ABSTRACT

LEE JENNI, GRACE DUKYOUNG. A Qualitative Approach to Understanding Environmental Planning and Education (Under the direction of Dr. M. Nils Peterson).

Qualitative methods give researchers a way to understand the stories and narratives that people use to describe their experiences and opinions in a full and complex fashion. Our first chapter uses focus groups to look at why educators do or do not use climate change to teach civic science literacy. The second chapter uses in person interviews with two different groups, public land managers and private land managers to understand if and how the two groups are using climate change to inform their decision making. The final chapter uses in person interviews with non-traditional users of Game Lands in North Carolina to gain insight to why Game Lands are being used, and to gauge why or why not these new users would be willing to pay a fee for access. The depth of our findings and the insights on these issues highlight the importance of qualitative research as a partner to quantitative research and demonstrates that by considering motivations and experiences, we can improve the ways we conserve, manage and teach about the environment.

A Qualitative Approach to Understanding Environmental Planning and Education

by
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DEDICATION

Dan, mom, dad, Garin, Dylan and Joe.

BIOGRAPHY

Grace was born in CA but lived in Cambridge, MA, and Seoul, South Korea, before returning to CA to complete her B.A. in Communication Studies at Loyola Marymount University. After finishing her B.A., Grace worked for a firm that offered community based public relations services. While working on environmental outreach campaigns, Grace realized she had an interest in community collaboration that worked to minimize conflict over conservation and environmental issues. To pursue these interests, Grace wanted to gain a deeper understanding of existing environmental challenges. Having no scientific background, Grace began a post baccalaureate program at the University of North Carolina, Wilmington in Environmental Studies. Upon completion of that program, Grace attended North Carolina State University where she was awarded a Masters in Natural Resource before continuing on to pursue her PhD in Conservation Biology.

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Joe – the best

Garin and Dylan –I might have finished years earlier, but it would all be meaningless without you.

And – to Dan. *illis quos amo deserviam.*

7 years
3 states
5 homes
2 babies
4 combat deployments
Countless other goodbyes = 1 dissertation
7 surgeries
1 organ transplant
1 civil rights movement
1 global pandemic

Thank you.

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CHAPTER 1- Introduction

One doesn't have to operate with great malice to do great harm. The absence of empathy and understanding are sufficient. – Charles M. Blow

Conservation biology is a crisis discipline (Ostfeld et al., 2002; Peterson et al., 2007) because it centers on slowing the seemingly inexorable demise of diversity. The ongoing elimination of diversity sometimes call the sixth great extinction event (Elewa, 2008), is fundamentally driven by humans. More specifically, climate change, and Diamond's evil quartet of overkill, habitat destruction and fragmentation, impact of introduced species and chains of extinction (Diamond, 1984) are ratcheting down the number of species on our planet. My identity as a Fisheries, Wildlife, and Conservation Biology scholar centers on a belief that solutions to the loss of diversity should be sought more often through qualitative research and solved more often through improved communication. Qualitative research adopts an emic perspective where the researcher immerses themselves into the lived experience of informants and learns to see their world from their perspective (Silverman, 2016). This 'insider' perspective can be criticized as being subjective and biased (Anderson, 2010), but is uniquely situated to facilitate improved communication by reducing barriers created by intersubjectivity (Arnett, 2007).

This focus on the interrelationships between qualitative methods and communication form the common thread through the research projects constituting this dissertation and seem timely as this dissertation was completed during the 2020 resurgence of the Black Lives Matter movement. As the Black Lives Matter movement grew after the murder of George Floyd, White people began asking Black people to teach them about systemic racism, and Black people began asking White people to “do the work”. To read documents written by Black people, to listen to their stories, and to immerse themselves in their lived experiences through observation, all three requests are qualitative data collection methodologies (Polkinghorne, 2005). It may sound trite, but deeper understanding comes from ‘walking in someone else’s shoes’, and qualitative research centers on learning through attempting to adopt the viewpoint of others. This approach is essential for understanding how people value diversity, and how to communicate the value of diversity to people.

In this dissertation I adopt a qualitative research stance attempting to understand and improve communication about three essential factors shaping conservation: climate change education, restoration of natural landscapes, and diversifying conservation stakeholders. The three chapters that follow this introduction, cover different topics, but they all allow people to share their lived experiences with the conservation phenomenon of concern, and provide practitioners the opportunity to improve communication with constituents. In Chapter 2, I use focus groups to elicit how teachers, administrators, and staff of middle schools in North Carolina negotiate barriers to teaching climate, use climate change to encourage critical thinking and discourse skills, and civics. Interestingly, the study counters popular narratives about teachers being afraid to teach about climate change from quantitative research ((Hess, 2002; Oulton et al., 2004; Stevenson et al., 2016; Buckland et al., 2020).). In Chapter 3, I talked to managers making decisions about how to restore open pine ecosystems on private and public lands throughout the southeastern United States. I use open ended interviews to illicit information about the decision-making processes and to ask if climate change is a consideration in their future planning. Private land managers were not willing to consider climate change as a decision-making factor and expressed a need for data about open pine ecosystem restoration that public land managers reported having in abundance. This context highlighted a lead for information transfer from the public to private sector, and the need to communicate that information using strategic framing that avoids reliance on climate change rhetoric (Baumgart-Getz, 2012; Wojcik et al., 2014).). In Chapter 4 I use interviews with the leaders of recreational organizations that use public lands set aside for hunting and fishing in North Carolina (Game Lands) to develop a deeper understanding of how they value Game Lands, and through what processes they would be most amenable to paying access fees. These leaders held nuanced views about how their membership valued Game Lands. Specifically, they believed that users valued both the wilderness feel of the properties and the amenities offered there. Insights from study suggest that engaging more diverse users at Game Lands will require protection open space, untrammeled landscapes, and areas with low use while also improving amenities like parking, trails, and bathrooms in strategic locations.

As conservation issues are increasingly recognized for being the intersectional, complicated issues that they are, it is even more crucial for researchers and scientists – the experts and solution makers – to listen to and allow themselves to be informed by the perspectives of constituents, user groups, and other stakeholders. Conservation is no longer an issue that revolves simply around protecting a tract of land. Our efforts to save the world require saving it for the people who live in it. Qualitative methods and the improved communication are a critical tool to ensure equity and inclusion as we work to solve conservation challenges.

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CHAPTER 2 - Educators' Perspectives on Opportunities for and Barriers to Building Civic Science Literacy Through Climate Education

ABSTRACT

Current scientific issues such as climate change are characterized by controversy, complexity, and uncertainty. Fully engaging with those issues requires civic science literacy (CSL): the ability to situate science knowledge in a sociopolitical context; form, defend, and analyze opinions about scientific issues; and participate on an individual and collective level to reach solutions. As teachers and school administrators are best positioned to begin to implement these reforms with school aged children, we sought to understand how they view integration of climate education into their classrooms and if they thought climate education was an effective vehicle to teach CSL. We conducted three focus groups of middle school educators (classroom teachers and administrators) in North Carolina, USA. Participants described climate change as a topic with a high level of student interest and as a topic that reflected the skills needed for CSL. Participants described teaching interdisciplinary connections, discourse skills, and personal responsibility as benefits associated with climate education. Conversely, participants described school and community culture, state standards and testing, teacher preparation and training, and the balance between district support versus control as barriers to utilizing climate change as a teaching mechanism. Further, teachers were motivated to teach climate change, but wanted training on how to do so, with attention to scaffolding concepts throughout K-12 education and addressing misconceptions around climate change. We need overall reforms in professional development to support teachers in their desire to teach about climate change.

INTRODUCTION

Civic science literacy (CSL) efforts are required to adequately equip children to address emerging environmental challenges in all their complexity (National Research Council, 2012). A seminal paper by Shen (1975) outlined CSL as preparing students to be able and motivated to consider complex contextual factors, weigh evidence, analyze and critique opinions, and engage in individual and collective decision making. Since then CSL literature has proliferated. Collectively this scholarship suggests three key outcomes of CSL: the ability to connect science with other disciplines, the ability to recognize and respond to the socio-political context, and the ability to form and defend opinions and critically examine those of others are shared attributes of CSL applications (Miller, 1998; Norris & Phillips, 2003; Miller, 2004; Allum et al., 2008). In the United States, the *Benchmarks for Science Literacy* (2013) and *National Science Education Standards* (1996) both call for CSL by explicitly requiring connecting science to a societal context. Because current environmental challenges are complex, people are directly affected, require a large quantity of citizens to participate in the interdisciplinary assessment and decision making, it requires a citizenry that can both fully understand the issues and participate in solutions (Schmandt, 1998; Liu, 2009). CSL continues to be an important way for people to make changes that are applicable to the ways that they are moving forward in the process of being. CSL skills are uniquely suited to address challenges such as those associated with genetic engineering and climate change, which have local and global implications that include political, economic, social, ecological and ethical dimensions (Berry, 2007; McCright & Dunlap, 2011).

Efforts to integrate CSL into the classroom have emerged globally. An application in Japan highlighted how guiding students through complex problems could build aspects of

CSL. Students learned English, Math, and Science by addressing ecological, social, and cultural problems for a hypothetical community, which improved social commitments such as caring for animals or the environment (Lim, 2008). In the United Kingdom, aspects of CSL were addressed in Citizenship classes, which cover social and moral responsibility, community involvement, and political literacy (Qualifications and Curriculum Authority, 1998). Tonge, Mycock & Jeffry (2012) reported that students who received these Citizenship classes were more likely to be civically active. In Canada, the *Common Framework of Science Learning Outcomes: Pan-Canadian Protocol for Collaboration on School Curriculum* stipulates that STSE concepts drive science education, which partially addressed the need for CSL by connecting science with its societal context (Pedretti & Nazir, 2011). In the United States, the Next Generation Science Standards called for systems thinking and application rather than memorization of knowledge, (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010; NGSS, 2013) which partially address CSL's emphasis on recognizing the complexity of science issues. The Partnership for 21st Century Learning is more closely aligned with the goals of CSL, as it stipulates creativity and innovation, critical thinking and problem solving (including analyzing different points of view and defending one's opinion), communication and collaboration, ability to evaluate information, and personal responsibility as essential skills for students (www.p21.org, 2011). Further, many U.S. States adopted standards associated with building CSL skills through the Common Core standards which were implemented in 2012 (National Governors Association, 2010). Commitment to these initiatives at the national level implies that teachers are at least familiar with their content, including their partial attention to CSL concepts.

Emerging models for CSL illustrate several possible barriers. CSL models may be less successful in lower income communities, although this is not surprising, given children from economically distressed homes typically learn less effectively than their counterparts in any educational context (Wapole, 2003). CSL might also be inconsistently implemented among schools as support for CSL programs may fluctuating with political tides (Tonge et al., 2012). This perceived political pressure on teachers may be more novel, especially when perceived or actual pushback from parents, teacher peers, students, or community members may drive teachers to avoid placing science education in a socio-political context in order to avoid controversy (Hermann, 2012). This avoidance, combined with media portrayals of science as neutral and independent may give the impression that citizenship and science are separate endeavors (Hodson, 2003). These political challenges may be compounded by pressure to teach towards rigid national standards and accountability measures (Schweisfurth, 2006) and pressure from high stakes testing constantly challenges the flexibility and autonomy teachers need to fully adopt CSL (Shoen & Fusarelli (Schoen & Fusarelli, 2008). Critics of the recent emphasis on standardized testing in the US ushered in by the No Child Left Behind Act (107th Congress, 2002) point out that teaching science as a complex, changing topic is difficult when the learning objectives are fixed and mandated (Hodson, 2003). Further, high stakes testing creates an environment in which teachers are pressured to prioritize covering breadth of content over depth of thinking, and accountability measures can foster fear among teachers that stifles creativity and innovation in teaching practices (Schoen & Fusarelli, 2008).

We addressed the need to understand how CSL is currently integrated into K-12 classrooms with a case study exploring how middle school educators (middle school classroom teachers, support staff and administrators) in North Carolina, USA described climate education in general and if they identified climate education as connected to CSL. Further, we explored how educators described climate education in theory or in practice. Finally, we investigated factors promoting and barriers to integrating climate education into the classroom. Climate change is a good case study topic because it has key CSL attributes: discussions around climate change are complex, heavily influenced by a socio-political context, and call for individual and collective action; making the subject the paradigmatic complex environmental challenge requiring CSL. In the United States, climate change has been included in the Next Generation Science Standards (NGSS, 2013), signaling that teachers are already or soon will be required to cover the topic. Further, climate change is listed among the top 20 issues that Americans feel are important to be addressed nationally (Pew Research Center, 2014), has been identified in several Presidential addresses as a national priority (Obama, 2013, 2014), and continues to be the source of much political debate (Hamilton, 2011). As teachers and school administrators are positioned at the intersection of many educational stakeholders (e.g. policy makers, school districts, students, and parents), they are uniquely equipped to describe how much, in what ways, and why CSL concepts are included in science education. Further, understanding how teachers view civic science education concepts is critical to its success, as education reforms directly depend on buy-in and implementation by teachers (Ryder & Banner, 2013).

METHODS

We held three focus groups drawn from educators in central North Carolina, USA. To recruit participants for the focus group, the lead researcher contacted all principals at middle schools within a three-county area and asked that they pass on an invitation to teachers at their school. The invitation (Appendix A) stipulated that we were interested in classroom middle school teachers who have taught or plan to teach about climate change in their classes, but that we would also include other educators interested in the topic. We focused on middle school because the middle school state standards included topics related to climate change that are not included at the elementary level (e.g. weather and atmosphere), and the middle school curriculum is more interdisciplinary than at the high school level, allowing for more integration of science content with CSL skills often associated with other subjects (e.g. civic responsibility in social studies). Thirty-one classroom science teachers, classroom teachers who taught other subjects (e.g. language arts or social studies), and support and administration staff (e.g. principals, reading specialists) replied and we split these participants into three groups comprised of a mix of members from each category, roughly keeping several with similar experiences together to facilitate rich description of shared perspectives (Gilflores & Alonso, 1995). Our groups consisted of 1) mostly science teachers, 2) non-science classroom teachers and 3) support staff and administrators.

Focus groups were led by a facilitator and assistant facilitator. Each facilitator used the same discussion protocol to guide the conversation (Appendix B), took detailed notes for later reference, and documented key points on large pieces of paper for the group to see. Each conversation was also audio recorded. The discussion protocol began with an introductory question, followed by three general lines of questions, and ended by asking for concluding remarks. Although we were interested in identifying how and if teachers incorporate CSL concepts into teaching about climate change, we never mentioned the term “civic science literacy,” to avoid anchoring bias (Creswell, 2008). First, the facilitator asked participants what they thought of teaching climate change. Leading with an open-ended, general question is meant to capture ideas that are most salient for participants (Creswell, 2008). Next, the facilitator asked about the teachers' preparation for teaching climate change in terms of pre-service or in-service training; how teachers currently teach about climate change, including whether they teach "both sides" of the issue; and finally, what, if any, barriers teacher experience when teaching climate change. The protocol concluded with asking teachers to identify any additional topics we had failed to cover, and which were most important of the ones we had discussed.

All audio recordings were transcribed and analyzed in concert with the written notes recorded by the assistant facilitators and discussion among all the lead facilitators. First, the lead author read all transcripts and generated a list of general themes. These themes were discussed among lead facilitators to further refine and identify any additional themes. Next, we coded each transcript with the themes resulting from this discussion using NVivo Software v. 10. Through the coding process, we determined the relative importance of the themes and constructed the relationships between the themes across the transcripts (Peterson et al., 1994).

RESULTS

We found that educators thought that teaching students about climate change was important and they believed students were interested in learning about climate change. The primary benefits they identified for teaching about climate change are congruent with best practices for teaching CSL because the topic is interdisciplinary, encourages critical thinking, promotes discourse skills and fosters a sense of personal responsibility and motivation for action. Although educators thought climate change was an important topic to address, they brought up some barriers to teaching climate education. Despite being highly motivated to share the knowledge that they did possess, educators have not been formally prepared to teach about climate change - leading to the spread of misinformation. Additionally, educators wanted to use climate change as a way to teach CSL but felt that standards and testing were constraints and there was tension between wanting more centralized support from administration while wanting more control over classroom instruction. Educators who did teach climate change and CSL skills, thought that was highly influenced by school context and we found that the socio-political context of climate change was seen as a barrier.

Educators thought that teaching about climate change was important because of its contemporary relevance, expressing that "this is crisis that kind of came of age with us," "climate change is the new hot topic," and "this is what the world is talking about." Educators also indicated that student were interested in learning about climate change. One teacher stated, "I'm sure you've all noticed that your students, when it comes to climate, weather, natural disasters, and so on, they take a big interest in it." Another said that she was asked to teach about climate change by "more than one student - I'd say three or four out of the fifty that I teach have specifically told me their interest in learning more about climate change and engineering, to be able to solve the problems that we face." Another focus group participant said that "I have had students express interest in it, even before we've covered it in class." Not only was climate change seen as being an important current issue, educators identified climate education as an effective way to teach CSL.

Climate education invites interdisciplinary instruction

Many teachers viewed climate change education as an effective tool for linking science to other subjects in school, and this interdisciplinary characteristic was cast in a positive light.

Teachers saw climate change as a natural connector between language arts and science as there are so many current, non-fictional texts on climate. They identified the use of such texts as a valuable way to support the Science curriculum. Educators saw that integrating stories about climate change helped their students understand the science: “sometimes you have to tell those stories to make the connections for the students.” These educators seemed to want to integrate subjects more, and climate education was described as an effective way to move toward that goal. Participants described ecosystems, weather, atmosphere, and general human impacts on the environment as topics naturally suited for climate change related education.

Climate education builds discourse and critical thinking skills

Participants described teaching about climate change as an opportunity to teach critical thinking and discourse skills. Educators made statements similar to one teacher’s comment that “I really want [my students] to know why they think what they think about certain issues like [climate change].” Another teacher embraced the political controversy around climate change by saying, “I think that in order to develop analytical minds … it’s good to get a little bit of … a healthy debate going.” These teaching opportunities seemed to be valued as a means to teaching students to make and defend their own opinions and respect the opinions of others. One educator spoke of teaching climate change as a “great way to teach children how to debate but do it in a way where they are respectful of other people’s viewpoints. It forces them to state their opinion, and to explain the reasoning behind their opinion.” Teachers also seemed to value teaching students how to evaluate the opinions of others and analyze where their perspectives come from: “I’m trying to make them think critically, and to really look at the evidence, look at how they’ve been raised - you know, look at all those different things.”

Comments similar to these were pervasive in discussions in all three groups, as educators described building critical thinking and discourse skills as a highly prioritized instructional goal.

Climate education fosters a sense of personal responsibility and motivation for action

Educators in all groups mentioned and seemed to highly value the opportunity to build a sense of personal responsibility and motivation for action among their students in relation to climate change. One educator identified teaching about climate change as a moral imperative. "You can't get away from [the impacts of climate change], so regardless of how controversial you feel it is, it's impacting us…I feel it's important enough that we need to know all we can, and learn all we can before it's too late." Another teacher described, "trying to get [the students] to know that your actions today will affect people years from now - hundreds of years from now. Your actions that you do right here in the Triangle - the people who are at the coast are feeling the effects." Another teacher expressed how much she values this aspect of climate education as a path towards CSL: "I want my students to be good stewards. That's first and foremost."

Though teachers readily identified several potential connections between climate education and CSL themes, they also discussed several factors affecting the inclusion or exclusion of CSL concepts during climate change related instruction. The most salient themes of this aspect of the discussions were importance of training, availability of resources, and personal motivation and knowledge of the teacher; the significant role of testing and standards in determining instruction; the tension between desiring more support from school districts while also wanting for more of a voice and more local control over classroom instruction; the role of school or community context in facilitating or hindering inclusion of CSL concepts, and recognizing that the socio-political context of climate change was a barrier.

Educators were highly motivated but were not formally prepared

Participants indicated that although they wanted to incorporate climate change into their teaching, they did not always have formal training on it. One science teacher commented, "I think I'm somewhat competent and comfortable teaching [about climate change], but it's just the knowledge that I have …I've kind of stumbled upon and done on my own time and research." Unfortunately, among those teachers who expressed some degree of confidence teaching about climate change, many revealed misconceptions they held about climate change. Several seemed to contribute climate change to a hole in the ozone layer: "[T]he climate is heating up, and it's because of all the carbon dioxide, and… the amount of cars we have and how that is reducing the ozone." Comments from others revealed deeper misconceptions. One teacher stated, "I brought in the moon phases of how those nine phases of the moon has a cause and effect on climate, weather, seasons… and the earth is rotating on its axis, we will have a bitter winter this year." Another offered, "not too long ago, with all of the bombings and the war, all of that has to do with the atmosphere…. And I think that's my theory of why [the climate] is changing."

Almost all participants noted that they had received very little pre-service training or professional development on climate change-related content or teaching strategies. Many teachers commented that pre-service programs focused on education topics (e.g. educational theories, classroom management) rather than subject content. The non-science teachers mentioned taking a few science courses, but most felt these did not prepare them to teach about climate change: “I did attend a few science classes, but none that I can remember that focused directly on …[the] environment….” And another commented, “in terms of… the technical expertise that I have in teaching [climate change], I don’t feel prepared.” The science teachers seemed to feel they had adequate background understanding to cover climate change but that they needed more training on how to integrate CSL concepts such as discourse skills: “we… feel comfortable based on our own background knowledge, but being able to turn our background knowledge into teachable information to these students…. I think that is a huge barrier.” Other teachers echoed this sentiment, and also expressed that they lacked the district-supplied teaching resources like labs, textbooks, activity kits, and teaching materials necessary to adequately cover climate change.

Educators find thought standards and testing limited climate change education

Educators in each group mentioned the significant role that testing and state standards play in determining the type, content, and pace of instruction. The discussion revealed an overall sense that teachers look to the standards for guidance as to what to teach in their classes, want to address them mainly to prepare students for state tests, and feel constrained by them regarding teaching climate change or CSL concepts. Educators said Common Core standards mandated that they find ways to make their instruction more interdisciplinary but also discussed how the standards were inadequate and constraining for addressing the complexities of CSL concepts. Further, as there no standards specifically addressing these topics, the tests do not cover them, which discourages teachers from making them a more significant part of instruction. Commenting on why she does not include more discussion of climate change, one teacher said that “there’s not a specific standard that points directly to climate change. I mean, I can definitely tie it in - and it makes sense to tie it in - but there's not a specific standard about climate change, and the test items address the specific standards." Other educators agreed. One said, "I hate to (agree that) the amount of questions on the test - that dictates how long we spend on the subject. But it is what it is." And another teacher pointed out, "… that's the reality. But it's kind of bad, when we're trying to make 21st-century learners. (Climate change) is a 21st-century problem, yet it's not important enough (to be on the test)." Beyond seeing inclusion of climate change constrained by the standards, educators also discussed how teaching to the standards and state tests limits are divorced from CSL concepts:

> So it's like two different sets of education happening there. And so if we're concerned about just teaching them the science and the curriculum, then we're just concerned about, what are the effective ways of teaching this kid the standard? Then if you're worried about how they're actually going to change their habits, then you're concerned about the psychology of teaching children to become good people. It's two separate educations.

Educators expressed tension between wanting more centralized support but also more control over classroom instruction

As participants seemed to accept that test preparation was a significant factor in determining instruction while expressing frustration in the constraints associated with this reality, educators seemed to desire more support from districts but expressed frustration at their lack of voice in shaping learning in the classroom. Participants expressed that teaching resources, professional development, and other forms of support provided by school districts as being inadequate to deliver instruction as effectively as possible. As a result, the consensus was that, "a lot of it always falls on the teacher…If we're going to do climate change and do it right, it needs to come from the school, the county, the system, because we can't do it on our own." In general, participants expressed a desire for more centralized support from school districts to lessen the workload on individual teachers.

Although participants expressed the desire for more centralized support, they also expressed how school districts posed significant barriers to teaching climate change and described a need for more voice and control over classroom instruction. Teachers identified guest speakers as an effective way to connect classroom instruction with real-world applications, but as one teacher commented, "You won't believe what they have to go through," citing that speakers had to get criminal background checks before visiting schools. Another expressed frustration that though she saw field trips as a valuable experience in connecting students with their communities, district restrictions made those trips difficult: "… I want to take my children there, but you're telling me I have to be back before dismissal time. If not, we have to go out and find a bus driver, pay them their hourly wage, and contribute to their retirement..." Overall, teachers seemed to see their level of control over instruction as limited: "… I don't know what our purpose is, and I guess because we don't really make those [curricular] decisions." One teacher summed up the sense of frustration by stating, "… where is it going to end? How can I teach? I just want to teach…. You know, I'll be glad [when] the day comes that I can just teach science."

Educators thought teaching climate change is highly influenced by school context

Participants with the most detailed descriptions of how they successfully teach climate change concepts tended to consider their own school as uniquely sympathetic to doing do. These educators frequently prefaced their statements by identifying the school where they teach. For instance, one teacher began her description of how she is able to foster a sense of personal responsibility among her students, “I feel like my position is maybe a little unique, because I’m at a Montessori middle school. …. [There is] a focus on how to address the need of adolescents to feel connected to their environment.” Another teacher from this same school commented, “I’m enormously thankful that I’m at the school that I’m at, because we are taught how to incorporate that social awareness.” An educator from a charter school known for its emphasis on social justice commented, “I think [school name] is very unique as a charter school. …[Our] mission… is a socially just and responsible, environmentally sustainable world.” At least for teachers within these schools, participants seemed to see unique school culture as a factor that can foster inclusion of climate change concepts in ways that are not present at “regular” (e.g. non-Montessori or charter) schools.

Besides citing specific school culture, other participants noted that the cultures of the communities associated with the school could color how climate education was perceived. Participants also described community culture as shaping student receptivity to the degree to which students are receptive to using climate change as a vehicle for teaching CSL concepts. One educator said of encouraging pro-environmental behaviors, “… depending on what area you’re in, it may not be as important or… you may not feel the need to teach those principals.” Another teacher mentioned that pressure from parents could discourage a school from allowing teaching controversial topics, despite the value that participants expressed in allowing for debates in building discourse skills: “… we couldn’t teach certain topics in a certain way or at all because it’s political.” Although there was a sense that the approach to addressing climate change with CSL topics such as discourse can be influenced by school and community culture, overall educators did not seem to see them as significant barriers.

Educators recognizing socio-political context was a barrier

We found that teachers were not comfortable using climate to teach political aspects of CSL. Educators acknowledged the influence of a sociopolitical context on climate education, but the majority of participants described it as a barrier to climate education, rather than an opportunity to address CSL. Many cited influences of political ideology on people's perspectives on climate change, and several teachers were concerned about religious perspectives as affecting how students approach climate change. One teacher observed, "some people think it's a hoax," and another commented "… if you've ever been in a room with religious kids that don't believe that climate change is brought on by mankind, it's a little tough to sell." Responses to these influences included using the controversy as a teachable moment (see Building critical thinking discourse skills), presenting the scientific perspective as authoritative, or presenting the scientific perspective as one perspective among many. In response to sociopolitical influences on climate education, one literacy specialist commented, "We teach the facts, and what I mean by the facts is when you teach what science says… regardless of what politics says." A science teacher explained that she herself is aware of the political debate, but that she does not present climate change as a debate to her students: I believe that there is such a body of evidence supporting climate change that to present the two sides as equal in this case would not be teaching the facts. In my mind, it would be like teaching the Holocaust and teaching about Holocaust denial. They are not equal in my mind. Holocaust denial is not supported…. And I believe that climate change is a similar issue, where there just isn't that sort of evidence. And so I see my role as presenting the evidence. Others seemed to avoid political controversy around climate change by presenting climate change as a scientific theory: “If you teach it as a theory and show evidence you leave the students to believe what they want.”

DISCUSSION

Surprisingly, this study suggests challenging socio-political contexts for climate education may motivate educators to engage with the topic. Focus group participants believed the controversy surrounding climate change helped them meet multiple and multidisciplinary education goals, promote discourse and improve critical thinking. This finding runs counter to previous research that suggests the controversy may scare teachers away from teaching about climate change (Hess, 2002; Oulton et al., 2004; Stevenson et al., 2016; Buckland et al., 2020). Schools in Wake County, however, are part of a highly ranked and progressive school system where educators are empowered to engage critical thinking and discourse. Action research (Levinson, 2006; Hendricks, 2017), involving students in the process and allowing them to develop their own opinions on controversial issues, has been shown to be a successful way to broach controversial issues with success (Oulton, 2004). More research is needed to see if and how controversy may actually improve the pedagogical value of content as educators, particularly in other educational contexts.

Several explanations exist for why educators believed professional development was needed to capitalize on the teaching opportunities offered by CE. Professional development has traditionally focused on pedagogy more than content (Kennedy, 1998; Cohen & Hill, 2000; Garet et al., 2001). This training focus may explain why educators noted the value presented by controversy and complexity inherent to climate change pedagogy, and why educators felt unprepared to teach the underlying science. But there is significant research showing that teachers and students benefit if teachers receive content-based training (Fennema et al., 1996; Kennedy, 1998; Ma, 1999; Stigler & Hiebert, 1999; Cohen & Hill, 2002; Desimone et al., 2002). Given this context, climate change may be a subject area where professional development focused on content knowledge provides larger gains than that focused on pedagogy. When teachers were given content on climate change to share with their students, there was greater confidence in their efficacy as well as in how much they emphasized science in general within their classrooms (Lee et al., 2004; Drewes et al., 2020). Adding climate change discussions into existing curriculum (i.e. geography, current events) can have significant impacts without requiring new classes (Siegner & Stapert, 2020). Teachers still need professional development focused on the science of climate change to feel confident with the content. This seems even more likely to be true in areas with less professional development resources (e.g., rural regions) than those associated with this study. A quantitative statewide survey, asking educators to identify areas where they would like more professional development combined with our findings would make a good case for administration to review the way professional development is structured and implemented.

This study suggests false norms about school support for climate education (CE) being rare may constrain CE. Descriptive norms reflect expectations about what is expected based on observing others (Cialdini et al., 1991), but they can be false when people misconstrue social context. For instance, people falsely assume their neighbors want turf grass landscaping when the landscaping reflects developers' behaviors and not homeowner behaviors or preferences (Peterson et al., 2013). Teaching CE may fall in this situation because general observations of public communication may present the false idea that climate change is too politically charged and dangerous to teach in most schools (Colston, 2015), despite educators across diverse schools considering it safe to teach, but only in their own school. Further, educators considered it a valuable and essential tool for leveraging critical thinking, dialogue, and other essential skills for students. This suggests professional development aimed at correcting false norms about support for teaching CE may be particularly beneficial. Our focus group research, however, provides inference for school districts similar to those engaged in this study. Future research with educators in different school districts (e.g., rural) would expand inference and may show that teachers in rural areas face resistance to teaching climate change from administrators and their peers.

The tension between need for more centralized support and less centralized influence over classroom activities identified in this study may prove particularly challenging for CSL. Specifically, educators highlighted a need for centralized resources to pay for field trips, bring climate experts into classrooms, and provide professional development around climate science. The accountability measures that accompany such resources including centralized testing and vetting of outside experts (An and Reigeluth, 2011), however, were seen as the primary barriers to teaching CSL. Action research again emerges in the literature as a way for teachers to feel supported while developing their own lesson plans (Smith & Hackling, 2016) and there have been some small scale studies that show that action research can lead to higher test scores in core academic classes (Buttimer, 2018). Action research may provide one tool for helping teachers balance additional oversight associated with additional resources teachers wanted to teach climate change. Specifically, action research proves that methods for teaching climate change, results in teachers with a higher teaching satisfaction (Satterfield, 2019), and higher teacher satisfaction results in higher test scores (Crawford, 2017). These higher test scores might lead to opportunities for greater school funding, which might alleviate this tension between classroom autonomy and standardized evaluation.

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CHAPTER 3 - A Qualitative Study of Objective Setting and Information Use in Open Pine System Governance Among Public Agency and Private Sector Decision Makers

ABSTRACT

Open pine systems can provide critical ecosystem services in the southeastern United States including habitat for wildlife, timber products, and resilience to disturbances associated with climate change. Given this context several efforts to restore open pine, and longleaf pine in particular, have emerged in both the public agency and private sector. In this study we used open ended interviews with ten public agency forest land managers and fourteen private forest landowners and managers to explore how they set objectives, used management plans, accessed information, and addressed climate change. Public sector informants worked with set, long-term objectives, reported adequate information for decisions, and considered climate change a central factor in decision making. Private sector informants worked with dynamic objectives, faced inadequate information for decision making and did not consider climate change a factor in decision making. These results highlight potential value in extension efforts for private sector forest managers, and efforts to make public sector forest management goals more flexible.

INTRODUCTION

Open pine ecosystems, particularly those dominated by longleaf pine (LLP: *Pinus palustris*), were the dominant land cover in much of the Southeastern United States, covering over 37 million hectares, spanning from Texas to Virginia (Frost, 1993). Disruption of natural fire regimes, fragmentation from intensive agriculture and urbanization, direct conversion of land for agriculture and urban development and expanding loblolly pine (*Pinus taeda*) plantations have resulted in loss of more than 90% of LLP forests since the 1700s (Oswalt et al., 2014). Loblolly pine forests can provide similar ecosystem services to LLP forests (Wahlenberg, 1960; Baker & Langdon, 1990) if they are managed as an open forest cover type. However, loblolly forests are typically planted in plantations and harvested on short rotations (Forest Service Fire Effects Information System, n.d.; Haywood, et al., 2015). Existing small and scattered remnants of open pine systems provide habitat for several endangered or threatened wildlife and plant species (Alavalapati et al., 2002; Means, 2006; Kirby et al., 2017, Clark et al., 2018), including red-cockaded woodpeckers (*Leuconotopicus borealis*) (Ligon, 1970; Costa, 2002), gopher tortoises (*Gopherus polyphemus*) (Auffenberg & Franz, 1982; Eubanks et al., 2003), the eastern indigo snake (*Drymarchon couperi*) (Gibbons et al., 2000; Hyslop et al., 2012) and the yellow trumpet pitcher plant (*Sarracenia alata*) (Brewer, 2003; Berkowitz et al., 2014). Open pine forests have also been shown to be resilient to impacts of climate change including severe storms (Forest Service Fire Effects Information System, n.d.; Johnsen et al., 2009; Stanturf et al., 2007), droughts (Samuelson, et al., 2012), wildfire (Gilliam & Platt, 1999; Costanza et al., 2015), and insect and disease outbreaks (Hodges et al., 1979; Martinson et al., 2007). This resilience may render slower growing and less intensive management of open pine systems more attractive for landowners than it has been in the past (Jose et al., 2006; Reynolds, 2015).

Efforts to restore open pine ecosystems, and the ecosystem services they provide, have grown rapidly in recent decades (Strahan et al., 2015, Guldin et al., 2016; Kush, 2016). Concurrently, there are a variety of initiatives such as the Longleaf Pine Initiative, Shortleaf Pine Initiative, America's Longleaf, East Gulf Coastal Plain Joint Venture, Gulf Coastal Plains and Ozarks Landscape Conservation Cooperative and the Migratory Bird Joint Ventures connecting landowners who are working to restore open pine systems (Foster et al., 2019; Greene et al., 2019). This restoration of open pine systems, like other resource management and conservation efforts is a complex challenge requiring high-quality planning and decision making (America's Longleaf, 2009; Scarlett, 2013) by nongovernmental agencies, federal and state governments, and the private sector, all of whom own and manage the forests. These groups develop individual plans, incorporating their own restoration goals, resulting in diverse and sometimes conflicting objectives and management actions (Walpole, 2017) when considered as a whole.

Taking climate change into consideration is an emergent consideration in land management decision making (Glicksman, 2008), and adapting restoration to climate change involves understanding, monitoring and plasticity as new information is learned (Van Lear et al., 2005; Levina and Tirpak, 2006, The Nature Conservancy, 2015). The unpredictable pace of climate change highlights the need for state and federal forest management agencies to be able to pivot (Keenan, 2015). However, current regulatory contexts require agency plans to meet static objectives (Conroy and Peterson, 2013, p25). Federal and state agencies as well as non-governmental organizations are responsible for managing forests on publicly owned land in accordance with their specific mission and mandates (Foster et al., 2019). These management initiatives include: a) Statewide Forest Resource Assessments and Strategies which require states to submit long-term and broadly sweeping management strategies that include managing for forest ecosystem health, water, biodiversity, recreation, forest products as well as for climate (USFW, 2016; Clark et al., 2018; Foster et al., 2019;), b). Federal mandates upon states including wildlife action plans mandated by the U.S. Fish and Wildlife Service State Wildlife (USFWS 2016), and c) Forest action plans mandated by the Food, Conservation, and Energy

Act (2008) which require objectives to be specifically addressed while being quantifiable and monitorable. And while public lands are dealing with overlapping and fixed requirements, the majority (87%) of the forestland in the 14 Southern states is privately owned and 68% of those lands are owned by small family landowners (Butler & Wear, 2013). These privately-owned lands are not constrained by the required mandates of public lands and their management objectives vary greatly from preservation of legacy, to privacy or land investments (Butler & Wear, 2013).

Despite the growing initiatives to restore open pine systems in the Southeast, little is known about how decision makers in the public or private forest management sectors set their objectives, plan management activities, or access critical information. Insights to these decisions, however, can be distilled from studies of planning documents associated with restoration of open pine systems. These studies suggest that plans that have strong and actionable objectives are built around significant amounts of data and a strong knowledge base and thus result in more successful instances of implementation (Foster et al., 2019). These document analysis studies also suggest inadequate engagement between governmental agencies and private stakeholders may be a key gap in planning efforts linked to conservation of open pine in the SW region of the US (Foster et al, 2015), but it is unclear whether governmental decision makers recognize this gap.

Our work builds on this earlier research using a qualitative case study (Lee Jenni et al., 2012) to explore how decision makers engaged with restoration of open pine systems in the Southeast set objectives, use management plans, access information, and address climate change. We focused on comparing public sector or agency decision makers (AM) and private sector decision makers and land managers (PM) because they face different decision constraints.

METHODS

We used a naturalistic qualitative approach in our study. This methodology treats the narratives from each informant as data, allowing themes to emerge from stories and experiences (Lincoln & Guba, 1985). We conducted 24 semi-structured interviews with decision makers and land managers. We used snowball sampling (Biernacki and Waldorf, 1981) and began with two key informants with first-hand knowledge of the open pine community in the Southeastern United States and the issues facing it. We then asked each subsequent informant to suggest others who would be able to provide input, until the same names were being suggested. This resulted in ten informants from federal, state or local agencies, and fourteen private landowners and managers. Interviews were conducted by phone, lasted from 20 minutes to two hours and were recorded on a phone application with permission from the interviewee. Interviews were then transcribed for analysis. Although informants were allowed to determine the direction of the interviews, we used eight interview prompts (Table 1) to determine what barriers were facing those who managed longleaf and how those barriers influenced management decision making.

Data was analyzed using MaxQDA qualitative data analysis software (MAXQDA, software for qualitative data analysis, 1989-2015, VERBI Software - Consult - Sozialforschung GmbH, Berlin,Germany) and thematic content analysis (Anderson, 2007). We began by sorting the transcript data into broad categories that illustrated a single coherent thought or theme, and then developed those themes by looking for relationships within the themes, searching for opposition among themes, and developing thematic hierarchies. Because important patterns emerged in association with decision makers representing government agencies versus private landowners, we developed tags to distinguish between these groups. We use the following tags to identify quotations from interviews: AM for public or agency informant, interview number or PM for private manager and interview number. For example, a quotation identified as: AM3 was given by an agency manager during interview # 3.

RESULTS

Although informants shared a vision of what open pine systems are, and what challenges these unique systems face, AM and PM diverged in terms of how: management objectives were conceptualized, management plans were utilized, information was accesses and used, and climate change was related to decision making (Table 2).

Differences in management objectives

AM reported that their strictly mandated objectives and structured working mechanisms made it difficult for them to make changes to their management plans while PM reported flexibility in their ability to set and revise goals resulting in an agile decision-making process. AM1 said that they “were commissioned to conserve and protect the game species of the state.” AM12 said that their mandate was very clear. It was “ to keep up with all the records of where plant and animal (occur) across the areas that we serve.” AM11 said that at their agency, the “primary objectives…don't change very often.” And because AM had less flexibility in their mandated goals, they found it difficult to change their management plans. AM11 said that when they create management plans, they do so “with expectations that we'll stay on that path.” AM3 said “it's very hard for it (the agency) to adjust and adapt.” AM6 said that their organization didn’t have “dynamically changing goals. It's a very long process (to change management plans).”

Reciprocally, PM had flexible objectives that changed based on new information. PM1 said that most private landowners are “willing to be flexible and adapt.” PM4 said that as a manager of private lands, “we’re continuously looking at the management objectives and (that they) certainly have to be flexible.” PM5 said that their management objectives “change based on information that's gathered. Yes, definitely.” And because management objectives were constantly changing, management plans were constantly being adapted. PM3 said that they updated their plans “on a regular basis. A very good friend of mine, he's always rewriting and updating his new plans too.” PM7 said that “management strategies are very much dynamic.” PM8 said that because “everything changes from season to season and year to year. It's never the same. (Making decisions) is incremental.”

Views on access to information

Although management objectives were inflexible, all ten of the AM reported having access to information they needed to make good decisions while PM said they didn’t always have access to the information that they wanted or needed. AM(1) said “We’ve got the resources if there’s something I don’t know or don’t have access to, we have such a good network of partners, basically, that we can usually get that information.”. AM5 said that agencies “share the data and results. We do have information portals that we can control whether or not the records are publicly visible versus internal, and we do try and post a lot of the raw data and information and again let people, at least especially in the (agency), know about it so if they want to do more analysis and interpretation of the data we have collected, that they have that freedom and ability to do so.” AM12 felt that if you looked hard enough, “there’s a lot of information out there.” AM13 said especially for the longleaf pine ecosystems, "because of how high profile and how connected so many people are on this issue, there's way more information sharing across - within levels and across levels in this system than there is any other ecosystem or for most other issues that I can think of in the Southeast."

But PM reported not having access to all information they needed and/or wanted. PM2 said that "There's not enough literature, not enough training, and not enough information shared…(we need) access to more research, more data, more information, and we the ability to create more mechanisms for distributing that information…into the hands of the people that really, really need it." PM4 said that in terms of sharing data, "there's still a lot of work to be done on longleaf, especially longleaf plantations. So I don't know that I have real good data there." PM(8) said that private land managers "don't even know what information is out there, they don't know what tools are out there, so we can't say if all the info we need or could use, is even available or not."

Specifically we found that PM wanted more data on economics and growth. PM2 said that "there just hasn't been much research and analysis done in (finance and economics) because in the south everything has centered around production forestry and that does not include longleaf, but it should…". PM7 said that "we don't have the financial models, we don't have all of the information available on a financial basis that we do for other species. That's the biggest shortage and what little bit is out there is not well disbursed." PM also wanted better growth data. PM4 said they really wanted more information on containerized seedlings. PM7 said that they didn't "have good growth of needle data." And PM8 agreed - that they needed "better growth and yield data (and would benefit from shared) growth and yield models." PM10 said, "(more information is needed) in longleaf regeneration."

Climate change as a consideration

AM5 said “(Climate change is) increasingly (becoming an important factor in decision making” and that “Yes, I do (consider climate change).” AM15 said that within the agency, there's definitely discussion about it (climate change). AM14 said that climate change is a required consideration as “the Forest Service mandated that climate change be considered in all management decision-making.”

But PM said that climate change was NOT a decision-making factor. PM11 said that not only does it “never really comes up…We try to leave out - because climate change is still pretty political in this part of the world, it’s not really - I feel like if we bring it up, it’s gonna kind of close a door. (Climate change is) - definitely (polarizing). PM3 said that they don’t take climate change into consideration because “most old men do not believe in climate change, I can tell you that. I'm not helping people manage land for polar bears...so, that and religion, I just don't talk to people about.” PM5 agreed that climate change was “a loaded word.” PM4 said that he didn’t think that:

> “climate change is going to change any decision that I may make in my lifetime, because frankly I think we’ve always had various cycles and I’m sure these longleafs to have been the predominant tree in the southeast they’ve seen many climate changes. Now I can’t say they haven’t seen drastic, but they’ve seen drastic rises in temperature like some people might predict, but I’m sure they’ve seen the rise in some temperature and if frankly if you had a rise in temperature all you’d probably see is an extension of the longleaf ecosystem farther to the north, which might not be a bad thing it has very little bearing on my day-to-day decisions. I’d say I’d put it at zero bearing frankly.”

DISCUSSION

The findings from this study highlight several recommendations for improving management of open pine systems with the goal of restoration. First, PMs need more information about economics, growth and yield data, and effects of climate change on forest management and how that might affect forest management in the future... Addressing this information gap can be difficult given long-term declines in forestry extension programming, funding and staffing (Serenari et al., 2013). Some innovative cost-effective approaches being used include peer to peer learning (Ma et al., 2012) or hands-on short courses. Other interactive learning opportunities such as Tree Schools (Khanal et al., 2019; Hansen et al., 2019) or PINEMAP (Wynne, 2016) which allow knowledge to be shared in an intensive working interaction with other PM or partnering with forest landowner associations (Hansen et al., 2019) may help extension programs maximize impact and compound their reach.

Open pine management extension may need creative framing to be effective with PMs, especially when dealing with controversial topics like climate change. Because climate change is currently not a decision-making consideration and is actually seen as a polarizing topic, interactions with PM should be framed using proximal impacts like weather, drought, etc. as research shows that pushing environmental awareness is not the most effective way to influence conservation outcomes (Baumgart-Getz, 2012; Wojcik et al., 2014). Research also shows that framing climate change considerations as a form of stewardship instead of referring to the economic impacts leads to more positive outcomes (Krantz & Monroe, 2016). Introducing systems thinking may also be an effective way to work with PM, as Church et. al (2002) showed in their study with farmers. Systematically evaluating feedback within agricultural systems helped farmers see their land as part of a larger interconnected system, leading them to entertain ideas that they previously might not have considered, including the possibilities of climate impacts (Stevenson et al., 2018). Additionally, systems thinking has been effectively employed to communicate climate change impacts to visitors of national parks and wildlife refuges (Schweizer et al, 2013). Baumgart-Getz (2012) suggest approaching difficult topics with a tiered approach (Morris et al., 2014) - beginning with those managers who seem most likely to consider taking climate change into consideration and then using a peer to peer system to educate reluctant PM about the benefits (Llewellyn, 2011). Further research might test the outcome of using these outreach methods. This study informs future research measuring the importance of flexible objectives, data availability, and accounting for effects of climate change (e.g., drought) in open pine system restoration efforts.

AM also need additional support, but in different forms focused on making objectives and goals more dynamic. Decision making focused on adaptive management strategies instead of technical ones, results in systems that are more resilient or capable of absorbing unpredictable changes such as those forests face from climate change (Garmestani et al., 2009). Interestingly, federal mandates such as National Environmental Policy Act (NEPA) do not specifically ban the use of adaptive management strategies (Thrower, 2006; Benson & Garmestani, 2011), but for AM to be able to pivot in their management plans as new and important data are gathered, federal agencies need to mandate adaptability (Ruhl & Fischman, 2010). Successful adaptative decision making requires dissemination of knowledge of potential climate impacts and suitable measures to decision makers at both the practice (PM) and policy levels (AM) (Kolström et al. 2011).

This study highlights several important differences between public sector management of open pine restoration and private sector management of open pine system restoration.

Specifically, managers in the public sector worked with externally established, set, long-term objectives, had a strong information base for making decisions, and considered climate change central to their decision making. Conversely private sector managers reported having dynamic objectives, facing inadequate information for decision making, and did not consider climate change relevant to decision making. These results highlight value in extension efforts providing private sector forest managers science-based information, and a need to strategically frame climate related science with a focus on proximal impacts (e.g., drought) rather than climate change itself.

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Table 3.1: Questions used in interviews with 24 decision makers about managing open pine systems in the southeastern United States in 2014.

1.	What are some of the challenges open pine systems are facing?
2.	Please describe your organization and its relationship with open pine ecosystems.
3.	What are your objectives associated with open pine ecosystems?
4.	How are management objectives determined?
5.	What actions were considered to achieve these objectives?
6.	What types of information do you need to make good decisions?
7.	What information do you wish you had?
8.	Is climate change a factor in your decision-making process?

Table 3.2: Key themes expressed during interviews with Agency Managers (n = 10) and Private land Managers (n = 14) in the southeastern United States in 2012.

	Agency Managers (n=10)	***Private Land Mangers (n=14)***
Objectives	Set, unchanging	Flexible, adaptable
Management plans	Fixed	Changing based on new information
Information	Had access to information needed to make decisions	Wanted more information in order to make decisions
Climate change	Was a decision-making factor	Was not a decision-making factor

CHAPTER 4 - Outdoor Recreation Organization Leaders' Perspectives on Multiple Use of Public Hunting Lands

ABSTRACT

In the United States, purchase and maintenance of public lands for wildlife conservation started as a way to ensure sustainability of hunting. This synergistic relationship endured for over a century, but cultural and demographic changes that started in the 1960s have made engaging new user groups on public hunting lands essential for wildlife conservation agencies. In this study, we use a qualitative case study based on interviews with executive directors and board members of outdoor recreation NGOS in North Carolina, USA to evaluate potential perceived barriers and opportunities for more fully engaging new user groups on public land previously designated for hunting. We found new users enjoy Game Lands because they offer a wilderness experience, are convenient to access, and have the potential for a variety of uses. Although these users universally preferred not to pay for access, they were also universally willing to pay after learning that hunters and anglers had to pay, but only under the condition that they paid one fee for access to all Game Lands.

INTRODUCTION

Game management in the Unites States, began as a way to make sure that desirable species were not overharvested and to make the hunting of "undesirable species" more lucrative (Palmer, 1912). Accordingly, most state wildlife management agencies evolved to serve the needs of sportsmen who supported agencies through self-taxation (Decker et al. 1996). Under this model, often labeled the client-based model of wildlife management, sportspersons paid wildlife managers to produce "sustained annual crops of wild game for recreational use" (Leopold 1933, p.3; Decker et al. 1996;). The Federal Aid in Wildlife Restoration Act of 1937 helped fund professionally trained wildlife scientists to coordinate efforts to maximize wildlife yields. During this period much of the human dimensions of wildlife science research focused on assessing challenges faced by hunters and gaining access to hunting land was a central task (Short, 1939; Morrow, 1950; Prukop & Regan, 2005). At the federal level, the National Wildlife Refuge System was started by Theodore Roosevelt in 1903 and focused on protecting wildlife from market hunters (e.g., refuges from the plume trade), and providing hunting opportunities for non-market hunters (Carnell, 2017). Several states began purchasing or leasing land as early as the 1930s to improve hunter access (Short, 1939; Morrow, 1950; Prukop & Regan, 2005) and improving hunter access continues to be a goal of many state wildlife agencies where access limitations remains acute, particularly in the southeastern U.S. (Mehmood et al., 2003).

Meanwhile, the client-based model began to erode during the 1960s and 1970s as demands for governmental accountability, and public participation in environmental decision making grew (Peterson and Rodriguez, 2012). New stakeholders including animal rights advocates, stakeholders primarily interested in non-hunted wildlife species, and neighborhood organizations. Although new stakeholders have emerged over the decades (e.g., recreational kayakers), these groups did not make reliable financial contributions to wildlife management agencies, creating a difficult context where wildlife management demands were expanding to meet demands from new user groups who did not typically contribute to funding for land acquisition or management (Dalrymple et al., 2010). These challenges were compounded by relatively rapid shifts in how people in the United States view wildlife (Manfredo, Teel and

Bright, 2003). In the last 14 years, the U.S. saw a 5.7% decrease in Traditionalist wildlife value orientation and a 4.7% increase in Mutualistic wildlife value orientations (Manfredo et al., 2017; Manfredo et al, 2018) and these shifts suggest state wildlife agencies must find ways to engage with a growing segment of non-traditional users to maintain relevancy and fulfill their mission of providing wildlife related recreation opportunities to the public (Holling and Meffe, 1996; Knight and Meffe, 1997; Serenari and Peterson, 2018).

Efforts to accommodate new users on public land previously designated for hunting provide a highly relevant context for understanding the challenges and opportunities associated with formally engaging new user groups on land set aside for wildlife conservation. Several states (e.g. Colorado, Oregon, Virginia) have initiated efforts to provide non-hunting recreational users formal access to lands previously designated as hunting land but we are only aware of Colorado implementing paid access for non-hunting recreational users of lands previously set aside for hunting on a limited basis on specific areas (B. Ackerman, personal correspondence, May, 2017). Adopting user fees for non-hunters on public hunting lands may facilitate formalizing economic relationships between non-traditional wildlife user groups and state wildlife agencies (Trauger et al., 1995; Jacobson et al., 2010) as entrance and user fees are among the most popular wildlife conservation funding mechanisms among non-hunters (Dalrymple et al., 2012).

Although we are not aware of literature exploring how non-hunters perceive being engaged as paying users of public lands previously designated for hunters, literature addressing addition of new recreational users to protected areas provides relevant insights. Collectively, this research illustrates challenges associated with allowing new groups access to recreational lands. Some challenges include degraded user experiences based on usage levels exceeding carrying capacity (Farrell and Marion, 2002; Rimmer et al., 2004), and failing to accommodate underrepresented populations for economic or language-related reasons (Rimmer et al., 2004; Lee & Scott, 2011; Lee et al., 2020). Conversely, existing users often voice concerns about new groups taking away traditional use rights include grazing livestock and collecting fuel wood (Serenari et al., 2017) although traditional users do participate in activities including birding or hiking that overlap with those of “newer” groups (Cooper et al, 2015).

We began addressing this research need with a naturalistic qualitative study using interviews with the executive directors and board members of outdoor recreation organizations in North Carolina. Specifically we address four questions: 1) why non-hunters use Game Lands, 2) why non-hunters think they should, or should not, pay for access, 3) the conditions under which they would support paying for Game Land access, and 4) how they viewed compatibility between their activities and hunting. North Carolina provides a good context for this study because it has experienced rapid urbanization and sprawl in recent decades (Ewing, Pendall, & Chen, 2011; Allen, Moorman, Peterson, Hess, & Moore, 2012), and the land remains 90% privately owned (Sharpe, 2010). North Carolina also continues to see an increase in the numbers of hunters (14% from 2001-2011) with 75% of them living in urban areas (U.S. Department of the Interior and U.S. Department of Commerce, 2012). Like many other state fish and wildlife management agencies in the U.S. (Anderson et al, 1985, McKinney et al, 2005), the NCWRC has been facing funding challenges related to an increase in the demand for wildlife activities and associated infrastructure and a decrease in the relative numbers of traditional users who financially support agency actions (DiCamillo & Shcaffer; 2000; Jacobson et al., 2006; USDI and USDC, 2008). Although the research was primarily descriptive in nature, we used the experience-based framework (Floyd & Gramann, 1997) as a lens to interpret results. This model suggests recreational users have multiple forms of satisfaction from experiences in nature (Hendee, 1974, Driver & Knopf, 1977), and that values are based on how users experience the social and physical setting in natural areas (Manfredo et al., 1983; Virden & Knopf, 1989).

METHODS

The NCWRC manages 809,371 ha of land with hunting access and have complete management authority on over 192,062 ha (B. McRae, NCWRC, personal communication). The NCWRC has full authority to manage for habitat and recreational use on lands that are held in a long-term lease with US Army Corps of Engineers (30,709 ha), limited authority to manage habitats, and the authority to manage for recreational use limited to hunting, trapping, and fishing on lands managed under a long-term agreement with USDA Forest Service (507,052 ha), and limited authority to manage habitats for only hunting on lands that are held in year-to-year cooperative agreements (85,345 ha).

Game Lands have four official purposes (North Carolina Wildlife Resources Commission, 2014): 1. To provide, protect, and actively manage habitats and habitat conditions to benefit aquatic and terrestrial wildlife resources, 2. To provide public opportunities for hunting, fishing, trapping, and wildlife viewing, 3. To provide for other resource-based Game Land uses to the extent that such uses are compatible with the conservation of natural resources and can be employed without displacing primary users, and 4. To provide an optimally sustainable yield of forest products where feasible and appropriate and as directed by wildlife management objectives. Funding sources used to acquire Game Lands include over $343 million contributed through the Natural Heritage Trust Fund, a fund supported by a portion of real estate tax and a portion of fees for personalized wildlife license plates. The Natural Heritage Trust Fund was folded into the Clean Water Management Trust Fund in 2013, with the fund receiving a direct appropriation from the General Assembly. Game Lands are also funded by NCWRC license fees and timber receipts from logging on the Game Lands, various U.S. Fish and Wildlife Service grants, collaborative partnerships with conservation organizations including the nature conservancy and ducks unlimited, partnerships with military installations and private donations (I. Harrold, NCWRC, personal communication).

We used a naturalistic qualitative approach in our study as this methodology is well suited to research on relatively unexplored phenomena where context plays a central role in social dynamics of concern (Lincoln & Guba, 1985; Denzin & Lincoln, 2005). This approach treats the narratives from each opinion leader (OL) as data, allowing themes to emerge from the stories and experiences (Lincoln & Guba, 1985). And although we used interview prompts (Table 1), OLs were allowed to determine the direction of the interviews.

We conducted 23 semi-structured interviews with leadership (executive directors or board members) of non-hunting state or regional recreational non-governmental organizations (LORG) in North Carolina. We focused our study on LORG, as these were the people that were the public face of their organization. LORG are individuals who have power to make decisions for the organization they represent and also to utilize organizational resources (equipment, time, money). We used snowball sampling to limit bias in interviews, starting with referrals from the North Carolina Wildlife Resources Commission who provided an initial contact list. At the end of each interview, we asked for names of other leaders of outdoor recreational NGOs, continuing to add possible interviewees to our list until the same people began to be recommended - indicating saturation (Bjernacki & Waldorf, 1981; Noy, 2008). As organizational leaders and decision makers, LORG were key informants (Phillips, 1981; Gilchrist, 1992; Marshall, 1996; Homburg et al, 2012), asked to speak on behalf of the members of their organization as well as to their own lived experience. Interviews were recorded on a hand-held recorder with the written permission of the interviewee and additional notes were taken during the interview. Interviews were then transcribed into 67 pages and analyzed. Although LORG were chosen because they held leadership positions within the non-hunting recreational groups that used Game Lands, they often participated in multiple activities on Game Lands, (Table 2) including hunting and fishing and although we had specifically asked LORG to speak as the head of their organization, there are times when responses seemed to reflect personal opinions. Data was analyzed and coded using NVivo qualitative data analysis software (QSR International Pty Ltd. Version 8, 2008) and thematic content analysis (Peterson, 1994; Braun & Clarke, 2006; Vaismoradi et al., 2013). We began by sorting our data from the transcripts into broad categories that illustrated a single coherent thought or theme, and then developed those themes by looking for relationships within the themes, searching for opposition among themes, and developing thematic hierarchies. We use the following citation format to identify quotations from interviews: LORG, Interview number. For example, a quotation identified as ‘LORG3’ was spoken during interview number 3. We minimized bias through saturation (Guest et al., 2006; Fusch & Ness, 2015). We achieved saturation by conducting interviews and analysis until we reached the point where we were getting no new data during interviews, we saw no new themes emerging from the analysis and coding, as well as the ability for study replication (Guest et al., 2006).

RESULTS

Leaders of the outdoor recreational group said the wildness, the convenience of location and the variety of uses were reasons for why their interest groups were currently using Game Lands (TABLE 3). When asked about barriers to use, given the emphasis on wilderness like experiences, we were surprised that the most frequently mentioned barrier was the lack of infrastructure and other amenities on Game Lands. Another prevalent barrier to use was the inconvenience of scheduling recreational use around hunting season. And although use was limited during hunting seasons, LORG considered most activities, with the exception of motorized vehicle use, to be compatible with hunting on Game Lands. When asked about the possibility of paying fees to access Game Lands, LORG initially stated they would not be willing to pay to use, because they didn't want to pay for something that is currently free, they didn't think that some uses should ever be charged and they believed that other comparable areas were free to use. They believed that hunters and anglers should continue to pay fees as they have to pay no matter where they recreate and because they are harvesting resources. But LORG indicated that they believed paying for access would be more accepted within their user groups if the NCWRC were to offer facilities that specifically supported non-traditional recreation and if the fee allowed annual access to all Game Lands.

Game Lands are valuable

All of the LORG enjoyed recreating on Game Lands because they perceived them as being more wild than State and Federal lands. LORG7 said they liked using Game Lands because "you kind of go where you want to...they're a little bit more wild...undeveloped." LORG2 thought that recreating on Game Lands had "a more natural, more rugged feel to it."

And LORG6 said they used Game Lands for “the more wild feel.” and that they enjoyed being able to use” these areas that are wild and pristine.”.

Game Lands were also seen as being valuable areas to recreate because of the proximity to where LORG lived or worked. Seven of the 23 LORG highlighted the importance of “proximity”, “convenience and location”. LORG 16 and 18 said that Game Lands were “easy to get to”. 8 of 23 LORG highlighted adjacency to major metro areas. LORG3 pointed out that even though Game Lands were close to big cities, only “a half-hour from some major populations... the accessibility (is) what would stand out.” LORG12 simply stated that they use Game Lands because “it’s close to the house.”

LORG said another great value to Game Lands was the possible diversity of recreational uses. LORG1 said Game Lands “offer the most…recreation types in one place. There are not a lot of places I can go where I can kayak and go for a run in the same place.” He explained that on any given day he would typically, “run in the Game Lands and bike in the Game Lands and … do quite a bit of hiking in the Game Lands. “LORG7 liked to spend time on Game Lands because they were able to spend time on “photography and bird watching…looking for waterfalls and what have you.”

Game Lands are valuable - but there are barriers to use

Although LORG were all currently using Game Lands, they did not use them frequently or as often as they would like to. Lack of user-friendly infrastructure, notably trails, parking and facilities were reoccurring reasons as to why Game Lands were not being used with more frequency. LORG4 used Game Lands for mountain biking and noted their use of Game Lands was constrained because “there are no set mountain biking trails.” LORG6 said that the greatest improvement to Game Lands would simply be “public access points to the water - not a boat ramp, but just a place to go down and sit on the bank and fish. A place where people could put in a small boat - a johnboat, or a canoe.” They said they would use Game Lands more if the WRC would “just improve access.” LORG18 agreed that “there is not a lot of access for the public.” They said that often they would choose to recreate in other areas because other areas were “easy to find, (and offered) ample parking and a set trail…”

Another reason that Game Lands were being avoided is that during hunting season, other types of users can only access Game Lands on specific days, which limited the times of the week and the year that LORG could use the Game Lands. LORG5 said that they often choose to recreate elsewhere because on Game Lands “you have to worry about the hunting seasons and when you can be there and when you can’t, so it’s just easier to (go) to a place you know there won’t be any issues.” LORG4 said that they utilized Game Lands, “very infrequently” because during hunting seasons, Game Lands were only open to other uses on Sunday. LORG9 agreed that the one day a week access made using Game Lands difficult. They said that they try to organize “group things sometimes with local clubs and it’s hard to schedule. It would work better for group things on Saturday. It fits better on people schedules.” Having access only one day a week during hunting season was a barrier, but LORG indicated that although they were allowed to use Game Lands with more freedom during non-hunting season, they still didn’t use the Game Lands that often during those times of the year because “hunting seasons are in the fall and winter and that’s really the only time that you can get in there and recreate cuz it’s so overgrown in the summer and spring.”(LORG1) LORG4 also pointed out that they were not able to use Game Lands during the time of the year they would most enjoy them because during “the three months when they are available (and not being used by hunters), at least two of those the heat and humidity around here is quite oppressive.”

Game Lands are valuable but LORG resist paying fees for access

Seventeen of the 23 interviewed LORGs initially said that they would not be willing to pay for access to Game Lands. Access to Game Lands is currently free for non-traditional uses and LORG believed that the introduction of a pay for access would restrict use. LORG1 said, “it’s kind of like a stifler for people who want to visit the area” and went on to say that if people had to “pay $15 for their one walk every year” they would probably “just go someplace else...30 min down the road.” LORG17 also thought that additional fees and permits were very unnecessary and would “just deter people from using them (Game Lands).” LORG6 thought that if people were to begin to be charged, then they “would be less likely to go to Game Lands and then you might lose a lot of opportunities to allow people to enjoy (their) hobby.” LORG10 flat out said that, “if I had to pay, I would never go out there.”

Not only were LORG opposed to adding a fee to their current free use, they specifically believed that certain kinds of recreational uses should never have to pay for access to any kind of public land. They felt that people who participate in activities that take place on foot (e.g. hiking, running, birding) should never have to pay for access. LORG4 said, “it would be hard to ask them (organization members) to pay a fee to go for a run.” LORG12 said that they “would not pay just to walk the dog. Doesn’t make sense to have to pay just to walk around…no one should have to pay to walk their dog or to just enjoy the land.” LORG13 said that because their favorite activity, bird watching, was something that you could do anywhere, “any place, any spot, sometimes even on the way home from the Food Lion...No - I would not pay to access Game Lands."   LORG6 also said that they didn't "think that hikers and birders should have to pay (because it's) an activity that you can do anywhere, and you shouldn't have to pay." And LORG18 simply said that "there are lots of areas around there where you can hike or go for a walk where you don't have to pay."

LORG said that they would refuse to pay for Game Land access because they believed, often mistakenly, that they currently don't pay to use alternative public lands. LORG1 stated that there should never be someone who says, "now you need to pay to walk in these woods, this public land." LORG17 said that as a hiker she would not pay for access. "Not when there are free places to hike. State parks are free, national parks are free, and national forests are free. I don't think that (asking people to pay to use Game Lands) will go over well at all." LORG14 said that they would refuse to pay for access because they believed that users "don't pay at national parks or forests, generally you don't pay to go for a walk."   LORG4 said if they had to pay, they "would not go out to (Game Lands) to run, we would just stick to (a state park adjacent to Game Lands.)". LORG12 said that "if (Game Lands) charged, I would drive to (a state park) or wherever." LORG12 continued: "That's not what Game Lands and public lands are about. You don't have to pay to walk on state parks or county parks."

LORG also just did not think that they were taking anything from the Game Lands that they should have to pay for. "It seems like their impact (a hiker or a paddler or a mountain biker) is smaller. They are just using the area." (LORG3). LORG11 explained that "we are just running on them. We're not walking away with a deer or a bunch of fish. I think it's a different situation. We're not really consuming anything or taking anything away from the Game Lands." LORG14 said that for example a hiker is "not really extracting anything" and so should not have to pay.

LORG believe Hunters and Anglers should continue to pay

Although LORG believed that their uses should not have to pay, they believed that hunters and anglers should continue to pay for access because those recreational activities are always associated with a fee. “There are lots of parks and areas where you can go for a walk but you don’t have to pay, but hunters, hunting, you have to pay for it no matter where you go, private land for grouse or public or whatever (LORG12)”. LORG10 suggested that hunters and anglers “have to pay for those activities no matter where they are? LORG3 explained that “to hunt or to fish on other lands, you would have to pay for it.”

LORG also thought that hunters and anglers should pay because they are harvesting a resource from the Game Land and those resources need to be maintained. LORG3 explained that “there is a difference between harvesting and recreating. Hunters and the fishermen are taking natural resources from the Game Lands. because they are walking away with something tangible, that’s what makes it feel different. LORG1 added that it made sense to have hunters and anglers pay because not only were they harvesting from the lands, the animals and fish that are being harvested need to be managed. “ The difference is that when you manage a population of wildlife, when you’re stocking fish or whatever, there’s an overhead.”

Users may be willing to pay for access if these conditions are met

Once we heard why LORG thought that their groups would not pay, we explained that there is an issue with non-traditional user groups who come onto state Game Lands to recreate and utilize the resources that are being paid for by hunter or angler license fees. We asked if this equity issue made a difference in their opinion. Surprisingly LORG said that yes, this did change their opinion and they would be willing to pay and felt that their group would be willing to pay but they believed payments would only be fair under certain conditions. The primary conditions informants described were the provision of new infrastructure for their preferred form of recreation and having a permit that provided annual use on all Game Lands.

LORG1 said that they would be willing to pay as long as the money was going towards something tangible and there were visible changes. "if they were gonna put in a couple of good access points or something like that, I would see no issues with paying $15 for the year. " LORG8 also indicated that they thought infrastructure like parking and bathrooms would justify having to pay fees, "… if there was parking… it would be phenomenal - so I think if people were paying a fee…if that were part of the package that came with the user permit, no one would argue with you about that." LORG 5 said that they thought "the people will pay; people would pay a user fee if they are quality trail systems." LORG15 said that they currently parked on private land to use the Game Lands near their home. They said that they currently "buy a key to access this lot and it's $60 a year," but there are only 200-250 keys available annually. LORG8 thought that their recreational group "would pay happily", if that meant that parking and access were guaranteed. LORG11 said that they would be willing to pay a fee for "access, shelters, security for leaving cars, possibly some development of some campsites not necessarily provision of all resources like latrines and running water and things like that, but at least a designated area for camping." LORG 17 also said that they would consider paying a fee if there was "a designated trailhead or parking area."

LORG also said that they were willing to pay if there was the possibility of gaining greater access for a larger variety of recreational activities and more access during the year. LORG 17 said that "if you would allow uses like that aren't currently allowed at all, that might be a different potential there (to pay for access)." LORG15 said that if they paid a fee, they "would want to have access on all non-hunting days."

A few LORG also mentioned that they would be more likely to support an annual pass, or something that they only had to pay for once, vs something they had to pay for every use. LORG2 said that "personally (they) would be ok with (paying a fee), provided that it was an annual pass, and not something that I had to do each time I went and if it was good across all Game Lands. LORG3 said that "(having an annual pass) would feel different then having to pay $2 out of your wallet and using a pay box every time - and being like - oh no, I don't have any change - that might make it easier."

DISCUSSION

Although meeting demands for both 'wild and pristine' experiences and better amenities at Game Lands will be difficult, it is essential for engaging diverse user groups. We offer insights into what motivates users to choose or not choose to recreate on specific lands and understanding these held values - or the importance that an individual puts on a place (McIntyre, 2008), is important not only for successful land management (Rossi et al, 2015) but also for engaging and attracting new users. The desire for 'wild spaces' is well documented (Aasetre, 2016), and clearly forms one of the multiple satisfactions users derive from nature-based recreation (Hendee, 1974, Driver & Knopf, 1977; Manfredo et al., 1983; Virden & Knopf, 1989; Floyd & Graham, 1997). Although adding amenities does not directly raise wilderness satisfaction (Tonge & Moore, 2007), strategic use of amenities in portions of Game Lands could limit those negative impacts and produce benefits including engaging users from more diverse groups (Edwards et al., 2012), and reducing misuse and abuse of resources (e.g., littering; Kowarik, 2018). One way to maintain wildness while providing amenities would be to cluster amenities and do so in places that already lack a wilderness aesthetic and to consider carrying capacities (Manning et al., 2005; Leung et al, 2014).

This study raises questions about norms demanding payment for some forms of recreation, and assuming others uses should be free by right. Typically, the greater their attachment to an activity or an area, the more willing users are to pay for access (Kyle et al, 2010), and the more users participate in an activity, the more value they place on it (Ives et al., 2017). In this case informants considered dog walking an activity that should be free despite many people using the activity to define and refine their identity (Dotson & Hyatt, 2008). Given diverse users paying entrance fees can reduce the economic burden on an agency (Serenai et al., 2017), it may be worth developing messaging, marketing and educational campaigns promoting access fees for non-traditional uses on Game Lands (Fishbein and Ajzen, 1975; Barro et al., 1996; Whittaker et al., 2006; Manning, 2011). Game Land managers should focus on developing messages and materials that are targeted towards new user groups, taking into account insights from this study including the importance of flat fees for all Game Lands, and highlighting the access costs being lower than for alternative public land in the region. Future research should address how the differences in pay structure influence ownership feelings of user groups, and what kinds of recreational activities are considered more valuable and for what reason. Future research would benefit from engaging a greater diversity of users and user groups, as well as individuals within the groups that LORG represented. Cost-benefit analyses would illuminate the degree to which non-traditional user groups' access fees could offset costs associated with providing additional amenities.

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Table 4.1: Interview Prompts

- Do you currently use Game Lands? Why? What do you consider the primary value of these Game Lands to your group?
- What other areas do you use?
  - Why do you choose those areas?
  - How do they differ from Game Lands?
- How do those differences affect your decision to use Game Lands?
- Are you aware of any barriers to Game Land use?
- Do you think (your group) would be supportive of paying a fee to access Game Lands?
  - Would you be willing to pay the same fee as hunters and anglers, $15 per year?
  - Do you consider this fee high or low?

Table 4.2: Recreational uses of Game Lands by LORG

How LORG use Game Lands	***# of LORG who use Game Lands for these activities***
Mountain bikers	9
Kayakers	5
Birdwatchers	6
Hikers	12
Trail runners	7
Fishers	5
Hunters	4
Boaters	3
Walkers	6
Nature photographers and observers	2

Table 4.3: Emergent themes and subthemes

Primary Theme	*Secondary Themes*	*Example quotes*
Game Lands are valuable	Value = wilderness	I like they're a little bit more wild…a little bit more undeveloped.
	Value = proximity to where LORG live and work	A lot of these places are real easy to get to - just up the road.
	Value = the diversity of uses	...they offer the most...recreation types in one place.
There are barriers to Game land use	Limited infrastructure is a barrier	…it's nice to have a wide, well maintained trail when you have a large group of people out. ….Game Lands don't have the established trails.
	Scheduling use around hunting season is a barrier	(you) have to worry about the hunting seasons and when you can be there and when you can't.
Non-traditional users resist new fees	People don't want to pay for things they currently use for free	If I (now) had to pay, I would never go out there.
	Some activities should never be charged.	...no one should have to pay to walk their dog or to just enjoy the outdoors
	Alternatives are free to use	That's not what Game Lands and public lands are about. You don't have to pay to walk on state parks or county parks.
	They are not taking anything from the land	A hiker or a paddler or a mountain biker, they are not taking anything with them.

Table 4.3: Emergent themes and subthemes (continued)

Non-traditional users believe traditional users should continue to pay	Hunting and angling are activities where you always have to pay	...but don't you have to pay for those activities (hunting and fishing) no matter where you are?
	They are taking resources, and someone has to manage those resources	There is a difference between harvesting and recreating.
Users conditionally willing to pay use fee	Willing to pay with new infrastructure	… put in a couple of good access points or something like that, I would see no issues with paying...
	Willing to pay with access to all Game Lines	If (the pass) was good across all Game Lands.
	Willing to pay if buying the pass is convenient	… provided that it was… not something that I had to do each time I went.

APPENDICES

Appendix A: Recruitment Flyer

[This flyer will be sent to middle schools in Wake County and Chapel Hill-Carrborro schools via e-mail. In Durham Public Schools, teachers will have access to the same information through MyLearningPlan, the DPS online professional development system]

Climate Change Education
Focus Group and Workshop

Saturday, September 21st
9:30am - 3pm

Wildlife Resources Commission Education Center
Centennial Campus
NC State University
Raleigh, NC

$75 Stipend for participation in focus group
Lunch provided

Are you a middle school teacher interested in learning more about resources for teaching climate change and walking away with lesson plans and materials? Want to talk about your experiences with other teachers and share ideas? Willing to contribute to a better understanding of what teachers need to address climate change in the classroom? Join us!

Tentative schedule:
9:30: Arrival at the WRC and Welcome
10:00: Break into focus groups to discuss your experiences of teaching climate change in the classroom.
11:45: Break for lunch
12:45: Abbreviated workshop featuring draft activities from the brand-new Project Learning Tree "Our Changing Forests" curriculum.
2:45: Wrap-up
3:00: Workshop concludes

Please register ***by September 13th*** through MyLearningPlan (for DPS teachers) or online at http://tinyurl.com/ClimateWorkshop. Registration is limited to 40 participants, so register early to reserve your spot. We are only recruiting middle school teacher at this time. Contact Kathryn Stevenson (919.605.3292 or ktate@ncsu.edu) with questions.

Appendix B: Focus Group Protocol

Openings Script:
Good morning, and welcome. Thanks for taking the time to join us to talk about teaching about climate change in the classroom. My name is [lead facilitator] and this is [assistant facilitator]. We are with NCSU/NCCU. We are interested in learning more about the experiences teachers have had with teaching about climate change, what resources you currently use, and how you might be supported best in the future. If you teach about climate change, we also want to know how you teach it, and any challenges you face in teaching about it.

We are holding three of these discussion groups today with teachers from the Triangle. You were invited because you teach middle school in the area. These focus groups are part of a research study. Participation is completely voluntary, and we have more information on the research in this information sheet [distribute sheets].

As we talk today, please remember there are no wrong answers but rather differing points of view. Please feel free to share your point of view even if it is different from what others have said. Keep in mind that we're just as interested in negative comments as positive comments, and at times the negative comments are the most helpful in building understanding. My role is to facilitate the discussion. Please talk directly to one another and ensure one person is talking at a time so we can hear everyone's point of view.

You have probably noticed the microphone. We are tape recording the session because we don't want to miss any of your comments. People often say very helpful things in these discussions, and we can't write fast enough to get them all down. Data from these discussions will be used to write reports available to you as well as papers to submit for publication, but we will never use your names or any other identifying information.

What questions do you have before we begin?

Let's get started. We've placed name cards on the table in front of you to help us remember each other's names. Let's find out some more about each other by going around the table. Please tell us your name and what subject/grades you teach.

<u>Introductory question:</u>
Let's start with an open-ended question:
How do you feel about teaching climate change in the classroom?

<u>Transition question:</u>
Now that we have scratched the surface, I'd like to ask more about your training to teach climate change, your experiences teaching it, and support you have or wish you had in teaching climate change.

<u>Main Questions:</u>
First, let's talk about courses you have taken.

Think back to courses you took in college. Which of these addressed topics related to climate or climate change?

Think back to professional development workshops or courses you have taken. Which of these addressed topics related to climate or climate change?

How prepared do you feel to address climate change in the classroom?

Teaching climate change/barriers:
In what context do you teach about climate change?

Do you feel you should teach "both sides" of climate change?
- What does "both sides" mean to you?
- Do you teach "both sides" of other topics in your courses?
- How do you teach "both sides"?

Do you feel climate change is a controversial topic to teach?
- What techniques do you use to address controversy?

What, if any, barriers do you experience in teaching climate change?

Resources used and wished for:
What resources do you use to help you teach climate change?

What types of resources would you like to see more of to help you teach climate change?

Are there any other types of support you would like to help you teach climate change?

Ending questions:
Of all the things we discussed today, what to you is the most important?

Have we missed anything in our discussion?

Appendix C: Registration Form

Thank you for your interest in the Climate Change focus group and workshop on September 21!

The focus group is part of a research study being conducted at NCSU. We are interested in learning more about teachers' experience with teaching about climate change and how you might best be supported in the future. We will audio record the focus groups, but the recordings will be destroyed after we have created a written transcript. All identifying information will be removed from the written transcript.

After the focus groups, you are invited (but not required) to stay for lunch on us as well as a training workshop using new climate change lessons from the Our Changing Forests module from Project Learning Tree. We would also like to offer you a $75 honorarium for participation in the focus groups.

If you have any questions about the focus group or workshop, please list them in this form and/or contact Kathryn Stevenson: 919.605.3292 or ktate@ncsu.edu.

1. Please provide your contact information below:
First Name:
Last Name:
School Name:

2. Please tell us about your teaching appointment:
Grade(s) taught:
Subject(s) taught:
Years teaching:

3. Did you teach about climate change in your classes last year?
- Yes
- No

4. Do you plan to teach about climate change in your classes during this school year?
- Yes
- No

5. As we are providing lunch for the workshop, please list any dietary restrictions below:
- Vegetarian
- Vegan
- Gluten free
- Allergy ____________________
- Other ____________________

6. Please list any questions or comments on the workshop below.

Appendix D: Information Sheet

North Carolina State University
RESEARCH INFORMATION SHEET

Title of Study: Perceptions of Teaching Climate Change among Middle School teachers

Principal Investigator:	**Faculty Advisor**:
Kathryn Stevenson	M. Nils Peterson
PhD student, NCSU	Assistant Professor, NCSU
ktate@ncsu.edu	nils_peterson@ncsu.edu
919-605-3292	919-515-7588

GENERAL THINGS YOU SHOULD KNOW ABOUT RESEARCH STUDIES

You are being asked to take part in a research study. Your participation in this study is voluntary and completely apart from your job requirement. You have the right to be a part of this study, to choose not to participate or to stop participating at any time without penalty. The purpose of research studies is to gain a better understanding of a certain topic or issue. You are not guaranteed any personal benefits from being in a study. Research studies also may pose risks to those that participate. In this consent form you will find specific details about the research in which you are being asked to participate. If you do not understand something in this form it is your right to ask the researcher for clarification or more information. A copy of this consent form will be provided to you. If at any time you have questions about your participation, do not hesitate to contact the researcher(s) named above.

PURPOSE

You are asked to participate in a study that is designed to learn more about middle school teachers' experience with teaching climate change in the classroom.

INFORMATION

Participants in this study include middle school teachers in Durham Public Schools, Chapel Hill-Carborro Schools, and Wake County Public Schools. Teachers will be asked to participate in a focus group lasting around one hour and no more than two hours. The focus group will be audio-recorded, but we will later create a written transcript of the recording and destroy the audio files. Any identifying information (i.e names of teachers or schools) will be removed from the written transcript. Participation in this study is completely voluntary.

RISKS

There are no significant foreseeable risks of participation in this study. You are also free to withdraw from the study at any time by emailing Kathryn Stevenson (ktate@ncsu.edu).

BENEFITS

Your responses will help better understand your experiences in teaching climate change and what steps can be taken to better support teachers in teaching climate change.

CONFIDENTIALITY
The information in study records will be kept confidential to the full extent allowed by law. The identity of the teacher will be known to the researchers, however links between individual teachers and data will be destroyed when the audio file is transferred to a written transcript for analysis. Participants will be assigned a non-identifying code, but these will never be linked to participant identity. Public reports from this study will focus on aggregate data. We will not identify individual teachers or schools in any public reports. If you wish, we will provide you with a copy of the report.

COMPENSATION
You are invited to join us for lunch after the focus groups and to participate in a training workshop using two lessons from the *Our Changing Forests* module of *Project Learning Tree*. You are also being offered a $75 gift card as a thank-you for your participation.

CONTACT
If you have questions at any time about the study or the procedures, you may contact the principal investigator, Kathryn Stevenson at 919-605-3292. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/515-4514).

PARTICIPATION
Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed at your request. Your participation in this focus group indicates your consent to participate.

Appendix E: Informed Consent for Research

Development of a Southeast Conservation Adaptation Strategy Conservation Decision Guidance Library

This research involves developing a better understanding of the management decision context for several important resource management themes, describing how management objectives relate to those themes and understanding how management decisions are made and how decision making can be improved. The final result of this research will be a detailed report that outlines objectives and decision-making processes.

Any individual comments or information you provide are completely confidential. Your name will never be associated with your responses in any way, and your privacy will be protected to the maximum extent allowable by law. While your participation is completely voluntary, you can help very much by agreeing to share your experiences and opinions. You can refuse to participate at any time.

Grace D. Lee Jenni and/or Michaela Foster will take notes and record comments on a handheld tape recorder during each interview. Any recorded comments from individual discussions will be identified only by a number linking the subject to the notes. Only Grace D. Lee Jenni and Michaela Foster will have access to full recordings or transcriptions of individual comments. If at any time you would like to stop participating, or if you would like to remove part or all of your statements from these notes, please notify Grace D. Lee Jenni. Individual comments will be stored on a password-protected computer.

If you have questions or comments about this study, please contact the researcher:

Grace D. Lee Jenni (Dept. of Forestry and Environmental Resources, Box 8002, North Carolina State University, Raleigh, NC 27695; email: gdlee2@ncsu.edu; phone: 310-922-5393)

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact:

Dr. David Kaber (Chair of NCSU IRB for the Use of Human Subjects in Research Committee, Box 7514, North Carolina State University, Raleigh, NC 27695; phone: 919-515-3086)

or

Mr. Matthew Ronning (Assistant Vice Chancellor, Research Administration, Box 7514, North Carolina State University, Raleigh, NC 27695; phone: 919-513-2148)

Appendix F: Interview Protocol

Development of a SECAS Conservation Decision Guidance Library

Time & Date:
Place
Interviewee:

Introductory Protocol

Thanks for taking the time to sit down with us. We asked you to speak with us today because you have been identified as someone who is knowledgeable about the decision-making process of managing open pine ecosystems. Our research project is focused on understanding decision-making, with particular interest in exploring any possible barriers to making "good" decisions and how we might move past those barriers. Our study is not an evaluation of current decision-making practices. Rather, we are trying to learn more about what we can do, if anything, to assist you.

To facilitate our note taking, and to make sure we quote you correctly, we would like to record our conversations today. Please sign the release form. For your information, only researchers on the project will be privy to the tapes, which will be eventually destroyed after they are transcribed. Also, please sign this form devised to meet our human subject requirements. Essentially, this document states that: (1) all information will be held confidential, (2) your participation is voluntary, and you may stop at any time if you feel uncomfortable, and (3) we do not intend to inflict any harm. Thank you for your agreeing to participate.

We have several questions that we would like to cover.

1. Why do open pine ecosystems matter? (Why are they important?)
2. What are some of the challenges these systems are facing?
3. Briefly describe your organization and its relationship with open pine ecosystems.
4. What are your objectives associated with open pine ecosystems? (probe: What are you working towards?

5. How are management objectives determined? Are objectives dynamic? Is climate change a consideration for changing management plan objectives?

6. What actions were considered to achieve above objectives? (Why? What? How many?) What were some of the factors that were involved in deciding what actions are needed to achieve those objectives?

7. Who are the decision makers?

8. Did you need to involve stakeholders? Which kinds? Why?

9. What types of information do you need to make good decisions? Do you have this information? What information do you wish you had? Is it available? Where?

10. What is the decision timing and frequency? (Are other decisions linked to this one? What factors do you consider during the decision-making process?)

11. Do you have a written management plan for open pine systems?

If yes -

i) How do the document/s link to your objectives setting and stakeholder interactions? Can we obtain a copy of the plans?

ii) How are these plans developed? What information do you use to develop these plans?

iii) Are there any barriers to effective plan development and implementation? What? Are there any challenges for managers to overcome to achieve objectives? What?

If no -

End interview

Thanks for your time; do you have any other suggestions for people that I should speak to?

Other Topics Discussed:

Documents Obtained:

Post Interview Comments or Leads: