Bald Eagle Lead Exposure in the Upper Midwest

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U.S. Fish and Wildlife Service

Lead poisoning has been studied before

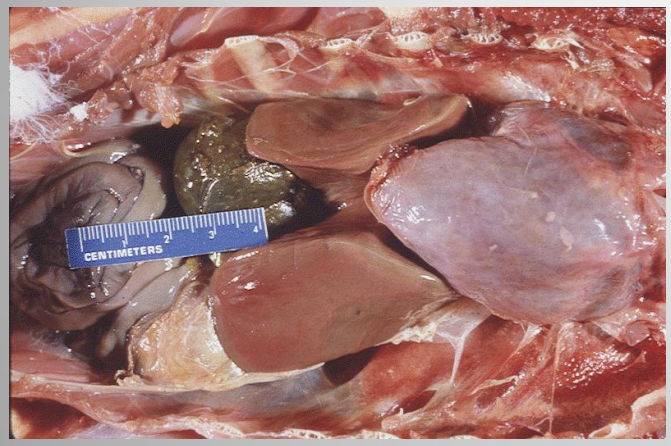
- Multiple sources indicate lead poisoning results from ingestion of bullet fragments
  - Cade 2007; Parish et al. 2006; Kim et al. 1998; Kenntner et al. 2001
- Eagles feed on gut piles and unretrieved carcasses
  - Ewins and Andress 1995; Stocek 2000; Lang et al. 2001
- Lead isotope ratios in condors/eagles conform to ratios in ammunition
  - Finkelstein et al. 2012; Redig et al. 2009; Helander et al. 2009

Clinical Signs of Lead Poisoning

- Loss of fat reserves
- Muscle degradation
- Wing droop
- Weakness
- Weight loss

Pictures provided by SOAR and the Raptor Education Group in WI

Clinical Signs of Lead Poisoning



Photograph / Copyright - Milton Friend.
Bright green staining of the vent area is often indicative of lead poisoning.

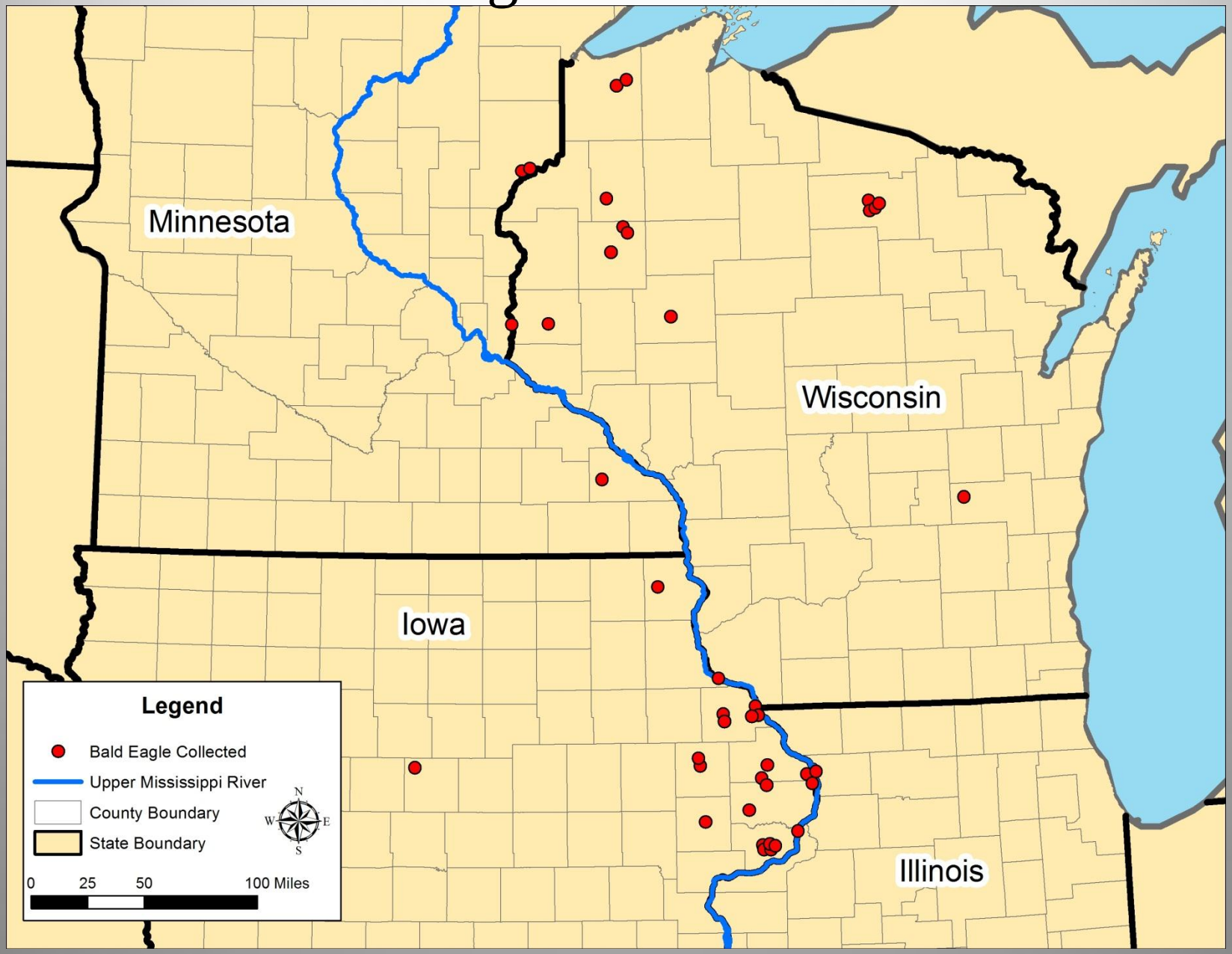
- Enlarged/distended gallbladder
- Bile staining around vent
- Discolored gizzard lining, and atrophied internal organs
- Liver lead levels (mg/kg; Franson and Pain 2011).
  - $\geq$ 6.0 = lethal
  - 2.0 - 5.9 = sublethal
  - 0.25 - 1.9 = background
  - $\leq$ 0.25 = below detection limit

Thousands of bald eagles winter on the Upper Mississippi River National Wildlife and Fish Refuge

311 active nests on the Refuge in 2013

Refuge Law Enforcement officers annually collect bald eagles carcasses from the surrounding landscape – Cause of death?

Locations where eagles were collected in 2012



58 Bald Eagles Processed in 2012

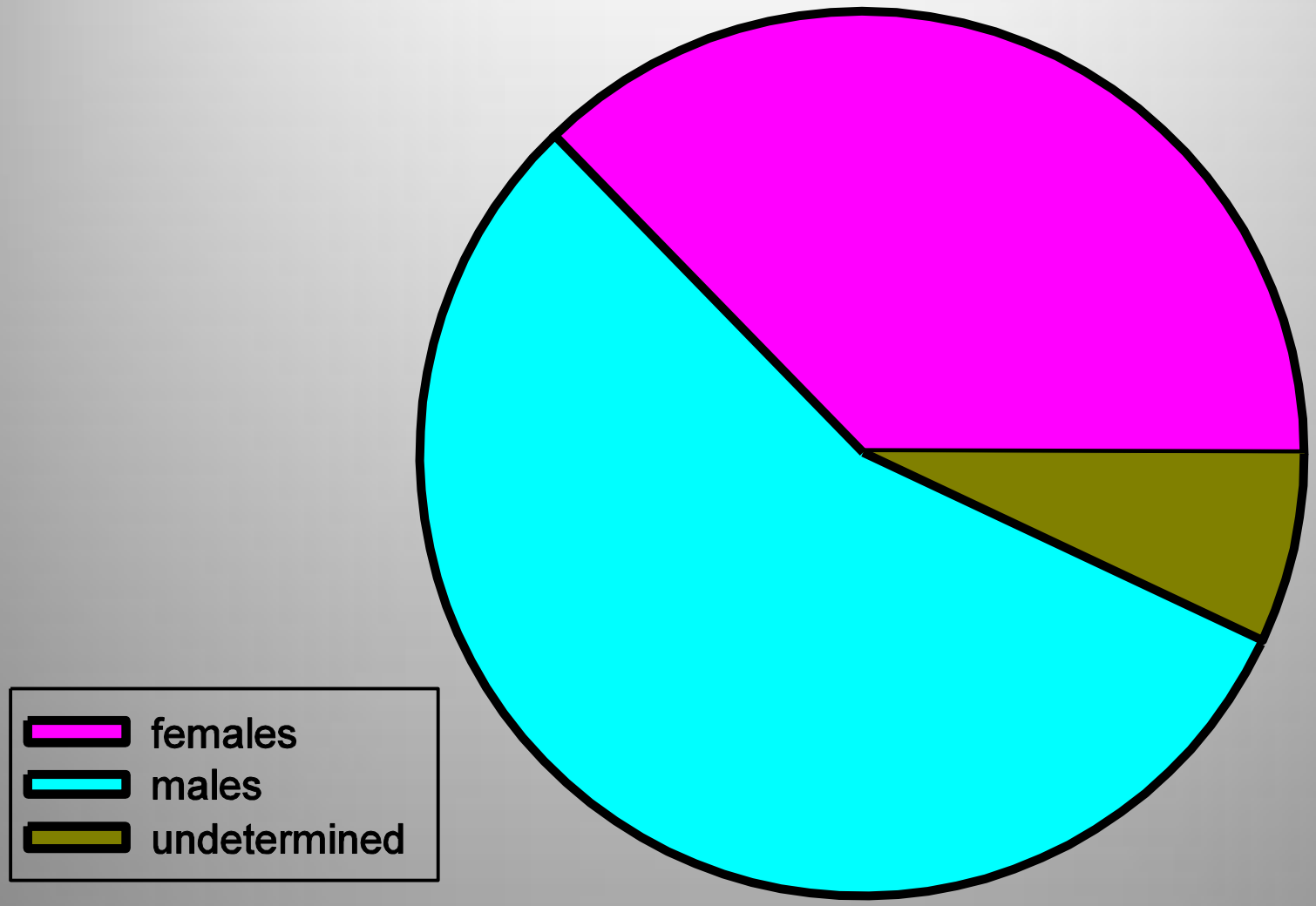
Post-mortem examinations included:

- Recorded histories (date found and state)
- Morphometric measurements
- Age/Gender
- Body Mass
- Gross lesions
- Liver mass
- Fat deposits

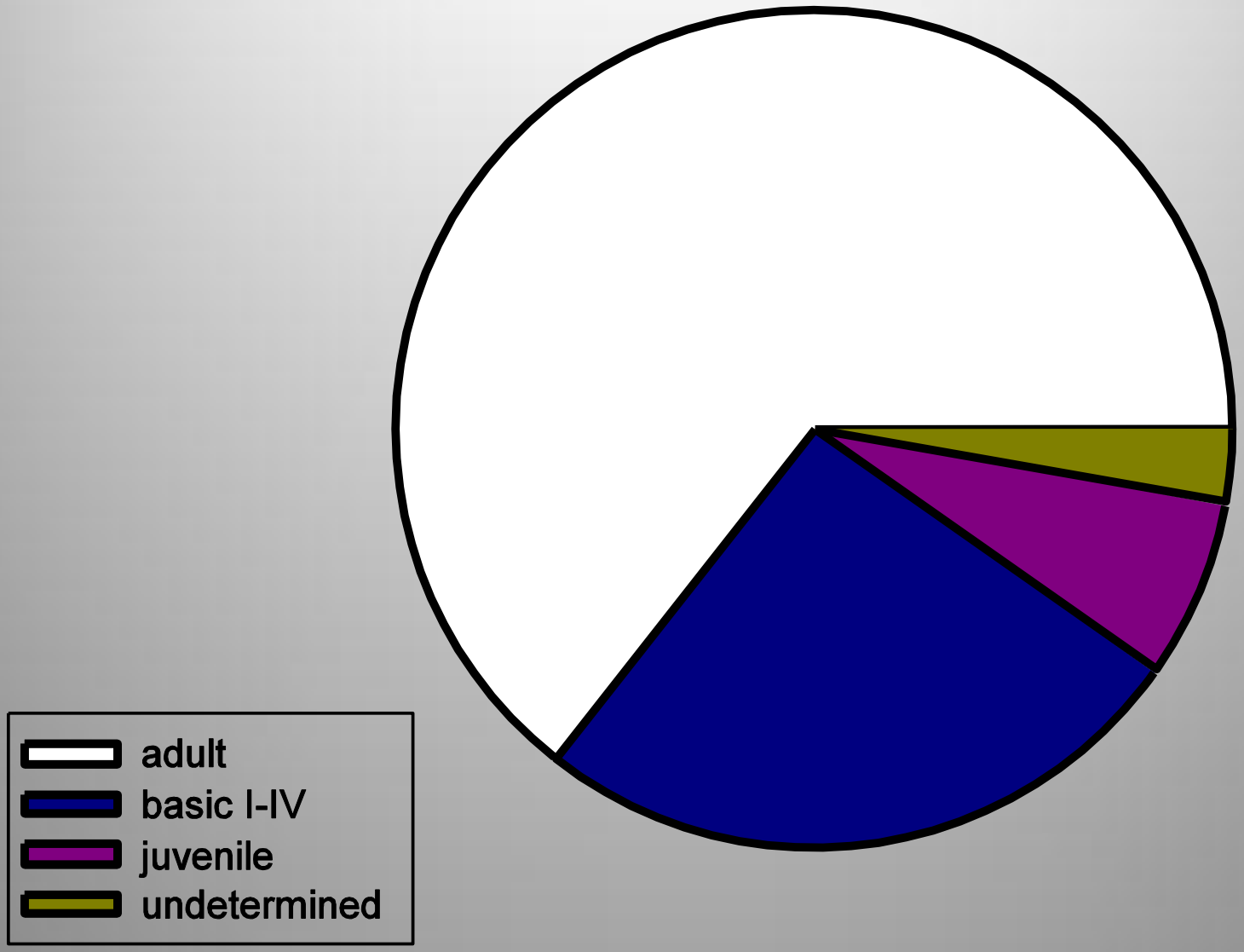
Livers harvested and sent to National Wildlife Health Center

- Liver lead levels analyzed
  - Lethal
  - Sublethal
  - Background
  - Not detectable

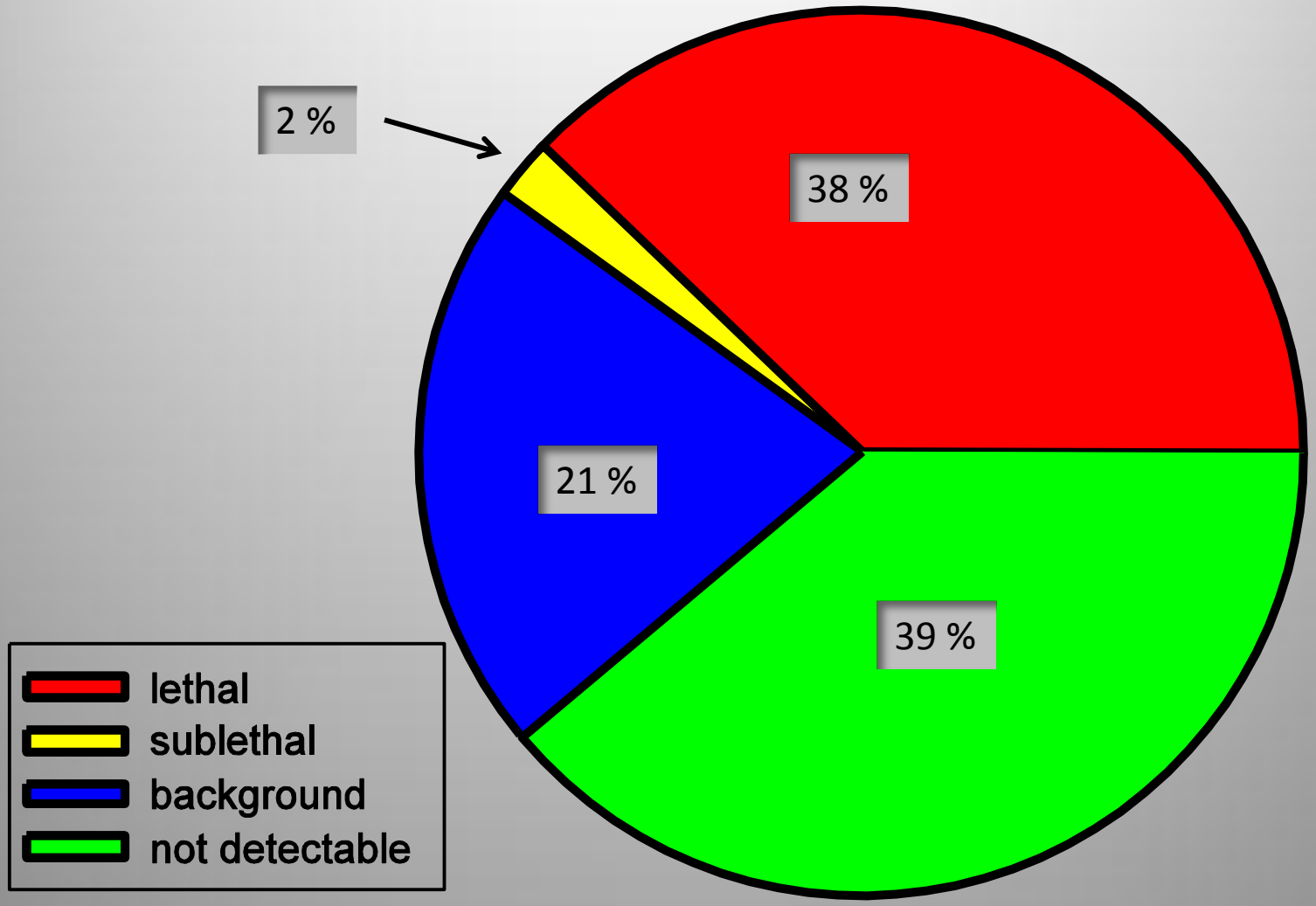
Gender n=58



Age n=58



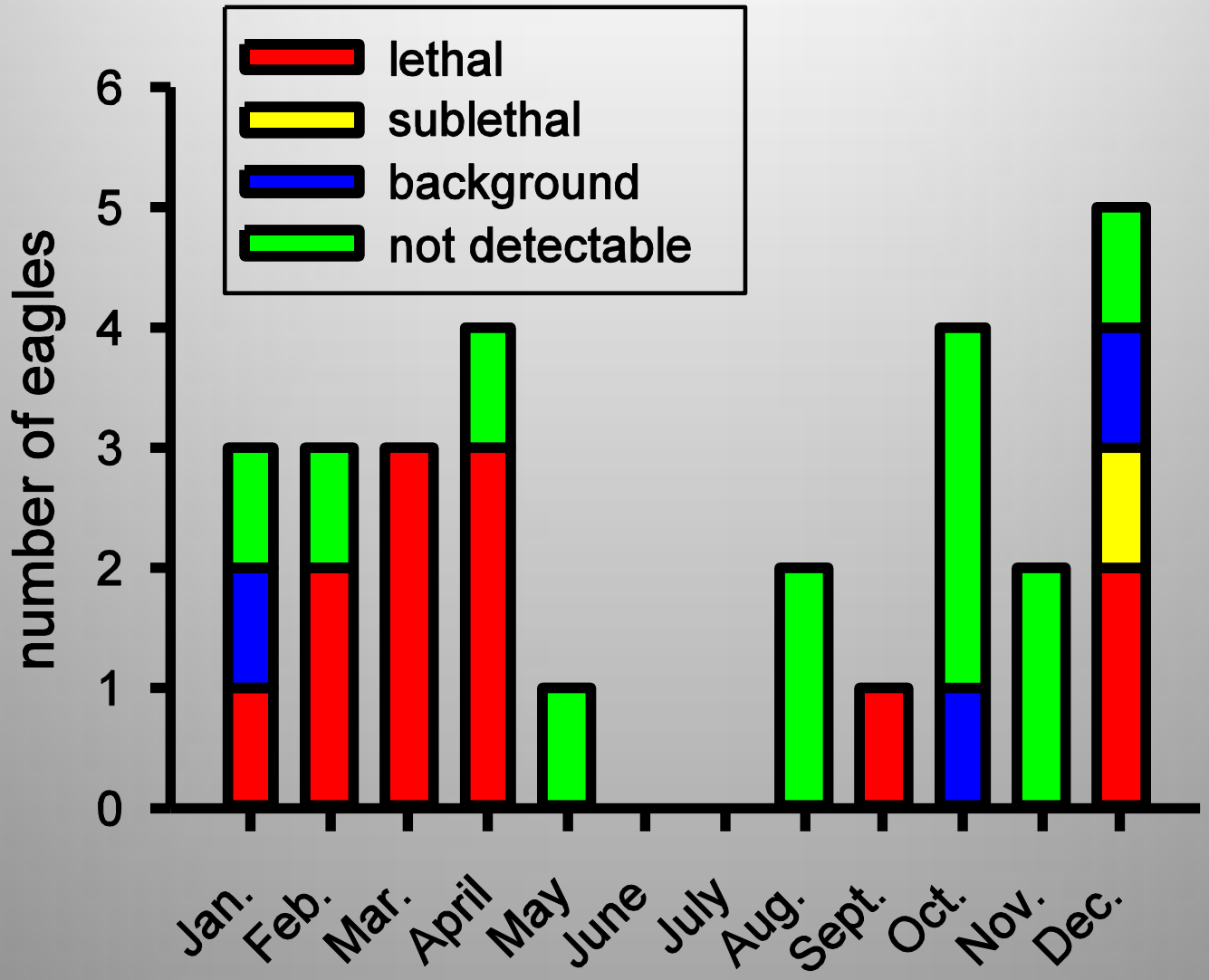
Lead levels n=58



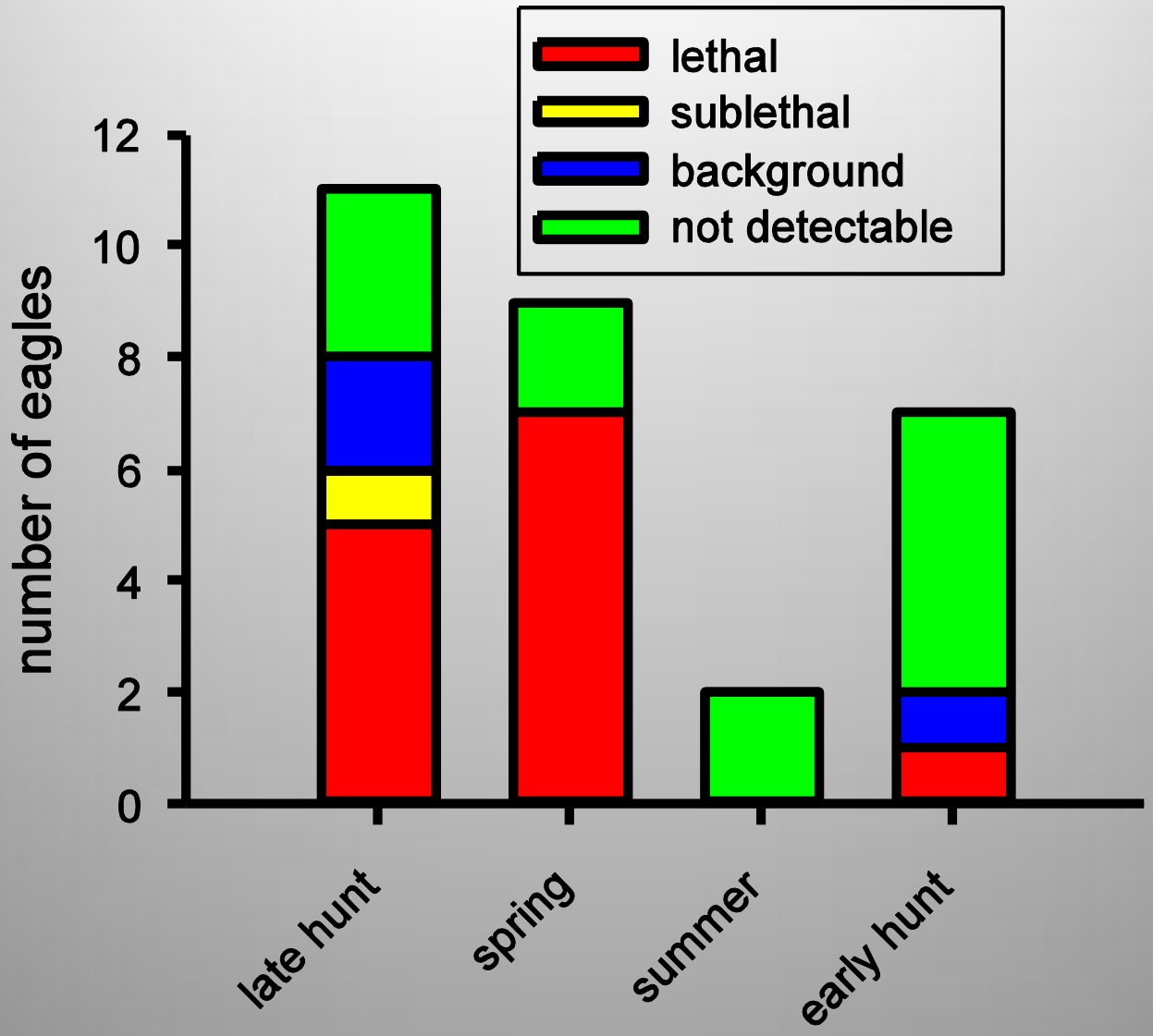
Correlation of lead poisoning with hunting activity

- California condor (Green et al. 2008)
- Turkey vulture (Kelly and Johnson 2011; Kelly et al. 2011)
- Golden eagle (Kelly et al. 2011; Stauber et al. 2010; Wayland et al. 2003; Wayland and Bollinger 1999; Patee et al. 1990)
- Bald eagle (Stauber et al. 2010; Redig et al. 2009; Kramer and Redig 1997)
- White-tailed eagle (Kenntner et al. 2001)
- Common raven (Craighead and Bedrosian 2008)

Temporal Distribution n=29

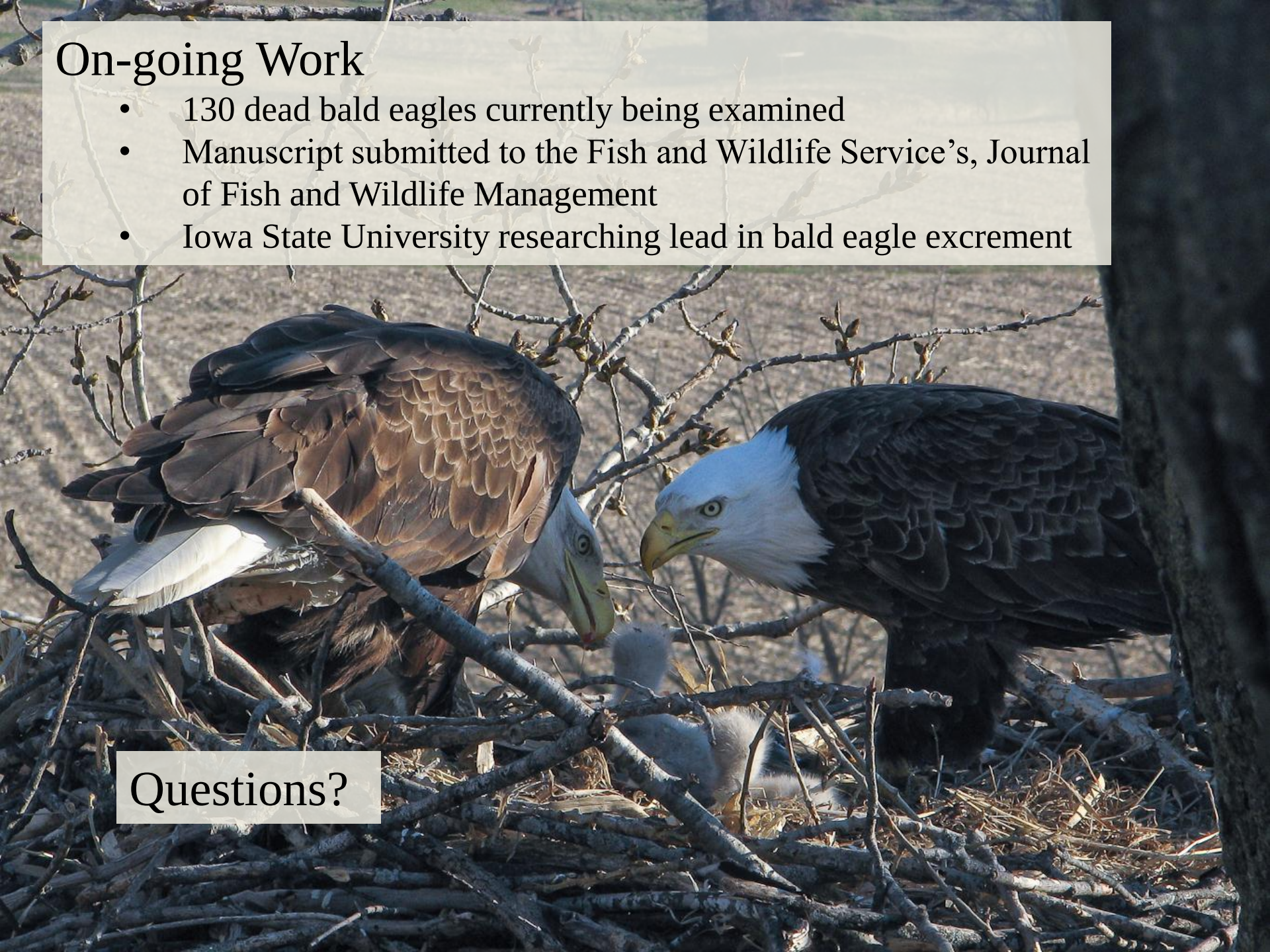


Temporal Distribution n=29



On-going Work

- 130 dead bald eagles currently being examined
- Manuscript submitted to the Fish and Wildlife Service's, Journal of Fish and Wildlife Management
- Iowa State University researching lead in bald eagle excrement



Questions?