# THREE DIMENSIONAL LAGRANGIAL MODEL FOR FATE AND TRANSPORT OF SILVER AND BIGHEAD CARP EGGS

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Silver and Bighead Carp species are spreading at alarming rates within the Mississippi River Basin. The invasion of Asian Carp in w ater bodies and streams is causing severe and potentially catastrophic ecological and economical damage. The understanding of the fate, transport and development of Asian Carp eggs has the potential to create control strategies before the eggs hatch and convert into developed organisms. However, there is not a clear understanding and knowledge of the hydrodynamic conditions at which the eggs are transported and kept in suspension. This is imperative because suspension is required for the eggs to survive. A three-dimensional Lagrangian numerical model was developed at the University of Illinois to simulate the transport dynamics of Silver and Bighead carps eggs. The numerical model includes the biological behavior (growth rate, densities changes) and the physical characteristics of the flow field, such as velocities and turbulent diffusivities, and provides a powerful tool to develop hydrodynamic control mechanisms. The model constructed for this study simulates horizontal and vertical transport and dispersion of Silver and Bighead Carp eggs using a random walk particle tracking method. The model accounts for advection deterministically, while dispersion is treated as a random variable function of turbulence. The egg's vertical movement is estimated using a mass balance between gravity and buoyancy forces (function of eggs density). The proposed model predicts the transport and dispersion patterns of Silver and Bighead Carp eggs. This research will not only contribute valuable information about the transport, and dispersal behavior of Silver and Bighead Carp eggs, but also assist in the identification of critical hydrodynamic conditions that maintain egg suspension. Cons equently, the thorough understanding of these conditions will support the development of control strategies for Silver and Bighead carp species in rivers and stream bodies.