

**Envirovet Summer Institute**  
**Session One: Wildlife and Ecosystem Health – White Oak Unit**

**Tuesday June 16 – Thursday July 2, 2009**

**White Oak Conservation Center**  
**Yulee, Florida**

**Schedule**

**Tuesday June 16 ARRIVAL DAY**

Students arrive throughout day.

**5:30 – 6:00 pm: Introduction to Envirovet Summer Institute Session I**

Presenter: Kirsten Gilardi, Co-Director, Envirovet Summer Institute, UC Davis Wildlife Health Center

Gilardi will walk students through the schedule for our two weeks at White Oak and on St Catherines Island, orienting students to White Oak Conservation Center and describing what to expect and prepare for throughout the session.

**6:00 – 6:45 pm: Ice-breaker**

Students will introduce themselves to fellow students and faculty, and share their motivations and hopes for participation in Envirovet 2009.

**7:00 pm: Dinner**

**Evening: Open**

**Wednesday June 17**

**DRIVERS OF ECOSYSTEM DECAY & STRATEGIES FOR RECOVERY**

**7:00 am:** Breakfast

**8:00 – 9:45 am: Ecosystem Health as a Condition, a Principle, and an Organizing Framework**

Presenter: Val Beasley, University of Illinois.

Beasley will introduce concepts of ecosystem health and conservation medicine, and will challenge participants to consider how vibrant natural ecosystems function and how human systems have caused ecosystems to become dysfunctional. Participants will be challenged to start thinking about where we are in human history, and the roles and responsibilities of the veterinary profession, government, academia, the corporate sector, grassroots organizers, and other groups in implementing innovative new strategies to accelerate our progress through to an era of ecological recovery.

**10:00 – 11:30 am: Biodiversity and Climate Change**

Presenter: Kirsten Gilardi for Tom Lovejoy, H. John Heinz III Center for Science, Economics and the Environment

Climate change is one of the defining environmental issues of our generation. Gilardi will deliver Lovejoy's foundational presentation to help set the tone for Session I with a presentation on the importance and value of biodiversity, and on the current and future impacts of global climate change on fundamental biological processes and ecosystems.

**11:45 am – 12:30 pm: Linkages between Human Health and the Environment**

Presenter: Aaron Bernstein, Harvard School for Global Health and the Environment

Why are the majority of emerging infectious diseases in humans zoonotic? What causes a pathogen to jump from animals to people? How are humans contributing to this natural phenomenon, and when and why is it not natural? Bernstein will discuss the interrelatedness of ecosystem health and human health, focusing on examples of where and how ecosystem disturbance and loss of biodiversity impacts human health and well-being.

**12:30 pm:** Lunch

**1:30 – 2:15 pm: Human Health and the Environment (cont).**

**2:15 – 3:00 pm: Group Discussion – How do we change underlying drivers of ecosystem degradation?**

How are health and climate change policies flawed? How should and can they be applied in developed vs. developing nations? Are current health and climate change policies compatible with ecosystem health? What can we do as veterinary professionals to understand the links ?

**3:15 – 4:15: Gilman International Conservation Projects Worldwide**

Presenters: Steve Shurter, Gilman International Conservation, White Oak Conservation Center

Lukas will provide an overview of White Oak Plantation, White Oak Conservation Center, the Howard Gilman Foundation and Gilman International Conservation.

Shurter will introduce flagship species conservation, a tool utilized by White Oak to protect remarkable sites of biodiversity, using Gilman International Conservation (GIC) work to conserve okapi in Central Africa as a prime example.

**4:15 – 4:30 pm: Group Assignment Introduction**

Presenter: K. Gilardi

Gilardi will describe the group project assignment for Session I and assign working groups.

**4:30 – 6:00 pm: Group project work time**

**7:00 pm: Dinner**

**Evening: Free**

**Thursday June 18**

**DRIVERS OF ECOSYSTEM DECAY & STRATEGIES FOR RECOVERY (cont).**

**7:00 am: Breakfast**

**8:00 – 10:45 am: Civil Upheaval and War**

Presenter: Mishkat Al-Moumin, Futrell Visiting Scholar, Environmental Law Institute

Al-Moumin, former Iraqi Minister of the Environment, will describe how poverty, violence, civil upheaval and war are causal of, *and caused by*, ecosystem degradation. Poverty, corruption, religious and

tribal conflict, and limited access to resources can lead to cruel governance, spark civil unrest, and cause war. Such civil violence then exacerbates human pressures on the environment. Al-Moumin will wrap up with a case study on the “ecocide” of wetlands in southern Iraq.

**11:00 am – 12:30 pm: Mitigating civil disparity and poverty**

Presenter: Patricia Erickson, University of Vermont

Erickson will describe the mission and operations of a non-profit organization she and her husband Jon Erickson established in the Dominican Republic called Batay Libertad which strives to improve the health and well-being of a Haitian community through education and health delivery.

**12:30 pm:** Lunch

**1:30 – 3:00 pm: Ecological Economics**

Presenter: Carol Franco, University of Vermont

How do we place economic value on healthy ecosystems? What does it cost society to implement ecosystem health programs, and what does it cost society if we don't? What are the trade-offs, and how do we work towards solutions that balance ecosystem health and conservation with the economic well-being of individuals, communities, and the business sector?

**3:15 – 4:00 pm: Group Discussion: How do we change underlying drivers of ecosystem degradation?**

How are economic policies flawed? How should and can they be applied in developed vs. developing nations? Are current economic policy and globalization compatible with ecosystem health? How do we effect positive change for the environment in the context of war and poverty? What can we do as veterinary professionals to understand the links ?

**4:15 – 6:00 pm: Grassroots Soccer**

Presenter: Erickson

Students will get outdoors and play Grassroots Soccer, a program which aims to raise awareness about health and well-being issues among youth in developing countries.

**7:00 pm: Dinner**

**Evening: Group Project work time recommended**

**Friday June 19 STRATEGIES FOR ECOSYSTEM HEALTH RECOVERY**

**6:30 am: Breakfast**

**7:30 am: Part I of Group Assignment due**

**7:30 am – 12:30 pm: Tour of White Oak Conservation Center**

Guides: White Oak Conservation Center staff

Join White Oak Conservation Center staff for a guided open-bus tour of the White Oak Conservation Center's threatened and endangered species collection. Bring your cameras!

**12:30 pm: Lunch**

**1:30 – 2:45 pm: The Okapi Project**

Presenter: Rosie Ruf, Gilman International Conservation

Ruf has managed the Okapi Project in the Ituri Forest of the Democratic Republic of the Congo for many years, and will describe the day-to-day operations of a conservation program that fully integrates a species preservation effort with the needs of surrounding communities, and provide a first-hand account of the challenges and rewards of working on a flagship species in a region in peril.

**3:00 – 3:45 pm:** Prepare/pack for trip to St. Catherines Island

**3:45 pm:** Depart White Oak for St. Catherines Island

**5:30 pm:** Depart St. Catherines Island dock for 30-min boat ride to island.

**6:15 pm:** Set up camp

**7:30 pm:** Dinner, brief orientation to the island

**Saturday June 20 ST. CATHERINES ISLAND**

**6:30 am:** Breakfast

**8:00 – 10:00 am: Field Exercise: Avian disease surveillance**

Instructors: Jen Hilburn, Brad Winn, Felicia Sanders, Terry Norton, Al Segars, Val Beasley, Liz VanWormer, Veronica Greco

Students will get hands-on experience in setting up avian mist nets, removing captured birds from nets, and processing captured birds (handling, banding, physical exam, bleeding), and will learn about how these techniques are used to survey free-ranging bird populations for disease.

**10:00-10:30 am:** Transport to beach

**10:30 -11:45 am: Field Demonstration: Shorebird Conservation and Capture**

Instructors: Brad Winn, Felicia Sanders, Terry Norton, Jen Hilburn, Veronica Greco

Students will help set up a cannon net and learn about how these nets are used to capture shorebirds, as well as how St. Catherines Island participates in various shorebird conservation programs, e.g. American Oystercatcher health assessments

**12:00-1:00 pm:** Lunch

**1:00 - 2:00 pm: Introduction to Map Reading**

Instructor: Tim Keith Lukas, University of the South

Students will learn how to read maps and chart paths, and to use a compass and a hand-held GPS unit.

**2:00 - 4:00 pm: Field Exercise: Orienteering**

Instructors: Norton, VanWormer, Beasley, Lukas, Segars

Students will test their new knowledge of maps and navigational aids by forming teams and going on an ecological "treasure hunt" through the woods.

**4:30 – 5:30 pm: Reptile and Amphibian Trapping Techniques**

Instructors: Tracey Tuberville, Kimberly Andrews, Chris Hagen

Interested students can help biologist set traps for reptiles and amphibians around the island, for checking tomorrow morning.

**6:00 pm:** Dinner

**7:30 - 8:30 pm: Cultural History of St. Catherines Island**

Instructor: Royce Hayes

Superintendent Hayes will take us to an archaeological site on the island and tell us about the rich history of the settlement of St. Catherines Island hundreds of years ago.

**8:30 - 10:30 pm: OPTIONAL: Nightlife on St. Catherines Island**

Instructors: Norton, Segars, Tuberville, Andrews, Hagen

Students will learn to identify amphibian calls, locate amphibians and alligators at night, and then we'll check out bioluminescence at the beach.

**Sunday June 21 ST. CATHERINES ISLAND**

**7:00 am:** Breakfast

**8:00 - 9:30 am: Field Demonstration: Reptile and Amphibian Capture Techniques**

Instructors: Tuberville, Hagen, Andrews, Norton, Segars

Students will observe various traps and techniques for sampling reptile and amphibian populations, and will help biologists check traps set the night before for reptile and amphibian captures.

**10:00 am -12:00 pm: Field Exercise: Wildlife Telemetry**

Instructors: Belgio, Inman, Lukas, Norton.

Students will use radiotelemetry receivers and antennae to locate troops of lemurs that are free-ranging on St. Catherines Island.

**12:00 pm:** Lunch

**Afternoon: Field Exercise: Gopher Tortoise Health Assessment and Conservation**

Instructors: Norton, Segars, Hagen, Andrews, Tuberville, Greco, assistants.

Students will conduct annual health assessments on the St. Catherines Island gopher tortoise population. Students will learn about diseases of free-ranging tortoises, gopher tortoise ecology and breeding biology, and free-ranging gopher tortoise management in the southeast.

**6:30 pm:** Dinner

**Evening: Loggerhead sea turtle population and health monitoring in the southeastern US**

Instructors: Norton, Segars

Norton and Segars provide veterinary support to numerous state and federal efforts focused on loggerheads and other sea turtle species. They will describe current research on loggerhead sea turtle

populations, major threats to these populations, common clinical presentations, and management strategies.

### **Monday June 22 ST. CATHERINES ISLAND**

**7:00 am:** Breakfast

#### **8:00 - 10:00 am: Field Demonstration: SCI Sea Turtle Nest Protection Program**

Instructors: Gayle Bishop, Norton, Segars

Students will learn about the loggerhead sea turtle nest protection program at St. Catherines and will (hopefully!) have a chance to help find and relocate a sea turtle nest to higher ground.

**10:00 am:** Pack up

**11:00 am:** Depart St. Catherines Island

**Afternoon:** Tour of the Georgia Sea Turtle Center on Jekyll Island, and return to White Oak

**6:00 pm:** Dinner

#### **Evening: African Elephants: Saving an Iconic Species from Overpopulation**

Presenter: Mark Stetter, Disney Animal Programs

Stetter will describe his collaborative work to assist wildlife managers in South Africa with the problem of elephant overpopulation in parks and reserves by developing techniques for surgical sterilization of free-ranging elephants in the field.

### **Tuesday June 23 WILDLIFE EPIDEMIOLOGY AND RISK ASSESSMENT**

**7:00 am:** Breakfast

#### **9:00 - 10:30 am: Wildlife Epidemiology and Risk Assessment**

Presenter: Jonna Mazet, UC Davis Wildlife Health Center

Mazet will introduce principles of wildlife epidemiology and risk assessment as they pertain to real-world problems and projects in wildlife conservation and ecosystem health.

#### **10:45 am – 12:15 pm: Population and Disease Modeling**

Presenter: Phil Miller, Conservation Breeding Specialist Group

Miller develops, tests, and applies computer-based models for risk assessment and decision making for wildlife conservation. These models, which focus on small population biology, conservation biology, human demography, social learning, and threats to sustainability including infectious diseases, have been developed to produce realistic management recommendations to prevent extinction of endangered species.

**12:30 pm:** Lunch

**1:30 – 4:30 pm: Epidemiology / Risk Assessment and Management Exercise**

Leads: Mazet and Miller

Students will engage in a group-based exercise to develop skills needed for outbreak investigation, epidemiologic modeling, risk assessment and risk reduction

**4:45 - 6:30 pm: Group Assignment Time**

Time for groups to start Part II of their projects and seek advice from faculty.

**7:00 pm:** Dinner

**Evening: Corporate Environmental Responsibility**

Presenter: Jackie Ogden, Vice President of Disney's Animal Programs and Environmental Initiatives, Orlando, FL.

Ogden will talk about Disney's commitment to corporate environmental responsibility, using their business and operational initiatives, stewardship and public education/outreach programs to illustrate the ways that businesses can help ameliorate threats to the environment.

**Wednesday June 24 WILDLIFE IMMOBILIZATION**

**7:00 am: Breakfast**

**8:00 am – 12:30 pm: Immobilization of Wildlife - Lecture**

Presenters: Scott Citino, Jeff Zuba (San Diego Wild Animal Park), and Greg Fleming (Disney Animal Kingdom).

Citino, Zuba and Fleming will provide a comprehensive overview on comparative anesthesiology and pharmacology, immobilization methods and equipment, physical vs. chemical restraint, and safety practices for use with captive and free-ranging wildlife.

**12:30 pm:** Lunch

**1:30 – 6:00 pm: Immobilization of Wildlife - Lab**

Leads: Citino, Zuba, and Fleming

A hands-on laboratory introducing students to anesthetic monitoring equipment for the field, dart projectors and darting. Video examples of physical and chemical immobilization will be presented.

**7:00:** Dinner

**Evening:** Open

**Thursday June 25 WILDLIFE IMMOBILIZATION (CONT.)**

**5:30 am: Breakfast**

**6:15 am – 12:30 pm: Immobilization of Wildlife – Field Demonstrations**

Leads: Citino, Zuba, and Fleming and WOCC animal care staff

Field demonstrations of, and hands-on experience with, physical restraint and immobilization of large ruminants (bongo), zebra, and other sensitive and/or difficult species (e.g. gerenuk).

**12:30 pm:** Lunch; video presentation by White Oak Animal Care staff on mechanical, physical and behavioral restraint techniques used at White Oak Conservation Center.

**1:30 – 6:30 pm: Group Assignment Working Time**

**7:00 pm:** Dinner

**Evening: P.S. Wildlife immobilization case studies**

Presenters: Fleming and Zuba

Fleming and Zuba have both worked closely in cooperation with African colleagues on various wildlife health and conservation challenges which have presented their teams with wildlife immobilization challenges. They will wrap up the wildlife immobilization unit by describing their experiences and encouraging students to thinking about how they would address challenging situations that may arise when immobilizing free-ranging wildlife.

**Friday June 26**

**7:00 am:** Breakfast

**8:00 – 11:00 am: Group Assignment Time**

Turn in Part II of assignment at 11:00

**11:15 am:** Depart White Oak for Jacksonville Zoo (bag lunch)

**12:00 – 5:30 pm: Jacksonville Zoo Field Trip**

Leader: Nick Kapustin, Senior Veterinarian, Jacksonville Zoo

Kapustin and his colleagues will present an overview of Jacksonville Zoo's local and international conservation partnerships, illustrating important contributions that zoos can make to both conservation and public awareness. We will tour the zoo's new Amphibian Conservation Center and other exhibits linked with conservation efforts, and have free time to explore the zoo.

**7:00 pm:** Dinner

**Evening: Introduction to Envirovet 2009 Tanzania session**

Presenter: Deana Clifford, UC Davis Wildlife Health Center

Clifford will provide a glimpse of your time in Tanzania: the schedule, logistics, the people you will meet, and the sites and projects the course will visit.

## **Saturday June 27    NON-CLINICAL COMPETENCIES & CAREER PATHS**

**7:00 am:** Breakfast

### **8:00 - 9:30 am: Human Dimensions of Wildlife**

Presenter, Michael Manfredo, Colorado State University

Manfredo is Head of the Departments of Human Dimensions of Natural Resources and of Forest, Rangeland and Watershed Stewardship at Colorado State University. He will get us started thinking about the role of social science in natural resource management. He will discuss his latest research examining how human values towards wildlife are changing and why we must consider the “human dimension”.

### **9:45 - 10:45 am: Practicing Ecosystem Health**

Presenter: Gwen Griffith, Cumberland River Compact

Griffith's career as a veterinarian has spanned the gamut between work as an equine practitioner to her present position as the director of a watershed protection program, funded by the EPA and run by a regional nonprofit, the Cumberland River Compact. Griffith's career exemplifies the many paths one can forge as a veterinarian with a commitment to wildlife and ecosystem health

### **11:00 – 12:15 pm: Grant Writing**

Presenter: Robert Perry, U. North Carolina's Albemarle Ecological Field Site

Perry was the Environment Program Director at the Geraldine R. Dodge Foundation for many years, where he reviewed and awarded hundreds of grant proposals. He will share his first-hand experiences in what constitutes an excellent grant proposal.

### **12:15 – 12:30 pm: Orientation to Grant Review Exercise**

Presenter: Deana Clifford, UC Davis Wildlife Health Center

Students will read and review a grant. Students will break into groups with a facilitator, hold a mock grant review panel, and decide whether or not to fund the grant proposal. We will discuss why or why not groups decided to fund the proposal and let you know what the actual panel decision was.

**12:30 pm: Lunch**

### **1:30 - 4:00 pm: Grant Review Exercise**

Facilitators: Perry and Clifford

Time to work on assignment and engage in group discussion on reviews.

**4:00 – 6:00 pm: Group project working time**

**7:00 pm:** Dinner

### **Evening: How to effectively work with difficult people and resolve conflicts**

Presenter: Kelly Williamson, White Oak Conservation Center and White Oak Plantation

The ability to communicate effectively affects every aspect of a person's life. As well, interpersonal and intragroup conflict presents problems for many people, and the resulting stress often

spills over into their lives outside of work. This session is geared towards students to help them recognize their effectiveness in communicating with others, and understand sources of, and common reactions to, conflict in the workplace.

## **Sunday June 28 NON-CLINICAL COMPETENCIES (cont.)**

**7:00 am:** Breakfast

### **8:00 am – 11:00 am: Media Training**

Presenter: Rob Hilsenroth, American Association of Zoo Veterinarians

Hilsenroth will advise students on how and when to work with the print and broadcast media to convey conservation messages and communicate about environmental crises. Students will have a chance to practice interview techniques. Students will practice media skills in group activities and on camera.

### **11:15 am – 12:30 pm: The Global Bushmeat Crisis**

Presenter: Heather Eves, Bushmeat Crisis Task Force and Adjunct Professor, Virginia Polytechnic and State University

Eves is a wildlife biologist whose conservation work began in Africa in 1985 with a focus on the bushmeat trade beginning in 1994. Eves will present an overview of the unsustainable bushmeat trade including trade drivers and dynamics as well as conservation and health impacts. Worldwide demand for bushmeat, including the United States, will be discussed. Successful and unsuccessful strategies to mitigate bushmeat trade will be highlighted, and existing and proposed programs, policy and legislation will be outlined.

**12:30:** Lunch

**Afternoon:** FREE

**7:00 pm:** Dinner

**Evening: Group Project Working Time**

## **Monday June 29 MANAGING ENDANGERED POPULATIONS**

**7:00 am:** Breakfast

### **8:00 – 9:15 am: Wildlife Translocation: Applying Principles of Risk Management**

Presenter: Scott Citino, White Oak Conservation Center

Citino will discuss the implications of wildlife translocation and reintroduction programs for the health and sustainability of free-ranging populations, and stress the importance of considering these potential impacts when planning and implementing a translocation program.

### **9:30 – 12:30 pm: Ex-situ Conservation: Endangered Species Reproduction**

Presenters: Linda Penfold (White Oak Conservation Center) and Bill Swanson (Cincinnati Zoo's Center for Conservation and Research of Endangered Wildlife)

Penfold and Swanson will present principles, techniques and strategies used to enhance the reproductive health of threatened and endangered species in captivity, as well as ways in which this

research is coupled with conservation of these species in the wild, including the challenges inherent in linking captive breeding to *in situ* conservation.

**12:30 - 1:30 pm:** Lunch

**1:45 - 5:00 pm: Laboratories**

Leads: Linda Penfold, Bill Swanson, and Cyd Teare (White Oak Conservation Center)

Students will divide into two groups and each group will rotate through concurrent laboratories on: 1) assisted reproduction techniques; and 2) biological sample handling

**5:15 – 6:15 pm: Case Studies: Bongo Translocation to Kenya; Kenyan Gerenuk Semen Importation to the US**

Presenters: Linda Penfold and Fran Lyon (White Oak Conservation Center)

Penfold and Lyon will illustrate real-life problem solving in the areas of assisted reproduction, animal translocation, and biological sample handling.

**7:00 pm: Dinner**

**Evening: Role of the wildlife veterinarian in species conservation efforts**

Presenter: Dave Hunter, Turner Enterprises, Inc. and Turner Endangered Species Fund

Hunter spent the first part of his career as a wildlife veterinarian working for state wildlife agencies in California and Idaho, and now serves as head veterinarian for the domestic and wild animal populations living on Ted Turner's ranches in North and South. His experiences as a wildlife veterinarian range from darting bighorn sheep to negotiating park boundaries in foreign countries.

**Tuesday June 30 – DISEASE SURVEILLANCE & DIAGNOSIS IN WILDLIFE**

**7:00 am:** Breakfast

**8:00 – 9:00 am: Group Project Time**

**9:00 am – 12:30 pm: Anthropogenic Drivers of Disease in Wildlife**

Presenter: John Fischer, Southeast Cooperative Wildlife Disease Study (SCWDS)

Fischer will present an overview of important diseases of wildlife, with an emphasis on diseases that occur as a result of human perturbation of natural ecosystems. Also, he will introduce the purpose, principles and practice of wildlife disease surveillance, and talk about the role of the wildlife disease diagnostician in monitoring ecosystem health. Students will be oriented to the afternoon laboratory session.

**12:30 pm:** Lunch

**1:30 – 5:00 pm: Laboratory - Wildlife Necropsy Techniques**

Lead: Kevin Keel, SCWDS

As part of routine white-tailed deer herd health surveillance at White Oak Plantation, students will break into groups of 4-5 each to conduct a white-tailed deer necropsy, collecting and recording extensive pertinent data.

**7:00 pm:** Dinner

**Evening: The role of the private sector in conservation and ecosystem health**

Presenter: Beau Turner, The Turner Foundation, Inc. and Turner Endangered Species Foundation

Turner will provide a personal account of his family's dedication to wildlife and wildlands conservation and ecosystem health through the The Turner Foundation, Inc., which was founded in 1990 as a private independent family foundation committed to preventing damage to the natural systems – water, air, and land – on which all life depends.

**Wednesday July 1 GOVERNMENT, THE LAW, AND ECOSYSTEM HEALTH**

**7:00 am:** Breakfast

**8:00 - 9:30 am: The Role of Government and Policy in Wildlife and Ecosystem Health**

Presenter: Dean Goeldner, USDA APHIS Veterinary Services

Based on many years working as a veterinarian in both the legislative and executive branches of the United States government, and in the Governmental Affairs Office of the American Veterinary Medical Association, Dr. Goeldner will talk about how lawmaking works, and how and when veterinarians play a critical role. He will illustrate his points by describing first-hand his responsibilities within the USDA to establish a federal program for chronic wasting disease control.

**9:45 - 10:45 pm: The Role of Veterinarians in International Animal Health Programs**

Presenter: Karen Sliter, Deputy Director, USDA APHIS International Services

Veterinarians play critical roles in treating and preventing disease in domestic and wild animals worldwide. Most projects and programs are collaborative, involving close work with in-country nationals, entail immersion in foreign cultures, and present unique challenges not faced by veterinarians working in their home countries. Sliter will describe the role of governmental veterinarians in international health surveillance and security.

**11:00 - 12:30 pm: Citizenship – Exercising Environmental Rights under the Law**

Presenter: Thomas Dawson, Wisconsin Department of Justice.

Dawson will shed light on some of the country's most powerful environmental laws, discuss their limitations, and be frank about the motivations of the legal profession, corporate America, and conservationists in using courts of law to wage environmental battles. He'll inspire us all to exercise our rights as citizens to participate in the democratic process and use the law to achieve our goals.

**12:30 pm: Lunch**

**Afternoon: CASE STUDIES IN ECOSYSTEM HEALTH**

**1:30 – 4:30 pm: Group Project Working Time**

**4:45 – 6:00 pm: The Mountain Gorilla Veterinary Project**

Presenter: Mike Cranfield, Maryland Zoo

As the Director of the Mountain Gorilla Veterinary Project, Cranfield is closely involved with addressing the complex human health and welfare issues surrounding the conservation of mountain gorillas, including the vital role that ecotourism plays in protecting the species from extinction, as well as the critical role that veterinary medicine plays in ensuring the sustainability of the species.

**7:00 pm:** Dinner

**Evening: Linking community health and conservation through family planning**

Presenter: Lynne Gaffikin, Evaluation and Research Technologies for Health, Inc.

Gaffikin works on family planning and women's reproductive health in places where the health and sustainability of surrounding wildlife populations and habitats are inextricably linked to the prosperity and well-being of communities.

**Thursday July 2 CASE STUDIES IN ECOSYSTEM HEALTH (cont)**

**7:00 am:** Breakfast

**8:00 –11:00: Group Project Presentations**

**11:15 - 12:30 pm: Carnivore conservation and medicine: Lessons learned from captivity and the wild**

Presenter: Linda Munson, UC Davis School of Veterinary Medicine

Munson will discuss her research on the health of captive and wild cheetah and Channel Island fox populations, her collaborations with the non-profit organizations like the Cheetah Conservation Fund in Namibia, which strives to reduce conflict between these species and communities, and will put in a plug for the vital role that pathology plays in understanding and contributing to conservation

**12:30 pm:** Lunch

**1:30 – 2:45 pm: From Honeybees to Rhinoceros: Conservation engages all forms of life**

Presenter: Robin Radcliffe, Cornell University and the International Rhino Foundation

Radcliffe's work focuses on the health and conservation of rhinoceros species around the globe, yet his interest in finding sustainable conservation solutions is broad-based. He will compare and contrast significant conservation challenges facing two seemingly disparate taxonomic organisms: the tiny honeybee on one end of the size scale and the megavertebrate rhinoceroses on the other.

**3:00 – 4:15 pm: One World, One Health**

Presenter: Steve Osofsky, Wildlife Conservation Society Field Veterinary Program

Impacts from interactions between domestic animals and wildlife and habitat are often profound. The issues at this interface are of critical importance to the long-term ecological and sociopolitical security of national parks, game reserves and grazing lands worldwide. The Animal Health for the Environment And Development (AHEAD) program helps catalyze problem-solving in the places where tensions and challenges at the livestock health/wildlife health/human health interface are often greatest.

**4:15 – 5:15 pm: Roundtable Discussion**

\*\*\*\* Turn in Course Evaluations!!! \*\*\*\*

**6:30 pm:** Party at the Pavilion

\*\*\*\*\*

**July 3 am:** Depart White Oak

**Issues and Techniques for the Developed World with Outreach to Developing Countries**  
**Aquatic Wildlife and Ecosystem Health**  
**Florida Atlantic University's Harbor Branch Oceanographic Institution**  
**Fort Pierce, Florida, USA**

July 5 - 19, 2009

---- FINAL SCHEDULE of 29/June/2009 ----

**Arrival and Check-in, Introduction to the Facilities, Holiday Weekend**

**Unless Otherwise Noted Below: Breakfasts at Harbor Branch will be from 7:00 to 7:45 AM in the Cafeteria Each Day.**

Unless given notice to the contrary, all students as well as faculty from outside the area will have lodging at Florida Atlantic University, Harbor Branch Oceanographic Institution (FAU, HBOI). All will check in at the Security Guard Post at the front gate and obtain security badges. Those staying overnight at HBOI will obtain room assignments and keys at the front gate, and move into housing.

July 4 will offer students some time to relax immediately before the intensive aquatic unit to come. There will be opportunities for the group to have an informal learning excursion on July 4 and July 12. Students who wish to do some shopping should do it during those days.

**Friday, July 3**

- 7:00 AM:** Breakfast in the Café at White Oak.
- 8:00 AM:** Leave White Oak to drive to St. Augustine, the oldest continuously occupied European- and African-established city, and the oldest port, in the continental United States. Time on your own to explore.
- Noon – 1:30:** Lunch.
- 1:30 PM:** Depart from St. Augustine.
- 4:30 - 5:00 PM:** Students and Envirovet director arrive at FAU, HBOI. *Greeting of the Envirovet Group.* Mrs. Brandy Nelson, Laboratory Leader of the Marine Education Unit, HBOI, FAU, Fort Pierce, Florida.
- 5:00 – 6:00 PM:** Settle into housing.
- 6:00 – 6:30 PM:** *Brief Introduction to Harbor Branch.* Mrs. Nelson.
- 6:30 – 7:30 PM:** Dinner.
- Evening:** Free.

**Saturday, July 4**

*Fourth of July Holiday Break.* Park exploration, beach, and/or shopping in the daytime. Breakfast and lunch out. Early evening, pizza and salad carry out to housing quarters. Evening gathering on the beach to see a classical Independence Day fireworks display.

**Sunday, July 5**

- 9:00 – 10:00 AM:** Meet in the Education Center (near the bronze walking woman), in the lobby where you see all the glass for the **opening breakfast**.
- 10:00 – 10:30 AM:** *Formal Welcome to HBOI, History of the Institution, Key Personnel, Some of What to Expect.* Dr. Dennis Hanisak, Director, Marine Education Unit, HBOI, Mrs. Nelson, and Dr. Val Beasley, Envirovet Program in Wildlife and Ecosystem Health, College of Veterinary Medicine, University of Illinois, Urbana, Illinois.

## Assessing and Restoring Freshwater, Estuarine, and Marine Ecosystem Health

- 10:30 AM – Noon:** *Tour of the HBOI Campus and Submarine Facility.* Mrs. Nelson, Mr. James Nelson, FAU, HBOI Marine Operations, and Ms. Tracy Griffin, FAU, HBOI Marine Education Unit.
- Noon – 12:30 PM:** *What Veterinarians Bring to the Table of Aquatic Animal and Ecosystem Health.* Dr. David Jessup, Marine Wildlife Veterinary Care and Research Center, California Division of Fish and Game, Santa Cruz, California.
- 12:30 – 1:30 PM:** Lunch.
- 1:30 – 3:30 PM:** *Freshwater and Marine Ecology: Watersheds, basic energetics, nutrient flows, currents, tides, mixing, salinity, temperature, in estuarine, coastal, and deeper water marine ecosystems.* Dr. Ed Proffitt, FAU, HBOI.
- 3:30 – 4:30 PM:** *Ecosystem Health: How Do You Diagnose and Treat a Sick Ecosystem?* Dr. Jessup.
- 4:30 – 6:30 PM:** *Principles of Ecosystem Management; and Everglades Ecological Restoration as a Case Study.* Drs. Lorraine Heisler and Matthew C. Harwell, both of US Fish & Wildlife Service, Vero Beach, Florida.
- 6:30 – 7:30 PM:** Dinner.
- Evening:** Free.
- Monday, July 6**
- 8:00 – 9:00 AM:** *Coral Hatchery.* Mr. Dustin Dorton, President, Oceans, Reefs, and Aquariums, FAU, HBOI and Dr. Josh Voss, Marine Science Department, FAU, HBOI.
- 9:00 – 11:00 AM:** *Coral Structure, Nutrition, and Ecology.* Dr. Bruce Fouke, Department of Geology and the Institute for Genomic Biology, University of Illinois, Urbana, Illinois.
- 11:00 AM – Noon:** *Broad Overview of Coral Diseases: Nutrients, Algae, Cyanobacteria, Other Bacteria, Viruses, Toxins, Acids, Elements, Manmade Chemicals, Elevated Temperatures: Their Sources and Their Individual and Interactive Effects on Coral Species and on Reef Health and Sustainability.* Dr. Fouke.
- Noon – 1:00 PM:** Lunch.
- 1:00 – 2:00PM:** *Broad Overview of Coral Diseases (Continued).* Dr. Fouke.
- 2:00 – 4:00 PM:** *Smithsonian Marine Ecosystems Exhibit in Ft. Pierce: Tour including multiple species of coral in mixed species exhibits, featuring the *Oculina* deep water coral, aspects of ecology and biology, as well as saltwater aquarium management for displays and research.* Smithsonian scientists, Dr. Fouke, Dr. Edwin Hernández-Delgado, Coral Reef Research Group, Center for Applied Tropical Ecology and Conservation, University of Puerto Rico, San Juan, Puerto Rico, and Mrs. Nelson.
- 4:30 – 5:30 PM:** *Coral Reef Destruction from Natural and Manmade Stressors around the World.* Dr. Hernández-Delgado.
- 5:30 – 6:30 PM:** Dinner.
- 6:30 – 7:30 PM:** *Coral Reef and Estuarine Rehabilitation.* Dr. Hernández-Delgado.

**7:30 – 8:00 PM:** *Plans for July 7 and July 8 Morning Field Exercises. What We Will be Looking for, Seeing, and Measuring: How and why we will make these observations and assessments.* Dr. David Cox, David Cox Consulting, Vero Beach, Florida, and Mrs. Nelson.

**Tuesday, July 7**

**8:00 AM – Noon:** *Environmental and Ecological Assessments and Sampling. Comparisons of water quality parameters, plankton, nekton, macrophytes, and macro-invertebrates in the water column and benthic zones of clean and contaminated areas. Sampling water and sediments for toxicologic analyses.* Students will be split into groups and rotate through all components. Drs. Cox and Beasley, Mrs. Nelson, Ms. Griffin, and HBOI Marine Botany staff.

**Noon – 1:00 PM:** Lunch.

**1:00 – 3:00 PM:** *Laboratory: Husbandry and Examination Methods for Marine Specimens Collected from the Field.* Dr. Cox, Mr. Thomas Landry, Department of Fisheries and Oceans, New Brunswick, Canada, and Mrs. Nelson.

**3:00 – 4:00 PM:** *Open and Semi-open Aquaculture Systems Used to Produce Invertebrates for Human Food. Differences among Species. Infectious and Toxicologic Diseases in Production Systems.* Mr. Landry.

**4:00 – 5:00 PM:** *Form, Function, and Health Problems of Shrimp/Prawns. Management of Ecosystems for their Health and Long-term Sustainability.* Mr. Landry.

**5:00 – 6:00 PM:** Dinner.

**6:00 – 7:30 PM:** *Form, Function, and Some Major Health Problems of Bivalves. Management of Ecosystems for their Health and Long-term Sustainability.* Mr. Landry.

**Wednesday, July 8**

**8:00 – Noon:** *From the Water to the Mangroves to the Top of the Watershed: An Illustration of Ecological Communities, Stressors, Problems, and High- and Low-Tech Solutions. Visit to a landfill, the inside of a sewage-treatment plant, and a “polishing marsh.”* Dr. Cox and Mrs. Nelson.

**Noon – 1:30 PM:** Shower and then lunch.

**1:30 – 3:00 PM:** *Form, Function, and Health Problems of Lobster, Crayfish, and other Arthropods. Management and Ecosystem Rehabilitation for Sustainable Health of these Organisms in the Wild. Humane Treatment and Methods for Euthanasia of these Species.* Dr. Matt Allender, College of Veterinary Medicine, University of Tennessee.

**3:00 – 4:00 PM:** *Form, Function, and Health Problems of Horseshoe Crabs. Management and Ecosystem Rehabilitation for their Health and Long-term Sustainability in the Wild.* Dr. Allender.

**4:00 – 5:00 PM:** *Invasive Species and Impacts on Aquaculture Systems.* Mr. Landry.

**5:00 – 6:00 PM:** Dinner.

**6:00 – 8:30 PM:** *Laboratory: Comparative Anatomy, Bleeding of Aquatic Invertebrates, Hematology, Euthanasia, Necropsy Methods, Morphology and Health Assessments.* Drs. Allender and Landry, and Dr. Kat Hadfield, National Aquarium, Baltimore, Maryland.

**Morphology, Physiology, and Management of Fishes, Amphibians, and Aquatic Reptiles in Enclosed Systems and the Wild. Microbial, Parasitic, and Toxic Stressors. Island-Based Fish Anesthesia, Health Monitoring, and Diagnostic Sampling.**

**Thursday, July 9**

- 8:00 – 9:00 AM:** *Comparative Morphology of Fishes. Links to Fish Behavior, Ecology, and Reproduction, and Susceptibility to Environmental Change.* Dr. Roy Yanong, Tropical Aquaculture Laboratory, Fisheries and Aquatic Sciences, Institute for Food and Agricultural Sciences, University of Florida, Ruskin, Florida.
- 9:00 – 11:00 AM:** *Comparative Physiology, Metabolism, and Pharmacokinetics/Toxicokinetics in Fishes. Cardiorespiratory and renal physiology. The gill as a respiratory, metabolic, and excretory organ. Phase I and Phase II metabolism by fishes. Influence of body size, temperature, and other environmental variables on xenobiotic fate in fishes.* Dr. Kevin Kleinow, Louisiana State University, Baton Rouge, Louisiana.
- 11:00 AM – Noon:** *Generalized Stress Responses in Confined Fishes. Impacts of temperature, crowding, biological oxygen demand, and ammonia cycle. Case histories.* Dr. Hadfield.
- Noon – 1:00 PM:** Lunch.
- 1:00 – 2:00 PM:** *Important Viral and Bacterial Diseases of Fishes Related to Environmental Management (Restocking, Introductions of Exotic Species, Nutrient Loading, Water Quality Problems, Pathogen Pollution) . Case histories.* Drs. Hadfield and Yanong.
- 2:00 – 3:30 PM:** *Fish Parasitology and Ecosystem Health, Part I – Metazoan Parasites of Fishes. How Environmental Change Can Influence Parasitic Diseases.* Dr. Hadfield.
- 3:30 – 5:00 PM:** *Fish Parasitology and Ecosystem Health, Part II – Protozoans, Microsporidia, and Myxosporea of Fishes. Pathogenesis and Major Diseases Caused by These Organisms. How Environmental Changes Can Influence Parasitic Diseases.* Dr. Yanong and Dr. Jan Lovy, Atlantic Veterinary College. Prince Edward Island.
- 5:00 – 6:00 PM:** Dinner.
- 6:00 – 8:00 PM:** *Open Forum on Water Use, and Health/Sustainability Issues & Managing Microbial Ecology for Health Promotion.* Dr. Kleinow, other Envirovet faculty members, and Envirovet students.

**Friday, July 10**

- 8:00 – 9:00 AM:** *Physical Examination Methods for Fishes.* Dr. Hadfield.
- 9:00 AM – 1:00 PM:** *Fish Collection Using Bag Seines and Boats off the Spoil Islands in the Indian River Lagoon. Blood Collection, Anesthesia, Euthanasia, Ante-mortem Sampling for Toxicology and Parasitology, Necropsy, and Tissue Collections for Histopathology, Parasitology, Microbiology, Virology, and Toxicology.* Drs. Hadfield, Yanong, and Allender, Mrs. Nelson, and Mr. Jerry Corsaut of the FAU, HBOI Aquatic Field Research Group.
- 1:00 – 2:30 PM** Lunch, shower, and change clothes and shoes (bathing & changing are not optional due to biosecurity issues).
- 2:30 – 4:30 PM:** *Tour of FAU, HBOI Closed Aquaculture Facilities for Culture of Expensive Food Fish.* Drs. Paul Wills and John Scarpa, and Ms. Amber Garr of the Aquaculture Research and Education Program of FAU, HBOI, and Drs. Yanong and Hadfield.
- 4:30 – 5:30 PM:** *Risks and Impacts of Intensive Semi-Open Aquaculture Culture Systems on Wild Fishes and Other Components of the Environment.* Dr. Lovy.

- 5:30 – 6:30 PM: Dinner.
- 6:30 – 7:30 PM: *Debate, Discussion, and Visioning for the Future of Wild Fisheries and Aquaculture Addressing Two Questions: What Should Be Done and How Can We Get There?* Envirovet 2009 students, and Drs. Wills, Lovy, Yanong, Hadfield, and Kleinow, as well as Dr. Matt Allender, College of Veterinary Medicine, University of Tennessee, Knoxville, Tennessee.

### Saturday, July 11

- 8:00 – 9:00 AM: *Comparative Morphology of Amphibians. Integumentary, digestive, respiratory, circulatory, digestive, urinary, and reproductive adaptations; and how these set the stage for infectious and toxicologic diseases.* Dr. Allender.
- 9:00 – 10:30 AM: *Amphibian Infectious Diseases and Anesthesia for Amphibians.* Dr. Hadfield.
- 10:30 AM – Noon: *Amphibians, Amphibian Declines, and Amphibian Eco-toxicology.* Dr. Beasley.
- Noon -- 1 PM: Lunch.
- 1:00 – 2:00 PM: *Comparative Morphology of Aquatic Reptiles. Integumentary, digestive, respiratory, circulatory, digestive, urinary, and reproductive adaptations; and how these set the stage for infectious and toxicologic diseases.* Dr. Allender.
- 2:00 – 3:00 PM: *Diseases of Aquatic Reptiles - Turtles, Snakes, and Crocodylians.* Dr. Allender.
- 3:00 – 6:00 PM: *Dissection Lab: Frogs, Salamanders, and Aquatic Chelonians, Aquatic Snakes, and an Alligator.* Dr. Allender.
- 6:00 – 7:00 PM: Dinner
- Evening: Free.

### Sunday, July 12

- Day Off: Rest Up. *Ecotourism & Cultural Exploration at Big Cypress Seminole Indian Reservation for the Billie Swamp Safari (air boat ride, swamp buggy ride, critter show) and Visit Ah-Tha-Thi-Ki Museum.*

## **Introduction to Ecological Pharmacology and Toxicology**

### Monday, July 13

- 8:00 – 9:00 AM: *Drug Discovery from Marine Organisms.* Dr. Peter McCarthy, FAU, HBOI
- 9:00 – 11:00 AM: *Introduction to Ecotoxicology.* Dr. Beasley.
- 11:00 AM – Noon: *Mutagenesis and Carcinogenesis Related to Environmental Contaminants.* Dr. Rhian Cope. Netherlands.
- Noon – 1:30 PM: Lunch.
- 1:30 – 2:30 PM: *Background on the Endocrine System and Endocrine Disruptors.* Dr. Jim Gelsleichter, University of North Florida, Jacksonville, Florida.
- 1:30 – 2:30 PM: *Case Studies of Endocrine Disruption in Fishes. A systems biology approach to endocrine disruption research.* Dr. Gelsleichter.

**3:30 – 5:30 PM:** *Endocrine Disruption in Alligators and other Vertebrates.* Dr. Louis Guillette, University of Florida, Gainesville, Florida.

**5:30 – 6:30 PM:** Dinner.

**Evening:** Free.

### Tuesday, July 14

**8:00 – 9:00 AM:** *Comparative Morphology, Physiology, and Life Histories of Water Birds (gulls, terns, related birds, waterfowl, aquatic-feeding raptors, penguins, and other sea birds).* Dr. Michael Fry, American Bird Conservancy, Washington, DC.

**9:00 – 11:00 PM:** *Contaminants and Wild Birds.* Dr. Fry.

**11:00 AM – Noon:** *Freshwater (Cyanobacterial) Phycotoxicology: Freshwater and brackish sources and principal effects of cyclic peptide hepatotoxins (microcystins and nodularin) and the neurotoxins, anatoxin-a, anatoxin-a(s), and saxitoxins in birds and mammals.* Dr. Beasley.

**Noon – 1:00 PM:** Lunch.

**1:00 – 2:00 PM:** *Marine Phycotoxicology: Estuarine and marine sources, and principal effects of saxitoxin, domoic acid, and brevetoxins in birds and marine mammals.* Dr. Beasley.

**2:00 – 3:30 PM:** *The European Union's Registration, Evaluation and Authorisation of Chemicals (REACH) Legislation, and How One Economic Community Can Move Others toward an Era of Higher Environmental Standards and Better Product Stewardship.* Dr. Cope.

**3:30 – 4:30 PM:** *Group Discussion: Students Meet to Develop Specific Plans to Get Toxicologic and Ecotoxicologic Insult Behind Us. Group 1 will address regional agricultural concerns in a developed country; Group 2 will address a major metropolitan area of a developed country; Group 3 will address either mining or petroleum in a developing country; and Group 4 will develop a program for the Earth to be proposed to a World Conference of National Political Leaders on the Topic of Ecological Stewardship. Work up a power point presentation for the group to be presented by at least two members of the group.*

**4:30 – 5:30 PM:** *Ten-Minute Student Presentations, Plus 5 Minutes Each for Discussion.*

**5:30 – 6:30 PM:** Dinner.

**Evening:** Free.

### Wednesday, July 15

#### **Major Infectious, Parasitic, and Toxic Diseases of Waterbirds and Raptors.**

**8:00 – 9:00 AM:** *Virology Update and Why RNA Viruses are so Often Involved in Emerging and Re-emerging Diseases.* Dr. Daniel Martineau, Canadian Cooperative Wildlife Health Center (Quebec region), Département de Pathologie et Microbiologie Vétérinaire, Faculté de Médecine Vétérinaire, Université de Montréal, St. Hyacinth, Quebec, Canada.

**9:00 – 11:00 AM** *Avian Pathology and Infectious Diseases: Major Viral, Bacterial, Fungal, and Parasitic Diseases of Waterfowl and Raptors.* Dr. Scott Terrell, Disney Animal Kingdom, Orlando, Florida.

**11:00 AM – Noon:** *Avian Influenza - Overview of the Risks of a Serious Pandemic, Countermeasures, and Communications. Implications for Developed and Developing Countries.* Dr. Joseph Gaydos, Orcas Island Office, SeaDoc Society, Wildlife Health Center, University of California-Davis, Eastsound, Washington.

- Noon – 1:00 PM:** Lunch.
- 1:00 – 3:00 PM:** *Avian Influenza – Training Workshops.* Drs. Gaydos and Terrell.
- 3:00 – 4:00 PM:** *Whooping Cranes – Endangered Species Introduction.* Dr. Marilyn Spalding. College of Veterinary Medicine, University of Florida, Gainesville, Florida.
- 4:00 – 5:00 PM:** *Waterbird Diseases – Creating New Niches.* Dr. Spalding.
- 5:00 – 6:15 PM:** *Urban Killer Whales, and Generating and Translating Science on Engandered Orcas and Other Marine Wildlife.* Dr. Gaydos.
- 6:15 – 7:15 PM:** Barbeque Dinner.
- Evening:** Free.

**Thursday, July 16**

- 8:00 – 10:00 AM:** *Oiled Wildlife, Petroleum and Other Hydrocarbon Spills, and the Oiled Wildlife Care Network of the University of California-Davis. Management of contaminated animals. Working with the public. Efforts to prevent spills.* Dr. Gaydos.
- 10:00 – 11:00 AM:** *Mercury in the Everglades.* Dr. Spalding.
- 11:00 – 11:30 PM:** *Flamingo Die-offs in East Africa.* Dr. Beasley.
- 11:30 – 12:30 AM:** Lunch.
- 12:30 – 3:30 PM:** *Avian Necropsy Laboratory. Examination of a range of bird species that died in the field due to a wide array of stressors.* Drs. Terrell, Spalding, and Beasley.

**Marine Mammals: Morphology, Physiology, Infectious and Toxicologic Diseases.**

- 4:00 – 6:00 PM:** *Adaptive Anatomy and Physiology of Marine Mammals.* Dr. Lisa Hoopes, University of Florida and Disney's Animal Kingdom, Bay Lake, Florida.
- 6:00 – 7:00 PM:** Dinner.
- Evening:** Free

**Friday, July 17**

- 8:00 – 9:00 AM:** *Bottlenose Dolphin Health Assessment Project.* Dr. Gregory Bossart, Georgia Aquarium. Atlanta, Georgia and HBOI.
- 9:00 – 10:00 AM:** *Emerging Diseases of Marine Mammals.* Dr. Bossart.
- 10:00 – Noon:** *Toxicology and Pathology of Beluga Whales in the St. Lawrence Estuary.* Dr. Martineau.
- Noon – 1:00 PM:** Lunch
- 1:00 – 2:00 PM:** *Conservation of Highly Endangered Monk Seals.* Dr. Alonso Aguirre, Wildlife Trust. New York, New York.

**2:00 – 5:00 PM:** *Necropsy Lab. Examination of a Range of Species of Marine Mammals that Died in the Field due to a Wide Array of Stressors.* (Marine Mammal Necropsy Facility). Drs. Bossart, Martineau, and Aguirre, Dr. Martine de Wit, Florida Fish and Wildlife Conservation Commission, Marine Mammal Pathobiology Laboratory, St. Petersburg, Florida, and the HBOI Marine Mammal Group.

**6:00 – 7:00 PM:** Dinner.

**Evening:** Free.

**Saturday, July 18**

**8:00 – 10:00 AM:** *Manatees and Marine Mammal Conservation Medicine.* Dr. Bossart.

**10:00 AM – Noon:** *Manatees: Threats and Management. An inside look at pathologic and forensic investigations, and a discussion on how these influence management decisions.* Dr. de Wit.

**Noon – 1 PM:** Lunch.

**1:00 – 3:00 PM:** *Monitoring Arctic Marine Mammal Health. Working with Subsistence Cultures and Federal Agencies. Heavy Metals and Organohalogen Contaminants in Marine Mammals.* Dr. Todd O'Hara, Institute of Arctic Biology, University of Alaska, Fairbanks, Alaska.

**3:00 – 4:00 PM:** *Wildlife Trust and Other Efforts to Refine Conservation Research, Stewardship, and Education. Outreach and Educational Programs in Latin America.* Dr. Aguirre.

**4:00 – 5:30 PM:** *Aquatic Unit Wrap up Discussion:* Dr. Beasley

**5:30 – 6:00 PM:** \*\*\*\*\* Turn in Course Evaluations!!! \*\*\*\*\*

**5:00 – 6:00 PM:** Dinner.

**Evening:** Free.

**Sunday, July 19**

**2:00 AM:** Departure for Fort Lauderdale Airport en route to Dar Es Salaam, Tanzania.

**Envirovet 2009 Developing Country Session**  
**Terrestrial and Aquatic Wildlife and Ecosystem Health Issues and Techniques for**  
**Developing Countries**

*The United Republic of Tanzania, EAST AFRICA*

*21 July 2009 – 10 August 2009*

**Session Organizers:**

**Faculty of Veterinary Medicine, Sokoine University of Agriculture, Morogoro, TANZANIA**

**Wildlife Health Center, University of California, Davis, CA, USA**

**Tanzania National Parks, Arusha, TANZANIA**

**Institute of Marine Sciences, University of Dar es Salaam, Zanzibar, TANZANIA**

**Wildlife Conservation Society, Ruaha Landscape Program, Iringa, TANZANIA**

**SESSION GOALS**

- **Produce globally aware ecosystem and wildlife health professionals able to solve problems in diverse cultural contexts.**
- **Develop understanding of the conditions and constraints relevant to addressing health and conservation issues in developing countries.**
- **Allow participants to develop a professional network of colleagues and exchange ideas in a supportive environment.**

## **INTRODUCTION & COURSE OVERVIEW**

The Health for Animals and Livelihood Improvement Project (HALI) is proud to have the opportunity to host the 2009 Envirovet Summer Institute Developing Country Session in Tanzania. HALI is a collaborative stakeholder-driven research and capacity building program led by the UC Davis Wildlife Health Center. Our partners are the Faculty of Veterinary Medicine at Sokoine University of Agriculture, the Wildlife Conservation Society Ruaha Landscape Program, and the University of Vermont Rubenstein School of Environment and Natural Resources. We use an interdisciplinary approach to investigate the health and economic impacts of zoonotic and waterborne diseases in wildlife, livestock and people in the Ruaha ecosystem of Tanzania. We are supported by the Global Livestock Collaborative Research Support Program (GLCRSP) which receives its support from USAID.

Through our partnerships with universities, non-profit organizations, and government agencies in Tanzania we have created an itinerary where Envirovet participants will learn about wildlife and ecosystem health issues through field-based activities and interactions with developing country professionals currently working to address these challenges. By linking Envirovet and HALI, students will have the added experience of participating in an ongoing research project and interacting “on the ground” with HALI team members and the communities with which we work.

### **THEMES TO BE COVERED:**

In order to maximize opportunities at multiple national parks, management areas, and community sites, this portion of the course will not be organized into strict modules. Instead the following themes will be introduced and then reinforced at many of the sites throughout the course.

#### **Theme 1 - Health and Conservation at the Wildlife-Livestock-Human Interface (HCI)**

Description: Natural resource conflicts and disease transmission are most likely to occur at the spatial and temporal interface between human populations (with their domestic animals) and wildlife. Anthropogenic changes to our ecosystems are expanding this interface with often deleterious consequences for both people and wildlife. Envirovet students will explore this issue by talking with and learning from case studies presented by researchers actively working to mitigate these problems; participating in field excursions to sites of wildlife-human conflict; talking with pastoralists living near a wildlife protected area; and participating in HALI project research activities (bovine tuberculosis testing of cattle, sampling of water for pathogens) to evaluate the prevalence of zoonotic disease at the interface between wildlife, livestock and human populations.

#### **Theme 2 - Challenges with Diagnosis, Surveillance and Control of Zoonotic and Emerging Infectious Diseases in Developing Countries (ZED)**

Description: Zoonotic pathogens are the most significant cause of emerging infectious diseases in people. Wildlife and domestic animals are an important part of the public health picture, as they provide a “zoonotic pool” from which diseases may emerge. We will explore the challenges to diagnosing, controlling and implementing surveillance programs for zoonotic and emerging infectious diseases in Tanzania. Diseases that will be highlighted include highly pathogenic Avian Influenza, Rift Valley Fever, and bovine tuberculosis, with an emphasis on current research and innovative methods being developed in Tanzania for diagnosis and surveillance.

#### **Theme 3 – Wildlife Health and Conservation Challenges in Protected Areas (CPA)**

Description: Approximately 25% of Tanzania’s land lies inside protected areas. Despite this significant achievement, Tanzania’s biological diversity remains threatened. Envirovet participants will learn about

the health and conservation challenges faced by professionals working in Tanzanian National Parks. They will participate in projects addressing some of these issues in Mikumi and Ruaha National Parks. By visiting two parks, participants will have the opportunity to compare and contrast the challenges facing these parks. Additionally, participants will learn about new initiatives that have created community based wildlife management areas. The course will have field exercises inside the newly created Pawaga-Idodi Wildlife Management Area, and discuss the pros and cons of community-based conservation initiatives with Tanzanians actively working in the field. The benefits and problems associated with ecotourism and cultural tourism will also be discussed. Finally, challenges and recent success in the conservation of Zanzibar's indigenous forests and mangroves will be highlighted in a visit to Jozani Chakwa Bay Conservation Area.

#### **Theme 4 – Health and Conservation Policy at the National and Global Level (POL)**

Both national and international policies affect conservation in developing countries. Policy implications arising from case studies about the drying of the Great Ruaha River and community-based conservation will be discussed. Participants will also gain familiarity with Tanzanian law regarding the environment, wildlife, and veterinary medicine.

#### **Theme 5 – Threats to Tropical Fresh Water and Marine Ecosystems (FWM)**

Tanzania's incredible biodiversity depends on the health of its fresh water and marine ecosystems. Tanzania has more inland waters than any other country in Africa, 1424 km of Indian Ocean coastline, and the Zanzibar and Mafia Island archipelagos. The health and ecosystem services of Tanzania's freshwater ecosystems are severely strained by the needs of Tanzania's human population. We will highlight these issues by closely studying the 15 year conservation crisis of the Great Ruaha River. The history and consequences of the drying of the Great Ruaha River will be presented in a detailed case study. Participants will visit various sites along the river and its tributaries to 1) see examples of irrigation and water diversions, 2) assess fish species diversity and 3) sample for pathogens in the water. Pollution problems and the latest research in freshwater and marine ecosystems will be highlighted through discussions and field exercises at Sokoine University of Agriculture and the Institute for Marine Sciences on Zanzibar. Coral health, and innovations in mariculture, and community based sustainable use programs will be discussed.

## **ENVIROVET DEVELOPING COUNTRY SESSION ITINERARY\*:**

\*Please note that exact times, activities, and speakers are subject to change.

### **Tuesday July 21-Day 1: Arrival, Orientation & Introduction (CPA/HCI)**

**7:00 am:** Most participants arrive in Dar es Salaam. (Others will have arrived previous night)

**8:30 – 1:00 pm:** Travel to Mikumi town, passing through Mikumi National Park en route.

**1:00-4:00 pm:** Light lunch and settle into lodgings on the border of Mikumi National Park. Time to shower and rest. Lodgings: Tan-Swiss Restaurant & Hotel, affiliates. Meals at Tan-Swiss.

**4:00 pm:** Tea

#### **4:15-4:30 pm: *Welcome & Opening of Envirovet Course***

Presenter: Rudovick Kazwala, Professor of Veterinary Medicine and Public Health, Sokoine University of Agriculture (SUA)

#### **4:30-5:00 pm: *Orientation to Course Itinerary, Logistics, and Activities***

Presenter: Deana Clifford, Associate Veterinarian and HALI Project Coordinator, UC Davis Wildlife Health Center (UCD WHC)

#### **5:15-6:30 pm: *Bovine tuberculosis in Africa***

Presenter: Rudovick Kazwala, SUA

Prof. Kazwala will explain the history of bovine tuberculosis (BTB) in Africa and detail what we know to date regarding the significance of BTB in wildlife, livestock and human populations. He will highlight current BTB research projects in Tanzania and discuss the development of the African Bovine Tuberculosis Network.

#### **6:30 pm: *Briefing about Immobilization Exercises***

Presenter: Clifford/Mlengeya

**6:45 pm:** Dinner

### **Wednesday July 22 – Day 2 (CPA/HCI/ZED)**

**6:00 am:** Early breakfast

**6:45 am:** Depart for Mikumi NP Headquarters

#### **7:30-8:15 am: *Welcome & Overview of Mikumi National Park: conservation priorities and challenges***

Presenter: Frederick Mofulu, Chief ecologist, Mikumi National Park, Tanzania National Parks (TANAPA).

Mr. Mofulu will orient us to Mikumi NP and highlight the conservation priorities and challenges for this ecosystem.

**8:15-9:00 am: Field exercise orientation**

Instructors: Vitalis Lyaruu, Donald Mpanduji, Titus Mlengeya leads

A brief review of chemical immobilization of species to be targeted in the immobilization exercises and a safety orientation will be given.

**9:00 am:** Chai break (tea and snacks)

**9:30-12:00 am: *Field exercises: Field immobilization of free-ranging African wildlife***

Instructors: Vitalis Lyaruu, Donald Mpanduji, Titus Mlengeya leads

A brief lecture about aspects of chemical immobilization of free-ranging African wildlife and a safety orientation will be given. Participants will then observe and assist with the immobilization of a giraffe or other species as determined by the veterinarian. Although an immobilization exercise is scheduled, there is no guarantee that an animal will be immobilized each session due to weather conditions, locations and suitability of animals, and other unforeseen circumstances. Animal welfare and human safety are the first priorities. The decision to immobilize is the responsibility of the TANAPA veterinarian in charge.

**12:30 pm:** Lunch (could do lunch and pm talks in the park or back at Tan-Swiss)

**1:30-2:00 pm: *Additional questions regarding morning exercise***

**2:00-3:30 pm: *Role of wildlife veterinarians and wildlife health in Tanzania***

Presenter: Titus Mlengeya, Chief Veterinary Officer, TANAPA

Dr. Mlengeya, an Envirovet alumnus, will describe the role of wildlife veterinarians in Tanzania and the current wildlife health issues in Tanzania's National Parks. Challenges to implementing wildlife health monitoring and research will be discussed.

**3:30 pm:** Tea

**3:45-4:30 pm: *Giraffe ear disease in Mikumi National Park***

Presenter: Vitalis Lyaruu, Southern zone veterinarian, Tanzania National Parks (TANAPA)

Dr. Lyaruu will describe the progress of his doctoral research investigating the prevalence and etiology of giraffe ear disease in Mikumi National Park.

**4:30-5:00 pm: *Wildlife Poisoning Cases in Tanzania's National Parks***

Instructors: Vitalis Lyaruu

Lyaruu will give a brief overview of some interesting wildlife poisoning cases that have occurred in the parks.

**5:15-6:30 pm: *Elephant conservation in the Selous-Niassa wildlife corridor –***

Presenter: Donald Mpanduji, Senior Lecturer, SUA

The Selous-Niassa wildlife corridor is a landscape linkage between Africa's largest protected areas: the Selous Game Reserve of Tanzania, (a UNESCO World Heritage Site and home to Africa's largest elephant, buffalo, sable and other wildlife populations) and the Niassa Game Reserve of Mozambique, well renowned for its large elephant population. Dr. Mpanduji will detail his research investigating elephant movements in the Selous - Niassa wildlife corridor, and discuss implications of his work and the challenges associated with transboundary conservation.

**7:00 pm:** Dinner

**Thursday July 23 – Day 3 (CPA)**

**6:00 am:** Early breakfast

**6:45 am:** Depart for Mikumi NP Headquarters

**7:30-11:30 am:** *Field exercises: immobilization*

Instructors: Vitalis Lyaruu/Mpanduji and Titus Mlengeya (TANAPA)

Participants will have another chance to assist with the immobilization of a buffalo or other species as determined by the veterinarian.

**12:00 pm:** Return to Tan-Swiss lodge, gather luggage and pack lunch for departure

**1:00-5:00 pm:** *Travel from Mikumi National Park to Iringa*

Participants will drive by Udzungwa National Park and Baobab Valley on their way to the Southern Highlands of Tanzania. These and other points of interest along the way will be highlighted.

**5:00-6:30 pm:** Arrive and settle into lodgings at Riverside campsite. Laundry opportunity

**6:30 pm:** Dinner

**Evening:** Free

**Friday July 24 – Day 4 ( POL/HCI/CPA)**

**7:00 am:** Breakfast

**8:00 am-12:00 pm:** *Village visit: community level sustainable development and appropriate technologies to improve health and livelihoods*

Leader, Andy Hart, Anglican Diocese of Ruaha

Dr. Hart will lead the group on a tour through Ismani village where he is helping the community try a variety of self supporting strategies to improve both animal health and people's livelihoods. Highlights will include a veterinary drug shop project, cattle and poultry health improvement efforts, donkey welfare improvements, water sanitation efforts, edible insects and more!

**12:30-2:30 pm:** *Lunch & Workshop Tour: Neema Crafts*

Leaders: Suzie Hart and the Neema Crafts staff

Neema Crafts provides opportunities for disabled Tanzanians by employing and teaching disabled people the skills to make unique ecologically conscious crafts. Participants will tour the workshop, learning about this innovative project, interacting with the staff, and have a chance to sample Neema Café's famous ice cream.

**3:00-5:30 pm:** *Visit to Kibebe Farm, Iringa*

Leaders: Richard and Victoria Phillips

Participants will tour a high-input dairy and beef farm with the owners, Richard and Victoria Phillips. The Phillips will discuss challenges relating to biosecurity, delivery of veterinary services, and disease threats.

They will also discuss their philosophy of raising livestock while protecting the natural environment, and their efforts to make their products certified organic.

**6:30 pm:** Dinner

**7:30-8:30 pm:** *Bird diversity in Tanzania and surveillance for avian influenza in wild birds*

Presenter: Neil & Liz Baker, Tanzania Bird Atlas

Baker will give an overview of the incredible bird diversity that Tanzania has to offer and discuss the conservation importance of Tanzania's important bird areas. Additionally, Neil will highlight the current surveillance efforts for highly pathogenic avian influenza in Tanzania's wild birds, with an emphasis on sentinel species and possible conservation impacts. Liz will discuss her efforts to create a Swahili language bird book for Tanzania.

### **Saturday July 25 – Day 5 (CPA)**

**7:30 am:** Breakfast

**8:30 am-12:00 pm:** - *Optional Field trip Isimila Stone Age site*

Isimila is one of Africa's richest Stone Age sites; excavations have uncovered thousands of stone tools dating from about 60,000 years ago (Acheulian period). Over time the Isimila River has also created a beautiful canyon with natural sandstone pillars. Participants will learn about the historical significance of this site and hike through the canyons with a trained guide.

**1:00 pm:** Lunch

**2:00-6:00 pm:** Afternoon free to explore the Iringa Market and town-life (Shuttle to town and back will be provided).

**\*\* LAST SHUTTLE LEAVES FROM INFO IRINGA AT 6:00 PM SHARP\*\***

**6:30 pm:** Dinner

**7:30 pm:** *Environmental Education in rural communities living near Ruaha National Park*

Leader: Jackson Ngowi, Program Manager, Friends of Ruaha Society (FORS)

Jackson will explain the mission of FORS and highlight their programs aimed at improving environmental awareness in schoolchildren and communities living near Ruaha National Park, and incorporating environmental education into school curricula.

### **Sunday July 26 – Day 6 (ZED/HCI/CPA/POL)**

**7:00 am:** Breakfast (pack luggage and prepare to leave Iringa)

**8:10 am:** Depart Riverside camp

**8:30-9:30 am:** *Control and surveillance for zoonotic diseases and diseases of economic importance in livestock*

Presenters: Dr. Hamza Mwamhehe, Chief Veterinarian, and Dr. Hilda Mrema, Veterinary Investigation Centre-Iringa

Drs. Mwamhehe and Mrema will highlight the economically important and zoonotic diseases that are priorities for surveillance and control in Tanzania. The impact of the 2007 Rift Valley Fever outbreak and constraints to disease control will be discussed, with a focus on the goal of establishing disease-free regions. They will also discuss the role of government in veterinary disease surveillance and the specific role of the VIC Iringa. (can have talk at Neema)

**9:30 – 10:30 am:** Participants will tour facilities of the Veterinary Investigation Centre in Iringa and have time for informal discussion.

**10:45-12:00 pm: *Integration of concepts – Discussion of health and economic challenges faced by pastoralists***

Leaders: D. Mutekanga, Wildlife Conservation Society Ruaha Landscape Program

In preparation for a visit to pastoralist households, WCS staff will lead a discussion about the health and economic challenges faced by pastoralist households. Water limitations, access to markets for livestock products, livestock diseases, access to veterinary and human health care services will be discussed. Participants are encouraged to formulate some questions to ask the pastoralist household that will be visited.

**12:00-2:00 pm: *Travel from Iringa to Malinzanga village (Pack lunch)***

**2:00 pm – 4:30 pm: *Cultural visit with Maasai households, Malinzanga village***

Leaders: David Mutekanga, Harrison Sadiki, Alphonse Msigwa?, Mzee Selendu

Participants will visit the household and livestock boma of a Maasai family. They will have the chance to ask the questions and tour the household, view livestock and gain a deeper understanding of pastoralist culture. Traditional dancing or a livestock demonstration may be performed and Maasai jewelry made by the women of the household will be available for purchase. Need to figure out/warn about tea with milk logistics in advance...ie maybe just chai rangi, small issue, but some students were kind of freaked out.

**4:30-6:00 pm:** Travel from Malizanga to Chogela campsite, Tungamalenga village

**7:00 pm:** Dinner

**Monday July 27 – Day 7 (CPA/FWM/HCI/POL)**

**7:00 am:** Breakfast

**8:00-9:00 am: *Discussion & Feedback: Pastoralism and Conservation. Can they co-exist?***

Leaders: David Mutekanga, WCS Ruaha Program

Participants have extra time to discuss questions that may have arisen from the household visit and additional aspects of challenges faced by pastoralists. Furthermore, tensions between pastoralism and conservation will be addressed.

**9:15-9:45 am: *Overview of the Wildlife Conservation Society (WCS) Ruaha Landscape Program & Orientation to the Pawaga-Idodi Wildlife Management Area***

Presenter: Mbano or Mutekanga, WCS Ruaha Landscape Program

Mbano will introduce participants to the wide range of conservation activities conducted by the Ruaha Landscape Program. He will talk about their approach to building local capacity for conservation; success and challenges. An orientation to the Pawaga-Idodi Wildlife Management Area will also be presented.

**9:45 am:** Tea

**10:00-11:00 am: *Case Study: The Unintended Consequences of Development Assistance: the case of Usangu irrigation schemes***

Presenter(s): TBA WCS Ruaha Landscape Program

In the Usangu region of Tanzania, smallholder rice schemes established with development assistance in the 1980s and early 90s precipitated a cascade of unintended outcomes, many of which are still being realized. The primary and direct effect was that *legal* channelization of water facilitated a proliferation of *illegal* diversions and satellite farms surrounding the rice schemes. The resultant loss of water to the Great Ruaha River is the central driver of the environmental and socioeconomic cascade of unintended effects most notably: a 77% reduction in the area of the Ihefu swamp; over 60% loss of dry season habitat in Ruaha National Park; the collapse of fisheries in Mtera Reservoir; increased potential for transmission of disease among livestock, wildlife and people (both waterborne & other); and the loss of hydroelectric power produced by the Mtera hydroelectric plant. The social and economic costs of these unintended consequences remain untallied, but the power crisis alone likely cost the Tanzanian economy around one billion U.S. dollars. These consequences and current actions to address them will be discussed.

**11:15 am-12:15 pm: *Health for Animals and Livelihood Improvement (HALI) in the Ruaha ecosystem***

Presenters: Harrison Sadiki, HALI Field Coordinator, SUA & Deana Clifford, HALI Project Coordinator & Envirovet Tanzania co-director, UC Davis Wildlife Health Center

The Health for Animals and Livelihood Improvement Project is collaborative and stakeholder-driven research and capacity building project of UC Davis Wildlife Health Center, Sokoine University of Agriculture, WCS Ruaha Landscape Program, and the University of Vermont. We use an interdisciplinary approach and team to investigate the health and economic impacts of zoonotic (bovine tuberculosis and brucellosis) and waterborne diseases in wildlife, livestock and people. Research findings, training and capacity building activities to date will be presented.

**12:15-12:45 am: *Orientation to Field Exercises***

Deana Clifford & Bakari Mbano

**1:00 pm:** Lunch

**2:00-6:00 pm: *Wildlife Field Exercises***

The participants will be divided into three subgroups (A, B, C) and participate in the exercises below.

***Exercise 1: Walking transect for wildlife presence and sign- Group A***

Leader(s): Rogassian Mtana, Ecologist, WCS Ruaha Landscape Program, & MBOMIPA game scouts  
Participants will learn how to identify tracks and sign of various wildlife species. Methods for estimating wildlife population presence/absence and density on foot will be discussed; how wildlife density data is mapped using ArcGIS and used for conservation and health studies will also be demonstrated.

***Exercise 2: East African plant communities - Group B***

Leaders : Mzee Mhoro (Former Herbarium Technician, University of Dar es Salaam), Mzee Moses (Village Chairman, Idodi) and Bakari Mbanu (WCS RLP)

Participants will learn about the unique plant communities in East Africa, including plants of conservation concern and of importance to wildlife. Special attention will also be given to medicinal plants utilized by people.

***Exercise 3: Bovine tuberculosis testing in pastoralist cattle & feedback - Group C***

Leader(s): Harrison Sadiki, Alphonse Msigwa - HALI Project, SUA

Participants will join HALI project researchers in testing cattle for bovine tuberculosis at pastoralist households. Biological samples (blood, milk and feces) may also be collected from cattle, sheep or goats. Risk factors for transmission of bovine tuberculosis and brucellosis will be highlighted at these visits, and challenges with administration and interpretation of intradermal skin testing for tuberculosis in African conditions will be discussed.

**7:00 pm:** Dinner/campfire

Evening:

**Tues July 28 – Day 8 (CPA/HCI/POL)**

**7:00 am:** Breakfast

**8:00-12:00 pm: *Wildlife Field Exercises (continued)***

Exercise 1: Walking transect for wildlife - Group C

Exercise 2: East African plants - Group A

Exercise 3: BTB testing livestock – Group B

**12:30 pm:** Lunch

**2:00 – 6:00 pm: *Wildlife Field Exercises***

Exercise 1: Walking transect for wildlife - Group C

Exercise 2: East African plants - Group A

Exercise 3: BTB testing livestock – Group B

**7:00 pm:** Dinner

**8:00-10:00 pm: *Night game drive (optional)***

Leaders: WCS and HALI staff

Participants will have the chance to look for nocturnal wildlife.

**Wed July 29 – Day 9 (HCI/ZED/FWM/POL/CPA)**

**7:30 am:** Breakfast

**8:30-9:30 am: *Feedback & Discussion-Wildlife Field Exercises***

Time for participants to share what they learned, any unique observations and to ask any follow-up questions.

**9:45-12:30 pm: *Field Visits-Wildlife conflicts at the human-livestock-wildlife interface***

Leaders: Aybu Omari Msago, WCS Ruaha Landscape Program

Participants will learn about efforts to reduce conflicts between agricultural activities and elephants/hippos, and livestock conflicts with carnivores by visiting sites where these activities have occurred. A unique program to use natural chili pepper oil to deter elephants from farms and design changes to livestock bomas (corrals) that reduce depredation will be highlighted

**1:00 pm:** Lunch

Free time to rest or explore Tungamalenga Snake Park, Souvenir stand etc.

**4:00-5:15 pm: *Wildlife Conservation in Protected Areas of Tanzania and the new movement towards Community-based Wildlife Management***

Leader: Bakari Mbanjo, Director, WCS Ruaha Landscape Program; Former Director, Wildlife Division, United Republic of Tanzania

Tanzania has designated over 28% of its land area under some degree of protection. Mzee Mbanjo will give a brief overview of the history of wildlife conservation in Tanzania, describe the structure of the current Protected Area system, and highlight new initiatives to create community-based wildlife management areas in Tanzania. Successes and challenges encountered during and after the establishment of the community-based Pawaga-Idodi Wildlife Management Area, and broader pros and cons of community-based initiatives will be discussed.

**5:30-6:30 pm: Case Study: *Spatial decline of buffalo in the Ruaha ecosystem***

Presenter: Deana Clifford

Clifford will review the evidence to date suggesting that Ruaha's once large buffalo populations have suffered a spatial range contraction and possibly a population decline. Possible causes for the decline will be described and participants will have the chance to brainstorm ideas about how they would begin to study and address this issue.

**7:30 pm: Special BBQ Dinner/campfire with Wahehe drama group performance**

**Thurs July 30 – Day 10 (HCI/ZED/CPA/FWM)**

**8:00 am:** Breakfast and pack luggage for departure (have luggage packed and ready by cars)

**9:00-10:15 am: *Wrap-up discussion***

Leader: Val Beasley

Participants will have time to provide feedback and discuss any thoughts or questions resulting from the presentations, village visits or labs.

**10:15 am:** Tea

**10:45-12:00 pm:** Travel from Tungamalenga to Ruaha National Park Headquarters

**12:00 pm:** Arrive Ruaha NP & settle into lodgings (Park bandas)

**1:00 pm:** Lunch

**1:45 pm:** Welcome to Ruaha

Presenter: Chief Park Warden or designate

**2:00-3:15 pm:** *Conservation and Management of Ruaha National Park*

Presenter: Ole Meing'ataki, Chief Ecologist, Ruaha National Park, TANAPA

Participants will be introduced to the reasons why Ruaha National Park is so significant from a conservation standpoint. The current ecosystem health issues, expansion of the park, plans for tourism growth, and management challenges for this park will be highlighted.

**3:15 pm:** Tea

**4:30-6:30 pm:** *Evening Game Drive*

Participants get a chance to see some of the amazing wildlife diversity of Ruaha.

**7:00 pm:** Dinner

**7:30-8:30 pm:** *Wildlife health issues in Ruaha National Park*

Presenter: Epaphras Alex, Veterinarian, Ruaha National Park

Dr. Alex will present an overview of his responsibilities at veterinarian for Ruaha, and describe the current health concerns in the park's wildlife. He will describe his ongoing parasite monitoring, research to elucidate the cause and impact of a novel skin disease in giraffe, and describe the next morning's field activities.

### **Fri July 31 – Day 11 (CPA)**

**7:00 am:** Breakfast & pick up pack lunch

**8:00 am -3:00 pm:** *Game drive: survey for giraffe skin disease & buffalo herd counts*

Leaders: Epaphras Alex & Ole Meing'ataki, TANAPA

Participants will split into three groups and drive through different parts of the park to determine the prevalence of skin lesions in giraffe. Counts of affected and unaffected giraffe will be determined and the locations of giraffe recorded using handheld GPS units. Digital photographs of skin lesions will be taken to build a digital library of the disease presentation. Additionally, if buffalo herds are encountered, the location will be recorded, the number of bulls, cows and calves counted, and the body condition of the herd assessed. Participants may input data to create a map of affected and unaffected individuals and buffalo herds.

**3:30 pm:** Tea

**3:30-5:00 pm:** *Giraffe and buffalo counts discussion*

Leaders: Ole Meing'ataki & Epaphras Alex, TANAPA

Each team will give a brief presentation about what was observed on their transects and any findings of interest.

(Time to shower/rest a bit)

**7:00 pm:** Dinner

**7:30-8:30 pm:** *Threats from unmanaged fire in the Ruaha ecosystem*

Presenter: Ole Meing'ataki, TANAPA

Mzee Mbano will describe the impact of fire on the health of the Ruaha ecosystem, and detail WCS and TANAPAs efforts to research the effects of fire and create a fire management regime. Field activities for the vegetation sampling activity will be described.

**Sat Aug 1 – Day 12 Extra day Ruaha\***

**12:30-6:00 pm:** *Vegetation sampling at fire research plots* Leaders: Ole Meing'ataki,

Students will participate in vegetation monitoring of fire research plots as part of an ongoing project to understand the impact of fire on herbivores and vegetation communities.

**3:30-6:45 pm:** Sundowner game drive

**7:00 pm:** Dinner/campfire with park personnel

**Sun Aug 2 – Day 13 Travel RNP to Udzungwa**

**7:00 am:** Breakfast and prepare to leave Ruaha

**8:00 am-4:30 pm:** *Travel from Ruaha to Udzungwa NP* (lunch Tan-Swiss)

**7:00 pm:** Dinner and set up camp

**Mon Aug 3 – Day 14 Udzungwa NP (ZED/POL/HCI)**

$\frac{3}{4}$  Day in Udzungwa (hike plus talks) then travel to SUA for dinner and sleep.

**Tues August 4 – Day 15 (ZED/HCI/FWM)**

**7:00 am:** Breakfast

**8:30-8:45 am:** *Introduction and Welcome to Sokoine University of Agriculture (SUA)*

Presenter: Philimone Wambura, Dean, SUA Veterinary School

**8:45-9:30 am:** *Veterinary Education in Tanzania; roles of public and private sector*

Dominic Kambarage, Deputy Vice Chancellor of Academic Affairs, SUA

Dr. Kambarage will explain the history and current capacity for veterinary education in Tanzania, and the current employment options for the public and private sector. Challenges to delivery of veterinary services and veterinary education will also be discussed.

**9:30-10:15 am:** *Rift Valley Fever: Lessons learned from the 2007 outbreak, health significance & implications of climate change*

Presenter: Rudovick Kazwala, Prof. of Veterinary Medicine & Public Health, Envirovet Tanzania Co-director, SUA

Rift valley fever is a viral disease transmitted by insect vectors commonly affecting animals and humans. The disease occurs following seasonal or non-seasonal rainfall exceeding the normal amount in areas where the virus and insect vectors are available. The importance of the disease arises from the fact that it affects animals and humans causing massive losses directly through deaths and indirectly through reduction of productivity. RVF occurred in Tanzania in 2007 with mortalities in both human and animal populations. Linkage of occurrence of RVF and climatic changes shall be discussed.

**10:15 am:** Tea

**10:45 am-12:00 pm:** *Tour of Sokoine University Veterinary School*

Leaders: SUA vet school staff

Participants will tour the small and large animal clinics, rabies isolation unit, anatomy and pathology facilities, animal areas, instruction facilities and the Mycobacterium laboratory.

**12:30 pm:** Lunch

**2:00-4:00 pm:** *Innovations in disease diagnostics for the developing world: tour and demonstration of APOPO Vapour Detection*

Leaders: Apopo staff

APOPO trains sniffer rats to detect explosives and diagnose disease. This innovative idea has been developed into a competitive technology by a group of Belgian and Tanzanian researchers and animal trainers. Participants will visit the APOPO facility to hear more about this unique program and to see a demonstration of the sniffer rats trained to detect tuberculosis.

**4:00 – 4:50 pm:** *New presentation I: Rabies in Tanzania & the new control initiative-Kazwala or other. ; or Dr. Mfinanga from National Inst. Med Research could talk about TB/BTB and community DOTS Or other option is to visit any Uluguru conservation or reforestation program*

**5:00- 5:50 pm:** **Talk 2;** Kihansi spray toad

**6:30 pm:** Dinner

**7:30-8:30 pm:** *Small Animal Practice and Animal Welfare in Tanzania*

Presenter: Armandus Muhairwa, Senior Lecturer, SUA

Dr. Muhairwa will discuss the current state of companion animal veterinary medicine and welfare in Tanzania. Most common diseases diagnosed in primary cases will be discussed as how they reflect the owner's small animal disease, nutrition and welfare awareness. Animal welfare education at the Faculty of Veterinary Medicine and the need of extending the education to the public as ways of improving welfare and care of small animals belonging to native Tanzanians will also be covered. Experience and input about small animal medicine and welfare from the participants will be invited during the discussion.

**Wed August 5 – Day 16 (FWM)**

**7:00 am:** Breakfast

**8:00 am-12:00 pm: *Focused Sessions on Health and Pollution***

The participants will divide into two groups and rotate through each laboratory.

***Session One - Avian Influenza and Village Poultry Health-Group A***

Instructor(s): Peter Msoffe, Senior Lecturer, SUA & Deana Clifford, UCD WHC

The potential impact of and possible entry points for High Pathogenic Avian Influenza (HPAI) in Tanzania will be discussed. Surveillance limitations for HPAI in developing countries will be addressed, and a new initiative to create Village Biosecurity through improved poultry health will be highlighted. During a hands-on laboratory participants will learn how properly handle chickens, take appropriate biological samples for HPAI testing, how to use and interpret the rapid influenza test, and how to minimize virus contamination during processing for food consumption.

***Session Two – Using biomarkers to assess environmental pollution in Tanzania-Group B***

Instructor: Robinson Mdegela, Senior Lecturer, SUA & Hezron Nonga, PhD Student, SUA

Dr. Mdegela will describe his research assessing biomarkers for pollutants in the widely distributed African sharptooth catfish. Participants will have a chance to work with these catfish and conduct ecotoxicological testing.

**12:30 pm:** Lunch

**2:00-6:00 pm: Session One – Group B and Session Two – Group A**

Groups switch laboratories for the afternoon session.

**7:30 pm:** Special Dinner Out

**Thurs August 6 – Day 17 (FWM/CPA)**

**6:45 am:** Breakfast and prepare to leave SUA

**8:00-11:00 am:** Travel from Morogoro to Dar es Salaam Airport

**12:15 pm:** Flight from Dar es Salaam to Zanzibar

**1:00 pm:** Arrival Zanzibar Airport

**1:00 – 7:00 pm: Orientation** Settle into lodgings and afternoon to rest and explore Stone Town

**Fri Aug 7 – Day 18 (FWM/CPA)**

**7:30 am: Breakfast**

**9:00-9:45 am: *Welcome & Introduction to the Institute of Marine Sciences***

Instructor: Aviti Mmochi, Assistant Research Fellow, IMS

Dr. Mmochi will describe the activities of IMS and the general effect on the ecological, economic and social development of the coastal communities. The Institute has had a long history of interaction with both governments especially on policies and environmental assessment and more recently this has moved

to local communities. A number of small scale ecological and economic initiatives have been developed and some of these are in full scale economic implications stage.

**10:00 am:** Tea

**10:00 -11:00 am:** *Water quality and Marine Pollution in Tanzania*

Presenter: Dr A. Mmochi

The lecture highlights the world status of water, definitions of water quality and marine pollution and the state of pollution in Tanzania. Case studies on the agricultural, sewage and tourism pollution in Zanzibar.

**11:15 am – 12:15 pm:** *Indian Ocean Coral reef ecology and health threats*

Presenter: Christopher Muhando, Assistant Research Fellow, IMS

Dr. Muhando will touch the following themes: Introduction to coral reef environment. Function of coral reefs to coastal ecology and socio-economy of coastal communities. Natural and anthropogenic factors influencing the distribution and health of coral reefs in Tanzania. The 1998 Coral bleaching event and Crown-of-thorns-starfish outbreaks. Coral recovery patterns after the 1998 coral bleaching event. Management of coral reefs. Research and monitoring strategies.

**12:30 pm:** Lunch

**2:00 – 3:15 pm:** *Linkages between terrestrial and marine ecosystem health*

Presenter: Jonna Mazet, UC Davis WHC

**3:15 pm:** Tea

**3:30 - 4:15 am:** *Seaweed Farming*

Presenter: Dr F. E. Msuya

Traditional seaweed farming methods, gender participation, strategies to combat seaweed die-offs and development of new techniques of seaweed farming will be discussed. Innovation of the seaweed industry – using the seaweed in the country and how to increase the production and the future of the seaweed industry.

**4:30-5:15 pm:** *Finfish farming, half pearl production and shell polishing*

Presenter: TBA

A brief introduction of the history of mariculture in Tanzania and the integrated mariculture pond system in Makoba Bay Zanzibar. Case studies on siting, construction, pond management and economics of milkfish farming in Tanzania. The cockle management initiatives, half pearl farming and shell polishing in Fumba Peninsular, Zanzibar, Tanzania.

**7:00 pm:** Dinner

**Saturday Aug 8 – Day 19**

**7:00 am:** Breakfast

**8:00-2:00 pm** *Jozani-Chwaka Bay National Park* (Pack lunch or lunch in field)

Leaders: park guides, WCS program representative

Jozani Forest is the largest remnant of the indigenous forest that once covered the island, and is at the center of the island's only terrestrial nature reserve. The park also contains swamp forest, evergreen thickets, mangroves and salt-tolerant grasslands, and a wide variety of wildlife including, Ader's duiker, suni antelopes, blue monkeys and the endangered Kirk's red colubus monkey (Zanzibar endemic). Participants will hike through this unique area, learn about local conservation efforts and get the chance to see rare species.

**2:30 – 5:00 pm Seaweed farming in Paje village**

Leader: F. E. Msuya, Assistant Research Fellow, IMS

Seaweed farming which was a strong initiative of Prof Keto Mshigeni of the University of Dar es Salaam started in Paje village in Zanzibar Island in 1989. The mainly women livelihood activity has grown to make Tanzania the 3<sup>rd</sup> in combined mariculture production of *Eucheuma denticulatum* and *Kapaphycus alvarezii* and the leading producer in *E. denticulatum*. Dr Msuya has been working with the Tanzanian farmers since 1989 will take you on a tour that will enable you to talk with the farmers and the buyers.

**Sun, August 9<sup>th</sup> –**

***Visiting Bweleo village in Fumba Peninsular***

Leaders: Dr Nariman Jiddawi and Dr A.Mmochi

Participants will see first hand the pearl farming and the shell polishing enterprises and get to ask additional questions.

Return to Stone Town

**5:00 – 6:00 pm: *Envirovet 2008 Course Wrap-Up***

Leader: Val Beasley, Envirovet Director

**7:30 pm: *Special end of course dinner***

**Mon, August 10 – Depart Tanzania**