To The Editor: GIS Use in Entomology

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Edited by Muhammad Monk

To the Editor,

During my time as a student at Texas A&M University, I have only been shown entomological research including geographic information systems (GIS) once. This was in a presentation by James Tracy (a PhD candidate) about the release and distribution of different species of tamarisk beetles (Desbrochers, 1870) (Coleoptera: Chrysomelidae) throughout the southwestern United States, where salt cedars (tamarix spp.) are an invasive problem. The beetles were introduced to these areas as a biological control against the invasive salt cedars as a means of reducing the salt cedar population. During the presentation GIS was used to overlay more than 40 maps based on various climate variables in order to determine the climate tolerance of each beetle species and where it would perform the most successfully. This use of GIS is just one of many applications that can be used in research, and it would be beneficial to the readers of this publication to learn more about GIS in order to apply it to their entomological research.

Upon further inspection of the literature I found several varied applications of GIS technology. Dr. Robert Novak studies mosquitoes and their role in vectoring diseases at the University of South Florida. As part of the school of public health, one of his main research focuses involves controlling populations of mosquitoes and finding the range they can travel. Because many mosquitoes are poor flyers, they often complete their entire life cycle near the source of water that they emerged from. Many mosquitoes are container breeders, and able to breed in shallow temporary sources of water, including many man-made objects. Dr. Novak has discovered that used tires are often stored in great numbers and can become central zones of breeding for mosquitoes that affect the entire surrounding area. He uses GIS to determine places of extremely low albedo (reflectivity of sunlight and then investigates these areas to determine if they are tire mounds. When tires are discovered, proper control measures can be taken to reduce mosquitoes breeding in the area.

GIS technology is also important in malaria research. Known malaria vector mosquitos have their species data input into GIS which is subsequently overlaid with multiple climate variables. This provides a projection for the distribution of these important vector species. These are then cross referenced with reports of malaria infection in order to produce maps of the spread of malaria. This can also indicate which mosquito species is most likely to be the primary vector in a given region allowing for more specific control measures.

Integrated pest management is another field that utilizes GIS technology. Map overlays for areas using pesticide as a biological control agent help keep different management methods separate and working as efficiently as possible. Reported outbreaks of certain pests or diseases of crops can also be analyzed by spatial distribution. This allows for the outbreak areas to be isolated, studied, and managed more efficiently and inexpensively. General population and biotic interaction data is also used to help

form effective strategies specific to the biology of different pests and biological control predators.

GIS also works well in studies involving genetics. With genetic research being applied to insect ecology, populations and sub classifications of species and subspecies have become increasingly more precise over the years. Use of GIS can help explain some of the minute genetic differences discovered between separate populations of what the same species. Utilizing the collection data of studied specimens allows us to view the genetic changes over a spatial difference. This allows researchers to isolate populations by area and project where gene change is progressing. Linking areas to changes also help one understand the reasons behind the process of natural selection in these areas. Areas with different populations may have different climatic data, different habitat coloration, biological interactions, or other limitations that can cause genetic divergence.

In conclusion, I believe that GIS plays an important role in entomological research and would like to see this publication release more information involving the use of GIS. I believe that the target audience would appreciate the knowledge, and that more students would be encouraged to use GIS in their research. On a related note, I believe that the department of entomology at Texas A&M should increase the amount of student exposure to GIS technology, and potentially even introduce GIS intensive courses to the curriculum.

Sincerely,
Kevin Henson
Senior Entomology Major at Texas A&M