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Research Paper

Are state growth management programs viable tools for biodiversity conservation? A case study examining Florida local governments

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HIGHLIGHTS

- Florida county government biodiversity conservation plans are highly variable.
- Plan quality is related to local education and wealth socioeconomic variables.
- State growth management programs may not be viable tools for conservation planning.

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ABSTRACT

We examined the quality of Florida's state growth management program and associated county comprehensive plans as an overall biological conservation strategy. A plan evaluation coding protocol using a conceptual framework derived from the science of conservation planning was applied to local comprehensive plan Conservation Elements to determine the extent to which county-level conservation planning met the well-accepted conceptual framework. We found a high degree of variability in the quality of conservation planning for biodiversity, which was related to political geography. The quality of plans in coastal counties was significantly higher than that of inland counties. Significant regional differences were also evident, with conservation planning quality in South Florida counties significantly higher than in Panhandle counties. Geographic differences in the quality of local conservation planning are attributable to socioeconomic differences, education of the public, and availability of resources for planners. A model selection and averaging approach based on information theory was employed to develop a predictive model of conservation planning quality of Florida local governments. The results of this study call into the question the efficacy of state growth management programs as land-use regulatory tools to stem current rapid losses in biological diversity.

1. Introduction

Biological diversity is declining worldwide (Clavel, Julliard, & Devictor, 2011). The main proximate driver of global biodiversity loss is land transformation (Vitousek, Mooney, Lubchenco, & Melillo, 1997). In the United States, most land transformation is driven by urban development (Noss et al., 2009). By 2045, cities are projected to expand by 79%, or 45 million acres in the United States, an area larger than the state of Florida (Ramalho & Hobbs, 2012). This rapid land development will result in increased habitat loss and fragmentation, furthering declines in natural systems. Accordingly, there is a pressing need to ensure that land-use policies designed, at least in part, to conserve biodiversity are as effective as possible (Beatley, 2000).

In the United States land development is primarily regulated at the local level (Bengston, Fletcher, & Nelson, 2004). City councils, county commissioners, and local planning departments influence how land is used through land-use regulations, zoning ordinances, and comprehensive plans. Given pressures to meet local economic and resource demands and accommodate property rights, the impacts of local land-use decisions on plant and animal populations and on larger ecological systems are often not considered (Burby & May, 1998). A hodge–podge of varying land usages materializes across the larger landscape when land development ensues absent coordination among neighboring local governments or across regions (Brody, 2003b). Natural systems and populations are degraded when land is divided into competing residential,

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urban, industrial, agricultural, and natural resource uses, bisected by highways, roads, levees, and canals (Odell, Theobald, & Knights, 2003; Saunders, Hobbs, & Margules, 1991). Collectively, local land-use decisions can result in significant adverse impacts on native species and communities (Brody, 2003b).

One strategy to facilitate coordination of planning at broad scales, mitigate biodiversity loss, and contain land development is state growth management laws. Roughly a quarter of U.S. states have enacted growth management legislation, which enables states to exercise control over land-use decisions of local governments and protect natural resources (Anthony, 2004; Bengston et al., 2004). Under these programs, the state develops a comprehensive plan for future growth and development and also requires local governments to develop comprehensive land-use plans and regulations to manage land development and contain sprawl (Bengston et al., 2004). Regional and local plans must be consistent with the state vision for land development as well as with plans of other regions and local jurisdictions and are subject to state approval (Miller et al., 2009). Central to the state growth management concept is the premise that coordinating the activities of local governments and regions will ensure that land is developed in a consistent, rational way that will balance economic growth and natural resource protection (Carruthers, 2002). Because growth management laws have the potential to affect land-use decisions at ecologically relevant scales, they can be important components of the toolbox to stem the loss of biodiversity (Beatley, 2000).

Nevertheless, among the thirteen states that have enacted growth management programs, legislative frameworks vary from strong to relatively little state oversight over local comprehensive plans (Anthony, 2004; Boarnet, McLaughlin, & Carruthers, 2011); Carruthers, 2002). Moreover, with respect to environmental protection, local comprehensive plans within some of these states have been found highly variable in their content, quality, and implementation (Berke & Manta Conroy, 2000; Brody, 2003b; Brody, Highfield, & Carrasco, 2004; Brody & Highfield, 2005; Tang, 2009). Research investigating the sources of variability in local comprehensive plans shows that the content of local comprehensive plans and the degree of their implementation is a product of local sociopolitical-economic variables and urbanization pressure (Tang, Bright, & Brody, 2009), the wealth and education level of the public (Brody, Carrasco, & Highfield, 2006), the education level of planners, and the existence of state mandates requiring specific plan content (Sandstrom, Angelstam, & Khakee, 2006).

Because local land-use decisions collectively have a critical impact on larger natural systems (Beatley, 2000), understanding the extent to which biodiversity conservation is considered in local comprehensive plans, and the degree of variability among local comprehensive plans, is important to conservation efforts. Successful long-term preservation of biodiversity requires long-range land-use planning that encompasses science-based planning methodologies applied at the regional or landscape level (Knight & Landres, 2002; Noss & Harris, 1986). Coordination is necessary between conservation and land-development planning at large scales so that land uses are designed to balance human needs and ecological functioning (Beatley, 2000; Sanderson, Redford, Vedder, Coppolillo, & Ward, 2002). As the majority of the nation's biodiversity is contained on privately-owned lands, it is imperative to find ways to minimize the cumulative adverse impacts of local land-use decisions (Doremus, 2003).

One way to evaluate plans is a goals-achievement approach, where the provisions of a plan are evaluated to determine how well they achieve pre-determined goals (Brody, 2003a,c; Brody, Carrasco, & Highfield, 2003; Brody et al., 2004; Tang et al., 2009; Tang, Brody, Quinn, Chang, & Wei, 2010). In this approach, a conceptual model of a high quality plan is first developed (Brody, 2003b; Tang et al., 2009). Indicators are developed for each plan component, which are words, pieces of information, strategies, or policies that comprise the component in theory. A coding protocol is then developed to score the extent to which the indicators are included in the plan. Plan provisions are then evaluated against that conceptual model to determine how well the plan meets the theoretical criteria. These studies assume that the greater the number of indicators found in the plan, the higher the quality of the plan (Brody, 2003b).

A host of principles from conservation science have been developed for use in conservation planning (Theobald et al., 2000). Those prescriptions include, for example, criteria that prioritize species for conservation action (Lewandowski, Noss, & Parsons, 2010), guidelines to select species to represent large classes of biodiversity and which can be monitored as bellwethers of the integrity of the larger system (Noss, O-Connell, & Murphy, 1997), methods to establish quantitative conservation targets for populations and habitats through the use of empirical data and population models (Armstrong, 2005), guidelines to prioritize and plan for ecological and evolutionary processes through process models and simulations (Klein et al., 2009; Pressey, Cabeza, Watts, Cowling, & Wilson, 2007), considerations about the effective size and design for protected areas, and how to prioritize potential sites for acquisition through the use of decision-support tools (Beier, Majka, & Spencer, 2008). We evaluated the quality and variation of local government comprehensive land-use plans in Florida using a goal-achievement approach, to consider the degree to which the existing comprehensive planning framework can facilitate effective biodiversity conservation. We hypothesized that quality of land-use planning for biodiversity conservation would vary geographically in response to economic, social, and geographic attributes.

2. Methods

We selected the state of Florida and its county governments as a case study because Florida has had one of the stronger state growth-management frameworks in place since the 1980s (Dawson, 1996; Dorworth, 2011). Driven by population growth pressures, in 1984 and 1985 the state of Florida enacted growth management laws requiring state agencies, regions, and local governments to develop comprehensive land-use plans to balance economic growth with the protection of natural resources (Carriker, 2006). Local government comprehensive plans are required to include a Conservation Element, which must establish a vision and policies for conserving local natural resources and biodiversity, and which must be consistent with state natural resource and biodiversity protection goals. Local governments must also develop specific ordinances, zoning regulations, and development orders to protect natural systems by minimizing the effects of urbanization (Carriker, 2006).

Florida's 67 counties provide a large sample size for hypothesis testing. Moreover, because of the importance of regional and landscape-level planning for biodiversity conservation and because of the emphasis on regional planning in Florida's growth management program, four regions were delineated for analysis, based both on general ecological patterns and on regions created by Enterprise Florida, Inc., a public–private entity that promotes statewide economic development (Beatley, 2000; Bengston et al., 2004). The regions were (1) Panhandle, (2) North, (3) Central, and (4) South (Fig. 1).

Our conceptual model of a high-quality plan for biodiversity conservation included five plan components: (1) Biodiversity Status Assessment, (2) Goal Setting, (3) Coordination, (4) Reserve Selection and Design, and (5) Management. For each of these components we created a list of indicators, which included the methods, tools, potential activities, pieces of information, or criteria