2008 Project Abstract
For the Period Ending June 30, 2010

PROJECT TITLE: Wildlife Disease Data Surveillance and Analysis
PROJECT MANAGER: Patrick T Redig, DVM, PhD
AFFILIATION: The Raptor Center, University of Minnesota
MAILING ADDRESS: 1920 Fitch Avenue
CITY/STATE/ZIP: St. Paul, MN 55108
PHONE: 612-624-4969
E-MAIL: redig001@umn.edu
WEBSITE: www.TheRaptorCenter.org
FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2008, Chap. [367], Sec. [2], Subd. 5(f)

APPROPRIATION AMOUNT: $ 100,000

Overall Project Outcome and Results

Wildlife is an integral part of the complex interrelationship between human, animal and environmental health, yet there is no centralized system for collection of wildlife health data. The study of wildlife health is limited by the logistics and expenses involved with sample acquisition. Wildlife rehabilitation centers represent an untapped resource as they admit a larger number of wild animals with a greater variety of species than any other resource.

This project developed a centralized database for tracking morbidity and mortality of wildlife seen in wildlife rehabilitation centers in Minnesota. A central goal was the development of standardized terminology,, a critical step in the ability to integrate data from multiple rehabilitation centers. Initially, a survey was designed and distributed to ascertain current practices for clinical wildlife health data management. Next, a series of workshops was held with experts in the field of wildlife health to define data sets for signalment, animal recovery information, cause of admission and initial clinical signs. The animal recovery and signalment descriptors were used to integrate 10 years of historical data from Minnesota's two largest wildlife rehabilitation facilities. This established baseline data for normal patterns of wildlife admissions and created a preliminary GIS and web-based information system. A pilot project involving six wildlife hospitals focusing on avian species susceptible to lead poisoning, was begun to evaluate the functionality of the circumstances of admission, clinical signs and pathophysiological diagnosis terminology. This project is ongoing.

The results of this project were instrumental in the creation of a template for wildlife health data reporting and the development of a system for surveillance of wildlife health issues. This information will be important for wildlife conservation projects, wildlife management, disease surveillance, and as an indicator of ecosystem health. The data can be accessed through the new web site, http://wildlifedisease.nbii.gov/cwhi/, or by contacting The Raptor Center.

Project Results Use and Dissemination
***This section NOT intended to count toward recommended 300 word length for Abstract**

The information resulting from this project has already been used to inform the development of a wildlife health reporting system being developed by the Wildlife Center of Virginia and to be distributed to wildlife rehabilitation centers around the country. A secondary outcome of this project, the development of a collaborative group called the Clinical Wildlife Health Initiative, has resulted in the expansion of this work to a national level. Discussions are underway on the potential use of this information in the United States Fish and Wildlife Service permitting process for rehabilitation center reporting, as well as the use of the

new system for long-term monitoring at rehabilitation centers along the Gulf Coast as a result of the Deepwater Horizon Oil Spill.

Trust Fund 2008 Work Program Final Report

Date of Report: 15 August 2010
Final Report:
Date of Work program Approval:
Project Completion Date: 30 June 2010

I. PROJECT TITLE: **Wildlife Disease Data Surveillance and Analysis**

Project Manager: Patrick T. Redig, DVM, Ph. D.
Affiliation: The Raptor Center, University of Minnesota
Mailing Address: 1920 Fitch Avenue
City / State / Zip : St. Paul, MN 55108
Telephone Number: 612-624-4969
E-mail Address: redig001@umn.edu
FAX Number: 612-624-8740
Web Page address: www.TheRaptorCenter.org

Location: St. Paul, MN

Total Trust Fund Project Budget:	**Trust Fund Appropriation:**	**$ 100,000**
	Minus Amount Spent:	**$ 99,973**
	Equal Balance:	**$ 27**

Legal Citation: M.L. 2008, Chap. [367], Sec. [2], Subd. 5(f)

Appropriation Language:
$100,000 is from the trust fund to the Board of Regents of the University of Minnesota for the Raptor Center to develop a GIS-based database that catalogs symptoms and conditions observed in injured wildlife.

II. and III. FINAL PROJECT SUMMARY:
The long-term project goal was to develop a centralized database for tracking of morbidity and mortality of wildlife seen in wildlife rehabilitation centers. Wildlife is an integral part of the complex interrelationship between human, animal and environmental health, yet there is no centralized system for collection of wildlife health data. The study of wildlife health is limited by the logistics and expenses involved with sample acquisition. Wildlife rehabilitation centers represent an untapped resource as they admit a larger number of wild animals and a greater variety of species than any other resource.

A central aim of this project was the development of standardized terminology for reporting of morbidity and mortality, a critical step in the ability to integrate data from multiple rehabilitation centers. In order to develop the standardized terminology, a survey was designed and distributed to ascertain current practices for wildlife health

data management. A series of workshops was held with experts in the field of wildlife health. Defined lists of data were developed for signalment, animal recovery information, cause of admission and initial clinical signs. These descriptors were used to integrate 10 years of historical data (animal recovery and signalment) from Minnesota's two largest wildlife rehabilitation facilities to establish baseline data for normal patterns of wildlife admissions, creating a preliminary GIS and web-based information system. A second pilot project involving six wildlife hospitals and focusing on avian species susceptible to lead poisoning was begun to evaluate the functionality of the terminology related to circumstances of admission, clinical signs and pathophysiological diagnosis.

The results of this project will be instrumental in the creation of a template for wildlife health data reporting and the development of a system for surveillance of wildlife health issues. This information is important for wildlife conservation projects, wildlife management, disease surveillance and as an indicator of ecosystem health. The data can be accessed through the web site or by contacting The Raptor Center.

IV. OUTLINE OF PROJECT RESULTS*:*
Amendment approved 3/10/2010

Result 1: Standardized dataset

Description: Currently available health data will be characterized, and needs for future health data collection from birds seen in wildlife hospitals will be identified. A defined list of data to be collected for use in the database will be developed. To do this, ~~two~~ workshops will be held to review current data collection and categorization, identify gaps in data collection, evaluate needs for a health monitoring system and formulate a process for development of a health monitoring system. After the initial workshop, a series of comprehensive meetings will be virtual workshops using teleconference technology. Wildlife experts recruited for these workshops will include wildlife veterinarians, professionals in wildlife health monitoring systems and epidemiology, MN DNR, wildlife services, Minnesota state veterinarian, USGS, National Wildlife Health Center, and wildlife rehabilitators. Between virtual workshops, each hospital involved will use the most recent iteration of the standardized dataset definitions in their facility to evaluate their functionality; these experiences will be shared in the next workshop and used to inform future iterations of the datasets. The participation of informatics and terminology specialists in the virtual workshop process will provide expert external input to this process. Once standard terminology is developed for circumstances of admission, clinical signs and pathophysiological diagnosis, the functionality of these definitions will be evaluated through use in a pilot project involving six wildlife hospitals. Capacity of current electronic medical records systems will be increased through acquisition or development to encompass reporting needs for use with the wildlife health monitoring system.

Summary Budget Information for Result 1:	**Trust Fund Budget:**	**$ 49,500**
	Amount Spent:	**$ 44,385**
	Balance:	**$ 5,115**

Deliverable	Completion Date	Budget	Status
Characterization of available health data	12.15.2008	14,500	100%
Workshops ~~(two)~~	06.30. 2010	12,000	100%
Defined list of data to be collected	06.30. 2010	7,000	100%
Evaluation of database functionality	06.30.2010	16,000	100%

Completion Date:

Final Report Summary:

A survey to ascertain current practices for collecting health data on animals seen in wildlife hospitals was distributed. This was followed by a series of workshops involving experts such as wildlife veterinarians, ecosystem health experts, public health officials, epidemiologists, informatics, GIS and statistics; through these workshops, a defined list of standardized terminology was developed for animal recovery information, causes of admission, initial clinical signs and pathophysiological diagnosis. This process was more labor-intensive than originally projected and a series of virtual workshops was used to complete the process. The results of these workshops were used to develop the concept of a web-based, centralized database for health information from wildlife clinical care facilities. Once developed, the standardized terminology was trialed at six wildlife rehabilitation hospitals around the country in a project focusing on lead exposure in avian wildlife. Based on a survey of institutions, ten species were reported to be affected by lead and commonly admitted. Using the new terminology and recording systems developed, admissions of these ten species are being tracked and evaluated for lead exposure. This pilot project is on-going and will be used to inform adjustments to the terminology work.

A significant challenge was realized in the lack of adequate electronic medical records systems at most facilities. As a result, a partnership was developed with the Wildlife Center of Virginia (WCV). Over the past eight years, WCV has been developing a wildlife incident/intake database with a medical records component. The development of standardized terminology was the critical component to finishing the development of their system, which eventually will be distributed to wildlife clinical care facilities around the country.

Result 2: Database for health information

Description: A user-friendly, publically accessible, searchable, GIS and web-based database will be developed in conjunction with Wildlife Disease Information Node (USGS) to be used for monitoring trends in health of birds seen in wildlife hospitals. The components of this database will initially include data fields for animal recovery information and related environmental data such as land use, climate, water, soil types and vegetation. This will be expanded to include standardized datasets. A 10 year historic dataset of admission information from birds seen at 2 wildlife hospitals will be developed to evaluate functionality of the database.

Summary Budget Information for Result 2: **Trust Fund Budget: $ 50,500**
Amount Spent: $ 55,588
Balance: $ (5,088)

Deliverable	Completion Date	Budget	Status
Database for animal recovery information	12.15.2008	15,000	100%
Expanded database – health datasets	06.30.2009	15,500	100%
Historic dataset of admission information	06.30.2010	13,500	100%
Evaluation of functionality of database	06.30.2010	6,500	100%

Final Report Summary:

An on-line GIS-linked database has been developed through the Wildlife Disease Information Node web site (http://wildlifedisease.nbii.gov/cwhi/). The data in this database currently encompasses all clinical wildlife cases involving 11 avian species seen in the past 10 years at The Raptor Center and the Wildlife Rehabilitation Center. The data can be sorted based on species, age, sex, state/county of recovery and wildlife facility case where case admitted. Informatics specialists worked with the staff of these two organizations to create a clean dataset of basic admission information and develop a preliminary data baseline. With the development of standardized datasets from Result 1, the database functionality is being expanded for future use and will be piloted with the lead exposure in avian wildlife study results; due to the lack of common terminology in clinical records up to this point, it was not possible to build in causes of admission, clinical signs and diagnosis for the historic datasets. Another significant challenge is in the available GIS information; past clinical records could only provide animal recovery information at a county level. This limits the ability to associate specific environmental data such as land use, water and vegetation with animal recovery location. The prospective pilot project currently being run with the expanded datasets is also using more detailed animal recovery location, which will be included in future versions of the web site and used to evaluate the utility of the environmental overlay maps.

V. TOTAL TRUST FUND PROJECT BUDGET:

Staff or Contract Services: $80,000

TRC Clinic Manager, 10% effort for 2 years: $15,000

Responsible for inventory of databases and information available, coordinating clean-up of data and data verification for future database consolidation, consolidation of data, refining of medical records and coordination of communication across institutions involved with database efforts. Also responsible for coordination of first workshop~~s~~.

TRC Staff Veterinarian, 5% effort for 1st year: $9,000; 10% effort for 2nd year

Responsible for data verification and consultation, evaluation of data collection methods and characterization of data, and analysis of data. Responsible for coordination, preparation, running and follow-up for virtual

workshop series, as well as development of standardized datasets with common terminology to be used for pilot project.

TRC Research Scientist, 5% effort for 1year: $14,000

Scientific resource and data analysis.

TRC technical staff and clerical support, 750 hours (250 hours year one, 500 hours year two): $15,000

Data clean-up and entry from electronic and paper databases; Workshop arrangements and communications.

Contract: Wildlife Rehabilitation Center: $7,000

Data clean-up and entry, data

Contract: USGS Wildlife Disease Information Node: $20,000

Creation of web-based database/data management system and integration with GIS overlays.

Professional Services: $8,500

Virtual Workshop Budget

16 participants, 10 weeks @ $55/session:

Note: We are following the amount provided to peer reviewers of trust programs by LCCMR. Not everyone would be able to participate each week and some will not take the offered payments as they are not eligible due to employment stipulations,

Equipment: $3,000

Four computer workstations will be purchased for The Raptor Center's medical and surgical clinic to provide real-time entry capacity of electronic medical records/health data. Embedded reporting software will be developed for data transmission to new centralized database.

Other: $ 10,000 – costs associated with bringing in experts for two workshops, including travel, per diems, honorariums, printed materials, communications and location rental.

$ 7,000 – software development: refinement and expansion of electronic medical records system to web-based system with GIS capacity. University of Minnesota Information Technology department.

TOTAL TRUST FUND PROJECT BUDGET: $ 100,000

Explanation of Capital Expenditures Greater Than $3,500: *A computer system for electronic medical records for collection, consolidation and integration of health data.*

VI. OTHER FUNDS & PARTNERS:

A. Project Partners:

Wildlife Disease Information Node (USGS)

– Josh Dein, Wildlife Disease Information Node

Wildlife Rehabilitation Center

Wildlife Center of Virginia

B. Other Funds Proposed to be Spent during the Project Period:

We have requested $20,000 from USGS; no commitment has been received to date

We have $65,000 committed from Katherine B. Andersen Fund of the St. Paul Foundation toward equipment upgrade for electronic medical records system (digital radiology)

During the project period, additional staff time will be donated for oversight of this project, as well as scientific resource of the Executive Director (5% - 2 years: $13,000).

C. Past Spending:

During the two years prior to July 1, 2008, The Raptor Center staff has spent 5% of clinic staff time (in-kind) on preparing the Center's medical records system for use in this project.

D. Time:

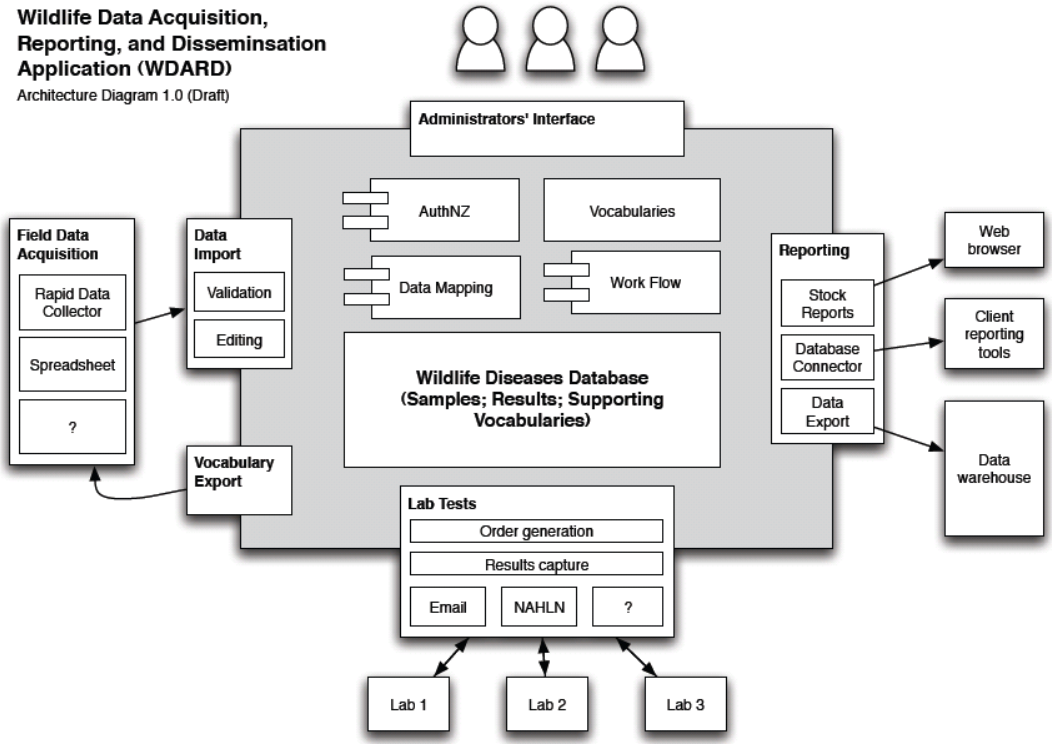
VII. DISSEMINATION: Sharing of data will be through the publically accessible database associated with the Wildlife Disease Information Node (http://wildlifedisease.nbii.gov/). In addition, the information resulting from this project will be used to inform the development of a wildlife health reporting system being developed by the Wildlife Center of Virginia and to be distributed to wildlife rehabilitation centers around the country.

VIII. REPORTING REQUIREMENTS:
Periodic work program progress reports will be submitted not later than 12/15/08, 6/30/09, and 12/15/09. A final work program report and associated products will be submitted between June 30 and August 1, 2010 as requested by the LCCMR

IX. RESEARCH PROJECTS:

Figures:

1. Data Architecture



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Appendix I: Workshop Participants

Lori Arent, MS	The Raptor Center, University of Minnesota	St. Paul, MN
Keely Bargnesi	Avian Conservation Center/Center for Birds of Prey	Charleston, SC
Ed Clark	Wildlife Center of Virginia	Waynesboro, VA
F. Josh Dein, BA, VMD, MS	Wildlife Disease Information Node	Madison, WI
Nate Flesness	International Species Information System (ISIS)	Eagan, MN
Cheryl Hoggard, DVM	National Wildlife Rehabilitators Association	
John Huckabee, DVM	PAWS Wildlife Center	Lynnwood, WA
Stacy Hughes	Avian Conservation Center/Center for Birds of Prey	Charleston, SC
Dave McRuer, MSc, DVM, Dipl ACVPM	Wildlife Center of Virginia	Waynesboro, VA
Mark Pokras, DVM	Tufts Cummings School of Veterinary Medicine	North Grafton, MA
Julia Ponder, DVM	The Raptor Center, University of Minnesota	St. Paul, MN
Leslie Reed, DVM	Wildlife Rehabilitation Center of MN	Roseville, MN
Lorisa Ricketts	The Center for Wildlife	Cape Neddick, ME
Karen Shenoy, DVM	NWRA	MN
Rachel Thompson	International Species Information System (ISIS)	Eagan, MN
Flo Tseng, DVM	Wildlife Clinic, Tufts	North Grafton, MA
Sallie Welte, VMD	Tri-State Bird Rescue and Research, Inc	Newark, DE
Jeff Wilcke, DVM, MS, DACVCP	VA-MD Regional College of Veterinary Medicine	Blacksburg, VA
Michelle Willette	The Raptor Center, University Of Minnesota	St. Paul, MN

Clinical Wildlife Health Initiative: Pilot Project Definitions

Circumstances of Admission

1) **Animal Interaction** – Contact with another animal leads directly or indirectly to the wildlife patient being admitted to a rehabilitation facility.

   a) Domestic animal – A form of animal interaction where wildlife had either direct or indirect contact with one or more of a variety of animals that have been tamed and made fit for a human environment. This term includes animals that were domesticated as a species but may now be feral.

      i) *Dog* – Wildlife injury caused by a domesticated dog. May be feral.

      ii) *Cat* – Wildlife injury caused by a domesticated cat. May be feral.

   b) Non-domestic animal – A form of animal interaction where wildlife had either direct or indirect contact with an animal not made tame or fit for a human environment.

      i) *Same species* – Wildlife injury caused by a non-domesticated animal of the same species.

      ii) *Different species* – Wildlife injury caused by a non-domesticated animal of a different species. This may also include wild yet non-native animals kept as pets (ex. escaped boa constrictors, roaming Serval cats, etc)

2) **Collision** – Injury resulting from an impact with either a stationary or a moving object.

   a) Moving object – Collision with an object that is in motion such as a vehicle or an object being swung purposefully or accidentally at the animal.

      i) *Car/Truck/Motorcycle* – Impact with any part of a moving car, truck, motorcycle, all terrain vehicle, snow-machine, etc.

      ii) *Train* – Impact with any part of a moving train.

      iii) *Plane* – Impact with any part of a moving plane.

      iv) *Watercraft* – Impact with a type of watercraft such as a boat, jet ski, ferry, etc.

      v) *Bicycle* – Impact with self-propelled vehicles including bicycles, scooters, etc.

      vi) *Motorized Farm Equipment* – Impact with a variety of farm equipment including tractors, mowers, ploughs, harrows, balers, etc.

vii) *Motorized Yard Equipment* – Impact with a variety of yard equipment including weed-eaters, lawnmowers, rototillers, etc.

viii) *Human Swung Object* – Collision with a moving object handled by a human either accidentally or with the intent of impact. The colliding object must not be thrown or it becomes a projectile. Examples: shovel used to hit a snake, tennis racket used to strike a bat, etc.

b) Stationary object – Collision with an object that is stationary that may be either manmade or a natural feature. The stationary object may have moving parts such as a windmill or hydro dam.

i) *Walls/Windows* – Injury resulting from an impact with a building, wall, window, etc.

ii) *Wind Turbines* – Injury resulting from an impact with the stationary pole or the moving blades of a wind turbine. Also includes damage caused by the negative pressure associated with the blades as is often found in wind turbine/bat interactions.

iii) *Powerlines/Wires* – Collision with any form of electrical or communication line or permanent wire fence structure that results in physical damage but NOT entrapment.

iv) *Natural Features* – Injury resulting from an impact with a natural feature such as a tree, rock-face, or the ground such as when an animal injures itself falling from a nest.

3) **Electrocution** – Injuries resulting from contact with more than one wire or a wire and a grounding object resulting in clinical signs associated with electrocution.

4) **Gas Flare –** Exposure to a gas flare associated with methane burners, refineries, oil and gas rig, etc.

5) **Entrapment** – A confining circumstance from which escape is difficult. Entrapment may occur from devices meant to capture animals, from devices or objects whose primary function is something other than to capture animals, or from spaces where the animal's body is free to move yet full escape to a natural setting is being impaired. When questioning which subcategory to use, the user should first define the intended purpose of the entrapping object or circumstance.

a) Trap – A confining object, device or circumstance whose primary function is to capture animals. Traps capturing animals other than the intended species of interest are included (by-catch).

i) *Fishing Tackle* – Traps intended to capture fish include fishing hooks, fishing line, fishing nets, crab pots, etc.

ii) *Leghold Trap/Snare* – Devices often used by wild game trappers that are intended for the harvest of fur-bearing animals. These devices include leghold traps, conibear traps, pitfall traps, deadfall traps, snares, etc.

iii) *Humane/Cage Trap* – Cages that are designed to capture live animals.

iv) *Glue Trap* – Traps made using a natural or synthetic adhesive applied to cardboard or similar material and used for the intended capture of rodents. The capture of unintentional species is common.

b) Non-trap – A confining object, device or circumstance whose primary function is something other than the capture/restraint of animals.

i) *Sporting/Landscaping Netting* – Any net or mesh-like material used in a variety of day-to-day functions but NOT intended to capture animals. Examples include garden/landscape netting, netting found in sports activities such as soccer and basketball, etc.

ii) *Fence* – Entrapment in any material used to prevent the movement of animals or humans either into or out of an area. Common examples include barbed wire, snow fencing, chain-linked fence, etc.

iii) *Litter/Garbage* – Entrapment in any waste material that has been carelessly left in the environment. Common examples include plastic wrappers or packaging, cans, bottles, string or rope (NOT INCLUDING fishing line or nets)

iv) *Oil/Grease Contamination* – Exposure to oil, grease, paint, or other petrochemical products leading to the penetration or covering of the fur, feathers, or external surface of the animal.

c) Spaces – Entrapment in a defined area where the body is free to move clear of restrictions however, escape away from the enclosed area is difficult.

i) *Chimney* – Entrapment within or through a chimney.

ii) *Building* – Entrapment within a building or room within a building. Common examples include houses, outdoor stair or window wells, warehouses, tents, barns, etc.

iii) *Vehicle* – Entrapment within or on a vehicle meant for human transportation. Examples include animals trapped within the wheel well of a plane, nests with young animals built under car bumpers, animals trapped within bilge water on boats, etc.

iv) *Pool* – Entrapment within any kind of swimming pool.

6) **Environment** – Conditions caused by environmental factors that lead directly or indirectly

to the animal being found and admitted for rehabilitation.

a) Harmful algal blooms – Animals admitted from an area affected by a known algal bloom and have clinical signs consistent with such an event. This circumstance requires an already determined diagnosis to select.

b) Weather – Inclement changes in the physical environment leading directly or indirectly to an animal being injured or displaced.

i) *Temperature* – Extreme hot or cold temperatures leading to an animal being injured or displaced.

ii) *Precipitation* – Any event associated with precipitation leading to an animal being injured or displaced. These factors may include: flooding, rain, hail, sleet, snow, avalanche, or draught conditions.

iii) *Wind* – Any event associated with wind leading to an animal being injured or displaced. These factors may include: hurricane, tornado, high winds, etc.

iv) *Lightning* – Direct or indirect exposure to lightning resulting in injury.

c) Seismic Event – Any event associated with a seismic event leading to an animal being injured or displaced. These factors may include: earthquake, tidal wave, volcano, etc.

d) Fire – Direct exposure to flames resulting from fire in the environment. Examples include: forest fires and grass fires.

e) Smoke – Direct exposure to smoke resulting from a fire in the environment.

7) Nest/Habitat Destruction – The destruction or disturbance of a nest, burrow, or essential habitat resulting in the animal being injured or displaced.

8) Behavioral Stranding – Referring to events other than weather leading to single or multiple animals cut off from their natural habitat and cannot be returned unassisted. Often caused by altered behavior such as marine mammal stranding.

9) **Orphan** – Any circumstance in which displaced healthy or injured young animals, still dependant on parental care for survival, are found and there is a high probability that the parents are dead or not available.

a) Parents Not Available – a single or group of young animals admitted for rehabilitation where it is known that the parents are deceased or appropriate attempts to unite the young animals with the parents have failed.

b) Parents Rejected – a single or group of young animals admitted for rehabilitation where it is known, or it is highly likely, that parental rejection has occurred.

10) **Inappropriate Human Possession** – A circumstance where an animal of any age is

inappropriately removed from its natural habitat and is in human possession due to either i) perceived risk by the rescuer, ii) to be kept as a pet, or iii) to be treated for injuries by a person lacking appropriate training, authorization, or assistance.

a) Abduction With Intent of Rescue – Any animal that is brought for rehabilitation with the intent of rescue, that has been removed from its natural habitat without warrant due to either i) perceived risk to the animal by the rescuer, ii) disregard or ignorance of the animal's natural history, or iii) when no attempt or an inappropriate attempt has been made to reunite a young animal with its parents. This term replaces the traditional "kidnapped".

b) Pet – Any animal inappropriately removed from its natural habitat and kept and cared for by a human as a "pet".

c) Unauthorized or Untrained Rehabilitation – Any injured animal removed from its natural habitat and kept and treated by a person lacking appropriate training, authorization, or assistance without seeking formal rehabilitation aid and with the intent of release.

11) **Projectile** – Any object propelled by a force through the air or water that eventually comes to rest.

a) Weapon – Any projectile discharged from an instrument whose primary design or intention is as a weapon.

i) *Gunshot* – A wound or injury caused by any projectile discharged from a firearm or similar device.

(1) *Rifle/Handgun* – An injury typically caused by a single metallic projectile propelled by gunpowder and discharged from a firearm having a rifled or helical groove pattern on the inner surface of the barrel. This also includes rifled slugs from shotguns and bullets or balls from smoothbore (non-rifled barrel) muskets/pistols.

(2) *Shotgun* – An injury typically caused by multiple metallic projectiles propelled by gunpowder and discharged from a firearm having a barrel with a smooth inner surface (smooth bore). Ex. birdshot, buckshot, etc.

(3) *Air Gun/BB Gun* – An injury typically caused by a single metallic projectile propelled by pressurized gas (air, CO2) or compressed spring, from a firearm with either a rifled or smooth inner surface to the barrel. These typically include pellet guns and BB guns.

ii) *Bow/Arrow* – An injury caused by a sharp-pointed shaft (arrow or bolt) that is projected by the elastic force from a bow or the spring-loaded force from a crossbow.

b) Non-weapon – Any projectile causing injury to an animal that originates from an instrument, structure, environment or being whose original design or intention is not

weapons related. Examples may include rockslides, falling branches, baseballs, objects falling from buildings, etc.

12) **Failure to Thrive/Maladaption** – Pertaining to any animal that has not acquired the necessary skills in order to function within the environment in a species appropriate manner. This term typically applies to animals that have not learned the necessary skills to hunt or forage (first year juvenile raptors), build or seek appropriate shelter, or interact with their environment in a manner that considered "normal" for that species.

13) **Undetermined** – Any unknown event whose origin is not specifically known or has not yet been decided. Also includes indeterminate causes where the circumstances may never be known.

14) **Dead on Arrival** – Any patient no longer living when admitted to the rehabilitation facility.

15) **Referral** – Any patient being transferred from one rehabilitation facility to another for the purpose of further rehabilitation or medical work-up.

a) Permit holding facility – Any patient being transferred from a State or Federally permitted rehabilitation facility for the purpose of further rehabilitation or medical work-up.

b) Non-permit holding facility – Any patient being transferred for the purpose of further rehabilitation or medical work-up from a facility lacking a State or Federal rehabilitation permit.

16) **Confiscation** – A patient admitted for rehabilitation that has been legally seized by an authorized person, organization or agency.

Anatomical System or Site of Physical Exam Findings/Clinical Signs on Admission

1) **Auditory** – Pertaining to the ears and associated structures including external ear structures (pinnae) and internal structures such as the eardrum and middle and inner ear components.

2) **Cardiovascular System – P**ertaining to the heart and blood vessels. This category may be selected in addition to localized damage to another anatomical structure resulting in hemorrhage.

3) **Cavity** –

a) Thoracic – Pertaining to the body cavity/potential space between the neck and the diaphragm in mammals. Does not include organs housed within this space.

b) Abdominal – Pertaining to the body cavity between the diaphragm and pelvis in mammals. Does not include organs housed within this space.

c) Coelomic – Pertaining to the combined thoracic and abdominal spaces in animals lacking a diaphragm (birds, reptiles, and amphibians). Does not include organs housed within this space.

4) **Digestive System** – Pertaining to all structures of the gastrointestinal tract and all accessory organs of digestion. Structures within the gastrointestinal system include the mouth, teeth, tongue, esophagus, crop, stomach(s), intestines, and anus. The accessory digestive organs include the salivary glands, pancreas, liver, and gall bladder. The cloaca is also included in this category but is shared with the urogenital system as well.

5) **Integumentary System** – Pertaining to the skin and associated structures such as the fur, hooves, horns, pads, scutes, feathers, beak, leg scales, wattles, spurs, glands, and all underlying subcutaneous tissue.

6) **Generalized** – Conditions impacting multiple body systems causing whole body effects.

a) Hypothermia – Decrease in body temperature below reference values published for that species

b) Hyperthermia/Fever – Elevation of body temperature above reference values published for that species.

c) Dehydration – Any condition consistent with a negative fluid balance. Clinical signs may include (but are not limited to) wrinkled skin, poor skin-tenting reaction, sunken eyes, increased mucous viscosity, and tacky mucous membranes.

d) Depression/lethargy – Lowering of or decrease in functional activity due to known or unknown cause.

e) Loss of body condition – Loss of body mass resulting in a reduced body condition score (BCS) below values considered "normal" in that species. Patients with a loss of body condition may either be thin or emaciated.

i) *Thin* – The body state where the animal's weight and body condition score are below "normal" values for that species but the animal is otherwise physiologically and clinically normal.

ii) *Emaciation* – Excessive leanness caused by disease or lack of nutrition characterized by extreme loss of subcutaneous fat and muscle that results in an abnormally lean body. Emaciated patients have significantly decreased total serum protein values

(often below 2.0 g/dl) and will often be given the lowest score available on standard body condition scoring systems. Other systemic health problems are usually present and the condition is usually not reversible with nutrition alone.

7) **Hematopoeitic System** – Pertaining to organs and tissues involved in the production of blood cells including lymph nodes, thymus, bursa of Fabricius, bone marrow and spleen.

8) **Musculoskeletal System** – Pertaining to a group of connective tissue components including bones, muscles, tendons, joints and ligaments.

a) Muscles/Tendon – Pertaining to muscles and associated tendons.

b) Joints/Ligament Tissue – Pertaining to any joint space or joint capsule and associated ligaments. Examples may include infected joints, swelling within the ligament or bursa, inflammation of the joint etc.

c) Skeleton – Pertaining to the stiff, hardened tissues forming the supporting framework of a vertebrate's body including bones and cartilage.

i) *Fracture* – A break in the continuity of a bone.

ii) *Non-fracture* – Pathology relating to the bone but not including fractures. These include luxations, subluxations, metabolic conditions of the bone, etc.

(1) Location – to be linked with an injury to the musculoskeletal system.

(a) *Skull*

(i) Facial bones – Pertaining to the mandible (lower jaw) and maxillae (upper jaw).

(ii) Cranium – All the bones of the skull excluding the facial bones.

(b) *Forelimb/Wing/Shoulder Girdle* – Pertaining to all single or fused bones of the forelimb/wing including phalanges, carpal bones, carpometacarpus, radius, ulna, and humerus; and all bones of the shoulder girdle included the scapula, clavicle/furcula, and coracoid bones.

(c) *Ribs/Sternum* – Pertaining to the ribs, sternum, and keel.

(d) *Hindlimb/Pelvis* – Pertaining to all single or fused bones of the hindlimb including phalanges, tarsal bones, tibia, fibula, tarsometatarsus, tibiotarsus, patella, femur, and all bones of the pelvis or synsacrum.

(e) *Spine/Tail* – Pertaining to all cervical, thoracic, lumbar, sacral and caudal vertebrae that make up the spine and tail.

(f) *Shell* – Pertaining to the fused boney plates that constitute the hard outer surface that protects turtles and tortoises. The superficial outer covering of the shell is made of keratin and is included under the integumentary system.

(i) Carapace - The dorsal (upper) shell of the turtle or tortoise.

(ii) Plastron - The ventral (lower) shell of the turtle of tortoise.

9) **Nervous System** – Pertaining to both the central and peripheral nervous system.

a) CNS Central/Brain – Relating to neurological deficits of the brain.

b) CNS Central/Spine – Relating to neurological deficits of the spinal cord.

c) CNS Peripheral Nerve – Relating to neurological deficits of the peripheral nervous system.

10) **Ocular** – Pertaining to the eyes and associated structures such as the eyelids, conjunctiva, ocular muscles, and lacrimal glands.

11) **Respiratory System** – Pertaining to the upper or lower respiratory tracts involved in respiration and gas exchange.

a) Upper Respiratory Tract – Pertaining to the nasal cavities, pharynx, larynx, trachea, and bronchi.

b) Lower Respiratory Tract – Pertaining to the lungs (including bronchioles, alveoli) and the air sacs in relevant species.

12) **Urogenital System** – Pertaining to all organs associated with the reproductive and urinary tracts.

a) Reproductive Tract – Pertaining to the organs associated with reproduction. In the female, they include the ovaries, uterine tubes, uterus, vagina, and vulva. In the male, they include testes, penis, scrotum, all accessory glands such as the prostate and all ducts essential for transporting sperm out of the body. Although the urethra plays an essential role in sperm transportation, this terminology scheme includes it with the urinary tract.

b) Urinary Tract – Pertaining to the organs concerned with the production and excretion of urine including the kidneys, ureters, urinary bladder, and urethra.

13) **Clinically Healthy** – No abnormal findings or signs of illness.

14) **Died Before Exam** – Died before a physical examination could be completed.

Categorization of Pathophysiology of Clinical Signs

1) **Degenerative** – Pertaining to the deterioration of a healthy tissue to an unhealthy state without the influence of other factors such as an inflammatory agent, infection, traumatic injury, etc. This pathology is most often caused by repetitive use, aging, or genetic predisposition. Disease examples may include degenerative joint disease and arthritis.

2) **Developmental/Congenital/Inherited** – Pertaining to the absence, deformity or excess of body parts as a result of faulty development of the embryo (developmental), abnormalities in structure or function which are present at birth and may or may not be inherited (congenital), or conditions caused by genes which condition the structure or function of an organ or tissue (inherited). Developmental and congenital diseases may or may not be associated with inherited defects.

3) **Autoimmune/Allergy/Immune-mediated** – A disease state that is characterized by an immune response (either antibody or cell-mediated) against the body's own tissues (autoimmune) or a reaction following second or subsequent exposure to a substance (allergen) causing an allergic reaction (allergy or immune-mediated response). Examples may include bee stings, pollen reactions, molds, certain drugs, etc.

4) **Metabolic** – A disease in which normal metabolic processes are disturbed and a resulting absence or shortfall or a normal metabolite (substance produced during metabolism) causes disease. Examples may include diabetes, hormone imbalance, enzyme deficiency, etc.

5) **Physical Injury** – An injury caused by i) trauma from an external force, ii) pressure or rubbing, iii) any kind of burn, or iv) exposure to a foreign substance.

   a) Trauma – Pertaining to a wound or injury, usually caused by an external force that may occur anywhere on the body.

      i) *External* – Pertaining to a wound or injury on the outer surface including limbs or superficial organs including eyes, ears, nose, etc of an animal.

      ii) *Internal* – Pertaining to a wound or injury to an organ normally found within a body cavity.

   b) Burns – Damage to tissues caused by contact with dry heat (fire), moist heat (steam or liquid), chemicals, electricity, or lightning.

   c) Radiation – An injury caused by high-energy radiation such as x-rays and gamma-rays.

d) Foreign Substance – External contamination with a chemical or material that may or may not be irritating but usually results in diminished or loss of function. This may include glue traps, oil on the fur or feathers, non-water proofed feathers, etc.

i) *Oil/Grease* - Exposure to oil, grease, paint, or other petrochemical products leading to the penetration or covering of the fur, feathers, or external surface of the animal.

e) Ischemia – A deficiency of blood supply to some part of the body due to a constriction or an obstruction of the blood vessel(s).

i) *Frostbite* – A condition in which blood vessels constrict due to exposure to cold temperatures resulting in limited or no blood supply to the extremities. This usually results in non-inflammatory tissue death.

6) **Mental** – Pertaining to injuries or conditions causing an altered mental state that may include alterations in behavior, aimless wandering, headpressing, aggression, etc.

a) Abnormal behavior – Any behavior considered uncharacteristic for that species with consideration to internal factors (health status, normal physiology, etc.) and external factors (season, environmental conditions, etc.)

i) *Imprint* – A condition in very young animals when parental attachment and learned basic behavioral patterns are incorrectly established on a human, other life form, or object rather than a member of its own species.

7) **Neoplastic (Tumor-related)** – Any new and abnormal growth where the cell multiplication is uncontrolled and progressive.

a) Benign – Any tumor whose typical presentation includes slow growth, rare or no metastasis, and is usually non-reoccurring after removal.

b) Malignant – Any tumor whose typical presentation includes irreversible loss of differentiation in adult cell types and a fast and invasive growth rate with the potential to spread to other tissue types in the body.

i) *Metastatic* – A malignant tumor with the ability to transfer from one tissue type or part to another not directly connected with it.

ii) *Non-metastatic* – A malignant tumor without the ability to transfer from one tissue type or part to another not directly connected with it.

8) **Nutritional** – Pertaining to any disease or injury resulting from an alteration in the processes involved in taking nutrients into the body and assimilating and utilizing them or from deficiencies or excesses of specific feed nutrients.

a) Starvation – A long continued deprival of food accompanied by associated clinical signs which may include: hunger, loss of body weight, decreased muscle power and endurance, reduced urination and defecation which may cease, emaciation, weakness, slow-heart rate and hypothermia.

b) Obesity – An excessive accumulation of fat in the body considered "normal" for that species under present conditions.

c) Inappropriate Diet – Injuries or illness resulting from an unsuitable diet for that species. This may lead to related issues such as food allergies, gastrointestinal illness, or metabolic deficiencies.

i) *Metabolic Bone Disease* – A range of bone diseases associated with metabolic disease. In wildlife, this mainly refers to a condition known as secondary hyperparathyroidism caused by an imbalance in the calcium and phosphorus ratio in the body usually resulting from a dietary deficiency in calcium.

9) **Inflammatory** – Pertaining to a localized protective response from the body brought on by injury or destruction of tissues which serves to destroy, dilute or wall off both the injurious agent and the injured tissue. Classic signs of inflammation include heat, redness, swelling, pain, and loss of function.

10) **Infectious** – Pertaining to invasion and multiplication of microorganisms in the body tissues often resulting in cellular injury due to the pathogen's competitive metabolism within the body, production of harmful toxins, replication within host cells, or through damage by the host's own immune response.

a) Bacterial – Diseases in which bacteria play a significant but not necessarily an exclusive role.

i) *Mycoplasma* – A bacterial infection caused by a member of the genera *Mycoplasma*.

ii) *Rickettsia* – A bacterial infection caused by a member of the family Rickettsiaceae.

iii) *Chlamydiophila* – A bacterial infection in birds caused by a *Chlamydophila psittaci*.

b) Viral – Diseases in which viruses play a significant but not necessarily an exclusive role.

i) *Pox Virus* – A viral infection caused by a member of the family Poxviridae.

ii) *Rabies* – A viral infection caused by Rabies Virus, a specific member of the genus *Lyssavirus* and family Rhabdoviridae.

iii) *West Nile Virus* – A viral infection caused by West Nile virus, a specific member

of the genus *Flavivirus*.

iv) *Canine Distemper* – A viral infection caused by Canine Distemper Virus, a specific member of the genus *Morbillivirus.*

v) Fungal – Diseases in which fungi play a significant but not necessarily an exclusive role.

(1) *Aspergillosis* – A fungal infection caused by any member of the genus *Aspergillus*.

vi) Parasitic – Diseases in which parasites play a significant but not necessarily an exclusive role.

(1) *External* – Infestation with any one of a number of parasites that use the outer surface of the body to complete part of its life cycle. External parasites may infect the animal's skin, feathers, fur, or surface of the respiratory tract.

(a) Fleas – An external parasitic infestation with fleas.

(b) Flies – An external parasitic infestation with flies or maggots.

(c) Lice – An external parasitic infestation with lice.

(d) Mites – An external parasitic infestation with mites. This includes sarcoptic mange, notoedric mange, demodectic mange, feather mites, chiggers, ear mites, etc.

(e) Ticks – An external parasitic infestation with any of the variety of tick species.

(2) *Internal* – Infestation with any one of a number of parasites that require an internal body compartment to complete its life cycle.

(a) Protozoa - Diseases in which Protozoa (a single-celled parasite) plays a significant but not necessarily an exclusive role

(i) Trichomoniasis – A parasitic infestation by a member of the family Trichomonadidae. In wildlife, this mostly refers to *Trichomonas gallinae* found in doves and bird eating raptors.

(ii) Hemoparasites – An infection by one of several species of parasites that may be found in the blood (within or outside of the blood cells).

(iii) Giardiasis – An infection by a member of the genus *Giardia* resulting in a range of subclinical to severe gastrointestinal illness.

(iv) Toxoplasmosis – A contagious disease of all species caused by the

sporozoan parasite *Toxoplasma gondii*. The primary host is usually a member of the cat family.

(b) Nematodes (Roundworms) – An infestation by roundworms found in the class Nematoda. This group is diverse and includes a significant proportion of the internal parasitic infestations in animals.

(c) Cestodes (Tapeworms) – An infestation by a worm from the class Eucestoda.

d) Trematodes (Flukes & Flatworms) – An infestation by a parasitic worm/fluke from the class Trematoda.

11) **Non-infectious** – Pertaining to an injury that usually causes inflammation but does not originate from an infectious source. Examples may include vasculitis (inflammation of a vessel) or inflammation caused by irritation by a drug or foreign substance. Often caused by an allergic or auto-immune reaction.

12) **Iatrogenic** – Any adverse condition in a patient resulting from treatment by a medical professional or person responsible for the animal's well being.

13) **Idiopathic** – Pertaining to a disease or illness of unknown cause despite thorough testing. This may also apply to diseases for which there is currently no test.

14) **Toxicity** – The characteristic or quality of being poisonous.

a) Hydrocarbon – Toxicity from a compound that only contains hydrogen and carbon as a *result of internalization*. Typical compounds include products derived from crude oil such as gasoline, motor oil, natural gas, etc.

b) Heavy Metal – Toxicity caused by a number of metals known to impact the health of living beings. These metals typically include lead, mercury, silver, zinc, copper, arsenic, cadmium, chromium, cobalt, tin, nickel, thallium, manganese, and iron.

i) *Lead* – Toxicity caused by the internalization and systemic spread of lead. Typically caused when lead is absorbed into the body from the gastrointestinal tract, bone marrow, or joint spaces. The term does not apply to animals that have been shot with lead bullets/pellets not causing clinical signs of lead toxicosis.
   (1) *Clinical*
   (2) *Sub-clinical*

ii) *Mercury* - Toxicity caused by the internalization and systemic spread of mercury.
   (1) *Clinical*
   (2) *Sub-clinical*

c) Cholinesterase Inhibitors – Pertaining to any chemical that prevents function of the enzyme cholinesterase. In wildlife medicine, this term mainly refers to insecticides used on a variety of animals and plants from the Carbamate and Organophosphate families.

d) Rodenticides – Pertaining to any pest control chemical destructive to rodents. These typically include *anticoagulants* (warfarin, brodifacoum, difethialone, etc.), *metal phosphides* (zinc phosphide), *chemicals causing hypercalcemia* (cholecalciferol) and *other poisons* such as "1080", strychnine, and white phosphorus.

e) Harmful Algal Blooms – Pertaining to toxins released from *Cyanobacteria* that may cause sudden death due to neurotoxins or severe liver damage due to hepatotoxins (liver toxins).

f) Envenomation – The poisonous effects caused by bites or stings of insects/arthropods or the bites of snakes.

g) Botulism – A toxemia caused by the ingestion of the toxin of *Clostridium botulinum*. Often known as "limberneck" in effected waterfowl.

15) **Undetermined** – Pertaining to a disease or illness whose identity is unknown due to either lack of testing or inability to test.

16) **Pending** – Pertaining to the time before a diagnosis or case resolution is decided, confirmed, or finished.

17) **Clinically healthy** – Pertaining to any patient lacking signs of illness.

18) **Dead on arrival** – Any patient no longer living when admitted to the rehabilitation facility.

Clinical Wildlife Health Initiative: Pilot Project
Pathophysiology of Clinical Signs
Chart of PP Codes

Code						Code
1	Degenerative					**1**
2	Dev/Cong/Inherited					**2**
3	Autoim/Allergy/Im-Med					**3**
4	Metabolic					**4**
5	Physical injury					**5**
6		Trauma				**6**
7			External			**7**
8			Internal			**8**
9		Burns				**9**
10		Radiation				**10**
11		Foreign Substance				**11**
12			Oil			**12**
13		Ischemia				**13**
14			Frostbite			**14**
15	Mental					**15**
16		Abn Behavior				**16**
17			Imprint			**17**
18	Neoplasia					**18**
19		Benign				**19**
20		Malignant				**20**
21			Metastatic			**21**
22			Non-metastatic			**22**
23	Nutritional					**23**
24		Starvation				**24**
25		Obesity				**25**
26		Inappropriate Diet				**26**
27			MBD			**27**
28	Inflammatory					**28**
29	Infectious					**29**
30		Bacterial				**30**
31			Mycoplasma			**31**
32			Rickettsia			**32**
33			Chlamydophila			**33**
34		Virus				**34**
35			Pox virus			**35**
36			Rabies			**36**
37			West Nile Virus			**37**
38			Distemper			**38**
39		Fungal				**39**
40			Aspergillosis			**40**

29	Infectious					**29**
41		Parasitic				**41**
42			External			**42**
43				Fleas		**43**
44				Flies		**44**
45				Lice		**45**
46				Mites		**46**
47				Ticks		**47**
48			Internal			**48**
49				Protozoa		**49**
50					Trichomoniasis	**50**
51					Hemoparasites	**51**
52					Giardiasis	**52**
53					Toxoplasmosis	**53**
54				Nematodes		**54**
55				Cestodes		**55**
56				Trematodes		**56**
57	Non-infectious					**57**
58	Iatrogenic					**58**
59	Idiopathic					**59**
60	Toxicity					**60**
61		Hydrocarbon				**61**
62		Heavy Metal				**62**
63			Lead			**63**
64				Clinical		**64**
65				Sub-clinical		**65**
66			Mercury			**66**
67				Clinical		**67**
68				Sub-clinical		**68**
69		Cholinesterase Inhs				**69**
70		Rodenticides				**70**
71		HABlooms				**71**
72		Envenomation				**72**
73		Botulism				**73**
74	Undetermined					**74**
75	Pending					**75**
76	Clinically Healthy					**76**
77	Dead on Arrival					**77**

Attachment A: Budget Detail for 2008 Projects - Summary and a Budget page for each partner (if applicable)

Project Title: Wildlife Health Data System

Project Manager Name: Patrick T. Redig, DVM Ph.D.

Trust Fund Appropriation: $ *100,000*

1) See list of non-eligible expenses, do not include any of these items in your budget sheet

2) Remove any budget item lines not applicable

2008 Trust Fund Budget	Revised Budget: Amendment accepted 3/10/2010	Amount Spent	Balance	Result 2 Budget:	Amount Spent	Balance	TOTAL BUDGET	TOTAL BALANCE
				Web-based database				
BUDGET ITEM			0			0	0	0
PERSONNEL: wages and benefits* **	26,000	23,180	2,820	27,000	32,088	-5,088	53,000	-2,268
Contracts			0			0	0	0
Professional/technical *(Virtual workshop, software development, USGS - development of database)*	15,500	13,363	2,138	20,000	20,000	0	35,500	2,138
Other contracts *(Wildlife Rehabilitation Center - veterinarian and clinical staff for*	3,500	3,500	0	3,500	3,500	0	7,000	0
Other direct operating costs *(for what? – be specific)*			0			0	0	0
Equipment / Tools			0			0	0	0
Office equipment & computers - Computer system for use with electronic medical records to integrate data)	3,000	2,827	173			0	3,000	173
Other Capital equipment *(list specific items)*			0			0	0	0
Land acquisition			0			0	0	0
Land rights acquisition *(less than fee)*			0			0	0	0
Professional Services for Acq.			0			0	0	0
Printing			0			0	0	0
Other Supplies *(list specific categories)*			0			0	0	0
Travel expenses in Minnesota	1,500	1,516	-16			0	1,500	-16
Travel outside Minnesota *(where?)*			0			0	0	0
Construction *(for what?)*			0			0	0	0
Other land improvement *(for what?)*			0			0	0	0
Other *(Describe the activity and cost) be specific*			0			0	0	0
COLUMN TOTAL	**$49,500**	**$44,385**	**5,115**	**$50,500**	**$55,588**	**-$5,088**	**$100,000**	**$27**

****Contract dollars were underspent and shifted to personnel costs - an amendment request should have been made.*