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Segmenting Stakeholders for Effective Extension Education: A Case Study of Sustainable Forestry Practices

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Cover Page Footnote

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Segmenting Stakeholders for Effective Extension Education: A Case Study of Sustainable Forestry Practices

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Abstract. The article describes a participatory segmentation strategy, called the Actor Diagramming and Tracing Method, that enables Extension agents to tailor education initiatives. Using a case study, the authors demonstrate the method by segmenting North Carolina family forest landowners based on resources needed for sustainable forestry management. Instead of surveying select participants, as previous researchers have, the authors engage a diverse set of stakeholders through interviews, in-situ observations, and diagramming. Three segments emerged with explicit steps to engaging forest owners' barriers and motivations, as well as a key factor to adoption of sustainable forestry practices: owners' relationships/social networks.

INTRODUCTION

Extension staff work closely with stakeholders to educate them about and facilitate their engagement with environmental sustainability practices. For outreach to be effective and for Extension staff to make the best use of their resources, they need to understand the driving behavioral factors behind stakeholders' decision-making and actions (Corbett, 2006; Klöckner, 2015). Behavioral factors that drive stakeholders' decision-making include stakeholder motivations, their ability to perform a task, and whether they have reminders to prompt the desired behavior (Fogg, 2009). Extension staff also need to understand how to identify the sub-actions that make up a desired behavior (McKenzie-Mohr, 2011). For example, the behavior of engaging in sustainable forestry includes the sub-actions of controlled burns, tree thinning, and coppicing, (Ile et al., 2021; Rathfon & Farlee, 2002).

The process of separating a stakeholder's behavioral factors and sub-actions from those of the public is called segmentation. Segmentation enables educators to design initiatives that appeal to stakeholders and offer appropriate prompts to behavior change in their target population (McKenzie-Mohr, 2011). Popular segmentation strategies, such as Claritas's 2023 PRIZM Primer and ESRI's 2023 Tapestry Segmentation, divide populations by demographics, geography, lifestyles, and needs; this allows product marketers to easily tailor campaigns to the correct groups. In this paper, we propose a similar approach to segmentation for Extension education.

Extension research emphasizes the importance of segmenting audiences to create targeted messaging, education, and delivery methods. For example, Gusto et al. (2021) interviewed Extension agents to determine their approach to client segmentation by examining individual or organizational affiliation and the educational topics associated with each group's needs. Salmon, Brunson, and Kuhns (2006) conducted surveys of landowners to identify educational needs based on the relationship between an owner's age, tenure of ownership, acreage, method of land acquisition, and perceived benefits of land ownership. Warner et al. (2016) conducted surveys of homeowners to segment them by their water conservation beliefs, attitudes, and practices. Huang, Lamm, and Dukes (2016) also conducted a survey, but theirs segmented Florida residents by their engagement in a specific set of water conservation strategies and related behaviors. Finally, surveys of North Carolina (NC) forest owners found five segmentations of owners based on their preferred information delivery methods (Bardon et al., 2007) and four typologies based on the owners' reasons for owning forestland (Bardon et al., 2023). As evidenced by the aforementioned articles, most Extension research on segmentation utilizes surveys with a limited set of stakeholders, primarily Extension staff or the target audience. Surveys consist of a list of questions (typically administered on paper or electronically) that only allow for one-way communication. Specifically, the researcher asks questions, and the respondent answers later on. This method does not allow for the researcher to respond

to changes in the participants' voices or facial expressions to identify confusion or ask follow-up questions.

Additionally, surveys typically provide yes/no questions or ask respondents to score statements on Likert or Likert-like scales; either of these question types can pigeonhole participants into answering in ways they otherwise would not. For example, Zobrist and Rozance (2015) found a mismatch between forest landowner survey responses and behavior—likely due to the inability of the survey to collect the nuanced behavioral information available from interviews and observations (Driscoll, 2011; Fan Ng, 2015; Steg et al., 2018; Sussman, 2015).

This study extends past survey research by including diverse stakeholders in data collection through interviews and on-site observation. Interviews require the interviewer to ask participants open-ended questions face-to-face, following a protocol. Based on participant questions and contextual cues (i.e. vocal intonation, facial expressions, and body gestures), the interviewer can clarify and ask follow-up questions to gather nuanced information. On-site observations require documentation on how participants behave in the space while asking them to describe what they do in that space. Thus, new and diverse aspects of behavior often emerge through interviews and observations because of the insights offered through the combination of words, gestures, smells, sounds, visual observations, and touch (Elwood & Martin, 2000; Schuler & Namioka, 1993; Sussman, 2015).

By utilizing these qualitative data collection methods with a diversity of stakeholders, new solutions and epistemological perspectives can emerge to address environmental challenges (Gregory et al., 2020; Hunt et al., 2019). Furthermore, involving diverse stakeholders in the creation of environmental solutions leads them to form

new identities (Webler & Tuler, 2021). In the case of this study, the identities we co-created serve as the categories that define groupings of family forest landowners based on their motivations, barriers, and behavioral triggers. Thus, if researchers aim to design effective environmental behavior interventions, it makes sense to collect data within the context in which the person will need or use the intervention as well as with the diverse stakeholders who make up the relationships needed to support the behavior change.

This paper presents a case study that demonstrates how to co-create segmented audiences using the Actor Diagramming and Tracing Method (Typhina, 2017). The Diagramming method utilizes participatory techniques to engage human and non-human actors of an environmental issue in the design and release of an intervention that can support environmentally friendly behavior changes. This case study applies the Diagramming method to identify the educational needs of North Carolina's unincorporated individual and family partnership forest landowners (referred to as family forest landowners) to increase sustainable forestry practices on their land. The findings reveal three segments of family forest landowners, their goals, what they need help with, their motivations, and the pivotal influencer to their behavior.

METHODS

Before implementing the case study, we received approval from the NC State University Institutional Review Board for the Protection of Human Subjects in Research. We utilized the theoretical framework of the Actor Diagramming and Tracing Method (ADT), which guides researchers in the cyclical integration of human and nonhuman actors through the development of pro-environmental interventions to

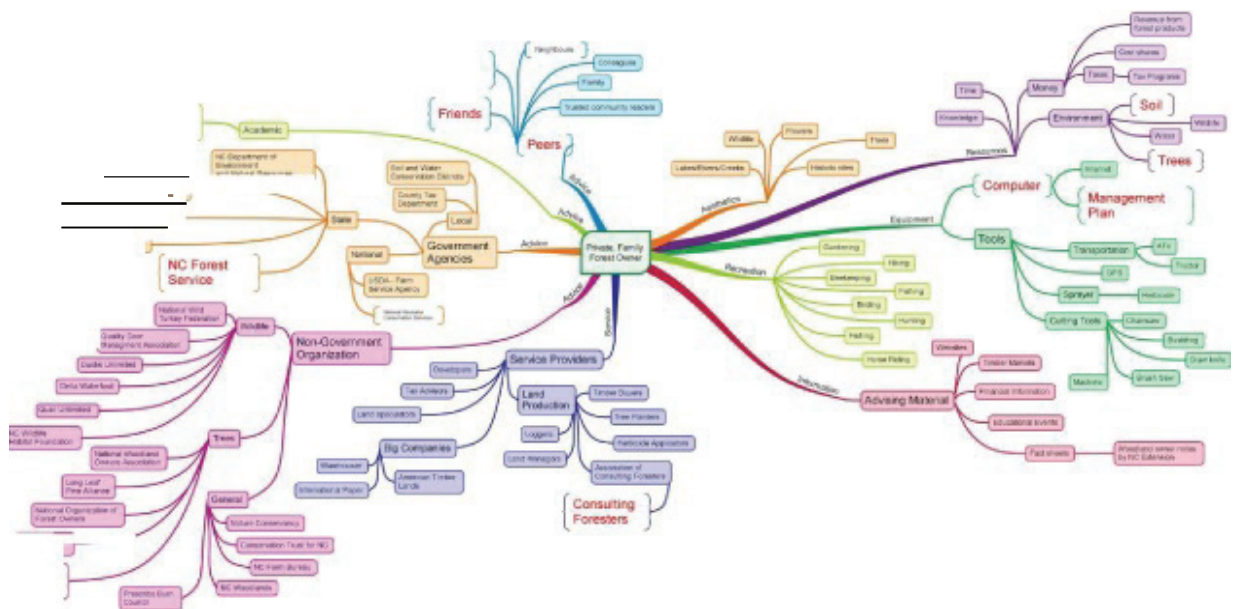


Figure 1. Study's actor diagram.

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best identify and negotiate the needs, abilities, barriers, and support mechanisms of all actors (Typhina, 2017). Actors include entities who are engaged in, who knew of, and/or who influenced the activity of other entities involved in creating the desired behavioral outcomes.

Following the use of the method, we designed a diagram of potential actors as we collected data; we created it in a way that helped us understand and share the connections and gaps between actors with participants. For our diagram (Figure 1), we color-coded and labeled groups of actors by sector and relationship, such as organizing the peer actors (e.g. family and friends) who give advice in light blue and labeling recreation (e.g. actors of gardening and hiking) in green. When participants mentioned an actor multiple times or described them as influential to their ability to engage in sustainable forestry practices, we made the name larger, in bold, and in red. We placed all the human actors on the left side of the diagram and the nonhuman actors on the right; for the full actor list, see Table 1. For us, this design made it easy for interviewees to discuss existing actors, add new ones, and draw out important influencers—such as those listed in large, red print.

Next, we traced a range of actors on the diagram through interviews and observations and engaged with and read about the non-human actors. To understand sustainable forestry behavior from multiple perspectives, we interviewed individuals representing educational organizations such as NC Cooperative Extension Forestry and NC State University; related industries such as Whitfield Forestry Consultants and Weyerhaeuser, Currie & Co. Contractors, Inc.; government groups such as USDA-NRCS and NC Forest Service; and nonprofit organizations such as the Nature Conservancy, American Forest Foundation, and NC Tree Farm. We also interviewed people from a range of roles: executive directors, professors, consultants, timber managers and buyers, forest rangers, and directors. We interviewed and observed family forest landowners who had farmed the coastal plains and piedmont regions of North Carolina for only 5 years and others who had over 20 years of farming experience. Data collection occurred over a multi-year period: from December 2014 to May 2015, the first author interviewed 11 forestry professionals and conducted place-based interviews and observations with five forest owners. Due to a lack of resources, we paused the research until new resources became available in July 2021, when the second author conducted interviews with three forestry professionals and one forest owner. Upon comparison of the new data set with the original, we identified the same prominent themes in both; this ensured the continued relevance of the original data set.

Then, we engaged in thematic coding of data using the grounded theory methodology, whereby we coded and grouped data until we reached overarching thematic groups (Glaser & Strauss, 2017). We then used these thematic groups—as well

Table 1. Human and Non-Human Actors

Human Actors	
-- Category --	-- Actors within Category --
Academic	NC Cooperative Extension
Government	NC Department of Agriculture NC Forest Service Soil and Water Conservation District USDA Farm Services Agency
Non-Profit	Nature Conservancy NC Forestry Association NC Wildlife Habitat Foundation Woodland Owners Association
Peers	Family Friends Neighbors Other forest owners
Service Providers	Consulting Foresters Developers Herbicide Applicators Loggers Tax Advisors Tree Planters Timber Company/Buyers
Non-Human Actors	
-- Category --	-- Actors within Category --
Eco-system	Soil Trees Water Wildlife
Personal Capacity	Knowledge Money/ Tax Programs/ Cost Shares Time
Recreational/ Cultural Spaces	Fishing holes Garden plots Hiking trails Hunting grounds
Information	Educational events Fact sheets Timber Markets Websites
Equipment	All-Terrain Vehicle Bushhog Chainsaw Computer GPS Management plan Sprayer

Note. This table lists some of the most cited actors out of 75 total actors from our Actor Diagram (Fig 1), organized by category in alphabetical order. We bolded the actors mentioned by interviewees as most influential (shown in Fig 1 with large, red font).

as respondent quotations—to present stakeholder-derived segmentation descriptions and recommendations, available in our results and discussion section.

FINDINGS AND DISCUSSION

SEGMENTS

As shown in the questions we asked in our interviews (see Appendices A and B), we asked interviewees to segment family forest landowners by describing their goals and challenges as well as the support they need to enact sustainable practices on their land. This open-ended inquiry process led to the following segmentations and recommendations:

Unengaged Landowners

The unengaged landowners segment does not engage in sustainable forestry practices on their land; often, they don't even know much about the land. They often don't live on the land, or if they do live on the land, they have never walked the full property. They do not actively seek ways to manage forest health. It may take three to five attempts to contact members of this segment before they act on recommendations.

To overcome the barriers outlined in Table 2, behavioral interventions for this segment should occur at critical decision-making points, such as when they: (a) purchase the land; (b) experience large scale destruction of their land by weather, insects, or disease; or (c) experience legal situations such as the need to renew their Present-Use Value Program status to lower land taxes. To engage landowners at critical decision-making points, Extension agents can request notification for land purchases and tax renewals in their area and develop a list of contacts with highly-engaged landowners when surrounding lands experience destruction. This communication should provide information and contacts to help unengaged landowners overcome the barriers listed in Table 2.

Semi-Engaged Landowners

The segment of semi-engaged landowners has an interest in and may engage in some sustainable forestry practices on their land. For example, several times a year they will research and/or attempt to foster a healthy ecosystem and/or manage their forest's health. Semi-engaged landowners may feel they can complete recommendations on their own; however, they may not understand all the components of the recommended processes and, thus, need additional follow-up from Extension agents. They tend to engage in occasional recreation on their land, such as hiking or bird watching.

To overcome the barriers outlined in Table 2, behavioral interventions for this segment should occur as soon as they indicate interest in sustainable forestry; these initial interventions should continue with follow-ups. Extension agents can capture this segment's contact information at points of interest such as: (a) Extension websites (prominently placing "join email listserv" buttons and requiring an email to download pdfs), (b) trainings and workshops, (c) community members, including highly-engaged landowners, local city/county agencies, and area nonprofits who may receive initial inquiries from this population.

Upon contacting an individual, the agent can help them to identify their goals, needs, and support network. Ideally, this follow-up will lead to an on-site visit where the agent can help the semi-engaged landowner overcome self-identified barriers to action (outlined in Table 2). From there, subsequent quarterly one-on-one follow-ups will afford sufficient contact and time to process and implement the new information. Additionally, it's important to invite and involve semi-engaged landowners in workshops and mentoring opportunities with highly-engaged landowners.

Highly-Engaged Landowners

This segment is very interested in and often engages in sustainable forestry practices on their land. They typically reside on their land, and they often know the land's history.

Table 2. Barriers to Sustainable Forestry Engagement

Barrier	Unengaged	Semi-Engaged	Highly-Engaged
Setting Goals	Unsure of their goals or how management practices could help them achieve goals	Unsure of which goals to start with based on their land's ecosystem	Unsure of which management plan goals to enact based on current land needs and their personal resources
Garnering Assistance	Unsure who could help them determine their goals and next steps to achieve them	Unsure where to find people to help them prioritize their goals and evaluate their land	Unsure how to involve/ negotiate family needs/interest (e.g. estate planning or family labor in land management)
Accessing Resources	-	Lack of time to research options or engage in land management	Challenge to find resources, tools, and trustworthy people at a price they can afford to manage land, as well as the time and money to implement their management plan goals

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For example, at least once a month or more they will research and/or employ sustainability practices to foster a healthy ecosystem and/or manage their forest's health. Highly-engaged landowners typically only need one or two sessions to understand and start implementing sustainability practices. They regularly engage in recreation on their land, such as hiking or hunting.

To overcome the barriers outlined in Table 2, behavioral interventions for this segment should occur via check-in emails and involvement in educational events—for example, sending a quarterly newsletter that covers a topic of interest and includes contact information for experts and peer family forest landowners who have experience in that topic. Agents can survey their contacts for potential topics or start with the lists in Tables 3 and 4. Additionally, this audience would respond well to yearly, personal emails or phone calls inquiring about their successes and challenges. Finally, by involving this segment in the production of educational initiatives, agents can help them further solidify their knowledge and increase their motivation through sharing

their experiences with the community. Highly-engaged landowners often find that by sharing their experiences and helping others overcome their challenges, they, too gain new insights into their own challenges.

Some examples of involvement with educational initiatives include: (a) developing networking/workshop type events specifically for highly-engaged landowners, during which they can help one another and receive help from experts to overcome their barriers to sustainable forestry (see Table 2); (b) asking highly-engaged landowners to speak about their experiences or present on a topic of interest at events for semi-engaged landowners; and (c) providing highly-engaged landowners with resources that enable them to mentor neighbors (particularly in the semi-engaged segment).

MOTIVATIONS & INTERESTS

Throughout our interviews and observations, we discovered what motivated landowners to engage in sustainable forestry practices and what topics interest them. Our data shows that

Table 3. Motivations for Sustainable Forestry

	Motivation (Percent of respondents who identified with the construct)	Motivation Description	Participant Quotes
1	Sharing the land with others now and in the future (90%)	sharing the land with family, friends, and community members through campfires and educational outings	“Enjoying the success of a deer harvest and sharing that with others” - landowner “This is a family legacy. I want my children's daughters and granddaughters to have the same experience and opportunity to experience nature as they did.” - landowner
2	Stewarding the land (81%)	understanding how to create a healthy and diverse ecosystem with consideration to their land's unique soil, drainage, and micro-climate	“A lot of people take pride in how their woodland looks...it's their enjoyment of it, their enjoyment throughout time, seeing their crop grow, enjoying managing things to get to grow like they want it to.” – forest professional “At the beginning, they aspire to stay out of trouble or get something done they don't like. After explaining the process...why you thin or clear cut and how it benefits the forest timber and wildlife...they become concerned about the management of their property, not wasting resources or tearing the land up...they can't tell you that in the beginning.” – forest professional
3	Enjoying the land (81%)	explicit emotional response participants associated with engaging in sustainable forestry	“This is a labor of love...I really enjoy tree farming.” - landowner “I really enjoy getting endangered species here, such as the Red Cockaded Woodpeckers.” - landowner “Enjoying the time on the land, such as recreation, hunting, and family time.” - landowner
4	Financial investment (63%)	current and future opportunities for income generation, ranging from hunting leases to the sale of forest products, such as pine needles (e.g. mulch), mushrooms, and lumber	“I see the land and forest as an investment for my family and for visiting families' enjoyment.” - landowner “This land is my nest egg and will also serve as college funds.” - landowner

Note. Motivations listed in order of importance as indicated by participants.

no one segment demonstrated a specific set of motivations or topics of primary interest, but rather, each individual’s motives and interests tended to fall within similar categories at varying levels.

Tables 3 and 4 discuss these motivations and interests in order of importance, as indicated by interviewees. Agents can use this information to structure further interviews and surveys.

PIVOTAL INFLUENCER

Across our data, the level of social support given to landowners appeared to be the most influential factor to their engagement in sustainable forestry practices. Seventy-nine percent of respondents explained that family forest landowners learned the most by interacting with others, especially if this interaction took place in person and on the land. Participants said that meeting on the land supported

Table 4. Resource Topics Supporting Sustainable Forestry Practices

	Topics (Percent of respondents who identified with the construct)	Topic Description	Participant Quotes
1	Financial viability (75%)	identifying ways they could reduce the financial burden of land management (e.g. cost-shares and tax structures) and increase financial profitability of the land (e.g. hunting leases and timber sales)	<p>“They come to us for financial help. Typically, they want to know what we can or cannot provide... but I’d rather know what they want and try to make that happen. Unfortunately, from what I see, forest management depends largely on what they can get financial assistance to actually do.” – forest professional</p> <p>“Management of the land is not cheap, and it is not something you can do overnight. What I tell them is that the money goes along with what you get done on your property and you have to choose what is important - looks or money.” – forest professional</p>
2	Goal and resource-driven management (64%)	ways to work through and simplify the complex process of identifying goals for the land, finding the resources and people to help them manage the land, staying on track with their management plan, understanding the effects of specific management decisions, and identifying ways to share the land with others (e.g. estate planning and community engagement).	<p>“They wrote a plan, but they don’t understand a word of the plan—even if it is explained to them. I tell them ‘don’t get frustrated, take your time.’ They have a lot on their mind, time or money constraints, and sometimes they just have to do what they can and it is our job to help them to understand what they need to do.” – forest professional</p> <p>“I get them into the mindset of looking at the whole picture, not just forestry...so that they are aware of what they’re doing, how it aligns with their end goal, and who can help them.” – forest professional</p>
3	Maintaining a healthy and diverse ecosystem (45%)	understanding how to create, maintain, and protect the ecosystem, as well as finding the time and resources to do so	<p>“I also try to protect certain trees because I want to maintain the diversity I have here.” - landowner</p> <p>“Sometimes they’ll say, ‘whatever the stand needs... tell me what I need to do.’ We can tell them the health of the stand and help manage... but sometimes the age of a tree is different than the financial age and that makes a difference in management... so management is also about trying to learn the landowner and their intent.” – forestry professional</p>
4	Protection from extreme weather events (33%)	preparing for and managing their land to prevent losses from extreme weather, such as fires, ice storms, and hurricanes; as well as losses sustained both financially and within the ecosystem	<p>“Fires used to really worry me but now I manage fires so I know that a fire will not destroy my forest.” - landowner</p> <p>“We suffered after the recent hurricane...a lot of trees went down. We also have a problem with ice storms because they can break the tops of the trees off.” - landowner</p>

Note. Topics listed in order of importance as indicated by participants.

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discussion of landowners' goals within the context in which foresters could manifest those goals.

For example, seeing and discussing soil quality, drainage possibilities, and historical sites at the same time meant the family could develop a management plan that fit their needs and the needs of the land. Besides one-on-one engagements, participants also mentioned the importance of in-person demonstrations, workshops, association meetings, and tours of other people's land to learn their management practices. One landowner said that "the most I learned was from inviting experts in everything to come to my land and tell me how to care for it—this included experts in soil, air, wildlife, anyone I could get here."

Another shared:

I learned from an old forestry ranger. He was very knowledgeable. I would credit him a lot for being a good mentor. He helped me a lot when I first got started. The tours on other people's farms and the networking helped too.

Participants said their support networks consist of forestry experts, mentors, friends, and family members. They explained that social engagement with their network not only provided valuable information, but that these people also inspired and motivated them to engage with their forest ($r=57\%$).

Seventy-two percent of landowners said that trust in a person directly impacts whether they would reach out to that person and consider following their recommendations. Landowners stated that their most influential relationships started because the other person expressed genuine curiosity in their goals. Both landowners and professionals explained that the delicate process of building trust starts by asking questions and listening. This process helped landowners define their goals and enabled experts to offer suggestions that met those goals within the context of the land and available resources. One professional stated that:

Since many of our foresters are from the area, they can make a connection with the landowner because they know somebody or they had somebody from their family know that land. They'll say, 'Hey, you know so and so, my uncle, worked on your land.' They know the history of the area and that helps the landowner feel comfortable. This connection makes the conversation easier and the landowner is more likely to provide information. Also, they are more comfortable sharing that information in person than doing it over the phone. That is why our folks are successful in helping people because they have a connection.

Another said that "It is important to have that conversation with the landowner in person. It's a way to develop the relationship, more informal and allows the

conversation to evolve naturally...as opposed to when you are on the phone, time is constrained."

CONCLUSION

As many studies—including ours—show, segmentation helps to account for the diversity of landowners' goals by providing a guide with which to develop relevant education, communication, and delivery methods (e.g. Bardon et al., 2007 & 2023; Gust, et al., 2021; Kendra & Hull, 2005; Kittredge, 2004; Kuipers et al., 2015; Salmon et al., 2006). However, the way one approaches segmentation directly affects the types of segments created. For example, Kendra and Hull (2005) examined motivations to owning forest land, resulting in the segmentation of absentee investors, professionals, preservationists, young families, forest planners, and farmers. Kuipers et al. (2015) segmented according to demographics and management objectives and thus defined segments of multiple-objective, consumptive-use, naturalist, and recreationists landowners. Salmon et al. (2006) segmented based on land ownership benefits, resulting in the segments of amenity-focused, multiple-use benefit, and passive landowners. Our study segmented owners by the level to which they performed sustainable forestry practices on their land, which led to the segments of unengaged, semi-engaged, and highly engaged landowners.

When reading these studies, one can see how the types of segmentation result in differing recommendations for educating family forest landowners. Our study contributes to existing literature by uncovering the capacity of one's social network to influence motivation and ability to engage in sustainable forestry practices. We found that through a relational network, landowners learn sustainability practices, how to acquire resources to enact these practices, and how to pair their personal goals with the capacity of their land. For Extension agents looking to use the segmentation recommendations in this paper to prompt sustainable forestry practices, we encourage them to use the last two steps of the method, which include: (a) developing educational materials collaboratively with diverse stakeholders through participatory prototyping and (b) working with these stakeholders to spread the educational materials throughout their social network.

Through use of a participatory method, ADT (Typhina, 2017), we discovered that participants' stories contained similar components, yet each story also revealed unique elements of a bigger story. Through interviews and in-situ observations, new puzzle pieces emerged and created a clearer understanding of how to tailor educational materials to increase the sustainability practices of family forest landowners. Therefore, we recommend that Extension agents continue testing the ADT method with other audiences and topics to uncover how to best communicate to each group.

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APPENDIX A

INTERVIEW PROTOCOL FOR FORESTRY PROFESSIONALS

Land Management Assistance

1. Tell me about your most recent experience helping a family forest landowner on their land.
2. Tell me about your most recent experience helping a family forest landowner on the phone or via email.
3. Show [tell] me about the educational materials you typically use when helping families learn sustainable land management practices.
4. What do you think are the most important things to tell family forest landowners about managing their forest?

Landowner Profiles

5. What typically concerns forest owners when it comes to managing their forested land?
6. What do forest owners aspire toward when it comes to managing their forested land?
7. How would you describe the different types of family forest landowners (i.e. unengaged, semi-engaged, and highly-engaged)?

Network of Influence

8. This is a diagram with various people and things families may use to manage their forested land, please use this pen to

- a. add or delete influential people or things families use to manage their forest
- b. circle the most influential people or things families use to manage their forest

9. Please describe the changes you made to the diagram

APPENDIX B

INTERVIEW PROTOCOL FOR FAMILY FOREST LANDOWNERS

Management Practices

1. Tell/show me about your most recent experience working on your forested land.
2. Tell me about something you have recently done for your forested land, while not on your land.

Landowner Profile

3. Would you describe yourself as unengaged, semi-engaged, or highly engaged in the management of your forest? Explain why.
4. Where or from whom have you learned the most about forest management practices?
5. How did you first get started in forest land management practices?
6. What are some things that concern you about managing your forested land?
7. What are some things that you aspire to manage on your forested land?

Network of Influence

8. This is a diagram with various people and things families may use to manage their forested land, please use this pen to
 - a. add or delete influential people or things to managing your forest
 - b. circle the most influential people or things to managing your forest
9. Please describe the changes you made to the diagram