designated for lead isotope analysis (the latter was sent to a West Virginia Univeristy PhD student to be included as part of his graduate research). A maximum of 6cc of blood was collected from each eagle. Blood samples were immediately packed on ice and frozen within 4 hours of collection. All samples were labeled with the eagle's band number and unique nest code. Methodology for eagle handling and tissue collection was in compliance with protocols approved by the Institutional Animal Care and Use Committee at the College of William and Mary (protocol IACUC-2017-04-18-12065).

Blood Analysis

Blood samples were sent to two labs for analysis of heavy metals and organic compounds. One vial from each eaglet was sent to the Wisconsin State Laboratory of Hygiene. This sample was evaluated for cadmium, lead and mercury using inductively coupled plasma mass spectrometry (CDC Method CTL-TMS-3.01). A second vial of blood was sent to Rob Hale's Lab at the Virginia Institute of Marine Science, College of William and Mary. Blood extracts were analyzed using gas chromatography and mass spectrometry (Chen *et al.*, 2008).

PROGRESS

Nest Survey

We surveyed a total of 358 occupied eagle territories to assess breeding performance within the two study areas including 297 in 2016 (Appendix I) and 61 in 2017 (Appendix II). The sample included 12 and 8 nests within the James/York River and Potomac River National Park Service properties respectively.

Banding and Blood Collection

We banded 44 young eaglets from 22 nests including 21 in 2016 from the James/York River study area and 23 in 2017 from the Potomac River study area (Tables 1, 2). Blood samples were collected from a single young from each nest entered.

Table 1. Morphometrics of bald eagle nestlings banded on or near NPS lands in VA and MD during the 2016 -2017 breeding seasons.

Band Number	Color Band[1]	Nest Name	Year	Sex	Weight (g)	Culmen Length with Cere (mm)	Culmen Length without Cere (mm)	Culmen Depth (mm)	Halux Length (mm)	Tail Length (cm)	Wing Chord (cm)
0629-12153	RH	VB1501	2016	M	2892	52.3	42.1	27.9	34.5	14.8	33.6
0629-12154	RK	VB1501	2016	M	3368	54.5	42.8	29.9	33.8	12.4	29.3
0629-12157	RP	VB1002	2016	F	4326	60.2	48.4	33.4	38.2	21.7	43.7
0629-47631	PB	SU1404	2016	F	4400	61.4	48.0	32.5	37.8	20.0	43.3
0629-47632	PC	SU1404	2016	M	3650	48.6	45.0	30.5	34.8	20.5	40.5
0629-47633	PD	SU1602	2016	F	4178	62.5	48.0	33.7	36.9	17.5	39.0
0629-47634	PE	SU1602	2016	M	3300	52.9	41.1	28.0	30.0	16.2	34.5
0629-47635	PH	YK1503	2016	M	3384	53.2	42.9	28.9	31.4	18.7	37.5
0629-47636	PK	YK1503	2016	M	3260	55.1	43.1	28.5	30.9	16.9	35.4
0629-47637	PM	JC1105	2016	M	3116	50.7	37.8	27.4	30.0	10.8	26.7
0629-47638	PN	JC1202	2016	U	3030	49.6	39.0	27.8	31.0	6.5	26.4
0629-47639	PP	JC1202	2016	U	3404	53	40.7	29.0	32.8	4.0	23.0
0629-47640	PR	YK1601	2016	F	3716	51.5	40.4	29.9	32.1	5.0	24.6
0629-47641	PS	YK1601	2016	M	2520	50	36.1	25.8	25.9	3.1	18.8
0629-47642	PU	JC0501	2016	M	3550	56.6	44.0	30.4	36.5	9.1	28.5
0629-47643	PV	IW0802	2016	M	2814	40.3	36.5	27.5	28.4	5.3	21.7
0629-47644	PW	IW0802	2016	U							
0629-47645	PX	JC0803	2016	F	4492	62	48.9	32.7	37.0	15.7	38.5
0629-47646	PZ	JC0803	2016	F	4672	60.4	48.4	33.6	37.2	21.8	42.7
0629-47647	RA	YK0701	2016	M	3740	54	42.4	29.5	33.8	17.5	36.5
0629-47648		YK0701	2016	M	2336	54.2	41.6	28.8	30.1	10.2	31.0
0679-01403	UA	PAX-11 Pine Hill Run	2017	M	2808	51.9	40.0	28.2	31.4	10.5	28.5
0679-01404	UB	PAX-11 Pine Hill Run	2017	F	3650	56.7	44.5	30.6	32.4	10.5	29.5
0679-01405	UC	PAX-13 Golf Course	2017	F	5020	61.4	49.8	33.5	37.5	20.4	40.5
0679-01406	UD	PAX-13 Golf Course	2017	F	4670	56.5	46.5	32.8	36.0	16.1	36.5
0679-01407	UE	IH-12	2017	M	2908	52.7	41.9	28.5	31.0	10.8	29.0
0679-01408	UH	IH-12	2017	F	3662	56.4	44.1	31.4	34.2	8.5	28.2
0679-01409	UK	IH-18	2017	F	4120	58.7	46.3	20.4	35.7	13.3	34.3
0679-01410	UM	IH-18	2017	F	4560	61.9	49.3	34.0	37.3	17.5	38.2
0679-01411	UN	IH-18	2017	M	3566	56.8	44.3	29.8	32.6	15.4	37.4
0679-01412	UP	IH-26	2017	M	2698	50.8	38.9	27.9	29.4	6.1	24.1
0679-01413	UR	IH-26	2017	F	3610	56.0	43.8	31.5	31.9	6.4	25.5
0679-01414	US	IH-26	2017	M	3118	51.7	40.9	28.5	30.1	9.3	27.2
0679-01415	UU	FF1611	2017	M	3140	53.7	44.5	29.5	33.1	9.8	27.6

Band Number	Color Band[1]	Nest Name	Year	Sex	Weight (g)	Culmen Length with Cere (mm)	Culmen Length without Cere (mm)	Culmen Depth (mm)	Halux Length (mm)	Tail Length (cm)	Wing Chord (cm)
0679-01416	UV	FF1611	2017	M	3160	56.8	45.1	30.6	33.2	11.9	30.7
0679-01417	UW	FF1610	2017	M	2896	53.5	41.7	28.0	30.6	10.0	26.5
0679-01418	UX	FF1610	2017	M	3850	58.2	45.5	32.0	35.1	11.6	31.5
0679-01419	UZ	PAX-5 Goose Creek	2017	M	2700	51.4		27.2	28.9	6.9	21.2
0679-01420	17/D	WE1109	2017	M	3306	54.2	44.2	29.5	33.2	14.0	34.0
0679-01421	25/D	WE1109	2017	M	3214	56.4	44.2	31.8	33.4	13.8	33.4
0679-01422	23/D	WE1110	2017	M	2766	52.4	42.5	29.8	32.8	13.3	33.5
0679-01423	37/D	Piscataway Park West	2017	M	3450	55.9	44.4	31.1	33.0	12.1	32.2
0679-01424	38/D	Piscataway Park West	2017	F	3698	53.4	41.2	31.5	33.7	10.4	30.5
0679-01425	39/D	Piscataway Park West	2017	M	2870	53.6	40.0	27.5	30.5	6.8	26.5

Table 2. List of nests and locations where bald eagle nestling blood samples were taken for contaminant analysis.

Nest Name	Year	Date	Location	Latitude	Longitude	County	State
IW0802	2016	4/23/2016	Lawnes Creek	37.139173	-76.668017	Isle of Wight	VA
JC0501	2016	4/23/2016	NPS nr Kingsmill	37.223787	-76.686643	James City	VA
JC0803	2016	5/8/2016	Jamestown Island	37.196927	-76.756874	James City	VA
JC1105	2016	4/18/2016	Gospel Spreading Farm	37.221063	-76.726244	James City	VA
JC1202	2016	4/18/2016	Jamestown Island	37.208628	-76.767483	James City	VA
SU1404	2016	4/15/2016	Swan Point	37.204837	-76.805537	Surry	VA
SU1602	2016	4/15/2016	Scotland West	37.185700	-76.789893	Surry	VA
VB1501	2016	5/11/2016	Owl Creek	36.823300	-75.984630	Virginia Beach	VA
YK0701	2016	5/8/2016	Newport News Reservoir	37.193489	-76.520892	Newport News	VA
YK1503	2016	4/15/2016	Yorktown Battlefield	37.224238	-76.494181	York	VA
YK1601	2016	4/18/2016	Yorktown Creek	37.231119	-76.516167	York	VA
FF1610	2017	5/4/2017	Mason Neck NWR	38.624588	-77.174891	Fairfax	VA
FF1611	2017	5/4/2017	Mason Neck NWR	38.621108	-77.189308	Fairfax	VA
IH-12	2017	5/3/2017	Indian Head	38.602903	-77.170288	Charles	MD
IH-18	2017	5/3/2017	Indian Head	38.550179	-77.228536	Charles	MD
IH-26	2017	5/3/2017	Indian Head	38.566365	-77.177560	Charles	MD
PAX-11 Pine Hill Run	2017	5/2/2017	Patuxent River NAS	38.266362	-76.426070	Saint Mary's	MD
PAX-13 Golf Course	2017	5/2/2017	Patuxent River NAS	38.305733	-76.393560	Saint Mary's	MD
PAX-5 Goose Creek	2017	5/2/2017	Patuxent River NAS	38.298713	-76.383305	Saint Mary's	MD
Piscataway Park West	2017	5/9/2017	Piscataway NP	38.688620	-77.080295	Charles	MD
WE1109	2017	5/8/2017	George Washington's Birthplace NP	38.191146	-76.915450	Westmoreland	VA
WE1110	2017	5/8/2017	George Washington's Birthplace NP	38.175437	-76.922633	Westmoreland	VA

Heavy Metal Analysis

Results from assays for cadmium, lead and mercury were received for all blood samples submitted to the Wisconsin State Laboratory of Hygiene (Table 3).

Table 3. Lab results of bald eagle nestling blood analysis for cadmium, lead, and mercury.

Band Number	Nest Name	Year	Collection Date	Sample Location	Cadmium (µg/L)	Lead (µg/dL)	Mercurgy (µg/L)
0629-12153	VB1501	2016	5/11/2016	Owl Creek	<0.21	0.41	72.6
0629-47631	SU1404	2016	4/15/2016	Swan Point	<0.21	0.26	42.65
0629-47633	SU1602	2016	4/15/2016	Scotland West	<0.21	<0.20	21.73
0629-47635	YK1503	2016	4/15/2016	Yorktown Battlefield	<0.21	0.27	21.66
0629-47637	JC1105	2016	4/18/2016	Gospel Spreading Farm	<0.21	0.4	27.54
0629-47638	JC1202	2016	4/18/2016	Jamestown Island	<0.21	0.28	57.35
0629-47640	YK1601	2016	4/18/2016	Yorktown Creek	<0.21	0.32	31.18
0629-47642	JC0501	2016	4/23/2016	NPS near Kingsmill	<0.21	<0.20	10.64
0629-47643	IW0802	2016	4/23/2016	Lawnes Creek	<0.21	0.27	23.34
0629-47645	JC0803	2016	5/8/2016	Jamestown Island	<0.21	0.21	24.44
0629-47647	YK0701	2016	5/8/2016	Newport News Reservoir	<0.21	0.67	47.37
0679-01404	PAX-11 Pine Hill Run	2017	5/2/2017	Patuxent River NAS	<0.21	2.12	26.8
0679-01405	PAX-13 Golf Course	2017	5/2/2017	Patuxent River NAS	<0.21	<0.20	25.7
0679-01408	IH-12	2017	5/3/2017	Indian Head	<0.21	0.55	41.9
0679-01410	IH-18	2017	5/3/2017	Indian Head	<0.21	0.4	31.84
0679-01414	IH-26	2017	5/3/2017	Indian Head	<0.21	0.5	28.9
0679-01416	FF1611	2017	5/4/2017	Mason Neck NWR	<0.21	0.62	54.0
0679-01418	FF1610	2017	5/4/2017	Mason Neck NWR	<0.21	0.24	48.3
0679-01419	PAX-5 Goose Creek	2017	5/2/2017	Patuxent River NAS	<0.21	0.92	38.3
0679-01420	WE1109	2017	5/8/2017	George Washington's Birthplace NP	<0.21	0.44	28.4
0679-01422	WE1110	2017	5/8/2017	George Washington's Birthplace NP	<0.21	0.56	12.0
0679-01424	Piscataway Park West	2017	5/9/2017	Piscataway NP	<0.21	0.31	90.3

Fire Retardant Analysis

Results from assays for a full panel of PBDEs were received for all blood samples submitted to the VIMS contaminants lab (Tables 4 and 5).

Table 4. Lab results of bald eagle nestling blood analysis for several flame retardants in the 2016 breeding season. All units are in ng g-1, wet weight. Readings below the detection limit are designated "nd." Results are not surrogate recovery corrected. We did not detect much above the quantitation limit (~1 ng/ml) compared to the lab blank. There were exceptions for BDE209 in some of the samples, but those are appropriate levels for the birds.

Band Number	(Blank)	0629-12153	0629-47631	0629-47633	0629-47635	0629-47637	0629-47638	0629-47640	0629-47642	0629-47643	0629-47645	0629-47647
Nest Name	(Blank)	VB1501	SU1404	SU1602	YK1503	JC1105	JC1202	YK1601	JC0501	IW0802	JC0803	YK0701
2,2',4,4'-tetrabromodiphenyl ether (BDE-47)	nd	nd	1.63	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,2',3,4,4'-pentabromodiphenyl ether (BDE-85)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,2',4,4',6-pentabromodiphenyl ether (BDE-100)	5.40	34.9	5.53	6.81	8.23	5.96	5.75	6.56	6.29	7.59	5.64	6.88
2,2',4,4',5-pentabromodiphenyl ether (BDE-99)	2.63	15.6	2.33	2.12	2.13	1.72	1.05	2.27	1.02	2.69	1.44	2.64
2,2',4,4',5,6'-hexabromodiphenyl ether (BDE-154)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,2',3,4,4',5',6-heptabromodiphenyl ether (BDE-183)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,2',3,3',4,4',5,5',6-nonabromodiphenyl ether (BDE-206)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
decabromodiphenyl ether (BDE-209)	nd	nd	nd	nd	nd	nd	49.2	nd	nd	55.8	nd	nd
2-ethylhexyl 2, 3, 4, 5-tetrabromobenzoate (TBB)	12.0	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2-ethylhexyl 2, 3, 4, 5-tetrabromophthalate (TBPH)	2.56	nd	nd	nd	3.01	nd	nd	nd	nd	nd	3.42	nd
1, 2-bis (2, 4, 6-tribromophenoxy) ethane (BTBPE)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Band Number	(Blank)	0629-12153	0629-47631	0629-47633	0629-47635	0629-47637	0629-47638	0629-47640	0629-47642	0629-47643	0629-47645	0629-47647
Nest Name	(Blank)	VB1501	SU1404	SU1602	YK1503	JC1105	JC1202	YK1601	JC0501	IW0802	JC0803	YK0701
decabromodiphenyl ethane (DBDPE)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
α-hexabromocyclododecane (α-HBCD)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
β-hexabromocyclododecane (β-HBCD)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
γ-hexabromocyclododecane (γ-HBCD)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,3, 4,4’, 5,6-hexabromodiphenyl ether (BDE-166) % recovery	84	64	70	64	64	70	63	70	66	74	68	67
tris (2-chloroethyl) phosphate (TCEP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tris (1-chloro-2-propyl) phosphate (TCPP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tris (1,3-dichloro-2-propyl) phosphate (TDCPP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tetrabromobisphenol A (TBBP-A)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
deuterated tris (1,3-dichloro-2-propyl) phosphate (dTDCPP) % recovery	70	65	81	79	80	112	98	95	96	88	101	84
triethyl phosphate (TEP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tripropyl phosphate (TPrP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tricresyl phosphate (TCP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tributyl phosphate (TBP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
triphenyl phosphate (TPP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tris (2-isopropylphenyl) phosphate (TiPP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
deuterated triphenyl phosphate (d15-TPP) % recovery	70	71	100	102	95	133	115	89	95	90	100	78

Table 5. Lab results of bald eagle nestling blood analysis for several flame retardants in the 2017 breeding season. All units are in ng g-1, wet weight. Readings below the detection limit are designated “nd.” Results are not surrogate recovery corrected.

Band Number Nest Name	(Blank) (Blank)	0679- 01408 IH-12	0679- 01410 IH-18	0679- 01414 IH-26	0679- 01416 FF1611	0679- 01419 PAX-5 Goose Creek	0679- 01404 PAX-11 Pine Hill Run	0679- 01405 PAX-13 Golf Course	0679- 01418 FF1610	0679- 01420 WE1109	0679- 01422 WE1110	0679- 01424 Piscat- away Park West
2,2’,4,4’-tetrabromodiphenyl ether (BDE-47)	1.11	nd	nd	nd	nd	1.17	nd	nd	nd	1.93	nd	1.32
2,2’,3,4,4’-pentabromodiphenyl ether (BDE-85)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,2’,4,4’,6-pentabromodiphenyl ether (BDE-100)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,2’,4,4’,5-pentabromodiphenyl ether (BDE-99)	0.958	0.825	0.941	1.18	1.2	1.55	1.63	1.1	nd	3.48	1.42	1.23
2,2’,4,4’,5,6’-hexabromodiphenyl ether (BDE-154)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,2’,4,4’,5,5’-hexabromodiphenyl ether (BDE-153)	nd	nd	nd	nd	nd	0.155	nd	nd	nd	1.4	nd	nd
2,2’,3,4,4’,5’,6-heptabromodiphenyl ether (BDE-183)	nd	nd	nd	nd	nd	nd	nd	nd	nd	4.37	nd	nd
2,2’,3,3’,4,4’,5,5’,6-nonabromodiphenyl ether (BDE-206)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
decabromodiphenyl ether (BDE-209)	nd	nd	nd	nd	nd	1.17	nd	nd	nd	4.14	nd	nd
2-ethylhexyl 2, 3, 4, 5-tetrabromobenzoate (TBB)	nd	nd	nd	13.5	nd	nd	nd	nd	nd	9.75	nd	nd
2-ethylhexyl 2, 3, 4, 5-tetrabromophthalate (TBPH)	nd	nd	nd	nd	nd	nd	nd	nd	nd	3.1	nd	nd
1, 2-bis (2, 4, 6-tribromophenoxy) ethane (BTBPE)	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.18	nd	nd

Band Number Nest Name	(Blank) (Blank)	0679-01408 IH-12	0679-01410 IH-18	0679-01414 IH-26	0679-01416 FF1611	0679-01419 PAX-5 Goose Creek	0679-01404 PAX-11 Pine Hill Run	0679-01405 PAX-13 Golf Course	0679-01418 FF1610	0679-01420 WE1109	0679-01422 WE1110	0679-01424 Piscat-away Park West
decabromodiphenyl ethane (DBDPE)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
α-hexabromocyclododecane (α-HBCD)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
β-hexabromocyclododecane (β-HBCD)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
γ-hexabromocyclododecane (γ-HBCD)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
2,3, 4,4’, 5,6-hexabromodiphenyl ether (BDE-166) % recovery	83	79	73	80	67	74	84	68	68	98	61	80
tris (2-chloroethyl) phosphate (TCEP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tris (1-chloro-2-propyl) phosphate (TCPP)	nd	134	35.5	nd	nd	28.7	nd	nd	nd	nd	nd	nd
tris (1,3-dichloro-2-propyl) phosphate (TDCPP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tetrabromobisphenol A (TBBP-A)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
deuterated tris (1,3-dichloro-2-propyl) phosphate (dTDCPP) % recovery	69	87	79	82	81	69	88	92	91	92	83	94
triethyl phosphate (TEP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tripropyl phosphate (TPrP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tricresyl phosphate (TCP)	21.2	nd	42.6	nd	39.7	20.4	42.5	nd	nd	nd	33.4	nd
tributyl phosphate (TBP)	11.8	nd	nd	nd	63.4	nd	nd	nd	nd	nd	nd	nd
triphenyl phosphate (TPP)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
tris (2-isopropylphenyl) phosphate (TiPP)	24.1	41.7	nd	38.3	30.9	21.6	36.7	18.4	25.4	24.4	25.1	18.5
deuterated triphenyl phosphate (d15-TPP) % recovery	49	116	59	95	74	54	84	77	77	95	61	85

Legacy Organochlorines

Results from assays for a full panel of organochlorines have not been received from the VIMS contaminants lab. We are expecting results soon.

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APPENDICES

Appendix I. Bald eagle occupancy, activity, and productivity data for the James River and York River during the 2016 breeding season.

Geographic Area	Year	Nest Name	Occupied Territory	Active Nest	Productivity
James/York River	2016	CC0202	Y	Y	2
James/York River	2016	CC0303	Y	Y	2
James/York River	2016	CC0305	Y	Y	1
James/York River	2016	CC0401	Y	Y	2
James/York River	2016	CC0402	Y	Y	2
James/York River	2016	CC0407	Y	Y	0
James/York River	2016	CC0501	Y	Y	2
James/York River	2016	CC0503	Y	N	----
James/York River	2016	CC0504	Y	Y	0
James/York River	2016	CC0601	Y	N	----
James/York River	2016	CC0604	Y	Y	1
James/York River	2016	CC0607	Y	Y	0
James/York River	2016	CC0705	Y	Y	3
James/York River	2016	CC0802	Y	Y	2
James/York River	2016	CC0803	Y	Y	2
James/York River	2016	CC0901	Y	Y	1
James/York River	2016	CC0902	Y	N	----
James/York River	2016	CC0903	Y	Y	2
James/York River	2016	CC1001	Y	Y	1
James/York River	2016	CC1003	Y	Y	2
James/York River	2016	CC1005	Y	Y	1
James/York River	2016	CC1006	Y	Y	0
James/York River	2016	CC1007	Y	Y	2
James/York River	2016	CC1101	Y	Y	0
James/York River	2016	CC1104	Y	Y	0
James/York River	2016	CC1105	Y	Y	0
James/York River	2016	CC1106	Y	Y	2
James/York River	2016	CC1107	Y	Y	1
James/York River	2016	CC1108	Y	Y	1
James/York River	2016	CC1201	Y	Y	2
James/York River	2016	CC1202	Y	Y	3
James/York River	2016	CC1203	Y	Y	2
James/York River	2016	CC1204	Y	Y	2
James/York River	2016	CC1205	Y	N	----
James/York River	2016	CC1206	Y	N	----
James/York River	2016	CC1207	Y	Y	1

Geographic Area	Year	Nest Name	Occupied Territory	Active Nest	Productivity
James/York River	2016	CC1301	Y	Y	1
James/York River	2016	CC1303	Y	Y	2
James/York River	2016	CC1305	Y	Y	0
James/York River	2016	CC1401	Y	Y	0
James/York River	2016	CC1402	Y	Y	0
James/York River	2016	CC1501	Y	Y	2
James/York River	2016	CC1502	Y	Y	2
James/York River	2016	CC1503	Y	N	----
James/York River	2016	CC1504	Y	Y	2
James/York River	2016	CC1506	Y	Y	0
James/York River	2016	CC1507	Y	Y	2
James/York River	2016	CC1508	Y	Y	2
James/York River	2016	CC1601	Y	Y	0
James/York River	2016	CC1602	Y	Y	0
James/York River	2016	CC1603	Y	Y	2
James/York River	2016	CC1604	Y	Y	2
James/York River	2016	CC1605	Y	Y	2
James/York River	2016	CC9102	Y	Y	1
James/York River	2016	CC9602	Y	Y	0
James/York River	2016	CC9805	Y	Y	0
James/York River	2016	CC9904	Y	Y	2
James/York River	2016	CD0202	Y	Y	2
James/York River	2016	CD0302	Y	Y	2
James/York River	2016	CD0403	Y	N	----
James/York River	2016	CD0604	Y	Y	2
James/York River	2016	CD0701	Y	Y	3
James/York River	2016	CD0702	Y	N	----
James/York River	2016	CD0804	Y	Y	2
James/York River	2016	CD0903	Y	Y	2
James/York River	2016	CD1102	Y	Y	2
James/York River	2016	CD1203	Y	N	----
James/York River	2016	CD1301	Y	Y	3
James/York River	2016	CD1302	Y	N	----
James/York River	2016	CD1401	Y	Y	2
James/York River	2016	CD1402	Y	Y	2
James/York River	2016	CD1601	Y	Y	1
James/York River	2016	CD1601	Y	Y	0
James/York River	2016	CD1602	Y	Y	0
James/York River	2016	CD1603	Y	Y	0
James/York River	2016	CD1604	Y	Y	0
James/York River	2016	CD1605	Y	Y	1

Geographic Area	Year	Nest Name	Occupied Territory	Active Nest	Productivity
James/York River	2016	CD9802	Y	Y	2
James/York River	2016	DW1001	Y	Y	2
James/York River	2016	GL0401	Y	N	----
James/York River	2016	GL0502	Y	N	----
James/York River	2016	GL1001	Y	Y	0
James/York River	2016	GL1101	Y	N	----
James/York River	2016	GL1601	Y	Y	0
James/York River	2016	GL1602	Y	Y	2
James/York River	2016	GL1603	Y	Y	2
James/York River	2016	HE0602	Y	Y	0
James/York River	2016	HE0604	Y	Y	2
James/York River	2016	HE0801	Y	Y	2
James/York River	2016	HE0802	Y	Y	2
James/York River	2016	HE1001	Y	Y	0
James/York River	2016	HE1301	Y	Y	2
James/York River	2016	HE1302	Y	Y	2
James/York River	2016	HE1303	Y	Y	0
James/York River	2016	HE1502	Y	Y	2
James/York River	2016	HE1601	Y	Y	0
James/York River	2016	HE9501	Y	Y	1
James/York River	2016	HO0401	Y	Y	0
James/York River	2016	IW0201	Y	Y	2
James/York River	2016	IW0401	Y	Y	2
James/York River	2016	IW0501	Y	Y	0
James/York River	2016	IW0701	Y	N	----
James/York River	2016	IW0702	Y	Y	0
James/York River	2016	IW0802	Y	Y	2
James/York River	2016	IW0902	Y	Y	0
James/York River	2016	IW1001	Y	Y	2
James/York River	2016	IW1002	Y	Y	0
James/York River	2016	IW1202	Y	Y	2
James/York River	2016	IW1301	Y	Y	0
James/York River	2016	IW1402	Y	Y	2
James/York River	2016	IW1403	Y	Y	0
James/York River	2016	IW1404	Y	Y	2
James/York River	2016	IW1502	Y	Y	3
James/York River	2016	IW1503	Y	Y	2
James/York River	2016	IW1601	Y	N	----
James/York River	2016	IW1602	Y	Y	2
James/York River	2016	IW1603	Y	N	----
James/York River	2016	IW1604	Y	Y	2

Geographic Area	Year	Nest Name	Occupied Territory	Active Nest	Productivity
James/York River	2016	IW1605	Y	Y	0
James/York River	2016	IW1606	Y	N	----
James/York River	2016	IW1607	Y	Y	2
James/York River	2016	IW1608	Y	Y	2
James/York River	2016	IW8601	Y	Y	2
James/York River	2016	JC0001	Y	Y	0
James/York River	2016	JC0101[A]	Y	N	----
James/York River	2016	JC0105[A]	Y	Y	1
James/York River	2016	JC0403	Y	Y	1
James/York River	2016	JC0404	Y	Y	2
James/York River	2016	JC0405	Y	Y	2
James/York River	2016	JC0407	Y	Y	1
James/York River	2016	JC0501[A]	Y	Y	2
James/York River	2016	JC0502	Y	Y	3
James/York River	2016	JC0503	Y	Y	1
James/York River	2016	JC0604[A]	Y	Y	0
James/York River	2016	JC0605	Y	Y	0
James/York River	2016	JC0703	Y	Y	0
James/York River	2016	JC0802	Y	Y	2
James/York River	2016	JC0803[A]	Y	Y	2
James/York River	2016	JC0805	Y	Y	2
James/York River	2016	JC0903	Y	Y	3
James/York River	2016	JC0904	Y	Y	3
James/York River	2016	JC0905	Y	Y	1
James/York River	2016	JC1001	Y	Y	0
James/York River	2016	JC1102	Y	Y	1
James/York River	2016	JC1103	Y	Y	2
James/York River	2016	JC1104	Y	Y	0
James/York River	2016	JC1105	Y	Y	1
James/York River	2016	JC1109	Y	Y	3
James/York River	2016	JC1202[A]	Y	Y	2
James/York River	2016	JC1301	Y	Y	2
James/York River	2016	JC1303	Y	N	----
James/York River	2016	JC1304	Y	Y	3
James/York River	2016	JC1305	Y	Y	2
James/York River	2016	JC1306	Y	Y	2
James/York River	2016	JC1307	Y	Y	2
James/York River	2016	JC1308	Y	Y	0
James/York River	2016	JC1309	Y	Y	3
James/York River	2016	JC1401	Y	Y	2

Geographic Area	Year	Nest Name	Occupied Territory	Active Nest	Productivity
James/York River	2016	JC1402	Y	Y	1
James/York River	2016	JC1403	Y	Y	2
James/York River	2016	JC1501	Y	Y	2
James/York River	2016	JC1502	Y	Y	2
James/York River	2016	JC1504	Y	Y	0
James/York River	2016	JC1505	Y	Y	0
James/York River	2016	JC1506	Y	Y	0
James/York River	2016	JC1601	Y	Y	1
James/York River	2016	JC1604	Y	Y	3
James/York River	2016	JC1605	Y	Y	1
James/York River	2016	JC1606[A]	Y	N	----
James/York River	2016	JC1607	Y	Y	2
James/York River	2016	JC1608	Y	Y	3
James/York River	2016	JC1609	Y	N	----
James/York River	2016	KQ1003	Y	Y	2
James/York River	2016	KQ1004	Y	N	0
James/York River	2016	KQ1604	Y	N	----
James/York River	2016	NK0302	Y	Y	2
James/York River	2016	NK0701	Y	Y	2
James/York River	2016	NK0703	Y	N	----
James/York River	2016	NK0902	Y	Y	2
James/York River	2016	NK0903	Y	Y	2
James/York River	2016	NK0904	Y	Y	1
James/York River	2016	NK1001	Y	Y	0
James/York River	2016	NK1102	Y	Y	2
James/York River	2016	NK1103	Y	Y	2
James/York River	2016	NK1501	Y	Y	1
James/York River	2016	NK1601	Y	Y	2
James/York River	2016	NK1602	Y	N	----
James/York River	2016	NK1603	Y	Y	0
James/York River	2016	NK1604	Y	N	----
James/York River	2016	NK1607	Y	Y	1
James/York River	2016	NN0202	Y	Y	0
James/York River	2016	NN0301	Y	Y	2
James/York River	2016	NN0701	Y	Y	3
James/York River	2016	NN0801	Y	Y	3
James/York River	2016	NN0802	Y	Y	2
James/York River	2016	NN1001	Y	Y	2
James/York River	2016	NN1301	Y	Y	0
James/York River	2016	NN1501	Y	N	----
James/York River	2016	NN1502	Y	N	----

Geographic Area	Year	Nest Name	Occupied Territory	Active Nest	Productivity
James/York River	2016	PB0401	Y	Y	2
James/York River	2016	PG0002	Y	Y	2
James/York River	2016	PG0401	Y	Y	0
James/York River	2016	PG0502	Y	Y	1
James/York River	2016	PG0503	Y	Y	0
James/York River	2016	PG0602	Y	Y	2
James/York River	2016	PG0603	Y	Y	2
James/York River	2016	PG0702	Y	N	----
James/York River	2016	PG0902	Y	Y	2
James/York River	2016	PG1001	Y	N	----
James/York River	2016	PG1003	Y	Y	3
James/York River	2016	PG1005	Y	N	----
James/York River	2016	PG1105	Y	N	----
James/York River	2016	PG1201	Y	Y	2
James/York River	2016	PG1202	Y	Y	0
James/York River	2016	PG1203	Y	Y	2
James/York River	2016	PG1204	Y	N	----
James/York River	2016	PG1206	Y	Y	3
James/York River	2016	PG1301	Y	Y	1
James/York River	2016	PG1303	Y	Y	2
James/York River	2016	PG1304	Y	Y	0
James/York River	2016	PG1401	Y	Y	3
James/York River	2016	PG1402	Y	Y	1
James/York River	2016	PG1601	Y	Y	0
James/York River	2016	PG1602	Y	Y	0
James/York River	2016	PG8901	Y	Y	0
James/York River	2016	PG9101	Y	Y	2
James/York River	2016	PG9201	Y	Y	0
James/York River	2016	PG9401	Y	Y	1
James/York River	2016	PG9402	Y	Y	3
James/York River	2016	PO9801	Y	Y	2
James/York River	2016	RM1001	Y	Y	1
James/York River	2016	RM1301	Y	Y	0
James/York River	2016	RM1501	Y	Y	0
James/York River	2016	SK0301	Y	Y	2
James/York River	2016	SK0401	Y	N	0
James/York River	2016	SK1101	Y	Y	3
James/York River	2016	SK1102	Y	Y	3
James/York River	2016	SK1201	Y	Y	2
James/York River	2016	SK1301	Y	N	----
James/York River	2016	SK1302	Y	Y	2

Geographic Area	Year	Nest Name	Occupied Territory	Active Nest	Productivity
James/York River	2016	SK1303	Y	Y	0
James/York River	2016	SK1304	Y	Y	1
James/York River	2016	SK1401	Y	Y	2
James/York River	2016	SK1601	Y	Y	2
James/York River	2016	SK1602	Y	Y	0
James/York River	2016	SK1603	Y	N	----
James/York River	2016	SK9101	Y	Y	0
James/York River	2016	SU0303	Y	Y	1
James/York River	2016	SU0406	Y	Y	0
James/York River	2016	SU0504	Y	Y	2
James/York River	2016	SU0803	Y	Y	1
James/York River	2016	SU0901	Y	Y	0
James/York River	2016	SU0905	Y	Y	0
James/York River	2016	SU0906	Y	Y	0
James/York River	2016	SU1001	Y	N	----
James/York River	2016	SU1004	Y	Y	1
James/York River	2016	SU1005	Y	N	----
James/York River	2016	SU1006	Y	Y	3
James/York River	2016	SU1007	Y	N	----
James/York River	2016	SU1008	Y	Y	1
James/York River	2016	SU1102	Y	Y	1
James/York River	2016	SU1104	Y	Y	2
James/York River	2016	SU1201	Y	Y	2
James/York River	2016	SU1203	Y	Y	0
James/York River	2016	SU1205	Y	Y	2
James/York River	2016	SU1206	Y	Y	1
James/York River	2016	SU1301	Y	Y	2
James/York River	2016	SU1302	Y	N	----
James/York River	2016	SU1303	Y	Y	2
James/York River	2016	SU1304	Y	Y	1
James/York River	2016	SU1401	Y	Y	0
James/York River	2016	SU1402	Y	Y	2
James/York River	2016	SU1403	Y	N	----
James/York River	2016	SU1404[A]	Y	Y	2
James/York River	2016	SU1405	Y	Y	1
James/York River	2016	SU1406	Y	N	----
James/York River	2016	SU1501	Y	Y	2
James/York River	2016	SU1502	Y	Y	2
James/York River	2016	SU1505	Y	Y	0
James/York River	2016	SU1601	Y	Y	2
James/York River	2016	SU1602	Y	Y	2

Geographic Area	Year	Nest Name	Occupied Territory	Active Nest	Productivity
James/York River	2016	YK0204	Y	Y	0
James/York River	2016	YK0301	Y	Y	2
James/York River	2016	YK0403	Y	Y	1
James/York River	2016	YK0601	Y	Y	2
James/York River	2016	YK0701[A]	Y	Y	2
James/York River	2016	YK0703	Y	Y	0
James/York River	2016	YK0901[A]	Y	Y	0
James/York River	2016	YK1003	Y	Y	0
James/York River	2016	YK1102	Y	Y	2
James/York River	2016	YK1105	Y	Y	1
James/York River	2016	YK1302	Y	Y	1
James/York River	2016	YK1503[A]	Y	Y	2
James/York River	2016	YK1602	Y	Y	2
James/York River	2016	YK1603[A]	Y	Y	2
James/York River	2016	YK1604	Y	Y	0
James/York River	2016	YK1605	Y	Y	2

[A] National Park Service Property

Appendix II. Bald eagle occupancy, activity, and productivity data for the Potomac during the 2017 breeding season.

Geographic Area	Year	Nest Name	Occupied Territory	Active Nest	Productivity
Potomac River	2017	BP-08	Y	Y	1
Potomac River	2017	BP-11	Y	Y	2
Potomac River	2017	BP-13	Y	Y	>=1
Potomac River	2017	BP-16	Y	Y	>=1
Potomac River	2017	FF0702	Y	Y	2
Potomac River	2017	FF0703	Y	Y	0
Potomac River	2017	FF0705	Y	Y	2
Potomac River	2017	FF0901	Y	Y	2
Potomac River	2017	FF0902	Y	Y	2
Potomac River	2017	FF1401	Y	Y	>=1
Potomac River	2017	FF1606	Y	Y	1
Potomac River	2017	FF1608	Y	Y	U
Potomac River	2017	FF1610	Y	Y	>=1
Potomac River	2017	FF1611	Y	Y	2
Potomac River	2017	FF1612	Y	Y	>=1
Potomac River	2017	FF1613	Y	Y	U
Potomac River	2017	FF1614	Y	Y	>=1
Potomac River	2017	FF1701	Y	Y	>=1

Potomac River	2017	FF9401	Y	Y	U
Potomac River	2017	Fort Washington 1[A]	Y	Y	2
Potomac River	2017	Fort Washington 2[A]	Y	Y	0
Potomac River	2017	IH-01	Y	N	----
Potomac River	2017	IH-03	Y	Y	1
Potomac River	2017	IH-12	Y	Y	>=1
Potomac River	2017	IH-15	Y	Y	2
Potomac River	2017	IH-17	Y	Y	3
Potomac River	2017	IH-18	Y	Y	2
Potomac River	2017	IH-20	Y	Y	1
Potomac River	2017	IH-23	Y	N	----
Potomac River	2017	IH-25	Y	Y	2
Potomac River	2017	IH-26	Y	Y	3
Potomac River	2017	IH-27	Y	Y	2
Potomac River	2017	KG-06-06	Y	Y	0
Potomac River	2017	KG-07-10	Y	Y	3
Potomac River	2017	KG-09-06	Y	Y	2
Potomac River	2017	KG-11-09	Y	Y	1
Potomac River	2017	KG-14-01	Y	Y	2
Potomac River	2017	KG-14-02	Y	Y	>=1
Potomac River	2017	KG-16-16	Y	Y	2
Potomac River	2017	KG-16-17	Y	Y	>=1
Potomac River	2017	KG-17-01	Y	Y	2
Potomac River	2017	KG-97-05	Y	Y	2
Potomac River	2017	Pax-11	Y	Y	2
Potomac River	2017	Pax-13	Y	Y	2
Potomac River	2017	Pax-2	Y	Y	0
Potomac River	2017	Pax-5	Y	Y	1
Potomac River	2017	Piscataway 1[A]	Y	Y	2
Potomac River	2017	Piscataway 2[A]	Y	Y	2
Potomac River	2017	Piscataway 3[A]	Y	Y	>=1
Potomac River	2017	Piscataway West[A]	Y	Y	3
Potomac River	2017	PW0701	Y	Y	3
Potomac River	2017	PW1302	Y	Y	>=1
Potomac River	2017	PW1401	Y	Y	>=1
Potomac River	2017	PW1402	Y	Y	>=1
Potomac River	2017	PW1701	Y	Y	0
Potomac River	2017	WE0308[A]	Y	N	0
Potomac River	2017	WE0411	Y	Y	0
Potomac River	2017	WE1109[A]	Y	Y	2
Potomac River	2017	WE1110	Y	Y	2
Potomac River	2017	WE1602	Y	Y	2
Potomac River	2017	WE1612	Y	Y	2

[A] National Park Service Property