

**CONTAMINANT CONCENTRATIONS IN WATERFOWL  
FROM THE SHEBOYGAN RIVER AREA OF CONCERN  
UPDATE: 2012 SAMPLES**

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## **INTRODUCTION:**

Results of the contaminant analyses of waterfowl samples collected from the Sheboygan River AOC in 2011 – 2012 indicated that PCB levels in both mallards and scaup decreased only slightly since the 1980's. As such, we recommended that all consumption advisories remain unchanged.

Additional samples of Canada geese, mallards and scaup were collected in 2012 as supplementary data.

## **RESULTS and DISCUSSION**

We realize the difficulty regarding the issuance of consumption advisories for waterfowl. Because they are mobile and migratory, it is difficult to pinpoint whether waterfowl have accumulated contaminants from outside WI or the United States or from a location in the state other than the area where they are harvested. To address this issue, we focused on collecting adult mallards and Canada geese known to be members of a resident flock and/or juvenile birds known to have been hatched in Wisconsin. In addition, scaup often overwinter on Lake Michigan and collecting them in the late winter/early spring would allow for the collection of ducks which have been in the area for 4-5 months, therefore better reflecting local contamination. However, we were only able to collect 2 scaup due to poor weather conditions.

### **PCBs**

Detectable levels of PCBs were observed in every resident mallard sample (range 0.11 – 6.7 µg/g) (Table 2). The mean PCB concentration in mallards (1.84 µg/g) was lower than the mean PCB concentration observed in samples collected in 2011-2012, but were still above the “do not eat” advisory concentration. As a result, the existing consumption advisory for mallards within the Sheboygan River will remain in effect. Similarly, PCBs were detected in 8 of 10 samples from resident Canada geese, but at lower levels than observed in resident mallards (range ND – 0.3 µg/g). The mean PCB concentration in resident Canada geese (0.124 µg/g) was nearly identical to the mean concentration observed in geese collected in 2011 – 2012. The mean concentration fell within the restricted consumption advisory concentration range (Table 1).

PCBs were not collected in the 2 scaup collected from the Sheboygan Harbor in 2012. This is a sharp contrast to the levels observed in scaup collected the previous year. The scaup collected in 2012 were obtained from hunters who harvested the scaup during the waterfowl season. It is possible these scaup recently migrated into the area and were not in the AOC long enough to accumulate PCBs in their tissue. The scaup collected during the previous year were harvested during the late winter and thus likely overwintered in the area of the AOC. It is reasonable to assume these birds had accumulated high levels of PCBs during the overwintering period.

### **METALS**

There is no single standard for permissible amounts of lead in food. Furthermore, FDA regulatory standards and guidelines for Pb in food are complicated by the relatively recent recognition (ATSDR 2007, EPA 2007) of Pb as a probable human carcinogen. However, for meat and fat products, an international consensus standard of 0.05 ppm is under discussion (FDA 2000).

Lead was detected in every sample collected from resident mallards (range 0.01 – 0.041 µg/g). However, the mean Pb concentration (0.023 µg/g) was below the advisory concentration of 0.05 µg/g, therefore, an advisory due to Pb contamination is not necessary. Lead was also detected in every sample from resident Canada geese, but 7 the 10 samples failed quality control standards (matrix duplicate exceeded quality control standards) which was considered during interpretation. However, the observed levels were very low and it is unlikely an advisory for Pb would be necessary. Lead was also detected in each scaup sample (range 0.003 – 0.008 µg/g) but the mean concentration (0.006 µg/g) was below the advisory concentration. The scaup samples also failed quality control standards.

Mercury was also detected in every sample collected from resident mallards (range 0.013 – 0.12 µg/g), but the mean concentration (0.05 µg/g) was below the advisory concentration, so an advisory based on Hg contamination is not necessary. Mercury was not detected in any of the 10 samples from resident Canada geese. Scaup contained the highest levels of mercury (range 0.06 – 0.25 µg/g).

Similar to the results observed in 2011 – 2012, cadmium levels in waterfowl samples collected in 2012 – 2013 were very low and often just above the limit of detection.

#### **PERFLUORINATED COMPOUNDS (PFCs)**

Advisory concentrations only exist for one PFC compound (perfluorooctane sulfonate). As such, only concentrations of this specific compound were able to be interpreted for the purpose of consumption advisories. Perfluorooctane sulfonate (PFOS) was detected in all 4 mallard samples that were analyzed for PFCs (range 6.9 – 17 ppb). The levels of PFOS observed in the 2013 mallard collection were less than those observed in the 2011 collection. Although a consumption advisory based on PFOS levels is not warranted, we do believe it is an issue worth monitoring in the future. PFOS was also detected in 9 of 10 samples from resident Canada geese (range ND – 1.8 ppb). The average concentration of PFOS in resident geese was below the advisory concentration. Only one sample from scaup had detectable levels of PFOS and the concentration in this sample was below the advisory concentration.

#### **CONCLUSIONS**

While the overall concentrations of contaminants from waterfowl collected in 2012 were lower than concentrations observed from waterfowl collected in 2011, the concentrations were still comparable and justify the existing consumption advisories. Based on levels of PCBs observed in both resident mallards and scaup, it is our recommendation that the “do not eat” advisory which is currently in place for the Sheboygan River and Sheboygan Harbor remain in effect. In addition, based on levels of PCBs observed in resident Canada geese, we recommend an advisory of “no more than 1 meal/week” be placed on Canada geese using the Sheboygan River. Comparing results from the current sample collection with samples collected in the mid-1980s for both mallards and scaup indicate PCB levels have decreased only slightly in both species over the last 25 years.

Table 1. Human Health Consumption Advisory Critical Concentrations in Fish or Meat Products.

CONTAMINANT	MINIMUM DETECTION LIMIT ( $\mu\text{g/g}$ )	ADVISORY CONCENTRATION ( $\mu\text{g/g}$ )		
		Unlimited consumption	No more than 1 meal/Week	Do Not Eat
PCB	0.04	<0.05	0.06 - 0.22	>2.0
Mercury (Children under age 15, pregnant women and women of childbearing age)	0.004	<0.05	0.06 - 0.22	>0.95
Lead	0.005	<0.05	n/a	n/a
Cadmium	0.0045	<0.3*	n/a	n/a
PFOS (perfluorooctane sulfonate)	0.12 (ng/g)	<40 (ng/g)	40 - 200 (ng/g)	> 800 (ng/g)

\*Level of concern rather than advisory concentration

Table 2: Total PCB, mercury, and lead concentrations (average  $\pm$  standard deviation) in waterfowl collected from the Sheboygan River AOC

Species	Sample Size	Collection Date	Total PCBs ( $\mu\text{g/g}$ )	Hg ( $\mu\text{g/g}$ )	Pb ( $\mu\text{g/g}$ )
Mallard	11	07/31/12 – 01/22/12	1.84 $\pm$ 1.77	0.048 $\pm$ 0.03	0.023 $\pm$ 0.01
Canada Geese	10	06/2012	0.124 $\pm$ 0.10	ND	0.007* $\pm$ 0.001
Scaup	2	10/28/2012– 11/04/2012	ND	0.15 $\pm$ 0.14	0.005* $\pm$ 0.004

\*Sample results failed QC (matrix duplicate exceeded quality control standards)

Table 3: Concentrations of DDE, cadmium, PFOS, and total PFCs (average  $\pm$  standard deviation) in waterfowl collected from the Sheboygan River AOC.

Species	Sample Size	DDE ( $\mu\text{g/g}$ )	Cd ( $\mu\text{g/g}$ )	PFOS (ng/g)	Total PFCs (ng/g)
Mallard	11	$0.175 \pm 0.20$	$0.003 \pm 0.001$	$11.4^* \pm 4.5$	$14.6^* \pm 5.1$
Canada Geese	10	$0.136 \pm 0.14$	$0.007 \pm 0.19$	$0.66 \pm 0.5$	$0.97 \pm 1.1$
Scaup	2	ND	ND	$0.31 \pm 0.35$	$7.5 \pm 5.2$

\*Only 4 mallard samples were analyzed for PFCs due to low sample volume.