Wood Frogs Population in a Changing Environment

Nofe Al-Asuoad[1], Roumen Anguelov[2], Keith Berven[3], Meir Shillor[1]

[1] Department of Mathematics and Statistics
Oakland University, Rochester, MI 48309
nalasuoa@oakland.edu, shillor@oakland.edu

[2] Department of Mathematics and and Applied Mathematics
University of Pretoria, Pretoria, South Africa
roumen.anguelov@up.ac.za

[3] Department of Biological Sciences
Oakland University, Rochester, MI 48309
berven@oakland.edu

We present new results for a mathematical model for the dynamics of a population of Wood Frogs, which continue the investigation begun in [1]. The model is in the form of a system of nonlinear impulsive differential equations for each developmental stage (larvae, juvenile, and mature). It also takes into account the differences in the growth of the early, middle, and late juvenile stages. We describe numerical simulations for the study of the environmental impact on the population, in particular we investigate three issues: the existence of periodic solutions for the model; the recovery of the population from 1-3 dry years in which no larvae hatch; and the dependence of the model on the system parameters. It is seen that the results agree qualitatively with the observed data, which allows us to use the model for a tentative prediction of next years development. We also present some additional mathematical and numerical issues for future study.

References

[1] N. Al-Asuoad, R. Anguelov, K. Berven, M. Shillor, Model and Simulations of a Wood Frog Population, Biomath 1 (2012), 1209032, http://dx.doi.org/10.11145/j.biomath.2012.09.032