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The James Spiny mussel (*Pleurobema collina*) is endangered and is at the top of Virginia's conservation list. This species plays a critical role in the environment by filtering and cleaning water while providing shelter and food for macroinvertebrates. However, conservation efforts are complicated by the mussels' burrowing behavior, camouflage, and complex life cycle. The goal of this research was to estimate detection probabilities that could be used to determine whether the species is present in an area and to track individually marked mussels to test for source-sink dynamics. Using existing literature and mark-recapture field data, these goals were accomplished by evaluating dispersion type, clustering trends, odds of detection based on environmental factors, substrate preferences, and matrix population models. These analyses serve as the foundation of mathematical models used to aid in the recovery of the James Spiny mussel. (Received September 12, 2015)