



Bald Eagles: A Conservation Victory



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Biology

- 8 foot wing span, 15 pounds
 - Males are smaller
- White head and tail at year 4-5
- Mate for life, life= 30 years in wild
- Nest can weigh 4,000 pounds



Why the Bald Eagle almost went extinct

- Habitat loss when virgin forests were cleared
- Eagle prey declined because of overhunting and fishing
- Eagles were shot because they were thought to be a threat to livestock
- DDT, an insecticide, built up in adult eagles and caused them to lay thin shelled eggs that cracked before chicks could hatch



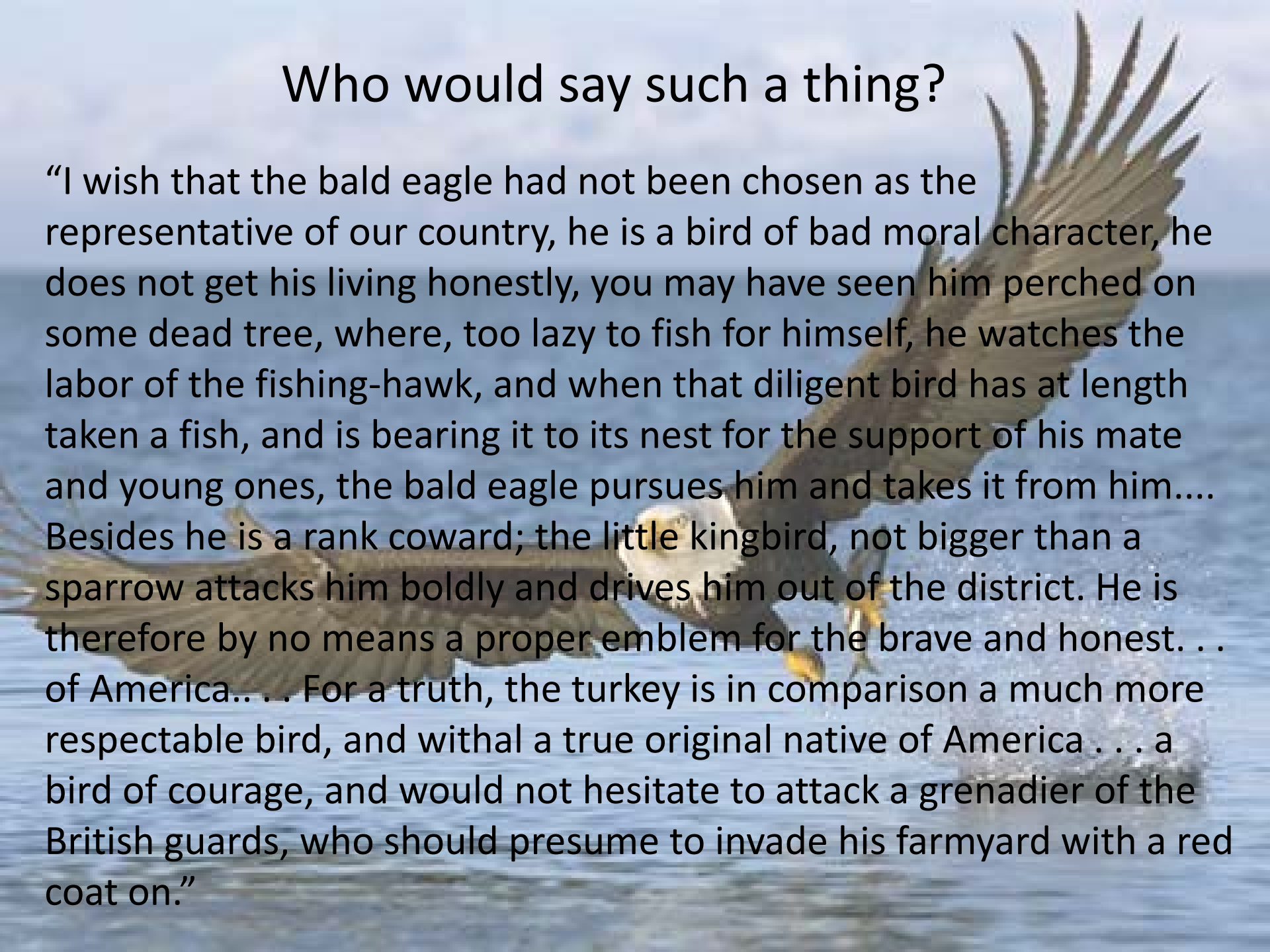
What we did to bring the Bald Eagle back

- Banned DDT
- Prohibited killing of eagles
- Improved water quality in many of our lakes/rivers
- Protected nest sites
- Restored eagles back to areas where they had been eliminated



Who would say such a thing?

“I wish that the bald eagle had not been chosen as the representative of our country, he is a bird of bad moral character, he does not get his living honestly, you may have seen him perched on some dead tree, where, too lazy to fish for himself, he watches the labor of the fishing-hawk, and when that diligent bird has at length taken a fish, and is bearing it to its nest for the support of his mate and young ones, the bald eagle pursues him and takes it from him.... Besides he is a rank coward; the little kingbird, not bigger than a sparrow attacks him boldly and drives him out of the district. He is therefore by no means a proper emblem for the brave and honest. . . of America. . . . For a truth, the turkey is in comparison a much more respectable bird, and withal a true original native of America . . . a bird of courage, and would not hesitate to attack a grenadier of the British guards, who should presume to invade his farmyard with a red coat on.”

A bald eagle is shown in flight, its wings spread wide, against a background of a blue sky and a body of water. The eagle's head is turned towards the viewer, and its talons are visible. The water below is slightly blurred, suggesting movement.

IL River Eagle Nests

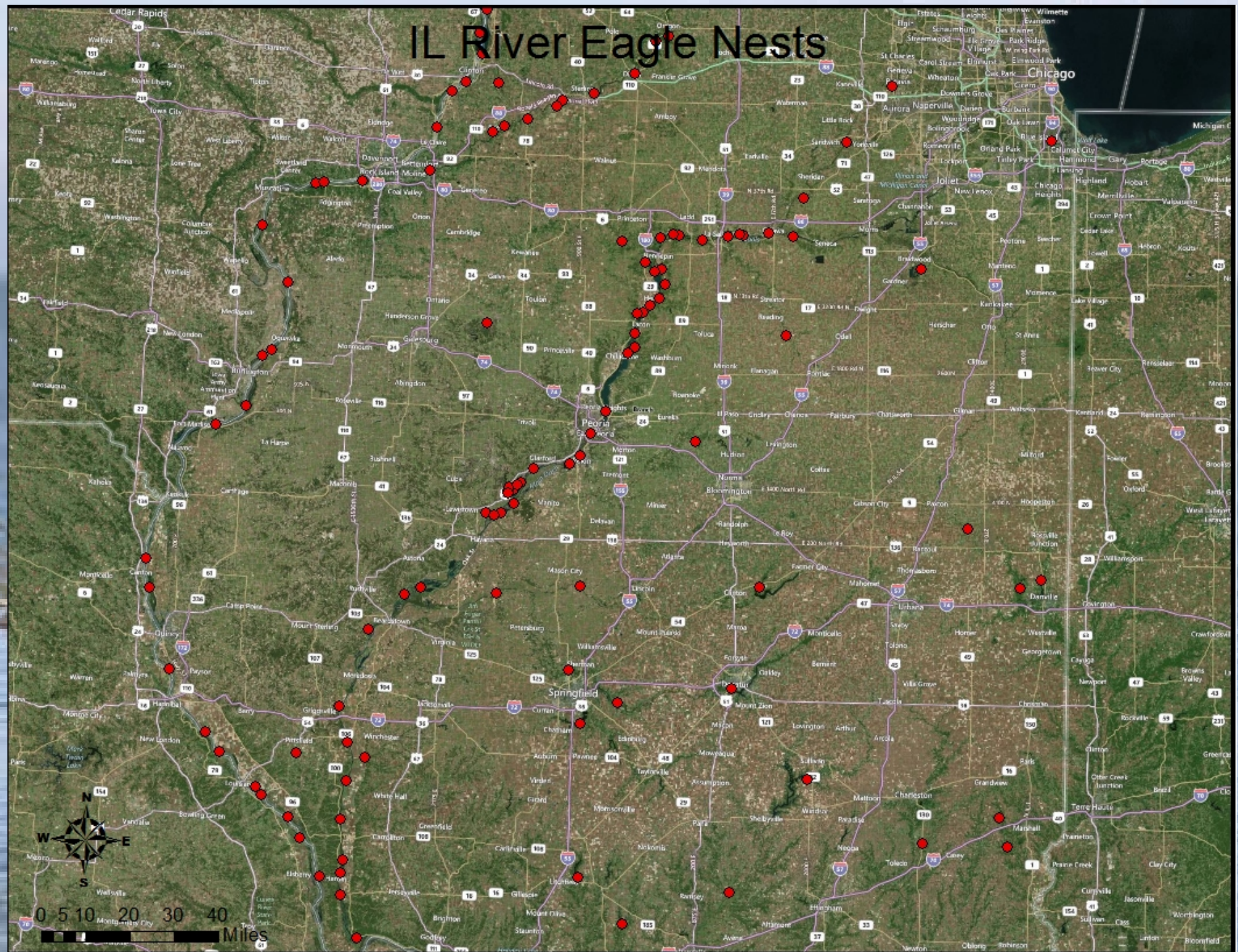
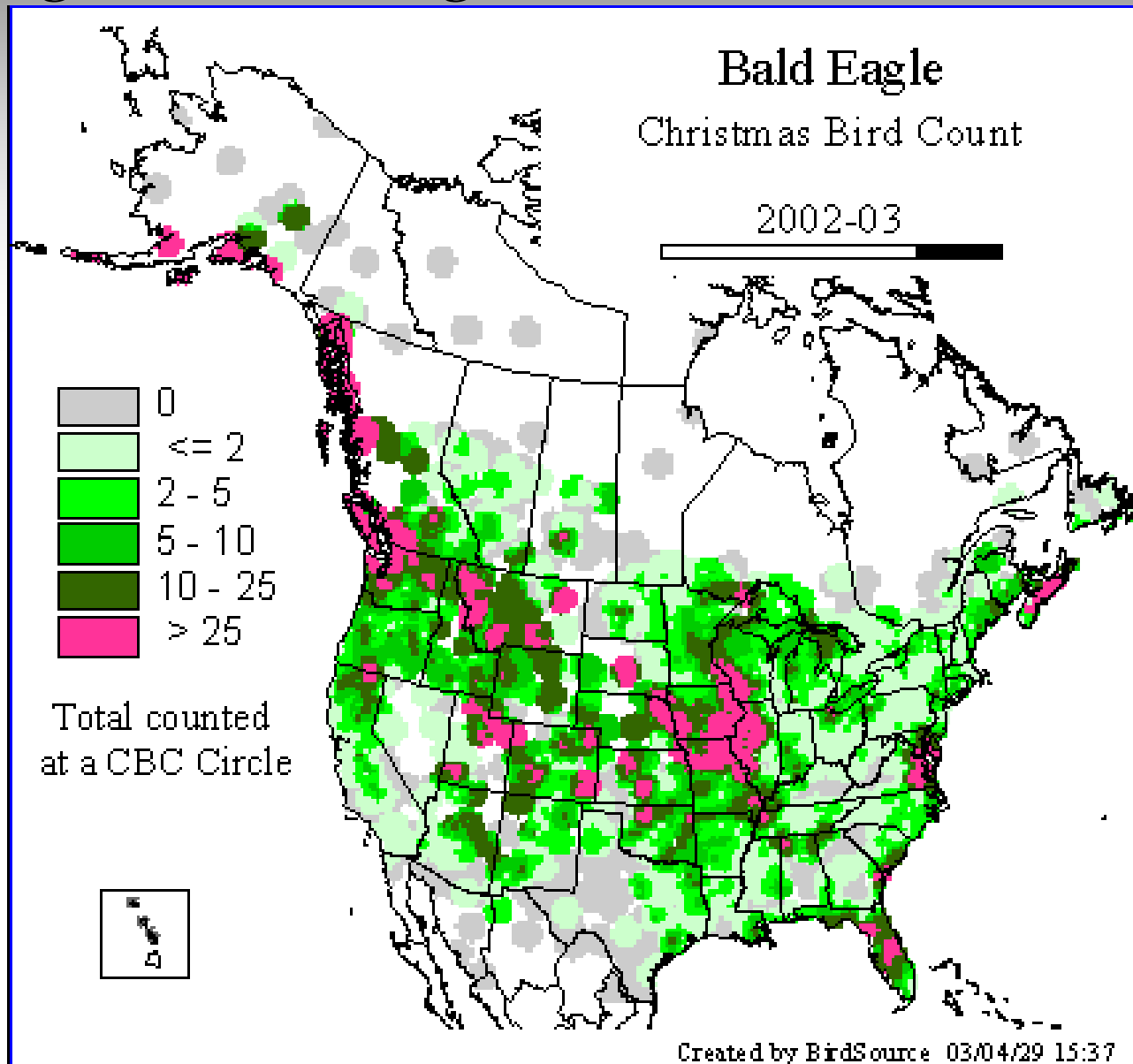


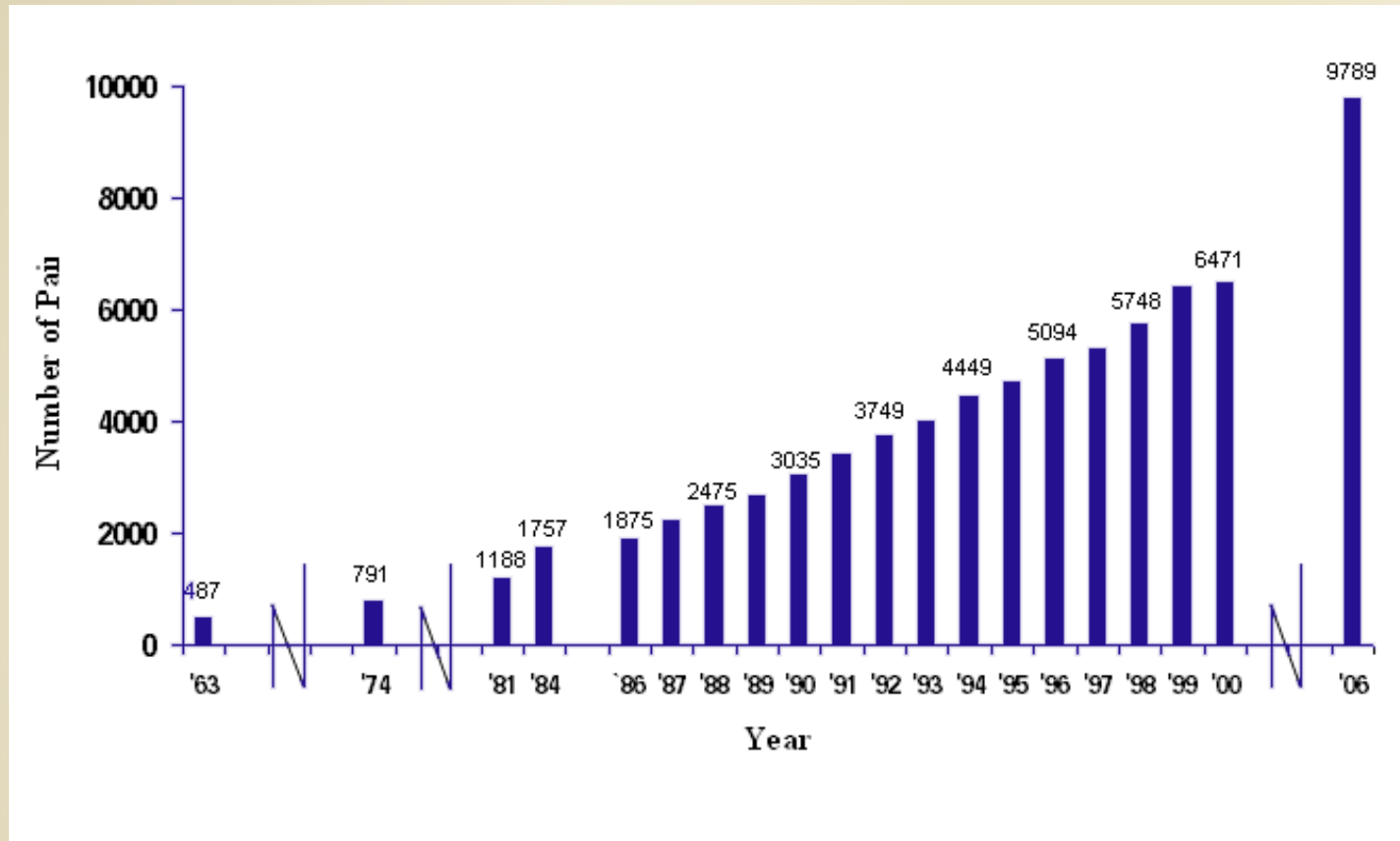
Figure 6b. Bald Eagle Christmas Bird Count Data



POPULATION TRENDS



POPULATION TRENDS

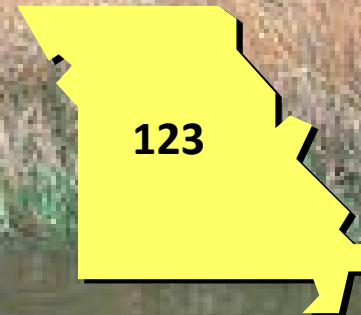
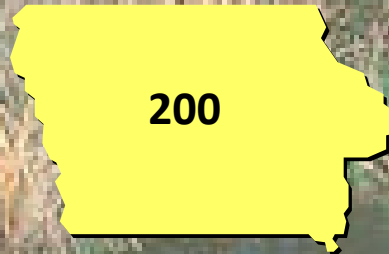
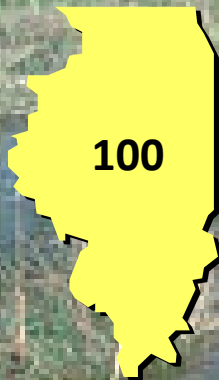


POPULATION TRENDS

State	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Illinois	8	9	11	12	10	14	24	26	43	36	"36"	b					100
Iowa	8	11	17	31	32	36	47	58	83	100	"100"	b					200
Missouri	11	13	11	14	14	24	27	36	45	53	64	75					123

b = no data recorded

" " = Census data from 1999



LAWS PROTECTING EAGLES

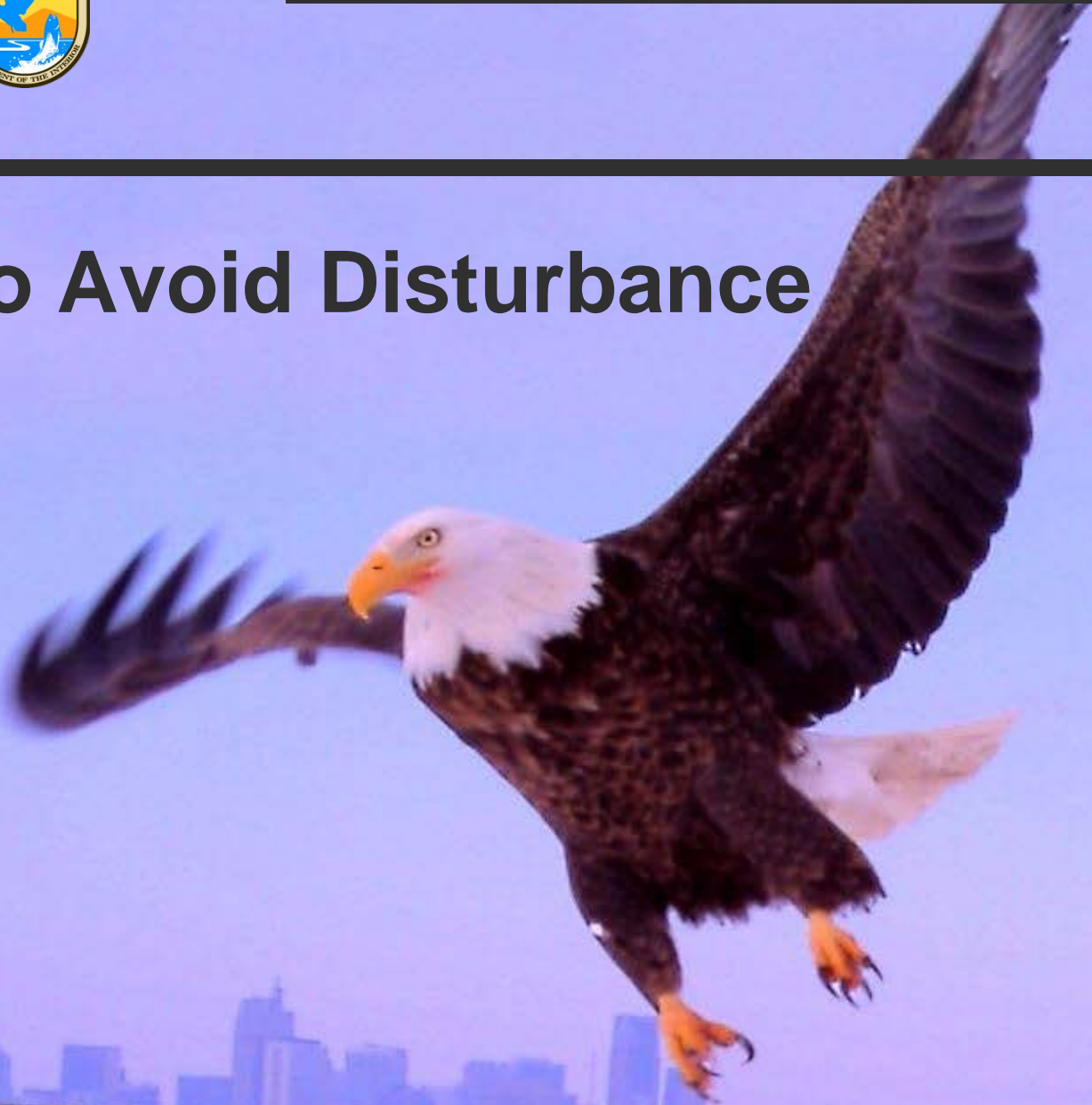
A bald eagle is shown in flight over a body of water. The eagle's wings are spread wide, and it is holding a fish in its talons. The background is a clear blue sky and water.

- **LACEY ACT (1900)**
- **MIGRATORY BIRD TREATY ACT (1918)**
- **BALD AND GOLDEN EAGLE PROTECTION ACT (1940)**
- **ENDANGERED SPECIES ACT (1973)**



U.S. Fish & Wildlife Service

How to Avoid Disturbance



www.dec.ny.gov



Step One

- Is there an eagle in the area?





Step Two

- How far is your activity from the eagle/eagle resource? Are in a direct path?



FWS: Rocky Mountain Arsenal



Step 3

- Is your activity likely to disturb the eagle?





Step 4

- Can this disturbance be minimized to the point where a permit is not needed?





Recommendations

- Keep distance between activity and nest
- Use of landscape buffers between activity and eagle area
- Avoid certain activities outside breeding season





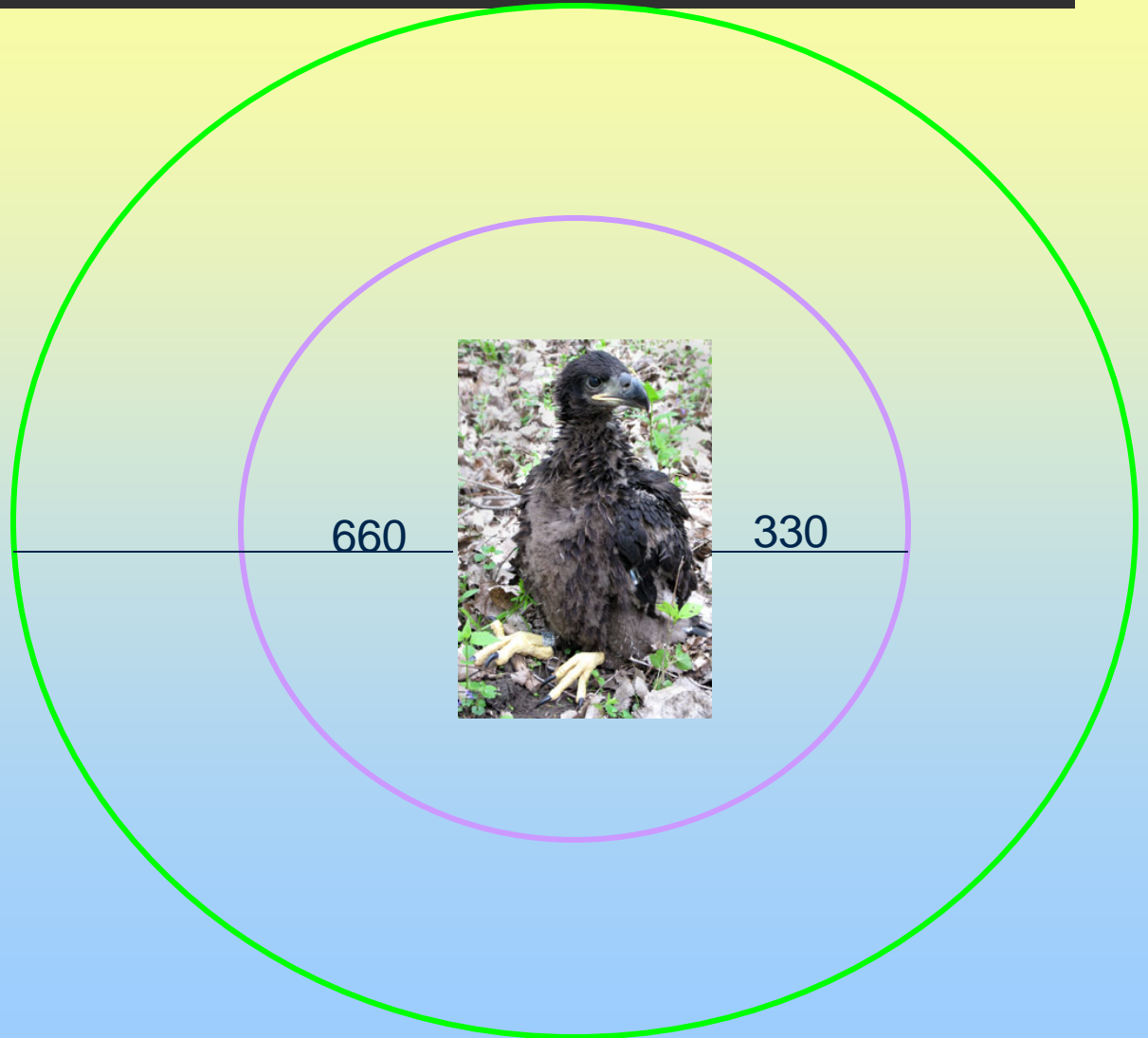
Ways to Avoid Disturbance and Permit

**Change Your
Distance**

**Change Your
Season**



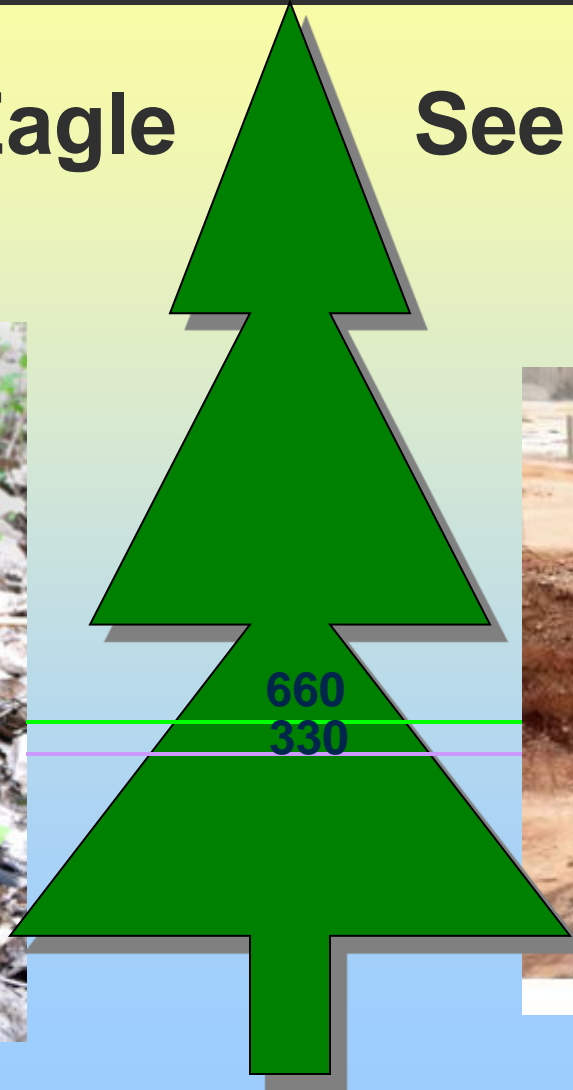
General Distance Rules





Can the Eagle

See Your Activity?

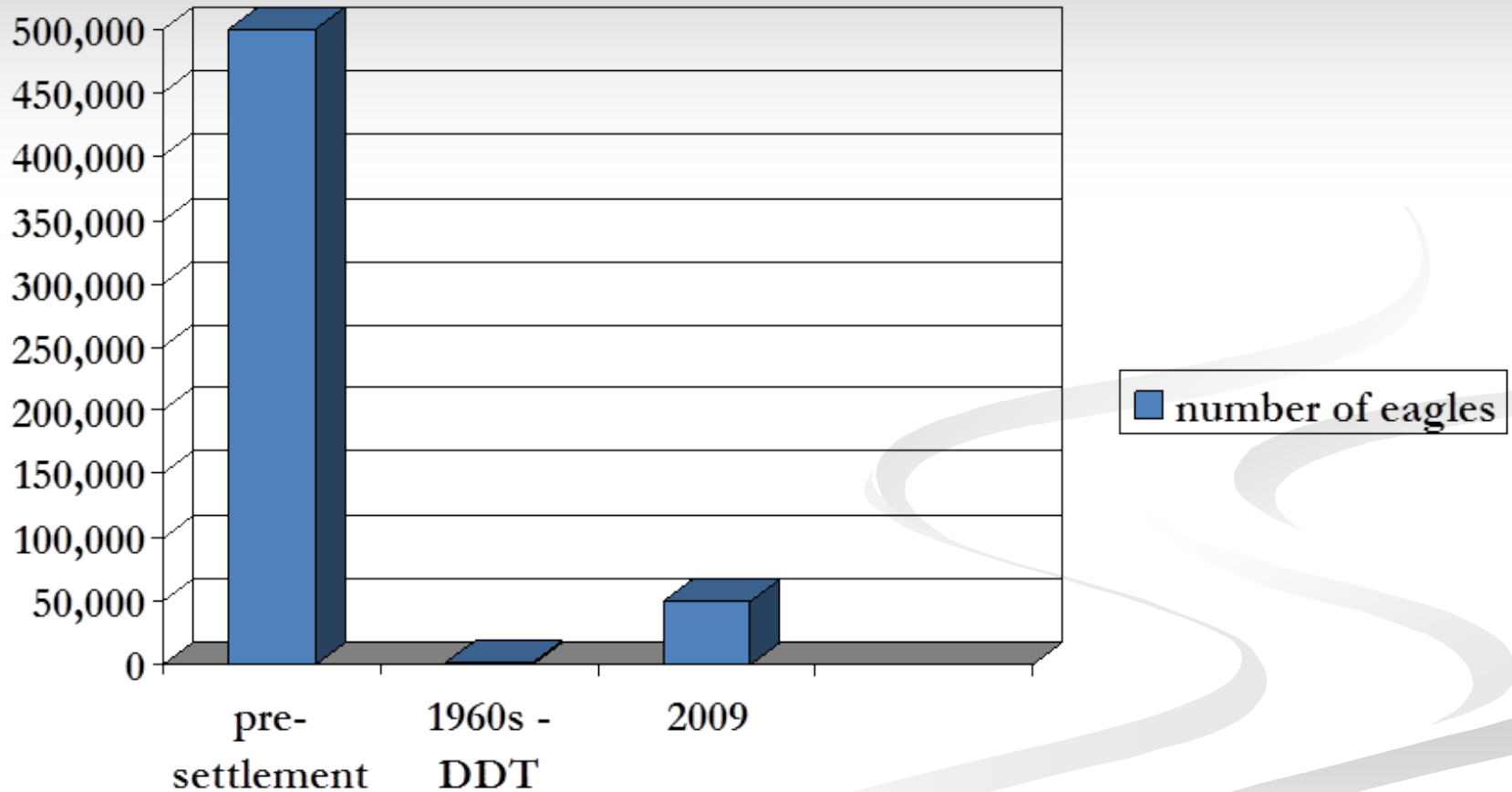




Do Eagles Demonstrate Tolerance to Activity?



Bald Eagle Trends



Source: U.S. Fish and Wildlife Service

Estimates of number of eagles dying from lead in Iowa

Year	Number of Eagles Admitted with Abnormal Lead Levels	Estimate of Total Eagle Deaths due to Lead Ingestion
2004	3	20
2005	14	93
2006	9	60
2007	13	87
2008	11	73
2009	27	180
2010	9	60
2011	18	120
TOTALS	104	693

The number of eagles admitted to wildlife rehabilitators is only a portion of the eagles dying each year. Band return rates have been used to estimate the probability of the public finding an animal and reporting it (Green, personal communication). The band return rate for bald eagles is 15%. Number of eagles admitted with abnormal lead levels / .15 = Estimate of Total Eagle Deaths due to Lead Ingestion.

On average, approximately 86 eagles are dying in Iowa each year due to lead ingestion.

Lead Ammo Fragmentation

BULLET FRAGMENTS IN DEER REMAINS: IMPLICATIONS FOR LEAD EXPOSURE IN SCAVENGERS

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ABSTRACT.—Bullet fragments in rifle-killed deer carrion have been implicated as agents of lead intoxication and death in Bald Eagles (*Haliaeetus leucoccephalus*), Golden Eagles (*Aquila chrysaetos*), California

Ninety-four percent of samples of deer killed with lead-based bullets contained fragments, 90% of offal piles showed fragments.

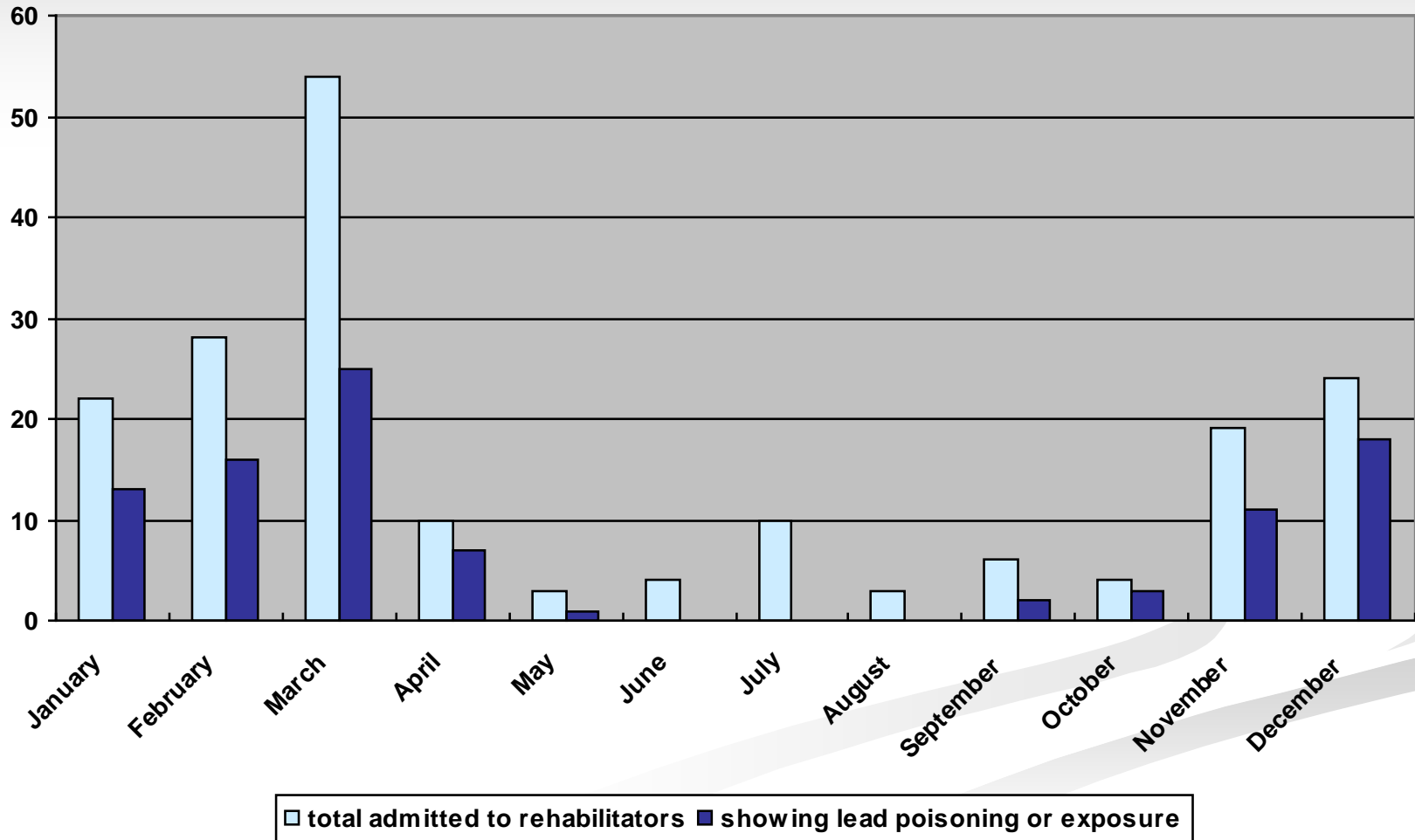
with 100–199, and 5 showing >200 fragments. In contrast, we counted a total of only six fragments in 4 whole deer killed with copper expanding bullets. These findings suggest a high potential for scavenger exposure to lead. *Reproduced with permission from the Wildlife Society Bulletin 34(1):167-170, 2006.*

HUNT, G., W. BURNHAM, C. PARISH, K. BURNHAM, B. MUTCH, AND J. L. OAKS. 2009. Bullet fragments in deer remains: Implications for lead exposure in scavengers. *In* R. T. Watson, M. Fuller, M. Pokras, and W. G. Hunt (Eds.). *Ingestion of Lead from Spent Ammunition: Implications for Wildlife and Humans*. The Peregrine Fund, Boise, Idaho, USA. DOI 10.4080/ilsa.2009.0123

Key words: Bullet fragmentation, lead, lead poisoning, raptors, scavengers.



Eagles admitted with abnormal lead levels - by the month - January 2004 thru December 2011



Year	Total # of eagles admitted to Iowa wildlife rehabilitators	# tested for lead (% of total)	# showing lead exposure	# showing lead poisoning (lethal without treatment)	% of total showing abnormal lead levels
2004	8	5 (62.5%)	0	3	37.5%
2005	20	18 (90.0%)	1	13	70.0%
2006	20	11 (55.0%)	2	7	45.0%
2007	23	17 (73.9%)	2	11	56.5%
2008	21	17 (80.9%)	2	9	52.4%
2009	39	37 (94.8%)	6	21	69.2%
2010	23	18 (78.3%)	5	4	39.1%
2011	33	28 (84.8%)	10	8	54.5%
TOTAL	187	151	28	76	55.6%

Unsustainable mortality rate?

- Using rehabilitation data as a sample, eagles admitted from January 2004 thru March 2011;
- Lead ingestion accounts for over half of all bald eagle mortalities, effectively doubling their mortality rate.
- When looking at entire data set (n=170), without lead mortality, only 78 eagles would have been admitted for care vs. 170.
- When looking at the sub sample of those tested for lead (n=131), only 39 eagles were admitted with known normal lead levels.

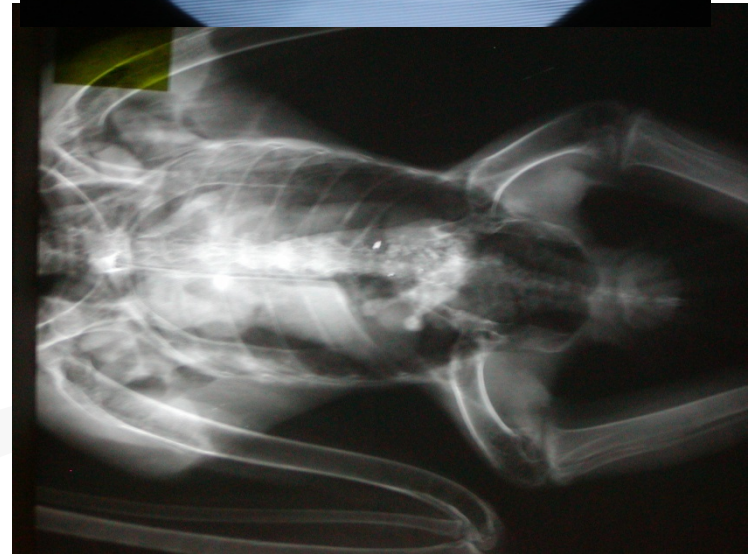
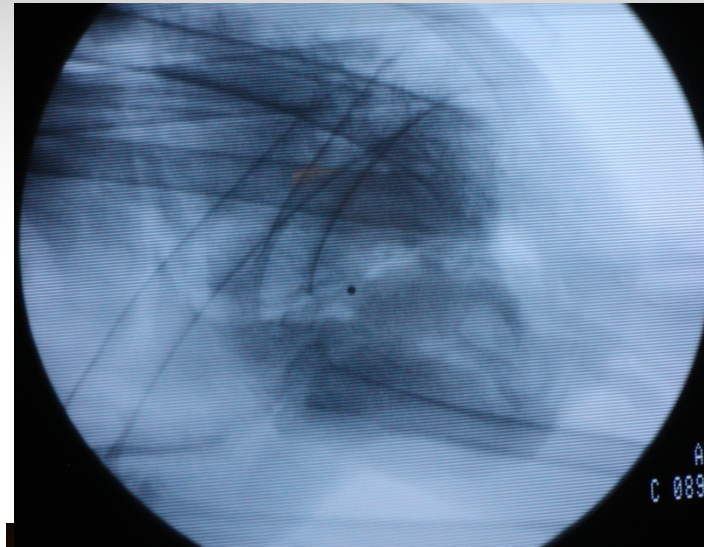
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Estimates of number of eagles dying from lead in Iowa

The number of eagles admitted to wildlife rehabilitators is only a portion of the eagles dying each year. Band return rates have been used to estimate the probability of the public finding an animal and reporting it (Green, personal communication). The band return rate for bald eagles is 15%. Number of eagles admitted with abnormal lead levels / .15 = Estimate of Total Eagle Deaths due to Lead Ingestion.

On average, approximately 86 eagles are dying in Iowa each year due to lead ingestion.

**Most eagles admitted with lead in their systems do not survive,
of 86 only 6 were able to be released (7%).**



Bald Eagle Lead Exposure in the Upper Mississippi River Corridor

Management Implications at Upper Mississippi River National Wildlife & Fish Refuge



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Sarah Warner, Contaminants Biologist

Mike Coffey, Contaminants Biologist

U.S. Fish & Wildlife Service

Objectives

Determine extent of lead exposure in bald eagles found dead along the Upper Mississippi River, Iowa, Minnesota, and Wisconsin.

Investigate the timing of bald eagles deaths during hunting seasons.

Raise hunter awareness about lead ammunition and exposure to bald eagles by providing a non-lead voucher program on the Refuge.

Examine the potential for bald eagles on the Refuge to be exposed to lead from deer offal after a hunting event.



Pb Shot History Related to Birds

1876 Pb poisoning reported in pheasants on English game preserve

1894 Pb poisoning reported for waterfowl in Galveston TX

1919 experimentally established Pb ingestion and poisoning rates

1950's IL Natural History Survey reports on Pb poisoning in waterfowl

1965 Mississippi Flyway Council recommended non-toxic shot development

1970's Lead Wars – multiple lawsuits; IAFWA recommended FWS transition toward non-toxic shot for all mig bird hunting; NWF petitions FWS for non-toxic reg; FWS published EIS on Pb-poisoning in waterfowl; polarization among states and within IAFWA – state rights' not relevant at flyway Nationwide/Flyway-wide prohibition Pb use is unnecessary/undesirable; Stevens Amendment to DOI appropriations bill prohibits USFWS implementation of non-toxic shot regulation

1980's Estimate of >2 million waterfowl dying annually from Pb poisoning; NWF sued FWS under Bald and Golden Eagle Protection Act as eagles were feeding on dying Pb poisoned waterfowl.

1986 FWS implemented 5 year phase out on use of Pb shot for waterfowl hunting.

We Know A Lot About Lead



- Direct ingestion of lead is one pathway.
- Scavenging/opportunistic avian foragers = ↑ exposure risk.
- Food habits in winter and increase in deer remains.
- Clinical signs and gross lesions at necropsy.
- Thresholds mg/kg ww (Franson and Pain 2011).
 - ≥ 6.0 = lethal
 - 2.0 -5.9 = sublethal
 - 0.25-1.9 = background
 - ≤ 0.25 = below detection limit

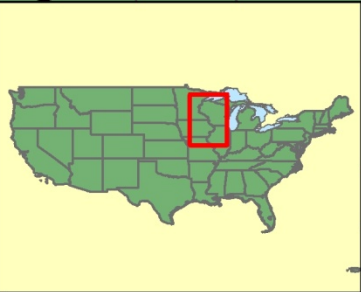


Average of 3000 bald eagles
winter on the Refuge

300 Active nests on the
Refuge in 2012



Lead Concentrations in the Livers of Bald Eagles Collected Postmortem



Number of eagles not shown on map due to lack of spatial data:

- 5
- ▲ 4
- ◆ 8

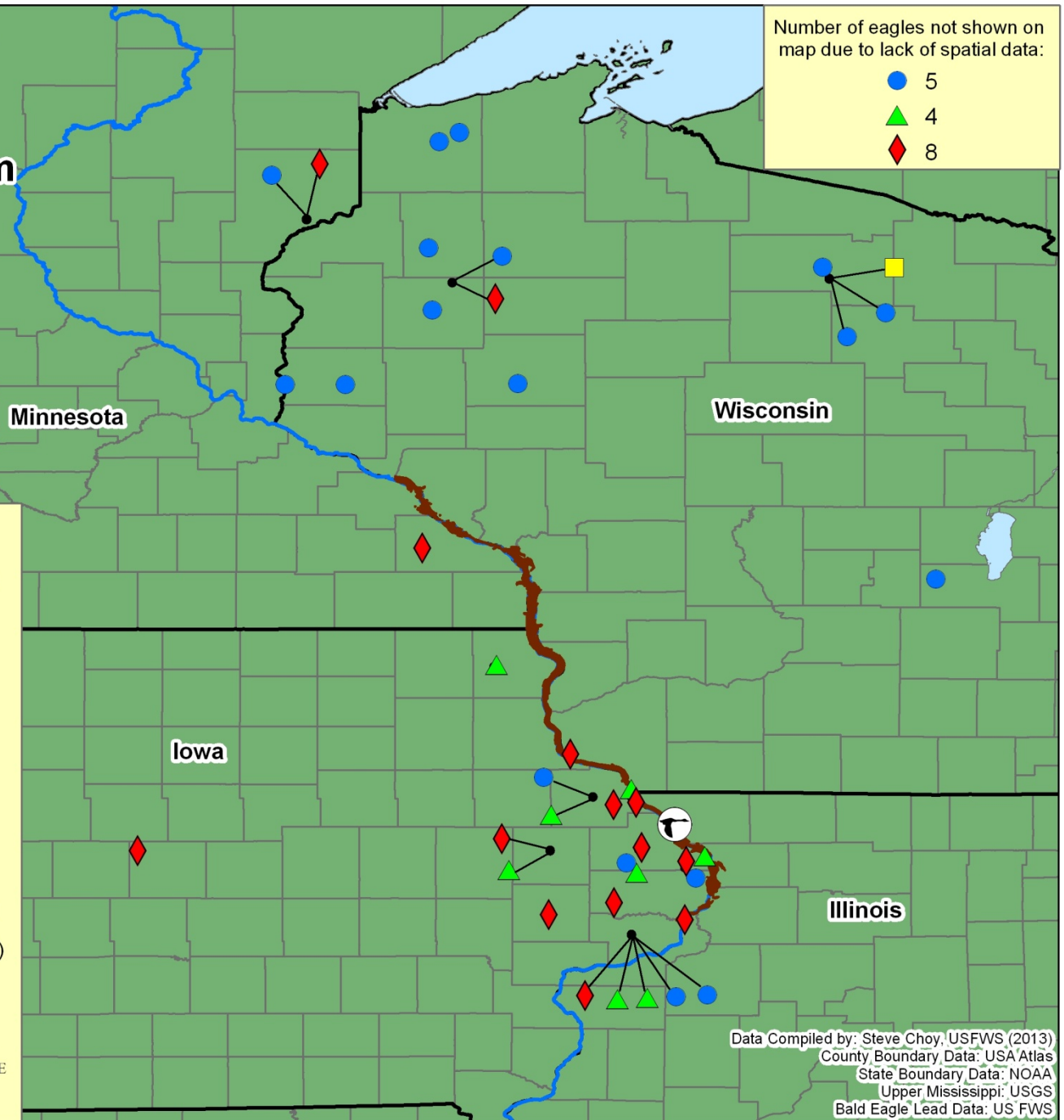
Legend

- Upper Mississippi River National Fish and Wildlife Refuge
- County Boundary
- State Boundary
- Upper Mississippi River
- Lost Mound Unit

Concentration of Lead in Bald Eagle Livers (n=58)

- < 0.25 ppm (Below Detection Limit)
- ▲ 0.25 - 1.9 ppm (Background Range)
- 2 - 5.9 ppm (Sublethal Range)
- ◆ > 6 ppm (Lethal Range)

0 25 50 100 Miles



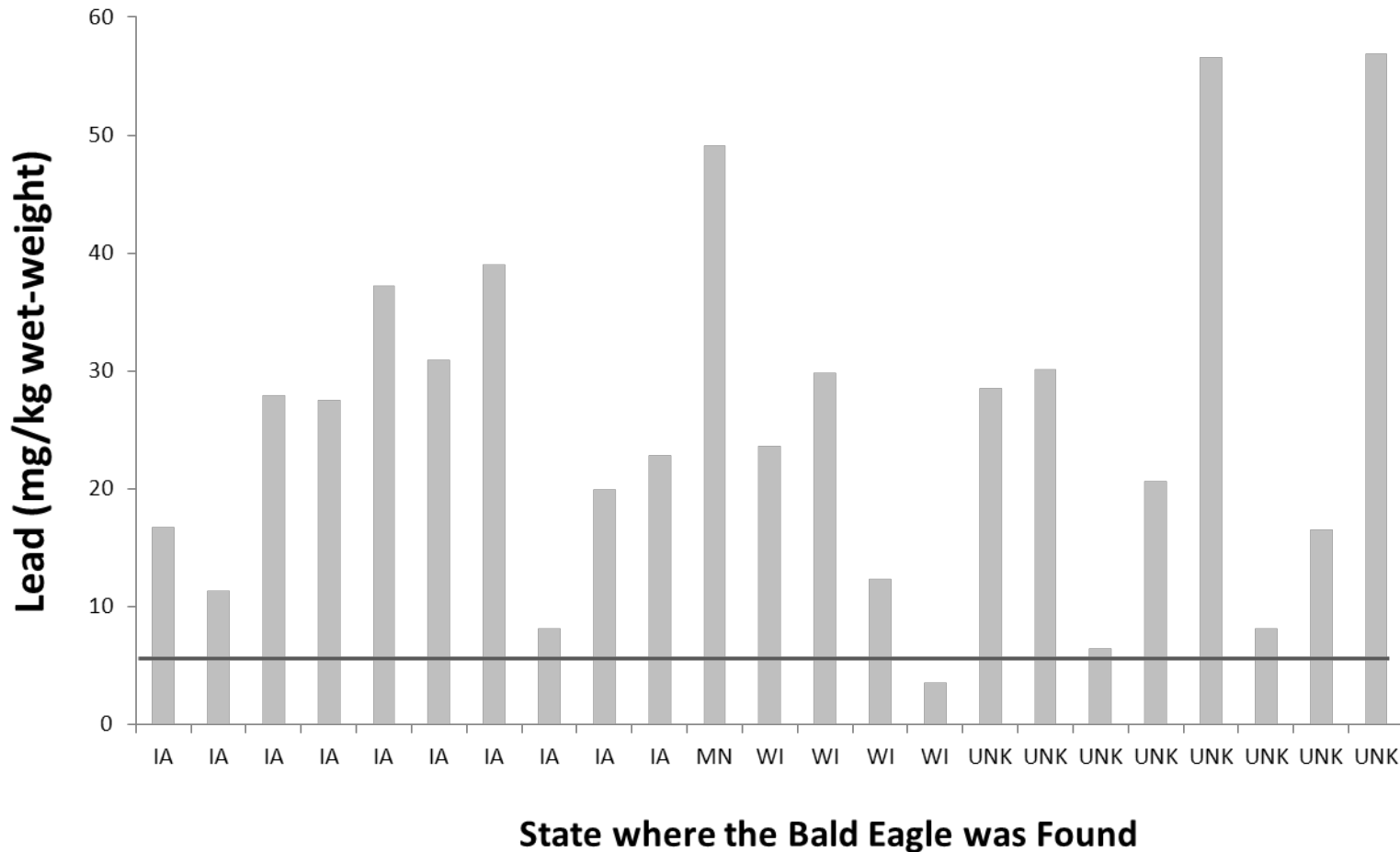
Data Compiled by: Steve Choy, USFWS (2013)
 County Boundary Data: USA Atlas
 State Boundary Data: NOAA
 Upper Mississippi: USGS
 Bald Eagle Lead Data: US FWS

Examination of 58 Bald Eagles February 22, 2012



Morphometric measurements, post-mortem examinations, harvested livers, recorded histories (date found and state), gross lesions, body mass, liver mass, fat deposits, age, gender.

Liver Lead Concentrations in Bald Eagles Collected from Mid-west States



- 22 (37.9%) = lethal
- 1 (1.7%) = sublethal
- 12 (20.6%) = background
- 23 (39.6%) = below detection limit

Gross Lesions Consistent with Lethal Lead Exposure



- Enlarged gall bladder
- Bile staining around vent

- Emaciation, green vent, distended gallbladder, discolored gizzard lining, and atrophied internal organs (Franson and Pain 2011).
- Common gross lesion found: enlarged gallbladder with bile
 - 16 (72.7%) in lethal range
 - 1 in background range
 - 6 below the detection limit



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

Clinical Signs Consistent with Lead Poisoning

- Loss of fat reserves and muscle degradation are some of the most consistent lesions associated with lead poisoning (Franson and Pain 2011).
- Significant negative correlations (Pearson's)
 - liver lead and body mass
 - liver lead and liver mass
- We did not detect a difference between liver lead and fat deposits at the 0.05 level ($P=0.06$)



Pictures provided by SOAR and the Raptor Education Group in WI

- Wing Droop
- Weakness
- Weight Loss



Hunting Season and Bald Eagle Mortality

- 29 (50%) of the 58 eagles had collection month data
- In total, 58% (17/29) of bald eagles were collected during the hunting season or shortly after (one month – not extend beyond February)
 - 4 (23%) lethal lead poisoning
 - 1 sublethal
 - 12 (70%) background range or below the detection
- 12 (41%) were found further outside of the hunting season (March, April, May, August)
 - 7 had liver lead concentrations consistent with lead poisoning (March, April)



Other Sources of Lead in Environment



- Scavenging bald eagles largely forage on deer remains in winter (Ewins and Andress 1995; Stoczek 2000; Lang et al. 2001).
- Stoczek (2000) found white-tailed deer and deer offal accounted for 30-40% of the diet in the 949 feeding observations on bald eagles.
- Dietary studies of bald eagles wintering in the lower Great Lakes found 47% of the 339 feeding observations were on white-tailed deer carcasses (Ewins and Andress 1995).
- Analysis of regurgitated castings of bald eagles wintering along the St. Lawrence River found white-tailed deer remains to be the most frequently detected dietary item (Lang et al. 2001).

Non-lead Voucher Program on Refuge



- Free non-lead ammunition to hunters participating in a managed deer hunt.
- Hunters participated in orientation to learn about hunting regulations at the Refuge.
- Received an overview of the environmental benefits and performance of non-lead ammunition.

- Collected offal from deer shot with lead.
- Radiographed for the presence of lead fragments.
- Calculated amount of lead that would have been used on Refuge.



Partnership with Local Retailer for Voucher Program



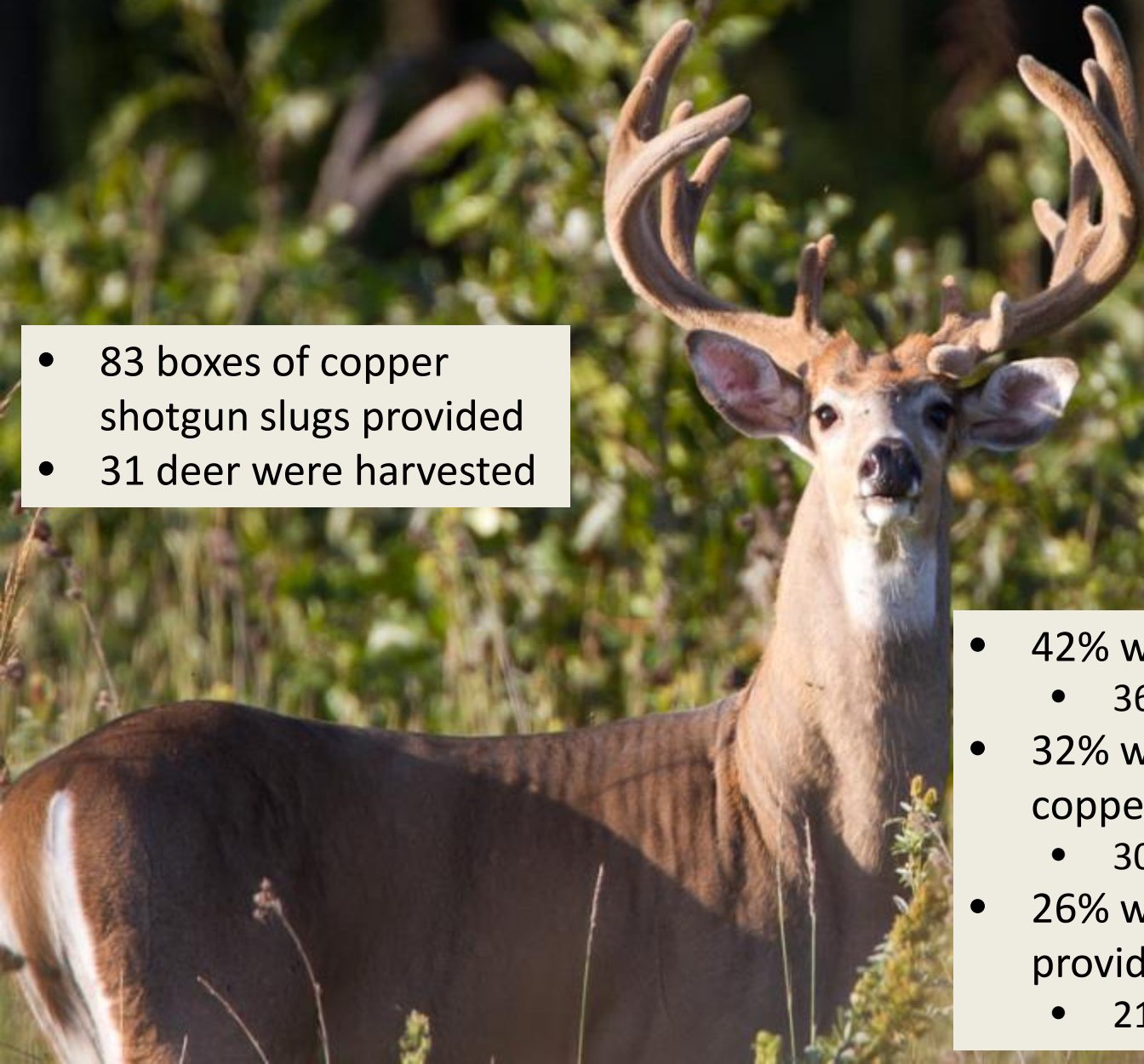
Collected Offal from Lead Shot Deer



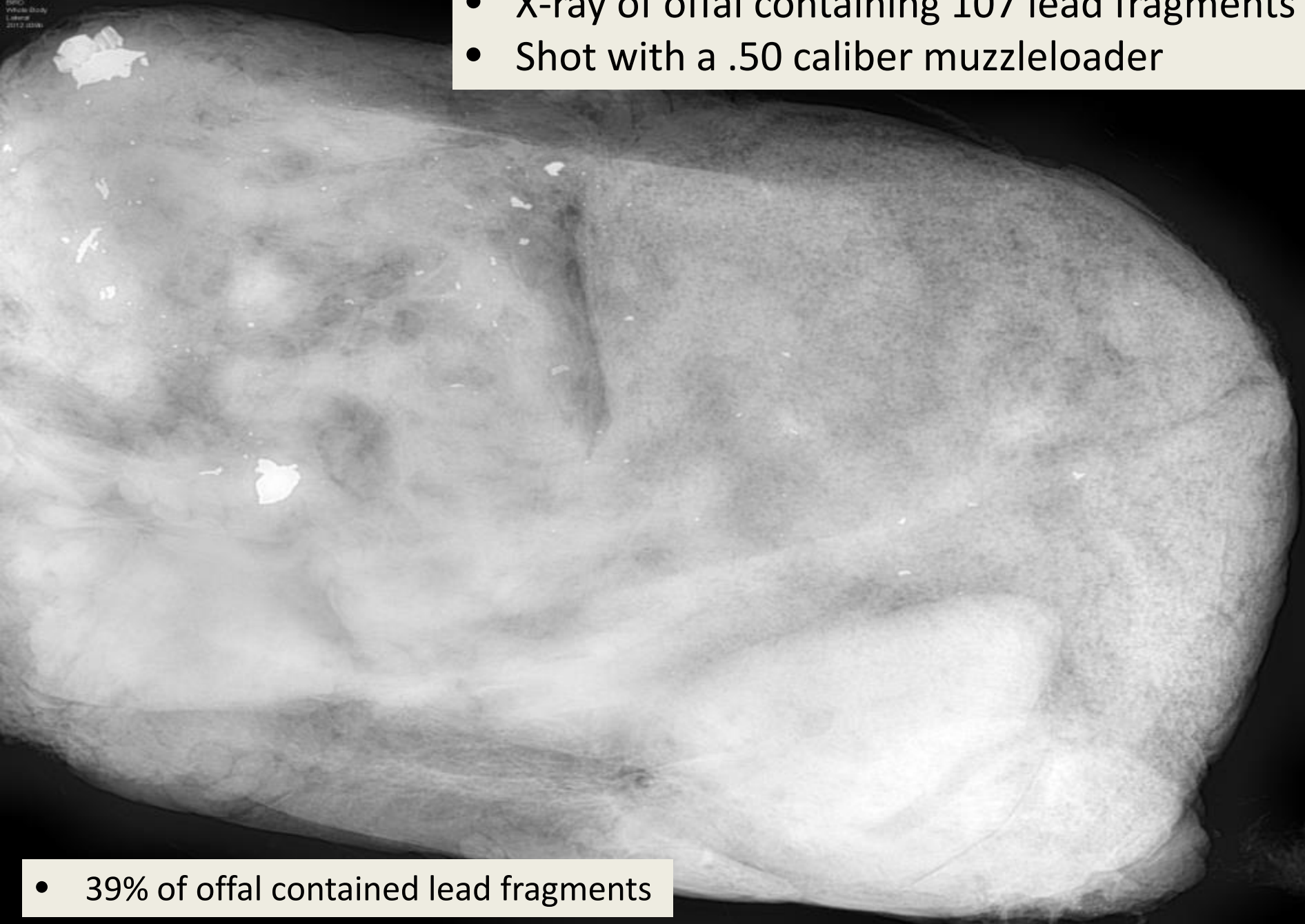
Results of the 2012 Voucher Program

- 83 boxes of copper shotgun slugs provided
- 31 deer were harvested

- 42% were shot with lead
 - 362.61 grams of lead
- 32% were shot with voucher copper slugs
 - 304.94 (g) equivalent lead
- 26% were shot with non-lead provided by hunter
 - 219.91 (g) equivalent lead



- X-ray of offal containing 107 lead fragments
- Shot with a .50 caliber muzzleloader



- 39% of offal contained lead fragments

**COPPER JACKET WITH LEAD
CORE FRAGMENTATION
HAS REDUCED KILLING
EFFICIENCY**



**SOLID COPPER HAS NO
FRAGMENTATION AND
INCREASED KILLING
EFFICIENCY**

Bald Eagles Feeding on Deer Remains in the Upper Midwest



Multiple Lines of Evidence Indicate Lead Ammunition as a Likely Source

- Concentration of bald eagles in winter and density of hunters in the winter Midwest.
- The quantity of offal piles left in the field from one hunting season can be substantial.
 - > 600,000 deer killed during 2012-13 hunting season in Iowa, Illinois, Wisconsin, and Minnesota.
- Food habits: opportunistic species and food preferences in winter.
- Offal piles and deer remains are a likely exposure pathway for bald eagles wintering in the Great Lakes Region.

HUNTERS ARE IMPORTANT CONSERVATIONISTS

Excise Taxes ~ \$7 billion
Since 1937

Licenses, Permits, Stamps,
Certificates & Contributions
~ \$1B/year



Management Implications

- Although lead shot was prohibited for waterfowl hunting in 1991, lead ammunition is still used in many upland hunting situations.
- Offal from deer shot with lead ammunition is a logical pathway for lead exposure in bald eagles and potentially other scavengers.
- Hunters positive about using copper ammunition.
- Wildlife managers have options to limit lead on the landscape and manage the risk of lead exposure to bald eagles by adopting non-lead ammunition programs.
- These actions will:
 - reduce the amount of lead in the environment.
 - allow managers to be more successful at meeting management goals for wildlife.
 - help to support the overall health of the ecosystem benefiting wildlife and humans.

QUESTIONS

