

# EcoHealthNet 2.0 2019 Research Exchange Project Descriptions

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| Project Title  | Host Organization  | Graduate Level | Openings | Project Description  | Location (City,Country) | SKILLS  |
|--|--------------------|----------------|----------|--|-------------------------|---|
| Analyzing wildlife trade dynamics into the United States                       | EcoHealth Alliance | Undergraduate  | 1        | EcoHealth Alliance (EHA) requests an EcoHealth Net researcher to assist in analyzing legal wildlife trade into the United States. The researcher will work with EHA scientists to analyze trade patterns for selected taxonomic group and/or regions into the United States, working primarily with data from the WildDB wildlife trade database. The research will focus on imports with risks for zoonotic disease, veterinary disease, or areas of high importance in wildlife trade. The researcher will participate in this work through data analyses and literature reviews and will be mentored in descriptive statistics, modeling, and programming. The researcher will be working with a multidisciplinary team focused on reducing the risks to humans and animals from the wildlife trade.  | New York, NY            | The candidate should have strong writing skills, basic statistics or analysis skills, and experience data cleaning or data processing and in analyzing scientific literature. Basic knowledge of the R programming language is desirable, and a background in biology or ecology and interest in zoonotic diseases is preferred.  |
| Merging economics and ecology to nudge bat conservation in Sulawesi, Indonesia | EcoHealth Alliance | Graduate/PhD   | 1        | EcoHealth Alliance (EHA) requests an EcoHealth Net researcher to participate in a project that links conservation biology, economics and public health in Sulawesi. The researcher will work with EHA scientists to integrate data from a multi-disciplinary, international collaboration to analyze and generate demographic models of bats and the impact of bat hunting and bat consumption on these populations. Some of the work the researcher will be involved in is modeling the optimal bat hunting patterns to maximize social welfare and reduce the environmental impact and health risks. The researcher will develop a dynamic optimization model to determine the most economically optimal long-term path for sustainable development. The researcher will participate in this work through data analysis and modeling simulation. The researcher will be mentored in advanced skills on economic modeling and data science. The researcher will be embedded in a multidisciplinary research environment, and be expected to participate in meetings and research discussions.   | New York, NY            | The candidate should have strong data interpretation and writing skills, have completed graduate-level coursework in optimal control theory, economic modeling, statistics, and have experience using the R programming software. The candidate should also have interest and knowledge of environmental and natural resources economics, and infectious diseases.  |
| Land Use Change as a Driver of Emerging Infectious Diseases                    | EcoHealth Alliance | Graduate       | 1        | EcoHealth Alliance (EHA) requests an EcoHealth Net researcher to participate in work modeling the spatial-temporal dynamics of land use decisions in West Africa. The researcher will work with EHA scientists to integrate data from a multi-disciplinary, international collaboration to develop ways to understand the links between land use change and disease emergence. Historically, the lack of high resolution and accurate land cover maps has impeded efforts to spatially plan and manage land use over large extents. The researcher will assist the spatial modeling team in incorporating satellite imagery (e.g. Sentinel and NASA's new ECOSTRESS sensor), to create a high-resolution land classification scheme for Liberia that better distinguishes between different types of forest cover and agricultural uses. The researcher will support team efforts to incorporate remote sensing data into a classification scheme and spectral library. The resulting classification will be used to examine how changes in land cover driven primarily by deforestation and conversion to agriculture impact infectious disease emergence in Liberia. The researcher may also participate in creating a spatial model that links and predicts infectious disease incidences as they relate to land use policy at the national level. The researcher will be mentored in advanced skills on spatial modeling. The researcher will be embedded in a multidisciplinary research environment and be expected to participate in meetings and research discussions. | New York, NY            | The candidate should have strong data interpretation and writing skills, have completed graduate-level coursework in spatial analyses, GIS, and remote sensing. The candidate should have experience in R programming language. Familiarity with the Google Earth Engine platform is recommended but not required. The candidate should also have interest or experience in disease ecology, land use change and sustainable development. |
| Economic-Ecological Modeling of Land Use Change in Liberia                     | EcoHealth Alliance | Graduate/PhD   | 1        | EcoHealth Alliance (EHA) requests an EcoHealth Net researcher to participate in work conducting economic-ecological modeling of the spatial-temporal dynamics of land use decisions in Liberia. The researcher will work with EHA scientists to integrate data from a multi-disciplinary, international collaboration to produce models and predictions of emerging infectious diseases and its links to land use change. The researcher will participate in a project to model how much land should be converted to a given commodity and where this development should occur to reduce the environmental and health impact, and to maximize agricultural yield. The researcher will also participate in modeling future scenarios of land use under different forecasts of commodity yield, production profits, and ecosystem services value to determine the most economically optimal long-term path for sustainable development. The researcher will participate in this work through modeling simulation, data analyses, and literature reviews. The researcher will be mentored in advanced skills on spatial and economic modeling and data science. The researcher will be embedded in a multidisciplinary research environment, and be expected to participate in meetings and research discussions.   | New York, NY            | The candidate should have strong data interpretation and writing skills, have completed graduate-level coursework in optimal control theory, economic modeling, statistics, and have experience using the R programming software. The candidate should also have interest and knowledge of environmental and natural resources economics, and infectious diseases.  |

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| Statistical phylogenetic inference of epidemic and pandemic RNA viruses   | University of Georgia, USA                                      | Graduate               | 1 | <p>Comparative genomic analysis of viral sequences has become central to disease epidemiology, ecology and evolutionary studies. The recent advances in computational analysis of genomic data has had a profound impact on emerging infectious disease studies and a growing influence on pandemic preparedness and response. This presents a unique opportunity to incorporate new types of data and new methodologies into research on RNA viruses with pandemic potential. This project aims to explicitly unify molecular evolution of RNA viruses with disease surveillance efforts/viral ecology, pathogenesis and host response to address the following research priorities:</p> <ul style="list-style-type: none"> <li>• Integration of ecological and phenotypic data for hypothesis testing (Objective 1)</li> <li>• Epidemiological and evolutionary dynamics of human influenza (Objective 2)</li> <li>• Evolution and transmission in livestock (Objective 3)</li> <li>• Phylogeography and epidemiology in natural reservoirs (Objective 4)</li> <li>• Interspecies transmission and disease emergence (Objective 5)</li> </ul> <p>Training in the Bahl Lab includes skills necessary for management of genomic data, integration of meta-data and bias assessment, statistical phylogenetic model development, figure preparation and interpretation study results. The trainee will develop statistical methods and models to estimate ecological and epidemiological correlates of association with viral evolution and diversification. The outcomes from these objectives, and the expertise and capabilities developed, will also be useful more broadly for the ongoing evaluation of surveillance studies data to identify emerging hotspots and the prediction of risk of zoonotic disease emergence</p> | Athens, GA, USA                | Basic scripting, experience with phylogenetic analysis  |
| Comparative gut microbial community composition of Chagas disease vectors | University of Georgia, USA                                      | Undergraduate/Graduate | 1 | <p>Work in the Gottdenker lab is broadly focused on understanding how anthropogenic changes affect disease transmission in throughout Panama. One PhD student in the lab is studying the wild gut microbiome of two triatomine species found across a deforestation gradient and across several locations in Panama. This Ecohealth project will explore the gut microbiota of triatomine species that are vectors of Chagas disease. Chagas disease, caused by the protozoan parasite <i>Trypanosoma cruzi</i> and spread via hematophagous triatomine bugs, is responsible for millions of infections and mortalities every year throughout Latin America.</p> <p>In collaboration with the University of Panama, we have 5 species of laboratory-reared triatomines, including a species that was recently added to the laboratory, and this project will be focused on two main aims: 1) exploring whether there are species-specific or genus-specific core gut microbiomes and 2) examining the effects of laboratory-reared practices on the gut microbiome of a triatomine species. Students will learn how to apply next-generation sequencing and bioinformatics approaches to the study of vector-borne zoonotic diseases.</p>   | Athens, GA, USA                | experience with DNA extraction and amplification  |
| Consequences of immune phenotype for coinfection outcomes                 | University of Georgia, USA & Kruger National Park, South Africa | Undergraduate/Graduate | 1 | <p>The Ezenwa lab at the University of Georgia seeks an EcoHealth Net researcher to participate in our study of helminth-tuberculosis coinfection dynamics in African buffalo. The student's project will focus on understanding how variation in individual immune phenotypes contributes to differential tuberculosis outcomes. The student will work with Ezenwa lab members to collect infection and immunity data in the field, perform laboratory assays, and then use statistical approaches to characterize individual immune phenotypes. The field data collection phase of this project will take place in Kruger National Park, South Africa, while laboratory work and data analysis will occur at the University of Georgia, USA. The student will work with a multidisciplinary team of researchers and develop skills in immunology, histopathology, disease ecology and data analysis.</p>  | Athens, GA, USA & South Africa | The candidate should have an interest and some knowledge of immunology and/or infectious diseases, previous experience conducting independent research and working in a laboratory environment, and the ability to work under difficult field conditions in a remote location.                                      |
| Modeling Dynamics of Rift Valley Fever                                    | EcoHealth Alliance  | Graduate               | 1 | <p>EcoHealth Alliance (EHA) requests an EcoHealth Net researcher to participate in work modeling the dynamics of the wildlife-livestock-human Rift Valley fever (RVF) system in South Africa. The researcher will work with EHA scientists to integrate data from a multi-disciplinary, international collaboration to produce models and predictions RVF outbreaks and understand the drivers of RVF dynamics. They will work with data from monitoring of climate, mosquito populations, livestock and human population health, and/or farmer behavior. The researcher will participate in this work through data analyses, simulation modeling, and literature reviews. The researcher will be mentored in advanced skills in epidemiological modeling and data science. The researcher will be embedded in a team in a dynamic and multidisciplinary research environment, and be expected to participate in meetings and research discussions. Preference will be given to students that can complete their 6-12 weeks before the end of July.</p>   | New York, NY                   | The candidate should have strong data interpretation and writing skills, have completed graduate-level coursework in statistics and/or epidemiological or ecological modeling, and have experience using the R programming knowledge. The candidate should have interest and some knowledge of infectious diseases. |

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| Factors influencing plague dynamics in black-tailed prairie dogs                    | EcoHealth Alliance   | Graduate               | 1 | Sylvatic plague, caused by the bacterium <i>Yersinia pestis</i> and vectored by fleas, is preventing recovery of endangered black-footed ferrets ( <i>Mustela nigripes</i> ) and conservation of prairie dogs ( <i>Cynomys</i> spp.) on which they depend for habitat and as prey. How and where plague is maintained in the environment between epizootics—which can eliminate entire prairie dog colonies—is very poorly understood. Extensive and varied data sets exist (e.g., periodic prairie dog colony mapping from 1992 to present), analysis of which could lead to a better understanding of plague dynamics at both a landscape scale and perhaps within individual colonies. Maps of prairie dog burrow openings for many colonies over several years are available, along with associated assessments of fleas on prairie dogs at known locations. These and other data sets could be cleaned, combined, and re-examined from a unique perspective using ideas and approaches from prior evaluation of plague dynamics associated with great gerbils ( <i>Rhombomysopimus</i> ) in Kazakhstan. Based in New York City, the student will advance skills using numerous platforms to manipulate and analyze geographic data (ArcGIS, QGIS, R); learn analysis methods suitable for long-term data; learn to compile and review ecological data in standard formats; and learn to organize, in conjunction with supervisor, weekly activities to achieve primary goals.   | New York, NY               | Geographical Information System, data compilation and modelling experience, R/Python code.   |
| Detecting and Managing Plague in Support of Endangered Black-footed Ferret Recovery | Smithsonian Conservation Biology Institute (SCBI) and the U.S. Fish and Wildlife Service (FWS) | Undergraduate/Graduate | 2 | Sylvatic plague, caused by the bacterium <i>Yersinia pestis</i> and vectored by fleas, is preventing recovery of endangered black-footed ferrets ( <i>Mustela nigripes</i> ) and conservation of prairie dogs ( <i>Cynomys</i> spp.) on which they depend for habitat and as prey. Controlling fleas with insecticides infused into prairie dog burrows has been shown to prevent plague, but is expensive, labor intensive to apply, and fleas can develop resistance. We propose to evaluate a new method and product to control fleas with by oral delivery of a bait containing small amounts of fipronil to prairie dogs. This new product and distribution system (invented by Randy Matchett) has shown 90-100% flea control for 1-2 months in pilot studies conducted during 2018 in 3 states. If effective over longer time frames, the costs for flea control to prevent plague over large areas (thousands of hectares) could be reduced by 90% and provide a mechanism to minimize development of resistance in fleas. The intern will learn to how to design a field study with manipulation; learn to trap and handle wild animals (capture recapture methodology) as well as other field techniques; learn how to analyze data collected from the field; learn to compile and review ecological data in standard formats; learn to coordinate with field team to execute assigned tasks; and learn to organize, in conjunction with supervisor, weekly activities to achieve primary goals.   | Montana, USA               | Work in a remote location, enjoy being outdoors in all weather conditions, and be prepared for long field days. Ability to engage within a team environment with staff and other interns and volunteers  |
| Understanding the Risk of Bat-Borne Zoonotic Disease Emergence in Western Asia      | EcoHealth Alliance   | Undergraduate/Graduate | 1 | The project aims to characterize the diversity and distribution of bats and bat-associated coronaviruses to identify ecological and environmental correlates of increased zoonotic disease risk in Western Asia. EcoHealth Alliance (EHA) requests an EcoHealth Net researcher to participate in project activities, specifically collecting diagnostic samples from wild-caught bats and characterizing bat-human interactions at sampling sites, but also to develop an independent research project that aligns with the aim of the project that can be completed in 6-8 weeks. Example projects could include, but are not limited to, recording and analyzing echolocation calls that contribute to the development of a regional call library, assessing physiological health of captured bats using blood smears and/or handheld diagnostic units, and collecting and identifying ectoparasites to identify parasite-host relationships across different bat species. The researcher will gain skills in non-lethal surveillance of bat-associated pathogens and working collaboratively as part of a multidisciplinary, international research team.   | New York, NY; Western Asia | The candidate should have prior field work experience, with international field work experience a plus, and an interest in bats. The candidate will be required to have (or a willingness to get) a valid passport and the pre-exposure rabies vaccine series. |
| OneHealth Economic analysis of zoonotic diseases in Bangladesh                      | EcoHealth Alliance   | Graduate               | 1 | EcoHealth Alliance (EHA) requests an EcoHealth Net researcher to participate in work analyzing the economic impact of four zoonotic disease (Anthrax, Rabies, Nipah, Avian influenza) in Bangladesh. The researcher will work with EHA scientists to identify and characterize medical expenditures and secondary economic losses related to zoonotic diseases among households, the private sector, the government, and the general population. They will integrate these multi-sectoral data to estimate the cost per zoonotic disease case to various economic sectors (e.g., health, livestock, and environment) and to society as a whole. A better understanding of sectors affected and magnitude of zoonotic disease impacts can help inform national and sub-national government budgetary decision making and the development of multi-sectoral, 'One Health' solutions (i.e., those that view human health, animal health, and the environment as connected) to address zoonotic disease threats. The study will help us to better understand the economic impacts of zoonotic disease as well as better define what the costs are composed of to guide more detailed research in the future. The primary goals of the study are to understand the economic impacts of zoonotic disease in Bangladesh and the distribution of those effects across various sectors using a survey standardized for each of the four target populations. Data will be analyzed for each of the four diseases and the economic cost of each will be estimated by extrapolating costs per household, business and members of the general population. The researcher will participate in this work through data collection, analyses, and literature reviews. The researcher will be mentored in advanced skills in epidemiological data science. The researcher will be embedded in a team in a dynamic and multidisciplinary research environment, and be expected to participate in meetings and research discussions. | Dhaka, Bangladesh          | The candidate should have strong data interpretation and writing skills, have completed graduate-level coursework in statistics and/or epidemiology. The candidate should have interest and some knowledge of these four zoonotic diseases.                    |

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| Modelling of Transmission of Arboviruses in Primate Populations   | University of California Davis, CA   | Undergraduate/ Graduate | 2 | <p>The EcoHealth Net researcher will participate in the development of models describing the dynamics of the arboviruses in Primates populations. The researcher will work with scientists at the EpiCenter for Disease Dynamics to collect baseline data required for parameterizing mathematical models, conceptualizing compartmental models to predict spread of viruses such as Zika virus and Yellow Fever virus in Primates. The researcher will contribute to development of a dataset of transmission parameters and clinic-pathological features of arboviral infections in primates. The researcher will develop and assist in simulation of mathematical models based on the natural history of arboviral infection, viral ecology in mosquito vectors, and primate population dynamics. The researcher will be mentored in advanced skills in mathematical modeling and epidemiology of emerging and re-emerging infectious diseases. The researcher will participate in regular research activities with the EpiCenter for Disease Dynamics through lab-wide meetings and will be expected to participate in discussions and present their research progress.</p>   | Davis, CA, USA                             | some familiarity with R or Python programming language, knowledge of disease ecology, or pathology will be preferred.  |
| Tracking AMR at a high risk wildlife-livestock-human interfaces in Bangladesh using a One Health approach | Institute of Epidemiology, Disease Control & Research (IEDCR) & Bangladesh Livestock Research Institute (BLRI) | Graduate                | 1 | <p>Institute of Epidemiology, Disease Control &amp; Research (IEDCR), Dhaka, Bangladesh and Bangladesh Livestock Research Institute (BLRI) requests an EcoHealth Net researcher to track antimicrobial resistance (AMR) at a wildlife-livestock-human interface using a One Health approach in Dhaka, Bangladesh. The researcher will work with IEDCR and BLRI scientists to identify the resistant organisms, resistance pattern, and molecular characterization of resistance genes and to investigate interspecies pathogen sharing of resistant organisms. The candidate will collect samples from wildlife (rhesus macaque), livestock and humans for laboratory analysis. The candidate may also help collect ecological and behavioral data to identify risk factors for AMR pathogen infection and potential interspecies transmission of resistant organisms. This project may include: a literature review, data analysis, and/or GIS spatial analysis. The candidate will be mentored in microbiological and epidemiological sciences. The candidate will work with a team in a dynamic and multidisciplinary research environment, and be expected to take part in meetings and research-oriented discussions.</p>  | Dhaka, Bangladesh                          | The candidate should have strong data interpretation and writing skills, have completed graduate-level coursework in epidemiology or microbiology or One Health and have experience using statistical software preferably in R. The candidate should have interest and some knowledge on antimicrobial resistance.                           |
| Antimicrobial resistance and residue in livestock and poultry food products and feed in Bangladesh        | One Health Institute, Chittagong Veterinary and Animal Sciences University                                     | Graduate                | 1 | <p>The increasing use of antimicrobials in humans and animals in Bangladesh has the potential to develop resistance to these drugs. The spread of antimicrobial resistance among humans cannot be dissociated in presence of resistant microbes with resistance-encoding genes in animals, food chain, and environment. The project is aimed to assess the present scenario of the antimicrobial drug residues in food products and feeds with antimicrobial resistance pattern of isolated pathogens with resistant gene detection. Milk, meat, and egg samples will be collected at different stages of production chain to determine the current status of antibiotic residue in animal originated food for humans. Samples from cattle, goats and poultry will be collected for isolation of resistant bacteria followed by identification of resistant gene. The researcher will partly be participating in sample (animal originated food) and data collection procedure and later on will be working in the laboratory to determine the antibiotic residue in different raw and processed food products followed by data entry and analysis. The candidate will get the opportunity to learn the use of TLC and HPLC techniques in determining the residue. The researcher will be working with a very experienced team and will have the opportunity to attend seminars, meetings and group discussions within the group.</p> | Chittagong, Bangladesh                     | The candidate should have strong epidemiological background of data collection, data entry and analysis using STATA or SAS. The candidate should have some experience of sample collection and preservation at laboratory. The candidate should have some knowledge of microbial agents (especially bacteria) and antibiotics.               |
| Environmental correlates of botulism outbreaks  | The U.S. Geological Survey's National Wildlife Health Center (NWHC)  | Graduate                | 1 | <p>Avian Botulism, caused by a naturally occurring toxin produced by the bacterium Clostridium botulinum, is a widespread disease affecting waterfowl across the US. Warm temperatures combined with decomposing vegetation and the presence of invertebrates provide ideal conditions for the botulism bacteria to activate and produce toxin. A risk model for Avian Botulism can be developed using data from the NWHC archives as well as peer-reviewed literature, providing a predictive tool for wildlife managers to know when the conditions are right for large-scale botulism outbreaks.</p>   | Madison, WI                                | GIS and non-linear statistics  |
| Characterizing human-wildlife interactions & risk of viral infection in Bangladesh                        | EcoHealth Alliance & Institute of Epidemiology, Disease Control & Research (IEDCR)                             | Graduate                | 1 | <p>Nipah virus is a bat-borne zoonotic virus that causes seasonal outbreaks of encephalitis in Bangladesh. The primary route of transmission is from raw date palm sap contaminated by bat saliva or urine. In Bangladesh, people hunt and eat bats, and while this has not been a significant risk factor for Nipah infection, the extent to which people are exposed to bat-borne pathogens via hunting is unknown. Further, the extent to which hunting occurs in eastern Bangladesh, where zoonotic disease surveillance is more limited, is unknown. The aim of this project is to characterize human-wildlife interactions, particularly bat hunting, in eastern Bangladesh and compare it to existing hunting data from western Bangladesh.</p> <p>The researcher will work with behavioral risk scientists at EHA headquarters and IEDCR in Bangladesh to characterize the distribution and magnitude of wildlife hunting in eastern Bangladesh to develop a spatially explicit comparative risk model for exposure to wildlife based on wildlife hunting. This project will involve primary field data collection in Bangladesh and data analysis in Bangladesh and New York.</p>  | Dhaka, Bangladesh (6 weeks) & New York, NY | Applicant should have some academic background in social sciences and/or epidemiology. Previous international work experience is beneficial and should be emphasized in their application. Must have the utmost respect for cultural and social differences, a desire to work in resource limited settings, and strong communication skills. |

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| Cyanobacterial abundance and potential toxin concentrations in benthic habitats in the tidal Potomac River | George Mason University  | Graduate                   | 1 | Potomac Environmental Research and Education Center (PEREC) has been conducting research on algal communities in the tidal Potomac River for over 3 decades. We have made significant progress in reducing eutrophication and excess phytoplankton populations in by controlling point source pollution. As water clarity has improved, aquatic macrophytes have reestablished themselves improving the overall health of the ecosystem. However, recently benthic algae have become more important and many of these are cyanobacterial species. We plan to initiate field and lab studies to measure the biomass and activity of these benthic algae and examine samples for potential toxins.  | Fairfax, VA, USA | The candidate should have experience in field and lab methods for aquatic ecology. The candidate should be comfortable working on boats. The candidate should be a team player who works well with others.   |
| Vector-borne disease surveillance in Kenya   | Mpala Research Centre, Laikipia, Kenya, George Mason University, & Smithsonian Global Health Program | Undergraduate/<br>Graduate | 2 | George Mason University, the Smithsonian Global Health Program, and the Mpala Research Centre have an ongoing collaboration to investigate emerging vector-borne diseases within the Laikipia region of Kenya. We request support for two graduate students to travel and work in Laikipia for 8-12 weeks, one student to focus on mosquito surveillance the other to focus on ticks. Over 17% of emerging infectious diseases are vector-borne, thus it is critical that we have trained research staff, who understand both proper field and epidemiological methods to conduct surveillance for emerging pandemic vector threats. Researchers will engage in trapping and dragging for mosquitoes and ticks within ecologically protected grasslands, learn how to identify important vectors of disease based on morphological characteristics, and take part in ongoing surveillance efforts being carried out in Kenya, with samples serving as a biorepository for further disease surveillance in East Africa. They will work with Mason, SI, EHA, and Mpala scientists to integrate data using a One Health approach. This research site in particular is home to multiple research projects and is accustomed to having student researchers. Data from this study will be used to model the influence of ecological, environmental, and climate factors with risk of VBD exposure based on conditions at collection sites. The researcher will be mentored in advanced skills in epidemiology and medical entomology, all embedded within an international research experience. | Laikipia, Kenya  | The candidate should have strong data interpretation and writing skills, have completed graduate-level coursework in statistics and/or epidemiological or ecological modeling, and have experience using the Statistical programs (STATA, R, SAS) The candidate should have a strong interest and some knowledge of vector-borne diseases. |