Cases of Suspected & Confirmed Carbofuran Toxicosis in Raptors in the Mid-Atlantic United States

Erica A. Miller, DVM
Lisa A. Murphy, VMD, DABT
Cristin Kelley, DVM

2016

2019

Eagles, owl fatally poisoned on Shore

Bald eagle poisoning deaths have become rare across U.S., but not in a part of Maryland dubbed 'bald eagle central'

By SCOTT DANCE
THE BALTIMORE SUN | MAY 04, 2019 | 7:00 AM

"A once-common farm pesticide killed millions of birds before the U.S. government took steps to restrict its use in the 1990s and ban it in 2009. Since then, such poisonings have made up a small fraction of deaths among bald eagles — except in Maryland."

dead bald eagles turned up in Sussex County over the weekend. And while some birders suspect pest poisoning, they and experts are still mystified.

"There's not too many scenarios" that could explain what happened to the eagles, said Bill Stewart, the president of the Delmarva Ornithological Society and a director of conservation and community at the American Birding Association. "Deliberate poisoning is certainly one of them."

The Delaware Department of Natural Resources and Environmental Control said one eagle was found dead near Dagsboro on Saturday morning. Then, three more birds were found disoriented in a farm field, and they soon died.

Those three birds were found about a mile away from where the first eagle was discovered, in Piney Neck, a small peninsula on the western edge of the Indian River Bay, east of Dagsboro. A fifth bald eagle in the area was found dead

town in Kent County. Six bald eagles and similar circumstances. With legal

Officials say these incidents are believed to be consistent with the ongoing and intentional poisoning of foxes, raccoons and other nuisance animals in the area.

After the March 1 incident, the release states that both U.S. Fish and Wildlife Service agents and Natural Resources Police officers returned to the area several times to retrieve eagle carcasses that have been discovered and reported by local landowners and property managers.

Officials say they believe people have been placing baits laced with a toxic pesticide called carbofuran — which is known to be particularly dangerous to birds — in fields, along wood lines and in fox dens. In its granular form, a single grain of this substance will kill a bird.

After it was blamed for millions of bird deaths per year, the EPA banned the granular form in 1991, but officials say the liquid version is less hazardous to birds since because they are

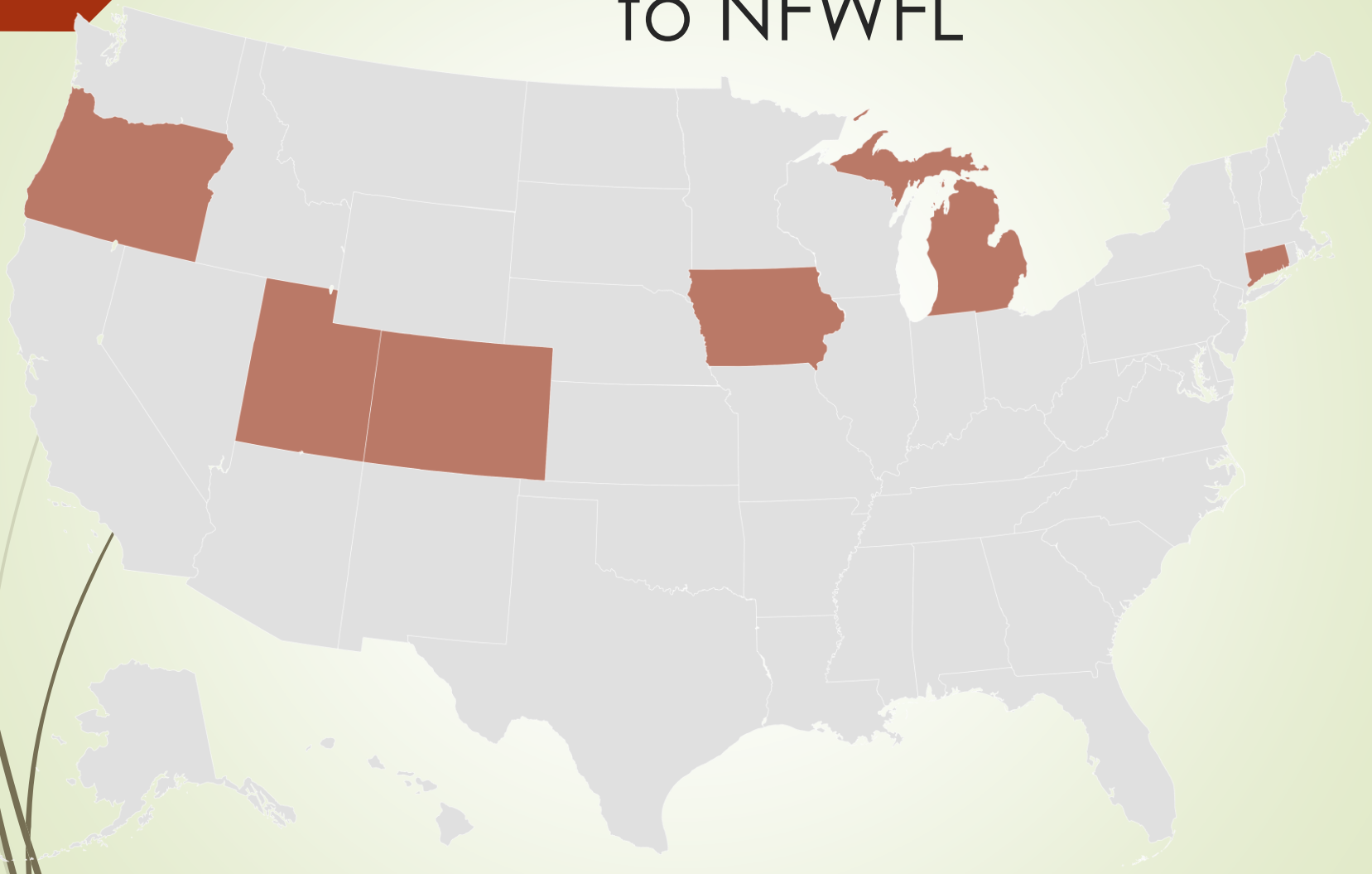
placing a toxic poison that has killed no fewer than twenty eagles in these areas. The only way this stops is if the local communities come forward with information," U.S. Fish and Wildlife Services Resident Agent in Charge Jay Pilgrim said in the release.

The eagles are federally protected by the Bald and Golden Eagle Protection Act, the release states, and U.S. Fish and Wildlife Services is now offering a reward of up to $10,000 to eligible individuals for information that furthers this investigation.

Tips about illegal fishing and hunting activities as well as the illegal killing of wildlife can be anonymously reported 24/7 to Maryland Wildlife Crime Stoppers by calling or texting, 443-433-4112, emailing mwc.dnr@maryland.gov or using the department's mobile app. Dispatchers then alert the nearest officer and tipsters may be issued a reward if the informa-

Origin of Cases Presenting to Tri-State Bird Rescue

Origin of Cases Presenting to NFWFL



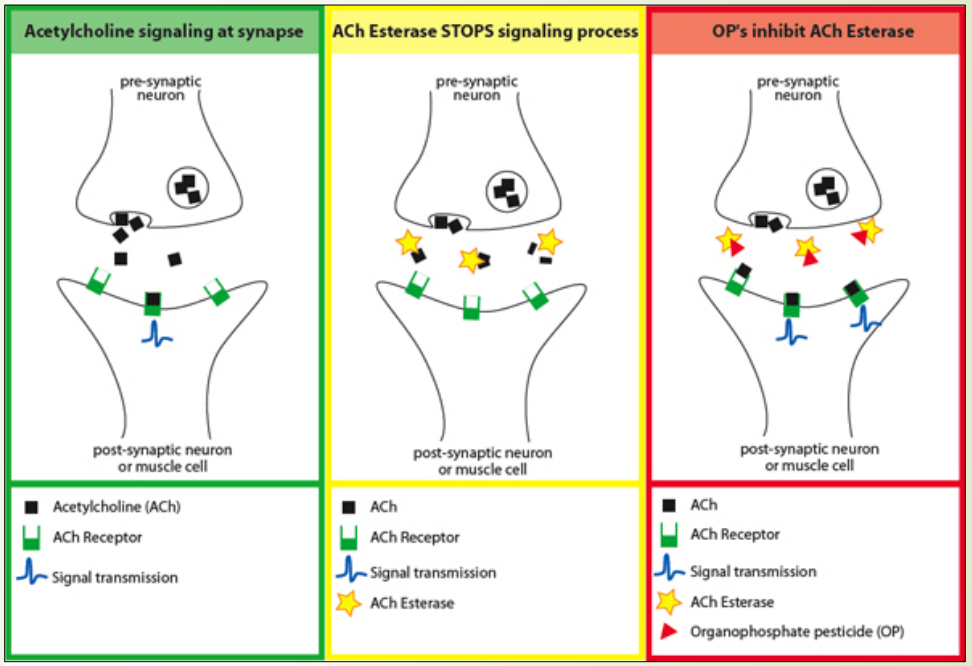
Cholinesterase Inhibitors

- **Organophosphates**
  - Derivatives of phosphoric acid
  - Diazinon, Malathion
  - degrade rapidly by hydrolysis on exposure to light, air and soil
- **Carbamates**
  - Derivatives of carbamic acid (NH_2COOH)
  - Carbaryl (Sevin™), Carbofuran, Methomyl
  - break down in the environment in weeks to months

Goel & Aggarwal, 2007

Organophosphates & Carbamates

- Inhibit AChE causing overstimulation of parasympathetic & sympathetic nervous systems, skeletal muscle & CNS
- ACh continues to stimulate nerve transmission
- Release of AChE occurs:
  - <1sec from ACh
  - hrs to days from carbamates
  - weeks to months from OPs



http://depts.washington.edu/opchild/images/ach.jpg

Diagnostic Sampling

- Crop content
  - Remove and freeze at -80C
- Blood or serum in heparin or CaEDTA
  - centrifuge ASAP & freeze at -20C
- Brain
  - remove ASAP and freeze at -80C

Cholinesterase (ChE) test

- **Serum, blood &/or brain**
- Test Type: Ellman method (enzymatic analysis)
- Reagents: acetylthiocholine iodide, dithiobisnitrobenzoic acid, phosphate buffer
- Reporting units
  - Serum & Blood: µM/mL/min
  - Brain: µM/g/min
  - Suppression in serum first; may not see effect on brain ChE if <2hrs

UV Plate reader

Organic Chemical Screen

- **Serum and/or GI contents**
- Sample Preparation:
  - Extract a portion (1g) of sample with organic solvent (acetonitrile)
  - Solid-phase extraction or QuECHERS method to clean up the extract
  - Analyze using GC/MS
  - NIST library search capability to identify toxins

GC/MS with NIST library

Cholinesterase (ChE) Activity

- Brain normal for BAEA = 18.55-11.81 µM/min/g*
- Blood normal for BAEA = 0.69-0.82 µM/min/mL
- Plasma normal for BAEA = 0.622-0.982 µM/min/mL**

- 20% reduction = sublethal exposure
- >50% reduction = lethal exposure; presumptive diagnosis
- 75% inhibition is definitive, even if no residue in GIT***

* Cowan & Blakley 2015 **JE Elliot et al. 2008 ***Mineau et al. 2012

Organic Chemical Screen

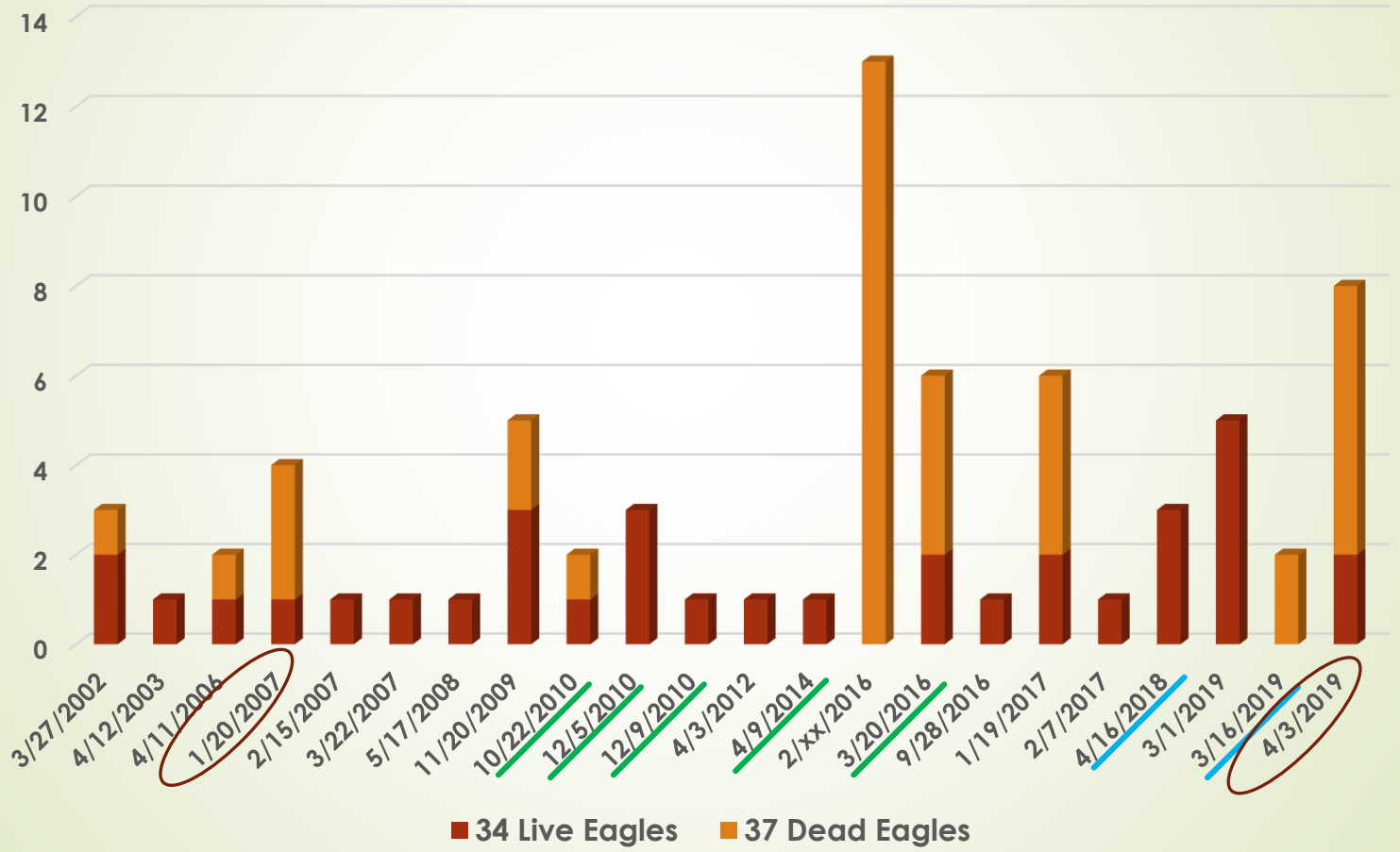
- Presence in GIT or serum = presumptive diagnosis
  - Confirmed if 100% mortality
- Compound in GIT + suppressed AChE activity = Conclusive evidence/ Definitive diagnosis

	#events
Definitive Dx	10
Presumed	2
Exposure	3
Suspect	7
Total	22

22 Events (1-13 birds):

- Carbofuran found in birds in 5 events
  - AChE suppression >75% in 3 of those events
- AChE suppression >75% in 5 additional events
- AChE suppression 50-75% in 2 events
- AChE suppression 20-50% in 3 events
- No lab work in 7 events

Incidence of Incidents

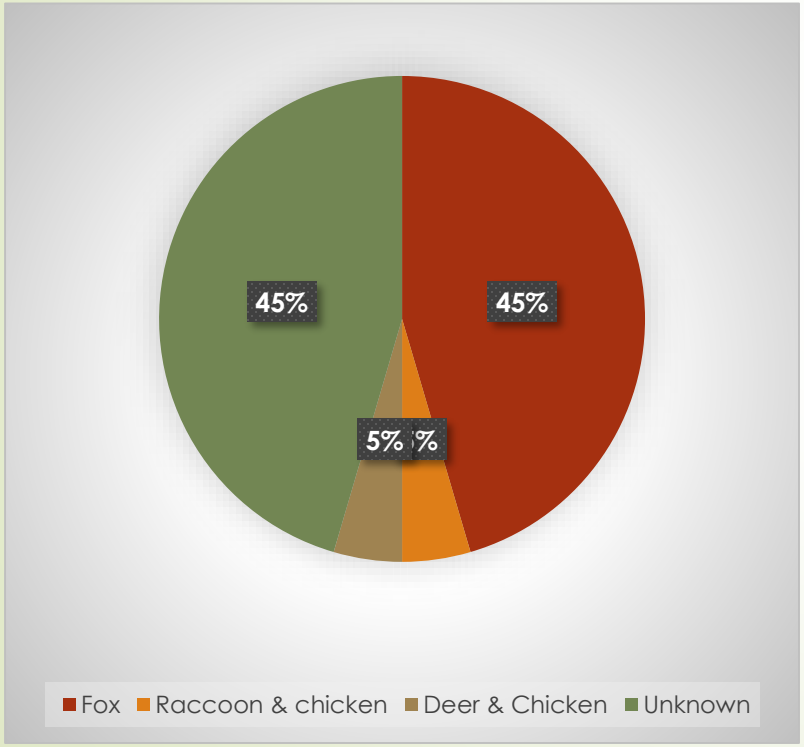


15 in MD
2002-19

5 in DE
2010, 14, 16

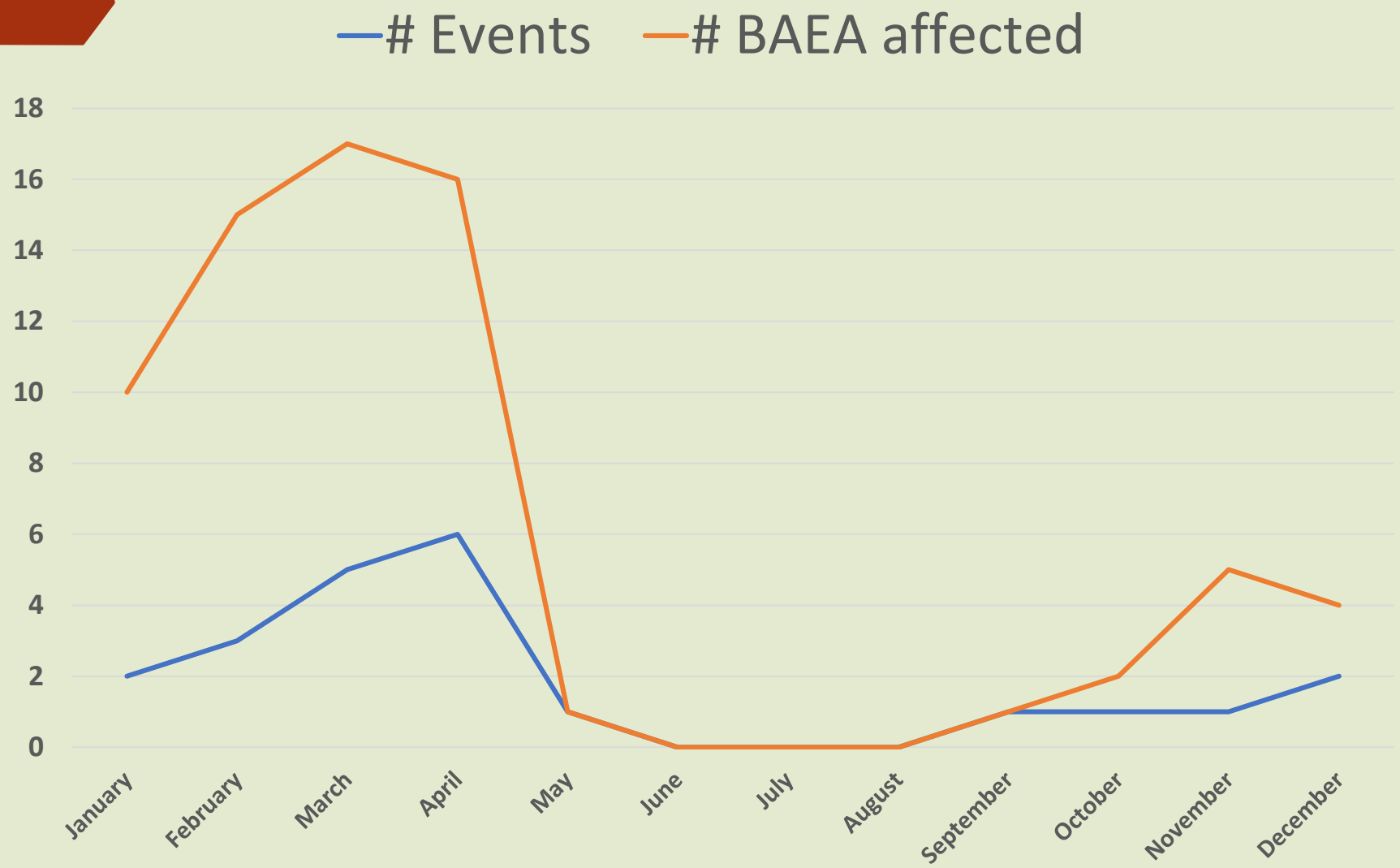
2 in NJ
2018, 19

Fox carcass found in 10/22 events



www.youtube.com/watch?v=twQDNP4ozSI

3 dead + 1 live BAEA 1 dead GHOW



Concurs with Wobeser et al 2004 and Cowan & Blakley 2015

Clinical signs noted in 34 bald eagles:

- Ataxia or inability to stand (34; 100%)
- Rigid paralysis—clenched talons (32; 94%)
- Full crop (often dark fluid) (17; 50%)
- Bradycardia (17; 41%)
- Salivation / moist respiration (11; 32%)
- Mydriasis/Myosis (7; 20%)
- Hyper-reactive (4; 12%)
- Convulsions/tremors (3; 9%)
- Other: tachypnea, hypothermia
- Death in as little as 9 minutes

  (Mineau, Porter & Meteyer 1993)

One of four eagles found on in Jan 2017
In DE. Photo credit: Troy Whaley

One of 13 eagles found dead in Feb. 2016.
MD DNR Police

One of five live eagles found in March 2016.
DNREC Div. Fish & Wildlife Natural Resources Police

Treatment

- Initiate at clinical signs, esp. with history
- Atropine 0.5mg/kg
  - ¼ IV and ¾ IM
- Diazepam or Midazolam
- Activated charcoal
- PO or SQ or IV fluids

Tri-State Bird Rescue & Research, Inc.

Immediately post-treatment

Provide warmth, quiet

24 hrs later

- 30 birds given Atropine were asymptomatic in <24 hrs
- 1 died <1hr after Atropine
- 2 recovered without Atropine

Poor response to Atropine

- Slower recovery
- Talons remained clenched
- Serum ChE 0.254
- Possible OP Toxicity? Or concurrent trauma?
- Euthanized @ 7 days

One Band Return

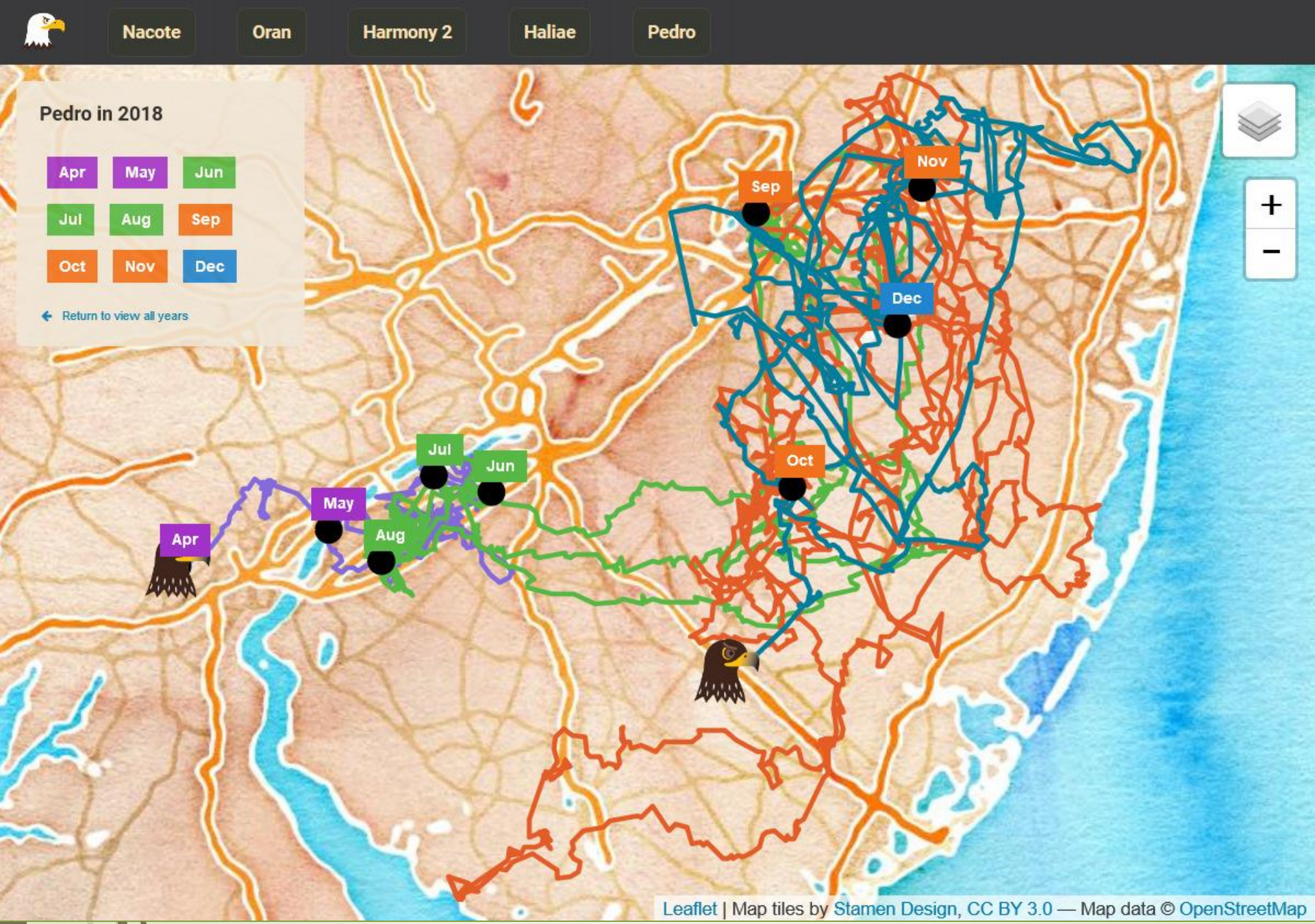
- 09-2520
- One of 3 live + 2 dead
- Caught 11/20/09; treated and released11/25/09
- Struck powerline 3/24/14 (1580d later)

Photos courtesy Bryan Watts & Libby Mojica

Post-release Telemetry

Photo credit: Marian Quinn

- April 2018
- 3 BAEA in field in Pedricktown, NJ
  - Dead fox nearby
- Captured and given atropine before transport
  - Bradycardia & clenched talons noted on all 3
  - More alert by arrival at Tri-State
  - Standing and alert w/in 24hrs
- Two had elevated Pb; chelated
- Satellite telemetry on 4yr old



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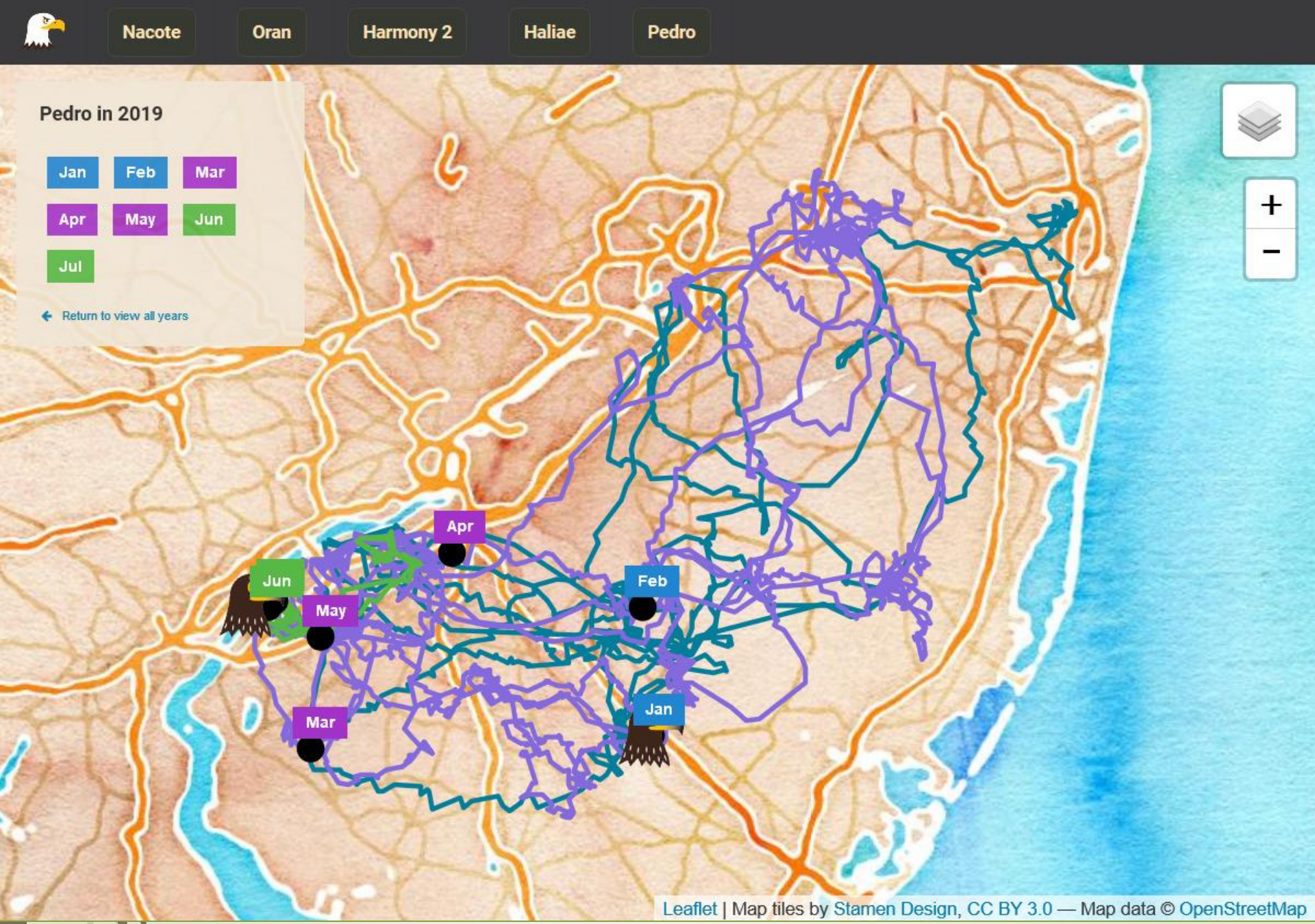

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Underdiagnosed or Misdiagnosed?

- 3-5% BAEA affected
- Hit by vehicles?
- Acutely fatal
  - Scavenged?
  - Not found?
- Not diagnosed when found?
- May recover with supportive care alone

Thank you!


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MARYLAND DEPARTMENT OF NATURAL RESOURCES
U.S. FISH & WILDLIFE SERVICE
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