Biological Control as a Tool to Mitigate Economic Impacts of Facilitative Ecological Interactions between the Giant Reed and Cattle Fever Ticks

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Abstract

Annual domestic impacts associated with introduced weeds are conservatively estimated at $27 billion, which incorporates costs of weed management, crop losses and displacement of productive rangeland, and displacement of some environmental services. Estimating the total economic damage of invasive weeds can be difficult, especially when they impact non-market services, or when impacts are indirect. The giant reed, *Arundo donax* L., is an invasive grass infesting riparian corridors and waterways in the southwestern U.S. and northern Mexico. In addition to the economic implications of water loss in this arid agricultural area, deleterious non-market effects ascribed to giant reed invasion include riparian habitat fragmentation, biodiversity loss, stream-bank erosion, and physical and logistical obstruction for border security and enforcement. These thick swaths of giant reed are also a highly suitable habitat for the cattle fever tick, *Rhipicephalus microplus* (Say), an important vector of the protozoa causing bovine babesiosis. Survival rates, fecundity, and fertility of engorged adult female cattle fever ticks were tested in tick cohorts placed in pastures, mixed brush, and arundo stands. Ticks were more likely to lay eggs and larger egg masses in giant reed and mixed brush when compared to ticks in mixed-grass pastures where microclimatic conditions are less favorable. Animals such as cattle, horse, and white-tailed-deer traversing through nearly-impenetrable stands of giant reed create common-use corridors that in effect facilitates parasitism of suitable hosts by cattle fever ticks thriving in that habitat. Our findings document the economically significant indirect impact by giant reed as a complicating factor to keep the U.S. free of cattle fever ticks and bovine babesiosis. Such considerations should be incorporated when modeling the total economic costs associated with an invasive plant. The use of biological control agents against giant reed stands represents a sustainable strategy to mitigate the indirect economic impacts of giant reed and disrupt facilitative ecological interactions between invasive species like cattle fever ticks and giant reed in south Texas.