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SIRIPORN HONGTHONG : ANALYSIS OF A MATHEMATICAL MODEL FOR THE EFFECT OF TOXICANT ON SINGLE-SPECIES ECOSYSTEMS. THESIS ADVISOR : YONGWIMON LENBURY Ph.D., NARDTIDA TUMRASVIN M.S. 84 p. ISBN 974-589-461-3

We consider a mathematical model of the effect of toxicants on single-species in a closed homogeneous environment. The population birth-rate as well as the carrying capacity are assumed to be directly effected by the level of toxicant in the environment as it is absorbed by the population. The toxicant level in the population can be depleted at a constant specific rate, a part of which amount may return to the environment even in the absence of any living organisms. A Hopf bifurcation analysis was carried out yielding boundary conditions which divide the parametric plane into regions of different dynamical behavior. It was found that when the natural birth rate of the population is too low, no nonwashout steady state exists in the system. At a fixed sufficiently high natural birth rate, the system can settle back to its former stable equilibrium state after the initial dumping of toxicant into the environment, provided that the rate at which the toxicant in the population returns to the environment is not too high. Sustained oscillation in the population and toxicant levels is exhibited for suitable ranges of parametric values. However, if the per capita decay rate or birth rate is too low, the system no longer admits a stable nonwashout steady state if the return rate is too high, and population may become extinct.