Fitness of birds in mercury-contaminated areas of Shenandoah River Valley

Year 1 of a proposed 3-year study

Who are we?

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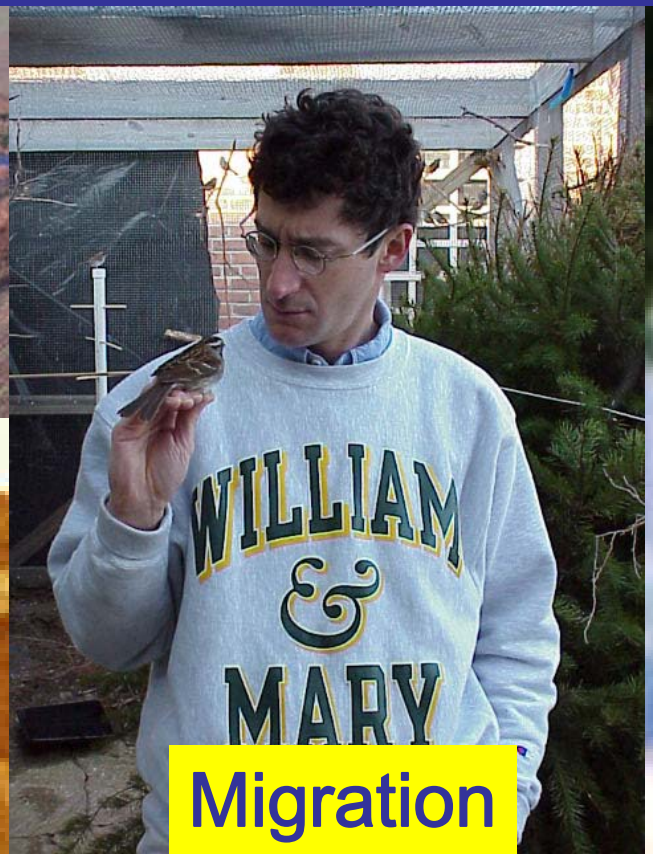
Created Wetlands

Neuroanatomy



Migration

Golf Courses

Objective: **Determine if individual birds in the contaminated parts of the watershed have reduced fitness, and …**

…if so, which species are affected and how seriously.

Overview of plan for Year 1:

1. Choose several breeding species in aquatic food web

2. Compare reproductive success to reference area

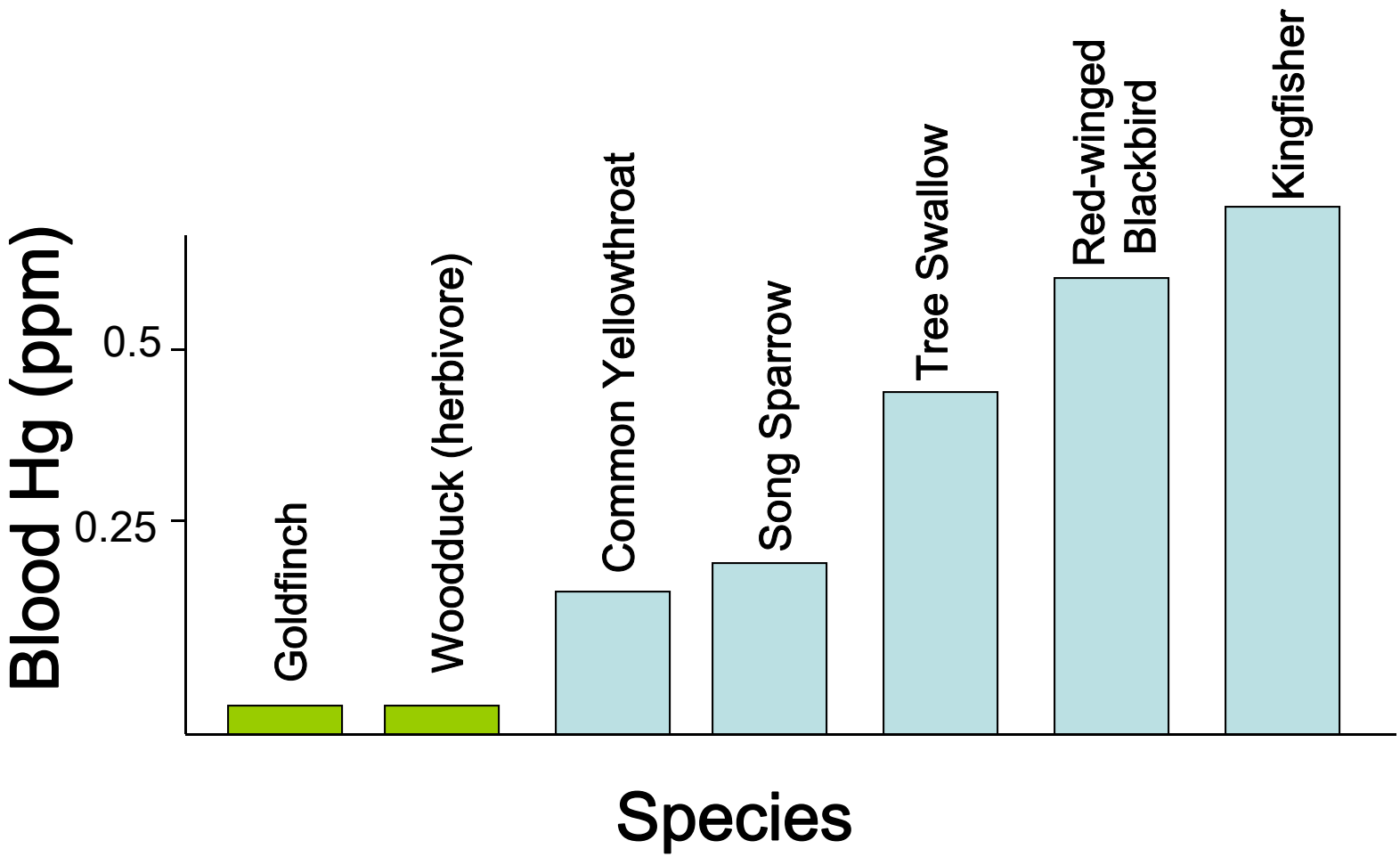
3. Determine if Hg levels are elevated

1. Choosing target species:

- Demonstrated to accumulate Hg
- High trophic level (eats insects or fish)
- Attaining large sample is practical


Tree Swallow
"model songbird"
Song Sparrow
Belted Kingfisher
"piscivore"
Common Yellowthroat
Red-winged Blackbird

Blood Hg levels for birds from New England rivers



Data from Evers et al. manuscript in review for *Ecotoxicology*

Additional species could be added if practical

Mallard

Louisiana Waterthrush

Unlikely candidates:

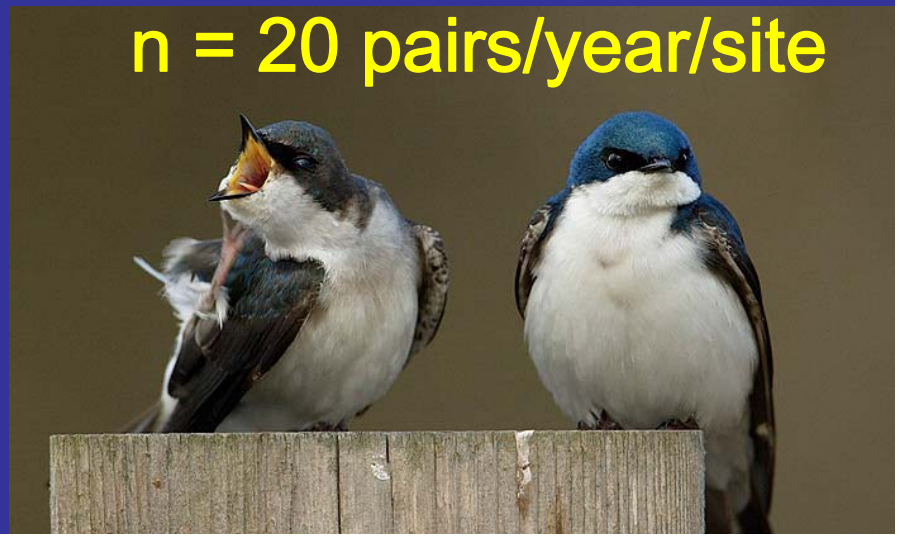
- American woodcock
- wintering mergansers
- green heron or great blue heron

2. Quantifying fitness effects:

Swallows:

- **Erect 200 shoreline nest boxes in and out of contaminated area**

- **Compare clutch size, fledging rate, nestling quality, etc.**



2. Quantifying fitness effects:

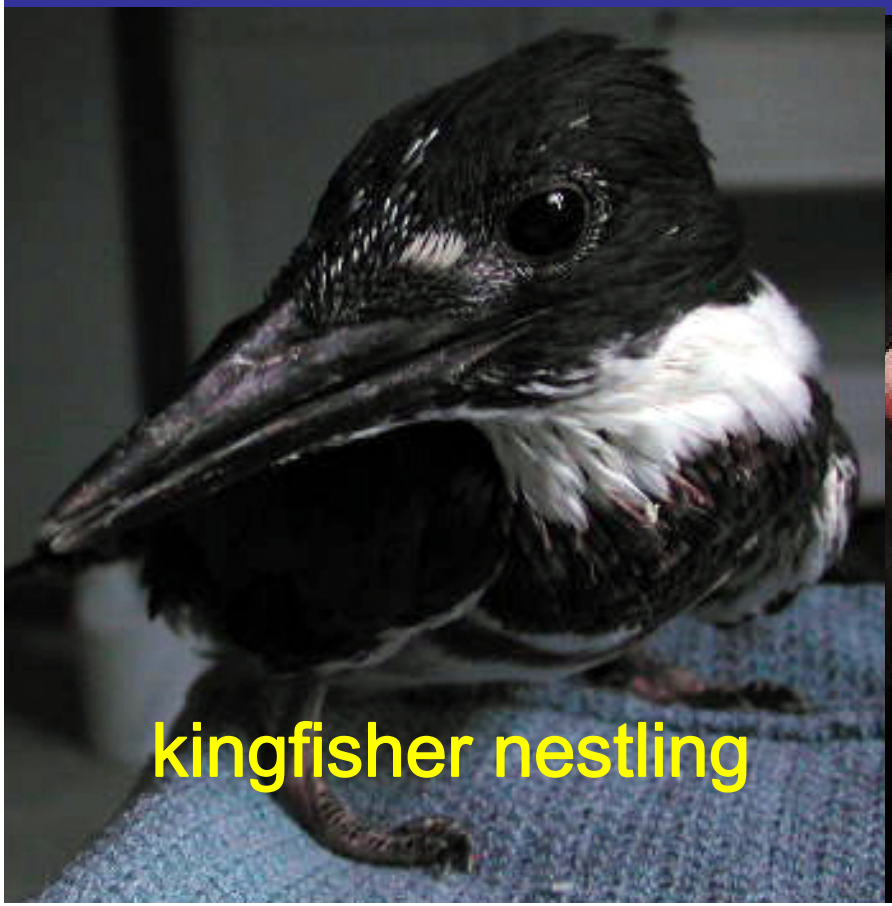
Kingfishers:

- **Locate nestholes in bank**

- **Compare reproductive parameters and foraging behavior**

n = <10 nests/year/site

Reproductive success of other 3 target species will not be studied unless Year 1 data suggest high levels of Hg



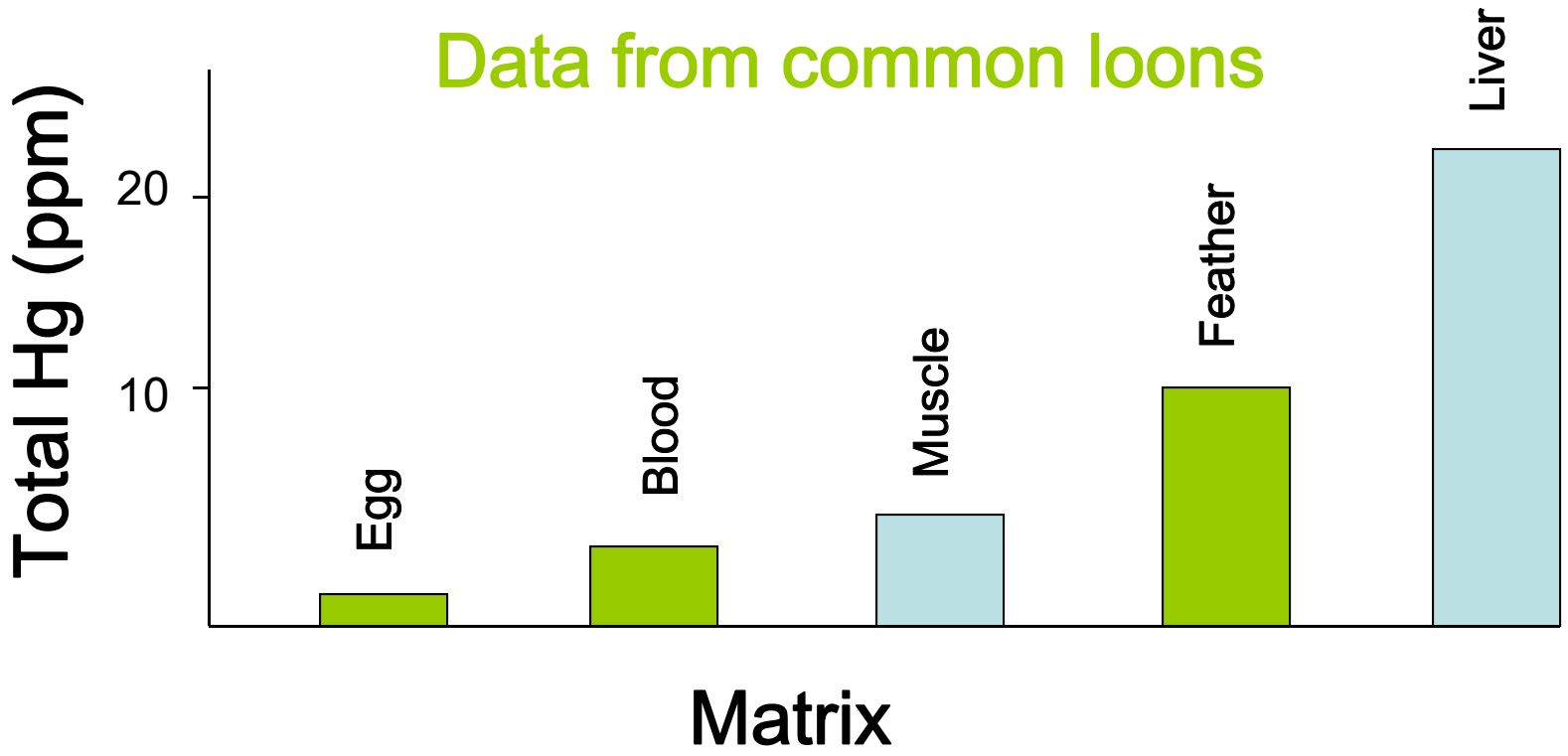
kingfisher nestling

swallow nestling

3. Testing for local mercury bioaccumulation:

Which matrix? *Egg, blood and feather are informative*

- **Correlated with recent food supply**
- **90-99% methylmercury**
- **Blood and feather are non-lethal samples**



Additional considerations:

- Mercury levels in feather vary with order of molt
- Mercury in egg varies with laying order
- Adults have more Hg in feathers/blood than young



Additional target species:

Collect blood, feathers, egg from 10 nests/site to look for trend of higher levels in contaminated area

If levels appear elevated in contaminated area, we'll sample more and quantify reprod. success in Years 2-3

Also, we can extend the investigation to additional species at lower risk, such as floodplain insectivores that don't forage exclusively along the shoreline

Future directions in years 2-3:

- Increase sample size of kingfishers
- Compare 1st and 2nd clutches of tree swallows
- Sample prey brought back to nestlings for mercury
- Examine reproductive success of additional species
- Confirm that >90% of Hg is MeHg in all matrices
- Compare avian community richness & density of target species (community outreach with local birdwatchers)
- Dosing study on eggs of affected species