Lead Poisoning in Maine's Common Loons (*Gavia immer*): Examining Biological and Social Dimensions

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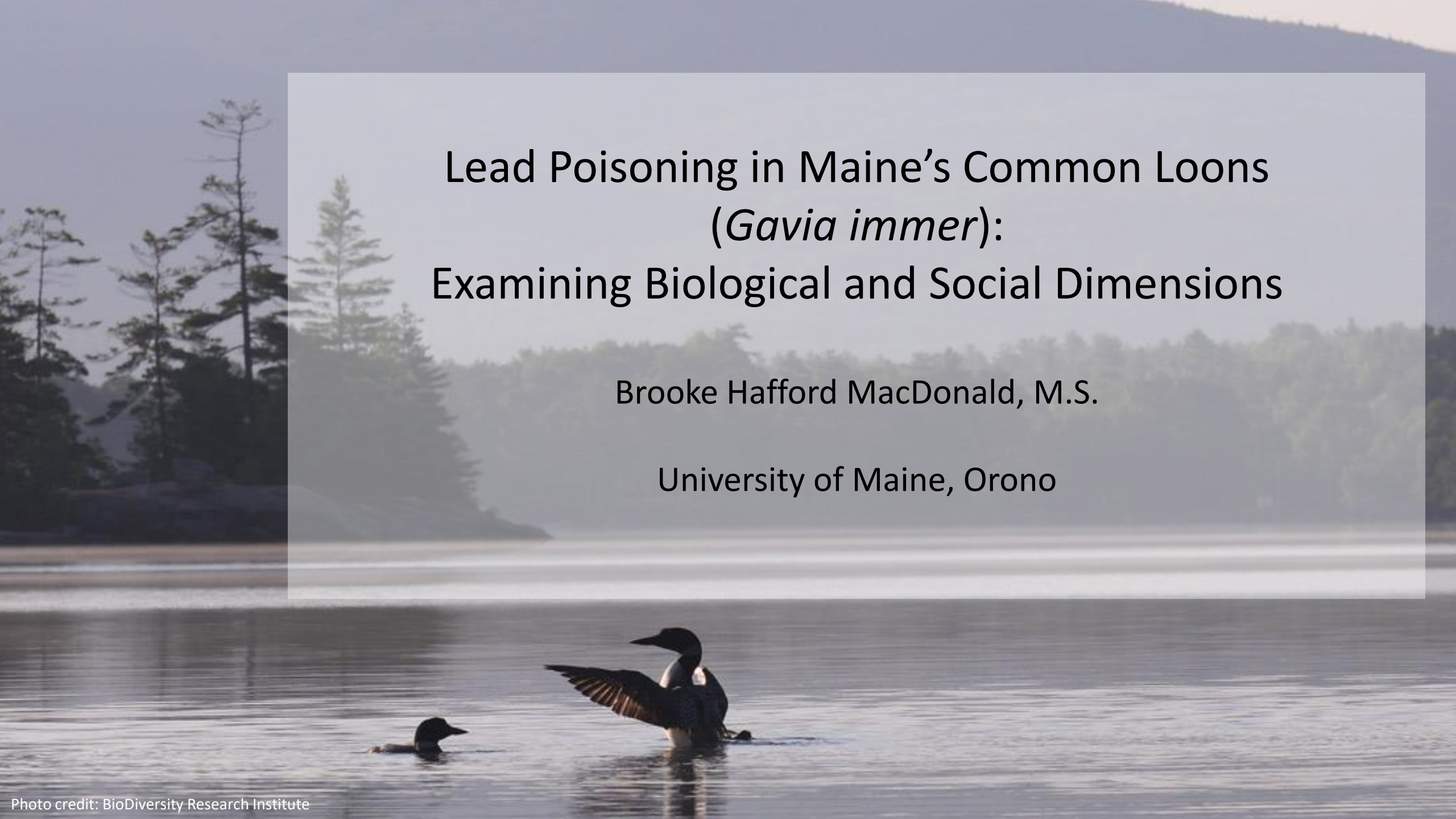


Photo credit: BioDiversity Research Institute

Photo: Audubon Society

Common Loon (*Gavia immer*)

- Nest on freshwater lakes and ponds during the summer months
- Breed in Canada and northern most United States
- Lead poisoning has been documented to be the leading known cause of death in northeastern loons (Sidor et al, 2003)

Common Loons and Lead Fishing Tackle Ingestion

Primary Exposure: Sinkers and Jigs Mistaken for Gizzard Stones

Photo Credit: New York Department of Environmental Conservation

Photo Credit: Loon Preservation Committee

Secondary Exposure:
Consumption of Fish with Attached Fishing Gear

Outward Signs of Lead Poisoning

Photo Credit: Somerset County Maine, Soil and Water District

- Disorientation
- Heavy breathing
- Weakness or Paralysis
- Regurgitation
- Polydipsia/Polyuria
- Seizures
- Blindness
- Vocal changes
- “Wing Droop”

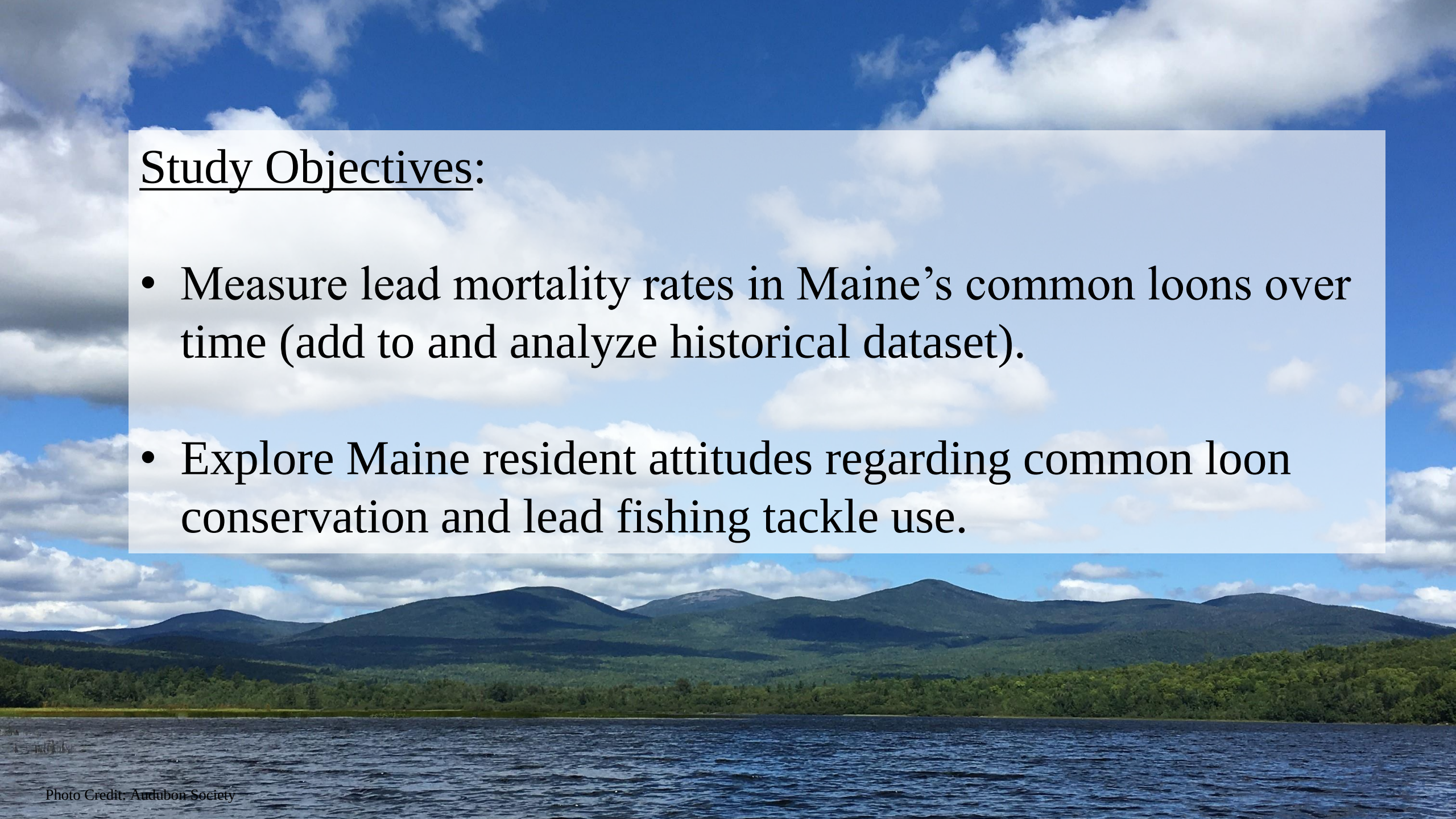
Prolonged exposure can lead to suppressed immunity, kidney impairment, liver dysfunction, gastrointestinal problems, neurological damage, and lower reproductive rates.

Maine Lead Legislation

- 2002: Banned sale of lead sinkers 0.5 oz or less
- 2013: Banned sale and use of lead sinkers weighing 1 oz or less, and measuring 2.5 inches or less
- 2016: Ban sale of bare lead jigs weighing 1 oz or less, and measuring 2.5 inches or less
- 2017: Ban use of bare lead jigs weighing 1 oz or less, and measuring 2.5 inches or less

Sinkers (no hook)

Jigs (hook attached)



Study Objectives:

- Measure lead mortality rates in Maine's common loons over time (add to and analyze historical dataset).
- Explore Maine resident attitudes regarding common loon conservation and lead fishing tackle use.

Photo Credit: Audubon Society

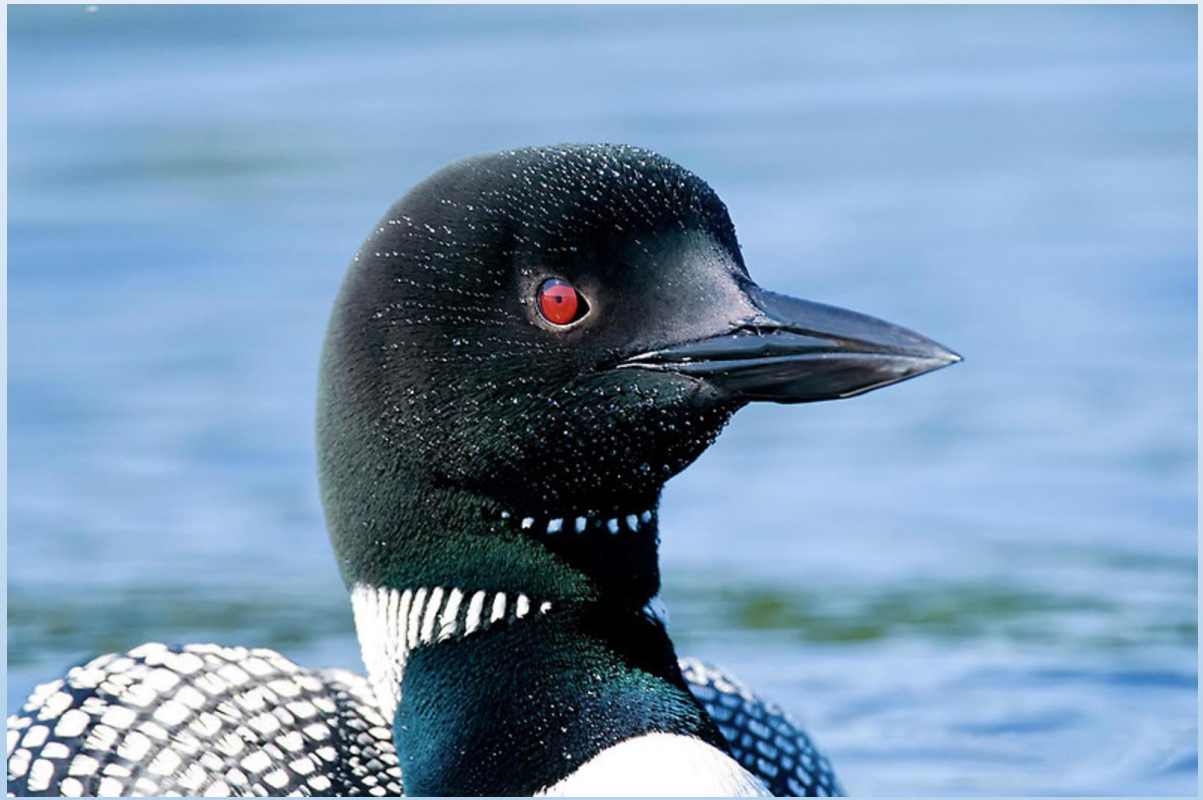
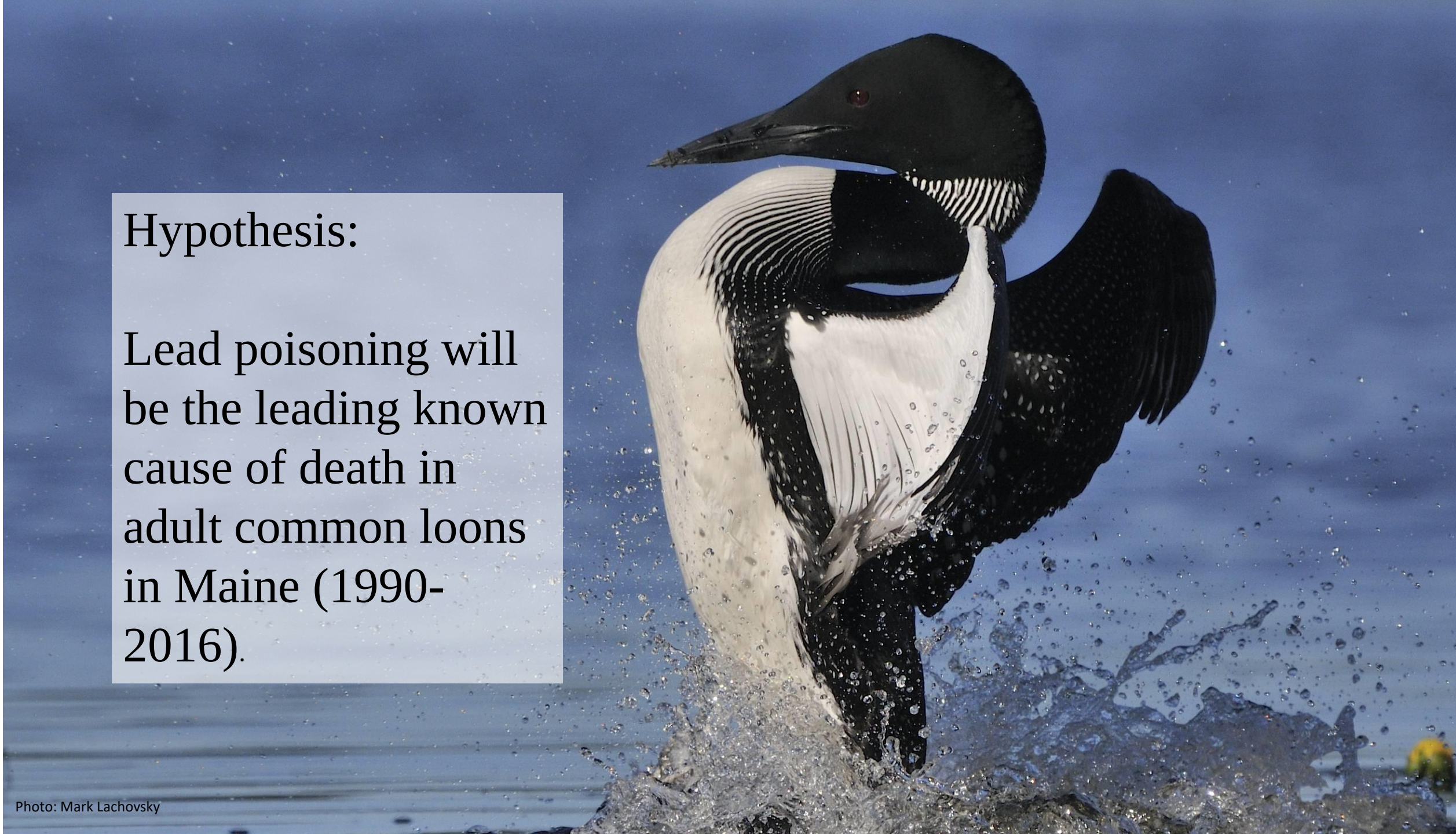


Photo: Audubon Society

Component 1:

Lead Mortality in Maine's Common Loons

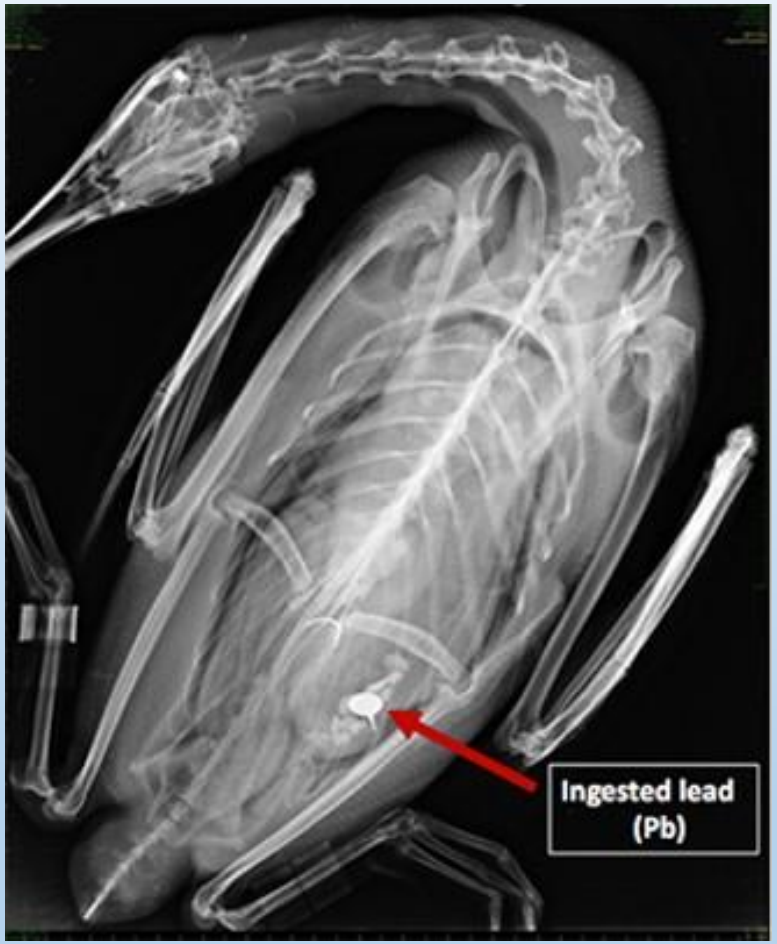


Hypothesis:

Lead poisoning will be the leading known cause of death in adult common loons in Maine (1990-2016).

Photo: Mark Lachovsky

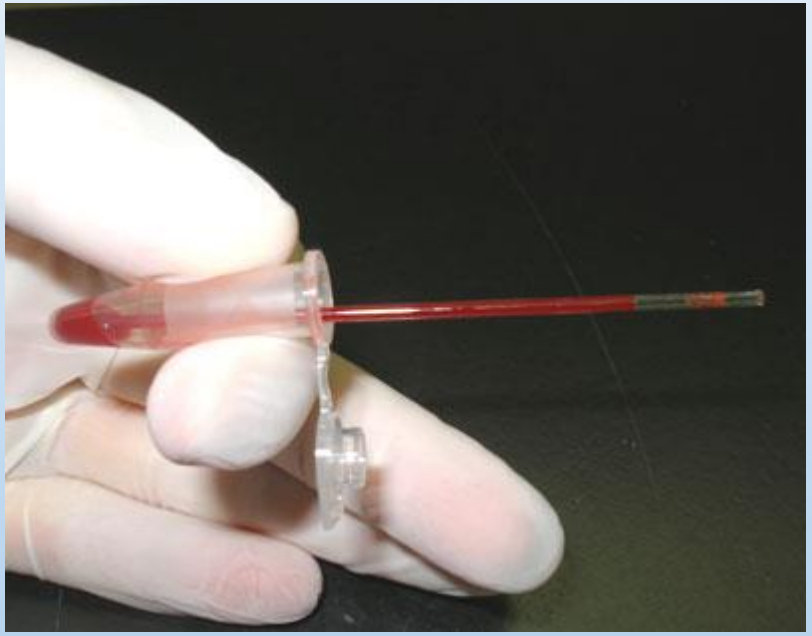
Methods: Post-Mortem Examinations



Methods: Post-Mortem Examinations

Methods: Post-Mortem Examinations

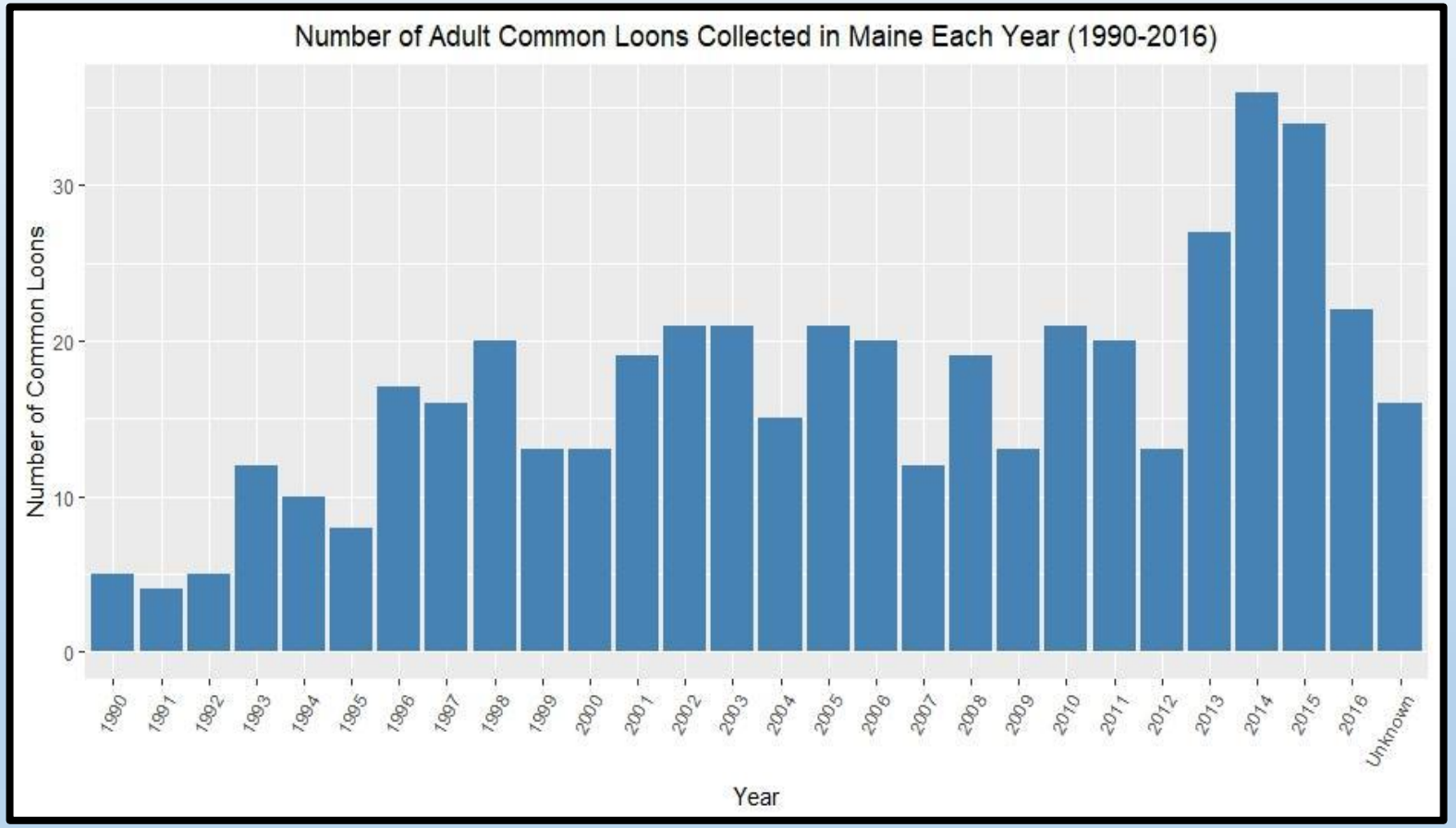
Necropsy Methods: Post-Mortem Examinations



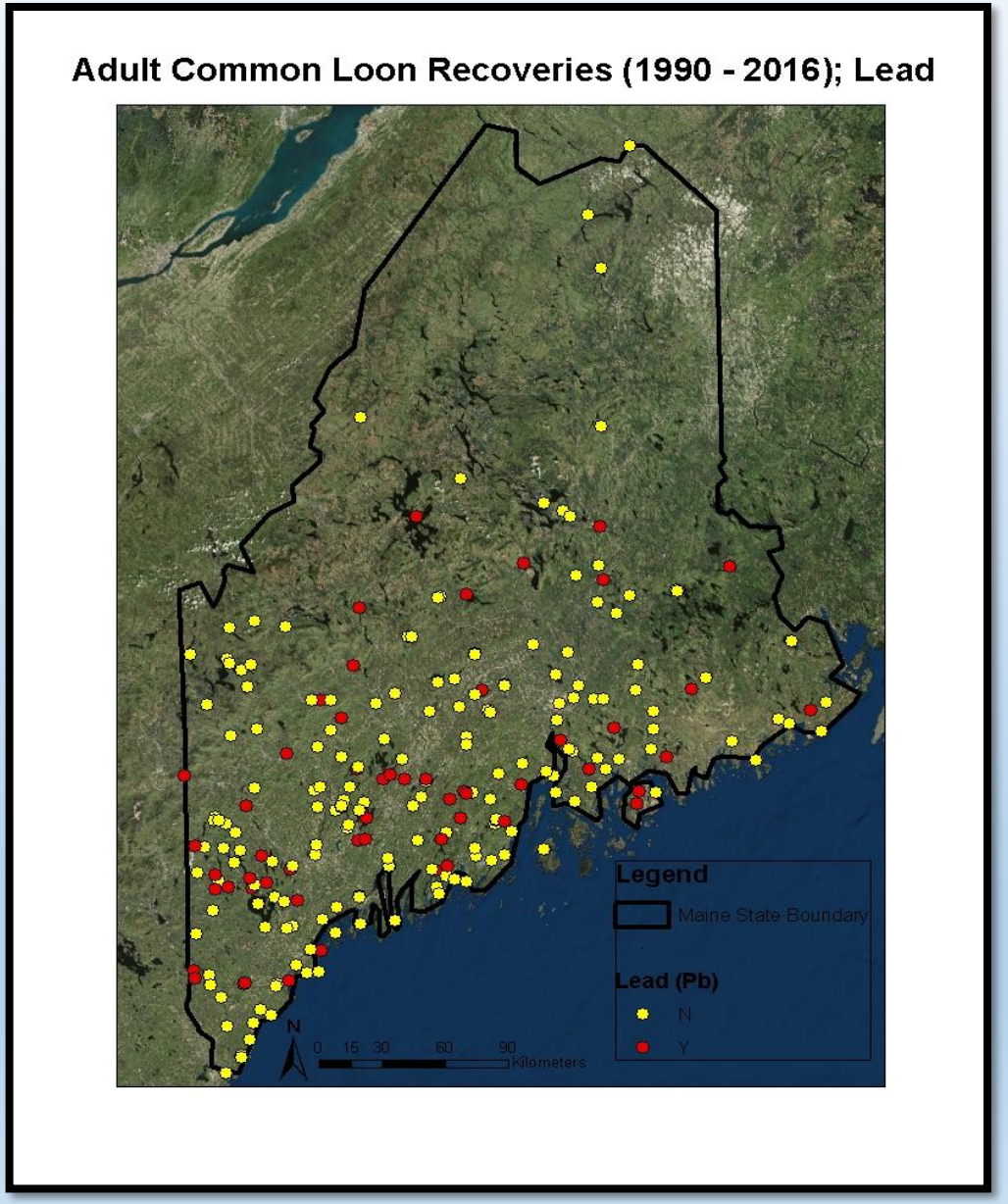
Methods: Analysis of Historical Dataset

Photo: mainepublic.org

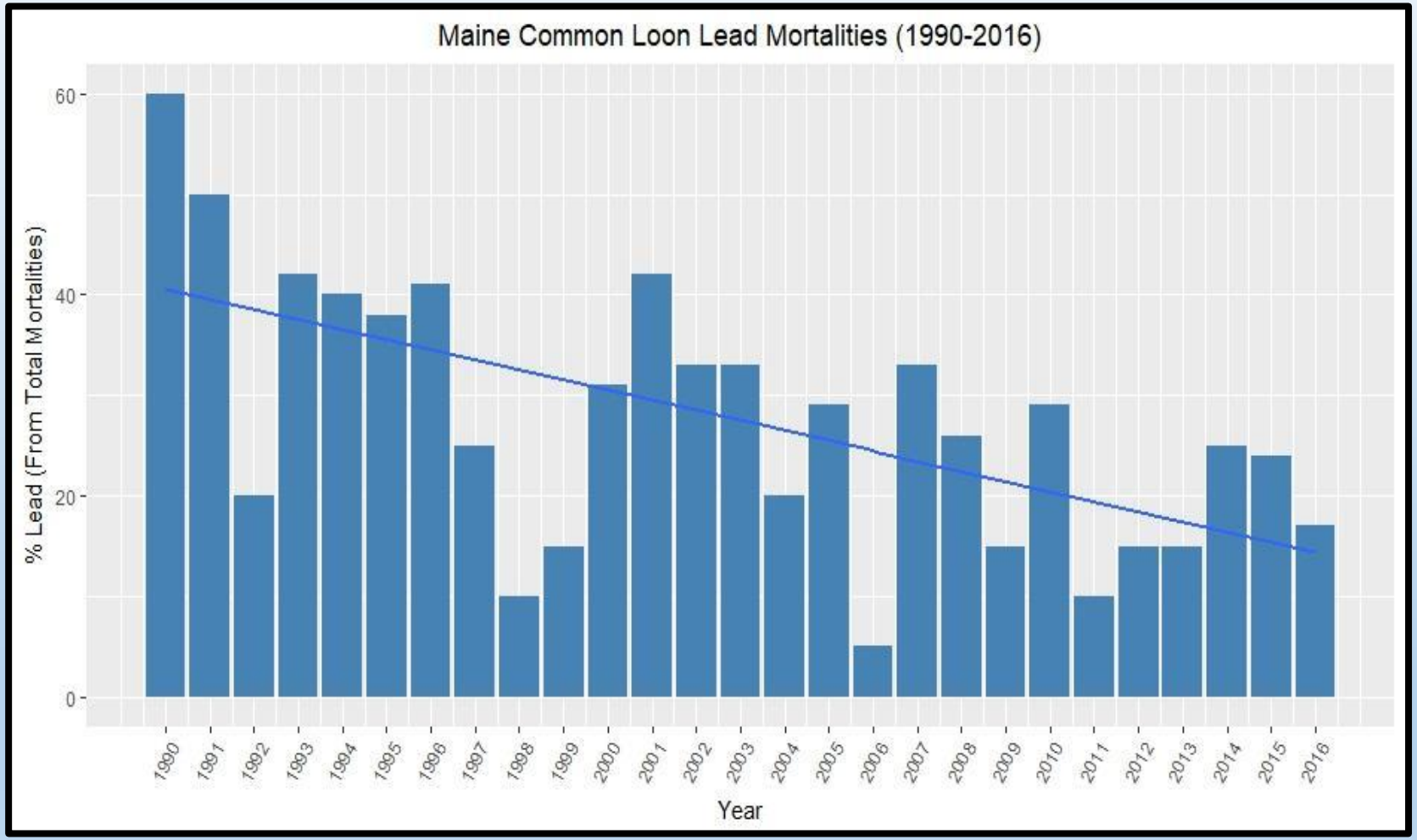
Results


Number of Adult Common Loons Collected in Maine Each Year (1990-2016)
Number of Common Loons
0
10
20
30
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Unknown
Year

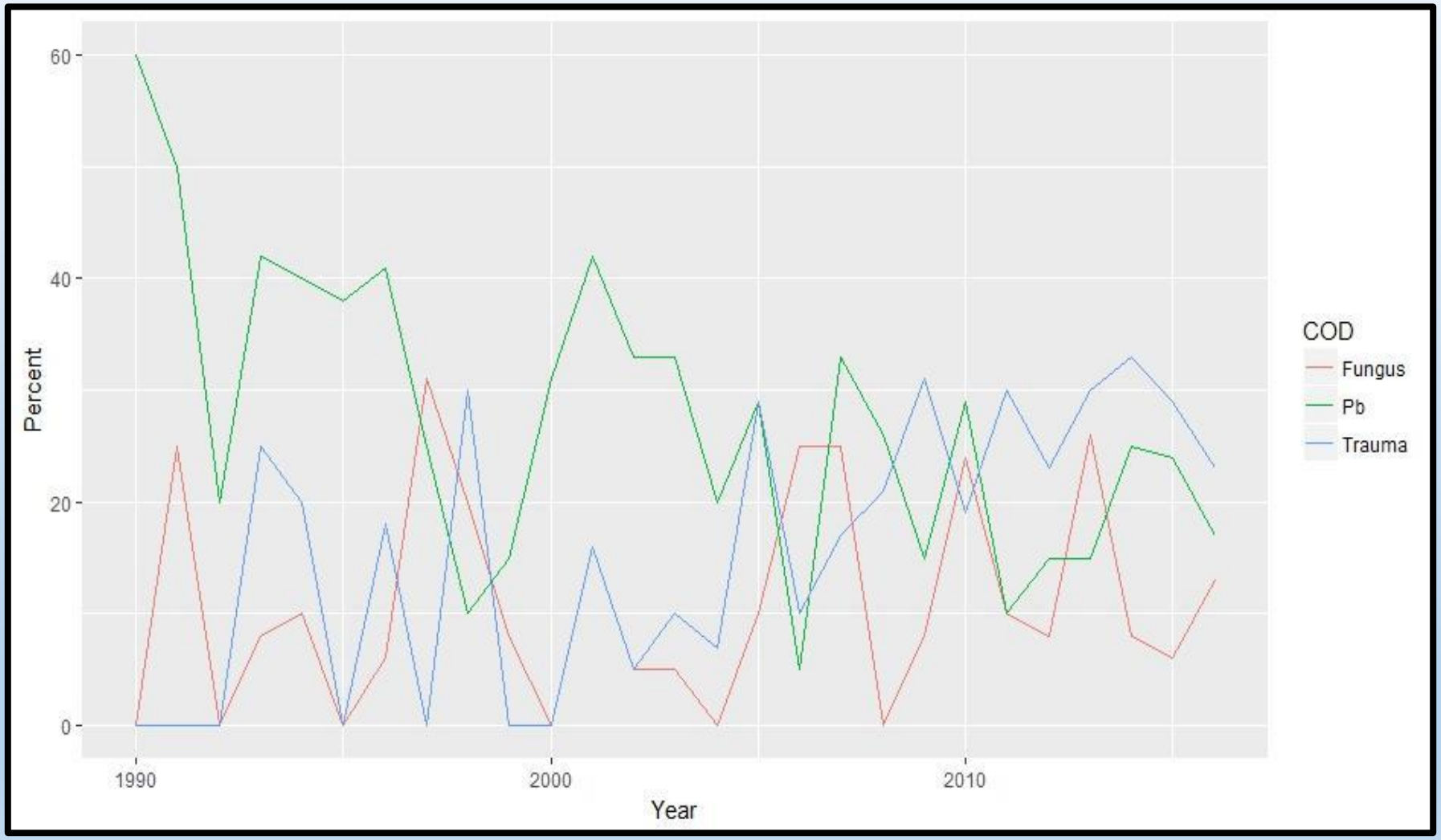
Results


Adult Common Loon Recoveries (1990 - 2016); Lead
Legend
Maine State Boundary
Lead (Pb)
N
Y
N
0 15 30 60 90
Kilometers

Results


Maine Common Loon Lead Mortalities (1990-2016)
% Lead (From Total Mortalities)
60
40
20
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year

Results



Conclusions

- Lead leading COD overall (1990-2016)
- Lead deaths decreasing over time
- Trauma increasing, first surpassing lead in 2009, and leading cause of death 2011-2016

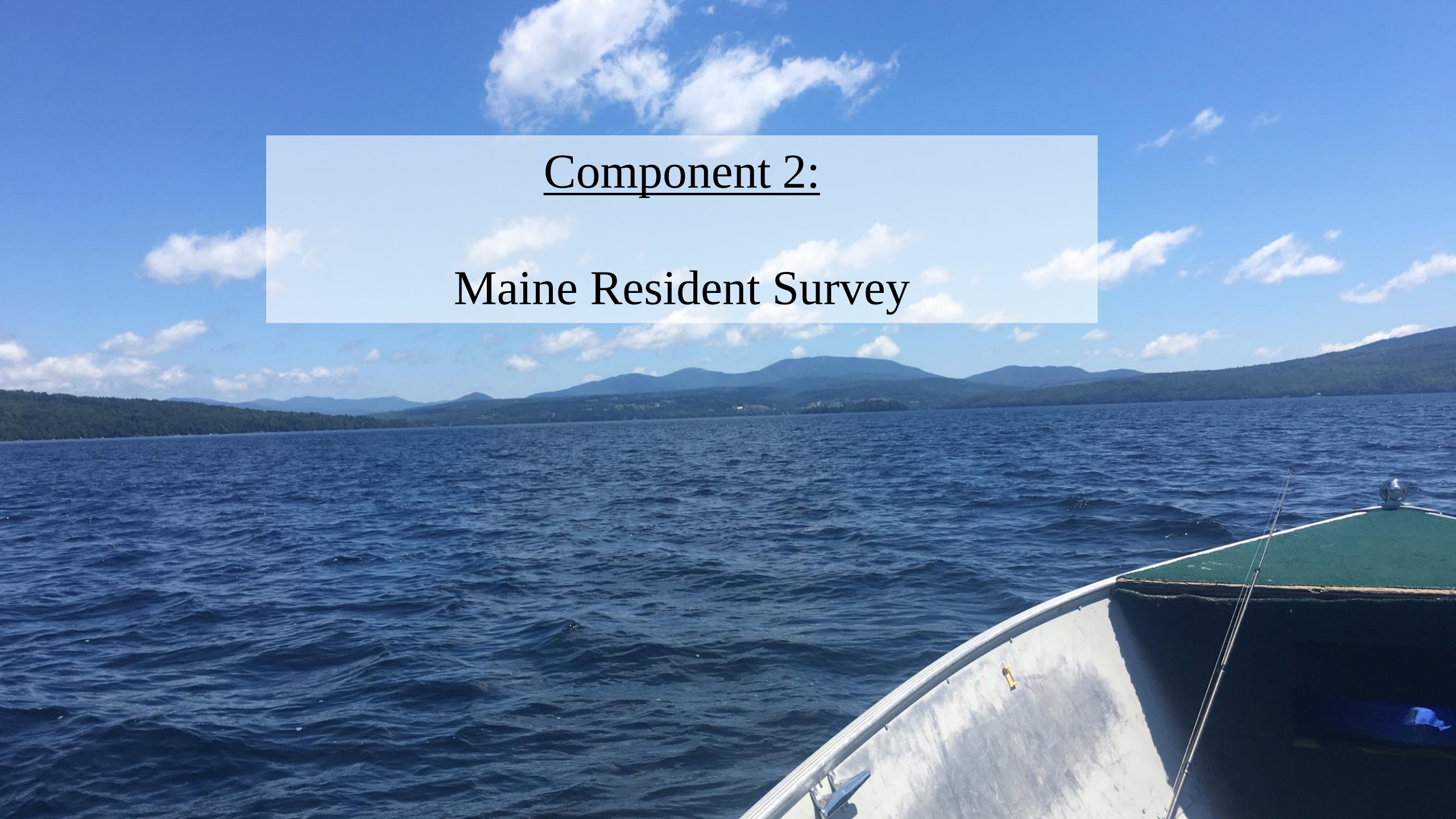
Photo: Donna Love

Study Limitations

- Non-standardized methods for carcass recovery
- Collection efforts lacking in northern Maine
- Carcass condition; Freezing/thawing
- Many cases left open - only able to determine COD during gross necropsy
- Trauma is difficult to categorize

Future Research

- Continue to monitor long-term trends (too soon to determine overall efficacy of legislative/outreach efforts regarding lead tackle use)
- Analysis of lead tackle type
- Recognize trauma as an emerging conservation issue

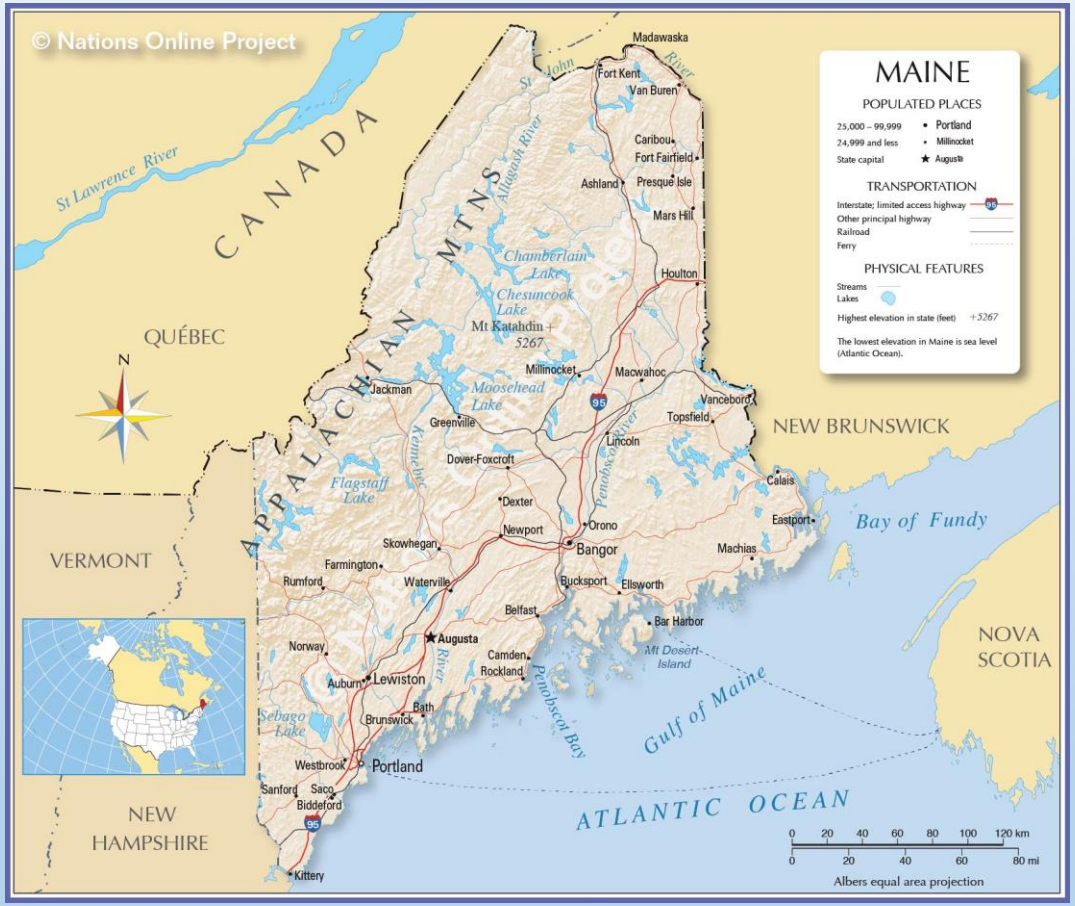


Component 2:

Maine Resident Survey

Survey Methods

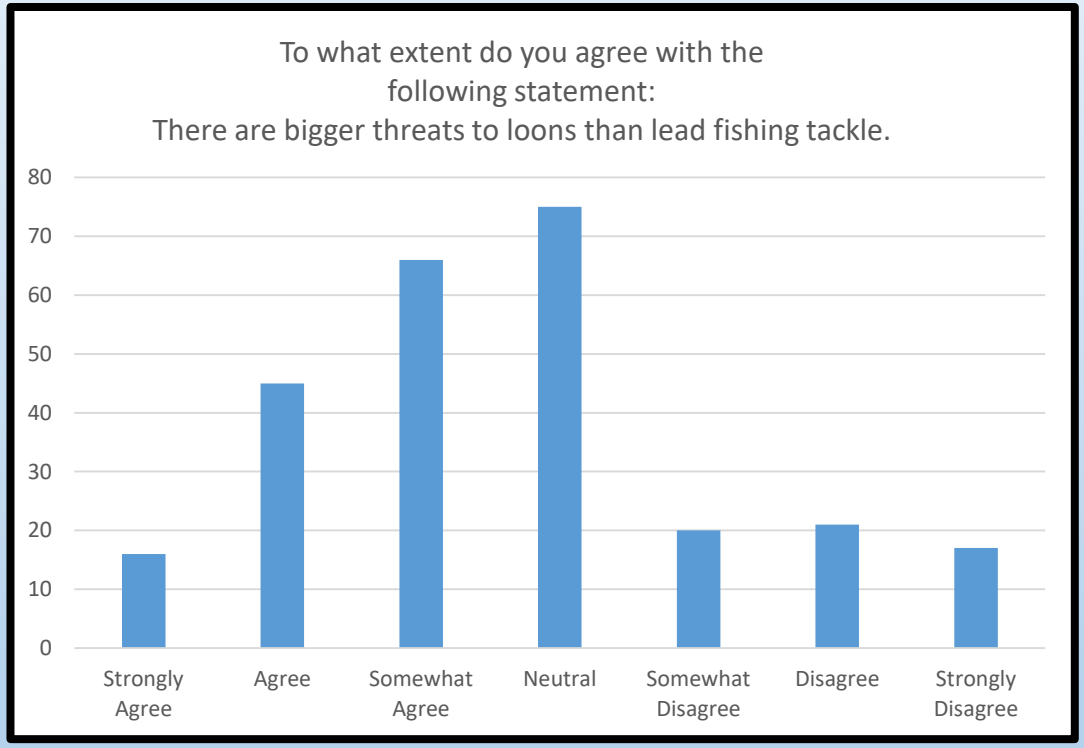
- Random sample of 2,500 Maine residents
- Questions influenced by Risk Perceptions model (van der Linden, 2015; Mase et al, 2015)
- Mail invitation, online survey
- Tailored Design Method (Dillman, 2014)
- 13% response rate



Overall Conclusions:
Biological and Social Science Convergence

Photo: Biodiversity Research Institute

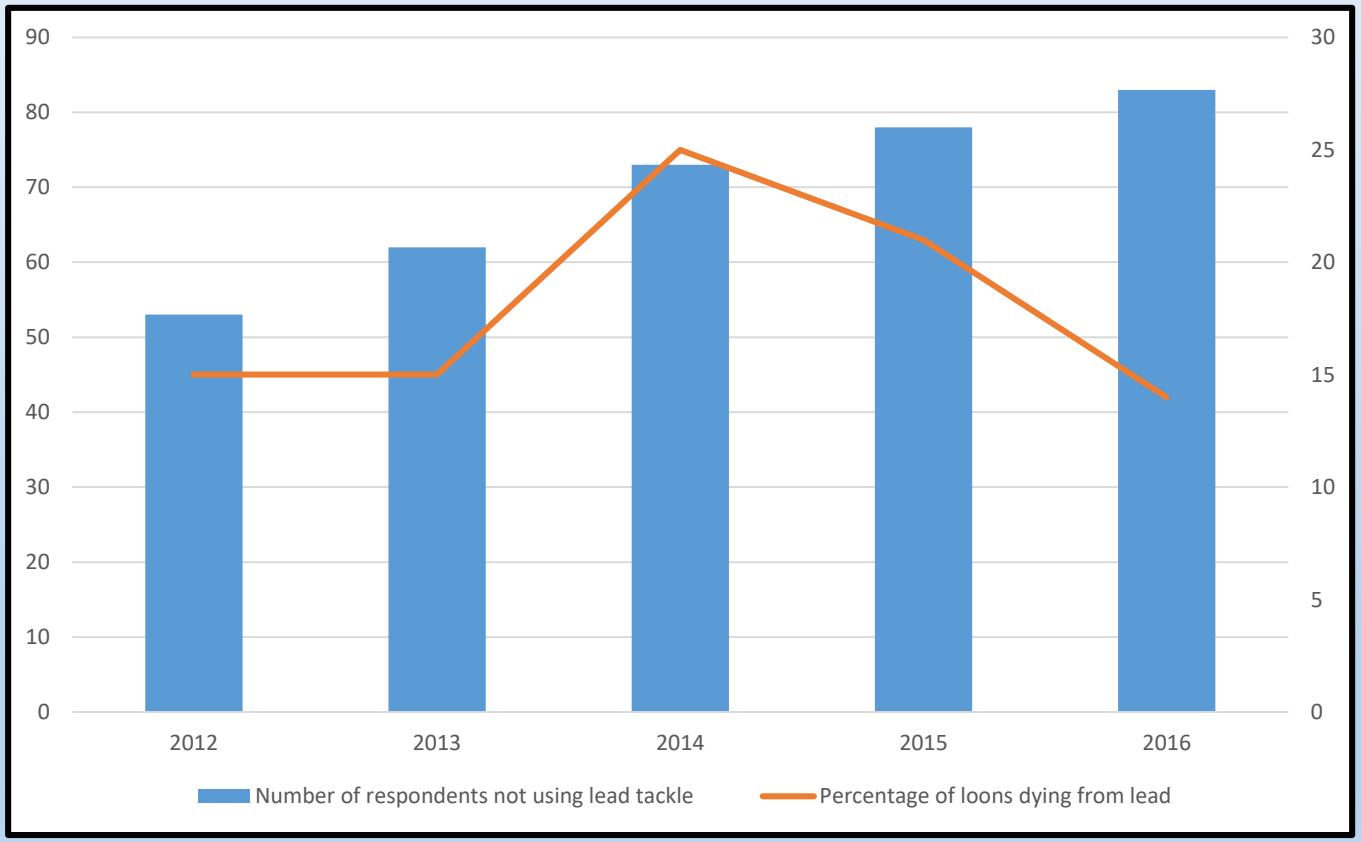
Trauma is #1 cause of death - and Mainers are concerned



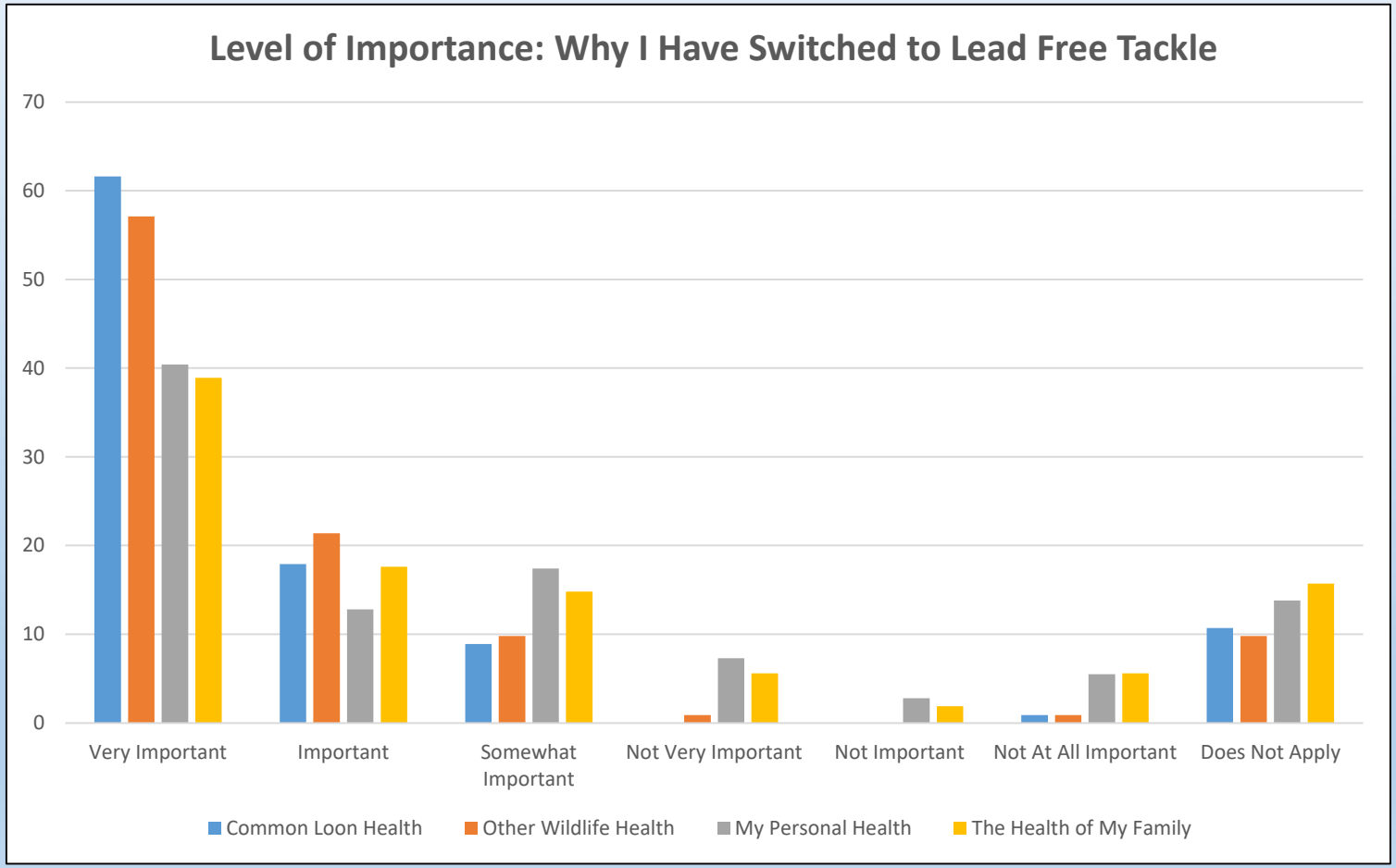
"I have witnessed boaters speeding on our lake (on 2 separate occasions) running directly at loons and striking and killing the common loon. It was heartbreaking....."

Wildlife Viewer, 74 year old female, Hampden, ME

Lead deaths are going down - and anglers are reporting using lead less often



The #1 reason anglers have already made the switch to lead-free tackle is common loon health.



The number 1 reason anglers *might* switch is human health

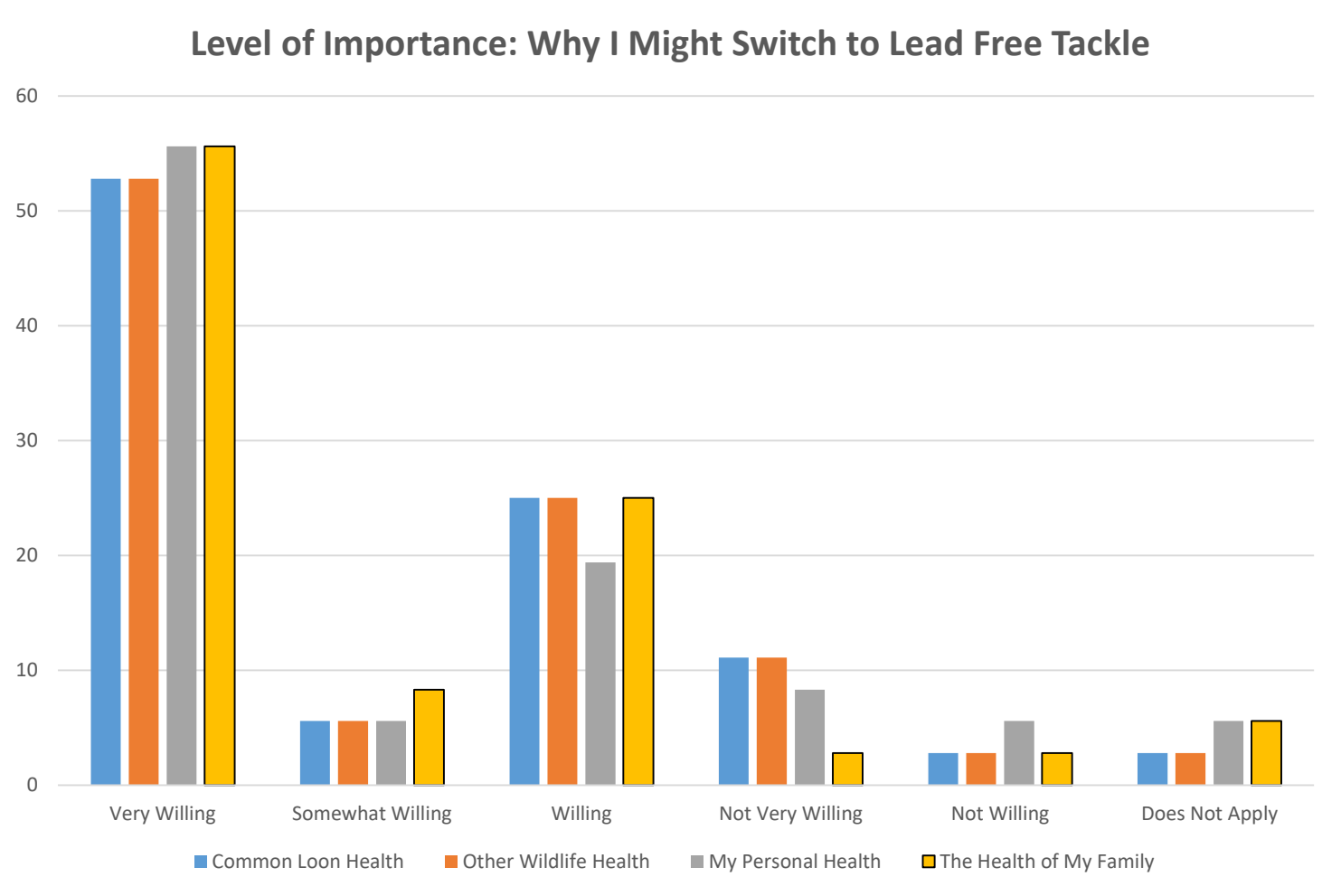


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Photo Credit: Connor Stephanison

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