Human Modification and Mosquito Invasions: Linking Ecosystem and Human Health

Professor Paul Leisnham, a native New Zealander or ‘Kiwi’, brings his latest research on mosquitoes and human health from ‘down under’ to Maryland. Human-induced environmental changes, such as land use modification and climate change, have been linked to the reemergence of major diseases carried by mosquitoes, and offer classic examples of how disrupted ecosystems adversely affect human health.

Mosquitoes and Disease
Mosquitoes are the most medically important insects. They transmit some of the most serious diseases worldwide, including malaria and dengue. These diseases cause millions of deaths worldwide, drive cycles of poverty, and contribute to dramatic socio-economic disruption. Dr. Leisnham has explored the ecological, social, and economic mechanisms by which invasive mosquitoes can invade new areas and expose human populations to an increased risk of disease. One result of Dr. Leisnham’s research is that disturbed New Zealand wetlands appear to be a source of invasive mosquitoes to neighboring urban areas.

Native and Exotic Mosquitoes in Maryland
Dr. Leisnham is currently studying the interactive effects of climate change, land use, and invasive species on mosquito communities in Maryland. He hypothesizes that human-induced land use and climate changes erode natural ecological processes that prevent the invasion of exotic mosquitoes, and that the erosion of these processes can lead to increased mosquito numbers. Dr. Leisnham’s research is the first of its kind to examine the interaction of these environmental pressures on mosquitoes, and Maryland is an ideal location to do it. The Eastern United States has experienced successful invasions of exotic mosquito species that transmit a range of human and animal diseases, including West Nile virus and Eastern Equine Encephalitis. Moreover, Maryland consists of a patchwork of different land uses and will experience considerable climate change in the coming years. Dr. Leisnham’s research will seek to understand how native and exotic biodiversity affect the invasion success (or failure) of exotic species across environmental conditions that change with land use and climate, including temperature, hydrology, and food resources.

Research Benefits:
- Help control and manage key mosquito species of public health importance.
- Identify human populations at particularly high risk from mosquito-borne disease.
- Increase our understanding of important processes helping or acting as a barrier to the invasion of exotic organisms.
- Shed light on how fundamental interactions between species change of environmental gradients.