INFECTIOUS DISEASES OF WILDLIFE

EVPP 460/560
BIOL 460/560
3 Credit Hours

Spring Semester 2021
Lecture: Tuesdays 4:30–7:10 p.m.
Synchronous Online
Blackboard

Instructor Information

Instructor: A. Alonso Aguirre, DVM, PhD
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College of Science
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Course Prerequisite/Co-Requisites

Undergraduate Students: EVPP 301/BIOL308 or BIOL305/306 or EVPP 305/306 or BIOL/EVPP318 AND 60 credit hours; or Instructor's permission.
Graduate Students: Courses on Evolution, Ecology, Zoology or Conservation Biology or permission of instructor.

Required Textbook

No required textbook. Readings for each class will be posted accordingly

Trusted Sources of information for COVID-19

- George Mason University Corona Virus Updates https://www2.gmu.edu/coronavirus
- Virginia Department of Health COVID-19 http://www.vdh.virginia.gov/coronavirus/
- Medical Library Association COVID-19 Resources https://www.mlanet.org/p/cm/ld/fid=1712&source=5
- CDC https://www.coronavirus.gov
- NIH https://www.nih.gov/coronavirus
- Daily COVID19 Health check reminder https://itsapps2.gmu.edu/symptom/Assessments

Student Resources

- The Student Support and Advocacy Center (SSAC) can assist Mason students seek support services and explore healthy lifestyle choices. They offer educational programming, one-on-one consultations, and resources in the areas of interpersonal violence, personal wellness, and alcohol and drug use; they also assist students encountering barriers to personal success.

- This is the calendar of religious holidays and observations. It is your responsibility to speak to Dr. Aguirre in advance should any religious observances affect your participation in class activities and assignments.
- You should be aware of how to report incidents of sexual misconduct to the University Title IX Coordinator. Mason is committed to creating a campus that is free of sexual misconduct and incidents of interpersonal violence in order to promote community well-being and student success.
- Mason has identified a number of other student support resources to facilitate your success in and beyond the classroom. Let me know how can I help promote your learning and well-being.

Instructor/Student Communication
Email Communication. Per university policy, I am only allowed to communicate with students using GMU.EDU email accounts.

Blackboard. All course-related announcements and emails for this course will be sent through Blackboard (BB). If you have a question or a concern about the course, email me using the mail feature in BB. Students should check BB and their e-mail daily. Failure on your part to check BB and e-mail on a regular basis is not an excuse for missed /late assignments or exams. I will respond to e-mails 48 hours upon receipt, Monday through Friday.
Personal Questions or Concerns. If you have personal concerns or an emergency, please contact me directly at aaguirr3@gmu.edu. I am available for meetings by appointment, online, via Blackboard Collaborate.

Ask the Professor – Ask the Professor is a discussion forum for asking me questions about the course that may be on interest to the entire class. If you have questions about a lecture or the project please use "Ask the Professor" forum in the Discussion Board tab on BB, so that your classmates can benefit from my response. There is a tab linking to the *Discussion Board forum* on the left side of the course BB page. You can also access this from the discussion tab. Please allow up to 48 hours for a response to an email.

Course Description
Globalization, habitat loss and fragmentation, the illegal wildlife trade, and other human activities have contributed to the increase of wildlife diseases across the globe. To meet these challenges, more state and federal agencies, organizations, and personnel are required to understand the wildlife-domestic animal-human interface in relation to infectious agents, biosecurity, and potential zoonotic diseases. This course is designed to provide a basic understanding of the fundamental principles of infectious diseases in wildlife, their relationship to species and ecosystems conservation, and their effects on endangered species, domestic animal health and public health.

The course is required for the new MS *Conservation Medicine and Planetary Health* concetration to be available Fall 2021. It will help students applying for veterinary medical school (obtain an upper level biomedical course) and allow those working on wildlife to have better understanding about the impact of disease agents on animals and humans. This course is appropriate for undergraduate students from Biology, Environmental Science and Policy, Public Health, Global Health, Global Affairs among others.

What this course CANNOT do
A single semester course in wildlife diseases cannot impart diagnostic skills or research capacity to address wildlife diseases for an individual. We offer *EVPP/BIOL427/527 Conservation Medicine* and *EVPP490/505 Planetary Health* during the Fall semester to deepen your knowledge in this topic.

However, work that requires diagnostics or research tools must involve trained diagnosticians/researchers, and epidemiologists. For diagnostics, veterinary pathologists with wildlife experience and consultation from experienced wildlife biologists are required. This by no means limits wildlife disease work to individuals with diagnostic training. Wildlife diagnostics is only one part of wildlife disease ecology and may or may not be necessary in all research projects. In fact, the best wildlife disease research is generally done by transdisciplinary teams that include wildlife biologists, population biologists, ecologists, epidemiologists, veterinarians, public health experts, pathologists, toxicologists, microbiologists, parasitologists, modelers, sociologists, anthropologists and others! We hope to emphasize tha with examples for discussion.

The course is not designed as a comprehensive survey of wildlife diseases. It is impossible to discuss all causes of disease but we will review certain disease causing agents, including viruses, prions, bacteria, fungi, protozoa and parasites. We will focus on mammals, birds, reptiles and amphibians and illustrate concepts important to the eco-epidemiological and evolutionary strategies of disease agents and their relationship to host species and the environment. We will emphasize the importance of proper diagnostics and how the biologist can facilitate this. Geographic distribution of selected infectious agents will be global, but emphasis will be on diseases that occur in North America.

Course Objectives and Student Learning Outcomes
During this course, we will examine the causes and mechanisms, pathobiology, ecology, epidemiology and population significance of infectious diseases of wildlife. We will explore methods of diagnosis, control, prevention, and outbreak investigations as they apply to management and conservation of wildlife populations. Also, diseases crossing species barriers will be examined. Students will participate in individual and team assignments in order to be able to:

1. Identify important infectious diseases of wildlife, including diseases transmissible to domestic animals and humans.
2. Understand the evolution of pathogens and their hosts, as linked to environmental conditions.
3. Understand the proximate mechanisms of pathogenesis in wildlife diseases.
4. Describe the epidemiological principles and models of disease spread in wildlife populations.
5. Describe primary methods of diagnosis, prevention, and control of wildlife diseases.
6. Outline a wildlife disease outbreak investigation.
7. Integrate wildlife diseases into principles of wildlife management, conservation, veterinary care and public health.

Basic Course Technology Requirements
Activities and assignments in this course will regularly use the Blackboard learning system, available at https://mymason.gmu.edu. ***Students are required to have regular, reliable access to a computer with an updated operating system*** *(recommended: Windows 10 or Mac OSX 10.13 or higher)* ***and a stable broadband Internet connection*** *(cable modem, DSL, satellite broadband, etc., with a consistent 1.5 Mbps [megabits per second] download speed or higher.* ***Activities and assignments in this course will regularly use web-conferencing software*** *(Blackboard Collaborate / Zoom). In addition to the requirements above,* ***students are required to have a device with a functional camera and microphone****. In an emergency, students can connect through a telephone call, but video connection is the expected norm.*

The Online Learning Environment
It is important that you become familiar with this syllabus, the course requirements, all course policies, and how to navigate in BB including within the online structure unique to this course. Since we do not meet in a classroom, I am not able to provide daily reminders of impending due dates for assignments, and projects. **This is your responsibility.**

Learning Modules - This course is organized into three modules: 1) Introduction to Infectious Diseases of Wildlife, 2) Infectious Disease Dynamics, and 3) Infectious Diseases of Wild Animals. Each module will have the following sections: 1) lecture topics, 2) required readings due before the start of class, 3) descriptions of any activity or assignment that you need to complete, 4) themes throughout the module, and 5) learning objectives students are expected to master within each module. All course materials are available BB. Classes will be based on topics outlined in the schedule, with recorded lecture notes and assignments related to covered material and applied infectious diseases articles.

Course Expectations
Each session will combine lectures, class exercises, and student discussion. As with any cross-listed course (undergrad/grad) offering, ***this will not be an easy course***. The successful student **must read assignments, study supporting materials, and prepare assignments outside of class**. Self-directed study skills are important. Students need to organize material logically and communicate well orally and in writing. ***Sharing*** of materials may be limited by what those materials contain and where they are shared. Sharing of instructor-created materials, particularly materials relevant to assignments or exams, to public online "study" sites is considered a violation of Mason's Honor Code. *Some kinds of participation in online study sites violate the Mason Honor code: these include accessing exam or quiz questions for this class; accessing exam, quiz, or assignment answers for this class; uploading of any of the instructor's materials or exams; and uploading any of your own answers or finished work. Always consult your syllabus and your professor before using these sites.*

Recommended Scientific Journals
EcoHealth https://www.springer.com/journal/10393
Journal of Wildlife Diseases
https://www.wildlifedisease.org/wda/PUBLICATIONS/JournalofWildlifeDiseases.aspx
Jounral of Wildlife Management https://wildlife.onlinelibrary.wiley.com/journal/19372817
*Journal of Zoo and Wildlife Me*dicine https://bioone.org/journals/journal-of-zoo-and-wildlife-medicine
Wildlife Health http://wildlifehealth.org/

Honor Code
The integrity of the University community is affected by the individual choices made by each of us. Mason has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using the appropriate format for this class. A simple listing of books or articles is not sufficient. **Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting.** If you have any doubts about what constitutes plagiarism, please see me.

Projects in this class are designed to be completed within your study group. With collaborative work, names of all the participants should appear on the work. Collaborative projects may be divided up so that individual group members complete portions of the whole, provided that group members take sufficient steps to ensure that the pieces conceptually fit together in the end product. Other projects are designed to be undertaken independently. In the latter case, you may discuss your ideas with others and conference with peers on drafts of the work; however, it is not appropriate to give your paper to someone else to revise. You are responsible for making certain that there is no question that the work you hand in is your own. If only your name appears on an assignment, your professor has the right to expect that you have done the work yourself, fully and independently.

Mason is an Honor Code university; please see the Office for Academic Integrity for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Disability Accommodations

If you are a student with a disability and you need academic accommodations, please notify the instructor and contact the Office of Disability Services (ODS to request accommodations, with appropriate documentation (ds.gmu.edu/forms/).

All academic accommodations must be arranged through the ODS. Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit http://ds.gmu.edu/ for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email:ods@gmu.edu | Phone: (703) 993-2474

Diversity and Inclusion

We seek to create a learning environment that fosters respect for people across identities. ***We welcome and value individuals and their differences, including gender expression and identity, race, economic status, sex, sexuality, ethnicity, national origin, first language, religion, age and ability.*** *We encourage all members of the learning environment to engage with the material personally, but to also be open to exploring and learning from experiences different than their own.*

- The Anti-Racism and Inclusive Excellence Taskforce is continuing to consult with faculty, students, and campus offices to develop resources to support faculty in anti-racist teaching approaches; we encourage you to attend one of the ARIE townhalls this semester. At Mason we remain committed to providing a safe learning, living, and working environment that embraces our diversity and is free from discrimination.

- Mason's Diversity Statement and Mason's Non-Discrimination Policy affirm our belief that student diversity is an invaluable asset for enriching the learning that happens at Mason.

Sexual Harassment, Sexual Misconduct, and Interpersonal Violence
George Mason University is committed to providing a learning, living and working environment that is free from discrimination and a campus that is free of sexual misconduct and other acts of interpersonal violence in order to promote community well-being and student success. We encourage students who believe that they have been sexually harassed, assaulted or subjected to sexual misconduct to seek assistance and support. University Policy 1202: Sexual Harassment and Misconduct speaks to the specifics of Mason's process, the resources, and the options available to students. *As a faculty member and designated "Responsible Employee," I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434) or Counseling and Psychological Services (703-993-2380). You may also seek assistance from Mason's Title IX Coordinator (703-993-8730;* titleix@gmu.edu*).*

COURSE ASSIGNMENTS

All assignments must be submitted through Blackboard NOT email

Class Participation and Readings
Throughout the semester there will be several in exercises that you will need to complete and will count towards your participation grade. The exercises may be offered during each class in class. We will use Blackboard Collaborate Ultra as the platform to split into working groups as required. Discussion of the required class readings will also cout towards patcipation.

Quizzes
Three quizzes will be given throughout the course. These will be timed, but will not be cumulative, and made up of multiple choice, fill in the blank, matching, definitions, and True/False. General questions about the lecture, textbook and class exercises will be fair game. Quizzes will be timed and open notes, a curve may be assigned depending on overall scores, discussing the quiz or sharing information about it is prohibited. ***Quizzes will open on Tuesday after lecture at 7:30 pm and close the following Monday at 6:00 pm.***

Videoclip Exercise
You will develop a 20 min-videoclip with a preassigned team to be presented in class. You will be selecting an ecosystem and you will need to compile required information that will serve as the script of your video. Discuss with your team members the following outline:

- Select your ecosystem, anywhere in the planet
- Information needed about ecosystems:
  - Geographical locations, climate and geological information (soil types, terrain)
  - Key vegetation, insects (possible disease vectors)
  - Key animal species present in the ecosystem (are there especially important species in your local ecosystem?)
  - Present wildlife diseases and zoonosis

  - Emerging infectious diseases
  - Animal migrations?
  - Human population (is it densely/sparsely populated?)
  - Anthropogenic activities (i.e. farming, industry, fishing, tourism, research)
  - Permission to get into locations; if not, who should you ask to get the permission?
- Describe specific disease or management problems linking the health of wildlife-domestic animals-wildlife-ecosystems in the ecosystem you identified
- Storyboard planning (the storyboard is the outline of the content of the video)
  - Decide location of your ecosystem and wildlife species
  - Identify which diseases are relevant for your ecosystem from a conservation medicine/disease ecology viewpoint
  - Decide which disease (and animals) you want to describe in detail (remember you only have 20 minutes, so limit it the a few relevant issues)
  - Briefly, describe the impacts of this/these disease(s) to wildlife, domestic animals, humans and ecosystems
  - Provide information of factors that may lead to the emergence or re-emergence of this disease or impacts on your ecosystem
  - Consider any human-animal-ecosystem bi-directional disease transmission concerns and mechanisms
  - Consider impacts to human, wildlife, livestock and ecosystem health, or concerns from an economic, cultural, environmental perspective
  - Consider if there are any ecosystem management implications of the disease, e.g. habitat use, development issues, vaccine programs, or other mechanisms of control, prevention and proactive intervention of disease ecology and disease outbreaks/die-offs

Disease Information Sheets

Through out the semester a list of diseases* of wild mammals, birds, reptiles and amphibians will be provided and Disease Information Sheets (DIS) will need to be filled for each taxa.
*If you would like to cover a different disease form the ones provided, it will required to be approeved by Dr. Aguirre before hand.

Facts of your DIS need to be referenced by peer-reviewed scientific journsals. The use of web sites as a reference WILL NOT BE ACCEPTED. You should be using primary literature (e.g. peer-reviewed or refereed journal articles and papers) for your authoritative citations. Full references (all authors names, no "et. al.") should be provided in the References section. Citation style may be as follows in ***Science*** **citation format**:

In-text citations: Researchers demonstrated the impacts of disease emergence at the animal-human interface (*1*).

Full Citation:

1. D. R. Murdoch, N. P. French, COVID-19: another infectious disease emerging at the animal-human interface. **133**, 4 (2020).

Final Exam

A take home final exam will be given to pre-assigned teams using a transdisciplinary framework. The primary purpose of this approach is to pool and integrate the team expertise so that more efficient and comprehensive assessment and intervention in a case by case basis. The exam was designed to develop TD thinking and work as a TD team, to be analytic and to develop a sense of how infectious diseases of wildlife are related to biodiversity and its conservation, to domestic animal health and to public health. You must answer all questions as a team as all members of the team will receive the same grade.

DISEASE INFORMATION SHEET
Fact sheet complied by:
Sheet completed on:
Infectious disease:
Susceptible animal groups:
Causative organism:
Zoonotic potential:
Distribution:
Incubation period:
Transmission:
Clinical signs:
Severity:
Post mortem, gross, or histologic findings:
Diagnosis:
Material required for laboratory analysis:
Relevant diagnostic tests available:
Relevant diagnostic laboratories:
Treatment:
Prevention and control:
Zoonotic:
Suggested disinfectant for housing facilities:
Disease notification (agency):
Measures required under the Animal Disease Surveillance Plan:
Measures required for introducing animals to infected animal:
Conditions for restoring disease-free status after an outbreak:
State, federal or international experts who may be consulted:
References (only professional refereed journals or book chapters):

Videoclip Presentation

You will be required to create a videoclip presentation based on on the Storyboard planning you developed earlier. You should work with your group members to provide an introduction & overview your ecosystem, hosts/s[ecies and infectious diseases. Next you should discuss the implications and management issues related to the ecology of the pathogen-host-environment..

The videoclip presentation must look professional. Videoclip will be 20-minutes and 5-10 minutes for questions for a total of **30 minutes**.

Videoclips will be graded on the clarity of the presentation, the professionalism of the video quality, the content of the material covered, and your ability to answer questions posed by classmates and instructor. Each topic below will get a score ranging from **1** (poor), **2** (good), **3** (very good) **4** (excellent)

Literature Review: Scope of information gathering
Scientific knowledge: How accurate is the information presented
Management Implications: All presentations should address *at least* 3 of the following areas:

a) Effects of an infectious disease in wildlife species and populations, and their impact on domestic animal and human health
b) Economic perspectives
c) Cultural perspectives
d) Socioeconomic perspectives
e) Environmental policy angle
f) Perspectives from the development, agriculture, and conservation
g) Solutions to the problems outlined

Conclusions: Conclusions are sound and supported by data.
Style: Delivery is clear and audible with proper elocution.
Time: Videoclip adheres strictly to time limit.

Grading Criteria
The total grade received for this course will be based on the following assignments and assessments:

Activity	EVPP 460/BIOL 460 % Contribution to Total Grade	EVPP 560/BIOL 560 % Contribution to Total Grade
Class participation	10%	10%
Extra readings	-	10%
Quizzes (3)	30% (10% each)	15% (5% each)
Videoclip Story Board	15%	20%
Disease Information Sheets	-	15% (5% each)
Final Exam	25%	20%
Videoclip Presentation	20%	10%
TOTAL	**100%**	**100%**

The final grade for *undergraduate students* will be based on this scale: A = 100–93%, A- = 92-90%, B+ = 89-86%, B=85-83, B- = 82-80%, C = 79–70%, D = 69–60%, F < 59%. **A CURVE WILL NOT BE APPLIED.**

CLASS SCHEDULE

Week	*Date*	*Topic*
Introduction to Infectious Diseases of Wildlife		
1	01/26	Introduction to the course: syllabus, assignments, expectations
		Why infectious diseases of wildlife?
2	02/2	SARS-CoV-2 the etiological agent of COVID19: case study
		Wildlife pathology and specimen collection/shipping
3	02/9	Infectious diseases of wildlife: Basic principles
		Case Study: Saiga antelope mass mortality event ***Quiz 1***
4	02/16	Globalization and the wildlife trade
		Forensic techniques: CSI for wildlife
5	02/23	Mechanical and chemical immobilization
		Stress & veterinary emergencies. P-Horse class exercise
Infectious Disease Dynamics		
6	03/2	Pathogens
		Hosts ***Quiz 2***
7	03/9	Ecology
		Epidemiology
8	03/16	Vaccination
		Control Mechanisms
9	03/23	Emergence
		Global Health ***Quiz 3***
Infectious Diseases of Wildlife		
10	03/30	Infectious diseases of wild mammals ***Final Exam Available***
11	04/6	Infectious diseases of wild birds ***Disease Sheet Due: Mammals***
12	04/13	Infectious diseases of reptiles and amphibians ***Disease Sheet Due: Wild Birds*** ***Videoclip Board Due***
13	04/20	Wildlife disease surveillance; disease control operations; euthanasia ***Disease Sheet Due: Reptiles and Amphibians***
14	04/27	***Videoclip Presentations*** ***Final Exam Due***

*In addition to the articles for each session, all graduate students are required to read ***two extra preselected, refereed papers*** listed below that need to be discussed in class.

REQUIRED READINGS (Undergraduate students please read references in BOLD):

Week 1:

Rogall G.M. and J.M. Sleeman. The USGS National Wildlife Health Center: Advancing Wildlife and Ecosystem Health. USGS, Madison, Wisconsin, 6 (2016).

Stephen C. Toward a modernized definition of wildlife health. Journal of Wildlife Diseases 50:427-430 (2014).

Stephen, C. Wildlife Health 2.0: Bridging the knowledge-to-action gap. Journal of Wildlife Diseases 53:1-4 (2017).

Week 2:

Franson, J.C., Friend, M., Gibbs, S.E.J., and Wild, M.A. (eds.) Field manual of wildlife diseases: U.S. Geological Survey Techniques and Methods 15, variously paginated, *https://dx.doi.org/10.3133/tm15*. ISSN 2330–7055 (online) (2015)
Read: Chap A, A1, C3 & C4

McNamara T.S. Wildlife pathology studies and how they can inform public health. ILAR Journal 56:306-311 (2015).

OIE and IUCN -SSC & WHSG. Guidelines for Working with Free-Ranging Wild Mammals in the Era of the COVID-19Pandemic, 25 August (2020) http://www.iucn-whsg.org/sites/default/files/En_WHSG%20and%20OIE%20COVID-19%20Guidelines_0.pdf

Week 3:

Fereidouni S., G.L. Freimanis, M. Orynbayev, P. Ribeca, J. Flannery, D.P. King. Mass die-off of Saiga antelopes, Kazakhstan, Emerg. Infect. Dis. 25:1169-1176 (2015).

Kock R. Drivers of disease emergence and spread: Is wildlife to blame? Onderstepoort Journal of Veterinary Research 81 (2014).

Kock R., M. Orynbayev, S. Robinson, S. Zuther, N. Singh, W. Beauvais. Saigas on the brink: multi-disciplinary analysis of the factors influencing mass mortality events. Sci Adv. 4:eaao2314 (2018).

Week 4:

Aguirre A.A., R. Catherina, H. Frye and L, Shelley. Illicit wildlife trade, wet markets and COVID-19: Preventing future pandemics. World Medical & Health Policy (2020).

Aguirre A.A., M.L. Gore, M. Kammer-Kerwick, K.M. Curtin, A. Heyns, W. Preiser, and L.I. Shelley. The intersectionality of illegal wildlife trade and emerging zoonotic pathogens poses biosecurity risks. Frontiers in Ecology and Evolution doi: 10.3389/fevo.2021.604929 (2021)

Gomez, A. and A. A. Aguirre. Infectious diseases and the illegal wildlife trade. Animal Biodiversity and Emerging Diseases: Annals of the New York Academy of Sciences 1149:16-19 (2008).

Week 5:

Arnemo, J.M., Ahlqvist, P., Andersen, R., Berntsen, F., Ericsson, G., Odden, J., Brunberg, S., Segerström, P. and Swenson, J.E.. Risk of capture-related mortality in large free-ranging mammals: experiences from Scandinavia. – Wildlife Biology 12:109-113 (2006).

Dickens, M.J., D.J. Delehanty, and L.M. Romero. Stress: An inevitable component of animal translocation. Biological Conservation 143:1329-1341 (2010).

Kock, R.A., M.H. Woodford, and P.B. Rossiter. Disease risks associated with the translocation of wildlife. Rev sci tech Off int Epiz 29:329-350 (2010).

Week 6:

Brearley, G., J. Rhodes, A. Bradley, G. Baxter, L. Seabook, D. Lunney, Y. Liu, and C. McAlpine. Wildlife disease prevalence in human-modified landscapes. Biological Reviews (2012).

Belsare, A.V., A.T. Vanak, and M.E. Gompper. Epidemiology of viral pathogens of free-ranging dogs and Indian foxes in a human-dominated landscape in central India. Transboundary and Emerging Diseases 61(S1):78-86 (2014).

Azab, W., A. Dayaram, A.D. Greenwood, and N. Osterrieder. Annual Review of Virology How Host Specific Are Herpesviruses? Lessons from Herpesviruses Infecting Wild and Endangered Mammals. Ann. Rev. Virol. 5:53–68 (2018).

Week 7:

Chauvenet, A.L.M., S.M. Durant, R. Hilborn, and N. Pettorelli. Unintended consequences of conservation actions: managing disease in complex ecosystems. PLoS ONE 6(12): e28671 (2011).

Tompkins, D.M., S. Carver, M.E. Jones, M. Krkošek, and L.F. Skerrat. Emerging infectious diseases of wildlife: a critical perspective. Trends in Parasitology 31:149-159 (2015).

Wallace RM, Gilbert A, Slate D, Chipman R, Singh A. Right place, wrong species: A 20-year review of rabies virus cross species transmission among terrestrial mammals in the United States. PLoS ONE 9(10): e107539 (2014).

Week 8:

Bienen, L., and G. Tabor. Applying an ecosystem approach to brucellosis control: can an old conflict between wildlife and agriculture be successfully managed? Front Ecol Env 4(6):319–327 (2006).

Roeder, P., J. Mariner, and R. Kock. Rinderpest: the veterinary perspective on eradication. Phil Trans R Soc B 368:20120139 (2013).

Uehlinger F.D., A.C. Johnston, T.K. Bollinger and C.L. Waldner. Systematic review of management strategies to control chronic wasting disease in wild deer populations in North America BMC Veterinary Research 12:173 (2016).

Week 9:

Aguirre, A. A. and G. M. Tabor. Global factors driving emerging infectious diseases: Impact on wildlife populations. Animal Biodiversity and Emerging Diseases: Annals of the New York Academy of Sciences 1149:1-3 (2008).

FAO. Global emergence of infectious diseases: links with wild meat consumption, ecosystem disruption, habitat degradation and biodiversity loss.Rome. https://doi.org/10.4060/ca9456en (2020).

Gallana M., M.-P. Ryser-Degiorgis, T. Wahli, and H. Segner. Climate change and infectious diseases of wildlife: altered interactions between pathogens, vectors and hosts. Current Zoology 59:427-437 (2013).

Week 10:

Aguirre A. A. and E. E. Starkey. Wildlife disease in U.S. national parks: historical and coevolutionary perspectives. Conservation Biology 8:654-661 (1994).

Aguirre, A. A. Parasitic diseases in wildlife and domestic animals: new trends of disease emergence. *In* P.C. Lefevre, J. Blancou, R. Chermette, and G. Uilenberg (eds.). Infectious and Parasitic Diseases of Livestock 1: General Considerations. Viral Diseases. Lavoisier, France, pp. 73-77 (2013).

White R.J. and O. Razgour. Emerging zoonotic diseases originating in mammals: a systematic review of effects of anthropogenic land-use change. Mammal Review 50:336–352 (2020)

Week 11:

Marra, P. et al. West Nile virus and wildlife. BioScience 54:393-402 (2004).

Samuel, M.D., B.L. Woodworth, C.T. Atkinson, P.J. Hart, and D. LaPointe. Avian malaria in Hawaiian forest birds: infection and population impacts across species and elevations. Ecosphere 6 (6):104-121 (2015).

Yasue M., C.J. Feare, L. Bennun and W. Diedler. The epidemiology of H5N1 avian Iinfluenza in wild birds: Why we need better ecological data. Bioscience 56:923-929 (2006).

Week 12:

Aguirre, A. A. and P. Lutz. Sea turtles as sentinels of marine ecosystem health: is fibropapillomatosis an indicator? EcoHealth 1:275-283 (2004).

Eskew, E.A. and B.D. Todd. Parallels in amphibian and bat declines from pathogenic fungi. Emerging Infectious Diseases 19(3):379-385 (2013).

Kolby J.E. and P. Daszak. The Emerging Amphibian fungal disease, chytridiomycosis: A key example of the global phenomenon of wildlife emerging infectious diseases. Microbiol Spectrum 4(3):EI10-0004-2015 (2016).

Week 13:

Grogan, L.F., L. Berger, K. Rose, V. Grillo, S.D. Cashins, and L.F. Skerratt. Surveillance for emerging biodiversity diseases of wildlife. PLoS Pathogens 10(5): e1004015 (2014).

Sleeman J. M.; C.J. Brand, and S.D. Wright. Strategies for wildlife disease surveillance. *In*: A. A. Aguirre, R. S. Ostfield, and P. Daszak (eds). New Directions in Conservation Medicine: Applied Cases in Ecological Health, Oxford University Press, New York (2012).

Watsa M. and the Wildlife Disease Surveillance Focus Group. Rigorous wildlife disease surveillance. Science 369 (6500):145-147 (2020)

Week 14:

Final PPT Presentations