

ABSTRACT

FOSTER, MICHAELA OLIVIA. Evaluating Natural Resource Management Plans and Plan Evaluation Studies. (Under the direction of Dr. Frederick Cabbage and Dr. M. Nils Peterson.)

The management challenges associated with natural resource problems have become increasingly complex over time, and in response, natural resource planning has expanded on the rational-comprehensive model to include more holistic and dynamic management approaches including more collaboration between agencies and stakeholder engagement. Evaluating plans helps to determine how planning shifts to address the evolving nature of natural resource management problems and highlights strengths and weaknesses in plans, and because plans are widely used and may be key tools for successful management of natural systems, routine evaluation of plan quality is necessary. A plan evaluation tool based on components of the rational-comprehensive planning model and key innovations intended to address wicked problems was developed and used to evaluate and compare management plans from federal, state, and nongovernment groups managing longleaf pine ecosystems in the Southeast United States in five components that influence plan effectiveness: (1) problem and objective statement, (2) fact base, (3) actions and implementation, (4) integration with other plans, and (5) stakeholder participation.

The tool seemed to be an effective means to provide an objective assessment of the management plans, with high intercoder reliability, and our findings indicate that agencies are producing plans that better address the challenge of restoring longleaf pine ecosystems. Plans from federal agencies scored higher on average than state and nongovernmental agency plans. Plans generally scored high in fact base and integration with other plans but scored poorly on strategic elements such as actions and implementation, reflecting differences in agency missions, cultures, and resources. Studies evaluating the quality and content of many

types of plans have grown in recent decades. However, there has been limited analysis of plan evaluation studies focused on natural resource plan evaluation. This focus is needed because natural resource management differs from other types in that management operates under the assumption that natural resources have a use value and are common pool resources. An analysis of natural resource plan evaluation studies was conducted by assessing the plan characteristics evaluated and methods used in ten natural resource management plan evaluation studies. The results found that natural resource plan evaluation studies follow many of the same practices as the general body of evaluation studies but tend to analyze goals, policies, implementation, and coordination characteristics more often than the larger body of plan evaluation studies. Our results indicate that compliance and stakeholder engagement may be key gaps in natural resource management plan evaluation studies. Future work should link plan quality to successful implementation and goal achievement, identify factors influencing plan quality scores, and investigate how agencies use findings from plan evaluation and meta-analysis studies.

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Evaluating Natural Resource Management Plans and Plan Evaluation Studies

by
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DEDICATION

To my mother,
to my family and loved ones,
and to all those who have supported and encouraged me along the way.

BIOGRAPHY

Michaela Olivia Foster was born in Reston, Virginia on December, 30, 1990 and grew up in Huntsville, Alabama. She received her undergraduate degree in Environmental Sciences and Policy from Duke University, where she graduated with distinction in 2013. She continued her academic pursuits in the Department of Forestry and Environmental Resources at North Carolina State University, and she earned her M.S. in Natural Resources in 2015. She looks forward to continuing her academic journey as she begins work towards her PhD in the fall of 2015.

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CHAPTER 1: INTRODUCTION

Managing natural resources has become increasingly complex over time, as government and nongovernmental organizations must manage with flat or decreasing budgets, operate under more legal mandates, and interact with more stakeholder groups. Hundreds and even thousands of decisions made each year by individuals, government, and nongovernmental organizations shape the condition of Southeastern landscapes, and many resource management decisions transcend political and jurisdictional boundaries, involve multiple stakeholders with sometimes competing and not well understood objectives, and must account for complex scientific information associated with global change processes, such as land cover and climate change, that exert influence on natural resources at many scales. These complex management challenges require more collaborative approaches to meet science and governance challenges, including leveraging resources and expertise and communicating and cooperating with partners that may be unfamiliar or even previous adversaries. This increasingly challenging context of natural resource management problems is making planning increasingly important (Allen & Gould, 1986; Lachapelle, McCool, & Patterson, 2003).

In response to the increasing complexity of management challenges, recent developments in natural resource planning have expanded on the rational-comprehensive model to include more comprehensive and dynamic management approaches including more collaboration between agencies and stakeholder engagement. Evaluation and monitoring protocols support adaptive management, allowing managers to gather information about the system and change management actions as conditions change. Increasing collaboration

between agencies allows agencies to surpass budget, political, and scientific constraints, and collaboration provides an opportunity for agencies to coordinate actions across the landscape, potentially increasing the reach and impact of management actions. Engaging with stakeholders helps to develop ownership between agencies and the public over the natural resource problem and outcome, which in turn, may lead to greater political and public support and increases the chances of successful implementation (Lachapelle & McCool, 2005).

These wicked problems and the evolving approaches to planning in the face of wicked problems provide the context for this thesis, where I will use a plan evaluation tool and a meta analysis to test several hypotheses related to improved planning responses to wicked problems. I hypothesize that stakeholder participation in the planning process positively impacts plans having a clear problem and objective statement and is positively related to plans being integrated with other plans. These, in turn, predict plans having a clear outline of management actions and implementation protocols. Strong planning fact bases may also better address wicked problems since data can be used to help identify management problems and define objectives, to monitor progress towards objectives, and to help determine if changes to management actions are needed. As the planning practice evolves to better address these wicked natural resource problems, I expect agencies to learn from previous planning efforts and to improve the quality of plans over time. Because each agency faces unique institutional and planning contexts, I hypothesize the quality of plans to vary among agencies.

Because plans may be key tools for successful management of natural systems, routine evaluation of plan quality is necessary (Berke, 1994). Natural resource management plans are used widely to make decisions across millions of acres of landscapes and seascapes, and they play an important role in shaping natural resource use and allocation under various complex constraints (Lachapelle et al., 2003). Plan evaluations help to determine how planning shifts to address the evolving nature of natural resource management problems. Meta-analysis of plan evaluation studies, as opposed to analyzing the plans themselves, is needed as the plan evaluation literature continues to grow. Meta-analysis of plan evaluation studies provide additional information about the plan evaluation practice by highlighting differences in studies, the criteria they assess, and the methods they use and may be used to compare planning efforts across multiple domains.

The restoration of longleaf pine ecosystems is a complex natural resource problem that will require high-quality planning to guide successful restoration efforts and provides a good context for exploring the current state of natural resource planning (The Nature Conservancy, 2015; Van Lear, Carroll, Kapeluck, & Johnson, 2005). In the next chapter of this thesis, I present a plan evaluation tool based on components of the synoptic model and key innovations intended to address wicked problems. I then evaluate and compare management plans from federal, state, and private groups managing longleaf pine ecosystems in the Southeast United States in five components that influence plan effectiveness: (1) problem and objective statement, (2) fact base, (3) actions and implementation, (4) integration with other plans, and (5) stakeholder participation. In the third chapter of this thesis, I present a meta-analysis of natural resource plan evaluation studies. I begin with a

review of the conceptual foundation for natural resource plan evaluation studies and describe the criteria determining plan quality. Then, I present findings from a meta-analysis of ten natural resource plan evaluation studies, detailing the criteria evaluated in the studies and methods used, and conclude with recommendations for best practices. The final chapter of the thesis presents conclusions and suggestions for future work based on the findings of the two studies presented in chapters two and three.

REFERENCES

- Allen, G. M., & Gould, E. M., Jr. (1986). Complexity, wickedness, and public forests. *Journal of Forestry*, 84, 20-23.
- Berke, P. R. (1994). Evaluating environmental plan quality: the case of planning for sustainable development in New Zealand. *Journal of Environmental Planning and Management*, 37 (2), 155–70.
- Lachapelle, P. R., McCool, S. F., & Patterson, M. E. (2003) Barriers to effective natural resource planning in a "messy" world, *Society and Natural Resources*, 16, 6, 473-490, DOI: [10.1080/08941920309151](https://doi.org/10.1080/08941920309151).
- Lachapelle, P. R., & McCool, S. F., (2005). Exploring the concept of “ownership” in natural resource planning. *Society and Natural Resources*, 18(3), 279-285, DOI: [10.1080/08941920590908141](https://doi.org/10.1080/08941920590908141).
- The Nature Conservancy. (2015). *Who speaks for the trees? Longleaf pine forests in the Sewee-to-Santee region*. Retrieved from <http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/southcarolina/howwework/longleaf-pine.xml>.
- Van Lear, D. H., Carroll, W. D., Kapeluck, P. R., & Johnson, R. (2005). History and restoration of the longleaf pine-grassland ecosystem: Implications for species at risk. *Forest Ecology and Management*, 211(1-2), 150-165.

CHAPTER 2: EVALUATION OF NATURAL RESOURCE PLANNING IN LONGLEAF PINE ECOSYSTEMS

In collaboration with Dr. Frederick Cabbage, Dr. Gerard McMahon, and Dr. Nils Peterson.

INTRODUCTION

The management challenges associated with natural resource problems have become increasingly complex over time, as more legal mandates, more interest groups, and decreasing budgets have interacted to constrain government and nongovernment organizations and their management opportunities. This increasingly wicked or challenging context of natural resource management problems is making planning increasingly important but also introducing challenges that make planning more difficult (Allen & Gould, 1986; Lachapelle, McCool, & Patterson, 2003). Natural resource management problems are inherently complex and unique in time and space (Salwasser, 2004). They are difficult to clearly define and such wicked problems often lead to unintended consequences. Wicked problems do not have definitive solutions, only better or worse solutions (Rittel & Webber, 1973; Head & Alford, 2008). These problems are characterized by dynamic conditions, scientific complexity, multiple stakeholders with diverse and at times competing values and goals, and a lack of resources, time, and information (Lachapelle et al., 2003).

Natural resource planning typically follows a rational-comprehensive or synoptic model, which provides a straight-forward approach to addressing tame problems (Lachapelle et al., 2003). The rational-comprehensive model is a science-based, expert-driven approach to management that assumes a predictable environment and consensus among stakeholders on goals, objectives, and a best alternative (Hudson, 1979; Lachapelle et al., 2003; Lawrence,

2000; McCool & Guthrie, 2001). In natural resource planning, data is gathered, often in the form of ecosystem and species assessments, and used to help define the management problem and to identify objectives, and actions and implementation protocols are developed based on the problem the agency aims to address and the goals and objectives the agency hope to achieve. While the rational-comprehensive planning model is well suited to address well defined problems in which objectives are shared and sufficient information is available, it may be inadequate at planning for and addressing wicked and messy problems (LaChapelle et al., 2003; Salwassar, 2004).

In response to the increasing complexity of management challenges, natural resource planning has expanded on the rational-comprehensive model to include more comprehensive and dynamic management approaches. Natural resource planning has also expanded public and stakeholder involvement in the process, allowing agencies to better represent stakeholders' social values (Lachapelle et al., 2003). In an effort to surpass resource limitation barriers, natural resource planning has placed greater focus on collaboration among agencies (Roberts, 2000). Agencies have moved towards ecosystem-based management strategies, a management framework that allows agencies to consider how interactions among all species in an ecosystem including humans are affected by natural processes over different temporal and spatial scales (Cortner, Shannon, Wallace, Burke, & Moote, 1996; Stankey, Clark, & Bormann, 2005).

These strategies also facilitate adaptive management, a structured management approach to improving management as outcomes become better understood (Williams & Brown, 2012). Adaptive management operates under the premise that uncertainty about the

ecosystem exists and provides a systemic approach to management that is not dependent on perfect information (Walters & Holling, 1990). Adaptive management focuses on learning while doing through monitoring and evaluation and allows planning and management to adapt over time as conditions change (Stankey et al., 2005; Williams & Brown, 2012). This provides managers some flexibility to choose and change management strategies over time.

Longleaf Pine Ecosystem Planning

This research examined the application of natural resource planning practices to the management of longleaf pine ecosystems in the Southeast. The restoration of longleaf pine provides a good context for exploring environmental planning and natural resource plan evaluation for multiple reasons. Longleaf pine dominated the Southeast's coastal plain in colonial times, covering up to 90 million acres, but due to agriculture conversion, overharvesting, conversion to other pines including loblolly, fire suppression, and urbanization, only 3.4 million acres remain today (Frost, 1993). These ecosystems typically exist in isolated fragments on public and private land throughout the Southeast, and a multitude of actors including federal and state governments, nongovernmental agencies, and the private sector own and manage these ecosystems (Van Lear, Carroll, Kapeluck, & Johnson, 2005).

The restoration of longleaf pine ecosystems is a complex natural resource problem and will require high-quality planning to guide successful restoration efforts (The Nature Conservancy, 2015; Van Lear et al., 2005). Each of the actors making decisions about the management of longleaf ecosystems (primarily agencies, NGOs, and private landowners) have common interests in restoring longleaf and other open grown pine systems.

Stakeholders are interested in restoring these systems both for protecting biodiversity and for developing profitable investments in timber products (The Longleaf Alliance, 2015). These systems are also included in climate change considerations because longleaf pine systems are naturally robust to climate extremes, growing under both wet and dry conditions, and are adapted to severe storms. These systems, compared to other Southern pines, are more tolerant of wildfire and resistant to pests such as Southern pine beetle, disturbances which are expected to exacerbate under warmer, drier conditions (Southeast Regional Partnership for Planning and Sustainability, 2009).

These stakeholders have developed many individual agency and cooperative plans, incorporating their own values and missions into restoration goals, which results in a range of conflicting objectives and management actions (Conroy & Peterson, 2013). Stakeholder participation processes play an important role in guiding the planning process and developing planning outcomes. Stakeholder input helps agencies define objectives and actions that meet the needs of both the agency and those who use the resource and are affected by its management. Engaging with stakeholders may also alert agencies to other plans and groups that should be considered during the planning process, which may influence what management actions are presented. Coordination among agencies may better align all agencies to meet overarching conservation goals, such as those presented in America's Longleaf's Range-wide Conservation Plan for Longleaf Pine (Armsworth et al., 2015).

Many agencies develop plans under direction from federal planning directives (Table 1). These federal organic acts provide federal agencies with discretion and authority to

manage federal lands, and list principles and requirements under which lands should be managed.

Table 1. Major Natural Resource Planning Directives

<i>Agency</i>	<i>Mission</i>	<i>Organic Act</i>	<i>Revision</i>
US Department of Interior Fish and Wildlife Service	“Working with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.”	National Wildlife Refuge System Administration Act of 1966	National Wildlife Refuge System Improvement Act of 1997
US Department of Agriculture – Forest Service	“Sustain the health, diversity, and productivity of the Nation’s forests and grasslands to meet the needs of present and future generations.”	National Forest Management Act of 1976	2012 Planning Rule
US Department of Defense – Natural Resources and Environment	“ provide the military forces needed to deter war and to protect the security of our country”	Federal Land Policy and Management Act of 1976	Sikes Act Amendments of 1997
National Association of State Foresters- State Forest Action Plans	“ represent State and Territorial Forester interests by influencing forest policy and leading efforts to promote healthy and sustainable trees and forests.”	Food, Conservation, and Energy Act of 2008	

Agencies have unique institutional histories and operational contexts (e.g. number of acres, operational missions, resources available) that factor into the quality and effectiveness of their planning efforts. Every agency has an individual process for engaging with stakeholders and work with certain partners. Management efforts are constrained by planning mandates, limited resources (e.g. budget, staff, and time), and scientific uncertainty about the ecosystem and dynamics between the system and management actions, and these constraints vary by agency. Thus, plans are likely influenced by the various planning and institutional contexts and constraints, which may be reflected through variation in the quality of plans between agencies.

Improvements to the Rational-Comprehensive model

Complex and wicked problems exist in conservation management and may not be well addressed in the rational-comprehensive model. Planning under the traditional rational-comprehensive model involves clearly defining the management problem including conducting a thorough assessment of the current state of the management area and articulating agreed upon management objectives and preferred actions to address objectives. However, natural resource problems are often difficult to define due to scale mismatches and dynamic systems, and many stakeholders with multiple, and at times conflicting, objectives and proposed actions are involved in planning and management.

These problems may be better addressed with improved stakeholder participation and stronger fact bases. As management problems have become increasingly more complex, planning practice has expanded to incorporate evaluation and monitoring protocols to facilitate adaptive management, to further collaboration between agencies, and to encourage more stakeholder and public involvement (Blahna & Yonts-Shepard, 1989). Natural resource problems affect many stakeholders, and engaging with them provides agencies with a better understanding of the scope of the management problem and what values and objectives are important to them. Stakeholder engagement may also promote collaboration between agencies who are working toward similar objectives. We hypothesize that better stakeholder participation in the planning process leads to plans having a clear problem and objective statement and to plans being better integrated with other relevant plans. These, in turn, are positively related to plans having clearly articulate and well-developed management actions and implementation protocols. Strong planning fact bases may also better address wicked

problems since data can be used to identify management problems, monitor progress towards objectives, and help determine if changes to management actions are needed.

As the planning practice evolves and as agencies update and produce new plans, we expect the quality of plans to improve over time as agencies learn and improve from previous planning efforts. Because the resources available and constraints faced by each agency vary given each agency's specific institutional and planning contexts, we expect plan quality to vary by the type of plan and agency producing it.

These shifts in management problems and planning have created a need for systematic plan evaluation efforts to test the set of hypotheses presented above related to addressing wicked problems. We use plan evaluation to identify where planning models should be updated to address shortcomings associated with the rational-comprehensive model. Given numerous constraints and challenges, planning is critical for successful management of natural systems, and an evaluation of management plans allows us to objectively assess planning practices. Plan evaluations may be used to determine the overall quality of plans, highlight the strengths and weaknesses of plans, and contribute to learning about the co-evolution of natural resource management problems and plans to address them.

In this paper, we present a plan evaluation tool based on components of the rational-comprehensive model (e.g., definition of problem, objectives and actions) and key innovations intended to address wicked problems which are: adaptive management, collaboration between agencies, and stakeholder engagement. We then evaluate and compare management plans from federal, state, and private groups managing longleaf pine ecosystems in the Southeast United States. The goal of this paper is to evaluate the current state of

planning practice for longleaf pine systems and evaluate relationships among five factors that influence plan effectiveness: (1) problem and objective statement, (2) fact base, (3) actions and implementation, (4) integration with other plans, and (5) stakeholder participation. It is our expectation that the resulting knowledge will benefit managers faced with restoring longleaf pine systems and other wicked natural resource management problems.

METHODS

Theoretical Background

We proposed a model for understanding how each of the five planning components we evaluated relates to each other (Figure 1). In our model, we hypothesized the actions and implementation component score is better when the problem and objective statement has been well-defined, the fact base has been developed, and the plan has articulated how it fits into the context of other plans.

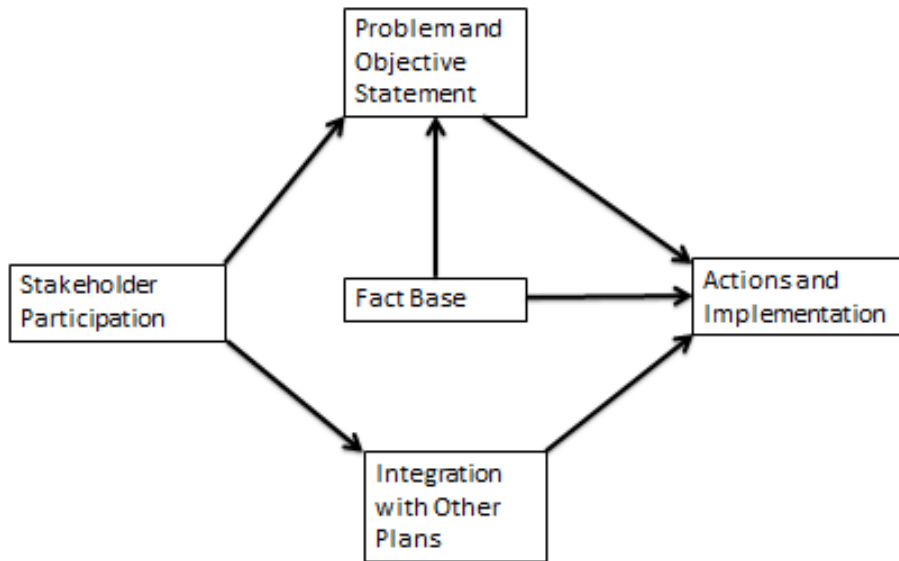


Figure 1. Hypothesized Path Diagram Model for Quality of Plan Evaluation Components

Stakeholder participation plays an important role in planning and implementation for natural resources, and insights gained during the engagement process may affect other areas of the planning process. We placed stakeholder participation early in the causal chain, and influencing problem and objective statement and integration with other plans. Given that natural resource problems are complex and affect a multitude of stakeholders, planning and management must be transparent, understanding of different types of knowledge and values, and flexible to adapt to changing conditions, and engaging with stakeholders and other agencies may help agencies to achieve desired management goals (Reed, 2008). Engaging with stakeholders helps to develop a sense of ownership between agencies and the public over the natural resource problem and outcome, which in turn, may lead to greater political

and public support and increases the chances of successful implementation (Lachapelle & McCool, 2005).

As Duram and Brown (1999) state, plans are “based on public opinions, agency regulations, and local conditions,” and the goals and objectives developed to reach desired resource conditions are a reflection of the values of the stakeholders expressed during the planning process. Previous work by Lachapelle, McCool, and Patterson (2003) identified inadequate goal definition, in particular goals that were specific and detailed enough to developed management actions, as one of the main barriers to effective planning. In our model, we expand on these findings and suggest that there is a positive relationship between clearly defined objectives and clearly articulated actions and implementation protocols.

Stakeholder participation may also increase agency capacity for coordination since participation processes increase public and other agency awareness of management problems and other initiatives targeting similar problems and increase agency understanding of how their actions affect the quality of the resource on their land and throughout the region (Duram & Brown, 1999). Thus, we suggested that better stakeholder participation leads to better integration with other plans and management initiatives. Stakeholder participation processes provide opportunities for other agency stakeholders to consult with each other, often informally as each agency operates under different mandates (Lachapelle, McCool, & Patterson, 2003). We see integration with other plans as fitting as an intermediary component between stakeholder participation and actions and implementation because agencies may be better able to understanding how their plan fits into the larger context of resource

management and may be better able to acquire support to implement proposed actions and may potentially increase the reach and impact of management actions.

A strong fact base can play an important role in the planning and decision making processes of natural resource agencies. For instance, agencies use ecosystem and species assessments to inform establishment of management objectives and actions (Lachapelle, McCool, & Patterson, 2003). As such, we suggested that the fact base component is positively related to both problem and objective statement and actions and implementation in our model.

We hypothesized government (federal and state) agencies would have higher scoring plans for longleaf pine ecosystem management than nongovernmental organizations since agencies must comply with planning mandates, have longer planning histories, and typically have more access to data through in-house research and development units; whereas, nongovernmental organizations are often dependent on partners for data. As a result of individual differences in agency missions, planning contexts, and resources, we hypothesized that plan quality varies by each agency, as well.

We predicted that plan quality would improve over time. In other words, older plans would score lower than newer plans, and we believe this is a reflection of learning over time. This trend was found in a longitudinal study of hazard mitigation plans in Florida and Washington (Brody, 2003).

Data Collection

Publically available natural resource management plans directing management of longleaf pine ecosystems from federal, state, and nongovernmental organizations (NGOs)

were gathered. Seventy-one management plans from the U.S.D.A. Forest Service (n=10), U.S.D.I. Fish and Wildlife Service (n=28), Department of Defense (n=3), America's Longleaf (n=1), Nature Conservancy (n=9), Joint Ventures (n=3), and state natural resource agencies (n=17) were collected, and then a stratified sample of 35 plans was selected from the population of 71 plans in order to analyze a proportional representation of agency, state, and NGO plans. The sample included the 1 plan from America's Longleaf, 2 plans from the Nature Conservancy, 3 plans from the Department of Defense, 3 plans from Joint Ventures, 4 State Forest Action plans, 4 State Wildlife Action plans, 12 plans from the Fish and Wildlife Service, and 5 plans from the Forest Service.

Plan Evaluation Tool

We developed a plan evaluation tool (Appendix A) based on approaches developed by Berke (1994); Berke, Crawford, Dixon, and Ericksen (1999); Berke, Godschalk, and Kaiser (2006); and Brody (2003), which provided a blended qualitative and quantitative approach to assess the quality of management plans. The tool allowed us to assess the strength of specific plan elements, and then allowed statistical analysis of those ratings. We calculated the total plan evaluation score using a series of questions that measure indicators in each of the five categories: (1) problem and objective statement, (2) fact base, (3) actions and implementation, (4) integration with other plans, and (5) stakeholder participation (Appendix A). The possible coding responses were scores of 0, 1, or 2. The responses were categorized as 0= not identified; 1= identified, vague; and 2= identified, detailed, relevant, clear (Berke et al., 2006; Brody, Highfield, & Carrasco, 2004).

We evaluated the problem and objective statement using five indicators: whether plans clearly define the management problems, describe major threats and trends related to the longleaf pine ecosystem, specify objectives to guide restoration actions, analyze alternatives, and list challenges and assets that managers have. The fact base was analyzed using three indicators: whether plans assess the current state of the management area and factors influencing its current and future state, articulate information in a clear and easy to understand manner, and cite data from credible, peer-reviewed sources.

Actions and implementation were evaluated using four indicators: whether plans identify management actions, allocate funding and assign responsibility for implementation, describe evaluation protocol, and include a protocol for plan revision. Planners and managers must be aware of how a particular plan and the objectives and actions presented in the plan fit in the larger context for landscape scale conservation, and we evaluated this integration with other plans by determining whether plans identify other plans and agencies to consider or coordinate with during planning and implementation.

We evaluated stakeholder participation using three indicators: whether plans incorporate stakeholders in plan preparation or implementation, include relevant stakeholders, and describe the engagement process. According to Berke and Godschalk (2009), plans that explain how multiple stakeholders and their interests are incorporated are more influential and frequently used. Collaboration between agencies and the public is necessary to address challenging problems like longleaf pine restoration (The Nature Conservancy, 2015). We developed the management plan evaluation protocol to be specific

to plans guiding the management of longleaf pine ecosystems, although not specific to management plans of a certain type or from any one agency in particular.

We pretested the protocol to ensure reliability in the plan evaluation. A team of two graduate students independently tested the same plan and compared results. We revised the evaluation tool after discussing unclear questions and coding disagreements, and we then repeated the pretesting process. The coders working independently evaluated a subset of 15 plans from the sample. Using the results from those evaluations, we calculated percentage agreement and intercoder reliability (Cohen's kappa). The percentage agreement score was 86%, and the Cohen's kappa reliability score was 0.72. Scores at or above 80% for percentage agreement are generally considered acceptable, and scores between 0.40-0.75 represent good agreement beyond chance for Cohen's kappa (Banerjee, Capozzoli, McSweeney, & Sinha, 1999; Miles & Huberman, 1994). After testing the tool and ensuring acceptable intercoder reliability, one coder evaluated the remaining 20 plans.

Data Analysis

The total evaluation score for each category was calculated by summing the scores from all indicators. Raw scores are listed in Appendix B. Category scores varied depending on the number of questions in the category, so we standardized the scores. We divided each category score by the total possible score for that category and multiplied by 100, so scores ranged from 0 to 100 for each category. The total evaluation score for each plan was calculated by summing the raw scores from the five categories, dividing by the total possible score, and multiplying by 100. Standardizing the scores allows equal emphasis to be placed

on each plan component regardless of how many indicators are used, and provides results that are easier to understand.

We evaluated relationships between plan components using structural equation modeling (SEM). We developed the model in STATA SE version 12. Path analysis approaches including SEM test the likelihood that category scores, or observations in general, fit a causal model by allowing several multiple linear regression equations to be analyzed simultaneously (Garson, 2008; Stevenson, Peterson, Bondell, Moore, & Carrier, 2014). We measured goodness of fit for the model using standardized root mean square residual (SRMR) and R^2 measures.

We used analysis of variance (ANOVA) with Tukey's post hoc analysis ($\alpha < 0.05$) to test for differences in plan quality among plan types and agencies. We then grouped evaluation scores by federal, state, and other (nongovernmental and regional partnerships) agencies and performed an ANOVA to test our hypothesis that federal agencies produced higher scoring plans than state and nongovernmental agencies.

We conducted regression analyses on total evaluation score as a function of plan implementation year to test whether overall plan quality improves over time. In this model, total plan evaluation score was the dependent variable (y), and implementation year was the independent variable (x). We also conducted regression analyses for each category score as a function of plan implementation year, using separate models for each category.

RESULTS

All plans were implemented between 1996 and 2014, and most plans were implemented between 2005 and 2010. There was considerable range in total evaluation scores, ranging from 41.9 (Nature Conservancy’s South Atlantic Coastal Plain Ecoregional Assessment) to 86.5 (Carolina Sandhills National Wildlife Refuge Comprehensive Conservation Plan). The mean total evaluation score was 68.9 (Table 2). Actions and implementation was the lowest scoring category with a mean of 45.1, while the problem and objective statement, integration with other plans, and stakeholder participation categories had mean scores of 70.2, 80, and 76.6, respectively. The fact base category had the highest mean score of 88.4.

Table 2. Plan Evaluation Scores by Agency

Agency Level	Problem & objective statement	Fact base	Actions & implementation	Integration w/ other plans	Stakeholder participation	Total
Federal	76.9	88.4	52.6	83.3	77.6	73.6
State	61.6	96.4	42.5	100	87.5	69.1
Other	58.3	77.4	22.2	41.7	58.3	52.3
Mean	70.2	88.4	45.1	80.0	76.6	68.9
Std. Deviation	14.2	14.5	18.2	34.2	36.0	12.9

We proposed and tested a model for understanding how plan components affect each other (Figure 2), and our results largely support the theoretical model predicting structural relationships among plan evaluation components (Figure 1). More stakeholder participation during the planning process was positively related to plans having well-defined management problem statement and objectives targeting the problem and to plans being integrated with other plans. A good problem and objective statement, in turn, predicted plans having clear action and implementation protocols. Since fact base did not significantly influence either

problem and objective statement or actions and implementation, we excluded this category from the final model (Figure 3).

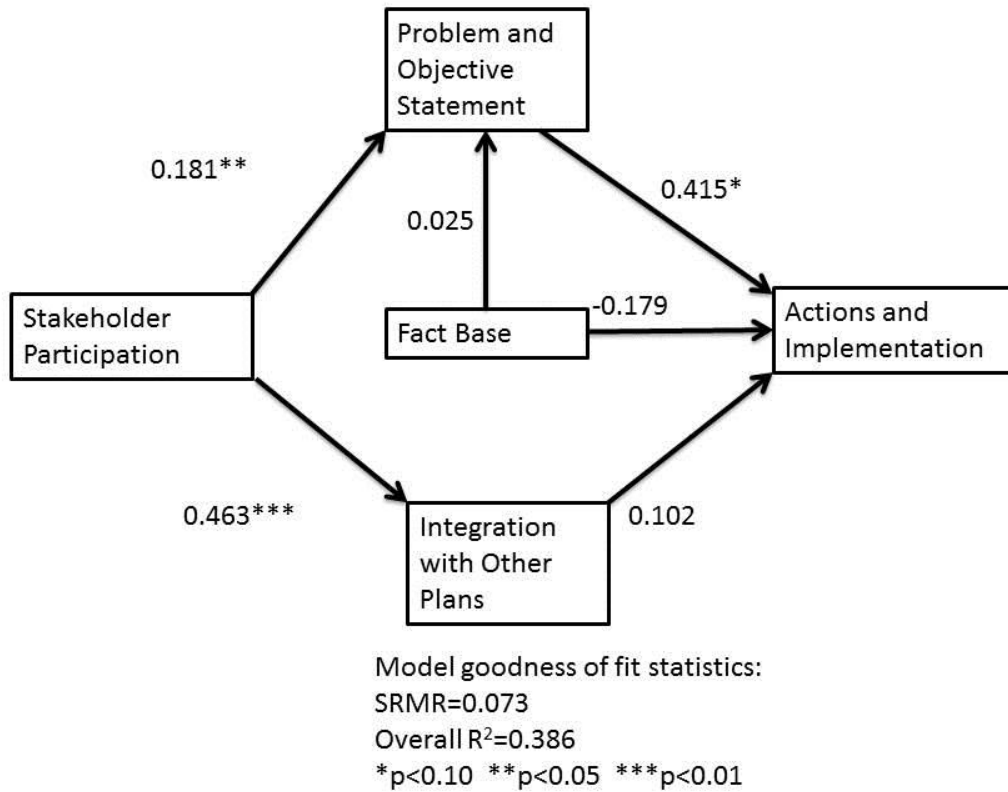


Figure 2. Relationships in Path Diagram Model for Quality of Plan Evaluation Components

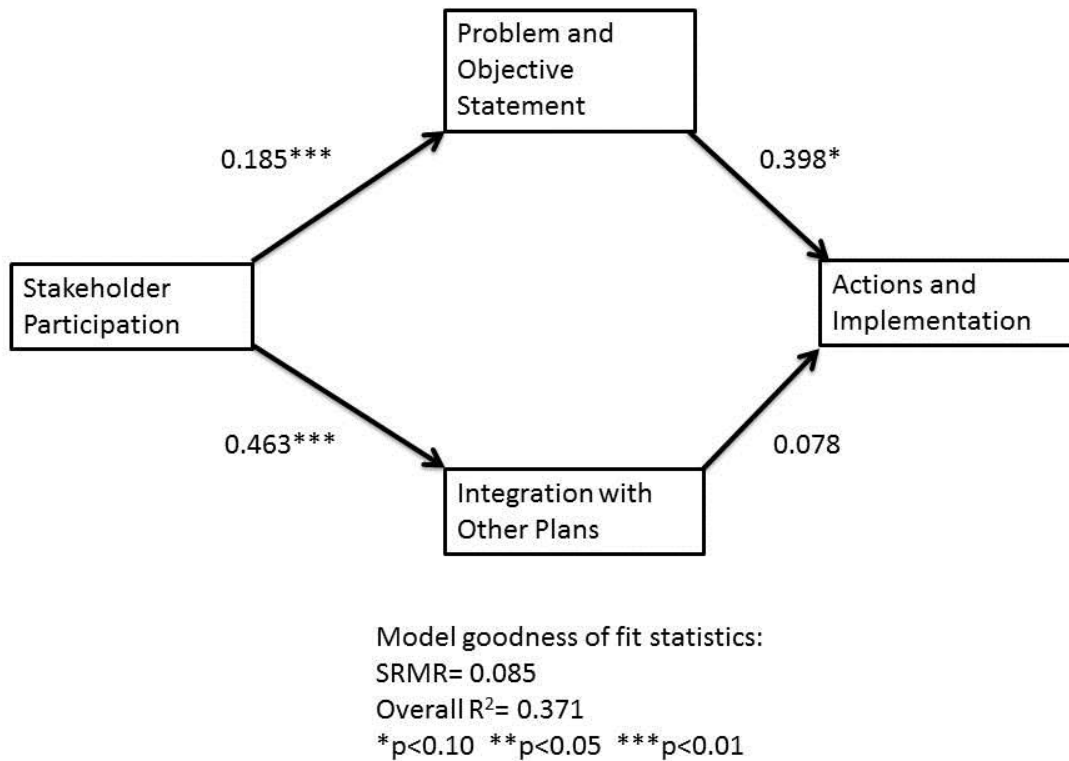


Figure 3. Final Path Diagram Model for Plan Evaluation Components

Our results indicate there was some variability in plan quality by plan type. Plans from the U. S. Fish and Wildlife Service scored higher (mean=79.4) than state forest action plans (mean=68.2), Forest Service plans (mean=61.7), Joint Venture plans (mean=55.4), and NGO plans (mean=49.1). Department of Defense plans (mean=74.3) and state wildlife action plans (mean=69.9) scored higher than Joint Venture and NGO plans (Figure 4).

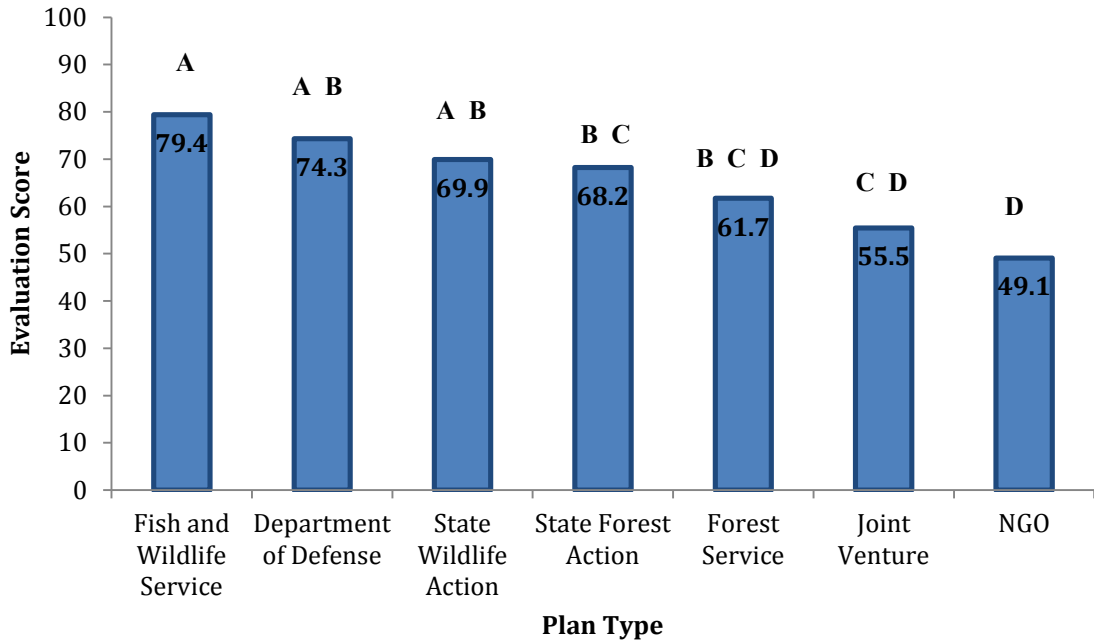


Figure 4. Mean Total Evaluation Scores by Plan Type. Plan types with different letters had statistically significant differences in plan evaluation scores.

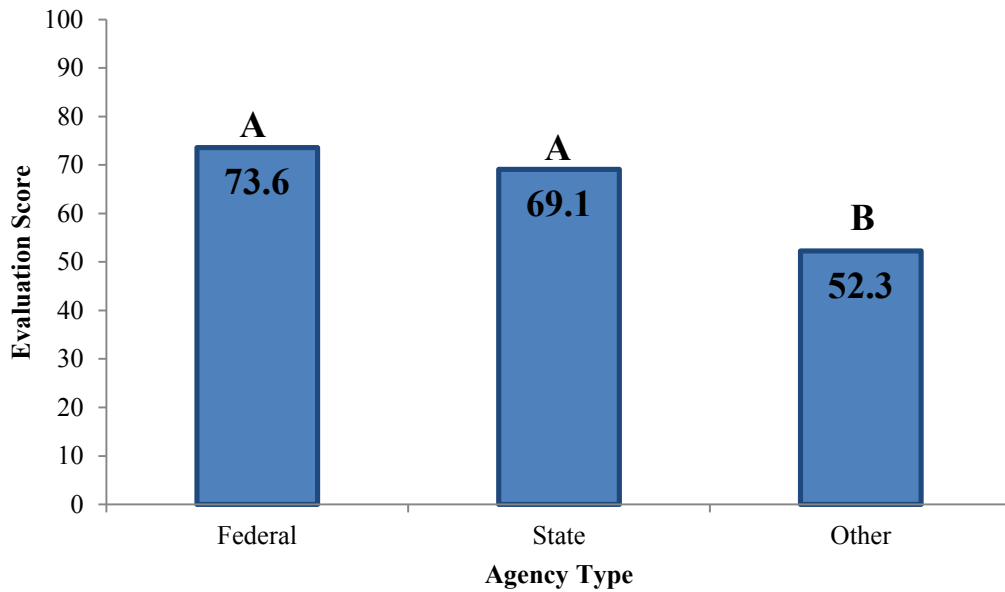


Figure 5. Mean Total Evaluation Scores by Agency Type. Agency types with different letters had statistically significant differences in plan evaluation scores.

Total plan evaluation scores varied significantly by agency level (federal, state, other), and the results of the ANOVA support this hypothesis (Table 2). Management plans from federal agencies (n=21) scored highest with a mean of 73.6 (Figure 5). Evaluation scores for federal plans ranged from 45.9 to 86.5 with a standard deviation of 10.5 (Appendix B-1-B-3). Scores for plans from state agencies (n=8) had a similar range (43.2 to 83.8, SD=12.3 and averaged 69.1 (Appendix B-4, B-5).

The remaining plans which included plans from nongovernmental organizations and from Joint Ventures (n=6) scored the lowest with a mean of 52.3 (Appendix B-6, B-7). There was less variability in the scores from these plans, and scores ranged from 41.9 to 62.2 and had a standard deviation of 7.6. Plans from nongovernmental agencies and Joint Ventures had significantly lower scores than federal ($p < 0.0001$) and state agency ($p = 0.0058$) plan evaluation scores.

Regression analysis indicates that the year the plan was implemented was a positive predictor of total evaluation score ($p = 0.018$, $R^2 = 0.158$). The regression analysis resulted in the following regression equation: $Y = -2576.486 + 1.318x + \epsilon$. The positive implementation year coefficient (1.318) indicates that as the implementation year became more recent, the plan evaluation scores increased. In other words, plans improved over time. Implementation year was a positive predictor of score in the problem and objective statement, fact base, integration with other plans, and stakeholder participation categories (Table 3). Scores for the actions and implementation category decreased over time; however, this result is not significant ($p = 0.0883$).

Table 3. Regression Models of Plan Evaluation Scores versus Date of Plan

Planning Scores	Intercept	β	P	R²
Total	-2576.486	1.318	0.018	0.158
Problem & objective statement	-2387.100	1.225	0.049	0.113
Fact base	-3696.674	1.997	0.002	0.257
Actions & implementation	2779.381	-0.063	0.088	0.086
Integration w/ other plans	-8756.387	4.404	0.002	0.252
Stakeholder participation	-8707.102	4.378	0.004	0.225

DISCUSSION

The evaluation of longleaf pine management plans and plan components provided useful insights about what characteristics led to high quality plans and which agencies produce better plans. Our results indicate that these plans were generally quite good, especially in the fact base component; however, this component had little influence on the remaining planning components. Plan quality improved over time, but specific focus on improving actions and implementation, potentially through improving stakeholder participation and problem and objective definition, is needed.

Across all agencies, efforts to maintain flexibility and perhaps avoid unfunded mandates may have result in low scores in actions and implementation planning. The dynamic nature of ecosystems may lead agencies to desire flexibility to reallocate resources, shift goals, and to adapt to changing conditions over different spatial and temporal scales, and agencies have incorporated adaptive management strategies to achieve this end (Armsworth et al., 2015; Cortner et al., 1996; Williams & Brown, 2012). Because adaptive management forces actions to be open-ended and subject to change, agencies may be hesitant to select proposed actions, and action and implementation planning may be poor in these

plans precisely because planners want to maintain flexibility required for adaptive management. The increase in flexibility, however, may come at the cost of goal achievement and may result in missed opportunities for coordination actions within and between agencies if agencies lack specific action plans for achieving their objectives. As Costanza, Weiss, and Moody (2013) describe, there appears to be a “knowing-doing gap”, the difference between stated goals and action outcomes, in prescribed burning of longleaf pine ecosystem in North Carolina, and they found burning occurred preferentially on high-quality sites instead of degraded sites, suggesting burning was not being used to accomplish restoration goals. Prescribed burning is a particularly challenging management strategy, and managers may chose sites that allow them to minimize risks, avoid conflicts, and utilize limited resources. Thus, management flexibility may, unintentionally, lead to actions being undertaken that do not address objectives.

Findings from this study should encourage agencies to increase focus on improving actions and implementation protocols, and to do so by exploring the relationships between actions and implementation and problem definition, objective setting and stakeholder participation. Establishing objectives is crucial because objectives specify what agencies hope to achieve through management actions and are used to calculate trade-offs between actions. Agencies weigh these trade-offs to determine which action strategy is best (Gregory & Failing, 2012). Without clear and specific objectives, managers may be addressing the wrong problems, may have difficulty tracking whether actions are addressing the management problem and achieving objectives, and may be unable to defend their actions against critics (Gregory & Failing, 2012; Meretsky et al., 2006).

Stakeholder Participation Influence on Planning

Previous research by Steelman and Hess (2009) found stakeholder participation was positive indicator of plan quality score, and our results support and expand this finding by identifying a potential pathway by which engaging with stakeholders positively impacts other aspects of the planning process. While engaging stakeholders does not ensure that clearly articulated set of actions are developed, stakeholder engagement may improve action planning indirectly through better definition of problem and objective statements. As Germain, Floyd, and Stehman (2001) argue, stakeholder participation processes may be used by the public and interest groups to direct the management agenda of the agency by providing additional knowledge, expressing values, and discussing concerns that agencies may not have considered using only a science-driven approach, and this, in turn, helps agencies better define the management problem and tailor objectives, leading to better actions and implementation. In the forest planning context, stakeholder participation during problem identification and structuring processes may lead to increase awareness of issues and may help agencies and stakeholders develop a common understanding of both what the desired management outcomes are and how they will be achieved (Khadka, Hujala, Wolfslehner, & Vacik, 2013). This suggests engaging stakeholders early on in the planning process may lead to better problem and objective statements, in turn, resulting in better actions and implementation strategies since clear objectives provide a framework for specific actions to be developed. Natural resource agencies have long standing practice of engaging the public during the planning process, and our findings suggest agencies should continue to strive to use best practices and better stakeholder participation techniques during the planning process to produce high quality plans (Fontaine 2011).

Strong Fact Base in Longleaf Pine Management Plans

Management plans from federal, state, and nongovernmental agencies tended to score high on fact base, and there may be multiple reasons why longleaf pine management plans tended to score higher on fact base than many related planning efforts. In many other planning efforts such as hazards management or growth and development management, the fact base is an area of poor performance (Berke & Godschalk, 2009; Stevens, 2013) rather than the highest scoring element of plans as it is in the case of longleaf management planning. In the hazards management domain, planning often focuses on response to sudden crisis (e.g., the Deep Horizon Oil Spill or Hurricane Katrina) and recovery instead of mitigation (Pearce, 2003). Thus little or no data exists when planning becomes necessary. In these cases, planning is a response to a problem (e.g., zoning after development in growth and development management) rather than a proactive endeavor (Burby & May, 1997). Conversely, forest management is characterized by long planning horizons, and planning in longleaf pine management often occurs ahead of actions, since actions often occur sequentially over time under adaptive management. Management tends to be more forward-looking, providing time to collect and incorporate data in the planning process (Wilson & Baker, 2001).

Most of the plans in this evaluation performed well in the fact base category; however, the path analysis indicates that this category has relatively little impact on the other evaluation categories, suggesting agencies may be focusing on the area of planning in which they do best, but need the least. This focus on fact base development may be a result of mandates (Burby & May, 1997) and long histories of data collection. Federal mandates such as the National Forest Management Act (NFMA) of 1976 and the National Wildlife Refuge

System Improvement Act (NWRISA) of 1997 require ecological assessments of the landscape, and this information base is used to develop and is included in plans (Loomis, 2002; Meretsky et al., 2006). Similarly, most state level wildlife management agencies are required to conduct science based management, and many staff within those agencies believe decisions can and should be based purely on data (Peterson, Riley, Busch, & Liu, 2007; Organ et al., 2012). Our findings support concerns presented by Lachapelle, McCool, and Patterson (2003) about the that the strong emphasis of science in the planning process, and as they suggest this focus may take away from incorporating stakeholder values and knowledge into plans. They go onto emphasize that the role of science should function to “inform or reinforce but not dictate actions” (475). Although developing strong fact bases through the incorporating of data is an important part of natural resource planning, agencies should consider expanding traditional science-based, expert-driven approaches to include insights from stakeholders in order to produce high quality plans with well-defined problem and objective statements which in turn will lead to better action and implementation protocols.

Plan Quality Improvement over Time

Evaluation scores tended to be higher for newer plans, suggesting agencies are getting better at planning to address complex challenges. Planning has improved across many domains in recent decades (Brody, 2003), but several trends associated with natural resource management may explain the shift detected in this study. First, agencies are increasingly required to plan and to include a set of common elements in all plans of the same type (e.g. set of eight elements included in all state wildlife action plans), which may raise the quality of plans if they are aligned with best practices (Fontaine, 2011; Kilgore, Hibbard, & Ellefson,

2006). Land use plans in general have rapidly proliferated along with establishment of best practices over the last two decades (Berke & Godschalk, 2009; Lyles & Stevens, 2014). With this growing body, planners are able to incorporate and improve on components from other plans and use those as examples for their own efforts. These developments mean planners have a growing pool of best practices which were not readily accessible prior to the early 2000s (Berke, 1994; Baer, 1997; Berke & Godschalk, 2009; Lyles & Stevens, 2014).

Variation in Plan Quality

Differences in agency missions and resources may explain variations in evaluation scores at the agency level and by plan type. Wildlife agencies may have scored higher than their forestry counterparts because they are more likely to focus on single use objectives (e.g., wildlife conservation), than forest management agencies which face “multiple use” mandates (Cubbage & McGinley, 2015). This possibility is reflected in higher problem and objective statement and actions and implementation component scores among wildlife agencies.

Government agencies may produce higher scoring plans than NGOs because they have greater resources for planning and have more mandated planning components. For instance, federal grant programs mandating state forest action and state wildlife action plans have specific planning requirements which may explain why these plans scored moderately well in the evaluation. State agencies received technical assistance from the U.S. Fish and Wildlife Service, U.S. Forest Service, and other partners. Both programs require inclusion of several elements, which are similar to the five elements we evaluated management plans for, including a description of habitat, species, threats and priorities; a proposal of management

actions; a list of monitoring, and evaluation protocols; plans for coordination with other agencies; and public participation (Association of Fish and Wildlife Agencies, 2014; National Association of State Foresters, 2015).

Nongovernmental organization plans scored lowest perhaps because the planning outcomes desired by NGOs must focus on fundraising and land donations, and support from partners and key constituencies. Since these outcomes differ from those desired by government agencies (complying with mandates, avoiding litigation, and responding to the public), planning best practices (e.g., Berke 1994) may not apply as well to nongovernmental organizations. For example, the Nature Conservancy (TNC) uses a science-based approach to management and TNC supporter cited this as the top reason they donated to the organization (Kareiva, Groves, & Marvier, 2014). This means data collection and assessments, elements that support strong fact bases, must be a priority for TNC. However, this may have detrimental effects on the quality of plans since having strong fact bases did little to improve the quality of the other planning components in our evaluation. As Kareiva, Groves, and Marvier (2014) discuss, identifying priorities and actions in ecoregional plans and assessments was not adequate for TNC to address their conservation needs.

CONCLUSION

The formal plan evaluation tool developed in this study had high intercoder reliability and may provide a useful plan evaluation tool in other forestry and natural resource planning contexts. Longleaf pine managers may find stakeholder participation helps them develop actions and implementation indirectly through improved problem and objective statements.

Although fact base is often a major focus of agency planning efforts and what agencies tended to perform best on, it may have little influence on actions and implementation. Efforts to improve longleaf pine planning should focus on state agencies and nongovernmental organizations, who have the most limited resources for high quality plans. Because longleaf pine plans are improving over time, older plans should be prioritized for revisions.

Future research should attempt to link plan quality to success in achieving goals and objectives to ensure that plans address management problems and meet management needs of the agency. Similarly agencies should develop strategies to better integrate insights from planners and those implementing the plans during the planning process. Many plans included poorly established goals, objectives, and actions, which may present challenges during implementation. Future research could further identify what factors influence scores for each of the plan evaluation categories. A lack of resources including staff, budget, and time as well as resistance to change and lack of collaboration due to political or historical barriers serve as confounding factors that may prevent high scores and may make implementation more difficult. Future research should also explore which agencies have the most challenging planning processes, what factors influence this, and how the planning context affects the quality of plans. Last, future work could investigate if and how agencies are using findings from plan evaluation studies to improve planning. Although the natural resource governance is tremendously complicated and influenced by several factors, developing high quality planning is an essential tool for ensuring that agencies address

natural resource problems, engage with stakeholders and other agencies, and implement actions that work towards achieving objectives.

REFERENCES

- Allen, G. M., & Gould, E. M., Jr. (1986). Complexity, wickedness, and public forests. *Journal of Forestry*, 84, 20-23.
- America's Longleaf. *Range-wide conservation plan for longleaf pine*. (2009, Mar 19). Retrieved from www.americaslongleaf.org.
- Armsworth, P.R., Larson, E. R., Jackson, S. T., Sax, D.F. Simonin, P., Blossey, B., Green, N., Klein, M.L., Lester, L., Ricketts, T. H., Runge, M. C., & Shaw, M.R. (2015). Are conservation organizations configured for effective adaptation to global change?. *Frontiers in Ecology and the Environment*, 13, 163-169.
- Association of Fish & Wildlife Agencies. (2014). *State wildlife action plans (SWAPs) overview*. Retrieved from <http://www.teaming.com/swap-overview>.
- Baer, W. C. (1997). General plan evaluation criteria: an approach to making better plans. *Journal of the American Planning Association*, 63 (3), 329-44.
- Banerjee, M., Capozzoli, M., McSweeney, L., & Sinha, D. (1999). Beyond kappa: A review of interrater agreement measures. *The Canadian Journal of Statistics*, 27(1), 3-23.
- Berke, P. R. (1994). Evaluating environmental plan quality: the case of planning for sustainable development in New Zealand. *Journal of Environmental Planning and Management*, 37 (2), 155-70.
- Berke, P. R., Crawford, J., Dixon, J., & Ericksen, N. (1999). Do cooperative environmental planning mandates produce good plans? Empirical results from the New Zealand experience. *Environment and Planning B: Planning and Design*, 26, 643-664.
- Berke, P. R., & Godschalk, D. R. (2009). Searching for the good plan: A meta-analysis of plan quality studies. *Journal of Planning Literature*, 23 (3), 227-240.
- Berke, P. R., Godschalk, D. R., & Kaiser, E. J. (2006). *Urban Land Use Planning* (5th ed.) Urbana, IL: University of Illinois Press.
- Blahna, D. J., & Yonts-Shepard, S. (1989). Public involvement in resource planning: Toward bridging the gap between policy and implementation. *Society and Natural Resources*, 2 (1), 209-227.
- Brody, S. (2003). Implementing the principles of ecosystem management through local land use planning. *Population and Environment*, 29 (6), 511-40.
- Brody, S., Highfield, W., & Carrasco, V. (2004). Measuring the collective planning capabilities of local jurisdictions to manage ecological systems in southern Florida.

- Landscape and Urban Planning*, 69, 32-50.
- Burby, R. J., & May, P. J. (1997). *Making Governments Plan: State Experiments in Managing Land Use*. Baltimore, MD: Johns Hopkins University Press.
- Conroy, M. J., & Peterson, J. T. (2013). *Decision making in natural resource management: a structured, adaptive approach*. John Wiley & Sons.
- Cortner, H. J., Shannon, M., Wallace, M., Burke, S., & Moote, M. (1996). Institutional barriers and incentives for ecosystem management. Gen. Tech. Rep. PNW-GTR-354. Portland, OR: Pacific Northwest Research Station, USDA Forest Service.
- Costanza, J.K., Weiss, J., Moody, A. (2013). Examining the knowing-doing gap in the conservation of a fire-dependent ecosystem. *Biological Conservation*, 158, 107-115.
- Cubbage, F. W. & McGinley, K. (2015). *Legislation and policies supporting the sustainable management of forests*. Contribution to the 2015 U.S. Report on Sustainable Forests. In press. USDA Forest Service, Washington, DC.
- Directorate of Public Works, Environmental Management Division. (2014). *Fort Benning integrated natural resources management plan: environmental assessment*. Fort Benning, GA.
- Duram, L.A. & Brown, K.G. (1999). Assessing public participation in U.S. watershed planning initiatives. *Society and Natural Resources*, 12, 455-467.
- Environmental Management Division. (2006). *Camp Lejeune integrated natural resources management plan*. Marine Corps Base Camp Lejeune, NC.
- Fontaine, J. (2011). Improving our legacy: incorporation of adaptive management into state wildlife action plans. *Journal of Environmental Management*, 92(5), 1403-1408.
- Frost, C.C. (1993). Four centuries of changing landscape patterns in the longleaf pine ecosystem. *Tall Timbers Fire Ecology Conference*. 18, 17-44.
- Game, E. T., Meijaard, E., Sheil, D., & McDonald-Madden, E. (2014). Conservation in a wicked complex world; challenges and solutions. *Conservation Letters*, 7(3), 271-277.
- Garson D (2008) Path Analysis, 1–21.
- Georgia Forestry Commission. (2010). *Georgia statewide assessment of forest resources: a comprehensive analysis of forest-related conditions, trends, threats and opportunities*.
- Germain, R. H., Floyd, D.W., & Stehman, S.V. (2001). Public perceptions of the USDA

- Forest Service public participation process. *Forest Policy and Economics*, 3, 113-124.
- Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T., & Ohlson, D. (2012). *Structured decision making: a practical guide to environmental management choices*. John Wiley & Sons.
- Head, B. & Alford, J. (2008). Wicked problems: The implications for public management. *Proceedings from Panel on Public Management in Practice International Research Society for Public Management 12th Annual Conference, Brisbane, 26-28 March 2008* (p. 1-26).
- Hudson, B. M. (1979). Comparison of current planning theories: counterparts and contradictions. *Journal of American Planning Association*, 45(4), 387–398.
- Kareiva, P., Groves, C., Marvier, M. (2014). Review: The evolving linkage between conservation science and practice at The Nature Conservancy. *Journal of Applied Ecology*. 51 (5), 1137-1147.
- Khadka, C., Hujala, T., Wolfslehner, B., & Vacik, H. (2013). Problem structuring in participatory forest planning. *Forest Policy and Economics*, 26, 1-11.
- Kilgore, M.A., C. Hibbard, and P.V. Ellefson. 2006. Comprehensive strategic planning for the use and management of forest resources: The experiences of state governments in the United States. *Forest Policy and Economics* 9(1):42-49.
- Lachapelle, P. R., McCool, S. F., & Patterson, M. E. (2003) Barriers to effective natural resource planning in a "messy" world, *Society and Natural Resources*, 16, 6, 473-490, DOI: [10.1080/08941920309151](https://doi.org/10.1080/08941920309151).
- Lachapelle, P. R., & McCool, S. F., (2005). Exploring the concept of “ownership” in natural resource planning. *Society and Natural Resources*, 18(3), 279-285, DOI: [10.1080/08941920590908141](https://doi.org/10.1080/08941920590908141).
- Lawrence, D. P. (2000). Planning theories and environmental impact assessment. *Environmental Impact Assessment Review*, 20, 607 – 625.
- Loomis, J. B. (2002). *Integrated Public Lands Management: Principles and Applications to National Forests, Parks, Wildlife Refuges, and BLM Lands*. Columbia University Press.
- Lower Mississippi Valley Joint Venture. (2011). *Open pine landbird west gulf coastal plain/Ouachitas*.
- Lyles, W. & Stevens, M. (2014). Plan quality evaluation 1994-2012: growth and contributions, limitations, and new directions. *Journal of Planning Education and Research*, 34(4), 433-450.

- McCool, S. F. & Guthrie, K. (2001). Mapping the dimensions of successful public participation in messy natural resources management situations. *Society of Natural Resources*, 14(4), 309–323.
- Meretsky, V. J., Fischman, R. L., Karr, J. R., Ashe, D. M., Scott, M. J., Noss, R. F., & Schroeder, R. L. (2006). New directions in conservation for the National Wildlife Refuge System. *BioScience*, 56(2), 135-143.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks, CA: Sage.
- Mississippi Forestry Commission. (2010). *Mississippi's assessment of forest resources and forest resource strategy*. Jackson, MS.
- National Association of State Foresters. (2015). *About the action plans*. Retrieved from <http://www.forestationplans.org/about>.
- North Carolina Division of Forest Resources. (2010). *North Carolina's forest resources assessment: a statewide analysis of the past, current, and future conditions of North Carolina's forest resources*. Raleigh, NC.
- North Carolina Wildlife Resources Commission. (2005). *North Carolina Wildlife Action Plan*. Raleigh, NC.
- Organ, J. F., Geist, V., Mahoney, S. P., Williams, S., Krausman, P. R., Batcheller, G.R., Decker, T. A., Carmichael, R., Nanjappa, P., Regan, R., Medellin, R. A., Cantu, R., McCabe, R. E., Craven, S., Vecellio, G.M, & Decker, D. J. (2012). *The North American Model of Wildlife Conservation*. The Wildlife Society, Bethesda, Maryland, USA.
- Pearce, L. (2003). Disaster management and community planning, and public participation: how to achieve sustainable hazard mitigation. *Natural Hazards*, 28, 211-228.
- Peterson, M. N., Riley, S. J., Busch, L., & Liu, J. (2007). Reconciling wildlife management's conflicted purpose with a land community worldview. *Journal of Wildlife Management*, 71, 2499-2506.
- Reed, M.S. (2008). Stakeholder participation for environmental management: a literature review. *Biological Conservation*. 141(10), 2417-2431.
- Rittel, H.W., & Webber, M.M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4, 155-169.
- Roberts, N. (2000). Wicked problems and network approaches to resolution. *International public management review*, 1(1), 1-19.

- Salwasssar, H. (2004). Confronting the implications of wicked problems: changes needed in sierra nevada national forest planning and problem solving. USDA Forest Service Gen. Tech. Rep. PSW-GTR-193. 7-21.
- Southeast Regional Partnership for Planning and Sustainability. (2009). *Longleaf pine climate change workshop summary*.
- Science Applications International Corporation. (2010). *Eglin Integrated Natural Resources Management Plan*. Department of the Air Force. Eglin Air Force Base, FL.
- South Carolina Department of Natural Resources. (2005). *South Carolina comprehensive wildlife conservation strategy*. Columbia, SC.
- South Carolina Forestry Commission. (2010). *South Carolina's statewide forest resource assessment and strategy: conditions, trends, threats, benefits, and issues*.
- Stankey, G.H., Clark, R. N., & Bormann, B. T. (2005). Adaptive management of natural resources: Theory, concepts, and management institutions. General technical report PNW-GTR-654. Portland, OR: U.S. Department of Agriculture, Forest Service.
- Steelman, T. A., & Hess, G. R. (2009). Effective protection of open space: does planning matter? *Environmental Management*, 44, 93–104.
- Stevens, M. (2013). Evaluating the quality of official community plans in southern british Columbia. *Journal of Planning Education and Research*, 33 (4), 471-490.
- Stevenson, K. T., Peterson, M. N., Bondell, H. D., Moore, S. E., & Carrier, S. J. (2014). Overcoming skepticism with education: Interacting influences of worldview and climate change knowledge on perceived climate change risk among adolescents. *Climatic Change*. doi:10.1007/s10584-014-1228-7
- The Longleaf Alliance. (2015). *Why Longleaf?* Retrieved from <http://www.longleafalliance.org/restoring-and-managing/why-longleaf>.
- The Nature Conservancy South Atlantic Coastal Plain Ecoregional Conservation Team. (2002). *South Atlantic Coastal Plain ecoregional assessment*.
- The Nature Conservancy & Gulf Coastal Plain Ecosystem Partnership. (2007). *Panhandle longleaf pine large-scale conservation area and gulf coastal plain ecosystem partnership conservation action plan*.
- The Nature Conservancy & NatureServe. (2003). *The Upper East Gulf Coastal Plain: an ecoregional assessment*.
- The Nature Conservancy. (2015). *Who speaks for the trees? Longleaf pine forests in the Sewee-to-Santee region*. Retrieved from

- <http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/southcarolina/howwework/longleaf-pine.xml>.
- U.S. Department of Agriculture Forest Service Southern Region. (1996). *Francis Marion National Forest revised land and resource management plan*.
- U.S. Department of Agriculture Forest Service Southern Region. (1999). *National forests in Florida land and resource management plan*.
- U.S. Department of Agriculture Forest Service Southern Region. (1999). *Revised land and resource management plan: Kisatchie National Forest*. Pineville, LA.
- U.S. Department of Agriculture Forest Service Southern Region. (2002). *Croatan National Forest land and resource management plan: National forests in North Carolina*. Management Bulletin R8-MB 108A.
- U.S. Department of Agriculture Forest Service Southern Region. (2004). *Revised land and resource management plan: National forests in Alabama*. Management Bulletin R8-MB 112A.
- U.S. Department of Agriculture Forest Service Southern Region. (2012). *Uwharrie National Forest land and resource management plan: National forests in North Carolina*. Management Bulletin R8-MB 140A.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2005). *Mountain Longleaf National Wildlife Refuge Habitat Management Plan*.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2006). *Cedar Island National Wildlife Refuge Comprehensive Conservation Plan*. Atlanta, GA.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2006). *Okefenokee National Wildlife Refuge Comprehensive Conservation Plan*. Atlanta, GA.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2006). *St. Marks National Wildlife Refuge Comprehensive Conservation Plan*. Atlanta, GA.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2007). *Mississippi Sandhills Crane National Wildlife Refuge Comprehensive Conservation Plan*. Atlanta, GA.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2008). *Eufaula National Wildlife Refuge Comprehensive Conservation Plan*. Atlanta, GA.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2008). *Grand Bay National Wildlife Refuge Comprehensive Conservation Plan*. Atlanta, GA.

- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2008). *Santee National Wildlife Refuge Comprehensive Conservation Plan*. Atlanta, GA.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2008). *Waccamaw National Wildlife Refuge Comprehensive Conservation Plan*. Atlanta, GA.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2009). *Bond Swamp National Wildlife Refuge Comprehensive Conservation Plan*. Atlanta, GA.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2009). *Draft Carolina Sandhills National Wildlife Refuge Comprehensive Conservation Plan and environmental assessment*. Atlanta, GA.
- U.S. Department of the Interior Fish and Wildlife Service Southeast Region. (2010). *Lake Wales Ridge National Wildlife Refuge Comprehensive Conservation Plan*. Atlanta, GA.
- Van Lear, D. H., Carroll, W. D., Kapeluck, P. R., & Johnson, R. (2005). History and restoration of the longleaf pine-grassland ecosystem: Implications for species at risk. *Forest Ecology and Management*, 211(1-2), 150-165.
- Walters, C.J., & Holling, C. S. (1990). Large-scale management experiments and learning by doing. *Ecology*, 71, 2060- 2068.
- Watson, C. & Malloy, K. (2008). *The South Atlantic migratory bird initiative implementation plan: an integrated approach to conservation of "all birds across all habitats"*. Atlantic Coast Joint Venture. Charleston, SC.
- Wildlife And Freshwater Fisheries Division, Alabama Department Of Conservation And Natural Resources. (2005). *Conserving Alabama's wildlife: a comprehensive strategy*. Montgomery, AL.
- Wildlife Resources Division, Georgia Department of Natural Resources. (2005). *A comprehensive wildlife conservation strategy for Georgia*.
- Williams, B. K. & Brown, E. D. (2012). Adaptive management: the U.D. Department of the Interior applications guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.
- Wilson, J.S. & Baker, P.J. (2001). Flexibility in forest management: managing uncertainty in Douglas-fir forests of the Pacific Northwest. *Forest Ecology and Management*. 145(3), 219-227.

CHAPTER 3: META-ANALYSIS OF NATURAL RESOURCE PLAN EVALUATION STUDIES: INSIGHTS FOR NATURAL RESOURCE PLANNING

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INTRODUCTION

Natural resource management plans (NRMPs) play an important role in shaping natural resource use and allocation under complex institutional, economic, and informational constraints (Lachapelle, McCool, & Patterson, 2003). Stakeholders of publically managed natural resources are often fragmented in their interests and tactics used to address those interests, and plans provide a platform for agencies and the public to develop a sense of ownership over the resource, its problems, and management outcomes and opportunities (Lachapelle & McCool, 2005; Salwassar, 2004). Legal mandates that require federal agencies to develop plans, such as the National Forest Management Act mandating National Forest plans, and others requiring plans from state agencies to receive public funds (e.g. state natural resource departments must complete State Forest and Wildlife Action plans) have made NRMPs even more important over recent decades. Natural systems are dynamic, and many factors interact to influence current conditions, resulting in scientific complexity. For example, forest health may reflect invasive species populations, fire frequency, weather, and chance events (Tiedermann, Klemmedson, & Bull, 2000). While managers are able to at least partially control some factors (e.g. invasive pest control), information about some of those interactions may be uncertain. Plans establish links between scientific information and problem definitions, objectives, and actions, which in turn may influence the effectiveness of reaching desired natural resource allocations (Salwassar, 2004).

Adopted NRMPs have power to shape the protection of natural resources, conservation of biodiversity, climate resilience, public participation, and many other factors (Bassett & Shandas, 2010; Lachapelle & McCool, 2005; Steelman & Hess, 2009). Plans provide a vision for what decision makers hope the future landscape will look like and are valuable resources guiding management of natural resources (Berke, Godschalk, & Kaiser, 2006). Considerable amounts of time, staff, and resources are poured into developing NRMPs, so it is important that plans are utilized and effective at achieving desired outcomes (Allen & Gould, 1986; Berke et al., 2006). Berke and Godschalk (2009) found that high quality plans, in general, are more likely to be used and may be associated with success in achieving objectives.

Because NRMPs are widely used to make decisions across millions of acres of land and seascapes around the world, routine evaluation of plan quality is essential (Berke, 1994). Plan evaluation studies highlight strengths and weaknesses in plans, explore how factors such as stakeholder participation and planning mandates affect plan quality, and contribute to learning about changes to planning theory and practice (Berke & Godschalk, 2009; Brody, 2003a, Bunnell & Jepson, 2011; Lyles & Stevens, 2014). Plan evaluation studies use content analysis methodology, identifying indicators linked to a “normative criteria of what constitutes a better plan,” to evaluate the quality of plans (Lyles & Stevens, 2014, p. 434). Content analysis of plans is a systematic process of measuring plan characteristics using a set of criteria that is selected by the researcher, based in planning theory, and adapted to the purpose of the study and type of plans being evaluated. Plan evaluation studies have assessed plans addressing several topics most notably ecosystem management (Brody, 2003b), natural

hazards (Berke, 1994, Brody, 2003a), climate change (Wheeler, 2008), and sustainability (Berke & Conroy, 2000). Most studies involve an analysis of plans from multiple jurisdictions (Stevens et al., 2014).

Plan evaluations are useful in identifying key plan components and identifying the best plan components. Berke (1994) found that New Zealand environmental plans scored low for natural hazards in fact base, goals, and policies, and local plans tended to score lower than regional plans. Bunnell and Jepson (2011) found that the overall quality of mandated plans were not statistically different than the quality of nonmandated plans, though quality of some components were statistically different between the two groups of plans. Brody (2003a) assessed the extent to which hazard mitigation components in comprehensive plans changed, and results indicated that plans improved over time in goals and policies components by building off of previous planning efforts, focusing on site-specific issues, and including citizens in the planning process.

Meta-analysis of plan evaluation studies, as opposed to analyzing the plans themselves, is needed as the plan evaluation literature continues to grow. Meta-analysis of plan evaluation studies provide additional information about the plan evaluation practice by highlighting differences in studies, the criteria they assess, and the methods they use. For instance, a meta-analysis by Berke and Godschalk (2009) found that several characteristics were commonly evaluated, and among those internal consistency and compliance were consistently strong, fact base and evaluation were consistently weak, and coordination and organization had moderate scores overall. They also found that plan evaluation studies did not address intercoder reliability adequately. Meta-analysis of plan evaluation studies may be

used to indicate the validity of the studies. Another meta-analysis by Lyles and Stevens (2014) found that plan evaluation studies were consistently strong in descriptions of the sampling process and weaker in describing the coding process, pretesting, and assessing reliability, indicating that plan evaluation studies may not be consistently applying rigorous methodology to generate reliable and replicable data.

Meta-analysis of plan evaluation studies enables comparisons of planning efforts across fields or topics by providing a snapshot summary of plan quality through the pooling of plan evaluation results. Results from a meta-analysis may be compared to plan evaluation studies to highlight best (or worst) plan components and assess what about plans matter most in a particular field. For instance, a plan evaluation study of longleaf pine management plans found that plans scored highly in fact base, and a meta-analysis of natural resource management plan evaluation studies may indicate if fact base scores highly across many natural resource management plans or just in longleaf pine management plans. Comparisons like these may be helpful in identifying how planning and plans differ by resource and management challenge. Further, meta-analysis of plan evaluation studies may provide some indication of which plan components are significant and most influential. For instance, if fact base is assessed in many plan evaluation studies, then this may suggest that it is an important plan component to both researchers and agency decision makers. However, as the results from our longleaf pine management plan evaluation study indicate, while fact base scored highly in most plans, it failed to significant influence the quality of either problem and objective statement or actions and implementation.

Two important meta-analyses have assessed the growing body of plan evaluation studies (Berke & Godschalk, 2009; Lyles & Stevens, 2014), but none have focused specifically on plan evaluation studies from the natural resources planning domain or compared results across planning domains. This represents a critical gap in NRMP evaluation, since natural resources differ in critical ways from the other popular planning domains. Notably natural resources are often common pool resources, but many plans focusing on urban planning, natural hazards, and sustainability fundamentally focus on private resources. As famously noted by Ostrom (1990), common pool resources require a novel approach to planning and management. Key principles differ from those applying to private property contexts in four ways: clearly defined boundaries, system for monitoring the use of the resource, graduated sanctions for rule breakers, and established responsibility for governing the resource at multiple levels. Similarly, natural resource management assumes a use value for resources, whereas other approaches (e.g., sustainability, hazards) may not accept that assumption. For instance, hazards management centers on avoidance value such as the value of reducing damages from hurricanes.

Additionally, the background of the planners and the context in which planning occurs differs by planning domain. Natural resources management often occurs on land managed by the government, and the people developing the plans come from natural resource agencies and backgrounds; whereas, those planning for hazards management often come from city planning backgrounds and develop plans that manage both public and private land. Natural resources management revolves around science based decision making, where long term data is often readily available. These differences may lead to insights about evaluation

criteria included, intercoder reliability, coding process, and other aspects of plan evaluation studies in the natural resource planning domain. The planning context and challenges planning must overcome may differ within the natural resources field by resource type, scale of the management problem, and agency. A meta-analysis of natural resource plan evaluation studies provides a baseline of plan quality for researchers to compare individual plan evaluation studies to, in order to gain insights about whether planning practices and what matters most about plans varies.

In this paper, we conduct a meta-analysis of natural resource plan evaluation studies. We begin with a review of the conceptual foundation for natural resource plan evaluation studies and describe the criteria determining plan quality. Then, we present findings from a meta-analysis of ten natural resource plan evaluation studies, detailing the criteria evaluated in the studies and methods used. We conclude with recommendations for best practices and future work.

Conceptual Foundation for NRMP Evaluation

Planning theory and literature provide a theoretical foundation for plan evaluation frameworks, specifically for what plan characteristics are being evaluated. Baer (1997) suggests a set of 8 criteria to use in evaluating plans: adequacy of context; “rational model” considerations; procedural validity; adequacy of scope; guidance for implementation; approach, data, and methodology; quality of communication; and plan format. The adequacy of context criteria is used to assess whether plans includes background information and the purpose of the plan, lists who the plan is for, and provides a summary or overview. “Rational model” considerations assess whether plans are based on planning theory and include

problem identification, goals and objectives, and alternatives. The procedural validity criteria is used to determine whether the plans identify who was involved in the planning process, how they were chosen, and how information was used. Adequacy of scope is used to assess whether plans include considerations of relevant social, economic, and natural issues and the implications of actions. The guidance for implementation category is used to assess whether plans identify priorities for implementation, implementation provisions, timeline, and agency responsibility. The approach, data, and methodology criteria is used to examine whether the plans incorporate a wide spectrum of data, are flexible enough to add new data, and cite sources. Quality of communication is used to assess whether the plan makes clear and convincing proposals that are consistent with objectives by identifying the reader of the plan and describing the rationale behind decisions. Last, plan format criteria is used to assess whether the plan includes the date of publication, authors, table of contents, page numbers, and graphics.

Further, Berke and Godschalk (2009) propose 2 dimensions that plan evaluations should assess: internal plan quality and external plan quality. Internal plan quality is linked to the content and format of important components of the plans, including issues and vision statement, fact base, goals, policies, implementation, monitoring and evaluation, and internal consistency. External plan quality is determined by the relevance of the scope and coverage of the plan and how well the plan reflects stakeholder values and the context in which the plan will be implemented. External plan quality assesses the organization and presentation of the plan, interorganizational coordination, and compliance with mandates. As Baer (1997)

and Berke and Godschalk (2009) both note, plan evaluations and the criteria used will vary by the type of plan and purpose of the evaluation study.

Previous research also provides a methodological foundation for plan evaluation studies. While most evaluation studies general follow widely accepted content analysis methodology, there are no standard procedures, and the evaluation instrument and methods used vary by study (Berke & Godschalk, 2009; Lyles & Stevens, 2014; Stevens, Lyles, & Berke, 2014). Rigorous standard procedures allow researchers to produce replicable data, and Lyles and Stevens (2014) suggest a framework to ensure studies produce replicable data, involving assessments of objectivity, sampling, and reliability in plan evaluation studies. Lyles and Stevens (2014) identified five criteria to assess objectivity: protocol design, usage, and availability; scoring; description of coders; coding procedures; and pretesting. Criteria to assess sampling (description of sampling process, sample frame, and sample) and reliability (identification of which test was used and what the scores were) should also be included.

METHODS

Identification of NRMP Quality Studies

We searched online databases for published, peer-reviewed plan evaluation studies. We conducted keyword searches of online databases and Google Scholar using ‘assess’ ‘evaluation’, ‘plan’, and ‘quality’, and we reviewed the citations of plan evaluation studies to identify other studies. The studies covered a range of plan topics, methodology, and samples. We narrowed this group of studies by selecting only those studies that evaluated plans that provided guidance to the management of natural resources or ecosystems. Those plan evaluation studies included plans which discussed open space protection, management of

watersheds and coastal zones, and conservation of natural resources. We selected one publication, the most comprehensive, from any set of publications based on the same plan quality data set.

Meta-Analysis of Plan Quality Studies

We analyzed the content and methodology of evaluation studies. To assess the content of the studies, we first identified the plan characteristics that each study was evaluating plans for. Then, we compiled the scores for each characteristic from every study that included them. It is not possible to use some of those scores directly because of differences in how the characteristics were measured and how scores were computed in the studies (e.g. number of indicators in each category and scales varied). We standardized those scores to a range from 0 to 1 by dividing the score by the total possible score for each category. For those studies that reported standardized scores, we included the scores directly.

We used a set of eleven indicators to assess methodology. Using the list of eleven questions below, we identified whether the indicators were included in the each plan evaluation, and responses were scored either yes or no. The indicators were:

1. Does the evaluation study contain a justification for which plan characteristics were evaluated?
2. Is the evaluation tool included?
3. Is the sampling process explained?
4. Was the evaluation tool pretested?
5. Was a reliability test conducted?
6. Was a reliability score reported?
7. Is a discussion of coders included?
8. Were multiple coders used for the evaluations?
9. Did coders work independently?
10. Is there an explanation of scoring procedures?
11. Are evaluation scores standardized?

Since there was a very small population of studies to draw, we conducted a complete census, gathering all studies, and no statistics is needed to interpret results. The results indeed are the findings for the entire population of known studies, so are definitive.

Our evaluation protocol aligns with previous plan evaluation meta-analysis research by Berke and Godschalk (2009) and Lyles and Stevens (2014). Some of the studies analyzed in this paper were also analyzed in those papers. We will compare our results to the findings presented in those papers as they provide a broader view of the wider plan evaluation literature.

RESULTS

Ten plan evaluation studies focused on natural resource management were published between 1999 and 2014. All but one study evaluated plans from the United States. The studies evaluated between 9 and 53 plans. Many of the studies evaluated similar characteristics of the plans. Twenty percent of studies evaluated a plan's issues component (Table 12). Eight out of 10 studies evaluated the plan's fact base. Nearly all (90%) of studies included an assessment of goals, and 80% of studies looked at policies. Seven out of 10 studies evaluated implementation and coordination components, and an assessment of monitoring and evaluation protocols were included in 40% of studies. Two studies assessed the organization of plans.

In addition to these common components, Berke, Crawford, Dixon, and Ericksen (1999) evaluated for internal consistency, compliance and clarity of purpose, and Norton (2005) assessed land suitability and carrying capacity, link between analysis and policies, and

comprehensiveness of coverage. Steelman and Hess (2009) also assessed the identification of priority areas and stakeholder engagement. We reported the standardized scores in table 12 for assessment components for those studies that included them, and we indicated evaluation components that were identified in studies but did not have a reported score with an (X).

Table 4. Summary of Evaluation Components

Study Authors	Issues	Fact Base	Goals	Policies	Implementation	Monitoring and Evaluation	Coordination	Organization	Compliance	Clarity of Purpose
Berke et al. 1999	0.54	0.09				0.30	0.45	0.43	0.36	0.69
Brody 2003b		0.23	0.36	0.44	0.58*		0.51			
Brody et al. 2004		0.25	0.38	0.44	0.31		0.43			
Davis 2004			X	X	X	X				
Evans-Cowley and Gough 2009		0.25	0.24	0.19			0.42			
Norton 2005a		X***	X	X	X	X				
Tang 2008		0.53	0.62	0.44	0.32	X	X	X		X
Tang et al. 2011		0.47	0.63	0.39	0.36		0.46			
Steelman and Hess 2009	X		X		X		0.43			
Termorshuizen et al. 2007**		X	X	X			X			

*assessment of monitoring was included in implementation category

**study assessed awareness and key indicators which corresponded to some of the categories

***data analysis section corresponds to fact base

While only two studies provided the evaluation tool, all studies provided an explanation of the protocol and the elements they evaluated the plans for (Table 13). All ten studies described how the plans included in the evaluation were selected, and all studies listed how many plans were evaluated. Half of the studies provided information about the coding process, and those studies all utilized multiple coders. Only two studies noted that coders worked independently. All but one study provided some description of how the plans were coded, and most commonly indicators were scored on an ordinal scale where 2=identified, complete; 1=identified, incomplete or unclear; and 0=not identified or other slight variations.

Just over half of the studies (60%) provided standardized scores, and those scores are reported in table 2. Only 30% of the studies noted pretesting the evaluation tool. Four studies noted conducting reliability tests between coders and reported scores, and all four used percentage agreement. Percentage agreement scores ranged between 80% and 97%. One of these studies also used Cronbach's alpha test.

Table 5. Summary of Evaluation Study Methodology

Study Authors	# of plans	Explanation of Criteria Selection	Tool Provided	Sampling Process	Pretest	Reliability Test	Reliability Score	Coder Discussion	# of Coders	Independent Coding	Scoring Justification	Standardized Score
Berke et al. 1999	50	X	X	X	X	% Agreement	0.8	X	2		X	X
Brody 2003b	30	X		X							X	X
Brody et al. 2004	45	X		X		% Agreement	0.97	X	2	X	X	X
Davis 2004	15	X		X							X	X
Evans-Cowley and Gough 2009	9	X		X	X	% Agreement	0.88	X	2		X	X
Norton 2005a	40	X		X							X	
Steelman and Hess 2009	20	X	X	X				X	2		X	
Tang 2008	46	X		X							X	
Tang et al. 2011	53	X		X	X	% Agreement, Cronbach's alpha	0.84 %, 0.95 alpha	X	2	X	X	X
Termorshuizen et al. 2007	38	X		X								

DISCUSSION

Our analysis of NRMP evaluation studies suggests similarities with other plan evaluation studies for characteristics being assessed and the methods used in the evaluations, and this may be because many of the studies were conducted by a common set of researchers who have conducted studies of NRMPs and other types of plans, and certain best practices are used across evaluation studies. Three researchers, along with their teams, conducted half of the natural resource evaluation studies we analyzed and were often found as authors in other evaluation studies (Berke & Godschalk, 2009; Lyles & Stevens, 2014). Many of the plan evaluation studies based their evaluation protocol from Berke and others which identified several evaluation components including issues, fact base, goals, policies, and implementation.

Many of the methods used in NRMP evaluation studies were similar to those used in the wider body of plan evaluation studies. We found that the coding process usually included multiple coders, coders working independently, and ordinal scoring scales, and this is consistent with findings from the Lyles and Stevens meta-analysis (2014). This may be because best practices in content analysis have been established and following them increases confidence in the study, since following best practices ensure rigorous and reliable methods were used to generate data (Berke, 1994; Baer, 1997).

NRMP evaluation studies tended to analyze goals, policies, implementation, and divergence from the larger body may be a reflection of researchers tailoring evaluation protocol to specific plans or topics (Lyles & Stevens, 2014). For instance, plan evaluation researchers may recognize that NRMPs are often developed by professionals in natural

resource departments. Customizing plan evaluation studies allows researchers to capitalize on the knowledge of planners in a specific field by utilizing their expertise to develop protocols, while ensuring that the findings are relevant to that planning field (Lyles & Stevens, 2014).

Unique attributes of natural resources and natural resource planning (e.g. planners from natural resource departments using science based decision making, common pool resources with assumed use values) may explain differences between NRMP evaluation studies and the general body of studies. Some natural resource agencies have strong cultures of science based decision making, which puts explicit focus on goal setting and linking goals to implementation, and this may explain why natural resource plan evaluation studies more often included goals, policies, and implementation evaluation elements (Peterson, Riley, Busch, & Liu, 2007). The assumptions of use value associated with natural resources and common pool principles associated with natural resources may begin to explain why goals, policy, implementation, and monitoring components were assessed more often in natural resource plan evaluation studies than in the larger body of plan evaluation studies.

Goals, policies, and implementation protocols guide the use and management of natural resources, and these elements have direct influence on management outcomes such as resource quality or quantity, making them key components in NRMPs. In the hazards management domain, goals often do not refer to the topic of the plan (hazards in this case, natural resources in others) but refer to property or people that may be affected by the hazard, and policies and implementation, in the hazards case, may serve as rules that the public may choose to comply with. The results of our longleaf pine management plan evaluation study indicate that clearly defined goals and objectives and well developed actions and

implementation protocols positively impact on plan quality. This is important because high quality plans may be more likely to be utilized (Berke & Godschalk, 2009).

Coordination with other plans and agencies was assessed in eight out of ten NRMP evaluation studies, while in just six from the Berke and Godschalk (2009) study, suggesting this is a key component in natural resource management plans. Natural resources are often common pool resources, and as such, may need collective action to be managed effectively; therefore, assessing how well plans recognizes and are integrated with other plans and agencies are essential components for plan evaluations (Adams, Brockington, Dyson, & Vyra, 2003). Natural resource agencies are entrusted to manage natural resources and are given authority and provisions to manage from the public. Natural resource agencies develop goals and policies with stakeholder values' in mind. Establishing goals, policies, and implementation protocols are especially important to natural resources both to determine allocations of the resource and to provide guidance to those managing the resource, especially as multiple stakeholders are involved, and as Armsworth et al. (2015) state "how effectively a conservation organization is structured to meet its objectives depends on how it interacts with and complements other such organizations" (p.167).

Managing natural resources often involves dealing with a lack of clearly defined boundaries for actions as well as the consequences of those actions (Tang 2008). Natural resource problems extend beyond the jurisdictional boundaries confined in the plan, and coordination between agencies overlapping boundaries may be necessary to achieve goals. The results of a correlation analysis of scores from our longleaf pine management plan evaluation study indicate that integration with other plans, a similar measure of coordination, had a positive impact on clearly defining management problems and objectives, providing a

strong fact base, articulating well developed actions and implementation protocols, and engaging well with stakeholders. In comparison, longleaf pine management plans averaged twice as high in this category than most of the other studies. This may suggest that with this particular resource, longleaf pine, agencies are more inclined to work with others to achieve restoration goals. There are many actors (federal, state, private) engaged in managing this resource, and as a result, coordination among them may be critically important, suggesting that number of actors may be a factor in how well plans are integrated with other plans and actions from other agencies. As collaborative management approaches are becoming more widely used and integrated into policies, evaluations are beginning to include criteria to assess collaboration as well (Conley & Moote, 2003).

Our findings suggest compliance and stakeholder engagement may be key gaps in natural resource plan evaluation studies. In comparison to five studies that evaluated compliance in the Berke & Godschalk (2009) study, only one NRMPs evaluation study evaluated compliance. This is surprising as legal mandates requiring NRMPs and the inclusion of particular elements is common in the natural resource field (e.g. NFMA requiring National Forest plans, inclusion of eight elements in all state wildlife action plans). Compliance may not be assessed as often in NRMP evaluation studies because mandates may vary by jurisdiction and thus are only relevant to a subset of plans, researchers may assume that all plans already comply with mandates, or plans put minimal focus on compliance, which does not trigger researchers to examine this component.

Failing to evaluate compliance may result in missed opportunities to reveal mismatches in plan proposals and resources to implement them (e.g. unfunded mandate to protect species) or to assess how plan quality differs under various mandates and planning

contexts (Berke et al., 1999). For instance, federal natural resource agencies, in general, face tougher planning challenges since they must comply with multiple mandates, manage larger amounts of land, and are subject to and have long histories of litigation than state or nongovernmental agencies (Cubbage & McGinley, 2015). The results of our longleaf pine management plan evaluation study found that plans from federal agencies were better despite tougher planning contexts. However, within the group, plans from the Forest Service, an agency with arguably the toughest planning context, scored poorest, suggesting that required compliance with many mandates may encourage agencies to produce better plans but there may be a limit before plan quality begins to decline.

Stakeholder engagement was assessed in one NRMP evaluation study; however, it is none-the-less should be an important plan characteristic and thus may warrant evaluation. Stakeholders have vested interest in natural resources as they receive the benefits of high quality natural resources but may incur costs (e.g. decrease in recreation opportunities or health effects) if quality decreases, so their values should be incorporated in the planning process and reflected in goals and policies (Fontaine, 2011; Lachapelle et al., 2003). This sentiment has been recognized by agencies and advocated for by the public, and federal agencies and often state agencies are required by law to engage with stakeholders.

Stakeholder engagement may not be included in natural resource plan evaluation studies because it is hard to measure its quality, especially when attempting to measure its quality through what is listed in plans as opposed to through the process itself (i.e. whether comments are received, acknowledged, synthesized, and responded to; whether forums or other types of meetings are held and adhere to best practices). Stakeholder engagement is a complex process that may not effectively engage the entire population of interests and

incorporate their values and interests. Government agencies have criticized stakeholder engagement processes as inefficient, and this sentiment may have permeated to natural resource plan evaluation researchers, who may believe stakeholder engagement is not a significant process in planning worth evaluating (Tang 2008).

Again, plans may lack discussion about stakeholder engagement, and thus not prompting evaluation, perhaps because many agencies must comply with federally mandated procedures and may deem outlining those efforts in plans as redundant. In a study by Steelman and Hess (2009) stakeholder engagement was a positive predictor of plan quality, and the results from our longleaf pine management plan evaluation study found that better stakeholder participation leads to more well-defined problem and objective statements and better integration with other plans. Failing to assess stakeholder engagement in plan evaluation studies may lead to an inadequate measure of plan quality.

CONCLUSION

Our study explored both the content and methodology of NRMP evaluation studies. The results indicate that natural resource plan evaluation studies follow many of the same practices as the general body of evaluation studies but tend to analyze goals, policies, implementation, and coordination plan characteristics more often than the larger body of plan evaluation studies. These findings may be explained by unique attributes of natural resources and differences in natural resource planners and plan evaluation researchers. They also may be attributed to the relatively thorough plans that are required under federal laws, thus leading to thorough evaluations.

We propose several best practices recommended for conducting natural resource plan evaluation studies regarding the plan content being assessed and the methodology used. Natural resource plan evaluation studies should assess issues or problems, fact base, goals, policies, implementation, and coordination with other agencies or plans, and depending on the purpose of the study, evaluations should also assess monitoring and evaluation, compliance, and stakeholder participation (Berke & Godschalk, 2009). To ensure data are replicable and to increase confidence in the findings of the study, best practice dictates that studies provide a detailed description of the protocol, with inclusion of the tool, detail the sampling process, and contain an explanation of coding and scoring methodology. As part of best practice, at least two evaluators should evaluate at least a subset of plans to measure reliability, the extent the evaluators agree on whether plans contain the specified elements, and reliability scores should be reported (Lyles & Stevens, 2014).

Future research is needed to address how plan evaluation studies differ across planning domains, how they contribute to both plan development and plan evaluation in practice, how plans and plan quality are linked to outcomes, and what factors influence plan quality. First, meta-analysis of plan evaluation studies should explore differences in planning across other domains to reveal strengths in both plan evaluations and plans and to refine best practices for plan evaluation. While it is obvious that the results of plan evaluation studies provide useful information about plans and the planning process, it is unclear if federal, state, and other agencies are incorporating this information into revising and creating new plans or into conducting their own plan evaluations (Lyles & Stevens, 2014). There are few studies that link planning efforts, planning laws and mandates, and plan quality to planning outcomes.

Future research exploring whether goals and objectives outlined in plans are achieved could contribute to the debate about the value of plans (i.e. do plans matter?) (Berke & Conroy, 2000). This is an important contribution for the future of plan evaluation research, as plan evaluations may not be necessary if plans are not used or have no influence on outcomes (Lyles & Stevens, 2014). Future research could examine which plan components most strongly influence plan quality. Last, few studies have explored what factors drive changes in plans and why or how those factors influence plans and plan quality, and longitudinal studies are needed to determine how planners are learning over time (Brody, 2003a).

REFERENCES

- Adams, W. M., Brockington, D., Dyson, J., & Vyra, B. (2003). Managing tragedies: understanding conflict over common pool resources. *Science*, 302, 1915-1916.
- Allen, G. M., & Gould, E. M., Jr. (1986). Complexity, wickedness, and public forests. *Journal of Forestry*, 84, 20-23.
- Armsworth, P.R., Larson, E. R., Jackson, S. T., Sax, D.F. Simonin, P., Blossey, B., Green, N., Klein, M.L., Lester, L., Ricketts, T. H., Runge, M. C., & Shaw, M.R. (2015). Are conservation organizations configured for effective adaptation to global change?. *Frontiers in Ecology and the Environment*, 13, 163-169.
- Bassett, E., & Shandas, V. (2010). Innovation and climate action planning—perspectives from municipal plans.” *Journal of the American Planning Association*, 76 (4), 435–50.
- Baer, W. C. (1997). General plan evaluation criteria: an approach to making better plans. *Journal of the American Planning Association*, 63 (3), 329–44.
- Berke, P. R. (1994). Evaluating environmental plan quality: the case of planning for sustainable development in New Zealand. *Journal of Environmental Planning and Management*, 37 (2), 155–70.
- Berke, P. R., Crawford, J., Dixon, J., & Ericksen, N. (1999). Do cooperative environmental planning mandates produce good plans? Empirical results from the New Zealand experience. *Environment and Planning B: Planning and Design*, 26, 643-664.
- Berke, P. R., & Manta-Conroy, M. (2000). Are we planning for sustainable development? An evaluation of 30 comprehensive plans. *Journal of the American Planning Association*, 66 (1), 21–33.
- Berke, P. R., Godschalk, D. R., & Kaiser, E. J. (2006). *Urban Land Use Planning* (5th ed.) Urbana, IL: University of Illinois Press.
- Berke, P. R., & Godschalk, D. R. (2009). Searching for the good plan: A meta-analysis of plan quality studies. *Journal of Planning Literature*, 23 (3), 227-240.
- Blahna, D. J., & Yonts-Shepard, S. (1989). Public involvement in resource planning: Toward bridging the gap between policy and implementation. *Society and Natural Resources*, 2 (1), 209-227.
- Brody, S. (2003a). Are we learning to make better plans? A longitudinal analysis of plan quality associated with natural hazards. *Journal of Planning Education and Research*, 23 (2), 191-201.

- Brody, S. (2003b). Implementing the principles of ecosystem management through local land use planning. *Population and Environment*, 29 (6), 511-40.
- Brody, S., Highfield, W., & Carrasco, V. (2004). Measuring the collective planning capabilities of local jurisdictions to manage ecological systems in southern Florida. *Landscape and Urban Planning*, 69, 32-50.
- Bunnell, G., & Jepson, Jr, E. J. (2011). The effect of mandated planning on plan quality. *Journal of the American Planning Association*, 77 (4), 338–53.
- Conley, A. & Moote, M.A. (2003). Evaluating collaborative natural resource management. *Society and Natural Resources*, 16(5), 371–386.
- Davis, B. C. (2004). Regional planning in the US coastal zone: a comparative analysis of 15 special area plans. *Ocean and Coastal Management*, 47 (1–2), 79–94.
- Evans-Cowley, J. S., & Gough, M. Z. (2009). Evaluating new urbanist plans in post-Katrina Mississippi. *Journal of Urban Design*, 14 (4), 439–61.
- Fontaine, J. (2011). Improving our legacy: incorporation of adaptive management into state wildlife action plans. *Journal of Environmental Management*, 92(5), 1403-1408.
- Lachapelle, P. R., McCool, S. F., & Patterson, M. E. (2003) Barriers to effective natural resource planning in a "messy" world, *Society and Natural Resources*, 16, 6, 473-490, DOI: [10.1080/08941920309151](https://doi.org/10.1080/08941920309151).
- Lachapelle, P. R., & McCool, S. F., (2005). Exploring the concept of “ownership” in natural resource planning. *Society and Natural Resources*, 18(3), 279-285, DOI: [10.1080/08941920590908141](https://doi.org/10.1080/08941920590908141).
- Lyles, W. & Stevens, M. (2014). Plan quality evaluation 1994-2012: growth and contributions, limitations, and new directions. *Journal of Planning Education and Research*, 34(4), 433-450.
- Norton, R. (2005). More and better local planning: State-mandated local planning in coastal North Carolina. *Journal of the American Planning Association*, 71 (1), 55-72.
- Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press.
- Peterson, M. N., Riley, S. J., Busch, L., & Liu, J. (2007). Reconciling wildlife management's conflicted purpose with a land community worldview. *Journal of Wildlife Management*, 71, 2499-2506.
- Salwassar, H. (2004). Confronting the implications of wicked problems: changes needed in sierra nevada national forest planning and problem solving. USDA Forest Service Gen. Tech. Rep. PSW-GTR-193, 7-21.

- Steelman, T. A., & Hess, G. R. (2009). Effective protection of open space: does planning matter? *Environmental Management*, 44, 93–104.
- Stevens, M. R., Lyles, W., & Berke, P. R. (2014). Measuring and reporting intercoder reliability in plan quality evaluation research. *Journal of Planning Education and Research*, 34 (1), 77–93.
- Tang, Z. (2008). Evaluating local coastal zone land use planning capacities in California. *Ocean and Coastal Management*, 51 (7), 544–555.
- Tang, Z., Lindell, M. K., Prater, C., Wei, T., & Hussey, C. M. (2011). Examining local coastal zone management capacity in U.S. Pacific coastal counties. *Coastal Management*, 39 (2), 105–32.
- Termorshuizen, J., Opdam, P., & van den Brink, A. (2007). Incorporating ecological sustainability into landscape planning. *Landscape and Urban Planning*, 79, 374-84.
- Tiedermann, A. R., Klemmedson, J.O., & Bull, E.L. (2000). Solution of forest health problems with prescribed fire: are forest productivity and wildlife at risk? *Forest Ecology and Management*. 127 (1-3), 1-18.
- Wheeler, S. M. (2008). State and municipal climate change plans. *Journal of the American Planning Association*, 74 (4), 481–96.

CHAPTER 4: CONCLUSION

I evaluated the quality of management plans from a variety of agencies that addressed the restoration of longleaf pine systems in the Southeast using a formal plan evaluation tool. The tool seemed to be an effective means to provide an objective assessment of the management plans with high intercoder reliability, and our findings indicate that agencies are developing plans that better address the challenge of restoration of longleaf pine ecosystems. Plans from federal agencies scored higher on average than state and nongovernmental agency plans, which may be a reflection of differences in agency missions and resources. Plans generally scored high in fact base and integration with other plans but scored poorly on strategic elements such as actions and implementation. The plan implementation and evaluation protocols, in general, were poorly developed, and this could have negative implications for meeting goals and objectives. Conservation efforts are increasingly moving towards landscape scale approaches, which require coordination and collaboration with partners. A lack of specified management actions may prevent the linking of conservation actions within the agency and may result in missed opportunities for collaboration between agencies working towards similar conservation goals or managing the same resource.

I conducted a meta-analysis of natural resource management plan evaluation studies, identifying the characteristics each study evaluated and the methodology they used. The results indicate that natural resource plan evaluation studies follow many of the same practices as the general body of evaluation studies, but tend to analyze goals, policies, implementation, and coordination characteristics and follow content analysis best practices more often than the larger body of plan evaluation studies. Our results indicate that

compliance and stakeholder engagement may be key gaps in natural resource management plan evaluation studies and perhaps these and other elements in the plans themselves.

Future work should investigate if and how agencies perform and utilize findings from evaluation studies to improve planning processes and decision making. Future research should link plan quality to success in achieving goals, and interviews with decision makers could be used to see if better plans are associated with successful implementation and goal achievement and to understand what role plans play in decision making processes. Interviews may also identify the types of management decisions being made, the objectives of those decisions, and how management decisions are made. These are important first step towards understanding the “decision context” for issues such as longleaf pine restoration and will inform the development of the Southeast Conservation Adaptation Strategy plan. Interviews may also contribute to understanding of what is considered a good decision and what constraints – institutional (fiscal, political, historical, regulatory requirements, time-sensitivity) and scientific (spatial and temporal scale, scientific uncertainty, the value of scientific information, missing information)– limit improved decision making and planning.

Interviews with decision-makers operating at a variety of scales and across multiple organizations may address a number of questions that might include:

1. What are the current planning process and legal requirements for making decisions? How do decision makers use scientific information? What parts of the decision are opportunistic? What parts are structured and planned?
2. What makes a decision a "good" decision? What is the most important ingredient for a good decision? What are the biggest barriers to making good decisions? How do you overcome these barriers?
3. What are the biggest scientific barriers to making a "good" decision? What are the biggest legal and institutional barriers to making a good decision?
4. Where are the biggest opportunities to coordinate with other institutions whose decisions influence a resource (e.g., long leaf pine)? What are the biggest barriers to better coordination?

In addition to interviews, a questionnaire may be useful in gathering quantitative data about decision makers, and as part of my thesis work, I have developed a questionnaire assessing decision making process, social networks, and climate change perceptions to be used in future work (Appendix C). This questionnaire is intended to evaluate how the personas of decision makers influence their decision making. It is important to understand the variety of individual and societal characteristics that influence how people utilize information in decision making. Defining decision-making personas can help illustrate how these characteristics impact individual decision-making processes, and relevant dimensions for defining personas may likely include: spatial, temporal, collaboration style, approach, and driving force. Information from the questionnaire may be used to inform planning processes. Findings from this questionnaire may be used to help tailor plans to capitalize on the strengths of natural resource agencies and decision makers and to ensure plans are relevant to their needs and priorities.

APPENDICES

Appendix A- Plan Evaluation Tool

Name of Organization _____

Name of Plan _____

Unique ID# _____

Coding Categories:
 2= Identified, detailed, relevant
 1=Identified, vague, incomplete
 0=Not identified

1. PROBLEM AND OBJECTIVES STATEMENT

		SCORE	PAGE #
1.1	Is the primary driver requiring this plan explained?	0 1 2	
1.2	Is the decision maker/administrative authority for the planning effort indicated?	0 1 2	
1.3	Is there a preliminary assessment of major trends related to the open pine ecosystem?	0 1 2	
1.4	Is there a description of major threats to the open pine ecosystems?	0 1 2	
1.5	Is there an overall objective of what the plan is working towards?	0 1 2	
1.5.1	Are objectives clearly stated?	0 1 2	
1.5.2	Are objectives measurable?	0 1 2	
1.5.3	Are objectives prioritized?	0 1 2	
1.5.4	Are fundamental objectives considered?	0 1 2	
1.5.5	Are means objectives considered?	0 1 2	
1.6	Are alternatives considered?	0 1 2	
1.6.1	How many alternatives are considered?	_____	
1.7	Is there a process for changing objectives based on changing conditions?	0 1 2	
1.8	Is there a review of the challenges managers must overcome to achieve the objectives?	0 1 2	
1.9	Is there a description of assets available to managers relating to open pine ecosystem management?	0 1 2	

SCORE: _____/28

2. FACT BASE

		SCORE	PAGE #
2.1	Contains analysis of current and future conditions impacting the open pine ecosystem.	0 1 2	
2.2	Gives an assessment of the current state of the landscape.	0 1 2	
2.3	Are clear maps included which display information that support reasoning and enhance relevance and comprehensibility?	0 1 2	
2.4	Are tables clear, relevant, and comprehensible?	0 1 2	
2.5	Is language used clear and understandable to reader?	0 1 2	
2.6	Are data sources cited?	0 1 2	
2.6.1	Are data sources peer-reviewed?	0 1 2	

SCORE: ____/14

3. ACTIONS AND IMPLEMENTATION

		SCORE	PAGE #
3.1	Are actions for implementing plans clearly identified?	0 1 2	
3.2	Are actions for implementing plans prioritized?	0 1 2	
3.3	Are timelines for implementation identified?	0 1 2	
3.4	Are specific individuals within the organization assigned responsibilities for implementation?	0 1 2	
3.5	Is funding allocation identified to implement the plan?	0 1 2	
3.6	Is evaluation criteria identified?	0 1 2	
3.6.1	Is evaluation criteria tied to objectives?	0 1 2	
3.7	Is there a timeline for updating the plan?	0 1 2	
3.8	Is there a process for updating the plan based on changing conditions or the result of new monitoring data?	0 1 2	

SCORE: ____/18

4. INTEGRATION WITH OTHER PLANS

	SCORE	PAGE #
4.1 Are horizontal connections with other plans or organizations explained?	0 1 2	
4.2 Are vertical connections with national, regional, and local plans and organizations explained?	0 1 2	

SCORE: _____/4

5. STAKEHOLDER PARTICIPATION

	SCORE	PAGE #
5.1 Are organizations and individuals involved in the plan preparation and implementation identified?	0 1 2	
5.2 Is there an explanation of why the organizations and individuals were involved in the plan preparation or implementation?	0 1 2	
5.3 Does the plan incorporate input from non-agency stakeholders?	0 1 2	
5.4 Are the stakeholders involved representative of those groups that will likely be impacted by the plan?	0 1 2	
5.5 Is there an explanation of participation techniques that were used?	0 1 2	

SCORE: _____/10

TOTAL SCORE: _____/74

Appendix B-1- Department of Defense Plan Evaluation Scores

Plan Name	Problem & objective statement	Fact base	Actions & implementation	Integration w/ other plans	Stakeholder participation	Total
Fort Benning INRMP	89.3	100.0	44.4	100.0	60.0	77.0
Eglin Air Force Base Integrated Natural Resources Management Plan	75.0	100.0	27.8	100.0	100.0	73.0
Camp LeJeune Integrated Natural Resource Management Plan	78.6	64.3	50.0	100.0	100.0	73.0
Mean	81.0	88.1	40.7	100.0	86.7	74.3
Standard Deviation	7.4	20.6	11.6	0.0	23.1	2.3

Appendix B-2- U.S. Fish and Wildlife Service Plan Evaluation Scores

Plan Name	Problem & objective statement	Fact base	Actions & implementation	Integration w/ other plans	Stakeholder participation	Total
Carolina Sandhills NWR		100.0	66.7	100.0	100.0	86.5
Santee NWR CCP		100.0	55.6	100.0	100.0	85.1
Eufaula NWR CCP		100.0	77.8	100.0	100.0	85.1
St. Marks NWR CCP		92.9	66.7	100.0	100.0	85.1
Okefenokee NWR CCP		100.0	55.6	100.0	100.0	83.8
Cedar Island NWR CCP		92.9	66.7	100.0	100.0	82.4
Waccamaw NWR CCP		92.9	55.6	100.0	100.0	77.0
Grand Bay NWR CCP		92.9	33.3	100.0	100.0	77.0
Mississippi Sandhill Crane NWR CCP		100.0	38.9	100.0	100.0	77.0
Lake Wales Ridge NWR CCP		92.9	38.9	100.0	100.0	77.0
Bond Swamp NWR CCP		92.9	50.0	100.0	100.0	75.7
Mountain Longleaf NWR Habitat Management Plan		85.7	55.6	25.0	0.0	60.8
Mean		80.7	55.1	93.8	91.7	79.4
Standard Deviation		6.0	13.3	21.7	28.9	7.1

Appendix B-3- U.S. Forest Service Plan Evaluation Scores

Plan Name	Problem & objective statement	Fact base	Actions & implementation	Integration w/ other plans	Stakeholder participation	Total
Croatan National Forest	71.4	92.9	50.0	100.0	70.0	71.6
National Forests in Alabama	75.0	92.9	50.0	25.0	50.0	66.2
Kisatchie National Forest	82.1	57.1	77.8	100.0	0.0	66.2
National Forests in FL	64.3	64.3	50.0	0.0	100.0	62.2
Uwharrie National Forest	60.7	78.6	44.4	50.0	50.0	58.1
Francis Marion National Forest	50.0	64.3	50.0	50.0	0.0	45.9
Mean	67.3	75.0	53.7	54.2	45.0	61.7
Standard Deviation	11.4	15.5	12.0	40.1	39.4	8.9

Appendix B-4- State Forest Action Plan Evaluation Scores

Plan Name	Problem & objective statement	Fact base	Actions & implementation	Integration w/ other plans	Stakeholder participation	Total
North Carolina Forest Action Plan	67.9	100.0	33.3	100.0	100.0	71.6
South Carolina Forest Action Plan	64.3	100.0	33.3	100.0	100.0	70.3
Mississippi Forest Action Plan	64.3	92.9	33.3	100.0	100.0	68.9
Georgia Forest Action Plan	60.7	100.0	5.6	100.0	100.0	62.2
Mean	64.3	98.2	26.4	100.0	100.0	68.2
Standard Deviation	2.9	3.6	13.9	0.0	0.0	4.2

Appendix B-5- State Wildlife Action Plan Evaluation Scores

Plan Name	Problem & objective statement	Fact base	Actions & implementation	Integration w/ other plans	Stakeholder participation	Total
North Carolina Wildlife Action Plan	82.1	100.0	61.1	100.0	100.0	83.8
A Comprehensive Wildlife Conservation Strategy for Georgia	64.3	92.9	72.2	100.0	100.0	78.4
Conserving Alabama's Wildlife: A comprehensive strategy	67.9	92.9	50.0	100.0	100.0	74.3
South Carolina State Wildlife Action Plan	21.4	92.9	50.0	100.0	0.0	43.2
Mean	58.9	94.6	58.3	100.0	75.0	69.9
Standard Deviation	26.2	3.6	10.6	0.0	50.0	18.2

Appendix B-6- Nongovernmental Organization Plan Evaluation Scores

Plan Name	Problem & objective statement	Fact base	Actions & implementation	Integration w/ other plans	Stakeholder participation	Total
Range-wide Conservation Plan for Longleaf Pine	67.9	57.1	16.7	100.0	90.0	58.1
South Atlantic Coastal Plain Ecoregional Assessment	46.4	78.6	22.2	0.0	70.0	47.3
Upper East Gulf Coastal Plain Ecoregional Assessment	46.4	92.9	22.2	0.0	10.0	41.9
Mean	53.6	76.2	20.4	33.3	56.7	49.1
Standard Deviation	12.4	18.0	3.2	57.7	41.6	8.3

Appendix B-7- Joint Ventures Plan Evaluation Scores

Plan Name	Problem & objective statement	Fact base	Actions & implementation	Integration w/ other plans	Stakeholder participation	Total
South Atlantic Migratory Bird Initiative Implementation Plan	64.3	92.9	22.2	50.0	90.0	62.2
Open Pine Landbird Plan	64.3	92.9	11.1	50.0	60.0	55.4
Gulf Coastal Plain Ecosystem Partnership Conservation Action Plan	60.7	50.0	38.9	50.0	30.0	48.6
Mean	63.1	78.6	24.1	50.0	60.0	55.4
Standard Deviation	2.1	24.7	14.0	0.0	30.0	6.8

Appendix C-1- Total Raw Evaluation Scores

Name	C1	C2	C3	C4	C5	Total
St. Marks National Wildlife Refuge Comprehensive Conservation Plan	24	14	12	4	10	64
Mountain Longleaf National Wildlife Refuge Habitat Management Plan	25	14	10	4	10	63
Fort Benning Integrated Natural Resources Management Plan	21	14	14	4	10	63
South Atlantic Coastal Plain Ecoregional Assessment	24	13	12	4	10	63
National Forests in Alabama Plan	23	14	11	4	10	62
Georgia Forest Action Plan	24	14	10	4	10	62
North Carolina Wildlife Action Plan	22	13	12	4	10	61
Carolina Sandhills National Wildlife Refuge Comprehensive Conservation Plan	18	13	13	4	10	58
Upper East Gulf Coastal Plain Ecoregional Assessment	20	13	10	4	10	57
Waccamaw National Wildlife Refuge Comprehensive Conservation Plan	24	13	6	4	10	57
Croatan National Forest Plan	22	14	7	4	10	57
Camp LeJeune Integrated Natural Resource Management Plan	23	13	7	4	10	57
Grand Bay National Wildlife Refuge Comprehensive Conservation Plan	25	14	8	4	6	57
Eufaula National Wildlife Refuge Comprehensive Conservation Plan	20	13	9	4	10	56
Okefenokee National Wildlife Refuge Comprehensive Conservation Plan	19	13	9	4	10	55
A Comprehensive Wildlife Conservation Strategy for Georgia	21	14	5	4	10	54
Santee National Wildlife Refuge Comprehensive Conservation Plan	22	9	9	4	10	54
Cedar Island National Wildlife Refuge Comprehensive Conservation Plan	20	13	9	4	7	53
Kisatchie National Forest Plan	19	14	6	4	10	53
Open Pine Landbird Plan	18	14	6	4	10	52
Eglin Air Force Base Integrated Natural Resources Management Plan	18	13	6	4	10	51
South Carolina Forest Action Plan	21	13	9	1	5	49
Conserving Alabama's Wildlife: A comprehensive strategy	23	8	14	4	0	49
Mississippi Forest Action Plan	18	9	9	0	10	46
Mississippi Sandhill Crane National Wildlife Refuge Comprehensive Conservation Plan	17	14	1	4	10	46
Uwharrie National Forest Plan	18	13	4	2	9	46
North Carolina Forest Action Plan	22	12	10	1	0	45
South Atlantic Migratory Bird Initiative Implementation Plan	19	8	3	4	9	43
South Carolina State Wildlife Action Plan	17	11	8	2	5	43
National Forests in Florida	18	13	2	2	6	41
Bond Swamp National Wildlife Refuge Comprehensive Conservation Plan	17	7	7	2	3	36
Range-wide Conservation Plan for Longleaf Pine	13	11	4	0	7	35
Lake Wales Ridge National Wildlife Refuge Comprehensive Conservation Plan	14	9	9	2	0	34
Gulf Coastal Plain Ecosystem Partnership Conservation Action Plan	6	13	9	4	0	32
Francis Marion National Forest Plan	13	13	4	0	1	31

Appendix C-2- Problem and Objective Statement Category Raw Scores

Name	1.1	1.2	1.3	1.4	1.5	1.5.1	1.5.2	1.5.3	1.5.4	1.5.5	1.6	1.6.1	1.7	1.8	1.9
St. Marks National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2	2	2	0	2	2	2	3	1	1	2
Mountain Longleaf National Wildlife Refuge Habitat Management Plan	2	2	2	2	2	2	2	0	2	2	2	3	1	2	2
Fort Benning Integrated Natural Resources Management Plan	2	2	2	1	2	2	2	0	2	2	2	4	1	0	1
South Atlantic Coastal Plain Ecoregional Assessment	2	2	2	2	2	2	2	0	2	2	2	3	1	1	2
National Forests in Alabama Plan	2	2	2	2	2	2	2	0	2	2	0	0	2	2	1
Georgia Forest Action Plan	2	2	2	2	2	2	2	0	2	2	2	3	1	1	2
North Carolina Wildlife Action Plan	2	2	1	1	2	2	2	0	2	2	2	3	1	1	2
Carolina Sandhills National Wildlife Refuge Comprehensive Conservation Plan	2	2	1	1	2	1	1	0	2	2	0	0	0	2	2
Upper East Gulf Coastal Plain Ecoregional Assessment	2	2	0	1	2	2	2	0	2	2	2	4	1	0	2
Waccamaw National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2	2	2	0	2	2	2	4	1	2	1
Croatian National Forest Plan	2	2	2	2	2	2	2	0	2	2	2	4	1	0	1
Camp LeJeune Integrated Natural Resource Management Plan	2	2	1	1	2	2	2	0	2	2	2	3	2	2	1
Grand Bay National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2	2	2	0	2	2	2	5	1	2	2
Eufaula National Wildlife Refuge Comprehensive Conservation Plan	2	2	0	1	2	2	2	0	2	2	2	3	1	1	1
Okfenokee National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2	2	2	0	2	2	0	0	1	0	0
A Comprehensive Wildlife Conservation Strategy for Georgia	2	2	2	1	2	2	2	0	2	2	0	0	1	1	2
Santee National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2	2	2	0	2	2	0	0	2	1	1
Cedar Island National Wildlife Refuge Comprehensive Conservation Plan	2	2	1	1	2	2	2	0	2	2	1	0	2	1	0
Kisatchie National Forest Plan	2	2	2	2	1	2	2	0	2	2	0	0	0	2	0
Open Pine Landbird Plan	2	2	1	2	1	2	2	0	2	2	0	0	0	1	1
Eglin Air Force Base Integrated Natural Resources Management Plan	2	2	2	2	1	1	2	0	2	2	0	0	0	0	2
South Carolina Forest Action Plan	2	2	2	2	2	2	2	0	2	2	1	4	1	1	0
Conserving Alabama's Wildlife: A comprehensive strategy	2	2	1	1	2	2	2	2	2	2	0	0	2	2	1
Mississippi Forest Action Plan	2	2	1	1	2	2	2	0	2	2	0	0	1	1	0
Mississippi Sandhill Crane National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	1	2	2	2	0	2	2	0	0	0	0	0
Uwharrie National Forest Plan	2	2	2	2	2	2	2	0	2	2	0	0	0	0	0
North Carolina Forest Action Plan	2	2	2	2	2	2	2	0	2	2	0	0	1	2	1
South Atlantic Migratory Bird Initiative Implementation Plan	2	2	2	1	2	2	1	0	2	2	0	0	0	2	1
South Carolina State Wildlife Action Plan	2	2	2	1	2	2	2	0	2	2	0	0	0	0	0
National Forests in Florida	2	2	2	2	2	2	2	0	2	2	0	0	0	0	0
Bond Swamp National Wildlife Refuge Comprehensive Conservation Plan	2	2	1	2	2	2	2	0	2	2	0	0	0	0	0
Range-wide Conservation Plan for Longleaf Pine	1	2	0	1	2	1	2	1	1	1	0	0	0	0	1
Lake Wales Ridge National Wildlife Refuge Comprehensive Conservation Plan	2	2	0	2	0	2	2	0	2	2	0	0	0	0	0
Gulf Coastal Plain Ecosystem Partnership Conservation Action Plan	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0
Francis Marion National Forest Plan	1	2	0	1	2	2	1	0	2	1	0	0	0	1	0

Appendix C-3- Fact Base Category Raw Scores

Name	2.1	2.2	2.3	2.4	2.5	2.6	2.6.1
St. Marks National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2	2	2
Mountain Longleaf National Wildlife Refuge Habitat Management Plan	2	2	2	2	2	2	2
Fort Benning Integrated Natural Resources Management Plan	2	2	2	2	2	2	2
South Atlantic Coastal Plain Ecoregional Assessment	1	2	2	2	2	2	2
National Forests in Alabama Plan	2	2	2	2	2	2	2
Georgia Forest Action Plan	2	2	2	2	2	2	2
North Carolina Wildlife Action Plan	1	2	2	2	2	2	2
Carolina Sandhills National Wildlife Refuge Comprehensive Conservation Plan	1	2	2	2	2	2	2
Upper East Gulf Coastal Plain Ecoregional Assessment	1	2	2	2	2	2	2
Waccamaw National Wildlife Refuge Comprehensive Conservation Plan	1	2	2	2	2	2	2
Croatan National Forest Plan	2	2	2	2	2	2	2
Camp LeJeune Integrated Natural Resource Management Plan	1	2	2	2	2	2	2
Grand Bay National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2	2	2
Eufaula National Wildlife Refuge Comprehensive Conservation Plan	1	2	2	2	2	2	2
Okefenokee National Wildlife Refuge Comprehensive Conservation Plan	1	2	2	2	2	2	2
A Comprehensive Wildlife Conservation Strategy for Georgia	2	2	2	2	2	2	2
Santee National Wildlife Refuge Comprehensive Conservation Plan	1	2	2	2	2	0	0
Cedar Island National Wildlife Refuge Comprehensive Conservation Plan	1	2	2	2	2	2	2
Kisatchie National Forest Plan	2	2	2	2	2	2	2
Open Pine Landbird Plan	2	2	2	2	2	2	2
Eglin Air Force Base Integrated Natural Resources Management Plan	1	2	2	2	2	2	2
South Carolina Forest Action Plan	1	2	2	2	2	2	2
Conserving Alabama's Wildlife: A comprehensive strategy	1	1	2	2	2	0	0
Mississippi Forest Action Plan	1	2	2	2	2	0	0
Mississippi Sandhill Crane National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2	2	2
Uwharrie National Forest Plan	1	2	2	2	2	2	2
North Carolina Forest Action Plan	1	1	2	2	2	2	2
South Atlantic Migratory Bird Initiative Implementation Plan	1	1	2	2	2	0	0
South Carolina State Wildlife Action Plan	0	1	2	2	2	2	2
National Forests in Florida	1	2	2	2	2	2	2
Bond Swamp National Wildlife Refuge Comprehensive Conservation Plan	0	1	2	2	2	0	0
Range-wide Conservation Plan for Longleaf Pine	1	2	0	2	2	2	2
Lake Wales Ridge National Wildlife Refuge Comprehensive Conservation Plan	2	1	2	2	2	0	0
Gulf Coastal Plain Ecosystem Partnership Conservation Action Plan	1	2	2	2	2	2	2
Francis Marion National Forest Plan	1	2	2	2	2	2	2

Appendix C-4- Actions and Implementation Category Raw Scores

Name	3.1	3.2	3.3	3.4	3.5	3.6	3.6.1	3.7	3.8
St. Marks National Wildlife Refuge Comprehensive Conservation Plan	2	0	2	2	2	1	1	1	1
Mountain Longleaf National Wildlife Refuge Habitat Management Plan	2	0	0	2	2	0	0	2	2
Fort Benning Integrated Natural Resources Management Plan	2	0	2	2	2	1	1	2	2
South Atlantic Coastal Plain Ecoregional Assessment	2	0	1	2	2	1	0	2	2
National Forests in Alabama Plan	2	2	0	0	1	1	1	2	2
Georgia Forest Action Plan	2	0	0	2	2	0	0	2	2
North Carolina Wildlife Action Plan	2	0	1	2	2	1	1	2	1
Carolina Sandhills National Wildlife Refuge Comprehensive Conservation Plan	1	2	1	0	2	2	1	2	2
Upper East Gulf Coastal Plain Ecoregional Assessment	1	2	1	0	2	1	0	2	1
Waccamaw National Wildlife Refuge Comprehensive Conservation Plan	2	0	0	0	1	0	0	2	1
Croatan National Forest Plan	2	0	1	0	2	1	0	0	1
Camp LeJeune Integrated Natural Resource Management Plan	2	0	0	0	0	0	1	2	2
Grand Bay National Wildlife Refuge Comprehensive Conservation Plan	1	0	1	1	2	0	0	2	1
Eufaula National Wildlife Refuge Comprehensive Conservation Plan	2	0	1	0	2	1	0	2	1
Okefenokee National Wildlife Refuge Comprehensive Conservation Plan	2	0	1	0	1	2	1	1	1
A Comprehensive Wildlife Conservation Strategy for Georgia	1	0	0	0	1	0	0	1	2
Santee National Wildlife Refuge Comprehensive Conservation Plan	2	0	1	0	2	0	0	2	2
Cedar Island National Wildlife Refuge Comprehensive Conservation Plan	1	0	0	0	0	2	2	2	2
Kisatchie National Forest Plan	1	0	1	0	0	2	2	0	0
Open Pine Landbird Plan	2	0	0	0	1	1	2	0	0
Eglin Air Force Base Integrated Natural Resources Management Plan	1	0	0	0	1	2	2	0	0
South Carolina Forest Action Plan	1	0	0	0	1	2	2	2	1
Conserving Alabama's Wildlife: A comprehensive strategy	2	2	1	0	2	1	2	2	2
Mississippi Forest Action Plan	1	0	0	0	1	2	2	2	1
Mississippi Sandhill Crane National Wildlife Refuge Comprehensive Conservation Plan	1	0	0	0	0	0	0	0	0
Uwharrie National Forest Plan	1	0	1	1	1	0	0	0	0
North Carolina Forest Action Plan	1	0	2	0	2	1	1	2	1
South Atlantic Migratory Bird Initiative Implementation Plan	1	0	1	0	1	0	0	0	0
South Carolina State Wildlife Action Plan	1	0	1	0	0	2	2	2	0
National Forests in Florida	1	0	0	0	0	1	0	0	0
Bond Swamp National Wildlife Refuge Comprehensive Conservation Plan	1	0	2	0	0	2	2	0	0
Range-wide Conservation Plan for Longleaf Pine	0	0	0	0	0	2	2	0	0
Lake Wales Ridge National Wildlife Refuge Comprehensive Conservation Plan	1	0	0	2	2	2	2	0	0
Gulf Coastal Plain Ecosystem Partnership Conservation Action Plan	2	2	0	0	0	1	0	2	2
Francis Marion National Forest Plan	0	0	0	0	0	2	2	0	0

Appendix C-5- Integration with Other Plans Category Raw Scores

Name	4.1	4.2
St. Marks National Wildlife Refuge Comprehensive Conservation Plan	2	2
Mountain Longleaf National Wildlife Refuge Habitat Management Plan	2	2
Fort Benning Integrated Natural Resources Management Plan	2	2
South Atlantic Coastal Plain Ecoregional Assessment	2	2
National Forests in Alabama Plan	2	2
Georgia Forest Action Plan	2	2
North Carolina Wildlife Action Plan	2	2
Carolina Sandhills National Wildlife Refuge Comprehensive Conservation Plan	2	2
Upper East Gulf Coastal Plain Ecoregional Assessment	2	2
Waccamaw National Wildlife Refuge Comprehensive Conservation Plan	2	2
Croatan National Forest Plan	2	2
Camp LeJeune Integrated Natural Resource Management Plan	2	2
Grand Bay National Wildlife Refuge Comprehensive Conservation Plan	2	2
Eufaula National Wildlife Refuge Comprehensive Conservation Plan	2	2
Okefenokee National Wildlife Refuge Comprehensive Conservation Plan	2	2
A Comprehensive Wildlife Conservation Strategy for Georgia	2	2
Santee National Wildlife Refuge Comprehensive Conservation Plan	2	2
Cedar Island National Wildlife Refuge Comprehensive Conservation Plan	2	2
Kisatchie National Forest Plan	2	2
Open Pine Landbird Plan	2	2
Eglin Air Force Base Integrated Natural Resources Management Plan	2	2
South Carolina Forest Action Plan	0	1
Conserving Alabama's Wildlife: A comprehensive strategy	2	2
Mississippi Forest Action Plan	0	0
Mississippi Sandhill Crane National Wildlife Refuge Comprehensive Conservation Plan	2	2
Uwharrie National Forest Plan	1	1
North Carolina Forest Action Plan	0	1
South Atlantic Migratory Bird Initiative Implementation Plan	2	2
South Carolina State Wildlife Action Plan	1	1
National Forests in Florida	1	1
Bond Swamp National Wildlife Refuge Comprehensive Conservation Plan	1	1
Range-wide Conservation Plan for Longleaf Pine	0	0
Lake Wales Ridge National Wildlife Refuge Comprehensive Conservation Plan	1	1
Gulf Coastal Plain Ecosystem Partnership Conservation Action Plan	2	2
Francis Marion National Forest Plan	0	0

Appendix C-6- Stakeholder Participation Category Raw Scores

Name	5.1	5.2	5.3	5.4	5.5
St. Marks National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2
Mountain Longleaf National Wildlife Refuge Habitat Management Plan	2	2	2	2	2
Fort Benning Integrated Natural Resources Management Plan	2	2	2	2	2
South Atlantic Coastal Plain Ecoregional Assessment	2	2	2	2	2
National Forests in Alabama Plan	2	2	2	2	2
Georgia Forest Action Plan	2	2	2	2	2
North Carolina Wildlife Action Plan	2	2	2	2	2
Carolina Sandhills National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2
Upper East Gulf Coastal Plain Ecoregional Assessment	2	2	2	2	2
Waccamaw National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2
Croatan National Forest Plan	2	2	2	2	2
Camp LeJeune Integrated Natural Resource Management Plan	2	2	2	2	2
Grand Bay National Wildlife Refuge Comprehensive Conservation Plan	2	2	1	1	0
Eufaula National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2
Okefenokee National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2
A Comprehensive Wildlife Conservation Strategy for Georgia	2	2	2	2	2
Santee National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2
Cedar Island National Wildlife Refuge Comprehensive Conservation Plan	1	2	2	1	1
Kisatchie National Forest Plan	2	2	2	2	2
Open Pine Landbird Plan	2	2	2	2	2
Eglin Air Force Base Integrated Natural Resources Management Plan	2	2	2	2	2
South Carolina Forest Action Plan	1	2	0	0	2
Conserving Alabama's Wildlife: A comprehensive strategy	0	0	0	0	0
Mississippi Forest Action Plan	2	2	2	2	2
Mississippi Sandhill Crane National Wildlife Refuge Comprehensive Conservation Plan	2	2	2	2	2
Uwharrie National Forest Plan	2	2	2	1	2
North Carolina Forest Action Plan	0	0	0	0	0
South Atlantic Migratory Bird Initiative Implementation Plan	2	1	2	2	2
South Carolina State Wildlife Action Plan	1	1	2	1	0
National Forests in Florida	2	1	2	1	0
Bond Swamp National Wildlife Refuge Comprehensive Conservation Plan	1	0	1	1	0
Range-wide Conservation Plan for Longleaf Pine	2	1	0	2	2
Lake Wales Ridge National Wildlife Refuge Comprehensive Conservation Plan	0	0	0	0	0
Gulf Coastal Plain Ecosystem Partnership Conservation Action Plan	0	0	0	0	0
Francis Marion National Forest Plan	1	0	0	0	0

Appendix D-Decision Maker Questionnaire

This questionnaire is designed to evaluate how the personas of decision makers influence their decision making. It is important to understand the variety of individual and societal characteristics that influence how people utilize information in decision making. Defining decision-making personas can help illustrate how these characteristics impact individual decision-making processes. This questionnaire has four components: process, social network, climate change perceptions, and demographics.

Part A. Process

Check one.

1. The current decision making process is...
 - not effective
 - somewhat effective
 - mostly effective
 - totally effective
 - I don't know

2. Is sufficient information available to make decisions?
 - Yes
 - No
 - I don't know

3. Management decisions are made on the following scales: (check all that apply)
 - long term
 - short term
 - I don't know

 - local
 - regional
 - national
 - I don't know

4. To what extent is collaboration a necessary part of decision making?
 - not necessary
 - somewhat necessary
 - mostly necessary
 - totally necessary
 - I don't know

5. How influential are stakeholders in the decision making process?
 - very influential
 - somewhat influential

not influential

6. Are alternatives thoroughly explored in the decision making process?

Yes

No

I don't know

7. To what extent do these scientific barriers affect decision making? Check one for each barrier.

	Never	Rarely	Occasionally	Frequently	A Great Deal
Temporal mismatch					
Spatial mismatch					
Uncertainty					
Value of scientific information					
Missing information					
Other					

8. To what extent do these institutional barriers affect decision making? Check one for each barrier.

	Never	Rarely	Occasionally	Frequently	A Great Deal
Fiscal					
Political					
Historical					
Regulatory requirements					
Time sensitivity					
Other					

Check one.

9. Collaboration happens

not at all

somewhat frequently

frequently

very frequently

all the time

10. To what extent do you feel the following are challenges to working with collaborators or inhibit your use of collaborators? Check one for each challenge.

	Never	Rarely	Occasionally	Frequently	A Great Deal
Fiscal					
Political					
Historical					
Regulatory requirements					
Time sensitivity					
Other					

Check one.

11. Do you currently work with partners?

Yes

No

12. Is working with partners listed in your position description?

Yes

No

13. We are interested in knowing why you don't work with partners (check all that apply).

There are few partners available to work with

My work assignment is not conducive to working with partners

Working with partners is not part of my job description

I do not have the flexibility to work with partners

Partnerships are not strongly encouraged in our agency

It is not something that I considered before

I am not interested in working with partners

I don't believe in outsourcing government work

Other (please specify)

14. To what extent do you typically work with the following types of partner groups?
 Check one for each partner group.

	Never	Rarely	Occasionally	Frequently	A Great Deal
Groups or individuals who show up one time for a particular event of project					
Groups or individuals who show up periodically as needs arise					
Groups or individuals involved in annual or periodic events					
Groups or individuals involved in a long-term collaborative process					
Groups or individuals that provide an ongoing assistance					
Other					

Part B. Social Network

1. List the people/organizations you think are important to your position (in terms of support you received in decision making).

Name of person or organization	Type of support provided (check all that apply)	Relationship to you <input type="checkbox"/> Colleague within agency <input type="checkbox"/> Colleague outside of agency <input type="checkbox"/> Other (check all that apply)	Length of connection (years or months)	Mode of communication (check all that apply)	Frequency of communication	Importance of these ties in management success
	<input type="checkbox"/> Financial <input type="checkbox"/> Decision-making <input type="checkbox"/> Collaboration <input type="checkbox"/> Planning <input type="checkbox"/> Information sharing <input type="checkbox"/> Emotional <input type="checkbox"/> Other: _____	<input type="checkbox"/> Colleague within agency <input type="checkbox"/> Colleague outside of agency <input type="checkbox"/> Other		<input type="checkbox"/> Email <input type="checkbox"/> Phone <input type="checkbox"/> In person <input type="checkbox"/> Other: _____	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Annually	<input type="checkbox"/> Not at all important <input type="checkbox"/> Slightly important <input type="checkbox"/> Moderately important <input type="checkbox"/> Very important <input type="checkbox"/> Extremely important
	<input type="checkbox"/> Financial <input type="checkbox"/> Decision-making <input type="checkbox"/> Collaboration <input type="checkbox"/> Planning <input type="checkbox"/> Information sharing <input type="checkbox"/> Emotional <input type="checkbox"/> Other: _____	<input type="checkbox"/> Colleague within agency <input type="checkbox"/> Colleague outside of agency <input type="checkbox"/> Other		<input type="checkbox"/> Email <input type="checkbox"/> Phone <input type="checkbox"/> In person <input type="checkbox"/> Other: _____	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Annually	<input type="checkbox"/> Not at all important <input type="checkbox"/> Slightly important <input type="checkbox"/> Moderately important <input type="checkbox"/> Very important <input type="checkbox"/> Extremely important
	<input type="checkbox"/> Financial <input type="checkbox"/> Decision-making <input type="checkbox"/> Collaboration <input type="checkbox"/> Planning <input type="checkbox"/> Information sharing <input type="checkbox"/> Emotional <input type="checkbox"/> Other: _____	<input type="checkbox"/> Colleague within agency <input type="checkbox"/> Colleague outside of agency <input type="checkbox"/> Other)		<input type="checkbox"/> Email <input type="checkbox"/> Phone <input type="checkbox"/> In person <input type="checkbox"/> Other: _____	<input type="checkbox"/> Daily <input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Quarterly <input type="checkbox"/> Annually	<input type="checkbox"/> Not at all important <input type="checkbox"/> Slightly important <input type="checkbox"/> Moderately important <input type="checkbox"/> Very important <input type="checkbox"/> Extremely important

Check one.

2. Did you consult the five individuals with whom you feel you have the most important information sharing relationship with when developing the most recent plan?

- yes
- no

3. Did you consult the five individuals with whom you feel you have the most decision-making relationship with when developing the most recent plan?

- yes
- no

4. On a scale of 1-5, please circle your level of agreement with each of the following statements (1 indicates strongly disagree and 5 indicates strongly agree).

	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>
Most people in my network are honest	1	2	3	4	5
I think people in my network can be trusted	1	2	3	4	5
I feel like people in my network trust me	1	2	3	4	5
People in my network are not solely interested in their own welfare	1	2	3	4	5
If I have a problem, there is always someone in my network to help me	1	2	3	4	5
I am willing to offer help to people in my network, if needed	1	2	3	4	5
I have a good rapport with people in my network	1	2	3	4	5
I think people get along very well in my network	1	2	3	4	5
People in my network socialize with each other very often	1	2	3	4	5
I feel like there is a great social bonding among members of my network	1	2	3	4	5

C. Climate Change Perceptions

15 Item Instrument

Recently you may have noticed that global warming has been getting some attention in the news. Global warming refers to the idea that the world's average temperature has been increasing over the past 150 years, may be increasing more in the future, and that the world's climate may change as a result. Check one.

1. What do you think? Do you think that global warming is happening?

Yes...

- ...and I'm extremely sure
- ...and I'm very sure
- ...and I'm somewhat sure
- ...but I'm not at all sure

No...

- ...and I'm extremely sure
- ...and I'm very sure
- ...and I'm somewhat sure
- ...but I'm not at all sure

Or...

- I don't know

2. Assuming global warming is happening, do you think it is ...

- Caused mostly by human activities
- Caused mostly by natural changes in the environment
- Other
- None of the above because global warming isn't happening

3. How worried are you about global warming?

- Very worried
- Somewhat worried
- Not very worried
- Not at all worried

4. How much do you think global warming will harm you personally?

- Not at all
- Only a little
- A moderate amount
- A great deal
- Don't know

5. When do you think global warming will start to harm people in the United States?
- They are being harmed now
 - In 10 years
 - In 25 years
 - In 50 years
 - In 100 years
 - Never
6. How much do you think global warming will harm future generations of people?
- Not at all
 - Only a little
 - A moderate amount
 - A great deal
 - Don't know
7. How much had you thought about global warming before today?
- A lot
 - Some
 - A little
 - Not at all
8. How important is the issue of global warming to you personally?
- Not at all important
 - Not too important
 - Somewhat important
 - Very important
 - Extremely important
9. How much do you agree or disagree with the following statement: "I could easily change my mind about global warming."
- Strongly agree
 - Somewhat agree
 - Somewhat disagree
 - Strongly disagree
10. How many of your friends share your views on global warming?
- None
 - A few
 - Some
 - Most
 - All

11. Which of the following statements comes closest to your view?
- Global warming isn't happening.
 - Humans can't reduce global warming, even if it is happening.
 - Humans could reduce global warming, but people aren't willing to change their behavior so we're not going to.
 - Humans could reduce global warming, but it's unclear at this point whether we will do what's needed.
 - Humans can reduce global warming, and we are going to do so successfully.
12. Do you think citizens themselves should be doing more or less to address global warming?
- Much less
 - Less
 - Currently doing the right amount
 - More
 - Much more
13. Over the past 12 months, how many times have you punished companies that are opposing steps to reduce global warming by NOT buying their products?
- Never
 - Once
 - A few times (2-3)
 - Several times (4-5)
 - Many times (6+)
 - Don't know
14. Do you think global warming should be a low, medium, high, or very high priority for the President and Congress?
- Low
 - Medium
 - High
 - Very high
15. People disagree whether the United States should reduce greenhouse gas emissions on its own, or make reductions only if other countries do too. Which of the following statements comes closest to your own point of view?
- The United States should reduce its greenhouse gas emissions ...
- Regardless of what other countries do
 - Only if other industrialized countries (such as England, Germany and Japan) reduce their emissions
 - Only if other industrialized countries and developing countries (such as China, India and Brazil) reduce their emissions
 - The US should not reduce its emissions
 - Don't know

D. Demographic Questions:

1. Gender:

Male

Female

2. In what year you were born? _____

3. What is your education level? Check one.

High school graduate

Bachelor's degree

Some college, no degree

Graduate or professional degree

Associate's degree

4. What is your official position title? _____

5. How many years have you served in this position? _____

6. How many years have you worked for the agency you currently work for? _____

7. Can you please give me the names and contacts of at least 3 other individuals involved in a similar type natural resource management?
