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U.S. FISH & WILDLIFE SERVICE
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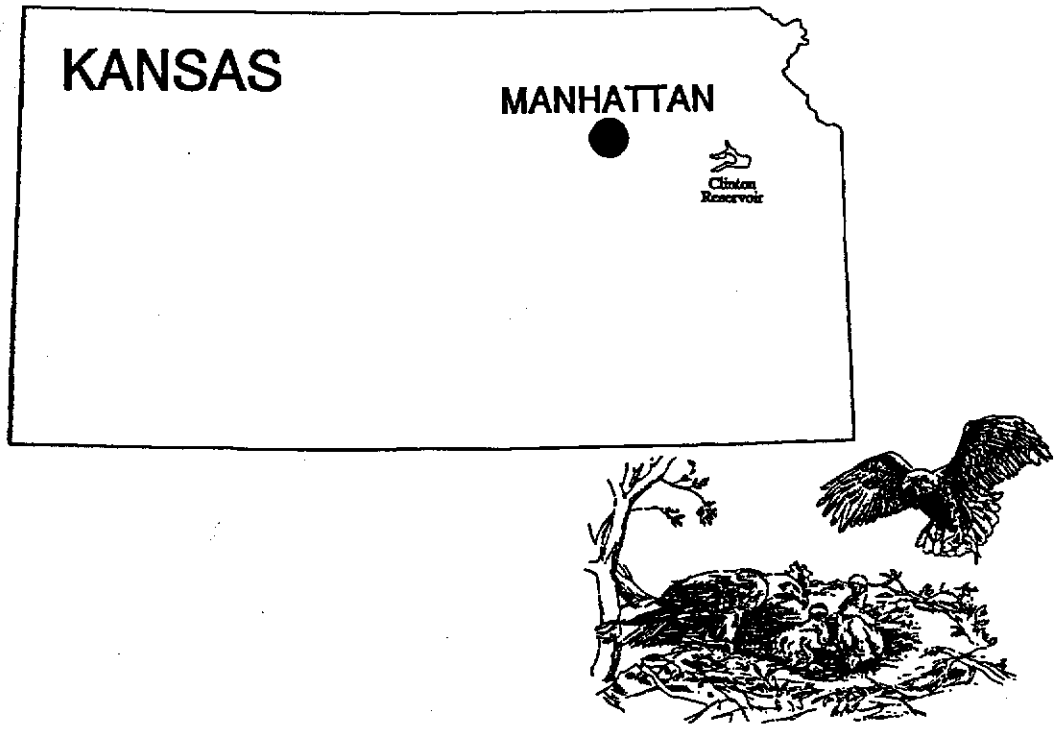
METAL CONCENTRATIONS IN BLOOD FROM AN ADULT BALD EAGLE NESTING AT CLINTON RESERVOIR IN KANSAS



U.S. FISH AND WILDLIFE SERVICE
Fish and Wildlife Enhancement
315 Houston Street
Manhattan, Kansas 66502

METAL CONCENTRATIONS IN BLOOD FROM AN ADULT BALD EAGLE NESTING AT CLINTON RESERVOIR IN KANSAS

by

George T. Allen

U. S. Fish and Wildlife Service
Fish and Wildlife Enhancement
315 Houston Street
Manhattan, Kansas 66502

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SUMMARY

▸ Concentrations of metals in blood from an adult male bald eagle nesting at Clinton Reservoir in eastern Kansas in 1991 were analyzed by induction coupled plasma emission spectroscopy without preconcentration.

▸ Because there are very limited data on background levels of most metals in bald eagle blood, the data herein are provided for comparison with other samples at later dates.

▸ Few metals were detected in the sample. The only metal detected that is not physiologically well controlled was mercury. However, the mercury concentration was low compared to concentrations found in blood from bald eagles in the western United States.

ACKNOWLEDGMENTS

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INTRODUCTION

The first publicized successful nesting effort by bald eagles in Kansas in recent history occurred on the Rock Creek Arm of Clinton Lake, a U.S. Army Corps of Engineers reservoir, in 1989. Eagles nested there successfully again in 1990 and in 1991. In 1991 Service biologists captured the adult male of the nesting pair for banding, mounting of a radio transmitter, and for collection of a blood sample to be analyzed for metals concentrations. The results of the analysis of the blood are presented in this report. Because there is very limited information available about levels of many elements in bald eagle blood, this report provides data for comparison to data from other studies.

STUDY AREA AND METHODS

Clinton Reservoir is located about eight kilometers southwest of Lawrence, in Douglas County, northeast Kansas. The main tributaries of Clinton Reservoir are the Wakarusa River and Rock Creek. The eagle nest used in 1989, 1990, and 1991 was in a flooded tree in the middle of the Rock Creek arm of the reservoir. Feeding areas of the adult and juvenile bald eagles at the reservoir have not been well documented.

In August 1991, Service personnel trapped an adult from the nesting pair at Clinton Reservoir using a floating noosed fish trap (Bloom 1987, Frenzel and Anthony 1982, Robards 1967). A sterile needle and a vacutainer were used to collect 8 ml of blood from a brachial vein of the eagle. Based on measurements of the trapped bird and the appearance of each of the adults, the bird captured is believed to have been the male of the nesting pair.

The blood sample was analyzed by the Research Triangle Institute (RTI) of Research Triangle Park, North Carolina. Induction coupled plasma emission spectroscopy (ICP) without preconcentration was used to measure concentrations of aluminum, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, strontium, vanadium, and zinc. RTI reported both dry weight and wet weight concentrations of the metals analyzed. Detection limits for most of the metals analyzed are indicated in Table 1. Other detection limits were: for iron and magnesium approximately 12 μg/g (micrograms per gram, or 1 part per million); for mercury 0.119 μg/g; for selenium 0.357 μg/g; and for zinc 1.19 μg/g.

Laboratory quality control was reviewed by the Patuxent Analytical Control Facility (PACF) of the Service. Precision and accuracy of the laboratory analyses were confirmed with procedural blanks, duplicate

analyses, test recoveries of spiked materials, and reference material analyses. Round-robin tests among Service and contract analytical labs also were part of the quality control.

Duplicate analyses did not differ for any element not detected in the original analysis. The relative percent differences for other metals were: iron, 24%; magnesium, 28%; mercury 43%; selenium, 29%; and zinc, 0.16%. Spike recoveries ranged from 89% to 111%. Analyses of reference standards produced recoveries that ranged from 61% to 132%, with the exception of a 196% recovery in one analysis of chromium.

Ths sample was submitted to RTI in August 1991. The results of the analysis were received in March 1992.

RESULTS AND DISCUSSION

Results of analyses are shown in Table 1. Metals concentrations in blood from fledgling males from the same nest site in 1989 and 1990 are shown in Table 2. Most detection limits for analyses of the blood from the fledglings were much higher than those for the analyses conducted by RTI.

Mercury should always be of concern in biota, but the concentration in the blood from the adult was much lower than the concentrations reported in adults from Oregon, northern California, and Montana (Frenzel and Anthony 1989, Wiemeyer et al. 1989). The other metals detected are normally found in blood.

The ICP scan from RTI had a good detection limit for mercury, which was not analyzed in the samples from the fledglings. Therefore, if mercury is of concern, I suggest that blood samples be sent to RTI for scans, or that the samples be preconcentrated for ICP or analyzed by atomic absorption spectroscopy.

Table 1. Element concentrations in blood from adult male bald eagle nesting at Clinton Reservoir, Kansas in 1991. A "<" symbol indicates a concentration less than the value shown. The actual concentration could be much lower.

Percent Moisture	Concentration (mcg/g) Aluminum Dry	Aluminum Wet	Arsenic Dry	Arsenic Wet	Barium Dry	Barium Wet	Beryllium Dry	Beryllium Wet
90.0	<5.95	<0.60	<0.36	<0.04	<0.60	<0.06	<0.12	<0.01

Concentration (mcg/g) Boron Dry	Boron Wet	Cadmium Dry	Cadmium Wet	Chromium Dry	Chromium Wet	Copper Dry	Copper Wet	Iron Dry	Iron Wet
<0.60	<0.06	<0.36	<0.04	<0.60	<0.06	<0.60	<0.06	360	36

Concentration (mcg/g) Lead Dry	Lead Wet	Magnesium Dry	Magnesium Wet	Manganese Dry	Manganese Wet	Mercury Dry	Mercury Wet	Molybdenum Dry	Molybdenum Wet
<0.36	<0.04	45.5	4.55	<0.60	<0.06	0.33	0.03	<0.60	<0.06

Concentration (mcg/g) Nickel Dry	Nickel Wet	Selenium Dry	Selenium Wet	Strontium Dry	Strontium Wet	Vanadium Dry	Vanadium Wet	Zinc Dry	Zinc Wet
<0.60	<0.06	0.52	0.05	<0.60	<0.06	<0.60	<0.06	6.43	0.64

Table 2. Dry weight metal concentrations from blood of fledgling male bald eagles from Clinton Reservoir, Kansas in 1989 and 1990. A "<" symbol indicates a concentration less than the value shown. The actual concentration could be much lower. Data from Allen (1991).

Year	Percent Moisture	Concentration (mcg/g) Aluminum	Arsenic	Barium	Beryllium
1989	83.1	7.0	<9.0	<0.1	<0.3
1989	81.6	<3.0	<8.0	<0.1	<0.3
1990	81.8	<3.0	<5.0	0.79	<0.1
1990	81.8	<3.0	<5.0	0.83	<0.1

Year	Concentration (mcg/g) Boron	Cadmium	Chromium	Copper	Iron	Lead
1989	<4.0	<0.5	<3.0	1.6	2200	<4.0
1989	4.0	<0.5	<3.0	1.8	2210	<4.0
1990	<2.0	<0.5	<1.0	1.6	2160	<4.0
1990	<2.0	<0.5	<1.0	1.6	2170	<4.0

Year	Concentration (mcg/g) Magnesium	Manganese	Molybdenum	Nickel	Selenium
1989	372	<0.9	<2.0	<5.0	<10.0
1989	375	<0.8	<2.0	<5.0	<10.0
1990	334	<0.3	<1.0	<2.0	< 6.0
1990	338	<0.3	<1.0	<2.0	< 6.0

Year	Concentration (mcg/g) Strontium	Vanadium	Zinc
1989	<0.3	<0.8	23
1989	0.2	<0.7	24
1990	0.2	<0.3	43.9
1990	0.2	<0.3	49.7

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