

Mallard Mercury Study on the South River 2007



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Study Objectives

- Live capture and collect blood and feather samples from breeding adult Mallards for Hg analysis
- Locate Mallard nest sites to collect eggs for Hg analysis
- Compare Hg results from the South River to the reference sites and published literature
- Determine if Hg levels in Mallards exceed levels associated with adverse affects in behavior and reproduction in lab based studies



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



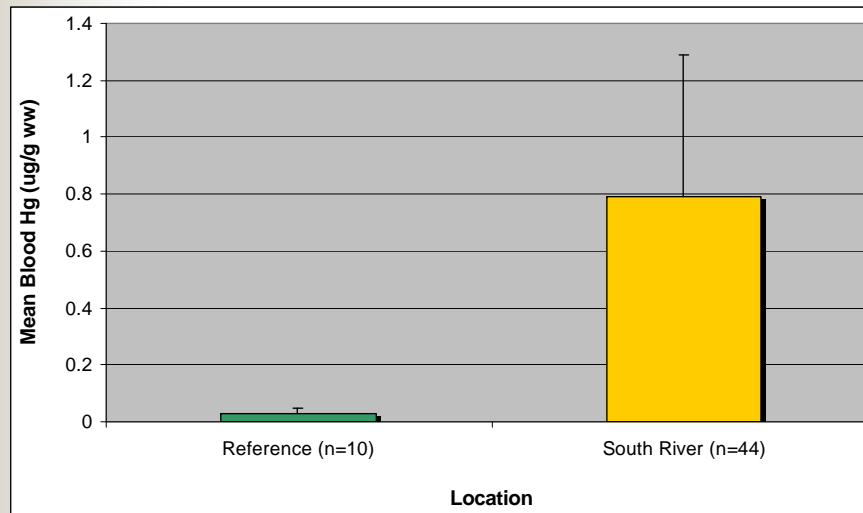




Sampling Summary

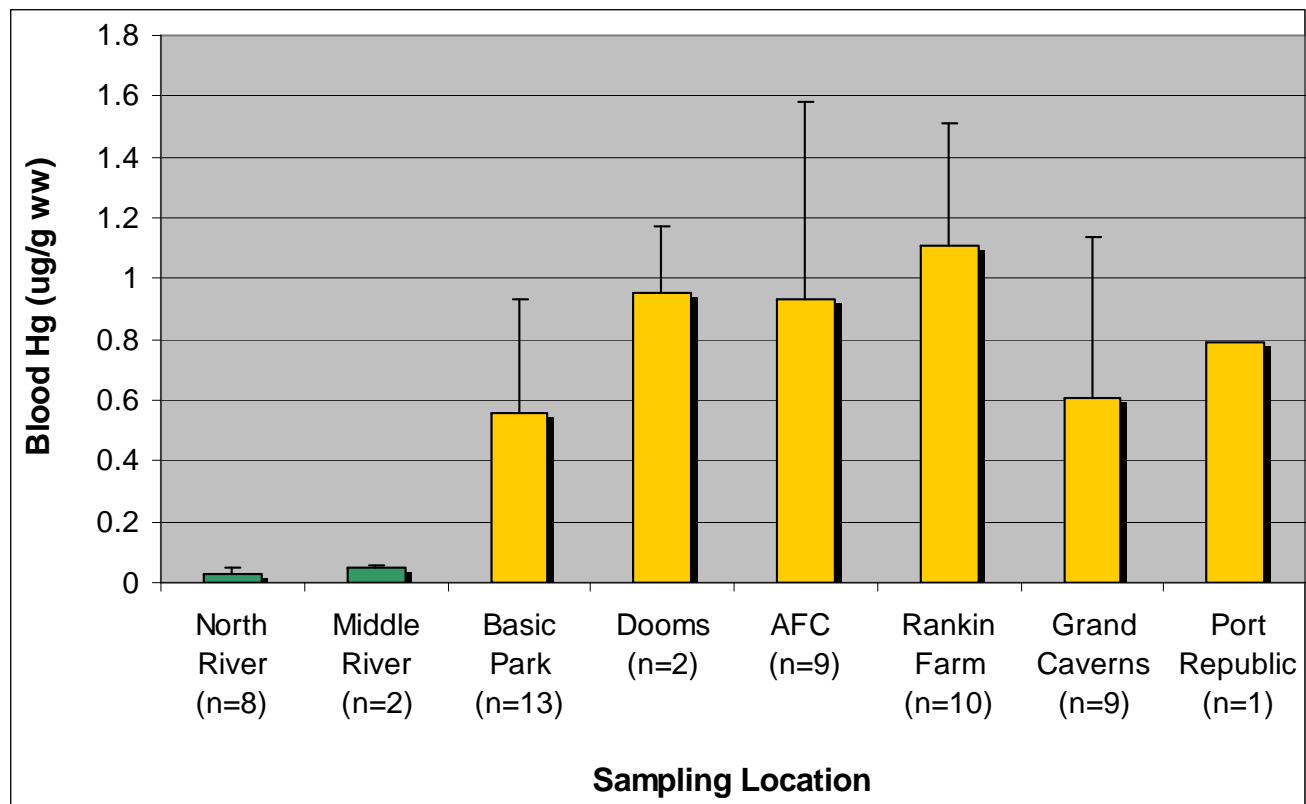
- Captured 48 Mallards
- Collected 107 eggs (consisting of 8 entire clutches); 2 clutches from the reference and 6 from the South River
- Equipped 5 hens with radio transmitters
- Sampling on the SR from Basic Park to Grottoes

Blood Hg Levels



- Reference 0.03 0.02 $\mu\text{g/g ww}$
- SR 0.79 0.50 $\mu\text{g/g ww}$
- SR 26 x higher than reference

Variation Among Location





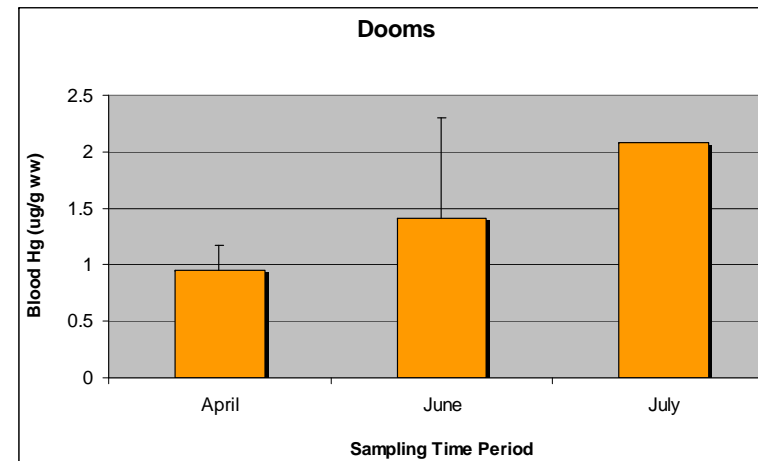
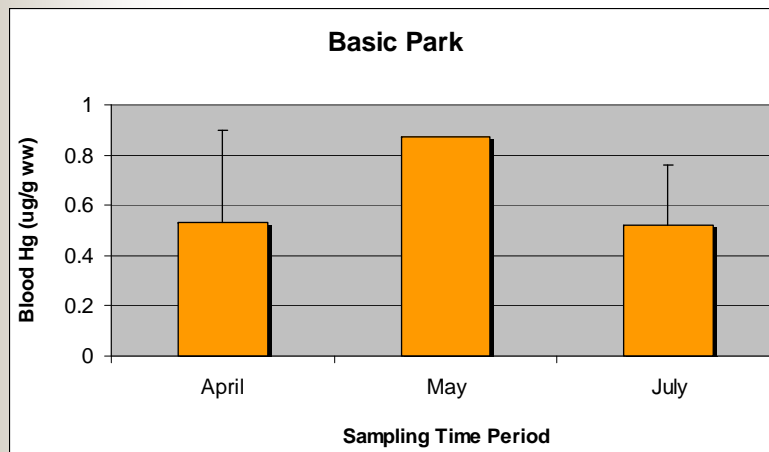
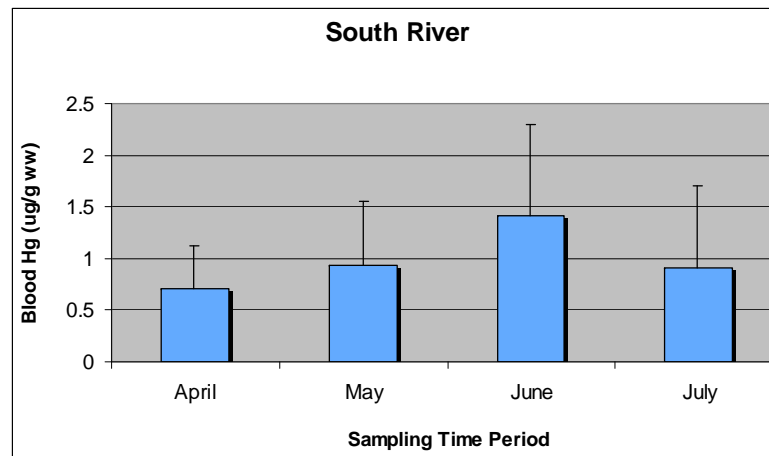
Gender Differences

- Males had slightly higher Hg than females from the reference sites
- Females contained higher Hg levels than males from South River
- Prey item selection??

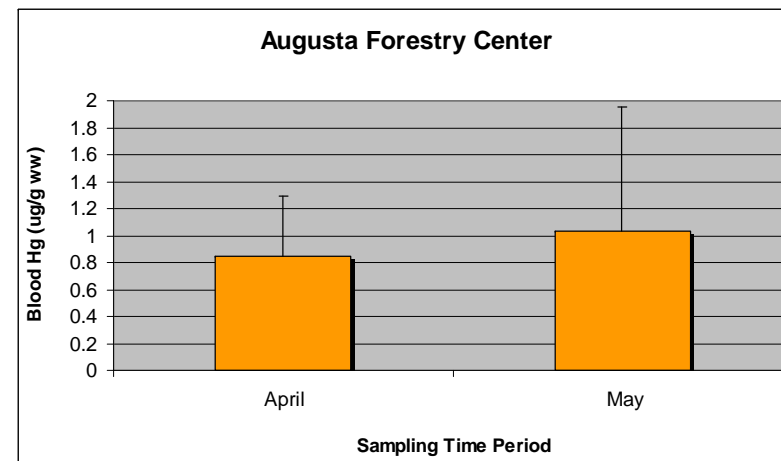
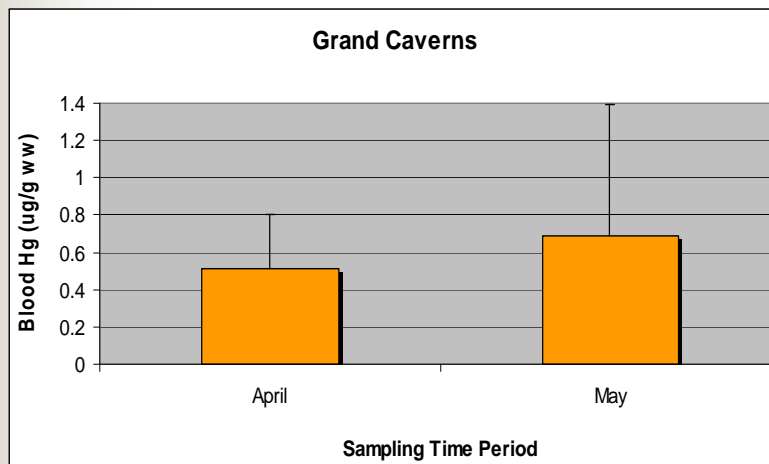
Increase in Blood Hg from Recaptures

| Location | Hg 1 | Hg 2 | # Days | % change |
|-----------------|-------------|-------------|---------------|-----------------|
| Grand Caverns | 0.79 | 1.11 | 34 | 40% |
| AFC | 1.28 | 2.19 | 31 | 71% |
| Grand Caverns | 0.68 | 1.71 | 25 | 150% |
| Rankin | 0.51 | 0.73 | 25 | 43% |
| Rankin | 1.46 | 1.63 | 10 | 12% |
| Rankin | 1.38 | 1.28 | 7 | -7% |

Seasonal Fluctuations in Hg



April to May



Hg in Mallard Eggs

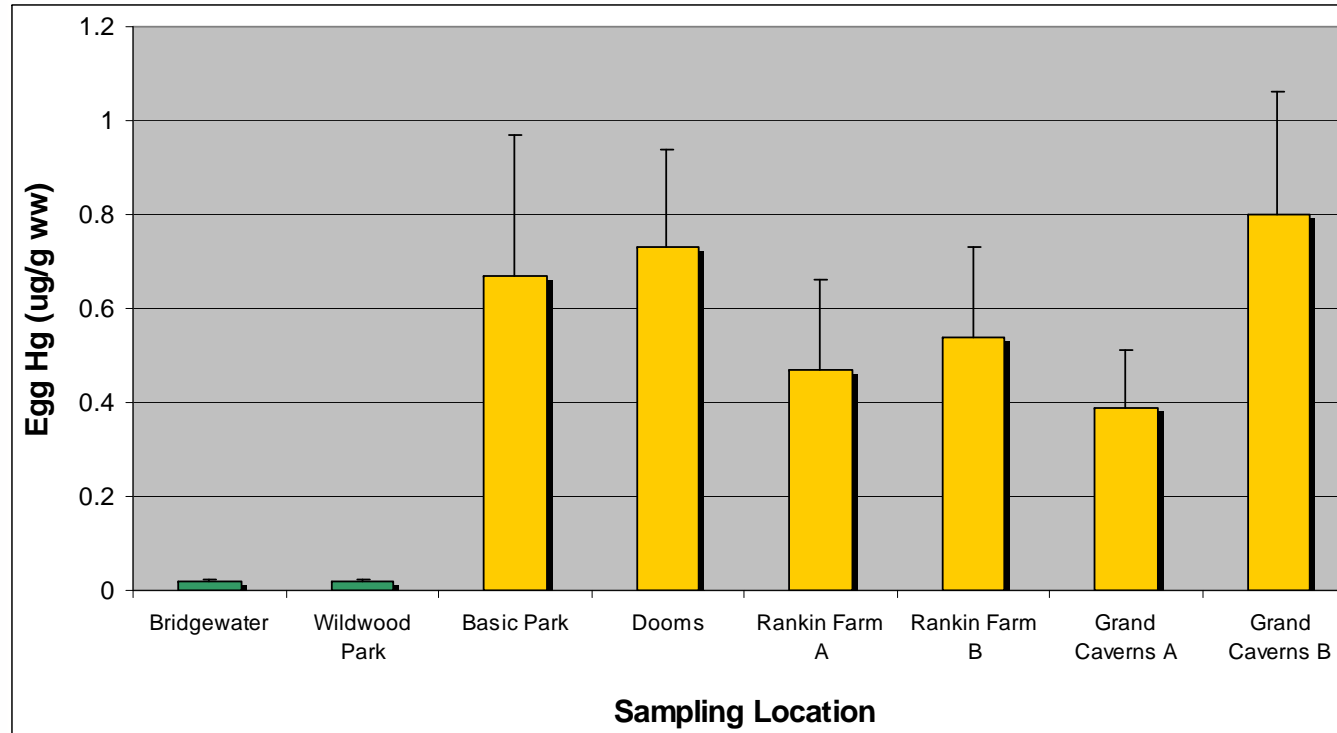


- Reference 0.02
0.004 ug/g ww
- South River 0.61
0.26 ug/g ww
- SR 30 x higher in Hg
than reference sites

Hg in Whole Clutches

| Location | Clutch | n | Range | Hg | SD |
|--------------------|----------|-----------|--------------------|-------------|--------------|
| Grand Caverns | A | 10 | 0.25 – 0.62 | 0.39 | 0.12 |
| Grand Caverns | B | 11 | 0.39 – 1.25 | 0.80 | 0.26 |
| Basic Park | A | 12 | 0.38 – 1.46 | 0.67 | 0.30 |
| Basic Park | A | 1 | | 1.00 | |
| Rankin Farm | A | 12 | 0.13 – 0.68 | 0.47 | 0.19 |
| Rankin Farm | B | 11 | 0.28 – 1.00 | 0.54 | 0.19 |
| Dooms | A | 12 | 0.50 – 1.09 | 0.73 | 0.21 |
| Bridgewater | A | 11 | 0.02 – 0.03 | 0.02 | 0.004 |
| Wildwood | A | 27 | 0.01 – 0.03 | 0.02 | 0.005 |

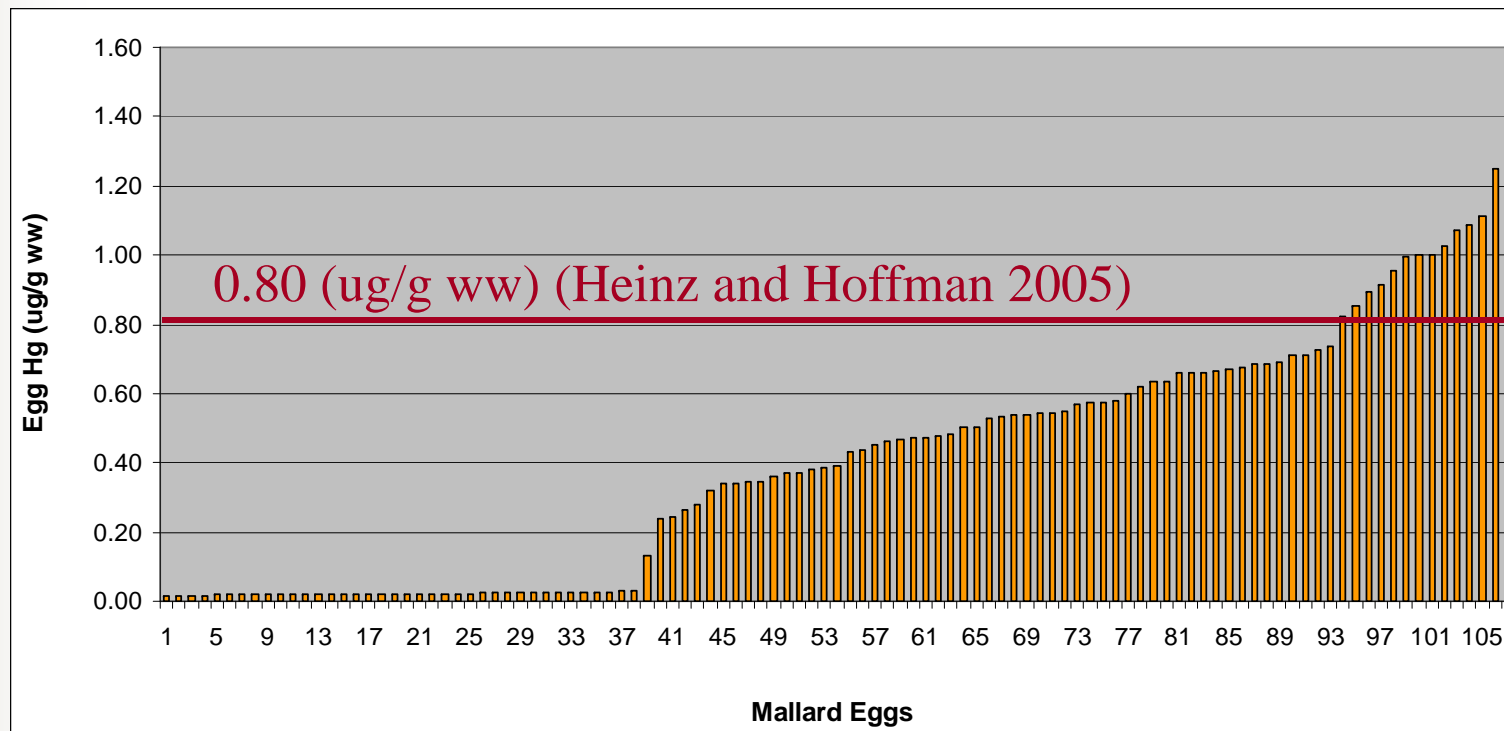
Variation in Egg Hg among Location



Hg in Individual Eggs

**** 20% eggs from the SR exceeding LOAEL**

**** 0% eggs from the reference exceeded LOAEL**





Eggs Exceeding LOAEL's by Clutch

| Clutch | % > 0.80 |
|-----------------|----------|
| Rankin A | 0% |
| Rankin B | 9% |
| Grand Caverns A | 0% |
| Grand Caverns B | 55% |
| Basic Park | 17% |
| Dooms | 33% |



Conclusions

- Feather results are pending from the laboratory.
- Hg levels in tissues of Mallards from the SR were significantly higher than levels observed from reference sites.
- Hg levels in Mallards from the SR tended to increase with longer exposure to the SR.
- 20% of Mallard eggs sampled from the SR exceeded established LOAEL's.
- Later nesting Mallards and renesting attempts are at greater risk.



Recommendations for 2008

- 1. Increase sampling size: Power Analysis indicates 75 additional eggs are required from the SR to meet 95% confidence limits.
- 2. Continue using current sampling techniques on the SR. Reference site sampling is not needed.
- 3. Extend the sampling time period to include later nesting Mallards and collect multiple clutches.
- 4. Analyze collected eggs for stable isotope analysis. Determine wintering Hg loads in eggs.



Acknowledgements

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