SPECIAL PROJECT REPORT **FY10-MEFO-1-EC**

Maine Field Office – Ecological Services **October 2010**

Environmental Contaminants in Two Bald Eagle Eggs from New Hampshire

Fish and Wildlife Service

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U.S. Fish and Wildlife Service
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Environmental Contaminants in Two Bald Eagle Eggs from New Hampshire

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Executive Summary

On June 12, 2006 and June 2, 2009, non-viable, addled bald eagle (*Haliaeetus leucocephalus*) eggs were collected from nests at Pontook Reservoir on the Androscoggin River and at Silver Lake, New Hampshire (NH), respectively. Egg contents were analyzed by the U.S. Fish and Wildlife Service for organochlorine compounds and trace elements.

Dioxin and furan congeners were below detection limits in the Pontook Reservoir egg. Two furan congeners were detected at low levels in the Silver Lake egg. Several dioxin-like PCB congeners occurred in both eggs to produce dioxin toxic equivalent (TCDD-TEQ) concentrations of 103 parts-per-trillion (ppt) in the Pontook Reservoir egg and 292 ppt in the Silver Lake egg. TCDD-TEQ concentrations in both eggs were below the suggested reproductive effect level for bald eagles (303 ppt).

The total polychlorinated biphenyl (Total PCB) level was substantially lower in the Pontook Reservoir egg (0.13 parts-per-million, ppm) than the Silver Lake egg (5.11 ppm). Similarly, the dichlorodiphenyl-dichloroethylene (DDE) concentration was lower in the Pontook Reservoir egg (0.01 ppm) than the Silver Lake egg (0.96 ppm). Concentrations of both compounds in the NH eggs were below toxicity threshold values for bald eagles or raptor species (Total PCB 20 ppm, DDE 5.5 ppm). Other organochlorine compounds in the analytical suite were below sample detection limits or were detected in the low parts-per-billion (ppb) range.

Total polybrominated diphenyl ether (Total PBDE) was below the detection limit in the Pontook Reservoir egg (< 12.0 parts-per-billion, ppb) and at 914 ppb in the Silver Lake egg. The Silver Lake egg was below the suggested PBDE toxicity threshold value. Pipping and hatching success may be affected in raptor eggs containing 1,800 ppb of PBDE.

Mercury was below the detection limit in the Pontook Reservoir egg (< 0.03 ppm) and detected at 0.33 ppm in the Silver Lake egg. The Silver Lake egg concentration was below the suggested mercury toxicity threshold range for birds (0.50 ppm to 0.80 ppm), but higher than the Lethal Concentration $_{50}$ (LC_{50}) reported in a mercury dosing study for some species of raptors (0.25 ppm). Other trace elements found in the NH bald eagle eggs were below detection limits or suggested toxicity threshold levels.

Contaminant levels in the two NH eggs were compared to concentrations found in a long-term study of inland Maine bald eagle eggs conducted between 2000 and 2009. Organic and trace element concentrations in the NH eggs fell within the ranges reported in the Maine bald eagle study. None of the contaminant levels detected in the two NH bald eagle eggs would be considered highly elevated compared to suggested toxicity threshold concentrations.

PREFACE

This report provides documentation of environmental contaminants in nonviable bald eagle eggs collected from two nests in New Hampshire. Analytical work was completed under USFWS Analytical Control Facility Catalogs 5100018 and 5100041.

Questions, comments, and suggestions related to this report are encouraged. Written inquiries should refer to Report Number FY10-MEFO-1-EC and be directed to:

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This report complies with the peer review and certification provisions of the Information Quality Act (Public Law 106-554, Section 515).

ACKNOWLEDGEMENTS

Funding for this project was provided by the U.S. Fish and Wildlife Service's Division of Environmental Quality in Washington, DC. The NH bald eagle eggs were collected by Chris Martin (New Hampshire Audubon), William Hanson (NextERA – Energy Maine Hydro) and Chris DeSorbo (BioDiversity Research Institute). Charlie Todd of the Maine Department of Inland Fisheries and Wildlife (Maine IF&W) assumed custody of the eggs and provided them to the USFWS. Peer review of the draft report was provided by Charlie Todd, Maine IF&W, and F. Timothy Prior, USFWS Retired. Final editorial review was provided by Wende Mahaney, USFWS.

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1. Background

Two bald eagle (*Haliaeetus leucocephalus*) eggs were opportunistically collected during bald eagle nestling sampling in New Hampshire in 2006 and 2009 (Figure 1). On June 12, 2006 a non-viable, addled bald eagle egg was recovered from a nest located on Pontook Reservoir on the Androscoggin River (N 44° 38' 36.66" / W 071° 13' 35.16"). Pontook Reservoir is located in Dummer Township, Coos County, in northeastern New Hampshire (Figure 2). On June 2, 2009 a second non-viable, addled egg was recovered from a nest on Silver Lake (N 43° 28' 06.31" / W 071° 32' 07.98"). Silver Lake is located in Tilton Township, Belknap County, in central New Hampshire (Figure 3). Since the U.S. Fish and Wildlife Service (USFWS) is currently researching contaminant levels in bald eagle eggs from Maine, the New Hampshire eggs were turned over to the Ecological Services - Maine Field Office for analyses.

2. Methods

Egg metrics were recorded immediately after collection (e.g., total weight, length, breadth). Egg length and breadth were measured with calipers to the nearest 0.1 mm. Total egg weight was measured to the nearest 0.1 gram with an electronic balance. Following a two week period of drying, eggshell weight was measured to the nearest 0.1 gram and eggshell thickness with membranes attached was measured to the nearest 0.001 mm with a digital micrometer (four measurements per eggshell half). Volume was calculated from length and breadth measurements (Hoyt 1979).

Prior to opening, eggs were cleaned of surface debris using a paper towel soaked with de-ionized water. After egg surfaces dried, each egg was scored at the equator with a stainless steel scalpel. Egg contents were extracted, placed in a chemical clean jar, and weighed. Samples of egg contents were frozen and later shipped to analytical laboratories.

Egg contents were analyzed for polychlorinated dibenzo-*p*-dioxins; polychlorinated dibenzofurans; polychlorinated biphenyl (PCB) congeners, including the non-ortho and mono-ortho dioxin-like PCB congeners; polybrominated diphenly ether; and other organochlorine compounds by the Geochemical and Environmental Research Group (GERG) in College Station, Texas. Trace element determinations were made by Laboratory and Environmental Testing, Incorporated (LET) in Columbia, Missouri. Percent lipid and percent moisture were also measured. Quality assurance and quality control (QA/QC) procedures at both laboratories included procedural blanks, duplicates, spike recoveries, and certified reference material. The USFWS Analytical Control Facility reviewed QA/QC results and accepted all organic and inorganic data packages from GERG and LET.

Figure 1. Locations of NH bald eagle egg collections

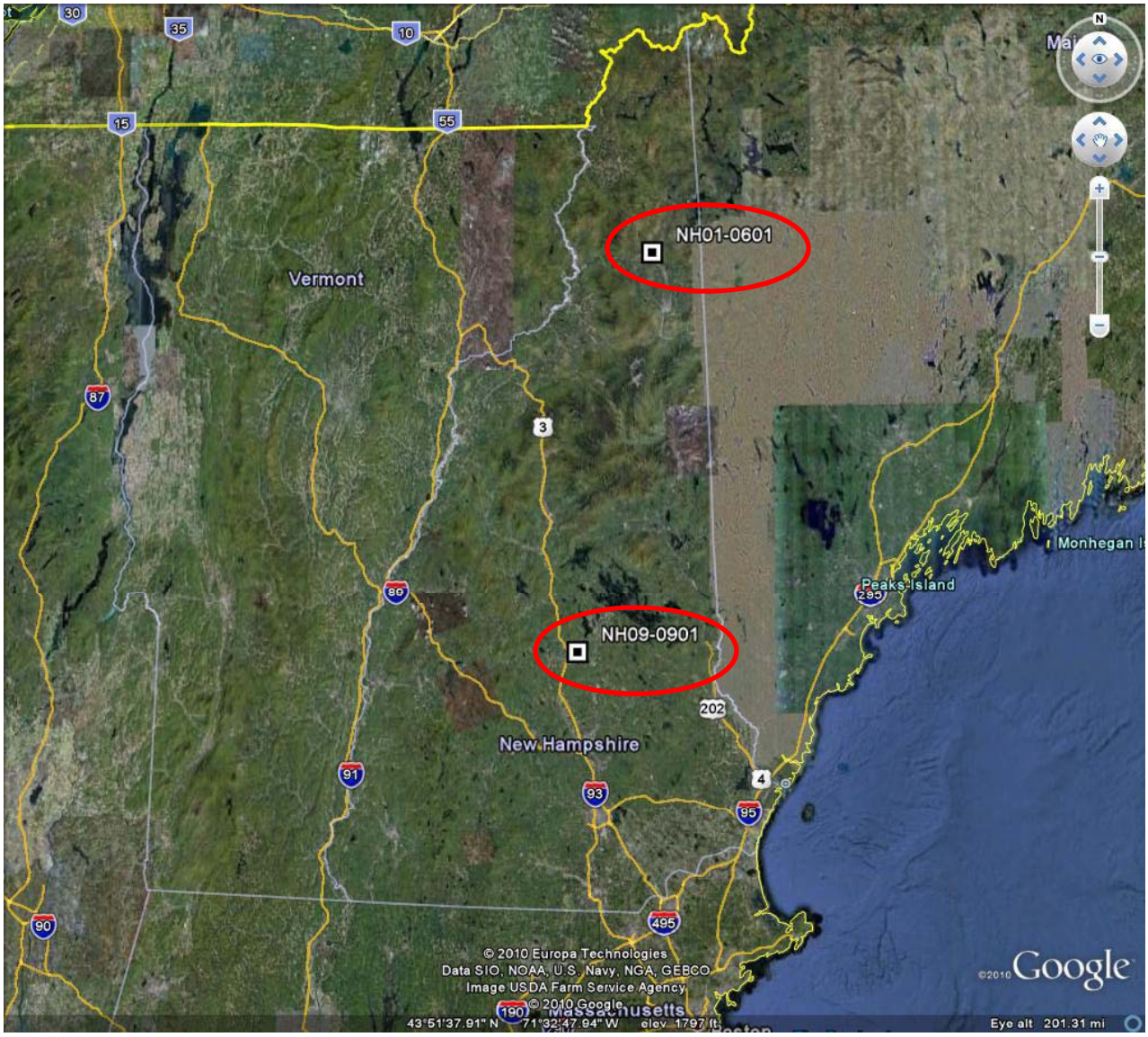

Figure 2. Location map – Pontook Reservoir

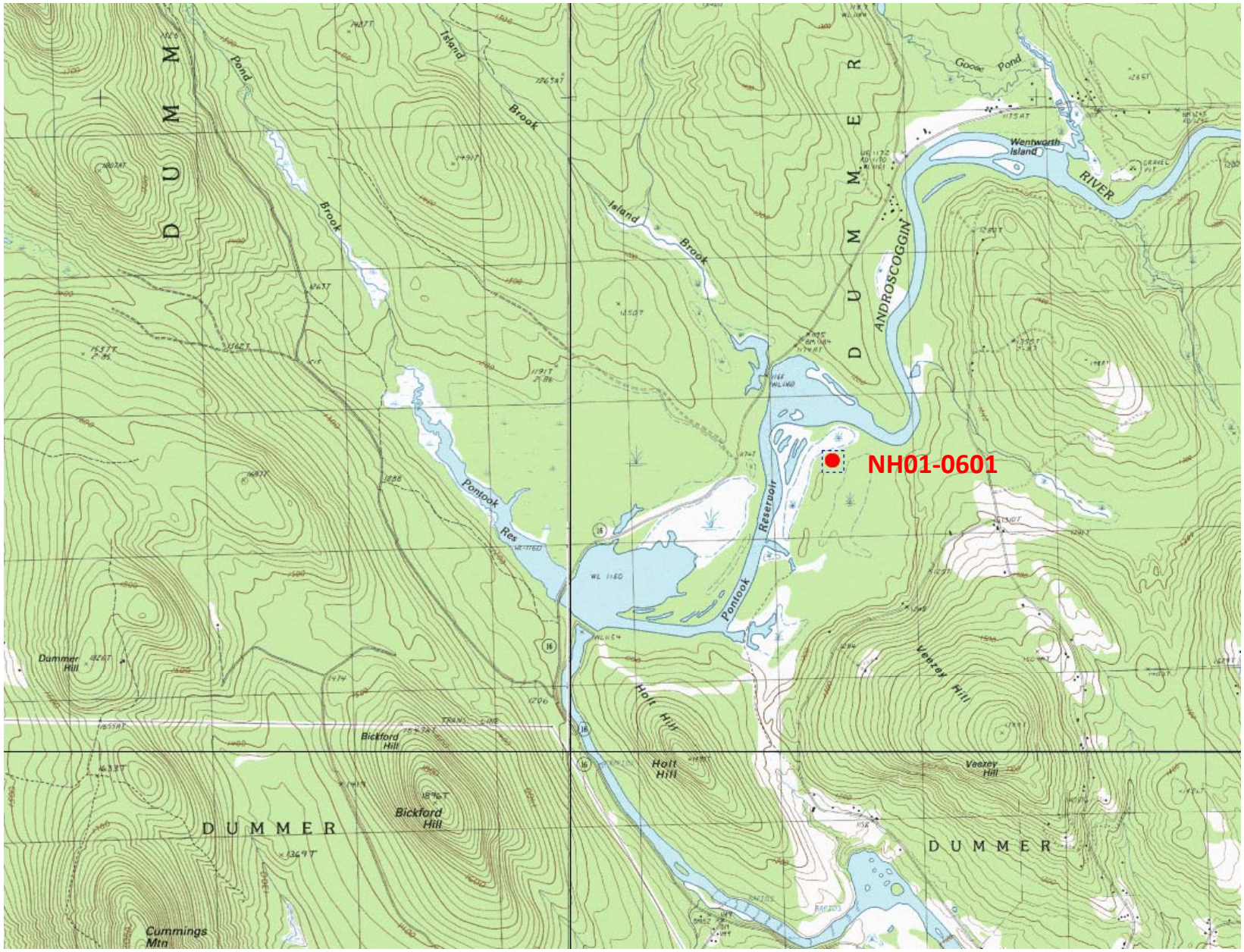

Figure 3. Location map – Silver Lake

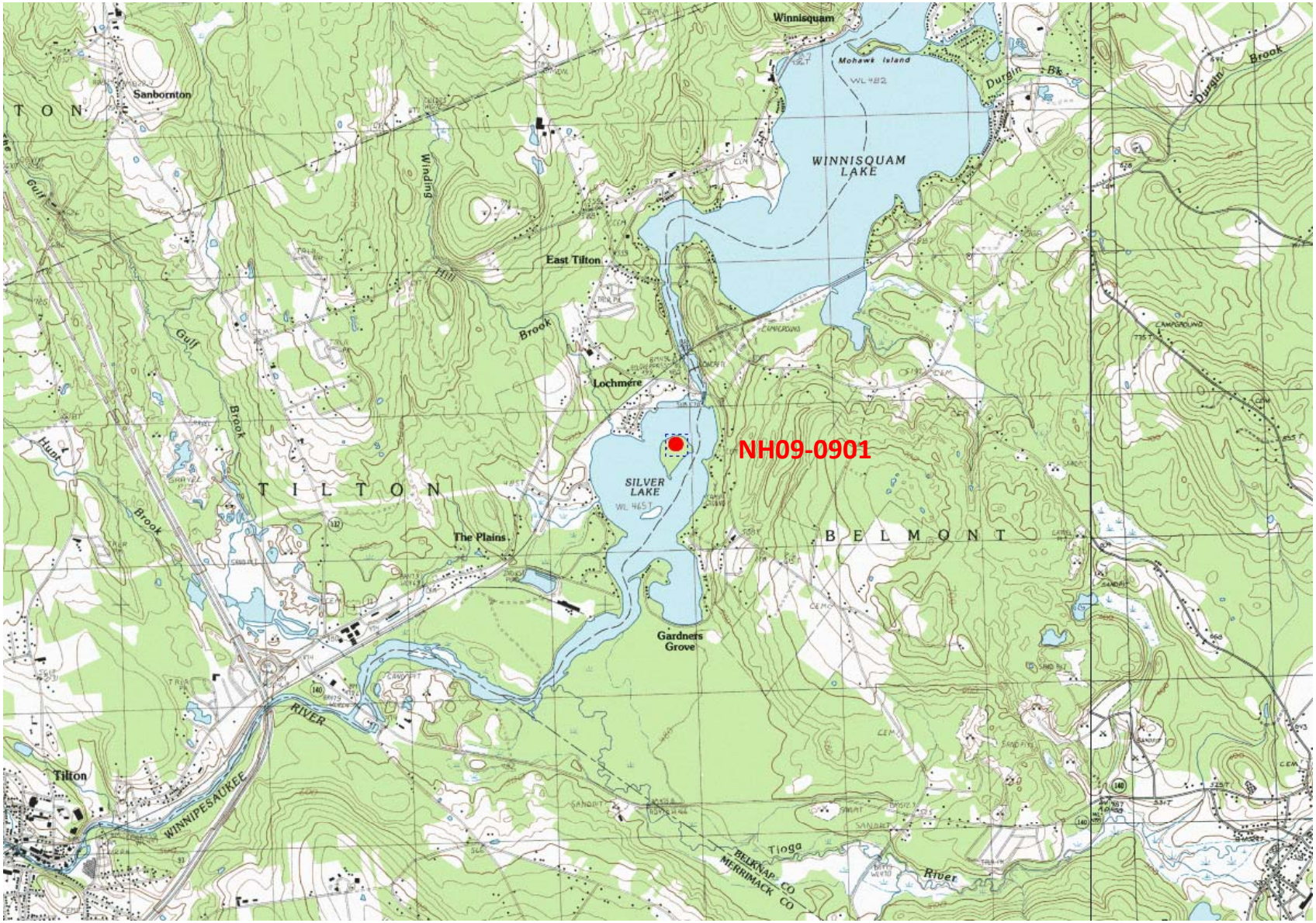

Table 1. NH bald eagle egg metrics and percent lipids

USFWS Sample No.	Total Egg Weight (g)	Length (mm)	Breadth 1 (mm)	Breadth 2 (mm)	Mean Breadth (mm)	Egg Content Weight (g)	Calculated Egg Volume (ml)	Eggshell Thickness (mm)	% Moisture	% Lipids
NH01-0601	122.9	86.2	56.6	56.5	56.6	102.7	140.6	0.544	70.5	3.60
NH09-0901	95.3	74.7	55.0	54.9	55.0	79.0	115.0	0.543	79.8	4.91

Egg volume calculations based on Hoyt (1979).

3. Analytical Results

Analytical results are presented in Table 2 (Dioxins, Furans, dioxin-like PCB Congeners), Table 3 (Total PCBs, DDE, and Other Organochlorine Compounds), Table 4 (Polybrominated diphenyl ether) and Table 5 (Trace Elements). Concentrations are presented in pg/g (parts-per-trillion) for dioxins, furans, and dioxin-like PCB congeners, in ng/g (parts-per-billion) for PBDE, and in µg/g (parts-per-million) for other organochlorine compounds and trace elements. All results are presented on a fresh wet weight basis to account for moisture loss after egg laying (Stickel *et al*. 1973). Dioxin toxic equivalent concentrations (TCDD-TEQs) were calculated using toxic equivalency factors for birds described in Van den Berg *et al*. (1998).

4. Discussion

The length and breadth dimensions of the two NH bald eagle eggs (Table 1) were consistent with reported values (Buehler 2000). A sulfur smell was evident during processing of both samples indicating the eggs were addled. The Pontook Reservoir egg contained a developed, decomposing embryo (Figure 4). The Silver Lake egg did not have a developed embryo and contained only a yellowish milky liquid with no discernable tissue.

Contaminant concentrations in the NH bald eagle eggs were compared to suggested no-effect levels and toxicity threshold values described in several studies.

4.1.1 Dioxin Toxic Equivalents (TCDD-TEQ). TCDD-TEQ, in the NH bald eagle eggs (103 pg/g, 292 pg/g; Table 2) were below the no-observable-adverse-effect level, NOAEL, for hatching in raptor species (303 pg/g, Elliott and Harris 2001/2002, Henny and Elliott 2007). The dominant contributors to the TCDD-TEQ in both NH eggs were the PCB# 77 and PCB# 126 congeners.

4.1.2 Polychlorinated Biphenyl (PCB). Total PCBs concentrations between 8 and 25 µg/g have been associated with decreased hatching success in terns, cormorants, and eagles (Hoffman *et al*. 1996). Henny and Elliott (2007) suggested a toxicity threshold value of 20 µg/g for Total PCBs in raptor species. The NH eagle eggs contained 0.16 µg/g (Pontook Reservoir) and 5.11 µg/g (Silver Lake) of Total PCBs (Table 3).

4.1.3 Dichlorodiphenyl-dichloroethylene (DDE). *p*,*p*'-DDE in the NH bald eagle eggs (0.01 µg/g Pontook Reservoir, 0.96 µg/g Silver Lake; Table 3) were well below the 3.6 µg/g threshold associated with eggshell thinning suggested by Wiemeyer *et al*. (1993) and the 5.5 µg/g threshold value associated with embryo lethality suggested by Henny and Elliott (2007).

4.1.4 Polybrominated diphenly ether (PBDE). Based on uptake by American kestrels (*Falco sparverius*), McKernan *et al*. (2009) suggested that the lowest-observed-effect level, LOEL, on pipping and hatching success may be as low as 1,800 ng/g penta-BDE; a level approaching concentrations detected in eggs of wild birds. Total PBDE in the two NH bald eagle eggs was below the detection limit in the Pontook Reservoir sample (< 12.0 ng/g) and at 914 ng/g in the

Silver Lake sample.

4.1.5 Other Organochlorine Compounds. Levels of other organochlorine compounds including hexachlorocyclohexanes, chlordane compounds, cyclodiene pesticides, and other compounds were below detection limits or found only in the low ng/g range (Table 3). Typically, adverse effects of these compounds to raptors and other bird species occur in the µg/g range (Peakall 1996, Wiemeyer 1996, Blus 2003).

4.1.6 Mercury (Hg). Total mercury was below the detection limit (< 0.03 µg/g, Table 5) in the eagle egg from Pontook Reservoir. In 75 inland and coastal bald eagle eggs analyzed by the USFWS Maine Field Office between 2000 and 2009, mercury was always detected. Notably, the Pontook Reservoir eagle egg from NH is the first encountered to date to be below the Hg analytical detection limit. The egg from Silver Lake had an Hg content of 0.33 µg/g. A generally accepted reproductive effect endpoint for Hg in bird eggs has not been established. Some researchers have suggested 0.80 µg/g as an endpoint (Heinz 1979, Henny *et al*. 2002), while other investigators and ecological risk assessors use 0.50 µg/g or 1.00 µg/g as ecological effect threshold or screening benchmark values (Scheuhammer *et al*. 2007, RAIS 2009). A dosing study of several avian species by Heinz *et al*. (2009), however, categorized two raptor species (American kestrel and osprey *Pandion haliaetus*) as highly sensitive to methylmercury[1] with LC_{50}s less than 0.25 µg/g. The sensitivity of bald eagles to Hg has not been established, but the Silver Lake eagle egg mercury content was higher than the LC_{50} for sensitive raptors and warrants further Hg analyses of any available non-viable eggs from NH.

4.1.6 Other Trace Elements. Eighteen trace elements besides mercury were included in the inorganic analytical scan (Table 5). Many of the elements in the scan are essential trace elements that are necessary for growth and development and are rarely toxic unless they occur at highly elevated concentrations (i.e., above the level where excess amounts can be regulated or excreted by the organism). Levels of other non-essential and potentially toxic trace elements including arsenic, cadmium, copper, lead, and selenium were at or below detection limits or found in low concentrations (Table 5) compared to reported toxic effect values (copper – USDOI 1998, lead – Eisler 1988; selenium - Ohlendorf and Heinz 2011).

[1] Methylmercury may account for nearly all of the total mercury in bird eggs (Schwarzbach *et al*. 2006).

Figure 4. Contents of the Pontook Reservoir bald eagle egg

Table 2. Dioxin toxic equivalents (TCDD-TEQs) in NH bald eagle eggs

USFWS Sample No. Location Units	TEF	NH01-0601 Pontook Reservoir TEF adjusted pg/g fww	NH09-0901 Silver Lake TEF adjusted pg/g fww
Dioxins			
2,3,7,8-TCDD	1	< 9.90	< 9.01
1,2,3,7,8-PeCDD	1	< 49.5	< 45.0
1,2,3,4,7,8-HxCDD	0.05	< 49.5	< 45.0
1,2,3,6,7,8-HxCDD	0.01	< 49.5	< 45.0
1,2,3,7,8,9-HxCDD	0.1	< 49.5	< 45.0
1,2,3,4,6,7,8-HpCDD	<0.001	< 49.5	< 45.0
OCDD	0.0001	< 99.0	< 90.1
Furans			
2,3,7,8-TCDF	1	< 9.90	< 9.01
1,2,3,7,8-PeCDF	0.1	< 49.5	< 45.0
2,3,4,7,8-PeCDF	1	< 49.5	38.609
1,2,3,4,7,8-HxCDF	0.1	< 49.5	< 45.0
1,2,3,6,7,8-HxCDF	0.1	< 49.5	< 45.0
1,2,3,7,8,9-HxCDF	0.1	< 49.5	28.923
2,3,4,6,7,8-HxCDF	0.1	< 49.5	< 45.0
1,2,3,4,6,7,8-HpCDF	0.01	< 49.5	< 45.0
1,2,3,4,7,8,9-HpCDF	0.01	< 49.5	< 45.0
OCDF	0.0001	< 99.0	< 90.1
TEQ Dioxins & Furans		BDL	68
Dioxin-like PCBs			
PCB# 77	0.05	31.725	91.028
PCB# 81	0.1	7.968	20.129
PCB# 126	0.1	55.044	96.867
PCB# 169	0.001	0.155	0.170
PCB# 105	0.0001	3.173	7.901
PCB# 114	0.0001	0.210	0.524
PCB# 118	0.00001	1.513	1.683
PCB# 123	0.00001	0.025	0.041
PCB# 156	0.0001	2.230	4.782
PCB# 157	0.0001	0.394	0.866
PCB# 167	0.00001	0.162	0.289
PCB# 189	0.00001	0.041	0.139
TEQ Dioxin-like PCBs		103	224
TCDD-TEQ (Dioxins, furans + dioxin-like PCBs)		103	292

pg/g = parts-per-trillion, fww = fresh wet weight (i.e., adjusted for moisture loss)
TEF = toxic equivalency factors from Van den Berg *et al* . 1998
Values in red preceded by < symbol indicate non-detects and detection limit. BDL = below detection limits
Non-detects were not adjusted for moisture loss or toxic equivalency factors

Table 3. Organochlorine compounds in NH bald eagle eggs

USFWS Sample No.	NH01-0601	NH09-0901
Location	Pontook Reservoir	Silver Lake
Units	µg/g fww	µg/g fww
Polychlorinated Biphenyls		
PCB-TOTAL	0.16	5.11
Hexachlorocyclohexanes		
alpha BHC	< 0.000239	0.0004
beta BHC	0.0003	0.0012
gamma BHC	0.0012	< 0.000481
delta BHC	< 0.000239	< 0.000481
Chlordane Compounds		
alpha chlordane	0.0039	0.0091
gamma chlordane	0.0018	0.0071
cis-nonachlor	< 0.000239	0.0412
trans-nonachlor	0.0010	0.1168
oxychlordane	0.0011	0.0315
heptachlor	0.0003	< 0.000481
heptachlor epoxide	< 0.000239	0.0031
DDT Metabolites		
o,p'-DDD	0.0003	0.0223
o,p'-DDE	0.0010	0.0023
o,p'-DDT	0.0007	0.0224
p,p'-DDD	0.0009	0.0694
p,p'-DDE	0.01	0.96
p,p'-DDT	0.0050	0.0052
Other Organochlorine Compounds		
aldrin	< 0.000239	< 0.000481
dieldrin	< 0.000239	0.0218
endosulfan II	< 0.000239	< 0.000481
endrin	< 0.000239	< 0.000481
HCB (hexachlorobenzene)	0.0005	0.0357
mirex	< 0.000239	0.0142
pentachloro-anisole	0.0006	0.0010
toxaphene	< 0.00478	< 0.00962

µg/g = parts-per-million, fww = fresh wet weight (i.e., adjusted for moisture loss)
Values in red preceded by < symbol indicate non-detects and detection limit

Table 4. Polybrominated diphenyl ethers (PBDEs) in NH bald eagle eggs

USFWS Sample No.	NH01-0601	NH09-0901
Location	Pontook Reservoir	Silver Lake
Units	ng/g ww	ng/g fww
PBDE-TOTAL	< 12.0	913.71
Congeners		
BDE# 1	< 0.598	< 1.20
BDE# 2	< 0.598	< 1.20
BDE# 3	< 0.598	< 1.20
BDE# 7	< 0.598	< 1.20
BDE# 8/11 (co-elute)	< 0.598	< 1.20
BDE# 10	< 0.598	< 1.20
BDE# 12	< 0.598	< 1.20
BDE# 13	< 0.598	< 1.20
BDE# 15	< 0.598	< 1.20
BDE# 17	< 0.598	< 1.20
BDE# 25	< 0.598	< 1.20
BDE# 28	< 0.598	8.93
BDE# 30	< 0.598	< 1.20
BDE# 32	< 0.598	< 1.20
BDE# 33	< 0.598	< 1.20
BDE# 35	< 0.598	< 1.20
BDE# 37	< 0.598	< 1.20
BDE# 47	< 0.598	416.32
BDE# 49	< 0.598	2.93
BDE# 66	< 0.598	6.26
BDE# 71	< 0.598	< 1.20
BDE# 75	< 0.598	< 1.20
BDE# 77	< 0.598	< 1.20
BDE# 85	< 0.897	5.50
BDE# 99	< 0.897	233.58
BDE# 100	< 0.897	131.90
BDE# 116	< 0.897	< 1.80
BDE# 118	< 0.897	2.18
BDE# 119	< 0.897	< 1.80
BDE# 126	< 0.897	< 1.80
BDE# 138	< 1.20	3.27
BDE# 153	< 1.20	50.36
BDE# 154	< 1.20	43.69
BDE# 155	< 1.20	4.66
BDE# 166	< 1.20	< 2.40
BDE# 181	< 1.50	< 3.00
BDE# 183	< 1.50	3.04
BDE# 190	< 1.50	< 3.00
BDE# 209	Not Measured	< 192

Values in red preceded by < sign indicate non-detects and detection limit
ng/g = parts-per-billion, ww = wet weight, fww = fresh wet weight (i.e., corrected for moisture loss)
Non-detects were not corrected for moisture loss

Table 5. Trace elements in NH bald eagle eggs

USFWS Sample No.	NH01-0601	NH09-0901
Location	Pontook Reservoir	Silver Lake
Units	µg/g fww	µg/g fww
Aluminum (Al)	< 2.00	< 0.400
Arsenic (As)	< 0.0600	< 0.0400
Boron (B)	< 0.600	< 0.400
Barium (Ba)	0.58	0.06
Beryllium (Be)	< 0.0300	< 0.0200
Cadmium (Cd)	< 0.0300	< 0.0200
Chromium (Cr)	< 0.200	< 0.100
Copper (Cu)	0.95	0.41
Iron (Fe)	24.1	4.9
Mercury (Hg)	< 0.0300	0.330
Magnesium (Mg)	115.50	61.01
Manganese (Mn)	0.8772	< 0.100
Molybdenum (Mo)	< 0.600	< 0.400
Nickel (Ni)	< 0.200	< 0.100
Lead (Pb)	< 0.0600	0.06
Selenium (Se)	0.18	0.39
Strontium (Sr)	0.73	0.38
Vanadium (V)	< 0.200	< 0.100
Zinc (Zn)	12.4	6.9

µg/g = parts-per-million, fww = fresh wet weight (i.e., corrected for moisture loss)
Values in red preceded by < symbol indicate non-detects and detection limit
Non-detects were not corrected for moisture loss

Table 6. Environmental contaminants in NH bald eagle eggs compared to Maine bald eagles

USFWS Sample No. Location State Year(s) of Collection		NH01-0601 Pontook Reservoir New Hampshire 2006	NH09-0901 Silver Lake New Hampshire 2009	State-wide (Inland) Maine 2000 - 2009	
	Units	Concentration	Concentration	Concentration	n
TCDD-TEQ	pg/g	103	292	258 ± 230 (28 - 1145)	67
Total PCBs	µg/g	0.16	5.11	4.44 ± 3.31 (0.84 - 17.29)	67
p,p'-DDE	µg/g	0.01	0.96	1.08 ± 0.82 (0.19 - 4.38)	67
Total PBDE	ng/g	< 12.0	914	558 ± 550 (68 - 3097)	38
Hg	µg/g	< 0.03	0.33	0.40 ± 0.25 (0.08 - 1.09)	67

pg/g = parts-per-trillion, ng/g = parts-per-billion, µg/g = parts-per-million
All concentrations expressed on a fresh wet weight basis (i.e., corrected for moisture loss)
Maine data shown as mean ± standard deviation. Range of concentrations in parentheses
State-wide Maine data only includes inland nest territories; coastal data not included in calculations
n = number of Maine eggs analyzed for a particular contaminant

5. Summary

Two non-viable, addled bald eagle eggs were collected from New Hampshire nests at Pontook Reservoir on the Androscoggin River in 2006 and at Silver Lake in 2009. Egg contents were analyzed by the U.S. Fish and Wildlife Service for organochlorine compounds and trace elements.

Dioxin and furan congeners were below detection limits in the Pontook Reservoir egg. Two furan congeners were detected at low levels in the Silver Lake egg. Several dioxin-like PCB congeners occurred in both eggs to produce dioxin toxic equivalent (TCDD-TEQ) concentrations of 103 pg/g in the Pontook Reservoir egg and 292 pg/g in the Silver Lake egg. TCDD-TEQ concentrations in both eggs were below the suggested reproductive effect level for bald eagles (303 pg/g, Elliott and Harris 2001/2002, Henny and Elliott 2007).

The total polychlorinated biphenyl (Total PCB) level was substantially lower in the Pontook Reservoir egg (0.13 µg/g) than the Silver Lake egg (5.11 µg/g). Similarly, the dichlorodiphenyl-dichloroethylene (DDE) concentration was lower in the Pontook Reservoir egg (0.01 µg/g) than the Silver Lake egg (0.96 µg/g µg/g). Concentrations of both compounds in the NH eggs were below toxicity threshold values for bald eagles or other raptor species (Total PCB 20 µg/g, DDE 5.5 µg/g; Henny and Elliott 2007). Twenty-four other organochlorine compounds were below analytical detection limits or were detected in the low ng/g range.

Total polybrominated diphenyl ether (Total PBDE) was below the detection limit in the Pontook Reservoir egg (< 12.0 ng/g) and at 914 ng/g in the Silver Lake egg. The Silver Lake egg was below the suggested PBDE toxicity threshold value. Pipping and hatching success may be affected in raptor eggs containing 1,800 ng/g of PBDE (McKernan *et al*. 2009).

Mercury was below the detection limit in the Pontook Reservoir egg (< 0.03 µg/g) and detected at 0.33 µg/g in the Silver Lake egg. The Silver Lake egg concentration was below suggested mercury toxicity thresholds for birds ranging from 0.50 µg/g to 1.00 µg/g (RAIS 2009, Scheuhammer *et al*. 2007), but higher than the 0.25 µg/g LC_{50} reported in a methylmercury dosing study with other species of raptors (Heinz *et al*. 2009). Other trace elements in the NH bald eagle eggs were at or below detection limits or below reported toxicity levels.

Contaminant levels in the two NH eggs were compared to concentrations found in a long-term USFWS study of inland Maine bald eagle eggs conducted between 2000 and 2009 (Table 6). Organic and trace element concentrations in the NH eggs fell within the ranges reported in the Maine bald eagle study.

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