BRACKEN FERN INVASION IN SOUTHERN YUCATÁN: A CASE FOR LAND–CHANGE SCIENCE*

LAURA C. SCHNEIDER

Land-change science seeks to understand land dynamics and their various consequences through an examination of coupled human-environment systems. This synthetic approach is used to address the recent, fourfold spread of bracken fern (*Pteridium aquilinum* (L.) Kuhn) throughout the cultivated landscapes of the southern Yucatán Peninsula, in Mexico. By joining biophysical, socioeconomic, and remote sensing–geographic information system (GIS) evidence, some of the one-dimensional explanations for the advance and persistence of the invasive species are rejected in favor of those focused on the synergy between human and environmental dimensions of the problem.

Global environmental change and related studies increasingly recognize the usefulness of integrative approaches that address the dynamics of coupled human-environment systems (Kates and others 2001; Steffen and others 2003; Turner and others 2003; Rindfuss and others 2004). Such approaches combine the human, ecological, and remote sensing and GIS sciences (Liverman and others 1998) and have been labeled "integrated land-change science" (Klepeis and Turner 2001; Turner 2003; Moran, Skole, and Turner 2004; Rindfuss and others 2004). Since 1997 the Southern Yucatán Peninsular Region (SYPR) project has exemplified this kind of science in its efforts to understand and model the interactions and consequences of tropical deforestation and agricultural expansion around and within the Calakmul Biosphere Reserve and Mesoamerican Biological Corridor in the states of Campeche and Quintana Roo in Mexico (Turner and others 2001; Turner, Geoghegan, and Foster 2004). The SYPR project early on identified an invasive species, bracken fern, as an important element of land-use dynamics in the region. That role, which is examined in this note, illustrates the kind of understanding that results from using a broadly integrated approach.

Research on invasive species is centered within the ecological community and on how invasion affects ecosystem structure, environmental productivity, biotic diversity, and other factors related to ecosystem function in the face of land-cover change (Elton 1958; Lodge 1993; Vitousek 1994; Vitousek and others 1997; Hobbs 2000; Mooney and Hobbs 2000; Sutherst 2000). Although this research recognizes the human-environment relationships embedded in invasions, most attention to date has focused on the ecological consequences of the invasion, as well as on the

* This research was supported by the Land-Use and Land-Cover Change Program of the National Aeronautic and Space Administration through Southern Yucatán Peninsular Region grants NAG 56406 and NAG 511134 and by the sustained support of the Center for Integrated Studies on the Human Dimensions of Global Environmental Change, Carnegie Mellon University (National Science Foundation NSF–SBR 95-21914). My thanks to an anonymous reviewer, to Billie L. Turner, and to Mazen Labban for their comments on the manuscript.

DR. SCHNEIDER is an assistant professor of geography at Rutgers University, Piscataway, New Jersey 08854-8045.

The Geographical Review 94 (2): 229–241, April 2004