Eight Things We Have Learned about Loons

Walter Piper
CHAPMAN UNIVERSITY
www.loonproject.org

Photos by Linda Grenzer

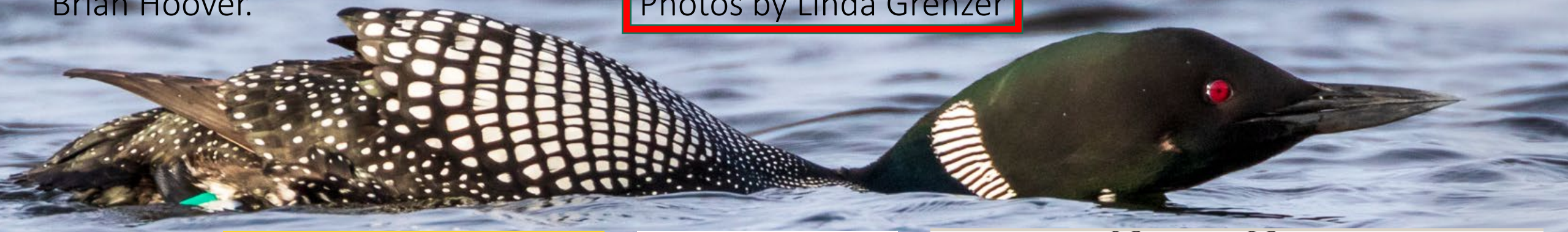
We have studied loons since 1993.

Acknowledgements

Field Work – Countless field techs and friends (>100) -- especially Linda Grenzer, Terri and Richard Rammer, Sheila Johnston, Elaina Lomery, Keren Tischler, Margaret Klich, Frank Spilker, Nathan Banfield, Lyla Furey, Kristin Brunk, Gabby Jukkula, Erin Harrington, Andrew Reinke, Amy Dolsen, Marc Schwabenlander, Eric Andrews, Allison Piper, Martha Kebeh, Katy Dahl, Claudia Kodsuntie, Hayden Walkush.

Collaborators, Past and Present – Kevin Rose, Max Glines, Marco Bisoffi, Jason Grear, Sarah Saunders, Lauren Riters, Michael Palmer, Charlie Walcott, Jay Mager, Mike Meyer, David Evers, Brian Hoover.

Photos by Linda Grenzer



NSF

NATIONAL GEOGRAPHIC

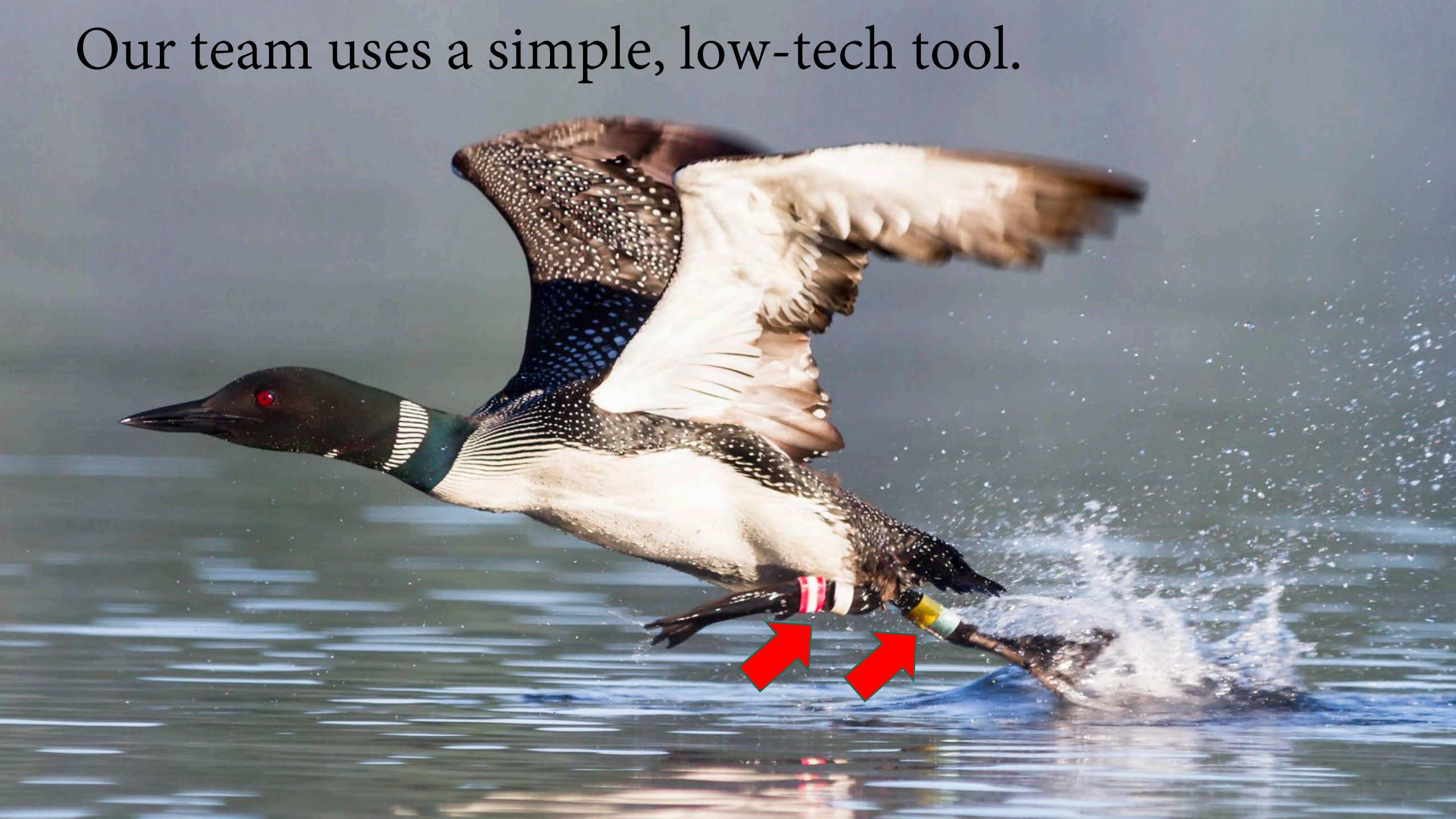
National Loon Center

Gull Chain of Lakes Association

……and many private donors. Thank you!

Quick Tour of Our Two Study Areas

Our team uses a simple, low-tech tool.



Scientific Goals

- On the Loon Project, we study how their behavior helps loons cope with two problems:
  - survival
  - reproduction

…and bring you up to date on the loon population of the Upper Midwest.

Today, I am going to share a few of our findings.

Fact #1

Loons do not mate for life.

A typical adult will have 3 to 5 mates during its life.

Why?

- Because loons – males and females both – commonly evict each other from territories.
- The evicted pair member must find a new territory and mate.
- The mate of the evicted bird pairs with the evicter.

Mike Meyer of Wisconsin DNR marked S/Y,R/G on Broken Bow Lake in 1993.

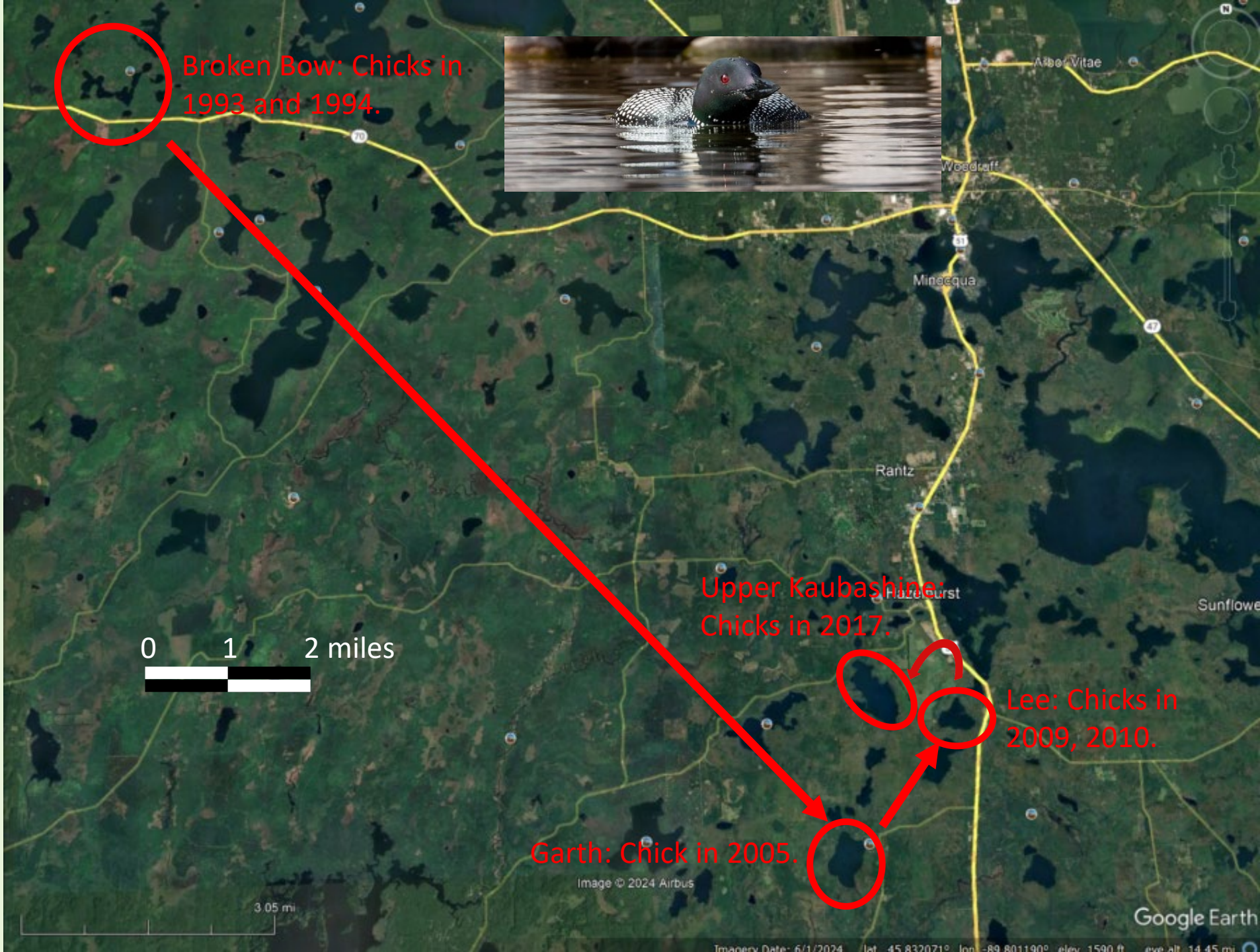
She had chicks there in ’93 and ’94.

She then dropped off our radar for a decade.

She resurfaced as the breeding female on Garth Lake in 2005 and had a chick there with a new male.

She proceeded to shift to Lee with a 3rd male in 2009.

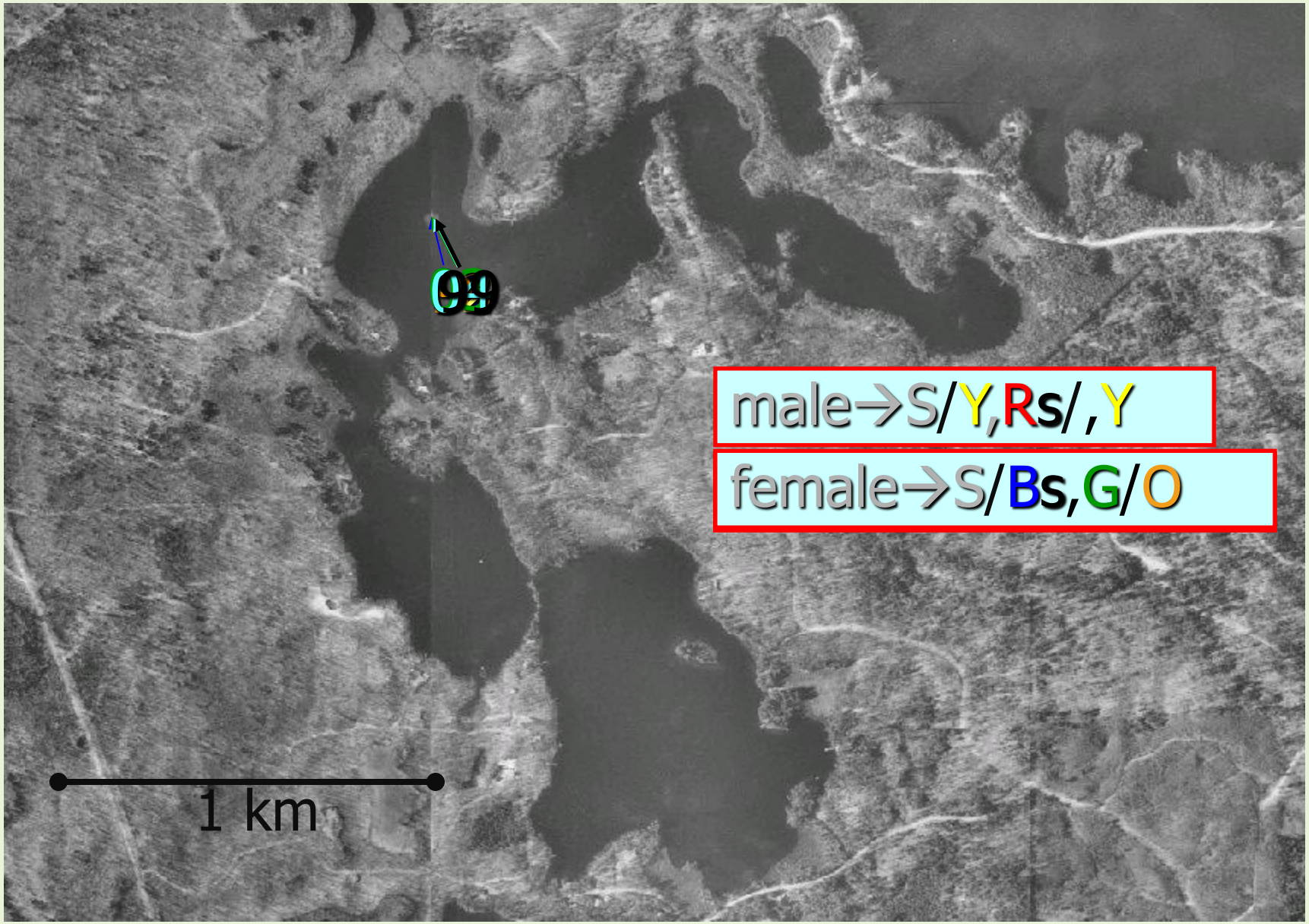
And ended her career with two chicks raised with a 4th male on Upper Kaubashine.



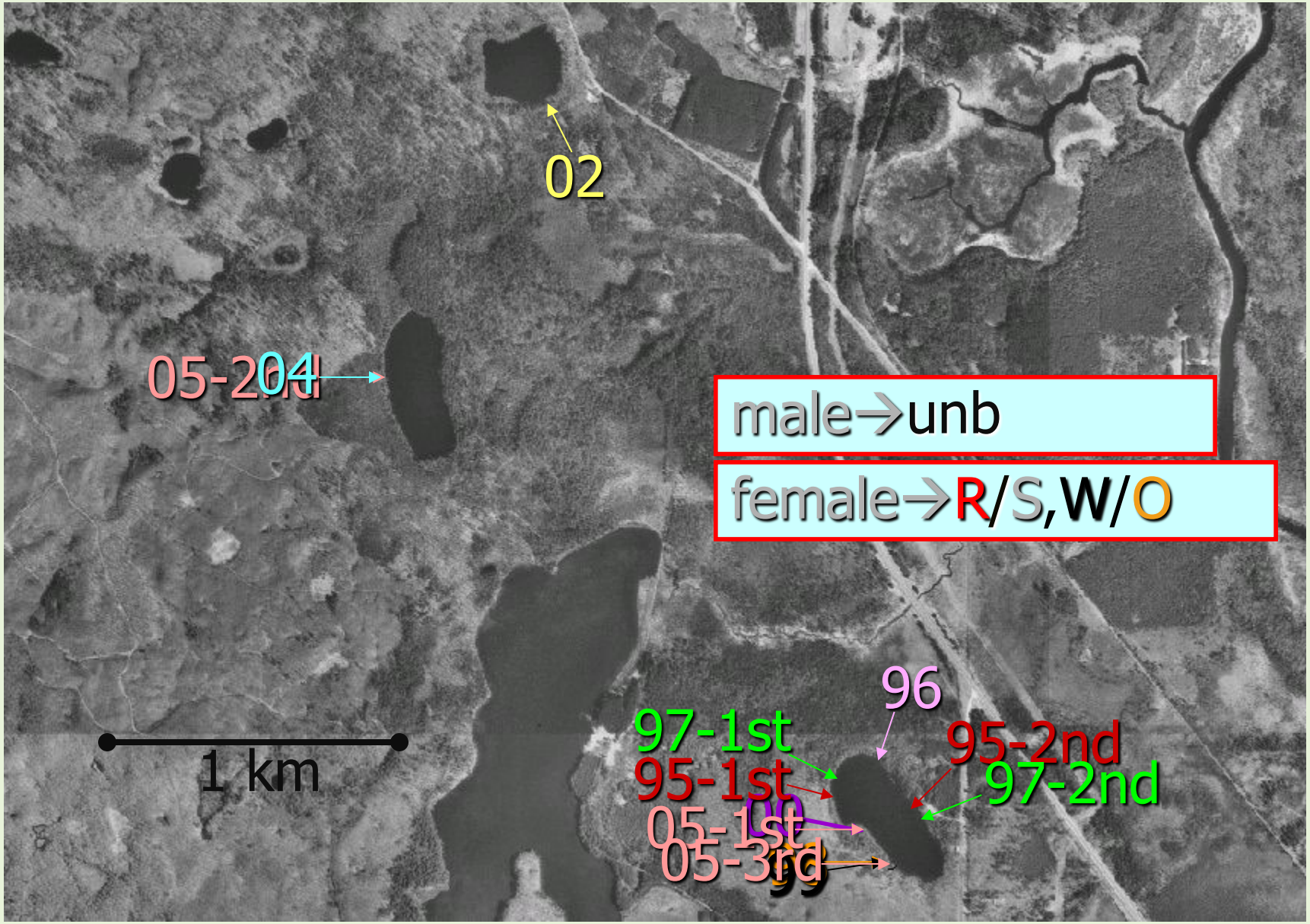
Fact #2

Male loons select the nest location.

Example 1



Example 2


02
05-2nd
male→unb
female→R/S,W/O
1 km
96
97-1st
95-1st
95-2nd
97-2nd
05-1st
05-3rd

A Critical Test

- Loon breeding pairs use a simple rule in nesting.
- If the previous nest was successful, they tend to reuse the nest site.
- If the previous attempt failed (lost to a predator), they move to a new site.

This common nesting strategy is called the "Win-Stay, Lose-Switch Rule".

Because of the WSLS Rule, we can ask:

Do pairs reuse <u>successful</u> nest sites when the male or female is replaced?*

reused successful site?	new ♂	new ♀	both new
Yes	3	16	5
No	14	10	15

*P<0.01, Fisher's Exact Test.

In other words, a pair “forgets” where it has nested successfully when the male is replaced.

Choice of nest locations by the male has an important consequence.

After their first year on a territory, females reach a plateau in breeding success.

In contrast, male breeding success continues to increase throughout their tenure.

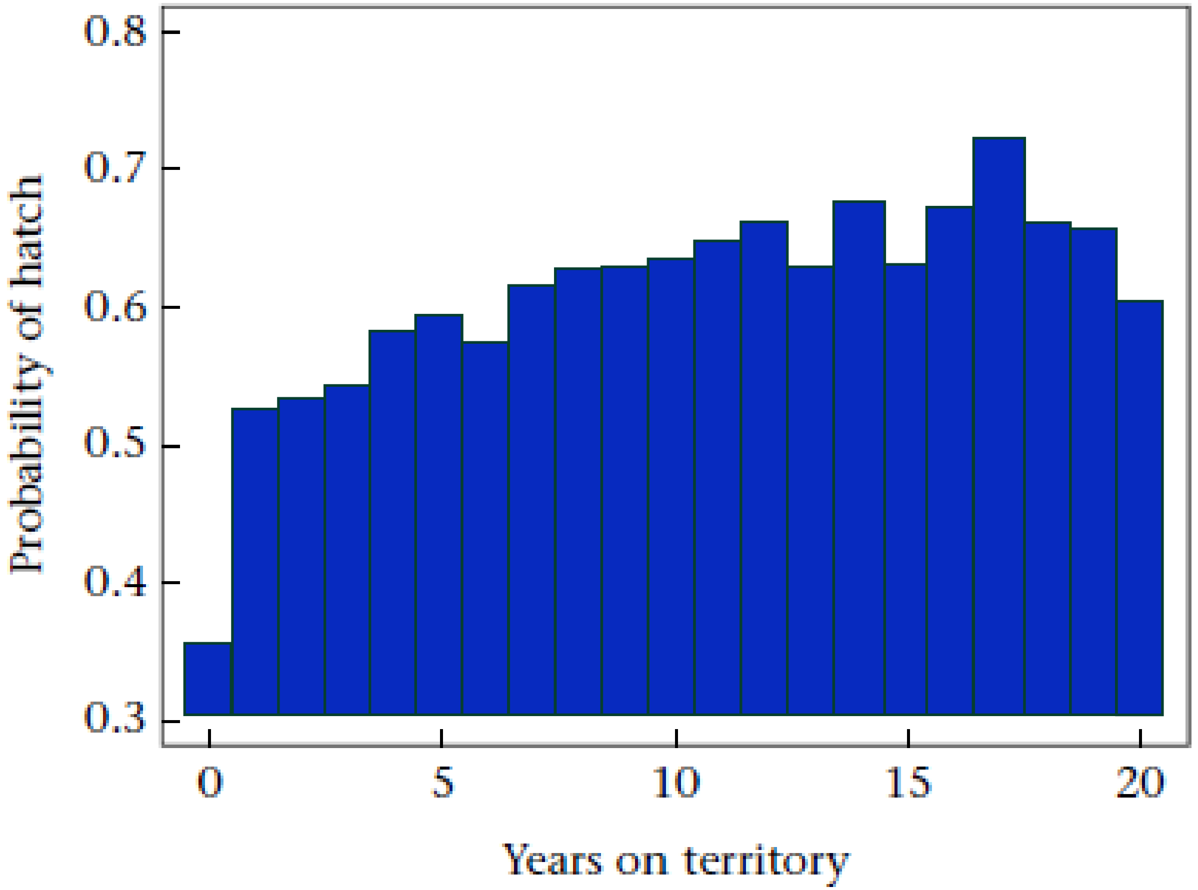


Figure 1. Probability that territorial loon pairs hatched at least one chick based on territory tenure of male and female pair members. Bars depict mean predicted values (± SE) after accounting for effects of all predictors.

Fact #3

Probably because they gain more than females do from staying on a familiar territory, males take greater risks in territory defense.

Males are more aggressive.

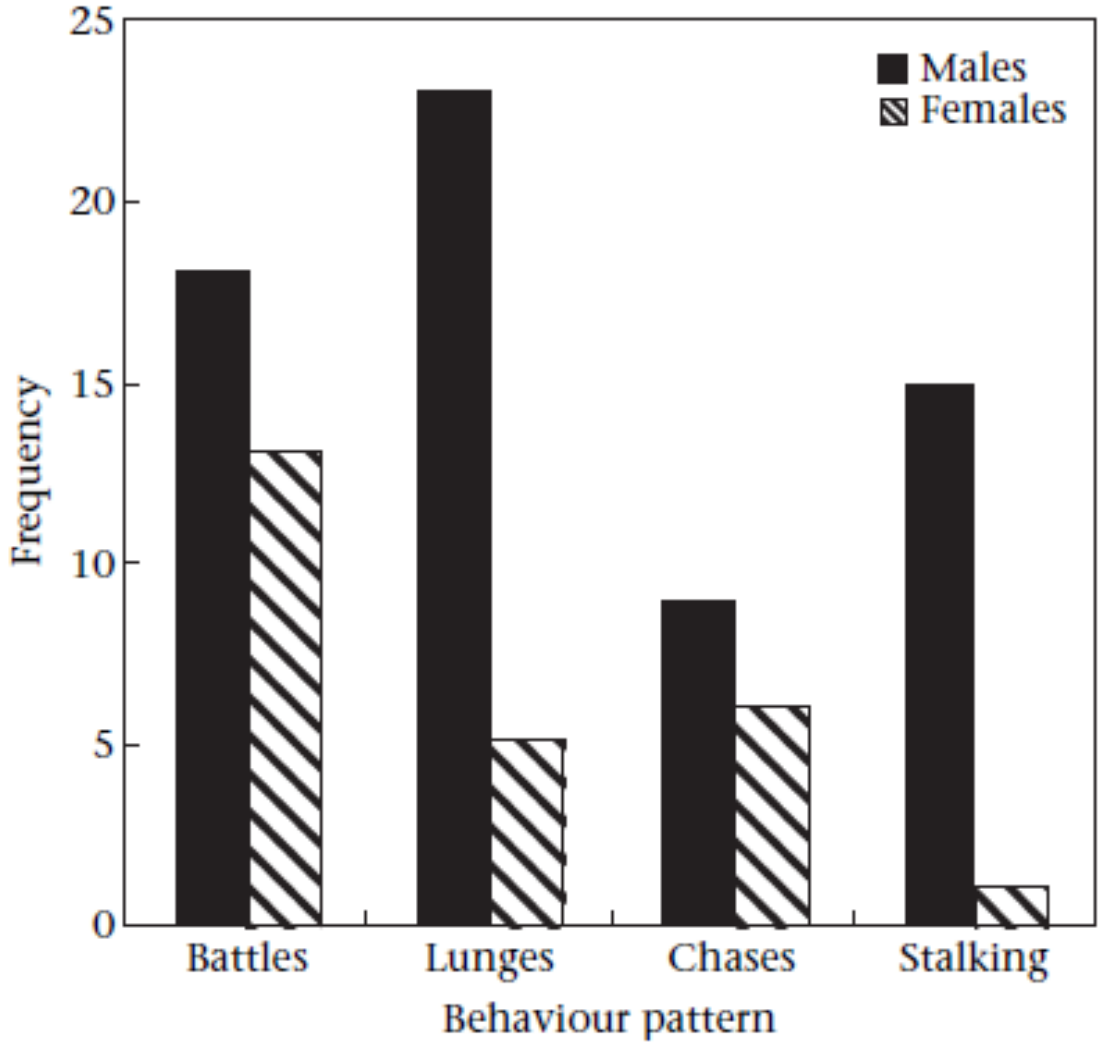


Figure 1. Frequency of aggressive behaviours by male and female loons during territorial intrusions ($N = 853$) on occasions when both pair members were present.

Males are more apt to sustain fatal injuries in battle.

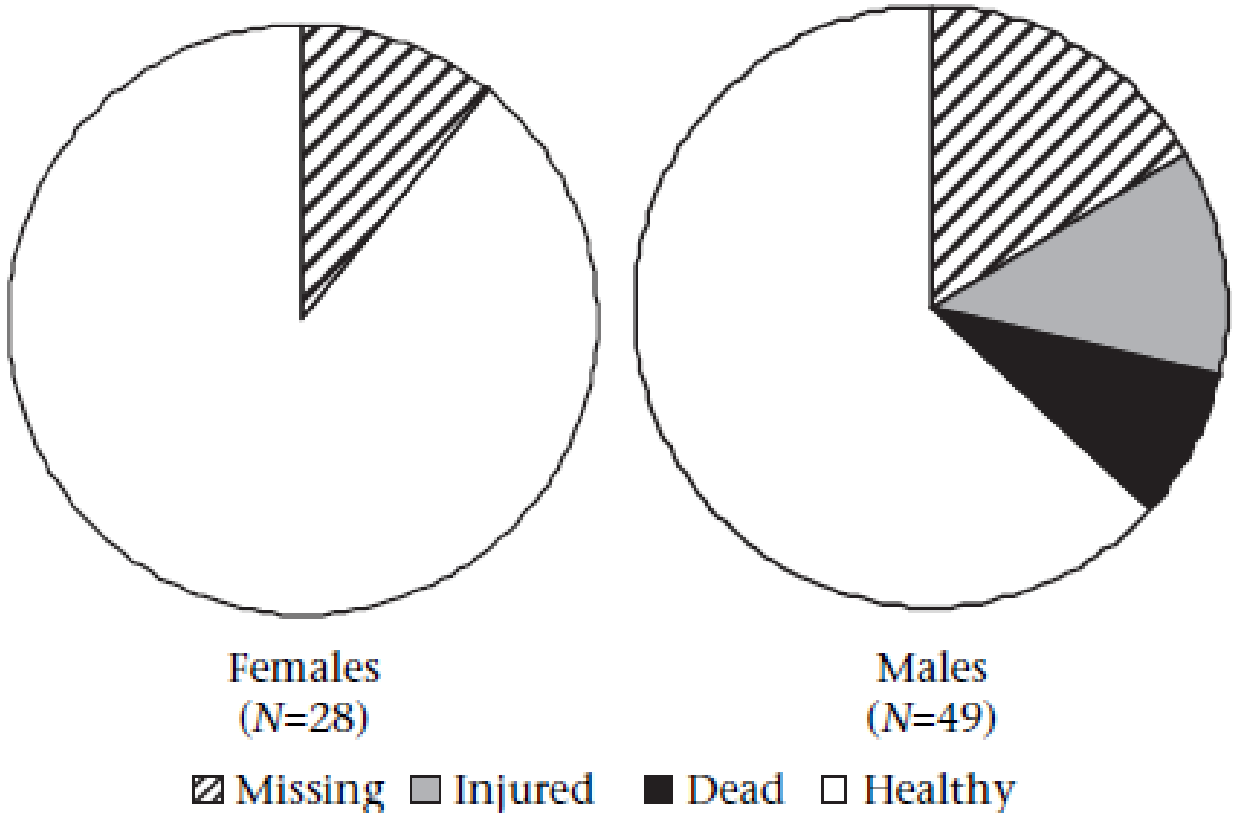
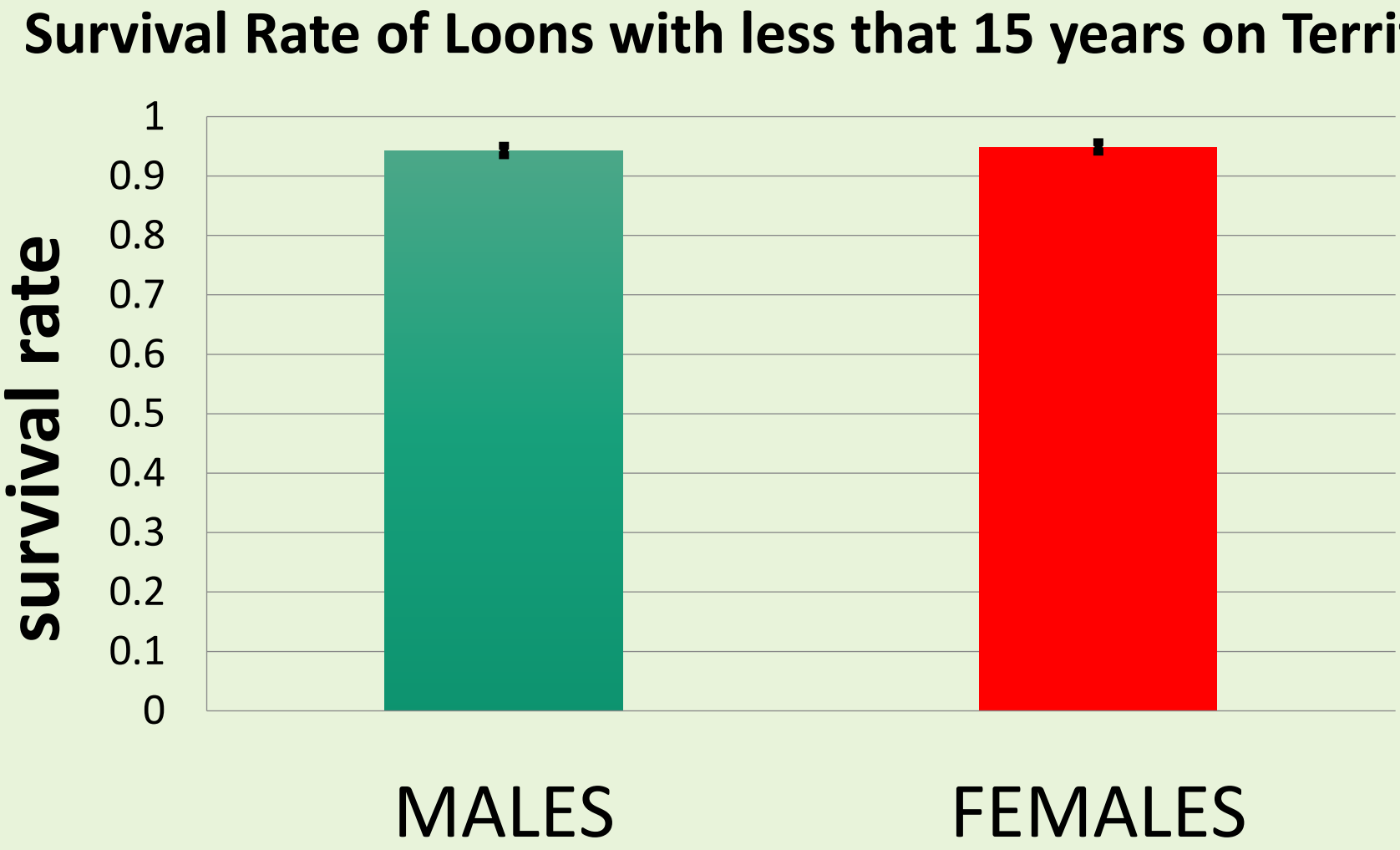


Figure 2. Status and health of displaced residents following midseason eviction of residents known to be in good health at the start of season.

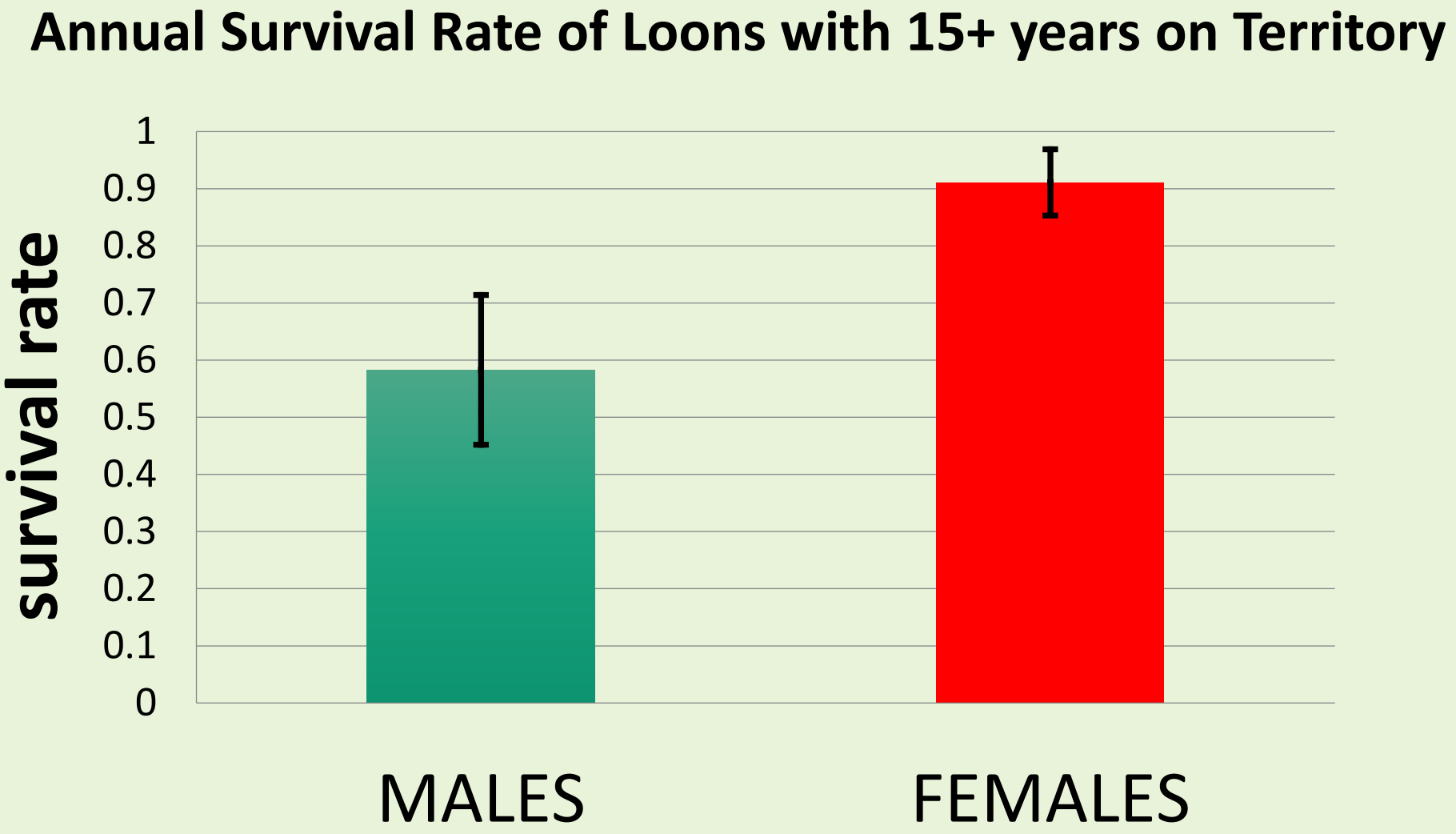
Fact #4

Male fighting ability starts to decline at age 20; females keep going strong into their 20s and even 30s.

Among loons with 1 to 14 years on territory, survival is high in both sexes.



But among loons with 15 years or more years on territory, survival crashes in males only. (Territory loss shows a similar pattern.)



Fact #5

“Social gatherings” comprise groups of loons looking to boost their breeding success.

We see four kinds of adults at late summer "social gatherings":

1. Members of the territorial pair
2. Displaced breeders
3. Young floaters (adults w/o a terr)
4. Failed breeders from nearby
5. Neighbors with chicks

Trying to defend the territory

Shopping for a territory

Spotlighting another pair's territory

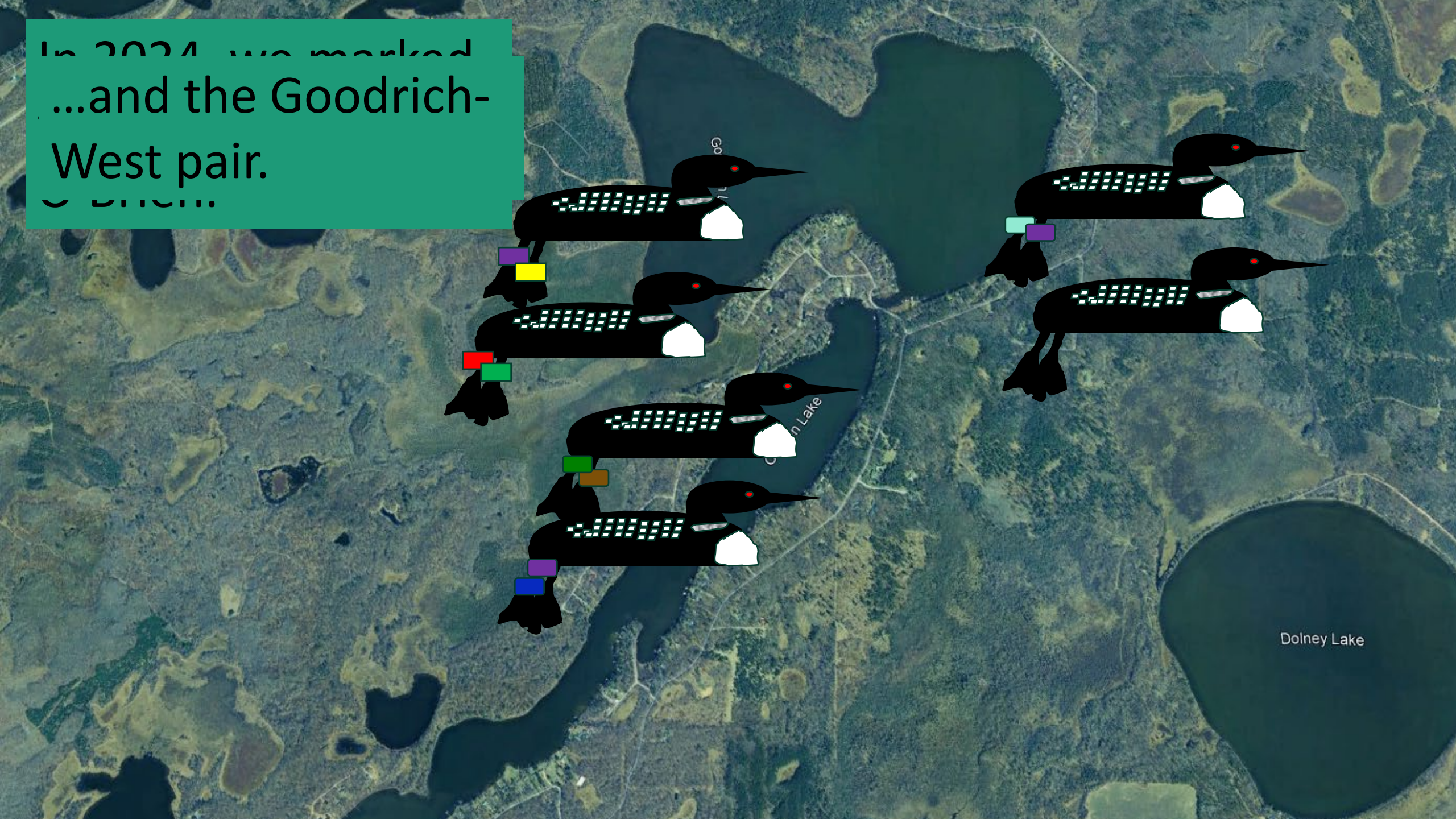
Fact #6

Marking and resighting loons produces some curious findings.

….and the Goodrich-SE female — who had not returned from her winter home in Tampa, Florida – was also replaced.

In 2024, we marked

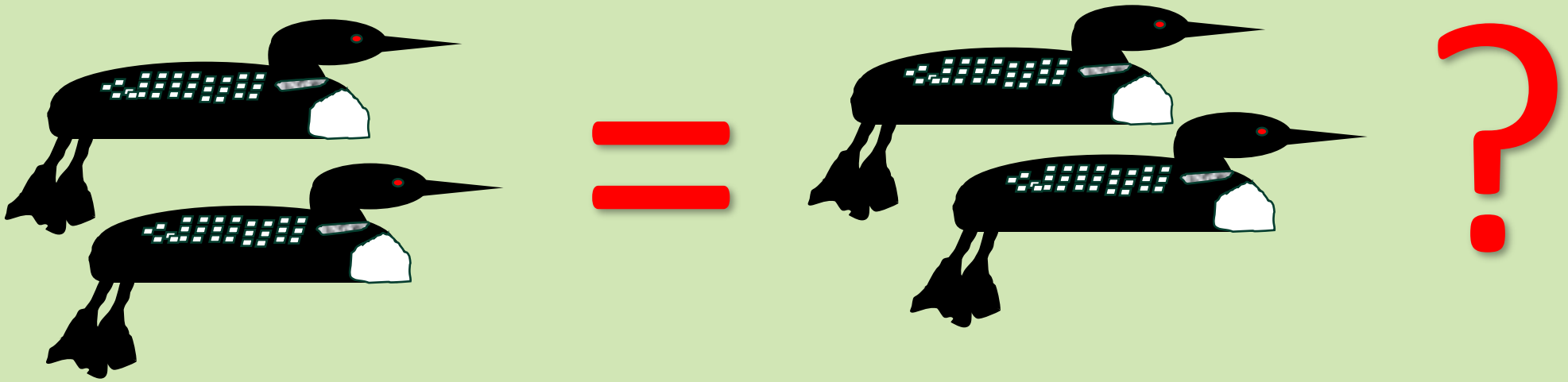
…and the Goodrich-West pair.



…and the unbanded female from SE was replaced by the ’23 female banded on O’Brien.

But this makes the point that the loons that you see may not be the ones you saw the year before.

Now that is a lot of shifting around for loons.



2024 loon pair

2025 loon pair

Now things are going to get dark.

Sorry!

Fact #7

The loon population in the Upper Midwest is declining.

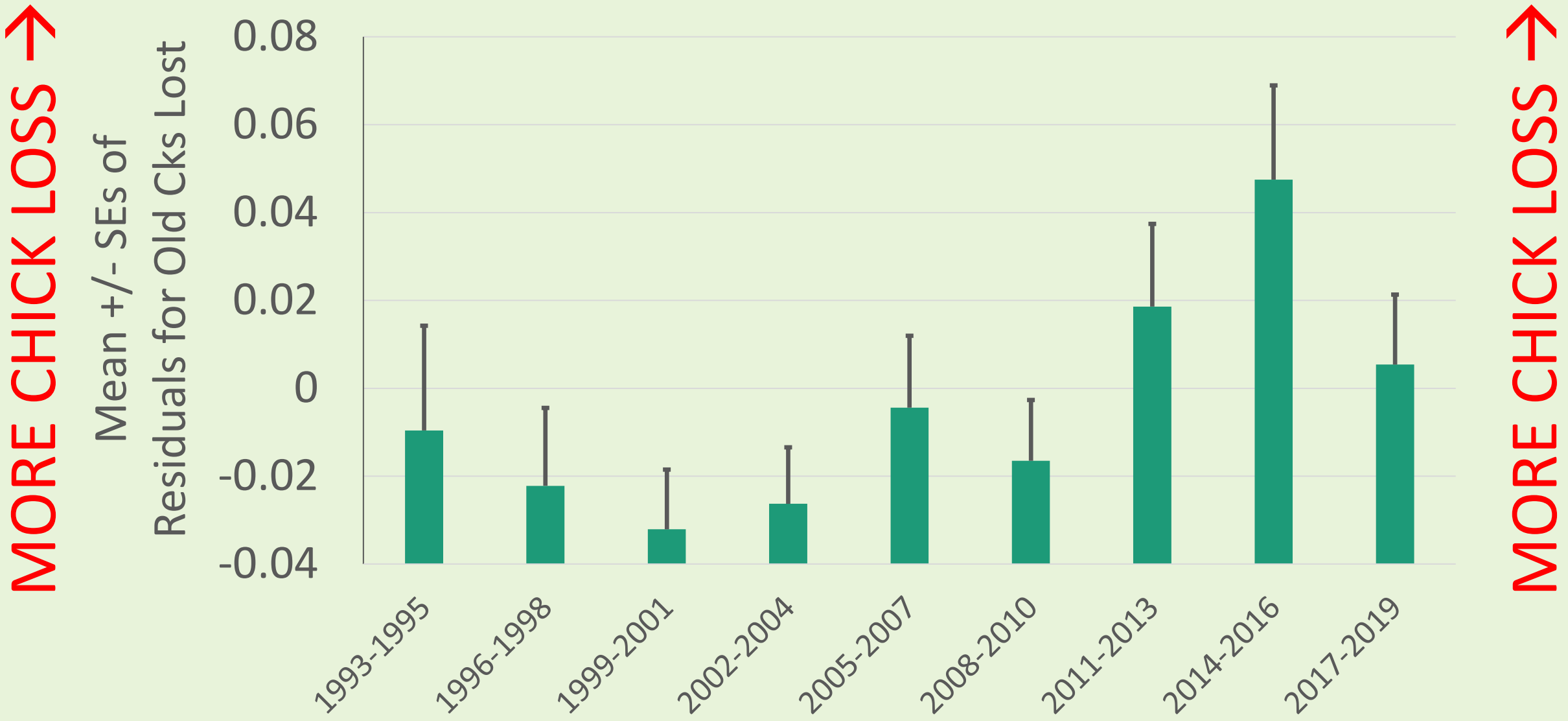
How do we know this?

- During our study of territorial and breeding behavior, we have collected data on breeding success and survival.

Photo by Kevin Pepper

Chicks older than 5 weeks are lost far more often nowadays than before.

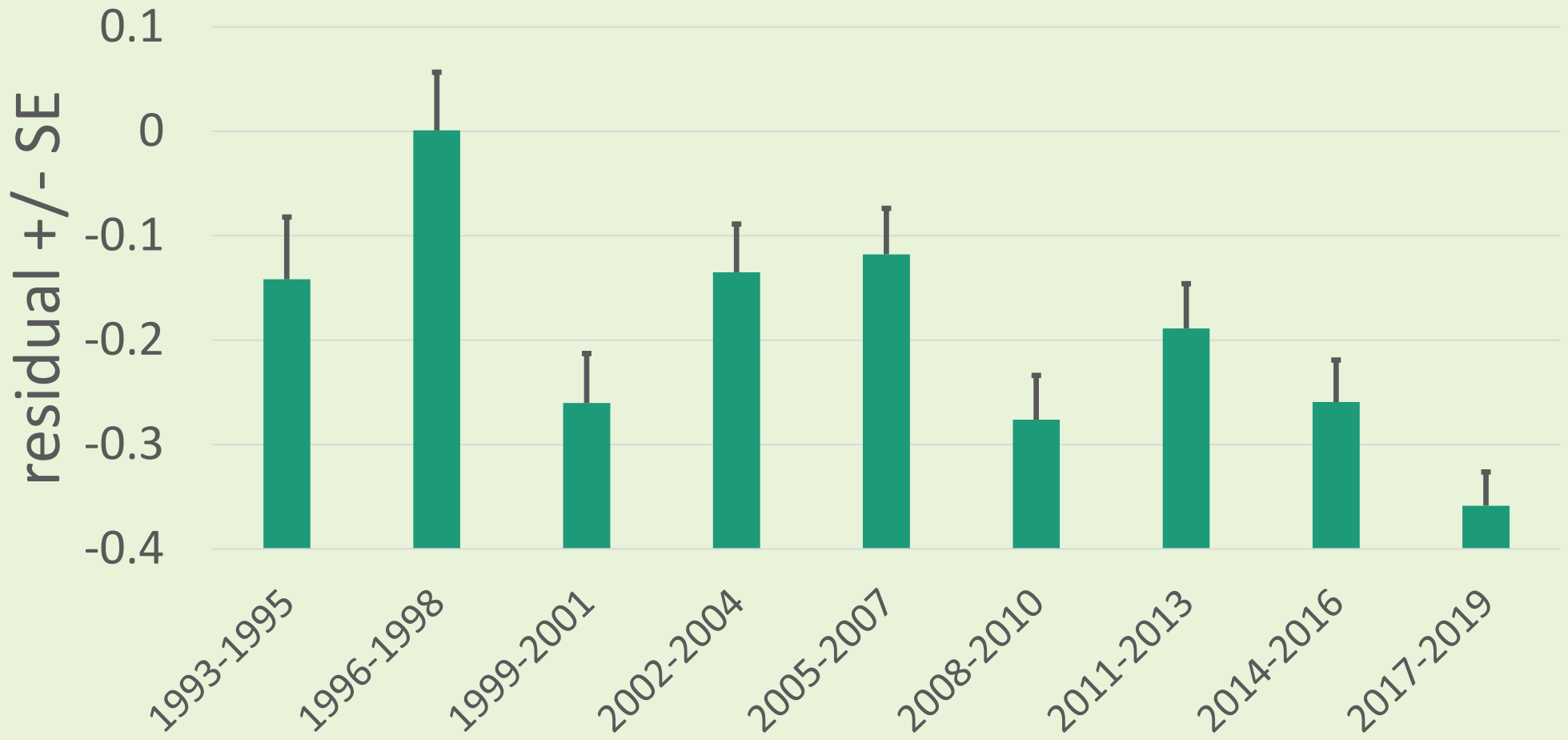
Losses of older chicks have increased by a lot.



There are fewer 2-chick broods than there used to be.

Two-ck broods are much less frequent now than earlier in the study.

MORE 2-CK BROODS→

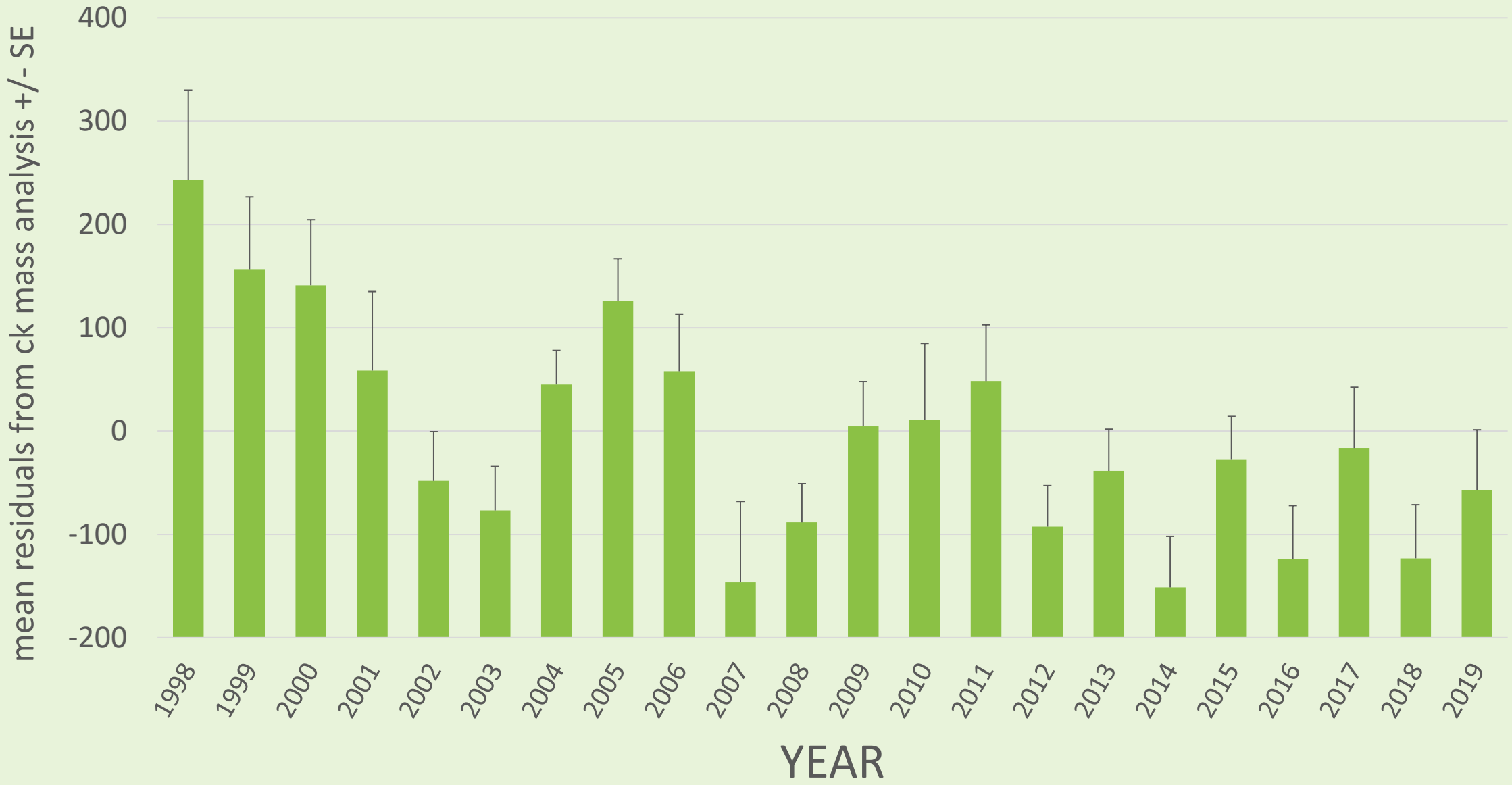


MORE 2-CK BROODS→

- From 1993-1998, 47% of fledged broods had 2 chicks.
- From 2014-2019, 27% of fledged broods had 2 chicks.

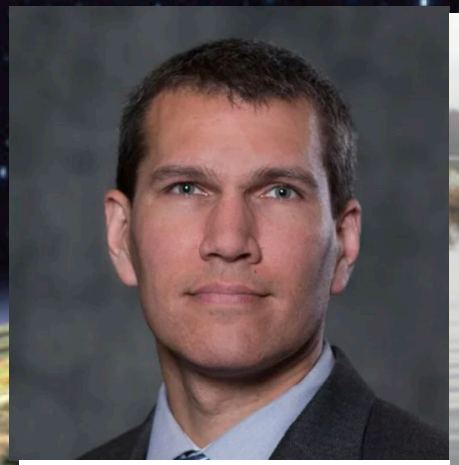
Chick mass has declined during the study.

After correcting for age, chicks are lighter now than ever before.



An average 5-week-old chick weighed 2120g in 2000, but weighs only 1890g (11% less) now.

Kevin Rose and Max Glines from Rensselaer Polytechnic Institute helped us explain our findings.

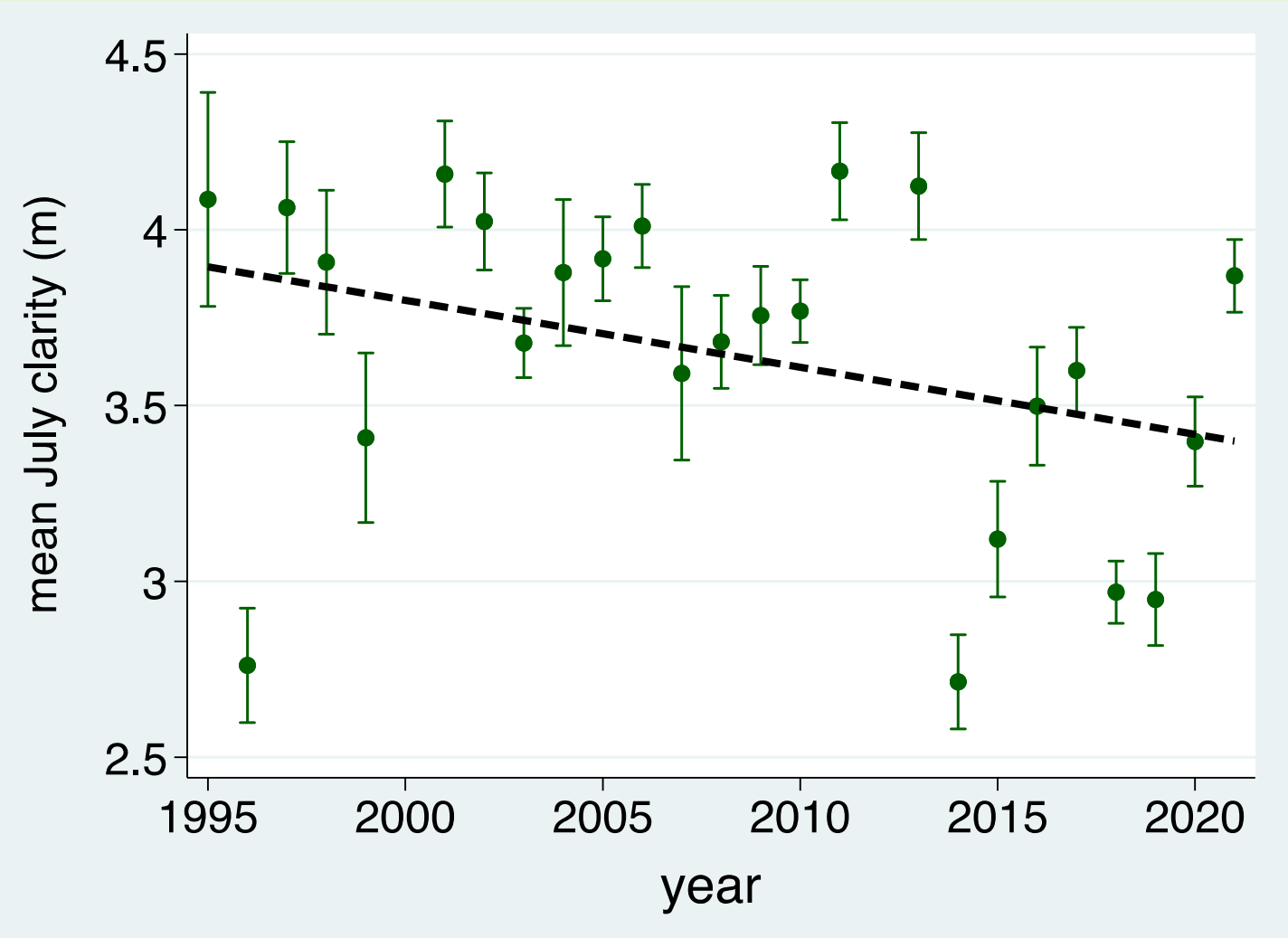


Kevin Rose

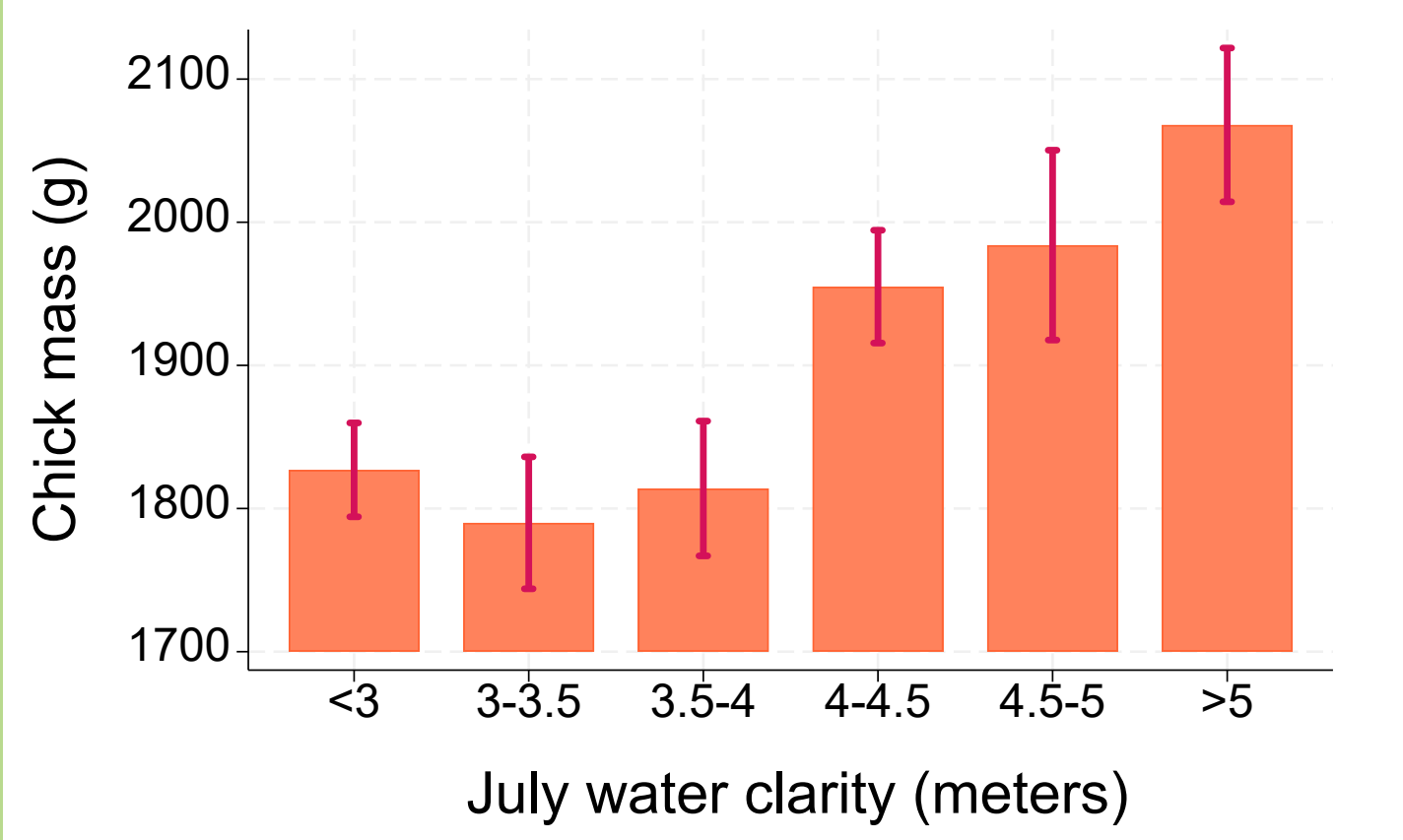
Max Glines

Image by UW-Stevens Point

July water clarity in Wisconsin has declined sharply in the past quarter century.



Chick mass strongly depends on water clarity in July*

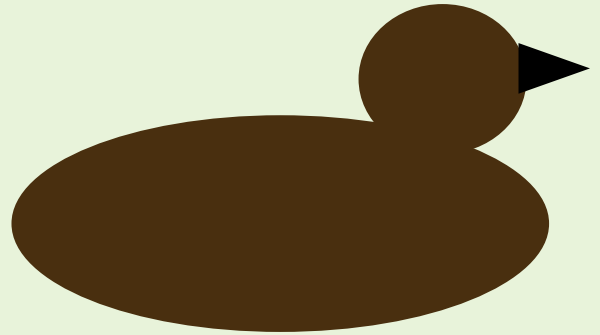


* P<0.0005, mixed model with lake as random effect. Predictors controlled: age, lake size year, parent mass.

If you are more of a visual person…..

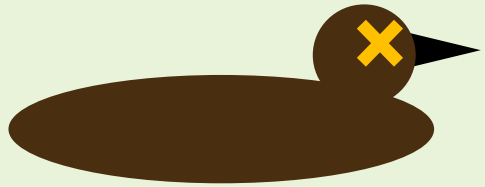
Clear water….

…..produces big, healthy chicks→



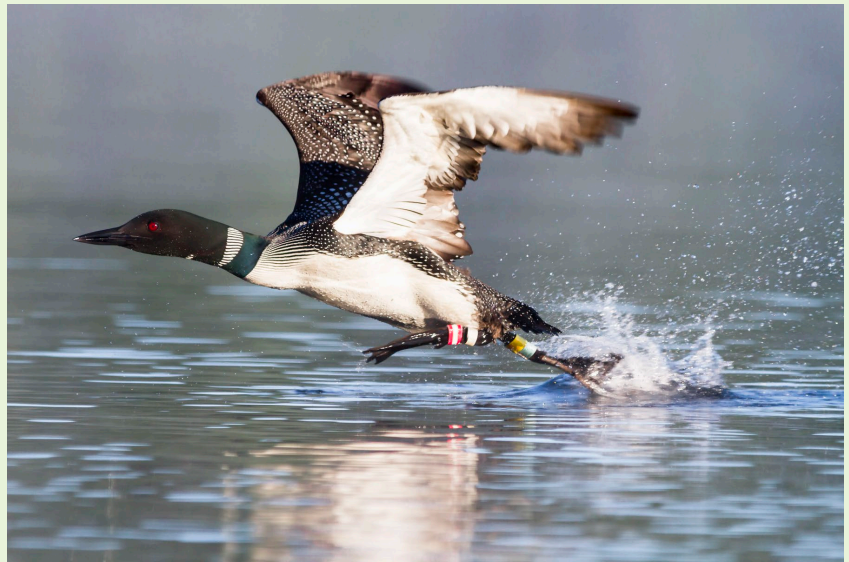
Turbid water….

…produces small, emaciated chicks→



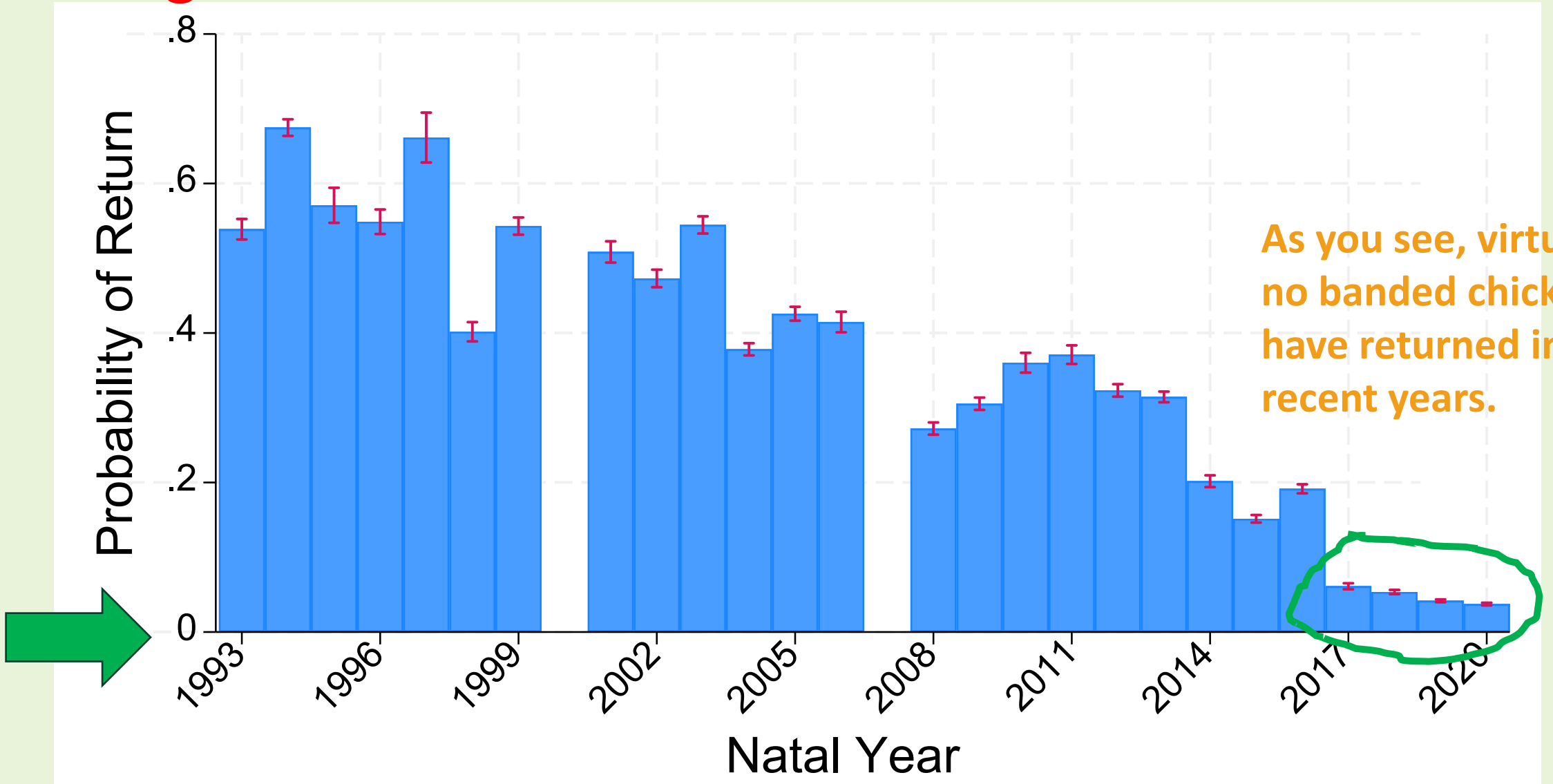
Okay, so there are now fewer chicks, and they are in poorer condition than in past decades.

- What about later stages in the life history?
  - ***Floater*** (Definition): a 2- to 6-year-old loon that does not yet own a territory.
  - Many chicks that we band return as floaters.
  - By identifying all intruders into territorial lakes, we track the floater population closely.



The floater population has declined in concert with reduced chick production.

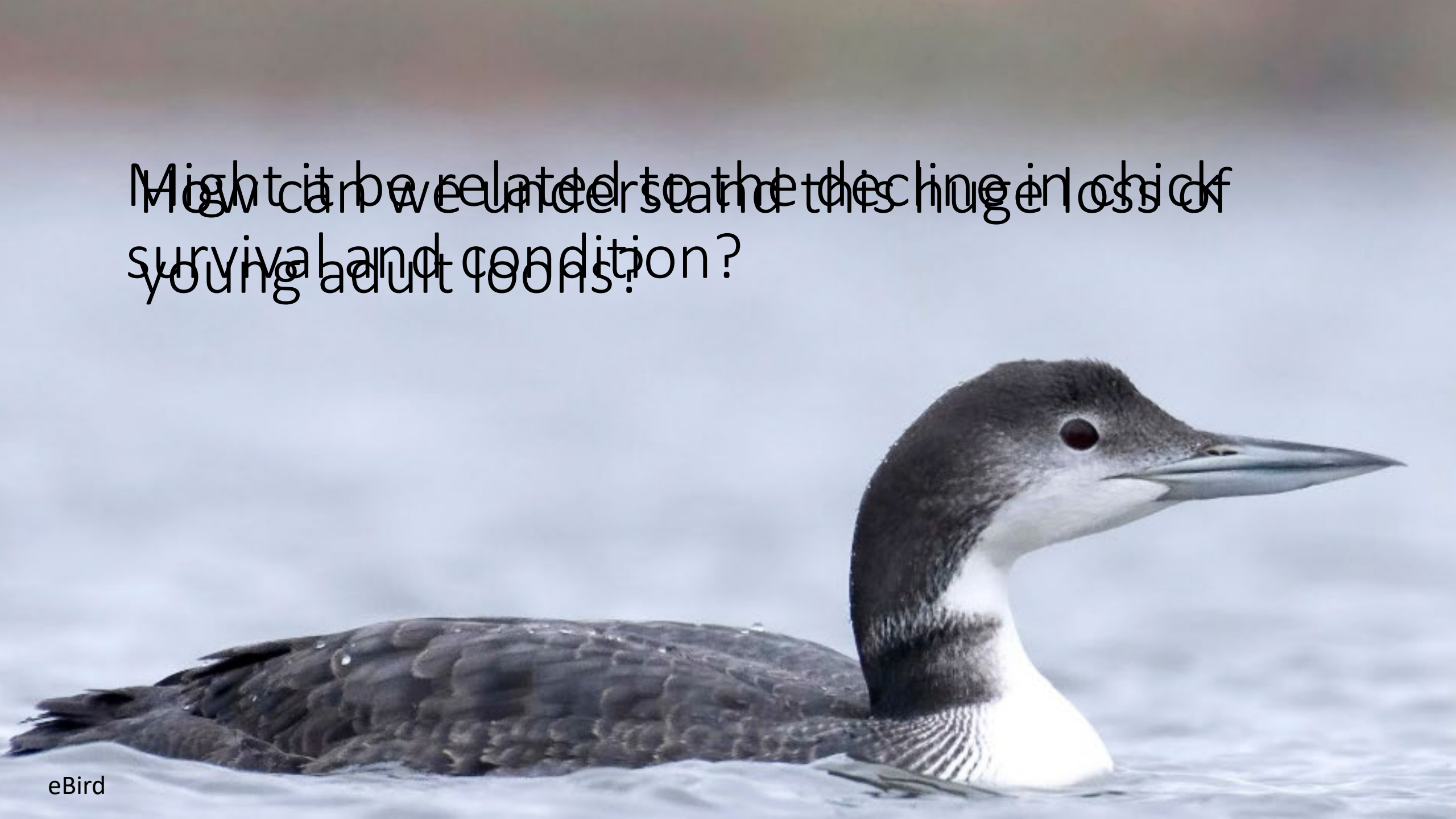
In fact, the decline in the floater population is the most alarming feature of the decline.



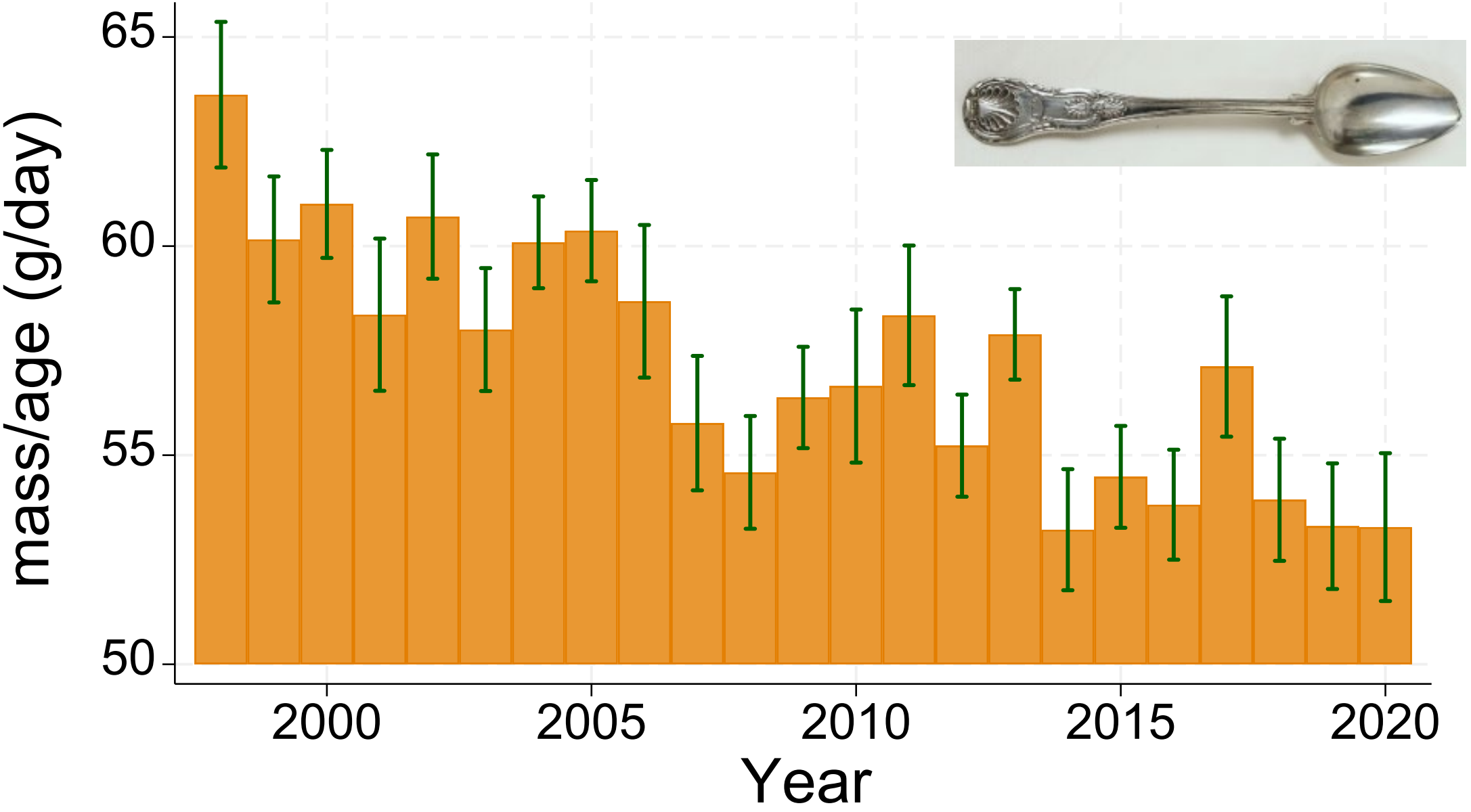
Likelihood Ratio χ_6^2 =125; p<0.0005; N=934 banded chicks from 133 lakes

How can we understand this huge loss of young adult loons?

Might it be related to the decline in chick survival and condition?



eBird

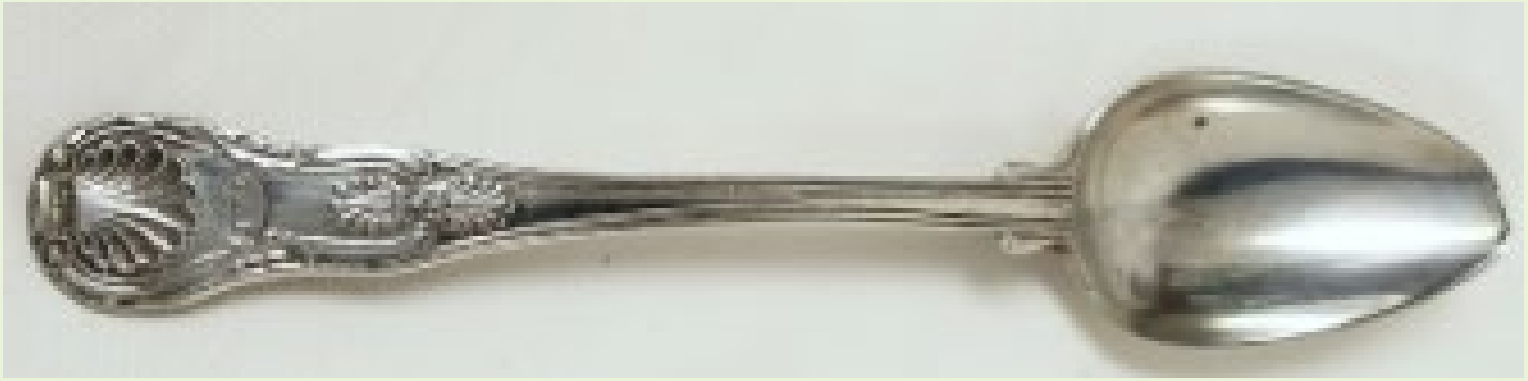

mass/age (g/day)
65
60
55
50
2000
2005
2010
2015
2020
Year

What is a silver spoon effect?

A silver spoon effect occurs when conditions early in an animal's life – such as the amount of food it receives from parents in the chick stage – place it on a track to be either long-lived and successful or to die early without leaving offspring.

We could look for a silver spoon effect in loons because we weigh them at five weeks of age.

….so we could ask, “Do fat, sassy chicks do better throughout life than skinny, retiring ones?”



We found three lines of evidence showing a silver spoon effect.

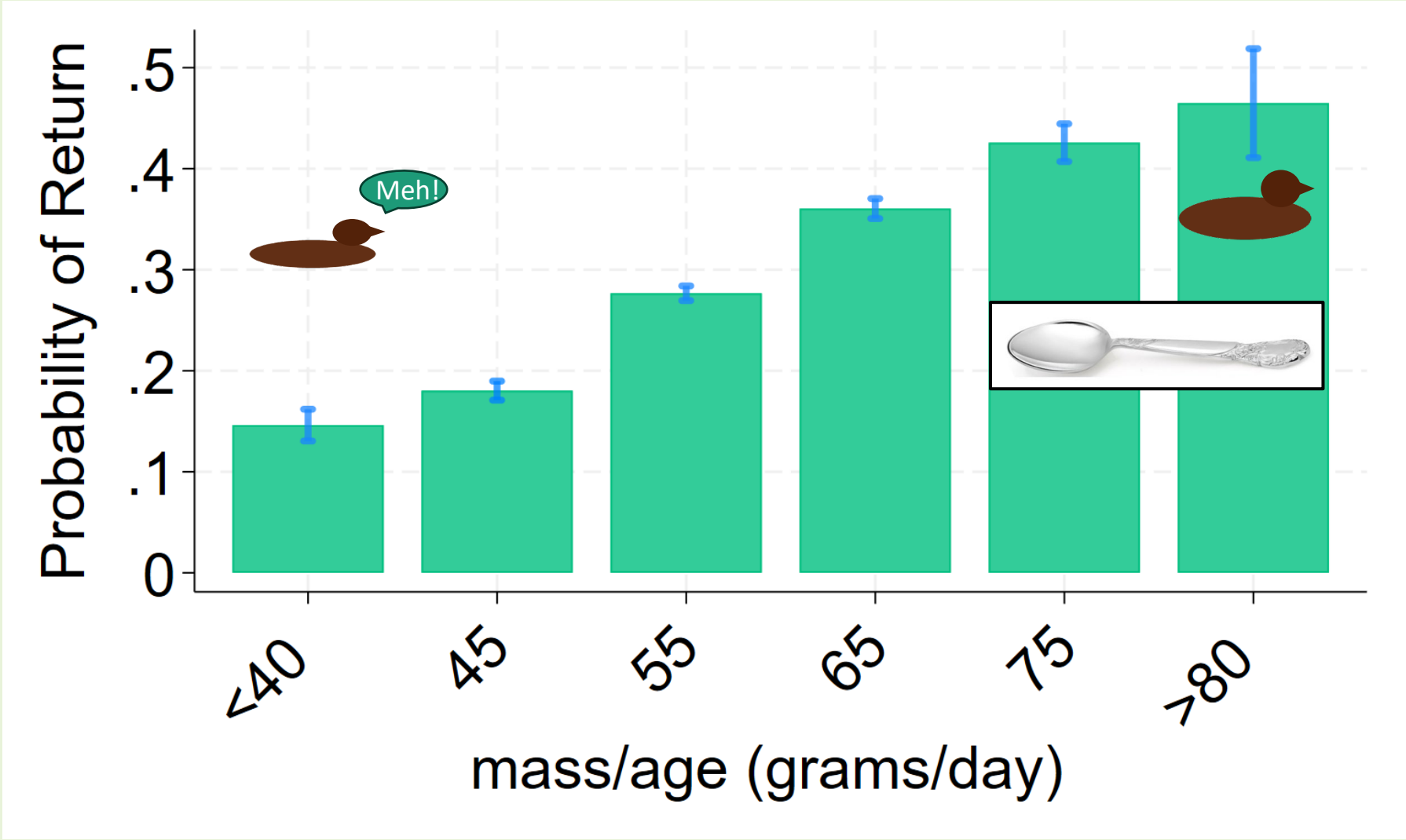
Heavier loon chicks……

…more often survive to adulthood.

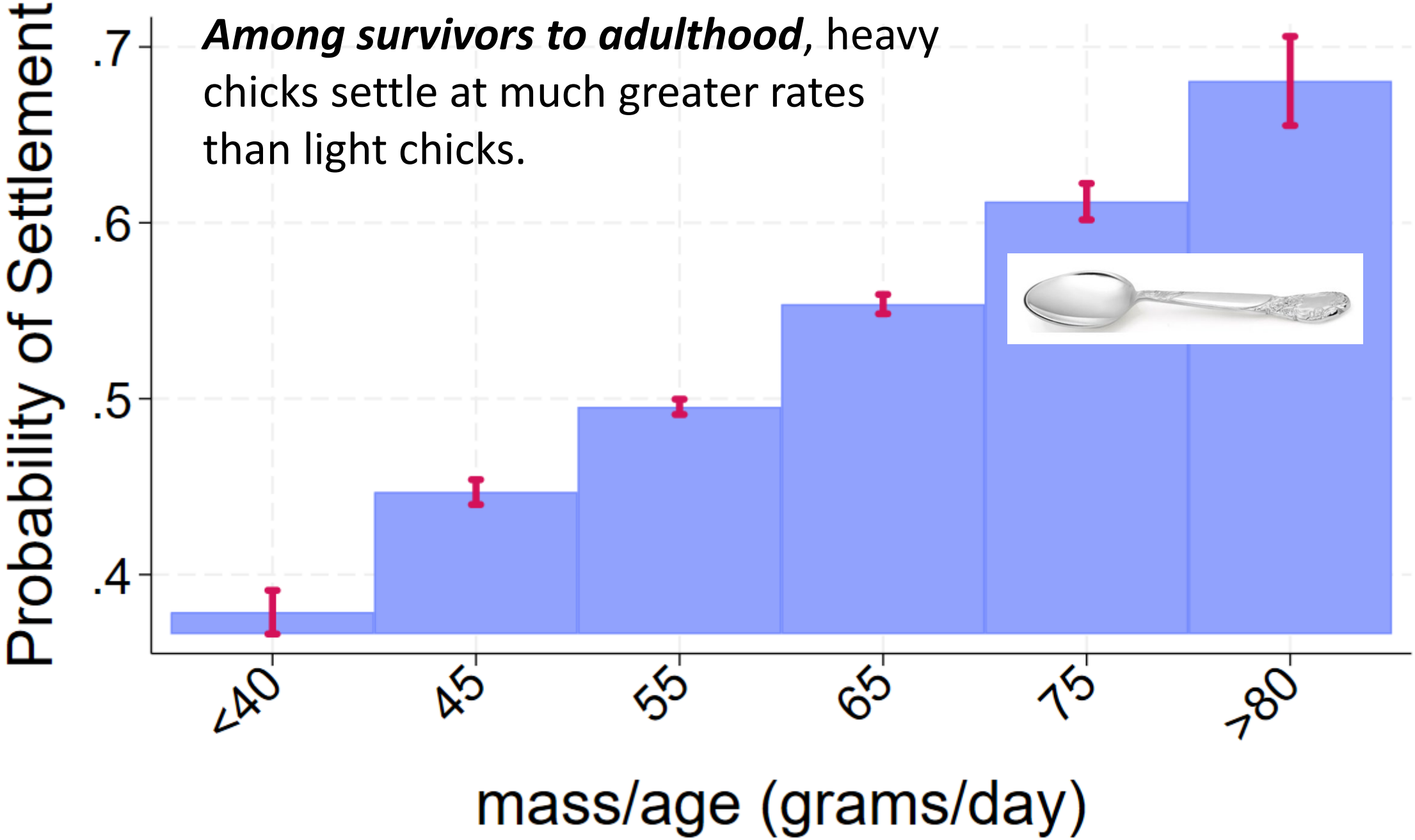
…settle at a higher rate.

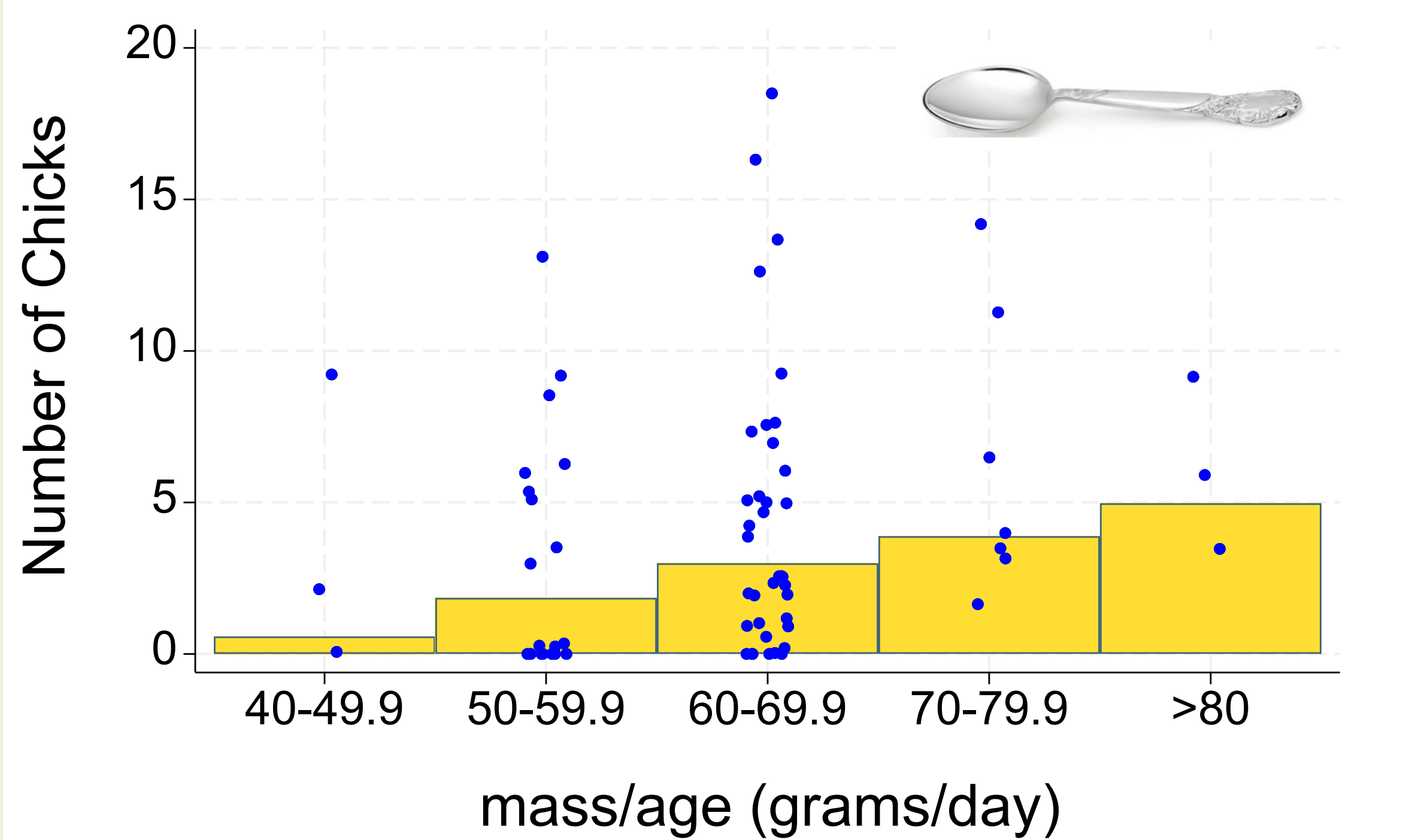
…raise more chicks themselves.

Chicks in **good condition** return 3X as often as chicks in **poor condition.**



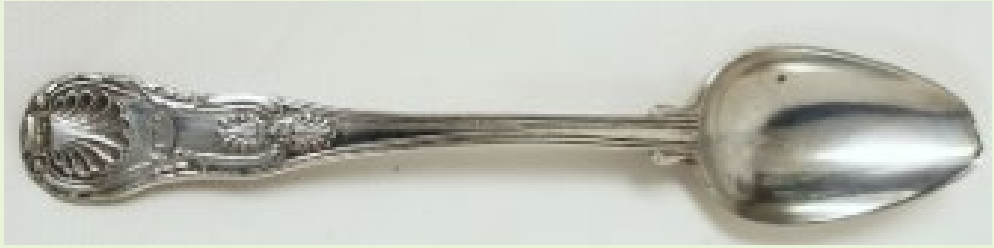
Among survivors to adulthood, heavy chicks settle at much greater rates than light chicks.




Number of Chicks
20
15
10
5
0
40-49.9
50-59.9
60-69.9
70-79.9
>80
mass/age (grams/day)

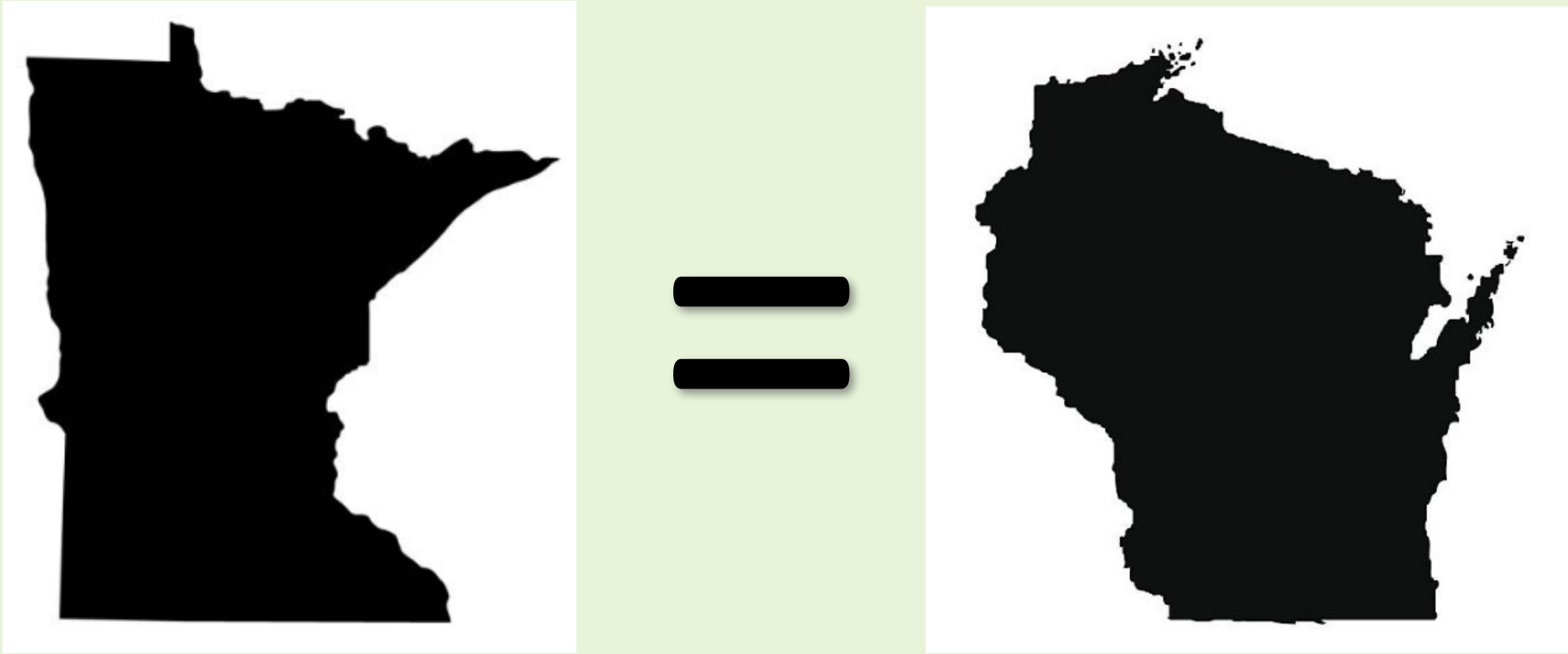
In short, Upper Midwest loons face a double whammy:

- Declining water clarity, increasing black fly abundance, and other factors reduce the number of chicks they hatch and raise to fledging age.
- The deterioration of chick rearing conditions means that even chicks that *do fledge* are of poorer quality than those that fledged 25 years ago (silver spoon effect).



Fact #8

Minnesota loons appear to be suffering from the same ills as Wisconsin loons.

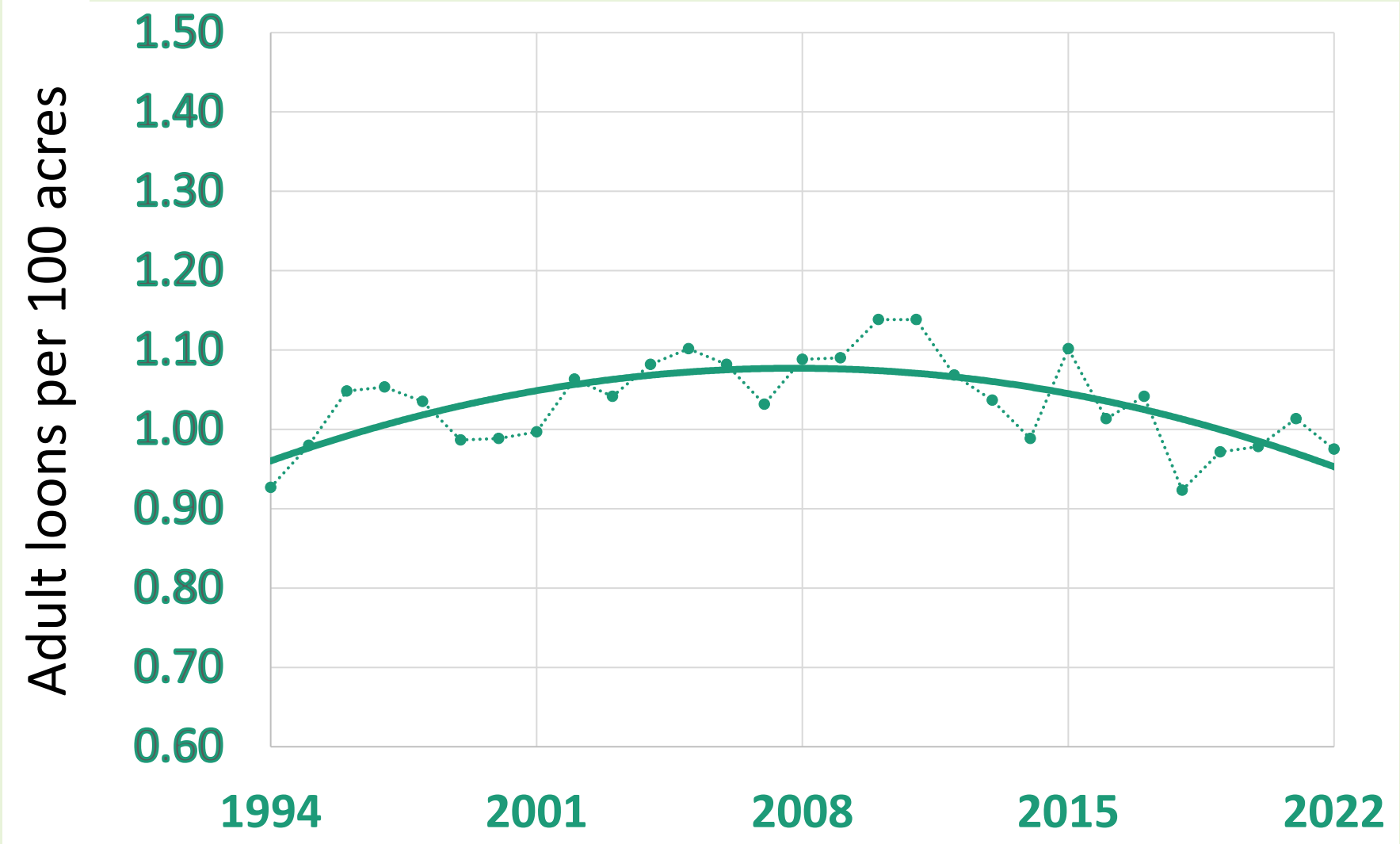


What do we know about the Minnesota loon population?

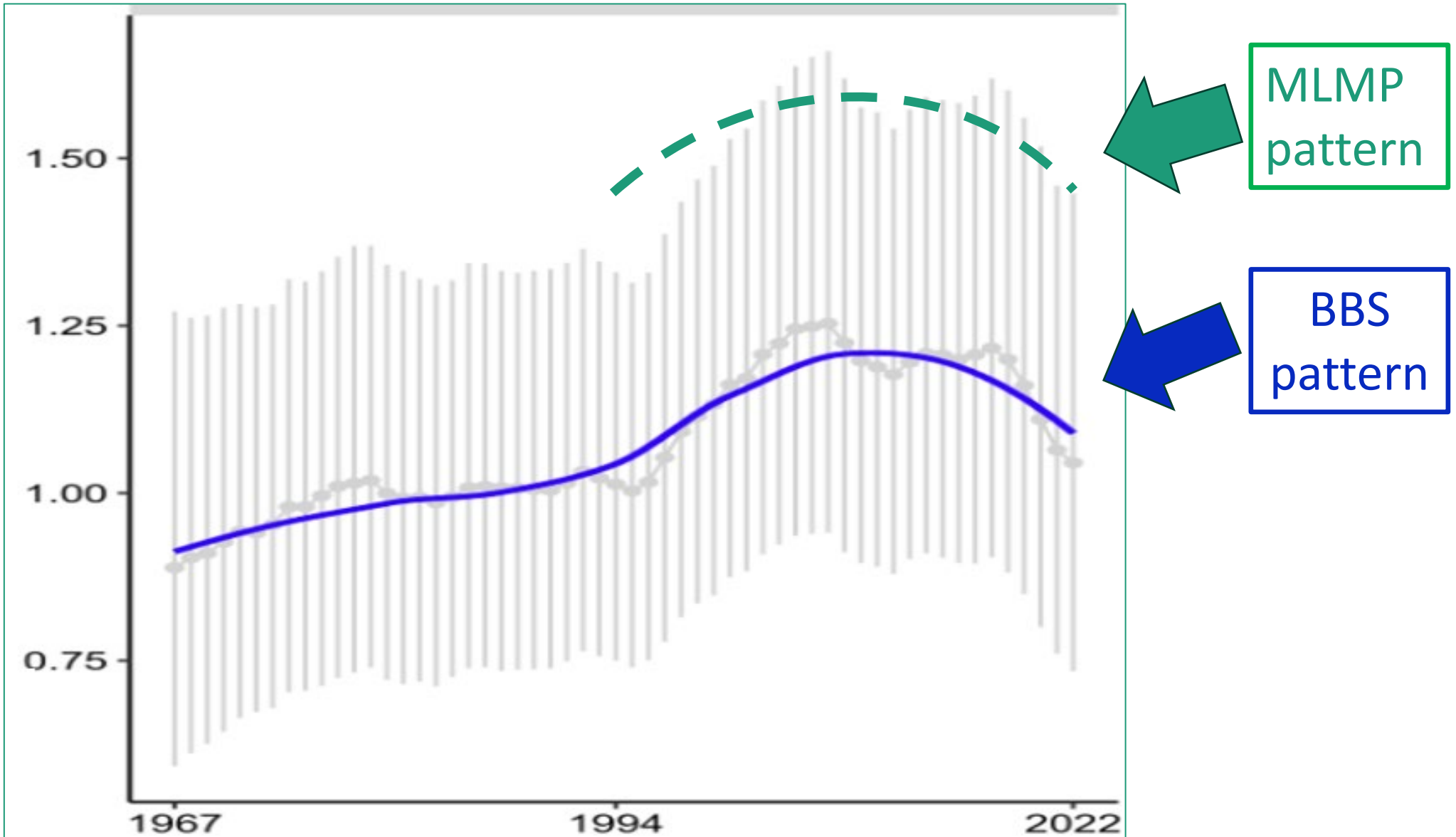
- Minnesota Loon Monitoring Program
- Breeding Bird Survey

Minnesota Loon Monitoring Program

If we collapse all of the MLMP data across 6 index regions, we get this picture of the statewide loon population:

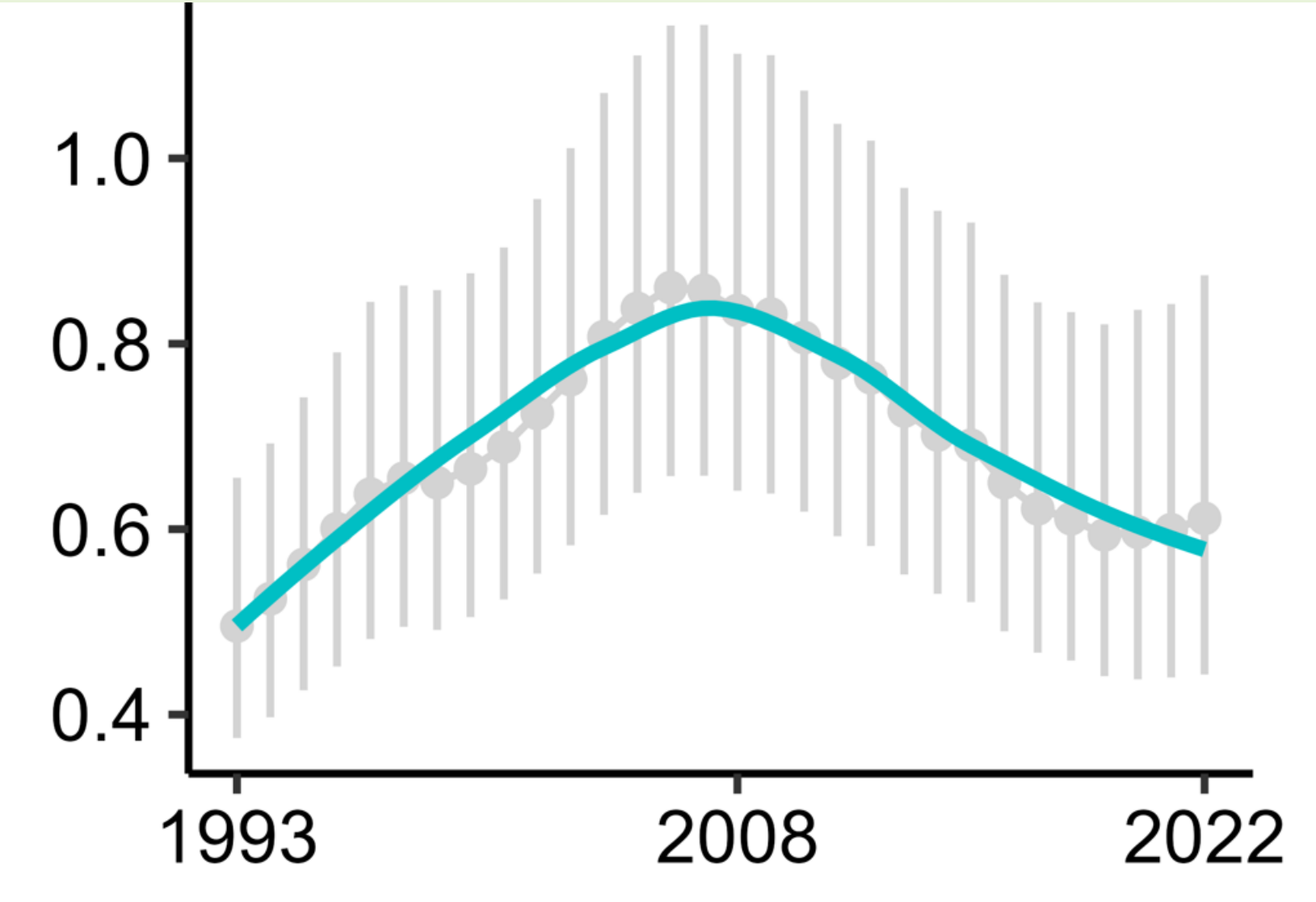


Minnesota Breeding Bird Surveys (1967 to present)



So things look similar in Wisconsin and Minnesota.

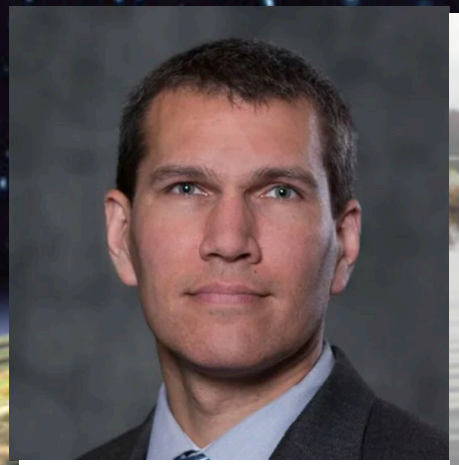
By the way, here is the plot of BBS data from Wisconsin.



Next Steps

We have a clue regarding loss of water clarity: it seems to depend upon rainfall.

Our next step is to learn whether decreased clarity results from increased phytoplankton or sediment levels.



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Max Glines

Image by UW-Stevens Point


Questions?