Mallard Mercury Study on the South River 2008

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Study Objectives

- Increase sample size of Mallard blood, feather, egg from the SR;
- Expand egg collection time frame to target 1st and 2nd clutch collections;
- Analyze 2007 archive eggs and eggs collected in 2008 for SI's to determine origin of Hg inputs from laying females;
- Analyze 2007 archive blood and blood collected in 2008 for SI's to determine trophic positioning of Mallards feeding on the SR.

Methods

- Live decoy traps and baited snap traps were deployed at river sites where Mallard pairs were observed
- Nest traps were set when a nest was located in order to trap and sample the incubating hen

Sampling

- All captured Mallards were sampled for blood and feathers, measurements recorded, and banded with a USFWS band
- Hens were equipped with a radio transmitter in order to track to her nest

Radio Telemetry

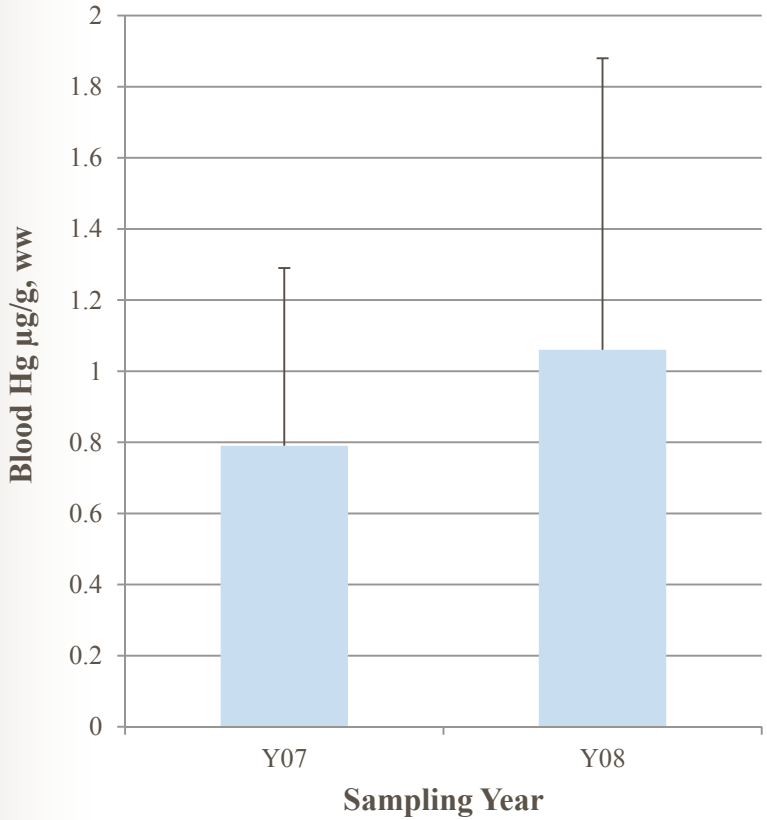
Sampling Summary

- Captured 61 Mallards;
- Equipped 12 hens with radio transmitters;
- Collected 176 eggs (consisting of 17 entire clutches);
- 1st and 2nd clutches collected from 5 hens;
- Sampling on the SR from 7 sites spanning Basic Park to Port Republic

Sample Status

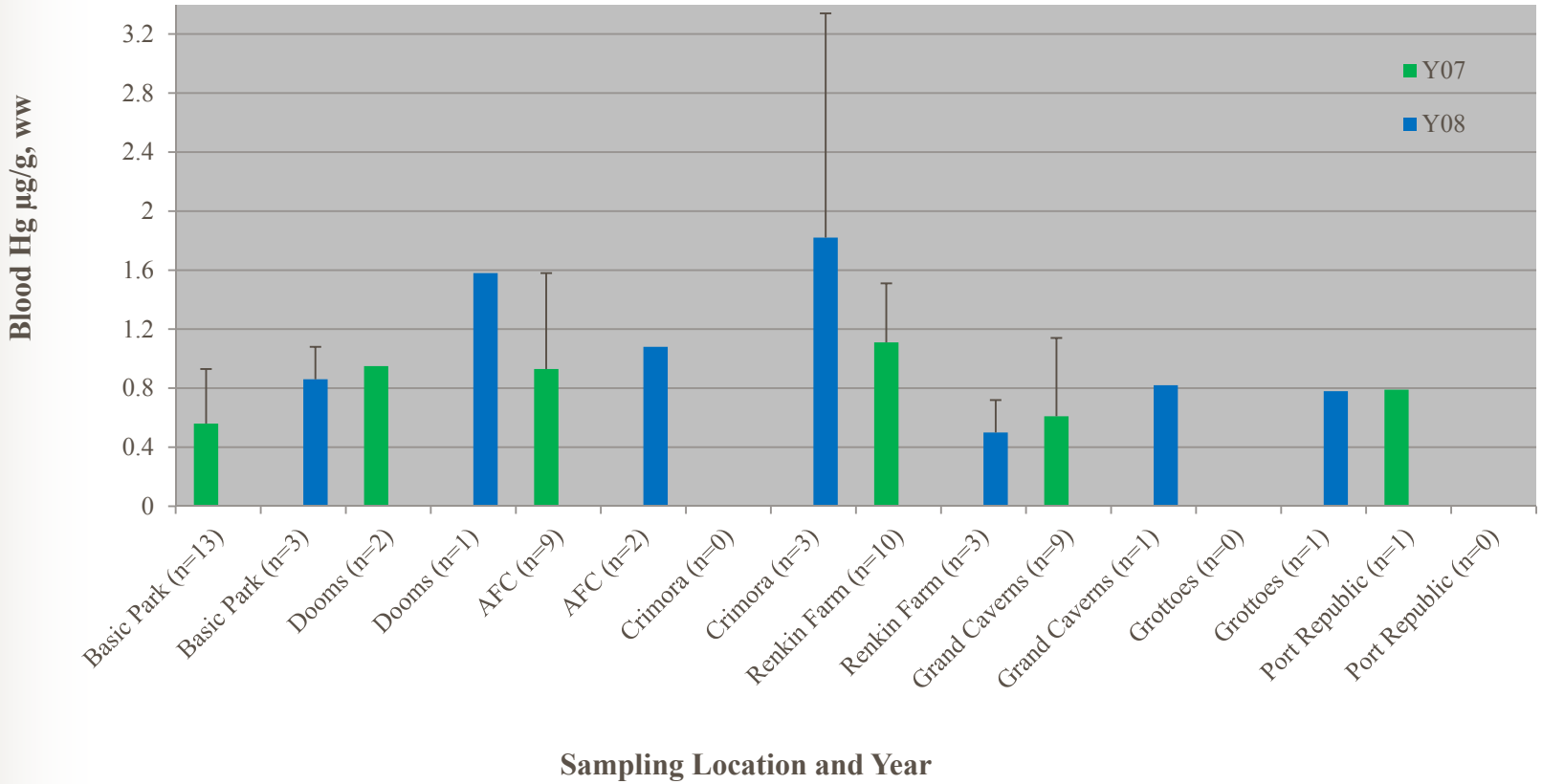
- University of Connecticut – 25 blood, 25 feather, 78 egg for Hg analysis
- Boston University – 25 blood for $\delta^{13}C$ and $\delta^{15}N$ stable isotope
- Colorado Plateau SI Lab – 69 eggs collected in 2007 from the SR; $\delta^{13}C$, $\delta^{15}N$, δD, ^{34}S

Blood Hg Levels

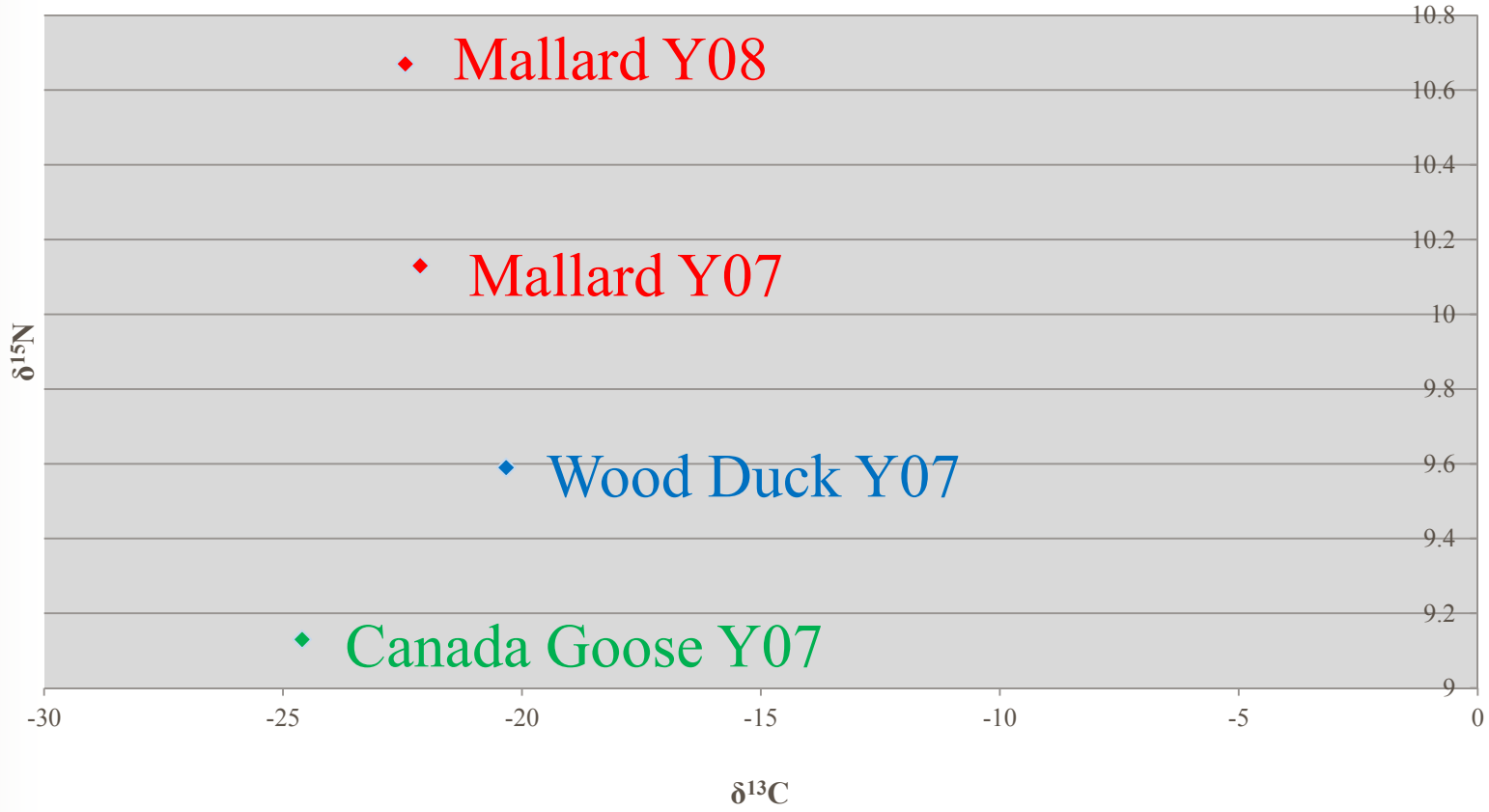


- 1.06 0.82 µg/g, ww (14 individuals)
- 1.02 0.70 µg/g, ww (11 re-samples)
- Blood Hg levels higher in 2008

Variation Among Location and Year



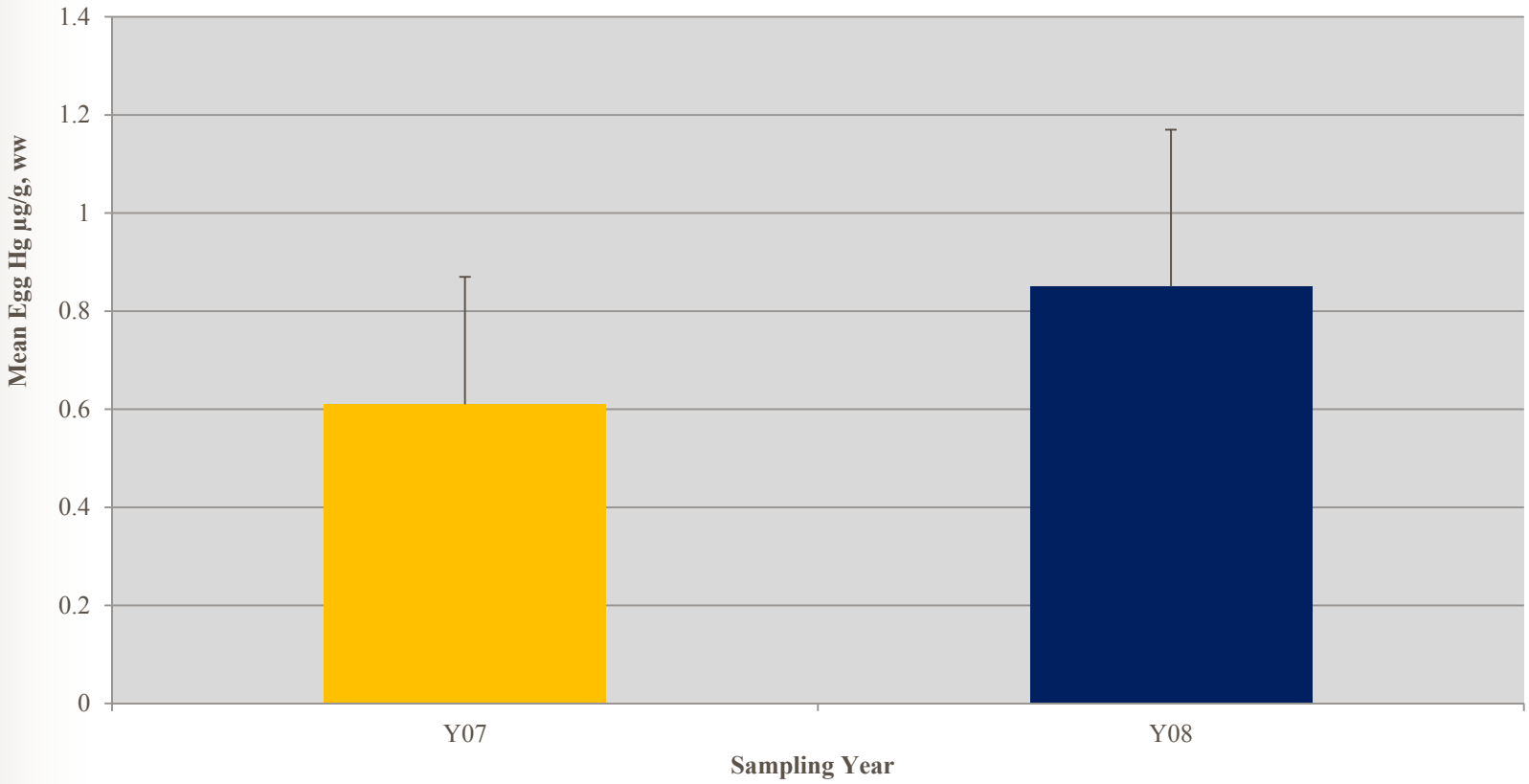
Waterfowl Trophic Positioning on the South River



Hg in Mallard Eggs

- 78 eggs analyzed
- South River 0.85 0.32 µg/g, ww
- Range 0.46 to 1.79 µg/g,ww
- Egg Hg higher in 2008

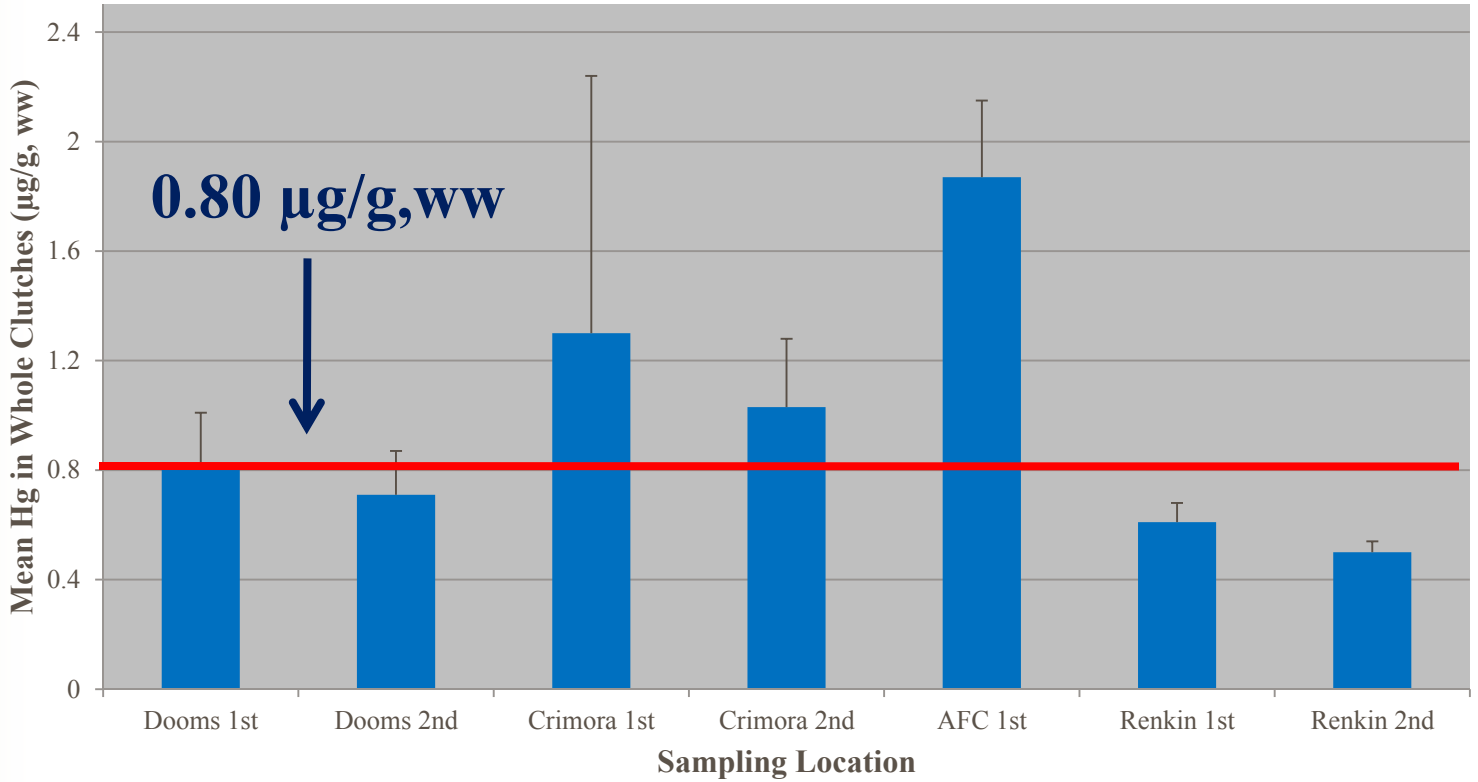
Mean Egg Hg for Y07 and Y08



Hg in Whole Clutches

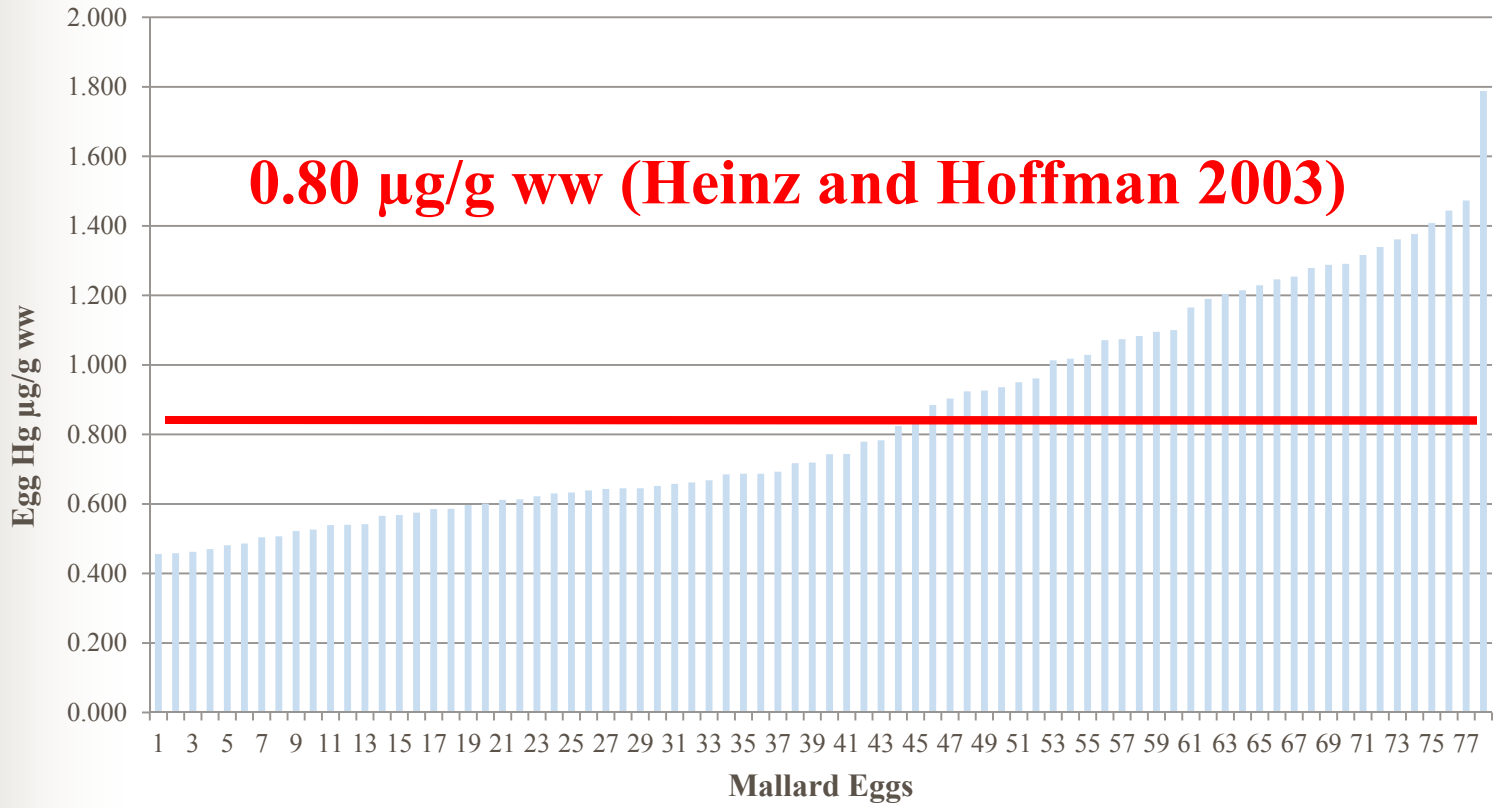
Location	Clutch	n	Range	Hg SD
AFC	1st	9	0.89 – 1.79	1.87 ± 0.28
Crimora	1st	10	1.17 – 1.47	1.30 ± 0.94
Crimora	2nd	9	0.69 – 1.44	1.03 ± 0.25
Renkin Farm	1st	14	0.48 – 0.72	0.61 ± 0.07
Renkin Farm	2nd	10	0.46 – 0.57	0.50 0.04
Dooms	1st	16	0.59 – 1.29	0.81 0.20
Dooms	2nd	10	0.57 – 1.07	0.71 0.16

Variation in Whole Clutch Hg by Location



Hg in Individual Eggs

**** 45% eggs from the SR exceeding LOAEL**



Eggs Exceeding LOAEL by Clutch

Clutch	**% > 0.80**
Dooms 1st	44%
Dooms 2nd	20%
Crimora 1st	100%
Crimora 2nd	78%
AFC	100%
Renkin Farm 1st	0%
Renkin Farm 2nd	0%

Feather Hg

- Mean Hg 3.33 ± 4.02 (n=25)
- Range 0.29 to 17.8 µg/g, fw
- 8% (2/25) exceeding 9.0 µg/g (LOAEL)
- Mean feather Hg among Males and Females similar; ♂= 3.08 and ♀= 3.60
- 8 individuals re-sampled between 2007-08
- Hg tended to increase from 07 to 08

% Difference in Feather Hg

Site	Gender	Y07	Y08	% change
Basic Park	♂	3.8	3.3	-13%
Basic Park	♂	0.02	0.65	3,150%
Crimora	♂	7.4	17.8	140%
Dooms	♂	0.21	2.9	1,280%
Dooms	♀	2.7	4.0	48%
Renkin Farm	♂	5.8	2.7	-53%
Renkin Farm	♀	1.8	2.6	44%
Renkin Farm	♂	2.9	2.0	-31%

Conclusions

- Hg levels in Mallard blood and eggs from the SR were higher in 2008 than 2007.
- 45% of Mallard eggs sampled from the SR exceeded established LOAEL's.
- Hg between 1st and 2nd clutch decreased slightly.
- Only 8% of feathers exceeded LOAEL.
- Preliminary SI results indicate differences in foraging strategies among waterfowl species on the SR.
- Most Stable Isotope results are pending from the labs.

Recommendations for 2008/09

- 1. Submit remainder of Mallard samples collected in 2008 for Hg and stable isotope analysis; eggs (n=98) and blood (n=65).
- 2. Determine origin of Hg inputs from remaining archived eggs through SI analysis.
- 3. Submit remainder of Mallard feathers (n=36) collected in 2008 for Hg analysis.
- 4. Analyze bi-catch waterfowl blood and feather samples for Hg and stable isotope analysis; Wood Duck (n=165) and Canada Geese (n=20).
- Interpret Hg and SI results.

Acknowledgements

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