

UC SANTA BARBARA

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## A Practical Approach to Conservation

Is conservation good for your health? Seems like a no-brainer, right?

Not so much, according to a group of scientists who have collaborated on a new research volume that explores what turns out to be a very tough question.

UC Santa Barbara ecologists teamed up with colleagues at Duke University and the University of Washington to present various perspectives on the subject for the journal *Philosophical Transactions of the Royal Society B*. Their special issue, "[Conservation, Biodiversity, and Infectious Disease](#)," is a combination of theoretical work and case studies, all of which embrace a systems approach to infectious disease ecology.

"I'm a firm believer that insights from ecology can help us manage disease and protect species," said co-editor [Kevin Lafferty](#), a senior ecologist with the U.S. Geological Survey and a principal investigator at the Marine Science Institute. "But ecological systems are too complicated to expect one-size-fits-all solutions."

The biodiversity-disease relationship often has been framed as a simple synergy between conservation action and improved human health, yet the links between habitat disturbance and other factors that affect disease risk are complex. The editors sought authors from diverse perspectives and backgrounds to investigate how economics, climate change and biodiversity change affect infectious diseases.

"What's really unique about this issue is that we have gone all the way from theory articles that look at how biodiversity changes might affect disease to multiple field

studies of various conservation interventions at different scales to an examination of the global drivers of biodiversity change,” said lead editor [Hillary Young](#), an assistant professor in the Department of Ecology, Evolution and Marine Biology (EEMB). “We wanted to present cases for viable and useful public health interventions.”

Take schistosomiasis, a parasitic disease carried by fresh water snails. Found predominantly in tropical and subtropical climates, schistosomiasis infects 240 million people in as many as 78 countries, with a vast majority occurring in Africa. Schistosomiasis ranks second only to malaria as the most common parasitic disease.

Susanne Sokolow, a researcher at the Marine Science Institute and at Stanford University’s Hopkins Marine Station, presents her study of the disease in Senegal in one paper in the special issue. She found that when dams block the migration of snail-eating river prawns, snail abundance — and presumably schistosomiasis — increase.

“This is a story that repeats itself in systems where river prawns are present, and one that has a simple solution,” said co-author Lafferty, who is an adjunct EEMB faculty member. “This is a type of species that can be restored and that’s the kind of win-win we’re looking for. A third win occurs because river prawn fisheries create economic benefits. Restoring the river is too vague a solution; honing in on the specific lever in the system to which the disease is sensitive gets us there faster.”

Young’s research in Kenya, also featured in this special issue, is different, but it tells a similar story: Details matter. The ecologists examined how different types of disturbances affected vector-borne diseases and found that agricultural disturbance and the removal of large wildlife caused strong and systematic increases in many pathogens. However, pastoral land use change had no general effect.

“The type of land use change matters; you can’t just say conservation is good for disease,” Young said. “In fact, conservations are much more effective when scientists understand the nuances involved.

“While the mechanisms involved in my system are entirely different from the schistosomiasis system, both underscore the importance of understanding the entire ecology of the system, finding win-win scenarios and acting on them rather than expecting generalities about conservation and disease,” she added.

Discovering the specifics can be problematic because measurements of the environment, of biodiversity and of infectious diseases vary greatly. In another of the volume's papers, Lafferty, Young and colleagues found a way to analyze global disease burden at two time points, which enabled them to examine the same things.

"We analyzed what drives the world's most important infectious diseases among countries and across decades," Lafferty explained. "It's the most comprehensive attempt yet to explain how conservation, climate and economics affect human health."

The researchers considered forestation, biodiversity, wealth, temperature, precipitation and urbanization. They found that any of those factors on their own could have a positive, negative or neutral effect, depending on the disease. By far the most consistent finding, though, was this: The wealthier the country, the less disease; and the more wealth increased, the lower the burden of infectious disease.

Young noted that this research produced a better understanding of causality than most studies. "This paper has some good news that is rarely part of the story in our field," Lafferty said. "Our analysis shows across the board — with just a couple of exceptions — that the burden of infectious diseases has diminished considerably over the last two decades and that is mostly due to increased wealth and urbanization."

"There is no one-size-fits-all lever, where improving access to healthcare is going to affect all infectious diseases," Young added. "This body of work highlights the need to understand the nuances that make biodiversity and conservation effective levers."

The discourse begun in the special journal will continue at the 15<sup>th</sup> annual Ecology and Evolution of Infectious Diseases conference to be held June 24-27 on campus. Many authors will present their work.

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The University of California, Santa Barbara is a leading research institution that also provides a comprehensive liberal arts learning experience. Our academic community of faculty, students, and staff is characterized by a culture of interdisciplinary collaboration that is responsive to the needs of our multicultural and global society.

All of this takes place within a living and learning environment like no other, as we draw inspiration from the beauty and resources of our extraordinary location at the edge of the Pacific Ocean.