Metapopulation models have been widely used in ecology to better understand the processes that drive abundance and distribution patterns across time and space. However, recent studies suggest that empirical support for the classic Levins metapopulation model is lacking. Small pond zooplankton communities are ideal for testing the predictions of metapopulation theory, as 1) dispersal modes and rates are well-known and 2) ponds have discrete borders that can easily be manipulated and monitored. We used a stochastic model of colonizations-extinctions to study the spatio-temporal occupancy patterns of the zooplankter *Daphnia* in a network of 38 ponds. In our model, the colonization probabilities depended on pond distance, and the extinction probabilities were allowed to vary among ponds. We fit the model to four years of field data and calculated spatial correlations between the observed data and simulations. Occupancy dynamics from these stochastic modeling exercises match theoretical predctions of the deterministic Levins metapopulation model. As theory predicts, the spatial arrangement and initial stocking conditions of the landscape play important roles in the resulting spatial and temporal population dynamics. In summary, results from these stochastic modeling exercises better our understanding of how network structure and number and identity of initially occupied patches drive spatio-temporal metapopulation dynamics.