

**ARIZONA GAME AND FISH DEPARTMENT  
INTER OFFICE MEMO**

**TO:** File

**FROM:** James T. Driscoll, Birds and Mammals Program Manager



**SUBJECT:** Public Records Request – Lead Mortalities in Bald and Golden Eagles

**DATE:** July 30, 2012

This documentation includes e-mails, mortality reporting forms, and necropsy results from recovered bald and golden eagle carcasses as well as various tables summarizing bald and golden eagle mortality data. This packet also contains a internal decision point white paper (draft version December 2007 and updated draft January 2008) that:

1. Provides a background to lead poisoning in wildlife.
2. Assesses potential impacts to various wildlife populations.
3. Identify clinical issues with diagnosing lead poisoning as a mortality source.
4. Identifies treatment options for lead-poisoning.
5. Summarizes the history of bald eagle lead-related mortalities in Arizona.
6. Identifies the complete range of management actions that the Department could take to reduce impacts of lead on bald eagles.

The Department considered the recommendations from the January 2008 internal decision point white paper and noted some of the actions had been implemented as part of the California Condor Voluntary Non-Lead Ammunition Program. The Department also recognized bald eagle populations are increasing throughout its range, including Arizona, despite any lead associated impacts. Also, the Department has in place management programs to ensure the bald eagle population and mortalities will be closely monitored. Through this monitoring program, the Department will consider additional action in the future if a mortality source increases to unacceptable levels.

## Kenneth Jacobson

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**From:** James Driscoll  
**Sent:** Friday, March 09, 2007 2:37 PM  
**To:** Kenneth Jacobson; Kyle McCarty  
**Subject:** FW: Dead Bald Eagles  
**Attachments:** Dead Bald Eagle 03-07-07.doc

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**From:** Michael Sumner  
**Sent:** Friday, March 09, 2007 2:26 PM  
**To:** James Driscoll  
**Subject:** RE: Dead Bald Eagles

Jamey,

Here's the form. Let me know if you need any further information.

Take care,  
Mike

---

**From:** James Driscoll  
**Sent:** Friday, March 09, 2007 10:40 AM  
**To:** Michael Sumner  
**Cc:** Bill Vanpelt  
**Subject:** RE: Dead Bald Eagles

Thanks Mike. Probably lead poisoning from the symptoms described.

Jamey

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**From:** Michael Sumner  
**Sent:** Friday, March 09, 2007 7:04 AM  
**To:** James Driscoll  
**Cc:** Brian Crawford; Dan Groebner; Dave Cagle  
**Subject:** RE: Dead Bald Eagles

Jamey,

There was a miscommunication yesterday. Brian's eagle was from **last** year but displayed similar symptoms. I have training this morning but will get you a completed form later today. No bands on this one.

Mike

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**From:** James Driscoll  
**Sent:** Thursday, March 08, 2007 11:48 AM  
**To:** 'Greg\_Beatty@fws.gov'; Michael Sumner; Brian Crawford  
**Cc:** Kenneth Jacobson; Kyle McCarty  
**Subject:** Dead Bald Eagles

Mike and Brian,

I just heard about the balds you picked up from John Ashburner (USFWS). John will be picking those up to send them with the one he picked up to be necropsied at Ashland. Can both of you fill out the mortality form attached so we can keep a record of their deaths and any necropsy results.

Thanks

Jamey

Greg,

Can you forward this to John. I do not have his email address.

P.S. These 3 and the one in Tucson make 4 dead bald eagles in the last 10 minutes.



Arizona Game and Fish Department  
 Nongame and Endangered Wildlife Program  
 2221 West Greenway Road  
 Phoenix, Arizona 85023  
 Phone: (602) 789-3500  
 FAX: (602) 789-3926



**DEAD OR INJURED BALD AND GOLDEN EAGLE RECOVERY FORM**

Name: Mike Sumner Work Unit: FOR1

Telephone: [REDACTED] E-mail: msumner@azqfd.gov

Date collected: 03-07-07 Collected By: Jeff Hough

Found By: Jeff Hough [REDACTED] Location: Along LCR between S. Fork & Hwy 261

County: Apache UTM: 650640E, 3774059N

Condition Found (dead, injured): Dead Species: *Haliaeetus leucocephalus*

Age: \_\_\_\_\_ Adult: X Subadult: \_\_\_\_\_ Band Number: N/A

Clinical signs (Any unusual behavior or physical appearance.): A mature bald eagle was observed in the same area approx. 2 weeks prior. It was flopping on the ground and bright green excrement was observed on the snow around it. It flew off when approached and was not located again (until found dead 03-07-07?).

Area description: (Habitat in area of discovery): Riparian area with adjacent pastures along Little Colorado River.

Comments (Additional information that can aid diagnosing cause of injury or mortality):  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Diagnosis (Attach laboratory reports):  
 \_\_\_\_\_  
 \_\_\_\_\_

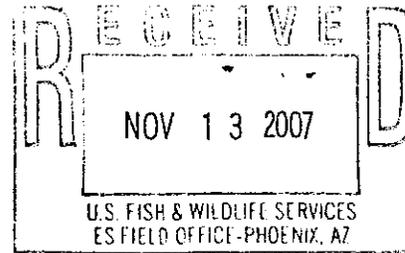
Please remit this form to the Nongame Branch's Raptor Management Coordinator following the protocol established in the cover memo.



IN REPLY REFER TO:

# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
Office of Law Enforcement  
Clark R. Bavin  
National Fish and Wildlife Forensics Laboratory  
1490 East Main Street  
Ashland, Oregon 97520



July 13, 2007

## VETERINARY MEDICAL EXAMINATION REPORT

**Agency:**  
USFWS/LE, Springerville  
P.O Box 1889  
Springerville, AZ 85938

**Lab Case #:** 07-000128  
**Examiner:** Ralston  
**Agency Case #:** 2007201581  
**Investigator:** Ashburner  
**Suspects:**

**Case Title:** North Springerville, AZ Bald Eagle, 3/2007

### EVIDENCE RECEIVED:

The following evidence was received in the Evidence Unit of the Laboratory on March 21, 2007, and was transferred to the undersigned examiner on May 11, 2007:

LAB-1: "Carcass of bald eagle" [ST#713069; Item#1]

### EXAMINATION/S CONDUCTED:

The evidence item was x-rayed, dissected, and examined visually (necropsy examination) for gross pathological lesions. Photographs were taken to document any significant gross pathological findings.

The crop/stomach contents (LAB-1A) from the eagle carcass were transferred to Pamela McClure, Forensic Scientist - Chemistry, for analyses to determine the presence of any carbamate or organophosphate pesticides or any other toxic substances. (See attached Chemistry Examination Report, dated June 22, 2007.)

A tissue sample (LAB-1B) from the eagle's crop/stomach contents was transferred to Mark A. Kirms, Senior Forensic Scientist - Chemistry, for identification of species of origin. (See attached Chemistry Examination Report, dated June 12, 2007.)

### NECROPSY EXAMINATION RESULTS:

Lab Case #: 07-000128

Lab-1

<b>Species:</b>	Bald Eagle	<b>Sex/Age:</b>	Male/Immature
<b>Weight:</b>	3340 gm	<b>Identification #:</b>	ST #713069; Item#1
<b>Body Condition:</b>	Good	<b>Specimen:</b>	Intact Carcass
<b>Post Mortem Condition:</b>	Good	<b>Date Examined:</b>	May 23, 2007

### HISTORY:

The eagle carcass was found at a pig farmer's dump site.

**EXTERNAL EXAMINATION:**

The oral mucous membranes are cyanotic. The crop is distended with contents. The keel is not prominent. There are no palpable fractures or electrothermal injuries evident. The feathers surrounding the vent are not fecal-stained. The legs are extended. The digits of the left foot are extended, while those of the right foot are clenched. The tips of the tail feathers are frayed. Both legs are banded (#629-50054 = right leg, 18W = left leg).

**INTERNAL EXAMINATION:**

The carcass was partially skinned and the breast removed to facilitate an internal examination. There are small areas of bruising on the upper and mid left neck. No penetrating gunshot wounds are observed. There are adequate subcutaneous and mesenteric fat deposits. The breast musculature is normally developed. The skull is intact. The brain is congested. All tissues are generally congested.

The trachea and air sacs are normal. The lungs are congested. The pericardial sac surrounding the heart contains a small amount of bloody liquid (hemopericardium). The heart appears intact, and it contains clotted blood. The liver, gall bladder, and pancreas have no visible significant findings. The kidneys are congested. The spleen is shrunken (1.9 cm X 1.1 cm). The crop (286 gm) and stomach (94 gm) contain brownish-colored fatty material and tissue pieces. The intestinal tract has normal contents. No lesions suggestive of an infectious disease process are apparent.

**RADIOGRAPHIC EXAMINATION:**

No fractures or metallic radiodensities suggestive of bullet fragments or pellets are observed.

**SUBSAMPLES SAVED/SUBMITTED FOR ANALYSIS:**

LAB-1A: Crop/stomach contents from eagle LAB-1  
LAB-1B: Tissue sample from crop/stomach contents of eagle LAB-1

**NECROPSY FINDINGS:**

- 1) Bruising of the upper and mid left neck
- 2) Crop and stomach contents

**DIAGNOSIS:**

Undetermined

**COMMENT:**

A specific cause of death of this eagle could not be determined. Based on the lack of gross pathological findings suggestive of disease or extensive trauma, the good body condition, and the presence of upper digestive tract contents, it is my opinion that this eagle died acutely. The small areas of bruising of the upper and mid left neck were in my opinion insignificant, unless the trachea was also compressed resulting in asphyxiation. However, the bruising was confined to focalized areas on one side of the neck and did not appear to encircle it, which could then be suggestive of snare trauma.

Examination Report 07-000128 - Continued  
July 13, 2007

**COMMENT:** (continued)

Analyses of the eagle's crop/stomach contents by Examiner McClure did not reveal the presence of any carbamate or organophosphate pesticides or any other toxic substances. (See attached Chemistry Examination Report, dated June 22, 2007.) However, this does not definitively rule out poisoning as the cause of death. Pesticides and other toxic compounds may either be too decomposed, at undetectable levels, or not identifiable by our current testing methods.

Analyses of the tissue sample from the eagle's crop/stomach contents by Examiner Kirms revealed the presence of heme proteins from a pig (see attached Chemistry Examination Report, dated June 12, 2007). This suggests the eagle had recently ingested pig (*Sus scrofa*).

The absence of external evidence of electrothermal injuries does not preclude that possibility as a cause of death. Low voltage contact **may not** result in obvious external lesions, but can cause cardiac abnormalities that ensue in death.

The absence of either gross pathological findings suggestive of a wound path or radiographic evidence of bullet fragments or pellets indicates the eagle had not been gunshot.

**DISPOSITION OF EVIDENCE:**

All evidence item(s) were transferred to the Evidence Unit pending return to the submitting agency.

  
Rhoda M. Ralston, DVM  
Veterinary Medical Examiner



IN REPLY REFER TO:

# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
Office of Law Enforcement  
Clark R. Bavin  
National Fish and Wildlife Forensics Laboratory  
1490 East Main Street  
Ashland, Oregon 97520

June 22, 2007

## CHEMISTRY EXAMINATION REPORT

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**Agency:**

USFWS/LE, Springerville  
P.O Box 1889  
Springerville, AZ 85938

**Lab Case #:** 07-000128

**Examiner:** McClure

**Agency Case #:** 2007201581

**Investigator:** Ashburner

**Suspects:**

**Case Title:** North Springerville, AZ Bald  
Eagle, 3/2007

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### EVIDENCE RECEIVED:

The following evidence was transferred to the undersigned examiner on June 01, 2007:

LAB-1A: Crop/stomach contents from eagle LAB-1

### EXAMINATION CONDUCTED:

LAB-1A:

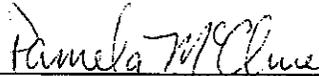
The evidence item was analyzed for the presence of carbamates employing high performance liquid chromatography and for the presence of organophosphates employing gas chromatography. In addition the evidence item was examined by mass spectrometry.

### EXAMINATION CONCLUSIONS:

LAB-1A: Results from the analyses conducted did not reveal the presence of organophosphates, carbamates or any other toxic substance.

### DISPOSITION OF EVIDENCE:

The evidence item was transferred to the Evidence Unit pending return to the submitting agency.

  
\_\_\_\_\_  
Pamela McClure  
Forensic Scientist



IN REPLY REFER TO:

# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
Office of Law Enforcement  
Clark R. Bavin  
National Fish and Wildlife Forensics Laboratory  
1490 East Main Street  
Ashland, Oregon 97520

June 12, 2007

## CHEMISTRY EXAMINATION REPORT

**Agency:**  
USFWS/LE, Springerville  
P.O Box 1889  
Springerville, AZ 85938

**Lab Case #:** 07-000128  
**Examiner:** Kirms  
**Agency Case #:** 2007201581  
**Investigator:** Ashburner  
**Suspects:**

**Case Title:** North Springerville, AZ Bald  
Eagle, 3/2007

### EVIDENCE RECEIVED:

The following evidence was transferred to the undersigned examiner on June 06, 2007:

LAB-1B: Tissue sample from crop/stomach contents of eagle LAB-1

### EXAMINATION CONDUCTED:

LAB-1B:

The evidence item was examined by Matrix-Assisted Laser Desorption Ionization Time of Flight (MALDI-TOF) mass spectrometry to determine the species source of origin.

### EXAMINATION CONCLUSIONS:

LAB-1B: Results from the analyses conducted established the presence of heme proteins from a pig (*Sus scrofa*).

### DISPOSITION OF EVIDENCE:

The evidence item was transferred to the Evidence Unit pending return to the submitting agency.

  
Mark A. Kirms  
Senior Forensic Scientist



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

**CASE:** 22499

Final Report

5/15/2009

**EPIZOO:**

**Legal INV#:** Declassified

**Submitter:**

Kenneth Jacobson  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 3/26/2009

**Specimen description/identification/Location:**

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Eagle, Golden	CARCASS			COCONINO	AZ

**DIAGNOSIS**

Emaciation of unknown cause.

**Comment:**

This adult male Golden Eagle was severely emaciated, and no gross or microscopic evidence of debilitating injury or illness was found. Liver lead concentration (1.54 ppm, wet wt.) was below known toxic levels. Samples of spleen and kidney were negative for West Nile virus. Cloacal and tracheal swabs were negative on screening for avian influenza viruses. The feathers and talons were transferred to the National Eagle Repository.

NANCY J. THOMAS DVM, DACVP  
Staff Diagnostic Pathologist

If you have questions regarding this case, contact:

NATHAN G. RAMSAY  
Wildlife Disease Technician

Phone: 608-270-2435 E-Mail: nramsay@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

Copies To:



Arizona Game and Fish Department  
 Nongame and Endangered Wildlife Program  
 2221 West Greenway Road  
 Phoenix, Arizona 85023  
 Phone: (602) 789-3500  
 FAX: (602) 789-3926



NWAC  
 3-25-09

**DEAD OR INJURED BALD EAGLE RECOVERY FORM**

Name: DAN GASKA Work Unit 6MUB FORZ

Telephone: [REDACTED] E-mail: [REDACTED]

Date collected: 11/25/07 Collected By: D. GASKA

Found By: NEW OWNER Location: SHOLTZ RD - Rd 62  
Kaibab NF

County: COCONINO UTM: [REDACTED]

Condition Found (dead, injured): DEAD - RECENT - GOLDEN EAGLE

Age: [REDACTED] Adult:  Subadult: [REDACTED] Sex: UNK.

Clinical signs (Any unusual behavior or physical appearance.): UNKNOWN

Area description: (Habitat in area of discovery): PINE / OPEN PRAIRIE  
N. OF GARLAND PRAIRIE - NEAR WATER AT  
STOCK TANK.

Comments (Additional information that can aid diagnosing cause of injury or mortality):  
PUT IN EVIDENCE LOCKER #3

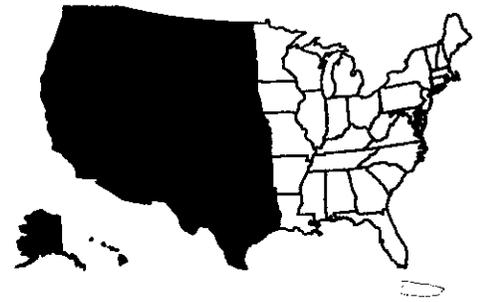
Diagnosis (Attach laboratory reports):  
[REDACTED]

Susi

Please remit this form to the ~~Nongame Branch's~~ Bald Eagle Management Coordinator following the protocol established in the cover memo.



National Wildlife Health Center  
6006 Schroeder Road  
Madison, WI 53711  
Phone: 608.270.2400  
FAX: 608.270.2415



### SPECIMEN HISTORY FORM

For mortality events please e-mail a USGS Field Investigation Team member before shipping

Western States: Krysten Schuler [kschuler@usgs.gov](mailto:kschuler@usgs.gov), 608-270-2447

Eastern States: Mark Jankowski [mjankowski@usgs.gov](mailto:mjankowski@usgs.gov), 608-270-2443

For single animal cases, please e-mail Wildlife Disease Technician before shipping

Nationwide: Nathan Ramsay [nathan\\_ramsay@usgs.gov](mailto:nathan_ramsay@usgs.gov), 608-270-~~2443~~ 2443

Submitter's name: Kenneth Jacobson  
Address: 5000 W. Carefree Hwy  
Phoenix, AZ 85086

Affiliation: Arizona Game and Fish Department  
Telephone: 623-236-7575

E-mail: [kjacobson@azgfd.gov](mailto:kjacobson@azgfd.gov)

Date collected: 11/25/07

Collector's Name: Dan Gaska

Method of animal collection:  Found Dead,  Died in Hand,  Euthanized

Method of euthanization:

Species: Golden Eagle (*Aquila chrysaetos*)

Number Submitted: 1 Condition:  Chilled,  Frozen,  Preserved Tissues

Specific die-off location (refuge unit, pond, address, intersection, park, etc): Forest Road 62 (Scholtz Rd) near stock tank, north of Garland Prairie

State: AZ County: Coconino Nearest City: Williams

Latitude/longitude (Decimal degree in WGS 84):

Disease onset date: (Best estimate)

Disease end date: (best estimate)

Species affected: (The diversity of species affected may provide clues to the disease involved.)

Age/sex: (Any pattern noticed that is related to age and sex?) Adult/unknown sex

Known dead: (Actual number counted)

1

Known sick:

Estimated dead:

Estimated sick:

(Consider removal by scavengers or other means, density of vegetation, etc.)

Clinical signs: (Any unusual behavior and physical appearance.)

Population at risk: (Number of animals in the area that could be exposed to the disease.)  
unknown

Population movement: (Recent changes in number of animals on area and their source or destination, if known.)

Problem area description: (Land use, habitat types, and other distinctive features.)  
pine forest with open prairie, National Forest

Environmental factors: (Record conditions such as storms, precipitation, temperature changes, or other changes that may contribute to stress.)

Comments: (Additional information/observations of value such as past occurrences of disease in area, photographs and videos are great additions.)



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

**CASE:** 20561

Final Report

2/22/2008

**EPIZOO:**

**Legal**  **INV#:**

Declassified

**Submitter:**

KATHY SULLIVAN  
ARIZONA GAME AND FISH  
3500 S. Lake Mary Road  
Flagstaff AZ 86001

**Date Submitted:** 11/28/2007

**Specimen description/identification/Location:**

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Eagle, Golden	CARCASS	AGFD08242		COCONINO	AZ

**DIAGNOSIS**

1. Plumbism (lead poisoning)
2. Cachexia (emaciation) secondary to plumbism

**Comment:**

The cause of illness and death in this adult female golden eagle was lead poisoning. The diagnosis of plumbism was confirmed by detection of very elevated levels of lead in the liver; the liver lead level in this eagle was 35.65 pp (wet weight). A small fragment of a lead bullet was detected in the gizzard of this eagle at necropsy.

Numerous tests and cultures for infectious diseases were negative in this eagle. Swabs of the trachea and cloaca were negative for avian influenza viruses by polymerase chain reaction (PCR) tests. Special cultures of the brain and pinfeathers for West Nile virus also were negative. No bacteria were isolated from the liver.

In summary, the cause of death in this golden eagle was confirmed to be plumbism. Cachexia (emaciation) in this bird was considered secondary to the plumbism. No infectious diseases were detected in this bird.

DAVID EARL GREEN, DVM, DACVP

Staff Diagnostic Pathologist

NATHAN G. RAMSAY,

Wildlife Disease Technician

If you have questions regarding this case, contact:

Phone: 608-270-2435 E-Mail: nathan\_ramsay@usgs.gov

**Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.**

**Copies To:**

MIGRATORY BIRD COORDINATOR (R2)  
USFWS (RO2), PO BOX 1306, ALBUQUERQUE, NM 87103-1306



**Arizona Game and Fish Department  
 Nongame and Endangered Wildlife Program  
 5000 West Carefree Hwy.  
 Phoenix, Arizona 85086  
 Phone: (623) 236-7500  
 FAX: (623) 236-7926**



**DEAD OR INJURED BALD AND GOLDEN EAGLE RECOVERY FORM**

Name: Kathy Sullivan Work Unit: FOR2

Telephone: 928-214-1249 E-mail: KSullivan@azgfd.gov

Date collected: 11/23/07 Collected By: Garrett Fabian – WM for Unit 5A

Found By: Campers Location: Next to tank near Mogollon Rim in Unit 5A

County: Coconino UTM: \_\_\_\_\_

Condition Found (dead, injured): sick Species: Golden Eagle

Age: \_\_\_\_\_ Adult: X Subadult: \_\_\_\_\_ Band Number: n/a

Clinical signs (Any unusual behavior or physical appearance.): lethargic; emaciated; could not fly; feet completed contracted – abrasions from walking on knuckles; found near water; feces white with metallic green. Possible signs of toxin ingestion.

Area description: (Habitat in area of discovery): Ponderosa pine habitat. Bird was located next to tank along the Mogollon Rim area in Unit 5A.

Comments (Additional information that can aid diagnosing cause of injury or mortality):  
Possible lead toxicity - big game hunting season underway in area. Bird was euthanized in the field (skull crushed), stored in refrigerator and shipped on 11/27/07 overnight to the National Wildlife Health Lab in Madison, WI.

Diagnosis (Attach laboratory reports):  
 \_\_\_\_\_  
 \_\_\_\_\_

Please remit this form to the Nongame Branch's Raptor Management Coordinator following the protocol established in the cover memo.

**From:** Kathy A. Sullivan  
**Sent:** Wednesday, December 05, 2007 4:08 PM  
**To:** James Driscoll; Susan MacVean  
**Subject:** FW: Golden Eagle (NWHC #20561)

Jamey and Susi -- Necropsy report of golden eagle is below. It died of lead toxicity, with high liver lead levels and a bullet fragment recovered from gizzard.

Specific location where the eagle was recovered as reported from Garrett: The eagle was found approximately 400 yards southwest of the Coconino FS 300/308 junction.

Kathy

Kathy Sullivan  
Condor Coordinator  
AZ Game and Fish Department  
3500 S. Lake Mary Road  
Flagstaff, AZ 86001  
928-214-1249  
Ksullivan@azgfd.gov

**From:** Nathan G Ramsay [mailto:nramsay@usgs.gov]  
**Sent:** Wednesday, December 05, 2007 10:14 AM  
**To:** Kathy A. Sullivan  
**Subject:** Golden Eagle (NWHC #20561)

Morning Kathy,

This eagle was necropsied on 11/29/07 by Dr Green. **External exam:** There are matted, blood-stained feathers on the right side of the head, obscuring the right ear opening; on the upper-breast; and at the base of both wing tips at the first primary flight feathers. There is a mild amount of clotted blood in the conjunctiva of the right eye. **Internal exam:** There is essentially no subcutaneous or visceral fat. The breast muscles show diffuse bilateral mild to moderate atrophy. There may be mild white streaking in the myocardium of both ventricles of the heart visible on the epicardial surface. The gall bladder is distended with dark-green, opaque, viscous bile. The spleen is ovoid, reddish-tan and about 30% of expected size. One irregular, shattered bullet fragment is present in the lumen of the gizzard (non-magnetic).

The lead level in the liver was 35.65 ppm. Anything above 8 ppm is considered toxic. The cloacal swab was AI Matrix RT-PCR Screen negative.

Have a great day,

Nathan G. Ramsay  
Wildlife Disease Technician  
National Wildlife Health Center  
6006 Schroeder Rd  
Madison, WI 53711  
(608) 270-2435

## James Driscoll

---

**From:** Kathy A. Sullivan  
**Sent:** Wednesday, December 05, 2007 4:08 PM  
**To:** James Driscoll; Susan MacVean  
**Subject:** FW: Golden Eagle (NWHC #20561)

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Specific location where the eagle was recovered as reported from Garrett: The eagle was found approximately 400 yards southwest of the Coconino FS 300/308 junction.

Kathy

Kathy Sullivan  
Condor Coordinator  
AZ Game and Fish Department  
3500 S. Lake Mary Road  
Flagstaff, AZ 86001  
928-214-1249  
[ksullivan@azgfd.gov](mailto:ksullivan@azgfd.gov)

---

**From:** Nathan G Ramsay [<mailto:nramsay@usgs.gov>]  
**Sent:** Wednesday, December 05, 2007 10:14 AM  
**To:** Kathy A. Sullivan  
**Subject:** Golden Eagle (NWHC #20561)

Morning Kathy,

This eagle was necropsied on 11/29/07 by Dr Green. **External exam:** There are matted, blood-stained feathers on the right side of the head, obscuring the right ear opening; on the upper-breast; and at the base of both wing tips at the first primary flight feathers. There is a mild amount of clotted blood in the conjunctiva of the right eye. **Internal exam:** There is essentially no subcutaneous or visceral fat. The breast muscles show diffuse bilateral mild to moderate atrophy. There may be mild white streaking in the myocardium of both ventricles of the heart visible on the epicardial surface. The gall bladder is distended with dark-green, opaque, viscous bile. The spleen is ovoid, reddish-tan and about 30% of expected size. One irregular, shattered bullet fragment is present in the lumen of the gizzard (non-magnetic).

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Have a great day,

Nathan G. Ramsay  
Wildlife Disease Technician  
National Wildlife Health Center  
6006 Schroeder Rd  
Madison, WI 53711  
(608) 270-2435

## James Driscoll

---

**From:** James Driscoll  
**Sent:** Monday, January 07, 2008 2:31 PM  
**To:** Ron Sieg  
**Cc:** Kenneth Jacobson  
**Subject:** RE: eagle data  
**Attachments:** Lead Exposure in Bald Eagles.Working Draft\_tuk.doc

Ron,

Tuk has been working on the lead paper that Andi and Susi started years ago. I have attached it and it is up to date, but do not distribute, it is still draft.

From this paper, we have 20 lethal and have recovered 2 that were sub-lethal and successfully rehabbed. But there were also 2 balds that had high bone level lead concentrations indicating prolonged high exposure to lead. The later was not included in the paper because we could not attribute those to ammunition. Basically, we have found that anything above 10 ppm (1000 nanograms/dL) is lethal.

Thanks

James T. Driscoll  
Raptor Management Coordinator  
Arizona Game and Fish Department  
5000 West Carefree Highway  
Phoenix, Arizona 85086  
[jdriscoll@azgfd.gov](mailto:jdriscoll@azgfd.gov)  
623-236-7581 Office  
623-236-7926 Fax

**FRAGMENTS FROM LEAD AMMUNITION ARE  
TOXIC TO WILDLIFE AND HUMANS.  
BUY NON-LEAD AMMUNITION  
SAVE A LIFE.**

---

**From:** Ron Sieg  
**Sent:** Monday, January 07, 2008 12:58 PM  
**To:** James Driscoll  
**Subject:** eagle data

Jaime, I'm giving a talk to the Commission on lead issues on the 18th. I have in my presentation (with info from Susi or Kathy) that "since 1999, there are 24 documented cases of lead toxicity in eagles in AZ." I know in our condor program lead toxicity = lead deaths. Is this true in the eagle program or does this include sublethal exposure? Thanks. rs

Ron Sieg, Region II Supervisor, Arizona Game and Fish Department, 3500 S. Lake Mary Road, Flagstaff, AZ 86001, 928-214-1240

**ARIZONA GAME AND FISH DEPARTMENT  
INTER OFFICE MEMO**

**TO:** File

**FROM:** James T. Driscoll, Birds and Mammals Program Manager



**SUBJECT:** Public Records Request – Lead Mortalities in Bald and Golden Eagles

**DATE:** July 30, 2012

This documentation includes e-mails, mortality reporting forms, and necropsy results from recovered bald and golden eagle carcasses as well as various tables summarizing bald and golden eagle mortality data. This packet also contains a internal decision point white paper (draft version December 2007 and updated draft January 2008) that:

1. Provides a background to lead poisoning in wildlife.
2. Assesses potential impacts to various wildlife populations.
3. Identify clinical issues with diagnosing lead poisoning as a mortality source.
4. Identifies treatment options for lead-poisoning.
5. Summarizes the history of bald eagle lead-related mortalities in Arizona.
6. Identifies the complete range of management actions that the Department could take to reduce impacts of lead on bald eagles.

The Department considered the recommendations from the January 2008 internal decision point white paper and noted some of the actions had been implemented as part of the California Condor Voluntary Non-Lead Ammunition Program. The Department also recognized bald eagle populations are increasing throughout its range, including Arizona, despite any lead associated impacts. Also, the Department has in place management programs to ensure the bald eagle population and mortalities will be closely monitored. Through this monitoring program, the Department will consider additional action in the future if a mortality source increases to unacceptable levels.

# LEAD EXPOSURE IN BALD EAGLES (*HALIAEETUS LEUCOCEPHALUS*) IN ARIZONA<sup>1</sup>

James T. Driscoll and Kenneth V. Jacobson

## CONFIDENTIAL AND DELIBERATIVE MATERIAL DRAFT REPORT – FOR INTERNAL USE ONLY

### BACKGROUND

Lead is a heavy metal known to be highly toxic to humans and wildlife. Environmental exposure to lead has increased substantially since the Industrial Revolution (Pain 1996). Due to human activities, lead has become ubiquitous in soil, air, and water at unnaturally high levels (Pain et al. 1994). Lead poisoning in birds and mammals has been linked to several sources, including ingestion of spent lead gunshot (Pain et al. 1994, Ma 1996), consumption of lead sinkers (Sears 1988), secondary consumption of lead contaminated prey (DeMent et al. 1986, Frenzel and Anthony 1989), mining and smelting activities (Beyer et al. 1997, Henny et al. 2000), and firearm training facilities (Lewis et al. 2001).

Lead poisoning in birds has been a concern for more than a century (e.g. Grinnell 1894). Lead exposure to waterfowl has been widely studied over the last half century. Bellrose (1959) estimated that lead poisoning killed 1.6-3.9 million waterfowl annually (2-3 percent of the fall population) in North America. Due to these losses, a conversion from lead to non-toxic shot was phased in for waterfowl from 1987 to 1991 in the United States (U.S. Fish and Wildlife Service 1986, 2002a,b). Canada made lead shot illegal for waterfowl in 1999 (Environment Canada 2002), and Mexico also passed a law requiring non-toxic (steel) shot for waterfowl. However, implementation and compliance to date in Mexico are not known (Sam Lawry, Arizona Game and Fish Department, pers. comm.). Although lead ammunition may not be legally used to take waterfowl in North America, it is legal to use for other hunted species, such as upland game birds, big game, and predators in most areas, including Arizona.

Since the conversion to non-toxic shot for waterfowl in the United States, the apparent effect on wildlife populations has varied. Lead exposure in black ducks (*Anas rubripes*) has decreased 44 percent since implementation of non-toxic shot along the Mississippi flyway (Samuel and Bowers 2000). However, Kramer and Redig (1997) found that the prevalence of lead has not changed for wintering bald eagles (*Haliaeetus leucocephalus*) in Minnesota and Wisconsin. They speculated this might reflect bald eagle consumption of mammals and birds that can be hunted year-round with lead shot.

### EXPOSURE

In total, 59 terrestrial bird species have been documented to ingest or suffer poisoning from lead in ammunition (Fisher et al. 2006). Although not as well studied as in waterfowl, lead exposure has been documented in raptors (Pain 1996), including prairie falcons (*Falco mexicanus*)

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<sup>1</sup> Document: Lead Exposure in Bald Eagles. Working Draft

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(Benson et al. 1974), Cooper's hawks (*Accipiter cooperii*) (Snyder et al. 1973), bald and golden eagles (*Aquila chrysaetos*) (Wayland and Bollinger 1999), red-tailed hawks (*Buteo jamaicensis*) (Sikarskie 1977), turkey vultures (*Cathartes aura*) (Wiemeyer et al. 1986), Andean condors (*Vultur gryphus*) (Locke et al. 1969) and California condors (*Gymnogyps californianus*) (Wiemeyer et al. 1988). Lead poisoning from ammunition sources has been documented in 14 raptor species common to Arizona (Fisher et al. 2006).

Birds of prey are usually exposed to lead by ingesting contaminated prey (Stendell et al. 1980, Janssen et al. 1986). In British Columbia, Peterson et al. (2001) determined that 77.8% of carcasses were found within 24 hours of death and that one dead duck carcass attracted a mean of 16.6 individual scavengers. As a result, any lead contaminated carcass has the potential for exposing many individuals in a short period of time. Pauli and Buskirk (2007) identified that 87% of the Prairie dogs (*Cynomys spp.*) shot with expanding bullets contained lead fragments and that >70% of the lead fragments were too small to be avoided during ingestion. Hunt et al. (2006) reported high incidence of bullet fragments in hunter shot deer carcasses with >74% of the carcasses and gut piles containing >100 visible fragments when shot with standard lead-based copper jacketed bullets. In Utah, Platt (1976) reports bald eagles feeding on hunter killed jack rabbits (*Lepus californicus*) with 71% of regurgitated pellets containing one or more ingested shot. Lead poisoning mortality of bald and golden eagles in Canada and the United States accounts for 5-10% of recorded post-fledgling mortality (Fisher, et al. 2006). In British Columbia, 37% of injured or dead bald eagles exhibited significant lead exposure (Fisher, et al. 2006). In Arizona, 72% of the California condor population in 2002 was exposed to lead. Exposure rates continued to rise in 2003 and 2004 with 75% and 81% of the condor population exposed, respectively. Although there was a 2005 decrease in lead exposure rates, 95% of the condor population was exposed to lead in 2006. These lead exposures have resulted in 9 condor mortalities from 2002 to 2006 (Cathy Sullivan, Arizona Game and Fish Department, pers. comm.).

The chronic, low-level effects of lead exposure in raptors are poorly known. Kramer and Redig (1997) suggested that although subclinical or chronic stages of lead poisoning may not directly cause mortality in raptors, their hunting ability might be reduced. Chronic lead exposure may also predispose raptors to other environmental hazards, such as vehicle or powerline collisions, and increase susceptibility to predators (Kramer and Redig 1997).

CLINICAL ISSUES

Initial symptoms of lead exposure include anorexia, anemia, weakness and depression, as well as bile stained feces (Redig 1979, Ma 1996). Vomiting follows in the terminal stages. After lead is ingested and absorbed, it becomes distributed primarily in the bloodstream, liver, kidney, and bone. High levels of lead in blood and soft tissue (e.g. liver and kidney) are indicative of recent, acute exposure, and these levels can remain elevated for several weeks to several months (Pain 1996). Uptake of lead by bone is slow, and high bone lead concentration is indicative of long-term exposure (Stendell et al. 1980). Lead in the bone is relatively immobile, and can accumulate over a lifetime (Pain 1996).

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Scheuhammer (1987) reviewed chronic toxicity of dietary lead in avian species and reported that female birds accumulate lead in bone tissues at a greater rate (up to 10 times more) than males. In addition, breeding females accumulated 4 to 5 times more lead in bones than non-breeding. Scheuhammer's review also indicated young birds are more susceptible to lead than adults of the same species, and young altricial birds are more sensitive to lead than young precocial birds. Ringed turtle doves (*Streptopelia risoria*) and kestrels (*Falco sparverius*) dosed with high levels of lead (10,000 µg/dL) in their feed or drinking water showed no impairment in egg production, eggshell thickness or egg fertility. However, there was a tendency to produce fewer fledglings. In starlings (*Sturnus vulgaris*), the only noticeable effects were lower nestling haematocrits and brain weights. Decreased brain weights have been associated with impaired central nervous system development in mammals (Silbergeld and Hruska 1980, Donald et al. 1986).

The accumulation and toxicity of dietary lead can be dramatically modified by manipulation of dietary calcium (Scheuhammer 1987). For example, adult mallards (*Anas platyrhynchos*) on a low calcium diet dosed with a single No. 4 lead shot died 30 days after developing symptoms of lead poisoning. However, a second group supplemented with additional calcium only experienced 50% mortality over the same amount of time (Carlson and Nielson 1985).

Blood lead levels are the most commonly measured parameter, as they reflect acute recent exposure, and are relatively easy to collect. Scheuhammer (1989) monitored doves, sharp-shinned hawks (*Accipiter striatus*), and herring gulls (*Larus argentatus*) for lead exposure in Canada and the United States. He considered blood lead levels <15 µg/dL to represent a normal lead exposure level. Lead levels of 18-65 µg/dL were considered moderately elevated, and distinctly higher than normal exposure, but not lead poisoned. Finally, blood lead levels >80 µg/dL represented highly elevated exposure, and termed as lead poisoned. P.T. Redig, DVM (The Raptor Center, Univ. of Minnesota, pers. comm.) used a finer blood lead level scale (developed for bald eagles), which he believes is applicable to California condors. Redig defines background levels as <20 µg/dL, subclinical as 20-60 µg/dL, clinical and generally treatable as 60-100 µg/dL, and toxic with increasingly poorer prognosis for treatment as >100 µg/dL.

TREATMENT

Given his experience with bald eagles and condors, Redig recommends chelation therapy for birds with a blood lead level of  $\geq 30$ -40 µg/dL. Chelation therapy is the administration of a drug (usually calcium EDTA) that draws toxic metals from the bloodstream so the body can pass them more effectively in urine or feces (Gale Encyclopedia of Medicine 2002). Although birds with  $\geq 30$ -40 µg/dL may appear healthy, lead levels are dynamic and the level measured in the blood will fluctuate depending on how much time has elapsed since ingestion. Redig states that any amount of lead is toxic and will impair a bird's health (P.T. Redig, pers. comm.).

Raptors regurgitate pellets of indigestible matter (casting), which could theoretically rid the system of toxic matter. However, foreign objects such as lead fragments can fail to be egested, and are therefore gradually absorbed over time (Redig et al. 1980, Pattee et al. 1981). Moreover, bald eagles whose primary diet is fish, do not cast pellets as frequently, making them more susceptible to lead poisoning (Stendell et al. 1980, Snyder and Snyder 2000). Bald eagles may be particularly susceptible to lead exposure because they are long-lived, have low recruitment rates,

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maintain small populations, depend on carcasses as food during the winter, and cast less frequently than other raptors (Stendell et al. 1980, Pattee et al. 1990, Snyder and Snyder 2000). Pattee et al. (1981) reported the liver lead toxic threshold for bald eagles is 1000 µg/dL. However, some researchers indicate this threshold may be lower, between 600 to 800 µg/dL (Kathy Converse, U.S. Geological Survey, pers. comm.). Blood lead levels of greater than 600 µg/dL are considered to be diagnostic of lead poisoning.

**HISTORY OF BALD EAGLE LEAD EXPOSURE IN ARIZONA**

In 25 years of bald eagle research in Arizona, relatively few carcasses have been recovered in good enough post mortem condition for necropsy, and prior to 1998, necropsy on bald eagles recovered in Arizona were rarely performed (n=2). In general, carcasses must be retrieving within 5 days of mortality. Otherwise, the carcasses have decomposed beyond testing. In total, 89 subadult, near adult, and adult bald eagle carcasses have been recovered in Arizona with 54% (48) in good enough condition for necropsy. Since 1998, these 48 bald eagles in good post-mortem condition were sent for necropsy at the National Wildlife Health Center or Ashland Laboratory. Results of these necropsies identified 42% with lead poisoning as the primary cause of mortality with liver lead levels ranging from 1 to 11 times the toxic threshold (Table 2). In addition, a 2005 subadult and a 2006 Arizona nestling were recovered alive while suffering from lead poisoning. Both individuals were successfully rehabilitated and later released.

Table 2. Known lead poisoning mortalities and lead concentrations in bald eagles recovered in Arizona.

Bald Eagle/Location	Date Recovered	Liver Lead Levels (µg/dL)
Saguaro Lake	January 1998	9400
Whiteriver	January 2003	6000 <sup>2</sup>
Pintail Lake	March 1999	4956
Lake Elaine	March 2002	4852
Lower Lake Mary	March 2002	4817
Scholz Lake	Fall 1998	4300
Fools Hollow Lake	March 2001	4277
Cosnino	January 2002	4150
Kaibab Lake	March 2000	3828
Show Low Wal-Mart	February 2003	3604
East Clear Creek	April 2000	3347
Horseshoe Dam Subadult <sup>1</sup>	January 2003	3005
K.A. Ranch	March 2004	3000
Wilcox	February 2004	2343
Stoneman Lake	March 2003	1352
Long Lake	March 2003	1330
White Horse Lake	March 2004	1311
Young	March 2004	1130
River Reservoir	March 2004	753 <sup>2</sup>
Clifton	April 2004	815

<sup>1</sup>Arizona hatched bald eagle.

<sup>2</sup>Blood lead levels before treatment.

Given that bald eagles migrate, exposure to lead could occur in any state within the migration flyway. However, it is common for bald eagle migrants to stay an average of 18 days at any given location near a suitable food source (Jacobson and Messing, In prep.). Pattee et al. (1981)

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discovered 60% (n=3) of birds in his experiment died within 12 to 20 days of ingesting lead pellets. Thus, there is an increased probability bald eagles recovered in Arizona were exposed to lead in Arizona.

Lead poisoning was determined as the primary cause of death in 42% of all bald eagle necropsies with 75% of those lead poisonings affecting adult bald eagles. In the Demographic Analysis of the Bald Eagle in Arizona (Allison et. al. in prep.), an elasticity analysis identified changes in adult survivorship as having the greatest influence on the Arizona bald eagle population. Specifically, a 5% increase in adult survivorship will produce the same increase in population growth as a 50% increase in juvenile survivorship. As a result, any management actions to reduce exposure of bald eagles to lead will likely result in increased adult bald eagle survivorship and greatly effect the growth rate of Arizona's bald eagle population.

RECOMMENDATIONS

The information provided describes lead poisoning as a significant mortality factor for bald eagles in Arizona. The Department should consider supporting management actions that reduce the exposure of bald eagles to lead in the environment.

- 1) Determine the source(s) of lead that has caused the death of bald eagles in Arizona.
- 2) Develop a variety of management options to reduce identified lead sources.
- 3) Provide information to hunters on the benefits of voluntarily using non-toxic ammunition.
- 4) Require non-toxic ammunition to be used on Department owned property hunts.
- 5) Require that hunters using lead ammunition properly dispose or cover carcasses and gut piles left in the field.
- 6) Eliminate the use of lead ammunition in upland game birds.
- 7) Develop a statewide plan to phase out lead ammunition used in hunting.

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## Kenneth Jacobson

---

**From:** James Driscoll  
**Sent:** Monday, April 07, 2008 10:48 AM  
**To:** Kenneth Jacobson  
**Subject:** FW: Dead Bald Eagle Map  
**Attachments:** deadbaldeagle.JPG

Thanks

James T. Driscoll  
Raptor Management Coordinator  
Arizona Game and Fish Department  
5000 West Carefree Highway  
Phoenix, Arizona 85086  
[jdriscoll@azgfd.gov](mailto:jdriscoll@azgfd.gov)  
623-236-7581 Office  
623-236-7926 Fax

Buy non-lead ammunition.

-----Original Message-----

**From:** Dan Groebner  
**Sent:** Thursday, April 03, 2008 10:51 AM  
**To:** [james\\_ashburner@fws.gov](mailto:james_ashburner@fws.gov)  
**Cc:** Dave Cagle; James Driscoll  
**Subject:** FW: Dead Bald Eagle Map

Jim and Jamey,

Lakeside District Forest Service (Bob Csargo and Charlie Denton [REDACTED] brought in a dead mature bald eagle yesterday afternoon found just northwest of Show Low a few miles (see map). It is now in the freezer closest to the garage door in the old warehouse at the AGFD regional office. It had been dead a few days at least. No bands and no obvious signs of foul play at the site. It was not in the ditch or very close to another road or house. Let us know what you want done or come and get it. Thanks.

Dan Groebner  
Region I Nongame Specialist  
Arizona Game and Fish Department  
2878 East White Mtn. Blvd.  
Pinetop, AZ 85935  
Voice (928) 367-4281  
Fax (928) 367-1258

-----Original Message-----

**From:** Charles M Denton [<mailto:cdenton@fs.fed.us>]  
**Sent:** Thursday, April 03, 2008 10:19 AM  
**To:** Dan Groebner  
**Subject:** Dead Bald Eagle Map

Dan,

Here is the map with the location of the dead eagle. The red flag in the drainage south of community tank is where it was. Thanks

(See attached file: deadbaldeagle.JPG)

Charlie Denton  
Wildlife Biologist  
Lakeside RD  
Apache/Sitgreaves NF  
(928) 368-2128  
Email: [cdenton@fs.fed.us](mailto:cdenton@fs.fed.us)

576000m E.

577000m E.

578000m E.

NAD27 Zone 12S 580000m E.

3798000m N.

3797000m N.

3796000m N.

3795000m N.

3794000m N.

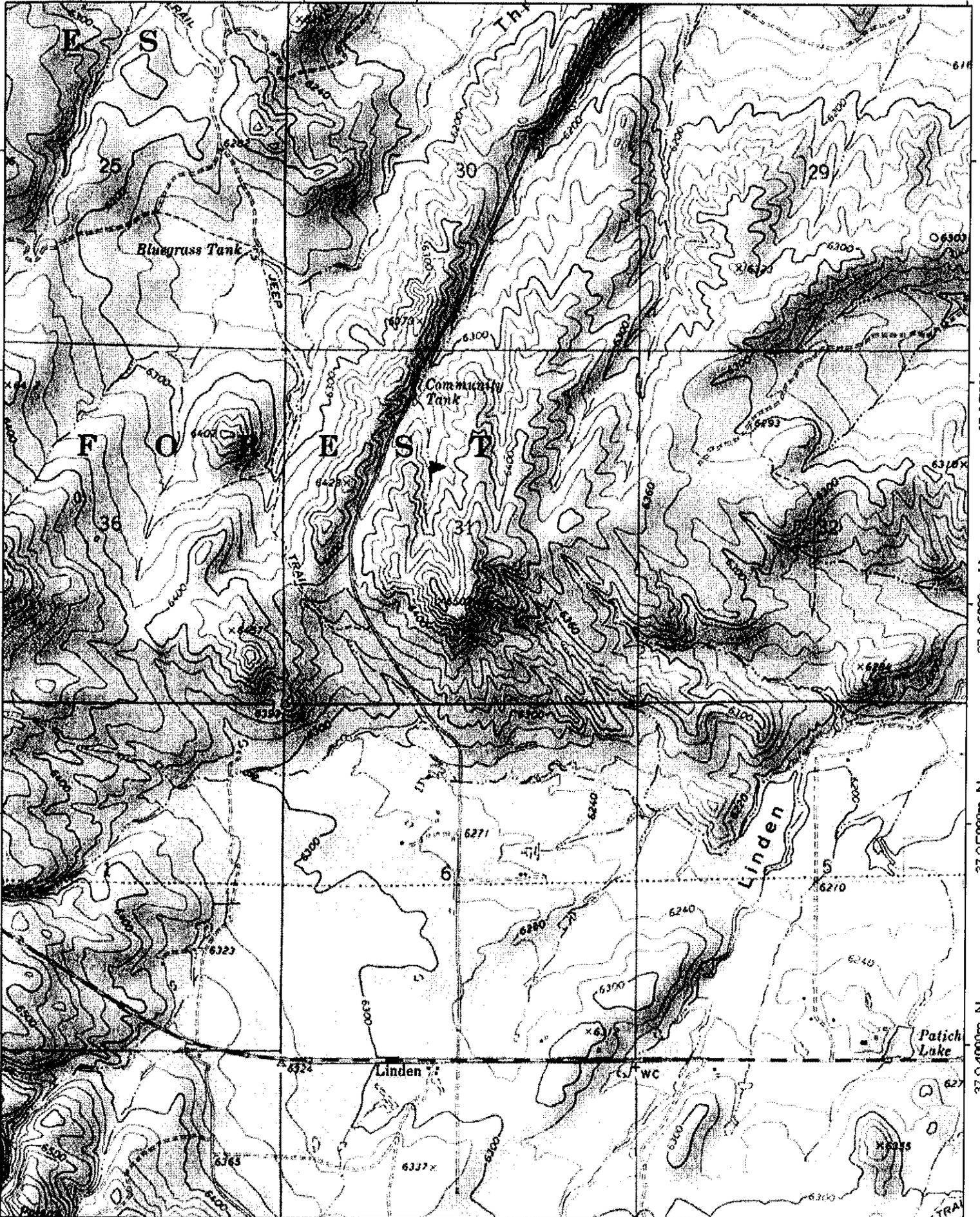
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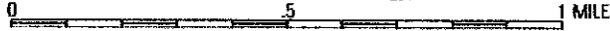
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578000m E.

NAD27 Zone 12S 580000m E.

TN ↑



## Kenneth Jacobson

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**From:** James Driscoll  
**Sent:** Monday, April 07, 2008 10:48 AM  
**To:** Kenneth Jacobson  
**Subject:** FW: another lead-poisoned BAEA

Thanks

James T. Driscoll  
Raptor Management Coordinator  
Arizona Game and Fish Department  
5000 West Carefree Highway  
Phoenix, Arizona 85086  
[jdriscoll@azgfd.gov](mailto:jdriscoll@azgfd.gov)  
623-236-7581 Office  
623-236-7926 Fax

### BUY NON-LEAD AMMUNITION.



---

**From:** Susan MacVean  
**Sent:** Thursday, April 03, 2008 9:26 AM  
**To:** James Driscoll  
**Cc:** Kathy A. Sullivan  
**Subject:** another lead-poisoned BAEA

Hi Jamey-

Don't know if you'd heard that an adult male bird was picked up by Kathy I THINK on March 21 near the Deer Farm (off I-40 between Flagstaff and Williams). I'm not sure if Kathy filled out the BAEA form? If not I'll get one to you Kathy.

Anyhow, Susan Ruble, local rehabber took the bird to Dr. Lisa at Canyon Pet Hospital (same vet that treated the last bird). Dr. Lisa said the bird came in with a very high lead load (4.9 ppm). She began chelation and the bird responded well and was going to be released but then it died 2 days ago. My question to you is: do you want the carcass? If so, we'll get it down to you. If not, I'll send it to the feather repository. If you want the details on the lead for your records, please call Dr. Lisa [REDACTED]. I told her you might be contacting her.

Susi



**Arizona Game and Fish Department  
Nongame and Endangered Wildlife Program  
5000 West Carefree Hwy.  
Phoenix, Arizona 85086  
Phone: (623) 236-7500  
FAX: (623) 236-7926**



**DEAD OR INJURED BALD AND GOLDEN EAGLE RECOVERY FORM**

Name: Kathy Sullivan Work Unit: FOR2

Telephone: 928-214-1249 E-mail: KSullivan@azgfd.gov

Date collected: 3/21/08 Collected By: Kathy Sullivan/Dan Gaska

Found By: Resident walking dog Location: off CR 72 -1.5 miles NE of Davenport Lake

County: Coconino UTM's: 0404090 E 3903280 N NAD 83

Condition Found (dead, injured): sick, unable to fly Species: Bald Eagle

Age: \_\_\_\_\_ Adult: X Subadult: \_\_\_\_\_ Band Number: n/a

Clinical signs (Any unusual behavior or physical appearance.): lethargic; sharp keel; could not fly; feet contracted; probable toxicity

Area description: (Habitat in area of discovery): Ponderosa pine habitat. Close to Davenport Lake where residents observe wintering bald eagles. Eagle found on ground under shrub.

Comments (Additional information that can aid diagnosing cause of injury or mortality): Bird discovered at 0800, but not recovered by AZGFD until 1700, FS was contacted first – GF not contacted until 1500.

Bird recovered in field and brought to Canyon Pat hospital in Flagstaff by raptor rehabilitator Susan Ruble. Dr. Lisa Ethridge treated the eagle (she successfully treated an eagle earlier this winter). Lead tests confirmed a high blood-lead level at 4.9 ppm. The bird appeared to be responding to treatment, but suddenly died on 4/1/08.

Diagnosis (Attach laboratory reports):

Will obtain from Canyon Pet Hospital.

Please remit this form to the Nongame Branch's Raptor Management Coordinator following the protocol established in the cover memo.

## James Driscoll

---

**From:** Susan MacVean  
**Sent:** Monday, August 11, 2008 11:24 AM  
**To:** James Driscoll  
**Subject:** FW: Golden Eagle Forms  
**Attachments:** Golden Eagle- Navajo Canyon 06-21-08 Ernie.doc; Golden Eagle- Lees Ferry 06-22-08 Billy.doc; Golden Eagle- Face Canyon 06-27-08 Cliff.doc

Jamey,

I assume (?) you had heard about these Golden Eagles from the Page area? 1 died possibly from lead, 2 were sent to Adobe and were probably lead. Sandy Cate should know the results if you don't already.

Contact Sophia (WM) if you need/want more info.

Susi

**From:** Sophia Fong  
**Sent:** Saturday, August 09, 2008 10:41 AM  
**To:** Sandy Cate  
**Cc:** Susan MacVean  
**Subject:** Golden Eagle Forms

Sandy,

Please see attached wildlife record forms. I apologize for not getting these to you sooner. Please let me know if you need additional information. I have also attached info about the raven and mourning dove. The raven was released after a week and flew off fine.

Have you heard any information about the lead in the other eagles?

Thanks again for all your help,

Sophia  
(cell)

**Sophia Fong**  
Wildlife Manager 12B  
Arizona Game and Fish Department  
3500 S. Lake Mary Road  
Flagstaff, AZ 86001  
(928) 645-6843

**Sign up for AZGFD eNews** and receive the latest news and information on wildlife issues and events, outdoor tips, education programs, regulations, and more. <http://www.azgfd.gov/eservices/subscribe.shtml>

**Wildlife Record Card**  
**Arizona Game and Fish Department Wildlife Center**

<i>For AZGFD use only</i>	Today's date: <u>06</u> / <u>24</u> / <u>08</u>
Species: <u>Golden Eagle-"Ernie"</u>	
Received by: <u>Sophia Fong</u> Injury: <u>Emaciated; Toxicity?</u>	
Special instructions: <u>Please Test for Lead Poisoning</u>	

**Date the animal was found:** 06 / 21 / 08

**Finder Information:**

Name: Please see attached sheets- Sophia Fong picked up from Page Vet Hospital  
Address: 3500S. Lake Mary Rd.  
City: Flagstaff Zip: 86001 Phone: (                      )  
Location animal was found (cross streets/hwy): Navajo Canyon- Lake Powell  
Care/Feeding to date (food, water): Food and water given by vet  
Observations when found (injury): Emaciated, sitting on ledge in Navajo Canyon, picked up by concerned citizen and taken to Vet. Given to Susan Rubel 06/24/08- lead poisoning tested positive with high levels  
Transported by: Sophia Fong Date transported: 06 / 24 / 08  
Driver's License # or License Plate # (for mammals only): \_\_\_\_\_  
*(per USDA Regulation)*  
Signature: \_\_\_\_\_

<i>For Wildlife Center Use Only</i>	
WRC# _____	Date: _____
Received by: _____	
Age: Infant/nestling <b>Juvenile</b> Adult Unknown	Sex: Male Female <b>Unknown</b>
HOUSED OFFSITE – Name: _____	Date: _____
FINAL DISPOSITION :	T      P      R      E      D
Location: _____	Date: _____
Name: _____	

**Evidence**

Case #	
Seizure #	
WM #	
Photos taken by	
Date of Photos	

Identify all items accompanying animal (e.g., kennel, aquarium) on back of WRC

**Wildlife Record Card**  
**Arizona Game and Fish Department Wildlife Center**

*For AZGFD use only*

Today's date: 06 / 23 / 08

Species: Golden Eagle- "Billy"

Received by: Sophia Fong Injury: Emaciated; Toxicity?

Special instructions: Please test for lead poisoning

Date the animal was found: 06 / 22 / 2008

**Finder Information:**

Name: Sophia Fong

Address: 3500 S. Lake Mary Rd

City: Flagstaff Zip: 86001 Phone: (                      )

Location animal was found (cross streets/hwy): Colorado River- 3 miles above Lee's Ferry

Care/Feeding to date (food, water): Food and water from Sophia Fong; Subcutaneous IV by Condor crew.

Observations when found (injury): Observed by boaters for last week sitting on rock shelf next to river. Taken to Susan Rubel in Flagstaff morning of 06/23/08- died in afternoon.

Transported by: Sophia Fong Date transported: 06 / 23 / 08

Driver's License # or License Plate # (for mammals only): \_\_\_\_\_  
*(per USDA Regulation)*

Signature: \_\_\_\_\_

*For Wildlife Center Use Only*

WRC# \_\_\_\_\_ Date: \_\_\_\_\_

Received by: \_\_\_\_\_

Age: Infant/nestling **Juvenile** Adult Unknown Sex: Male Female **Unknown**

HOUSED OFFSITE - Name: \_\_\_\_\_ Date: \_\_\_\_\_

FINAL DISPOSITION :    T       P       R       E       D

Location: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_

**Evidence**

Case #	
Seizure #	
WM #	
Photos taken by	
Date of Photos	

Identify all items accompanying animal (e.g., kennel, aquarium) on back of WRC

**Wildlife Record Card**  
**Arizona Game and Fish Department Wildlife Center**

<i>For AZGFD use only</i>	Today's date: <u>06 / 30 / 08</u>
Species: <u>Golden Eagle- "Cliff"</u>	
Received by: <u>Sophia Fong</u> Injury: <u>Emaciated; Toxicity?</u>	
Special instructions: <u>Please Test for Lead Poisoning</u>	

**Date the animal was found:** 06 / 27 / 08

**Finder Information:**

Name: Kelly Judy and Friends- Sophia Fong picked up from houseboat at Antelope Marina

Address: 3500S. Lake Mary Rd.

City: Flagstaff Zip: 86001 Phone: (                      )

Location animal was found (cross streets/hwy): Face Canyon- Lake Powell

Care/Feeding to date (food, water): Food and water given by Sophia Fong

Observations when found (injury): Emaciated, at bottom of slot canyon in Face Canyon, picked up by concerned citizen and met by Sophia Fong at Antelope Marina. Taken to Susan Rubel on 06/30/08

Transported by: Sophia Fong Date transported: 06 / 30 / 08

Driver's License # or License Plate # (for mammals only): \_\_\_\_\_  
*(per USDA Regulation)*

Signature: \_\_\_\_\_

<i>For Wildlife Center Use Only</i>	
WRC# _____	Date: _____
Received by: _____	
Age: Infant/nestling <b>Juvenile</b> Adult Unknown	Sex: Male Female <b>Unknown</b>
HOUSED OFFSITE – Name: _____ Date: _____	
FINAL DISPOSITION :      T      P      R      E      D	
Location: _____	Date: _____
Name: _____	

**Evidence**

Case #	
Seizure #	
WM #	
Photos taken by	
Date of Photos	

Identify all items accompanying animal (e.g., kennel, aquarium) on back of WRC

## James Driscoll

---

**From:** Jan Miller [Janm@libertywildlife.org]  
**Sent:** Thursday, January 22, 2009 10:15 AM  
**To:** Kamile\_McKeever@fws.gov; James Driscoll; Sandy Cate  
**Cc:** Dr. Kathy Orr; Megan Mosby; Terry Stevens  
**Subject:** Golden eagle

Hi Kamile,

The GOEA that arrived last Friday has very high levels of lead and a high titer of aspergillus. He is a very sick bird with a poor prognosis. We are continuing the chelating for lead and medication for the aspir along with supportive care. I will continue to keep you posted on his condition

*Jan Miller*

*Animal Care Coordinator*

*Liberty Wildlife*

*480-998-0230*

*janm@libertywildlife.org*

*Permit # PR7699638*

## James Driscoll

---

**From:** Jan Miller [Janm@libertywildlife.org]  
**Sent:** Thursday, January 22, 2009 3:57 PM  
**To:** Kamile\_McKeever@fws.gov; Sandy Cate; James Driscoll  
**Cc:** Dr. Kathy Orr; Megan Mosby; Terry Stevens  
**Subject:** FW: Golden eagle

Kamile,

Unfortunately the GOEA passed away this afternoon. I will check with Dr. Orr to see if she would like to necropsy otherwise we will just send it to the repository.

*Jan Miller*

*Animal Care Coordinator*

*Liberty Wildlife*

[REDACTED]

[REDACTED]

*Permit # PR7699638*



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

CASE: 22456

Final Report

3/18/2009

EPIZOO:

Legal  INV#:

Declassified

**Submitter:**

JAMES DRISCOLL  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

Date Submitted: 2/25/2009

Specimen description/identification/Location:

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Eagle, Bald	CARCASS			NAVAJO	AZ

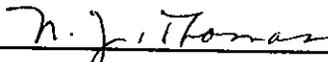
**DIAGNOSIS**

Lead poisoning.

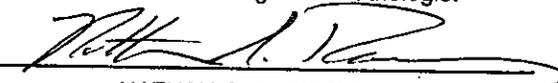
**Comment:**

This adult male Bald Eagle had a thrombus occluding a large mesenteric blood vessel and obstructing the blood circulation in the lower small intestine. Lead toxicity can cause vascular damage and thrombosis, and this diagnosis was confirmed by detection of severely elevated lead concentrations in liver (18.45ppm, wet wt.) and kidney (47.99ppm, wet wt.) tissue. This bird was otherwise in good body condition with no other significant abnormalities.

Cloacal and tracheal swabs were negative on screening for avian influenza viruses. Tissues were negative for West Nile virus. The carcass will be transferred to the National Eagle Repository in the near future.

  
\_\_\_\_\_  
NANCY J. THOMAS DVM, DACVP  
Staff Diagnostic Pathologist

If you have questions regarding this case, contact:

  
\_\_\_\_\_  
NATHAN G. RAMSAY  
Wildlife Disease Technician

Phone: 608-270-2435 E-Mail: nramsay@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

**Copies To:**

MIGRATORY BIRD COORDINATOR (R2)  
USFWS (RO2), PO Box 1306, Albuquerque, NM 87103-1306

CLINT LUEDTKE  
Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086



THE STATE OF ARIZONA  
**GAME AND FISH DEPARTMENT**

5000 W. CAREFREE HIGHWAY  
PHOENIX, AZ 85086-5000  
(602) 942-3000 • WWW.AZGFD.GOV

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LARRY D. VOYLES  
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ROBERT D. BROSCHEID



February 24, 2009

Mr. Nathan Ramsay  
National Wildlife Health Center  
Biological Resources Division  
6006 Schroeder Road  
Madison, Wisconsin 53711-6223

Re: Dead Adult Bald Eagle from Lakeside, Arizona

Dear Mr. Ramsay:

In the accompanying cooler is one bald eagle carcass for you to examine. The carcass has a toe tag with the most pertinent information about the individual for your records.

The adult bald eagle was recovered near Lakeside in Navajo County, Arizona on February 20, 2006, although it had been observed on the ground the previous day. Upon approach, the adult bald eagle was lethargic but had no apparent signs of trauma. The animal was captured and transferred to White Mountain Animal Hospital, where blood samples and x-rays were taken (results on blood samples pending). With no obvious signs of injury, the eagle was given one round of chelation therapy. The animal died that night in captivity.

Please inform me of any contributory cause of mortality. If you have any questions, please feel free to call me at (623) 236-7581 or email at [jdriscoll@azgfd.gov](mailto:jdriscoll@azgfd.gov).

Sincerely,

James T. Driscoll  
Acting Birds and Mammals Program Manager

:jd

cc: Kenneth Jacobson, Bald Eagle Management Coordinator  
Greg Beatty, U.S. Fish and Wildlife Service

Enclosure.



National Wildlife Health Center  
6006 Schroeder Road  
Madison, WI 53711  
Phone: 608.270.2400  
FAX: 608.270.2415



### SPECIMEN HISTORY FORM

For mortality events please e-mail a USGS Field Investigation Team member before shipping

**Western States:** Krysten Schuler [kschuler@usgs.gov](mailto:kschuler@usgs.gov), 608-270-2447

**Eastern States:** Mark Jankowski [mjankowski@usgs.gov](mailto:mjankowski@usgs.gov), 608-270-2443

For single animal cases, please e-mail Wildlife Disease Technician before shipping

**Nationwide:** Nathan Ramsay [nathan\\_ramsay@usgs.gov](mailto:nathan_ramsay@usgs.gov), 608-270-2456

Submitter's name: James T. Driscoll  
Address: 5000 West Carefree Highway  
Phoenix, Arizona 85086

Affiliation: Arizona Game and Fish Department  
Telephone: 623-236-7581

E-mail: [jdriscoll@azgfd.gov](mailto:jdriscoll@azgfd.gov)

Date collected: 2/20/09

Collector's Name: Dan Groebner

Method of animal collection:  Found Dead,  Died in Hand,  Euthanized

Method of euthanization:

Species: Bald Eagle

Number Submitted: 1 Condition:  Chilled,  Frozen,  Preserved Tissues

Specific die-off location (refuge unit, pond, address, intersection, park, etc): Scott Reservoir

State: Arizona County: Navajo Nearest City: Lakeside

Latitude/longitude (Decimal degree in WGS 84): 34.17196N, 109.96371W

Disease onset date: (Best estimate) 02/19/09

Disease end date: (best estimate) 02/20/09

Species affected: (The diversity of species affected may provide clues to the disease involved.) Bald Eagle

Age/sex: (Any pattern noticed that is related to age and sex?) Adult - Unknown Sex

Known dead: (Actual number counted) 0 Known sick: 1

Estimated dead: 0 Estimated sick: 1  
(Consider removal by scavengers or other means, density of vegetation, etc.)

Clinical signs: (Any unusual behavior and physical appearance.)

Lethargic, unable to fly - Suspected Lead Poisoning.

Population at risk: (Number of animals in the area that could be exposed to the disease.)

Wintering bald eagle population

Population movement: (Recent changes in number of animals on area and their source or destination, if known.)

Winter Migration

Problem area description: (Land use, habitat types, and other distinctive features.)

U.S. Forest Service Land, Ponderosa Pine Forest

Environmental factors: (Record conditions such as storms, precipitation, temperature changes, or other changes that may contribute to stress.)

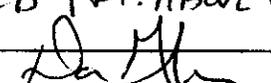
None

Comments: (Additional information/observations of value such as past occurrences of disease in area, photographs and videos are great additions.)

Sus

**Injured Wildlife Record**  
**Arizona Game and Fish Department Field Operations**  
Send completed Form to  
Regional Wildlife Program Manager

**Finder Information: PLEASE FILL OUT THE FOLLOWING #1 THRU #7 ONLY**

1-Name: DAN GROEBNER  
2-Address: 2878 E. WHITE MTN BLVD  
3-City: PINETOP State: AZ Zip: 85935 Phone: 9283674281  
4-Location animal was found (cross streets/hwy): 0.25 mi. W OF SCOTT RES. ON  
PORTER CREEK - 125 S 55508 E 3781708N NAD83  
5-Care/Feeding to date (food, water): VET CARE AT WHITE MTN ANIMAL  
HOSPITAL  
6-Observations when found (injury, etc.): LETHARGIC EASY TO CAPTURE  
PERCHED 1 FT. ABOVE GROUND ON SLOWDOWN. SEEN IN SAME AREA  
7-Signature:  THE DAY BEFORE

**Animal Information:**

Date In: 2/20/09 Date Found: 2/20/09  
Species: BAND TAIL Received By: D. GROEBNER  
Age: Infant/Nestling Juvenile  Adult Unknown Sex: Male Female  Unknown  
Injury: LETHARGIC, SITALPHEEL Fracture: ?

**Housed Offsite:**

Date: 2/20/09 Name: WHITE MTN ANIMAL HOSPITAL  
DR. CLE ALUMBRAC

**Final Disposition:**

DIED OVERNIGHT 2/20-21/09. BLOOD; XRAY  
SAMPLES DRAWN BY DR. ALUMBRAC - SENT TO MADISON  
FOR NECROPSY VIA PHX  
Date: 2/23/09 Name: DAN GROEBNER

**From:** Dan Groebner  
**Sent:** Tuesday, March 03, 2009 4:41 PM  
**To:** James Driscoll; Kenneth Jacobson; Kyle McCarty  
**Subject:** RE: Scott Reservoir BAEA (NWHC #22456)

Thanks Jamey,

Ole just called and said his lead tests came back at 5 ppm! He also said he'd be sending a bill for the lab work. Do you have an account for this kind of thing or should I try to knock off the local bank and pay for it up here?

Dan Groebner  
Region I Nongame Specialist

---

**From:** James Driscoll  
**Sent:** Tuesday, March 03, 2009 4:03 PM  
**To:** Kenneth Jacobson; Dan Groebner; Kyle McCarty  
**Subject:** Re: Scott Reservoir BAEA (NWHC #22456)

Tuk,  
Please send to Jan.  
Thank you.

Jamey Driscoll

I am currently out of my office.  
This message was sent from my Blackberry.

---

**From:** Nathan G Ramsay <nramsay@usgs.gov>  
**To:** James Driscoll  
**Sent:** Tue Mar 03 14:58:38 2009  
**Subject:** Scott Reservoir BAEA (NWHC #22456)

Hi James,

This eagle had a thrombus in a large mesenteric blood vessel that had caused vascular impairment to a length of intestine. This lesion, a severely-engorged gall bladder and severely bile-stained GI content is suggestive of lead poisoning in bald eagles. The cloacal swab is AI Matrix RT-PCR Screen negative and we have lead tests pending on the liver and kidney. We will let you know the results when they come in.

Have a great day,

Nathan G. Ramsay  
Wildlife Disease Technician  
National Wildlife Health Center  
6006 Schroeder Rd.  
Madison, WI 53711  
608-270-2435

**From:** Nathan G Ramsay <nramsay@usgs.gov>

**To:** James Driscoll

**Sent:** Wed Mar 04 15:12:17 2009

**Subject:** 22456 update

Hi James,

This eagle had lead concentrations well above the toxic level, the kidney tested at 47.99 ppm and the liver tested at 18.45 ppm.

Nathan G. Ramsay  
Wildlife Disease Technician  
National Wildlife Health Center  
6006 Schroeder Rd.  
Madison, WI 53711  
608-270-2435

## James Driscoll

---

**From:** Nathan G Ramsay [nramsay@usgs.gov]  
**Sent:** Tuesday, March 03, 2009 2:59 PM  
**To:** James Driscoll  
**Subject:** Scott Reservoir BAEA (NWHC #22456)

Hi James,

This eagle had a thrombus in a large mesenteric blood vessel that had caused vascular impairment to a length of intestine. This lesion, a severely-engorged gall bladder and severely bile-stained GI content is suggestive of lead poisoning in bald eagles. The cloacal swab is AI Matrix RT-PCR Screen negative and we have lead tests pending on the liver and kidney. We will let you know the results when they come in.

Have a great day,

Nathan G. Ramsay  
Wildlife Disease Technician  
National Wildlife Health Center  
6006 Schroeder Rd.  
Madison, WI 53711  
608-270-2435

## James Driscoll

---

**From:** Nathan G Ramsay [nramsay@usgs.gov]  
**Sent:** Wednesday, March 04, 2009 3:12 PM  
**To:** James Driscoll  
**Subject:** 22456 update

Hi James,

This eagle had lead concentrations well above the toxic level, the kidney tested at 47.99 ppm and the liver tested at 18.45 ppm.

Nathan G. Ramsay  
Wildlife Disease Technician  
National Wildlife Health Center  
6006 Schroeder Rd.  
Madison, WI 53711  
608-270-2435

## Kenneth Jacobson

---

**From:** Krysten L Schuler [kschuler@usgs.gov]  
**Sent:** Wednesday, April 01, 2009 10:24 AM  
**To:** Kenneth Jacobson  
**Cc:** Nathan G Ramsay  
**Subject:** golden eagle necropsy (NWHC case 22499)

Hello Ken,

Nathan is out of the office this week and asked me to update you on this case. We took a look at the golden eagle from Kaibab NF. It was an adult male that was severely emaciated. It had an enlarged gall bladder and bile staining throughout the GI tract and other tissues. We strongly suspect lead poisoning. We will be testing the liver to confirm that.

We were curious why the eagle was submitted now after being found in 2007. Was it suspected for lead poisoning based on the time of the year that it was found?

Cheers,  
Krysten

\*\*\*\*\*

Krysten Schuler, PhD  
Wildlife Ecologist  
Field Investigation Team  
USGS National Wildlife Health Center  
6006 Schroeder Road  
Madison, WI 53711  
(608) 270-2447  
(608) 270-2415 fax  
[kschuler@usgs.gov](mailto:kschuler@usgs.gov)

**Kyle McCarty**

**From:** Kenneth Jacobson  
**Sent:** Thursday, May 28, 2009 1:58 PM  
**To:** Kyle McCarty; James Driscoll  
**Subject:** FW: Bald eagle reports  
**Attachments:** Male BAEG #091167.jpg; M-BAEG -091167.jpg; Fe BAEG #091166.jpg; Fe BAEG 091166.jpg

**From:** Jan Miller [mailto:████████████████████]  
**Sent:** Wednesday, May 27, 2009 4:04 PM  
**To:** Kenneth Jacobson  
**Subject:** Bald eagle reports

Tuk,

Here is the information on the two fledgling bald eagles from the Orme Nest. Attached is the bloodwork for both birds.

Both birds presented on Sunday 5/17/09 extremely dehydrated and thin. Both birds were treated with supportive care and blood was taken to send in. We treated them also for lead due to the ataxia and anemia. Both birds were covered with engorged ticks which can also cause anemia. The fledglings seemed to rally the first day with the fluid therapy and treatment. By the end of the second day both birds were failing again. The male #629-52950 (Liberty # 09-1167) died on 5/21/09. The female #629-52948 (Liberty # 09-1166) died on 5/20/09.

**Necropsy report on Female #09-1166 preformed at 6:30pm by Dr. Kathryn Orr DVM:**

- Severe post mortem autolysis despite storage in refrigerator
- Severe pectoral muscle atrophy with small spots of hemorrhage (probably from IM injections of Ca EDTA)
- Lungs green in color
- Liver consistency of "cooked" liver
- Kidneys and spleen soft and pale in color
- Ovary present
- Heart has pale patches in muscle
- Stomach distended with foul smelling partially digested food
- Intestines autolyzed

Tissue collected in formalin- heart, spleen, thyroid, adrenal, kidney, liver, and lung

Negative for lead, positive for aspergillus, negative for West Nile Virus

**Necropsy report on Male #09-1167 preformed at 6:30pm by Dr. Kathryn Orr DVM:**

- Severe pectoral muscle atrophy with small spots of hemorrhage (probably from IM injections of Ca EDTA)
- Liver blotchy coloration but normal consistency
- Kidneys and spleen soft and pale in color
- Testes small
- Stomach severely distended with foul smelling partially digested food
- Intestines autolyzed

Tissue collected in formalin- heart, spleen, thyroid, adrenal, kidney, liver, and lung

Normal range for lead, positive for aspergillus, and positive for West Nile Virus

Dr. Orr would really like to send in the tissue samples collected if the lab would like to test. We also have frozen samples of heart and liver from the male. We collected the ticks from the frozen birds that you can have as well. I asked Kathy about the vinegar and water to fight the aspergillus fungus and she is not aware if that would be effective. I told her about the two Rodeo nestlings that are dead in the nest and she said that they are probably too desiccated to be able to tell anything. I think that I got answers to your questions and if there is anything else let me know. We have the carcasses in the freezer but I can't imagine that they would want them for tests.

Jan Miller  
Animal Care Coordinator  
Liberty Wildlife



**ANTECH DIAGNOSTICS**  
17672-A Cowan Avenue Irvine CA 92614 Phone: 800-745-4725

**Avian Veterinary Service**  
11825 N 70th  
Scottsdale, AZ 85254  
Tel: 480-998-0230  
Fax: 480-998-0230

Client # 43207  
Chart # 091166

Accession No. <b>IRBD56969644</b>	Doctor NOT STATED	Owner <b>LIBERTYW</b>	Pet Name 62952948	Received 05/18/2009
Species Psittacine	Breed	Sex	Pet Age 12W	Reported 05/27/2009 11:51 AM

Test Requested	Results	Reference Range	Units
<b>AVIAN CBC</b>			
WBC Estimate	9.0	4.0-10.0	1000/uL
RBC Morphology			
RBC MORPHOLOGY	NORMAL		
Blood Parasites	None Obs		
Heterophils	70	45-80	%
Heterophil Absolute	6300		
Bands	0		%
Absolutes	0		
Lymphocytes	27	18-50	%
Absolutes	2430		
Monocytes	2	0-3	%
Absolutes	180		
Eosinophils	1	0-2	%
Absolutes	90		
Basophils	0	0-1	%
Absolutes	0		
Thrombocyte Estimate	Adequate		
<b>HEMATOCRIT (B/E)</b>			
HCT	30 (LOW)	42-55	%
<b>COMPREHENSIVE CHEMISTRIES</b>			
SGOT (AST)	144	20-350	IU/L
Total Protein	4.6	3.0-5.5	g/dL
Albumin	1.6	1.2-3.2	g/dL
Cholesterol	228	50-350	mg/dL
Phosphorus	8.2 (HIGH)	3.0-5.5	mg/dL
Calcium	12.1 (HIGH)	7.6-12.0	mg/dL
Glucose	373 (HIGH)	180-350	mg/dL
Sodium	182 (HIGH)	140-160	mEq/L
Verified by repeat analysis.			
Potassium	2.0 (LOW)	3.0-4.5	mEq/L
Verified by repeat analysis.			
Chloride	140 (HIGH)	90-110	mEq/L
Verified by repeat analysis.			

Accession No. IRBD56969644	Doctor NOT STATED	Owner LIBERTYW	Pet Name 62952948
Test Requested	Results	Reference Range	Units
CPK	702 (HIGH)	50-400	IU/L
Uric Acid	9.7	2.0-10.0	mg/dL
Globulin	3.0	2-4	g/dL

**ASPERGILLUS ANTIBODY (AVIAN)**

Avian Aspergillus (ELISA)	3.0 (HIGH)	0.7-1.3
---------------------------	------------	---------

A positive titer supports previous or current infection with aspergillus. A negative titer does not exclude aspergillosis. Results are best interpreted in light of clinical presentation, aspergillus antigen test, and electrophoresis.

\*

TEST PERFORMED AT THE MILLER SCHOOL OF MEDICINE, UNIVERSITY OF MIAMI.

**ASPERGILLUS GALACTOMANNAN**

Aspergillus Galactomannan	0.2	0.0-0.6
---------------------------	-----	---------

TEST PERFORMED AT THE UNIVERSITY OF MIAMI

**PROTEIN ELECTROPHORESIS**

Total Protein	4.6	3.0-5.5	g/dL
Albumin	2.63	1.2-3.2	g/dL
Globulin	1.97		g/dL
Alpha 1	0.35	0.0-0.8	g/dL
Alpha 2	0.31	0.0-0.8	g/dL
Beta 1	0.86 (HIGH)	0.0-0.57	g/dL
Gamma 1	0.45	0.0-0.57	g/dL

**Comment**

The albumin portion is in reference range. The beta portion is elevated above reference range. The alpha and gamma portion are within reference ranges. This may represent acute inflammation or infection. Further testing to determine the cause of acute disease is recommended based on the clinical history of the patient.

**REVIEWED BY:**

Lon J. Rich, DVM, PhD, Diplomate ACVP  
1-800-542-1151 ext. 2421

**AVIAN BLOOD LEAD**

Lead	1	ug/dL
------	---	-------

An avian blood lead concentration below 10 ug/dL is considered within the normal range. An avian blood lead concentration between 10 and 15 ug/dL is considered suspicious for lead poisoning and treatment may be warranted based on clinical signs. An avian blood lead concentration above 15 ug/dL is indicative of lead toxicity, is usually accompanied by signs of lead poisoning and chelation therapy is recommended. If heavy metal toxicity is suspected but the lead concentration is in the normal range, a blood zinc assay is recommended.

**WEST NILE TITER (SN)**

West Nile Titer (SN)	<1:10
----------------------	-------

Titers at or below 1:64 may be non-specific in the absence of prior vaccine history and a second sample should be submitted within 4 weeks to determine if seroconversion has occurred.

Test performed at CORNELL UNIVERSITY

**ANTECH DIAGNOSTICS**  
17672-A Cowan Avenue Irvine CA 92614 Phone: 800-745-4725

**Avian Veterinary Service**  
11825 N 70th  
Scottsdale, AZ 85254  
Tel: 480-998-0230  
Fax: 480-998-0230

Client # 43207  
Chart # 091167

Accession No. <b>IRBD56969733</b>	Doctor NOT STATED	Owner <b>LIBERTY WILD</b>	Pet Name 62952950	Received 05/18/2009
Species Psittacine	Breed	Sex	Pet Age 12W	Reported 05/27/2009 11:51 AM

Test Requested	Results	Reference Range	Units
<b>AVIAN CBC</b>			
WBC Estimate	8.0	4.0-10.0	1000/uL
RBC Morphology			
RBC MORPHOLOGY	NORMAL		
Blood Parasites	None Obs		
Heterophils	68	45-80	%
Heterophil Absolute	5440		
Bands	0		%
Absolutes	0		
Lymphocytes	30	18-50	%
Absolutes	2400		
Monocytes	1	0-3	%
Absolutes	80		
Eosinophils	1	0-2	%
Absolutes	80		
Basophils	0	0-1	%
Absolutes	0		
Thrombocyte Estimate	Adequate		
<b>HEMATOCRIT (B/E)</b>			
HCT	27 (LOW)	42-55	%
<b>COMPREHENSIVE CHEMISTRIES</b>			
SGOT (AST)	217	20-350	IU/L
Total Protein	4.6	3.0-5.5	g/dL
Albumin	1.6	1.2-3.2	g/dL
Cholesterol	259	50-350	mg/dL
Phosphorus	5.5	3.0-5.5	mg/dL
Calcium	9.7	7.6-12.0	mg/dL
Glucose	365 (HIGH)	180-350	mg/dL
Sodium	167 (HIGH)	140-160	mEq/L
Potassium	5.4 (HIGH)	3.0-4.5	mEq/L
Chloride	131 (HIGH)	90-110	mEq/L
CPK	2979 (HIGH)	50-400	IU/L
Uric Acid	16.9 (HIGH)	2.0-10.0	mg/dL
Globulin	3.0	2-4	g/dL
<b>ASPERGILLUS ANTIBODY (AVIAN)</b>			
Avian Aspergillus (ELISA)	2.5 (HIGH)	0.7-1.3	

Accession No. RBD56999733	Doctor NOT STATED	Owner LIBERTY WILD	Pet Name 62952050
<b>Test Requested</b>	<b>Results</b>	<b>Reference Range</b>	<b>Units</b>

A positive titer supports previous or current infection with aspergillus. A negative titer does not exclude aspergillosis. Results are best interpreted in light of clinical presentation, aspergillus antigen test, and electrophoresis.

\*  
TEST PERFORMED AT THE MILLER SCHOOL OF MEDICINE, UNIVERSITY OF MIAMI.

**ASPERGILLUS GALACTOMANNAN**

Aspergillus Galactomannan	0.1	0.0-0.6	
---------------------------	-----	---------	--

TEST PERFORMED AT THE UNIVERSITY OF MIAMI

**PROTEIN ELECTROPHORESIS**

Total Protein	4.6	3.0-5.5	g/dL
Albumin	1.82	1.2-3.2	g/dL
Globulin	2.78		g/dL
Alpha 1	0.12	0.0-0.8	g/dL
Alpha 2	1.16 (HIGH)	0.0-0.8	g/dL
Beta 1	1.00 (HIGH)	0.0-0.57	g/dL
Gamma 1	0.50	0.0-0.57	g/dL

**Comment**

The albumin portion is in reference range. The alpha and beta portions are elevated above reference ranges. The gamma portion is within reference range. This may represent acute, severe inflammation or infection. Further testing to determine the cause of acute disease is recommended based on the clinical history and signs of the patient.

REVIEWED BY:  
Lon J. Rich, DVM, PhD, Diplomate ACVP  
1-800-542-1151 ext. 2421

**AVIAN BLOOD LEAD**

Lead	2	ug/dL
------	---	-------

An avian blood lead concentration below 10 ug/dL is considered within the normal range. An avian blood lead concentration between 10 and 15 ug/dL is considered suspicious for lead poisoning and treatment may be warranted based on clinical signs. An avian blood lead concentration above 15 ug/dL is indicative of lead toxicity, is usually accompanied by signs of lead poisoning and chelation therapy is recommended. If heavy metal toxicity is suspected but the lead concentration is in the normal range, a blood zinc assay is recommended.

**WEST NILE TITER (SN)**

West Nile Titer (SN)	>= 1:320
----------------------	----------

Titers at or below 1:64 may be non-specific in the absence of prior vaccine history and a second sample should be submitted within 4 weeks to determine if seroconversion has occurred.

Test performed at CORNELL UNIVERSITY



Arizona Game and Fish Department  
 Nongame and Endangered Wildlife Program  
 5000 West Carefree Hwy.  
 Phoenix, Arizona 85086  
 Phone: (623) 236-7500  
 FAX: (623) 236-7926



Shipped to  
 NWAC  
 2-23-10  
 10001

**DEAD OR INJURED BALD AND GOLDEN EAGLE RECOVERY FORM**

Name: Susan MacVean (or Andi Rogers) Work Unit: FOR2

Telephone: 928 214-1250 (or 1251) E-mail: smacvean@azgfd.gov

Date collected: 2-22-2010 Collected By: Officer Matt Bratz (DPS)

Found By: reported by citizen Location: median of I-40, Flagstaff

County: Coconino UTM: \_\_\_\_\_

Condition Found (dead, injured): injured Species: BAEA

Age: \_\_\_\_\_ Adult: \_\_\_\_\_ Subadult: xx Band Number: \_\_\_\_\_

Clinical signs (Any unusual behavior or physical appearance.): \_\_\_\_\_

very weak, emaciated, unable to stand in kennel

Area description: (Habitat in area of discovery): \_\_\_\_\_

Comments (Additional information that can aid diagnosing cause of injury or mortality):

bird went to Dr. Lisa Ethridge at Canyon Pet Hospital, Flagstaff. Bird had old pelvic fracture- determined break was not repairable.

Diagnosis (Attach laboratory reports):

pelvic break - euthanized

Please remit this form to the Nongame Branch's Raptor Management Coordinator following the protocol established in the cover memo.

**Kyle McCarty**

**From:** Kenneth Jacobson  
**Sent:** Monday, February 22, 2010 4:00 PM  
**To:** Susan MacVean  
**Cc:** Andi Rogers; Kyle McCarty  
**Subject:** FW: immature BAEA  
**Attachments:** Dead or Injured Bald and Golden Eagle Recovery Form.doc

Susan,

Yes we would like to get the eagle transferred down here. We will send it out next Monday to the NWHC for Necropsy. I would just refrigerate the carcass and not freeze it if at all possible. I will need one of these filled out for the eagle also.

As for the other eagle, the bone is not healing and Liberty suspects that there is likely an infection preventing the healing process. They are still working on the eagle in hopes of better results.

Thanks,

Kenneth "Tuk" Jacobson  
Bald Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]



Sign up for AZGFD eNews and receive the latest news and information on wildlife issues and events, outdoor tips, education programs, regulations, and more.  
<http://www.azgfd.gov/eservices/subscribe.shtml>

**From:** James Driscoll  
**Sent:** Monday, February 22, 2010 3:54 PM  
**To:** Kenneth Jacobson  
**Subject:** FW: immature BAEA

Thanks,

James T. Driscoll  
Raptor Management Coordinator

**Kyle McCarty**

**From:** Kenneth Jacobson  
**Sent:** Tuesday, February 23, 2010 2:36 PM  
**To:** Kyle McCarty  
**Subject:** FW: immature BAEA  
**Attachments:** BAEA.I40.22Feb2010.doc

Kyle,

I shipped this eagle out today, so nothing more for you to do. I also created a 2010 folder in the J:Drive Mortality folder where I saved the attached file.

Thanks,

Kenneth "Tuk" Jacobson  
Bald Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE UPDATE

**CASE:** 22941

**EPIZOO:**

2/25/2010

### FINDINGS TO DATE

**Submitter:**

Kenneth Jacobson  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 2/24/2010

**Specimen description/identification/Location:**

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Eagle, Bald	CARCASS			COCONINO	AZ

**Comment:**

2/25/10: The female juvenile Bald Eagle submitted from near Flagstaff, Arizona, was necropsied 2/24/10. This eagle was in fair body condition and good postmortem condition. Radiographic examination revealed a pelvic fracture with no associated hemorrhage, which suggests it was not a result of recent trauma.

The gall bladder was markedly distended and there was very viscous, dark green bile. Lead Poisoning is suspected however lab results to confirm this are pending. Swabs and various tissue samples have been submitted for other tests as well. Results are pending.

If you have questions regarding this case, contact:

*Signature on File*

\_\_\_\_\_  
Jennifer L. Bradsby,  
Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: [jbradsby@usgs.gov](mailto:jbradsby@usgs.gov)

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

**CASE:** 22941

Final Report

3/8/2010

**EPIZOO:**

**Legal**  **INV#:**

**Declassified**

**Submitter:**

Kenneth Jacobson  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 2/24/2010

**Specimen description/identification/Location:**

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Eagle, Bald	CARCASS			Coconino	AZ

**DIAGNOSIS**

Pelvic fracture from previous traumatic incident

**Comment:**

This juvenile female Bald Eagle was in fair body condition. The feathers of the ventral abdomen and tail were matted with green feces and urates. Movement of both legs was restricted and asymmetrical. Radiographs were taken and a pelvic fracture (also noted by the examining veterinarian) seemed to involve the tail bone and multiple bones of the pelvis. These fractures likely compromised prey capture and may have interfered with the innervation that controls defecation. There were no heavy metal densities in the radiograph of this eagle. Lead analysis of the liver was conducted but results were negative for lead poisoning. Screening tests on tracheal and cloacal swabs were negative for avian influenza viruses and West Nile virus.

Feet and feathers are being sent to the National Eagle Repository.

Carol U. Meteyer DIPL.ACVP  
Staff Diagnostic Pathologist

If you have questions regarding this case, contact:

Jennifer L. Bradsby  
Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

**Copies To:**  
MIGRATORY BIRD COORDINATOR (R2)  
USFWS Albuquerque (RO2), PO Box 1306, 2105 Osuna Road, NE, Albuquerque, NM 87103-1306



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

### Final Report

8/3/2010

**CASE:** 23050

**EPIZOO:**

**Legal INV#:**

**Declassified**

**Submitter:**

Kyle McCarty

Arizona Game & Fish/Phoenix

5000 W. Carefree Highway

Phoenix, AZ 85086

**Date Submitted:** 5/18/2010

**Specimen description/identification/Location:**

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Eagle, Bald	CARCASS	0679-03020	blue 25/A	Maricopa	AZ
002	Eagle, Bald	CARCASS, WHOLE BLOOD	0679-03021	blue 25/B	Maricopa	AZ
003	Eagle, Bald	CARCASS	0679-03030	blue 25/R	Maricopa	AZ

### DIAGNOSIS

001, 003: Tick ectoparasitism and West Nile virus infection

002: West Nile virus disease and tick ectoparasitism

### Comment:

8/3/2010

The diagnostic findings in these three Bald Eagle chicks are complicated. All three chicks had numerous small hemorrhages best visualized on the undersurface of the skin, and two of the chicks (Accessions 002 and 003) had many small soft-bodied ticks (presumed *Argas* sp. larval stages) on their skin or feathers. West Nile virus was detected in one or more tissues from each of the birds, but only one bird (002) had microscopic lesions compatible with disease caused by West Nile virus. Blood loss from ectoparasitism is compatible with the clinical pathology results (anemia, hypoproteinemia) from these birds, and the clinical signs (weakness, immobility, flaccid limb paralysis) are compatible with tick paralysis or severe blood loss from ectoparasitism. Therefore, tick parasitism is likely to have played a significant role in these chicks' deaths. The concurrent West Nile virus infections in all three birds is highly suspicious, but some birds do survive this viral infection; the lack of compatible microscopic lesions in two of the three chicks suggests the infection was not fatal at the time of their deaths. Nevertheless, this agent is likely to have at least complicated the effects of ectoparasitism, if not playing a primary role.

No anticoagulant rodenticides were detected in liver tissue from each of the three chicks. No lead was detected in liver tissue from each of the three chicks, and brain cholinesterase activity was normal in the two chicks that were tested (001, 002). Blood from chicks 002 and 003 was negative for botulinum type C and E toxins. No significant bacteria were isolated from liver tissue of chicks 001 and 002. Cloacal and tracheal swabs from all three chicks were negative on screening for avian influenza viruses.

**CASE:** 23050

# Final Report

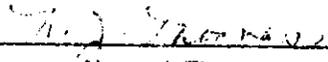
8/3/2010

**EPIZOO:**

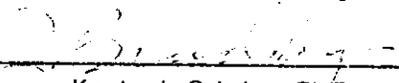
**Legal** INV#:

**Declassified**

**See attached necropsy records for individual specimen observations.**

  
\_\_\_\_\_  
Nancy J. Thomas DVM, DACVP  
Staff Diagnostic Pathologist

If you have questions regarding this case, contact:

  
\_\_\_\_\_  
Krysten L. Schuler Ph.D.  
Wildlife Disease Specialist

Phone: 608-270-2447 E-Mail: [kschuler@usgs.gov](mailto:kschuler@usgs.gov)

**Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.**

**Copies To:**

**NNE JUSTICE-ALLEN**

Arizona Game & Fish/Phoenix, 5000 W Carefree Highway, Phoenix, AZ 85086

**ENDANGERED SPECIES (RO2)**

USFWS Albuquerque (RO2), PO Box 1306, 2105 Osuna Road NE, Albuquerque, NM 87103-1306

Shipped to NWMC  
5-19-10



THE STATE OF ARIZONA  
**GAME AND FISH DEPARTMENT**

5000 W. CAREFREE HIGHWAY  
PHOENIX, AZ 85086-5000  
(602) 942-3000 • WWW.AZGFD.GOV

**GOVERNOR**  
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J.W. HARRIS, TUCSON  
**DIRECTOR**  
LARRY D. VOYLES  
**DEPUTY DIRECTORS**  
GARY R. HOVATTER  
BOB BROSCHEID



May 19, 2010

Ms. Krysten Schuler  
National Wildlife Health Center  
Biological Resources Division  
6006 Schroeder Road  
Madison, Wisconsin 53711-6223

Re: Dead bald eagle nestling from Maricopa County, Arizona

Dear Ms. Schuler:

In the accompanying cooler is one nestling (11-12 weeks old) bald eagle carcass for you to examine. Also included is a specimen history form.

This nestling was found alive and recovered on May 15, 2010 below its nest at the confluence of the Salt and Verde Rivers in Maricopa County, Arizona, and was taken to a wildlife rehabilitator. We had previously banded this bird with a blue color band 25R when it was about 9 weeks old. This eaglet died sometime overnight May 17-18, and it was from the same nest as the two dead nestlings (banded 25A and 25B) that I had sent for examination earlier this week.

All three nestlings were lethargic upon recovery, alert but with limited mobility, very thin, and dehydrated. They exhibited stiff legs and drooping wings. The nest is known to be infected with an unidentified species of large tick, and some small ticks were removed from the nestlings when they were taken to rehab. The adult pair was providing food and appeared well. However it is unknown how much the nestlings were actually eating prior to recovery. The vet at the rehab facility suspected botulism based on symptoms exhibited by each of the nestlings; blood samples from these birds were sent in the earlier shipment to test for this possibility.



THE STATE OF ARIZONA  
**GAME AND FISH DEPARTMENT**

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PHOENIX, AZ 85086-5000  
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**DIRECTOR**

LARRY D. VOYLES

**DEPUTY DIRECTORS**

GARY R. HOVATTER

BOB BROSCHEID



In my May 17 letter I noted that we had an additional mortality in a bald eagle nest a few miles upstream from where these three nestlings were found. Although we did recover this carcass, it was too far degraded and I am not sending it along for analysis.

Please inform me of any contributory cause of mortality. If you have any questions, please feel free to call me at (623) 236-7569 or email at [kmccarty@azgfd.gov](mailto:kmccarty@azgfd.gov). Finally, please return the cooler to me at the above address.

Sincerely,

Kyle McCarty

Bald Eagle Field Projects Coordinator

:km

cc: Kenneth Jacobson, Bald Eagle Management Coordinator  
Greg Beatty, U.S. Fish and Wildlife Service

Enclosure.

Document: 20100519.Birds.NWHC BAEA Mortality.doc

LIBERTY WILDLIFE \* MEDICAL CHART

Shipped to NWHC  
5-17-10

Species Bald Eagle  
Log Number 10-0880 Date In 5-14-10  
Estimated Age Fledgling Weight 6.16 j 2724  
Sex (if known) Male Band Info (if applicable) 25A

Initial Condition:

Brought in by Game & Fish. FOC Very thin, lethargic.  
Mouth, eyes vent clear. Wings, legs, feet ok. No Ex palpated.  
Not standing. Dehydrated

Date Comments

5/14 Administered 120 cc warm normal sal. (No) / FC  
Showed no interest in food. FF 1/2 rat  
Gave another ~~200cc~~ 220cc fluids SQ  
Drew blood to Antech for WNV, Asper, Lead, CBC, Chem  
In house Hct ~ 33  
7:00 PM 5/14/2010 4-60cc ~~Normal~~ SQ

5/15 GAVE 120cc WARM NORMAL SOL  
1:30 ped ~ 70g BOP  
5:30 ADMIN 120cc NORMAL SOL & FED 1/2 RAT KO

5-16-10 Dead by 7:00 Aline at 6:30

WT 7.0 lbs

**ANTECH DIAGNOSTICS**  
 17672-A Cowan Avenue Irvine CA 92614 Phone: 800-745-4725

**Avian Veterinary Service**  
 11825 N 70th  
 Scottsdale, AZ 85254  
 Tel: 480-998-0230  
 Fax: 480-998-0230

Client # 43207  
 Chart #

Accession No. <b>IRBD71132645</b>	Doctor NOT STATED	Owner <b>LIBERTY WILD</b>	Pet Name 10-0880 EAGLE	Received 05/16/2010
Species Avian	Breed	Sex	Pet Age 12W	Reported 05/16/2010 08:23 AM

Test Requested	Results	Reference Range	Units
<b>CBC (AVIAN AND EXOTICS)</b>			
WBC Estimate	9.0	4.0-10.0	1000/uL
RBC Morphology	RBC MORPHOLOGY NORMAL		
Blood Parasites	None Obs		
Heterophils	69	40-70	%
Heterophil Absolute	6210		
Bands	0		%
Absolutes	0		%
Lymphocytes	29	18-50	%
Absolutes	2610		
Monocytes	2	0-3	%
Absolutes	180		
Eosinophils	0	0-2	%
Absolutes	0		
Basophils	0	0-1	%
Absolutes	0		
Thrombocyte Estimate	Adequate		
<b>HEMATOCRIT (B/E)</b>			
HCT	27 (LOW)	42-55	%
<b>COMPREHENSIVE CHEMISTRIES</b>			
Total Protein	3.1	3.0-5.5	g/dL
Albumin	0.9 (LOW)	1.9-3.2	g/dL
	Verified by repeat analysis.		
Globulin	2.2	2-4	g/dL
SGOT (AST)	292	20-350	IU/L
Phosphorus	7.0 (HIGH)	3.0-5.5	mg/dL
Glucose	331	180-350	mg/dL
Calcium	10.5	7.6-12	mg/dL
Sodium	160	140-160	mEq/L
Potassium	4.8 (HIGH)	3.0-4.5	mEq/L
Chloride	128 (HIGH)	90-110	mEq/L
Cholesterol	261		mg/dL
CPK	2622 (HIGH)	50-400	IU/L
Uric Acid	11.4 (HIGH)	2.0-10.0	mg/dL

**AVIAN & EXOTIC LEAD LEVEL (Pending)**  
**AVIAN ASPERGILLUS ANTIBODY TITER (Pending)**

LIBERTY WILDLIFE \* MEDICAL CHART

Shipped to NWAC  
5-17-10

Species Bald Eagle  
 Log Number 10-0924 Date In 5/15/10  
 Estimated Age 10 wks Weight 5 lbs.  
 Sex (if known) Fe Band Info (if applicable) 25/B

Initial Condition:

Found on ground below nest - Acting neurological  
 This bird was found below nest 3 days ago  
 w/ head on ground - but seemed to act normal when  
 approached & was placed back into nest at that  
 time. OPME Nestling

Date Comments

5/15/10 - temp 105.7° Very down - The legs are  
 extending forward at the hock & seems to  
 have paralysis. Mucous membranes ~~white~~  
 a little pale, yellowish tinge to beak  
 Breathing is labored. Very thin. Needs  
 further assessment of limbs when less stressed

Blood Arvan Compch. KO KO

Lead  
 WNV Ant/PCR } Antch

Administered 120cc Normasol SQ\*

1:30 feed ~ 70g BOP. OK

5:30 ADMIN 120cc NORMASOL & FED 1/2 RAT CUT UP KO UP

5/16/10 7:00am Trouble holding up head, cannot stand, can flap wing  
 Blood drawn for botulism test to Madison, 120cc Normasol SQ

120cc H<sub>2</sub>O via syringe tube

9:00am force feed stew meat ~ 220gm

LIBERTY WILDLIFE \* MEDICAL CHART  
CONTINUATION REPORT

Species Bald Eagle Sex \_\_\_\_\_  
Log Number 10-0921 Date in 5/15/10  
Estimated Age \_\_\_\_\_ Weight on arrival \_\_\_\_\_ Band No. 25B  
Initial Condition: \_\_\_\_\_

**Continuation Report:**

5-10-10 1300 @ou here. Assessed pt. Given 120cc H<sub>2</sub>O via tube. 120cc  
SS narinosol. Still down - but somewhat feisty. (D)  
Given @ 1109m stew meat (D)  
1600 @ou here. 180cc H<sub>2</sub>O per tube. "color" improves. (D)  
1730: Found dead in Cage. (U)

**ANTECH DIAGNOSTICS**  
 17672-A Cowan Avenue Irvine CA 92614 Phone: 800-745-4725

**Avian Veterinary Service**

11825 N 70th  
 Scottsdale, AZ 85254  
 Tel: 480-998-0230  
 Fax: 480-998-0230

Client # 43207  
 Chart # 10-0921

Accession No. <b>IRBD71132387</b>	Doctor ORR	Owner <b>LIBERTY WILDL</b>	Pet Name BALD EAGLE	Received 05/16/2010
Species Avian	Breed	Sex F	Pet Age 10W	Reported 05/16/2010 08:23 AM

Test Requested	Results	Reference Range	Units
<b>CBC (AVIAN AND EXOTICS)</b>			
WBC Estimate	9.0	4.0-10.0	1000/uL
RBC Morphology			
RBC MORPHOLOGY		NORMAL	
Blood Parasites	None Obs		
Heterophils	77 (HIGH)	40-70	%
Heterophil Absolute	6930		
Bands	0		%
Absolutes	0		
Lymphocytes	21	18-50	%
Absolutes	1890		
Monocytes	2	0-3	%
Absolutes	180		
Eosinophils	0	0-2	%
Absolutes	0		
Basophils	0	0-1	%
Absolutes	0		
Thrombocyte Estimate	Adequate		
<b>HEMATOCRIT (B/E)</b>			
HCT	30 (LOW)	42-55	%
<b>COMPREHENSIVE CHEMISTRIES</b>			
Total Protein	3.6	3.0-5.5	g/dL
Albumin	1.0 (LOW)	1.9-3.2	g/dL
Verified by repeat analysis.			
Globulin	2.6	2-4	g/dL
SGOT (AST)	1324 (HIGH)	20-350	IU/L
Phosphorus	5.4	3.0-5.5	mg/dL
Glucose	298	180-350	mg/dL
Calcium	10.0	7.6-12	mg/dL
Sodium	160	140-160	mEq/L
Potassium	5.0 (HIGH)	3.0-4.5	mEq/L
Chloride	130 (HIGH)	90-110	mEq/L
Cholesterol	194		mg/dL
CPK	1516 (HIGH)	50-400	IU/L
Uric Acid	9.7	2.0-10.0	mg/dL

AVIAN & EXOTIC LEAD LEVEL (Pending)

WEST NILE TITER (Pending)

WEST NILE TITER (PCR) (Pending)

## James Driscoll

---

**From:** Kenneth Jacobson  
**Sent:** Wednesday, May 19, 2010 3:49 PM  
**To:** James Driscoll  
**Subject:** Lead Data  
**Attachments:** Known lead poisoning mortalities table.doc

Thanks,

Kenneth "Tuk" Jacobson  
Bald Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]

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Known lead poisoning mortalities and lead concentrations in bald eagles recovered in Arizona.

Bald Eagle/Location	Date Recovered	Liver Lead Levels ( $\mu\text{g/dL}$ )
Saguaro Lake	January 1998	940
Scholz Lake	Fall 1998	430
Pintail Lake	March 1999	495.6
Young	Fall 1999	230.5 <sup>2</sup>
Camp Verde	Fall 1999	156.6 <sup>2</sup>
Kaibab Lake	March 2000	382.8
East Clear Creek	April 2000	334.7
Fools Hollow Lake	March 2001	427.7
Cosnino	January 2002	415
Lake Elaine	March 2002	485.2
Lower Lake Mary	March 2002	481.7
Horseshoe Dam Subadult <sup>1</sup>	January 2003	300.5
Whiteriver	January 2003	600 <sup>3</sup>
Show Low Wal-Mart	February 2003	360.4
Stoneman Lake	March 2003	135.2
Long Lake	March 2003	133
Wilcox	February 2004	234.3
White Horse Lake	March 2004	131.1
K.A. Ranch	March 2004	300
Young	March 2004	113
River Reservoir	March 2004	75.3 <sup>3</sup>
Clifton	April 2004	81.5
Little Colorado River	March 2007	263.9
Scott Reservoir	January 2009	184.5

<sup>1</sup> Arizona hatched bald eagle.

<sup>2</sup> Femur lead levels (dry weight).

<sup>3</sup> Blood lead levels before treatment.

## James Driscoll

---

**From:** Kenneth Jacobson  
**Sent:** Wednesday, May 19, 2010 4:04 PM  
**To:** James Driscoll  
**Attachments:** Raw Lead Data.xlsx

Thanks,

Kenneth "Tuk" Jacobson  
Bald Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]

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Sample/Source/Death	glcNum	Species	DeathMonth	atnDeath	Year
Lead -- 26.39 ppm wet weight	07D01	BAEA	3	7	2007
Lead -- 30.05 ppm wet	03D03	BAEA	1	31	2003
Lead -- 7.53	04D05	BAEA	3	20	2004
Lead -- 23.43	04D02	BAEA	2	26	2004
Lead. Liver 18.45ppm; kidney=47.99 ppm wet wt.	09D01	BAEA	2	20	2009
Lead -- 48.52 ppm wet	03D02	BAEA	3	1	2002
Lead -- 43 ppm	98D03	BAEA			1998
Lead -- 15.66 Dry (femur)	99D02	BAEA			1999
Lead -- 23.05 ppm dry (femur)	99D01	BAEA			1999
Lead -- 94 ppm	98D01	BAEA	1	15	1998
Lead 4.58 ppm wet post chelation. >60.0 ppm blood	98J13	BAEA	1	16	2003
Lead -- 41.5 ppm wet weight	02D03	BAEA	1	27	2002
Lead -- 36.04 ppm wet weight	03D06	BAEA	2	10	2003
Lead -- 42.77 ppm wet weight	02D04	BAEA	3	10	2001
Lead -- 49.56 ppm wet weight	99D03	BAEA	3	12	1999
Lead -- 13.52 ppm wet weight	03D04	BAEA	3	15	2003
Lead -- 30.0 ppm	04D03	BAEA	3	19	2004
Lead -- 11.3	04D04	BAEA	3	21	2004
Lead -- 13.11ppm	04D06	BAEA	3	21	2004
Lead -- 48.17 ppm wet weight	02D01	BAEA	3	22	2002
Lead -- 38.28 ppm wet weight	00D01	BAEA	3	28	2000
Lead -- 13 ppm wet weight	03D05	BAEA	4	1	2003
Lead -- 33.47 ppm wet weight	00D02	BAEA	4	8	2000
Lead -- 8.15 ppm	04D07	BAEA	4	12	2004

	Latitude	UTMX	UTMY	Zone	AreaName
	34.0983	-109.3670	650640	3774059	12 Little Colorado River
	33.9440	-111.6830			Cliff
			645036	3767288	12 East end of River Reservoir, AZ
			618681	3555500	12 11 miles S. of Wilcox, AZ
			595508	3781708	12 Scott Reservoir
			446000	3893500	12 Flagstaff
			408303	3894811	12 Scholz Lake
					Camp Verde
					Young
					Saguaro Lake Helipad
					White River
					Cosnino
					Showlow, Walmart
					Fools Hollow Lake
					Pintail Lake
					Stoneman
					KA Ranch/Horseshoe lake
					Spring Creek Ranch, Sierra Anches, AZ
					SE side of Whitehorse Lake
					Lower Lake Mary
					Kaibab Lake
					Flagstaff
					East Clear Creek
					Clifton, AZ

## Comments

Lead poisoning.

USFWS investigation - Kate Looney

Lead levels taken post chelation.

629-37345; VID BL/Silver --> Banded as migrant juvenile in Montana. NAD 27

Coordinates in NAD83.

WM picked up @ continental area, Flagstaff ... Lake Elaine

reported January 1999, but occurred some time before.

Died while in transport to Liberty Wildlife Rehab

Legs chopped off post mortem -- transferred by Preston Fant

Wintering adult found dead. Andi Roger delivered the bird, sent to N.W.H.C.

Died face down with wings spread

SAD sent to ACH on 4/18/03

T14N R12E Sec. 19

## James Driscoll

---

**From:** James Driscoll  
**Sent:** Wednesday, May 19, 2010 4:06 PM  
**To:** 'Carrie\_Marr@fws.gov'  
**Cc:** 'jean\_calhoun@fws.gov'; 'Greg\_Beatty@fws.gov'; Kenneth Jacobson; Kyle McCarty; Jorge Canaca; Eric Gardner; Mike Senn; Mike Rabe  
**Subject:** Bald Eagle Mortality Locations from Lead Poisoning  
**Attachments:** Known lead poisoning mortalities table.doc; Raw Lead Data.xlsx

Carrie,

Attached is the information you requested. Not all of the Bald Eagle Mortality Forms are filled out completely by the reporting party, therefore we only have actual GPS Coordinates for seven of these occurrences. We figured you could put a dot on a map as easily as we could for the other locations.

The Department requests that when you present this information to your colleagues, you frame the presentation with some facts about the national and local bald eagle population. That is, even though the information you will be presenting is threat to some individual bald eagles, the National population appears to be growing, and the local Arizona bald eagle population has grown over 600% since the species was listed. Focusing more locally, we ask that you also mention that the bald eagles discovered in Arizona with lead poisoning may have been contaminated in other states along their migration corridor as research shows it takes an average of 12 days after contamination for a bald eagle exhibit signs of lead poisoning. Also we request that you mention that only 3 lead poisoned bald eagles recovered since 1998 have been identified from the Arizona population.

If you need any further assistance, please let me know.

Thanks,

James T. Driscoll  
Raptor Management Coordinator  
Arizona Game and Fish Department  
5000 West Carefree Highway  
Phoenix, Arizona 85086

Office: 623-236-7581  
Fax: 623-236-7926

Note: My cell phone number 602-542-8812 is being disconnected. Please contact my office phone number if you need my assistance.

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# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

### Final Report

9/1/2010

**CASE:** 23170

**EPIZOO:**

**Legal**  **INV#:**

**Declassified**

**Submitter:**

Kyle McCarty  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 7/28/2010

**Specimen description/identification/Location:**

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Eagle, Bald	CARCASS			Coconino	AZ

### DIAGNOSIS

1. Severe crushing trauma to skull, neck, brain and eyes due to vehicle impact (blunt and crushing trauma)
2. Internal hemorrhage (internal bleeding) due to vehicle impact

**Comment:**

9/1/2010

The cause of death in this well-nourished adult male Bald Eagle was severe crushing trauma to the head with extensive internal bleeding. This trauma was consistent with impact by one or more vehicles.

Swabs of the trachea and cloaca were negative for avian influenza viruses by polymerase chain reaction (PCR) tests. Special virus cultures for West Nile virus on the spinal cord (no brain remained for any tests), spleen, and kidney were negative. No pathogenic bacteria (e.g., *Salmonella* spp., *Pasteurella* spp., etc.) were isolated from the liver. Levels of lead in the liver were below detection limits (<0.25 ppm wet weight).

David Earl Green DVM, DACVP  
Staff Diagnostic Pathologist

If you have questions regarding this case, contact:

Jennifer L. Bradsby

Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

**Copies To:**

MIGRATORY BIRD COORDINATOR (R2)

USFWS Albuquerque (RO2), PO Box 1306, 2105 Osuna Road, NE, Albuquerque, NM 87103-1306



# NATIONAL WILDLIFE HEALTH CENTER

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608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE UPDATE

**CASE:** 23170      **EPIZOO:**

8/9/2010

## FINDINGS TO DATE

**Submitter:**

Kyle McCarty  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 7/28/2010

**Specimen description/identification/Location:**

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Eagle, Bald	CARCASS			Coconino	AZ

**Comment:**

The adult male Bald eagle submitted from Coconino County, Arizona, was necropsied 8/4/10. This eagle was found dead on 3/5/10<sup>09</sup> along Interstate 17 Northbound. Necropsy revealed a severely crushed and flattened skull. Additionally, there was a fracture of the sternum and internal hemorrhage. These findings suggest this eagle died of crushing trauma or impact trauma by a vehicle. Swabs and tissue samples have been submitted for further tests to rule out any underlying illness. Results are pending. Significant results will be reported to you.

If you have questions regarding this case, contact:

*Jennifer L. Bradsby*

Jennifer L. Bradsby ,

Field Investigation Team Case Manager

Phone: 608-270-2456

E-Mail: jbradsby@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

**Kyle McCarty**

**From:** Kenneth Jacobson  
**Sent:** Thursday, March 05, 2009 10:59 AM  
**To:** Beatty Dude; Kyle McCarty  
**Cc:** James Driscoll  
**Subject:** FW: eagle hit on I-17 today  
**Attachments:** BAEA.I17SRockyPark.03052009.doc

FYI.

**From:** Susan MacVean  
**Sent:** Thu 3/5/2009 10:06 AM  
**To:** Kenneth Jacobson  
**Cc:** James Driscoll  
**Subject:** eagle hit on I-17 today

Tuk, here's the form on this eagle- near adult (a little frosting on body feathers and some brown feathers on its crest on an otherwise white head). Feels fat to me. Major bummer...We're getting the elk carcasses away from the highway so no more eagles get hit.

By the way, let me know if this is no longer the current form.

At the latest, I can bring it down next week (Friday) when I come down for the falconry meeting. For now it's in our freezer.

Susi

Susan MacVean, Nongame Specialist  
Arizona Game and Fish Department  
3500 S. Lake Mary Rd., Flagstaff, AZ 86001  
928 214-1250, fax 928 779-1825

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**Arizona Game and Fish Department  
Nongame and Endangered Wildlife Program  
2221 West Greenway Road  
Phoenix, Arizona 85023  
Phone: (602) 789-3500  
FAX: (602) 789-3926**



091002  
shipped to  
NWAC  
7-27-10

**DEAD OR INJURED BALD EAGLE RECOVERY FORM**

Name: Susan MacVean Work Unit: FOR2

Telephone: 928 214-1250 E-mail: smacvean@azgfd.gov

Date collected: 3/5/09 0830 Collected By: citizen

Found By: 1<sup>st</sup> reported by DPS then by citizen Location: I-17, N-bound, MP 313.5, S of Rocky Park

County: Coconino UTM's: \_\_\_\_\_

Condition Found (dead, injured): 1<sup>st</sup> reported as still alive but citizen that brought to our office picked it up dead. Eagle still warm. Apparently feeding on fresh elk carcass.

Age: 4 yrs old? Adult: Near Adult Subadult: \_\_\_\_\_ Sex: \_\_\_\_\_

Clinical signs (Any unusual behavior or physical appearance.): appears healthy (i.e., not emaciated) but should be tested for lead

Area description: (Habitat in area of discovery): ponderosa pine, eagles regularly seen along this stretch of I-17 in winter

Comments (Additional information that can aid diagnosing cause of injury or mortality):  
\_\_\_\_\_  
\_\_\_\_\_

Diagnosis (Attach laboratory reports):  
\_\_\_\_\_  
\_\_\_\_\_

Please remit this form to the Nongame Branch's Bald Eagle Management Coordinator following the protocol established in the cover memo.



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

### Final Report

9/10/2010

**CASE:** 23171

**EPIZOO:**

Legal  **INV#:**

Declassified

**Submitter:**

Kyle McCarty

Arizona Game & Fish/Phoenix

5000 W. Carefree Highway

Phoenix, AZ 85086

**Date Submitted:** 7/28/2010

**Specimen description/identification/Location:**

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Eagle, Bald	CARCASS			Coconino	AZ

### DIAGNOSIS

Lead poisoning (plumbism)

**Comment:**

9/10/2010

The probable cause of death in this emaciated adult male Bald Eagle was lead poisoning (plumbism). This diagnosis was confirmed by toxicological analysis of the liver; liver lead levels were 35.11 ppm wet weight, which is considered markedly elevated to a toxic level. No metal foreign bodies were found in the gastrointestinal tract, so the source of the lead remains unknown. Despite toxic and lethal levels of lead in the liver, it is possible this eagle was so impaired by plumbism that its immediate cause of death was an attack by a predator. The head of this eagle was completely detached from its neck, and there was extensive drying and scavenging of skin and muscles of the head and neck.

Swabs of the trachea and cloaca were negative for avian influenza viruses by polymerase chain reaction (PCR) tests. Special virus cultures for West Nile virus on the brain, spleen, and kidney were negative. No pathogenic bacteria were isolated from the liver. No other diagnostic tests were attempted on this eagle.

David Earl Green DVM, DACVP  
Staff Diagnostic Pathologist

If you have questions regarding this case, contact:

Jennifer L. Bradsby  
Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

**Copies To:**

MIGRATORY BIRD COORDINATOR (R2)

USFWS Albuquerque (RO2), PO Box 1306, 2105 Osuna Road, NE, Albuquerque, NM 87103-1306



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE UPDATE

**CASE:** 23171      **EPIZOO:**

8/9/2010

## FINDINGS TO DATE

**Submitter:**

Kyle McCarty  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 7/28/2010

**Specimen description/identification/Location:**

ACC	SPECIES	SPECIMEN TYPE	BAND NUMBER	SUBMITTER'S ID	COUNTY	STATE
001	Eagle, Bald	CARCASS			Coconino	AZ

**Comment:**

The adult male Bald eagle submitted from Flagstaff was necropsied 8/3/10. This eagle was decapitated with extensive scavenging of soft tissues of the head and neck. Visceral organs were markedly atrophied and shrunken. There was no evidence of singed or burned feathers or scales on feet that would indicate collision with high tension power lines (noted on specimen history form). Swabs and various tissue samples have been submitted for further tests in order to determine the cause of death (including tests for lead poisoning). Results are pending. Significant results will be reported to you.

If you have questions regarding this case, contact:

*Jennifer L. Bradsby*

Jennifer L. Bradsby ,  
Field Investigation Team Case Manager

Phone: 608-270-2456      E-Mail: [jbradsby@usgs.gov](mailto:jbradsby@usgs.gov)

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.



Arizona Game and Fish Department  
 Nongame and Endangered Wildlife Program  
 2221 West Greenway Road  
 Phoenix, Arizona 85023  
 Phone: (602) 789-3500  
 FAX: (602) 789-3926



shipped to  
 NWHC  
 7-27-10

16702

**DEAD OR INJURED BALD EAGLE RECOVERY FORM**

Name: Erin Turnpaugh Work Unit: FOR2

Telephone: [REDACTED] E-mail: ETurnpaugh@azgfd.gov

Date collected: 4/4/10 Collected By: Erin Turnpaugh

Found By: Home owner Location: E. lake Country Rd and N. Lake Hills Dr.

County: Coconino UTM's: 12 S 0446047, 3893376 WGS 84

Condition Found (dead, injured): Dead

Age: \_\_\_\_\_ Adult: XX Subadult: \_\_\_\_\_ Sex: \_\_\_\_\_

Clinical signs (Any unusual behavior or physical appearance.): bird had been there for a while -- neck and head flesh gone...

Area description: (Habitat in area of discovery): Found in a subdivision, within 100 yards of a house. Found underneath high tension power lines.

Comments (Additional information that can aid diagnosing cause of injury or mortality):  
Might be worth checking for electrocution & lead poisoning

Diagnosis (Attach laboratory reports):  
 \_\_\_\_\_  
 \_\_\_\_\_

Please remit this form to the Nongame Branch's Bald Eagle Management Coordinator following the protocol established in the cover memo.

**Kyle McCarty**

**From:** Kenneth Jacobson  
**Sent:** Monday, April 12, 2010 12:26 PM  
**To:** Kyle McCarty  
**Subject:** FW: Eagle form  
**Attachments:** BAEADeAdAdult.Turnpaugh.Flagstaff.4April2010.doc

FYI

Thanks,

Kenneth "Tuk" Jacobson  
Bald Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]

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**From:** Susan MacVean  
**Sent:** Monday, April 12, 2010 12:15 PM  
**To:** Kenneth Jacobson  
**Cc:** James Driscoll  
**Subject:** FW: Eagle form

Tuk --

Here is a form for an adult eagle found under high tension powerlines here in Flagstaff. There are a couple of Phx folks here today that I can send it down with or I can drop it off tomorrow on my way south.

Jamey, I am cc'ing you in case Tuk is not around.

Susi

**From:** Erin Turnpaugh  
**Sent:** Monday, April 12, 2010 11:16 AM  
**To:** Susan MacVean  
**Subject:** RE: Eagle form

## James Driscoll

---

**From:** Kyle McCarty  
**Sent:** Monday, September 27, 2010 3:51 PM  
**To:** Susan MacVean  
**Cc:** Kenneth Jacobson; James Driscoll  
**Subject:** bald eagle mortality lab report -- lead  
**Attachments:** 2010.09.27.PDF

Susi,

Attached is the final lab report for a bald eagle recently sent for testing, collected by Erin Turnpaugh 4/4/10 (this is the bird that was found in a subdivision missing the head). Toxic lead level was found.

Kyle M. McCarty  
Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
623-236-7569



NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road
Madison, Wisconsin 53711-6223
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DIAGNOSTIC SERVICES CASE REPORT

Final Report

9/10/2010

CASE: 23171

EPIZOO:

Legal [ ] INV#:

Declassified [ ]

Submitter:

Kyle McCarty
Arizona Game & Fish/Phoenix
5000 W. Carefree Highway
Phoenix, AZ 85086

Date Submitted: 7/28/2010

Specimen description/identification/Location:

Table with columns: ACC, SPECIES, SPECIMEN TYPE, BAND NUMBER, SUBMITTER'S ID, COUNTY, STATE. Row 1: 001, Eagle, Bald, CARCASS, Coconino, AZ

DIAGNOSIS

Lead poisoning (plumbism)

Comment:

9/10/2010
The probable cause of death in this emaciated adult male Bald Eagle was lead poisoning (plumbism). This diagnosis was confirmed by toxicological analysis of the liver; liver lead levels were 35.11 ppm wet weight, which is considered markedly elevated to a toxic level. No metal foreign bodies were found in the gastrointestinal tract, so the source of the lead remains unknown. Despite toxic and lethal levels of lead in the liver, it is possible this eagle was so impaired by plumbism that its immediate cause of death was an attack by a predator. The head of this eagle was completely detached from its neck, and there was extensive drying and scavenging of skin and muscles of the head and neck.

Swabs of the trachea and cloaca were negative for avian influenza viruses by polymerase chain reaction (PCR) tests. Special virus cultures for West Nile virus on the brain, spleen, and kidney were negative. No pathogenic bacteria were isolated from the liver. No other diagnostic tests were attempted on this eagle.

Handwritten signature of David Earl Green

David Earl Green DVM, DACVP
Staff Diagnostic Pathologist

If you have questions regarding this case, contact:

Handwritten signature of Jennifer L. Bradsby

Jennifer L. Bradsby
Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

Copies To:
MIGRATORY BIRD COORDINATOR (R2)
USFWS Albuquerque (RO2), PO Box 1306, 2105 Osuna Road, NE, Albuquerque, NM 87103-1306

## James Driscoll

---

**From:** Kenneth Jacobson  
**Sent:** Monday, November 01, 2010 10:00 AM  
**To:** James Driscoll; Kyle McCarty  
**Cc:** Beatty Dude  
**Subject:** Bald Eagle Rescue near Perkinsville

FYI,

I went out on a bald eagle rescue Sunday (10/31) to retrieve an adult bald eagle. Personnel from the Verde Canyon Train noticed an adult bald eagle on the ground on the evening of 10/30. I received the call to respond ~6:45 p.m. While in route, I received a second call reporting that the eagle had moved up onto some cliffs and that the rescue was apparently a false alarm (nothing I could do if it was flighted). To be on the safe side, the Verde Canyon Train checked for a down eagle at first light of 10/31. The eagle was back on the ground. At 7:25 a.m., I was again called to action. After traveling to the Perkinsville area on a VVRR high car, the adult bald eagle was eventually found on the ground standing in a puddle of water near the Verde river. Upon first capture, it was apparent that the eagle had difficulty breathing and significant amounts of smelly fluid was being expelled. Upon arrival back at the railroad station, Liberty Wildlife was notified of my impending arrival and I transported the eagle to their facilities. Initial blood tests yielded high blood lead levels. Additional blood work is being performed to determine the cause of respiratory issues. Awaiting updates from Liberty on birds condition.

This adult bald eagle was an unbanded adult female bald eagle. There was another adult bald eagle perched and flying in the area. Both breeding adults were banded in 2010, so it is unclear if this individual is new to the pair or a floater/wintering eagle.

Thanks,

Kenneth "Tuk" Jacobson  
Bald and Golden Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]

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## Kenneth Jacobson

---

**From:** Kenneth Jacobson  
**Sent:** Monday, November 01, 2010 10:00 AM  
**To:** James Driscoll; Kyle McCarty  
**Cc:** Beatty Dude  
**Subject:** Bald Eagle Rescue near Perkinsville

FYI,

I went out on a bald eagle rescue Sunday (10/31) to retrieve an adult bald eagle. Personnel from the Verde Canyon Train noticed an adult bald eagle on the ground on the evening of 10/30. I received the call to respond ~6:45 p.m. While in route, I received a second call reporting that the eagle had moved up onto some cliffs and that the rescue was apparently a false alarm (nothing I could do if it was flighted). To be on the safe side, the Verde Canyon Train checked for a down eagle at first light of 10/31. The eagle was back on the ground. At 7:25 a.m., I was again called to action. After traveling to the Perkinsville area on a VVRR high car, the adult bald eagle was eventually found on the ground standing in a puddle of water near the Verde river. Upon first capture, it was apparent that the eagle had difficulty breathing and significant amounts of smelly fluid was being expelled. Upon arrival back at the railroad station, Liberty Wildlife was notified of my impending arrival and I transported the eagle to their facilities. Initial blood tests yielded high blood lead levels. Additional blood work is being performed to determine the cause of respiratory issues. Awaiting updates from Liberty on birds condition.

This adult bald eagle was an unbanded adult female bald eagle. There was another adult bald eagle perched and flying in the area. Both breeding adults were banded in 2010, so it is unclear if this individual is new to the pair or a floater/wintering eagle.

Thanks,

Kenneth "Tuk" Jacobson  
Bald and Golden Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
Cell: (928) 941-0170

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## Kyle McCarty

---

**From:** Jan Miller [REDACTED]  
**Sent:** Tuesday, November 16, 2010 12:17 PM  
**To:** Kyle McCarty  
**Subject:** RE: Bald Eagle Rescue near Perkinsville

Hi Kyle,

Kathy is interested in getting a necropsy done on the bird. She would like to have the liver tested to get a different reading on the lead level. She will also be able to see what else was going on. I will keep you posted.

---

**From:** Kyle McCarty [mailto:KMcCarty@azgfd.gov]  
**Sent:** Monday, November 15, 2010 5:30 PM  
**To:** Jan Miller  
**Subject:** FW: Bald Eagle Rescue near Perkinsville

Hi Jan,

Tuk told me this bald eagle died over the weekend. Aside from nuclear levels of lead, were there any other health complications? I'm going to enter this in our mortality database.

Thanks.

### Kyle M. McCarty

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway | Phoenix, AZ 85086  
623-236-7569



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---

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**Sent:** Monday, November 01, 2010 10:00 AM  
**To:** James Driscoll; Kyle McCarty  
**Cc:** Beatty Dude  
**Subject:** Bald Eagle Rescue near Perkinsville

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high blood lead levels. Additional blood work is being performed to determine the cause of respiratory issues. Awaiting updates from Liberty on birds condition.

This adult bald eagle was an unbanded adult female bald eagle. There was another adult bald eagle perched and flying in the area. Both breeding adults were banded in 2010, so it is unclear if this individual is new to the pair or a floater/wintering eagle.

Thanks,

Kenneth "Tuk" Jacobson  
Bald and Golden Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]

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## Kyle McCarty

---

**From:** Mike Rabe  
**Sent:** Monday, November 08, 2010 11:38 AM  
**To:** Ingested Lead and Wildlife Team  
**Subject:** FW: Every Day in the Verde Canyon is Eagle Watch

FYI

**From:** Kenneth Jacobson  
**Sent:** Monday, November 08, 2010 11:36 AM  
**To:** Mike Rabe  
**Cc:** Brian Wakeling  
**Subject:** RE: Every Day in the Verde Canyon is Eagle Watch

Yes, The diagnosis was acute lead poisoning with blood lead levels of 725 ppm. Toxic threshold for bald eagles is 10 ppm. I just received a call from Liberty and the eagle is responding well to treatment with the latest blood lead level being 33 ppm. The bird will need another round or two of chelation treatment, but outlook is good on recovery.

Thanks,

Kenneth "Tuk" Jacobson  
Bald and Golden Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]

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**From:** Mike Rabe  
**Sent:** Friday, November 05, 2010 8:11 AM  
**To:** Kenneth Jacobson  
**Cc:** Brian Wakeling  
**Subject:** FW: Every Day in the Verde Canyon is Eagle Watch

Tuck,

Was the diagnosis lead poisoning?

**From:** Brian Wakeling  
**Sent:** Friday, November 05, 2010 7:28 AM  
**To:** Mike Rabe  
**Subject:** FW: Every Day in the Verde Canyon is Eagle Watch

FYI

Brian Wakeling  
Game Branch Chief  
623-236-7385

**From:** Steve Sams [REDACTED]  
**Sent:** Thursday, November 04, 2010 7:24 PM  
**To:** [REDACTED]  
**Cc:** Brian Wakeling  
**Subject:** Re: Every Day in the Verde Canyon is Eagle Watch

Your cooperation with the Arizona Game and Fish Department relating to the bald eagles along the Verde is admirable. However, you may wish to confer with them about your statement of "suffering from possible lead poisoning". Who made that determination? The inference is that hunters and fishermen have caused this eagle to be ill. Did a veterinarian make that determination? This sounds like the verbiage coming from the Center For Biological Diversity and the Humane Society. AZGFD is on record as opposing the proposed ban on lead shot and sinkers forwarded by these organizations. If you wish to maintain credibility with those that you are sending your emails, you may want to verify facts before you forward statements as fact.

Steve Sams  
Prescott Valley, AZ

**From:** [Verde Canyon Railroad](#)  
**Sent:** Thursday, November 04, 2010 5:10 PM  
**To:** [REDACTED]  
**Subject:** Every Day in the Verde Canyon is Eagle Watch

Having trouble viewing this email? [Click here](#)

You're receiving this email because of your relationship with The Verde Canyon Railroad. Please [confirm](#) your continued interest in receiving email from us.

You may [unsubscribe](#) if you no longer wish to receive our emails.



~~~~~

# Verde Canyon Railroad

**and Liberty Wildlife make a great team!  
November, 2010**

~~~~~

**It is Eagle Watch Every Day in the Verde Canyon..not just during a Season.**

~~~~~



The rescued eagle is responding and is hungry

During an afternoon excursion on Saturday, October 30th, keen-eyed Verde Canyon Railroad staff spotted an adult bald eagle close to the tracks. The bird appeared in peril, with its wings spread across a large rock. Via radio, the crew called the supervisor at the train depot about the sighting and scouted for the animal on the return trip from Perkinsville. By this time, the eagle had moved to a nearby low cliff overhanging the tracks.

Over the past two decades of operation, the Verde Canyon Railroad has maintained a strong relationship with the Arizona Game & Fish Department, actively involved with their Eagle Watch Program. Recently the Railroad adopted Liberty Wildlife, an animal rescue and rehabilitation center in Scottsdale, as a corporate charity. Because of this association, the Verde Canyon Railroad staff has become more knowledgeable about the habits and actions of the feathered residents in the Canyon.

Recognizing the potentially serious signs of distress exhibited by the eagle, the train employees also were sensitive to unnecessary human intervention. The decision was made to return at sunrise the next day to see if the eagle was still grounded where it had been spotted.

Early Sunday morning, from their vantage point on a high-rail vehicle, Verde Canyon Railroad Naturalist Brandi Lee Cooper and Road Master John Doull spotted the eagle sitting in water near the river's edge. The bird's status was relayed to Arizona Fish & Game eagle expert Kenneth "Tuck" Jacobson in Prescott Valley.

Jacobson determined that the eagle's life was in danger and human intervention was imperative. The high-rail returned to the depot, picked up Jacobson and within an hour arrived back to the ailing eagle's location. As Jacobson collected the bird and prepared it to be transported to Liberty Wildlife he noted another eagle continually circling overhead. "His actions were in no way threatening to us and he was obviously concerned for his mate" said Jacobson.

Suffering from possible lead poisoning with respiratory involvement, the eagle is now being treated by professionals. It has been determined that the Eagle is approximately 5 years old and is female. Liberty Wildlife staff is confident of a full recovery and an eminent release back into the Verde Canyon soon.

Lead shot and lead sinkers used in recreational hunting and fishing have an adverse effect on scavenger animals, including eagles and other birds of prey. If they consume carrion tainted with lead, it poisons their system and generally results in death. Hunters and fishermen are encouraged to use copper shot and sinkers which do not unfavorably affect waterfowl and wildlife.



While Liberty Wildlife educates about animal rehabilitation and responsible conservation, Verde Canyon Railroad provides an unparalleled learning opportunity by placing people in the cohesive environment Liberty Wildlife envisions for all animals.

To make reservations on Verde Canyon Railroad, call 800-293-7245 or visit [www.verdecanyonrr.com](http://www.verdecanyonrr.com) to become part of a great journey. To learn more about Liberty Wildlife, visit [www.libertywildlife.org](http://www.libertywildlife.org).

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# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

### Final Report

6/30/2011

**CASE:** 23355

**EPIZOO:**

Legal  **INV#:**

Declassified

**Submitter:**

Kyle McCarty  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 12/2/2010

**Specimen description/identification/Location:**

| ACC | SPECIES       | SPECIMEN TYPE | BAND NUMBER | SUBMITTER'S ID | COUNTY  | STATE |
|-----|---------------|---------------|-------------|----------------|---------|-------|
| 001 | Eagle, Golden | CARCASS       |             |                | Yavapai | AZ    |

**DIAGNOSIS**

Emaciation  
Chronic deformity, left metatarsal region, due to healed fracture

**Comment:**

6/30/2011

This juvenile female Golden Eagle was severely emaciated. The bird's left leg below the hock was rotated and bent medially due to a fully healed fracture, and the bottom of the left foot had a chronic ulcer ("bumblefoot lesion") indicating abnormal weight-bearing over a long period of time, but the foot joints and tendons moved normally. The effect of the leg deformity is uncertain, but it may have contributed to the bird's debilitation. No lead was detected in liver tissue. Brain cholinesterase activity was within normal limits, ruling out poisoning by organophosphate pesticides. Attempts to isolate West Nile virus from pooled kidney/spleen tissue were negative. Cloacal and tracheal swabs were negative on screening for avian influenza viruses.

No food items were present in the stomach, but dark bloody fluid there suggests it may have fed on the cow carcass that was found nearby. Testing of that material for botulinum type C toxin was delayed by reconstruction of our diagnostic laboratories, but it will be done in the near future (early July is the expected re-occupation date); those test results will be sent in a supplemental report.

*Nancy J. Thomas*

Nancy J. Thomas DVM, DACVP  
Staff Diagnostic Pathologist

*Anne E. Ballmann*

Anne E. Ballmann DVM, Ph.D.  
Wildlife Disease Specialist

If you have questions regarding this case, contact:

Phone: 608-270-2445 E-Mail: aballmann@usgs.gov

**Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.**

**Copies To:**

MIGRATORY BIRD COORDINATOR (R2)  
USFWS Albuquerque (RO2), 500 Gold Ave SW, Albuquerque, NM 87102  
ANNE JUSTICE-ALLEN  
Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086



NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road
Madison, Wisconsin 53711-6223
608-270-2400 (FAX 608-270-2415)

DIAGNOSTIC SERVICES CASE UPDATE

Final Report

12/6/2010

CASE: 23355 EPIZOO:

Legal INV NUM:

FINDINGS TO DATE

Submitter:

Kyle McCarty
Arizona Game & Fish/Phoenix
5000 W. Carefree Highway
Phoenix, AZ 85086

Date Submitted: 12/2/2010

Specimen description/identification/Location:

Table with 6 columns: ACC, SPECIES, SPECIMEN TYPE, BAND NUMBER, SUBMITTER'S ID, COUNTY, STATE. Row 1: 001 Eagle, Golden, CARCASS, Yavapai, AZ

Summary of Physical Characteristics

Table with 6 columns: ACC, SEX, AGE, WEIGHT, BODY CONDITION, POSTMORTEM STATE. Row 1: 001 Female, Immature (juvenile), 2295 gm, Emaciated, Fair

Comment:

12/6/2010: This golden eagle was severely emaciated. There was no fresh ingesta in the gastrointestinal tract. No lesions were noted during gross exam. The left hock had a healed injury that likely did not contribute to the present body condition. Laboratory tests are in progress and you will be notified of significant results.

If you have questions regarding this case, contact:

Krysten L. Schuler

Krysten L. Schuler, Ph.D.

Wildlife Disease Specialist

Phone: 608-270-2447

E-Mail: kschuler@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

## Kyle McCarty

---

**From:** Jennifer L Bradsby [jbradsby@usgs.gov]  
**Sent:** Friday, January 28, 2011 8:49 AM  
**To:** Kyle McCarty  
**Subject:** RE: FW: NWHC case 23355\_Diagnostic Update

Kyle,

Regarding chemistry lab testing -- we tested for lead (none was detected), as well as testing brain cholinesterase activity (ChE). Brain Cholinesterase levels were not depressed ruling out poisoning by organophosphate or carbamate insecticides/pesticides. I hope this provides some clarification.

All best,  
Jennifer

Jennifer Bradsby  
Field Investigation Team, Case Manager  
USGS National Wildlife Health Center  
6006 Schroeder Rd.  
Madison, WI 53711  
Phone (608) 270-2443  
Fax (608) 270-2415  
Please visit our website at: [www.nwhc.usgs.gov](http://www.nwhc.usgs.gov)

**From:** "Kyle McCarty" <KMcCarty@azgfd.gov>  
**To:** <jbradsby@usgs.gov>  
**Date:** 01/27/2011 01:11 PM  
**Subject:** RE: FW: NWHC case 23355\_Diagnostic Update

Jennifer,

Regarding this case, I had a question about the test for pesticides mentioned by Krysten. What does that include and does it cover poisons in general? I don't have anything specific in mind. Thanks for any clarification.

### Kyle M. McCarty

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway | Phoenix, AZ 85086  
623-236-7569

**From:** Krysten L Schuler [mailto:kschuler@usgs.gov]  
**Sent:** Wednesday, January 19, 2011 11:41 AM  
**To:** Kyle McCarty  
**Cc:** Jennifer L Bradsby  
**Subject:** Re: FW: NWHC case 23355\_Diagnostic Update

Hi Kyle,  
We haven't been able to come up with a cause behind the eagle's emaciation. Tests for avian influenza, West Nile virus, lead, and pesticides have been negative. Our preliminary cause of death is emaciation of unknown cause. I am leaving the USGS for another position and this is my last week, Jennifer Bradsby (cc'ed above) will be following up on this case.  
Best regards,  
Krysten

\*\*\*\*\*  
Krysten Schuler, PhD  
Wildlife Ecologist  
Field Investigation Team  
USGS National Wildlife Health Center  
6006 Schroeder Road  
Madison, WI 53711  
(608) 270-2447  
(608) 270-2415 fax  
[kschuler@usgs.gov](mailto:kschuler@usgs.gov)

From: "Kyle McCarty" <KMcCarty@azgfd.gov>  
To: <kschuler@usgs.gov>  
Date: 01/18/2011 05:38 PM  
Subject: FW: NWHC case 23355\_Diagnostic Update

Dr. Schuler,  
I was curious to know if there were any more findings associated with this dead golden eagle, case 23355?

Thanks,

**Kyle M. McCarty**

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway | Phoenix, AZ 85086  
623-236-7569

---

**From:** Jennifer L Bradsby [<mailto:jbradsby@usgs.gov>]  
**Sent:** Tuesday, December 07, 2010 8:54 AM  
**To:** Kyle McCarty  
**Subject:** NWHC case 23355\_Diagnostic Update

Attached, please find the most recent diagnostic findings for your submission to the National Wildlife Health Center.

If you have further information regarding this mortality event (such as updated mortality numbers, cessation date, or species affected) or have any questions regarding this case, please do not hesitate to contact Dr. Krysten Schuler at 608-270-2447 or [kschuler@usgs.gov](mailto:kschuler@usgs.gov).

Jennifer Bradsby

Field Investigation Team, Case Manager

USGS National Wildlife Health Center

6006 Schroeder Rd.

Madison, WI 53711

Phone (608) 270-2443

Fax (608) 270-2415

Please visit our website at: [www.nwhc.usgs.gov/attachment "NWHC 23355 Diagnostic Update.pdf" deleted by Krysten L Schuler/BRD/USGS/DOI](http://www.nwhc.usgs.gov/attachment/NWHC_23355_Diagnostic_Update.pdf)



National Wildlife Health Center  
6006 Schroeder Road  
Madison, WI 53711  
Phone: 608.270.2400  
FAX: 608.270.2415



### SPECIMEN HISTORY FORM

For mortality events please e-mail a USGS Field Investigation Team member before shipping

**Western States:** Krysten Schuler [kschuler@usgs.gov](mailto:kschuler@usgs.gov), 608-270-2447

**Eastern States:** Anne Ballmann [aballmann@usgs.gov](mailto:aballmann@usgs.gov), 608-270-2445

For single animal cases, **Nationwide:** Jennifer Bradsby [jbradsby@usgs.gov](mailto:jbradsby@usgs.gov), 608-270-2443

Submitter's name: Kyle McCarty

Telephone: 623-236-7569

Address: Arizona Game & Fish Dept.  
5000 W Carefree Highway  
Phoenix, AZ 85086

E-mail: [kmccarty@azgfd.gov](mailto:kmccarty@azgfd.gov)

Date collected: 11/29/2010

Method of animal collection:  Found Dead,  Died in Hand,  Euthanized

Species: Golden eagle

Number Submitted: 1 Condition:  Chilled,  Frozen,  Preserved Tissues

Specific die-off location (refuge unit, pond, address, intersection, park, etc): Forest Road 574 near Chasm Creek

State: AZ County: Yavapai Nearest City: Camp Verde

Latitude/longitude (Decimal degree in WGS 84): 34.45 N, -111.82 W Zone:

Disease onset date: (Best estimate)

Disease end date: (best estimate)

Species affected: (The diversity of species affected may provide clues to the disease involved.) Golden eagle - immature

Age/sex: (Any pattern noticed that is related to age and sex?) none

Known dead: (Actual number counted) 1

Known sick: 0

Estimated dead: 1

Estimated sick: 0

(Consider removal by scavengers or other means, density of vegetation, etc.)

**Clinical signs:** (Any unusual behavior and physical appearance.) Prior to being found dead, the golden eagle was reported to have been hopping around, unable to fly (11/29/2010). There were no obvious signs of trauma (no wounds or broken bones), however the eagle carcass was noticeably thin (i.e., sharp-keeled, lack of muscle). Also, there were two piles of an unknown blackish substance found – it was not clear if this substance was regurgitated by the eagle or not.

**Population at risk:** (Number of animals in the area that could be exposed to the disease.)

There is a pair of bald eagles that have a nesting territory in the area (the nest is 1.8 miles from the spot where the dead golden eagle was recovered).

**Population movement:** (Recent changes in number of animals on area and their source or destination, if known.)

n/a

**Problem area description:** (Land use, habitat types, and other distinctive features.)

Forest Service land used for hunting, grazing, recreation. Pinyon pine – juniper habitat ; mid-elevation desert scrub.

**Environmental factors:** (Record conditions such as storms, precipitation, temperature changes, or other changes that may contribute to stress.) n/a

**Comments:** (Additional information/observations of value such as past occurrences of disease in area, photographs and videos are great additions.)

The golden eagle was found dead near a cow carcass from which it presumably fed. Poisoning is suspected but there was no evidence of cause of death at the scene.



Arizona Game and Fish Department  
 Nongame and Endangered Wildlife Program  
 5000 West Carefree Hwy.  
 Phoenix, Arizona 85086  
 Phone: (623) 236-7500  
 FAX: (623) 236-7926



SENT TO NONGAME  
 11-30-20

**DEAD OR INJURED BALD AND GOLDEN EAGLE RECOVERY FORM**

Name: JAKE FOUSEK Work Unit: FOR 6  
 Telephone: [REDACTED] E-mail: jfousek@azgfd.gov  
 Date collected: 11/29/10 Collected By: JAKE FOUSEK  
 Found By: PUBLIC Location: FR 574  
 County: YAVAPAI UTM's: N 34° 26.966' W 111 49.379'  
 Condition Found (dead, injured): DEAD Species: GOLDEN  
 Age: ? Adult:     Subadult: X Band Number:    

Clinical signs (Any unusual behavior or physical appearance.):  
REPORTED TO BE HOPPING AROUND UNABLE TO FLY  
ON 11/29/10 - FOUND DEAD @ 17:00

Area description: (Habitat in area of discovery): DESERT SCRUB

Comments (Additional information that can aid diagnosing cause of injury or mortality):  
TWO PILES OF WHAT LOOKS LIKE VOMIT NEAR  
LARVAE

Diagnosis (Attach laboratory reports):  
 \_\_\_\_\_  
 \_\_\_\_\_

Please remit this form to the Nongame Branch's Raptor Management Coordinator following the protocol established in the cover memo.

## Kenneth Jacobson

---

**From:** Carrie\_Marr@fws.gov  
**Sent:** Tuesday, November 30, 2010 9:16 PM  
**To:** Greg\_Beatty@fws.gov  
**Cc:** Kenneth Jacobson; Shaula\_Hedwall@fws.gov; Preston\_Fant@fws.gov; Steve\_Spangle@fws.gov  
**Subject:** Re: FW: dead eagle

Greg

Given my interest in lead poisoning in our wintering bald eagles and golden eagles, I have been discussing the possibility of a cross-region/multi-state EC investigation with other EC biologists at our National EC Meeting this week. When I return, and at our staff mtg next week, I can update you on the status of our discussions. Working with other FWS programs, including LE, as well as outside agencies and NGOs may be critical to the success of a study like this.

Thanks,

Carrie Marr  
Environmental Contaminants  
Arizona Ecological Services Office  
US Fish and Wildlife Service  
2321 W Royal Palm Rd., Suite 103  
Phoenix, Arizona 85021  
602.242.0210 x214  
602.242.2513 (fax)

-----Greg Beatty/R2/FWS/DOI wrote: -----

To: "Kenneth Jacobson" <KJacobson@azgfd.gov>  
From: Greg Beatty/R2/FWS/DOI  
Date: 11/30/2010 12:36PM  
cc: Shaula Hedwall/R2/FWS/DOI@FWS, Carrie Marr/R2/FWS/DOI@FWS, Preston Fant/R2/FWS/DOI@FWS, Steve Spangle/R2/FWS/DOI@FWS  
Subject: Re: FW: dead eagle

Thanks Tuk for the FYI

I will also forward this to Preston and to our Flagstaff office that covers the Camp Verde area and our contaminants folks....

Greg Beatty  
US Fish and Wildlife Service  
2321 West Royal Palm Road, Suite 103  
Phoenix, Arizona 85021  
602-242-0210, 602-242-2513 FAX  
<http://www.fws.gov/southwest/es/arizona>  
"Kenneth Jacobson" <KJacobson@azgfd.gov>

"Kenneth Jacobson"  
<KJacobson@azgfd.gov>

11/30/2010 09:44 AM

To<Greg\_Beatty@fws.gov>

cc"James Driscoll" <JDriscoll@azgfd.gov>, "Kyle McCarty"

<KMcCarty@azgfd.gov>

SubjectFW: dead eagle

Greg,

We received a call from our WM in Camp Verde regarding a possible golden eagle poisoning case. We advised him to contact Preston Fant for a possible law enforcement investigation. At this point, we are probably out of the loop while the mortality is being investigated.

Thanks,

Kenneth "Tuk" Jacobson  
Bald and Golden Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]

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**From:** Bill Burger  
**Sent:** Monday, November 29, 2010 4:56 PM  
**To:** James Driscoll; Kenneth Jacobson  
**Subject:** dead eagle

Jake Fousek, WM near Camp Verde, is going to call you about a dead eagle. Apparently a golden eagle. There is also some suspicion as to the possibility of poisoning.

Bill Burger  
Arizona Game and Fish Department  
Region VI Nongame Specialist  
7200 E. University Dr.  
Mesa, AZ 85207  
(480) 324-3553  
[bburger@azgfd.gov](mailto:bburger@azgfd.gov)

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## Kenneth Jacobson

---

**From:** Kyle McCarty  
**Sent:** Thursday, June 30, 2011 2:52 PM  
**To:** James Driscoll; Kenneth Jacobson  
**Cc:** Jake Fousek; Bill Burger; Greg\_Beatty@fws.gov; Carrie\_Marr@fws.gov  
**Subject:** Final report\_lab results RE: dead golden eagle - Camp Verde  
**Attachments:** 23355FinalReport.pdf

Final report from the National Wildlife Health Center on the golden eagle found near Camp Verde last November. What I glean from this report is that the bird had a prior leg fracture that didn't heal quite right and may have affected its lifestyle because otherwise no lead, no pesticide poisoning, no West Nile detected.

### Kyle M. McCarty

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway | Phoenix, AZ 85086  
623-236-7569

**From:** Kyle McCarty  
**Sent:** Wednesday, January 19, 2011 12:48 PM  
**To:** James Driscoll; Kenneth Jacobson  
**Cc:** Jake Fousek; Bill Burger; 'Greg\_Beatty@fws.gov'; 'Carrie\_Marr@fws.gov'  
**Subject:** lab results RE: dead golden eagle - Camp Verde

All,  
I received an update from the National Wildlife Health Center regarding the immature golden eagle that was recovered dead 11/29/10 near Camp Verde. Unfortunately they have not been able to determine cause of death; lead and pesticides were negative as were WNV and avian influenza. If I receive any further results I will pass them along.

### Kyle M. McCarty

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway | Phoenix, AZ 85086  
623-236-7569

---

**From:** Krysten L Schuler [<mailto:kschuler@usgs.gov>]  
**Sent:** Wednesday, January 19, 2011 11:41 AM  
**To:** Kyle McCarty  
**Cc:** Jennifer L Bradsby  
**Subject:** Re: FW: NWHC case 23355\_Diagnostic Update

Hi Kyle,  
We haven't been able to come up with a cause behind the eagle's emaciation. Tests for avian influenza, West Nile virus, lead, and pesticides have been negative. Our preliminary cause of death is emaciation of unknown cause. I am leaving the USGS for another position and this is my last week, Jennifer Bradsby (cc'ed above) will be following up on this case.  
Best regards,  
Krysten

\*\*\*\*\*  
Krysten Schuler, PhD  
Wildlife Ecologist  
Field Investigation Team  
USGS National Wildlife Health Center

6006 Schroeder Road  
Madison, WI 53711  
(608) 270-2447  
(608) 270-2415 fax  
[kschuler@usgs.gov](mailto:kschuler@usgs.gov)



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

### Final Report

6/30/2011

**CASE:** 23355

**EPIZOO:**

Legal  **INV#:**

Declassified

**Submitter:**

Kyle McCarty  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 12/2/2010

**Specimen description/identification/Location:**

| ACC | SPECIES       | SPECIMEN TYPE | BAND NUMBER | SUBMITTER'S ID | COUNTY  | STATE |
|-----|---------------|---------------|-------------|----------------|---------|-------|
| 001 | Eagle, Golden | CARCASS       |             |                | Yavapai | AZ    |

### DIAGNOSIS

Emaciation  
Chronic deformity, left metatarsal region, due to healed fracture

### **Comment:**

6/30/2011

This juvenile female Golden Eagle was severely emaciated. The bird's left leg below the hock was rotated and bent medially due to a fully healed fracture, and the bottom of the left foot had a chronic ulcer ("bumblefoot lesion") indicating abnormal weight-bearing over a long period of time, but the foot joints and tendons moved normally. The effect of the leg deformity is uncertain, but it may have contributed to the bird's debilitation. No lead was detected in liver tissue. Brain cholinesterase activity was within normal limits, ruling out poisoning by organophosphate pesticides. Attempts to isolate West Nile virus from pooled kidney/spleen tissue were negative. Cloacal and tracheal swabs were negative on screening for avian influenza viruses.

No food items were present in the stomach, but dark bloody fluid there suggests it may have fed on the cow carcass that was found nearby. Testing of that material for botulinum type C toxin was delayed by reconstruction of our diagnostic laboratories, but it will be done in the near future (early July is the expected re-occupation date); those test results will be sent in a supplemental report.

*Nancy J. Thomas*

Nancy J. Thomas, DVM, DACVP  
Staff Diagnostic Pathologist

*Anne E. Ballmann*

Anne E. Ballmann, DVM, Ph.D.  
Wildlife Disease Specialist

If you have questions regarding this case, contact:

Phone: 608-270-2445 E-Mail: [aballmann@usgs.gov](mailto:aballmann@usgs.gov)

**Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.**

### **Copies To:**

MIGRATORY BIRD COORDINATOR (R2)  
USFWS Albuquerque (RO2), 500 Gold Ave SW, Albuquerque, NM 87102  
ANNE JUSTICE-ALLEN  
Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086



NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road
Madison, Wisconsin 53711-6223
608-270-2400 (FAX 608-270-2415)

11501
Riverside
nestling

DIAGNOSTIC SERVICES CASE REPORT

CASE: 23484

Final Report

5/26/2011

EPIZOO:

Legal [ ] INV#:

Declassified [ ]

Submitter:

James Driscoll
Arizona Game & Fish/Phoenix
5000 W. Carefree Highway
Phoenix, AZ 85086

Date Submitted: 3/22/2011

Specimen description/identification/Location:

Table with 7 columns: ACC, SPECIES, SPECIMEN TYPE, BAND NUMBER, SUBMITTER'S ID, COUNTY, STATE. Row 1: 001, Eagle, Bald, CARCASS, Maricopa, AZ

DIAGNOSIS

Severe bile obstruction
Emaciation

Comment:

5/26/2011

This female Bald Eagle nestling was emaciated. As mentioned by the submitter, the tissues were very pale. The bones were soft and poorly mineralized. The liver was large, deep green and fibrous when cut. These observations suggested problems with the outflow tract of the bile produced in the liver. Examination of the liver and biliary system suggested either an obstructed bile duct or a developmental anomaly in the duct carrying the bile from the liver to the gall bladder. Microscopic examination of tissues showed round worm eggs in the tissue of the bile duct. There are situations in other animals where round worms can migrate abnormally and move into the bile duct causing fatal obstruction. My guess is that this is what happened to this young eagle. Extra sections of slides of the bile duct and liver are being made to see if the adult round worm can be found and if it is associated with obstruction and regional inflammation. If this can be confirmed, a supplemental report will be sent. It is more common that migrating round worms that cause damage are not found in the tissues sections. Analysis of the liver for heavy metals that might also damage the liver were negative.

The other changes noted in this eagle can be attributed to malnutrition and liver failure including anemia and poor bone mineralization.

This eagle was negative for West Nile virus and no viruses were isolated from the spleen. Screening tests on tracheal and cloacal swabs for avian influenza viruses were negative.

The feet and feathers will be sent to the National Eagle Repository.

Carol U. Meteyer

Carol U. Meteyer, DIPL.ACVP
Staff Diagnostic Pathologist

Jennifer L. Buckner

Jennifer L. Buckner

If you have questions regarding this case, contact:

Field Investigation Team Case Manager
Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

Copies To:

- MIGRATORY BIRD COORDINATOR (R2)
USFWS Albuquerque (RO2), 500 Gold Ave SW, Albuquerque, NM 87102
ANNE JUSTICE-ALLEN
Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086
KYLE MCCARTY
Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086



NATIONAL WILDLIFE HEALTH CENTER

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Madison, Wisconsin 53711-6223
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DIAGNOSTIC SERVICES CASE UPDATE

CASE: 23484 EPIZOO:

3/24/2011

Legal INV NUM:

FINDINGS TO DATE

Submitter:

James Driscoll
Arizona Game & Fish/Phoenix
5000 W. Carefree Highway
Phoenix, AZ 85086

Date Submitted: 3/22/2011

Specimen description/identification/Location:

Table with 7 columns: ACC, SPECIES, SPECIMEN TYPE, BAND NUMBER, SUBMITTER'S ID, COUNTY, STATE. Row 1: 001, Eagle, Bald, CARCASS, Maricopa, AZ

Summary of Physical Characteristics

Table with 6 columns: ACC, SEX, AGE, WEIGHT, BODY CONDITION, POSTMORTEM STATE. Row 1: 001, Female, Nestling or suckling, 1915 gm, Emaciated, Good

Comment:

The nestling female bald eagle submitted from Maricopa county was necropsied 3/24/11. The liver was mildly enlarged, bright green uniformly, indicating severe cholestasis, a condition in which the flow of bile from the liver is blocked. This may suggest a congenital anomaly but other laboratory tests have been requested, including heavy metal screening, to rule out other causes of death. You will be notified of significant results.

If you have questions regarding this case, contact:

Jennifer L. Buckner

Jennifer L. Buckner,
Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.



THE STATE OF ARIZONA  
**GAME AND FISH DEPARTMENT**

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March 21, 2011

Dr. LeAnn White  
National Wildlife Health Center  
Biological Resources Division  
6006 Schroeder Road  
Madison, Wisconsin 53711-6223

Re: Dead bald eagle from Maricopa County, Arizona

Dear Dr. White:

In the accompanying cooler is one bald eagle carcass for you to examine. Also included is a specimen history form.

On March 18, 2011, during a routine bald eagle banding event conducted by Arizona Game & Fish Department biologists, a nestling was found to be in poor health and was taken to a wildlife rehabilitation facility. The nestling bald eagle (approximately 5.5 weeks old) was small and well below the weight normally seen at this age, and showed a lack of muscle exhibited by the sharpness of the keel. The nestling's legs and feet were abnormally white-colored instead of yellow, and the inside of the mouth was very pale and lacking color as well. Although feather growth was occurring in the nestling, some of its flight feathers on the wing were long and thin instead of having developed a normal, wide profile. The nestling died while undergoing a hydration treatment soon after being admitted to the rehab facility.

Due to concerns with other bald eagles in the area, we would like you to conduct a necropsy to rule out disease and contaminants. Please inform me of any contributory cause of mortality. If you have any questions, please feel free to call me at (623) 236-7581 or email at [kjacobson@azgfd.gov](mailto:kjacobson@azgfd.gov). Finally, please return the cooler and ice packs using the FedEx airbill provided.

Sincerely,

Kenneth Jacobson  
Bald and Golden Eagle Management Coordinator

cc: Greg Beatty, U.S. Fish and Wildlife Service

Document: 20110321.Birds.NWHC BAEA Mortality.doc

## Kenneth Jacobson

---

**From:** Kyle McCarty  
**Sent:** Wednesday, May 04, 2011 4:11 PM  
**To:** 'Gewecke, Brian'; [REDACTED]  
**Cc:** Kenneth Jacobson; James Driscoll  
**Subject:** Orme juvenile update

Jan at Liberty reports today that the Orme juvenile rescued from the nest on April 25 is showing improvement and she is cautiously optimistic. Blood results from the juvenile were positive for Aspergillosis, negative for West Nile Virus, and some exposure to lead but not to a high degree. They will be moving the juvenile outside to a flight pen and observe it for a few days. It's at the stage when it should be exercising the wings and preparing for flight. Depending how that goes, it could be ready for release as early as next week.

### Kyle M. McCarty

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway | Phoenix, AZ 85086  
623-236-7569

**From:** Kyle McCarty  
**Sent:** Wednesday, April 27, 2011 9:51 AM  
**To:** Kenneth Jacobson; James Driscoll; 'Gewecke, Brian'; [REDACTED]; Anne Justice-Allen; 'Greg\_Beatty@fws.gov'; 'Carrie\_Marr@fws.gov'; 'Katie\_Wade@fws.gov'; 'Kathy Orr'; [REDACTED]  
**Cc:** Kyle McCarty  
**Subject:** RE: Orme rescue part 2, 4/25/11

Another update from Liberty Wildlife...the bald eagle nestling that we recovered from the ground at Orme nest on Sunday died yesterday afternoon. So, there is one nestling left alive and still being treated (the one that we recovered from the nest on Monday).

Attached are some photos of the tick larvae that we removed.

### Kyle M. McCarty

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway | Phoenix, AZ 85086  
623-236-7569

**From:** Kyle McCarty  
**Sent:** Tuesday, April 26, 2011 10:39 AM  
**To:** 'Kathy Orr'; Kenneth Jacobson; James Driscoll; Gewecke, Brian; [REDACTED]; [REDACTED]; Anne Justice-Allen; 'Greg\_Beatty@fws.gov'; 'Carrie\_Marr@fws.gov'; 'Katie\_Wade@fws.gov'  
**Cc:** Kyle McCarty  
**Subject:** Orme rescue part 2, 4/25/11

All,

Yesterday we recovered the third nestling from the Orme nest, found ticks on it and took it to Liberty. Then, Dr. Orr and I spent another 2.5 hours removing the tiny tick larvae from this bird. We removed 358 and surely we did not get all of them (they are about 0.5-2.0 mm depending on how much blood they have feasted). Hopefully, the time and effort to pull off the ticks will pay out.

This bird appeared to be a little better off physically than its sibling except it also has limited mobility in the legs. It couldn't stand up right without a lot of effort and even then it was not quite stable, mostly just laying kind of flat/hunched. It initially had an elevated temperature, but cooled down.

**Kyle M. McCarty**

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway | Phoenix, AZ 85086  
623-236-7569

**From:** Kathy Orr [mailto: [REDACTED]]  
**Sent:** Monday, April 25, 2011 9:07 AM  
**To:** Kyle McCarty  
**Cc:** Kenneth Jacobson; James Driscoll; Gewecke, Brian; [REDACTED] Anne Justice-Allen; [Greg.Beatty@fws.gov](mailto:Greg.Beatty@fws.gov); [Carrie.Marr@fws.gov](mailto:Carrie.Marr@fws.gov)  
**Subject:** Re: Orme rescue 4/24/11

The nestling is still alive this morning and appears no worse, but not noticeably better. It is sitting up on its hocks. Thanks to Kyle for prompt retrieval and transport of the nestling and for staying to help pick off ticks on Easter and his birthday! Nestling has been force fed and given more fluids today. We will keep everyone posted. Kathy Orr, DVM

On Mon, Apr 25, 2011 at 8:35 AM, Kyle McCarty <[KMcCarty@azgfd.gov](mailto:KMcCarty@azgfd.gov)> wrote:

All,

Yesterday (4/24/11), nestwatchers found two 8-week old nestlings on the ground at the Orme nest. One nestling was DOA, the other was alive but not well. A third nestling is still alive in the nest. All three had been accounted for in the nest on Saturday.

Took the live, grounded nestling to Liberty Wildlife. Immediately tick larvae were found on the bird. It was showing the same symptoms as the nestlings last year, mainly a paralysis or semi-paralysis of the legs exhibited by stiffness and immobility. Although the nestling was able to move it's toes, it did so sparingly and was unable to sit up correctly. The wings, neck and head appeared to move normally but the bird had little energy.

We spent 2.5 hours removing as many ticks as possible (they are quite small, a few mm at most) from the live nestling. I estimate we collected >100 of them. Anne is sending them off for expert identification.

I will be sending the dead nestling to the Wildlife Health Center today for necropsy.

Thanks to Dr. Orr, Jan and Joe, and others at Liberty for making themselves available on Sunday afternoon. You all are great.

**Kyle M. McCarty**

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator

5000 W. Carefree Highway | Phoenix, AZ 85086

## James Driscoll

---

**From:** Kyle McCarty  
**Sent:** Thursday, March 03, 2011 7:05 PM  
**To:** James Driscoll  
**Cc:** Kenneth Jacobson  
**Subject:** RE: Question  
**Attachments:** 2011 Lead & Mortality Tables.docx

Here's updated tables for lead and mortalities.

### **Kyle M. McCarty**

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway | Phoenix, AZ 85086  
623-236-7569

**From:** Kenneth Jacobson  
**Sent:** Monday, February 28, 2011 10:21 AM  
**To:** Kyle McCarty  
**Subject:** FW: Question

Kyle,

Do you have time to update the lead table?

Thanks,

Kenneth "Tuk" Jacobson  
Bald and Golden Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]

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**From:** James Driscoll  
**Sent:** Friday, February 25, 2011 3:48 PM  
**To:** Kenneth Jacobson  
**Subject:** FW: Question

Tuk,

We need to update both the Lead Table and the Mortality Table for The Peregrine Fund. As soon as we can.

Thanks,

James T. Driscoll  
Raptor Management Coordinator

Office: 623-236-7581

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**From:** James Driscoll  
**Sent:** Thursday, February 24, 2011 12:55 PM  
**To:** Mike Senn  
**Cc:** Eric Gardner  
**Subject:** FW: Question

Mike,

The Peregrine Fund was curious if we had any updates to the table (recent information from 2004 to now) in the Conservation Assessment and Strategy for the Bald Eagle in Arizona - Known Lead Poisoning Mortalities in Bald Eagles (see Text and table from the published report below). I asked Mike Rabe if we wanted to release that information, and he suggested I asked you as the Lead Team Leader. We have the data in our database, so it is not hard to generate this table.

**Lead Poisoning.** Lead poisoning in bald eagles has been linked to ingestion of spent lead gunshot (Pain et al. 1994, Ma 1996), consumption of lead sinkers (Sears 1988), and secondary consumption of lead contaminated prey (DeMent et al. 1986, Frenzel and Anthony 1989). Lead poisoning in other birds and mammals has been linked to mining and smelting activities (Beyer et al. 1997, Henny et al. 2000), and firearm training facilities (Lewis et al. 2001).

Even with 25 years of study on bald eagles in Arizona, mortality agents remain a mystery. One reason for this lack of knowledge is missed opportunities. Bald eagle carcasses in the late 1980s through the 1990s were only necropsied if the bird died of un-natural causes (e.g. those requiring a law enforcement investigation). Most lead poisoning mortalities occur during winter when starvation is common. Reichel (1984) described 88% (n=17) of lead poisoned bald eagles as emaciated. Additionally, Pattee et al. (1981), discovered (under a controlled experiment) that when fed doses of lead, healthy bald eagles ceased eating several days before succumbing to lead poisoning. Thus by diagnosing starvation without a necropsy, the opportunities to document lead poisoning were missed.

Pattee et al. (1981) reported the toxic liver lead level for bald eagles as 10.0 parts/million (ppm). However, some researchers indicate this may be lower between 6.0 to 8.0 ppm (K. Converse, U.S. Geological Survey, pers. comm.). Blood lead levels diagnostic of lead poisoning is greater than 60 µg/dl. From 1998 to 2004, 22 bald eagles (39% of all documented mortalities) had liver lead levels averaging 32.9 ppm (excluding femur and blood values), ranging from 0 to 9 times the toxic threshold, and all were emaciated (Table 3) (AGFD unpublished data). Only 1 of the confirmed lead poisoned bald eagles hatched in Arizona.

Table 3. Known lead poisoning mortalities and lead concentrations in bald eagles recovered in Arizona, 1998 to 2004.

| Bald Eagle Location | Recovered    | Liver Lead Levels (ppm) | Bald Eagle Location     | Recovered     | Liver Lead Levels (ppm) |
|---------------------|--------------|-------------------------|-------------------------|---------------|-------------------------|
| Saguaro Lake        | January 1998 | 94.0                    | Horseshoe Dam           | January 2003  | 30.05                   |
| Scholz Lake         | Fall 1998    | 43.0                    | Whiteriver <sup>2</sup> | January 2003  | 60.0 <sup>3</sup>       |
| Pintail Lake        | March 1999   | 49.56                   | Show Low                | February 2003 | 36.04                   |
| Young               | Fall 1999    | 23.05 <sup>1</sup>      | Stoneman Lake           | March 2003    | 13.52                   |
| Camp Verde          | Fall 1999    | 15.66 <sup>1</sup>      | Long Lake               | March 2003    | 13.3                    |
| Kaibab Lake         | March 2000   | 38.28                   | Wilcox                  | February 2004 | 23.43                   |
| East Clear Creek    | April 2000   | 33.47                   | K.A. Ranch              | March 2004    | 30.0                    |
| Fools Hollow Lake   | March 2001   | 42.77                   | River Reservoir         | March 2004    | 7.53 <sup>4</sup>       |
| Cosnino             | January 2002 | 41.5                    | White Horse Lake        | March 2004    | 13.11                   |
| Lake Elaine         | March 2002   | 48.52                   | Young                   | March 2004    | 11.30                   |
| Upper Lake Mary     | March 2002   | 48.17                   | Clifton                 | April 2004    | 8.15                    |
| Average             |              |                         | 32.9                    |               |                         |

(ppm dry weight).

<sup>2</sup>Arizona hatched bald eagle.

<sup>3</sup>Blood lead levels before chelatin treatment ( $\mu\text{g}/\text{dL}$ ).

<sup>4</sup>Liver lead levels after 1 chelatin treatment.

<sup>1</sup>Femur lead levels

Bald eagles can travel large distances quickly (Hunt et al. 1992, K. Jacobson and H. Messing unpublished data); and they follow migrating waterfowl in the winter. Therefore, the ingestion of lead could occur in any area along their migration. Pattee et al. (1981) discovered 60% (n=5) of birds in his experiment died within 12 to 20 days of ingesting lead pellets. However, it is also common for migrating bald eagles to remain near a suitable food supply (Dargan 1991). Thus, we are uncertain of the lead's source, i.e. local or regional.

To address this issue, AGFD and the USFWS initiated a protocol in 2003 for identifying, documenting, and processing all bald eagle carcasses found in Arizona. This procedure allows for the monitoring of mortality factors to facilitate implementing reactive management (Strategy Section II.G.7). In addition, a long-term dispersal study could appropriately document the frequency of lead poisoning mortalities during migration (Strategy Section II.G).

*Let me know how to proceed.*

*Thanks,*

*James T. Driscoll  
Raptor Management Coordinator*

*Office: 623-236-7581*

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**From:** James Driscoll  
**Sent:** Wednesday, February 23, 2011 12:54 PM  
**To:** Mike Rabe  
**Subject:** Question

Are we O.K. with releasing an updated table on the lead levels in bald eagles that is found in the Conservation Agreement for the Bald Eagle in Arizona?

Thanks,

James T. Driscoll  
Raptor Management Coordinator  
Arizona Game and Fish Department  
5000 West Carefree Highway  
Phoenix, Arizona 85086

Office: 623-236-7581  
Fax: 623-236-7926

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Table 3. Known lead poisoning mortalities and lead concentrations in bald eagles recovered in Arizona, 1998-2010

| Bald Eagle Location     | Date Recovered | Liver Lead Levels ( $\mu\text{g/dL}$ ) |
|-------------------------|----------------|----------------------------------------|
| Saguaro Lake            | January 1998   | 940                                    |
| Whiteriver <sup>1</sup> | January 2003   | 600 <sup>2</sup>                       |
| Pintail Lake            | March 1999     | 495.6                                  |
| Lake Elaine             | March 2002     | 485.2                                  |
| Lower Lake Mary         | March 2002     | 481.7                                  |
| Scholz Lake             | Fall 1998      | 430                                    |
| Fools Hollow Lake       | March 2001     | 427.7                                  |
| Cosnino                 | January 2002   | 415                                    |
| Kaibab Lake             | March 2000     | 382.8                                  |
| Show Low Wal-Mart       | February 2003  | 360.4                                  |
| Lake Elaine             | April 2010     | 351.1                                  |
| East Clear Creek        | April 2000     | 334.7                                  |
| Horseshoe Dam Subadult  | January 2003   | 300.5                                  |
| K.A. Ranch              | March 2004     | 300                                    |
| Little Colorado River   | March 2007     | 263.9                                  |
| Wilcox                  | February 2004  | 234.3                                  |
| Scott Reservoir         | January 2009   | 184.5                                  |
| Stoneman Lake           | March 2003     | 135.2                                  |
| Long Lake               | March 2003     | 133                                    |
| White Horse Lake        | March 2004     | 131.1                                  |
| Young                   | March 2004     | 113                                    |
| River Reservoir         | March 2004     | 75.3 <sup>3</sup>                      |
| Clifton                 | April 2004     | 81.5                                   |
| Young                   | Fall 1999      | 230.5 <sup>4</sup>                     |
| Camp Verde              | Fall 1999      | 156.6 <sup>4</sup>                     |

<sup>1</sup> Arizona hatched bald eagle.

<sup>2</sup> Blood lead levels before treatment.

<sup>3</sup> Liver lead levels after 1 chelatin treatment.

<sup>4</sup> Femur lead levels (ppm dry weight).

In addition to these mortalities, a 2005 subadult, a 2006 Arizona nestling, and a 2007 adult were recovered alive while suffering from lead poisoning. These individuals were successfully rehabilitated and later released.

Table 6. Probable causes of bald eagle mortality in Arizona, 1987 to 2010.

| Mortality factor for bald eagles in Arizona <sup>1</sup> | Adults <sup>2</sup> | Subadult | Nesting/<br>Fledgling | Adults | Subadult | Total |
|----------------------------------------------------------|---------------------|----------|-----------------------|--------|----------|-------|
| Unknown                                                  | 6                   | 4        | 126                   | 15     | 6        | 157   |
| Replacement/Intruding Adult                              | 53                  | 4        | 8                     | --     | --       | 65    |
| Lead Poisoning                                           | 1                   | --       | --                    | 19     | 5        | 25    |
| Starvation                                               | 1                   | 2        | 12                    | 2      | --       | 17    |
| Predations                                               | 1                   | --       | 15                    | 1      | --       | 17    |
| Heat stress                                              | --                  | --       | 13                    | --     | --       | 13    |
| Mexican chicken bugs                                     | --                  | --       | 12                    | --     | --       | 12    |
| Shot                                                     | 3                   | 5        | --                    | 2      | 1        | 11    |
| Impact injury                                            | --                  | 2        | 2                     | 2      | 4        | 10    |
| Fell from nest                                           | --                  | --       | 8                     | --     | --       | 8     |
| Electrocution                                            | --                  | 3        | 2                     | --     | 1        | 6     |
| Drowned                                                  | --                  | 1        | 4                     | --     | 1        | 6     |
| Bacterial infection                                      | 1                   | --       | 3                     | --     | --       | 4     |
| Siblicide                                                | --                  | --       | 4                     | --     | --       | 4     |
| Poisoning                                                | 1                   | 2        | --                    | --     | --       | 3     |
| Fishing line                                             | 1                   | --       | 2                     | --     | --       | 3     |
| Abandonment                                              | --                  | --       | 2                     | --     | --       | 2     |
| Physiological problems                                   | --                  | --       | 2                     | --     | --       | 2     |
| Anemia                                                   |                     |          | 2                     |        |          | 2     |
| Ectoparasites (ticks)                                    |                     |          | 2                     |        |          | 2     |
| Fractured pelvis                                         |                     |          | 1                     |        | 1        | 2     |
| Bee stings                                               | --                  | --       | 1                     | --     | --       | 1     |
| Frostbite                                                | --                  | --       | 1                     | --     | --       | 1     |
| Internal injuries                                        |                     |          |                       | 1      |          | 1     |
| Total                                                    | 68                  | 23       | 222                   | 42     | 19       | 374   |

<sup>1</sup>Includes results reported in Hunt et al. (1992) and Mesta et al. (1992).

<sup>2</sup>Shaded areas = bald eagles hatched or breeding in Arizona.

## James Driscoll

---

**From:** Kenneth Jacobson  
**Sent:** Thursday, July 07, 2011 2:58 PM  
**To:** James Driscoll  
**Cc:** Kyle McCarty  
**Subject:** Rehabbed Bald Eagle in NM

Jamey,

I just fielded a call from NM Game and Fish department regarding a "golden eagle" in rehab at The Wildlife Center with bands 27/C. It is a 2011 bald eagle nestling from Canyon De Chelly. They believe the bird may be suffering from lead poisoning. At this point, we should be kept in the loop as more details arise.

Kyle – Have we reported the 2011 bands to the BBL yet? If not, we should do that soon.

Thanks,

Kenneth "Tuk" Jacobson  
Bald and Golden Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
[REDACTED]

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## James Driscoll

---

**From:** Mee, Letitia, DGF [Letitia.Mee@state.nm.us]  
**Sent:** Thursday, July 07, 2011 3:10 PM  
**To:** [REDACTED] Kenneth Jacobson; James Driscoll  
**Cc:** Katie\_Wade@fws.gov; Dale Stahlecker  
**Subject:** Bald Eagle- Poisoned  
**Importance:** High

Regarding the report of an Eagle poisoned today... The bands are Arizona Game & Fish bands (Right Metal 0679-0-3059) (Left Blue 27C)

The eagle was picked up by Navajo Fish & Wildlife Conservatory in Sanostee, NM.

The eagle is now at The Wildlife Center 505-753-9505 in Espanola, NM for rehabilitation.

**Sharon**, here is some more information regarding this particular eagle it is a **Female Juvenile Bald Eagle** banded in Canyon De Chelly on May 23, 2011 by AZGFD.

AZGFD Contacts: Tuk Jacobson 623-236-7575 - [kjacobson@azgfd.gov](mailto:kjacobson@azgfd.gov)  
Jamey Driscoll 623-236-7581 - [jdriscoll@azgfd.gov](mailto:jdriscoll@azgfd.gov)

AZGFD would like to be notified of the prognosis and progress with the eagle... they are monitoring all aspects of these banded eagles. They also requested any and all blood work, medical treatment and mortality notice. If the eagle survives to potential release, it has been requested that it be released where it was found.

Thank you all and a BIG Thank you to Dale Stahlecher who knew exactly who the eagle (bands) belong to!!!

*Letitia "Tish" Mee*

Manager, Special Use Permits Program  
New Mexico Department of Game & Fish  
Law Enforcement Division  
P.O. Box 25112, Santa Fe, NM 87504  
Office: (505) 476-8064  
Fax: (505) 476-8133

[www.wildlife.state.nm.us](http://www.wildlife.state.nm.us)

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## James Driscoll

---

**From:** Anne Justice-Allen  
**Sent:** Monday, April 02, 2012 10:19 AM  
**To:** [REDACTED]  
**Cc:** Tim Snow; Kyle McCarty; James Driscoll  
**Subject:** Golden eagle from NM hwy 9

Ms. Snyder,

We finally have the results of the toxicology testing. The eagle that you submitted was positive for brodifacoum, an anticoagulant rodenticide and had detectable lead. The levels were 0.025 ppm and 2.0 µg/g, respectively. The lead level is not high enough to cause clinical disease by itself but nothing is known about the interactions of these two toxicants. There were signs consistent with brodifacoum toxicity on necropsy.

Thank you for submitting this bird to our Department.

Regards,

Anne

*Anne Justice-Allen, DVM*

*State Wildlife Health Specialist*

*Arizona Game and Fish Dept*

*5000 W. Carefree Hwy*

*Phoenix, AZ 85086*

*off. 623-236-7351*

*fax 623-236-7918*

## Kenneth Jacobson

---

**From:** Kyle McCarty  
**Sent:** Monday, July 11, 2011 10:18 AM  
**To:** 'Arthur\_Benally@nps.gov'  
**Cc:** Kenneth Jacobson  
**Subject:** RE: BAEA

Thanks Art.

Unfortunately, we were notified last week that one of the fledglings was recovered sick in New Mexico (Sanostee) on July 6. It is currently at a wildlife rehabilitation facility over there and the early prognosis is lead poisoning.

I will let you know if it survives and can be released back to the wild.

### **Kyle M. McCarty**

Arizona Game & Fish Dept. | Bald Eagle Field Projects Coordinator  
5000 W. Carefree Highway | Phoenix, AZ 85086  
623-236-7569

**From:** [Arthur\\_Benally@nps.gov](mailto:Arthur_Benally@nps.gov) [[mailto:Arthur\\_Benally@nps.gov](mailto:Arthur_Benally@nps.gov)]  
**Sent:** Thursday, July 07, 2011 1:46 PM  
**To:** Kyle McCarty  
**Cc:** Kenneth Jacobson  
**Subject:** BAEA

Another successful year, thanks.

I will pick June 27th as the fledge date. I had time to check this morning, nest is empty. One adult in the area and heard one juve (could not locate juve), no other activity, lake is very low.

Until next time, art

Arthur Benally  
Biological Science Tech.  
Canyon de Chelly National Monument  




Phoenix Deer Valley Airport

Flight Center

Spec Office Warehouse Bldg.

Meinda Industrial Park

Deer Valley Commerc Center Condo

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US Census Bureau

12 S 399384 91 m E 3727964 96 m N elev 444 m

Imagery Date: Nov 20, 2009

## Kenneth Jacobson

---

**From:** Anne Justice-Allen  
**Sent:** Tuesday, July 10, 2012 1:38 PM  
**To:** Kenneth Jacobson  
**Subject:** RE: eagles and lead  
**Attachments:** 23355Supp\_AZ\_2010\_004.pdf; NWHC23516SuppAZ\_2011\_011.pdf; NWHCFinal\_AZ\_2011\_010.pdf; 2011\_042GOEA\_WADDL.pdf

I have results pending on one additional bird.

*Anne Justice-Allen, DVM*

*State Wildlife Health Specialist  
Arizona Game and Fish Dept  
5000 W. Carefree Hwy  
Phoenix, AZ 85086  
off. 623-236-7351  
fax 623-236-7918*



**From:** Kenneth Jacobson  
**Sent:** Tuesday, July 10, 2012 1:14 PM  
**To:** Anne Justice-Allen  
**Subject:** RE: eagles and lead

Pdf's would be great.

Thanks,

Kenneth "Tuk" Jacobson  
Eagle Management Coordinator  
5000 W. Carefree Highway  
Phoenix, AZ 85086  
Work: (623) 236-7575  
Cell: (928) 941-0170

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**From:** Anne Justice-Allen  
**Sent:** Tuesday, July 10, 2012 12:28 PM  
**To:** Kenneth Jacobson  
**Subject:** eagles and lead

Tuk,

I have several lab reports (both positive and negative). Do you want hard copies or pdfs?

*Anne Justice-Allen, DVM*

*State Wildlife Health Specialist  
Arizona Game and Fish Dept  
5000 W. Carefree Hwy  
Phoenix, AZ 85086  
off. 623-236-7351  
fax 623-236-7918*



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

### Supplemental Report

9/9/2011

**CASE:** 23355

**EPIZOO:**

Legal  **INV#:**

Declassified

**Submitter:**

Kyle McCarty  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 12/2/2010

**Specimen description/identification/Location:**

| ACC | SPECIES       | SPECIMEN TYPE | BAND NUMBER | SUBMITTER'S ID | COUNTY  | STATE |
|-----|---------------|---------------|-------------|----------------|---------|-------|
| 001 | Eagle, Golden | CARCASS       |             |                | Yavapai | AZ    |

### DIAGNOSIS

Emaciation

Chronic deformity, left metatarsal region, due to healed fracture

### Event History:

This bird was found dead on forest service land near Camp Verde AZ. The location is 1.8 miles from a bald eagle nest. Prior to being found dead the eagle was reported to have been hopping around, unable to fly. A cow carcass was found nearby. Two piles of black material were also found near the carcass and were submitted.

**Comment:** 6/30/2011

This juvenile female Golden Eagle was severely emaciated. The bird's left leg below the hock was rotated and bent medially due to a fully healed fracture, and the bottom of the left foot had a chronic ulcer ("bumblefoot lesion") indicating abnormal weight-bearing over a long period of time, but the foot joints and tendons moved normally. The effect of the leg deformity is uncertain, but it may have contributed to the bird's debilitation. No lead was detected in liver tissue. Brain cholinesterase activity was within normal limits, ruling out poisoning by organophosphate pesticides. Attempts to isolate West Nile virus from pooled kidney/spleen tissue were negative. Cloacal and tracheal swabs were negative on screening for avian influenza viruses.

No food items were present in the stomach, but dark bloody fluid there suggests it may have fed on the cow carcass that was found nearby. Testing of that material for botulinum type C toxin was delayed by reconstruction of our diagnostic laboratories, but it will be done in the near future (early July is the expected re-occupation date); those test results will be sent in a supplemental report.

### Supplemental Report 9/7/11:

The stomach contents from this eagle were tested for botulinum type C toxin using the mouse protection test, and the results were not consistent with botulism. Both of the inoculated mice became sick, and bacterial cultures did not yield any pathogens. Because the test material was stomach contents rather than a relatively clean blood sample, gastric acids or digestive secretions may account for the test results. However, external toxins ingested by the eagle cannot be ruled out.

*Nancy J. Thomas*

Nancy J. Thomas, DVM, DACVP  
Staff Diagnostic Pathologist

*Anne E. Ballmann*

Anne E. Ballmann, DVM, Ph.D.

Wildlife Disease Specialist

Phone: 608-270-2445 E-Mail: aballmann@usgs.gov

If you have questions regarding this case, contact:

**Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.**

### Copies To:

MIGRATORY BIRD COORDINATOR (R2)  
USFWS Albuquerque (RO2), 500 Gold Ave SW, Albuquerque, NM 87102  
ANNE JUSTICE-ALLEN  
Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086



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## DIAGNOSTIC SERVICES CASE REPORT

**CASE:** 23516

Supplemental Report

7/26/2011

**EPIZOO:**

Legal  **INV#:**

Declassified

**Submitter:**

Anne Justice-Allen  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 4/26/2011

**Specimen description/identification/Location:**

| ACC | SPECIES     | SPECIMEN TYPE | BAND NUMBER | SUBMITTER'S ID | COUNTY   | STATE |
|-----|-------------|---------------|-------------|----------------|----------|-------|
| 001 | Eagle, Bald | CARCASS       | 0679-03049  | 26R            | Maricopa | AZ    |

### DIAGNOSIS

Trauma associated with falling from the nest  
Tick infestation; 7/25/2011 identified as *Argas giganteus*

**Comment:**

7/7/2011

### SUPPLEMENTAL REPORT 7/25/2011

The ticks found on this carcass of this Bald Eagle nestling were further identified as *Argas giganteus*. The range for this tick includes the western United States.

### ORIGINAL REPORT 7/7/2011

This 8-wk-old Bald Eagle nestling was in poor body condition and poor postmortem condition. Tissues were decomposed and maggots were present limiting diagnostic evaluation. There was evidence of trauma with hemorrhage in and around the mouth, subcutaneous hemorrhage along the abdominal wall and bruising of the pectoral muscle. Ticks were found on the skin of the carcass and were identified as *Argas sp.* Although the number of ticks on this eagle were not overwhelming, some of the tick life stages are quite small and difficult to see, ticks may leave the carcass after death, and these ticks are considered 'lair parasites' spending much more time in the nest than on the birds. Ticks can live for extended periods between feedings and a population of ticks can remain in the nest through the non nesting season. Because of the history of tick-associated behavior which lead to falls from the nest last year, I assume this is the likely cause of falling for the chicks in the nest this year as well. Treating the nests, or destroying the nests between seasons might help to break this cycle of tick infestation.

Screening tests for West Nile virus and avian influenza viruses were negative.

*Carol U. Meteyer*

Carol U. Meteyer, DIPL.ACVP  
Staff Diagnostic Pathologist

*Jennifer L. Buckner*

Jennifer L. Buckner

If you have questions regarding this case, contact:

Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

Copies To:



# NATIONAL WILDLIFE HEALTH CENTER

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Madison, Wisconsin 53711-6223  
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## DIAGNOSTIC SERVICES CASE REPORT

### Final Report

5/26/2011

**CASE:** 23484

**EPIZOO:**

Legal  **INV#:**

Declassified

**Submitter:**

James Driscoll  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 3/22/2011

**Specimen description/identification/Location:**

| ACC | SPECIES     | SPECIMEN TYPE | BAND NUMBER | SUBMITTER'S ID | COUNTY   | STATE |
|-----|-------------|---------------|-------------|----------------|----------|-------|
| 001 | Eagle, Bald | CARCASS       |             |                | Maricopa | AZ    |

### DIAGNOSIS

Severe bile obstruction  
Emaciation

### **Comment:**

5/26/2011

This female Bald Eagle nestling was emaciated. As mentioned by the submitter, the tissues were very pale. The bones were soft and poorly mineralized. The liver was large, deep green and fibrous when cut. These observations suggested problems with the outflow tract of the bile produced in the liver. Examination of the liver and biliary system suggested either an obstructed bile duct or a developmental anomaly in the duct carrying the bile from the liver to the gall bladder. Microscopic examination of tissues showed round worm eggs in the tissue of the bile duct. There are situations in other animals where round worms can migrate abnormally and move into the bile duct causing fatal obstruction. My guess is that this is what happened to this young eagle. Extra sections of slides of the bile duct and liver are being made to see if the adult round worm can be found and if it is associated with obstruction and regional inflammation. If this can be confirmed, a supplemental report will be sent. It is more common that migrating round worms that cause damage are not found in the tissues sections. Analysis of the liver for heavy metals that might also damage the liver were negative.

The other changes noted in this eagle can be attributed to malnutrition and liver failure including anemia and poor bone mineralization.

This eagle was negative for West Nile virus and no viruses were isolated from the spleen. Screening tests on tracheal and cloacal swabs for avian influenza viruses were negative.

The feet and feathers will be sent to the National Eagle Repository.

*Carol U. Meteyer*

Carol U. Meteyer, DIPL.ACVP

Staff Diagnostic Pathologist

*Jennifer L. Buckner*

Jennifer L. Buckner

Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

If you have questions regarding this case, contact:

**Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.**

### **Copies To:**

MIGRATORY BIRD COORDINATOR (R2)

USFWS Albuquerque (RO2), 500 Gold Ave SW, Albuquerque, NM 87102

ANNE JUSTICE-ALLEN

Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086

KYLE MCCARTY

Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086

WMRS

**WASHINGTON ANIMAL DISEASE DIAGNOSTIC LABORATORY**

**P.O. Box 647034  
Pullman, WA 99164-7034  
Phone: (509) 335-9696  
Fax: (509) 335-7424**

**Veterinarian:** Dr. Anne Justice-Allen  
**Clinic:** Arizona Game & Fish WMRS  
**Address:** 5000 W Carefree Hwy  
  
Phoenix, AZ 85086  
**Phone:** (623) 236-7351

**Owner:** AZ-2011-42  
**Animal:**  
**Species:** Golden Eagle  
**Breed:**  
**Age:**  
**Sex:** Not Reported

**SUMMARY REPORT**

**03/19/12**

**WADDL #2012-2272**

**Report authorized by: James Stanton, Senior Pathologist**

**Received: 02/28/12**

All testing at WADDL is complete. The anticoagulant brodifacoum is detected in the liver (similar to case 2012-2269). There are no histologic lesions to indicate that the anticoagulant exposure was the cause of death; however, the lack of histologic lesions also does not rule out that brodifacoum was the cause. Gross pathology and clinical history would be a more sensitive means of evaluating a hemorrhagic disease. While hepatic lead levels are mildly elevated, lead toxicity is not considered likely as the levels are not at toxic levels.

**FINAL DIAGNOSIS:**

Brodifacoum exposure with possible toxicity

**WORK PENDING:** None

---

Dr. James B. Stanton/JBS/jbs/phy

Analytical Sciences Laboratory  
University of Idaho

WMRS

Holm Research Center  
2222 West 6th Street, P.O. Box 442203  
Moscow, Idaho 83844-2203

Phone: (208) 885-7081 FAX: (208) 885-8937  
email: asl@uidaho.edu http://www.agls.uidaho.edu/asl/

Certificate of Analysis

Prepared For: Anne Justice-Allen  
Arizona Game And Fish Department  
WMRS  
5000 West Carefree Hwy  
Phoenix, AZ 85086

Case ID: VMAR12-009  
Report Date: 15-Mar-12  
Date Received: 02-Mar-12  
Client Reference: 2012-2272  
Owner: AZ-2011-42  
Species: Avian-Golden Eagle

Report Status:  Final  Preliminary  Addendum  Corrected

Interpretation of Results:

The liver contains a mildly elevated, but non-toxic, lead concentration (potential toxic range: > 5.00 µg/g).

The sample was forwarded to Michigan State University Diagnostic Center for Population and Animal Health. The sample tested **positive** for brodifacoum, a long-acting anticoagulant rodenticide. Concentrations of anticoagulant rodenticides in tissues have not been correlated with incidence/severity of clinical disease, and its presence in tissues indicates exposure only. Detection of chemical residue in tissues, coupled with clinical/gross evidence of bleeding, would support an anticoagulant rodenticide poisoning diagnosis.

Anticoagulant Screen  
Sample: Liver

| <u>Anticoagulant</u> | <u>Detected/Not Detected</u> |                     |
|----------------------|------------------------------|---------------------|
| <b>Brodifacoum</b>   | <b>Was Detected</b>          | <b>At 0.025 ppm</b> |
| Bromadiolone         | Was Not Detected             | At 0.02 ppm         |
| Chlorophacinone      | Was Not Detected             | At 0.20 ppm         |
| Coumachlor           | Was Not Detected             | At 0.02 ppm         |
| Coumafuryl           | Was Not Detected             | At 1.0 ppm          |
| Difenacoum           | Was Not Detected             | At 0.02 ppm         |
| Difethialone         | Was Not Detected             | At 0.07 ppm         |
| Diphacinone          | Was Not Detected             | At 0.20 ppm         |
| Warfarin             | Was Not Detected             | At 0.02 ppm         |

Note: Whole blood (EDTA or heparin) is the preferred tissue for antemortem testing; liver is the preferred tissue for postmortem testing. In some cases of exposure, liver levels may contain up to 10X the blood levels.

Patricia A. Talcott, MS, DVM, PhD., DABVT  
Veterinary Toxicologist

QC Review/Approval: tknopes / smcgeehan

# UI Analytical Sciences Laboratory

## Certificate of Analysis

Client Sample ID: AZ-2011-42

Sample Type: Liver Tissue

UIASL Sample ID: V1201073

Species: Avian-Golden  
Eagle

Preservation: None

**Heavy Metals Screen**

Method: ICP -- Nitric Digest

|            | Results (µg/g) | RL    | Adult<br>Approx. Ref. Range |   |
|------------|----------------|-------|-----------------------------|---|
| Arsenic    | < 4            | 4.0   | < 1                         |   |
| Cadmium    | < 0.1          | 0.10  | < 1.5                       |   |
| Copper     | 5.2            | 0.10  | 3 - 12                      |   |
| Iron       | 280            | 1.0   | 160 - 1000                  |   |
| Manganese  | 3.8            | 0.050 | 2.6 - 5.4                   |   |
| Molybdenum | 0.69           | 0.50  | ---                         |   |
| Lead       | 2.0            | 1.0   | < 1                         | * |
| Zinc       | 28             | 0.20  | 18 - 80                     |   |

Comment:

Note: Any included reference ranges are only guidelines and the analytical results need to be interpreted in conjunction with management and dietary factors, as well as with clinical and/or postmortem observations. Reference ranges can vary significantly between individuals or groups of animals from different ranges and habitats or on different diets.

Note: Serum concentrations of some elements (e.g., zinc, iron, phosphorus, magnesium) may be artificially elevated due to hemolysis or leaching from the red blood cells. Zinc can leach from some rubber blood collection tube stoppers. We recommend collecting blood in plastic vials or royal blue top vacutainer tubes (RBTT) without heparin (for trace element analysis) for submission of samples to be analyzed for zinc. The sample should be spun and the serum separated from the clot prior to shipping -- the serum can be placed in another RBTT without additive or into a snap-cap vial.

Samples will be discarded one month after date of final report unless otherwise requested.

ND = Not Detected NA = Not Applicable RL = Reporting Limit

QNS = Quantity Not Sufficient

BDL = Below Detection Limit

\* = Outside Reference Range

**WASHINGTON ANIMAL DISEASE DIAGNOSTIC LABORATORY**

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**Veterinarian: Dr. Anne Justice-Allen  
Clinic: Arizona Game & Fish WMRS  
Address: 5000 W Carefree Hwy  
  
Phoenix, AZ 85086  
Phone: (623) 236-7351**

**Owner: AZ-2011-42  
Animal:  
Species: Golden Eagle  
Breed:  
Age:  
Sex: Not Reported**

**HISTOPATHOLOGY REPORT**

**03/01/12**

**WADDL #2012-2272**

**Report authorized by: James Stanton, Senior Pathologist**

**Received: 02/28/12**

Tissues that are moderately to severely autolyzed, but otherwise lack significant histologic changes include lungs, heart, liver, kidney, and skeletal muscle.

**HISTOLOGIC DIAGNOSIS:**

1. Histologically normal tissues

**COMMENTS:** There is no evidence of a cause of death in this wild animal, nor is there any evidence of an underlying disease. Per your phone message, the fresh tissues will be submitted for anticoagulant rodenticide screening and lead level analysis.

**WORK PENDING:** Toxicology

---

Dr. James B. Stanton/JBS/jbs/lzp

Phone contact: A brief summary of the results is left on Dr. Justice-Allen's voicemail on 2/29/12 11:48 AM.

October 26, 2009

Notes on golden eagle mortalities in Arizona:

Golden eagle mortalities are tracked similarly to the process AGFD has in place for bald eagles. However fewer goldens are recovered, likely because they are more circumspect of human activity and generally occur in more remote areas than bald eagles. Also, goldens have a widespread distribution and are not obligate users of the water bodies that attract both bald eagles and people who might discover a carcass. The scarcity of golden eagle mortality information reflects our lack of data on the population status of the species in the state.

In total, I found 19 records of golden eagle mortality in our files, with one from 1997 and the remainder from the period 2003-2009. Of these 19 records, only five were sent to the National Wildlife Health Center or Arizona Veterinary Diagnostic Lab for necropsy. Three of these five were confirmed by the labs as lead toxicity. Additionally, one other golden eagle tested for high levels of lead and aspergillus, however the ultimate cause of death was unknown. The only other known cause of death included five from collisions (vehicle, power line).

| Golden eagle mortalities known/reported to AGFD. |          |                                     |                          |
|--------------------------------------------------|----------|-------------------------------------|--------------------------|
| Cause of death                                   | Date     | Liver lead level (ppm) <sup>1</sup> | Location                 |
| Lead toxicity                                    | May 1997 | 8.1                                 | Exact location unknown   |
| Lead toxicity                                    | Feb 2003 | 12.8                                | Near Seligman.           |
| Lead toxicity                                    | Nov 2007 | 35.65                               | Hunt unit 5A (Region 2). |
| Unknown – possibly lead/aspergillosis            | Jan 2009 | --                                  | Exact location unknown   |
| Collision w/wire or electrocuted                 | Feb 2004 | --                                  | Sulpher Springs Valley   |
| Hit by vehicle                                   | Jul 2005 | --                                  | Interstate 8 milepost 57 |
| Hit by vehicle                                   | Nov 2006 | --                                  | Near Kingman             |
| Hit by vehicle                                   | Nov 2006 | --                                  | Hwy. 87 milepost 277     |
| Hit by vehicle                                   | Jan 2009 | --                                  | Near Christopher Creek   |
| Emaciation of unknown cause                      | Oct 2005 | --                                  | Eagar                    |
| Emaciation of unknown cause                      | Nov 2007 | --                                  | Kaibab NF                |
| Unknown – aspergillosis likely                   | Sep 2008 | --                                  | San Carlos Reservation   |
| Unknown                                          | Dec 2006 | --                                  | Near Kingman             |
| Unknown                                          | 2006     | --                                  | Exact location unknown   |
| Unknown                                          | 2006     | --                                  | Exact location unknown   |
| Unknown                                          | Mar 2007 | --                                  | Near Young               |
| Unknown                                          | Aug 2008 | --                                  | Near Page                |
| Unknown                                          | Sep 2008 | --                                  | Indian Springs Wash      |
| Unknown                                          | Nov 2008 | --                                  | Pinto Creek              |

<sup>1</sup>Lead poisoning threshold is 6-8 ppm.

Kyle M. McCarty  
Bald Eagle Field Projects Coordinator

| Species | Mortality (0/1) | CauseOfDeath                          | DeathMonth | DeathDay | DeathYear | Plumage | RecoveredMonth | RecoveredDay |
|---------|-----------------|---------------------------------------|------------|----------|-----------|---------|----------------|--------------|
| GOEA    | 1               | Lead -- Liver 8.1ppm; Kidney 0.72ppm  | 1997       |          |           |         |                |              |
| GOEA    | 1               | Lead -- Liver 12.8ppm                 | 2003 A     |          |           |         |                |              |
| GOEA    | 1               | Collision, Electrocuton               | 2004       | 2        | 25        |         | 2              | 25           |
| GOEA    | 1               | Collision w/vehicle                   | 2006       | 11       | 21        |         | 11             | 20           |
| GOEA    | 1               | Collision w/vehicle                   | 2006 A     | 11       | 21        |         | 11             | 21           |
| GOEA    | 1               | unknown                               | 2006       |          |           |         | 12             | 4            |
| GOEA    | 1               | unknown                               | 2006 A     |          |           |         |                |              |
| GOEA    | 1               | unknown                               | 2006 A     |          |           |         |                |              |
| GOEA    | 1               | Emaciation of unknown cause           | 2007 A     | 11       | 25        |         | 11             | 25           |
| GOEA    | 1               | Lead -- 35.65 (wet weight)            | 2007 A     |          |           |         | 11             | 23           |
| GOEA    | 1               | unknown                               | 2007       | 3        | 22        |         | 3              | 22           |
| GOEA    | 1               | unknown                               | 2008 A     |          |           |         | 9              | 5            |
| GOEA    | 1               | unknown                               | 2008       | 9        | 5         |         | 9              | 5            |
| GOEA    | 1               | unknown                               | 2008       |          |           |         | 11             | 22           |
| GOEA    | 1               | Collision w/vehicle                   | 2008       |          |           |         |                |              |
| GOEA    | 1               | Collision w/vehicle                   | 2009       |          |           |         | 1              | 25           |
| GOEA    | 1               | unknown -- possibly Lead, Aspergillus | 2009       | 1        | 22        |         | 1              | 16           |

| Recovered Year | Location/Description                | Contact                   |
|----------------|-------------------------------------|---------------------------|
|                | No information                      | Jim deVos, AGFD           |
|                | Near Seligman.                      | Jim deVos, AGFD           |
| 2004           | Sulpher Springs Valley, Rucker Ca   | Frank Soils, USFWS, Frank |
| 2006           | Stockton Hill Rd, milepost 13, King | Tyler Richins, AGFD       |
| 2006           | Hwy 87 south near milepost 208      | Kyle McCarty, AGFD        |
| 2006           | Near Kingman Airport                | Tyler Richins, AGFD       |
| 2007           | Scholtz Rd/FS 62 near stock tank,   | Dan Gaska, AGFD           |
| 2007           | Unit 5A next to tank near Mogollon  | Garret Fabian, AGFD       |
| 2007           | E of Young, AZ, half mile SW of Q   | Craig McMullen, AGFD      |
| 2008           | Indian Springs Wash up from Verc    | Kyle McCarty, AGFD        |
| 2008           | Pinto Creek, ~2 mi below Henders    | Amyann Madara, USFS       |
|                | Near Page, AZ                       | Sophia Fong, AGFD         |
| 2009           | Hwy 260 milepost 277, between C     | Craig McMullen, AGFD      |
| 2009           | unknown                             | Liberty                   |

## Comments

Necropsied 5/7/1997. Recent lead exposure.

Necropsied 2/7/2003. Found by a black-footed ferret biologist.

Burned back & wings. Bird strike along midspan of wire w/3 phase configuration

Probable roadkill. Within 5 feet of road, possibly had carrion in beak.

Found dead/battered on road 100 ft down from roadkill skunk.

Dead up to 2 weeks. Likely an adult. In high-use OHV, target shooting area.

Missing both legs below ankle, otherwise intact.

Possible roadkill. Missing one leg and tail, much of body mangled and open, head twisted over body, wings splayed.

Liver lead 1.54ppm, below threshold. WNV and avian flu negative.

Found alive, lethargic, emaciated, feet contracted, unable to fly. Near tank, feces w/metallic green. Euthanized in field. Lead bullet fragment found in gizz.

Found laying on breast, wings spread. Maggoty. No casings, bullets, tracks found in area.

Was seen alive but grounded, lethargic by finder a few days before collected dead.

Much of body cavity gone. Lying on back in creek.

One of three goldens from area. Two live ones went to rehab -- status/outcome unknown.

Found dead on highway, probably hit by car.

Very high levels of lead and high titer of aspergillus. Died in rehab undergoing chelation and medication.

ard.

| Golden Eagle mortality summary. Last updated 6/11/2012. |                          |     |                                                                                                                                                                                                                                                                |                                          |                                       |
|---------------------------------------------------------|--------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------|
| Eagle location                                          | Date collected           | Age | Comments                                                                                                                                                                                                                                                       | Necropsy by:                             | Submitted by:                         |
| ? (FOR5)<br>Reference #<br>97-1986                      | 5/7/1997                 | U   | Necropsy diagnosis: Intoxication, lead. Liver tissue contained 8.1 ppm lead. Kidney lead 0.72 ppm. Elevated liver lead levels in relation to kidney indicated recent exposure. Pesticides negative.                                                            | AZ<br>Veterinary<br>Diagnostic<br>Lab.   | Kim Murphy,<br>FOR5                   |
| Near<br>Seligman<br>Reference #<br>03-0940              | 2/7/2003                 | A   | Necropsy diagnosis: Intoxication, lead. Liver tissue contained 12.8 ppm lead. WNV negative.<br>Found by Black-footed ferret crew.                                                                                                                              | AZ<br>Veterinary<br>Diagnostic<br>Lab    | Jim DeVos                             |
| Sulphur<br>Springs<br>Valley                            | 2/21/2004                | I   | Rucker Canyon Rd and Highway 191.<br>Reported with burned back and wing and "bird strike along midspan of wire with 3-phase configuration". Reported as a collision / electrocution but no necropsy report was attached, so maybe unconfirmed (?).             | n/a                                      | Frank Solis<br>(USFWS);<br>Tom Wood   |
| Eagar, AZ<br>Case 19603                                 | 10/17/2005               | I   | Band # 629-44319. Blue band M over W. Dale Stahlecker banded in NM on 5/23. Found in front yard of a neighborhood in Springerville/Eagar. WNV negative, lead negative. Preliminary diagnosis was marked emaciation and bile engorgement.<br>34 6.7N, 109 17.5W | National<br>Wildlife<br>Health<br>Center | Dan Groebner,<br>Mike Sumner.<br>FOR1 |
| Interstate 8,<br>milepost 57                            | 7/4/2005                 | I   | Little information. Apparently reported as road killed. Have photo.                                                                                                                                                                                            | n/a                                      | Dan Urquidez                          |
| Kingman,<br>AZ                                          | 11/20/2006               | A   | Believed to have been vehicle collision. Found 5 feet from roadside. Stockton Hill Rd milepost 13.                                                                                                                                                             | n/a                                      | Tyler Richins                         |
| Highway 87,<br>mile marker<br>208                       | 11/21/2006               | A   | Road-killed. Found on highway, crushed and battered. May have been feeding on a road-killed skunk which was 100 feet up the road.<br>Approx 435155 E, 3732790 N                                                                                                | n/a                                      | Kyle McCarty,<br>WMNG                 |
| Kingman<br>airport<br>vicinity                          | 12/4/2006                | A   | Cause of death undetermined. Found dead perhaps 2 weeks old in a high use area for OHV and target shooters.                                                                                                                                                    | n/a                                      | Tyler Richins                         |
| East of<br>Young, AZ                                    | 3/22/2007                | U   | Cause of death undetermined. No casings, bullets, or tracks in area. Carcass in advanced decay when found about 1/2 mile southwest of Q Ranch, east of Young. Initially reported as a BAEA, but was a GOEA.<br>517434E, 3767402N                               | n/a                                      | Craig<br>McMullen                     |
| unknown                                                 | Aug 2006 –<br>April 2007 | A   | Cause of death undetermined. No information on location or finder. GOEA carcass missing both legs below 'ankle', otherwise looked intact.                                                                                                                      | n/a                                      | unknown                               |
| unknown                                                 | Aug 2006 –<br>April 2007 | A   | No information on location or finder. GOEA, possible road-killed. Much of body open, mangled, with head/neck twisted over body and wings splayed. Missing one leg and tail.                                                                                    | n/a                                      | unknown                               |
| Coconino FR<br>300 and 308<br>junction                  | 11/23/2007               | A   | Found alive next to tank along Mogollon Rim area in unit 5A. Lethargic, emaciated, feces with metallic green. Euthanized in field.<br>Necropsy diagnosis: Lead poisoning. Liver                                                                                | National<br>Wildlife<br>Health<br>Center | Garret Fabian,<br>FOR2                |

|                          |            |     |                                                                                                                                                                                                                                                                                            |                                 |                                |
|--------------------------|------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------------|
|                          |            |     | lead level 35.65 ppm (above 8 ppm considered toxic). One irregular shattered bullet fragment visible in lumen of the gizzard (non-magnetic). Essentially no fat.                                                                                                                           |                                 |                                |
| Garland Prairie          | 11/25/2007 | A   | Near stock tank on Scholtz Rd – FS 62, Kaibab National Forest, north of Garland Prairie.<br>Necropsy diagnosis: Severely emaciated, cause undetermined. Liver lead 1.54 ppm below toxic level. WNV negative. Avian influenza screening negative.                                           | National Wildlife Health Center | Dan Gaska, FOR2                |
| Indian Springs Wash      | 9/5/2008   | A   | Found alive by public, non-flying and lethargic. Was dead upon recovery and too far gone for necropsy. Cause of death undetermined.<br>436961E, 3744012 N (NAD27)                                                                                                                          | n/a                             | Kyle McCarty, WMNG             |
| San Carlos Reservation   | 10/1/2008  | U   | Handled by Liberty Wildlife. Bird underwent treatment for Asper. WNV negative. Euthanized due to worsening condition. Asper lesions found during necropsy by Dr. Orr.                                                                                                                      | Liberty Wildlife                | Jan Miller                     |
| Pinto Creek              | 11/22/2008 | (A) | Cause of death unknown. Pinto Creek about 2 miles below Henderson Ranch. Found by USFS, photographed. Carcass laying in shallow water, looked like part of body was eaten out. Info was passed on to a Wildlife Manager, but it appears the carcass was not recovered – no follow up info. | n/a                             | Amyann Madara, USFS            |
| Near Page, AZ            | 2008       | U   | No information.                                                                                                                                                                                                                                                                            | n/a                             | Sophia Fong; Sandy Cate        |
| Unknown                  | 1/16/2009  | U   | Live bird at Liberty Wildlife, had high lead levels and high titer of aspergillus. Chelated and treated for asper, but died 1/22/2009.                                                                                                                                                     | n/a                             | Jan Miller                     |
| Highway 260 milepost 277 | 1/25/2009  | I   | Dead on road, presumed hit by vehicle on Hwy 260 between Christopher Creek and rim road 99. Initially reported as an immature BAEA, but was a GOEA.                                                                                                                                        | n/a                             | Craig McMullen                 |
| Kaibab Plateau           | 6/2/2009   | A   | Highway 67 milepost 592, presumed hit by vehicle. Banded 629-34846.                                                                                                                                                                                                                        | n/a                             | Tom McCall; Susi MacVean. FOR2 |
| Chasm Creek              | 11/29/2010 | I   | Reported by public alive, found dead upon recovery. 34 26.97 N, 111 49.38 W.<br>Necropsy diagnosis: Severely emaciated. Had a chronic deformity (a healed injury) which may have inhibited the bird. Lead negative.                                                                        | National Wildlife Health Center | Jake Fousek                    |
| Seligman, AZ             | 6/9/2011   | A   | Cause of death undetermined, but found dead near railroad tracks by BFF crew. UTM 3914328 / 320792. Banded 1098-00895.                                                                                                                                                                     | n/a                             | Jeffrey Corcoran, FOR3         |
| Seligman, AZ             | Aug 2011   | I   | Cause of death undetermined. Recovered in good condition, no information on finder or location.                                                                                                                                                                                            | n/a                             | unknown                        |
| Seligman, AZ             | Aug 2011   | A   | Cause of death undetermined. Recovered in good condition, no information on finder or location.                                                                                                                                                                                            | n/a                             | unknown                        |
| Mormon Lake, AZ          | 11/21/2011 | A   | Injured by vehicle strike, euthanized in field due to severe extent of injuries. Lake Mary                                                                                                                                                                                                 | n/a                             | Kathy Sullivan, FOR2           |

|                                      |            |   |                                                                                                                                                                                     |     |                          |
|--------------------------------------|------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------------------------|
|                                      |            |   | Road adjacent to Mormon Lake.                                                                                                                                                       |     |                          |
| New Mexico Hwy 9                     | 12/28/2011 | A | Found 7 mi. E of AZ-NM line. Necropsy diagnosis: Sub-clinical level of lead, brodifiacoum toxicity.                                                                                 | ?   | Anne Justice-Allen, WMRS |
| Near Seligman, AZ                    | 1/10/2012  |   | Found dead, appeared to be hit by vehicle. I-40, MP 127.5 eastbound.                                                                                                                | n/a | Ben Shelby, FOR3         |
| Hwy 389, MP 13                       | 2/17/2012  | A | Road-killed. Game Management Unit 13A.                                                                                                                                              | n/a | Jeremy Felish, FOR2      |
| Empirita Ranch, West Well            | 3/6/2012   | I | Cause of death undetermined. No obvious signs of injury or mortality. Had small wire wrapped around ankle. 31 56.4N, 110 27.8W.                                                     | n/a | Aaron Miller, FOR5       |
| Near Seligman, AZ                    | 3/12/2012  |   | Cause of death undetermined. Unit 10, Diamond A Ranch, Hubbard pasture. Found dead by side of two-track dirt road, head smashed.                                                    | n/a | Jennifer Cordova, FOR3   |
| Near Marcou Mesa (N of Holbrook, AZ) | 3/26/2012  | A | Cause of death undetermined. Found decayed underneath powerline. UTM 579805E / 3887060N.                                                                                            | n/a | Joel Weiss, FOR1         |
| Near Williams, AZ                    | 3/29/2012  | A | Found dead next to railroad tracks south of Double A Knoll, wing and leg broken. Likely hit by train (remains of elk carcass found along tracks nearby). Banded 0679-04936 by SWCA. | n/a | Mike Rice, FOR2          |
| Near Colorado City, AZ               | 5/28/2012  | A | Found dead in BLM Community Pit south of city, dumped with trash. Gunshot wound in chest, dead for a while. Found by WM on patrol.                                                  | n/a | Jeremy Felish, FOR2      |

| ProbableCauseofDeath                              | glenumh | Species | DeathMonth | hthp | DeathYear | Latitude | Longitude | UTMX   | UTMY    | Zone | AreaName                              |
|---------------------------------------------------|---------|---------|------------|------|-----------|----------|-----------|--------|---------|------|---------------------------------------|
| Lead -- 26.39 ppm wet weight                      | 07D01   | BAEA    | 3          | 7    | 2007      | 34.0983  | -109.3670 | 650640 | 3774059 | 12   | Little Colorado River                 |
| Lead -- 30.05 ppm wet                             | 03D03   | BAEA    | 1          | 31   | 2003      | 33.9440  | -111.6830 |        |         |      | Cliff                                 |
| Lead -- 7.53                                      | 04D05   | BAEA    | 3          | 20   | 2004      |          |           | 645036 | 3767288 | 12   | East end of River Reservoir, AZ       |
| Lead -- 23.43                                     | 04D02   | BAEA    | 2          | 26   | 2004      |          |           | 618681 | 3555500 | 12   | 11 miles S. of Wilcox, AZ             |
| Lead: Liver 18.45ppm; kidney=47.99 ppm wet wt.    | 09D01   | BAEA    | 2          | 20   | 2009      |          |           | 595508 | 3781708 | 12   | Scott Reservoir                       |
| Lead -- 48.52 ppm wet                             | 03D02   | BAEA    | 3          | 1    | 2002      |          |           | 446000 | 3893500 | 12   | Flagstaff                             |
| Lead -- 43 ppm                                    | 98D03   | BAEA    |            |      | 1998      |          |           | 408303 | 3894811 | 12   | Scholz Lake                           |
| Lead -- 15.66 Dry (femur)                         | 99D02   | BAEA    |            |      | 1999      |          |           |        |         |      | Campo Verde                           |
| Lead -- 23.05 ppm dry (femur)                     | 99D01   | BAEA    |            |      | 1999      |          |           |        |         |      | Young                                 |
| Lead -- 94 ppm                                    | 98D01   | BAEA    | 1          | 15   | 1998      |          |           |        |         |      | Saguaro Lake Hellpad                  |
| Lead 4.58 ppm wet post chelation. >60.0 ppm blood | 98J13   | BAEA    | 1          | 16   | 2003      |          |           |        |         |      | White River                           |
| Lead -- 41.5 ppm wet weight                       | 02D03   | BAEA    | 1          | 27   | 2002      |          |           |        |         |      | Cosnino                               |
| Lead -- 36.04 ppm wet weight                      | 03D06   | BAEA    | 2          | 10   | 2003      |          |           |        |         |      | Showlow, Walmart                      |
| Lead -- 42.77 ppm wet weight                      | 02D04   | BAEA    | 3          | 10   | 2001      |          |           |        |         |      | Fools Hollow Lake                     |
| Lead -- 49.56 ppm wet weight                      | 99D03   | BAEA    | 3          | 12   | 1999      |          |           |        |         |      | Pintail Lake                          |
| Lead -- 13.52 ppm wet weight                      | 03D04   | BAEA    | 3          | 15   | 2003      |          |           |        |         |      | Stoneman                              |
| Lead -- 30.0 ppm                                  | 04D03   | BAEA    | 3          | 19   | 2004      |          |           |        |         |      | KA Ranch/Horseshoe lake               |
| Lead -- 11.3                                      | 04D04   | BAEA    | 3          | 21   | 2004      |          |           |        |         |      | Spring Creek Ranch, Sierra Anches, AZ |
| Lead -- 13.11ppm                                  | 04D06   | BAEA    | 3          | 21   | 2004      |          |           |        |         |      | SE side of Whitehorse Lake            |
| Lead -- 48.17 ppm wet weight                      | 02D01   | BAEA    | 3          | 22   | 2002      |          |           |        |         |      | Lower Lake Mary                       |
| Lead -- 38.28 ppm wet weight                      | 00D01   | BAEA    | 3          | 28   | 2000      |          |           |        |         |      | Kaibab Lake                           |
| Lead -- 13 ppm wet weight                         | 03D05   | BAEA    | 4          | 1    | 2003      |          |           |        |         |      | Flagstaff                             |
| Lead -- 33.47 ppm wet weight                      | 00D02   | BAEA    | 4          | 8    | 2000      |          |           |        |         |      | East Clear Creek                      |
| Lead -- 8.15 ppm                                  | 04D07   | BAEA    | 4          | 12   | 2004      |          |           |        |         |      | Clifton, AZ                           |

Comments

Lead poisoning.

USFWS investigation - Kate Looney

Lead levels taken post chelation.

629-37345; VID BL/Silver --> Banded as migrant juvenile in Montana. NAD 27

Coordinates in NAD83.

WM picked up @ continental area, Flagstaff ... Lake Elaine

reported January 1999, but occurred some time before.

Died while in transport to Liberty Wildlife Rehab

Legs chopped off post mortem -- transferred by Preston Fant

Wintering adult found dead. Andi Roger delivered the bird, sent to N.W.H.C.

Died face down with wings spread

SAD sent to ACH on 4/18/03

T14N R12E Sec. 19

Table 3. Known lead poisoning mortalities and lead concentrations in bald eagles recovered in Arizona, 1998-2011.

| Bald Eagle Location     | Date Recovered | Liver Lead Levels ( $\mu\text{g}/\text{dL}$ ) | Blood lead level |
|-------------------------|----------------|-----------------------------------------------|------------------|
| Saguaro Lake            | January 1998   | 940                                           |                  |
| Whiteriver <sup>1</sup> | January 2003   | 600 <sup>2</sup>                              |                  |
| Pintail Lake            | March 1999     | 495.6                                         |                  |
| Lake Elaine             | March 2002     | 485.2                                         |                  |
| Lower Lake Mary         | March 2002     | 481.7                                         |                  |
| Scholz Lake             | Fall 1998      | 430                                           |                  |
| Fools Hollow Lake       | March 2001     | 427.7                                         |                  |
| Cosnino                 | January 2002   | 415                                           |                  |
| Kaibab Lake             | March 2000     | 382.8                                         |                  |
| Show Low Wal-Mart       | February 2003  | 360.4                                         |                  |
| Lake Elaine             | April 2010     | 351.1                                         |                  |
| East Clear Creek        | April 2000     | 334.7                                         |                  |
| Horseshoe Dam Subadult  | January 2003   | 300.5                                         |                  |
| K.A. Ranch              | March 2004     | 300                                           |                  |
| Little Colorado River   | March 2007     | 263.9                                         |                  |
| Wilcox                  | February 2004  | 234.3                                         |                  |
| Scott Reservoir         | January 2009   | 184.5                                         |                  |
| Stoneman Lake           | March 2003     | 135.2                                         |                  |
| Long Lake               | March 2003     | 133                                           |                  |
| White Horse Lake        | March 2004     | 131.1                                         |                  |
| Young                   | March 2004     | 113                                           |                  |
| River Reservoir         | March 2004     | 75.3 <sup>3</sup>                             |                  |
| Clifton                 | April 2004     | 81.5                                          |                  |
| Young                   | Fall 1999      | 230.5 <sup>4</sup>                            |                  |
| Camp Verde              | Fall 1999      | 156.6 <sup>4</sup>                            |                  |
| Perkinsville            | October 2010   | --                                            | 725ppm           |

<sup>1</sup> Arizona hatched bald eagle.

<sup>2</sup> Blood lead levels before treatment.

<sup>3</sup> Liver lead levels after 1 chelatin treatment.

<sup>4</sup> Femur lead levels (ppm dry weight).

In addition to these mortalities, a 2005 subadult (05S01), a 2006 Arizona nestling (06J25), and a 2007 adult, and an adult in 2010 (03J12) were recovered alive while suffering from lead poisoning. These individuals were successfully rehabilitated and later released.

Table 6. Probable causes of bald eagle mortality in Arizona, 1987 to 2010.

| Mortality factor for bald eagles in Arizona <sup>1</sup> | Adults <sup>2</sup> | Subadult  | Nestling/<br>Fledgling | Adults    | Subadult  | Total      |
|----------------------------------------------------------|---------------------|-----------|------------------------|-----------|-----------|------------|
| Unknown                                                  | 6                   | 4         | 126                    | 15        | 6         | 157        |
| Replacement/Intruding Adult                              | 53                  | 4         | 8                      | --        | --        | 65         |
| Lead Poisoning                                           | 1                   | --        | --                     | 19        | 5         | 25         |
| Starvation                                               | 1                   | 2         | 12                     | 2         | --        | 17         |
| Predations                                               | 1                   | --        | 15                     | 1         | --        | 17         |
| Heat stress                                              | --                  | --        | 13                     | --        | --        | 13         |
| Mexican chicken bugs                                     | --                  | --        | 12                     | --        | --        | 12         |
| Shot                                                     | 3                   | 5         | --                     | 2         | 1         | 11         |
| Impact injury                                            | --                  | 2         | 2                      | 2         | 4         | 10         |
| Fell from nest                                           | --                  | --        | 8                      | --        | --        | 8          |
| Electrocution                                            | --                  | 3         | 2                      | --        | 1         | 6          |
| Drowned                                                  | --                  | 1         | 4                      | --        | 1         | 6          |
| Bacterial infection                                      | 1                   | --        | 3                      | --        | --        | 4          |
| Siblicide                                                | --                  | --        | 4                      | --        | --        | 4          |
| Poisoning                                                | 1                   | 2         | --                     | --        | --        | 3          |
| Fishing line                                             | 1                   | --        | 2                      | --        | --        | 3          |
| Abandonment                                              | --                  | --        | 2                      | --        | --        | 2          |
| Physiological problems                                   | --                  | --        | 2                      | --        | --        | 2          |
| Anemia                                                   |                     |           | 2                      |           |           | 2          |
| Ectoparasites (ticks)                                    |                     |           | 2                      |           |           | 2          |
| Fractured pelvis                                         |                     |           | 1                      |           | 1         | 2          |
| Bee stings                                               | --                  | --        | 1                      | --        | --        | 1          |
| Frostbite                                                | --                  | --        | 1                      | --        | --        | 1          |
| Internal injuries                                        |                     |           |                        | 1         |           | 1          |
| <b>Total</b>                                             | <b>68</b>           | <b>23</b> | <b>222</b>             | <b>42</b> | <b>19</b> | <b>374</b> |

<sup>1</sup>Includes results reported in Hunt et al. (1992) and Mesta et al. (1992).

<sup>2</sup>Shaded areas = bald eagles hatched or breeding in Arizona.



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE UPDATE

CASE: 23050      EPIZOO:

6/11/2010

## FINDINGS TO DATE

Submitter:

Kyle McCarty  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

Date Submitted: 5/18/2010

Specimen description/identification/Location:

| ACC | SPECIES     | SPECIMEN TYPE        | BAND NUMBER | SUBMITTER'S ID | COUNTY   | STATE |
|-----|-------------|----------------------|-------------|----------------|----------|-------|
| 001 | Eagle, Bald | CARCASS              | 0679-03020  | blue 25/A      | Maricopa | AZ    |
| 002 | Eagle, Bald | CARCASS, WHOLE BLOOD | 0679-03021  | blue 25/B      | Maricopa | AZ    |
| 003 | Eagle, Bald | CARCASS              | 0679-03030  | blue 25R       | Maricopa | AZ    |

Comment:

5/21/2010: Three immature bald eagles from the same nest were submitted. The first (Accession 001) was an immature female in nearly full fledging plumage. The only lesion found was numerous hemorrhages beneath the skin and they were confined to the skin without extending into the underlying muscle. They were located over the majority of the body, with the highest density over the legs.

Accession 002 was an immature male with numerous hemorrhages visible on the undersurface of the skin with the highest density from 5-8 hemorrhagic foci/sq. inch. Most were along the legs and pectoral region. The bird was in good body condition with no other lesions, and no hemorrhage in the internal organs. Accession 003 had a similar pattern of foci with no obvious internal lesions. It was more decomposed than the previous two. Acc 002 and 003 both had a considerable number of parasites on the carcass and dusting birds taken into rehab may prevent transfer to other patients.

The description of symptoms of dehydration, anemia, and lethargy could be explained by blood loss from ectoparasites or possible tick-induced paralysis. We have a variety of laboratory tests in progress for bacteria, West Nile virus, pesticides, and botulism to rule out other potential sources. Significant laboratory results will be conveyed to you as they become available.

6/11/2010: Virological testing of Accessions 001 and 002 indicated these birds were positive for West Nile virus. Results are not available for Acc 003 at this time. Histological examination of tissues from Acc 001 did not show WNV disease. Tissues from Acc 002 had a mild encephalitis, some lesions in the heart, and substantial necrosis in the spleen so disease from WNV was prominent. The birds were both anemic.

We have negative results for all testing for rodenticides, avian influenza viruses, Salmonella, lead poisoning, cholinesterase inhibition from organophosphate or carbamate pesticides, and pathogenic bacteria. Botulism testing will be conducted soon as a rule out diagnosis.

At this time, we will need more information to interpret the combination of tick infestation and WNV infection for Acc 001, but the cause of death can be attributed to WNV for 002. We will provide information on 003 as it becomes available.

*Krysten L. Schuler*

If you have questions regarding this case, contact:

Krysten L. Schuler, Ph.D.

Wildlife Disease Specialist

Phone: 608-270-2447

E-Mail: [kschuler@usgs.gov](mailto:kschuler@usgs.gov)

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
Madison, Wisconsin 53711-6223  
608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

### Final Report

8/3/2010

**CASE:** 23050

**EPIZOO:**

Legal  **INV#:**

Declassified

**Submitter:**

Kyle McCarty

Arizona Game & Fish/Phoenix

5000 W. Carefree Highway

Phoenix, AZ 85086

**Date Submitted:** 5/18/2010

**Specimen description/Identification/Location:**

| ACC | SPECIES     | SPECIMEN TYPE        | BAND NUMBER | SUBMITTER'S ID | COUNTY   | STATE |
|-----|-------------|----------------------|-------------|----------------|----------|-------|
| 001 | Eagle, Bald | CARCASS              | 0679-03020  | blue 25/A      | Maricopa | AZ    |
| 002 | Eagle, Bald | CARCASS, WHOLE BLOOD | 0679-03021  | blue 25/B      | Maricopa | AZ    |
| 003 | Eagle, Bald | CARCASS              | 0679-03030  | blue 25R       | Maricopa | AZ    |

**DIAGNOSIS**

001, 003: Tick ectoparasitism and West Nile virus infection

002: West Nile virus disease and tick ectoparasitism

**Comment:**

8/3/2010

The diagnostic findings in these three Bald Eagle chicks are complicated. All three chicks had numerous small hemorrhages best visualized on the undersurface of the skin, and two of the chicks (Accessions 002 and 003) had many small soft-bodied ticks (presumed *Argas* sp. larval stages) on their skin or feathers. West Nile virus was detected in one or more tissues from each of the birds, but only one bird (002) had microscopic lesions compatible with disease caused by West Nile virus. Blood loss from ectoparasitism is compatible with the clinical pathology results (anemia, hypoproteinemia) from these birds, and the clinical signs (weakness, immobility, flaccid limb paralysis) are compatible with tick paralysis or severe blood loss from ectoparasitism. Therefore, tick parasitism is likely to have played a significant role in these chicks deaths. The concurrent West Nile virus infections in all three birds is highly suspicious, but some birds do survive this viral infection; the lack of compatible microscopic lesions in two of the three chicks suggests the infection was not fatal at the time of their deaths. Nevertheless, this agent is likely to have at least complicated the effects of ectoparasitism, if not playing a primary role.

No anticoagulant rodenticides were detected in liver tissue from each of the three chicks. No lead was detected in liver tissue from each of the three chicks, and brain cholinesterase activity was normal in the two chicks that were tested (001, 002). Blood from chicks 002 and 003 was negative for botulinum type C and E toxins. No significant bacteria were isolated from liver tissue of chicks 001 and 002. Cloacal and tracheal swabs from all three chicks were negative on screening for avian influenza viruses.

CASE: 23060

## Final Report

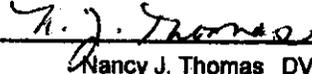
8/3/2010

EPIZOO:

Legal  INV#:

Declassified

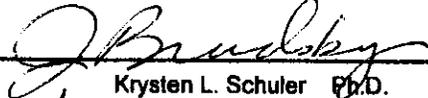
See attached necropsy records for individual specimen observations.



Nancy J. Thomas DVM, DACVP

Staff Diagnostic Pathologist

If you have questions regarding this case, contact:



Krysten L. Schuler Ph.D.

for Wildlife Disease Specialist

Phone: 608-270-2447

E-Mail: [kschuler@usgs.gov](mailto:kschuler@usgs.gov)

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

**Copies To:**

ANNE JUSTICE-ALLEN

Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086

ENDANGERED SPECIES (RO2)

USFWS Albuquerque (RO2), PO Box 1306, 2105 Osuna Road, NE, Albuquerque, NM 87103-1306



NATIONAL WILDLIFE HEALTH CENTER  
 6006 Schroeder Road  
 Madison, Wisconsin 53711-6223  
 608-270-2400 (FAX 608-270-2415)

**DIAGNOSTIC SERVICES CASE REPORT**

**Final Report**

9/10/2010

**CASE:** 23171

**EPIZOO:**

Legal  **INV#:**

Declassified

**Submitter:**

Kyle McCarty  
 Arizona Game & Fish/Phoenix  
 5000 W. Carefree Highway  
 Phoenix, AZ 85086

**Date Submitted:** 7/28/2010

**Specimen description/identification/Location:**

| ACC | SPECIES     | SPECIMEN TYPE | BAND NUMBER | SUBMITTER'S ID | COUNTY   | STATE |
|-----|-------------|---------------|-------------|----------------|----------|-------|
| 001 | Eagle, Bald | CARCASS       |             |                | Coconino | AZ    |

**DIAGNOSIS**

Lead poisoning (plumbism)

**Comment:**

9/10/2010

The probable cause of death in this emaciated adult male Bald Eagle was lead poisoning (plumbism). This diagnosis was confirmed by toxicological analysis of the liver; liver lead levels were 35.11 ppm wet weight, which is considered markedly elevated to a toxic level. No metal foreign bodies were found in the gastrointestinal tract, so the source of the lead remains unknown. Despite toxic and lethal levels of lead in the liver, it is possible this eagle was so impaired by plumbism that its immediate cause of death was an attack by a predator. The head of this eagle was completely detached from its neck, and there was extensive drying and scavenging of skin and muscles of the head and neck.

Swabs of the trachea and cloaca were negative for avian influenza viruses by polymerase chain reaction (PCR) tests. Special virus cultures for West Nile virus on the brain, spleen, and kidney were negative. No pathogenic bacteria were isolated from the liver. No other diagnostic tests were attempted on this eagle.

David Earl Green DVM, DACVP  
 Staff Diagnostic Pathologist

If you have questions regarding this case, contact:

Jennifer L. Bradsby  
 Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

**Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.**

**Copies To:**

MIGRATORY BIRD COORDINATOR (R2)  
 USFWS Albuquerque (RO2), PO Box 1306, 2105 Osuna Road, NE, Albuquerque, NM 87103-1306



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DIAGNOSTIC SERVICES CASE REPORT

Final Report

6/30/2011

CASE: 23355

EPIZOO:

Legal [ ] INV#:

Declassified [ ]

Submitter:

Kyle McCarty
Arizona Game & Fish/Phoenix
5000 W. Carefree Highway
Phoenix, AZ 85086

Date Submitted: 12/2/2010

Specimen description/identification/Location:

Table with 7 columns: ACC, SPECIES, SPECIMEN TYPE, BAND NUMBER, SUBMITTER'S ID, COUNTY, STATE. Row 1: 001, Eagle, Golden, CARCASS, Yavapai, AZ

DIAGNOSIS

Emaciation
Chronic deformity, left metatarsal region, due to healed fracture

Comment:

6/30/2011
This juvenile female Golden Eagle was severely emaciated. The bird's left leg below the hock was rotated and bent medially due to a fully healed fracture, and the bottom of the left foot had a chronic ulcer ("bumblefoot lesion") indicating abnormal weight-bearing over a long period of time, but the foot joints and tendons moved normally. The effect of the leg deformity is uncertain, but it may have contributed to the bird's debilitation. No lead was detected in liver tissue. Brain cholinesterase activity was within normal limits, ruling out poisoning by organophosphate pesticides. Attempts to isolate West Nile virus from pooled kidney/spleen tissue were negative. Cloacal and tracheal swabs were negative on screening for avian influenza viruses.

No food items were present in the stomach, but dark bloody fluid there suggests it may have fed on the cow carcass that was found nearby. Testing of that material for botulinum type C toxin was delayed by reconstruction of our diagnostic laboratories, but it will be done in the near future (early July is the expected re-occupation date); those test results will be sent in a supplemental report.

Nancy J. Thomas

Nancy J. Thomas, DVM, DACVP
Staff Diagnostic Pathologist

Anne E. Ballmann

Anne E. Ballmann, DVM, Ph.D.
Wildlife Disease Specialist

Phone: 608-270-2445 E-Mail: aballmann@usgs.gov

If you have questions regarding this case, contact:

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

Copies To:

- MIGRATORY BIRD COORDINATOR (R2)
USFWS Albuquerque (RO2), 500 Gold Ave SW, Albuquerque, NM 87102
ANNE JUSTICE-ALLEN
Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086



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DIAGNOSTIC SERVICES CASE REPORT

Supplemental Report

9/9/2011

CASE: 23355

EPIZOO:

Legal [ ] INV#:

Declassified [ ]

Submitter:

Kyle McCarty
Arizona Game & Fish/Phoenix
5000 W. Carefree Highway
Phoenix, AZ 85086

Date Submitted: 12/2/2010

Specimen description/identification/Location:

Table with columns: ACC, SPECIES, SPECIMEN TYPE, BAND NUMBER, SUBMITTER'S ID, COUNTY, STATE. Row 1: 001, Eagle, Golden, CARCASS, Yavapai, AZ

DIAGNOSIS

Emaciation
Chronic deformity, left metatarsal region, due to healed fracture

Event History:

This bird was found dead on forest service land near Camp Verde AZ. The location is 1.8 miles from a bald eagle nest. Prior to being found dead the eagle was reported to have been hopping around, unable to fly. A cow carcass was found nearby. Two piles of black material were also found near the carcass and were submitted.

Comment: 6/30/2011

This juvenile female Golden Eagle was severely emaciated. The bird's left leg below the hock was rotated and bent medially due to a fully healed fracture, and the bottom of the left foot had a chronic ulcer ("bumblefoot lesion") indicating abnormal weight-bearing over a long period of time, but the foot joints and tendons moved normally. The effect of the leg deformity is uncertain, but it may have contributed to the bird's debilitation. No lead was detected in liver tissue. Brain cholinesterase activity was within normal limits, ruling out poisoning by organophosphate pesticides. Attempts to isolate West Nile virus from pooled kidney/spleen tissue were negative. Cloacal and tracheal swabs were negative on screening for avian influenza viruses.

No food items were present in the stomach, but dark bloody fluid there suggests it may have fed on the cow carcass that was found nearby. Testing of that material for botulinum type C toxin was delayed by reconstruction of our diagnostic laboratories, but it will be done in the near future (early July is the expected re-occupation date); those test results will be sent in a supplemental report.

Supplemental Report 9/7/11:

The stomach contents from this eagle were tested for botulinum type C toxin using the mouse protection test, and the results were not consistent with botulism. Both of the inoculated mice became sick, and bacterial cultures did not yield any pathogens. Because the test material was stomach contents rather than a relatively clean blood sample, gastric acids or digestive secretions may account for the test results. However, external toxins ingested by the eagle cannot be ruled out.

Nancy J. Thomas

Nancy J. Thomas DVM, DACVP
Staff Diagnostic Pathologist

Anne E. Ballmann

Anne E. Ballmann DVM, Ph.D.

Wildlife Disease Specialist

Phone: 608-270-2445 E-Mail: aballmann@usgs.gov

If you have questions regarding this case, contact:

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

Copies To:

MIGRATORY BIRD COORDINATOR (R2)
USFWS Albuquerque (RO2), 500 Gold Ave SW, Albuquerque, NM 87102

ANNE JUSTICE-ALLEN
Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086



# NATIONAL WILDLIFE HEALTH CENTER

6006 Schroeder Road  
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608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE UPDATE

CASE: 23484      EPIZOO:

5/19/2011

Legal      INV NUM:

## FINDINGS TO DATE

**Submitter:**

James Driscoll  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 3/22/2011

**Specimen description/identification/Location:**

**Summary of Physical Characteristics**

| ACC | SEX    | AGE                  | WEIGHT  | BODY CONDITION | POSTMORTEM STATE |
|-----|--------|----------------------|---------|----------------|------------------|
| 001 | Female | Nestling or suckling | 1915 gm | Emaciated      | Good             |

**Comment:**

3/24/11: The nestling female bald eagle submitted from Maricopa county was necropsied 3/24/11. The liver was mildly enlarged, bright green uniformly, indicating severe cholestasis, a condition in which the flow of bile from the liver is blocked. This may suggest a congenital anomaly but other laboratory tests have been requested, including heavy metal screening, to rule out other causes of death. You will be notified of significant results.

5/19/11: There are no significant laboratory results to report. Screening for heavy metals was negative. No viruses of any kind were isolated. Tests for avian influenza viruses and West Nile virus were negative.

If you have questions regarding this case, contact:

*Jennifer L. Buckner*

Jennifer L. Buckner,

Field Investigation Team Case Manager

Phone: 608-270-2456

E-Mail: jbradsby@usgs.gov

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.



# NATIONAL WILDLIFE HEALTH CENTER

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608-270-2400 (FAX 608-270-2415)

## DIAGNOSTIC SERVICES CASE REPORT

### Final Report

5/26/2011

**CASE:** 23484

**EPIZOO:**

Legal  **INV#:**

Declassified

**Submitter:**

James Driscoll  
Arizona Game & Fish/Phoenix  
5000 W. Carefree Highway  
Phoenix, AZ 85086

**Date Submitted:** 3/22/2011

**Specimen description/identification/Location:**

| ACC | SPECIES     | SPECIMEN TYPE | BAND NUMBER | SUBMITTER'S ID | COUNTY   | STATE |
|-----|-------------|---------------|-------------|----------------|----------|-------|
| 001 | Eagle, Bald | CARCASS       |             |                | Maricopa | AZ    |

### DIAGNOSIS

Severe bile obstruction  
Emaciation

### Comment:

5/26/2011

This female Bald Eagle nestling was emaciated. As mentioned by the submitter, the tissues were very pale. The bones were soft and poorly mineralized. The liver was large, deep green and fibrous when cut. These observations suggested problems with the outflow tract of the bile produced in the liver. Examination of the liver and biliary system suggested either an obstructed bile duct or a developmental anomaly in the duct carrying the bile from the liver to the gall bladder. Microscopic examination of tissues showed round worm eggs in the tissue of the bile duct. There are situations in other animals where round worms can migrate abnormally and move into the bile duct causing fatal obstruction. My guess is that this is what happened to this young eagle. Extra sections of slides of the bile duct and liver are being made to see if the adult round worm can be found and if it is associated with obstruction and regional inflammation. If this can be confirmed, a supplemental report will be sent. It is more common that migrating round worms that cause damage are not found in the tissues sections. Analysis of the liver for heavy metals that might also damage the liver were negative.

The other changes noted in this eagle can be attributed to malnutrition and liver failure including anemia and poor bone mineralization.

This eagle was negative for West Nile virus and no viruses were isolated from the spleen. Screening tests on tracheal and cloacal swabs for avian influenza viruses were negative.

The feet and feathers will be sent to the National Eagle Repository.

*Carol U. Meteyer*

Carol U. Meteyer, DIPL.ACVP

Staff Diagnostic Pathologist

*Jennifer L. Buckner*

Jennifer L. Buckner

If you have questions regarding this case, contact:

Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

**Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.**

### Copies To:

MIGRATORY BIRD COORDINATOR (R2)

USFWS Albuquerque (RO2), 500 Gold Ave SW, Albuquerque, NM 87102

ANNE JUSTICE-ALLEN

Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086

KYLE MCCARTY

Arizona Game & Fish/Phoenix, 5000 W. Carefree Highway, Phoenix, AZ 85086



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Madison, Wisconsin 53711-6223
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DIAGNOSTIC SERVICES CASE REPORT

Supplemental Report

7/26/2011

CASE: 23516

EPIZOO:

Legal [ ] INV#:

Declassified [ ]

Submitter:

Anne Justice-Allen
Arizona Game & Fish/Phoenix
5000 W. Carefree Highway
Phoenix, AZ 85086

Date Submitted: 4/26/2011

Specimen description/identification/Location:

Table with 7 columns: ACC, SPECIES, SPECIMEN TYPE, BAND NUMBER, SUBMITTER'S ID, COUNTY, STATE. Row 1: 001, Eagle, Bald, CARCASS, 0679-03049, 26R, Maricopa, AZ.

DIAGNOSIS

Trauma associated with falling from the nest
Tick infestation; 7/25/2011 identified as Argas giganteus

Comment:

7/7/2011
SUPPLEMENTAL REPORT 7/25/2011
The ticks found on this carcass of this Bald Eagle nestling were further identified as Argas giganteus. The range for this tick includes the western United States.

ORIGINAL REPORT 7/7/2011

This 8-wk-old Bald Eagle nestling was in poor body condition and poor postmortem condition. Tissues were decomposed and maggots were present limiting diagnostic evaluation. There was evidence of trauma with hemorrhage in and around the mouth, subcutaneous hemorrhage along the abdominal wall and bruising of the pectoral muscle. Ticks were found on the skin of the carcass and were identified as Argas sp. Although the number of ticks on this eagle were not overwhelming, some of the tick life stages are quite small and difficult to see, ticks may leave the carcass after death, and these ticks are considered 'lair parasites' spending much more time in the nest than on the birds. Ticks can live for extended periods between feedings and a population of ticks can remain in the nest through the non nesting season. Because of the history of tick-associated behavior which lead to falls from the nest last year, I assume this is the likely cause of falling for the chicks in the nest this year as well. Treating the nests, or destroying the nests between seasons might help to break this cycle of tick infestation.

Screening tests for West Nile virus and avian influenza viruses were negative.

Carol U. Meteyer

Carol U. Meteyer, DIPL.ACVP
Staff Diagnostic Pathologist

Jennifer L. Buckner

Jennifer L. Buckner

Field Investigation Team Case Manager

Phone: 608-270-2456 E-Mail: jbradsby@usgs.gov

If you have questions regarding this case, contact:

Diagnostic findings may not be used for publication without the pathologist's knowledge and consent.

Copies To:



# Analytical Sciences Laboratory

WMRS

## University of Idaho

Holm Research Center  
2222 West 6th Street, P.O. Box 442203  
Moscow, Idaho 83844-2203

Phone: (208) 885-7081 FAX: (208) 885-8937  
email: asl@uidaho.edu http://www.agls.uidaho.edu/asl/

### Certificate of Analysis

**Prepared For:** Anne Justice-Allen  
Arizona Game And Fish Department  
WMRS  
5000 West Carefree Hwy  
Phoenix, AZ 85086

**Case ID:** VMAR12-009  
**Report Date:** 15-Mar-12  
**Date Received:** 02-Mar-12  
**Client Reference:** 2012-2272  
**Owner:** AZ-2011-42  
**Species:** Avian-Golden Eagle

**Report Status:**  Final  Preliminary  Addendum  Corrected

#### Interpretation of Results:

The liver contains a mildly elevated, but non-toxic, lead concentration (potential toxic range: > 5.00 µg/g).

The sample was forwarded to Michigan State University Diagnostic Center for Population and Animal Health. The sample tested **positive** for brodifacoum, a long-acting anticoagulant rodenticide. Concentrations of anticoagulant rodenticides in tissues have not been correlated with incidence/severity of clinical disease, and its presence in tissues indicates exposure only. Detection of chemical residue in tissues, coupled with clinical/gross evidence of bleeding, would support an anticoagulant rodenticide poisoning diagnosis.

#### Anticoagulant Screen

Sample: Liver

| <u>Anticoagulant</u> | <u>Detected/Not Detected</u> |                     |
|----------------------|------------------------------|---------------------|
| <b>Brodifacoum</b>   | <b>Was Detected</b>          | <b>At 0.025 ppm</b> |
| Bromadiolone         | Was Not Detected             | At 0.02 ppm         |
| Chlorophacinone      | Was Not Detected             | At 0.20 ppm         |
| Coumachlor           | Was Not Detected             | At 0.02 ppm         |
| Coumafuryl           | Was Not Detected             | At 1.0 ppm          |
| Difenacoum           | Was Not Detected             | At 0.02 ppm         |
| Difethialone         | Was Not Detected             | At 0.07 ppm         |
| Diphacinone          | Was Not Detected             | At 0.20 ppm         |
| Warfarin             | Was Not Detected             | At 0.02 ppm         |

*Note:* Whole blood (EDTA or heparin) is the preferred tissue for antemortem testing; liver is the preferred tissue for postmortem testing. In some cases of exposure, liver levels may contain up to 10X the blood levels.

Patricia A. Talcott, MS, DVM, PhD., DABVT  
Veterinary Toxicologist

QC Review/Approval:           tknopes / smcgeehan

# UI Analytical Sciences Laboratory

## Certificate of Analysis

Client Sample ID: AZ-2011-42

Sample Type: Liver Tissue

UIASL Sample ID: V1201073

Species: Avian-Golden  
Eagle

Preservation: None

**Heavy Metals Screen**

Method: ICP -- Nitric Digest

|            | Results (µg/g) | RL    | Adult<br>Approx. Ref. Range |   |
|------------|----------------|-------|-----------------------------|---|
| Arsenic    | < 4            | 4.0   | < 1                         |   |
| Cadmium    | < 0.1          | 0.10  | < 1.5                       |   |
| Copper     | 5.2            | 0.10  | 3 - 12                      |   |
| Iron       | 280            | 1.0   | 160 - 1000                  |   |
| Manganese  | 3.8            | 0.050 | 2.6 - 5.4                   |   |
| Molybdenum | 0.69           | 0.50  | —                           |   |
| Lead       | 2.0            | 1.0   | < 1                         | * |
| Zinc       | 28             | 0.20  | 18 - 80                     |   |

**Comment:**

Note: Any included reference ranges are only guidelines and the analytical results need to be interpreted in conjunction with management and dietary factors, as well as with clinical and/or postmortem observations. Reference ranges can vary significantly between individuals or groups of animals from different ranges and habitats or on different diets.

Note: Serum concentrations of some elements (e.g., zinc, iron, phosphorus, magnesium) may be artificially elevated due to hemolysis or leaching from the red blood cells. Zinc can leach from some rubber blood collection tube stoppers. We recommend collecting blood in plastic vials or royal blue top vacutainer tubes (RBTT) without heparin (for trace element analysis) for submission of samples to be analyzed for zinc. The sample should be spun and the serum separated from the clot prior to shipping -- the serum can be placed in another RBTT without additive or into a snap-cap vial.

Samples will be discarded one month after date of final report unless otherwise requested.

WMRS

**WASHINGTON ANIMAL DISEASE DIAGNOSTIC LABORATORY**

**P.O. Box 647034  
Pullman, WA 99164-7034  
Phone: (509) 335-9696  
Fax: (509) 335-7424**

|               |                          |          |              |
|---------------|--------------------------|----------|--------------|
| Veterinarian: | Dr. Anne Justice-Allen   | Owner:   | AZ-2011-42   |
| Clinic:       | Arizona Game & Fish WMRS | Animal:  |              |
| Address:      | 5000 W Carefree Hwy      | Species: | Golden Eagle |
|               |                          | Breed:   |              |
|               | Phoenix, AZ 85086        | Age:     |              |
| Phone:        | (623) 236-7351           | Sex:     | Not Reported |

**SUMMARY REPORT**

**03/19/12**

**WADDL #2012-2272**

**Report authorized by: James Stanton, Senior Pathologist**

**Received: 02/28/12**

All testing at WADDL is complete. The anticoagulant brodifacoum is detected in the liver (similar to case 2012-2269). There are no histologic lesions to indicate that the anticoagulant exposure was the cause of death; however, the lack of histologic lesions also does not rule out that brodifacoum was the cause. Gross pathology and clinical history would be a more sensitive means of evaluating a hemorrhagic disease. While hepatic lead levels are mildly elevated, lead toxicity is not considered likely as the levels are not at toxic levels.

**FINAL DIAGNOSIS:**

Brodifacoum exposure with possible toxicity

**WORK PENDING:** None

---

Dr. James B. Stanton/JBS/jbs/phy

**ARIZONA GAME AND FISH DEPARTMENT  
INTER OFFICE MEMO**

**TO:** File

**FROM:** James T. Driscoll, Birds and Mammals Program Manager



**SUBJECT:** Public Records Request – Lead Mortalities in Bald and Golden Eagles

**DATE:** July 30, 2012

This documentation includes e-mails, mortality reporting forms, and necropsy results from recovered bald and golden eagle carcasses as well as various tables summarizing bald and golden eagle mortality data. This packet also contains a internal decision point white paper (draft version December 2007 and updated draft January 2008) that:

1. Provides a background to lead poisoning in wildlife.
2. Assesses potential impacts to various wildlife populations.
3. Identify clinical issues with diagnosing lead poisoning as a mortality source.
4. Identifies treatment options for lead-poisoning.
5. Summarizes the history of bald eagle lead-related mortalities in Arizona.
6. Identifies the complete range of management actions that the Department could take to reduce impacts of lead on bald eagles.

The Department considered the recommendations from the January 2008 internal decision point white paper and noted some of the actions had been implemented as part of the California Condor Voluntary Non-Lead Ammunition Program. The Department also recognized bald eagle populations are increasing throughout its range, including Arizona, despite any lead associated impacts. Also, the Department has in place management programs to ensure the bald eagle population and mortalities will be closely monitored. Through this monitoring program, the Department will consider additional action in the future if a mortality source increases to unacceptable levels.

# LEAD EXPOSURE IN BALD EAGLES (*HALIAEETUS LEUCOCEPHALUS*) IN ARIZONA<sup>1</sup>

James Driscoll and Kenneth Jacobson

Adapted from: Rogers, Andi S., S.R. MacVean, and J.T. Driscoll. 2002. *Lead Exposure and Mortality in California Condors (*Gymnogyps californianus*) and Bald Eagles (*Haliaeetus leucocephalus*) in Arizona*. Arizona Game and Fish Department.

## CONFIDENTIAL AND DELIBERATIVE MATERIAL DRAFT REPORT – FOR INTERNAL USE ONLY

### BACKGROUND

Lead is a heavy metal known to be highly toxic to humans and wildlife. Environmental exposure to lead has increased substantially since the Industrial Revolution (Pain 1996). Due to human activities, lead has become ubiquitous in soil, air, and water at unnaturally high levels (Pain et al. 1994). Lead poisoning in birds and mammals has been linked to several sources, including ingestion of spent lead gunshot (Pain et al. 1994, Ma 1996), consumption of lead sinkers (Sears 1988), secondary consumption of lead contaminated prey (DeMent et al. 1986, Frenzel and Anthony 1989), mining and smelting activities (Beyer et al. 1997, Henny et al. 2000), and firearm training facilities (Lewis et al. 2001).

Lead poisoning in birds has been a concern for more than a century (e.g. Grinnell 1894). Lead exposure to waterfowl has been widely studied over the last half century. Bellrose (1959) estimated that lead poisoning killed 1.6-3.9 million waterfowl annually (2-3 percent of the fall population) in North America. A total of 59 terrestrial bird species have been documented to ingest or suffer poisoning from lead in ammunition (Fisher et al. 2006). Although not as well studied as in waterfowl, lead exposure has been documented in raptors (Pain 1996), including prairie falcons (*Falco mexicanus*) (Benson et al. 1974), Cooper's hawks (*Accipiter cooperii*) (Snyder et al. 1973), bald (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) (Wayland and Bollinger 1999), red-tailed hawks (*Buteo jamaicensis*) (Sikarskie 1977), turkey vultures (*Cathartes aura*) (Wiemeyer et al. 1986), Andean condors (*Vultur gryphus*) (Locke et al. 1969) and California condors (*Gymnogyps californianus*) (Wiemeyer et al. 1988). Lead poisoning from ammunition sources has been documented in 14 raptor species common to Arizona (Fisher et al. 2006).

### WATERFOWL HUNTING

Due to waterfowl losses and the link to lead ammunition, a conversion from lead to non-toxic shot was phased-in for waterfowl from 1987 to 1991 in the United States (U.S. Fish and Wildlife Service 1986, 2002a,b). Since the conversion to non-toxic shot for waterfowl in the United States, the apparent effect on wildlife populations has varied. Lead exposure in black ducks

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<sup>1</sup> Document: Lead Exposure in Bald Eagles. Working Draft

**CONFIDENTIAL AND DELIBERATIVE MATERIAL**

(*Anas rubripes*) has decreased 44 percent since implementation of non-toxic shot along the Mississippi flyway (Samuel and Bowers 2000). However, Kramer and Redig (1997) found that the prevalence of lead has not changed for wintering bald eagles (*Haliaeetus leucocephalus*) in Minnesota and Wisconsin. They speculated this might reflect bald eagle consumption of mammals and birds that can be hunted year-round with lead shot. Although lead ammunition may not be legally used to take waterfowl in North America, it is legal to use for other hunted species, such as upland game birds, big and small game, and predators in most areas, including Arizona.

EXPOSURE

Birds of prey are usually exposed to lead by ingesting contaminated prey (Stendell et al. 1980, Janssen et al. 1986). In British Columbia, Peterson et al. (2001) determined that 77.8% of carcasses were found within 24 hours of death and that one dead duck carcass attracted a mean of 16.6 individual scavengers. As a result, any lead contaminated carcass has the potential for exposing many individuals in a short period of time. Pauli and Buskirk (2007) identified that 87% of the Prairie dogs (*Cynomys spp.*) shot with expanding bullets contained lead fragments and that >70% of the lead fragments were too small to be avoided during ingestion. Hunt et al. (2006) reported high incidence of bullet fragments in hunter shot deer carcasses with >74% of the carcasses and gut piles containing >100 visible fragments when shot with standard lead-based copper jacketed bullets. In Utah, Platt (1976) reports bald eagles feeding on hunter killed jack rabbits (*Lepus californicus*) with 71% of regurgitated pellets containing one or more ingested shot. Lead poisoning mortality of bald and golden eagles in Canada and the United States accounts for 5-10% of recorded post-fledgling mortality (Fisher, et al. 2006). In British Columbia, 37% of injured or dead bald eagles exhibited significant lead exposure (Fisher, et al. 2006). In 2002, 72% of Arizona's California condor population was exposed to lead. Exposure rates continued to rise in 2003 and 2004 with 75% and 81% of the condor population exposed, respectively. Although there was a 2005 decrease in lead exposure rates, 95% of the condor population was exposed to lead in 2006. These lead exposures have resulted in 9 condor mortalities from 2002 to 2006 (Kathy Sullivan, Arizona Game and Fish Department, pers. comm.).

The chronic, low-level effects of lead exposure in raptors are poorly known. Kramer and Redig (1997) suggested that although subclinical or chronic stages of lead poisoning may not directly cause mortality in raptors, their hunting ability might be reduced. Chronic lead exposure may also predispose raptors to other environmental hazards, such as vehicle or powerline collisions, and increase susceptibility to predators (Kramer and Redig 1997).

CLINICAL ISSUES

Initial symptoms of lead exposure include anorexia, anemia, weakness and depression, as well as bile stained feces (Redig 1979, Ma 1996). Vomiting follows in the terminal stages. After lead is ingested and absorbed, it becomes distributed primarily in the bloodstream, liver, kidney, and

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bone. High levels of lead in blood and soft tissue (e.g. liver and kidney) are indicative of recent, acute exposure, and these levels can remain elevated for several weeks to several months (Pain 1996). Uptake of lead by bone is slow, and high bone lead concentration is indicative of long-term exposure (Stendell et al. 1980). Lead in the bone is relatively immobile, and can accumulate over a lifetime (Pain 1996).

Scheuhammer (1987) reviewed chronic toxicity of dietary lead in avian species and reported that female birds accumulate lead in bone tissues at a greater rate (up to 10 times more) than males. In addition, breeding females accumulated 4 to 5 times more lead in bones than non-breeding. Scheuhammer's review also indicated young birds are more susceptible to lead than adults of the same species, and young altricial birds are more sensitive to lead than young precocial birds. Ringed turtle doves (*Streptopelia risoria*) and kestrels (*Falco sparverius*) dosed with high levels of lead (10,000 µg/dL) in their feed or drinking water showed no impairment in egg production, eggshell thickness or egg fertility. However, there was a tendency to produce fewer fledglings. In starlings (*Sturnus vulgaris*), the only noticeable effects were lower nestling haematocrits and brain weights. Decreased brain weights have been associated with impaired central nervous system development in mammals (Silbergeld and Hruska 1980, Donald et al. 1986).

Blood lead levels are the most commonly measured parameter, as they reflect acute recent exposure, and are relatively easy to collect. Scheuhammer (1989) monitored doves, sharp-shinned hawks (*Accipiter striatus*), and herring gulls (*Larus argentatus*) for lead exposure in Canada and the United States. He considered blood lead levels <15 µg/dL to represent a normal lead exposure level. Lead levels of 18-65 µg/dL were considered moderately elevated, and distinctly higher than normal exposure, but not lead poisoned. Finally, blood lead levels >80 µg/dL represented highly elevated exposure, and termed as lead poisoned. P.T. Redig, DVM (The Raptor Center, Univ. of Minnesota, pers. comm., 2002) used a finer blood lead level scale (developed for bald eagles), which he believes is also applicable to California condors. Redig defines background levels as <20 µg/dL, subclinical as 20-60 µg/dL, clinical and generally treatable as 60-100 µg/dL, and toxic with increasingly poorer prognosis for treatment as >100 µg/dL.

TREATMENT

Given his experience with bald eagles and condors, Redig recommends chelation therapy for birds with a blood lead level of  $\geq 30$ -40 µg/dL. Chelation therapy is the administration of a drug (usually calcium EDTA) that draws toxic metals from the bloodstream so the body can pass them more effectively in urine or feces (Gale Encyclopedia of Medicine 2002). Although birds with  $\geq 30$ -40 µg/dL may appear healthy, lead levels are dynamic and the level measured in the blood will fluctuate depending on how much time has elapsed since ingestion. Redig states that any amount of lead is toxic and will impair a bird's health (P.T. Redig, pers. comm., 2002).

Raptors regurgitate pellets of indigestible matter (casting), which could theoretically rid the system of toxic matter. However, foreign objects such as lead fragments can fail to be egested, and are therefore gradually absorbed over time (Redig et al. 1980, Pattee et al. 1981). Bald eagles may be particularly susceptible to lead exposure because they are long-lived, have low

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recruitment rates, maintain small populations, and depend on carcasses as food during the winter. Pattee et al. (1981) reported the liver lead toxic threshold for bald eagles is 100 µg/dL. However, some researchers indicate this threshold may be lower, between 60 to 80 µg/dL (Kathy Converse, U.S. Geological Survey, pers. comm.). Regardless, blood lead levels of greater than 60 µg/dL are considered to be diagnostic of lead poisoning.

HISTORY OF BALD EAGLE LEAD EXPOSURE IN ARIZONA

In 25 years of bald eagle research in Arizona, relatively few carcasses have been recovered in good enough post mortem condition for necropsy, and prior to 1998, necropsies on bald eagles recovered in Arizona were rarely performed (n=2). In general, carcasses must be retrieved within five days of mortality for reliable diagnoses. Since 1998, 48 bald eagles were sent for necropsy either at the National Wildlife Health Center or Ashland Laboratory. In total, 89 subadult, near adult, and adult bald eagle carcasses have been recovered in Arizona with 48 (54%) being in good enough condition for necropsy. Results of these necropsies identified 20 (42%) with lead poisoning as the primary cause of mortality with liver lead levels ranging from 1 to 11 times the toxic threshold (Table 2). Of these 20 bald eagles, 1 was verified, through its bands, as having an Arizona origin. The other 19 individuals may be Arizona bald eagles as 40% of the breeding adults and 17% of all fledged bald eagle nestlings are unbanded (Allison et. al. in prep.). In addition to these mortalities, a 2005 subadult, a 2006 Arizona nestling, and a 2007 adult were recovered alive while suffering from lead poisoning. These individuals were successfully rehabilitated and later released.

Table 2. Known lead poisoning mortalities and lead concentrations in bald eagles recovered in Arizona.

| Bald Eagle/Location                 | Date Recovered | Liver Lead Levels (µg/dL) |
|-------------------------------------|----------------|---------------------------|
| Saguaro Lake                        | January 1998   | 940                       |
| Whiteriver                          | January 2003   | 600 <sup>2</sup>          |
| Pintail Lake                        | March 1999     | 495.6                     |
| Lake Elaine                         | March 2002     | 485.2                     |
| Lower Lake Mary                     | March 2002     | 481.7                     |
| Scholz Lake                         | Fall 1998      | 430                       |
| Fools Hollow Lake                   | March 2001     | 427.7                     |
| Cosnino                             | January 2002   | 415                       |
| Kaibab Lake                         | March 2000     | 382.8                     |
| Show Low Wal-Mart                   | February 2003  | 360.4                     |
| East Clear Creek                    | April 2000     | 334.7                     |
| Horseshoe Dam Subadult <sup>1</sup> | January 2003   | 300.5                     |
| K.A. Ranch                          | March 2004     | 300                       |
| Wilcox                              | February 2004  | 234.3                     |
| Stoneman Lake                       | March 2003     | 135.2                     |
| Long Lake                           | March 2003     | 133                       |
| White Horse Lake                    | March 2004     | 131.1                     |
| Young                               | March 2004     | 113                       |
| River Reservoir                     | March 2004     | 75.3 <sup>2</sup>         |
| Clifton                             | April 2004     | 81.5                      |

<sup>1</sup>Arizona hatched bald eagle.  
<sup>2</sup>Blood lead levels before treatment.

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Given that bald eagles migrate, exposure to lead could occur in any state within the migration flyway. However, it is common for bald eagle migrants to stay an average of 18 days at any given location near a suitable food source (Jacobson and Messing, In prep.). Pattee et al. (1981) discovered 60% (n=3) of birds in his experiment died within 12 to 20 days of ingesting lead pellets. Thus, there is an increased probability bald eagles recovered in Arizona were exposed to lead in Arizona.

Lead poisoning was determined as the primary cause of death in 20 (42%) of 48 bald eagle necropsies with 15 (75%) of those lead poisonings affecting adult bald eagles. With 40% of Arizona's breeding adults being unbanded, In the Demographic Analysis of the Bald Eagle in Arizona (Allison et. al. in prep.), an elasticity analysis identified changes in adult survivorship as having the greatest influence on the Arizona bald eagle population. Specifically, a 5% increase in adult survivorship will produce the same population growth as a 50% increase in juvenile survivorship. Given that 40% of the bald eagle breeding population is unbanded and that lead poisoning has been documented in 2 Arizona bald eagles, any management actions to reduce exposure of bald eagles to lead will likely result in increased adult bald eagle survivorship and greatly effect the growth rate of Arizona's bald eagle population.

RECOMMENDATIONS

Due to the fact that lead poisoning is a significant mortality factor for bald eagles in Arizona, the Department should consider supporting management actions that reduce the exposure of bald eagles to lead in the environment.

- 1) Determine the source(s) of lead that has caused the death of bald eagles in Arizona.
- 2) Develop management options to reduce identified lead sources.
- 3) Expand the Condor education campaign to a statewide program to educate Arizona's hunters on the risks to bald eagles and other wildlife associated with using lead ammunition and provide non-lead alternatives.
- 4) Provide information to hunters on the benefits of voluntarily using non-toxic ammunition.
- 5) Phase-in use of non-lead ammunition for hunting on Department owned property.
- 6) Provide incentives for hunters using lead ammunition to properly dispose of carcasses and gut piles.
- 7) Phase-in the use of non-lead ammunition for upland game birds.
- 8) Develop a statewide plan to phase-out lead ammunition used for hunting.

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# ARIZONA GOLDEN EAGLE NEST SURVEY 2011

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*Photo by Ron Austing*

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# ARIZONA GOLDEN EAGLE NEST SURVEY 2011 SUMMARY REPORT

Kyle M. McCarty and Kenneth V. Jacobson

## INTRODUCTION

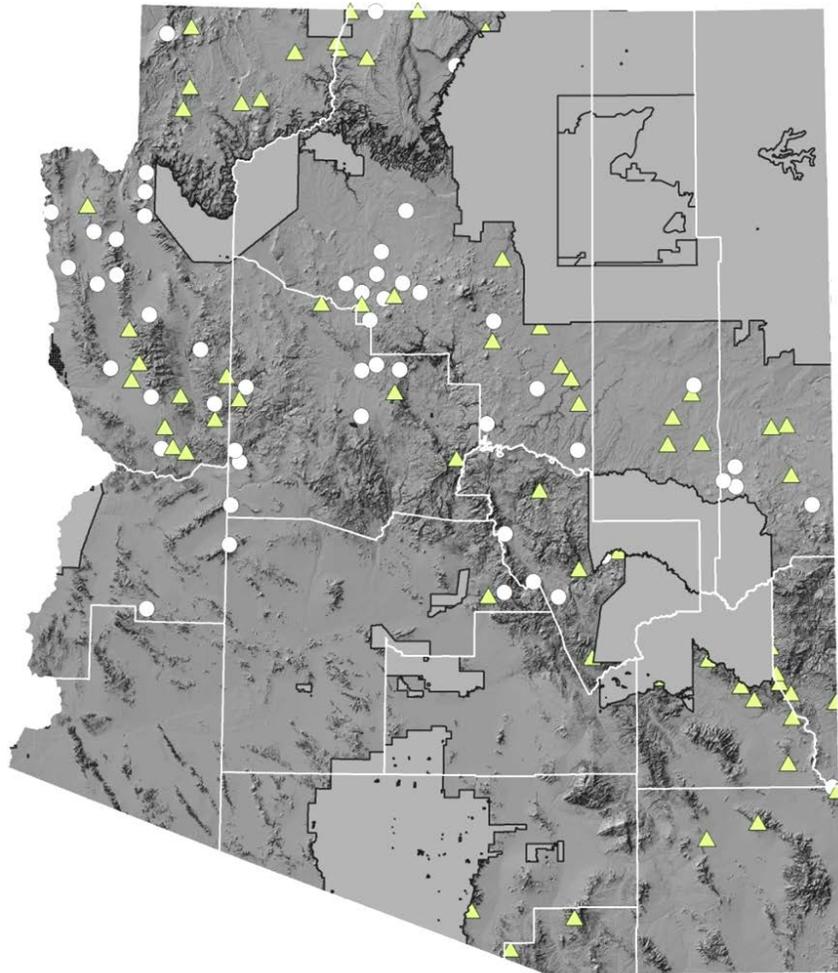
In 1940, Congress passed the Bald Eagle Protection Act in an effort to provide protection for declining bald eagle populations (*Haliaeetus leucocephalus*). In 1962, the Act was amended to include golden eagles (*Aquila chrysaetos*) due to the difficulty of distinguishing between the juveniles of each species, becoming the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d, 54 Stat. 250). The BGEPA was modeled after the Migratory Bird Treaty Act of 1918 and contains similar language to protect birds, eggs, and nests.

With the removal of the bald eagle from the Endangered Species Act (ESA) in 2007, the BGEPA became the primary law protecting the species. At the same time as the delisting proposal, and as a means of facilitating post-delisting management of bald eagles, the USFWS also codified the definition of “disturb” under the BGEPA (USFWS 2007b). Disturbance includes an action that “causes, or is likely to cause...injury to an eagle” or interference with “normal breeding, feeding, or sheltering behavior” causing a decrease in productivity or nest abandonment (USFWS 2007b). Contrary to the ESA there was no mechanism for permitted take (USFWS 2007a, b). In 2009, the USFWS finalized regulations to provide a mechanism to authorize take (USFWS 2009). In addition to the BGEPA, golden eagles are protected under the Migratory Bird Treaty Act, Lacey Act, Airborne Hunting Act, and the Convention on International Trade in Endangered Species of Wild Flora and Fauna and under Arizona Revised Statute Title 17.

Few long-term studies have been undertaken on golden eagle populations in North America (Kochert and Steenhof 2002, Kochert et al. 2002). Braun et al. (1975) reported as many as 100,000 individuals in North America in the 1970s. Olendorff et al. (1981), using data from USFWS aerial transect surveys in 1974-1978 and other data sources, estimated the wintering population of golden eagles in the western U.S. at 63,242 birds, with a potential 20,500 North American breeding pairs. Watson (1997) estimated the number of breeding pairs at 20,000-25,000 in North America. More recently, the USFWS contracted a study to complete golden eagle aerial transect surveys across the western United States, with an estimated 27,392 golden eagles within the area surveyed (Good et al. 2004, 2007). They repeated the surveys in 2006-2009, and estimated a total of 20,722 golden eagles within the study area in 2009 (Nielson et al. 2010). Given the limitations of short-term survey data, the USFWS cautiously estimated the population up to 30,000 golden eagles across the U.S. (USFWS 2011).

In Arizona, information on breeding golden eagles is limited. Studies have reported on golden eagle productivity in west-central Arizona (Millsap 1981), prey remains in nests (Eakle and Grubb 1986), and nest structure (Grubb and Eakle 1987). The Arizona Breeding Bird Atlas (Corman and Wise-Gervais 2005) found possible, probable, or confirmed evidence of breeding golden eagles in 187 of 1,834 (10.2%) priority blocks. Additional data was gathered during a 2006 Arizona Game and Fish Department (Department) survey effort, which found 14 occupied nests among 85 surveyed locations that had been identified as historic or current breeding areas.

The 2006 survey protocol, however, was limited to only 2 visits in mid-April and mid-June, so occupancy early failures likely missed (AGFD unpublished data). Including this year's data, records of historic and current breeding areas were distributed statewide, with the lowest density occurring in the southwestern corner (Figure 1). Breeding areas are classified as "historic" when occupancy has not been detected within 10 years, regardless of survey effort.

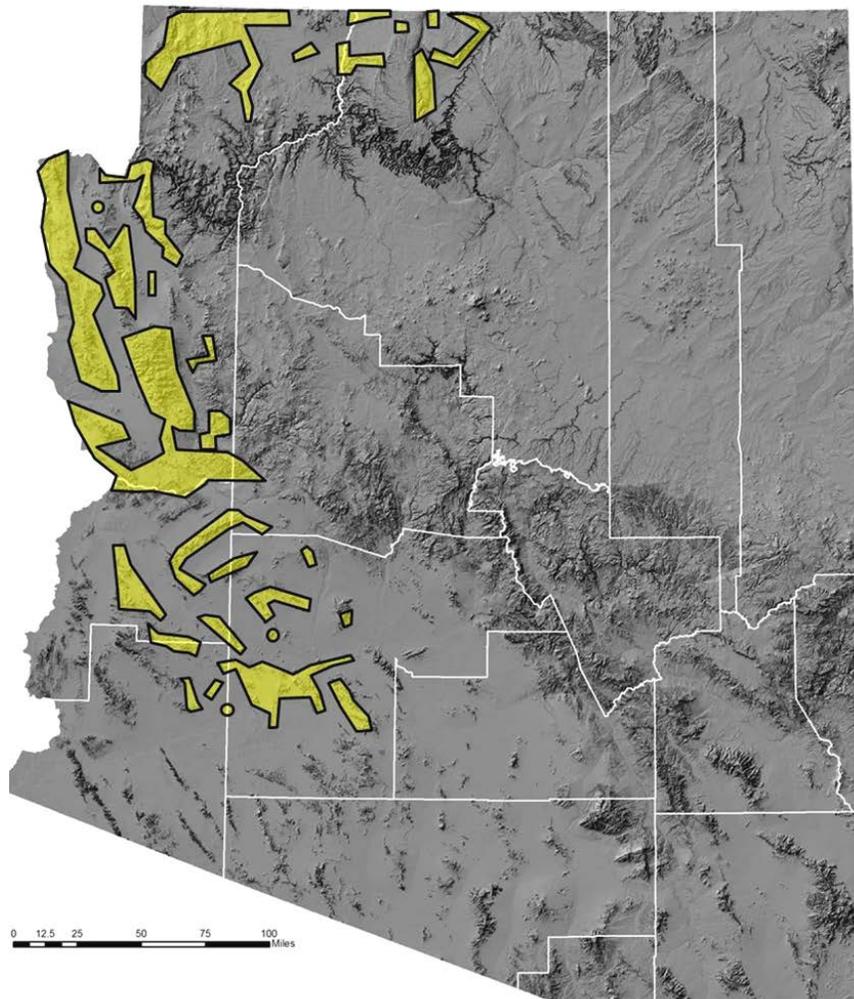


*Figure 1. Distribution of historic (triangles) and current (circles) golden eagle breeding areas in Arizona in 2011. Breeding areas are not shown on Indian lands (shaded). County lines in white.*

In 2011, the Bureau of Land Management (BLM) funded the Department to conduct a 2-year baseline golden eagle nest survey to inventory potential nest sites primarily within and adjacent to proposed wind and solar energy project areas. Future surveys will be necessary to determine occupancy status. The greatest challenge to detecting golden eagle nesting sites is the remote and often inaccessible terrain in which they occur. Helicopters are an indispensable tool for surveying bald eagle nests in similar habitat throughout Arizona (McCarty and Jacobson 2010) and served as the primary search method within this survey.

## STUDY AREA

In 2011, helicopter surveys were conducted in portions of Coconino, La Paz, Maricopa, Mohave, Yavapai, and Yuma Counties surrounding and within proposed renewable energy project areas (Figure 2). Terrain was characterized mainly by basin and range topography with wide valleys separated by rugged mountain chains.



*Figure 2. Aerial golden eagle nest survey areas completed in Arizona in 2011 (shaded).*

The northern half of the survey area was diverse in habitat, characterized by eight biotic communities (Brown 1994) including Mohave Desertscrub, Sonoran Desertscrub [Lower Colorado River Valley and Arizona Upland Subdivisions], Great Basin Desertscrub, Great Basin Conifer Woodland, Semidesert Grassland, Interior Chaparral, Plains and Great Basin Grasslands, and Rocky Mountain (Petran) Montane Conifer Forest. Elevations ranged from 137 m (450 ft) at the Colorado River to 2,566 m (8,417 ft) in the Hualapai Mountains. The northern half included the Arizona Strip (north of the Colorado River and Grand Canyon National Park), as well as the

mountains bordered by the Bill Williams River to the south, Lake Mead to the north, the Aquarius Mountains to the east, and the Colorado River to the west.

Habitat in the southern half of the survey area was mostly Sonoran Desertscrub [Lower Colorado River Valley and Arizona Upland Subdivisions], with some Interior Chaparral in the uplands. Elevations ranged from 137 m (450 ft) at the Colorado River to 1,732 m (5,681 ft) in the Harquahala Mountains. This half of the survey area was bordered by Interstate 8 to the south, the Bill Williams River to the north, the White Tank Mountains to the east, and the Dome Rock Mountains to the west, excluding the Kofa National Wildlife Refuge and Yuma Proving Ground.

## METHODS

We prioritized survey effort to lands adjacent to or administered by the BLM, most of which occur in the western half of the state, which contained proposed wind or solar energy development projects. These lands are often intermingled with private or state trust properties. In addition, the survey area included lands managed by the U.S. Forest Service, U.S. Fish and Wildlife Service, and National Park Service (Lake Mead National Recreation Area). Efforts were focused on cliff nest surveys within a 10 mile radius of each proposed project and as much of the surrounding suitable nesting habitat as possible, however due to limited flight time we did not search forested areas for tree nests.

ArcMap was used to calculate slopes greater than 40 degrees to coarsely identify potential cliff-nesting habitat within and surrounding the priority survey areas. In addition, we compiled and reviewed data on sightings of golden eagles or nests from various state and federal agencies and the Department's Heritage Database Management System to identify specific areas of interest.

A two to three-person team conducted surveys between February and June 2011. At least one observer was a Department biologist with five or more years of experience in helicopter searches for cliff-nesting bald eagles. The pilot had extensive experience in flying low-level wildlife surveys in Arizona, including golden eagle nest searches. Helicopters flew at approximately 60 meters (200 ft) above ground level and at 50-60 knots (58-70 mph). Topography, presence of high-tension wires, and wind influenced altitude and speed. We made multiple passes of tall cliffs and complex terrain as necessary for a complete survey of these substrates.

Although our goal was to inventory large eagle-sized nests and not to determine productivity, we timed the flights to correspond with the golden eagle breeding season in order to opportunistically collect some occupancy data. Without additional visits, nest survey flights were insufficient for designating sites as "unoccupied". When we were able to determine breeding status, we followed operational definitions derived from Postupalsky (1974, 1983) and Steenhof and Kochert (1982) (Appendix A). A site was termed a "breeding area" (BA) only if the site was documented as occupied within the last 10 years. Sites with documented occupancy more than 10 years old were termed "historic BAs". Any areas with "large" nests and not enough observations to designate occupancy status were termed as "potential BAs". "Large" refers to nests we deemed of suitable size for breeding golden eagles as compared to our experience with bald and golden eagle nests in Arizona. "Medium" refers to nests that were not likely to have

been large enough for eagles. Golden eagle nestlings were aged following Hoechlin (1976) and Driscoll (2010).

## RESULTS

The 2011 golden eagle nest survey effort totaled 98.1 hours over 17 days (Table 1). We examined 9 known BAs, 20 historic BAs, and suitable cliff nesting habitat throughout the western third of Arizona as illustrated in Figure 2. Significant findings include 17 new BAs, 4 occupied historic BAs, 5 occupied but previously known BAs, and 134 potential golden eagle BAs with 208 suitable nest structures in varying condition. A single golden eagle was documented in the area at 12 of these potential BAs indicating possible occupancy. In addition, there were 13 sightings of golden eagles not clearly associated with nests.

| Date | Areas surveyed                                                                                                                                             | Time (min) |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 2/22 | Cerbat Mountains, White Hills                                                                                                                              | 390        |
| 2/23 | Black Mountains                                                                                                                                            | 420        |
| 2/24 | Black Mountains, Lake Mead Recreation Area, Grand Wash Cliffs, Long Mountain                                                                               | 440        |
| 3/9  | Black Mountains (south of Highway 68), Hualapai Mountains                                                                                                  | 335        |
| 3/10 | Hualapai, Mohave and Bill Williams Mountains; Aubrey Peak Wilderness, Bill Williams River                                                                  | 380        |
| 3/11 | Hualapai Mountains, Santa Maria River, Poachie Range, Trout Creek, Austin Peak                                                                             | 410        |
| 3/22 | Little Horn and New Water Mountains; Tank and Palomas Mountains (east of Yuma Proving Ground), Agua Caliente, Baragan, Turtleback, and Gila Bend Mountains | 340        |
| 3/23 | Plomosa, Eagletail, and Dome Rock Mountains                                                                                                                | 445        |
| 3/24 | Eagletail and Gila Bend Mountains                                                                                                                          | 195        |
| 4/12 | Harcuvar, Granite Wash, Harquahala and Little Harquahala Mountains                                                                                         | 315        |
| 4/13 | Gila Bend Mountains                                                                                                                                        | 230        |
| 4/14 | Big Horn, Belmont, Saddle, White Tank, and Maricopa Mountains                                                                                              | 345        |
| 6/13 | Vermilion Cliffs, Paria River, Coyote Buttes, Shinarump Cliffs                                                                                             | 260        |
| 6/14 | Kaibab Plateau (eastern slope), Snake Gulch, Kanab Creek, Yellowstone Mesa                                                                                 | 400        |
| 6/15 | Lost Spring Mountain, Hurricane Cliffs, Hole-N-Wall Canyon, Seegmiller Mountain                                                                            | 425        |
| 6/16 | Virgin Mountains, Black Rock Mountain                                                                                                                      | 280        |
| 6/17 | Virgin Mountains, Wolf Hole Mountain, canyons and buttes in area                                                                                           | 275        |

Results for documented nest structures/potential BAs are located in Appendix B. Areas worthy of further discussion (new BA's, historic BAs, known BA, and golden eagle sightings) are described here. Nest locations are sensitive data, considered confidential by AGFD, and omitted from this report. Management agencies requiring specific locations should contact the AGFD Heritage Data Management System at (623) 236-7612.

## SURVEYS IN SUITABLE HABITAT

The suitable cliff nesting habitat surveyed in 2011 was primarily located in the western third of Arizona (Table 1 and Figure 2) and resulted in the identification of 17 new breeding areas (Table 2) and 134 potential BAs encompassing a total of 208 nests (Appendix B). At 12 of the 134 potential BAs, a single golden eagle was documented near large nests indicating a likelihood of occupancy (Table 3).

### La Paz County

*Harquahala West.* – On April 12, we saw a golden eagle fly from a cliff where it had been perched above a large, empty nest. Another large cliff nest in fair condition was found approximately 0.5 miles away. We saw no evidence of nesting activity.

*Kofa.* – On March 22, 2011, we discovered a golden eagle incubating on a cliff nest (#1) (Figure 3). Another large cliff nest (#2) in fair condition was found less than a mile away.



Figure 3. *Harquahala Wilderness Area (left) and Kofa breeding area (right).* Photos by Kyle McCarty and Kenneth Jacobson.

*Plomosa Mountains.* – On March 23, 2011, we saw a golden eagle perched on Black Mesa. There was a substantial amount of whitewash on the perch. Although no nests were found in the immediate vicinity, we did find a large nest in fair condition approximately 1.5 miles away.

### La Paz/Maricopa Counties

*Eagletail Mountains.* – On March 24, 2011, we saw a golden eagle flying low over the mountains, and found four large cliff nests in fair to good condition within a mile of the bird. We saw no evidence of nesting activity.

### Maricopa County

*Harquahala.* – On April 12, 2011, we saw one golden eagle perched within the Harquahala Wilderness Area (Figure 3) but were unable to locate any nests. During a ground search of the same area on May 27, we found a cliff nest (#1) with a 5-week old nestling and one adult.

### Mohave County

*Black Mountains East.* – On February 23, 2011, we discovered a golden eagle incubating in a cliff nest (#1). A second adult flew to the nest.

*Black Mountains North.* – On February 23, 2011, we saw a pair of golden eagles perched together in the area of a large cliff nest (#1) which was in good condition.

*Black Mountains South.* – On March 9, 2011, we discovered a golden eagle incubating on an east-facing cliff nest (#1).

*Black Mountains West.* – On February 23, 2011, we discovered a golden eagle incubating in a cliff nest (#1). A second adult was flying in the area. At least 3 other large cliff nests were found within 1.5 miles (#2, 3, and 4) (Figure 4).



*Figure 4. Golden eagle incubating at the Black Mountains West breeding area. Photo by Kyle McCarty.*

*Black Mountains 2 North.* – On February 24, 2011, we saw a golden eagle perched less than a mile from at least five large cliff nests in the area southwest of Mount Perkins. We saw no evidence of nesting activity.

*Black Mountains 3.* – On February 22, 2011 we surveyed the area and found several large cliff nests in a promising area at the edge of the Detrital Valley near Highway 93. During a ground survey on March 7, we saw a golden eagle fly low along the east side of the cliff face and go out of view behind a large rock below the high cliffs. Although there were five nests of poor quality and one large nest in good condition in close proximity on the cliffs, we saw no evidence of nesting activity.

*Black Mountains 15.* – On February 23, 2011, we saw a flying golden eagle that performed a brief undulation flight display, perhaps in response to the helicopter, about 7 miles north of Highway 68. There were several large cliff nests in the general area, with the closest one approximately 1.3 miles away. We saw no evidence of nesting activity.

*Black Mountains 22.* – On February 23, 2011, we saw an adult golden eagle perched on a butte in the area of three large cliff nests, approximately 2.5 miles north of Highway 68. We saw no evidence of nesting activity.

*Cerbat Mountains East.* – On February 22, 2011, we flushed a golden eagle from a perch near a large cliff nest. It circled over the nest and perched again. Another large cliff nest in good condition was found approximately 1.2 miles away. We saw no evidence of nesting activity.

*Cerbat Mountains West.* – On February 22, 2011, we discovered a golden eagle incubating in a relatively small cliff nest (#1) on an outcrop.

*Cerbat Mountains North.* – On February 22, 2011, we saw a golden eagle performing an undulating flight display near a large cliff nest (#1) that was buried in snow, with a second golden eagle flying in the area.

*Grand Wash North.* – On February 24, 2011, we discovered a golden eagle incubating in a large cliff nest (#1), and found two other large, old nests (#2, #3) within 0.5 miles.

*Grand Wash North 2.* – On February 24, 2011, we saw a pair of golden eagles perched on the cliffs near Grapevine Wash, and found a large cliff nest (#1) approximately one mile away.

*Hualapai South.* – On March 10, 2011, we discovered a golden eagle incubating on a north-facing cliff nest (#1).

*Hurricane Cliffs 3.* – On June 15, 2011, we saw a golden eagle perched on the cliffs less than 0.5 miles from three large nests, at least two of which were in good condition.

*Long Mountain.* – On February 24, 2011 we found a large cliff nest and one golden eagle flying in the area. We saw no evidence of nesting activity.

*Middle Grand Wash.* – On February 24, 2011, we discovered a golden eagle incubating on a cliff nest (#1), with a second golden eagle in the area executing an undulating flight display.

*Middle Hurricane Cliffs.* – On June 15, 2011, we saw an adult golden eagle in flight being chased by a common raven. The eagle flew to a perch in a cliff alcove where there appeared to be a nest, possibly with a nestling, however the ledge was concealed by shrubbery and we were unable to confirm the nest sighting. There were also two other large cliff nests in fair to good condition in the immediate area.

*Seegmiller Mountain.* – On June 15, 2011, we saw a golden eagle perched and found three large cliff nests within a mile of its location. Two of the nests were in good or very good condition, and one was in poor condition with a rock in the nest. One of the good nests appeared to have a dark form laying inside, possibly a feathered nestling, however due to windy conditions we were unable to confirm the nest contents. A fourth large nest in fair condition was found within 1.6 miles of the perched eagle.

*Trout Creek.* – On March 11, 2011, we saw a golden eagle fly to a cliff nest (#1) and start incubation. We likely had arrived during a nest exchange.

*Virgin Mountains.* – On June 17, 2011, we discovered a golden eagle nestling in a cliff nest (#1). The nestling was at least 5 weeks old with a mix of dark and white plumage.

*White Hills South.* – On February 22, 2011, we saw a pair of golden eagles flying in the area of at least two large cliff nests (#1, 2).

Yavapai County

*Harcuvar North.* – On April 12, 2011, we discovered a golden eagle in a cliff nest (#1) with two downy nestlings, 1-2 weeks old. Another large nest (#2) in poor condition was found 2.2 miles away. On May 26, two adults were in the area and the two nestlings were approximately 6 weeks old by plumage.

*Poachie.* – On March 11, 2011, we discovered a golden eagle incubating on a nest (#1) in a pothole-type ledge on a cliff (Figure 5). Two other old, large nests (#2, 3) were found 1-2.2 miles away, and assigned to the same breeding area.



*Figure 5. Golden eagle incubating at the Poachie breeding area. Photo by Kyle McCarty.*

| Table 2. Summary of new breeding areas in 2011. |                     |                  |                            |                                                                              |
|-------------------------------------------------|---------------------|------------------|----------------------------|------------------------------------------------------------------------------|
| Breeding Area                                   | Status <sup>1</sup> | Elevation (feet) | Nests in area <sup>2</sup> | Comments                                                                     |
| <b>La Paz County</b>                            |                     |                  |                            |                                                                              |
| Kofa                                            | A                   | 2,450            | 2                          | On 3/22, one adult incubating in new nest #1. Second nest < 1 mile away.     |
| <b>Maricopa County</b>                          |                     |                  |                            |                                                                              |
| Harquahala                                      | A                   | 3,980            | 1                          | On 5/27, one 5-week old nestling in nest with one adult.                     |
| <b>Mohave County</b>                            |                     |                  |                            |                                                                              |
| Black Mountains East                            | A                   | 4,130            | 1                          | On 2/23, one adult incubating in new nest #1. 2 <sup>nd</sup> adult in area. |
| Black Mountains North                           | O                   | 2,640            | 1                          | On 2/23, pair observed near nest.                                            |
| Black Mountains South                           | A                   | 2,680            | 1                          | On 3/9, one adult incubating in new nest #1.                                 |
| Black Mountains West                            | A                   | 4,000            | 4                          | On 2/23, one adult incubating in new nest #1. 2 <sup>nd</sup> adult in area. |
| Cerbat Mountains West                           | A                   | 5,460            | 1                          | On 2/22, one adult incubating in new nest #1.                                |
| Cerbat Mountains North                          | O                   | 5,780            | 1                          | On 2/22, pair observed near nest.                                            |
| Grand Wash North                                | A                   | 5,115            | 3                          | On 2/24, one adult incubating in new nest #1.                                |
| Grand Wash North 2                              | O                   | 5,215            | 1                          | On 2/24, pair observed near nest.                                            |
| Hualapai South                                  | A                   | 4,250            | 1                          | On 3/10, one adult incubating in new nest #1.                                |
| Middle Grand Wash                               | A                   | 5,615            | 1                          | On 2/24, one adult incubating in new nest #1. 2 <sup>nd</sup> adult in area. |
| Virgin Mountains                                | A                   | 6,500            | 1                          | On 6/17, one 5-week old nestling in new nest #1                              |
| Trout Creek                                     | A                   | 3,900            | 1                          | On 3/11, one adult flew to incubate in new nest #1.                          |
| White Hills South                               | O                   | 4,050            | 2                          | On 2/22, pair observed near nests.                                           |
| <b>Yavapai County</b>                           |                     |                  |                            |                                                                              |
| Harcuvar North                                  | A                   | 4,160            | 2                          | On 4/12, two 2-week old nestlings in new nest #1.                            |
| Poachie                                         | A                   | 2,960            | 3                          | On 3/11, one adult incubating in new nest #1.                                |

<sup>1</sup> Breeding area status codes: U=unoccupied, O=occupied, A=active, S=successful, F=failed.

<sup>2</sup> Active nests assigned nest number 1.

| Table 3. Summary of single golden eagle sightings near large nests in 2011. |      |               |                                     |
|-----------------------------------------------------------------------------|------|---------------|-------------------------------------|
| Location                                                                    | Date | Nests in Area | Comments                            |
| <b>La Paz County</b>                                                        |      |               |                                     |
| Harquahala West                                                             | 4/12 | 2             | Perched above empty nest.           |
| Plomosa Mountains                                                           | 3/23 | 1             | Perched, 1.5 miles to nearest nest. |
| <b>La Paz/Maricopa Counties</b>                                             |      |               |                                     |
| Eagletail Mountains                                                         | 3/24 | 4             | Flying, <1 mile to nearest nest.    |
| <b>Mohave County</b>                                                        |      |               |                                     |
| Black Mountains 2 North                                                     | 2/24 | 5             | Perched, <1 mile to nearest nest.   |
| Black Mountains 3                                                           | 2/22 | 5             | Flying along cliffs past nests.     |
| Black Mountains 15                                                          | 2/23 | 1             | Flying, 1.3 miles to nearest nest   |
| Black Mountains 22                                                          | 2/23 | 3             | Perched on cliff near nests.        |
| Cerbat Mountains East                                                       | 2/22 | 2             | Flushed from perch above nest.      |
| Hurricane Cliffs 3                                                          | 6/15 | 3             | Perched <0.5 miles from nests.      |
| Long Mountain                                                               | 2/24 | 1             | Flying over nest.                   |
| Middle Hurricane Cliffs                                                     | 6/15 | 2             | Flew to possible third nest.        |
| Seegmiller Mountain                                                         | 6/15 | 3             | Perched, < 1 mile to nearest nest.  |

## HISTORIC BREEDING AREAS

We surveyed all 20 known historic BAs located within the 2011 nest survey area (Figure 2). Of these, 3 were active, 1 occupied, 2 with one golden eagle and large nest(s), 10 with only nests in varying conditions, and 4 where neither eagles or nests were detected (Table 4). Specific historical data and 2011 survey results for each of these areas are detailed below. Any historic BA documented as being occupied during the 2011 nest survey will be reclassified as a BA in future reports.

### Coconino County

*Johnson Spring.* – Observations in 1979 indicated two fledglings were seen, as well as a cliff nest, however the data form listed two nesting stages with one observation date of April 18, 1979. On June 13, 2011, we found a golden eagle perched in the area of two large cliff nests in poor to fair condition, one of which appeared to be the original nest and was very old. We also documented a second perched golden eagle and a third large nest within a mile. The third nest was in fair condition and did not appear to have been used recently.

*Rock Canyon.* – In 1979 a fledgling was reported, however the data form listed two nesting stages with one observation date of April 19, 1979. On May 2, 2006 one adult golden eagle was seen in the area. On June 14, 2011, we searched the area but did not find any eagles or nests.

*Shinarump Cliffs.* – In 2000, two young were seen on June 12 (one had fledged and one was still in the nest). On June 13, 2011, we were unable to find nest #1, and found three other nests in fair to good condition along the cliffs. Two of these nests were considered to be perhaps not quite large enough to be eagle nests. No eagles were seen and there was no evidence of nesting activity.

*Suicide Ridge.* – In 1978, a fledgling was observed in June. In 2006, a nest was present but no eagles were seen. On June 14, 2011, we found a large nest in the original location, however no eagles were seen and there was no evidence of recent nesting activity.

*Top Rock.* – In 1979, a fledgling was reported, however the data form listed two nesting stages with one observation date of April 18, 1979. On June 13, 2011, we found two large old nests in poor to fair condition in the vicinity of the original location and it was unclear which one, if either, was the original nest. We found another large cliff nest in good condition approximately 2.2 miles to the south. No eagles were seen and there was no evidence of nesting activity.

### Coconino/Mohave Counties

*Loco Point.* – In 1979, a fledgling was reported, however the data form listed three different nesting stages with one observation date of April 16, 1979. On June 14, 2011, we did not find the original nest, but found up to six other large cliff nests within 1.5 miles of the original location. Most of the nests were in poor to fair condition. We also saw a golden eagle soaring in the area over Bulrush Wash, a side canyon of upper Kanab Creek.

Mohave County

*Black Rock Gulch.* – In 1979, one fledgling and two adults were reported. In 2006, no nests or eagles were seen. On June 16, 2011, we found two cliff nests in poor to fair condition within 0.5 miles of the original location. However both nests were considered to be perhaps not quite large enough to be eagle nests. We saw no eagles and no evidence of recent nesting activity.

*Bronco Creek.* – In 1979, a pair of golden eagles was observed with two eggs on April 2, and a three-week old nestling was reported on May 3. In 2006, no nests or eagles were seen. On March 11, 2011, we searched the area and were unable to find the old nest or any likely nest locations. The immediate terrain was low with little potential substrate, and we suspect that the coordinates for the historic record are inaccurate or perhaps refer to an observation point.

*Craig's Knoll.* – In 1979, a fledgling was reported on May 1. On June 15, 2011, we found a nest in the original location that had disintegrated into a large dirt pile on the cliff ledge. We saw no eagles and no evidence of recent nesting activity.

*Eagle Point.* – In 1979, two adults and a pair of two-week old nestlings were seen on May 2. On April 13, 2006 one golden eagle and four inactive nests were seen in the area. On March 10, 2011, we searched the area and found four large cliff nests in close proximity to each other. Two of the nests were in fair to good condition and two were old nests. We saw no eagles and no evidence of nesting activity.

*Elephant Mountain.* – In 1979, an adult was incubating on April 12, and fledglings were observed on June 20. In 2006, no nests or eagles were seen. On March 11, 2011, we found a golden eagle incubating in a new nest (#2) approximately 1.7 miles from the original location, however the original nest was not found.

*Hell's Half Acre.* – In 1979, an adult was incubating on April 11, and a six-week old nestling was observed on June 13. On April 11, 2006 one possible golden eagle was seen, and no nests were found. On March 11, 2011, we were unable to find the original nest, but found two large nests in fair to good condition within 1.6 miles of the original location. We saw no eagles and no evidence of nesting activity.

*Hualapai Mountains.* – A pair of golden eagles with a juvenile was discovered on August 21, 1991, although it is not clear from the records if a nest was actually found. On March 9, 2011, we found an incubating golden eagle in a cliff nest (#2) approximately 0.5 miles from the originally reported location.

*Hurricane Cliffs.* – In 1988, a juvenile was heard vocalizing and an adult was seen leaving the nest on July 7. On June 15, 2011, we found a nest in the original location. The nest was in poor condition, well-hidden in a south-facing alcove on the cliffs. We saw no eagles and no evidence of recent nesting activity.

*Maggie Wash.* – In 1979, an adult was incubating on March 22, and a pair of three-week old nestlings were observed on May 3. In 2006, no nests or eagles were seen. On March 10, 2011, we searched the area and were unable to find the old nest location. There was one outcrop with a

great deal of whitewash on the ledge, however it appeared more suitable for a prairie falcon aerie. We saw no eagles and no evidence of nesting activity.

*Shingle Canyon.* – In 1979, an adult was reported incubating two eggs on February 22, and two 2.5-week old nestlings were observed on May 3. In 2006, no nests or eagles were seen. On March 9, 2011, we found at least 9 large cliff nests within 1.2 miles of the original location, although it is unclear if any of these was the original nest. Six of the nests were in fair to good condition. Although there was no evidence of nesting activity, we saw an adult or subadult golden eagle approximately 1.4 miles from the nearest nest.

*White Hills.* – In 1994, a golden eagle was reported incubating on April 12. In 2006, no nests or eagles were seen. On March 6, 2011, we searched this area and the nearby hills on foot and found a nest in fair to good condition on a tower along the power line transmission road in the general location of the original nest record, however the nest contained no large sticks, was quite flat, and appeared more suitable for use by red-tailed hawks which were seen in the area. We saw no eagles and no evidence of nesting activity.

*Yellowstone Mesa.* – In 1979, three fledglings were reported, however the data form listed three nesting stages with one observation date of April 19, 1979. On June 14, 2011, we found a large, old nest in the area, but did not see a nest in the original location. We saw no eagles and no evidence of recent nesting activity.

#### Yavapai County

*Burro Creek.* – A nest occupied by golden eagles was discovered in 1992. This area has been regularly checked during bald eagle surveys since then. On April 17, 2000 a pair of golden eagles was seen in a nest. On March 15, 2011, we saw no golden eagles and no evidence of nesting activity, however at least three old nests were present on the cliffs in the area from Francis Creek south to Bozarth Point.

*Peoples Canyon.* – In 1979, two young were reported fledged. On April 18, 2006, two adult golden eagles were seen vocalizing but no nests were found. On March 11, 2011, we found a golden eagle incubating in a new cliff nest. An old nest was present in the original location, and we found another large cliff nest in poor to fair condition. All three nests were within 0.8 mile of each other.

| Table 4. Summary of findings at historic breeding areas surveyed in 2011. |                     |                  |      |                                                     |
|---------------------------------------------------------------------------|---------------------|------------------|------|-----------------------------------------------------|
| Historic Breeding Area                                                    | Status <sup>1</sup> | Elevation (feet) | Date | Comments                                            |
| <b>Coconino County</b>                                                    |                     |                  |      |                                                     |
| Johnson Spring                                                            | O                   | 5,300            | 6/13 | Two eagles and three nests found.                   |
| Rock Canyon                                                               | --                  | 4,800            | 6/14 | No eagles or nests.                                 |
| Shinarump Cliffs                                                          | --                  | 5,000            | 6/13 | No eagles. One to three nests found.                |
| Suicide Ridge                                                             | --                  | 6,000            | 6/14 | No eagles. One nest found.                          |
| Top Rock                                                                  | --                  | 5,650            | 6/13 | No eagles. Two nests found.                         |
| <b>Coconino/Mohave Counties</b>                                           |                     |                  |      |                                                     |
| Loco Point                                                                | --                  | 4,400            | 6/14 | One eagle and six nests found.                      |
| <b>Mohave County</b>                                                      |                     |                  |      |                                                     |
| Black Rock Gulch                                                          | --                  | 4,000            | 6/16 | No eagles. Two nests, perhaps too small for eagles. |
| Bronco Creek                                                              | --                  | 2,900            | 3/11 | No eagles or nests.                                 |
| Craig's Knoll                                                             | --                  | 6,800            | 6/15 | No eagles or nests.                                 |
| Eagle Point                                                               | --                  | 2,900            | 3/10 | No eagles. Four nests found.                        |
| Elephant Mountain                                                         | A                   | 4,290            | 3/11 | Golden eagle incubating in nest #2.                 |
| Hell's Half Acre                                                          | --                  | 2,400            | 3/11 | No eagles. Two nests found.                         |
| Hualapai Mountains                                                        | A                   | 4,950            | 3/9  | Golden eagle incubating in nest #2.                 |
| Hurricane Cliffs                                                          | --                  | 6,300            | 6/15 | No eagles. One nest found.                          |
| Maggie Wash                                                               | --                  | 2,700            | 3/10 | No eagles or nests.                                 |
| Shingle Canyon                                                            | --                  | 3,800            | 3/9  | One eagle and nine nests found.                     |
| White Hills                                                               | --                  | 3,050            | 3/6  | No eagles. One nest found.                          |
| Yellowstone Mesa                                                          | --                  | 5,600            | 6/14 | No eagles. One nest found.                          |
| <b>Yavapai County</b>                                                     |                     |                  |      |                                                     |
| Burro Creek                                                               | --                  | 3,400            | 3/15 | No eagles. Three nests found.                       |
| Peoples Canyon                                                            | A                   | 3,400            | 3/11 | Golden eagle incubating in nest #2.                 |

<sup>1</sup> Breeding area status codes: U=unoccupied, O=occupied, A=active, S=successful, F=failed.

## KNOWN BREEDING AREAS

These areas have documented golden eagle breeding activity in at least one of the past ten years, and were discovered prior to this year's survey (Table 5). Specific historical data and 2011 survey results for each of these areas are detailed below.

### Coconino County

*Walnut Canyon.* – During a ground visit on May 4, 2011, National Park Service and AGFD personnel observed two downy nestlings 1-2 weeks old and one adult golden eagle in a cliff nest (#1) (Figure 6). The NPS reported both nestlings fledged in July.



*Figure 6. Walnut Canyon breeding area. Photo by Susan MacVean.*

### Gila County

*Parker Creek.* – Nest #1 was discovered in 1996 when an active golden eagle nest was reported. In 2006, 2009-2010, a large nest was found but no eagles were seen. We surveyed the area during a bald eagle nest search on February 1, 2011 and saw a pair of golden eagles in courtship flight, and one golden eagle in the area on March 16.

*Pinto Creek.* – Nest #1 was discovered in 2009, when a golden eagle was found incubating in a cliff nest. We surveyed the area during a bald eagle nest search on April 20, 2011 and saw no golden eagles and no evidence of nesting activity.

### Mohave County

*Aubrey Peak Wilderness.* – In 1977, two adults and a juvenile were observed on July 19. In 1979, incubation was observed March 22 and a fledgling was reported June 13. In 2006, a new nest was found with a 4-week old nestling on April 17, but the nest was empty on May 19. On March 10, 2011, a golden eagle was incubating in another new cliff nest and a second adult was seen flying in the area. Five other large cliff nests were also found and assigned to the same breeding area. All 8 nests are located in an area of approximately 2.5 mi<sup>2</sup>.

Yavapai County

*Burro Mesa.* – A nest was discovered in 1979, but was not found during searches of the area in 2009-2011, and we consider it gone. In 2008, two other nests (#2, 3) were discovered approximately 1.5 miles from the originally reported location, and a golden eagle was seen incubating in nest #2 on April 21 that year. On March 15, 2011, during a survey of upper Burro Creek for bald eagles, we saw no golden eagles and no evidence of nesting activity.

*Granite.* – The breeding area was discovered in 1993, when an active nest was observed. The area was occupied by golden eagles in 1994-1995, 1997-1998, 2002, 2005-2006, and 2008, with one nestling seen in both 2006 and 2008. We surveyed the area during a bald eagle nest search on March 15, 2011 and found a golden eagle incubating in nest #2. The nest was empty and failed by April 20.

*Hell Point.* – The breeding area was discovered in 1975 and originally documented as a historic bald eagle breeding area (Hunt et al. 1992). Golden eagles were observed first using the site in 1993, when two nestlings were seen on April 28. Five cliffs nests have been found, at least three of which are still present. In 2006, an 8-week old nestling was seen on May 19. In 2007-2008, the nest attempt failed during incubation. On March 15, 2011, we found a golden eagle incubating in nest #2, and saw an eagle either incubating or brooding on April 20.

*Mormon Pocket.* – The breeding area was discovered in 1992, when an active nest with young was observed. In 2006, two nestlings 5-6 weeks old were seen on May 19. In 2009, an adult was seen incubating on March 16. In 2011, we examined nests #1 and 2 during four bald eagle nest surveys in January to April and saw no golden eagles and no evidence of nesting activity.

*Watson Lake.* – The breeding area was discovered in 1992, when a pair of golden eagles was observed in the area of two cliff nests. Nestlings were seen in 1997-1999, 2001, and 2006, and incubation in 2009. In 2011, we examined nests #1 and 2 during three bald eagle nest surveys in January to April and saw no golden eagles and no evidence of nesting activity. Nest #2 was degraded and in poor condition.

| Table 5. Summary of findings at known breeding areas surveyed in 2011. |                     |                  |                   |                                                                                 |
|------------------------------------------------------------------------|---------------------|------------------|-------------------|---------------------------------------------------------------------------------|
| Breeding Area                                                          | Status <sup>1</sup> | Elevation (feet) | Nest <sup>2</sup> | Comments                                                                        |
| <b>Gila County</b>                                                     |                     |                  |                   |                                                                                 |
| Parker Canyon                                                          | O                   | 4270             | --                | On 2/1, pair observed in area in courtship flight.                              |
| Pinto Creek                                                            | --                  |                  | --                | On 4/30, all known nests empty and no eagles.                                   |
| <b>Coconino County</b>                                                 |                     |                  |                   |                                                                                 |
| Walnut Canyon                                                          | S                   | 6300             | 1                 | On 5/4, two 1-2 week old nestlings. Reported to have fledged in July.           |
| <b>Mohave County</b>                                                   |                     |                  |                   |                                                                                 |
| Aubrey Peak Wilderness                                                 | A                   | 2790             | 3                 | On 3/10, an adult incubating in nest #3. 2 <sup>nd</sup> adult in area.         |
| <b>Yavapai County</b>                                                  |                     |                  |                   |                                                                                 |
| Burro Mesa                                                             | --                  | 3800             |                   | On 3/15, all known nests empty and no eagles.                                   |
| Granite                                                                | F                   | 4400             | 2                 | On 3/15, an adult incubating in nest #2. Breeding attempt failed by 4/20.       |
| Hell Point                                                             | A                   | 4200             | 2                 | On 3/15, an adult incubating in nest #2. Nest still active on 4/20.             |
| Mormon Pocket                                                          | U                   | 4000             | --                | Nest visited on 1/3, 1/31, 3/15, and 4/20- All known nests empty and no eagles. |
| Watson Lake                                                            | U                   | 5300             | --                | Nest visited on 1/31, 3/15, and 4/20- All known nests empty and no eagles.      |

<sup>1</sup>Breeding area status codes: U=unoccupied, O=occupied, A=active, S=successful, F=failed.

<sup>2</sup>Nest numbers are determined sequentially upon discovery and may be derived from Hunt and others 1992; Driscoll and Beatty 1994; Driscoll and others 1992, 1995a, 1995b, 1997, 1998, 1999; Jacobson and others 2004, 2005, 2006, 2007; Koloszar and Driscoll 2001a, 2001b; Koloszar and others 2002; Canaca and others 2004; McCarty and Jacobson 2008, 2009, 2010.

ADDITIONAL GOLDEN EAGLE SIGHTINGS

During the 2011 golden eagle nest survey, 13 sightings of golden eagles were documented that were not closely associated with large nests (Table 6). Additional specifics for two of these sightings are detailed below.

Mohave County

*Boriana Canyon.* – A pair of golden eagles were seen in courtship flights on February 8, 1979, however there was no mention of a nest in the data and we presume no nest was found. On March 10, 2011, we saw an adult or subadult golden eagle perched less than a mile from the original observation. We saw no evidence of recent nesting activity.

Yavapai County

*Cypress Mountain.* – On March 15, 2011, we were in transit during an aerial survey for bald eagles and saw a pair of golden eagles perched together on a boulder 0.5 miles south of Cypress Mountain in Prescott National Forest. We did not search for nests but there was promising cliff substrate and good habitat, and we view this as a promising area for future surveys.

| Table 6. Summary of additional golden eagle sightings in 2011. |      |                  |                                                                   |
|----------------------------------------------------------------|------|------------------|-------------------------------------------------------------------|
| Location                                                       | Date | Number of Eagles | Comments                                                          |
| <b>Mohave County</b>                                           |      |                  |                                                                   |
| Black Mountains                                                | 3/23 | 1                | Immature perched on Sugarloaf Mountain.                           |
| Black Mountains                                                | 3/23 | 1                | Perched in low hills at edge of Detrital Valley west of Chloride. |
| Black Rock Mountain                                            | 6/16 | 1                | Flew from cliffs near Pocum Wash. Whitewash on perch.             |
| Boriana Canyon                                                 | 3/10 | 1                | Perched in area.                                                  |
| Cerbat Mountains                                               | 2/22 | 1                | Perched in area south of Mt. Tipton.                              |
| Cerbat Mountains                                               | 2/22 | 1                | Perched on Bull Mountain.                                         |
| Cerbat Mountains                                               | 2/22 | 1                | Perched near mouth of Vock Wash.                                  |
| Cerbat Mountains                                               | 2/22 | 1                | Immature perched in Elements Canyon.                              |
| Cornwall Canyon                                                | 3/11 | 1                | Flew from mesa top east of Elephant Mountain.                     |
| Grand Wash Cliffs                                              | 2/24 | 1                | Perched on cliffs east of Music Mountain Mine.                    |
| Grand Wash Cliffs                                              | 2/24 | 1                | Immature perched west of Black Mesa area of Music Mountains.      |
| Willow Canyon                                                  | 6/14 | 1                | Perched in a side canyon of Snake Gulch.                          |
| <b>Yavapai County</b>                                          |      |                  |                                                                   |
| Cypress Mountain                                               | 3/15 | 2                | Pair perched together on a boulder.                               |

OVERVIEW

We discovered 208 new large nests throughout the area surveyed. Some of these nests occurred along the same cliff wall or were in close proximity to each other (<2 miles), and by grouping nests into suspected territories we named 134 potential golden eagle breeding areas (Appendix B). In 12 locations we found a single eagle in the area of at least one large nest indicating a potential for occupancy.

We discovered 17 new breeding areas, 4 occupied historic BAs, and 5 occupied but previously known BAs. In most cases we visited each site only once and were unable to document

productivity, however from our limited data we observed incubation was already underway at some nests in late February and was ongoing in March. Nestlings were observed at four breeding areas and hatching was estimated to having occurred in mid-April through mid-May.

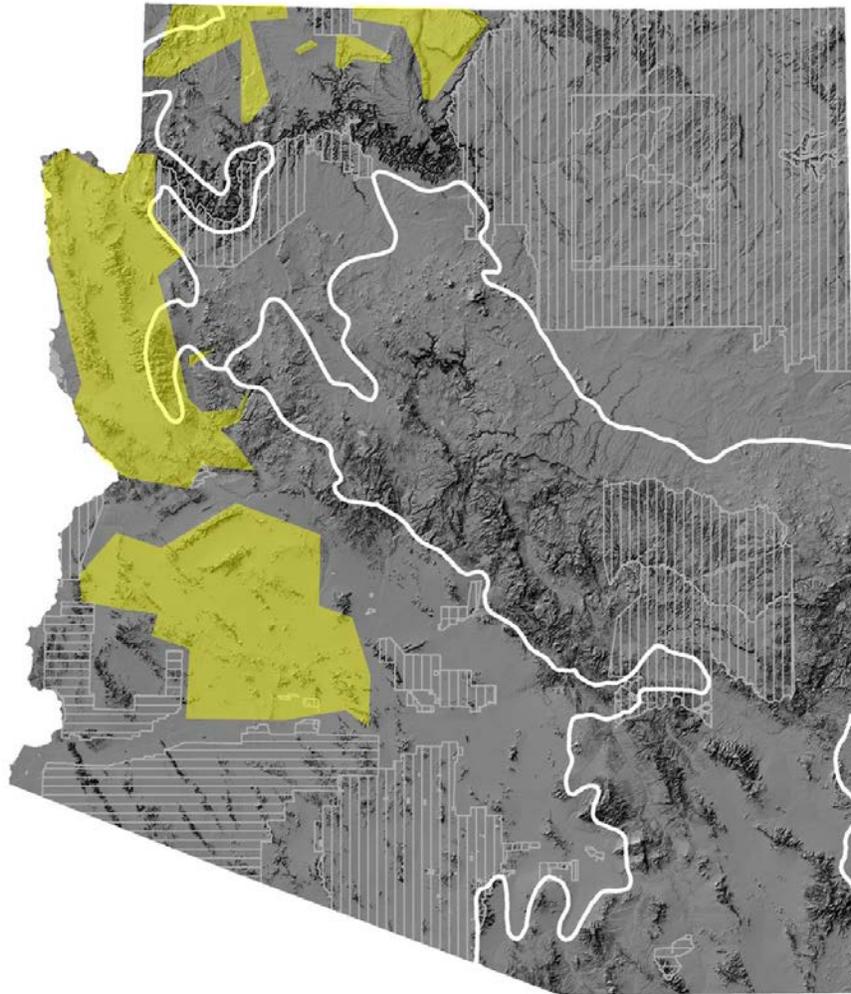
Finally, we had 13 sightings of golden eagles not associated with nests. Areas with sightings of paired or individual birds are promising leads, however sightings of individual golden eagles in February may be non-breeding floater, migrant, or wintering individuals.

#### Bird Conservation Region

Although our surveys were based on the need for golden eagle nest data on and adjacent to BLM lands associated with proposed wind and solar energy projects, management of golden eagle populations is being evaluated by USFWS using Bird Conservation Regions (BCRs) as ecological units. Arizona is approximately divided in thirds by BCR 16, 33, and 34 (NABCI 2000). An insignificant fraction of BCR 35 (Chihuahuan Desert) is represented as well.

Surveys in 2011 occurred mainly in BCR 33 (Sonoran and Mohave Deserts) in southwestern and western Arizona plus portions of BCR 16 (Southern Rockies/Colorado Plateau) in northern Arizona. Tribal lands, military lands, Grand Canyon National Park, and the Kofa National Wildlife Refuge were excluded from this survey due to access and flight restrictions (Figure 7). The majority of accessible survey area within BCR 33 was surveyed in 2011, but some gaps remain. Future nest surveys within BCR 33 should focus on areas not surveyed in the Aquarius Mountains southeast to the Bradshaw Mountains, the Grand Wash Cliffs in the Music Mountains area, the Peacock Mountains, portions of Lake Mead National Recreation Area, Buckskin Mountains near Parker Dam, the greater Tucson area, and mountains around the Gila River from Coolidge Dam downstream to Florence.

The 2011 surveys covered part of the Arizona Strip area in BCR 16, but additional surveys are needed in the Grand Wash Cliffs north of Grand Canyon, upper Parashant and Andrus Canyons, Kanab Creek and tributaries, Kaibab Plateau Saddle Mountain Wilderness Area, and cliffs east of Colorado City. Although surveyed in 2011, additional nest surveys would be beneficial along the Virgin River corridor and Virgin Mountains as we encountered difficult winds in these areas while surveying and at times were unable to approach the cliffs closely or slowly. Nearly the entire portion of BCR 16 south of Grand Canyon and east of the Colorado River were not surveyed in 2011.



*Figure 7. Aerial golden eagle nest surveys completed in 2011 (shaded yellow) in relation to Bird Conservation Regions (white borders), Indian lands (vertical lines), and military lands (horizontal lines). BCR 16 is in the north, BCR 33 in the southwest/west, and BCR 34 in the central/southeast.*

#### MANAGEMENT RECOMMENDATIONS

1. Priority areas for future aerial nest surveys include all unexplored suitable breeding habitat and historic BAs within 10 miles of proposed wind and solar projects. Currently, the majority of these areas occur in northern Arizona from Kingman east/southeast to Springerville, and in southeastern Arizona.
2. Future nest survey efforts should also focus completing the nest survey of accessible and suitable habitat within each of Arizona's 3 main BCR's.
3. Obtain access to Tribal and Department of Defense lands to conduct golden eagle nest surveys in those areas.
4. Once nest surveys are completed, aerial surveys should be used in concert with follow-up ground surveys to document occupancy. From the air, surveyors can easily cover wide areas

of golden eagle habitat to discover large nests. From the ground, large nests can be observed for an appropriate duration to determine occupancy. Highest priority for occupancy surveys includes areas with golden eagle sightings and/or potential BAs with large nests in fair to good condition.

5. A representative sample of BA's should be monitored for productivity within each BCR.

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#### APPENDIX A: RAPTOR REPRODUCTIVE STATUS CRITERIA

**Breeding Area (BA):** An area containing 1 or more nests within the range of 1 mated pair of birds. Operationally, once a BA is established, we consider it a BA whether it is occupied by eagles in a given year or not, until or unless it is designated historical (i.e., 10 consecutive years unoccupied).

**Historic BA:** A breeding area documented as having been unoccupied for ten consecutive years prior to the current year.

**Occupied BA:** An occupied BA must have a nest, which is any nest, where at least 1 of the following activity patterns was observed during the breeding season:

- a. Young were raised.
- b. Eggs were laid.
- c. One adult sitting low in the nest, presumably incubating.
- d. Two adults present on or near the nest.
- e. One adult and 1 bird in immature plumage at or near a nest, if mating behavior was observed (display flight, nest repair, copulation).
- f. A recently repaired nest with fresh sticks, or fresh boughs on top, and/or droppings and/or molted feathers on its rim or underneath.

**Active Nest:** One in which eggs have been laid. Activity patterns (a), (b), and (c) above are diagnostic of an active nest.

**Unoccupied BA:** A nest or group of alternate nests at which none of the activity patterns diagnostic of an occupied nest were observed in a given breeding season. BAs must exist as occupied before they can be recognized and classified as unoccupied.

**Successful BA:** An occupied BA from which at least 1 young fledged during the breeding season under consideration. Nests were successful if at least 1 young was raised past 80% of fledging age.

**Failed BA:** An occupied BA from which no young fledged regardless of cause.

APPENDIX B: POTENTIAL BREEDING AREAS DOCUMENTED IN 2011 NEST SURVEY

| Table 7. Summary of potential breeding areas with large nests documented in 2011. |        |        |                |                                                                         |
|-----------------------------------------------------------------------------------|--------|--------|----------------|-------------------------------------------------------------------------|
| Area Name                                                                         | Nest # | Aspect | Elevation (ft) | Comments                                                                |
| Aquarius Mtns2                                                                    | 1      | N      | 5,500          | Old nest.                                                               |
| Aubrey Hills                                                                      | 1      | S      | 1,180          | Fair-poor condition.                                                    |
| Aubrey Wilderness 2                                                               | 1      | NE     | 3,090          | Large nest.                                                             |
|                                                                                   | 2      | NE     | 2,940          | 2 nests (1 large, 1 medium-large)                                       |
|                                                                                   | 3      | NW     | 2,730          | Large nest.                                                             |
| Belmont East                                                                      | 1      | --     | 2,350          | Good condition                                                          |
| Belmont West                                                                      | 1      | E      | 3,250          | Fair-good condition.                                                    |
|                                                                                   | 2      | W/NW   | 3,370          | Fair-good condition.                                                    |
|                                                                                   | 3      | W/SW   | 3,140          | Fair condition.                                                         |
|                                                                                   | 4      | --     | 2,820          | Poor condition.                                                         |
| Big Horn North                                                                    | 1      | --     | 2,050          | 2 large nests, good. Red-tailed hawk incubating.                        |
|                                                                                   | 2      | S      | 2,460          | 2 large nests, fair-good.                                               |
| Big Horn South                                                                    | 1      | --     | 2,390          | Good condition.                                                         |
| Bill Williams Mtns                                                                | 1      | E      | 1,430          | Large nest. Active red-tailed hawk nest nearby.                         |
| Black Mtns 1                                                                      | 1      | --     | 4,270          | Large nest.                                                             |
| Black Mtns 2                                                                      | 1      | N      | 2,440          | Large nest with lots of whitewash.                                      |
| Black Mtns 3                                                                      | 1      | --     | 2,980          | Several large nests in area. One golden eagle flying in area.           |
|                                                                                   | 2      | --     | 3,170          | Several large nests in area. One golden eagle flying in area.           |
|                                                                                   | 3      | --     | 3,150          | Several large nests in area. One golden eagle flying in area.           |
| Black Mtns 4                                                                      | 1      | NW     | 1,960          | Large nest low on N side of small ridge.                                |
| Black Mtns 5                                                                      | 1      | N/NW   | 2,650          | 2 large nests.                                                          |
| Black Mtns 6                                                                      | 1      | --     | 2,870          | Large nest                                                              |
| Black Mtns 7                                                                      | 1      | NW     | 1,880          | Large nest, possible second nest.                                       |
| Black Mtns 8                                                                      | 1      | N      | 1,190          | Large nest in pothole/ledge.                                            |
| Black Mtns 9                                                                      | 1      | E      | 3,900          | At least 6 large nests on E face (2 very old nests on W face).          |
| Black Mtns 10                                                                     | 1      | --     | 4,720          | Large nest.                                                             |
| Black Mtns 11                                                                     | 1      | NW     | 3,660          | Large nest.                                                             |
|                                                                                   | 2      | --     | 2,720          | Large nest.                                                             |
| Black Mtns 12                                                                     | 1      | NW     | 2,470          | At least 2 old nests (1 large, 1 medium-large size), lots of whitewash. |
| Black Mtns 13                                                                     | 1      | NE     | 2,900          | Old nest.                                                               |
| Black Mtns 14                                                                     | 1      | W      | 3,520          | Large nest.                                                             |
|                                                                                   | 2      | N      | 3,480          | Large nest.                                                             |
| Black Mtns 15                                                                     | 1      | NW     | 3,540          | Other nests in area. Golden eagle flying in area.                       |
| Black Mtns 16                                                                     | 1      | E      | 3,500          | Large nest on ledge.                                                    |
|                                                                                   | 2      | SE     | 3,900          | Other nests in area (1 with a red-tailed hawk).                         |
| Black Mtns 17                                                                     | 1      | NE     | 4,700          | Large nest (also an old nest on SW side almost gone).                   |
| Black Mtns 18                                                                     | 1      | N, W   | 4,370          | 2 large nests on cliff.                                                 |
| Black Mtns 19                                                                     | 1      | S/SE   | 4,470          | Large nest on cliff, poor-fair condition.                               |
| Black Mtns 20                                                                     | 1      | N      | 4,320          | Large old nest.                                                         |
| Black Mtns 21                                                                     | 1      | N      | 4,490          | 2 large cliff nests.                                                    |
| Black Mtns 22                                                                     | 1      | SE     | 3,910          | Golden eagle perched on butte. 3 large nests on cliff.                  |

| Table 7. Continued. |        |        |                |                                                                                                          |
|---------------------|--------|--------|----------------|----------------------------------------------------------------------------------------------------------|
| Area Name           | Nest # | Aspect | Elevation (ft) | Comments                                                                                                 |
| Black Mtms 23       | 1      | S, SE  | 1,690          | At least 2 large nests, possibly 3.                                                                      |
|                     | 2      | S, SE  | 1,510          | At least 2 large nests, possibly 3.                                                                      |
|                     | 3      | NW     | 4,150          | Other nests in area.                                                                                     |
|                     | 4      | NW     | 4,100          | Other nests in area.                                                                                     |
|                     | 5      | NW     | 4,080          | Other nests in area.                                                                                     |
| Black Mtms 24       | 1      | SW     | 4,240          | Old nest.                                                                                                |
|                     | 2      | E?     | 4,270          | Old nest.                                                                                                |
|                     | 3      | N      | 4,180          | 2-3 large nests, fair condition.                                                                         |
|                     | 4      | E      | 3,920          | Poor condition/mulch.                                                                                    |
| Black Mtms 25       | 1      | W      | 3,560          | Fair condition.                                                                                          |
| Black Mtms 26       | 1      | N      | 4,020          | Very old nest, poor condition.                                                                           |
|                     | 2      | E/NE   | 3,650          | Very old nest, poor condition.                                                                           |
| Black Mtms 27       | 1      | E      | 4,000          | Old nest, poor condition.                                                                                |
| Black Mtms 28       | 1      | --     | 2,670          | Good condition. Lots of whitewash.                                                                       |
| Black Mtms 29       | 1      | E      | 3,080          | Many large old nests at various heights, marked some. E or NE facing                                     |
|                     | 2      | E      | 3,060          | Many large old nests at various heights, marked some. E or NE facing                                     |
|                     | 3      | E      | 3,020          | Many large old nests at various heights, marked some. E or NE facing                                     |
|                     | 4      | --     | 3,060          | Very old nest.                                                                                           |
|                     | 5      | --     | 3,030          | Very old nest.                                                                                           |
| Black Mtms 30       | 1      | ESE    | 2,910          | Fair condition.                                                                                          |
| Black Mtms 31       | 1      | N      | 3,300          | Large nest.                                                                                              |
| Black Rock 1        | 1      | --     | 2,980          | Very good condition.                                                                                     |
|                     | 2      | --     | 3,010          | Good condition, medium-large size.                                                                       |
| Black Rock 2        | 1      | N      | 4,310          | Poor condition.                                                                                          |
| Black Rock 3        | 1      | --     | 3,580          | Poor condition.                                                                                          |
| Cerbats 1           | 1      | SE     | 4,710          | Large old nest.                                                                                          |
| Cerbats 2           | 1      | E      | 4,840          | 2 large old nests near mining operation.                                                                 |
| Cerbats East        | 1      | SW     | 5,370          | Golden eagle flushed from perch, circled over nest then perched again. Fair nest on short cliff SW side. |
|                     | 2      | E      | 5,240          | Large nest.                                                                                              |
| Dome Rock           | 1      | N      | 2,200          | Old nests, poor condition.                                                                               |
| Eagle Point         | 3      | N/NE   | 3,430          | 2 large old nests. Fair condition. Tucked away.                                                          |
|                     | 4      | E/NE   | 3,240          | Good condition.                                                                                          |
|                     | 5      | E      | 3,170          | Fair-good condition                                                                                      |
| Eagletails          | 1      | N      | 2,440          | Fair condition. Golden eagle flying in area.                                                             |
|                     | 2      | NE     | 2,420          | Fair condition. Golden eagle flying in area.                                                             |
|                     | 3      | N      | 2,560          | Good condition. Golden eagle flying in area.                                                             |
| Eagletails 1        | 1      | --     | 2,001          | Large nest with large rock in middle.                                                                    |
| Eagletails 2        | 1      | N      | 2,190          | 2 nests, good-fair condition.                                                                            |
| Eagletails 3        | 1      | NE     | 2,160          | Remnant nest on north side of pinnacle                                                                   |
|                     | 2      | N      | 2,110          | Remnant nest.                                                                                            |
|                     | 3      | W/N    | 2,900          | At least 2 nests adjacent to each other, good condition. Third nest maybe too small.                     |
| Eagletails 4        | 1      | NW     | 2,150          | Poor condition.                                                                                          |
| Eagletails 5        | 1      | W      | 2,540          | Fair-good condition                                                                                      |

| Table 7. Continued. |        |        |                |                                                                            |
|---------------------|--------|--------|----------------|----------------------------------------------------------------------------|
| Area Name           | Nest # | Aspect | Elevation (ft) | Comments                                                                   |
| Eagletails 6        | 1      | S/SW   | 2,380          | 2 nests in good-fair condition.                                            |
| Eagletails 7        | 1      | N      | 2,990          | 4-5 good condition nests.                                                  |
| Flattop             | 2      | N      | 2,960          | Medium-large nest on NE side. A common raven flew from nest.               |
| Gila Mtns 1         | 1      | E/NE   | 1,840          | Fair-good condition.                                                       |
|                     | 2      | SE     | 1,700          | Fair condition. Red-tailed hawk in area.                                   |
|                     | 3      | W      | 1,340          | Fair condition.                                                            |
| Gila Mtns 2         | 1      | --     | 1,790          | Poor condition.                                                            |
| Gila Mtns 3         | 1      | --     | 1,900          | Poor condition. Large, old.                                                |
| Grand Wash 1        | 1      | --     | 5,470          | Large nest on second tier of cliffs.                                       |
|                     | 2      | --     | 5,510          | Large nest on second tier of cliffs.                                       |
| Grand Wash 2        | 1      | --     | 5,140          | Very large nest.                                                           |
|                     | 2      | --     | 5,290          | Large nest.                                                                |
| Grand Wash 3        | 1      | --     | 6,090          | Large nest.                                                                |
|                     | 2      | --     | 5,610          | Large nest.                                                                |
| Grand Wash 4        | 1      | --     | 6,180          | 1 old nest, 1 large nest.                                                  |
| Grapevine Mesa      | 1      | --     | 2,780          | Large nest with nesting material.                                          |
| Harcuvar Stem       | 1      | W/SW   | 2,950          | 2 large nests good. Some good cliffs in this small range.                  |
| Harquahala          | 1      | --     | 3,980          | 1 GOEA perched. Some good cliffs/outcrops in area. Good habitat.           |
| Hualapai 1          | 1      | N      | 4,580          | Old, poor condition. Lower level.                                          |
|                     | 2      | S      | 5,160          | Old, poor condition but large, on second level of rocks from top.          |
| Hualapai 2          | 1      | S      | 5,600          | good shape                                                                 |
| Hurricane Cliffs 2  | 1      | WNW    | 5,860          | 2 large nests, fair-good on lower cliffs.                                  |
|                     | 2      | WNW    | 5,850          | 1 fair nest lower cliffs, second smaller nest nearby.                      |
| Hurricane Cliffs 3  | 1      | N      | 5,540          | 1 good nest on lower cliffs. Golden eagle perched nearby.                  |
|                     | 2      | N      | 5,510          | 1 good nest on lower cliffs. Golden eagle perched nearby.                  |
|                     | 3      | --     | 5,960          | 1 nest on higher cliff. Golden eagle perched nearby.                       |
| Hurricane Cliffs 4  | 1      | W      | 5,320          | Good condition.                                                            |
| Hurricane Cliffs 5  | 1      | --     | 5,600          | At least 2 nests on white cliff, probably red-tailed hawk.                 |
| Hurricane Cliffs 6  | 1      | --     | 5,180          | 2 fair nests close                                                         |
|                     | 2      | --     | 5,180          | Good condition.                                                            |
| Hurricane Cliffs 7  | 1      | W      | 5,180          | Fair-good condition.                                                       |
| Hurricane Cliffs 8  | 1      | W      | 4,870          | Good condition nest on mid-level cliff face.                               |
| Kaibab 1            | 1      | N      | 6,350          | Poor condition. Large but old, spread out on ledge. South side of canyon.  |
| Kaibab 2            | 1      | N      | 6,130          | Fair condition.                                                            |
| Kanab 1             | 1      | NW     | 4,730          | Good condition.                                                            |
| Kanab 2             | 1      | S      | 5,150          | Poor condition. Very old.                                                  |
| Kanab 3             | 1      | --     | 4,920          | Old condition.                                                             |
| Kanab 4             | 1      | --     | 4,620          | Poor condition, very old.                                                  |
| Kanab 5             | 1      | --     | 4,570          | Good condition. 3 large nests close proximity, inside curve of cliff face. |
| Little Harquahala   | 1      | NE     | 2,490          | Old nest, poor condition.                                                  |
|                     | 2      | N      | 2,350          | Old nest, poor condition.                                                  |

| Table 7. Continued.     |        |        |                |                                                                                                                                           |
|-------------------------|--------|--------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Area Name               | Nest # | Aspect | Elevation (ft) | Comments                                                                                                                                  |
| Little Horn             | 1      | E/N    | 2,930          | 3 nests with 1 old medium-size. Fair-good condition.                                                                                      |
|                         | 2      | W/S    | 2,940          | Good condition.                                                                                                                           |
|                         | 3      | S      | 2,710          | Large nest.                                                                                                                               |
| Little Horn 2           | 1      | W/S    | 2,250          | Large nest.                                                                                                                               |
|                         | 2      | ~NW    | 2,310          | Large good-looking nest.                                                                                                                  |
| Little Horn 3           | 1      | ~N     | 2,390          | At least 2 large nests. 1 fair-good, 1 poor condition. Eagle-sized.                                                                       |
| Little Horn 4           | 1      | ~NE    | 2,140          | Large nest and platform, moderately old                                                                                                   |
|                         | 2      | --     | 2,150          | Fair condition.                                                                                                                           |
|                         | 3      | --     | 1,880          | Large nest.                                                                                                                               |
|                         | 4      | ~N     | 2,080          | Large nest.                                                                                                                               |
| Long Mtn                | 1      | W      | 4,280          | Large nest on small outcrop. 1 golden eagle flying in area.                                                                               |
| Lost Spring             | 1      | W      | 5,640          | Rough circle of sticks with some greenery.                                                                                                |
| Lost Spring 2           | 1      | SE     | 5,280          | 3 nests on lower red cliffs, probably red-tailed hawk.                                                                                    |
| McCracken Mountains     | 2      | E/NE   | 3,890          | Old nest on ledge. A few large sticks.                                                                                                    |
| Middle Big Horn         | 1      | E      | 2,820          | 2 large nests, 1 fair, 1 good condition.                                                                                                  |
| Middle Hurricane Cliffs | 1      | NW     | 5,170          | Golden eagle chased by CORA, flew to perch in cliff alcove. Possible nest on ledge behind shrubbery, well-concealed and very hard to see. |
|                         | 2      | WNW    | 5,310          | Fair, large nest on ledge spread out.                                                                                                     |
|                         | 3      | NW     | 5,230          | Fair-good condition, tall nest stacked up on lower cliffs.                                                                                |
| Mohave                  | 1      | N      | 1,790          | 2 old nests, perhaps medium-large. 1 large nest good.                                                                                     |
| New Water 1             | 1      | E/N    | 2,640          | At least 3 large nests, good condition, 1 poor-fair. One nest tucked back deep facing north.                                              |
| New Water 2             | 1      | E      | 2,140          | Very large nest, good condition.                                                                                                          |
| New Water 3             | 1      | E      | 2,570          | Eagle-sized nest.                                                                                                                         |
| New Water Butte         | 1      | --     | 1,850          | Old, fair condition.                                                                                                                      |
| New Water Point         | 1      | --     | 2,180          | Large nest, good. Prairie falcon in area.                                                                                                 |
|                         | 2      | --     | 2,100          | Fair condition.                                                                                                                           |
|                         | 3      | --     | 1,800          | Fair condition.                                                                                                                           |
| North Black Mtns 2      | 1      | W      | 3,040          | Several large nests in area, mostly W-facing. 1 golden eagle perched in area.                                                             |
|                         | 2      | W      | 3,280          | Several large nests in area, mostly W-facing. 1 golden eagle perched in area.                                                             |
|                         | 3      | W      | 3,250          | Several large nests in area, mostly W-facing. 1 golden eagle perched in area.                                                             |
|                         | 4      | W      | 3,230          | Several large nests in area, mostly W-facing. 1 golden eagle perched in area.                                                             |
| North Harquahala        | 1      | NW     | 4,060          | Nest good condition, but borderline size.                                                                                                 |
|                         | 2      | SE     | 3,150          | Nest fair condition, decent size.                                                                                                         |
| North Hurricane Cliffs  | 1      | --     | 4,480          | Poor condition, medium-large size nest near point.                                                                                        |
|                         | 2      | --     | 4,490          | Poor condition, under overhang.                                                                                                           |
|                         | 3      | SW     | 4,530          | Poor condition. Old/dirt.                                                                                                                 |
|                         | 4      | W      | 4,140          | Small nest cup.                                                                                                                           |
| Painted Rock            | 1      | E      | 1,180          | Nest poor condition.                                                                                                                      |
| Paria River             | 1      | --     | 4,910          | Poor condition.                                                                                                                           |
|                         | 2      | E      | 4,910          | Poor condition, in large alcove, left side facing downstream.                                                                             |

| Table 7. Continued. |        |        |                |                                                                                                       |
|---------------------|--------|--------|----------------|-------------------------------------------------------------------------------------------------------|
| Area Name           | Nest # | Aspect | Elevation (ft) | Comments                                                                                              |
| Paria River         | 3      | --     | 5,000          | Poor condition, river right.                                                                          |
| Picacho Hills       | 1      | W      | 1,780          | Fair-poor condition.                                                                                  |
|                     | 2      | --     | 1,800          | Large nest.                                                                                           |
| Plomosa 1           | 1      | W      | 2,020          | Good condition with rock in nest.                                                                     |
| Plomosa 2           | 1      | S      | 2,280          | Large nest.                                                                                           |
|                     | 2      | NW     | 2,080          | Good condition, 2 nests, very large.                                                                  |
| Plomosa 3           | 1      | E      | 2,520          | Prairie falcon flushed from cliff, old nest poor condition.                                           |
|                     | 2      | N      | 2,520          | Fair condition. Mid-level.                                                                            |
|                     | 3      | S      | 2,190          | Good condition.                                                                                       |
|                     | 4      | SW     | 2,460          | Good condition.                                                                                       |
|                     | 5      | W      | 2,350          | Good condition.                                                                                       |
|                     | 6      | NW     | 1,760          | Fair-poor condition                                                                                   |
| Plomosa 4           | 1      | N      | 2,190          | Good condition.                                                                                       |
|                     | 2      | ~E/NE  | 1,470          | 1 poor condition. 1 fair-good condition.                                                              |
| Plomosa 5           | 1      | NE     | 1,890          | Good condition                                                                                        |
|                     | 2      | --     | 1,670          | Poor condition.                                                                                       |
| Plomosa 6           | 1      | N      | 3,070          | Good condition, red substrate.                                                                        |
|                     | 2      | ~W     | 2,970          | 3 large, fair condition, with whitewash (2 old nests in alcove, 1 on pinnacle nearby).                |
| Plomosa 7           | 1      | NE     | 2,740          | Large nest, fair condition. Prairie falcon flew from cliff. 1 golden eagle 1.5 miles away.            |
| Plomosa 8           | 1      | NE     | 1,780          | Looks like was a large nest with a medium nest now built on (2 active red-tailed hawk nests in area). |
| Poachie 2           | 1      | SW     | 2,900          | Poor condition but eagle size.                                                                        |
|                     | 2      | N      | 2,690          | Fair-good condition.                                                                                  |
| Rawhide 1           | 1      | E      | 1,430          | Poor condition.                                                                                       |
|                     | 2      | E      | 1,440          | Poor condition.                                                                                       |
| Rawhide 2           | 1      | NW     | 2,730          | Old but definitely eagle size                                                                         |
|                     | 2      | N      | 2,430          | Old. Fair condition.                                                                                  |
| Saddle Mtn          | 1      | E      | 2,330          | Good condition. Second nest in area poor condition.                                                   |
|                     | 2      | N      | 2,670          | Fair condition. Old.                                                                                  |
| Seegmiller          | 1      | NE     | 4,970          | Good-very good condition. Golden eagle in area.                                                       |
|                     | 2      | ESE    | 5,050          | Good condition.                                                                                       |
|                     | 3      | ENE    | 4,950          | Poor condition. Rock in nest.                                                                         |
|                     | 4      | --     | 5,930          | Fair condition nest deep in middle of lower part. Also, possible peregrine falcon in area.            |
| Seegmiller 2        | 1      | E      | 5,800          | Fair condition, medium-large size.                                                                    |
| South Harcuvar      | 1      | NW     | 4,320          | Poor condition.                                                                                       |
|                     | 2      | NE     | 3,420          | Fair condition.                                                                                       |
| Tank                | 1      | NE     | 1,430          | Good condition. Edge of DOD land. Good-looking nesting habitat in restricted airspace.                |
| Trout Creek 2       | 1      | SW     | 4,740          | Fair condition.                                                                                       |
| Turtleback          | 1      | S      | 1,150          | Nest pretty good condition, at least fair.                                                            |
| Vermillion Cliffs   | 1      | S      | 6,910          | Poor condition.                                                                                       |
|                     | 2      | S      | 6,950          | Poor-fair condition.                                                                                  |
| Vermillion Cliffs 2 | 1      | S      | 6,730          | Poor condition.                                                                                       |
| Virgin Canyon       | 1      | --     | 1,880          | Large nest.                                                                                           |
|                     | 2      | --     | 1,720          | Large nests.                                                                                          |
| Virgin Mtns 2       | 1      | --     | 3,960          | Poor condition.                                                                                       |

| Table 7. Continued. |        |        |                |                                                                                                                |
|---------------------|--------|--------|----------------|----------------------------------------------------------------------------------------------------------------|
| Area Name           | Nest # | Aspect | Elevation (ft) | Comments                                                                                                       |
| Virgin Mtns 3       | 1      | --     | 3,650          | Poor condition.                                                                                                |
| Virgin Mtns 4       | 1      | N      | 7,050          | Fair condition. Medium-large size.                                                                             |
| Virgin Mtns 5       | 1      | NW     | 5,730          | Fair condition nest on mid to upper level, deep in bend of cliff face.                                         |
| Virgin Mtns 6       | 1      | N      | 5,600          | Good condition, nice nest on mid-level of cliff face.                                                          |
| Virgin Mtns 7       | 1      | E      | 4,950          | Fair condition, perhaps too small but usable.                                                                  |
| West Harquahala     | 1      | NW     | 3,490          | 1 golden eagle flew off cliff. Large nest fair-good condition on cliff below bird, empty. Good cliffs in area. |
|                     | 2      | NW     | 3,470          | Fair condition.                                                                                                |
| White Hills 1       | 1      | W      | 4,970          | Large nest.                                                                                                    |