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We extend existing impulsive differential equation models for integrated pest management (IPM) by including stage structure for both predator and prey as well as by adding stochastic elements in the birth rate of the prey. Based on our model, we propose an approach that incorporates various competing stochastic components. This approach enables us to select a model with optimally determined weights for maximum accuracy and precision in parameter estimation. This is significant in the case of integrated pest management because the proposed model accommodates varying unknown environmental and climatic conditions, which affect the resources needed for pest eradication. (Received September 15, 2014)