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Examining the Role of Resource-Based Industries in Ecosystem Approaches to Management: An Evaluation of Comprehensive Plans in Florida

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While ecosystem approaches to management often necessitate the participation of key stakeholders during the plan-making process, few empirical studies have focused on the role of industry. Large resource-based industries not only have the greatest impact on critical natural resources, but also own much of the land base and critical habitat in the United States. This article examines the impact of resource-based industries in Florida on ecosystem management strategies and environmental planning in general. Specifically, it tests the relationship between industry participation in the planning process and the quality of local plans associated with managing ecological systems over the long term. Results indicate that the presence of industry during the planning process significantly raises the quality of adopted plans associated with managing ecological systems.

Keywords ecosystem management, industry, plan quality, stakeholder participation

In the United States, government environmental managers and planners are abandoning the traditional species by species approach to regulation and instead are embracing the emerging paradigm of ecosystem management. Ecosystem management represents a departure from traditional management approaches by addressing the interaction between biotic and abiotic components within a land or seascape,

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while at the same time incorporating human concerns (Szaro et al. 1998). In this approach, entire ecological systems, and the ecological processes within them, become the focus for management efforts, rather than a single species or jurisdiction. As a place-based concept, ecosystem management involves a transboundary,[1] interdisciplinary, and holistic approach to maintaining ecological processes while meeting human needs (Grumbine 1994; Christensen et al. 1996). Ecosystem management has been proposed as an improved framework for protecting resources over the long term and achieving sustainable development practices. At least 18 federal agencies have committed to the principles of ecosystem management and are exploring how this concept can be incorporated into their present day activities (Haeubner and Franklin 1996; Haeubner 1998).

Stakeholder participation and collaboration have been identified as two of the most important aspects of effective ecosystem management (Westley 1995; Yaffee et al. 1996; Lackey 1998; Duram and Brown 1999; Wondolleck and Yaffee 2000). Since ecosystem approaches to land management follow ecological boundaries, rather than administrative or political lines, collaboration and the formation of partnerships across land ownership are an essential part of reaching a desirable outcome. While theorists and practitioners call for widespread participation in ecosystem management projects, few empirical studies have focused exclusively on the role of the industrial sector as an important stakeholder. Instead, most research investigates intergovernmental coordination or citizen participation, despite the fact that the large industries not only have the greatest impact on critical natural resources, but much critical habitat in the United States is located on privately held land (Hoffman et al. 1997; O'Connell 1996). Given these factors, the participation of large landholding resource-based companies in ecosystem management initiatives is critical to maintaining the function and integrity of transboundary natural systems. While there have been many qualitative evaluations of the ecosystem planning process and the contributions of various stakeholders (including industry) (see Yaffee et al. 1996; Duane 1997; Beyer et al. 1997; Innes 1996; Duram and Brown 1999; Wondolleck and Yaffee 2000), few, if any, quantitative studies have examined the specific impact of industry on the quality of adopted plans.

This article quantitatively examines the impact of resource-based industries[2] on ecosystem management strategies and environmental planning in general. Specifically, it tests the relationship between industry participation in the planning process and the quality of local comprehensive plans in Florida to manage ecological systems over the long term. Resource-based industry and four other stakeholders groups are examined during the planning process to determine which has the greatest effect on the quality of the adopted plan. Given the importance of industry actors in managing ecological systems, a thorough examination of their role, interests, and impacts will make a significant contribution to understanding how ecosystem management efforts can become more effective in reaching their goals.

Florida was selected as the study area for the following reasons: (1) The state requires that each local community prepared a legally binding comprehensive plan. While there are many different types of resource management plans in Florida, comprehensive plans follow a consistent format (in terms of production, element types, and review/updating processes), are an institutionalized policy instrument, and most importantly provide a basis for city and countywide land use and resource management decisions. Among other requirements, the state mandate sets forth procedures for public participation throughout the planning process. (2) There is an established definition and framework for ecosystem management to ensure a level of consistency in the way the concept is understood and carried out. (3) There are multiple ecosystem management projects at the national, state, and regional levels, indicating a desire and need for a more systems-based approach to resource management. (4) Florida contains some of the most biologically diverse and valued ecosystems in the country. (5) These ecosystems are in a state of decline due to increasing human development, creating an immediate need for ecosystem policy implementation.

The following section examines the importance of stakeholder participation and collaboration throughout the ecosystem planning process. The role of resource-based industries in improving the quality of ecosystem plans is then discussed. Next, sample selection, variable measurement, and data analysis procedures are described. Results based on multiple regression analysis indicate the degree to which resource-based industry participation in planning process, as compared to other participating stakeholders, contributes to the quality of local plans when it comes to managing broader ecological systems.

Stakeholder Participation and Collaboration in Ecosystem Approaches to Management

Stakeholder Participation

Because ecosystem approaches to management often extend across different organizations, agencies, and lines of ownership, the planning process usually necessitates the involvement of multiple and sometimes competing interests. Furthermore, many local comprehensive planning processes geared toward environmental management, such as those in Florida, are required by mandate to develop a citizen participation program. Who is involved and to what degree will inevitably influence the outcome of the decision-making process: the management plan.

Often the focus of collaborative environmental initiative is on intergovernmental relations, such as between various federal agencies or state and local government. However, coordination at the ecosystem level should incorporate the interests of the broader community to include nongovernment organizations, industry, private landholders, and local citizens. Without including all stakeholders in a framework of collaboration and joint problem solving, ecosystem management initiatives are bound to have limited success (Wondolleck and Yaffee 2000).

Because ecosystem management is by definition a transboundary, multiparty issue, participation of key stakeholders becomes a key component of a successful outcome (Grumbine 1994; Westley 1995; Yaffee et al. 1996; Duane 1997; Weber 1998; 2000). Participation of stakeholders from the beginning of a project increases trust, understanding, and support for ecosystem-based protection (Yaffee and Wondolleck 1997). Furthermore, including key parties in the decision-making process helps to build a sense of ownership over a proposal and ensures that all interests are reflected in the final management plan (Brechin et al. 1991; Innes 1996; Daniels and Walker 2001). Organizations and individuals often bring to the process valuable knowledge and innovative ideas about their community that can increase the quality of adopted plans (Moore 1995; Beierle and Konisky 2001).

Innes (1996) examined the role of consensus building through case studies of environmental problems involving multiple issues that cut across jurisdictional boundaries. All the cases involved shared power across agencies and levels of government, and between private and public sectors. Innes found that collaboration not only increased trust, communication, and the development of public–private networks, but also resulted in stronger outcomes or plans that were beneficial to the resource or to the natural system as a whole. In a comprehensive survey of ecosystem management in the United States, Yaffee et al. (1996) found that participation and collaboration of key stakeholders was the single most important factor (cited by 61% of respondents) that enabled projects to reach a quality outcome. Specifically, collaboration within and among public agencies and businesses was an important mechanism for increasing cooperation and communication, fostering trust, and allowing for a more effective outcome that met a greater set of interests.

Resource Industries in Ecosystem Management

Most of the literature on stakeholder participation in planning and ecosystem management is written primarily from a public-sector perspective where the influence of government or non-government organizations is examined. The participation of industry does not receive a great deal of attention in arguments for collaboration and consensus building, despite the fact that industry has the largest impact on our natural resource base and that much of the critical habitat in the United States is located on industry-owned lands (Wondolleck and Yaffee 2000). Industry land holdings (a subset of privately held lands in the United States) include many important elements of ecosystem diversity, particularly in the eastern part of the country, and comprise approximately two-thirds of the land base of the continental United States. So, government must encourage industry participation to adequately protect biodiversity (O'Connell 1996; Vogt et al. 1997). For example, 57% of forests in the United States are privately owned. In regions such as the southeast, private ownership comprises up to 90% of the land base. Furthermore, 90% of the more than 1200 listed endangered and threatened species occur on nonfederal lands and more than 5%, including nearly 200 animal species, have at least 81% of their habitat on nonfederal lands (Wondolleck and Yaffee 2000).

Consistent with these data, Cortner and Moote (1994) argue that a fundamental requirement for effective ecosystem management is the coordination of public and private interests. Hoffman et al. (1997) suggest that because much of the critical habitat in the United States lies on business-owned land, the inclusion of this key stakeholder in the decision-making process is necessary to achieve successful management of ecological systems. They further assert that involving business-related stakeholders is the best way to foster joint gains in environmental protection and economic growth over the long term.

These arguments are supported by data from Beyer et al. (1997), who found that the informal participation of industrial forest stakeholders was one of the keys to the present and future success of the Eastern Upper Peninsula of Michigan Ecosystem Management Project (EUP). This group is comprised of government agencies, forest product companies, and The Nature Conservancy, a leading environmental nongovernmental organization (NGO). These partners (composed of eight public and private landholders) collectively manage 2.6 million acres of land in the EUP. Despite varying resource management goals and activities, group members have formed a collaborative venture to facilitate the sustainable management of the EUP ecosystem over the long term. In summary, private lands clearly must play a critical role in any cooperative strategy to protect biodiversity and ecosystem integrity.

The Impacts of Industry Participation on Ecosystem Plan Quality

The participation of resource-based industries in the planning process is associated with land ownership, resources, and knowledge that, when brought to the planning process, may increase the quality of the final plan. As insinuated earlier, industry participation often means that areas of high biodiversity, natural habitat, or critical ecosystem components will receive greater consideration by planning participants. If key landholders are not part of the planning process, the final plan may not cover the entire ecosystem, falling short of its intentions to manage the complete natural system. Industry participation also contributes valuable resources, such as time, personnel, and sometimes funding, which will enhance plan quality by allowing for more expansive data collection, better monitoring programs, more regular plan updates, etc. If even an insignificant percentage of a large corporation's resources was directed to a planning process, the impact of this contribution could greatly improve the capability of the final plan to accomplish its stated goals. Finally, with industry participation comes knowledge of the resource and technical expertise that will likely contribute to higher plan quality. More than ever, industries are collecting and analyzing their own baseline data to monitor the natural resources upon which they depend.

The presence of industry in the planning process can thus boost the collective capacity of planning participants, which should enhance each individual component of a plan. For example, it is expected that the fact basis would include a more complete resource inventory, where impacts to these resources would be better known. Goals and objectives would be more inclusive, better balanced, and reflect a more systemwide approach. Interorganizational coordination elements would be stronger where more collaboration with other parties and jurisdictions is emphasized. Tools and strategies would be more focused and inclusive and would include more incentive-based policies and better monitoring tools. Finally, implementation sections of the plan would provide greater accountability, flexibility, and enforcement of policies. The underlying assumption of the positive influence of stakeholder participation is that these groups have valuable knowledge and resources to contribute to plan development.

Research Methods and Data Analysis

Sample Selection

In Florida, every jurisdiction is mandated by the state to adopt a comprehensive plan containing specific elements and goals. For example, plans must contain a conservation and coastal management element. Goals within these elements must focus on protecting critical natural resources and various ecosystem components. Because plans in Florida are driven by a consistent set of criteria, it is more feasible from a research design perspective to compare the quality of one plan to the next.

The sample of jurisdictions studied was selected initially for use in an investigation of the impacts of planning mandates on the quality of hazards policies in comprehensive plans (see Burby et al. 1997) and was used again here to make use of longitudinal data. The population was based on local jurisdictions in Florida that have completed recent updates to their comprehensive plans. A sampling frame was obtained through a list of local jurisdictions throughout the state and was subjected to the following sampling strategy. First, the sample of local jurisdictions was limited to jurisdictions with a population of 2500 or more to make certain the sample was not skewed toward small communities (Berke and French 1994). Second, large cities, such as Miami, were excluded from the sample because it is believed that these jurisdictions have very different contextual factors that may skew the sample (Berke et al. 1996). Third, the sample was limited to coastal jurisdictions to maintain a degree of consistency and comparability in terms of the types of ecosystems assessed. From the sampling frame, a random sample of 30 jurisdictions was drawn and each jurisdiction's comprehensive plan was evaluated against an evaluation protocol determining a high-quality ecosystem plan.[3]

Measuring Ecosystem Plan Quality

Ecosystem plan quality was defined and measured by adding ecosystem considerations to existing conceptions of what constitutes a high-quality plan. Plan quality has been conceptualized for other issues, such as natural hazards (Godschalk et al. 1998; Berke et al. 1998; Godschalk et al. 1999), but never for ecosystem management capabilities.

Ecosystem plan quality was first conceptualized through the following five components: (1) Factual basis refers to an understanding and inventory of existing resource issues, environmental policies, and stakeholders' interests within the ecosystem. It takes both a written and visual form and serves as the resource inventory and problem identification instrument upon which policy decisions within the plan are made. (2) Goals and objectives guide the implementation of ecosystem management. They contain both general statements of long-term goals regarding clarity and consistency, and specific measurable objectives (such as a 40% reduction in nutrient runoff to reduce impacts on an estuarine system). (3) Interorganizational coordination and capabilities capture the ability of a local jurisdiction to collaborate with neighboring jurisdictions and organizations to manage what are often transboundary natural resources. This plan quality component addresses joint fact-finding, information sharing, intergovernmental agreements, and integration with other plans in the region (e.g., higher level ecosystem plan, National Estuary Program). (4) Policies, tools, and strategies represent the heart of a plan because they set forth actions to protect critical habitats and related natural systems. Policies include regulatory tools, such as buffer requirements, as well as incentive tools, land acquisition programs, and educational efforts. (5) Finally, for comprehensive plans to be effective, implementation procedures must be clearly defined and specified for all affected parties. This plan component includes designation of responsibility, a timeline for actions, regular plan updates, and monitoring of resource conditions and policy effectiveness.

Together these five plan components constitute the potential of a local plan to manage and protect the integrity of ecological systems. Indicators (items) within each plan component further "unpack" the conceptions of plan quality. A "plan coding protocol" listing each plan component and its indicators is provided in Appendix A. This protocol was used to evaluate and measure plan quality for the random sample of local comprehensive plans in Florida. Each indicator was measured on a 0–2 ordinal scale, where 0 is not identified or mentioned, 1 is suggested or identified but not detailed, and 2 is fully detailed or mandatory in the plan. In the factual basis component of the protocol, several items have more than one indicator. For example, habitats can be either mapped, catalogued, or both. In these cases, an item index was created by taking the total score and dividing it by the number of subindicators (i.e., an item that received a 1 for mapping and 1 for cataloging was given an overall issue score of 1). This procedure assured that items remained on a 0–2 scale as well as favored plans that support their descriptions with clear maps. Together, these indicators capture the principles of effective ecosystem management and translate them into elements that can be identified, measured, and compared across each plan.

An overall measure of ecosystem plan quality was derived by creating indices for a plan component or overall plan quality [as done by Berke et al. (1996; 1998)]. Indices were constructed for each plan component based on three steps. First, the actual scores for each indicator were summed within each plan component. Second, the sum of the actual scores was divided by the total possible score for each plan component. Third, this fractional score was multiplied by 10, placing each plan component on a 0–10 scale. A total plan quality score was obtained by adding the scores of each component. Thus, the maximum score for each plan is 50.

While comprehensive plans are limited to single jurisdictions and are not traditional ecosystem management plans per se, they provide an ideal measure for ecosystem management capabilities at the local level. First, because these plans need to look beyond jurisdictional boundaries, drive collaborative efforts with other jurisdictions or organizations, and contain policies that seek to protect critical habitats comprising broader ecosystems, they act as strong indicators of how well local jurisdictions will manage ecosystems over the long term. A plan's content and policies often determine a local jurisdiction's level of natural resource use, participation in regional/ecosystem planning efforts, and ability to protect critical natural habitat essential to maintaining ecosystem services. Adopted comprehensive plans are also legally binding policy instruments and serve as strong indicators of the actions localities will actually take, as opposed to informal or loosely binding arrangements that characterize many ecosystem plans.

Second, since comprehensive plans are essentially guides to future actions, they take a long-range approach suitable for dealing with temporal scales related to ecosystems. Finally, comprehensive plans are continually being updated to reflect new information and shifts in the public interest. Adaptability is an important component to address constantly changing ecological and social conditions. A comprehensive plan thus contains many of the characteristics of a traditional ecosystem management plan, only it is focused on the local level.

Measuring Industry and Other Stakeholders' Participation

Stakeholder participation variables were measured through a survey on public participation and planning conducted in the summer of 1999 as part of a National Science Foundation (NSF) research project. In each jurisdiction, personal interviews with planning directors and citizen participation staff were conducted to measure characteristics of the participation processes. The participation of 13 different stakeholders in the planning process was recorded as a dichotomous variable.[4] The use of this many predictor variables in regression analysis having only 30 cases would likely produce ''overfitting'' of the data, so these variables were grouped into five categories: resource-based industry (i.e. forestry, agriculture, marine/coastal operations), business (i.e., development associations, commercial development groups, homeowners associations), environmental nongovernment organizations (NGOs), local government departments (i.e., transportation, development services, environmental protection, emergency services), and others (e.g., neighborhood groups, elected officials, affordable housing groups, representatives of special districts, etc.).

Measuring Contextual Control Variables

Contextual control variables were included in the final model to isolate the effects of environmental factors. Capacity was determined through a survey of planning directors in each sampled jurisdiction. Planning capacity is usually defined as the amount of professional planning expertise involved in developing a plan. This variable was measured based on the number of staff devoted to writing the plan and evaluated on an interval scale. Generally, the more personnel devoted to drafting a plan, the stronger it tends to be. Population and wealth were measured using U.S. Census data. Population for each jurisdiction was measured based on census estimates of 1997, which was the median year the plans were adopted. These data were then logged to reduce skewness in the data, which is common for population and wealth. Similarly, the natural log of the median home value using census estimates measured the wealth of a community.

The analysis of the data was based on two phases of ordinary least squares (OLS) regression. First, the impacts of stakeholder variables alone on plan quality were examined. Second, contextual control variables were added to estimate the influence of industry in a more fully specified model. Tests for model specification, multicollinearity, and heteroskedasticity revealed no violation of OLS regression assumptions. In addition, a series of diagnostics was performed to test for influential data points or outliers because influential data points may have a significant impact in a sample as small as 30. Various types of plots, as well as robust regression, uncovered no influential data points affecting the results.

Results

The results of the first regression model indicate that the presence of specific stakeholders does statistically impact the quality of comprehensive plans with regard to their ability to protect natural systems (Table 1). The presence of resource intensive industry groups has the strongest positive influence on ecosystem plan quality with an effect of 10.0, which is statistically significant (compared to the baseline variable others) far beyond the .05 level. A *t*-test for the significance of industry irrespective of the "others" baseline dummy is also statistically significant at the .05 level. These results support the hypothesis that although industry is often overlooked as a key stakeholder, it can, in certain instances, bring to the planning process valuable knowledge and resources regarding its ownership of critical habitats, which in turn increase the quality of adopted plans.

Prior case study research of planning processes support these statistical results. For example, the participation of the marina industry in the Fort Lauderdale planning process resulted in stronger coastal management policies. Marine trade and recreation representatives met in groups and one-on-one with planning staff throughout the development of the comprehensive plan. Since this stakeholder group depends on a healthy natural environment for its business, it has a financial interest in ensuring clean waters. The marine industry proposed higher water quality standards and clean-up efforts that were later incorporated as policies in the final plan (Brody 2001a). In this instance, industry was a driving force in generating stronger environmental and ecosystem management policies for coastal areas.

TABLE 1 Effect of Key Stakeholders on Plan Quality[a]

Variable	Coefficient	Standardized coefficient	Standard error	*t* Value	Significance
Industry	10.06	.58	2.60	3.86	.001
Business[b]	3.54	.18	2.60	1.36	.184
NGOs	5.06	.33	2.34	2.16	.040
Government	–3.05	−.17	2.58	−1.18	.247
Constant	13.16		2.81	5.39	.000
N	30				
F Ratio (4,25)	7.77				
Significance	.0003				
Adjusted R^2	.48				

[a]Plan quality was measured as the total plan coding score divided by the total possible score and multiplied by 10 to create a scale from 0 to 50.

[b]Business groups include development associations, commercial development groups, and homeowners associations.

Similarly, in Pinellas County, Florida Power, Inc., played a key role in educating planners about existing natural resources and generating policies to manage those resources for the future. As a major landholder and community member, Florida Power was an active participant in the planning process. The company shared information related to critical habitats on its lands and ensured that these areas were considered part of the environmental programs associated with the plan. More specifically, Florida Power allowed critical habitats occurring along utility easements to be incorporated into the existing network of protected lands throughout the county (Brody 2001b).

It is important to note that of course not all resource-intensive industries make environmental protection a priority. In fact, organizations in Florida and across the country have violated environmental regulations and possibly concealed the impacts of their operations on the natural environment to avoid costly lawsuits. Large single firms can also have diverse and conflicting interests and behaviors so that they can simultaneously violate environmental regulations while becoming involved in initiatives to protect critical natural resources on their lands and the lands of others. However, there is evidence to support the hypothesis that under specific circumstances, when industrial groups want to be a part of the planning process, their participation can significantly increase the environmental quality of the adopted plan. It is not the goal of this article to assess the motivations of resource-based industries, but whether their presence can enhance the outcome of the planning process.

The presence of NGOs in the planning process also has a statistically significant regression coefficient. This result is expected, since environmental groups often provide valuable environmental data and expertise to the planning process. The proenvironmental stance and educational mission of many NGOs should drive ecosystem plan quality higher. For example, by actively participating in the Pinellas County planning process through a working group, the Audubon Society was able to educate county staff by sharing their data and environmental knowledge of the region. In this case, communication, information sharing, and a staff receptive to the comments of working group members led to a stronger, more innovative environmental component of the comprehensive plan. Through environmental working

TABLE 2 Impact of Industry on Plan Quality[a] When Controlling for Contextual Factors

Variable	Coefficient	Standardized coefficient	Standard error	*t* Value	Significance
Industry	6.77	.40	2.19	3.09	.005
Remaining stakeholders	−0.26	−.14	0.25	−1.05	.300
Wealth	3.51	.07	5.94	0.59	.560
Population	8.83	.70	1.79	4.92	.000
Capacity	−0.32	−.13	0.30	−1.08	.290
Constant	−36.53		32.28	−1.31	.269
N	30				
F Ratio (5,24)	13.94				
Significance	.0000				
Adjusted R^2	.74				

[a]Plan quality was measured as the total plan coding score divided by the total possible score and multiplied by 10 to create a scale from 0 to 50.

group discussions, it was pointed out by the Audubon Society that existing parks served as migratory bird habitat (Brody 2001b). Certain activities of the park staff, such as mowing native vegetation, were detrimental to the bird populations. These concerns led directly to a policy in the final plan (policy 3.1.6) that strengthens the level of protection for critical habitats in existing parklands.

Contextual control factors were then added to the statistical model to further isolate the effects of industry participation on ecosystem plan quality. Business, NGO, and government stakeholder categories were grouped into a single variable called "remaining stakeholders." Population, wealth, and planning capacity (i.e., the number of staff devoted to drafting the comprehensive plan) were included to control for extraneous variables that may also drive the plan quality measure.

In the second regression model, industry participation remains a powerful predictor of ecosystem plan quality, but population of each jurisdiction is the most significant variable (Table 2). This effect may be explained by the fact that population levels can often be associated with a high level of urban development and the decline of critical natural habitats. Urbanization is often associated with higher levels of disturbance to natural ecosystems, resulting in a greater perceived need to protect remaining areas of biodiversity. High levels of population may then indirectly drive ecosystem plan quality higher. Wealth of a jurisdiction and planning capacity are not significant variables in the model, as might have be expected. Wealthier communities often are more interested in environmental protection policies and greater planning capacity has been associated with higher plan quality in general (Burby et al., 1997; Berke et al., 1996). A future study with a larger sample size with more statistical power may determine that these two variables are more statistically significant.

Conclusions

Based on initial results of the study, on average, the presence of resource-based industries significantly increases the quality of plans with respect to their ability to manage ecosystems over the long term. When industry brings to the planning process valuable resources, knowledge of critical habitats, and innovative ideas of how to sustainably manage these habitats based on their own experience, it can strengthen the ability of the final plan to achieve the principles of ecosystem management. Industry often conducts its own monitoring activities and maintains large databases on environmental conditions. By sharing information throughout the planning process, this stakeholder group has the ability to boost the collective capacity of those drafting the plan, leading to more effective management of ecological systems. If a comprehensive or environmental management plan has the potential to directly or indirectly affect industry lands, industry collaboration throughout the planning process is thus essential.

It is important to note that the quality of a plan is not always correlated with the quality of its implementation. Indeed, a poor plan might be more quickly and firmly installed than a stronger, but more cumbersome counterpart. However, it is generally believed that if a community makes the commitment to generate a high quality plan, this commitment will carry over to implementation stages. Also, it is widely argued that public participation during the planning process will result in a more enduring outcome (Godschalk et al. 1994).

That is not to say all industries are concerned with ecosystem management and will help raise the quality of plans through active participation. Many organizations in Florida and around the country are staunchly opposed to any type of environmental initiatives since they view them as threats to corporate profitability. However, it is clear from the results of this study that when industry groups want to be part of the planning process, they tend to positively impact the quality of the final plan as it relates to ecological systems management. Environmental planners should therefore target specific types of industry that will be the most likely to enhance the quality of the final plan and improve ecosystem management outcomes. A strategy of targeted participation can ensure that stakeholders that have the most to contribute are present during the planning process.

Less than 20% of the jurisdictions studied targeted any type of industry group for participation in the planning process. In contrast, 60% of the sample targeted local business groups, such as storeowners, and approximately half targeted neighborhood associations. In this sense, industrial stakeholders represent an untapped planning resource who have the ability to boost the collective capacity of planning participants, resulting in a stronger, better balanced plan that not only meets the interests of the community but may more likely to be implemented over time.

While this study indicates that resource-based industries and associated large landholders can play an important role in producing plans that seek to manage ecological systems, additional research is necessary to determine under which circumstances these groups have the greatest impact on plan quality. For example, the stage of participation during the planning process and the specific participatory techniques used to engage stakeholders might be critical in determining industry's impact on the quality of management plans. Future studies should probe further to understand not only which specific industries are most beneficial to ecosystem management outcomes, but under which circumstances. Also, the motivations for industry to participate in the planning process must be more clearly articulated. While the presence of certain industries may enhance the final plan, there is no coherent framework for understanding how industry itself might benefit from engaging in ecosystem approaches to management. Future studies should also investigate the link between plan quality and plan implementation with respect to ecosystem management capabilities. Much of the quantitative planning literature is weak when it comes to the strength of implementing a plan in part due to the difficulties in accurately measuring the success of an adopted plan and the large time frame needed to assess if the requirements of the plans are put into place. This study is limited to an assessment of the quality of a plan, but does touch upon the quality of its implementation. Finally, while plan evaluation is a time-consuming and expensive technique, larger sample sizes with greater statistical power would enhance the results. Thus, this article should be considered a starting point for future quantitative evaluations of the role of industry in ecosystem management and planning.

Notes

1. The term *transboundary* is defined for this study as a management approach that focuses beyond a single human boundary, such as a local jurisdiction or some line of human ownership.
2. Resource-based industries were defined as industrial forestry groups, large-scale agricultural groups, port and marine industry groups, and utility groups. This stakeholder category was designed to capture the private major land holders and resource users in Florida. While these specific groups have different operational goals and interests, this study combines them into a single category for the purposes of analysis, since their contribution to the planning process (land, knowledge, resources) is very much the same.
3. The effort needed to evaluate comprehensive plans prohibited a larger sample size. The n/p ratio was kept as high as possible to facilitate statistical interpretation of results.
4. Planning directors and staff involved in overseeing the planning processes provided information based on records of which stakeholders were involved in creating the plans.

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APPENDIX A Ecosystem Plan Coding Protocol

Factual Basis		
A. Resource Inventory		
Ecosystem boundaries/ edges	Ecological zones/habitat types	Ecological functions
Species ranges	Habitat corridors	Distributions of vertebrate species
Areas with high biodiversity/species richness	Vegetation classified	Wildlife classified
Vegetation cover mapped	Threatened and endangered species	Invasive/exotic species
Indicator/keystone species	Soils classified	Wetlands mapped
Climate described	Other water resources	Surface hydrology
Marine resources	Graphic representation of transboundary resources	Other prominent landscapes
B. Ownership Patterns		
Conservation lands mapped	Management status identified for conservation lands	Network of conservation lands mapped
Distribution of species within network of conservation lands		
C. Human Impacts		
Population growth	Road density	Fragmentation of habitat
Wetlands development	Nutrient loading	Water pollution
Loss of fisheries/marine habitat	Alteration of wat2erways	Other factors/impacts
Value of biodiversity identified	Existing environmental regulations described	Carrying capacity measured
Incorporation of gap analysis data		
Goals and Objectives		
Protect integrity of ecosystem	Protect natural processes/functions	Protect high biodiversity
Maintain intact patches of native species	Establish priorities for native species/habitat protection	Protect rare/unique landscape elements
Protect rare/endangered species	Maintain connection among wildlife habitats	Represent native species within protected areas

(Continued)

APPENDIX A *(Continued)*

Maintain intergenerational sustainability of ecosystems	Balance human use with maintaining viable wildlife populations	Restore ecosystems/critical habitat
Other goals to protect ecosystems	Goals are clearly specified	Presence of measurable objectives
Interorganization Coordination and Capabilities for Ecosystem Management		
Other organizations/stakeholders identified	Coordination with other organizations/jurisdictions specified	Coordination within jurisdiction specified
Intergovernmental bodies specified	Joint database production	Coordination with private sector
Information sharing	Links between science and policy specified	Position of jurisdiction within bioregion specified
Intergovernmental agreements	Conflict management processes	Commitment of financial resources
Other forms of coordination		
Policies, Tools, and Strategies		
A. Regulatory Tools		
Resource use restrictions	Density restrictions	Restrictions on native vegetation removal
Removal of exotic/invasive species	Buffer requirements	Fencing controls
Public or vehicular access restrictions	Phasing of development	Controls on construction
Conservation zones/overlay districts	Performance zoning	Subdivision standards
Protected areas/sanctuaries	Urban growth boundaries to exclude habitat	Targeted growth away from habitat
Capital improvements programming	Site-plan review	Habitat restoration actions
Actions to protect resources in other jurisdictions	Other regulatory tools	
B. Incentive-Based Tools		
Density bonuses	Clustering away from habitats	Transfer of development rights
Preferential tax treatments	Mitigation banking	Other incentive-based tools

(Continued)

APPENDIX A *(Continued)*

C. Land Acquisition Programs		
Fee simple purchase	Conservation easements	Other land acquisition techniques
D. Other Strategies		
Designation of special taxing Districts for acquisition funding	Control of public investments and projects	
Monitoring of ecological health and human impacts	Public education programs	
Implementation		
Designation of responsibility	Provision of technical assistance	Identification of costs or funding
Provision of sanctions	Clear timetable for implementation	Regular plan updates and assessments
Enforcement specified	Monitoring for plan effectiveness and response to new information	

APPENDIX B Concept Measurement

Name	Type	Measurement	Scale	Source	Mean	Std. Dev.
Plan quality	Dependent	Sum of five plan components: factual basis + goals and objectives + interorganizational coordination + policies + implementation	Interval; 0–50	Sample of Plans	20.62	7.76
Industry	Independent	Presence of stakeholder in planning process	Dichotomous; 0,1	Survey	0.3	0.466
Business	Independent	Presence of stakeholder in planning process	Dichotomous; 0,1	Survey	0.8	0.407

(Continued)

APPENDIX B *(Continued)*

NGOs	Independent	Presence of stakeholder in planning process	Dichotomous; 0,1	Survey	0.433	0.504
Government	Independent	Presence of stakeholder in planning process	Dichotomous; 0,1	Survey	0.733	0.450
Capacity	Independent	Number of planners devoted to drafting the plan	Continuous	Survey	2.833	3.13
Population	Independent	Natural log of the population estimate for a jurisdiction for 1997	Interval	U.S. Census	4.513	0.620
Wealth	Independent	Natural log of the median home value	Interval	U.S. Census	4.931	0.157