Jeong-Mi Yoon
University of Houston-Downtown
e-mail: yoonj@uhd.edu
Lisa Morano
Vlad Hrynkiv
Anh Tuan Nguyen*
Sara Wilder*
University of Houston-Downtown; *: undergraduate students
e-mail: Moranol@uhd.edu,Hrynkivv@uhd.edu

Population Dynamics of Glassy-winged Sharpshooter in Texas Vineyards

Pierce's Disease (PD) is a bacterial disease of grapevines with the capacity to kill an entire vineyard in one year. Outbreaks of the disease threaten California vineyards and are a chronic problem in Texas, particularly along the Gulf Coast. The disease is caused by a bacterium, *Xylella fastidiosa* and is transmitted by xylem-feeding insects commonly called sharpshooters. To understand the role of sharpshooter ecology on PD epidemiology, the USDA-APHIS has funded sharpshooter trap data from 50 Texas vineyards from 2003-to present under the direction of Dr. Forrest Mitchell, Texas A&M University. Among the insects monitored, *Homolodisca vitripennis* (Glassy-winged sharpshooter-GWSS) is the most abundant insect captured across all vineyards in Texas. Modeling of the enormous GWSS data set is an excellent opportunity to have both biology and mathematics students and apply modeling techniques to temporal changes in insect populations in order to predict future PD risk and determine the optimal management protocols.
This collaborative research has been funded by the NSF Grant: The Interdisciplinary Training for Undergraduates in Biology and Mathematical Sciences (UBM). During year 2009-2010, our group has developed a population model based on the time-delayed logistic equation for the dominant single species in the central Texas hill regions (Ecoregion 7: Edwards Plateau) for the years 2003-2009. The chosen model was transformed as one-parameter delayed equation by the non-dimensional technique. The existence of the periodic cyclic solution was explained by the local stability analysis of the linear model near the carrying capacity analytically. Undergraduate students worked on obtaining the optimal values of parameters which could guarantee the periodic solution numerically using software, MATLAB and compared it to the experimental histogram. From the fall of 2010 we have been working on the revision model with harvesting and immigration terms which could include the environmental factors such as insecticide use, information campaigns, weeds cleaning, and temperature changes. We will test the autonomous and also the non-autonomous harvesting terms. In the future, the model will be extended to a spatio-temporal model based on the Fisher's equation with delayed logistic population growth.