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Title: Assessing the conservation status of the Zebra Swallowtail (*Eurytides marcellus*), in Northern Virginia forests

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ABSTRACT

Critical assessments of niche requirements have been made for less than 1% of endangered insects and insufficient data may exist to allow protection of even highly charismatic butterflies. The goals of this study were 1) to assess the conservation status of *Eurytides marcellus* Cramer (Lepidoptera: Papilionidae) in Northern Virginia through larval and adult population surveys in four protected forest areas, 2) to identify suitable habitat for *E. marcellus* populations through a combination of field studies of potential habitat quality factors correlated to larval or adult densities and Geographic Information Systems spatial analysis of land-use and habitat requirements, 3) to model adult dispersal among suitable sites via Euclidean and least-cost distance methods in order to identify barriers to or corridors promoting dispersal across the landscape, and 4) To design and implement a spatially explicit individual-based model capable of testing the affects of habitat parameters on a Zebra Swallowtail population throughout its complex life cycle.

Larval and adult surveys reveal that *E. marcellus* currently exists in extremely low density in Northern Virginia, warranting a revision of its secure conservation (S5) status for this area. Density of caterpillars was most strongly correlated with habitat area, but was also influenced by other habitat factors, including leaf toxicity. GIS analysis identified 35 suitable locations in the Fairfax County region of Northern Virginia as possible locations for robust larval *E. marcellus* populations. A Euclidean distance dispersal model suggested that there are three unconnected adult butterfly dispersal networks in Fairfax County. Further analysis of dispersal using a least-cost distance model found that Fairfax County exhibits severe impediments to butterfly dispersal. An analysis of population responses to changes in habitat factors through an individual-based model found that populations of *E. marcellus* are most dependent on access to abundant populations of their host plant, pawpaw (*Asimina triloba*), rather than to adult nectaring sources. *Eurytides marcellus* may exemplify the decline of a formerly common species, and may act as an indicator for the conservation status of other imperiled species in the region. The integration of geographic analysis techniques and computer modeling applications provided a necessary avenue to explore the conservational integrity and status of this species in a non-intrusive manner. These applications combined with field studies will be integral to the assessment of the conservation status of many species.