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*Modeling Eradicating Vector-borne Diseases via Structured Culling*

We derive appropriate mathematical models to assess the effectiveness of culling as a tool to eradicate vector-borne diseases. The model, focused on the culling strategies determined by the stages during the development of the vector, becomes either a system of autonomous delay differential equations with impulses (in the case where the adult vector is subject to culling) or a system of non-autonomous delay differential equations where the time-varying coefficients are determined by the culling times and rates (in the case where only the immature vector is subject to culling). Sufficient conditions are derived to ensure eradication of the disease, and simulations are provided to compare the effectiveness of larvicides and insecticide sprays for the control of West Nile virus. We show that eradication of vector-borne diseases is possible by culling the vector at either the immature or the mature phase, even though the size of the vector is oscillating and above a certain level.

This is a joint work with S. A. Gourley and R. S. Liu.